Literature review

Medical education and post pandemic challenges: where are we now?

Educação médica e desafios pós-pandemia: onde estamos agora?

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ABSTRACT | INTRODUCTION: The COVID-19 pandemic was a shifting point regarding many aspects. Medical education was heavily impacted by this worldwide phenomenon, and nowadays, as it tries to recover from those hard times and go "back to normal", it is faced with new issues and challenges as neither students nor teachers are the same as before. However, both issues and challenges present as opportunities for improvement, and creative solutions are encouraged. **OBJECTIVE:** The authors aim to present an overview of post-pandemic challenges in medical education and possible solutions and resources. **METHODS:** A bibliographic search was carried out in online databases such as ERIC (Education Resources Information Center), LILACS, PubMed, and Google Scholar using MeSH terminology keywords. Articles that best correlated with the objective were selected to be presented in a narrative review. **RESULTS:** The use of Information and Communication Technologies (ICT), the change in teaching methodologies, and the mental health and soft-skills impact of the pandemic are some of the main issues that medical education is facing after COVID-19. Emerging tools may be useful for both teachers and students to face such matters. **CONCLUSION:** The COVID-19 pandemic created new challenges for both students and educators, not only on the technical and academic levels but also on the personal and emotional spheres. These challenges are presented as opportunities for improvement as we transition to post-pandemic times.

KEYWORDS: Medical Education. Information Technology. COVID-19.

RESUMO | INTRODUÇÃO: A pandemia de COVID-19 foi um ponto de inflexão em vários aspectos. A educação médica foi fortemente impactada por esse fenômeno mundial e, hoje, enquanto tenta se recuperar desses tempos difíceis e "voltar ao normal", se enfrenta com novas questões e desafios, pois nem os alunos, nem os professores são os mesmos de antes. No entanto, tanto os problemas quanto os desafios se apresentam como oportunidades de melhoria, e as soluções criativas são incentivadas. **OBJETIVO:** Os autores pretendem apresentar uma visão geral dos desafios pós-pandêmicos na educação médica e possíveis soluções e recursos. **MÉTODOS:** Foi realizada uma pesquisa bibliográfica em bases de dados online como ERIC (Education Resources Information Center), LILACS, PubMed e Google Scholar usando palavras-chave da terminologia MeSH. Os artigos que melhor se correlacionaram com o objetivo foram selecionados para serem apresentados em uma revisão narrativa. **RESULTADOS:** A utilização das Tecnologias de Informação e Comunicação (TIC), a mudança das metodologias de ensino, o impacto da pandemia na saúde mental e nas competências transversais são alguns dos principais problemas que a educação médica enfrenta após a COVID-19. Ferramentas emergentes podem ser úteis tanto para professores quanto para alunos no enfrentamento dessas questões. **CONCLUSÃO:** A pandemia de COVID-19 criou desafios tanto para os alunos quanto para os educadores, não apenas no nível técnico e acadêmico, mas também no âmbito pessoal e emocional. Esses desafios são apresentados como oportunidades de melhoria à medida que fazemos a transição para tempos pós-pandêmicos.

PALAVRAS-CHAVE: Educação médica. Tecnologia de Informação. COVID-19.

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Introduction

Even though this may vary in other countries, in Colombia, under the regulations of the Colombian Ministry of Education, medical undergraduate programs include two professional development cycles: first, a preclinical one, in which students take virtual or in-person classes and laboratory practices; then a clinical one, in which the student goes to health centers and hospitals for direct interaction with patients. This second cycle is marked by a teaching method where students acquire abilities together with a tutor physician. Colombia's regulatory entity also determines that medical undergraduate programs and medical-surgical specializations are only allowed a 20% virtual component on their curricula, to ensure the acquisition of practical in-person skills and abilities.[1,2]

Medical education should not be limited to an acritical and mechanical human resources production chain; the COVID-19 pandemic revealed that healthcare systems must transform to act in environments where people interact with each other and their surroundings on a daily basis.[3]

The extensive incursion of Information and Communication Technologies (ICT) in educational systems became essential and irreplaceable for teaching after the pandemic. Virtual interactions can serve as an introduction to the inevitable future of telemedicine. The pandemic led to the implementation of multiple technologies since Higher Education Institutions had to develop support strategies in digital formats to continue with their academic processes. An example of this is the pandemic increase in Collaborative International Online Learning (COIL) methodology application. COIL uses a "Mirror Classroom" strategy, where two or more teachers and students from different educational institutions can share a course using technological tools.[2,4,5]

Institutional leadership is determining for medical education to be able to face both internal and external challenges with aims to the third decade of the 21st century.[6] In this article, the authors aim to present an overview of post-pandemic challenges in medical education and possible solutions and resources.

Methods

For this review, a bibliographic search was carried out in online databases such as ERIC (Education Resources Information Center), LILACS, PubMed, and Google Scholar. Search keywords included MeSH terminology such as "Medical Education", "Information Technology" and "COVID-19". After identifying the articles of interest, a critical reading of the titles, abstracts, keywords, and full texts was carried out to select those that best correlated with the objective of the review, thus delimiting a significant final sample, including publications between the years 2012 to 2023.

Pandemic's impact on education

The COVID-19 pandemic has led to an unforeseen acceleration for the digital transformation of university teaching, which had an irreversible impact on medical education, making it necessary to speed up active transformations toward curricular innovations based on acquired capacities, to implement new assessment formats and standardized tests through ICT.[3,4,7,8]

Enhancing creativity, flexibility, and assertiveness is a must, as well as relaunching education's social mission and interprofessional education in our institutions.[3]

Globally, some challenges for medical education have been put forward, such as: improving the quality and effectiveness of healthcare providers, adjusting social priorities, and redefining health professionals' roles.[9,10]

Due to ICT incorporation into teaching-learning processes, new cognitive processes are developing, which are different from those reinforced by traditional formative procedures. See Table 1.[4]

Table 1. Online activities that may strengthen teaching[10,11]

Flipped classroom
Small groups interactions
Laboratories
Simulation
Clinical training on standardized patients

Source: the authors (2023).

It is important that these challenges do not leave behind the four key learning elements proposed by United Nations Educational, Scientific and Cultural Organization (UNESCO) for education in the 21st century: learning to know, learning to do, learning to be, and learning to live together.[8,12]

The high emotional value of the situation created by the pandemic is to be considered, as a successful educational proposal is difficult to achieve if students' emotions and their pandemic-derived experiences are not considered. Professors must implement flexibility, responsibility, empathy, and solidarity into their teaching practices. In a study carried out by Varela et al.[13] in Medellín (Colombia), it was highlighted that teaching and learning processes that used ICTs amid the pandemic considered the students' opinions, noting that: "All the tools that have been demonstrated during this pandemic have been very positive. The University has somehow thought about the student's needs and has tried to solve them" (S10), and in the study by Santos et al.[14], carried out in the Dominican Republic, one of the students affirms that: "I feel good since it is a good method that they have incorporated so that students do not lose the semester due to this pandemic that is affecting us".[8]

Even though hybrid educational programs have been promoted, combining the advantages of synchronic and non-synchronic online teaching (see Table 2), completely replacing educational plans with an online model was a big challenge for both teachers and students during COVID-19. In addition, Internet accessibility can be limited by socioeconomic factors, and the public or private origin of funding for academic institutions can generate variations on the resources available to develop good teaching-learning processes.[15]

Table 2. Advantages of synchronic and non-synchronic online medical education[16]

Online Education	Advantages
Synchronic	- Greater accessibility - Tools to record lectures - Money, time, and energy saved on transportation - Greater autonomy - Remote discussion sessions - Easy to reschedule
Non-synchronic	- Unlimited access to Webinars and recorded lectures - Flexibility to do activities at their own desired pace - Greater participation through communication alternatives - Greater use of various didactical tools

Source: the authors (2023).

Post pandemic findings

The arrival of ICT in learning areas came with a big shift in both teaching processes by professors and learning processes by students. As mentioned before, the pandemic raised many challenges that involved cultural, relationship, and lifestyle changes, modifying the way people interact, think, and act. It was an unexpected moment of adaptation for everyone.

Regarding teachers and administrative personnel, it was an unforeseen shift in their processes — despite universities already slowly implementing virtuality strategies (such as online platforms and simulation spaces), these require specific competencies, abilities, and resources related to the use of technologies. However, with the drastic and unpredicted arrival of the pandemic, all personnel was forced to set challenges without previous planning, adapting from one day to another to a new way of working. This strengthened the handling and use of technological resources, devices, tools, learning platforms, and didactic methodologies that allowed educators to continue their teaching processes. Some emerging educational ICT tools are presented in Table 3.[13]

Table 3. Emerging educational tools[15,17-22]

Platforms for synchronic lectures, academic sessions, conferences, clinical case discussions, and journal clubs.	- Zoom - Cisco Webex - Microsoft Teams - Skype - GoToMeeting - Google Meet
Cloud file managers	- Google Drive - Trello - Box
Podcasts and Social Networks	- Facebook - Twitter - Instagram - YouTube
Online evaluations and tests	- Google Forms - Microsoft Forms - Socrative - Vizia - Edpuzzle - Pear Deck - Kahoot - Quizziz - Poll everywhere - iSpring - Mentimeter - Nearpod

Source: the authors (2023).

It is relevant to highlight that, for universities' administrative personnel, the implementation of ICT as a learning tool came with time and money savings, as well as a shortcut to some processes. Particularly in our case (as our university is engaged in ecological and environmental efforts), it also helped reduce paper waste — the use of e-mail and digital platforms allowed students to take exams on their own devices and present academic essays and workshops "paper-free". On the other hand, it also challenged work models, making administrative personnel analyze which positions and courses could continue on a mixed online and in-person basis or completely online.[16]

From the students' perspective, it was also a drastic change with huge challenges, not only the pandemic presented a challenge but coming back to college life after a couple of years of "comfortable" home education too. This left a mark in everyone's lives, pressing them to adapt to a new routine, to the requirements of in-person lectures, and to form new relationships with their classmates, which, in some cases, they have only met through a screen. Before the pandemic, younger generations used technology mainly as entertainment, now it has become a fundamental tool in learning, and it planted a seed of autonomy in the student's own formative process.

In addition, after the pandemic personal relationships bounced back, as being on campus allowed students to develop a sense of community and support that was difficult to maintain online. They became closer to their teachers, to the lectures, and, above all, they became more emphatic, as they needed to feel the importance of their personal and professional lives to others.[16] Therefore, individual and regular interactions between students and professors are paramount, even on virtual environments, as adapting is a difficult process whose weight can be lightened when students feel that they matter, giving them more chances to be successful in their educational career paths by creating a community of knowledge, especially on the medical field where empathy is fundamental not only with colleagues but also with patients.

Currently, in our university's experience, in-person attendance is mandatory for the first four semesters of medical school (preclinical cycle); however, the clinical cycle is more flexible, where clinical practices are prioritized over in-person lectures, allowing a "tele-presential" modality taking in consideration the time it takes for students to go from out-of-campus hospitals to the classroom. Nevertheless, clinical practices and lectures may overlap on some schedules, which interferes with the learning process, forcing some students to study the contents only to pass the exams and not for the long term, affecting their clinical abilities with patients, who are the ultimate test for a doctor's knowledge, as well as their grades on cycle evaluations and the way they relate with professors as figures of authority.[15]

Main issues on post-pandemic education

Amongst the issues found after coming back to educational environments after the pandemic and taking an integral approach to the different spheres of human beings, mood changes in both students and professors are of utmost importance. After the lockdown, in which social interaction was limited to people in the same household, going back to classrooms with strangers as classmates, developing meaningful friendships and a sense of community became difficult. In many of the students, depressive and anxious symptoms raised and were exacerbated by their first in-person exams, presentations, and, in many cases, their first interactions with patients.

Apart from that, respect for professors and doctors as authority figures decreased, as many students do not hold their educators on the same place as before the pandemic. Respect is fundamental not only for daily life interactions but especially for doctor-patient relations. Throughout medical school, teachers and doctors emphasize this value but, the barrier created by the pandemic made this difficult. Everyone deserves respect, but some students became oversensitive, and some teachers would rather not act as authority figures and are too flexible due to the aftermath of the pandemic.

It is not a secret that for students matching up with a new routine of leaving home early to go to class may be difficult, as they now spend more time on campus

and times when they could take quick naps at home between classes are now gone. This means adapting to new study and learning methods; to get the results they expect they must take greater responsibilities. This is especially problematic for those who became used to study on their own at home. Furthermore, knowledge became momentary, seeking short-term results ("good grades") rather than long-term abilities developed for patient care. Some even went to extremes, such as cheating to get good grades, which affects the quality of healthcare. Due to momentary learning, some students solely and exclusively prepare for the exam and not for real-life situations; they are not able to develop solid foundations, and thus, theoretical and practical integration becomes complicated since arriving to a patient setting without quality academic foundations does not contribute to developing an efficient practice. In the future, such students will not know how to adequately treat their patients.

All these issues and changes in sociocultural habits and communication on medical education are having psychological and mental consequences, affecting people's well-being.[4]

Possible solutions

To confront the issues found when coming back to academic life after the COVID-19 pandemic, implementing a reflexive and solidary pedagogy is proposed, making medical sciences curricula more flexible. Due to the academic contents of medical areas, what happened during the pandemic can be analyzed from a social perspective to facilitate lectures without losing the essence of each course, as it shall remain, because it allows students to access knowledge, understand it, and evaluate the importance of social systems and economic developments on health maintenance and disease prevention. From now on, classes should propitiate a more humanized approach to professional development so graduates can answer socio-economical needs and, at the same time, be able to face daily challenges with empathy; classes should allow students to Learn to Be.

Another element to highlight is that reclaiming daily life after the multiple changes that arose from the pandemic is an individually challenging situation, especially on the emotional level, which can make it hard for educational proposals to be successful if students' emotions and lived situations are not considered, that is, teachers must try to understand a bit each of their students' realities. Also, students should retake values as honesty and value each opportunity and the effort teachers put into their academic programs. Teachers should increase academic demand and not only evaluate students based on standardized tests but also on soft skills such as patient-doctor relations.[23]

In this new landscape, professors' voices shall guide a hopeful society into a flexible, responsible, empathic, and solidary process of academic and professional development. As many times before, an adverse situation can be a starting point and an opportunity to change things for the better, to create alternate solutions, in this case, to improve medical education.[8]

Conclusions

In conclusion, the COVID-19 pandemic created new challenges for both students and educators, not only on the technical and academic levels but also on the personal and emotional spheres. With new challenges come new opportunities, therefore, the issues of coming back to classrooms and campuses should be faced with creative solutions that tailor those issues but also take into consideration everything we learned from the pandemic. Also, soft skills cannot be forgotten, as they are of utmost importance in a field as medical education.

However, individual variations on socioeconomic, emotional, and academic factors present as a limitation for this review: each country faced COVID-19 in different ways, and many Education Institutions had divergent approaches, depending on resources and students' possibilities to enroll with online methodologies.

Authors' contributions

Estrada VV participated in the bibliographic search, made significant contributions, and participated in the writing and review of the manuscript. Martínez AH worked on the conception of the idea, conducted a bibliographic search, made significant contributions, and participated in the writing and revision of the manuscript. Sánchez LMM participated in the conception of the work, bibliographic search and made significant contributions to the writing and correction of the manuscript. All authors reviewed and approved the final version and agreed to its publication.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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