Covid-19 induced innovation in the training of healthcare professional

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Abstract

COVID-19 has been a major challenge for the healthcare sector, but also an opportunity for innovation and learning. The training and education of healthcare professionals during viral epidemics are crucial to ensure their safety, competence, and confidence. These advancements carry the capacity to enhance the quality and effectiveness of healthcare provision, not solely within the timeframe of the pandemic but also in the future. Published data on the training of healthcare professionals were obtained and reviewed to produce this article. The review analyses the various innovations that were implemented in the education and training of healthcare practitioners amidst the COVID-19 crisis. The COVID-19 pandemic has globally amplified the utilization of information technology in education. The restricted physical entry to educational and medical institutions prompted a sudden increase in the utilization of digital technologies to address the learning needs of students in various healthcare fields. During the COVID-19 pandemic, healthcare professionals witnessed several significant changes in their training. In conclusion, the COVID-19 pandemic has acted as a powerful catalyst for innovation in the training of healthcare professionals. Here are the key takeaways: adaptive solutions, remote monitoring, embracing innovation, collaboration and research and resilience and adaptability. As we move forward, these innovations will continue to shape healthcare education, ensuring that professionals are well-prepared to face future challenges.

Keywords: COVID-19, innovation, healthcare professional, pandemic and education

Introduction

The declaration of the COVID-19 pandemic by the World Health Organization on 11 March 2020 had a profound impact on global economies, societies, and healthcare infrastructures [1]. Pharmaceutical companies were under pressure to develop vaccines quickly, in addition to overseeing complicated supply chains, implementing innovative methods to interact with healthcare professionals, managing a predominantly remote workforce, and addressing challenges to various clinical trials [2]. Hospitals also delivered healthcare services to individuals with COVID-19, all the while maintaining the provision of care to other patients, often encountering challenges such as staff members at risk, shortages of equipment and supplies and in certain cases, worsening financial limitations [3,4]. Another key disruption that has not been given much reportage is healthcare professional training. Educators had to find efficient ways to deliver training, teaching, and practical sessions.

To address the challenges presented by the COVID-19 pandemic, this study aims to systematically examine and analyse the innovative approaches adopted in the training of healthcare professionals.

Evidence in Context

• COVID-19 hastened the integration of digital technologies for remote healthcare training. • Virtual simulations and online platforms facilitated continuous education during disruptions. • Online courses and webinars became essential for accessible, updated medical training. • Shifts to online assessments and examinations ensured uninterrupted evaluations. • Emphasis on virtual counseling and telehealth supported trainees' mental well-being.

To view Article

Training healthcare professionals was important during the pandemic and ensuring continuous workforce supply for future services. In the 2010s, the early integration of technology into classroom education utilised multimedia platforms such as Prezi, computer-aided instruction, electronic audience feedback systems like iClicker, and real-time polling systems such as Poll Everywhere [3]. Since that period, there have always been calls to transition from traditional face-to-face teaching and learning to online due to increasing technological innovation. The COVID-19 pandemic has provoked a sense of urgency to expedite the process of transition. The utilization of E-learning as an instructional strategy in medical education has proven to be effective [3]. It has shown that healthcare professionals may improve their academic performance if a blend of traditional and E-learning is adopted [5]. During the pandemic, medical schools and other healthcare training colleges and universities had to quickly adapt to new strategies, such as using online and virtual platforms to ensure the safety of the students, trainers and patients while ensuring the quality of education is maintained under the numerous constraints caused by the COVID-19 pandemic [6,7]. This shift from traditional in-person teaching to innovations brought challenges, such as limited access to hands-on practical and clinical experiences. Again, the shift harmed the development of good communication skills, as effective communication is required for interaction between students, faculty members, patients and other health professionals [8,9]. Despite these changes, COVID-19 brought to light an opportunity for innovation in medical education by introducing new technologies and more flexible modes of teaching and learning. Adapting to the new normal, thus online and virtual platforms, faced many challenges. Significant challenges include adaptation to the online system due to a complete overhaul of the traditional teaching method. The conflict within the student body due to the absence of in-person communication with peers and academic staff had a detrimental effect on their enthusiasm and involvement [10-12]. Again, access to advanced technological hardware and reliable internet connections posed a big threat to adapting to the new teaching and learning system [13-15]. This literature review examines the innovative measures implemented to ensure the ongoing training of healthcare professionals and the continuous development of their professional skills.

Methods

Published data on the training of healthcare professionals were obtained and reviewed to produce this article. Popular databases were utilized to find important literature regarding the subject matter and to compile existing scholarly works from relevant journals. Articles were retrieved from various platforms such as Google Scholar, PubMed, and Research Gate.

Search terms were derived from the subject and goals of this current study. Using Boolean Operators like "AND" and "OR" some of the keywords used to form search terms were; innovations, healthcare professionals, training, models, virtual stimulations, artificial intelligence and education. The search terms were used both individually and in combinations to retrieve articles. All articles meeting the inclusion criteria were thoroughly reviewed to identify significant information for the present study and included in the written analysis.

Inclusion and exclusion criteria

Inclusion criteria

The articles utilized in the research were chosen for assessment based on predetermined selection criteria:

01. Original qualitative, quantitative, or mixed-method studies.

02. Study period 2019 to 2023.

03. Language of articles: English

04. Peer-reviewed

05. Full-text articles

Exclusion criteria

The criteria for exclusion of articles were:

01. Articles with no accessible content, either in print or electronic format.

02. All publications that are not peer-reviewed

01. Commentaries

02. Articles that are not written in English.

The review analyses the various innovations that were adopted in the training of healthcare professionals during the COVID-19 pandemic.

Results

The COVID-19 pandemic has globally amplified the utilisation of information technology in education. The limited physical access to classrooms and healthcare facilities triggered an immediate surge in the adoption of digital platforms to cater to the educational requirements of students across all healthcare disciplines [11,16].

Virtual simulations

Virtual simulations played a crucial role in medical education during the COVID-19 era [17]. It allowed students to continue learning remotely during COVID-19, where traditional in-person education was disrupted. They provided an alternative to hands-on experience when access to physical laboratories was unavailable. Virtual simulation has been extensively integrated into training curricula for nursing, emergency and paediatric emergency medicine. It is also utilized for instructing fundamental medical sciences, medical radiation and imaging, as well as puncture or catheterization techniques. Moreover, virtual simulation is employed in interprofessional medical education and diverse case-based learning scenarios [18-20]. Simulation provides a safe and realistic learning environment across various patient-care settings, including inpatient care, emergency services, outpatient clinics, and home healthcare [21,22]. Simulation-based learning experiences play a vital role in amalgamating theoretical knowledge with practical applications, enabling individuals to acquire the essential skills required for autonomous practice [17,23].

Currently, 52% of healthcare studies focus on immersive virtual reality applications [21,24]. Students interacted with a virtual environment that simulated clinical scenarios, allowing them to practice skills and decision-making. Again, 360-degree medical simulation videos provided an immersive experience during COVID-19, where Advanced Life Support (ALS) simulations demonstrated how to salvage a cardiac arrest [3,23]. Virtual simulations replicated clinical scenarios where learners engaged interactively, integrating theoretical knowledge with practice [25]. Platforms like Medscape offered patient simulations covering diagnosis, treatment, and referral scenarios. Learners had the opportunity to view these scenarios on desktops, mobile devices, or VR headsets and make decisions from the comfort of their homes [21,25].

Medical SBL was shown to be very effective for acquiring clinical skills and aiding in the better care of patients [6,26]. Utilizing high-fidelity mannequins, standardized patients, and biological specimens, they endeavored to enhance the readiness of prospective medical practitioners in clinical training by imparting effective communication abilities, proficiency in medical interviewing, foundational clinical techniques, and the principles of surgical skills in a secure and iterative manner [27,28]. In the United States, the application of simulation-based stress testing for clinical systems was deployed to guide the formulation of management protocols for the COVID-19 pandemic [29]. The simulation training was offered to around 30,000 healthcare professionals across the province of Canada by the Alberta Health Service [22]. The Yale School of Medicine, situated in New Haven, CT, USA, pioneered an original curriculum that converted high-fidelity, mannequin-based simulation into an entirely virtual tele-simulation format [17]. Aligned with a renewed commitment to advancing health-professional education, a new simulation facility was introduced at Massachusetts General Hospital in Boston, MA, USA, to provide comprehensive training to health professionals on hospital operations [3].

Virtual stimulations were also used in surgical training programmes such as neurosurgery, thoracic surgery, plastic surgery, otolaryngology, orthopaedic surgery, and radiology [30] Some surgical training institutions were reported for the development of online procedural skills such as knot tying, suturing, and microsurgical skills [31,32]. Virtual game simulation modules were also used to strengthen nursing training as they educated trainees on COVID-19 assessment and personal protective equipment to provide care during the peak of the COVID-19 cases [33]. In educating nurses, simulated video consultations and interactive videos were used to replace existing clinical practicum sessions [34,35].

COVID-19 also changed anaesthesia training from a month of direct laryngoscopy and bag-mask ventilation to two weeks of simulation, video-laryngoscope intubation, and deep anaesthesia extubation to prevent coughing and droplets [8]. During the COVID-19 pandemic, many American universities extensively utilized Second Life along with the free virtual patient community created by the University of Southern California [21,36,37]. Currently, various human patient simulators and laparoscopic trainers are also available for purchase [25,38]. In China, a free website with many medical and teaching resources helps make medical education fairer [21].

Utilizing simulation-based learning provides students with exposure to ethically safe environments, effectively mitigating the risks associated with real patients or animals. This approach fosters a sense of safety among students, thereby reducing the fear of making errors and ultimately bolstering their confidence in applying their theoretical understanding [20]. It also aided the learners in developing professional knowledge, critical problem-solving skills, efficient clinical judgment and preparation, self-efficacy, satisfaction, and emotions [21]. In resources constrained environments, Simulation-Based Learning (SBL) may serve as a cost-efficient, secure, and readily available method for education and instruction. Furthermore, it has the potential to expand the scope for healthcare students to engage with both patients and animals, presenting a hopeful alternative [21,39]. The utilisation of virtual stimulation was impacted by a few issues, including the difficulty in obtaining virtual stimulation training materials, such as computer hardware and networks, the expense and availability of high-quality virtual reality gear, such as hand controllers and head-mounted displays, and the issue of "virtually induced motion sickness" [21,38].

Online Courses and Webinars

Online courses and webinars were crucial in training healthcare professionals during COVID-19. Online platforms enhance medical education by lowering the expenses of instructors and lab materials. Most healthcare educators resorted to online platforms to disseminate information and teach healthcare students. During the COVID-19 pandemic, there was a widespread increase in the use of CD/DVD or USB drives for self-study course materials, audio/video mini-lectures and specialised software for interactive online learning [9]. Educational institutions transitioned to online lectures, discussions and tutorials through individual institute-based platforms and commercial platforms like Zoom and Google [11,12]. In Ghana, the University for Development Studies moved to online classes via the institutional platform (UDS E-learning) during the lockdown [40] and continued with online teaching after the Ghanaian government eased the COVID-19 restrictions [41]. At University College London Medical School, tutors continued practical and clinical skills via an online platform, Blackboard collaborate. Students were taught various topics such as bladder catheterisation, intravenous drug administration, gloving and gowning, suturing, nasogastric tube insertion, basic and advanced life support and care of critically ill patients [42]. Fruits such as cucumbers, oranges and bananas were used as models for bladder catheterisation, injections and suturing respectively. Preparations for intravenous drug administration were made by inserting an intravenous cannula into kitchen sponges [42]. In Chile, first-year anaesthesia trainees were excluded from the clinical activity and continued their teaching solely online using platforms such as Zoom, Microsoft Teams, Google Meet [8,43] Panopto, and Canvas [37]. These online platforms were widely used for delivering lectures and assignments worldwide to ensure the continuation of academic activities. Various institutions transitioned to online classes during the lockdown in the Mediterranean region [24]. Various healthcare training institutions in the region provided online lectures, discussion forums, and webinars on COVID-19-related and related topics [24]. The use of online platforms such as Telegram and WhatsApp became very common. WhatsApp and Telegram groups were platforms where students, guided by their lecturer, engaged in learning activities. WhatsApp and Telegram groups aimed to facilitate the sharing of resources and enable discussions between students and lecturers. The creation and utilisation of these groups became popular due to their ease of use and accessibility from anywhere with a good internet connection [44]. Lecture materials were commonly circulated in PDF, Word, or PowerPoint form, with instructional content conveyed through audio recordings [45]. Interactions within the classroom were facilitated via the utilization of consistent groupings [44-46].

In Mexico, a digital distance-learning platform was successfully used to deliver an online curriculum to a large audience, including 8000 students, 18000 junior doctors, and 5000 staff members [47]. Various platforms such as Coursera, Udacity and edX created course content to teach healthcare students during the COVID-19 era [3]. Courses such as Introduction to Healthcare, Vital Signs:

Understanding What the Body Is Telling Us, The Business of Health Care, AI in Healthcare, Medical Billing and Coding Fundamentals were organised on the Coursera platform to educate professionals and learners about the healthcare system [10,13,28]. Free webinars such as PharmaCourses and MedTalks offered online seminars on various medical topics, including insulin pump therapy, heart failure, coronary artery diseases in diabetes mellitus patients, and atrial fibrillation [11]. The National Neuroscience Curriculum Initiative (NNCI) developed a "Quarantine Curriculum" for its members under quarantine during the COVID-19 era. The 14-day learning curriculum included self-study resources and interactive sessions aimed at empowering the members to participate and create virtual communities for other learners [30,48]. The online platforms facilitated real-time communication for lectures, discussions, and collaborative projects. Students could join these learning sessions remotely from any part of the world. The use of online platforms also allowed easy integration of guest lectures and expertise from professionals located anywhere. Slack and Google Teams supported teamwork, group projects, and collaborative learning. Collectively, these online learning platforms allowed easy sharing of resources, research, and collaborative documentation. Social media platforms such as WhatsApp and Telegram offer an easier and more cost-effective method of sharing information among students compared with other online platforms [44].

Online teaching faced many challenges during COVID-19. Zoom and Google Meet had security and privacy issues. Anyone with the meeting ID and password could join a session [28,49]. Long virtual sessions tired learners and reduced engagement [28]. Adapting to online platforms was difficult for some. Too much information was another drawback of online teaching [43].

Structural alterations

During the COVID-19 era, final examinations and assessments for many healthcare trainees stalled. However, the increased use of online platforms and technology led to the development of various platforms where students took examinations and assessments remotely from their homes. Most examinations were conducted online mainly using MCQs [50]. In the UK, computer-based written examinations and assessments with online proctoring and online-based interviews were used to conduct Vivas and examinations for graduating students [3,19,27]. Other institutions providing healthcare education have integrated open-book assessments to assess critical thinking competencies instead of rote memorization capabilities [51,52]. Some educational institutions had to modify their grading policies to accommodate the difficulties faced by students during the COVID-19 pandemic [53]. In the USA, most dental schools used the Lockdown browser to examine their students during the pandemic; the browser prevents students from searching on any search engine besides focusing on the examination [37]. These modifications facilitated medical education programs in upholding top-tier educational standards, with a focus on safeguarding the well-being of all parties involved. Some universities, however, cancelled all forms of examinations and assessments for healthcare trainees, prolonging the duration of student's stay in their respective programs of study [52].

Virtual Counselling to Support Trainee's Wellbeing

The pandemic of COVID-19 had a notable effect on the mental health and overall well-being of students, resulting in feelings of distress, disturbances in sleep patterns, anxiety, and symptoms of depression [54]. To address the mental health concerns of students during the COVID-19 pandemic, many healthcare training institutes provided support services to students. Two studies showed positive effects on mental health indicators like self-compassion, perceived stress, cognitive skill use, and mindfulness, but did not improve depression, anxiety, and burnout [55]. Another study tested a cognitive behavioural therapy program on medical students in Palestine during the COVID-19 pandemic, reporting better mental health outcomes after eight weeks of treatment [56]. Existing evidence suggests that virtual counselling may enhance mental health outcomes for medical students, but more robust and long-term studies are needed to verify its effectiveness and feasibility. The use of virtual counseling may not be appropriate for all medical students, as some may need or prefer in-person support, or may encounter difficulties such as lack of privacy, technical issues, or poor internet connection [57,58].

Some establishments offered virtual counselling sessions conducted by experienced professionals, online materials for self-care and stress regulation, and peer support communities

To address this concern. TimelyMD, a telehealth provider specializing in catering to the healthcare needs of college students across over 180 educational institutions such as Duke University, Emory University, Georgetown University, Johns Hopkins University, and University of Notre Dame, offers convenient virtual counselling services [59]. Again, Talkspace, an online platform and app that connected students with licensed therapists, partnered with West Virginia University and other institutions to offer virtual counseling to students [10,60]. Some medical schools conducted online yoga sessions and mindfulness practices to promote the general well-being of their students and help them cope with the stress of the pandemic [26]. These innovations ensure that students attain quality academic education and support their support for an overall better well-being during the pandemic.

Virtual clinical rotation

During the COVID-19 era, adaptations in clinical rotations were essential for training healthcare professionals. Many institutions shifted to virtual clinical rotations to ensure the safety of the students and patients. Students had more flexibility in rotation timing and duration to not cause overcrowding in the schools and facilities. Dental students in Japan were segregated into distinct groups to reduce the impact of the so-called 3C phenomenon, comprising close indoor venues, crowded places, and close contact, while exclusively employing online modalities for case demonstration and evaluation [37,61].

Institutions adapted schedules to accommodate changing circumstances in teaching and learning due to the COVID-19 pandemic. In China, rotations and Live conferencing videos were used to train learners in the clinical years during the COVID-19 pandemic [62]. Clinical rotations reduced the overcrowding among the students, thereby reducing the chance of direct contact with potentially infected patients and reducing the risk of exposure to respiratory secretion, which was one of the main routes of contracting COVID-19 [19].

Telehealth

Some institutions integrated telemedicine into patient consultations, enabling students to gain insights into diagnosis and treatment planning from a distance [62,63]. Rutgers Robert Johnson Medical School successfully introduced a new telehealth elective course to ensure that medical students could maintain critical clinical experience during the pandemic [61]. Again, the Haiti Medical Education project facilitated the collaboration between primary healthcare providers in rural Haiti and experts from around the world [64].

Similarly, Project ECHO, a telemedicine model, facilitated a link between community healthcare providers and experts through virtual mentoring. This tele-mentoring involved the provision of guidance and mentorship to junior or community staff by experts or senior faculty [65]. At certain academic establishments, telehealth robotic technology incorporating standardized actor patients has been employed to facilitate the development of formative simulated telehealth consultations and the enactment of gerontological case scenarios [66]. Nurse practitioner students benefited from the development of a hybrid telephone-based programme that provided interprofessional training experiences for them to complete their clinical hours [67]. Among the alternative approaches explored were the utilization of a mobile computer or tablet for facilitating remote ward visits in the analysis of individuals afflicted with COVID-19, fostering practical learning in the absence of direct attendance via monitored telephone or video discussions, and integrating virtual students into clinical interactions [39]. Students participated in telehealth visits, observed virtual patient encounters, and learned remotely. These allowed students to practice decision-making and patient management.

Clinical rotations and telemedicine training taught students how to conduct remote consultations and manage patients virtually. Psychiatric healthcare educators utilized various communication platforms like Weibo, WeChat, and TikTok to distribute vital information to individuals undergoing mental health training and to health officials. This initiative was designed to guarantee the delivery of reliable mental health services in light of the obstacles presented by the COVID-19 crisis [16].

Artificial Intelligence

Artificial Intelligence (AI) significantly impacted healthcare training during COVID-19. AI-based tools with clinical decision support features improved prognosis, diagnostics, and care planning [68

]. AI can enhance care outcomes, improve efficiency, and allow practitioners to spend more time with patients. They assist healthcare professionals in making informed decisions to accelerate life-saving treatments [3]. Various AI such as Linus Health, Viz.ai, PathAI, Freenome, Caption Health, BioXcel therapeutics, Reverie Labs, Valo Health, Deep Genomics, Vicarious surgical, Accuracy, and Intuitive were developed to aid in medical diagnosis, drug discovery and treatment planning, robotic surgery, treatment, and patient care [69] were used during and after the COVID-19 pandemic. Databases were created to offer students swift access to information that enables healthcare professionals to remain updated on the most recent research about COVID-19, medical subjects, and other illnesses [70]. In a review by Chang et al, 2021 [37] involving ten countries, all research works in most countries were ceased. In Japan, all animal studies were desisted but limited to in vitro studies, which can be done with computers at home using computer software and AI. An evaluation framework for an online learning program, PICRAT, was suggested. This acronym stands for the modes of learner engagement (passive, interactive, or creative) and the teacher's application of technology (replacing, amplifying, or transforming the traditional learning experience). The comprehensive framework was utilized to assess the progress of online learning in postgraduate medical education amidst the COVID-19 pandemic [71]. PICRAT was utilized to evaluate the advancement of online learning programs in the following ways: analyzing the alignment of PICRAT with other technology integration models, such as TPACK, SAMR, TIM [49,72], developing and validating an instrument to measure teachers' self-reported PICRAT levels in online and blended courses, examining the effects of PICRAT on student engagement, motivation, and achievement in online learning environments, providing feedback and guidance to online instructors and course designers based on their PICRAT scores, and comparing the PICRAT levels of different online learning programs across disciplines, institutions, and countries [73,74]. A meticulous iterative process was utilised in creating and implementing a practical digital learning system to manage the impact of COVID-19 on mental health [75].

Additionally, AI-driven chatbots and virtual assistants have been deployed to provide healthcare professionals with up-to-date information and guidance, assisting them in staying informed about the latest medical text and treatment protocols [70]. Moreover, machine learning algorithms have been instrumental in analysing vast amounts of medical data, aiding healthcare professionals in making data-driven decisions, predicting disease spread, and optimising patient care [6].

Learning Consortia

Many institutions adapted educational materials from other institutions. In otolaryngology education, three learning consortia were developed to build a collaborative network between educators, faculties, and trainees. Faculties from various otolaryngology institutions gave lectures, facilitating trainees to train and learn from various institutions aside from their home school. These lectures were recorded and made readily accessible to trainees worldwide [30,76,77].

The "Training and Education of Healthcare Workers During Viral Epidemics" initiative was crucial during the COVID-19 era, examining learning interventions for health professionals during major viral outbreaks like Ebola, SARS, MERS, and the ongoing pandemic. The initiative examined the content, design, delivery, and assessment methodologies of various learning programs and courses, providing recommendations for future epidemics [9]. The "COVID-19 Workers Get Training to Protect Their Own Health" project, a collaborative effort involving the National Institute of Environmental Health Sciences (NIEHS) and academic and community partners, focused on online learning courses covering infection prevention, personal protective equipment, mental health, and other topics [78]. Lastly, the "Virtual Adaptation of Traditional Healthcare Quality Improvement Training in Response to COVID-19" program, executed by researchers from University College Dublin and the Health Service Executive in Ireland, identifies effective approaches and pitfalls in delivering quality improvement training and education for health professionals.

Conclusion

During the period of the COVID-19 pandemic, healthcare professionals witnessed several significant changes in their training. Virtual simulations played a crucial role in providing realistic training experiences remotely, allowing professionals to practice essential skills and scenarios in a safe and controlled environment. Online courses and webinars became vital tools for continuing education, ensuring professionals stayed updated with the latest knowledge and guidelines.

The shift to online platforms for educational purposes has provided healthcare professionals with the opportunity to continue their learning remotely. Online courses and webinars have allowed for the dissemination of current and relevant data relating to COVID-19 management, treatment, and other relevant topics. Alterations in the examination and assessment structure accommodated remote testing, enabling professionals to demonstrate their competencies. Thus, the pandemic has necessitated changes in the way examinations and assessments are conducted for healthcare professionals. Remote proctoring and online assessments have been implemented to ensure the continuity of education and certification without compromising safety. Virtual counselling emerged as a valuable resource to support trainees' well-being, providing a much-needed outlet for stress and emotional support. The mental and emotional wellbeing of trainees has been a concern during these challenging times. Virtual counselling sessions have been established to provide support, address stress, and maintain the mental health of healthcare professionals. Virtual clinical rotations allowed professionals to observe and learn remotely, expanding their exposure to various cases. Through teleconferencing and virtual reality, healthcare trainees can observe and participate in patient care remotely, helping them develop essential clinical skills. Telehealth: Telehealth technology has become an integral part of healthcare during the pandemic. It has allowed healthcare professionals to provide remote diagnosis, treatment, and monitoring of patients, ensuring continuity of care while minimizing exposure to the virus. Artificial Intelligence: Artificial Intelligence (AI) has supported healthcare professionals by providing tools for data analysis, prediction models, and virtual patient monitoring. AI has played a crucial role in research, diagnosis, treatment, and resource allocation during the pandemic. Learning consortia involve collaboration between various institutions or organizations to develop and share educational resources, experiences, and best practices. Learning consortia fostered collaboration and knowledge sharing among professionals, allowing for collective growth and advancement in the field. Overall, these adaptations and innovations greatly impacted the training of healthcare professionals during the pandemic, enabling continued learning, support, and skill development in the face of unprecedented challenges.

These innovations and adaptations have significantly impacted the training of healthcare professionals, supporting their learning, well-being, and the delivery of quality care during the COVID-19 pandemic.

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Declaration of competing interest

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