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backlog in services anticipated even after the pandemic has subsided, medical ET cannot be neglected. The pandemic has accelerated the transition to tele-oncology, unmasking a new era in telemedicine that is expected to remain in the long term. As medical schools adapt to the new face of medicine, students' transition to telemedicine should be prioritised, given that they have an important future role. Further efforts should focus on integrating telemedicine ET in tele-oncology services and educating students on using telemedicine systems.

Author Contributions

K.R. wrote the letter, and A.A. contributed to comments and editing.

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Letter

Response to Letter by Rallis and Tejerina

Manasi Mahesh Shirke,[1,4] Safwan Ahmed Shaikh,[1,4] and Amer Harky[2,3,*]

We have read the response to our article by Rallis and Tejerina 'Tele-oncology in the COVID-19 era: are medical students left behind?', elaborating ways in which telemedicine education and training (ET) can be incorporated in tele-oncology services for medical students [1,2]. The pandemic has shifted the focus of patient care to management of COVID-19 cases, with surgeries limited to emergencies. It goes without saying that medical education is overlooked, with students getting less opportunities to participate in clinical procedures/placements due to the potential risk of contracting the virus. Additionally, with in-person classes, electives, and research opportunities being cancelled, we are well aware of the drawbacks brought about by the pandemic. In response, we have stated a few ways in which telemedicine has revolutionised the delivery of medical education in a matter of months.

Several teaching hospitals in the UK have suspended their clinical attachments, leading to medical students receiving reduced exposure to specific specialties, which can potentially be detrimental to exam performance and competency in the years to come. However, frequent rotation between hospitals and wards can make medical students potential vectors for the disease, hence putting others at risk. Additionally, over one-third of medical students in the UK, every year, come from Black and other ethnic minority backgrounds [3]. Evidently they have been disproportionately affected in the pandemic and hence are at an increased risk compared with their white counterparts [4]. This raises the dilemma of the efficacy of online education versus the potential risks imposed by in-person learning.

We appreciate that medical ET cannot be neglected; however, major changes in the medical curriculum would be required to accommodate ET, change that will only come with time. Telemedicine has opened borders, resulting in education being delivered on a global scale through virtual conferences, webinars, case series, and more. Students can learn from world experts on topics and specialties of interest, free of cost [5]. Universities in China had introduced an innovative way to supplement remote medical education utilising online problem-based learning techniques to complete the curricula; these have been implemented in subsequent years, despite the COVID-19 pandemic [6].

Tele-oncology can be used to supplement the e-learning of medical students to provide a more holistic medical education. Students can be a part of the virtual patient meeting and be involved in the history-taking of the patient as well as decision making and planning. Medical students can also be taught to and then administer virtual physical exams via tele-oncology services. This would help medical students develop their communication skills as well as reinforce their physical examination skills. Such visits would provide a more realistic scenario with patients during these times than a case series [7,8].

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Students could assist in preoperative and postoperative e-visits for oncology patients scheduled for surgery. This would provide a chance for medical students to develop a rapport with patients. This lays out an opportunity for students to educate patients on aspects of their disease that they may be curious about. The application of screen-sharing technology would allow students to be involved in reviewing pathological slides of tumours and other imaging of the patients they are following [8,9]. This experience of telehealth-based collaborative learning has immense potential in the world of medical education beyond the COVID-19 pandemic.

In addition to disruptions in the delivery of medical education, the pandemic has also impacted research. Internet-based research primarily focuses on surveys and relies on computer-based technologies for data collection, mining, and analysis. However, traditional clinical research, like randomised control trials (RCTs), require physical examination and lab testing before enrolment. These procedures pose an unacceptable risk to investigators and subjects alike [10].

Researchers are now screening subjects for potential inclusion for trial and obtaining informed consent, further utilising remote technologies for the follow-up of those subjects not needing labs or physical examination. This has led to an increase in demand for remote monitoring tools for procedures such as blood glucose, pulmonary function, and electrocardiography. Despite the pitfalls of transitioning traditional scientific research to remote technology, the pandemic could potentially pave the way for the development of computer models, increased use of data mining, and computational biology [10].

The concerns raised about medical ET in under-represented fields, like oncology, resonate with us. However, with the rapid development of internet and smartphone apps, delivery of education has transformed into a multimodal paradigm, offering greater possibilities and convenience. Although telemedicine has yet to be of substantial use in oncological education, it has transformed the medical education sector, delivering knowledge to students coming from all walks of life. With technological revolution, it is safe to assume that improvement and management of medical education and its resources will overcome the drawbacks highlighted here and result in a sustainable, mainstream model for delivery of medical education and routine medicine in universities and hospitals alike.

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Forum

Multiplex Spatial Bioimaging for Combination Therapy Design

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Multiplex spatial analyses dissect the heterogeneous cellular abundances and interactions in tumors. Single-cell bioimaging profiles many disease-associated protein biomarkers in patient biopsies to inform the design of cancer therapies. Guided by the mechanistic insights from spatial cellular maps, combination therapy can efficiently eliminate cancers with reduced off-targets, resistance, and relapse.

Combination therapy is the administration of multiple drugs or modalities for cancer to achieve higher efficacy than using lower doses of individual drugs and to alleviate adverse effects and reduce drug resistance. Despite significant efforts in clinical trials to test combination therapies, the outcome of these therapeutic options varies in individual patients and is associated with treatment failure [1]. While histological inspection is part of a clinical routine in therapeutic planning, multiplexed and single cell analyses of tumors can aid in the mechanistic design of multidrug combinations for clinical applications. To decipher the spatial context of the tumor microenvironment (TME), multiplexed profiling approaches analyze the proteomics, RNA transcripts, metabolites, and epigenetic changes that can reveal the organization of the tumor–immune and tumor–stroma microenvironment, and the heterogeneity among cells. Here, we present the emerging multiplex bioimaging