

## Research Article

# Teaching Dentistry during the COVID-19 Pandemic

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## Abstract

**Background:** The SARS-CoV-2 pandemic outbreak led to the reduction in conventional face-to-face meetings, clinical examination and learning opportunities. Consequently COVID-19 has had a significant effect on the delivery of dental education, training and Continued Professional Development (CPD). This has affected the teaching at both Undergraduate (UG) and at Postgraduate (PG) levels.

**Methods:** This article reviews the challenges faced in the delivery of teaching dentistry and strategies that can be undertaken to overcome these obstacles during the current pandemic and the future.

**Results:** COVID-19 has resulted in the delay and cancellation of traditional face to face dental examinations, teaching sessions and national conferences at various levels. Novel ways of delivering dental education and CPD have evolved.

**Discussion:** The use of virtual resources and these advantages in telecommunication technology have been able to assist dental clinicians keeping up to date with the current advances in dentistry. Virtual learning with innovative models using information and communications technology applications and computer-based programs may be key modalities of delivering dental education, training and Continued Professional Development (CPD) during the current pandemic and looking to the future.

**Keywords:** COVID-19; SARS-CoV-2; Coronavirus; Continued professional development; Dentistry

## Introduction

The global pandemic respiratory illness and spread by droplet transmission has caused nations and health care systems across the world having to undertake preventative strategies. This is in the form of social distancing, infection control and lockdown measures to prevent the spread of the novel Coronavirus SARS-CoV-2 [1].

Over the course of the COVID-19 pandemic, Dentistry within the National Health System (NHS) has had to rapidly adapt, reconsider and review the delivery of healthcare to patients [2].

Routine elective dental services were halted during the peak of the pandemic with many appointments being substituted by virtual consultations and telephone triage to reduce the unnecessary spread of disease. Universities, teaching hospitals and postgraduate dental training programs have rapidly adapted to incorporate remote online learning resources as platforms to support teaching and learning. These webinars and online workshops have been found to exhibit similar effectiveness in comparison to other training methods [3]. This reconfiguration of the training and learning model has established to transform clinical education with the basis on gaining competency and quality rather than the time or quantity spent learning [4,5].

CPD is a mandatory element in the continued registration with the General Dental Council (GDC) [6]. This forms part of a clinician's development. In the UK, the pandemic has encouraged organizations to review traditional face-to-face teaching sessions in both lecture based and practical, resulting in many courses and educational conferences to be cancelled or postponed. Looking to the future, the resumption of these educational environments will require the planning for social distancing, appropriate Personal Protective Equipment (PPE), regular rapid COVID 19 antigen test and COVID-19 vaccine to ensure the safety of students and teachers. There is scope for concern with when, if how the safety of the large volume of delegates, attending a national conference resumes.

## Materials and Methods

During the height of the COVID-19 pandemic students at many universities were advised to adopt practices of virtual teaching. This educational style substituted with the traditional face-to-face exposure of managing patients on clinics as well as the training in simulated clinical environments including the use of the 'phantom head'. Manual dexterity is a key skill in the dental profession and the lack of practical elements in a curriculum could impact overall training [7]. Practical postgraduate training courses were cancelled and hence the evaluation of novel opportunities for new skills and techniques had to be acquired. This article will assess these challenges faced during the delivery of teaching and what alternative methods have been employed and rapidly adapted to optimizing continued dental education.

## Results

### Telecommunication technology

Computer software and advances in online telecommunication technology have provided scope for virtual conferences, webinars and teaching. These have helped contribute towards verifiable CPD [6].

**Citation:** Loh M, Iyengar K, YC Loh W. Teaching Dentistry during the COVID-19 Pandemic. *J Med Public Health*. 2021;2(1):1013.

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**Publisher Name:** Medtext Publications LLC

**Manuscript compiled:** Apr 20<sup>th</sup>, 2021

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## Simulation technology

There is great value in the undergraduate dental student examination of 'real' patients to facilitate their learning progress [8]. Advanced technology may provide opportunities for trainees to conduct a virtual simulated practical clinical assessment on a simulated patient to assist with their educational needs. These ideas may be transpired and considered within other allied surgical specialties in medicine.

## Multi-dimensional digital technology

The use of clinical images in a multidimensional digital format (for example: images of characteristics of dental disease at various angles in the oral cavity in association with medical syndromes diagnosed by the patient's exterior) could assist with replicating an in-person patient examination. A collection of videos could be utilized in assisting the student with forming a clinical assessment of a patient. For example: a video of the incorrect use of interdental brushes for cleaning. This serves to activate clinical knowledge and the clinician to identify signs of suboptimal oral hygiene. These images must be managed considering the General Data Protection Regulation (GDPR) and copyright requirements to maintain patient confidentiality [9]. If possible, utilizing an interactive touch screen is advised, for students to enlarge images and explore other important clinical findings.

## Case based discussion

A series of engaging live webinars for all members of the dental team should be encouraged. These sessions could be scheduled at a suitable time with easy access for all participants. Audience participation through the use of video function and call will assist with aiding student focused learning.

## Virtual reality

Dentistry requires significant tactile examination and dexterity. The 'sensation' of drilling into a decayed tooth is a difficult feat to completely replicate in a virtual space. Encouragement for innovative imaging technology and perhaps use of 'plastic models' if possible, could assist with providing a more 'three-dimensional feel' and realistic approach to learning. Clinicians can remotely practice suturing skills on a foam pad. The use of 'virtual blades' and other similar software's could enable manual rehearsal through virtual methods. These sessions could be reviewed remotely by a supervising clinician.

The advances in this virtual realities providing simulation technology has enabled continuous feedback and opportunities for learning [9]. These simulations have the ability to provide feedback for dexterity, allowing users to feel dental anatomy in a virtual environment. This form of virtual reality has been shown to improve the clinicians' practical skills in an operative environment [10].

## Discussion

The structure of pedagogical teaching and the development of a dentist's skill are through the treatment and management of dental pathology through clinical practices underpinning the profession. Adaptation of techniques to mimic laboratory and practical work is central to the training of dental students and post-graduate training. The pandemic scenario posed threat to the practice and refinement of these skills in 'live' patients.

The idea of acclimatization to this shift to a virtual approach to teaching and learning is mandatory in the current pandemic climate. Increased familiarity with the advantages of audiovisual technology

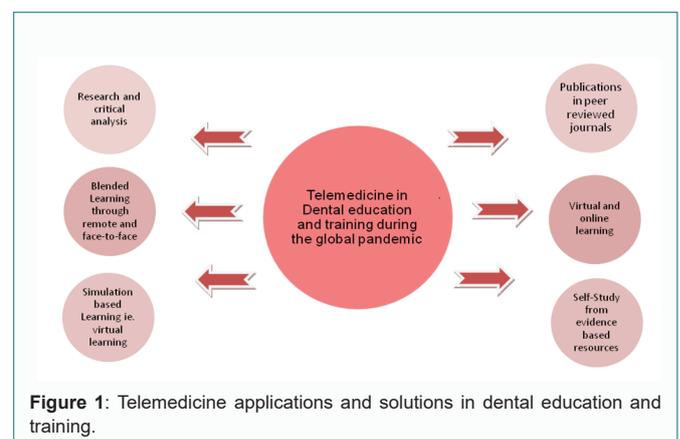
will allow the individual greater confidence when utilizing these resources. Regular review and communication with peers is important to remind learners of the unprecedented time dentistry as a profession is learning to adapt to.

Disadvantages to the virtual educational methods discussed above include the regulation of quality assurance and continuous improvement. Regular audits and quality improvement projects will be required to evaluate the users experience with the virtual learning environment. Advanced technology in the form of Three-Dimensional (3D) monitors and imaging may assist with revolutionizing this interactive space. Understandably, the clinician-patient relationship is difficult to completely replicate in an artificial space, but this medium may prove successful in providing an alternative method of learning, particularly for undergraduate students with limited clinical experience. Another arguable disadvantage is the availability of technology; users may require handheld consoles, 3D monitors and touch screen devices which may not be readily accessible for all learners. The internet connection or infrastructure may be poor. There are also the cost considerations for the virtual simulation technology. This virtual idea is an approach which is likely to be further developed to produce a consistent and fair alternative approach to facilitating education in the current pandemic climate. The other disadvantages of virtual education include students may be prone to distraction and adopted stilted virtual tendencies when interacting with the unfamiliar fellow students and teachers. The human contact and rapport are missing in the virtual environment. See Table 1 for summary.

Lastly, teaching clinics can still be arranged but operate at a reduced capacity provided following the GDC, Public Health England (PHE) and University guidance. Patient appointments can be staggered to avoid overcrowding clinical and waiting areas. Students and teachers can be organized timely to staggered schedules to provide appropriate care and educational experiences.

## Conclusion

The COVID-19 outbreak has had a significant impact the teaching of UG and PG dentistry through the restriction of traditional face-to-face meetings, teaching events and conferences. A consideration of the mental health of dental students and post-graduates should be taken into account during this atypical period. The rapid adaption to a new approach to education has shown to affect an individual negatively. Novel approaches to teaching through the use of virtual learning and computer technology based programs as suggested within this article may serve as a consideration for education in the pandemic environment (Figure 1). Whilst the authors are not suggesting this



**Figure 1:** Telemedicine applications and solutions in dental education and training.

Table 1: Effect of COVID-19 on dental education and possible solutions.

	Effects and impact due to COVID-19 restrictions	Possible solutions
Pre-dental sixth form/college students	Cancellation of pre-dental university 'placement' opportunities required to assist with university applications	Virtual placement assessment platforms to match candidates and educational institutions
	'Shadowing' at dental clinics, outpatient and in-patient settings suspended	
	'Volunteering' opportunities have been reduced in clinical settings	
Undergraduate dental students	Disruption of hospital, general practice and community 'placements' required for experience towards dental degree qualification and hence registration with the GDC	Review learning opportunities about Telehealth; attend Virtual webinars, online-courses, and 'Self-study'.
	Possible suspension of qualifying practical examinations	Expand Virtual practical examination model
Postgraduate dental clinicians	Reduction in 'face to face' daily patient contact and experience	Virtual Classes
	Missing teaching of patient examination techniques.	Virtual Seminars
	Restricted chair-side teaching	Virtual journal clubs
	Reduced out-patient based clinical examination techniques at CPD course events	Virtual on-line demonstration skill workshops
		Simulation based learning
Qualifying examinations	Global suspension of 'face to face' practical undergraduate (UG) and postgraduate (PG) qualifying examinations	Extension of Training period
	Difficulty in collecting patient clinical data for PG thesis	Expand Virtual practical examination model
	Difficulty in completing and submission of PG thesis due to above	Non-surgical topics for new thesis
Re-deployment challenges	Graduate dentists working in unfamiliar surroundings and situations, for example: assisting on medical wards in a hospital setting	Relaxation of sample size
	Fear of 'Burn-out' both physical and mental	Peer, mentor support, support from other health care professionals in the department e.g. Senior Nurses, Consultants
		Counselling, Well-being sessions, 'Mindfulness'
		Regular contact with online dental forums, advice from the British Dental Association (BDA), dental indemnity and other similar communities

form of teaching is able to completely replace the in-person teaching environment, this opportunity can bridge or serve as an adjunct to clinicians obtaining educational training as well as CPD hours during an exceptional time.

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