COVID-19: establishing an oral surgery-led urgent dental care hub

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Key points

Addresses the evolving advice and guidance from leading government dental bodies affecting the profession.

Provides a working example for setting up and developing an urgent dental care centre.

Discusses the current and future challenges likely to face the profession amid this international crisis.

Abstract

COVID-19 has changed the face of dentistry in the UK and around the world. The potential for aerosol generation, the presence of the virus within saliva and the fact that dental professionals work with the oral-pharyngeal environment determines that dental treatment poses a risk of viral transmission. At the start of the pandemic, the cessation of routine dental care across the country necessitated the rapid establishment of an emergency dental service at King's College Hospital. This paper describes its evolution to date and the challenges encountered along the way.

Introduction

The arrival of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 virus) and its resultant disease (COVID-19) in the UK had a profound effect on dentistry, resulting in the cessation of all routine dental activity.

First reported in China in December 2019, COVID-19 has caused worldwide disruption to everyday life, with each affected country implementing containment and, later, delay phase measures. In response, the English, Welsh, Scottish and Northern Irish National Health Services (NHSs) and improvement boards released guidance outlining the arrangements for modified provision of dental services under their contracts. On 26 February 2020, the Emergency Planning Manager at King's College Hospital (KCH) outlined measures to manage COVID-19 patients; the first inpatient tested positive on 4 March 2020. A series of Trust-wide and department-level

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Refereed Paper. Accepted 19 May 2020 https://doi.org/10.1038/s41415-020-1713-5 changes were swiftly implemented to aid the identification of patients using hospital services who may have recently travelled to a high-risk country, as well as those with a temperature or acute respiratory infections, a cough, fever or shortness of breath characteristic of COVID-19 infection. A major incident was declared on 11 March 2020. Within the KCH Dental Institute, the rapid establishment of an urgent dental care (UDC) service was identified as our main priority; the following timeline describes its development.

Day 1 (12 March 2020)

The UK response to COVID-19 moved from containment to delay phase.1 Under its major incident framework, KCH responded by ceasing all non-cancer-elective inpatient activity. Where possible, outpatient appointments were conducted virtually or by telephone. All outpatient appointments in the Dental Institute were cancelled with immediate effect and the continuation of day case surgery under general anaesthetic was reviewed on a daily basis. Training in the 'donning and doffing' of personal protective equipment (PPE) was rolled out to staff. At this time, no enhanced PPE was available within the dental hospital; we treated emergency patients and elective day surgery lists with standard PPE.

Day 2 (13 March 2020)

KCH suspended all routine dental outpatient and day case activity.

Day 5 (16 March 2020)

The Scientific Advisory Group for Emergencies (SAGE) provided advice regarding selfisolating and stopping all non-essential contact, including unnecessary travel. Working from home where possible and avoidance of social gatherings were recommended, especially for people over 70, pregnant women and those with certain underlying health conditions.² In order to provide resilience in the event of a team member becoming infected with COVID-19 and to facilitate social distancing within the workplace, the decision was made to divide the workforce within our large oral surgery department into two operational teams, each working at home on alternate weeks to ensure appraisal, mandatory training and quality improvement projects were up-to-date.

Day 8 (19 March 2020)

In response to the World Health Organisation's (WHO's) advice for aerosol generating procedures (AGPs), the British Association of Oral Surgeons (BAOS) and the British Association of Oral and Maxillofacial

Surgeons (BAOMS) jointly issued guidance³ stating that PPE in the form of FFP3 masks should be available to all staff, in primary and secondary care, who treat patients with suspected or confirmed COVID-19. At this time, this enhanced PPE was not available within the Dental Institute; staff continued to treat emergency patients using standard PPE.

Day 9 (20 March 2020)

The Chief Dental Officer (CDO) for England published the second in a series of preparedness letters for primary dental care, updating practitioners in general dental practice and the community service on the emerging COVID-19 situation.⁴ Recommendations included a reduction in routine treatment, identification of patients with potential symptoms, avoidance of all AGPs, the use of robust cross-infection control measures and the referral of all patients with COVID-19 symptoms requiring urgent dental treatment to local services equipped with enhanced PPE. Confusion as to what constituted an AGP grew and activity within our department continued without the availability of appropriate PPE while the demand for emergency dental care rose.

Day 12 (23 March 2020)

Nationwide lockdown to slow the spread of COVID-19 and protect the NHS's ability to cope with the outbreak began.⁵ KCH restricted hospital visitors with the exception of birthing mothers, paediatric patients, end-of-life patients and those with some additional care needs. Conversion of the main theatre suite and recovery beds provided additional capacity for critical care beds. UDC capacity was increased and a new standard operating procedure (SOP) modified from the pre-existing Local Safety Standards for Invasive Procedures (LocSSIPs) for oral surgery procedures6 was introduced to improve efficiency and minimise contact with patients requiring emergency treatment.

Day 14 (25 March 2020)

The CDO for England issued the third preparedness letter for primary dental care, calling for all routine, non-urgent dental care (including orthodontics) to cease and for the establishment of a remote urgent care service providing telephone triaging and treatment with 'advice, analgesia and antimicrobial means where necessary'. Those who could not be managed in this way were to be referred to a local UDC system.⁷ Without the availability of appropriate PPE in primary care, the challenge of providing emergency dental treatment lay with secondary care providers. A dedicated telephone line taking calls from patients wishing to be seen in the department of acute dental care (ADC) at KCH had already been established previously. An increasingly high volume of calls were being received, so the decision was taken to locally restructure as an UDC hub to ensure that the limited service was made available to those patients who needed it most. A strict triaging process was adopted so that only those with genuine dental emergencies such as acute orofacial infections, severe uncontrolled pain, dental trauma and uncontrolled bleeding were given appointments; these were usually the same or next day.

The following arrangements were introduced to allow us to run a service which was as safe and effective as possible within the restrictions of lockdown and the PPE available to us:

- Use of a *pro forma* to document the telephone conversation with patients (Appendix 1)
- 'COVID screening' was incorporated into the telephone triage call, allowing patients to be categorised as: 'COVIDasymptomatic,' 'COVID-symptomatic' or 'vulnerable'. The latter group included those with medical comorbidities, the over-70s and pregnant patients who we wished to isolate from other patients should they be booked for an appointment
- Patients with no dentist or unable to contact their general dental practitioner (GDP) who did not meet the criteria for a face-to-face consultation at KCH could be prescribed antimicrobials remotely where this was considered appropriate
- Only patients with appointments were to be admitted – one adult was permitted to accompany children and vulnerable adults
- The temperature of all patients was taken on arrival
- 'COVID-asymptomatic', 'COVIDsymptomatic' (known COVID-19+ or COVID-like symptoms) and 'vulnerable' patients were seen in separate clinics with separate waiting areas
- Physical distancing was introduced in the waiting rooms
- For clinical examination and assessment (non-AGPs), face and eye protection, a disposable fluid-resistant surgical mask, disposable apron and gloves were worn

- Wherever possible, AGPs were to be avoided, particularly in 'COVIDsymptomatic' patients
- AGPs were limited to pulpotomy and surgical extraction
- AGPs were restricted to designated dental surgeries. A 30-minute settling period before deep cleaning following an AGP and ventilation of all rooms between patients implemented to further reduce risk of viral transmission⁸
- The dentist performing the procedure and assisting nurse were provided with enhanced PPE to prevent aerosol humanto-human transmission. This included properly fitting long-sleeved, disposable, fluid-repellent surgical gown, hair cover, gloves, face and eye protection, and a FFP3 respirator and face shields for surgical procedures, used with appropriate 'donning and doffing' technique following staff training within the Trust. PPE was to be worn throughout treatment and during disinfection, while aerosol generation is a risk
- Specialist endodontists were available to manage clinically restorable, symptomatic teeth with a good prognosis, and pulpotomy rather than extirpation was undertaken to provide symptomatic relief
- The clinical team undertaking pulpotomies performed a maximum of six per day
- Paediatric dentists were available to manage complex dental trauma or urgent extractions for children.

Day 15 (26 March 2020)

KCH introduced 3M FFP3 masks, which were not considered to require fit-testing as the pass rate from previous testing was very high. A limited but reliable supply of these masks was made available to the Dental Institute for use in the ADC and oral surgery departments where the volume of patient activity was greatest.

Day 16 (27 March 2020)

A new patient pathway and SOP were introduced to the ADC and oral surgery departments (Fig. 1) to streamline our successful existing LocSSIP. With a limited supply of FFP3 masks, a system had to be developed to ensure these were used to greatest effect. It was decided that two 'clinical teams' comprising an oral surgeon and qualified dental nurse would be operational at any one time, to allow for the surgeries to be stood down for a period of at least 30 minutes





following an AGP involving the use of a surgical handpiece. Since respirator masks are known to be effective for four to six hours, it was felt that one team could comfortably treat four or five patients without the need to remove and dispose of their masks. A new disposable surgical mask was worn over the FFP3 mask to allow it to be worn during the treatment of multiple patients (this was later stopped at the advice of the Trust Infection Control team who had liaised with manufacturers). Face shields were also worn. The continuous wear of the tight-fitting masks impairs the ease of talking to patients, so other members of the wider clinical team confirmed consent and provided post-operative instructions in a clinical area outside the surgery, respecting social distancing. All clinical documentation and personal belongings were kept outside of the treatment surgeries to reduce contamination within the surgical environment and aid postsurgical decontamination. Only a whiteboard indicating the patient's name, date of birth and planned procedure entered the room with them. Surgical notes were written up outside of the dental surgery after the procedure by the operating clinician. As our service and clinical practice changed rapidly in response to new challenges and demands at this time, e-mail handover between the operational team of surgeons was introduced to ensure continuity of good practice.

Day 17 (28 March 2020)

The UDC service was extended to include access on Saturdays and Easter bank holidays, in order to accommodate increasing demand and to prevent patients with dental problems presenting to our accident and emergency department. This continued to be consultantled and operated in exactly the same way as our weekday service.

Day 22 (2 April 2020)

Public Health England published a press release and infographic on updated PPE guidance for NHS teams.⁹ Risk assessment and the tailoring of the need for PPE to specific clinical environments was advised; sessional wear of PPE was also deemed appropriate where it was safe to do so. KCH ADC and oral surgery departments had already adopted this practice and 'buddy checks' between dentist and nurse to ensure PPE was appropriately fitted before any patient contact were being undertaken to limit potential contamination and viral transmission.

Day 30 (10 April 2020)

Telephone follow-ups were introduced for specific patient groups, including:

- Medically complex and/or vulnerable patients
- Immunosuppressed patients
- Patients taking anticoagulation medication

- Patients treated with increased risk of post-operative nerve damage and other complications
- Patients with significant facial cellulitis/ abscess
- Unusual cases.

The use of senior clinicians to provide appropriate advice in the early post-operative period reduced the likelihood of unplanned readmissions and ensured continuity of care.

Day 34 (14 April 2020)

The Central Alerting System issued a bulletin regarding the safety of ibuprofen and COVID-19, stating that the commissioned expert working group had concluded that there was insufficient evidence to date to establish a link between the use of ibuprofen and other non-steroidal anti-inflammatory drugs (NSAIDs) and contracting or deterioration of COVID-19 infection.¹⁰ In light of the early emerging evidence regarding the safety of these drugs in COVID-19 patients, our post-operative advice on analgesia recommended paracetamol only; however, this joint statement from the Medicines and Healthcare Products Regulatory Agency (MHRA), NHS England, NHS improvement and NICE now reassured clinicians to begin recommending NSAIDs where clinically appropriate.

Fig. 2 Patient consultations during the early COVID-19 period



Day 35 (15 April 2020)

NHS England and NHS Improvement published detailed guidance and an SOP for UDC systems in the context of coronavirus.11 The key recommendations were for UDC centres to operate at two broad levels - remote and face-to-face management with particular emphasis given to limiting the latter to reduce COVID-19 transmission. Remote management via telephone or video link was to include a patient risk assessment and dental triage. Adoption of the 3As approach (advice, analgesia and antimicrobials) was encouraged where appropriate. Face-to-face management principles included the provision of clear protocols for patient care, appropriate zoning and separation measures, robust infection prevention and control procedures, and use of appropriate PPE for AGPs and non-AGPs with fit-testing and checking by staff. Leaving a surgery vacant with the door closed for 20 minutes following use for an AGP in a negative pressure room or one hour for a neutral pressure room before terminal cleaning was advised. Similar practices had been adopted in our UDC centre on day 16, almost three weeks earlier.

Discussion

The detailed timeline highlights the rapid and flexible response required to develop an effective emergency dental service during the COVID-19 crisis. The ease and routes of transmission of this virus increase the likelihood of dental care professionals coming into contact with affected patients, thus contributing to its spread. The rapidly implemented changes establishing a new COVID-19 UDC service at KCH were essential to ensure patient safety and to minimise the risk of viral transmission, while carefully adhering to government social distancing protocols at a time when demand for our emergency dental service increased exponentially. Uncertainty regarding the exit from lockdown and the lack of notice given to the profession regarding the resumption of dental services forced many dentists to open their doors in a climate of uncertainty and without clear guidance being available. We hope that sharing our experience to date may benefit others who are re-establishing their service.

Increased demand for emergency dental care in the absence or limited availability of primary care dentistry

In the four weeks since the introduction of the local UDC hub at KCH, clinicians have responded to 3,500 telephone calls (Fig. 2), 3,318 from adults and 182 on behalf of child patients (Fig. 3). In order to minimise the number of patients travelling to our clinics and the footfall in our building, only the most urgent cases were accepted for face-to-face treatment, with others being encouraged to stay at home in line with government advice. Eight hundred and seventy-six (26%) adults and 44 (24%) child patients were booked for a face-to-face consultation after telephone triage (Fig. 3). Antimicrobials were remotely prescribed to 368 patients. Five hundred and eighty-five (67%) of the adult patients seen for a consultation received treatment in the oral surgery department and 46 had a pulpotomy; the remainder had non-surgical treatment in ADC, restorative dentistry or special care dentistry (Fig. 4). In the first two weeks, patients who required face-to-face treatment travelled from around the South East of England because of the lack of UDC centres being established elsewhere; some patients were forced to travel considerable distances to access our service.

We were reassured to learn that, by establishing our UDC hub swiftly, the number of patients with dental emergencies presenting to KCH emergency department has not increased. Therefore, the problem of accessing dental care has not been inappropriately displaced and, during this time, only three patients have required inpatient care for incision and drainage of dental abscesses, suggesting those individuals requiring urgent dental extraction are receiving them; early management of acute dental emergencies does seem to be preventing unnecessary hospital admissions.12 As a secondary care provider of dental services, we have undoubtedly benefited from multidisciplinary input to our service design and delivery. Complex patients presenting initially via telephone triage have been managed by colleagues from restorative dentistry, special care dentistry, paediatric dentistry, orthodontics and oral medicine. Consultants from all these specialities have also contributed extensively to the telephone triaging of patient calls.

Infection control and dental activity

The WHO recommends that clinical triage is undertaken to identify patients with possible COVID-19 symptoms before or at admission.¹³ Additionally, it recommends the establishment of 'a well-equipped triage station at the entrance to the facility, supported by trained staff' and the immediate isolation of

patients with COVID-like symptoms in an area separate from other patients. With the support of nursing colleagues, the greeting of patients, confirmation of their appointment, digital temperature recording and hand sanitisation on entering the building were introduced to our UDC service from day one, with appropriate distancing measures.

The ability of the COVID-19 virus to survive for up to 72 hours on plastic and stainless steel14 highlights the need for thorough and effective decontamination of all surfaces following dental treatment. Our approach has been to minimise the number of surfaces in the dental surgeries which can potentially become contaminated with paper clinical records remaining outside the surgeries. At this time, particularly good hand hygiene is vital. All staff and patients are provided with alcohol-based hand gel on entering the Dental Institute and clinical areas. Staff also adhere to the WHO-recommended 'Your 5 Moments for Hand Hygiene: Dental Care,15 as per usual practice.

It has been suggested that taking intraoral radiographs can encourage saliva production and coughing,16 prompting some authors to recommend extraoral radiography as more appropriate during the COVID-19 outbreak.17 We decided that we did not agree with this premise and continued to request the most diagnostically appropriate radiograph to ensure that the principles of ionising radiation regulations (IR[ME]R) and wider patient safety would continue to be upheld during the pandemic.

Use of PPE

At the start of the crisis and suspension of elective dental procedures, evidence regarding the need for enhanced PPE in dentistry was slow to emerge. Our institution's decision to continue to provide an ADC service stemmed from the need to provide access to emergency dental care for patients as government lockdown measures tightened and primary care services became unavailable. The protection of patients and staff members in order to minimise COVID-19 transmission was central to the service we developed. As national bodies, including the office of the CDO, released information regarding AGPs in dentistry and the need for enhanced PPE, the Dental Institute at KCH established a limited supply of FFP3 masks, which we used efficiently to reduce viral transmission. Protocols for the use of PPE evolved as subsequent guidance and information was released; this ensured safety



Fig. 3 Demographics of patients managed in KCH UDC hub during the early COVID-19 period

Fig. 4 Management of patients seen for face-to-face consultation during the early **COVID-19** period



was prioritised despite increasing demand for our service.

AGPs

A systematic review by the WHO in 2007 prompted the establishment of a list of AGPs for NHS England, Wales and Scotland which included some dental procedures.¹⁸ High-speed dental handpieces and ultrasonic cleaning devices have been shown to create aerosols that significantly contaminate the whole of a dental surgery; there is, therefore, a risk of the transmission of infection via these bioaerosols to dental staff involved in treating an infected patient.19 Human-to-human transmission of COVID-19 is thought to be propagated via respiratory droplets and contact routes.²⁰ Recent identification of COVID-19 in saliva samples of infected individuals²¹ and the lengthy incubation period associated with its infection confirms the need for enhanced PPE in the dental setting where staff work in close proximity to the oropharynx. Despite the initial ambiguity in

guidance relating to AGPs in dentistry, Public Health England acknowledged that some dental procedures generated aerosols which represented routes for potential transmission of COVID-19, hence the specific inclusion of this in its list of AGPs which may be associated with COVID-19 transmission.²²

Pre-procedural mouth rinses

Previous studies have shown that povidone iodine mouthwash rapidly inactivates SARS-CoV, MERS-CoV, influenza virus A (H1N1) and rotavirus following 15 seconds of exposure.23 Coronaviruses have also been shown to be effectively inactivated by a oneminute, 0.5% hydrogen peroxide mouth rinse.²⁴ There is therefore the potential to reduce the COVID-19 load within saliva with the use of a cheap, commercially available 0.2% povidone iodine mouthwash and/or nasal spray or 0.5-1% hydrogen peroxide mouthwash.^{25,26} In our UDC hub, we chose to use hydrogen peroxide, which was more



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Issue	Solutions
Avoidance of non- emergency attendances	Notice of attendance by appointment only at main doors entrance Patient appointment confirmation, temperature check and hand sanitising with socially distanced staff upon entering building
Identification of true emergencies	Senior staff triage telephone calls from patients; clinical and pain control advice given, antibiotics remotely prescribed and appointments scheduled
Need for socially distanced emergency attendances and cohorting	Only patients with appointments admitted (with the exception of escorts for vulnerable adult or child patients and interpreters) Timed attendances spread throughout the day to stagger patient arrivals to reduce congestion and waiting times COVID-asymptomatic, COVID-symptomatic and vulnerable patient groups assessed and treated in separate clinical areas with separate waiting areas Some chairs in waiting room taken out of use to ensure social distancing Reception staff communicate with patients from behind glass partitions
Reduced interpersonal interaction	Clinicians divided into two teams working alternate weeks Surgical teams (a surgeon and nurse) work together to treat four to eight cases back to back Other members of surgical team discuss the planned procedure, answer any questions and gain verbal consent prior to the patient entering the surgery. During treatment, they are close by to provide support if required and afterwards deliver post-operative instructions, and provide supporting leaflet and gauze pack The surgical teams don full PPE prior to patient entering the surgery; after a 'time out' check, the extraction begins immediately More challenging cases carried out by most experienced staff to reduce operating time and avoidance of an AGP wherever possible
Conservation of PPE (respirator masks)	Operating surgeon and nurse rested and hydrated prior to donning PPE to allow them to treat as many patients as they reasonably can The clinical team discuss and plan sessions to ensure availability of respirator masks and face shields are adequate and used to greatest effect
Maintenance of surgeries	Extractions are carried out in closed surgeries only Disruption to patient flow avoided by keeping some surgeries on standby in case an AGP in another surgery requires it to be left for a 30-minute rest period prior to decontamination Clear written indication of permitted re-entry time on closed door of resting surgeries COVID-symptomatic/positive patients treated in a closed surgery on a different floor
Prevention of unplanned admissions	Telephone support team handle calls from post-operatively treated patients Clinicians telephone patients at high risk of surgical complications Clinical staff provide telephone review for patients from cancelled clinics
Staff wellbeing	Sessional, socially distanced team huddles allow communication of vital information as processes and equipment change daily; thanks, positive feedback and praise given to the team for their continuing hard work. The comfort of the operating team is reviewed regularly as tight-fitting respirator masks are uncomfortable and other PPE can cause staff to feel hot. While they do not leave the surgery during a treatment session, the operating team are aware that support is immediately available to them if required. Staff rest areas supplied with refreshments

Table 1 Key learning points from our experience in establishing an UDC service during the COVID-19 pandemic

readily available and not unpleasant for patients to use.

Pharmacological management

The CDO for England has repeatedly published advice4,7,11 for GDPs working in primary care to provide remote 'advice, analgesia and antimicrobials' for their patients with acute dental problems. This approach may offer short-term symptomatic relief and delay the progression of dental disease initially, but will not address the underlying cause. As we approach the sixth week since the declaration of a nationwide pandemic, we have provided active treatment for many patients for whom repeated courses of antimicrobials and analgesics prescribed in primary care have not been effective. As access to local UDC hubs continues to improve across the regions, the demand for dental intervention (extraction, pulpotomy or extirpation) will increase as time passes and teeth may progress from being restorable to unrestorable, so more extractions will be required. The demand for secondary care oral surgery services is therefore likely to increase with a concomitant increase in the risk of AGP production (and therefore possibility of COVID-19 transmission) if use of a surgical handpiece is required.

COVID-19 testing

At the time of submission of this paper, no COVID-19 testing was available for dental staff or patients before treatment. The government have subsequently focused on increasing testing capacity; however, the screening of dental outpatients and asymptomatic members of our dental team is not currently available. In the absence of such testing, the UDC hub at KCH has had to rely on telephone triage to identify 'at-risk' and 'potentially at-risk' patient groups in an attempt to isolate these patients from others. We accepted that this was not a robust solution, but at the time, it was the best available. As testing capacity is further increased, it may become possible to offer staff regular screening and to test patients immediately before attending an appointment to optimise safety within dental practice.

Our key learning points from our experience in establishing an UDC service during the COVID-19 pandemic to date are summarised in Table 1.

Conclusion

This paper highlights the rapid change in the service model of emergency dental care within the departments of ADC and oral surgery at KCH. During this time, the development and delivery of this service has benefited greatly from advice and support of consultants in other dental specialities. By day 16 of the national crisis, a full 18 days ahead of the guidance for dental services published by NHS England and NHS Improvement, we demonstrated our firm commitment to patient care and made a significant, early contribution to frontline dental services when few others were operational. We did this while prioritising patient and staff safety, informed by the emerging evidence at that time. We

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hope that this account of how we adapted our practice and overcame the challenges of a paucity of evidence and guidance, limited PPE and high demand on our service will provide dental professionals with some practical considerations as they deliberate how best to proceed during the continuing COVID-19 pandemic.

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Appendix 1: Acute Dental Triage For

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Relevant medical history?		
Clinically urgent?	Yes	No
Clinical outcome		
Advice given 🛛		
Appointment given 🗆	Time of appointment:	
Patient acknowledges infected with COVID-19 b	and understands there is by virtue of attending this	an inherent risk of becoming appointment.
Health status in relation to COVID-19	Asymptomatic	Symptomatic
Health status in relation to COVID-19 Does the patient live in a household with a symptomatic person/s?	Asymptomatic Yes	Symptomatic No



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