Repercussions of COVID-19 on Dentistry –‘Interim Dental Practice Guidelines & Recommendations for Resuming Dental Practices’

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Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first originating in Wuhan, China in late December 2019 is the latest contagion termed coronavirus disease 2019 (COVID-19) to rapidly develop and spread globally resulting in 2019-2020 pandemic. The case count from virus soared to cause concern over this global pneumonia as declared as Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) on 30th January [1]. By now, the novel coronavirus has spread worldwide constituting public health challenge causing international concern with enormous impact on healthcare professional who are front liners in any emergency condition [2]. Due to the characteristics of dental settings as close proximity of dentist and patients during treatment, resultant intrinsic high volume of aerosols produced, and identification of covid-19 in the saliva of infected patients, the dentists and allied dental staff are considered among the highest risk health professional group for acquiring covid-19 due to cross-infection and have a central role in limitation of disease spread [3, 4]. Dental care providers (DCPs) should be aware and prepared for tackling any impending infectious disease challenge as might be the case in the outbreak of SARS-CoV-2 transmission and its associated coronavirus disease. Several associations have proposed guidelines and recommendations for limiting transmission of covid-19 from carriers to dentists and vice versa during the outbreak and the resultant post-covid dental practice modifications [5]. The aim of this article is to highlight potential impact of covid-19 on dental practice and DCPs, give a review of specific interim recommendations for dental practice for patient screening, infection control, and patient management protocol as suggested by the American Dental Association (ADA), National Health Service (NHS) England, The Faculty of General Dental Practice (UK), RCS England, Public Health England (PHE), Health and safety England (HSE), Scottish Dental Clinical Effectiveness Programme (SDCEP), Center for Disease Control and Prevention (CDC) and Ministry of Health Government of Pakistan. The paper also indicates likely changes expected in the dental settings in the post-covid period in light of various international sources to serve as a guide in formulating national regulations as the dental practices plan towards re-opening.

Keywords: Coronavirus; 2019-nCoV; COVID-19; Dental practice; Oral Health; Infection Control; Personal protective equipment

Introduction

Coronavirus, as named as 2019-Novel Coronavirus (2019-nCoV) on 12th January 2020 resulted in 2019-2020 pandemic termed as COVID-19 by the World Health Organization (WHO) on 11 February 2020 [5, 6]. Etiological agent responsible for COVID-19, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) shares the host receptor ‘human angiotensin-converting enzyme 2’ (ACE2) with the variant SARS-CoV which was previously identified [7]. Despite global efforts to contain SARS-CoV-2 and its associated disease COVID-19, the outbreak has gripped the entire international community causing widespread public health concerns and is still on a rise due to its community spread pattern. The abrupt and severe outbreak of this pandemic resulting in high mortality rate swayed the governments all over to take drastic preventive and containment measures which remain the mainstream treatment to flatten the curve of covid-19 transmission, to in turn limit its spread and avoid collapse of health care systems globally [7, 8].

Association of COVID-19 with Dentistry & implications on dental practice

Dental care centres invariably carry high risk of covid-19 transmission due to the specificity of its procedures. Face to face communication with patients, aerosols produced by dental hand pieces, inhalation of airborne microorganisms that remain suspended in air, sharp dental instruments, ultrasonic scalers, air/water syringes, and variable survival times of corona virus on various environmental surfaces in dental offices are potential routes of virus transmission in dental settings [9-14]. Use of high speed hand piece or ultrasonic instruments with sneeze or cough can drive saliva secretions or blood to aerosolize to surroundings. Close contacts with infected individuals as during taking dental radiographs, coughing from infected individual, and the fact...
that individual may be shedding virus and communicating infection while being asymptomatic carrier in their incubation period are additional risks of COVID-19 transmission in the dental office [15]. Transmission via generation of large amounts of aerosols and droplet admixed with patient’s saliva and blood during dental procedures are alarming and require extra airborne and droplet precautions during and after the pandemic for dental practitioners and allied staff [16-22]. The fact that there are no particularly effective drugs or vaccine against novel coronaviruses and the features of COVID-19 have made its control extremely challenging as it remains to be proven whether patients in their recovery phase are a potential source of virus transmission [23-27].

Advancements in the field of Salivaomics also show SARS-CoV2 in abundance in salivary and nasopharyngeal secretions of infected individuals highlighting the crucial role of dentists and dental auxiliaries to determine COVID-19 through saliva as a non-invasive cost-effective diagnostic marker and to act diligently in preventing spread of COVID-19 as aerosols generated during dental procedures are likely to be mixed with patient’s virus-contaminated saliva [28-30].

The New York Times reminded the world that dentistry has the most risk of any profession in relation to COVID-19 as shown in (figure 1) [27]. The dataviz team at Visual Capitalist took a look at data from the Bureau of Labor Statistics and the Occupational Information Network, and charted a graph of the jobs with the highest COVID-19 Risk Score as calculated by daily physical proximity, contact with others and potential exposure to disease and infections with similar findings where dentists and dental auxiliaries were found to be at a high-risk exposure to coronavirus as shown in (figure 2). Strict, effective and definitive infection control protocols are hence critical and urgently needed in addition to universal precautions and measures from the dental teams to protect DCPs, prevent the virus from further spread and reduce the risk of nosocomial infections in dental settings to help control the epidemic situation.

Interim guidelines for dental practice

There has been universal concurrence on directives globally on step-down process, postponing all elective dental treatment and limiting dental practice to dental emergencies only since after mid-March 2020 [31, 32]. ADA on 16th March 2020 proposed to defer all elective dental care for 3 weeks. Scotland, Wales and Northern Ireland stopped all AGPs on 17th March with routine dental practice cessation on 23rd March. New Zealand also suspended the non-essential routine dental care on same day. Nationwide lockdown was implemented in Pakistan on 24th March. The setback faced by dental community in Pakistan resonates with the dentists all over the world who are in a similar situation regarding safety and protocols for dental practice from viral contamination. While all routine dental care has been suspended in countries experiencing COVID-19 disease during the period of pandemic, the need for organised urgent care delivered by teams provided with appropriate personal protective equipment takes priority as much of the uncertainty is related to the nature of a novel coronavirus pathogen with unique person-to-person transmission and lack of previous experience with it immunologically or otherwise [32, 33].

Categorization of dental procedures

The ADA issued interim guidance (as updated on 24th April & 7th May 2020) for short-term dental practice recovery and management of dental practice during COVID-19 period stating three main categories of dental procedures including dental emergencies, urgent and non-urgent/routine dental care and issued related practice guidance [34, 35]. Government of Pakistan issued guidelines for interim dental practice on 5th May 2020 focusing on provision of emergency dental care during the pandemic [36]. As per Scottish Dental Clinical Effectiveness Programme (SDCEP) guidance, dental emergencies are conditions that require contact with a dentist within an hour. Urgent dental problems are those that result in severe worsening pain and
Figure 2: Increased risk of COVID-19 to dental health care professionals (DHCPs)

remain unresponsive to medication, or have possibility to significant deterioration of oral health requiring self-help and access to treatment within 24 hours. It focuses on management of conditions that require immediate attention to alleviate burden on emergency department. These if undertaken, should be kept minimally invasive as possible, avoiding aerosol producing devices by use of interim techniques and temporary materials. Routine dental problems are those for which self-help advice or access to dental treatment would normally be required within a week [37-40]. Various range of dental conditions provided by emergency, urgent and routine dental settings, but not limited to these are listed in Figure 3. Covid-19 strongly influenced utilization of emergency dental services with dental pulpal or periapical lesions main reasons for attending dental emergencies, followed by cellulitis / abscess, and trauma. According to a study done in a hospital setting in China, the proportion of dental and oral infections increased from 51.0% of pre-COVID-19 period to 71.9% during COVID-19, the dental trauma decreased from 14.2% to 10.5% whereas, the non-urgency cases reduced to three-tenths of pre-COVID period [2, 41]. The number of emergency dental visits significantly declined in period following covid outbreak.

Pre-operative strategies & patient assessment

NHS advocate making arrangements for the patients to be triaged and assessed before appointment. Reassurance of patients, detailed screening via tele/online communication, online questionnaires, remote consultation and triage service or referral (when absolute necessary) serve as road maps in identifying dental emergencies and commencement of initial management. Management can be done through tele-communication via advice, analgesia, and antimicrobials (AAA approach) where appropriate, indicated and responsibly prescribed and to triage care into the urgent care systems where required [42]. Prescribing antibiotics for toothache, including acute pulpitis is of no clinical benefit in managing dental pain and when prescribed, timely referral for definitive management should be made to avoid repeated intake of antimicrobials. The return to work interim guidance toolkit as published by ADA and Government of Pakistan (as per interim guidelines published on 5th May 2020) focuses on management of dental practices including strategies as patient flow in and through the practice, operatory usage, timing and sterilization, staff routine as they don and doff PPE and scheduling best time when returning to patient care [36]. Special consideration should be given to employee screening for covid-19, in-office patient registration, repeating history questions, their preliminary screening, use of hand sanitation upon entry into facility, monitoring body temperature along with clinical findings upon arrival [36, 43].
**Figure 3:** Categories of dental procedures

- **Dental Emergencies**
  - Life threatening emergencies as airway compromise
  - Cellulitis causing airway compromise
  - Worsening oro-facial swelling
  - Trauma/ Dento-alveolar injuries as avulsion
  - Uncontrolled post-extraction bleeding
  - Dental conditions resulting in acute systemic illness or raised temperature due to dental infections
  - Severe trismus
  - Oro-facial conditions likely to exacerbate systemic conditions

- **Urgent Dental Care**
  - Dental and soft tissue infections without systemic effect
  - Orofacial swelling that is not worsening
  - Severe dental or facial pain that cannot be controlled by patient following self-advice
  - Fractured tooth/teeth causing pulp exposure
  - Suspected oral cancer
  - Dento-alveolar trauma affecting adult tooth involving dentine or pulp OR luxation/avulsion of permanent tooth

- **Non-urgent / Routine Dental Care**
  - Routine dental care treatments
  - Mild or moderate pain responsive to pain relief measures
  - Controlled post-extraction bleeding
  - Bleeding gums
  - Minor dental injuries
  - Loose or displaced crowns, bridges, veneers
  - Fracture/loose restorations, dentures and dental appliances
  - Fractured posts
Precautions in waiting area, reception area & dental operatory

These include limiting paper and communal objects from dental office and operatory rooms with regular surface cleaning, covering keyboard of computer with disposable, flexible, clear barrier and changing it between patients. It is also advised to regulate the number of people in waiting areas at the dental set up, practice social distancing, provide supplies (tissues, alcohol-based hand rubs, soap at sinks and trash cans) or preferably waiting in their cars to only arrive in the clinical area when staff is ready to accommodate patient needs.

Surface disinfection at dental office/ operatory

General guidelines globally constitute strict sterilization and disinfection measures to prevent cross-infection. United States Environmental Protection Agency (EPA’s) sets criterion for products to be used for surface disinfection with 0.1% sodium hypochlorite or 70% ethanol significantly reducing coronavirus infectivity on surfaces within 1 min exposure time [44,45].

Aerosol generating procedure (AGPs) and non-aerosol generating procedures (non-AGPs)

Urgent dental care falls into two categories depending on whether the treatment includes aerosol generating procedures (AGPs) or not. PHE guidance as updated on 21st May 2020 is applicable to all types of dental setups with relevant advice on PPE to be used for AGPs and non-AGPs. As a basic rule, during the COVID-19 period AGPs should be avoided where possible and should be undertaken only in designated dental settings and preferably be managed over phone with appropriate advice and prescriptions [36, 46]. (Figure 4) enlists some of the AGPs and non-AGPs at the dental settings.

Role of Personal protective equipment (PPEs)

As the most common route of transmission in dental office is via aerosols and droplet inhalation, PPE has a major role in transmission control. These include protective eye wear, face mask and a shield or visors, disposable working cap, appropriate gloves, aprons/gown and impermeable shoe covers depending upon AGP or non-AGP to be carried out. For non-AGP procedures, compliance with standard infection control procedures and droplet precautions are advised to ensure there is no contact or droplet transmission. The use of face and eye protection, disposable Fluid Resistant Surgical Mask (FRSM), disposable apron and gloves should be considered. If unavoidably AGP is being carried out, enhanced PPE is indicated as it requires airborne precautions to prevent aerosol transmission to DCPs.

HSE UK as updated on 27th April 2020, recommended to use long-sleeved disposable fluid-repellent gown or disposable fluid-repellent coveralls, a filtering face piece class 3 (FFP3) respirator, a face shield or visor eye protection and gloves on AGP for suspected / possible or confirmed covid patients. These PPE should be worn by those undertaking or assisting the procedure [47,48,49,50]. When treating patients in close proximity to their respiratory systems, National Institute for Occupational Safety and Health (NIOSH) USA also recommends the operator to wear full face shield or visor, particulate well-fitted fluid-resistance respirator as N95 mask of its equivalent FDA approved mask forming a positive seal around nose and mouth to be worn for each patient in combination to goggles, gown and gloves [47, 48]. It is important to understand that surgical masks, which do not seal around the nose and mouth, are not adequate to completely protect against aerosol-borne disease transmission. HSE states FFP3 respirators filter at least 99% airborne particles whereas FFP2 and N95 filter 94% and 95% respectively hence offer protection when FFP3 are not available to protect against covid-19 [36, 48, 51, 52].

Where AGP is single procedure, PPE is subject to single use and disposal is advised after each patient or procedure, as indicated. Use of fluid resistance surgical facemask (FRSM) is advised to health and social workers in inpatient area whether they are directly involved as in transfer of patients or not involved in patient care. For the health and social care workers at the reception and communal areas without any direct patient care involvement, maintenance of social distance of 2 metres or use of FRSM has been advocated [37, 52]. NHS guidance on PPE as updated on 18th May 2020 is given in (figure 5).

Dental radiography

As regards the dental radiographs, intraoral radiographs should be best avoided given the risk of salivary transmission and risk of inducing coughing and gagging. Where required, preferably extra-oral radiographs should be used. If intra oral radiograph is taken, additional precautions are recommended including adequate PPE to prevent cross-contamination through perforations [53, 54].

Use of pre-procedural mouthwashes

Several associations recommend use of pre-procedural mouth rinses as 1% hydrogen peroxide, 0.2% chlorhexidine, 2% Povidine-iodine or 2% Listerine for 30 seconds to reduce intraoral and aerosol generated microbial count. Hydrogen peroxide and iodine containing mouth rinses are among the most recommended [48, 55]. The Joint guidance on PPE from British Association of Oral & Maxillofacial Surgeons and Oral Surgeons as published on 22nd April 2020 state that there is no additional benefit of using mouthwash prior to examination or treatment as a means for reducing transmission and their use pre-operatively comes down to the clinician’s judgement [56].

Intra-operative protocols

Intra-operative use of rubber dam and high velocity evacuation in particular while performing AGPs and four-handed dental assistance is recommended as it can reduce the exposure to aerosols contaminated with patient’s saliva or blood. It has been reported that rubber dam isolation significantly reduces...
airborne particles in 3-foot diameter of operational field by almost 70% [57]. For AGPs, the use of disposable instruments, hand instrumentation and low speed hand pieces have been suggested over high speed handpieces, ultrasonic scalers, air abrasion devices, and triple syringe. The handpieces without anti-retraction function may further contaminate dental unit tubes of air and water leading to cross infection and should be avoided at best. When the use is unavoidable, use of high saliva ejector along with anti-retraction handpiece with anti-retractive valves or anti-reflux designs are recommended [5, 54, 57, 58].

Figure 4: Aerosol generating procedure (AGPs) and non-aerosol generating procedures (non-AGPs)

Figure 5: Personal protective equipment guidance for urgent dental care settings
Reference: The COVID-19 guidance and standard operating procedure for urgent dental care NHS
Role of Hand hygiene

Hand hygiene has been considered the most critical measure for reducing cross-infection transmission risk. DCPs are advised to wash their hands with soap and water or alcohol-based hand rub (ABHR) before patient examination, before dental procedure, after touching the patient, surroundings and dental equipment, and after contact with oral mucosa [59, 60].

Precautions for managing dental emergencies of potentially exposed or covid-19 patients

It is not very common for symptomatic covid patient to attend dental clinic however, if this is due to a dental emergency, it is recommended to refer them to dental facility with airborne infection isolation rooms (AIIRs). Necessary droplet transmission control environment as isolation room with negative pressure and High Efficiency Particulate Air (HEPA) filter systems have been advised. AIIRs are single rooms at negative pressures relative to their surroundings with a minimum of 6 air changes per hour. HEPA filter integrated into the air-conditioning system is required to filter air directly before recirculation. The rooms should be closed and have minimum entry and exit points. Operatory should be minimal with equipment necessary for the procedure and highest level of PPE for all dentists and allied staff using N95 or higher-level respirators [58].

Dealing recovered COVID-19 patients at dental settings

ADA and CDC advise that recovered covid cases can be seen in normal dental settings for dental emergencies only where recovery is at least 3 days since after resolution of symptoms. For asymptomatic individuals with laboratory-confirmed covid-19, the time period is at least 7 days since the date of being tested positive where there are no subsequent complications [58].

Disposal of waste & PPEs

The medical waste should be transported to transient storage area. The reusable instruments cleaned, sterilized and stored in accordance with manufacturer’s instructions. Contaminated medical and domestic waste of patients with suspected or confirmed covid-19 infection constitute infectious waste and should be packed in yellow double-layered bags, ligated and marked properly before disposal [5]. As regards PPE, the crucial step once they have been safely removed is their safe disposal. Aprons and gloves are subject to single use as per standard guidelines followed by proper hand hygiene. Respirators, FRSM, eye protection and disposable fluid repellent coveralls or long-sleeved disposable fluid repellent gowns can be subject to single or sessional use [52]. Disposable, single-use, eye and face protection is recommended for single or single-session use and to be discarded as healthcare clinical waste whereas the reusable eye and face protection is acceptable if decontaminated between single or single-sessional use as per instructions by manufacturer [37,43]. FFP masks are also discarded as clinical waste and hand hygiene performed after disposal.

Risk of transmission with PPE re-use between patients

The inadvertent risk of transmission by frequent handling of equipment and touching to discard and replace PPE between patients theoretically increases the exposure risk in particular in high demand environments. This serves as the rationale behind sessional use of PPEs only under certain circumstances. Sessional use however should be risk-assessed and be in compliance with manufacturer’s instructions. Sessional use of FFP3 should be shielded from splatter by a visor to protect respirator from droplet contamination. A session ends when healthcare worker leaves exposure environment [61]. Return to work interim ADA guidelines advocate the use the professional judgement to be used for removal and replacement of masks between patients with recommendations to replace, subject to the nature of activity being undertaken in particular when they are compromised during AGPs, soiled, damaged or difficult to breathe through [43, 58]. The Joint guidance on PPE from British Association of Oral & Maxillofacial Surgeons and Oral Surgeons as published on 22nd April 2020 state that policy should not compromise due to the capacity and indicate the high risk involved with the reuse of FFP3 masks over using a surgical mask or waterproof surgical mask under visor for short examinations or treatments with low aerosol generating exposure potential. CDC’s guidance continues for single use disposable facemasks and use of new facemask for each patient as regulated by FDA [5, 56]. To take significant actions, the ADA and PHE are working on policy making and updating the protocols for dentists and dental auxiliaries. The ADA’s interim guidance and updated statements from 18th April 2020 have been issued for dentists who plan to re-open their dental practice following lift of ban by authorities. Ministry of Health Services, Government of Pakistan. Guidelines also provides guidance on dental care services during COVID-19 [36]. Health care workers should consider the need for contact and droplet precautions based on the nature of care or task being undertaken are urged to exercise professional judgement, use highest level of PPE available after get fit testing in order to minimize virus transmission [52, 61].

Recommendations for return to dental practice – Review of international sources for resuming dental services

It is suspected that the practice of dentistry will be irrevocably affected by the COVID-19 pandemic, until a successful antiviral agent or a vaccine is found [1, 3]. The health care systems globally are in process of devising standard operating procedures and guidelines for safe practice in the post-pandemic period where some are currently reopening and others devising strategies on planning to reopen dental services as part of an exit from the lockdown strategy. By end of April 2020, National and Regional Governments and professional organizations started publishing recommendations and guidance for re-structuring and re-opening
of dental services [33]. As of 1st May 2020, the CDC recommends postponement of elective procedures, surgeries, and non-urgent dental visits. On 11th May 2020, the office of the chief dental officer (CDO) England reinforced on temporary cessation of routine dental care to ensure safety of dental team and public and limit the community transmission of covid-19 [42].

According to the COVID-19 guidance for urgent dental care as updated on 18th May 2020, England is in the delay phase of the coronavirus pandemic where stringent measures have been put in place to prevent sustained transmission of COVID-19 and provision of all routine, non-urgent dental care including orthodontics has been stopped until further notice [38]. As of 18th May 2020, the urgent dental care systems in NHS are working on remote consultation and triage services with outcome as AAA and referral where absolutely needed with the avoidance of AGPs unless absolutely necessary [38, 62]. Care quality commission (CQC) on 19th May 2020, updated the advice to dental practice in England confirming the decision to offer dental care lies with the provider [44].

The CDO Scotland on 20th May 2020, outlined staged recovery and steps for remobilization of NHS dental services to increase capacity and scope of treatments at urgent dental care centres (UDCCs) in phase 1. Phase 2a includes opening of dental practices for provision of non-AGP procedures for patients requiring urgent dental care for face-to-face consultation and phase 2b for adding routine dental care for the non-AGPs. The referral and management of AGPs along with covid-19 patients requiring emergency or urgent care continue in UDCCs whereas, introduction of AGPs to dental practices is planned in phase 3 [62, 63]. SDCEP Resuming General Dental Services following COVID-19 Shutdown published guide and implementation tools for general dental practice specifically concerning phase 2 of dental services remobilisation on 25th May 2020. (Figure 6) elaborates patient management at primary care dental setting and referral to UDCCs when required. Group A – Includes individuals who are not currently suspected to be a possible or confirmed COVID-19 case (no symptoms, not living in a household with a symptomatic person, no positive swab test, not waiting for a test or test results). This includes patients who are at higher risk, though not necessarily shielding, or extremely high risk (shielding) of developing severe illness with coronavirus. Group B - Individuals who have COVID-19 symptoms or who have swab-tested positive for COVID-19 or who have close contact with a COVID-19 case (i.e. in their household) and therefore should be self-isolating.

As various jurisdictions ease restrictions on provision of non-emergent care, the Return to Work Interim Guidance issued by ADA advises on soft launch for dental practices with team and making new strategies, ensuring all staff are up to date with new CPD and core training requirements as well as current covid-19 guidelines [64, 65]. Various international guidelines recommend developing strict and appropriate screening protocols via telecommunication ensuring secure website for patient information collection, video conferencing, and holding virtual consultation clinics. When treating patients in dental emergencies, applying additional droplet precautions and sequestered treatment of infected or suspect patients in specially fitted suites with negative pressure has been recommended [3]. ADA and CDC guidance also advise giving post-procedural patient exit instructions for those reporting any sign and symptoms of covid-19 following 14 days after their appointment and if discovered positive, after dental treatment it is suggested that contact tracing and isolation of close contacts be done (as dental staff providing treatment).

COVID-19 Dental Services Evidence Review (CoDER) Working Group Review; a group of researchers including Cochrane Oral Health and clinicians in the UK issued review of recommendations for re-opening of dental services on 6th May 2020, where a total of 12 guidance documents from 11 countries (including USA, Canada, Australia, France, Spain, Norway, Denmark, Switzerland, Portugal, Belgium, and Malta) were produced [33]. A rapid review of these international sources put forward basic outline for future dental practice where most sources recommended patient triage over telephone while others recommended temperature-screening at reception. The, recent evidence indicates temperature screening is ineffective for detecting infected person and this could be misleading [66]. Protocols should be made to provide range of advice and training on revised protocols to the dental team and regular monitoring of staff should be done. If staff member develops symptoms, they should stay at home for 7 days from the onset of symptoms, or longer if they continue to have a high temperature. If member staff lives with a person who develops symptoms of covid-19, the staff member should self-isolate for 14 days from onset of symptoms and during this if they develop symptoms, they should stay at home for 7 days from the day of onset of their symptoms, even if this takes beyond 14 day period [33,38,63]. The staff rotas should be made accordingly and record maintained appropriately. It is essential to train the staff accordingly ‘Clinical bubble’ approach can be adopted where individual staff members always work with same colleagues to limit contact between team members and if needed, to assist contact tracing and tracking [63]. Various dental domains requiring consideration while making strategies for re-opening of dental practice are included in (figure 7).

Dental settings should have clear protocols for patient care, with appropriate zoning and separation measures for all patients. Sites, areas and facilities should be demarcated clearly for the specific patient groups they have been designated to receive (Eg: to separate patients who are shielded or at increased risk with relevant physical and temporal separation measures taken). At the triage stage, in the event that a dental team identifies a suspected patient or patient at increased risk as having possible COVID-19 symptoms, they are advised to refer them to a medical practitioner for further assessment and treated in line with local protocols for minimizing contact with wider population [36, 38].

At the respective dental settings, reception areas should include necessary guidance and advice. Escorts with patients should be allowed where absolute necessary (as with child attending with parent) where one escort per patient should be from patient’s household to minimize risk of exposure [38]. SDCEP resuming dental services as published on 25th May 2020, encourage payment made by card and using contactless or remote payment where possible with facility to clean card machine after handling is required and need to use key board is felt [63]. The British Orthodontic Society cross-infection advice on recovery of dental settings and preparing for immediate post-lock down phase advises to consider the use of plastic screen at reception area to reduce respiratory transmission and sliding doors at entrance to clinics to reduce surface contamination. Adequate separation physically or by spacing appointments should be ensured to decrease the risk of potential contamination. Triaging patients to prioritize vulnerable patients or those with special needs and scheduling appointment to avoid exposure/ contact with higher risk patients has been suggested. Resuming General Dental services guidance focusing on phase 2 of resuming dental services advice to triage care and advice primarily over phone for the covid-positive individuals (symptomatic or swab-tested positive or those who have had close contact with covid-19 case) and referral to UDCC if dental treatment is required [63]. Observing hand hygiene and social distancing is recommended in the clinic with disinfection of hands on arrival and on completion of treatment along with provision of appropriate protection.

**Figure 6:** Patient flowchart for managing patients during Phase 2a & 2b Source: (SDCEP – 25th May 2020) (63)

**Figure 7:** Recommended domains of dental setting requiring consideration
Surfaces in clinical room should be kept clear, all equipment in sight including communal items and clutter should be limited to ensure limitations of viral cross-contamination. If possible, to have designated entrance and exit doors in and out of practice [38, 65]. Reducing transmission risk reduction at dental operatory includes use of high volume suction devices, rubber dam isolation, pre-operative mouthwashes, and adequate availability of PPEs similar to that recommended in the interim guidelines. Air quality and importance of ventilation has been acknowledged by some sources who recommend minimum 15 minutes gap between patients whereas as, some recommend HEPA filter to be used. The guidance on return to practice recommendations includes availability and use of appropriate PPE for all staff while wearing face mask, eye protection all the time and laundered work uniform available on site or by laundry service to avoid the risk of infection transmission. For unsuspected patients, sources recommend use of eye protection including glasses, goggles, face shields and single use gloves whereas some recommended use of FFP2 mask or equivalent with additional advice on of surgical hat or its equivalent [33]. SDCEP resuming dental practice guidance recommends use of fluid resistant (type IIR) surgical mask for Group- A patients undergoing non-AGP as explained in Figure 6 above [63].The recommendations for confirmed covid-19 cases also depends if the procedure is non-AGP or AGP. Eye protection (glasses, goggles and face shields), single use of gloves and disposable surgical gown has been strongly recommended for non-AGPs. Few sources advise use of double gloves when treating covid-19 patients. Use of FFP2 mask (75%) or its equivalent and surgical hat or equivalent has been recommended by some international protocols. When carrying out the AGP on confirmed covid cases, majority international guidelines (83%) recommend use of FFP2 mask or its equivalent that is changed after each patient with few sources (25%) suggesting use of FFP3 or equivalent mask if available. Appropriate time should be given to staff members when wearing high level PPE to prevent pressure sores, dehydration and exhaustion. Decisions as when to change PPE during clinical session should be in conjunction with local risk assessment and in line with the national guidelines [33, 65].

The general protocol for re-opening of dental services and

Figure 8: Flowchart for steps of decontamination process Source: (NHS)
risk reduction intervention remain the same as that followed in interim period. Sources explicitly recommend minimally invasive procedures. Most international sources recommend to avoid AGPs and where absolutely necessary, 83% recommend use of filtering facepiece class 2 (FFP2 which is equivalent to N95) masks for covid-19 and non-covid-19 confirmed cases. Few sources (25%) recommend use of FFP3, equivalent to N99 masks for AGPs [33]. Great emphasis is given to focus on activities that minimize the risk of covid spread and at the same time provide high quality dental care. It is advisable to limit the time of stay in treatment room. The international recommendations also indicate closure of operatory door to prevent viral transmission post-AGPs. Patient’s appointments should be spread between 20-30 minutes to allow for enough time for disinfection of operatory and avoid cross-infection between patients in waiting rooms. Windows to the outside in neutral pressure rooms can be opened.

After treatment, safe removal of PPE should be done and hand hygiene followed after doffing of PPE and decontamination of environment. Cleaning and disinfection of all surfaces is advised in clinical area following each patient. Decontamination process in clinical and non-clinical areas should be done using adequate PPE (as eye wear, gloves and mask) followed by hand washing. Clinical waste disposal and decontamination should be done as per local system regulations. Some sources recommend that PPE should be placed in plastic bag in pedal-operated hard-lid container. Main steps of decontamination process in primary dental care settings during the coronavirus pandemic as outlined by NHS is given in (figure 8).

The ‘Cochrane Recommendations for the re-opening of dental services: a rapid review of international sources’ as updated on the 16th May includes guidance from 5 more international sources. This latest document has recommendations from 16 countries including (France, Spain, Portugal, Austria, Switzerland, Belgium, Netherlands, Norway, Denmark, Malta, America CDC, America ADA, Canada, Australia, New Zealand, and India) [67]. There is mutual consensus for the use of surgical masks for covid negative patients and FFP2 masks for covid infective patients undergoing AGPs. For covid-negative patients undergoing AGP, there was grey area in opinion for the use of surgical mask combined with face shield/visor and FFP2 mask on the pretext that chances of asymptomatic patients is low in community as shown in (figure 9) [67, 68]. The British Association of Oral & Maxillofacial Surgeons and British Association of Oral Surgeons recommended that all urgent dental procedures, including oral examination, are to be treated as aerosol-generating in terms of PPE [56]. There is lack of well-designed randomized controlled studies and if we follow evidence-based dentistry, this decision ultimately lies on the practitioner based on individual clinical expertise, best available evidence, and patient values that can adapt to local circumstances.

The dental practice fortunately works on the principle of adopting universal precautions on all patients. In terms of infection control in the dental settings following covid-19, it is imperative to maintain a high degree of suspicion by dental personnel whilst strictly adopting the standard infection control precautions in order to protect their own and patient’s health. It would be a good practice to maintain audit trails tracking effect of covid-19 on the service delivery and patient protocols. Details on dental domains to be considered while formulating guidance at national level include factors explained in (figure 10). As we move from interim covid-19 to the post-covid phase, this guidance enlists quick review to the re-opening of dental set ups in the light of various international recommendations and provides key points to be considered in devising practice policy and producing comprehensive national guidelines that require regular reviewing. The national guidelines for interim dental practice published by ADA, and other authorities

![Figure 9: Review of international recommendations regarding use of mask in covid-negative and covid-positive patients undergoing non-AGPs and AGPs - Reference (67)](image-url)
including the Government of Pakistan have been a positive step. Dental recovery guidance and definitive guidelines for dental practice globally should be developed and implemented by local and regional health care authorities. DCPs should be ready to support the wider covid-19 response by use of their professional experience and expertise outside the normal range of oral and dental health activities in supporting community safety.

**Conclusion & Future directions**

Keeping into account the upheaval of coronavirus, implementation of sensible pragmatic way forward is needed in terms of infection control policies that are reviewed and adopted in practice as we look forward to reopen dental practices. Clear and practical guidance with effective cross infection control strategies are needed to prevent the spread of covid-19 in dental setups as the potential mode of transmission and environmental risk during dental procedures potentially pose the DCPs at significant risk and mandate PPEs to avoid health systems being overwhelmed [5]. It is suggested that by using saliva as a form of liquid biopsy as a diagnostic tool for both covid-19 positive cases and asymptomatic carriers, healthcare providers will be safe from the risk of nosocomial transmission [69]. Due to highly dynamic nature of covid-19, the foregoing recommendations are likely to change. Dental personnel should keep themselves abreast of latest pronouncements and brush up their knowledge regarding latest reliable practice guidelines for safety of patient, operator, assistants, hygienists and public at large. We can move dentistry and dental practice past covid-19 into a new normal that is safer for us and our patients. The foregoing review is provisional account of plausible characteristics and international guidelines on resuming dental services to help decisions makers establish robust practical evidence-based guidelines.

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**Conflicts of Interest**

The authors declare no conflict of interest.

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