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DOI:
10.1111/clr.13784

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (Harvard):
Becker, K, Gurzawska-Comis, K, Brunello, G & Klinge, B 2021, 'Summary of European guidelines on infection control and prevention during COVID-19 pandemic', *Clinical Oral Implants Research*, vol. 32 , no. S21, pp. 353-381. https://doi.org/10.1111/clr.13784

Received: 27 February 2021 | Revised: 7 April 2021 | Accepted: 14 May 2021

DOI: 10.1111/clr.13784

REVIEW ARTICLE

CLINICAL ORAL IMPLANTS RESEARCH WILEY

Summary of European guidelines on infection control and prevention during COVID-19 pandemic

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Funding information
The study was self-funded by the authors.

Abstract

Objectives: The current COVID-19 pandemic highlighted the need for a review of guidelines on infection control and prevention to ensure safe delivery of dental care. However, it is not clear to what extent the rapidly published European guidelines reflect the current evidence and thus provide homogeneous recommendations.

Material & Methods: Guidelines from all European Union countries, Scotland, Switzerland and United Kingdom were retrieved. Information on triage, mouth rinse, personal protective equipment (PPE) for aerosol free/ generating procedures (non-AGP/AGP) and treatment of potentially infectious patients were summarized and compared with recommendations from international organizations (WHO, ECDC, CDC).

Results: All included countries (30/30) published COVID-19 guidelines in 2020. All countries recommended triage and to postpone non-urgent treatment of potentially infectious patients. Hydrogen peroxide (1%–1.5%) was the most frequently recommended antiseptic mouth rinse to reduce viral load (24/30). PPE for non-AGP treatments included mainly surgical masks (21/30) or FFP2/FFP3/N95 masks (16/30), whereas FFP2/FFP3 masks (25/30) and face shields (24/30) were recommended for AGP by the vast majority of guidelines. For high-risk/COVID positive patients, most countries recommended maximum protection and treatment in specialized dental clinics (22/30).

Conclusion: There was general agreement among recommendations for triage, mouth rinse, and PPE during AGP and treatment of potentially infectious patients. In contrast, recommendations on PPE for non-AGP treatment varied considerably among the European countries possibly due to limited scientific evidence regarding transmission risk during non-AGP treatments.

KEYWORDS

COVID-19 pandemic, guideline, infection control and prevention, personal protective equipment

Kathrin Becker, Katarzyna Gurzawska-Comis and Giulia Brunello contributed equally to this work.

1 | INTRODUCTION

In dentistry, infection control and prevention (ICP) have a long history reaching back to Ignaz Semmelweis, who significantly reduced deaths during childbirth by advising doctors to wash their hands before touching the women in labour in 1847 (Nield, 2020). Three decades thereafter, Robert Koch discovered and proved that airborne droplets can transmit tuberculosis (Lu & Zambito, 1981). Willoughby D. Miller reported on infectious properties of saliva as well as the relevance of mechanical instrument cleaning and disinfection in dentistry (Miller, 1890, 1891). At the same time, gloves were proposed to prevent infection from these diseases (Lathan, 2010). Nevertheless, most dentists did not appreciate the relevance of preventive measures until 1931, when it became evident that the incidence of tuberculosis in their profession was particularly high (Nield, 2020). In the late 1950s, research on aerosols, antiseptics, ventilation, rubber dam, disinfection and additional preventive measures gained in popularity. With the emergence of HIV/AIDS in the 1980s, autoclaves were introduced as a substitute for disinfection with boiling water as well as various other measures to decrease the risk of microbial transmission in Dental Unit Water Supplies (DUWS) (Nield, 2020). However, it took over one century from the discovery of preventive measures to the development of evidence-based recommendations for the protection of patients and dental professionals. In the 1990s, guidelines on ICP were published for the first time by, for example the British Dental Association (BDA) in 1991 (Bimbaum, 1991) and the German Commission on Hospital Hygiene and Infection Protection at the German Commission on Hospital Hygiene and Infection Protection at the Robert Koch Institute (1998). They covered standard infection prevention protocols on instrument cleaning, sterilization, personal protective equipment (PPE) and additional preventive measures. Nowadays, various European countries provide evidence-based recommendations on ICP (ECDC, 2020).

Since the outbreak of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic in 2020, dentists were considered to be among medical professionals at the highest infection risk, for the reasons being that the virus resides in the epithelium of the oral cavity, throat, nose and salivary ducts making saliva particularly infectious (Wyllie et al., 2020). Face masks are a highly effective preventive measure during SARS-CoV-2 pandemic, but not applicable in dental settings as patients cannot wear mask during treatments. Aerosol, blood and splatter may further increase transmission risk (Epstein et al., 2021; Izzetti et al., 2020). To protect both dental professionals and patients, refined COVID-19 guidelines or recommendations were rapidly published in various countries, and also by international organizations. However, due to the progress of the situation, it is not clear to what extent they cover the available evidence and thus provide homogenous recommendations. Nevertheless, for continuation of dental care, scientifically based recommendations are essential.

Therefore, the primary aim of this review was to collect, summarize and assess the homogeneity of the most recent versions of national guidelines from European countries for the management of dental care during COVID-19 pandemic issued by official authorities (e.g. Ministry of Health) or recognized dental associations.

The secondary aim was to compare the national guidelines with available scientific evidence and recommendations published by the European Centre for Disease Prevention and Control (ECDC), the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC), as the United States (US) is the country reporting the highest number of COVID-19 cases and deaths since the start of the pandemic.

2 | MATERIAL AND METHODS

The present study was conducted and reported according to the "Standards for reporting qualitative research: a synthesis of recommendations" (O'Brien et al., 2014).

The purpose of the present review was to summarize the most recent available European national recommendations and guidelines regarding dental care provision during COVID-19. Beside guidelines issued in the 27 member countries of the European Union (EU), in addition, relevant guidelines released in Switzerland, United Kingdom (UK) and Scotland were included. Also, for comparison, guidelines released by the ECDC, WHO and CDC were taken into consideration.

A manual search was carried out for national guidelines available on websites of European governments, national dental organizations and in a database of the World Dental Federation (FDI). Additionally, the administrative secretary of the European Chief Dental Officers was contacted and asked to forward the request to the respective national officers for access to the national guidelines. Eventually, selection of the guidelines was also based on word-of-mouth communication with an international network of colleagues from different countries in order to assist with the identification and translation of relevant documents.

No language restrictions were applied. The native languages of the members of this research group were German, Italian, Polish and Swedish, with good knowledge of English and Spanish. The team was able to translate guidelines published in Bulgarian, Croatian, French, Portuguese and Romanian with translations tools (DeepL Translator and Google Translator) being used when necessary. For other languages, the help of volunteer colleagues, recruited from the circle of acquaintances of the authors, was indispensable (Czech, Danish, Dutch, Estonian, Finnish, Greek, Hungarian, Latvian, Lithuanian, Slovakian, Slovenian). In the last cases, all the manuscripts were also double checked by the authors by means of translation tools. All guidelines were retrieved from the web between 23 December 2020 up to 15 January 2021. A data extraction form was developed a priori, and information was extracted by three reviewers (K.B., G.B., K.G.C.). The following data were registered: guideline-related information (county, organization releasing the guideline, title, URL at which the document was available for download, date of release, linked evidence), information regarding triage prior to the appointment or on arrival

at the dental clinic, measures applied by patients to reduce the risk of COVID-19 infection (i.e. PPE, social distance in waiting areas, temperature check, hand hygiene, presence of accompanying people, maximum waiting time and type, concentration and timing of mouth rinse) and air ventilation. Furthermore, type of treatments (i.e. urgent and elective) recommended for low-risk and high-risk/positive COVID-19 (COVID+) patients was also recorded. Low risk referred to patients presumed to be COVID-19 negative, while high risk/COVID+ were considered the patients with suspected or confirmed positive COVID-19 status or who had been in contact with COVID+ individuals.

Data items also included PPE for dental professionals recommended on the basis of risk assessment for the treatment of patients. Thus, the following PPE was searched: type of mask/respirator, eye protection (e.g. goggles, face shield), gloves, head protection (e.g. cap, cowl) and body protection (e.g. gown, apron), overshoes. For high-risk/COVID+ patients, no distinction on recommended PPE for either non-AGPs or AGPs was made, whereas for low-risk patients recommended PPE for non-AGPs and AGPs were listed separately. Finally, recommended locations and conditions for providing care to high-risk/COVID+ patients were noted.

If data were not found within the guidelines, they were not reported in the data summary. Therefore, their exclusion does not mean that missing measures were not recommended.

Tables and graphs were used to summarize the data. Only data from the 30 selected European countries are presented in the graphs.

3 | RESULTS

A total of 52 national European guidance documents from 30 countries, including 27 EU countries, Switzerland, Scotland and UK, were identified. As in Scotland some of the recommendations vary compared to UK, and therefore presented separately. Five additional guidelines released by ECDC, WHO and CDC were also included (see Supplementary File). In 38 out of 52 analysed national European guidance documents (and in three of five documents from ECDC, WHO, and CDC), reference lists of scientific evidence were included. None of the guidelines assessed the quality of the cited references. However, this evaluation did not fall into the scope of the present work. A detailed summary of each selected document is presented in Table 1 (O'Brien et al., 2014).

3.1 | Patient triage

In all EU countries as well as in Switzerland, Scotland and UK, remote triage (i.e. by telephone, email or other means of communication) prior to the appointment is recommended. This is in agreement with ECDC and WHO guidelines. Similarly, in US, the patients should be triaged on phone before visiting a dental office or clinic as recommended in the CDC guidelines.

Once the patient arrives at the clinic, the triage is considered fundamental in particular when it has not been performed in advance remotely (ECDC, WHO, CDC). In 23 out of 30 selected European countries, triage at the dental clinic has been recommended, whereas no specific information regarding a reassessment at the arrival has been reported in the guidelines of the remaining countries (Austria, Belgium, France, Latvia, Portugal, Sweden and Switzerland).

3.2 | Measures applied by patients to reduce the risk of COVID-19 infection

Patient-related measures to minimize the risk of COVID-19 infection and transmission in dental settings include the use of PPE, social distancing, limitation of the time and people in the waiting areas, temperature check, hand hygiene and preoperative mouthwash.

3.2.1 | PPE to be worn by patients

In accordance with WHO, ECDC and CDC, in areas with high community transmission of COVID-19, patients should be encouraged to wear a mask, regardless of the individual risk assessment. In all the included European national guidelines but one (i.e., Bulgaria), mask has been recommended. Some countries listed additional PPE when treating patients attending a dental clinic, including face shield or full-face visor (Denmark, Malta), gloves (Finland, Lithuania) and overshoes (Lithuania).

3.2.2 | Waiting areas

Maintaining a social distancing of at least 1 to 2 metres has been recommended in the guidelines of 29 out of 30 European countries, while no information regarding social distancing in the waiting areas has been reported in Czech guidelines. Indeed, according to the latter, patients should be invited to wait outside and to enter after a call or text message at the very last moment before their appointment. A 1-metre distance is recommended in the ECDC, WHO and CDC guidelines.

Concerning body temperature measurement, it has been recommended in the national guidelines of 13 European countries (Bulgaria, Croatia, Cyprus, Estonia, Hungary, Italy, Latvia, Malta, Netherlands, Poland, Romania, Slovakia, Switzerland). Temperature check on arrival is specifically not recommended in the French and Irish guidelines. However, in the remaining guidelines, including the ECDC, WHO and CDC ones, this measure is not reported.

The WHO reported the importance of hand hygiene performed by the patients, and it was also recommended in the majority of the European countries (24/30), as well as in the ECDC and CDC guidelines. In the guidance documents of 6 countries, it is not reported that patient visiting the dental office or clinic is required to perform

TABLE 1 Summary of guidelines of 30 European countries, US, ECDC and WHO on infection prevention and control (IPC) measures to prevent COVID-19 transmission in dental settings

	Triage		Patient measures			
Country Organization Date of Release	**Phone**	**Clinic**	**PPE**	**Waiting area**	**Mouth rinses**	**Air ventilation**
Austria Austrian Dental Association 30 September 2020	Yes	Yes	Mask	- Social distancing (1 m) - Hand hygiene - Not accompanied	H_2O_2 1%	Regular ventilation
Belgium Epidemiology of Infectious Diseases Service, Sciensano High Health Council 3 November 2020	Yes	Not reported	Mask	- Social distancing (1.5 m)	H_2O_2 1% Povidone-iodine 1%	More than 2.5 air changes/ h
Bulgaria Bulgarian Dental Association 3 June 2020	Yes	Yes	Not reported	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied - Max two patients (1 enters, 1 exits)	H_2O_2 1% CHX not recommended (inefficient)	Air ventilation between patients
Croatia Croatian Chamber of Dental Medicine May 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: children, vulnerable: elderly, disable) - Max waiting time (0–10 min) - Disinfection barrier for shoes soaked	H_2O_2 1% (15 s gargling and 30 s rinsing) CHX 0.2% (15 s gargling and 60 s rinsing) Povidone-iodine (gargling and 30 s rinsing)	Natural ventilation (windows, after every patient and beginning / end of the day). Mechanical ventilation (recommended but not specified).

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- Surgical masks - Standard PPE	- Surgical masks - Eye protection (protective shield) - Headwear (surgical cap) - Respiratory masks not absolutely necessary	Urgent only	Not specified		Treatment in clinics / university hospital, Special hotline from Austrian Agency for Health and Food Safety exists
Urgent and elective, but urgent has priority	- FFP2 if patient cannot wear mask / minimum surgical mask - Eye protection (goggles or visor) - Gloves	- FFP2 if patient cannot wear mask (in case of shortage surgical mask plus face shield) - Eye protection - (goggles or preferably face shield) - Gloves - Body protection (apron) - Overshoes (if necessary)	Urgent only	- FFP2 - Eye protection - (face shield) - Gloves - Headwear (cap) - Body protection (apron)		Private practice, clinic
Urgent and elective. Urgent treatment priority. AGP should be avoided.	Not specified if it is for non-AGP. - FFP2 or FFP3; surgical mask minimum protection - Eye protection (glasses with lateral protection or face shield) - Gloves - Headwear (cap) - Body protection (disposable long-sleeve gown)	Not specified if it is for AGP. - FFP2 or FFP3; surgical mask minimum protection - Eye protection (glasses with lateral protection or face shield) - Gloves - Headwear (cap) - Body protection (disposable long-sleeve gown)	Not reported	- FFP2 or FFP3 - Eye protection (glasses with lateral protection or face shield) - Gloves - Headwear (cap) - Body protection (waterproof disposable long-sleeve gown)		Not reported
Urgent and elective	- Surgical mask - Eye protection (face shield) - Gloves - Headwear (cap)	- FFP2 - Eye protection (face shield) - Gloves - Headwear (disposable cap) - Body protection (disposable surgical gown)	Urgent only	Dentist: - FFP3 - Eye protection (goggles and face shield) - Double gloves - Headwear (disposable cap) - Body protection (disposable surgical gown, disposable trousers) Patient: - Headwear (disposable cap) - Body protection (disposable surgical gown)		Hospital (clinical institute) - disposable chair covers - the last on the working day - completely sterilized and disinfected and ventilated after treatment

(Continues)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Cyprus Ministry of Health 2 May 2020 Pancyprian Dentist Association 3 May 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied - Enter clinic after phone call - If multiple patients, isolated waiting rooms recommended and disinfected between visits	No scientific evidence, optional to use H_2O_2 1.5% + 0.2% iodine solution (30 s)	Not specified
Czech Republic Czech Dental Chamber 20 April 2020	Yes	Yes	Surgical mask	- Patients have to wait outside - Information by call/text message when they can enter	H_2O_2 (60 s) Alcoholic mouth rinse 40% (60 s)	Recommended before surgery
Denmark Statens Serum Institute 10 Mar 2020 The National Board of Health 6 January 2021	Yes	Yes	Surgical mask and face shield (while high infection risk)	- Social distancing (1 m, 2 m for high-risk patients) - Hand hygiene - Not accompanied (exceptions)	Not recommended	Sufficient ventilation equivalent to a regular bedroom (that is however, no specific requirements for number of air changes / hour).
Estonia Estonian Health Board 11 April 2020 Estonian Dental Association 30 April 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: children)	Not reported	Recommended but not specified
Finland National Institute for Health and Welfare (THL) 13 October 2020	Yes	Yes	According to respective recommendations of the region, currently masks and gloves	- Social distancing (2 m) - Hand hygiene - Not accompanied - Tooth brushing	For high-risk patients (COVID–19). H_2O_2 1%–1.5% (60 s) Betadine iodine (10 mg/ml) (60s)	Good ventilation recommended.

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- Surgical mask - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (waterproof gown)	- At least FFP2 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (waterproof gown)	Urgent only (if possible, postpone for 14 days, advise RT-PCR test before next appointment)	- FFP3 - eye protection (goggles and face shield) - gloves - Headwear (cap) - Body protection (waterproof gown)		Hospital in negative pressure room Dental clinic
Urgent and elective	- FFP2 - Eye protection (visor) - Gloves - Headwear (cap)	- FFP2 - Eye protection (visor) - Gloves - Headwear (cap)	Urgent only	- FFP2 - Eye protection (visor) - Double gloves - Headwear (cap) - Body protection (gown)		Not specified
Urgent and elective	- Surgical mask - Eye protection (goggles or face shield) - Gloves - Body protection (gown or apron)	RT-PCR test required before performing the procedure - Surgical mask - Eye protection (goggles and/or face shield) - Gloves - Body protection (disposable apron with/without sleeves)	Urgent only	- FFP2/FFP3 - Eye protection (goggles and/or face shield) - Gloves - Body protection (surgical gown)		Hospital, dental emergency - Isolation rooms - Separated entrance - See the patients in off-hours
Urgent and elective	- Surgical mask - Eye protection (goggles) - Body protection (apron)	- FFP2/FFP3 - Eye protection (goggles) - Body protection (gown) RT-PCR test required 48 hr before	Urgent only	- FFP2/FFP3 - Eye protection (goggles and face shield) - Gloves - Headwear (cap): optional - Body protection (surgical gown)		Tallinn North Estonian Regional Hospital and Tartu University Hospital in Tartu Facilities—not reported
Elective and urgent	- FFP2 or FFP3 - Eye protection (face shield)	- FFP2 or FFP3 - Eye protection (face shield)	Urgent only	- FFP2/FFP3 (if they have a valve, additional surgical mask), - Eye protection - (face shield) - Gloves - Headwear - Body protection - (long-sleeved disposable liquid-impervious jacket)		Not specified, all dentists

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
France French National Authority for Health 14 May 2020	Yes	Not reported	General public mask or surgical mask. Surgical mask always for patients who risk to develop a severe form of the disease, high-risk patients and COVID+	- Social distancing (1 m) - Forehead temperature check not recommended - Hand hygiene - Not accompanied (exceptions: minors and non-autonomous patients)	H_2O_2 Povidone iodide	Treatment room with window: maintain a minimum permanent ventilation without generating an air current. Ventilation for at least 15 min after AGP. Windowless treatment room: no AGP. Consider air handling unit (AHU). Air conditioning: no consensus among experts. Air purifiers: no consensus among experts.
Germany German working group for hygiene in dentistry (DAHZ) 20 April 2020 Association of the Scientific Medical Societies in Germany (AWMF) 20 September 2020 Federal Institute for Occupational Safety and Health 30 September 2020	Yes	Yes	Mask	Social distancing (1.5 m)	30–60 s (for all mouth rinses): Octenidine ≤0.1% H_2O_2 1%–1.5% CHX 0.2% CPC 0.2% Sodium hypochlorite ≤0.25% Dequalinium chloride/ benzalkonium chloride Listerine® cool mint For high-risk patients: octenidine, povidone iodide or H_2O_2	Natural air ventilation recommended.
Greece Helenic Dental Federation 3 November 2020	Yes	Yes	Surgical mask	- Social distancing (1.5–2 m) - 1 patient/h - Not accompanied	H_2O_2 1% (30 s) CHX not recommended	The practice must be well ventilated but the use of "climate control apparatus" is not considered safe unless it is used 24/7 and in accordance with the regulations of the Ministry of Health.

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective. Urgent treatment priority.	- Surgical mask - Eye protection (goggles or face shield) - Disposable gloves - Headwear (cap) - Overshoes: their use is not justified	Non-staining AGP (rubber dam): - FFP2 - Eye protection (goggles or face shield) - Disposable gloves - Body protection (plastic apron) - Headwear (cap) - Staining AGP: - FFP2 - Eye protection (goggles or face shield) - Disposable gloves - Headwear (cap) - Body protection (gown) - Overshoes: their use is not justified	Urgent only	Not specified		Preferably at the end of the room programme or reserve exclusive half-day.
Urgent and elective	- Surgical masks; - FFP2 (if patient cannot wear mask) for employees - Eye protection (goggle with lateral protection)	- Surgical masks; FFP2 /FFP3 (if patient cannot wear mask) for employees - Eye protection (goggle with lateral protection)	Urgent only	- FFP2/FFP3 - Eye protection (face shield, goggle with lateral protection) - Gloves - Body protection (gown) - If possible: - Headwear (cap) - Overshoes		University clinic, specialized practice prioritized, every dentist can treat COVID−19 patients.
Urgent and elective	Surgical mask	FFP2	Urgent only	- FFP2 or FFP3 without valve - Eye protection (goggles with side coverage and face shield) - Gloves - Headwear (disposable cap) - Body protection (surgical gown) - Overshoes		Dedicated (special) team of the Greek National Health System (ESY)

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Hungary Ministry of Human Resources 4 May 2020	Yes	Yes	Mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: minors and people with limited self-care)	H_2O_2 1% (60 s) Before and after treatments	Continuous ventilation/ air cleaning is recommended. Natural ventilation: 15 min between patients. Air conditioning not recommended.
Ireland Ireland's Health Services (HSE) Health Protection Surveillance Centre 9 October 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Temperature check—not recommended - Hand hygiene - Not accompanied (exceptions: children and people with limited self-care)	Not recommended	At all times it is appropriate to maximize ventilation in so far as practical given the facility and climate conditions. If AGP on low-risk COVID patient ventilation is not recommended
Italy Committee of representatives from dental associations coordinated by the Ministry of Health 30 May 2020	Yes	Yes	Mask	- Social distancing (1 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: minors)	1st mouth wash: H_2O_2 1% (30 s) or Povidone iodide 0.2% (30 s) or CPC 0.05%–0.1% (60 s) 2nd mouth wash: CHX 0.2%–0.3% (60 s)	Natural ventilation: 10–15 min (open windows). Mechanical ventilation: air exchange 39.6 m^3/h per person. Air conditioning: importance of filter maintenance.
Latvia Latvian Dental Association / French Dental Association 25 August 2020 12 March 2020	Yes	Not reported	Mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Natural air ventilation every 15 min (or filtration)	CHX 0.2% (20 s) plus H_2O_2 1% (20 s)	Natural air ventilation: 15 min after every patient.

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- FFP2 or FFP3 - Eye protection (goggles or face shield) - Disposable gloves - Headwear (cap) - Body protection (long-sleeved protective clothing; plastic apron) - Disposable clothing (optional)	- FFP2 or FFP3 - Eye protection (goggles or face shield) - Disposable gloves - Headwear (cap) - Body protection (long-sleeved protective clothing; plastic apron) - Disposable clothing (optional)	Urgent only	- FFP2 or FFP3 - Eye protection (goggles and plastic shield) - Disposable gloves - Headwear (cap) - Body protection (fully protective long-sleeved clothing; plastic apron)		Dedicated centres
Urgent and elective	Surgical mask or FFP2 based on risk assessment	- FFP3, FFP3s with valves should be shielded with full-face visors, - Eye protection (goggles or face shield) - Gloves - Headwear (cap): not required - Body protection (full-body gown/fluid repellent coveralls) - Overshoes: not required Follow UK guidelines	Urgent only, minimize AGP	- FFP3/hood - Eye protection (goggles or face shield) - Gloves (not vinyl) - Body protection (disposable gown)Follow UK guide		Room with mechanical ventilation. If the room is not mechanically ventilated it should be vacated for 1 hr after completion of treatment before cleaning commences
Urgent and elective	- FFP2/ surgical mask II2 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (disposable waterproof gown) - Overshoes - Disposable sleeves (optional)	- FFP2 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (disposable waterproof gown) - Overshoes - Disposable sleeves (optional) - For patients: - Eye protection (goggles) - Headwear (disposable cap) - Overshoes	Not specified (minimize AGP).	- FFP2 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (gown) - Overshoes - Disposable sleeves (optional) - Double gloves: no evidence		Not specified
Urgent and elective (patient requires negative RT-PCR COVID test at least 48 hr before treatment)	Blue group according to guidelines (http://www.lza-zobi.lv/uploads/files/covid19_praktiskais_celvedis25aug2020.pdf) - Surgical mask - Face shield	Orange and red group - FFP2/FFP3 - Face shield - Headwear (cap) - Body protection (waterproof apron)	Urgent only	- FFP2/FFP3 - Eye protection (face shield) - Headwear (cap) - Body protection (surgical gown) - Overshoes		Only 1 clinic is permitted: Paula Stradina Klinikas Universtats

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Lithuania Ministry of Health 12 December 2020	Yes	Yes	Mask, gloves, overshoes	- Social distancing (2 m) - hand hygiene - Not accompanied - Maximum waiting time 15 min	CHX plus H_2O_2 1%	Natural air ventilation: 15 min (open windows), can be omitted in presence of EN1822-U15 filter).
Luxemburg Luxembourg Health Directorate 28 April 2020 29 April 2020 14 August 2020	Yes	Yes	Mask	Social distancing (2 m) Hand hygiene Not accompanied (exceptions: only if necessary)	H_2O_2 1% Povidone iodide 0.2%	Natural air ventilation: 15 min. It can be omitted in presence of EN1822-U15 filter.
Malta Ministry for Health June 2020	Yes	Yes	Facemask or cloth face covering or visor	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied - If number of people in the practice (including staff) exceeds 1 per 4 m^2, pts should wait outside	For AGP. H_2O_2 1% Povidone iodide 0.2% CHX 0.5–0.12% + CPC 0,01% - 1%	Natural ventilation: 20 min (open windows). Usually, 15 min with air purification method. If no windows and no air purification method: 30 min after AGP.
Netherlands Professional organization of dentists, orthodontists and oral surgeons in the Netherlands (KNMT) 29 June 2020 Committee Guideline Oral Care Corona 29 June 2020 15 December 2020	Yes link to triage: https://www.knmt.nl/sites/default/files/flowchart-triage-corona-mondz org-versie61-17122020.pdf	Yes (not reported whether on phone or in practice)	Wearing mask by patients is allowed—low risk; surgical mask type I/II/IIR	- Social distancing (1.5 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: children) - avoid waiting in practice	Only for high risk H_2O_2 1% (60 s)	Natural ventilation—windows open after each treatment. Air conditioning—only with HEPA filter. Mechanical ventilation—preferably by negative pressure (high risk).

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- FFP2 or medical mask - Eye protection (face shield) - Headwear (disposable surgical cap) - Body protection (disposable waterproof coverall)	- FFP3 type respirator (usage for one patient) - Eye protection (face shield) - Disposable surgical gloves - Headwear (disposable surgical cap) - Body protection (disposable waterproof coverall) - Disposable overshoes	Urgent only	- FFP3 type respirator (usage for one patient), - Eye protection (face shield) - Disposable surgical gloves - Headwear (disposable surgical cap) - Body protection (disposable waterproof coverall) - Disposable overshoes		University hospital
Urgent and limited elective	- Surgical mask IIR - Eye protection (goggles with lateral protection) - Gloves	- Surgical mask IIR - Eye protection (goggles with lateral protection) - Gloves	Urgent only	- FFP2 - Eye protection (goggles with lateral protection) - Gloves - Headwear (cap) - Body protection (gown)		Referral to advanced care centres. Propose to postpone or teledentistry.
Urgent and elective	Low-risk procedures (Non-AGP or Non-Spatter Generating Procedure): - Surgical mask - Disposable gloves - Disinfectable footwear/overshoes Medium Risk Procedure (Splatter Generating Procedure): - Surgical mask - Eye protection (googles or face shield) - Disposable gloves - Headwear (cap) - Body protection (disposable plastic apron) - Disinfectable footwear/overshoes	- FFP2 or FFP3 or equivalent (KN/N95) - Eye protection (googles or face shield) - Disposable gloves - Headwear (cap) - Body protection (disposable plastic apron) - Disinfectable footwear/overshoes	Not specified.	- FFP2 or FFP3 or equivalent (KN/N95) - Eye protection (goggles with side protection, face shield) - Gloves - Headwear (hair covering) - Body protection (gown covering full length of arms)		Private practice (deduced): - last appointment of the day - double surface disinfection: after patient is dismissed and before the first patient of the morning with sodium hypochlorite. If in doubt (and as a last resource) referral to hospital.
Urgent and elective	- Surgical mask (FRSM Type IIR or type II) - Eye protection (face shield) - Gloves - Body protection (disposable apron with long sleeves) - Shoes must be clean with 80% alcohol	- surgical mask (FRSM Type IIR or type II) - Eye protection (face shield) - gloves - Body protection (disposable apron with long sleeves) - Shoes must be clean with 80% alcohol	Urgent only (avoid AGP)—group B according to guidelines	- FFP2 - Eye protection (face shield) - Gloves - Headwear (textile cap and disposable cap) - Body protection (disposable apron with long sleeves) - Shoes must be clean with 80% alcohol		Specialized clinic and dental practice - Leave the room for 30 min following by cleaning and disinfection - Negative pressure room

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Poland Polish Dental Association 20 March 2020 Ministry of Health 24 March 2020 National Health System 27 March 2020	Yes	Yes	Surgical mask—obligatory in public	- Social distancing (1–1.5 m) - Temperature check - Hand hygiene - Not accompanied (exception: children) - 1 patient/h	H_2O_2 1% (60 s) CHX 0.2% (60 s)	Natural ventilation Mechanical ventilation: 6 exchange per hr. Biosanitizer with 6% plasma peroxide (15 min).
Portugal Directorate-General of Health 1 May 2020	Yes	Not reported	Mask	- Social distancing (2 m) - Hand hygiene - Not accompanied (exceptions: only if necessary)	H_2O_2 1% (30 s) Povidone iodide 0.2% (30 s)	Promote air renewal, preferably by opening the window. If air conditioning is used, not in recycle mode.
Romania College of Dentists in Romania 25 May 2020	Yes	Yes	Mask	- Social distancing (1.5–2 m) - Temperature check - Hand hygiene - Not accompanied (exceptions: children, people with special needs, very elderly patients) - Max time: 15 min	H_2O_2 1% or 1.5% (30 s) Povidone-iodine 0.2% - 10% (30 s) Before and after treatments	Dental interventions only in rooms with automatic ventilation or natural ventilation (window). Very good ventilation / ventilation of the dental office (open door / window) for at least 15 min after each patient.

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent	- Surgical mask/FFP2 - Eye protection (face shield and googles) - Gloves - Headwear (cap) - Body protection (gown) - Overshoes	- FFP2 and surgical mask - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (gown) - Overshoes	Urgent only: category C according to guidelines (https://nil.org.pl/uploaded_files/art_1582966062_200229-coronavirus.pdf)	- FFP3 - Eye protection (goggles and face shield) - Double gloves - Headwear (cap) - Body protection (coverall) - Overshoes		Mobile clinic (dentobus) and specialized clinic (the list of clinics: https://pts.net.pl/covid-19-mapa-pracujacych-gabinetow-stomatologicznych/). Mechanical ventilation and sterilization with biosanitizer with 6% plasma peroxide (15 min) or with ozone
Urgent and elective	- FFP2 (N95) - Eye protection (goggles and/or face shield) - Non-sterile disposables gloves - Headwear (cap) - Body protection (disposable apron) - Clinical footwear	- FFP2 (N95) or FFP3 - Eye protection (goggles and/or face shield) - Double gloves - Headwear (cap) - Body protection (gown with rear opening, disposable, waterproof / fluid resistant, long sleeve, below the knee) - Clinical footwear (otherwise overshoes) - Full protection coverall (optional to the gown) - Cowl (optional)	Urgent only	- FFP2 (N95) or FFP3 - Eye protection (goggles and/or face shield) - Double gloves - Headwear (cap) - Body protection (gown with rear opening, disposable, waterproof / fluid resistant, long sleeve, below the knee) - Clinical footwear (otherwise overshoes) - Full protection coverall (optional to the gown) - Cowl (optional)		Not reported the location. Consider scheduling the consultation late in the morning or afternoon, at specific times, so that there is no sharing of the waiting area.
Not specified. Treatment priorities be considered.	Not reported.	Not reported.	Not specified	- Surgical mask or KN95 / FFP2 (non-AGP in suspected COVID-19 patients); KN95, FFP2/FFP3 (AGP in suspected COVID-19 patients and always in COVID+) - Eye protection (goggles and/or face shield) - Disposable non-sterile gloves - Headwear (disposable waterproof cap) - Body protection (non-sterile waterproof long-sleeved surgical gown +disposable protective boots, or disposable waterproof coverall)		Not specified

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Scotland Scottish Dental Clinical Effectiveness Program (SDCEP) 12 June 2020 25 September 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Hand hygiene - Not accompanied (exceptions: child, vulnerable)	Not recommended	Natural ventilation 15 min Air conditioning - not recommended
Slovakia Ministery of Health 26 October 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Temperature check - Hand hygiene - Not accompanied (exceptions) - Max one person in waiting area	H_2O_2 1%	Not specified
Slovenia Dental Chamber of Slovenia 25 March 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Hand hygiene - Not accompanied (exceptions)	Not recommended	Natural ventilation—open windows while working or for 10 min after each patient
Spain General Council of Dentists of Spain 13 April 2020 Ministry of Health, Ministry of Labour and Social Economy, National Institute for Safety and Health at Work (INSST), General Council of Dentists of Spain 27 June 2020	Yes	Yes	Mask	- Social distancing (1.5 m) - Hand hygiene - Not accompanied (exceptions: minors, or in case of addiction, disability etc.)	H_2O_2 1% (30 s) Povidone iodide 0.2% (30 s) CPC (30 s) CHX not recommended	Ensure adequate ventilation (5–10 min after each patient).

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- Surgical mask (FRSM type II) - Eye protection (goggles or face shield) - Gloves - Body protection (single use apron, gown required if risk of splashing/spraying)	- FFP3 - Eye protection (goggles or face shield) - gloves - Headwear (cap): not recommended (following UK guidelines) - single use gown - overshoes: not recommended (following UK guidelines)	Urgent only (list of urgent treatment: https://www.sdcep.org.uk/wp-content/uploads/2020/03/SDCEP-MADP-COVID-19-guide-300320.pdf)	Following UK guidance		UCCD (urgent dental care centres) Primary care not expected to provide urgent care for COVID +
Urgent and elective (avoid AGP)	- FFP2/FFP2 with valve, needs to be covered by surgical mask - Eye protection (goggles and/or face shield) - Gloves - Headwear (cap) - Body protection (full-body gown or uniform)	- FFP2/FFP2 with valve, needs to be covered by surgical mask - Eye protection (goggles and/or face shield) - Gloves - Headwear (cap) - Body protection (full-body gown or uniform	Urgent only (avoid AGP)	- FFP3/FFP3 with valve, needs to be covered by surgical mask - eye protection (goggles or face shield) - gloves - Headwear (cap) - disposable full-body gown - overshoesPatient: cover the head, position to reduce cough		Regional specialized clinics: high risk or hospital (red zone): COVID+
Urgent and elective	- Surgical mask/ FFP2 - Eye protection (goggles or face shield) - Gloves - Headwear (cap) - Body protection (gown)	- FFP2 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (gown=	Urgent only	- FFP2/FFP3 - Eye protection (goggles and face shield) - Gloves - Headwear (cap) - Body protection (coverall) - Overshoes		Ljubljana Health Centre, Maribor Health Centre, Celje Health Centre
Urgent and elective. Priority urgent cases.	- FFP2 - Eye and face protection - Gloves - Clogs and overshoes	- FFP2 or FFP3 - Eye and face protection - Double gloves - Headwear (waterproof disposable cap) - Body protection (waterproof disposable gown) - Clogs and overshoes	Urgent only	Not specified		Not specified

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
Sweden Swedish Work Environment Authority 16 April 2020 Swedish National Board of Health and Welfare 09 June 2020 Public Health Agency of Sweden 23 December 2020	Yes	Not reported	Masks (private practices/ dental clinics are free to decide if they adhere to the rules)	- Social distancing (1.5 m) - Limit amount of people - Not accompanied (except for children)	For high-risk patients: H_2O_2 1% (30 s)	Secure ventilation and good air exchange at the whole clinic. Patient appointments should allow for reasonable halt between patients.
Switzerland Swiss Dental Association (SSO), Association of Cantonal Dentists in Switzerland (VKSZ) 23 September 2020	Yes	Not reported	Yes (it is recommended to avoid patients waiting for treatment inside the practice)	- Social distancing (1.5 m) - Temperature check - Not accompanied (if possible) - Waiting <15 min	H_2O_2 1.5% (30 s) Povidone-iodine (30 s)	For AGP: complete air exchange <15 min, no treatment in rooms without option for ventilation or air filtration permitted
UK Public Health England (PHE) 20 August 2020 National Health System (NHS) 27 October 2020	Yes	Yes	Surgical mask	- Social distancing (2 m) - Hand hygiene - Not accompanied (exceptions)	Not recommended	Recommended AGP: 30 min in separated rooms

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
Urgent and elective	- Medical mask IIR - Eye protection (face shield) - Short sleeves	- Medical mask IIR - Eye protection (face shield) - Gloves - Short sleeves - Body protection (disposable apron)	Urgent only	Basic hygiene routines as for infection free pathogens but with reinforced PPE: - FFP2, N95 or KN95 - eye protection (face shield) - gloves - headwear (cap) - body protection (long-sleeved disposable coat)		Hospital-dentistry clinic specially equipped, staffed and suited for handling of contagious infections.
Urgent and elective	FFP2	FFP2 (if rubber dam not possible)	Urgent only	- FFP2, - Eye protection (visor) - Gloves - Body protection (gown)		Specialized practice, clinics
Urgent and elective	- Surgical face mask (FRSM Type IIR) - Eye protection (goggles or face shield) - Gloves - Headwear (cap): not required - Body protection (apron) - Overshoes: not required	- FFP3, FFP3s with valves should be shielded with full-face visors, - Eye protection (goggles or face shield) - Gloves - Headwear (cap): not required - Body protection (full-body gown/fluid repellent coverall) - Overshoes: not required	Urgent only (classified according to SDCEP https://www.sdcep.org.uk/wp-content/uploads/2020/03/SDCEP-MADP-COVID-19-guide-300320.pdf) avoid AGPs where possible, unless there is no alternative treatment option and/or the AGP intervention cannot be deferred.	- FFP3/hood - Eye protection (goggles or face shield) - Gloves (not vinyl) - Body protection (disposable gown)		Designated urgent dental care (UDC) provision and primary dental care (NHS and private clinics)

(Continuous)

TABLE 1 (Continued)

Country Organization Date of Release	Triage		Patient measures			
	Phone	Clinic	PPE	Waiting area	Mouth rinses	Air ventilation
US Centers for Disease Control and Prevention (CDC) 4 December 2020 14 December 2020	Yes	Yes	Surgical mask (in areas with high community transmission)	- Social distancing (1 m) - Hand hygiene - Not accompanied (unless necessary)	Not reported	Natural ventilation: at regular intervals (depending on size of the room, number of windows and doors, outside temperature and the airflow/wind). Mechanical ventilation: 6–10 exchange per hr.
EU European Centre for Disease Prevention and Control (ECDC) 19 October 2020	Yes	Yes	Mask in areas with high community transmission	- Social distancing (1 m) - Hand hygiene - Not accompanied (exceptions: assistance required)	Not reported	Natural ventilation: at regular intervals (depending on size of the room, number of windows and doors, outside temperature and the airflow/wind). Mechanical ventilation system: exchanged 6 to 10 times per hour, depending on the national standards.
Global organization World Health Organization (WHO) 3 August 2020 1 December 2020	Yes	Yes	Medical or non-medical mask. In areas of known or suspected community or cluster SARS-CoV–2 transmission.	- Social distancing (1 m) - Hand hygiene - Not accompanied (exceptions: assistance required)	H_2O_2 1% (20 s) Povidone-iodine 2% (20 s)	Increase ventilation and airflow according to the type of ventilation available, natural or mechanical or natural (average of 6–12 air exchanges per hour). Split air conditioning or other recirculation devices not recommended. Consider installation of filtration systems (exhaust fans, whirlybirds or HEPA filters).

Abbreviations: AGP, aerosol generating procedures; CHX, chlorhexidine; CPC, cetylpyridinium chloride; FRSM, Fluid Resistant Surgical Mask; H_2O_2, hydrogen peroxide; HEPA, High Efficiency Particulate Air; PPE, personal protective equipment.

Treatment Low-risk			Treatment High-risk/COVID+			
	PPE			PPE		Location & conditions
Type of treatment	non-AGP	AGP	Type of treatment	non-AGP	AGP	
urgent and elective (elective postpone in areas with high community transmission of COVID−19)	- FFP2/FFP3 (surgical mask in case of a shortage of respirators) - Eye protection (goggles or face shield) - Gloves - Body protection (water-resistant gown with long sleeves)	- FFP2/FFP3 (surgical mask in case of a shortage of respirators) - Eye protection (goggles or face shield) - Gloves - Body protection (water-resistant gown with long sleeves)	Urgent only	- FFP2/FFP3 (surgical mask in case of a shortage of respirators) - Eye protection (goggles or face shield) - Gloves - Body protection (water-resistant gown with long sleeves)		Patients with confirmed COVID−19 should be referred to a designated dental care facility, which usually have a dedicated COVID−19 path and dedicated well-ventilated room.
Urgent and elective. Postpone elective treatments in areas with high community transmission of COVID−19.	- FFP2 or FFP3 (or medical mask in case of shortage of respirators) - Eye protection (goggles or face shield) - Gloves - Body protection (long-sleeve, water-resistant gown)	- FFP2 or FFP3 - Eye protection (goggles or face shield) - Gloves - Body protection (long-sleeve, water-resistant gown)	Urgent only	- FFP2 or FFP3 - Eye protection (goggles or face shield) - Gloves - Body protection (long-sleeve, water-resistant gown)		Referral to a designated dental care facility, which usually have a dedicated COVID−19 path and dedicated well-ventilated room.
Urgent and elective. Delay elective treatments accordingly to COVID−19 transmission rates or to official recommendations at national, sub-national or local level.	- Medical mask - Eye protection (goggles or face shield that covers the front and sides of the face) - Gloves - Body protection (fluid resistant disposable gown)	- FFP2/N95 or higher - Eye protection (goggles or face shield that covers the front and sides of the face) - Gloves - Body protection (fluid resistant disposable gown)	Urgent only	- FFP2/N95 or FFP3 for AGP - Eye protection (goggles or face shield that covers the front and sides of the face) - Gloves - Body protection (fluid resistant disposable gown)		Referral to specialized oral health care services. When appropriate, home visit by a dedicated oral health care team.

hand hygiene (Belgium, Czech Republic, Germany, Greece, Sweden, Switzerland).

To reduce the number of people, present in waiting area at the same time, patients are asked to attend alone for their appointment except in exceptional circumstances (e.g., children, vulnerable), as clearly specified by the national guidelines of 26 out of 30 European countries (excluding Belgium, Czech Republic, Germany, Latvia), and the ECDC, WHO and CDC guidelines.

3.2.3 | Mouth rinse

The WHO recommends the use of pre-procedural mouth rinses (i.e., 1% hydrogen peroxide or 0.2% povidone-iodine for 20 s) to reduce the viral load in the saliva. In 24 out of 30 selected European countries, the use of mouth rinses before dental treatments is suggested, as shown in Figure 1. Interestingly, the guidelines of all these countries include the use of mouth rinse containing hydrogen peroxide (H_2O_2), alone or in combination with other antiseptic products (Cyprus, Italy, Latvia and Lithuania), at a concentration of 1%–1.5%, when reported. In half of these countries (12 countries), povidone-iodine is proposed as an alternative to hydrogen peroxide, while in Cypriot guidelines the discretionary use of 1.5% H_2O_2 with 0.2% iodine solution is described. Only a minority of the guidance documents recommends cetylpyridinium chloride (CPC) alone (Spain and Germany) or in combination with chlorhexidine (CHX) (Malta and Italy). CHX is recommended as an adjunct antiseptic agent to other mouth rinses also in Latvia and Lithuania, while a possible single usage was only found in Croatian, German and Polish guidelines. Regarding CHX, the efficacy of its preoperative application is debated; therefore, it is explicitly not recommended in three national guidance documents (Bulgaria, Greece and Spain).

Other suggested products include alcoholic mouth rinse (Czech Republic) and dequalinium chloride/benzalkonium chloride, Listerine® cool mint, octenidine and sodium hypochlorite (Germany).

Preoperative mouth rinses for reducing the viral load prior to dental procedures are not recommended in the guidance documents of 5 countries (Denmark, Ireland, Scotland, Slovenia and UK), and the use of mouth rinses is not mentioned in national guidelines of one EU country (Estonia), and in the ECDC and CDC guidelines.

3.3 | Air ventilation

Adequate air ventilation is recommended across most guidelines, but with no further specifications according to the type of ventilation available (mechanical or natural) and the type of patients undergoing dental treatments (low risk or high risk/COVID+).

The fallow time, when reported, varied between a minimum of 5 min (Spain) and 30 min (UK), with 15 min recommended by the majority of the guidelines (France, Hungary, Italy, Latvia, Lithuania, Luxemburg, Romania, Scotland, Switzerland). A fallow time of at least 10 min is recommended by the Slovenian guideline, while in the Maltese guidance document the fallow time ranges between 15 and 30 min depending on the presence of a window, availability of air purification methods and dealing with aerosol generation.

Concerns are raised by the WHO regarding the use of air conditioning or other kind of recirculation devices, while the installation of filtration systems has been advised. Air conditioning is not recommended in Hungarian and Scottish guidelines, while in French guideline the absence of a consensus among the experts is reported. Details on air conditioning usage and maintenance are indicated in the guidelines of three European countries (Italy, Netherlands and Portugal).

In a minority of guidelines, recommendations for mechanical ventilation are reported. In particular, details on air exchange per hour have been provided in the Belgian, Italian and Polish guidelines. The ECDC recommends 6 to 10 times exchanges per hour depending on the national standards. Similar values are also reported in the WHO and CDC guidelines. Finally, negative pressure ventilation was recommended by Dutch guidelines as preferred measure during the pandemic.

3.4 | Type of treatment based on individual risk assessment

The type of treatment provided by dental health professionals in each country is based on individual risk assessment. Interestingly, no classification of elective and urgent/emergency treatments is provided in the majority of the guidelines. To make data comparable, it was decided to divide the patients in two categories, that is low-risk and high-risk/COVID+.

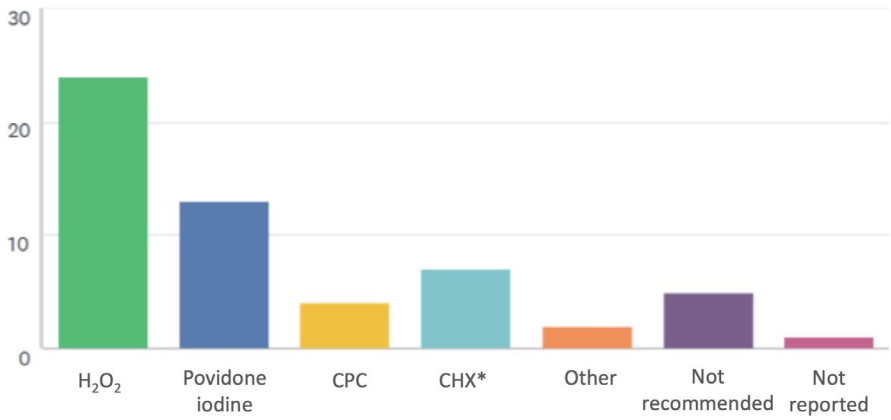

FIGURE 1 Type of mouth rinses recommended in the 30 European countries. The results represent the number of countries which recommend specific type of mouth rinse(s). H_2O_2, hydrogen peroxide; CPC, cetylpyridinium chloride; CHX, chlorhexidine

For low-risk patients, both elective and urgent treatments have been recommended in all national and international guidelines, but two. Priority should be given to urgent dental problems, and reducing AGP is frequently encouraged. It is to be noted that in some countries, real-time PCR COVID-19 testing before the treatment is recommended regardless of the procedure to be carried out (Latvia) or limited to AGP (Denmark and Estonia). In Germany, real-time PCR COVID-19 testing for asymptomatic patients has been recommended. It is to be performed within 3 days prior to elective ambulant surgical treatments (not specific to dentistry) or prior to all dental treatments in case of very high incidence of disease. In the Romanian guidelines, no clear specification is provided for low-risk patients, whereas in the Polish guidelines, it has been emphasized that dental procedures should be limited to urgent cases. In France, it was emphasized that systematic real-time PCR testing in all patients is not indicated.

Regarding high-risk/COVID+ patients, if treatment cannot be postponed, urgent or emergency oral health care should be provided as indicated by the WHO, preferably avoiding AGP. All the guidelines agree that treatment should be carried out only if strictly necessary. Only in five guidelines this aspect is not reported or explicitly recommended (Bulgaria, Italy, Malta, Romania and Spain).

3.5 | Recommended PPE for dental health professionals for low-risk patients

The guidelines of all the included European countries except one (Romania) provide recommendations for appropriate PPE to be worn by dental health professionals for the management of low-risk patients and appropriate measures implemented in case of AGP. A graphic representation of the recommended PPE is provided in Figure 2 for non-AGP and in Figure 3 for AGP.

Beside non-AGP and AGP, in several guidelines, a third intermediate category in terms of risk of virus spreading is described. For instance, in the French guidelines, the AGP is split in staining and non-staining ones (i.e. under rubber dam). Furthermore, in the Maltese guidelines, splatter generating procedure is considered at medium risk. Similar division is reported in Dutch, Latvian, Polish, Scottish and UK guidelines. For the medium risk, the recommended type of PPE was similar to the one for AGP; therefore, it was decided not to present the results graphically.

The WHO recommends the use of surgical mask for non-AGP, while FF2/N95 mask or higher protection for AGP. Except for Romania, the guidelines of the other 29 selected European countries contain information on the type of masks for dental health professionals in case of low-risk patients. For non-AGP, surgical mask is advised by 21 European countries, of which 13 recommend surgical mask only (Austria, Croatia, Cyprus, Denmark, Estonia, France, Greece, Latvia, Luxemburg, Netherlands, Scotland, Sweden and UK), while in the other 8 the use of FFP2/N95 mask or higher protection is preferable if available (Belgium, Germany, Ireland, Italy, Lithuania, Malta, Poland and Slovenia). In the guidelines of the remaining 8 European countries (Bulgaria, Czech Republic, Finland, Hungary, Portugal, Slovakia, Spain and Switzerland), only the use of FFP2/N95 mask or higher protection is recommended for non-AGP. In Germany, different recommendations were available for dentists in private practice (surgical mask recommended) and for employed staff including dentists and nurses. For the latter, recommendations are issued by the Federal Office for Occupational Safety and Health, which recommends FFP2 mask to be worn by dentists for all treatments in which patients are not advised to wear masks. For AGP, the use of FF2/N95 mask or higher protection is recommended in the majority of European countries (25/30), of which 5 contemplate surgical mask as an alternative (Belgium, Germany, Ireland, Poland and Sweden). In 4 countries, surgical mask represents the only type of mask recommended for AGP (Austria, Denmark, Luxemburg and Netherlands). In this context, the Austrian guideline emphasizes the liberal character of the dental profession and the related

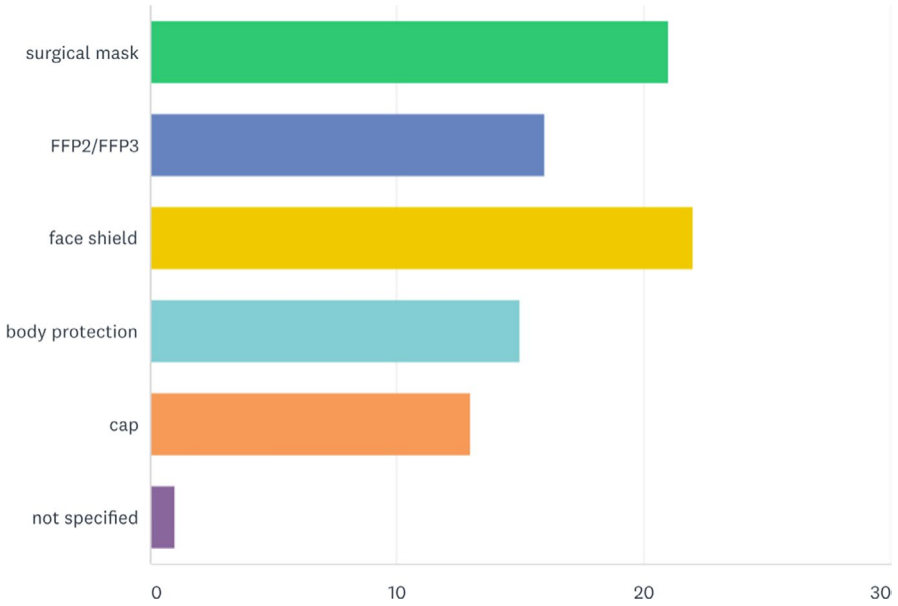

FIGURE 2 Type of personal protective equipment (PPE) recommended in the national guidelines of the 30 European countries for non-aerosol generating procedure (non-AGP). The results represent the number of countries which recommend specific type of PPE

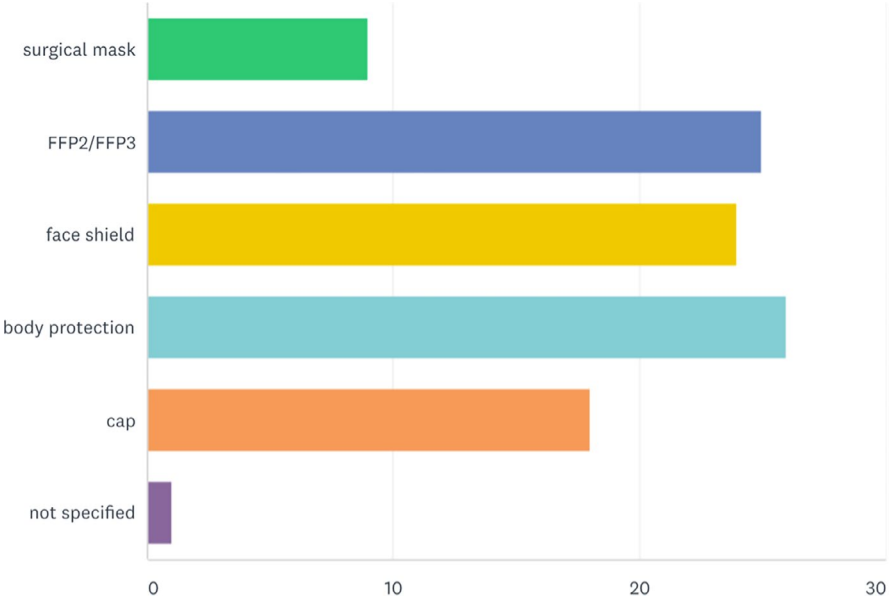

FIGURE 3 Type of personal protective equipment (PPE) recommended in the national guidelines of the 30 European countries for aerosol generating procedure (AGP). The results represent the number of countries which recommend specific type of PPE

responsibility to select appropriate PPE. In the ECDC guidelines, surgical masks are recommended in case of a shortage of respirators. The selection of the type of mask should be taken into consideration according to the local prevalence of COVID-19 and the probability that the consultation will include AGP. Similar recommendations are reported in the CDC guidelines.

Regardless of the type of procedure, adequate eye protection is considered fundamental by the WHO, which encourages the use of goggles or/and face shield covering the front and sides of the face. Similar advice has been also reported in the ECDC and CDC documents. In Europe, the use of face shield is recommended for both non-AGP and AGP in 22 out of 30 countries, while in Austria and Ireland it is indicated for AGP only. In 3 of 6 European countries not listing face shield as recommended PPE, other means of eye protection are suggested (Estonia, Germany and Luxemburg), whereas in 3 others no information has been reported (Greece, Romania, and Switzerland).

Gloves are considered standard PPE for dental procedures (WHO). The use of gloves is recommended in the national guidelines of 22 European countries, as well in the ECDC and CDC documents. Interestingly, double gloving is recommended for performing AGP in two countries (Portugal and Spain).

The use of protective headwear, in particular surgical cap, is advised by 13 European countries for both non-AGP and AGP (Bulgaria, Croatia, Cyprus, Czech Republic, France, Hungary, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Slovenia), whereas in 5, protective headwear is limited to AGP (Austria, Ireland, Latvia, Spain and UK). No information on head protection is reported in the ECDC, WHO and CDC guidelines.

The WHO recommends the use of fluid resistant disposable gown for both non-AGP and AGP. It must be stressed that due to the use of translation tools, it was hard to discern the differences between apron, surgical gown and coverall in some cases. Therefore, it was decided to put them in a single category. 26 European countries (out of 30) suggest the use of body protection for AGP, while only in 15 countries their use is suggested also for non-AGP (Bulgaria, Croatia, Denmark, Estonia, Hungary, Italy, Lithuania, Malta, Netherlands, Poland, Portugal, Scotland, Slovakia, Slovenia and UK). No information regarding body protection is provided in the guidelines of 4 European countries (Germany, Greece, Luxemburg and Romania). In accordance with WHO indications, the use of waterproof gown with long sleeves is advised by the ECDC and CDC guidelines.

Regarding overshoes, no information is reported in the majority of the European national guidelines (19 out of 30), as well in the ECDC, WHO and CDC ones. The use of overshoes is advised by 4 countries regardless of the type of the procedure (Italy, Malta, Poland and Spain), while only for AGP in Belgium, Lithuania and Portugal. Moreover, their use is not required in another 4 countries (France, Ireland, Scotland and UK).

Further rarely mentioned PPE includes clinical footwear (Malta, Netherlands, Portugal and Spain), disposable sleeves (Italy) and cowls (Portugal).

3.6 | Recommended PPE for dental health professionals for high-risk/COVID+patients

In the majority of the European countries (27/30), specific recommendations regarding PPE to be used when treating high-risk/COVID+patients are provided. No specific PPE for high-risk/COVID+patients is recommended in the Austrian, French and Spanish guidelines.

Overall, maximum protection is generally recommended for these patients and no distinction on PPE for non-AGP and AGP is provided. This is probably because it is strongly encouraged to avoid AGP in these patients.

The WHO recommend the use of respirators (i.e. N95 or FFP2 or FFP3 standards, or equivalent), especially for AGP, as well as face shield and body protection. These protective measures are

recommended in the guidelines of all the 27 European countries providing information on PPE for high-risk/COVID+patients. The use of protective headwear is also recommended in these countries except for Denmark, Ireland, Scotland, Switzerland and UK. Similarly, the ECDC and CDC guidelines suggest all the above-mentioned PPE apart from surgical caps.

Double gloving is recommended in Croatia, Czech Republic, Poland and Portugal. Moreover, vinyl gloves should not be used for these patients according to UK guidelines.

Overshoes are recommended in (Germany, Greece, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia and Slovenia), while they are not listed among the recommended PPE in the ECDC, WHO and CDC guidelines.

3.7 | Locations and conditions indicated for the treatment of high-risk/COVID+patients

High-risk/COVID+patients should be referred to specialized oral health care services accordingly to WHO, which also foresees the possibility of home visit by dedicated teams in case of need.

In the majority of the European countries, (22 out of 30) high-risk/COVID+patients should be treated in dental clinics / university hospitals, which constitute the only permitted locations for these patients in 12 countries (Austria, Croatia, Cyprus, Denmark, Estonia, Latvia, Lithuania, Netherlands, Poland, Slovakia, Slovenia and Sweden) (Figure 4). Dental clinics / university hospitals represent alternatives to specialized care centres in 6 countries (Greece, Hungary, Luxemburg, Scotland, Switzerland and UK) and to both specialized and general practices in 4 countries (Belgium, Germany, Ireland and Malta). In Finland, all dentists can provide care to high-risk/COVID+patients, whilst in the guidance documents of the remaining European countries the appropriate dental setting for the treatment of these patients is not specified.

Reported measures to reduce the risk of nosocomial transmission include isolation rooms, mechanical ventilation, air disinfection, longer fallow time and considering scheduling the appointment at the end of the working day.

Both the ECDC and CDC guidelines recommend the referral of these patients to designated dental care facility, which usually have a dedicated COVID-19 path and well-ventilated rooms.

4 | DISCUSSION

This review was conducted to summarize and assess the homogeneity of the most recently published COVID-19 guidelines on infection control and prevention related to dental care in European countries. It revealed that all the included countries published specific guidelines in 2020.

Briefly, all countries recommended remote triage. The majority (29/30) countries also recommended patient mask wear, hand hygiene (24/30) and social distancing (29/30), thus following WHO recommendation from August 2020. Antiseptic mouth rinses with potential virucidal properties were recommended by over two thirds of the countries (23/30). Beneficial effects of air ventilation were mentioned in the majority of the guidelines (28/30), while the minority (13/30) included specifications about fallow time and air exchanges per hour. Urgent treatments were only recommended for high-risk/COVID+patients, while also most countries recommended the continuation of elective treatments of low-risk patients (28/30). For non-AGP, the majority of countries found surgical masks (21/30) to be sufficient, whereas 16/30 emphasized possible benefits of FFP2/FFP3 masks. Moreover, face shield (22/30) and body protection (15/30) were recommended frequently. For AGP, few countries found surgical masks to be sufficiently protective (7/30) and four of these countries specified that surgical masks should be used only when FFP2/FFP3 masks are not available. Thus, the majority of countries recommended using FFP2/FFP3 masks (25/30) for AGP. Face shields (24/30), body protection (25/30) and headwear (17/30) were also recommended by the majority of included countries. It has to be noted that the recommended PPE measures were meant to be applied by all staff members including nurses. However,

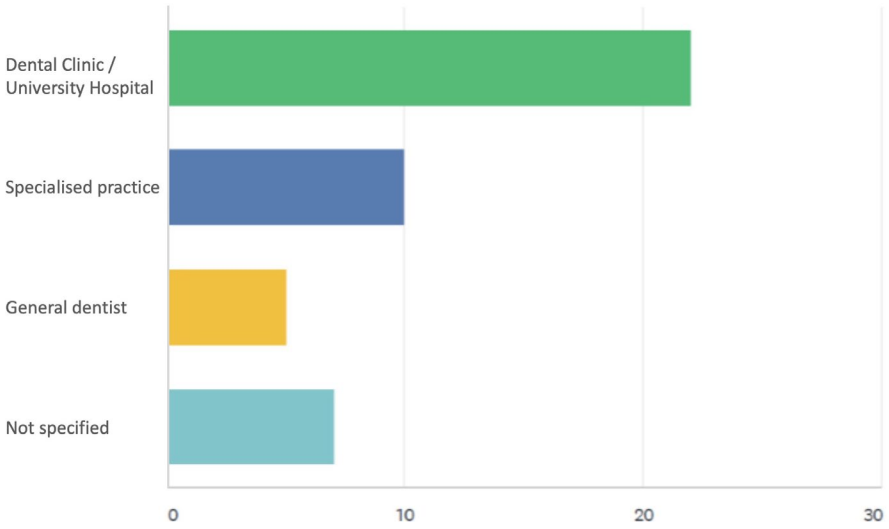

FIGURE 4 Type of dental setting recommended in the national guidelines of the 30 European countries for the treatment of high-risk/COVID+patients. The results represent the number of countries which recommend specific dental settings

in one country (Germany), national authority (Federal Institute for Occupational Safety and Health) recommended stricter PPE measures for employees in medical settings than those suggested in dental guidelines.

Regarding high-risk/COVID+patients, most of the guidelines provided information of recommended PPE (27/30) and locations (24/30) for dental treatments, but the conditions were generally not indicated. All countries specifying PPE recommended maximum protection for the treatment of high-risk/COVID+patients.

The term "triage" describes the process of separating patients into groups based on their needs and possible benefit for urgent treatment. The rationale behind telephone triage is to identify patients with the highest priority for treatment and/or the patients with high risk of COVID-19 transmission. This process is based on risk assessment, including epidemiological history and clinical symptoms, often followed by patient questionnaire (Gurzawska-Comis et al., 2020). To make triage efficient, it needs to be based on detailed algorithms (Programme, 2007), but also, on clinical judgement and shared decision making to determine whether patient management should continue remotely or face to face. Dentists worldwide had to adapt rapidly to remote patient consultation. The future will show if these types of communication tools will be used even after pandemic.

Following the patients' journey after remote triage and their allocation for elective or urgent treatment, it is important that their visit is as safe as possible. Therefore, a number of measures have been implemented and used worldwide, such as hand hygiene, 1–2 m distance and mouth and face cover (ECDC, 2020; WHO, 2020) to limit the risk of SARS-CoV-2 transmission in our daily life. Additional measures in the dental clinic have been introduced including reduction of waiting time for treatment, attendance without accompanying person and use of mouth rinse. The last item is the most controversial patient-related measure owing to limited scientific evidence.

The rationale for using mouth rinse is to reduce the risk of SARS-CoV-2 infection risk before treatment among dental professionals and possibly other patients attending the surgery, rather than directly for the patient using it. However, CHX was reported to cause irritation, allergic reaction or anaphylaxis when applied as a gel, for longer periods or for irrigation of extraction socket (Pemberton & Gibson, 2012; Rose et al., 2019). Therefore, before exposing patients to these antiseptics, consideration of the potential risks versus benefit should be undertaken, which is a part of the consent process (European Commissioner for Research Innovation & Science, 2014).

A recent systematic review (Clarkson et al., 2020) reported that 82% of international dental guidance recommended the use of pre-procedure mouth rinse, which corresponds with our results of 80% European countries recommending their use. Also, Vergara-Buenaventura and Castro-Ruiz (2020) highlighted the frequent recommendation of antiseptic mouth rinses in guidelines during pandemic despite absence of specific evidence for the safety and efficacy in COVID-19 positive patients. In summary, due to vague scientific evidence, further in vitro and clinical studies evaluating the impact on virus load and transmission risks during dental treatment are required to justify benefit of mouth rinse use.

The most reassuring patient measure that has been introduced by Cyprus, Denmark, Estonia and Latvia is real-time PCR test 48 hr before the dental appointment. Germany has recommended real-time PCR test before surgery and pointed at potential benefits in dentistry when COVID-19 incidence is particularly high. The negative test is not providing 100% evidence that a patient is not SARS-CoV-2 positive (false negative); however, it is considered to be the most predictive measure available before hospital admission. The other advantage of pre-treatment real-time PCR test is the detection of asymptomatic patients, whose number can be particularly high in areas of high COVID-19 prevalence (Pollock & Lancaster, 2020; WHO, 2020). However, none of the international guidance documents (WHO, ECDC) recommended the use of real-time PCR test before attendance for dental treatment.

Another important, rather controversial, measure is air ventilation that has been vaguely specified by the majority of the guidelines. Only few guidelines, including CDC, ECDC and WHO, reported details on natural ventilation, mechanical ventilation and air conditions. However, Germany even opposed additional mechanical ventilation systems including HEPA filters due to limited evidence. In contrast, Switzerland opposed AGP in the absence of proper ventilation. The treatment room should have 6–12 air changes per hour (ACH) as recommended by WHO that should correspond to fallow time. The fallow time has been reported only by 48% international guidance according to Clarkson et al., (2020), while our results showed that 43% of countries (13/30) recommended it, most frequently mentioning fallow times of 5 to 30 min (15 min recommended by the majority of guidelines). Our search did not reveal the difference between fallow time for low-risk and high-risk/COVID+patients. However, Clarkson et al., (2020) and Programme (2007) proposed fallow time depending on ACH, use of rubber dam and high-volume suction that varies between 10 and 60 min. If ACH is >10 and the high-volume suction and rubber dam are used, the fallow time of 10 min was recommended that is in accordance with a recent experimental study (Allison et al., 2021). The lack of specifications regarding air ventilation in national guidelines might be related to number of variables that affect fallow time including room volume, size of windows, air flow vectors, temperature, humidity and characteristics of aerosol particles (Sergis et al., 2020). In addition, WHO 2009 indicated that natural ventilation alone cannot satisfy the recommended ventilation requirements and alternative ventilation systems such as a hybrid (or if required mechanical) ventilation system should be considered. The rationality about adequate air ventilation is to reduce risk of airborne virus transmission; nevertheless, no consensus on specific ventilation measures is currently available in guidelines.

The type of treatment offered by dental care during pandemic in each country is based on risk assessment, and in this review, it was divided into low risk and high risk/COVID+. For patients with a low-risk COVID-19 (including potentially asymptomatic), the majority of countries recommended both elective and urgent treatments (except of Poland and Romania). Definition of emergency, urgent and

elective treatment, was not consistent and not always provided. It has to be highlighted that the majority of national guidelines recommended to prioritize the urgent treatments, limit elective treatments and avoid AGP if possible. Polish guidelines advised only urgent treatment; however, it has to be noted that they have not been updated since March 2020. The Romanian guidelines did not specify which treatment should be offered to patients with low COVID-19 risk.

The classification of AGP and non-AGP raised debate among clinicians and scientists, due to lack of robust evidence regarding the nature of generated sprays depending on the procedure, as well as contamination from respiratory and oral fluids. The WHO defines AGP as any medical, dental or patient care procedure that results in the production of potentially infectious airborne particles <5 μm in size (aerosols), which can remain suspended in the air and inhaled (World Health Organization, 2014). The risk of SARS-CoV-2 transmission by performing AGP in dentistry has been classified as high (Allison et al., 2021; Sergis et al., 2020). The procedures classified as AGP are debatable, and only few guidelines specify them. According to this category, appropriate PPE has been advised by some countries such as Croatia, Estonia, France, Latvia, Netherlands, Poland, Scotland, Switzerland and UK.

Regarding the use of mask, during the first wave of pandemic, the majority of the European countries advised FFP2 or FFP3 wear (Becker et al., 2020; Gurzawska-Comis et al., 2020). However, new scientific evidence has been published concerning the risk associated with different dental procedures high (Allison et al., 2021; Sergis et al., 2020). Type of mask was the only type of PPE that was specified by all included countries due to importance of protection from airborne SARS-CoV-2 transmission. It has to be highlighted that some countries like UK and Scotland changed the guidelines after the first wave of pandemic and did not recommend any more the use of FFP3 for surgical procedure using slow handpiece (<60,000 rpm), including implant procedures instead the advice was to use fluid resistant surgical mask type II (FRSM Type IIR). In addition, the mask should be well fitted and covering both nose and mouth.

Gloves were mentioned as the second most frequently type of PPE by all European national guidelines. Double gloving was recommended, for example by Croatia, Czech Republic, Germany, Poland, Portugal and Spain. However, there is limited evidence that it might decrease the risk of contamination (Verbeek et al., 2020).

Eye or face protection (including full-face visors/face shields) was recommended by 73% for non-AGP and 83% for AGP of European countries, and it was in agreement with WHO, ECDC and CDC guidelines. Additionally, some countries recommended eye protection by lateral closing goggles (Germany, Estonia and Luxemburg). According to a systematic review by Chu et al., (2020), face shields could confer additional benefit to wearing medical masks to protect against infection (Chu et al., 2020). However, no randomized trials were identified showing that these interventions provide higher protection from infection.

Body protection has been identified in guidelines with three types, namely apron with or without long sleeves, full-body gowns and coveralls. Our results showed that 52% of guidelines recommended use of body protection (aprons or gowns) for non-AGP and, while 83% for AGP, which is in line with the higher transmission risk assumed for AGP. Coveralls were recommended for high-risk patients and confirmed COVID cases only. The need for changing the body protection between patients, immediately after completing a procedure, as well as the technique for doffing was frequently highlighted.

The current situation of pandemic is very challenging especially for the dentists working in the front line, providing urgent treatments for high-risk/COVID+patients. Therefore, it is crucial to have clear information on appropriate protection measures. Although 23% of countries did not specify locations and conditions for the treatment of these patients, almost all countries (90%) responded to the need for definition of appropriate PPE, consistent with maximum protection: FFP2/FFP3, gowns or coveralls, headwear and face shields/goggles. Regarding location, treatment in hospital settings was frequently recommended (73%). Some guidelines further specified treatment condition, that is in isolation or negative pressure rooms. Interestingly, Poland introduced mobile clinical facilities called “dentobus” to support dental care for COVID+patients.

This review focussed on summarizing and assessing the homogeneity of the recent versions of national guidelines of European countries for the management of dental care during COVID-19 pandemic. Due to the similar legislation and strong connection among the included countries, it was decided to limit the present review to Europe. Consequently, the main limitation of the present review is that it does not reflect the worldwide situation. Other countries with high population such as Russia and Turkey were not included as they did not fulfil the requirement of being closely connected to European Union. However, Turkish recommendations were in line with the majority of European guidelines and suggested patient mask wear, preprocedural mouth rinse and PPE such as surgical masks/FFP2 masks, face shields and body protection (Turkish Ministry of Health, 2020). The Russian guideline, in contrast, only specified treatment of COVID+patients and measures for air ventilation (Minister of Health of Russian Federation, 2021). In most countries, an official English version of the guidelines is not provided by the organizations, so further transparency and ease of comparison is not available. This also led to the involvement of several colleagues supporting with the translation and the data extraction, in addition to the use of translation tools. Furthermore, it was decided not to summarize information on surface disinfection as this aspect was extensively discussed in our previous paper (Gurzawska-Comis et al., 2020).

Another limitation is that several guidelines were published during the first wave of pandemic. Despite a high number of articles on COVID-19 published in the second half of 2020, several guidelines did not reflect the most recent evidence. Hence, further systematic reviews and clinical trials are needed to better understand which measures should be applied during day-to-day dental practice.

Previous pandemics encouraged the introduction of new infection control and prevention regulation and measures to decrease the transmission of blood-borne as well as airborne diseases (Klevens &

Moorman, 2013; Samaranayake & Peiris, 2004). It can be expected that a similar scenario will result in case of COVID-19 and additional measures may become part of our daily practice, such as remote consultation or FFP2/FFP3 usage for AGP.

In conclusion, this review revealed that AGP is considered to be associated with high risk of COVID-19 transmission during pandemic. Therefore, higher protection has generally been recommended for this type of procedures. The risk arising from potentially asymptomatic patients not wearing mask during non-AGP appeared to be unclear, which is reflected by the heterogeneity of guidelines. Moreover, recommendations on air ventilation were mostly vague and no detailed specification of conditions for the treatment of high-risk patients was provided by the majority of guidelines. Overall, the current European guidelines are following the recommendation of the international organizations (ECDC, WHO and CDC).

In the future, the introduction of vaccination and the decrease of COVID-19 incidence may initiate new standards for ICP in dentistry. We believe that the dynamic of pandemic will have beneficial impact on revision of European guidelines, favouring more homogenous/standardized recommendations on infection control and prevention in dentistry across Europe.

ACKNOWLEDGEMENTS

The authors very much appreciate the special support from the CDO (Chief Dental Officer) in Austria, Gabriele Sax, Gesundheit Österreich GmbH, Vienna. The authors would also like to acknowledge the contribution of the following colleagues for providing national guidance documents necessary for this review and/or for their help in translating the national guidelines from their original language into English: Robert Stigler (Austria), Stella Kamou, Spyridon Papageorgiou, Spyridon Comis (Cyprus, Greece), Jan Chalupa (Czech Republic), Andreas Stravropoulos, Klaus Gotfredsen (Denmark), Mervi Sepp (Estonia), Sophie Ylinen (Finland), Katalin Nagy (Hungary), Elena Hude (Latvia), Egle Ramanauskaite (Lithuania), Marvin Straathof (Netherlands), Mihai Tarce (Romania), Nikolay Makarov (Russia),Maria Muchova (Slovakia), Manca Garbajs (Slovenia), Alberto Salgado (Spain).

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest related to this study.

AUTHOR CONTRIBUTION

Kathrin Becker: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Visualization (equal); Writing-original draft (equal); Writing-review & editing (equal). **Giulia Brunello:** Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Visualization (equal); Writing-original draft (equal); Writing-review & editing (equal). **Bjorn Klinge:** Conceptualization (equal); Investigation (equal); Supervision (equal); Writing-original draft (equal); Writing-review & editing (equal).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Becker K, Gurzawska-Comis K, Brunello G, Klinge B. Summary of European guidelines on infection control and prevention during COVID-19 pandemic. *Clin Oral Impl Res*. 2021;32(Suppl. 21):353–381. https://doi.org/10.1111/clr.13784