

Dental care during COVID-19 pandemic: Follow-up survey of experts' opinion

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Abstract

Objectives: The purpose of the present survey is to give an update of European experts' opinion on infection control and prevention in dentistry during second wave of pandemic. The secondary aim was to analyze how experts' opinion changed in the light of the new scientific evidence since the first wave.

Material & Methods: An anonymous online 14-item questionnaire was sent to a total of 27 leading academic experts in Oral (and Maxillofacial) Surgery from different European countries, who had completed a previous survey in April-May 2020. The questionnaire covered the topics of dental setting safety, personal protective equipment (PPE), and patient-related measures to minimize transmission risk. Data collection took place in November-February 2020/21.

Results: 26 experts participated in the follow-up survey. The overall transmission risk in dental settings was scored significantly lower compared to the initial survey ($p < .05$), though the risk associated with aerosol-generating procedures (AGP) was still considered to be high. Maximum PPE was less frequently recommended for non-AGP ($p < .05$), whereas the majority of experts still recommended FFP2/FFP3 masks (80.8%), face shields or goggles (88.5%), gowns (61.5%), and caps (57.7%) for AGP. Most of the experts also found mouth rinse relevant (73.1%) and reported to be using it prior to treatment (76.9%). No uniform opinion was found regarding the relevance of COVID-19 testing of staff and patients.

Conclusion: With the continuation of dental care provision, transmission risk has been scored lower compared to the first wave of pandemic. However, high risk is still assumed for AGP, and maximum PPE remained advised for the respective treatments.

KEYWORDS

COVID-19 pandemic, expert opinion, infection control and prevention, personal protective equipment, surveys and questionnaire

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1 | INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can be transmitted through saliva and respiratory droplets, as well as by contact with contaminated surfaces (Chan et al., 2020; Li et al., 2020; Xu et al., 2020; Yu et al., 2020). Its airborne transmission route among the high number of pre- or asymptomatic patients poses a significant challenge in dental settings, where face masks cannot be worn by patients. Furthermore, the risk of coronavirus disease 2019 (COVID-19) transmission in dental settings may be further increased by the production and spread of contaminated aerosol and splatter (Epstein et al., 2021; Izzetti et al., 2020).

During the first wave of pandemic, the risk of nosocomial transmission as well as of initial shortage of appropriate personal protective equipment (PPE) led several European countries to temporarily suspend elective dental treatments (Coulthard, 2020; Gurzawska-Comis et al., 2020; Luo et al., 2021). Infection control and prevention (ICP) protocols and recommendations were then developed to support dental health professionals returning to work after practice closures and restrictions, advising mitigation factors in particular for aerosol-generating procedures (AGP; Clarkson et al., 2020; Kumbargere Nagraj et al., 2020). Irrespective of COVID-19 individual risk assessment, emergency dental treatments were always recommended to be carried out.

During the first wave of pandemic, a survey of experts was performed asking for their opinion on appropriate PPE as well as assessment of risk associated with dental care. Overall, transmission risk of COVID-19 was assumed to be high in dental settings, especially for AGP. Thus, maximum protection (i.e., FFP2/FFP3 masks, caps, gowns, and face protection) was recommended by the wide majority of European experts in oral and maxillofacial surgery and oral surgery participating in our survey on dental care provision during the first wave, especially for AGP (Becker et al., 2020).

However, with the progression of the pandemic, it became clear that dental care could not be postponed any longer. The availability of PPE and understanding of disease transmission improved over time. Therefore, continuation of elective treatment has been recommended by international organizations, except for suspected or confirmed COVID-19 cases or in areas with very high prevalence of COVID-19 (ECDC, 2020; World Health Organization, 2020).

Several patient-related measures have been proposed so far to limit COVID-19 cross-infection in dental settings (e.g., limitation of the number of accompanying people, social distancing in waiting areas, hand disinfection, and mouth rinses; Gurzawska-Comis et al., 2020). Additionally, national guidelines have been published by most of the countries including recommendations on ICP during pandemic. Frequently, they followed international guidelines (e.g., WHO, ECDC) which proposed use of appropriate PPE for dental staff based on patients' risk assessment for COVID-19 and the type of dental treatment (ECDC, 2020; World Health Organization, 2020). Furthermore, most national guidelines recommended the use of preprocedural mouth rinse with antiseptic agents, even though this

measure is still lacking scientific evidence regarding its efficacy and benefits (Clarkson et al., 2020).

As an adjunct, preprocedural real-time polymerase chain reaction (PCR)-based test for low-risk asymptomatic patients attending AGP elective dental treatments might also be considered (Umer & Arif, 2021), while the utilization of preprocedural rapid serological tests should be discouraged due to the high frequency of false-negative results (Tysiąc-Miśta & Bulanda, 2020). In addition, it is still controversial whether real-time PCR testing could be beneficial during a pandemic in dental settings. The use of fixed or mobile filter systems and ventilation protocols is still debatable.

As most guidelines were produced during the first wave of pandemic and as there is still not enough scientific evidence, solid and updated recommendations on ICP are required. As long as there is still a lack of solid evidence, the experts' opinions should be accounted. Therefore, the primary aim of the present study was to collect updated opinions of European experts, who participated in the survey proposed by our group in April–May 2020 (Becker et al., 2020) on ICP in dental settings, PPE and additional measures to minimize COVID-19 transmission risk. Secondary aim was to analyze how experts' opinion changed overtime, considering the new scientific information available and the experience gathered at the frontline since the outbreak of COVID-19 pandemic.

2 | MATERIAL AND METHODS

The study protocol was submitted to and approved by the Ethics Committee of the University of Dusseldorf (protocol no. 2020-926). The study was conducted according to the Declaration of Helsinki and the European Medicines Agency Guidelines for Good Clinical Practice. This study was also conducted and reported following the "Good practice in the conduct and reporting of survey research" criteria (Kelly et al., 2003).

2.1 | Study population

The present survey-based study was conducted via a questionnaire distributed among 27 academic experts in Oral and Maxillofacial Surgery or Oral Surgery from different European countries, who had responded to our previous survey (Becker et al., 2020). An invitation was sent by email explaining the purpose of the present follow-up study. A link to the consent form and online survey was reported as well. All experts were either based in one of the 27 European Union (EU) countries or within the following states with strong connection to EU: Iceland, Norway, Moldova, Switzerland, and United Kingdom (UK; Becker et al., 2020).

As no response was received from France, Slovakia, Hungary, Bulgaria, and Lithuania during the first study (Becker et al., 2020), these respective countries were excluded from the follow-up survey.

The participation in the survey was voluntary and without any incentive. All responders signed an informed consent form before

accessing the questionnaire which was provided through an online survey platform (SurveyMonkey®). Data collection of the follow-up survey took place from 23 November to 4 February 2021, whereas the initial survey had been performed from 12 April to 22 May 2020. Data were stored anonymously.

2.2 | Questionnaire

A 14-item structured questionnaire was developed (Attachment 1). It was created based on a published questionnaire, previously completed by all the invited experts (Becker et al., 2020).

In order to allow the comparison between data recorded in the two waves of pandemic, the first 10 items included minor modifications and covered the same areas as the first survey. In order to explore emerging topics of interest, 4 new items were added. Furthermore, the option to leave a comment on a question was added.

The questionnaire was organized as follows:

- a. participant working environment (two items, single choice);
- b. infection risk of dental health professionals (two items, single choice);
- c. facilities for dental treatment of COVID-19 positive patients (one item single choice);
- d. measures to prevent infection of health professionals and nosocomial transmission in dental clinics (two items, matrix/single choice per row);
- e. information about where dental care was provided for COVID-19 positive patients or at high risk (one item, multiple select);
- f. recommended PPE for dental health professionals (two items, matrix/single choice per row);
- g. antiseptic mouth rinse (one item, single choice);
- h. COVID-19 testing of dental staff (two items, single choice);
- i. recommended type of treatment provision during the second wave (one item, single choice).

As in the previous survey (Becker et al., 2020), they were asked if they treated their patients in the private and/or university dental clinic settings (question 1) and information on the number of staff members working in their departments was also explored (question 2).

In question 3 and 4 (scoring of the risk from AGP, and non-AGP), participants had an option to leave a comment to explain their response. Question 5 was added, asking where patients infected with COVID-19 (COVID+) should be treated. Question 8 on room-related preventive measures was moved to question 6, and two options for response were added (high-efficiency particulate air [HEPA] filters, high vacuum evacuators). Question 9 was moved to 7 (patient-related measures), and antigen or PCR test prior to treatment was added as a new response. Question 10 was moved to 8 (facilities performing treatment of COVID-19 patients in the respective countries), and

now it was possible to leave a comment and state, whether one was actually involved in treatment of COVID-19 patients. Questions 5 and 6 were shifted to questions 9 and 10 (protective measures for non-AGP/AGP), and now also antigen test before treatment could be selected as a preventive measure. Additionally, instead using the classifying answers among *recommended for patients of unknown risk/high risk/very high risk/not recommended*, we now specified *recommended for every patient/patient with COVID-19 symptoms/not recommended*. Questions 11–14 were added to the survey and included aspects that were in general not relevant during first wave of pandemic (when elective treatments were postponed in most countries), that is, virucidal mouth rinse, regular testing of staff, and continuation of elective treatments.

2.3 | Statistical analysis

The data analysis was performed using Microsoft Excel® for Mac version 16.37 (Microsoft®) and an online survey tool (Survey Monkey®). For each question, the absolute number of votes and the relative agreement (%) were calculated. As only one group was surveyed (experts in oral surgery), no comparative analyses were performed per time point. To compare expert votes between first and second survey, chi-square test was used. Results were found significant if $p < .05$.

3 | RESULTS

A total of 26 out of 27 experts from different European countries responded to the survey. No response was received from Estonia. The mean duration of answering the questionnaire was 8 min and 45 s. Details on the adherence to the “Good practice in the conduct and reporting of survey research” criteria for questionnaire studies are reported in Attachment 2 from submission (Kelly et al., 2003).

3.1 | Participant working environment

Ten participants (38.5%) responded to be treating patients at the Dental University Hospital, and 14 (53.9%) indicated treatment in both private practice and Dental University Hospital. Beside their academic responsibility, two participants (7.7%) reported performing their clinical activity in private practice. Despite the minor changes in the responses, no significant differences were observed ($\chi^2 = 1.67$, $df = 2$, $p = .43$).

The number of staff members working in their departments was heterogenous: 0–10 (one expert, 3.9%), 11–20 (nine experts, 34.6%), 21–30 (six experts, 23.1%), 31–50 (two experts, 7.7%), 51–100 (six experts, 23.1%), >100 (two experts, 7.7%). Whereas number of staff members increased slightly compared to survey one, no significant differences were observed ($\chi^2 = 4.34$, $df = 5$, $p = .50$).

3.2 | Infection risk of dental health professionals

For aerosol-free treatments (non-AGP), 12 experts (46.2%) found the risk to be low, whereas six rated the risk to be neutral (23.1%) and eight rated the transmission risk to be high (30.7%; Figure 1). When comparing the findings with the first survey, risk associated with non-AGP retrieved significantly lower scores ($X^2 = 6.25$, $df = 2$, $p = .04$). However, it was commented that ICP needs to be followed, and proper protection has to be used, otherwise risk may be higher.

For AGP, three experts rated the risk to be low (11.5%), eight experts scored the risk to be neutral (30.8%) and 15 (57.7%) to be high (Figure 1). Thus, risk associated with AGP was scored significantly lower compared to the initial survey ($X^2 = 9.08$, $df = 2$, $p = .01$). It was commented that the overall risk would be high, but risk may be neutralized by precautions and PPE, and following of ICP guidelines.

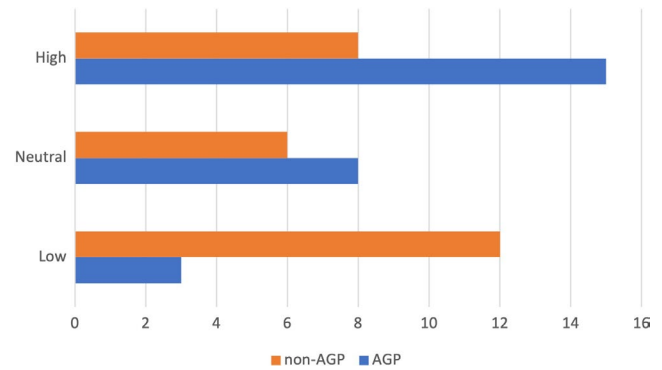


FIGURE 1 Absolute number of experts' votes regarding the perceived risk for aerosol-free procedures (non-AGP) and aerosol-generating procedures (AGP) for infection risk of dental health professionals

3.3 | Facilities for dental treatment of COVID-19 positive patients

A total of nine experts (34.6%) responded that dental treatments of COVID-19+ patients should be performed at Dental University Hospitals. The remaining 17 participants (65.4%) suggested private practice and Dental University Hospitals as eligible. None of the experts identified the private practice as the only recommended setting for urgent treatment of COVID-19 positive patients. The responses were in line with the initial survey ($X^2 = 0.00$, $df = -1$, $p = 1.00$).

3.4 | Measures to prevent infection of health professionals and nosocomial transmission in dental clinics

Findings regarding measures to prevent infection of health professionals and nosocomial transmission in dental clinics are presented in Figure 2. Comparable to the initial survey, most of the experts (23 experts, 88.5%) found treating COVID-19+ patients in separate isolation rooms relevant ($X^2 = 2.07$, $df = 2$, $p = .36$). In contrast, fewer experts recommended the reduction of AGP (19 experts, 73.1%), and this was significantly different from the initial survey ($X = 28.51$, $df = 2$, $p < .01$). More than half of the participants also found the use of rubber dam relevant (16 experts, 61.5%), which was comparable to the initial survey ($X^2 = 2.12$, $df = 2$, $p = .35$). Heterogenous opinions were found for extraoral radiographs (relevant: 11 experts, 42.3% neutral: eight experts, 30.8%, not relevant: seven experts, 26.9%), and these opinions were significantly different to the initial survey ($X^2 = 7.32$, $df = 2$, $p = .02$). Air disinfection also received heterogeneous scores (relevant: 13 experts, 50.0%; neutral: 12 experts, 46.2%; not relevant: one expert, 3.9%), which was comparable to survey one ($X^2 = 0.94$, $df = 2$, $p = .62$). Additionally, heterogeneous recommendations were found for high vacuum evacuators (relevant: 10 experts, 38.5%, neutral: 15 experts, 57.7%, not relevant: one

expert, 3.85%; new item). In contrast, limiting the contact among staff members was found relevant by the wide majority of experts in both surveys (22 experts, 84.6% in second survey, 23 experts 85.0% in first survey; $X^2 = 0.01$, $df = 2$, $p = 1.00$). Additionally, natural air ventilation (21 experts, 80.8%) and usage of fixed filter systems or mobile filtration units with HEPA filters (17 experts, 65.4%) were found to be relevant by most of the experts (new items).

Several patient-related measures were found important to limit the risk of COVID-19 transmission (Figure 3). In both surveys, the experts agreed that the number of patients in waiting area and the time they spend there should be minimized. Most experts also agreed to limit the number of accompanying people (23 experts, 88.5%), which was in line with previous survey. Phone interviews to assess the health status (COVID-19 risk assessment) were scored to be highly relevant (19 experts, 73.1%) during both surveys ($X^2 = 2.33$, $df = 2$, $p = .31$). In contrast, assessing patient treatment needs via phone was approved by 14 (53.9%) of the experts only, which was comparable to the previous survey ($X^2 = 1.76$, $df = 2$, $p = .41$). The hand hygiene (25 experts, 96.2%) and surgical mask wear inside the clinic were considered to be crucial (24 experts, 92.3%; $X^2 = 0.00$, $df = 2$, $p = .99$ and $X^2 = 4.23$, $df = 2$, $p = .12$). Slightly fewer experts recommended temperature taking (15 experts, 57.7%; $X^2 = 2.95$, $df = 2$, $p = .23$) and mouth rinse (19 experts, 73.1%; $X^2 = 0.65$, $df = 2$, $p = .72$). In contrast, significantly fewer experts recommended to postpone elective treatments (relevant: 10 experts, 38.5%; $X^2 = 12.45$, $df = 2$, $p < .01$). Heterogenous recommendations were found regarding antigen or real-time PCR testing prior to treatment (not relevant: six experts, 23.1%, neutral: nine experts, 34.6%; relevant: 11 experts, 42.3%; new item).

3.5 | Information about where dental care was provided for patients with a high risk of COVID-19

Results on where dental care was provided for patients with high risk of COVID-19 are presented in Figure 4. Dental treatments of

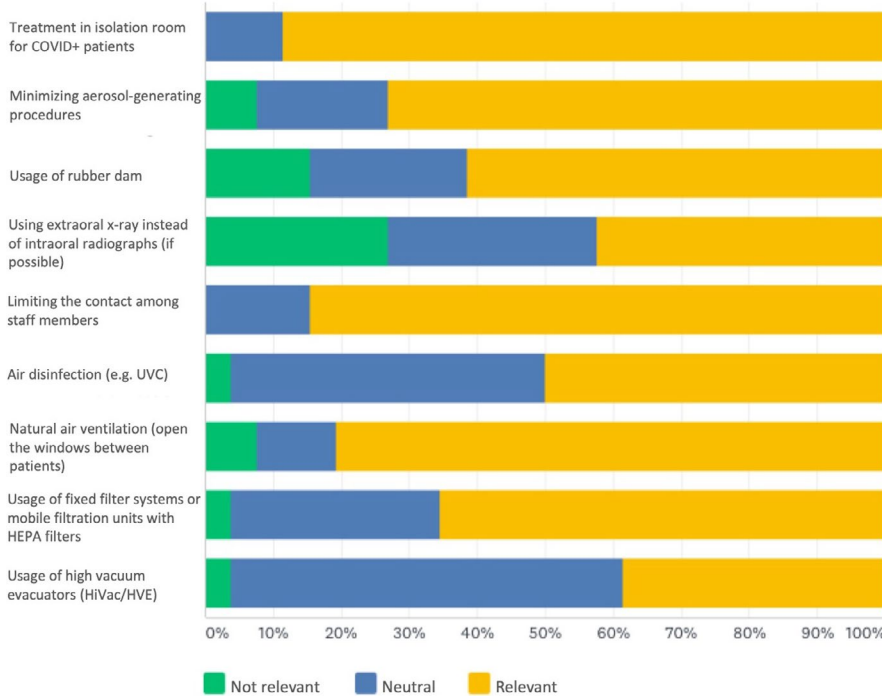


FIGURE 2 Relevance scoring for the use of different measures to decrease transmission risk of coronavirus disease 2019 in dental settings

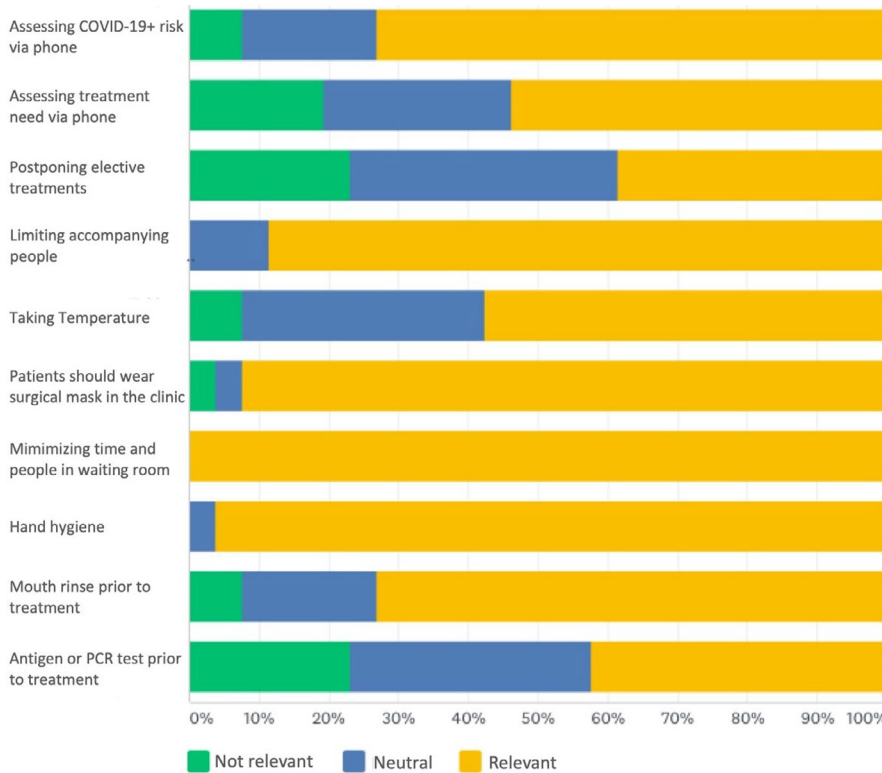


FIGURE 3 Relevance of applied patient-related measures to decrease transmission risk of coronavirus disease 2019 (COVID-19) in dental settings

COVID-19+ patients were performed at Department of Oral Surgery (18 experts, 69.2%) and/or at the Department of Oral and Maxillofacial Surgery (15 experts, 57.7%). In 13 countries, both departments were responsible in parallel. Private practice was mentioned by 11 experts (42.3%), whereas other facilities (e.g., emergency units) were highlighted by 10 experts (38.5%). A total of seven experts (26.9%) responded to be involved in the treatments of infected patients.

3.6 | Recommended PPE for dental health professionals

For non-AGP procedures, the recommendations varied for the different PPE measures (Figure 5). The majority of experts recommended FFP2/FFP3 masks for every patient (16 experts, 61.5%), whereas eight experts (30.8%) recommended these masks for patients with

FIGURE 4 Information about where dental care was provided for patients with a high risk of coronavirus disease 2019

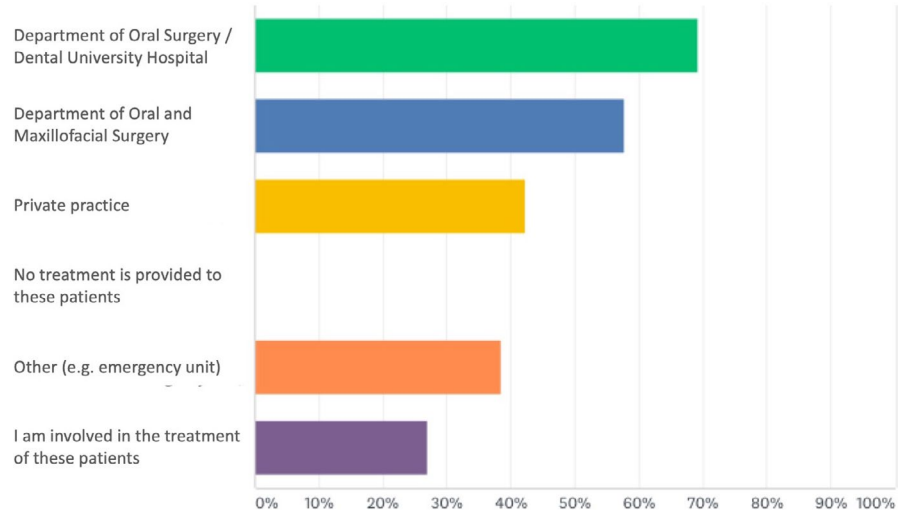
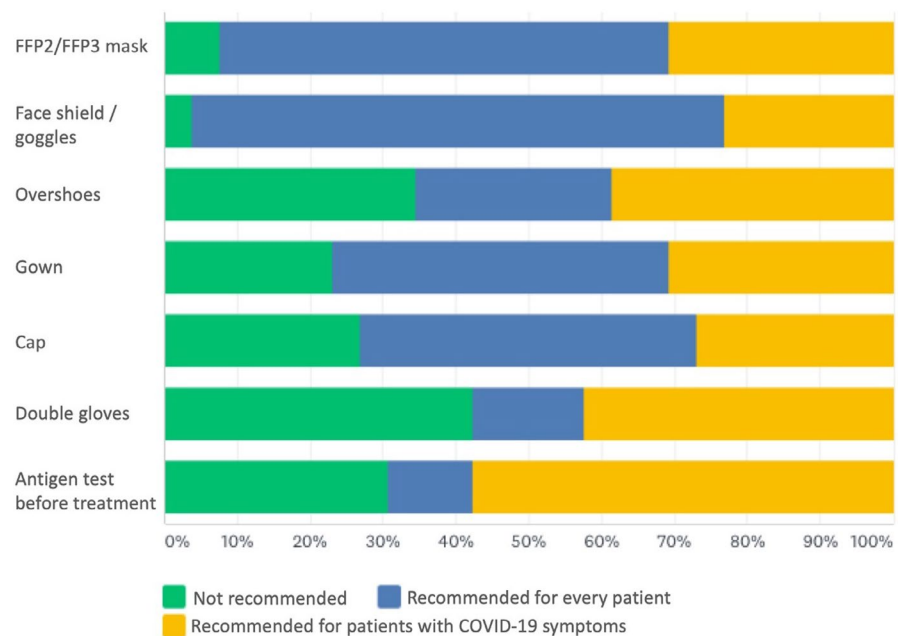


FIGURE 5 Recommended personal protective equipment measures during aerosol-free procedures (non-AGP). COVID-19, coronavirus disease 2019



COVID symptoms only and two experts (7.7%) did not recommend them at all, so they were slightly less frequently recommended compared to the initial survey ($X^2 = 1.52$, $df = 2$, $p = .47$).

Face shields or goggles were recommended for every patient by the majority of experts (19 experts, 73.1%) likewise to the initial survey ($X^2 = 3.20$, $df = 2$, $p = .20$). Heterogenous recommendations were found for overshoes (not recommended: nine experts, 34.6%, every patient: seven experts, 26.9%; symptomatic patients: 10 experts, 38.5%) likewise to the first survey ($X^2 = 1.51$, $df = 2$, $p = .56$). Gowns were recommended for every patient by 12 experts (46.2%), while eight experts recommended them only for symptomatic patients (30.8%), by trend gowns were slightly less recommended as compared to the first survey ($X^2 = 2.27$, $df = 2$, $p = .32$). Significantly less experts recommended caps (recommended for every patient by 12 experts, 46.2%; $X^2 = 11.26$, $df = 2$, $p < .01$) and slightly fewer experts recommended double gloves (recommended for every patient by four experts, 15.4%) ($X^2 = 4.34$, $df = 2$, $p = .11$). Antigen test prior to treatment was recommended for

symptomatic patients by 15 experts (57.7%), whereas eight experts (30.8%) did not recommend them at all (new item).

For AGP, the recommended type of PPE is presented in Figure 6. The majority of experts recommended using FFP2/FFP3 masks (21 experts, 80.8%), similar to survey one. Face shields were recommended by 23 experts (88.5%), again almost identical to survey one. Overshoes were recommended by 11 experts (42.3%), comparable to survey one ($X^2 = 1.00$, $df = 2$, $p = .62$). Gowns were recommended by most of the experts (16 experts, 61.5%), which was also in line with the initial survey ($X^2 = 1.46$, $df = 2$, $p = .48$).

Caps were recommended by 15 experts (57.7%), and this recommendation changed significantly compared to the initial survey where they were recommended more frequently ($X^2 = 6.83$, $df = 2$, $p = .03$). Double gloves were recommended by only seven experts (26.9%) whereas they were by trend more often recommended during survey one ($X^2 = 3.49$, $df = 2$, $p = .18$). Antigen test prior to treatment was recommended for every patient by seven experts

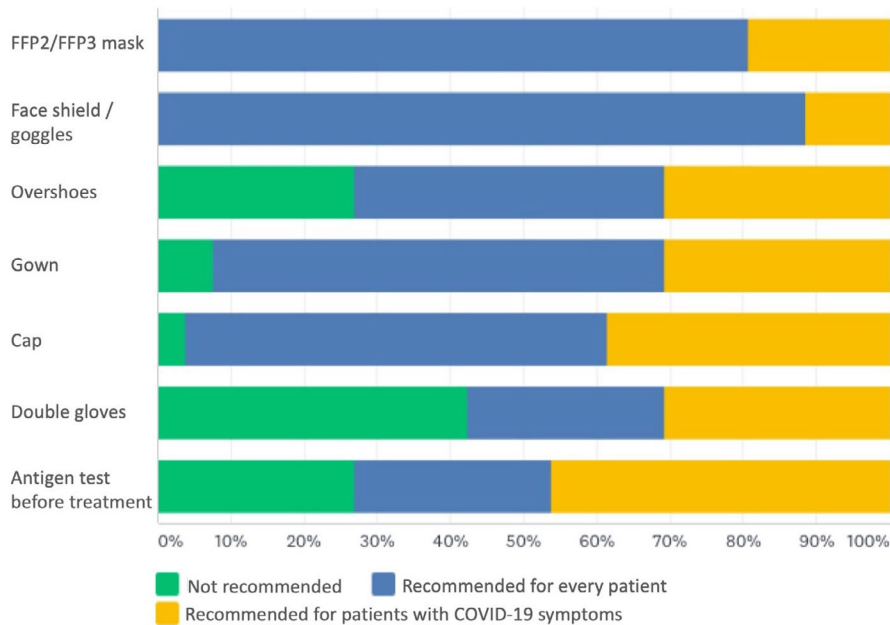


FIGURE 6 Recommended personal protective equipment measures during aerosol-generating procedures. COVID-19, coronavirus disease 2019

(26.9%), whereas 12 experts considered this measure useful for symptomatic patients (46.2%). Seven experts did not find this measure useful at all (26.9%; new item).

3.7 | Antiseptic mouth rinse

Most of the experts (20 experts, 76.9%) advised antiseptic mouth rinse prior to treatment. Most frequently mentioned were hydrogen peroxide (H_2O_2) (recommended by seven experts, varying concentration and rinsing time), chlorhexidine (CHX; two experts), combination of CHX and H_2O_2 (one expert), chlorhexidine digluconate plus chlorobutanol (Eludryl®; one expert, 2–3 min), essential oils plus ethanol (Listerine®; one expert).

3.8 | COVID-19 testing of dental staff

The majority of experts (14 experts, 53.9%) recommended testing of staff on a regular basis. Real-time PCR test (five times, from weekly to monthly) and antigen test (four times, mostly on weekly basis) were proposed. One expert (3.9%) proposed testing only after contact with COVID+ people.

A minority (eight experts, 30.8%) responded that regular tests should be performed, including real-time PCR test (five times, i.e., every 3 months/every 20 days/weekly/time interval not specified), weekly antigen test (twice), or only when staff is symptomatic.

3.9 | Recommended type of treatment provision during the second wave

Most experts recommended that all treatments should be provided during the second wave of pandemic (20 experts, 76.9%). However,

two experts commented that elective treatments in oral surgery should not be performed as long as the incidence of COVID-19 is high, and one expert commented that COVID-19 symptoms should be assessed prior to elective treatment. Only one expert suggested that elective treatments could be postponed.

4 | DISCUSSION

Transmission risk of COVID-19 in dental settings has been reported to be high (Banakar et al., 2020) for the reason being that dentists work in proximity to the oral cavity, which is the natural reservoir of SARS-CoV-2. AGP are likely to further increase infection risk in dental environment (Nulty et al., 2020; United States Department of Labor, 2020).

Due to the absence of evidence-based recommendations on ICP during the first wave of COVID-19 pandemic, the authors performed a survey gathering the opinion of European experts. This study revealed that adequate personal protective equipment (PPE) and reduction of AGP were considered to be crucial (Becker et al., 2020). However, as new scientific evidence on SARS-CoV-2 transmission became available, this led to the development of national and international COVID-19 ICP guidelines (Becker et al., 2020). Despite this, these guidelines were found not to be uniform across Europe.

Therefore, the present study aimed at providing follow-up of experts' opinion-based recommendations on crucial aspects of ICP for the continuation of dental treatment during COVID-19 pandemic, and to compare them with the results from the first survey.

In summary, the present survey revealed that experts rated the transmission risks in the dental settings to be significantly lower compared to the initial survey. Almost half of the experts now rated the risk of non-AGP to be low, whereas the AGP were still considered to involve high infection risk for dental health professionals by most of the experts. Regarding the PPE, significantly fewer experts recommended FFP2/FFP3 masks for non-AGP compared to the first

survey, whereas opinion on the PPE for AGP did not change except for headwear. During the second survey, experts no longer suggested postponing elective treatments. No uniform responses were retrieved regarding testing of staff and patients. The majority of experts found antiseptic mouth rinse to be relevant and confirmed its use in daily practice. A slightly higher number of dental staff working during the second wave was also reported, which might account for the resume of elective dental treatments.

Reasons why the overall risk of SARS-CoV-2 transmission was rated lower in the second survey probably because of new scientific evidence and availability of adequate PPE. Additionally, epidemiological data revealed low infection rates among dental health professionals, thus showing effectiveness of the recommended measures (Estrich et al., 2020). The perception of risk might have changed also due to practical experience gained during pandemic or as a result of simple relaxation, after months of alertness.

Allison et al. (2021) reported surface contamination was higher in the proximity to patients and operators, remaining high within a radius of 1–1.5 m. Surface contamination remained detectable at a maximum distance of 4 m. Sergis et al. (2020) showed that avoidance of premisting (mixing of coolant water and air prior to burr contact) might reduce the spread of small droplets from high-speed hand pieces. The aerosol particles generated during AGP are associated with higher risk of transmission and nosocomial infection. However, there is still a lack of evidence to what extent aerosol-generated particles are infectious once diluted in large amounts of water. This might reflect experts' opinion in the second survey. Risk from non-AGP and AGP was rated significantly lower compared to first survey, however, the majority of experts rated the risk associated with AGP still to be high.

Number of patient-related measures, COVID-19 ICP, and adequate PPE were introduced after the outbreak of pandemic and were frequently recommended by most of the experts.

The patient journey was suggested to start with COVID-19 risk assessment by telephone, even though remote identification of dental treatment need was no longer suggested. In this context, it has to be noted that only less than one third of experts recommended antigen testing prior to treatment for every patient. Thus, a high number of infected asymptomatic patients is expected to be missed by the proposed strategy. The reasons for the limited advice for rapid testing may be related to lack of scientific evidence, low sensitivity, and cost (Hirotsu et al., 2020; Mak et al., 2020; Scohy et al., 2020). However, the real-time PCR testing was slightly more appreciated by the experts.

To ensure patients' safety, the experts in both surveys agreed that the time in the waiting area should be reduced and patients should possibly attend their appointments alone. Patients' hand hygiene and wearing of masks were highlighted by all experts to be relevant, and the latter was by trend even more appreciated in the second survey.

Body temperature check before the appointment is still debatable. The temperature screening has been described by the Clinical Evidence Assessment published in May 2020 (ECRI CEA, 2020) to be

ineffective and will potentially miss more than half of infected individuals. The reason given was related to the low number of infected individuals who have fever at the time of screening and also inconsistent technique by operators. In addition, dental infection often presents with fever and if the patient would not be allowed to access the dental care due to the temperature screening, the consequence might become life-threatening (i.e., sepsis, compromised airway in case of Ludwig angina). Additionally, virus load was reported to be high prior to the onset of symptoms including fever (Walsh, Jordan, et al., 2020). Thus, temperature check may not be the most effective measure, even though it was employed by more than half of the experts.

A number of measures to prevent infection of health professionals and nosocomial transmission in dental clinics have been implemented since the start of pandemic. The experts in both surveys recognized the use of rubber dam and limiting contact between staff members to be relevant. Furthermore, the experts' opinion regarding the use of an isolation room for symptomatic patients did not change significantly, and isolation rooms were found useful by almost all experts also in the second survey.

The opinion regarding air disinfection was not uniform, and it might be related to lack of evidence and also the sparse information provided by national guidelines (Becker et al., 2021). Natural air ventilation, by contrast, was recommended by the vast majority. Proper ventilation depends on various factors as room volume, size of windows, air flow vectors, temperature, humidity, and characteristics of aerosol particles that have an impact on duration of fallow time (Sergis et al., 2020). In addition, shorter fallow times may be required when high-volume suction and rubber dam are used (Scottish Dental Clinical Effectiveness Programme, 2020). The use of suction was suggested for the reduction of contamination from AGP by 67%–75% at 0.5–1.5 m (Allison et al., 2021). Other methods for decreasing contamination from AGP were proposed, such as mechanical or hybrid filtration systems, which can be fixed or mobile. They can include HEPA filtration and may be used in conjunction with air disinfection (Kumbargere Nagraj et al., 2020). Approximately two thirds of the experts in the second survey considered filtration systems including HEPA filters to be relevant.

A patient-related measure that has been originally suggested by experts to reduce the risk of SARS-CoV-2 transmission was extraoral radiography (Meng et al., 2020). However, the results from second survey suggested that their indication is not as relevant as originally suggested. Another patient-related measure is preprocedural an antiseptic mouth rinse, which has been also proposed to reduce viral load. Approximately two thirds of experts still found antiseptic mouth rinse to be relevant and reported to also utilize it in daily practice. An *in vitro* study suggested significant reduction of SARS-CoV-2 infectivity with dequalinium chloride, benzalkonium chloride, polyvidone-iodine, ethanol, and essential oils (Meister et al., 2020). However, there is still a lack of clinical studies providing evidence regarding virucidal efficiency (Kumbargere Nagraj et al., 2020).

There was a shortage of PPE during the first wave of the pandemic, and it was not clear which type of PPE was appropriate for non-AGP/AGP. In contrast with our previous study (Becker et al., 2020), although the majority of experts still recommended that dentists should use FFP2/FFP3 masks for every patient undergoing non-AGP, it was less frequently recommended compared to the first survey. This change cannot be explained by the improved availability of PPE and is therefore most likely related to the reduced risk assumed for non-AGP. By contrast, for AGP, the majority still recommended usage of FFP2/FFP3 masks. Interestingly, headwear such as caps was recommended by less than half of experts for non-AGP, and by a slightly more than half for AGP. This was a significant reduction compared to the initial survey, maybe because contact transmission is no longer considered to be the main transmission route of SARS-CoV-2. Indeed, the use of different type of PPE for each procedure for dental staff might be impractical as PPE has to be changed between the patients. Therefore, some dental hospitals/clinics introduced (Grossman et al., 2020).

Slightly more than half of the experts found testing of staff members relevant, whereas only approximately one third also reported that they were performing it in clinical practice. This might be related to the start of vaccination program in European countries, which is expected to provide immunity among dental health professionals (Walsh, Jordan, et al., 2020).

As emerged from the follow-up survey, high-risk patients/COVID+ patients still pose a significant challenge to the dental health professional whenever treatment needs are urgent and cannot be postponed. One third of the experts suggested that COVID+ patients should be treated in hospital settings only, whereas approximately two thirds recommended that treatments can be performed at both, clinics and private practice.

A limitation of the survey relates to the small number of involved experts, all of whom have the same specialized profession. Our procedure was chosen during the initial survey to enable equal representation of every country involved. Due to the anonymous approach, pooling per country was not possible. Future survey studies, however, might include a larger number of participants from different specializations and different levels of experience. Another limitation of the present survey is that most experts responded before the widespread dissemination of mutants of SARS-CoV-2, which were reported to have a much higher infectivity (Galloway et al., 2021; Leung et al., 2021), and also the start of mass vaccination programs.

In conclusion, this follow-up study revealed that the present pandemic still poses significant challenges on dental health professionals. In particular, early identification of potentially infectious patients and proper protection during AGPs appear to be highly relevant. However, additional challenges may arise due to new variants of the virus which may be more infectious, thus possibly making dental practices a hotspot for virus transmission.

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CONFLICT OF INTEREST

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

AUTHOR CONTRIBUTION

Giulia Brunello: Conceptualization (equal); Formal analysis (equal); Methodology (equal); Resources (equal); Writing-original draft (equal); Writing-review & editing (equal). **Katarzyna Gurzawska-Comis:** Conceptualization (equal); Investigation (equal); Methodology (equal); Writing-original draft (equal); Writing-review & editing (equal). **Kathrin Becker:** Conceptualization (equal); Data curation (equal); Formal analysis (equal); Methodology (equal); Project administration (equal); Resources (equal); Visualization (equal); Writing-original draft (equal); Writing-review & editing (equal). **Stefano Sivolella:** Conceptualization (equal); Methodology (equal); Supervision (equal); Writing-review & editing (equal). **Frank Schwarz:** Conceptualization (equal); Methodology (equal); Supervision (equal); Writing-review & editing (equal). **Bjorn Klinge:** Conceptualization (equal); Investigation (equal); Methodology (equal); Supervision (equal); Writing-review & editing (equal).

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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SUPPORTING INFORMATION

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

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