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# Impact of COVID-19 on maxillofacial surgery practice: a worldwide survey

F. Maffia<sup>1</sup>, M. Fontanari<sup>1</sup>, V. Vellone<sup>2</sup>, P. Cascone<sup>2</sup>, L. G. Mercuri<sup>3</sup>

<sup>1</sup>Research Student Programme, “La Sapienza” University of Rome, Rome, Italy;

<sup>2</sup>Department of Odontostomatological and Maxillofacial Sciences, “La Sapienza” University of Rome, Rome, Italy; <sup>3</sup>Department of Orthopedic Surgery, Rush University Medical Center, Chicago, Illinois, USA

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**Abstract.** The outbreak of coronavirus disease 2019 (COVID-19) is rapidly changing our habits. To date, April 12, 2020, the virus has reached 209 nations, affecting 1.8 million people and causing more than 110,000 deaths. Maxillofacial surgery represents an example of a specialty that has had to adapt to this outbreak, because of the subspecialties of oncology and traumatology. The aim of this study was to examine the effect of this outbreak on the specialty of maxillofacial surgery and how the current situation is being managed on a worldwide scale. To achieve this goal, the authors developed an anonymous questionnaire which was posted on the internet and also sent to maxillofacial surgeons around the globe using membership lists from various subspecialty associations. The questionnaire asked for information about the COVID-19 situation in the respondent’s country and in their workplace, and what changes they were facing in their practices in light of the outbreak. The objective was not only to collect and analyse data, but also to highlight what the specialty is facing and how it is handling the situation, in the hope that this information will be useful as a reference in the future, not only for this specialty, but also for others, should COVID-19 or a similar global threat arise again.

**Key words:** coronavirus; COVID-19; maxillofacial surgery; pandemic; outbreak; DORSCON Scale.

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The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (COVID-19), is rapidly changing our habits. Since December 2019, the news of a pneumonia focus of unknown cause in the city of Wuhan, Hubei Province, China, has shaken the whole world<sup>1</sup>. To date, April 12, 2020, the virus has reached 209 nations, affecting 1.8 million people and causing more than 110,000 deaths<sup>2</sup>. More and more governments have been forced to take significant countermeasures

in the face of the rapid spread of this disease. Two of the main tasks are to reduce the likelihood of the infection and enhance each country’s healthcare system resources.

In affected regions, hospitals are making decisions based on their resources as to which departments will directly deal with COVID-19 patients and those that will not. The natural consequence of this will be that the latter departments will only be treating emergencies, so as not to expose both the patients and staff to the risk of

infection and to allow a better distribution of the necessary resources to the departments actually managing COVID-19 patients.

Maxillofacial surgery represents an example of a specialty that has had to adapt to this outbreak, because of the subspecialties of oncology and traumatology. Considering the varied socio-political situations in each country, the maxillofacial surgery model was considered appropriate to evaluate the security measures taken by the institutions. This approach

allowed the authors to paint a picture of this model, on a global scale, during a very different social reality.

The aim of this study was to examine the effect of the COVID-19 outbreak on the specialty of maxillofacial surgery and how the current situation is being managed on a worldwide scale. To achieve this goal, the authors developed an anonymous questionnaire which was posted on the internet and also sent to maxillofacial surgeons around the globe using membership lists from various subspecialty

associations. The questionnaire asked for information about the COVID-19 situation in the respondent's country and in their workplace, and what changes they were facing in their practices in light of the outbreak. The objective was not only to collect and analyse data, but also to highlight what the specialty is facing and how it is handling the situation, in the hope that this information will be useful as a reference in the future, not only for this specialty, but also for others, should COVID-19 or a similar global threat arise again.

## Materials and methods

The survey was conducted from March 20, 2020 to April 12, 2020. The questionnaire was developed using Google Forms. This platform was chosen because it is free, easy to use for both the researchers and respondents, and it provides easily extrapolated data for use in Excel (Microsoft, Redmond, WA, USA). Moreover, this platform creates charts as the respondents complete the questionnaire, which allows observation of the data in real time and the

Table 1. Questionnaire and results.

1	Which continent are you from?		
	Europe	62	39.7%
	North America	15	9.6%
	South America	16	10.3%
	Asia	50	32.1%
	Africa	8	5.1%
	Oceania	5	3.2%
		156	100.0%
2	Which country?		
3	Which city?		
4	On the basis of the DORSCON Scale, how is the situation in your country?		
	Green	9	5.8%
	Yellow	20	12.8%
	Orange	37	23.7%
	Red	90	57.7%
5	Where do you work? (One or more options)		
	Public hospital	64	41.0%
	University hospital	83	53.2%
	Private clinic	67	42.9%
6	Institution name		
7	Number of employees (all hierarchy levels) normally working in the department before the outbreak		
8	Mark the boxes with the specialties performed in your department		
	Traumatology	125	80.1%
	Orthognathic surgery	103	66.0%
	TMJ surgery	101	64.7%
	Head and neck tumour surgery	87	55.8%
	Craniofacial surgery	54	34.6%
	Paediatric surgery	74	47.4%
	Dental surgery	114	73.1%
	Oral surgery	141	90.4%
9	Is your department still open?		
	Yes, and it is working normally	6	3.8%
	Yes, with restrictions	122	78.2%
	No	28	17.9%
10	Which specialties are still working? <sup>a</sup>		
	Traumatology	104	66.7%
	Orthognathic surgery	9	5.8%
	TMJ surgery	7	4.5%
	Head and neck tumour surgery	58	37.2%
	Craniofacial surgery	6	3.8%
	Paediatric surgery	11	7.1%
	Dental surgery	31	19.9%
	Oral surgery	54	34.6%
11	Number of employees (all hierarchy levels) working in the department during the outbreak <sup>a</sup>		
12	Have any of them been assigned to another department with necessity? <sup>a</sup>		
	Yes	29	22.7%
	No	79	61.7%
	I don't know	20	15.6%
13	As a percentage, how much do you think your department is still active? <sup>a</sup>		
	>90%	8	6.3%
	70–90%	7	5.5%
	50–69%	18	14.1%
	30–49%	20	15.6%

14	<30%	75	58.6%
14.1	What was the reason for the department closing? <sup>b</sup>		
15	Feel free to better explain the situation		
	Did your hospital give you guidelines to face the outbreak?		
	Yes	128	82.1%
	No	28	17.9%
15.1	If yes, could you briefly describe what these guidelines are?		
15.2	You can upload a picture or a document of these new practice rules in the following box		
16	Do you think that these rules are appropriate?		
	Yes	92	59.0%
	No	23	14.7%
	I don't know	41	26.3%
17	Do you feel safe?		
	Yes	81	51.9%
	No	75	48.1%
18	Did the hospital give you protection? (One or more options)		
	FFP1 masks	50	32.1%
	FFP2 masks	55	35.3%
	FFP3 masks	31	19.9%
	Disposable suit	75	48.1%
	Protection glasses	81	51.9%
	None of these	27	17.3%
	Other (Open-ended)		
19	Did you experience outpatient clinic visits during the outbreak?		
	Yes	105	67.3%
	No	51	32.7%
19.1	If yes, how did you manage them? (One or more options)		
	Physicians were protected by PPE (personal protective equipment)	84	80.0%
	Patient received PPE at the access to the hospital	21	20.0%
	Furniture was moved to ensure a safe distance (1 meter or more)	43	41.0%
	Waiting room was reorganized to avoid gatherings	78	74.3%
	Pre-visit by telephone	65	61.9%
	Access to the hospital through body temperature control	52	49.5%
	Questionnaire for possible risk factors (interpersonal contacts and travel)	69	65.7%
	Unnecessary physical contacts were avoided (handshakes, greetings)	101	96.2%
20	Did anything change in hospitalizations?		
	Yes	114	73.1%
	No	42	26.9%
20.1	If yes, what?		
21	Did anything change in patient preparation to undergo surgery?		
	Yes	77	49.4%
	No	51	32.7%
	I don't know	28	17.9%
21.1	If yes, what?		
22	Did anything change in already hospitalized patients?		
	Yes	54	34.6%
	No	63	40.4%
	I don't know	39	25.0%
22.1	If yes, what?		
23	Did you collect human specimens for COVID-19 screening or diagnosis? (One or more options)		
	Yes, for all already hospitalized patients	6	3.8%
	Yes, for all patients ready to undergo surgery	3	1.9%
	Yes, for all patients with known comorbidities	6	3.8%
	Yes, for all symptomatic patients	30	19.2%
	Yes, for all patients	0	0.0%
	No	115	73.7%
24	Did your department face patients who were positive for the COVID-19 virus?		
	Yes	21	13.5%
	No	93	59.6%
	I don't know	42	26.9%
24.1	If yes, how did you manage them?		
25	Have department workers been tested for COVID-19?		
	Yes	27	17.3%
	No	107	68.5%
	I don't know	22	14.1%

DORSCON Scale, Disease Outbreak Response System Condition; FFP, filtering facepiece; PPE, personal protective equipment; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; TMJ, temporomandibular joint.

<sup>a</sup>Question asked only if the answer was 'Yes, and it works normally' or 'Yes, with restrictions' to question number 9.

<sup>b</sup>Questions asked only if the answer was 'No' to question number 9.

possibility of using the charts themselves as figures in publications.

The questionnaire was produced in English and included 33 questions, both multiple-choice and open-ended, and was divided into three sections (Table 1). The first section asked for general information about the respondent: country, institution name, and the situation in the country according to the DORSCON Scale (Disease Outbreak Response System Condition). The DORSCON Scale is a colour-based representation that describes the current disease situation. The Scale is divided into four colours indicating the gravity of the situation: green, yellow, orange, and red. It takes into account the nature of the disease and its impact on daily life, and provides general indications and advice to the public<sup>3</sup>.

The second section was structured to obtain a snapshot of the respondent's workplace and medical practice before the outbreak: private, public, university-based practice, the number of employees, and the maxillofacial services offered.

The third section focused on the practice situation during the outbreak. The respondents were asked to explain what changes were occurring in the organization of their hospital and what measures had been adopted to protect staff and patients. Any direct contact with patients suffering from COVID-19 was queried. It was also asked whether anyone in the respondent's department had been infected with COVID-19. The respondents

could also upload files, such as any COVID-19 guidelines, that they might have received from their institution or hospital.

The questionnaire internet link was distributed by e-mail via personal invitation, Facebook, WhatsApp, LinkedIn, and ResearchGate. Furthermore, the executive secretaries of both the American Society of Temporomandibular Joint Surgeons (ASTMJS) and the European Society of Temporomandibular Joint Surgeons (ESTMJS) kindly allowed the survey to be circulated in their newsletters. Moreover, the authors asked the respondents to share the questionnaire link with their colleagues and contacts in the maxillofacial field. Ten replies were received in duplicate and were merged accordingly.

To improve the analysis of the results concerning the subspecialties still working during the outbreak, the outbreak activity index (OAI) was introduced. The OAI was defined as the residual activity in the analysed centre for each specialty and was calculated as the ratio of specialties active during the emergency divided by the specialties previously active, multiplied by a factor of 100.

## Results

A total of 166 responses to the survey were acquired from 54 countries. The number of replies per country varied from a minimum of 1 to a maximum of 18 (Fig. 1). In

total, 156 maxillofacial surgery centres, including public hospitals and private practices, completed the questionnaire. The response rate was 20.2%, out of 822 invitations sent. Only complete responses were received, as most of the questions were mandatory. Moreover, the replies were only sent and received if the respondent reached the end of the questionnaire.

Complete results are presented in Table 1. Cumulative DORSCON Scale percentages are displayed in Fig. 2. The levels of alert for each continent are reported in Table 2.

In 82% of the responding centres that had remained open, the maxillofacial subspecialties had been reorganized. Traumatology was reported as the service that was most maintained, resulting in an OAI of 83.2%. Only 13.5% of the responding institutions had closed this subspecialty. Oral surgery, practiced in 90.4% of centers, decreased activity to 34.6%, with an overall reduction of 55.8% yielding and OAI of 38.3%. Nevertheless, oral surgery remained one of the three most active subspecialties together with traumatology (OAI = 83.2%) and head and neck tumour surgery (OAI = 66.7%). The greatest reduction in activity occurred in both orthognathic surgery (OAI = 8.7%) and temporomandibular joint (TMJ) surgery (OAI = 6.9%). The OAIs for the other subspecialties were 11.1% for craniofacial surgery, 14.9% for paediatric surgery, and 27.2% for dental surgery.

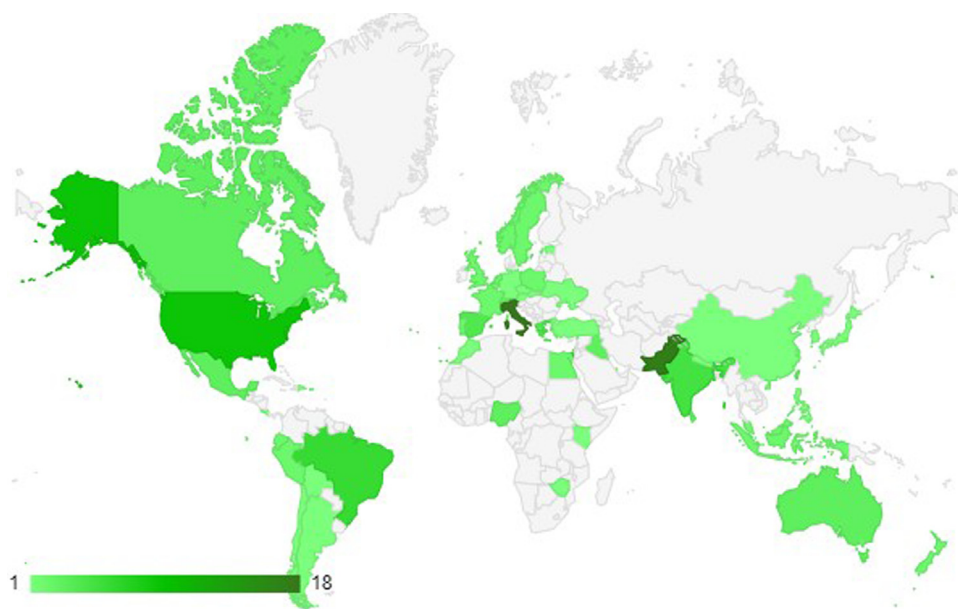


Fig. 1. Participating countries. The colour scale bar shows the variation in the number of responses from each country.

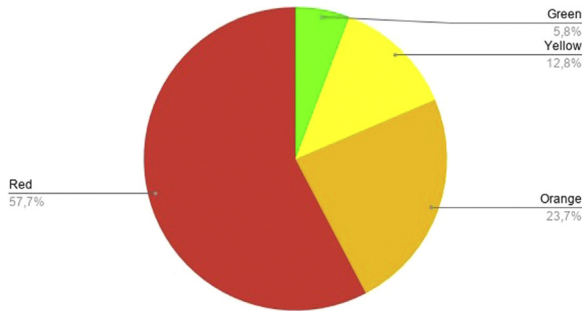


Fig. 2. Percentage of each DORSCON Scale level for all countries.

Table 2. Level of alert of each continent based on the DORSCON Scale.

Continent	Green	Yellow	Orange	Red
Africa	0%	12.50%	50.00%	37.50%
Asia	12.00%	24.00%	30.00%	34.00%
Europe	3.28%	8.20%	6.56%	81.97%
North America	6.67%	6.67%	33.33%	53.33%
Oceania	0%	0%	0%	100.00%
South America	0%	6.25%	56.25%	37.50%

DORSCON Scale, Disease Outbreak Response System Condition.

Twenty-eight maxillofacial surgery departments were reported to have been closed. By continent, nine were in Asia, seven in Europe, five in North America, three in Oceania, and four in South America. Only six maxillofacial surgery departments were reported to be functioning normally, one each in Israel (DORSCON orange), Japan (DORSCON red), Pakistan (DORSCON red), Singapore (DORSCON orange), Taiwan (DORSCON yellow), and Poland (DORSCON yellow).

Globally, maxillofacial surgery departmental staffing was reported to have been reduced by 55%, ranging between an average of 28 employees before the outbreak and an average of 11 during the emergency.

Perception of safety varied among the continents (Fig. 3). In Asia, the ratio of doctors who felt ‘safe’ to those who did not was 1:1. In North America, this ratio was almost 3 to 1, favouring ‘safe’ (Fig. 3).

Over half (57.1%) of the maxillofacial surgery centres that reported not receiving any COVID-19 management guidelines, did not receive personal protective equipment (PPE) from their administration either. Furthermore, 7% of the centres despite receiving such guidelines, received no PPE. Of the 28 respondents who did not receive COVID-19 management guidelines from their administration, 57.7% did not feel ‘safe’. In contrast, only 46.1% of the respondents who had received such guidelines felt ‘safe’.

Table 3 shows the relationship between outpatient visits and the DORSCON Scale.

Table 4 shows the responses regarding the presence or absence of changes within the hospital according to the DORSCON Scale. Changes in protocols for dealing with both patients who would be undergoing surgery and those already in the hospital were made in 48.1% of the responding maxillofacial surgery departments. A quarter (25.5%) changed only inpatient protocols, while 35.1% modified only the protocol for patients undergoing surgery. Just over three-quarters (78.6%) of the respondents did not know of any change in either of these protocols, while 66.7% reported no change in either protocol. Of the departments that were managing patients who were positive for COVID-19, 71.4% tested for the virus infection. Only 24.7% that did not manage infected patients did likewise.

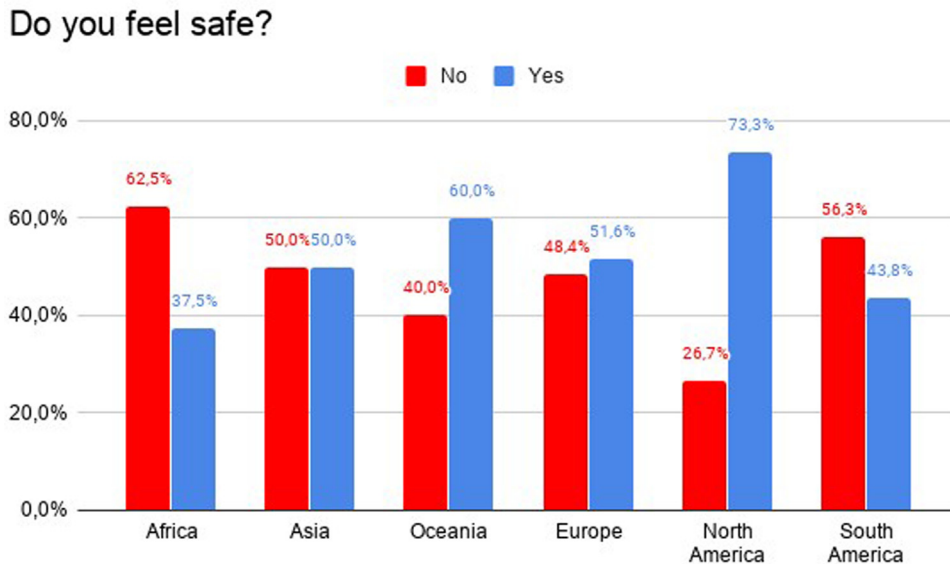


Fig. 3. Perception of safety by continent.



Table 3. Outpatient clinic visits during the outbreak according to the DORSCON Scale.

DORSCON Scale	Did you experience outpatient clinic visits during the outbreak?	
	Yes	No
Green	44.4%	55.6%
Yellow	60.0%	40.0%
Orange	56.8%	43.2%
Red	75.6%	24.4%

DORSCON Scale, Disease Outbreak Response System Condition.

## Discussion

COVID-19 is a coronavirus belonging to the genus Betacoronavirus, a group of coronaviruses causing infections in humans and vertebrates. This group also includes the Middle East respiratory syndrome-related coronavirus (MERS-CoV)<sup>4</sup>.

The virus has a zoonotic origin and became infectious for humans after a spillover event<sup>5</sup>. Viruses of the Betacoronavirus genus have a particular tropism for the respiratory system, generating both mild and flu-like illnesses and very severe illnesses such as fatal pneumonia<sup>6</sup>. The incubation period of this virus ranges from 2 to 14 days, with a mean of 5 or 6 days<sup>1,7</sup>. This characteristic results in the potential of encountering patients who are positive for COVID-19 but who may still be asymptomatic, or so-called 'carrier' patients<sup>4,8</sup>. The most common symptoms at onset are fever, cough, shortness of breath, and fatigue. Other typical symptoms are rhinorrhoea, sneezing, haemoptysis, diarrhoea, and abdominal pain<sup>4,6,9</sup>. Severe presentations include severe acute respiratory syndrome (SARS), with peripheral ground-glass opacities in the lungs on chest imaging<sup>9</sup>. On March 3, 2020, the World Health Organization (WHO) reported that the mortality rate of patients affected by COVID-19 was approximately 3.4%<sup>10</sup>.

The nasopharynx and nose are described as the major reservoirs of the virus<sup>11</sup>. Therefore, the predominant mode of transmission of the COVID-19 virus is

direct spread from an infected patient's cough and/or sneeze, with others then inhaling droplets and aerosol containing the virus<sup>11</sup>. In addition to this mode of infection, contact transmission via contact with virus-contaminated surfaces and then touching the oral, nasal, or conjunctival mucous membranes can lead to infection<sup>4</sup>.

Maxillofacial surgeons, dentists, and otorhinolaryngologists, as well as others who perform procedures in the head and neck region, are at high risk of being exposed to and infected by COVID-19<sup>11,12</sup>. These specialties provide such specific treatment options for patients that it is almost impossible to transfer these activities to other specialties for management. This necessitates the management of head and neck patients presenting for treatment and the development of new protocols to ensure provider, personnel, and patient safety from the virus during that treatment.

Efforts have been made by many international scientific societies to develop guidelines for their respective specialties<sup>13–15</sup>. While this paper focuses on maxillofacial surgery, many of the recommendations will be useful for all head and neck specialties.

Every country has been facing the virus at different times and with different intensity of spread. China and Italy were the first nations to experience an epidemic outbreak. On April 12, 2020, the United States (USA) was reported to be the most affected nation in the world and Italy to

have the highest number of deaths<sup>16</sup>. The mortality rates reported by these countries have been very different: Italy 12.8%, China 4%, and the USA 3.7%. These differences are explained by the number of people tested, characteristics of each healthcare system, and the demographics of each country<sup>16</sup>.

According to the responses to this survey, the majority of countries reacted to the emergency by decreasing their surgical activity with a reduction in elective procedures. Only centres in Israel, Japan, Pakistan, Poland, Singapore, and Taiwan were still working at normal capacity, even though the state of alert in those countries was high on the DORSCON Scale. Taiwan postponed only elective cases for patients with risk factors for infection. On comparing the date of the responses with the respective national spread of the outbreak, these countries' surgeons responded before their country reached the peak infection phase<sup>16</sup>. Singapore and Taiwan represented unique models: their governments adopted a different policy in the management of the outbreak that focused on isolation of only infected or possibly infected people. They also are meticulously controlling travelers<sup>17</sup>. This approach was evidenced by the high activity level (>90%) reported by respondents from those countries.

Another interesting phenomenon was the variability within countries. While one centre was working normally, another in the same country was reducing their activity. This trend was seen in responses from countries like Brazil, India, Pakistan, Turkey, and the USA. The reasons probably stem from the size of these countries, the differences in regional administrations, and the particular characteristics of the virus control efforts. For example, a centre from Brazil reported a peculiarity: facial trauma as a result of personal aggression and motor vehicle accidents had decreased due to social distancing and stay-at-home orders.

Table 4. Department changes according to the DORSCON Scale.

DORSCON Scale	Did anything change in hospitalizations?		Did anything change in patient preparation to undergo surgery?			Did anything change in already hospitalized patients?		
	No	Yes	I don't know	No	Yes	I don't know	No	Yes
Green	33.3%	66.7%	22.2%	44.4%	33.3%	22.2%	66.7%	11.1%
Yellow	50.0%	50.0%	20.0%	45.0%	35.0%	20.0%	50.0%	30.0%
Orange	21.6%	78.4%	10.8%	35.1%	54.1%	18.9%	43.2%	37.8%
Red	23.3%	76.7%	20.0%	27.8%	52.2%	28.9%	34.4%	36.7%

DORSCON Scale, Disease Outbreak Response System Condition.

Three-quarters (75.6%) of the countries with a DORSCON Scale red level, such as Ecuador, Greece, Italy, Pakistan, Spain, Switzerland, Turkey, and the USA, were still experiencing outpatient visits. The respondents stated that the procedure used to screen potential outpatients was either a questionnaire or pre-visit telephone call requesting information on the patient's history of travel to or from high-risk areas and possible contacts with virus-positive people, measurement of body temperature, respiratory function status, evaluation of insidious symptoms, and a quick on-site swab test for COVID-19<sup>7</sup>.

The literature reports that approximately four in five virus-positive patients are asymptomatic<sup>7,18</sup>. This demonstrates the importance of risk stratification during outpatient visits and hospitalization. However, all of the previously mentioned preventive measures are not sufficient to safeguard physician health and safety. Iraq, Pakistan, the Philippines, and Spain have taken further precautions in this regard by creating patient appointment schedules, whereby any patient at risk is seen at the last appointment of the day. In this way, thorough room sanitation can be achieved without generating any delay.

With the reduction in outpatient visits, the majority of respondents reported that all elective maxillofacial surgery had been reduced or cancelled. In departments where elective surgery was still being performed, closer attention was being paid to patient selection and screening. In the Netherlands and Turkey, a chest computed tomography scan was added to evaluate possible signs of pneumonia. However, for all emergency cases, the patient should be treated as positive for the virus and proper precautions taken<sup>11,12</sup>.

In Italy, some centres adopted a telephone triage protocol to ask about the presence of COVID-19 symptoms and possible high-risk contacts. The patient was then tested with a nasopharyngeal swab 2 days before admission. If the result was negative, the healthcare administration allowed hospitalization. In the postoperative phase, the nasopharynx swab test was repeated. However, these guidelines were adopted on April 1, 2020 after two Italian centres had already closed on March 24, 2020 due to some of the department staff testing positive for the virus. In hindsight, this was too late in light of the national course of the outbreak.

The use of prophylactic perioperative hydrogen peroxide or povidone-iodine mouthwash was reported by respondents

from Brazil and Egypt; their use is supported by the literature<sup>4</sup>. Respondents from the Republic of South Korea and Italy reported employing COVID-19 testing only for patients scheduled for general anaesthesia on intubation and extubation. These procedures, as well as endoscopy, airway suctioning, and tracheotomy, are considered aerosol-generating procedures (AGPs)<sup>11,12</sup>. The use of high-speed devices like piezoelectric devices and drills are also considered AGPs, due to the amount of blood and saliva aerosolized<sup>4</sup>. For this reason, all of these techniques are considered high-risk procedures and should be performed with a high level of protection<sup>19</sup>.

Respondents from Brazil, India, Indonesia, and Pakistan reported that patient intubation should be performed by anaesthesiologists protected with FFP2 masks, as advised by the WHO<sup>20</sup>.

In Spain and Israel, operating surgeons reported the use of two different kinds of mask for protection, an FFP2 mask covered by a normal surgical mask, and a face shield or goggles, or both. FFP2 or FFP3 masks and disposable suits were only implemented in a minority of cases. Most of the respondents did not report any major enhancement in operating room protocol. In Iraq, it was reported that one centre was unable to provide adequate PPE to its workers, so they had to purchase FFP3 masks, goggles, and suits themselves.

Zou et al. doubted the effectiveness of FFP2 masks and reported that during the major outbreak in China, the reduction in viral transmission to medical staff only stabilized when PAPRs (powered, air purifying respirators) were used<sup>21</sup>. Singapore and the USA have adopted the use these respirators. Therefore, PAPRs should be the primary protection for medical personnel treating positive patients and emergency patients who cannot be tested<sup>11,21</sup>. There are limitations to the routine utilization of these respirators in surgery, due to their particular airflow settings, as well as their cost and availability<sup>11</sup>. An Italian centre has kept the number of personnel in the operating room to a minimum, allowing access to surgeons only a few minutes before surgery, after the patient has already been prepared by the anaesthesiologists.

In Greece, Kenya, and Sri Lanka, patients were discharged when it was determined that hospitalization was no longer necessary. Early discharge was adopted by the majority of the respondents. In Canada, patients were discharged early in order to free up more

beds. Taiwan adopted a proactive stance by keeping some beds free in case of an uncontrolled outbreak. In Israel, the number of inpatient visits was reduced to a minimum, as well as their duration. Most countries changed the hospital bed arrangements to reduce contact between inpatients. Other measures reported were single-room set-ups and isolation rooms for patients with risk factors. In Pakistan, already hospitalized patients who were free from COVID-19 symptoms, were isolated until discharge. The Republic of Korea and Israel moved all patients to safer and well-sanitized inpatient wards.

In a Spanish centre, wards and intensive care units (ICU) were divided into two different areas: COVID-19 positive and negative. Generally, patients were advised to maintain a safe distance of 1.5 meters. In addition, they were instructed on soap and water hand washing and on hand hygiene using alcohol-based liquids, and surgical masks were provided. Also, the number of visitors was reduced to one per patient and access was only allowed for a visitor wearing PPE. However, in many cases, no visitors were allowed.

A high level of insecurity in the workplace was reported in this regard. North America respondents had the highest perception of safety. Responses from Canada, Mexico, and the USA were recorded between March 23, 2020 and March 28, 2020. In the USA during this time frame, the cumulative number of cases increased from 43,700 to 121,500. To date, April 12, 2020, the official number of cases is now 557,600<sup>16</sup>. In Oceania, most of the respondents reported a perception of safety. The Asian and European trend was equally distributed. In Africa and South America, most respondents felt unsafe about their local situation.

Efforts are being made to develop an efficient and effective telemedicine system for dealing with patients as well as medical education. Many countries, such as the USA, reported visits and follow-ups performed by video or telephone, thereby reducing physical contact. In Italy and Taiwan, university hospital professors are using Google Meet to continue lecturing to maxillofacial residents.

Not all countries and their respective maxillofacial centres responded to the questionnaire. One answer per country is not enough to explain the situation properly. Personal interpretation of the questions and the personal biases of the responses should also be considered.



In conclusion, this survey highlighted many differences between continents and countries in their handling of the COVID-19 outbreak. The COVID-19 crisis has had a great impact on maxillofacial surgery practice all over the world, but not in the same way. The lack of precise and timely development of universal guidelines has resulted in dangerous and unacceptable healthcare settings in affected countries. This has inevitably resulted in unsafe working conditions, made worse by the lack of PPE and testing capabilities, all leading to high-risk situations for many healthcare workers and patients in many countries. However, it is admirable that almost every centre did its best to optimally face the outbreak. This great effort from the maxillofacial and general medical community has no precedent in history.

Protecting healthcare workers from high-risk infection hazards is vital to ensuring their safety while delivering care and to avoid a healthcare system collapse. Therefore, in conclusion, it seems appropriate to request that every healthcare institution receives well-researched and documented protocols for dealing with future inevitable global pandemics. These should be developed and vetted by both local and coordinated international healthcare-based organizations. On the basis of these guidelines, each specialty could then develop specific and effective specialty-based guidelines to ensure the safety and wellbeing of providers and patients worldwide.

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### Competing interests

None.

### Ethical approval

Not required.

### Patient consent

Not required.

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Address:

Valentino Vellone  
Dipartimento di Scienze Odontostomatologiche e Maxillo-Facciale  
“La Sapienza” Università di Roma  
Rome  
Italy

Tel: +39 3289489538

E-mails: [valentino.vellone@gmail.com](mailto:valentino.vellone@gmail.com),  
[maffia.1606949@studenti.uniroma1.it](mailto:maffia.1606949@studenti.uniroma1.it)