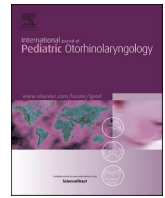


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Personal protective equipment availability and usage amongst pediatric otorhinolaryngologists during the COVID-19 pandemic: An international survey

Dong Hyun Kim^a, Neil. K. Chadha^b, Lily. HP Nguyen^c, Murad Husein^{d,*}

^a Faculty of Medicine, McGill University, Canada

^b Division of Pediatric Otolaryngology-Head and Neck Surgery, B.C. Children's Hospital, University of British Columbia Vancouver, Canada

^c Department of Otolaryngology - Head & Neck Surgery, Department of Pediatric Surgery, Institute of Health Sciences Education, McGill University, Canada

^d Department of Otolaryngology - Head & Neck Surgery, Children's Hospital, London Health Sciences Centre Western University, Canada

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ABSTRACT

Objectives: To survey a group of global pediatric otolaryngology specialists to assess their usage and access to personal protective equipment during the COVID-19 pandemic.

Methods: A survey of 13 questions was created collecting information on: basic demographics of practice, types of PPE used for procedures of varying aerosolization risk, access to positive air-purifying respirator (PAPR) and patient testing for SARS-CoV-2. Pediatric otolaryngologists were invited to complete the survey via Whatsapp™.

Results: 96 responses were collected from 17 different countries. N95 was the most commonly utilized PPE when dealing with COVID-19 patients (64.2%–81.9% depending on aerosolization risk of the procedure). Significantly higher use of PAPR was noted in high-risk aerosolization generating medical procedures, when compared to other risks. Face covering was used consistently (91.6%). Most respondents (78.1%, n = 75) had access to PAPR or had at least requested it. The majority of patients (56.2%, n = 54) was being tested for SARS-CoV-2 prior to procedures performed in operating rooms (OR); whereas, only 1.1% (n = 1) of clinic patients were tested for SARS-CoV-2 irrespective of the history or symptomatology.

Conclusions: Most pediatric otolaryngologists used N95 and some form of face covering (eg. goggles, face shields) when dealing with patients with COVID-19 positive status. PAPR was used in situations of high aerosolization risk. Majority of respondents were screening all patients prior to procedures in the operating room.

1. Introduction

The COVID-19 pandemic presents a unique challenge for the medical community and, in particular, otolaryngology specialists who frequently perform aerosol generating medical procedures (AGMPs). Examples of AGMPs include airway procedures (e.g. laryngoscopy, bronchoscopy), sinonasal surgery, head and neck mucosal surgery (tracheostomy) and mastoid surgery [1]. This is substantiated by reports of the SARS-CoV-2 predilection towards upper airway/nasopharyngeal mucosa [2].

After the rise in the number of COVID-19 infections led to the World Health Organization (WHO) declaring a global pandemic, many guidelines have recommended the withholding of non-essential AGMPs [1,3,4]. However, many pediatric otolaryngology procedures are still necessitated as emergencies, a common example being bronchoscopic

removal of an aspirated foreign body from a child's airway. This dilemma is exacerbated by global personal protective equipment (PPE) shortage, and changing PPE recommendations against COVID-19^{5–7}. WHO had called for droplet precautions in low transmission risk procedures with COVID-19 patients [5]. Center for Disease Control and Prevention (CDC) and European Center for Disease Control and Prevention (ECDC) have initially recommended airborne precautions for all procedures regarding COVID-19 but with the PPE shortage, CDC has stepped down to droplet precaution in low risk procedures [6–9]. All three bodies have recommended respirators (N95 or higher) for AGMPs and high-risk procedures [8]. This represents a change from Pre-COVID-19 era in that most local practices utilized surgical masks and gloves as the norm during AGMPs. Pre-COVID-19 consensus procedural PPE recommendation could not be found.

* Corresponding author.

E-mail address: murad.husein@lhsc.on.ca (M. Husein).

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Powered air-purifying respirator (PAPR) is the highest level of PPE recommended in COVID-19 era; however, N95 masks (or equivalent) are the most widely used PPE with this pandemic [1]. PAPR has several advantages over N95 masks, including comfort with longer use, better aerosol particulate protection, absence of fit test, facility of usage with facial hair, and reusability [10–14].

The availability and usage of PPE during the COVID-19 pandemic varies greatly amongst hospitals due to local resources, needs and population served. Thus, beyond regulatory recommendations, it is important to capture the reality of PPE accessibility and utility. This would aid the practitioners to take into account recommendations by the governing bodies, otolaryngologic colleagues practices and their local resources to request for lacking PPEs. Herein, we report a survey of global pediatric otolaryngology specialists to assess their usage and access to PPE during the COVID-19 pandemic.

2. Materials and methods

This study was exempted from Research Ethics Board approval as it consisted of a voluntary anonymous survey amongst Pediatric Otolaryngologists.

2.1. Questionnaire formation

An electronic survey of 13 questions was created by the research team with the aim of exploring PPE usage and access among pediatric otolaryngologists. The survey was created using the SurveyMonkey™ website and was entitled, “Global COVID-19 PPE and COVID-19 Testing Survey”. The survey captured information on basic demographics of practice, types of PPE used for procedures of varying aerosolization risk, access to positive air-purifying respirator (PAPR) and patient testing for SARS-CoV-2. The survey was anonymous with no self-identifying questions. No personal information was collected.

Otolaryngologic procedures were categorized into four increasing levels of transmission risk: clinic endoscopy, non-AGMP, low risk AGMP, and high-risk AGMP. Non-AGMP, low risk AGMP, and high risk AGMP referred to procedures performed in the operating room. Examples of a low risk AGMP include flexible bronchoscopy through the ventilating port of a cuffed endotracheal tube. Examples of a high risk AGMP include endoscopic approach to pituitary.

2.2. Survey dissemination

The survey was distributed via Whatsapp™ to all members of an international group of self-identified Pediatric Otolaryngologists. Participation was purely voluntary, all responses were anonymous and confidential, and participants could withdraw from the study at any point. Only one individual from each facility/hospital of practice was asked to complete the survey to avoid overlaps in responses from same facility. A total of 96 responses out of 171 members were collected from April 17th, 2020 to April 26th, 2020.

2.3. Data analysis

Individual physicians were considered as the unit of analysis. The responses were sorted and tabulated for frequency using IBM SPSS Statistics Version 26™ and Microsoft Excel. Responses were categorized hierarchically to avoid redundancy. For example, if a site had access to PAPR and N95 for a procedure, only PAPR was counted. PAPR was the highest form of protection, N95 was 2nd highest and surgical mask, lowest. In tabulating the prevalence of face protection, following answers were accepted: goggles, face shields, non-PAPR hoods and PAPR. Chi-square test was used to compare: 1) PAPR usage in high risk AGMP versus low risk AGMP, non-AGMP and clinic endoscopy 2) PAPR availability according to respondents' continents. A p-value of 0.05 or less was considered statistically significant.

3. Results

A total of 96 responses was obtained across 17 different countries and 6 continents. 21 responses came from North America, 20 from Europe, 14 from Oceania, 3 from Africa, 9 from Asia and 4 from Central/South America.

3.1. Facial PPE used for COVID-19 positive patients (Fig. 1)

When performing high risk AGMPs, 35.8% (n = 34) reported PAPR as their primary PPE. This represented statistically significant increase in PAPR in high risk AGMPs when compared with PAPR use in clinic endoscopy, non-AGMP, low-risk AGMP (p < 0.01 for all). The majority (64.2%, n = 61) of the respondents used N95 for high risk AGMP, and none used surgical masks. One respondent did not perform high-risk AGMP during the pandemic.

In low-risk AGMP, the most commonly employed PPE was N95 (80%, n = 77). 16.7% (n = 16) used PAPR and 3.1% (n = 3) used surgical masks. In non-AGMP, N95 was also the most commonly employed PPE (74%, n = 71). 13.5% (n = 13) used PAPR and 12.5% (n = 12) used surgical masks. Following the same pattern, for clinic-based endoscopy, 81.9% (n = 77) of the respondents used N95, 7.4% (n = 7) used PAPR and 10.6% (n = 10) used surgical masks. Two sites did not perform clinic-based endoscopies at this time.

Some form of face cover including goggles, face-shield, non-PAPR hood, or PAPR was utilized in 91.6%–96.9% of procedures consistently throughout all procedures involving COVID-19 positive patients.

3.2. Access to PAPR (Fig. 2.)

48% (n = 46) of the survey respondents stated they had access to PAPR. Access to PAPR was not statistically correlated with country of practice (Chi-Square = 7.340, df = 6, p = 0.291). In our survey, no respondents from Africa (n = 3) and Central/South America (n = 3) reported access to PAPR. 22% (n = 21) sites did not request for PAPR. Of the 29 sites that requested PAPR, 21% (n = 20) were awaiting decision and 9% (n = 9) requests were denied. Where available, PAPR was mainly reserved for COVID-19 positive patients (82.6%). 45.7% (n = 21) respondents used PAPR only for AGMP in COVID-19 positive patients and 37% (n = 17) used for both AGMP and non-AGMP in COVID-19 positive patients. Only two sites (4.3%) used PAPR for all patients, regardless of COVID-19 infection status. Six sites had specific criteria to accessing PAPR: N95 fit test fail (n = 1), tracheostomy only (n = 2), and facility purchased PAPR but not used by otolaryngologists (n = 3). In the latter category, PAPR was mainly reserved for anesthesiologists.

3.3. COVID-19 testing for pediatric otorhinolaryngology patients (Fig. 3.)

Prior to pediatric otorhinolaryngology surgeries, 56.2% (n = 54) of survey respondents tested all patients for COVID-19 status. 34.5% (n = 33) only tested patients with suspected COVID-19 infection based on symptomatology. 9.3% (n = 9) of respondents stated they do not test regularly before entering the operating room.

In contrast, a significantly higher number of clinic patients were not being tested. 48.9% (n = 45) reported not testing for COVID-19 status, and 50% (n = 46) stated they tested only on suspicion. Only one site screened all patients before the clinic visit.

The turnaround time for COVID-19 test results was not different for surgical and clinic patients (Table 1). 87.7% of test results for surgery patients and 93.8% of the test results for clinic patients were reported to come back within 48 h.

4. Discussion

The availability and indications for PPE, particularly PAPRs, during the COVID-19 pandemic were varied across participant responses. To

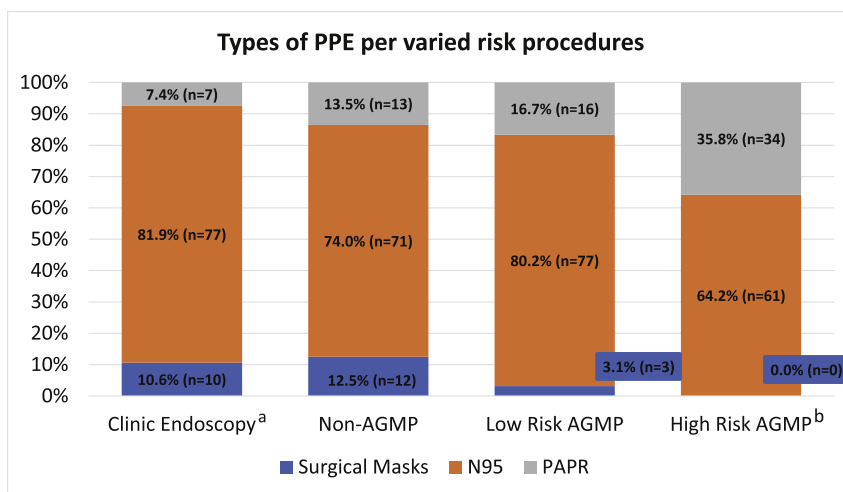


Fig. 1. Types of PPEs used for procedures of varying aerosolization risks

^a 2 respondents did not perform clinic endoscopy at this time

^b 1 respondent did not perform high risk AGMP at this time.

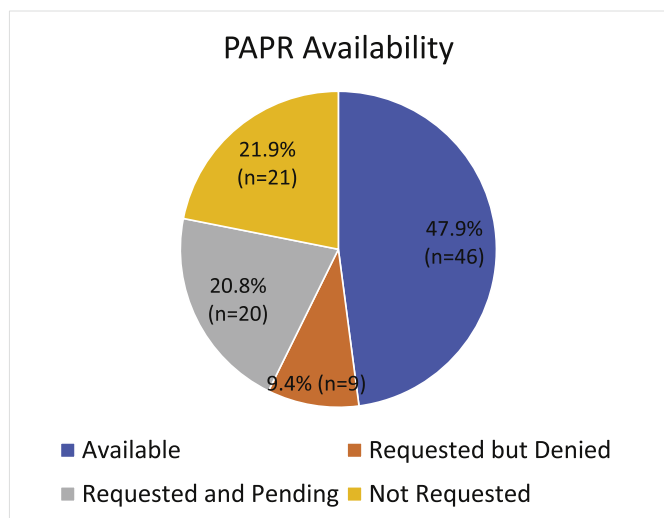


Fig. 2. Availability or request status of PAPR.

our knowledge, this is the first study in the literature to assess the real-life profile of PPE use in otorhinolaryngology specifically during the COVID-19 era.

Despite recommendations from WHO and CDC for surgical masks in

COVID-19 related low risk procedures, N95 was the most prevalent in its use as PPE for any COVID-19 positive patient procedures, regardless of the aerosol generating risk [8]. This represents a shift from pre-COVID-19 where surgical masks and gloves were used for low risk procedures like nasopharyngoscopy. This perhaps highlights the inclination to be “better-safe-than-sorry” in light of conflicting and changing recommendations. Surgical masks were not readily used, and if used, were reserved only for perceived lower risk situations such as clinic endoscopy or non-AGMPs. Finally, some form of face covering in the forms of goggles or face shields was utilized in all procedures relating to COVID-19 patients, consistent with recommendations by CDC, WHO and ECDC [1]. Both face protection and N95 (or equivalent) mask usage were well adhered to, as per governmental recommendations [8]. These findings suggest that Pediatric Otolaryngologists, when not restrained by resource limitation, prefer to opt for higher level of PPE even if guidelines change.

Regarded as the highest level of protection, PAPR appears to be the choice of protection by the otolaryngologists when available. Higher

Table 1

Turnaround time for COVID-19 test results for patients seen in operating room (OR) or in clinic.

	<24hrs	<48hrs	<72hrs
OR (81)	39 (48.1%)	32 (39.5%)	10 (12.3%)
Clinic (34)	16 (47.1%)	14 (41.2%)	4 (11.8%)

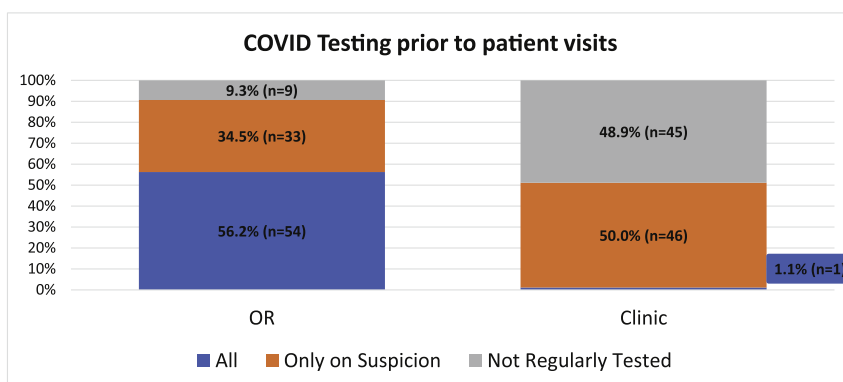


Fig. 3. Prevalence of testing for SARS-CoV-2 prior to patients seen in operating room (OR) or in clinic.

rates of PAPR usage was seen with increasing transmission risk of the procedures. More respondents donned PAPR only for aerosolizing procedures, rather than all procedures for COVID-19 patients. Most guidelines do not have specific PAPR recommendation; rather, PAPR is recommended alongside N95 respirators [5–7]. It is interesting to note that the majority of the respondents have requested for or obtained PAPR, highlighting the perceived need for PAPR in battling the pandemic even in the absence of clear recommendation for it. Given the ease of PAPR and highlighted benefit of reusability, institutions should assess feasibility for PAPR purchases in combating COVID-19.

Because of the high transmission risk of otorhinolaryngological surgeries, the majority of the patients seen for surgical intervention are being screened for COVID-19 status. Clinic visits pose a different set of challenges, as half of the respondents did not routinely test their patients prior to clinic visits (ie without suspicion). It is not clear from the survey why screening is not done in the clinic environment. This could be because most clinics are cancelled save for emergent clinical situations [3]. The fast turnaround time of the test results within 48 h has been reported consistently. The fast turnaround time is a reassuring finding that suggests COVID-19 tests should not delay appointment times greatly and could be done before the appointment. We note that in emergency cases where COVID-19 test cannot be performed in time, the local guideline should be followed. There is no clear recommendation on which patients should be tested for COVID-19 status prior to visiting hospitals, only that patients wear surgical masks during the visit [1,8]. Testing would depend on local testing resources. However, most physicians in our survey reported N95 and face shields in clinic visits, even though such high form of protection is not always warranted, indicating a need for clearer recommendation.

The limitations of the study are that the survey was completed by individual Pediatric Otolaryngologists. Thus, the responses may reflect personal access to PPE rather than institutional policies. The survey invitation asked for only one individual to respond from each facility/hospital; however, this was not enforced. Moreover, 25 respondents did not specify the location of their practice, and thus the authors were not able to screen for same facilities without bias. Hence, individual physicians rather than facilities were chosen to be the unit of analysis. Additionally, there was underrepresentation of responses from Africa, South America and Asia which may reflect bias in these continents. Such underrepresentation may have resulted from the authors' professional connections mainly existing in the USA-Canada-United Kingdom network of pediatric otorhinolaryngology. Finally, the novel COVID-19 pandemic is still unfolding and as the world gains more experience, the profile of PPE usage, infectious disease protocols, and recommendations will inevitably change. When looking at the recommendations, it is important to take into consider the local prevalence of COVID-19, PPE availability and urgency of cases.

5. Conclusions

There were variations in PPE practices among Pediatric Otolaryngologists during the COVID-19 pandemic. When dealing with COVID-19

patients, the most commonly employed PPE among Pediatric Otolaryngologists were N95 and a form of face covering. High utilization of PAPR was noted with increasing aerosolization risk of procedures. PAPR was not available for the majority of the respondents, but the majority had at least requested it. Patients prior to surgeries were tested more regularly than those coming in for clinic visits.

Declaration of competing interest

No conflict of interest is reported by any of the authors.

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