Risk management during COVID-19: safety procedures for otolaryngologists

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Abstract. The pandemic caused by SARS-CoV2 has stressed health care systems worldwide. The high volume of patients, combined with an increased need for intensive care and potential transmission, has forced reorganization of hospitals and care delivery models. In this article, are presented approaches to minimize risk to Otolaryngologists during their patients infected with COVID-19 care. We performed a narrative literature review among PubMed, Scopus and Web of Science electronic databases, searching for studies on SARS-CoV2 and Risk Management. Standard operating procedures have been adapted both for facilities and for health care workers, including the development of well-defined and segregated patient care areas for treating those affected by COVID-19. Personal protective equipment (PPEs) availability and adequate healthcare providers training on their use should be ensured. Preventive measures are especially important in Otolaryngology-Head and Neck Surgery, as the exposure to saliva suspensions, droplets and aerosols are increased in the upper aerodigestive tract routine examination. Moreover, the frequent invasive procedures, such as laryngoscopy, intubation or tracheotomy placement and care, represent a high risk of contracting COVID-19. (www.actabiomedica.it)

Key words: COVID-19; Risk Management; Personal protective equipment; SARS-CoV2; Head and Neck Surgery.

Introduction

The COVID-19 pandemic has imposed us an unprecedented reflection and changing of hygienic habits and sanitation procedures, outside and inside the hospital. Italy has been one of the first countries to face this challenge.

Fatalities from patients who tested positive for COVID-19 in Italy are summarized in the following chart, based on data from the Italian National Institute of Health (Istituto Superiore di Sanità, ISS) (Table 1) (1).

An increased number of fatalities in a country is likely related to differences in the number of performed swab tests, the high number of older people (Italy is the second in the world after Japan), and high density of positive patients, with small areas experiencing larger clusters (as happened in Lombardia, in northern Italy).

Overall, about 40% of Italian doctors who died were family doctors, while 25% were specialists with a high risk of infection due to involvement of the respiratory tract and mucosa. The most involved specialities comprehend pneumology, anesthesiology, infectious
disease, otolaryngology, ophthalmology and dentistry (1, 2). The transmission of SARS-CoV2 occurs through close contact (less than 2 meters) by exposure to droplets expelled by coughing, sneezing, or speaking. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) cannot penetrate the skin, but it can penetrate all exposed mucous membranes, including the eyes (3-5).

The experience gained during the pandemic provided evidence about risk management (6,7, 38). Anyway, no unique consensus for diagnostic and management has been internationally provided. This is reflected in the absence of unique and internationally approved indications for an oropharyngeal swab, the actual diagnostic gold standard. A European and Global vision is still lacking, and management is left to National Health Institutes or single Centers administration.

By considering the current epidemiological situation and infection trends, controlling the COVID-19 pandemic requires the adoption of precise risk management strategies aimed to reduce contamination between infected individuals and health workers (9).

**Risk management**

Proactive steps must be taken in anticipation of the trigger and adverse events, represented by a spread of contagion within the hospital among patients, health workers and caregivers (10).

Risk management strategies should follow Reason’s “Swiss cheese model” (Fig.1) to identify and correct systematic and procedural failures. Assessing these risks permits to recognize barriers, including the appropriate removal of PPE, which can prevent the occurrence of a triggered adverse event (11).

**Latent errors** depend on structural and management filter errors such as lack of strategic planning for the COVID-19 emergency, according to reorganization of logistics, activities and procedures and staff training on rules and the use of PPEs. **Active errors** are performed individually by the operator, i.e., incorrect use of the PPE devices and their removal not in accordance with the clean and the dirty identified paths, as well as incorrect compliance with the outpatient

![Figure 1. Modification of Reason’s diagram according to the clinical risk of harm for COVID-19 patients and for contamination of healthcare staff, as obtained by sum of latent and active errors.](image-url)
eyes, mouth, or nose; and above all, inside the hospital, the use of PPEs including gloves, medical masks, goggles/face shields and gowns in order to protect the health care team and the patients (4, 15).

During April, the stock of PPE, in particular masks and respirators, was often insufficient to meet the need because of the limited capacity of production and the massive demand due to misinformation and panic buying. Also, despite the pandemic spread and gravity seems to be much lower than the beginning, a new wave is expected starting from autumn 2020. That’s why it is mandatory to limit PPEs waste and improve the information about their correct use, in order to increase their availability (15).

Safety procedures in otolaryngology during the covid-19 pandemic: clinical setting

The pandemic of COVID-19 is heavily interfering with ordinary medical practices and surgeries.

Otolaryngology is one of the most affected specialities because routine examination and procedures place physicians close to patients’ upper respiratory tract. During the inspection of the oral cavity and the oropharynx, as well as in rhinoscopies, laryngoscopies and tracheostomy tube replacements, doctors and health workers are in direct contact with saliva and mucous suspensions. This is due to being only 20-30 cm far from the patient’s face, performing manoeuvres that potentially cause cough or sneeze as a physiological reflex (17- 21). Besides, COVID-19 infections frequently present with respiratory symptoms involving the upper airway tract. Thus a swab test should be performed before ENT evaluation. In case of possible positive patients, the Italian Higher Institute of Health (ISS) recommends to the healthcare team to wear surgical masks, disposable gowns, gloves, and goggles; when performing aerosol-generating procedures. ISS recommends to use FFP2 (filtering facepiece) or FFP3, disposable and water-repellent gowns, gloves, and protective goggles (20).

Moreover, in order to reduce patient exposure to contamination, all non-urgent examinations should be postponed by telephone contact. Delayable evaluations include benign and chronic diseases, oncologic controls, pediatric evaluations, and in every case, the presence of new-onset symptoms should be excluded. (20-23) Patients should be informed on the need to access sanitary facilities by wearing a surgical mask (18).

As the ENT evaluation creates aerosols from the respiratory secretion, the outpatient room should be considered a potentially contaminated area (19). Therefore, the outpatient room must be structurally isolated by creating controlled access for the user through a filter area where the patient will enter wearing a mask (20, 21). The healthcare team should dispose of a clean area, dedicated to PPE wearing, and a separated dirty area for safe removal and elimination of contaminated PPE as described in the model in Fig. 2.

Figure 2. Basic model of the structural organization of the patients’ and health workers’ pathways in order to contain as much as possible the potential spread of the virus in ENT daily clinical practice during epidemic.

Safety procedures in otolaryngology during the covid-19 pandemic: operating room setting

As for medical examination, surgery experienced substantial changes, with drastic cuts of operating room activity. As remarked and described by Pearlman AN et al., protocols created during COVID-19 pandemic reflected a “safety first” philosophy (38). This was due to avoiding patient’s contamination entering the hospital for non-urgent procedures, and because of the use of operating room ventilators to support
COVID-19 intubated patients in many hospitals (4, 13, 34). In Wuhan, the most affected medical personnel were anesthesiologists, otolaryngologists, and ophthalmologists because of the close contact between nasal, oropharyngeal cavities and the eyes (32). For these professionals, during surgical procedures, the risk of intraoperative transmission of COVID-19 is very high. For these reasons, a growing number of Universities and surgical associations created guidelines, suggesting only performing emergency surgeries or, at least, those that cannot be delayed, such as oncological surgeries (18, 21, 34).

In particular, endonasal endoscopic surgery and skull base surgery are considered to be high-risk procedures, since the use of debriders and drills within the nasal cavity produced aerosol droplets (30), as described in the Chinese experience (29). Many authors reported positive COVID-19 cases among surgeons and operating room team after an endoscopic nasal surgery (31). Also, pediatric surgery, except for emergent procedures, should be postponed, as the pediatric population can contract COVID-19 even if the great majority of children presents with mild or no symptoms (4).

The Italian Society of Otolaryngology (SIO), following the British ENT Association instructions, recommends the use of PPEs during COVID-19 patients’ surgery, i.e. double disposable and water-repellent gowns, double gloves, FFP3 or N99 type masks, or, if not available, FFP2 or N95, eye protection, surgical cap, and proper shoes/boots. As far as eye protection is concerned, in order to protect from conjunctival penetration, the use of a disposable respirator and safety goggles, or a full-face respirator is suggested. Safety goggles with a rubber air seal provide a tighter air barrier (27, 28). Before the operation, it is recommended to test for COVID-19 through an oropharyngeal and nasopharyngeal swab twice (4 days before and 48 hours before surgery). If the test cannot be performed, the patient should be considered as positive. If the test is negative and the patient is asymptomatic, there is no particular instruction for the use of PPE, but the number of staff people and the length of surgery must be reduced. If the patient is positive, the surgery should be delayed, and the test should be repeated a few days later unless an emergent procedure is needed (33–35).

Special isolating zones are fundamental, and so is an isolated operating room. A hostile pressure transfer vehicle, or at least a unique passageway, should be used to move patients.

During intubation, an extra layer of gloves is necessary. When administering anaesthesia, it is preferable to do a rapid induction, moderate sedation and good muscle relaxant in order to avoid a choking cough. Strict monitoring should be performed throughout the entire operation (8).

Tracheostomy is classified as a high-risk procedure in COVID-19 patients since it is an aerosol-generating procedure: the need for tracheostomy must consider both benefits and risks for the patient and staff (25, 26, 36, 37). Different medical societies have created their own recommended procedures to guide medical staff and to minimize risks for the patient. It is fundamental to create a dedicated team, well-informed about the recommended techniques and ability to apply them to the workplace. The presence of two head and neck surgeons and one anesthesiologist (a COVID team) is mandatory (15, 24).

The following table (Table 2) sums up the instructions of two societies and offers a list of things to do during the days before surgery, during surgery, and after surgery.

**Conclusions**

In the current pandemic, as well as in any other medical emergency, the most crucial goal is to reduce the spread of the virus, especially within hospitals, where every contact represents a risk for patients and staff. It is necessary to prevent transmission of the disease from patients to medical staff and also from medical staff to patients. In case of a new wave, prompt behaviour with correct precautions are mandatory. For these reasons, in these circumstances, limiting nonessential activities and surgeries is needed.

Hospitals must prevent the contamination of their medical staff and health care personnel in order to decrease connected clinical risks and the relative
risk of contagion among the team of practitioners. If the contagion expands to the team and determines the reduction of their operation, sufficient health care for citizens is not guaranteed, also leading to high direct and indirect costs.

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**Ethical Statement:** The article doesn't contain the participation of any human being and animal.

### Table 2. How health care professionals need to plan and do before, during and after the tracheostomy in COVID-19 pandemic

| Planning (Week of Surgery) | Day of Surgery |
|---------------------------|----------------|
| • Team education: prepare the PPE and learn how to wear and use them | • Check the availability of PPEs for all staff, tracheostomy grab bag and tubes of various size with functioning cuff, closed in-line suction |
| • Choose the operating room, preferably one with negative-pressure or, if that’s not available, a well-ventilated room with closed doors during the procedure | • Check the indication and the appropriateness of the tracheostomy, and whether the patient is relatively stable for tolerating lying flat with periods of apnea |
| • Review the indication for tracheostomy, for the timing and for the prognosis | • A full paralysis of the patient reduces the risk of coughing |
| • Choose cuffed and non-fenestrated tracheostomy tubes | • Stop ventilation and turn off flows after exposition of the trachea, allowing time for passive expiration |
| • Choose the COVID team and perform some simulation | • Advance the cuff beyond the proposed tracheal window, hyperinflate the cuff, and re-establish oxygenation with PEEP |

| During Surgery | After Surgery |
|----------------|--------------|
| • Stop ventilation and turn off flows after exposition of the trachea, allowing time for passive expiration | • Pay attention during patient transfer and to holding the tracheostomy tube while in movement |
| • Advance the cuff beyond the proposed tracheal window, hyperinflate the cuff, and re-establish oxygenation with PEEP | • Use only in-line closed suction circuits |
| • Before opening the trachea, stop ventilation | • Perform a periodic check of cuff pressure |
| • Create a tracheal window, taking and inserting the cuffed non-fenestrated tracheal tube | • Do not change dressing unless there’s clear sign of infection |
| • Inflate the cuff immediately and confirm the position with end-tidal CO2 | • The first tube change should be delayed by 7-10 days and staff must use all personal protections; perform a pause in ventilation, with flows off before deflating the cuff and inserting the new tube, after that follows immediate cuff re-inflation |
| • Take off PPE correctly, in the appropriate area | • Use the cuffed non-fenestrated tube until the patient is confirmed negative to infection |

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