ABSTRACT

Background and objectives: during orotracheal intubation (OTI), it occurs the exposure to COVID-19 aerosols and consequent contamination of the professionals involved, observing the need to apply preventive measures. The objective is to know, in the scientific literature, which are the main preventive measures for health professionals to aerosols generated during OTI of patients suspected or confirmed for COVID-19.

Contents: this is an integrative review, with search in the LILACS, SciELO, BDENF, MEDLINE, PubMed and Cochrane Wiley databases. Primary articles, with full text in Portuguese, Spanish and English, which contemplated the research objective, were selected. Of the 335 articles found, 22 were selected according to the inclusion criteria. In 18 (82%) of articles, they highlighted the use of barrier methods when performing the intubation procedure, such as acrylic box and plastic tarpaulin. In other studies (3; 14%), it was observed the need to include qualified intubation teams in hospital institutions to reduce the contamination of professionals, in addition to the application of checklists that guide the procedure. A single article brought the use of an orthopedic protective cover adapted to protect the intubator. Conclusion: the measures are
defended to reduce exposure to aerosols and allow the safety of health professionals. The use of an intubation box must be used with caution, weighing the risks and benefits against the possibility of aerosolization during its use in orotracheal intubation.


**INTRODUCTION**

In December 2019, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was responsible for the first cases of pneumonia of unknown etiology in the city of Wuhan, China.\(^1\) It is an RNA virus of family **Coronaviridae**, widely distributed among humans and other animals.\(^2\) The exponential growth of cases in China, reaching hundreds of countries, led the World Health Organization (WHO) to declare the disease called Coronavirus Disease 2019 (COVID-19) as a pandemic.

The disease can occur as flu-like syndrome (FLS), through fever, simultaneously with the onset of dry cough, tiredness, nasal congestion or sore throat.\(^3\) However, the clinical manifestation can present as Severe Acute Respiratory Syndrome (SARS) and pneumonia, ranging from low to high criticality in patients.\(^1\) Severity is related to age and the presence of comorbidities, such as diabetes, obesity and cardiovascular diseases, with mortality of 14.8% in older adults over 80 years and with an association of fatal outcome for the presence of comorbidities for all ages.\(^3,4\)

The number of patients admitted for hospital care without progression to criticality is higher when compared to those who need beds in the Intensive Care Unit (ICU).\(^5\) However, when assessing patients who evolve to the ICU, between 33% and 75% of critically ill patients require artificial respiratory support by invasive mechanical ventilation (IMV), with mortality of 10.2% for all those affected by COVID-19 and 14.6% for mechanically ventilated patients.\(^5,6\) Mortality occurs in 61.5% of critically affected patients, in 28 days of ICU admission.\(^1\)

Thus, health professionals should be prepared for the assistance of those who evolve to ventilatory failure, with the imminent need for orotracheal intubation (OTI). However, during the assistance for definitive airway management, the team is exposed to aerosols resulting from the procedures, with risk of contamination associated with the different routes of transmission, contact with patients for a longer period of time, intense working hours and greater complexity of care tasks.\(^7\)

The National Health Commission of China reported that 3,300 health professionals were infected during care until March 2020, with 22 deaths.\(^8\) For the care
of these patients, it is imperative to use all personal protective equipment for standard precaution, droplets and aerosols, especially for aerosol-generating procedures (AGP).9

Health professionals who participate in critical AGP, such as OTI, cardiopulmonary resuscitation and airway aspiration, must be equipped with personal protective equipment (PPE), such as gloves, caps, face shield or goggles, N95 mask and waterproof apron.10 Furthermore, it is advised to perform these procedures in isolation rooms of respiratory infection with negative pressure and the use of special filters of the high-efficiency particulate air (HEPA) type in mechanical ventilators.10

New guidelines for the use of PPE constantly emerge, as well as aerosol prevention measures are updated to the knowledge of professionals and health establishments. Considering the cases of critically ill patients who require OTI and permanence in IMV, associated with the risk of exposure during PGE by the care team and the need to constantly update the guidelines for infection control, we see the need to compile the main guidelines to facilitate the reading, access and understanding of these professionals who are on the front line. Thus, this research aims to know in scientific literature what are the main prevention measures for health professionals to aerosols generated during OTI of patients suspected or confirmed for COVID-19.

METHODS

This is an integrative review, in which the six methodological steps necessary for its development were followed, namely: 1) guiding question elaboration; 2) search or sampling in literature; 3) critical analysis of included studies; 4) data collection; 5) discussion of results; and 6) integrative review presentation.11 Through the strategy PICo, the research question to be investigated was elaborated: what are the aerosol exposure prevention measures during OTI by health professionals in patients suspected or confirmed for COVID-19? Population would be health professionals, Intervention, measures to prevent contamination of health professionals by the virus, and Context, exposure to aerosols during OTI.

The inclusion criteria were articles from primary studies published in Portuguese, English or Spanish, available as full texts for reading in full. This integrative review excluded studies that did not answer the research question or did not contemplate the objective, in addition to articles in the format of letters, consensus and guidelines, in addition to review articles (narrative, integrative and scoping review).

The selection of articles took place through the Virtual Health Library (VHL), in the Latin American and Caribbean Literature in Health Sciences (LILACS), Medical
Literature Analysis and Retrieval System Online (MEDLINE) and Database in Nursing (BDENF) databases. Likewise, the search was carried out in the Scientific Electronic Library Online (SciELO), and, for the selection of randomized clinical studies, a search was carried out in Cochrane Wiley. To expand the selection of international studies not included in the VHL, the search was carried out through the National Library of Medicine (PubMed). During the selection in virtual libraries, the international indexed Medical Subject Headings (MeSH) descriptors were used: “COVID-19”, “aerosols”, “intubation”, “protect”. With the help of the Boolean operator AND, sets of descriptors were applied to the following databases: BDENF, LILACS, MEDLINE and Cochrane Wiley, “(COVID-19) AND (aerosols) AND (intubation)”; SciELO, “(COVID-19) AND (aerosols)”); and PubMed, “(((COVID-19) AND (aerosols)) AND (intubation)) AND (protect)”.

After the identification of primary articles, the selection process was carried out from the exclusion of duplicates, subsequent reading of titles and abstracts to exclude those that did not contemplate the research topic. The steps of identification, selection and inclusion of articles were carried out between May and June 2021 and followed the PRISMA method (Figure 1).
The 22 selected primary studies were assessed for methodological scientific rigor, classified according to the level of evidence (LoE). Articles with LE I were considered to be systematic reviews or meta-analyses; LoE II, randomized controlled trials; LoE III, controlled studies without randomization; LoE IV, case-control or cohort studies; LoE V, systematic reviews of qualitative or descriptive studies; LoE VI, qualitative or descriptive studies; and LoE VII, opinions or consensus. Subsequently, the information contained in the studies was summarized, according to author, year and place of publication, objective, design and LoE, and measures to prevent aerosols from COVID-19 during OTI.

RESULTS AND DISCUSSION
A total of 22 primary studies were selected to make up this integrative review. Almost all studies were found in PubMed (20; 92%), followed by MEDLINE (1; 4%) selected through VHL and Cochrane Wiley (1; 4%). The United States published 12 (55%) articles, Canada, four (19%), Australia, two (10%), Israel, one (4%), Turkey, one (4%), England, one (4%), and Malaysia, one (4%). No studies published in Brazil or other countries in Latin and South America were identified.

Regarding the methodology, no meta-analysis studies were identified, considered the best scientific evidence among scientific studies. Randomized clinical trial-type studies made up most of the sample, with 11 (50%) whose LoE is II; non-randomized or quasi-experimental studies comprised eight (36%) of LoE III; cohort studies comprised one (5%) of LoE IV; while descriptive studies, of the case study type, totaled two (9%), of LoE VI.

Article synthesis was carried out regarding author, year and country, objective, design and level of evidence, and the main protection measures highlighted in the scientific articles, as shown in Chart 1.

<table>
<thead>
<tr>
<th>Main author, year and place</th>
<th>Objective</th>
<th>Design and LoE</th>
<th>COVID-19 aerosol prevention measures during OTI</th>
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</thead>
<tbody>
<tr>
<td>Rose P, 2020, Canada.</td>
<td>Assess the risk of droplet and contact contamination for healthcare professionals using 3 intubation techniques as part of a quality assurance study.</td>
<td>Double-blind randomized quality assurance study</td>
<td>Intubation was assessed simulating droplet dispersion with: a) no protective barrier between manikin and intubator; b) use of transparent plastic; and c) acrylic box, covering the dummy’s head. The use of plastic barrier did not add any benefit when compared to the other techniques. When using plastic, the risk of droplet dispersion and subsequent contamination to the intubator increased when compared to the acrylic box.</td>
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<tr>
<td>Azhar MN, et al., 2021, Malaysia.</td>
<td>Investigate the relationship between the use of a protective</td>
<td>Randomized double-blind controlled</td>
<td>Simulation of intubation with and without plastic box, through videolaryngoscopy in dummy. The</td>
</tr>
<tr>
<td>Turner JS, et al., 2020, United States.(^{16})</td>
<td>aerosol box and contamination of health professionals before and after personal protective equipment (PPE) donning and doffing.</td>
<td>use of a box for intubation reduces droplets and aerosols contaminants in PPE of health professionals involved in the procedure. There was an increase in mobility and visualization during intubation, in addition to the decrease in success in the first attempt.</td>
<td>study LoE II</td>
</tr>
<tr>
<td>Derrick J et al., 2020, Australia.(^{17})</td>
<td>Measure the effects of a box to contain aerosols on intubation in different simulation scenarios in the Emergency Department.</td>
<td>Five intubation scenarios were used, with the participation of 48 medical residents, performing 96 intubations. OTI time was significantly longer with the use of a protective box, compared with no use. There was greater difficulty in intubating in difficult-to-manage emergency airways. The box use can increase intubation time and hinder the procedure (17 versus 10 seconds, respectively).</td>
<td>Randomized double-blind controlled study LoE II</td>
</tr>
<tr>
<td>Feldman O et al., 2021, Israel.(^{18})</td>
<td>Investigate whether the use of a plastic casing could reduce aerosol exposure during laryngoscopy.</td>
<td>Simulation of 90 intubations on a dummy, with saline nebulization to simulate aerosols. The measured mean aerosol count was significantly reduced when the wrap was worn over the patients’ head. Thus, casings during intubation can avoid the chance of increased levels of dispersed aerosol particles. There was no difference in OTI time compared to the conventional technique.</td>
<td>Randomized double-blind controlled study LoE II</td>
</tr>
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<td>Assess the time to OTI of paramedics wearing personal protective equipment with and without an aerosol protection box. The results suggest that</td>
<td>A total of 18 paramedics simulated intubation by laryngoscopy with and without an aerosol protection box. The results suggest that</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Outcome</td>
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<tr>
<td>Fong S. et al., 2021, Canada.</td>
<td>Randomized double-blind controlled simulation study</td>
<td>Explore the impact of using a protection box for aerosols during normal and difficult-to-handle OTI. The performance of 296 intubations with and without the protection box was verified in 4 difficult airway scenarios. The mean intubation time with and without the box was 31 versus 25 seconds, respectively. With the protection box, there were more OTI attempts, damage to the PPE entirety and optimization of maneuvers to achieve intubation.</td>
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<tr>
<td>Burnett GW, et al., 2020, United States.</td>
<td>Randomized double-blind study</td>
<td>Assess intraoperative contamination and decontamination of an aerosol protection box and the impact of a preoperative educational visual aid. It was divided into groups that could previously see contamination points in the box and without access. Those who could see contaminated themselves less and the box was completely cleaned. It should be considered to educate professionals for correct use. There is a potential risk of contamination when removing the box after intubation for both professionals and the environment.</td>
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<tr>
<td>Ozbek AE, et al., 2021, Turkey.</td>
<td>Randomized, prospective, double-blind study</td>
<td>Compare the use of conventional PPE, protective box and transparent plastic, and its impacts on intubation time by experienced professionals wearing adequate PPE (N95, face shield, apron and gloves) and adequately trained can successfully intubate using the box, however, the procedure time can be prolonged compared to non-use (27 versus 37 seconds, respectively).</td>
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<tr>
<td>Authors</td>
<td>Study Title</td>
<td>Study Design</td>
<td>Outcome</td>
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<tr>
<td>Querney J, et al., 2020, Canada.</td>
<td>Assess the acceptance of the use and airway management of two modalities of protective aerosol barrier.</td>
<td>Double-blind randomized simulation study</td>
<td>In an intubation scenario with a) only PPE and b) PPE added to protective box and plastic barrier, there was no significant difference between intubation times. For participants, adding protection barriers does not affect visibility, mobility, and communication in OTI.</td>
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<tr>
<td>Begley JL, et al., Australia.</td>
<td>Assess the impact of two aerosol protection boxes on the OTI of patients with COVID-19.</td>
<td>Randomized study without blinding</td>
<td>When assessing two acrylic box formats for OTI, both showed an increase in the time required to intubate, compared to non-use. There was also a violation of PPE integrity when using both barrier box formats. It was concluded that barrier box increases OTI time, putting patients at risk of hypoxemia.</td>
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<tr>
<td>Madabhushi P, et al., 2020, United States.</td>
<td>Determine whether the use of a barrier box with videolaryngoscope delays intubation time to acceptable parameters.</td>
<td>Double-blind randomized clinical trial</td>
<td>After allocating 76 patients in a group (without barrier and with barrier to intubation), it was observed that, with the use of videolaryngoscope, there is no delay in intubation time in patients with normal airway conditions, when professionals are well trained previously.</td>
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<tr>
<td>Ben-Yakov M, et al.,</td>
<td>Determine the degree of protection offered</td>
<td>Randomized clinical trial</td>
<td>Comparing three methods of OTI using PPE (without barrier, box and</td>
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<tr>
<td>Year</td>
<td>Location</td>
<td>Method</td>
<td>Study Type</td>
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<tr>
<td>2020</td>
<td>Canada</td>
<td>by barrier methods and explore the usage factors by two popular barrier systems.</td>
<td>LoE II</td>
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<tr>
<td>Fidler RL, et al., 2021, United States</td>
<td>Describe the behavior of aerosols using 7 protection models during OTI, for how long each barrier limits aerosols and protection outside barriers.</td>
<td>Near-experimental study*</td>
<td>LoE III</td>
</tr>
<tr>
<td>Bryant J, et al., 2020, United States</td>
<td>Verify the effectiveness of a barrier method in reducing the risk of exposure to aerosolized pathogens in airway management, including OTI.</td>
<td>Near-experimental study*</td>
<td>LoE III</td>
</tr>
<tr>
<td>Gore RK, et al., 2020, United States</td>
<td>Assess the effectiveness of aerosol containment in a new protective barrier system,</td>
<td>Near-experimental study*</td>
<td>LoE III</td>
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<tr>
<td>Study</td>
<td>Methodology</td>
<td>Results</td>
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<tr>
<td>Patel GP, et al., 2020, United States.</td>
<td>Describe the Emory Healthcare Hospital intubation team during the COVID-19 pandemic.</td>
<td>About 16 OTI teams formed, performing 253 intubations in the hospital. Protocols were created with the use of devices for clamping the OTT (orotracheal tube), use of HEPA filters, minimal participation of people in the OTI, and proper use of PPE (cap, gloves, gown and N95). Only one limb was contaminated by SARS-CoV-2. The use of skilled OTI teams allows the safety of professionals.</td>
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<tr>
<td>Wills TT, et al., 2020, United States.</td>
<td>Describe the integration of an orthopedic cover as an item for COVID-19 protection.</td>
<td>It is an additional protective equipment that can be used in health professionals during the performance of procedures such as OTI. The disadvantage is the lack of a ventilation system for those who use this PPE.</td>
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<tr>
<td>Ahmad I, et al., 2020, England.</td>
<td>Report the experience of a Rapid Endotracheal Mobile Intubation Team and the outcomes in patients in a seven-week observation period.</td>
<td>About 150 OTI were analyzed. Videolaryngoscopy was used in 91.3%, with single pass success in 80%. In all, 11 of the 63 professionals were contaminated and only one incident of PPE violation. Trained intubation teams followed by protocolized rapid sequence OTI are beneficial in promoting patient and staff protection.</td>
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<tr>
<td>Brant-</td>
<td>Create an alternative near-</td>
<td>A transparent plastic barrier fixed</td>
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<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Location</td>
<td>Study Design</td>
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<tr>
<td>Zawadzki GM, et al., 2021, United States.</td>
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<td>Fried EA, et al., 2020, United States.</td>
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<tr>
<td>Tronnier A, et al., 2020, United States.</td>
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<tr>
<td>Turer DM, et al., 2021, United States.</td>
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</table>
simulation, there was high concentration in the environment. When using barriers, associate vacuum and air filtration systems to contain particles.

*Articles whose methodology was not described, classified according to the authors’ understanding.

Of the studies analyzed, it was found that 18 (82%) highlighted the use of barrier methods during the orotracheal intubation procedure, such as transparent plastic and acrylic box. It was observed in 3 (14%) the need for previously trained multidisciplinary intubation teams, as well as structured checklists to perform the definitive airway management procedure. According to the authors, trained intubation teams and protocols would make it possible to reduce the risks of exposure of professionals, as well as minimize unfavorable outcomes for patients infected by COVID-19. Still, 1 (5%) reported the use of an adapted orthopedic covering, which would cover the head of the intubator as a new PPE, but the disadvantage refers to mobility and difficulty in ventilation for professionals.

The need for OTI occurs in up to 75% of critically ill patients affected by COVID-19 who require direct ICU care. However, the performance of this procedure by health professionals puts them at risk of exposure to the virus. Intubation, along with orotracheal extubation procedures, non-invasive manual ventilation, tracheostomy, oxygen support by high-flow cannula, bronchoscopy and suction of secretions by suction, are among the critical assistance supports that generate aerosols.

In an example of OTI, doctors and nurses are the professionals who are most contaminated, as they handle the upper and lower airways with very close contact, as a result of the high risk of exposure. During the collapse in public health seen in Italy in early 2020, where the country reached the highest number of contaminations and deaths by COVID-19, about 9% of those infected were health professionals. Thus, it is crucial to know measures that prevent exposure to the virus and the contagion of those who work in critical sectors such as emergency and ICU.

Among the articles assessed, the mandatory use of PPE is unanimous to those involved in intubation. Considering the public health emergency and the high risks of contamination of professionals during aerosol-generating procedures, it is recommended to use a N95 mask, aprons, face shield and gloves, because these devices protect professionals from direct exposure to SARS-CoV-2 viruses. We emphasize the need
for correct donning and doffing of PPE used during service, as well as the correct disposal after the OTI procedure. Carrying out the correct processes for both times of use and disuse of PPE avoids both inadvertent exposure and the risk of contamination with aerosols accumulated on professionals’ mask, gloves, face shields or apron.\textsuperscript{38}

When dealing with preventive measures during OTI, studies mostly bring the use of protective barriers in association with the use of PPE: devices in acrylic box format, protective plastic and cover that cover the patients’ headboard.\textsuperscript{14-28,32,33,35} The hypothesis raised is that only the use of PPE does not adequately protect, requiring the association of protective barriers to ensure safety.\textsuperscript{36} Intubation boxes are acrylic boxes containing two holes, where the intubator allocates the arms for access to the airway, and an opening in its lower portion to attach the patients’ head.\textsuperscript{19} The application of barriers such as an acrylic box makes it possible to concentrate the aerosols inside and prevent dispersion to the environment during the procedure.\textsuperscript{15,22,28} However, there was an increase in intubation time compared to non-use, difficulty in mobilizing the intubator and access to the airway, as well as the risk of error in the first attempt to intubate.\textsuperscript{15,16,18,19,21,25}

In emergencies, the delay and difficulty of access to intubate inadvertently expose patients to hypoxemia and worsening of their clinical condition.\textsuperscript{16,23} When trying to handle the airway, there was a violation of the apron and glove due to the holes in the acrylic box, exposing to risk of contamination.\textsuperscript{19,23} The two openings designed to accommodate the intubator’s arms allow for the redirection of aerosols to the environment, with evidence of accommodation on professionals’ arms, chest and head.\textsuperscript{14,20,26,33}

Some articles highlighted the need to associate airflows with negative suction systems inside the acrylic box, coupled in HEPA filters, showing less contamination of the intubator, as well as the almost minimal dispersion to the environment.\textsuperscript{29,32,35} The post-procedure risk was also evidenced: at the end of intubation, the removal of the acrylic box allows the dispersion of aerosols concentrated inside it directly to the bedside, procedure materials, as well as the team involved.\textsuperscript{26,28,30} If the association of barrier protectors with OTI is chosen, teams must be trained in the decontamination of boxes and plastic barriers, with additional risk of exposure during removal after completion of the procedure.\textsuperscript{20,33}

The use of protective acrylic boxes should be based on team familiarization and training of those involved in handling, in order to reduce exposure to aerosols.\textsuperscript{20,24} The
use of a video laryngoscope facilitates the visualization of the airway and avoids the increase in intubation time, providing greater safety for both professionals and patients. Thus, teams should analyze care routines on the benefit and risk of adding barrier protectors to intubation, and the possibility of increasing the videolaryngoscope in daily life. The training of professionals to perform OTI in emergency and ICU, as well as the use of checklists that guide the methodology of the procedure, show safety for both teams and patients.

In a study developed in the United States, after the creation of a protocol containing guidelines on intubation (number of professionals present in the room to reduce exposure, use of tube clamps and HEPA filter, training in airway management and rapid OTI sequence), it was observed that, after 253 intubations, only 1 professional was contaminated and there was success in the first attempts, demonstrating that the application of protocols and the constant training of teams enable safety.

On the contrary, in another study, despite the complete use of PPE and training for intubation skills, of the 63 professionals, 11 were infected. First-attempt OTI success occurred in 80% of procedures. The creation of intubation teams, similar to the rapid response teams, can benefit from the guarantee of safety in performing high-risk care for teams. Only one study addressed the use of tube clamps when passing the airway and the application of a HEPA filter to the expiratory circuit of the mechanical ventilator, as they were part of the OTI protocol.

During the assessment of articles obtained in research, it was observed that the vast majority of published studies were guidelines and experts’ recommendation letters. Recommendations regarding the association of certain OTI devices and methods in suspected or confirmed COVID-19 patients come from experts in the field to guide professionals during intubation. Among the guidelines, the following stand out: performing OTI preferably in negative pressure rooms; minimum permanence of professionals (in a negative pressure room, the permanence of a doctor, a nurse and an assistant physician in a critical room, and in an auxiliary circulating anteroom with a cardiopulmonary resuscitation cart, drugs and complete airway material); HEPA filters in the mechanical ventilator’s expiratory circuit; avoid bag-valve-mask inflation, clamps to clamp the OTT when disconnecting the ventilation system.

Although the guidelines are sources of experts in the area, there is a lack of original primary studies highlighting the efficiency of these recommendations in protecting professionals from exposure to COVID-19 aerosols. As this is a very recent
topic, considering the emergence of guidelines for professionals regarding the care of critically ill patients who need a definitive airway, it is believed that there was not enough time to assess all these guidelines in methodology studies with a high level of evidence.

The limitation of this study is the research method, because it is an integrative review, and not systematic literature. Due to the very recent emergence of COVID-19, robust studies on the safety of devices such as clamps, HEPA filters, the separation of procedure rooms to avoid contamination of professionals, as well as oxygen therapy devices for the pre-oxygenation stage prior to OTI have not been identified.

Thus, with the acquisition of experience in the care of infected patients who need OTI, there is a need for original research on aerosol prevention measures for professionals involved in the procedure. The exclusion of 3 articles in other languages and 18 articles not available in full are limitations regarding the research method, inclusion and exclusion criteria.

Knowledge about methods of preventing dispersed aerosols during definitive airway management is crucial for the protection of professionals. In this way, constant updates from studies with a high level of evidence allow teams to be confident in the implementation of these measures in the daily care of patients suspected or confirmed for COVID-19.

CONCLUSION

The use of barrier protectors such as the intubation box in everyday care should be analyzed with caution. Despite concentrating the aerosols in its interior, the risk of escape in its openings directly to the intubator is evident. There is difficulty in mobility and visualization, requiring previous training and experience from professionals so that there is no harm to patients with its use. Likewise, without familiarity with the device, there is an increase in procedure time, exposing patients to hypoxemia.

On the other hand, the intubation teams, the use of protocols and the training of teams demonstrate effectiveness in reducing contamination to professionals. It is necessary to observe the need for more clinical studies on safety and guarantee of protection, using other recommendations described in guidelines and expert guidance.

REFERENCES


Authors’ contributions:

Aline Branco, Rita Catalina Aquino Caregnato e Rafaela Milanesi contributed to the conception, article design, analysis, article writing, review and final approval of the article.

All authors have approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.