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CHAPTER 13

Protocols and guidelines for the care of respiratory emergencies in children up to two years of age: An integrative review

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ABSTRACT

Objective: To analyze guidelines and protocols for the care of respiratory emergencies in children up to two years of age in the literature. Methodology: this is an integrative review of the literature, using the guidelines of the PRISMA Protocol, the research question was formulated based on the PICo strategy (P – Children up to two years of age, I – Guidelines and protocols for respiratory emergencies, Co-Emergency): What is the evidence available in the literature on the guidelines and protocols for respiratory emergency care in children up to two years of age? Contemplating the studies published from January 2018 to July 2023, available in full, focusing on protocols for children up to two years of age with no lower age limit, not restricting language, place of origin or method used. Articles found in the databases with the Virtual Health Library (VHL), Cochrane Library. Embase, Pubmed, Scopus, Web Of Science to the use of the RAYYAN® program. Results: four studies included the sample, including the affirmation of the use of poractant alfa for the treatment of severe acute respiratory syndrome in children under two years of age, with an improvement in the mortality rate of 20.4%. The efficacy and fundamental use of hospital medical materials for the management of the advanced airway and reduction of surgical management is proven, reducing the patient's exposure to unnecessary events. And the use of specific medication for the treatment of cases of anaphylaxis and asthma in the first hour. Continuing education training is essential for team harmony, assertive communication and provision of intensive care in order to reduce damage and possible vital complications leading to death. Final considerations: interventions for the clinical management of pediatric respiratory emergencies should follow the ABCDE evaluation method, considering the specificities of each stage of development (less than 30 days, up to one year, up to two years). The administration of surfactant to children younger than 30 days of age is noteworthy, with the potential to reduce the mortality of infants with severe acute respiratory syndrome, and the rigorous evaluation of the indication for orotracheal intubation.

Keywords: Nursing, Emergency, Pediatric Respiratory Distress Syndrome, Respiratory Distress Syndrome of the Newborn, Clinical Protocols, Evidence-Based Practice.

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INTRODUCTION

Emergencies are defined based on an unforeseen health problem with or without risk to life, requiring immediate care. Emergency consists of occurrences in which there is an imminent risk to life or great suffering requiring immediate care (CFM, 95). Emergency rooms and emergency rooms are the *care loci* that receive individuals in urgent and emergency situations, who require specific assistance for the return of life stability (Ribeiro *et al*., 2019).

Pediatric emergencies often occur due to respiratory diseases, and are considered a public health problem, since infections are recurrent and seasonal, with a higher prevalence in winter. In this sense, climatic variations contribute to the emergence and/or worsening of respiratory diseases in children. Cold and dry air irritates the upper airways, generating symptoms of runny nose, nasal congestion and shortness of breath, increasing the risk of seeking urgent and emergency services (Joshi *et al*., 2020).

The Acute Respiratory Infections (ARIs) that most affect children are asthma, community-acquired pneumonia, especially respiratory syncytial virus, human rhinovirus, influenza, parainfluenza, and adenovirus (Neto *et al*., 2018). AKI signs are identified by parents through cough associated with hyperthermia (Joshi *et al*., 2020).

In developing countries, pediatric care for lower respiratory tract infections predominates, due to their living conditions and hygiene. In developed countries, the hospital setting is characterized by respiratory diseases of viral etiology (Rahim *et al*., 2023). In Brazil, there is a prevalence of children complaining of cough and fever (Silva *et al*., 2021).

Respiratory emergencies in children cause about four million deaths annually in children under five. Worldwide, in 2015, 920,136 deaths due to pneumonia were described, representing 15% of deaths in this age group (Souza *et al*., 2020). In Brazil, between 2009 and 2018, there were 18,902 deaths of children associated with respiratory problems, with a mortality coefficient of 0.64 deaths per thousand live births, with the highest mortality rates observed in the Southeast (34.96%) and Northeast (30.67%) regions (Souza *et al*., 2020).

The nursing team is among the professionals who stand out in the care of children in urgency and emergency (Oliveira *et al*., 2020). According to the National Policy for Emergency Care (PNAU), nursing professionals should perform the reception, risk classification, diagnosis and care necessary for the sick person (Brasil, 2011).

In the face of pediatric respiratory emergencies, nursing professionals have the duty to have technical-scientific competence to act effectively and in a timely manner, impacting on a better prognosis for the individual (Flores *et al*., 2020). Law No. 7,498, of July 25, 1986, provides for the practice of nursing: nurses must coordinate the actions to be performed by the members of the

nursing team, following guidelines for their execution, assisting in the team's care plans for pediatric emergencies, raising safety and readiness for care (Brasil, 1986).

Nurses should apply pathophysiological knowledge through anamnesis and physical examination, combined with the use of protocols during pediatric care (Santos *et al*., 2020). In this sense, pediatric emergency care requires the understanding of anatomical and physiological singularities, which change with child development (Collet *et al*., 2020). However, there is a gap in the literature regarding the development of exclusive risk classification protocols for children in urgent and emergency situations, which may compromise the care provided to children. Added to this is the scarcity of protocols for respiratory emergencies, infections that contribute to increasing morbidity and mortality rates in the world. Between 2015 and 2016, infant mortality rates increased again after 26 years, with an increase of 5.3% in the country (UNICEF, 2019).

In view of the above, the importance of using protocols for the care of pediatric respiratory urgencies and emergencies is evidenced, in order to qualify care, promote quality of life and the well-being of children. In addition to fostering welcoming and humanization throughout the care process. Thus, the objective of this study is to analyze the literature on guidelines and protocols for the care of respiratory emergencies in children up to two years of age.

METHODOLOGY

TYPE OF STUDY

This is an integrative review of the literature, which followed the guidelines of the PRISMA Protocol (Moher *et al*. 2009). The research question was formulated based on the PICo strategy (Hulley; Newman; Cummings, 2015): (P – Children up to two years of age, I – Guidelines and protocols for respiratory emergencies, Co-Emergency): What is the evidence available in the literature on guidelines and protocols for respiratory emergency care in children up to two years of age?

STUDY SELECTION

The following inclusion criteria were adopted: original articles, published in the last five years (between January 2018 and July 2023, a period selected in order to detect the most recent publications), available in full electronically, with a focus on children aged less than or equal to two years, the language, the location of origin of the productions and/or the method used were not restricted. The exclusion criteria were: articles that diverge from the reflections proposed by this study, literature reviews/reflections, editorials, brief communication, clinical trial projects, abstracts of annals, theses, dissertations, course completion work, epidemiological bulletins, management reports, books and articles that did not provide the abstract.

DATA COLLECTION

Data collection took place between April and July 2023, using the following terms included in the *Medical Subject Headings* (MeSH): Nursing, Emergency Room; Child health; Respiratory Distress Syndrome, Pediatric; Infantile Respiratory Distress Syndrome; Protocol, Clinical. In the search strategies PUBMED, EMBASE, SCOPUS, Web of Science and Cochrane. In the Virtual Health Library (VHL) through the Health Sciences Descriptors (DeCS): Emergency Nursing; Pediatric Respiratory Distress Syndrome; Respiratory Distress Syndrome of the Newborn; Clinical Protocols. It is noteworthy that for this collection, only the keywords were used, discarding the synonyms presented. In order to enhance the retrieval of articles, a cross-search between keywords was used by means of the Boolean connector "AND", adopting the same combination in all search locations. Data collection was carried out by two researchers, in a different way, and the disagreements were discussed until there was a consensus.

DATA ANALYSIS AND PROCESSING PROCEDURES

The articles were selected and identified in three stages: 1) Reading the titles and abstracts of the studies and excluding those that did not fit any of the criteria; 2) Full reading of all articles selected in the first stage; 3) Selection of works that fit the eligibility criteria. It should be noted that duplicate articles in the databases were excluded after reading them in full in order to avoid exclusion errors.

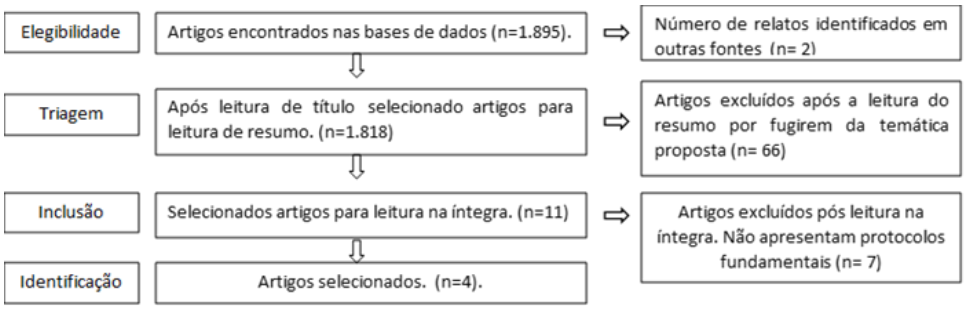
To facilitate the extraction of the information contained in the studies, RAYYAN,® a free *online software*, was adopted, used to assist in conducting systematic and integrative reviews, by exporting the data from the databases, creating a selection of information from the articles that facilitate their selection, namely: identification, title, year of publication, indexing base, journal, level of evidence, Objective, *study design*, main results, and conclusion. To identify the level of evidence of the selected works, the criteria proposed by Galvão (2006) were adopted: level I systematic reviews or meta-analyses of Randomized Controlled Trials (RCTs); level II: evidence obtained from at least one well-designed RCT; level III: well-designed clinical trials without randomization; level IV from well-designed case-control and cross-sectional studies; level V obtained from systematic reviews of descriptive or qualitative studies; level VI from a single descriptive or qualitative study; and level VII: evidence originating from the opinion of authorities and/or expert committees.

The results were structured in tabular format and the data were discussed according to the literature. Ethical aspects were preserved, and all authors of the articles included in this review were appropriately referenced.

RESULTS AND DISCUSSION

A total of 1,895 articles were found in the search strategies, and after applying the eligibility criteria, four articles that covered the research question were selected.

Figure 1. Flowchart of the selection of articles that contemplated was under review of the literature. Maringá, PR, Brazil, 2024. (n=4)



None of the studies selected for this review were developed in Brazil or even in South America, demonstrating the scarcity of productions on the subject. The articles were published in English (n=4). Table 1 shows the characterization of the articles included in this review.

Table 1. Characterization of the articles that included the integrative literature review. Maringá, PR, Brazil, 2024. (n= 4)

ID	Title	Authors	Year of publication	Country	Tongue	Level of evidence
A1	A shared protocol for porcine surfactant use in pediatric acute respiratory distress syndrome: a feasibility study	Wolfler, Andrea; PLATE, Mark; Amigoni, Ângela; SANTUZ, Pierantônio; Gitto, Eloísa; Rossetti, Emanuel; Tinelli, Carmim; Montani, Cinzia; Savron, Fábio; Pizzi, Simone; D'amato, Luigia; Mondardini, Maria Cristina; Conti, Giorgio; De Silvestri, Annalisa	2019	Italy	English	6
A2	Evaluation of a program resuscitation training neonatal care professionals healthcare in Zanzibar, Tanzania: a pre-post intervention study	Ding, X.; Money, L.; Msellem, M.I.; Hu, Y.; Qiu, J.; Liu, S.; Zhang, M.; Zhu, in.; Latur, J.M.;	2021	Tanzania	English	3

A3	European Resuscitation Council Guidelines 2021: Paediatric Life Support	Van de Voorde, P.; Turner, N.M.; Djakow, J.; de Lucas, N.; Martinez-Mejias, A.; Biarent, D.; Bingham, R.; Brissaud, O.; Hoffmann, F.; Johannesdottir, G.B.; Lauritsen, T.; Maconochie, I.	2021	Belgium	English	
A4	Airway emergency management in a pediatric hospital before and during the COVID-19 pandemic	Christopher S. Thom; Hitesh Deshmukh; Leane Soorikian; Ian Jacobs; John E. Fiadjoe; Janet Lioy	2020	USA	English	6

Source: the authors (2024).

The studies included preterm newborn children up to two years of age, with weight ranging from less than one kilogram to more than four kilograms. Other relevant information about the studies is shown in Table 2.

Table 2. Information on the studies included in this review (objective, method, main results). Maringá, PR, Brazil, 2024. (n=4)

ID	Objective	Method	Main Results
A1	To evaluate the use of a protocol on the use of *poractant alfa* in Acute Respiratory Distress Syndrome (ARDS) in children under two years of age.	Multicenter observational study	69 children received treatment with poractant alfa for the treatment of respiratory syndrome. 54 children had severe ARDS. 11 children died, 10 had complex comorbidities. Two children died during extracorporeal membrane therapy (ECMO). Mortality rate: 20.4%.
A2	To evaluate a neonatal resuscitation training program delivered over a two-year period to health care workers in Zanzibar, Tanzania.	Intervention study (pre-post intervention)	Through the training and education of 23 health professionals over two years, an increase in knowledge, care and management of children in Cardiorespiratory Arrest was obtained. The team's performance in the face of complications over the years increased from 32.26 to 42.23.
A3	Provide guidelines on the management of critically ill infants and children, before, during, and after cardiac arrest.	Guidline	Multiprofessional material for the management of infants and children through interventions such as the use of adrenaline for cases of anaphylaxis. Corticosteroid administration in the first hour when the asthmatic state occurs. Score verbal and non-verbal communication in order to provide

			appropriate assistance. Harm reduction in life-threatening emergencies that could lead to cardiorespiratory arrest.
A4	To evaluate the effect of a Neonatal and Infant Airway Emergency Program to improve medical responses, communication, equipment use, and outcomes for all infants requiring emergent airway interventions in the neonatal and infant intensive care unit (NICU).	Retrospective cross-sectional study	With the use of the program, the number of events remained constant, being approximately 12 cases per year. All new cases were treated with the necessary equipment and specialists. Emphasis on the use of the flexible fiber-laryngoscope and the Benjamin laryngoscope in emergency events. The use of a bronchoscope has helped to reduce surgical management due to greater airway protection.

Source: the authors (2024).

The main (general) interventions in respiratory emergencies for children under two years of age are shown in the table below and followed the ABCDE method of approach to critically ill patients, with the specificities arising from age being pointed out (Chart 1).

Table 1. Interventions for the emergency care of children under two years of age. Maringá, PR, Brazil, 2024. (n= 4)

ABCDE Method Evaluation	**Interventions**
The Establish airways	- Keep them pervious, and vacuum when necessary; alignment and tilt of the head and jaw, alignment of the body; - If unconscious, consider it an invasive airway with an orthotracheal tube of adequate size, avoiding pushing the tongue back during insertion; - If semi-conscious, consider nasopharyngeal airway to avoid if skull base fracture is suspected.
B Respiration	- Check respiratory rate: up to 30 days (upper limit of normal 60 breath movements per minute (mpm), lower limit of normal 25 mpm), up to one year (upper limit of normal 50 mpm, lower limit of normal 20 mpm), up to two years (upper limit of normal 40 mpm, lower limit of normal 18 mpm); - Abnormal sounds accompanied by retractions (notch and/or accessory muscles), grunts; thoracic expansion; Oxygenation; consider the use of capnography and thoracic ultrasonography; - Provide oxygen to achieve target saturation of 94% or more (with as little supplemental FiO2 (fraction of inspired oxygen) as far as possible); - Not administering preventive oxygen therapy; - Initiate oxygen therapy at high FiO2 based on clinical signs of circulatory or respiratory failure, and titrate oxygen therapy as soon as SpO2 and/or PaO2 (Partial Pressure of Oxygen) becomes available; - Consider high-flow nasal cannula (HFNC) or non-invasive ventilation (NIV) for children who do not respond to low oxygen flow; - In hypoxemic children despite Positive End Expiratory Pressure (PEEP) (elevated (>10 cmH2O) and standard optimization measures, consider permissive hypoxemia (reduced oxygenation target for SpO2 88–92%); - Mechanical Ventilation: adjust respiratory rate (and expiratory time) and/or tidal volume (CV) according to age. Use a VT of 6 to 8 ml/kg LW (ideal body weight), considering, among others, the physiological and apparatus dead space (especially in younger children). The dead space of the appliance should be minimized. Look for normal chest elevation. Avoid hyperinflation as well as hypoventilation.
C Circulation	Check pulse rate - up to 30 days (upper limit of normal 180 bpm, lower limit of normal 110 bpm), up to one year (upper limit of normal 170 bpm, lower limit of normal 100 bpm), up to two years (upper limit of normal 160 bpm, lower limit of normal 90 bpm);

	- Capillary filling time; - Urine output; - Level of consciousness; - Assess preload: jugular veins, palpation of the liver, crackles; - Check blood pressure - up to 30 days (systolic blood pressure - upper limit of normal 75 mmHg, lower limit of normal 50 mmHg), up to one year (upper limit of normal 95 mmHg, inferring limit of normality 70 mmHg); - Consider collection of laboratory tests and lactate serials and cardiac ultrasound;
D **Disability**	- Verify the level of consciousness using the Glasgow Coma Scale (GCS): ≤8 (level of consciousness incompatible with reflexes that can preserve the airway), AVPU (Verbal-Pain-Unresponsive); - Size, symmetry and photoreaction to light; - Recognize the seizure as a neurological emergency. - Check capillary blood glucose if consciousness is altered and/or potential hypoglycemia. Collection in the calcaneal region avoiding the central area, - When hypoglycemia is present (50-70 mg/dl or 2.8-3.9 mmol/L). It should be treated with maintenance glucose (6-8 mg/kg/min) or orally (0.9 g/kg tablet or equivalent) plus carbohydrate. - If hypoglycemia is (<50mg/dl (2.8 mmol/L) with neuroglycopenic symptoms, it should be performed in two ways, the first using 0.3 g/kg bolus IV glucose in 10% or 20% solution. In the absence of IV glucose, IM or SC glucagon (0.03mg/kg or 0.5mg <25kg or 1 mg >25kg) is used. - Retesting is required 10 minutes after the end of treatment. Targeting above 50 mg/dl and focus blood glucose of 100 mg/dL. - Sudden unexplained neurological symptoms, especially those that persist after resuscitation, neuroimaging should be performed urgently.

Source: the authors (2024).

In order to assist teams working in emergency units that care for children under two years of age, the main materials that should be available in the service for airway management were collected from the literature (Chart 2).

Table 2. Materials used for Orotracheal Intubation (OTI) of children under two years of age that should be available in emergency units. Maringá, PR, Brazil, 2024. (n= 4)

Airway equipment	**Other equipment**
Direct laryngoscopy handles and slides (size 00, 0, 1)	Notification system and telephones for the entire hospital
Videolaryngoscopy cables, blades and monitors (size 0, 1)	Personal protective equipment (gown, gloves, N95 masks, surgical masks)
Benjamin Laryngoscopes	Viral filters for in-line use (15mm inner diameter, 22mm outer diameter)
Flexible fiber-optic laryngoscopes and monitor tower (2.2 mm and 2.8 mm with suction)	
Endotracheal tubes (2.0, 2.5, 3.0, 3.5, 4.0)	
Alligator tweezers (large, small)	
Tracheostomy surgical set with traditional neonatal and pediatric size (size 1, 1.5) and nasopharyngeal (sizes 6.5-8.5) tracheostomy tubes.	
Laryngeal mask (traditional and intubation MLs, sizes 1, 1.5)	
Nasopharyngeal airway (sizes 6.5–8.5)	

Source: the authors (2024).

Among the resources used for the management of respiratory emergencies in children, especially newborns, the use of surfactant was evidenced. In study A1, the surfactant used was poractant alfa, administered to premature infants with pulmonary dysplasia on mechanical ventilation with plateau pressure < 30 cmH2O and PEEP ≥5 cmH2O. The surfactant is administered according to the age of the child, for those under one month, it is recommended to use 100mg/kg diluted in 0.9% saline solution in a ratio of 1:2 to be administered via tracheal cannula. When the child is more than 30 days old, its use occurs in two stages: starting with washing with a solution of 20mg/kg diluted in saline solution until obtaining a solution of 4 to 5 ml/kg, whose purpose is to remove inflammatory mediators, generating the whitening of the alveoli and bronchi. The second dose will be prepared at 30mg/kg diluted in saline solution in a 1:2 ratio with the aim of restoring endogenous surfactant (A1).

The literature shows that the milestone in the reduction of newborn mortality occurred in the 80's after the early use of surfactants. Prematurity can favor the development of severe acute respiratory syndrome, as well as peri-intraventicular hemorrhages, tension pneumothorax, pulmonary dysplasia, sepsis, and even death due to the lack of exogenous surfactant (Oshiro *et al*., 2023).

A study identified that the administration of surfactant through the tracheal route has greater efficacy in the distribution of newborns with severe acute respiratory syndrome (Rebello *et al*., 2015). For children using continuous positive airway pressure (CPAP), surfactant should be administered through a thin catheter, with the aid of a laryngoscope introduced into the trachea, avoiding the use of positive pressure under the airways. However, this technique requires sedation, resulting in depression of the respiratory system and consequent intubation, and the use of a laryngeal mask is an alternative. It is reiterated that in Brazil, the laryngeal mask can only be used by children weighing more than two kilograms (Oshiro *et al*., 2023).

The studies included in this review presented clinical protocols that address the management of severe conditions that represent the main causes of respiratory emergencies in children: respiratory failure, asthmatic status, and anaphylaxis (A1, A3). For the management of respiratory failure (RI), initially the cervical should be aligned and airway patency established, and orotracheal aspiration should be performed only if necessary and carefully (A3). It is essential to administer low-flow oxygen, if there is no good response, choose oxygenation via high-flow nasal cannula or non-invasive ventilation in the presence of RI or hypoxemia (A1). Due to the immaturity of the nervous system of infants, whose response consists of activation of the parasympathetic system, hypoxemia, and bradycardia, it is essential that professionals are able to manage the airways properly (Gomes *et al*., 2022).

The results highlighted the relevance of rigorously evaluating the indication for orotracheal intubation and mechanical ventilation of each child (A3). The literature establishes the use of an endotracheal tube with cuff when the child has lung disease associated with reduced lung compliance

or increased resistance, and cuff pressure should be maintained between 20 and 25 cm of H2O, in order to reduce the risks of aspiration and tracheal injury (Gomes *et al*., 2022).

When the child is unconscious, the route of choice for airway management should be oropharyngeal intubation with a cannula of appropriate size for the child. In the case where the child is semi-conscious, opt for nasopharyngeal intubation, except in cases where skull base fracture or coagulopathy is suspected (Gomes *et al*., 2022).

Differing from these findings, a study indicated the use of videolaryngoscopy as the standard technique for all intubations, as it reduces the risk of injury to the airway handled in the emergency room (Borges *et al*., 2022). The alternative use of direct laryngoscopy with *Macintosh* or videolaryngoscopes is used in difficult airways and/or if intubation fails, as it allows visualization of the airway without the need to perform the alignment of the oral and pharyngeal axes, reducing the force used and the movement of the cervical spine. Thus, intubations with videolaryngoscopy have a high number of successful intubations in the first attempt (Mandal *et al*., 2015).

Study A3 suggests the use of the DOPES acromion for the evaluation of children on mechanical ventilation who suddenly deteriorate their clinical condition, as follows: D – displacement of the orotracheal tube or mask; O - obstruction of pipe, circuit, via area; P - pneumothorax; E – equipment (oxygen, pipes, fittings, valves); and S - stomach (abdominal compartment). Orotracheal intubation may result in the introduction beyond the Carina of the Trachea, generating bronchial selectivity, or be introduced into the esophagus escaping from the airway. Obstruction due to torsion, foreign body, secretion, or blood may occur. Pneumothorax and finally, there may be a failure in the ventilation system, such as interruption in the power supply, disconnection of the oxygen source or circuit, preventing ventilation exchange and gas exchange from being effective (Gomes *et al*., 2022).

Asthma flare-up is associated with a higher chance of developing respiratory failure among infants due to hypoxemia caused by the disease. Thus, children who have an oxygen saturation of less than or equal to 92% should be hospitalized, and those with a saturation below 90% require more aggressive treatment (Pastorino *et al*., 2021).

A key point is the recognition of the severe crisis, which occurs through anamnesis and physical examination, in addition to the determination of pulmonary function, arterial blood gas analysis (due to compensation, initially the partial pressure of carbon dioxide (PaCo2) may be normal or reduced) and chest X-ray (A3). Similar data were found, since the indication of tests to evaluate children with asthma are situations in which the clinical picture does not respond to treatment or there are complications (Pastorino *et al*., 2021).

The Brazilian Ministry of Health determines that the diagnosis of asthma in children is clinical, through the evaluation of birth history and possible previous respiratory infections. The

allergic version is the most prevalent in childhood, and may be associated with the allergic disease passed on by its descendants, such as eczema, allergic rhinitis, food or drug allergies (Brasil, 2021).

The treatment described consists of the administration of oxygen in order to maintain saturation between 94% and 98%, the use of a short-acting beta-2 agonist, by means of spacers, such as the use of albuterol (2.5–5 mg, 0.15mg/kg) which has a half-life between two and four hours, associated with an anticholinergic such as ipratropium bromide (0.25–0.5 mg) which has a short-acting half-life (A3). In this aspect, divergences have been noted in the literature, since salbutamol may trigger a vasodilation effect superior to bronchodilation, and may worsen oxygen saturation parameters after its administration in the first 30 minutes (Pastorino *et al*., 2021).

Within the first hour of treatment, systemic corticosteroids (prednisolone 1–2 mg/kg, with a maximum of 60 mg/day) should be administered. The use of corticosteroids in treatment is due to their effect on reducing inflammatory cells by inhibiting the production and survival of eosinophils, T lymphocytes, mast cells, dendritic cells, and chemotactic mediators, with efficacy in reducing symptoms and asthmatic exacerbation (Ramadan *et al*., 2019).

There are two forms of treatment, dual and triple therapy, the first is the management of asthma attacks with the use of inhaled corticosteroids associated with long-acting agonist β (LABAs) or the combination of both and the addition of long-acting muscarinic antagonists (LAMAs) in more severe cases as the first choice or without improvement after the use of dual therapy. When compared, triple therapy leads to improved asthma control and a decrease in severe symptoms, a lower number of non-serious adverse events, but no difference in quality of life or mortality (Rosenberg, 2021).

When a serious and life-threatening event occurs, it is necessary to use intravenous magnesium sulfate in a single dose of 50 mg/kg for 20 minutes (maximum dose of two grams). In children, isotonic magnesium sulfate can also be used as a nebulized solution (2.5 ml of 250 mmol/l; 150 mg) (A3). The use of magnesium sulfate helps in the treatment of severe asthma, due to its effect on the relaxation of smooth muscle tissues, through the inhibition of calcium and myosin ligament and by blocking cholinergic neuromuscular transmission that excites muscle fibers, causing a reduction in severity (Wongwaree *et al*., 2022).

The use of nebulization with magnesium sulfate (MgSO4) is an alternative, has a low cost and no adverse effects, making it possible to use it in communities with or without financial resources (Alansari *et al*., 2015). The literature shows that nebulization with MgSO4 is a side effect, the sensation of nasal stinging, and in one case, it evolved to episodes of mild vomiting (Wongwaree *et al*., 2022).

When used early, it may obtain a better outcome with nebulization of MgSO4 when the symptomatology occurs before six hours, reducing the severity from the beginning of treatment

(Wongwaree *et al*., 2022). However, a study conducted with patients who used nebulization with magnesium or placebos resulted in similarities in their behavior in severe cases, with no difference in the duration of treatment or discharge. Concluding that it is rarely an effective treatment (Alansari *et al*., 2015). Anaphylaxis is determined by severe, life-threatening systemic hypersensitivity (Manhães *et al*., 2021) The incidence of anaphylaxis cases ranged from 1-761 per 100,000 people per year, and can be induced by foods such as peanuts, nuts, seafood, and eggs, being more prevalent than those induced by insects or anesthesia. Boys are more susceptible to anaphylaxis than girls when they are younger than 10 years, above this age there is an inversion, and the incidence is even higher among girls (A2).

Deaths due to anaphylactic shock are rare in children under two years of age. Mortality is estimated at 0.05-0.51 per million people per year for drug cases, 0.03-0.32 for food, and 0.09-0.13 for poison-induced (Cardona *et al*., 2020; Turner *et al*., 2017). We found a description of a five-month-old infant, previously diagnosed with cow's milk allergy, who, after ingesting cereal with traces of milk, developed anaphylactic shock and died (Manhães *et al*., 2021).

The articles that make up the review reiterated the importance of identifying anaphylaxis as early as possible in order to start treatment assertively as soon as possible. The medication of choice consists of adrenaline (epinephrine) administered intramuscularly, especially in the vastus lateralis muscle of the thigh (dose 0.01 mg/kg, up to 0.15 mg in children under six years of age), if symptoms do not cease quickly (five to 10 minutes), a second dose of adrenaline may be administered (A3). The recommended route is intramuscular due to its good tolerance, since several patients have a previous history and use the epinephrine pen at the onset of symptoms, reducing the mortality rate. For the use of the intravenous route, the patient must be in a hospital environment, monitored and administered with the aid of a continuous infusion pump, if the aid of other necessary devices or resuscitators is necessary. Incorrect use can lead to fatal arrhythmias (Cardona *et al*., 2020).

In addition to pointing out the interventions that should be part of the clinical protocols for pediatric respiratory emergency care, the studies highlighted the relevance of hospital services instituting continuing education programs that promote the continuous training and updating of multidisciplinary teams that work in the care of children (A2, A4). Training related to cardiopulmonary resuscitation of children is effective when theoretical-practical resources are articulated, eliciting critical and reflective thinking, initiative and empowerment of the team for decision-making in the face of cardiopulmonary arrest in children (A2). The presence of a trained multidisciplinary team helps prevent errors associated with care, increasing patient safety (Matias *et al*., 2021).

The use of tools for quick and effective communication among professionals was also recommended. As an example, the resource used was the pager-type telephone (beeper), activated by

pressing a button that issues a notification alerting professionals about the emergency, thus reducing response time (A3). There are numerous electronic devices for multiprofessional communication in the hospital environment, favoring quick responses and ensuring greater interaction between professionals and patients, which are low cost and easy to handle (Moreira *et al*., 2019). However, the sharing of patient information must be approved in advance, and be carried out under a critical and cautious lens to avoid the patient's worsening and/or even progression to death (Lima *et al*., 2022).

Although this integrative review is relevant, it has important limitations regarding the scarcity of studies developed on the subject, hindering the quantitative analysis of the data, especially the Brazilian scientific production, which is not found for this analysis. Also noteworthy is the heterogeneity of the study designs, with a low level of evidence. Thus, it is necessary to interpret the data sparingly and adapt it to the local reality.

Although it has such limitations, it has the potential to assist health professionals by bringing together protocols and guidelines that can be applied in hospitals, with a view to evidence-based practice and best practices.

FINAL THOUGHTS

The main guidelines for the care of respiratory emergencies in children up to two years of age were compiled and synthesized, configuring them as a subsidy for clinical practice based on scientific evidence. Interventions for the clinical management of pediatric respiratory emergencies should follow the ABCDE assessment method, taking into account the specificities of each developmental phase (less than 30 days, up to one year, up to two years). The administration of surfactant to children younger than 30 days of age is noteworthy, with the potential to reduce the mortality of infants with severe acute respiratory syndrome, and the rigorous evaluation of the indication for orotracheal intubation.

It is reiterated that the small number of articles published on the subject, in line with the low level of evidence of the works, made it difficult to conduct the analysis and presentation of evidence. It is suggested that researchers, especially those who are involved in the practice, develop research, protocols, and clinical trials to reiterate the most effective practices in the management of respiratory emergencies in children, in order to qualify care, improving cost-effectiveness-safety.

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