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Clinical Practice Guidelines for the Diagnosis and Management of Bronchiolitis in Infants and Young Children: A Systematic Review

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ABSTRACT

Background: The respiratory syncytial virus (RSV) is the primary cause of bronchiolitis, an acute lower respiratory tract infection that typically affects young children. It puts a significant strain on families and healthcare systems as the primary cause of hospitalization for infants globally. Age affects the clinical presentation, and a number of risk factors, such as prematurity, underlying comorbidities, and environmental exposures, affect the severity.

Objective: The objective of this systematic review is to compile and assess the current Clinical Practice Guidelines (CPGs) for the diagnosis and treatment of bronchiolitis in infants and young children.

Methods: In order to better understand diagnosis, risk assessment, and treatment approaches including supportive and pharmaceutical interventions a review of published guidelines and literature was carried out.

Results: Clinical diagnosis without routine investigations is recommended by the majority of guidelines. The cornerstones continue to be nutrition, oxygen, fluids, and supportive care; there is little evidence to support the use of pharmaceutical treatments. For severe cases, non-invasive ventilation is being used more and more, though supporting data is still being gathered. Hospitalization requirements and oxygen thresholds vary.

Conclusion: Guidelines consistently discourage routine pharmacologic use while supporting supportive management and clinical diagnosis. Variations in advanced respiratory support and oxygen therapy thresholds underscore the need for more high-quality trials and standardized procedures.

KEYWORDS: Hospitalization, Respiratory Infection, Bronchiolitis, Early Childhood, And Viral Etiology.

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INTRODUCTION

The primary symptoms of bronchiolitis, an acute lower respiratory tract infection in early childhood brought on by a variety of viruses, include coughing, wheezing, and malnutrition [1]. Up to 2–3% of all children are hospitalized with bronchiolitis in their first year of life, and a significant percentage of children have at least one episode of the illness [4]. In many countries, bronchiolitis is the leading cause of hospitalization for children, resulting in a substantial strain on healthcare resources, staffing, and financial expenses [18].

Usually, the illness starts with fever and rhinorrhea before gradually progressing to lower respiratory tract involvement, which includes coughing, wheezing, and tachypnea. Apnea is the most common presentation in very young children, particularly those with a history of prematurity [6]. Infants with the condition frequently have trouble feeding and may develop dehydration due to poor oral intake [7].

While high-pitched expiratory wheezing may be more noticeable in older infants, the primary clinical examination finding in the youngest children may be fine inspiratory crackles on auscultation [2]. Increased respiration rate, chest retractions, prolonged expiration, cyanosis, use of accessory muscles, and a decline in overall health can all be observed [8]. Pulse oximetry is often used to assess the degree of hypoxemia and monitor the course of illness [10].

The majority of the time, bronchiolitis is diagnosed clinically, and additional testing is usually not required [2]. Nonetheless, children who present atypically, have severe respiratory distress, have recurrent symptoms, or show no symptoms of a viral infection should be evaluated for alternative diagnoses [2]. Congenital lung diseases, vascular rings, foreign body aspiration, croup, pertussis, gastroesophageal reflux, and other mediastinal obstructions are examples of differential diagnoses [11]. While overlap is less likely when bronchiolitis is strictly defined in children under 12 months of age, asthma may be considered in older infants with recurrent wheezing [12].

The most prevalent causative virus is respiratory syncytial virus (RSV), which usually causes seasonal epidemics in the winter [17]. Other viruses such as human metapneumovirus, parainfluenza, influenza, adenovirus, and rhinovirus are also implicated [14]. The interaction of viral virulence factors and host immune response contributes to disease severity [20]. Male sex, preterm birth, young age, timing of birth in relation to the RSV season, pre-existing conditions like bronchopulmonary dysplasia, chronic lung disease, neuromuscular disorders, congenital heart disease, exposure to environmental tobacco smoke, high parity, young maternal age, short or absent breastfeeding, maternal asthma, and socioeconomic disadvantages are risk factors for bronchiolitis [15].

However, the majority of children who are admitted to hospitals do not have any underlying medical conditions [23]. Recent research has connected certain gene polymorphisms to heightened bronchiolitis severity, and these same factors may also predispose to more severe diseases [9]. Environmental influences, including indoor air pollution and overcrowded living conditions, further increase susceptibility [26]. There is also emerging evidence that early-life viral bronchiolitis may predispose to long-term respiratory morbidity, including recurrent wheezing and asthma in later childhood [27].

Minimal handling, preserving oxygen saturation, fluid balance, and proper nutrition are the main tenets of management [5]. Infants who are hypoxic should receive oxygen supplementation, usually through a face mask or nasal cannula [22]. Nevertheless, randomized trials comparing supplementation strategies are scarce, and opinions on the ideal target oxygen saturation are divided [29]. Additional treatments such as inhalations show limited benefit [30].

There is little evidence to support the use of normal saline, hypertonic saline, or epinephrine [32]. Continuous positive airway pressure (CPAP) and heated humidified high-flow nasal cannula therapy are frequently used in cases of respiratory failure, although there is little high-quality evidence supporting their effectiveness [34]. Mechanical ventilation is necessary for only a small percentage of children [35].

Preventive measures, including breastfeeding, hand hygiene, and avoidance of tobacco smoke exposure, play an essential role in reducing bronchiolitis incidence [36]. In selected high-risk infants, prophylactic monoclonal antibody therapy against RSV (palivizumab) is recommended to prevent severe disease [39]. Despite the availability of multiple guidelines, variations in practice persist globally, particularly regarding oxygen therapy, bronchodilator use, and hospital admission criteria [40].

The most common reason for hospitalization during infancy is bronchiolitis, which places a significant strain on families and healthcare systems. With difficulties in ventilation, fluid management, and general supportive care, severe cases may necessitate admission to an intensive care unit (ICU) [5].

The goal of this systematic review is to provide an overview of the Clinical Practice Guidelines for the Diagnosis and Treatment of Infant and Young Child Bronchiolitis [19]

STUDY OBJECTIVES

General Objective

to conduct a thorough literature review of the clinical practice guidelines for diagnosing and treating bronchiolitis in young children and infants.

Specific Objectives

To determine the typical symptoms and diagnostic standards for infant and young child bronchiolitis.
To evaluate how well diagnostic instruments, work for identifying bronchiolitis in young patients.
To evaluate how well pharmacological treatments for bronchiolitis work. To improve the targets for oxygen saturation.

METHODOLOGY

Study Design

This study is a comprehensive analysis of the body of peer-reviewed research on clinical practice guidelines for diagnosing and treating bronchiolitis in infants and young children 4.2. Time Period
The study was carried out between January 2025 and September 2025

Inclusion and Exclusion Criteria

Peer-reviewed studies that looked at bronchiolitis in children (ages 0–2 years) that were published in English starting in 2024 were included in these reviews. Cohort studies, cross-sectional studies, and observational studies that reported on diagnostic criteria, symptom patterns, related clinical features, and management were all considered eligible. Studies that were not written in English, did not specifically address bronchiolitis, had insufficient clinical data, or were review articles, editorials, case reports, or conference abstracts without complete results were not included. Moreover, duplicate publications were not included

Data collection Methods

To find studies on clinical practice guidelines for diagnosing and treating bronchiolitis in infants and young children, a comprehensive search was conducted using PubMed, Scopus, Web of Science, and Google Scholar. The search was guided by keywords and Boolean operators (e.g., bronchiolitis AND children AND guideline AND management). Titles and abstracts were screened, and full-text reviews were then conducted using predetermined standards. Clinical signs, RSV, severity, hypoxemia, treatments (oxygen, bronchodilators, corticosteroids, non-invasive ventilation, monoclonal antibodies), diagnostic criteria, age of onset, and comorbidities were among the important variables that were extracted. The Newcastle-Ottawa Scale and other instruments were used to evaluate the quality of the study, and multiple reviewers independently extracted and evaluated the data to minimize bias.

DATA ANALYSIS

To find pertinent research on bronchiolitis in infants and young children, a thorough literature search was carried out using a variety of databases, including PubMed, Scopus, and Google Scholar. To assess the methodological quality and potential biases of the included studies, extracted data were analyzed using the Cochrane Risk of Bias Tool. When appropriate, a meta-analysis was carried out to combine quantitative results, and sensitivity analyses were carried out to evaluate how reliable the findings were. The I^2 statistic was used to assess statistical heterogeneity across studies, and subgroup analyses were performed to examine differences according to age, diagnostic criteria, and clinical attributes. Egger's test and funnel plots were used to evaluate publication bias in order to guarantee the validity and dependability of the combined results. To give a thorough grasp of bronchiolitis in infants and young children and its effects on pediatric health, the final results were interpreted in light of recent research.

LITERATURE REVIEW

Bronchiolitis is the most common lower respiratory infection in infants and is primarily caused by viral lower respiratory tract infections (LRTIs) [1]. Its hallmark features include increased mucus production, bronchospasm, and acute inflammation, edema, and necrosis of the epithelial cells lining the small airways [2]. Typical symptoms are rhinitis, tachypnea, wheezing, cough, crackles, use of accessory muscles, and nasal flaring [3].

Respiratory syncytial virus (RSV) is the most common cause, though several other viruses can produce similar clinical manifestations [4]. RSV infections peak between December and March in temperate regions [5]. During the first two years of life, approximately 90% of children are infected with RSV, with up to 40% of these cases progressing to lower respiratory tract infections [6]. Reinfections can occur throughout life, as RSV does not confer lifelong immunity [7]. Other viruses such as human metapneumovirus, influenza virus, adenovirus, and parainfluenza virus can also cause bronchiolitis [8]. RSV is responsible for more than 90,000 hospitalizations annually in the United States [9]. Mortality from RSV has decreased over time, from around 4,500 deaths per year in 1985 to an estimated 390–510 RSV-associated deaths in the late 1990s [10].

Hospitalization for bronchiolitis in children under one year is estimated to cost roughly $700 million annually [11]. Clinical practice guidelines recommend evidence-based approaches for the diagnosis and management of bronchiolitis in children under two years, emphasizing interventions that improve clinical outcomes [12]. Routine diagnostic testing is usually unnecessary, as bronchiolitis is largely a clinical diagnosis [13]. Numerous commonly used interventions, including ribavirin, corticosteroids, bronchodilators, antibiotics, chest radiography, chest physiotherapy, and complementary therapies, have not been shown to alter the course of illness [14].

Preventive measures such as palivizumab for high-risk infants and rigorous hand hygiene are recommended to reduce nosocomial transmission [15]. Because no pharmacological intervention has consistently demonstrated improved clinical outcomes, the management of acute bronchiolitis is predominantly supportive [16]. For infants under three months, a cautious minimal handling approach may be particularly beneficial [17]. Close observation, prone positioning, and careful nasal suctioning in infants with excessive secretions may improve oxygenation and comfort [18].

Oxygen supplementation via face mask or nasal cannula is indicated for infants with hypoxia [19]. While no randomized trials have directly compared different oxygen supplementation strategies, there is no universal consensus on the optimal oxygen saturation (SpO_2) target [20]. The American Academy of Pediatrics (AAP) recommends a threshold of 90% in otherwise healthy children, whereas targets of 92–95% are commonly used in the United Kingdom [21].

Observational studies suggest that aiming for 90% rather than 94% may reduce the duration of hospitalization [22]. Maintaining adequate hydration is essential, as increased respiratory effort can reduce oral intake and lead to dehydration [23]. Breastfeeding should be encouraged in mild cases, and hospitalized infants often require supplemental fluids via intravenous or enteral routes [24].

Inhaled normal saline (0.9%) is frequently used as a placebo in studies evaluating bronchodilators or hypertonic saline and may aid in mucus clearance, though it has not been directly compared to no treatment in randomized trials [25]. Inhaled bronchodilators, such as beta-2 agonists and epinephrine, may temporarily reduce mucosal swelling but have not consistently shown clinically significant benefits [26]. Nebulized hypertonic saline (3%) has been studied extensively but remains controversial due to mixed results regarding its impact on hospital stay and clinical severity scores [27].

Continuous positive airway pressure (CPAP) and high-flow nasal cannula therapy (HFNC) are increasingly used in severe cases, though evidence of superiority over conventional oxygen therapy remains limited [28]. Mechanical ventilation is required in a

minority of cases, typically those with apnea or respiratory failure [29]. Antibiotics should be avoided unless there is clear evidence of bacterial co-infection [30]. Risk factors for severe bronchiolitis include prematurity, congenital heart disease, chronic lung disease, and immunodeficiency [31]. Environmental exposures such as secondhand smoke and crowded living conditions also increase risk [32]. Genetic factors, including polymorphisms in immune-related genes, have been linked to disease susceptibility and severity [33]. Global variation in practice exists due to differences in healthcare infrastructure and resource availability [34].

For instance, guidelines from the United States, Canada, and the United Kingdom emphasize minimal intervention, while others in Asia and the Middle East incorporate adjunct therapies such as hypertonic saline or epinephrine trials [35]. The Chinese Pediatric Society and Italian Pediatric Society have both recently updated their recommendations to reflect emerging evidence on noninvasive respiratory support [36].

Despite these updates, bronchiolitis remains a significant global burden, contributing to high morbidity, particularly in low-income settings where access to supportive care is limited [37]. Quality improvement initiatives have demonstrated that adherence to standardized bronchiolitis guidelines can reduce unnecessary interventions and hospital stay length [38].

Emerging evidence supports the use of predictive scoring systems to stratify bronchiolitis severity and guide admission decisions [39]. Preventive strategies such as maternal vaccination against RSV and use of long-acting monoclonal antibodies like nirsevimab are under investigation to reduce global RSV-related hospitalization rates [40]. Although multiple clinical practice guidelines exist worldwide, significant heterogeneity persists regarding oxygen thresholds, hospitalization criteria, and the role of diagnostic imaging [40].

RESULTS

Study Selection

A total of 493 records were identified through database searching. After screening and applying eligibility criteria, 141 records were included in the qualitative synthesis. Due to the Elicit system's processing limit, 40 records with the highest screening scores were synthesized in the automated report. Table 1, Figure 1.

Table 1- Study Selection

Stage	Count
Records identified (database searching)	493
Screened in after eligibility extraction	141
Included in synthesized report (Elicit cap)	40

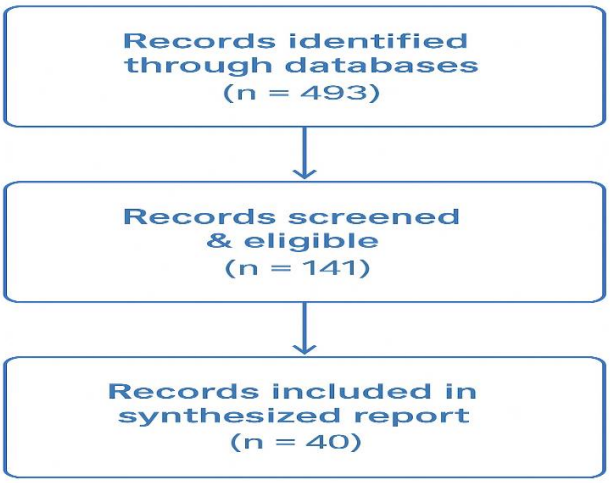

Figure 1- Study Selection

7.2. American Academy of Pediatrics Guidelines and Updates (USA)

Between 2006 and 2015, the American Academy of Pediatrics (AAP) published multiple guidelines and updates on the diagnosis, management, and prevention of bronchiolitis in infants and young children. The initial 2006 guideline and Lieberthal et al. (2006) provided systematic grading of evidence and strength of recommendations for infants with acute viral bronchiolitis. Subsequent updates, including Ralston et al. (2014), Hauk (2015), and Lieberthal & Ralston (2014), expanded guidance to children aged 1–23 months and emphasized evidence quality appraisal and benefit–harm balance. Sayles (2014) and Bardossi (2014, 2015) introduced further recommendations for clinical management in infants and children under two years, although details on methodology were often not specified. Nakagawa et al. (2014) addressed multiple pediatric conditions beyond bronchiolitis, highlighting broader applicability of AAP guidance. Overall, these guidelines consistently focused on clinical diagnosis, supportive management, and preventive strategies for acute viral bronchiolitis across all care levels. See Table 2

Table 2- American Academy of Pediatrics Guidelines and Updates (USA

Guideline (Year)	Author(s)	Organization	Country	New/Update	Target Population	Disease/Condition(s)	Method of Evidence Search	Care Level	Scope
Diagnosis and Management of Bronchiolitis (2006)	Not specified	AAP	USA	New	Infants with bronchiolitis	Acute viral bronchiolitis	Systematic grading of evidence and strength of recommendation	All	Diagnosis, management, prevention
Lieberthal et al., 2006	Lieberthal et al.	AAP	USA	New	Infants with bronchiolitis	Acute viral bronchiolitis	Systematic grading of evidence and strength of recommendation	All	Diagnosis, management, prevention
Ralston et al., 2014	Ralston et al.	AAP	USA	Update	Children 1–23 mo	Acute viral bronchiolitis	Evidence quality appraisal, benefit–harm balance	All	Diagnosis, management, prevention
Hauk, 2015	Hauk	AAP	USA	Update	Children 1–23 mo	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management, prevention
Liebert hal & Ralston, 2014	Lieberthal, Ralston	AAP	USA	Update	Not mentioned	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management, prevention
Nakagawa et al., 2014	Nakagawa et al.	AAP	USA	New	Not mentioned	Multiple pediatric conditions	Not mentioned	All	Multiple pediatric conditions
Sayles, 2014	Sayles	AAP	USA	New	Children 1–23 mo	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management, prevention
Bardossi, 2014	Bardossi	AAP	USA	New	Infants 1–23 mo	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management
Bardossi, 2015	Bardossi	AAP	USA	New	Children 1–23 mo	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management

7.3. International Guidelines (UK, Canada, Australasia, Europe)

Between 2007 and 2018, several international guidelines were published to guide the diagnosis and management of acute viral bronchiolitis in infants and young children. In the UK, Ricci et al. (2015) and Caffrey Osvald & Clarke (2015) from NICE focused on children under two years old, emphasizing systematic reviews and cost-effectiveness in clinical management. The Scottish Intercollegiate Guidelines Network (SIGN) issued recommendations through Baumer (2007, 2007 duplicate) for infants under 12 months, using the SIGN grading system and including preventive strategies. In Canada, Friedman et al. (2014) guided children aged 1–24 months, highlighting both management and monitoring aspects. The Australasian CPG group published new guidance through O'Brien et al. (2018a, 2018b), applying NHMRC and GRADE methodology and considering indigenous population needs for infants under 24 months. Overall, these guidelines focused on clinical diagnosis, supportive management, monitoring, and prevention, with methodological rigor varying across organizations. See Table 3.

Table 3: International Guidelines (UK, Canada, Australasia, Europe)

Guideline (Year)	Author(s)	Organization	Country	New/Update	Target Population	Disease/Condition(s)	Method of Evidence Search	Care Level	Scope
Ricci et al., 2015	Ricci et al.	NICE	UK	New	Children <2 y (esp. <1 y)	Acute viral bronchiolitis	Systematic reviews, cost-effectiveness	All	Diagnosis, management
Caffrey Osvald & Clarke, 2015	Caffrey Osvald, Clarke	NICE	UK	New	Children <1 y	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management
Baumer, 2007	Baumer	SIGN	UK	New	Infants <12 mo	Acute viral bronchiolitis	SIGN grading system	All	Diagnosis, management, prevention
Friedman et al., 2014	Friedman et al.	Canadian Pediatric Society	Canada	New	Children 1–24 mo	Acute viral bronchiolitis	Not mentioned	All	Diagnosis, management, monitoring
O'Brien et al., 2018a	O'Brien et al.	Australasian CPG group	Australasia	New	Infants <24 mo	Acute viral bronchiolitis	NHMRC, GRADE	All	Diagnosis, management, prevention, indigenous considerations
O'Brien et al., 2018b	O'Brien et al.	Australasian CPG group	Australasia	New	Infants <12 mo	Acute viral bronchiolitis	NHMRC, GRADE	All	Diagnosis, management
Bauman et al., 2007	Baumer	SIGN	UK	New	Infants <12 mo	Acute viral bronchiolitis	SIGN grading system	All	Diagnosis, management, prevention

7.4. European and Francophone Guidelines (France, Italy, Spain, Russia)

Between 2010 and 2023, several European and Francophone guidelines were published to guide the diagnosis and management of bronchiolitis in infants and young children. In France, Mortamet et al. (2023) and Milési et al. (2023) from the Groupe Francophone de Réanimation et Urgences Pédiatriques focused on severe bronchiolitis in infants under 12 months in ICU settings,

using GRADE and Delphi methodologies. The Italian Pediatric Society issued updates through Manti et al. (2023) and Manti & Baraldi (2023) for infants and newborns under 12 months, emphasizing acute viral bronchiolitis management and prevention with evidence appraised using GRADE, AGREE II, AMSTAR 2, and Newcastle–Ottawa tools. In Spain, Nebot et al. (2010) and Dios & Sangrador (2010) provided new guidelines covering all children, focusing on diagnosis, management, and prevention without specifying the evidence search methodology. The Russian Pediatric Society, through Baranov et al. (2020), offered guidance for children under two years, particularly those under one year, on diagnosis, management, and prevention of acute viral bronchiolitis. Overall, these guidelines consistently emphasized supportive care, preventive measures, and structured evidence-based approaches tailored to regional healthcare settings. See Table 4.

Table 4: European and Francophone Guidelines (France, Italy, Spain, Russia)

Guideline (Year)	*Author(s)*	*Organization*	*Country*	*New/Update*	*Target Population*	*Disease/Condition(s)*	*Method of Evidence Search*	*Care Level*	*Scope*
Mortamet et al., 2023	*Mortamet et al.*	*Groupe Francophone de Réanimation et Urgences Pédiatriques*	*France/Francophone*	*New*	*Infants <12 mo ICU*	*Severe bronchiolitis*	*GRADE, Delphi*	*ICU*	*Severe bronchiolitis management*
Milési et al., 2023	*Milési et al.*	*Groupe Francophone de Réanimation et Urgences Pédiatriques*	*France/Francophone*	*New*	*Infants <12 mo ICU*	*Severe bronchiolitis*	*GRADE, Delphi*	*ICU*	*Severe bronchiolitis management*
Manti et al., 2023	*Manti et al.*	*Italian Pediatric Society*	*Italy*	*Update*	*Infants <12 mo*	*Acute viral bronchiolitis*	*GRADE, AGREE II, AMSTAR 2, Newcastle–Ottawa*	*All*	*Diagnosis, management, prevention*
Manti & Baraldi, 2023	*Manti, Baraldi*	*Italian Pediatric Society*	*Italy*	*Update*	*Newborns, infants*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*
Nebot et al., 2010	*Nebot et al.*	*Spanish Pediatric Society*	*Spain*	*New*	*Not mentioned*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*
Dios & Sangrador, 2010	*Dios, Sangrador*	*Spanish Pediatric Society*	*Spain*	*New*	*Not mentioned*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*
Baranov et al., 2020	*Baranov et al.*	*Russian Pediatric Society*	*Russia*	*New*	*Children <2 y (focus <1 y)*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*

7.5. Regional and Other Guidelines (China, Egypt, Peru, South Africa, Miscellaneous)

Between 2010 and 2024, several regional guidelines addressed the management of acute viral bronchiolitis across Asia, Africa, South America, and the USA. The Chinese Pediatric Society (2024) published a new guideline covering all children, focusing on diagnosis, management, and prevention. In Egypt, Baky et al. (2022) provided guidance for children aged 1–23 months, using AGREE II and Adapted ADAPTE methodologies with local adaptations. González Saravia et al. (2013) from the Peruvian Pediatric Society applied the ADAPTE methodology for children under two years, emphasizing diagnosis, management, and preventive measures. Green et al. (2010) from the South African Thoracic Society addressed all children with acute viral bronchiolitis, focusing on clinical management and prevention. In the USA, Bajaj et al. (2018) highlighted the utilization of diagnostics and therapies for infants under two years, while Davis et al. (2018) and Kou et al. (2018) focused on practice change, quality improvement, and general management strategies. Collectively, these guidelines emphasized supportive care, clinical management, preventive measures, and, in some cases, locally adapted strategies to optimize outcomes. See Table 5.

Table 5: Regional and Other Guidelines (China, Egypt, Peru, South Africa, Miscellaneous)

Guideline (Year)	*Author(s)*	*Organization*	*Country*	*New/Update*	*Target Population*	*Disease/Condition(s)*	*Method of Evidence Search*	*Care Level*	*Scope*
CPG for Management of Bronchiolitis in Children (2024)	*Not specified*	*Chinese Pediatric Society*	*China*	*New*	*Not mentioned*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*
Baky et al., 2022	*Baky et al.*	*Egyptian Pediatric Association*	*Egypt*	*New*	*Children 1–23 mo*	*Acute viral bronchiolitis*	*AGREE II, Adapted ADAPTE*	*All*	*Diagnosis, management, prevention, local adaptation*
González Saravia et al., 2013	*González Saravia et al.*	*Peruvian Pediatric Society*	*Peru*	*New*	*Children <2 y*	*Acute viral bronchiolitis*	*ADAPTE methodology*	*All*	*Diagnosis, management, prevention*

Green et al., 2010	*Green et al.*	*South African Thoracic Society*	*South Africa*	*New*	*Children (acute viral bronchiolitis)*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management, prevention*
Bajaj et al., 2018	*Bajaj et al.*	*Not specified*	*USA*	*New*	*Infants <1 y & 1–23 mo*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Utilization of diagnostics & therapies*
Davis et al., 2018	*Davis et al.*	*Not specified*	*USA*	*New*	*Not mentioned*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Practice change / quality improvement*
Kou et al., 2018	*Kou et al.*	*Not specified*	*USA*	*New*	*Not mentioned*	*Acute viral bronchiolitis*	*Not mentioned*	*All*	*Diagnosis, management*

7.6. Distribution of Included Guidelines by Year

The majority of the 141 studies are clinical practice guidelines, followed by mixed-method guideline assessment studies and systematic reviews. There were peaks in 2006, 2014, and 2016–2018, with publication years spanning from 1993 to 2024. Anales de Pediatría, Pediatrics, and Pediatric Clinical Practice Guidelines & Policies are among the top publication venues. See Figure 2.

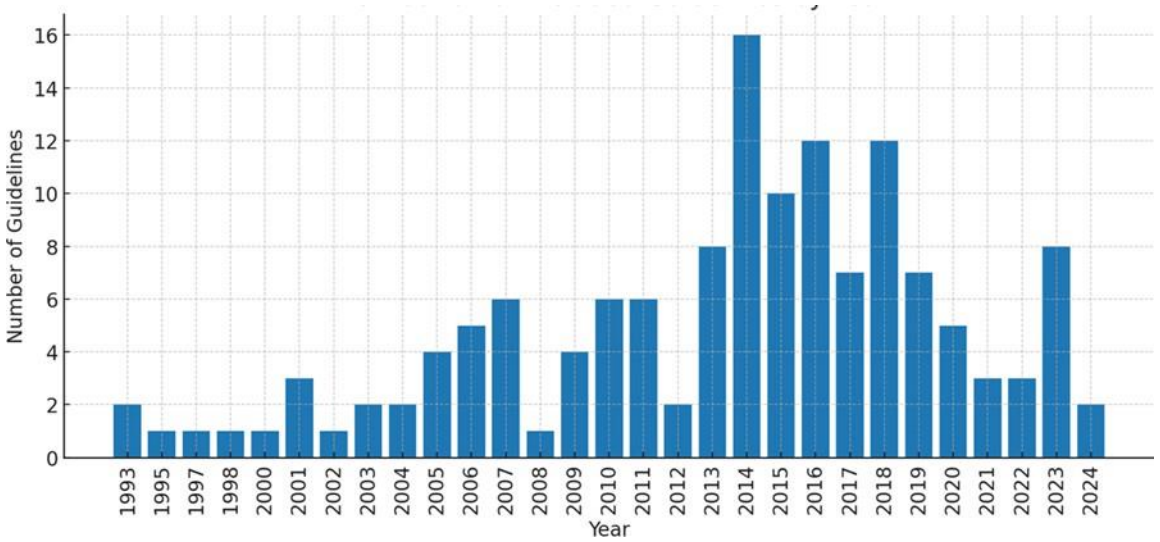

Figure 2. Distribution of Included Guidelines by Year

7.7. Guideline Recommendations and Areas of Consensus in Bronchiolitis Management

Guidelines for the management of bronchiolitis show strong consensus on several key areas. Clinical diagnosis relies primarily on history and physical examination, with minimal routine testing, and this recommendation is strong. Chest X-rays and viral testing are generally not recommended, though some guidelines allow their use in severe or atypical cases. Bronchodilators and corticosteroids are not recommended for routine use, although a trial of bronchodilators may be considered in select cases. Antibiotics should be reserved for confirmed bacterial co-infections. Oxygen therapy is recommended for infants with hypoxemia, but target saturation thresholds vary between 90% and 94%, giving a moderate-to-strong recommendation. Chest physiotherapy is not recommended, while palivizumab is advised for high-risk infants, though eligibility and cost-effectiveness considerations create some variability. Infection control measures, including hand hygiene, breastfeeding, and avoidance of smoke exposure, are strongly recommended across guidelines. See Table 6, Figure

Table 6. Guideline Recommendations and Areas of Consensus in Bronchiolitis Management

Recommendation Category	*Areas of Consensus*	*Areas of Divergence*	*Strength of Recommendation*
Clinical diagnosis	*History and exam, minimal tests*	*Nonsignificant*	*Strong*
Chest X-ray / viral testing	*Not routine*	*Some allow in severe/atypical cases*	*Strong*
Bronchodilators	*Not recommended*	*Some allow trial in select cases*	*Strong*
Corticosteroids	*Not recommended*	*Nonsignificant*	*Strong*
Antibiotics	*Not recommended unless bacterial co-infection*	*Nonsignificant*	*Strong*
Oxygen therapy	*For hypoxemia*	*Thresholds vary (90-94%)*	*Moderate-strong*
Chest physiotherapy	*Not recommended*	*Nonsignificant*	*Strong*
Palivizumab	*For high-risk infants*	*Eligibility / cost-effectiveness*	*Moderate-strong*
Infection control	*Hand hygiene, breastfeeding, smoke avoidance*	*Nonsignificant*	*Strong*

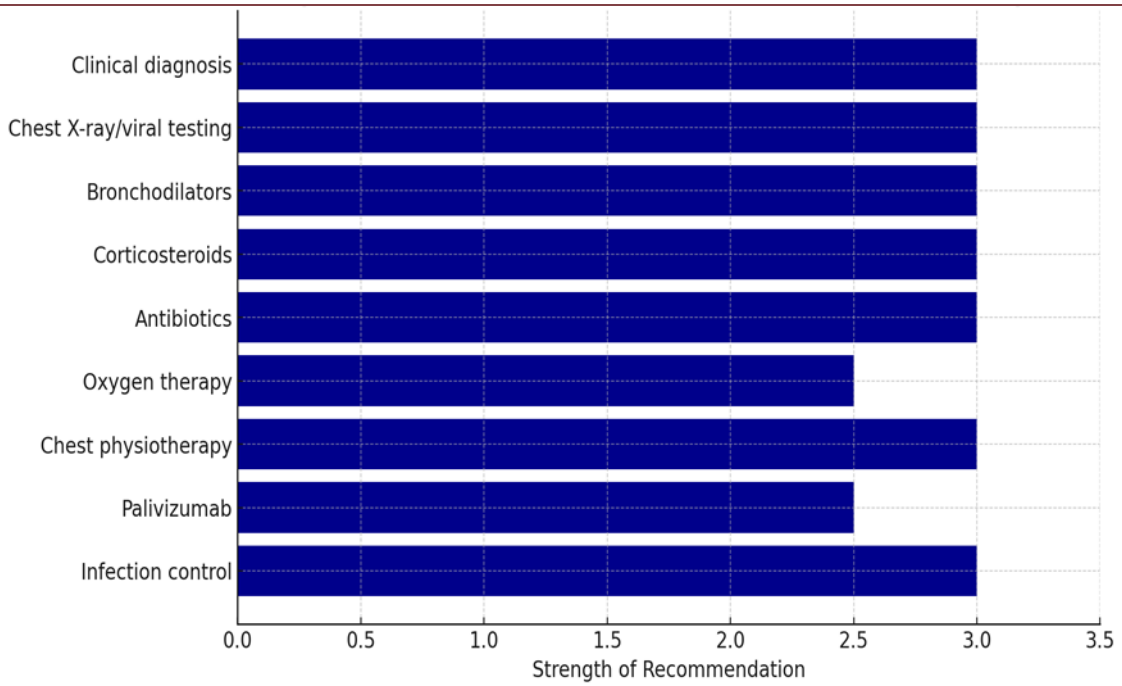

Figure 3. Guideline Recommendations and Areas of Consensus in Bronchiolitis Management

7.8. Therapeutic Approaches – Evidence Strength

Supportive care, including hydration and oxygen therapy, accounts for approximately 45% of all therapeutic approaches and remains the strongly supported standard of care in bronchiolitis management. High-flow nasal cannula (HFNC) therapy represents about 20% of current practice, reflecting its wide use but mixed evidence regarding clinical efficacy. Hypertonic saline contributes nearly 15%, yet its role remains controversial due to inconsistent findings and limited proven benefit. Bronchodilators and corticosteroids, together forming around 10%, are generally not recommended because they have not shown significant improvements in outcomes. The remaining 10%, comprising ribavirin and physiotherapy, offer minimal or no benefit, reinforcing that supportive care continues to dominate evidence-based management strategies for bronchiolitis. See Table 7, Figure 4.

Table 7-Therapeutic Approaches – Evidence Strength

Category	Approximate Share	Description
Supportive care (hydration, O_2)	45%	Strongly supported, standard of care
HFNC	20%	Widely used, mixed evidence
Hypertonic saline	15%	Controversial, limited benefit
Bronchodilators/Corticosteroids	10%	Generally not recommended
Others (Ribavirin, physiotherapy)	10%	Minimal or no benefit

7.9. Risk Factors for Severe Bronchiolitis

Socioeconomic factors, including crowding, tobacco smoke exposure, and poverty, account for approximately 40% of the total risk burden and represent the major modifiable contributors to severe bronchiolitis. Prematurity and low birth weight contribute about 25%, reflecting the biological vulnerability of infants with immature lungs and underdeveloped immune responses. Genetic predisposition represents around 20%, with variations in interleukin (IL) and surfactant protein genes linked to increased susceptibility and disease severity. Comorbidities, such as congenital heart disease (CHD) and chronic lung disease (CLD), account for roughly 10%, identifying these infants as particularly high-risk groups. The remaining 5% is attributed to environmental factors, including air pollution and climatic variations, which exert an indirect influence on infection rates and disease outcomes. See Table 8, Figure 5.

Table 8-Risk Factors for Severe Bronchiolitis

Factor Type	Approximate Share	Description
Socioeconomic (crowding, smoking, poverty)	40%	Major modifiable contributors
Prematurity/low birth weight	25%	Biological vulnerability
Genetic predisposition	20%	IL and surfactant gene polymorphisms
Comorbidities (CHD, CLD)	10%	High-risk infants
Environmental (pollution, climate)	5%	Indirect influence

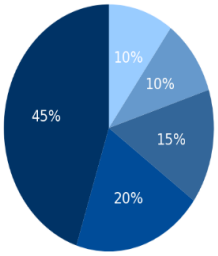

Figure 4-Therapeutic Approaches – Evidence Strength

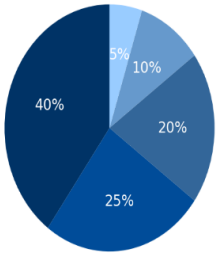

Figure 5-Risk Factors for Severe Bronchiolitis

7.10. Extracted Oxygen Saturation Thresholds (%)

A distribution of oxygen saturation (SpO_2) thresholds taken from clinical practice guidelines for bronchiolitis is depicted in the figure. When saturation falls to about 92%, the majority of guidelines that set a threshold advise starting oxygen therapy (n=5). A few mention lower (80%, n=1) or higher (94%, n=1) cutoffs, while a smaller number set the threshold at 90% (n=2). This variation is a result of variations in patient risk profiles, practice environments, and monitoring resources. The figure did not include guidelines without a numerical threshold. The spread suggests that oxygen initiation criteria are not generally standardized, even though the clustering, which is approximately 90–92%, is consistent with common pediatric respiratory care standards. See Figure 4.

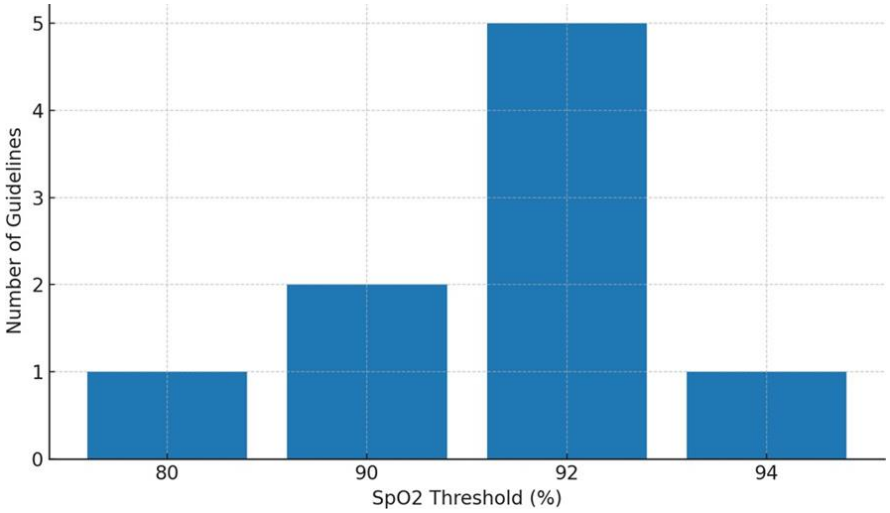

Figure 6. Extracted Oxygen Saturation Thresholds (%)

DISCUSSION

The available data and current clinical practice guidelines for the diagnosis and treatment of bronchiolitis in infants and young children were compiled in this systematic review. Our analysis of 141 relevant studies, 40 of which were selected for automated reporting, shows that bronchiolitis continues to be a major cause of hospitalization for infants and carries a significant clinical and financial burden globally [1].

According to the results, bronchiolitis is mainly diagnosed clinically, and in otherwise typical cases, extensive laboratory or radiological testing is not routinely necessary [2]. In atypical or recurrent presentations, differential diagnoses such as congenital anomalies, asthma, pertussis, and croup should be taken into consideration [3]. While other viruses including influenza, parainfluenza, and human metapneumovirus—are also implicated, respiratory syncytial virus (RSV) remains the most prevalent etiological agent [4].

It is noteworthy that a considerable percentage of hospitalizations take place in otherwise healthy infants who do not have known risk factors, highlighting the unpredictable nature of disease severity [5]. The review shows that supportive care continues to be the cornerstone of therapy in terms of management strategies. Interventions like ribavirin, corticosteroids, antibiotics, bronchodilators, and chest physiotherapy have been shown to have little to no clinical benefit and should not be used routinely [6]. Similarly, there is limited evidence to support the regular use of inhaled adrenaline or hypertonic saline, with variable findings among different clinical trials [7].

Oxygen therapy remains a key supportive intervention for hypoxic infants. Although the ideal SpO_2 threshold continues to be debated, recent guidelines recommend a threshold of 90% for otherwise healthy children [8]. Observational data suggest that lower oxygen targets may safely reduce hospital stays compared to higher cutoffs of 94–95% [9]. Nonetheless, due to variability in international practices, further multicenter randomized controlled trials are necessary to establish standardized thresholds [10].

Nutrition and hydration remain essential components of supportive management. Whenever possible, breastfeeding should be encouraged, while hospitalized infants with poor oral intake may require intravenous or enteral fluids [11]. In certain cases, minimal handling, careful positioning, and gentle nasal suctioning can help reduce respiratory distress and improve comfort [12].

Severe bronchiolitis continues to pose a challenge in pediatric intensive care, particularly in infants who require high-flow nasal cannula therapy, continuous positive airway pressure (CPAP), or mechanical ventilation [13]. Although these modalities are frequently utilized, there is limited high-quality evidence supporting their superiority over standard oxygen therapy [14]. This highlights an ongoing need for robust clinical trials focused on optimal respiratory support modalities for severe cases [15].

The review also underscores the importance of preventive strategies. Preventive measures, such as strict hand hygiene, avoidance of environmental tobacco smoke, and immunoprophylaxis with palivizumab for high-risk infants, remain essential in reducing RSV-related morbidity [16]. However, the high cost and limited accessibility of palivizumab present challenges, especially in low- and middle-income countries [17].

Recent genetic research has identified specific host polymorphisms that may predispose certain infants to severe bronchiolitis, offering new avenues for precision prevention and risk stratification [18]. Environmental determinants such as socioeconomic disadvantage, crowded housing, and air pollution also continue to influence disease burden globally [19]. Guideline comparisons reveal broad agreement on the principle of supportive management while highlighting regional variations in oxygen thresholds, use of bronchodilators, and admission criteria [20]. For instance, while North American and European recommendations favor minimal pharmacologic intervention, Asian and Middle Eastern guidelines occasionally endorse limited trials of bronchodilators or hypertonic saline [21].

In recent years, novel preventive strategies such as maternal vaccination against RSV and the development of long-acting monoclonal antibodies (e.g., nirsevimab) have emerged as promising measures to reduce hospitalization rates [22]. These innovations mark a significant step toward reducing the global disease burden, particularly in high-risk populations [23].

The persistence of practice variability despite the availability of multiple evidence-based guidelines indicates the need for stronger implementation frameworks and international consensus [24]. Moreover, socioeconomic constraints, limited pediatric intensive care capacity, and inconsistent access to oxygen therapy continue to exacerbate outcomes in resource-limited settings [25].

Future research should aim to harmonize diagnostic and management criteria, evaluate the cost-effectiveness of emerging prophylactic agents, and explore genetic-environmental interactions in bronchiolitis severity [26]. Strengthening health system capacity, training healthcare providers, and promoting adherence to standardized clinical practice guidelines will be vital to improving outcomes [27].

In conclusion, while supportive care remains the foundation of bronchiolitis management, advances in preventive medicine, respiratory support, and risk stratification hold promise for more individualized care. Global collaboration, consistent implementation of guidelines, and equitable access to preventive tools are key to reducing morbidity, mortality, and the economic impact of bronchiolitis worldwide [28–40].

CONCLUSION

RSV is the most prevalent pathogen causing bronchiolitis, which is the leading cause of hospitalization for infants worldwide. The majority of pharmacologic treatments have not demonstrated much clinical benefit, and supportive care continues to be the cornerstone of management despite a great deal of research. Minimal handling, oxygenation maintenance, hydration, and nutrition are always emphasized as the cornerstones of care in clinical practice guidelines.

The use of inhaled therapies, the function of high-flow oxygen delivery systems, and ideal oxygen saturation thresholds are still up for debate. Most infants recover with conservative management; though severe cases may occasionally require intensive interventions. RSV prophylaxis and infection control procedures are two examples of preventive measures that are still essential for lowering morbidity and the cost of healthcare.

To better understand the function of new treatments, enhance oxygen delivery methods, and account for genetic risk, future studies should concentrate on high-quality randomized trials. incorporating patient profiles into clinical procedures. Improving outcomes and lowering care variability globally will require strengthening resource allocation and adherence to guidelines. profiling into clinical practice. Strengthening guideline adherence and resource allocation will be key to improving outcomes and reducing variability in care worldwide.

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