Children's Mercy KANSAS CITY
Evidence Based Practice

Critically Appraised Topic (CAT): Characteristics associated with treatment after admission for patients with croup

Specific Care Question

In patients 6 months to 6 years of age with croup (viral laryngotracheitis) seen in an acute care setting, which patient characteristics are associated with treatment after hospital admission (i.e., requiring an intervention once admitted rather than observation alone)?

Recommendations from the Croup Clinical Pathway Committee

*A **conditional** recommendation is made to assess patients' clinical status (respiratory rate, stridor, and need for repeat RE) following treatment of croup to determine appropriate management disposition, based on very low certainty of the evidence and clinical expertise. Patients with persistent or worsening respiratory signs, such as tachypnea or stridor, after epinephrine treatments in the acute care setting may be more likely to require interventions such as additional medications or respiratory support if they are admitted. Evidence shows that receiving 1-2 racemic epinephrine (RE) treatments in the acute care setting does not predict the need for inpatient interventions.[1-4] In an acute care setting, dexamethasone and RE represent standard initial care for children with croup.[1,5-6] Post-treatment assessment of the patient's respiratory status, including persistent tachypnea, ongoing stridor, and the need for repeat RE, helps healthcare providers determine appropriate transfer to higher levels of care, such as hospitalization, while reducing unnecessary escalation.[1-3,7-9]*

Rationale for Question Asked

Diagnosis and assessment of croup severity rely on clinical evaluation rather than laboratory or imaging studies.[5] Standard management in outpatient and emergency department settings includes systemic corticosteroids, with or without nebulized RE.[8,10-11] While these interventions effectively reduce symptom severity and admission rates, uncertainty persists regarding which patients require hospitalization for ongoing medical management.[4,9,12] Identification of patient characteristics associated with the need for additional inpatient care would support more precise admission decisions and improve resource utilization. This review addresses the clinical question of which patient characteristics are associated with hospital admission and additional care.

Overview of Evidence

Four cohort studies (*N* = 1,314) evaluated three patient characteristics (tachypnea, doses of RE received in an acute care setting, and stridor) that may be associated with the need for additional interventions upon hospitalization.[1-2,7-8] While multivariate logistic regression was used in three of the four studies to analyze the patient characteristics of interest, each study adjusted for a different set of covariates. A meta-analysis could not be conducted as pooling the data would bias interpretation and be misleading.

Tachypnea (see Table 1)

Two cohort studies (N = 866) examined whether the patient characteristic of tachypnea was associated with the likelihood of inpatient interventions upon admission.[1,8] Asmundsson et al. (2019) evaluated 628 children admitted with croup and found that tachypnea in the ED was significantly associated with a higher likelihood of inpatient intervention (*OR* = 2.496, 95% CI [1.4, 4.4], *p* = 0.002). Similar findings were reported by Hancock et al. (2023), who found a significant association between tachypnea and the need for inpatient RE (*OR* = 2.61, 95% CI [1.2, 5.5]).

Certainty of the Evidence for Interventions Associated with Tachypnea[17]

The certainty of the body of evidence was very low due to serious risk of bias from the lack of transparency regarding missing data, serious indirectness from study populations receiving different amounts of pre-admission medication, and serious imprecision reflected in wide confidence intervals, making the true effect less clinically meaningful.

Racemic epinephrine dose count (see Table 2)

Three cohort studies (*N* = 1,260) examined whether the number of RE doses received in an acute care setting was associated with the need for

inpatient interventions upon admission.[1-2,8] Asmundsson et al. (2019) evaluated 628 children and found no significant difference in outcomes between those who received 1-2 doses of RE and those who received 3 doses of RE (*OR* = 1.812, 95% CI [0.943, 3.482], *p* = 0.074). Hancock et al. (2023) evaluated 238 children and found no significant difference between those who received 1-2 doses of RE and those who received 3-4 doses (OR = 0.77, 95% CI [0.27, 2.19]). Hester et al. (2019) analyzed 394 children and found that patients who received ≥ 3 doses of RE prior to admission were more likely to require additional inpatient RE treatments or airway support compared with patients who received only 2 preadmission doses of RE (*OR* = 2.08, 95% CI [1.15, 3.76], *p* = 0.03).

Certainty of the Evidence for Intervention Associated with Doses of Racemic Epinephrine Administered in an Acute Care Setting[17]
The certainty of the body of evidence is very low due to serious indirectness arising from differences in inpatient care qualifiers and noncomparable dose groupings, and to serious imprecision reflected in wide confidence intervals that include no effect, resulting in uncertainty about the true association between the number of RE doses and the need for inpatient interventions.

Stridor (see Table 3)
Two cohort studies (*N* = 448) examined whether stridor in the acute care setting was associated with the need for inpatient care upon admission.[2,7] Hester et al. (2019) evaluated 67 of 394 children who had a history of stridor when presenting to the ED. The authors of this study reported no significant differences between those who were admitted and received additional interventions versus those who were admitted and were observed only or discharged from the ED (*OR* = 0.89, 95% CI [0.47, 1.68], *p* = 0.90). Elder & Rao (2019) evaluated 25 of 54 children who had stridor two hours after the second dose of nebulized adrenaline and found that they had a higher likelihood of inpatient interventions (*OR* = 0.15, 95% CI [0.03, 0.75], *p* = 0.011).

Certainty of the Evidence for Interventions Associated with Stridor[17]
The certainty of the body of evidence is very low due to serious risk of bias from inadequate adjustment for baseline severity, serious indirectness from varying clinical states of stridor and differing admission criteria, and serious imprecision from a low number of participants, limiting the certainty of the effect estimates.

Table 1
Comparison: Admission with additional intervention vs. admission with no intervention. Variable: Tachypnea

Author (year)	Study Type	Population	Patients with tachypnea requiring hospitalization	Hospitalization with tachypnea and additional interventions	Hospitalization with tachypnea and no additional interventions	Results
Asmundsson (2019)	Cohort	Children 6 months to 5 years, treated with at least 1 dose of RE in the ED before admission to the hospital *N* = 628	*n* = 430	*n* = 114 (26.5%)	*n* = 316 (73.5%)	Adjusted odds ratio for receiving RE, heliox, or transfer to PICU after admission: *OR* = 2.50, 95% CI [1.41, 4.43], *p* = 0.002
Hancock (2023)	Cohort, retrospective	Children aged 6 months to 6 years	*n* = 89	*n* = 29	*n* = 60	Adjusted odds ratio for receiving RE after admission:

		who had received 2 doses of nebulized adrenaline in the ED or another medical setting *N* = 238				*OR* = 2.61, 95% CI [1.24, 5.52] *No p-value reported

Table 2
Comparison: Admission with additional intervention vs. admission with no intervention. Variable: Racemic Epinephrine

Author (year)	Study Type	Population	Patients requiring hospitalization	Hospitalization with additional interventions	Hospitalization for observation only	Results
Asmundsson (2019)	Cohort	Children 6 months to 5 years, treated with at least 1 dose of RE in the ED before admission to the hospital *N* = 628	One dose: *n* = 206 Two doses: *n* = 362 Three doses: *n* = 60	One dose: *n* = 42 (20%) Two doses: *n* = 81 (22.4%) Three doses: n = 19 (31.7%)	One dose: *n* = 164 (80%) Two doses: *n* = 281 (77.6%) Three doses: n = 41 (68.3%)	Adjusted odds ratio for receiving RE, heliox, or transfer to PICU after admission, comparing one to two doses versus three doses of RE in the acute care setting: *OR* = 1.812, 95% CI [0.943, 3.482],
Hancock (2023)	Cohort, retrospective	Children aged 6 months to 6 years who had received 2 doses of nebulized adrenaline in the ED or another medical setting *N* = 238	One dose: *n* = 56 Two doses: *n* = 155 Three doses: *n* = 27	One dose: *n* = 14 (25%) Two doses: *n* = 38 (24.5%) Three doses: *n* = 7 (25.9%)	One dose: *n* = 42 (75%) Two doses: *n* = 117 (75.5%) Three doses: *n* = 20 (74%)	Adjusted odds ratio for receiving RE after admission, comparing one to two doses versus three to four doses of RE in the acute care setting: *OR* = 0.77, 95% CI [0.27, 2.19]
Hester (2019)	Cohort, retrospective	Children aged 3 months to 8 years *N* = 394	One dose: *n* = 49 Two doses: *n* = 248 Three doses: *n* = 69	One dose: *n* = 8 (16.3%) Two doses: *n* = 42 (16.9%) Three doses: *n* = 21 (30.4%)	One dose: *n* = 41 (83.7%) Two doses: *n* = 206 (83%) Three doses: *n* = 38 (55%)	Adjusted odds ratio for receiving additional RE or airway intervention after admission, comparing two doses versus ≥ three doses of RE in the acute care setting: *OR* = 2.08, 95% CI [1.15, 3.76], *p* = 0.03

Table 3
Comparison: Admission with additional intervention vs. admission with no intervention. Variable: Stridor

Author (year)	Study Type	Population	Patients with stridor requiring hospitalization	Hospitalization with stridor requiring additional interventions	Hospitalization with stridor not requiring additional interventions	Results
Elder & Rao (2019)	Cohort	Children aged 6 months to 6 years, who had received 2 doses of nebulized adrenaline in the ED or another medical setting *N* = 54	*n* = 25	*n* = 8 (32%)	*n* = 17 (68%)	P-value for receiving nebulized adrenaline, IV antibiotics, IV steroids, or transfer to the ICU after inpatient admission: *p* = 0.011* *Multivariate logistic regression was completed, but only the p-value was reported
Hester (2019)	Cohort, retrospective	Children aged 3 months to 8 years *N* = 394	*n* = 67	*n* = 15 (22.4%)	*n* = 52 (77.6%)	P-value for receiving additional RE or airway intervention after admission: *p* = 0.90* *Multivariate logistic regression was completed, but only the p-value was reported

Study characteristics
Version 1 (July 2022):
The search for suitable studies was completed on April 27, 2022. Amanda Nedved, MD, and Donna Wyly, MSN, RN, APRN, CPNP-AP, PPCNP-CB, ONC, reviewed the 50 titles and/or abstracts found in the search and identified[13] 11 single studies believed to answer the question. After an in-depth review of the single studies, three cohort studies answered the question.[1-2,7]

Version 2 (March 2026):
An updated literature search (January 2022 – February 2026) using the same search strategy was conducted on PubMed on February 3, 2026. K. Berg, MD, reviewed the 29 titles and/or abstracts found in the search and identified[13] five single studies believed to address the question. After an in-depth review of the single studies, one was believed to answer the question and was added to the three studies from the version 1 search.[8]

Identification of Studies
Search Strategy and Results (see Figure 1)

1)'laryngotracheobronchitis'/exp OR laryngotracheobronchitis OR 'laryngotracheitis'/exp OR laryngotracheitis OR 'croup'/exp OR croup,
2) 'emergency care'/exp OR 'emergency care' OR 'emergency ward'/exp OR 'emergency ward' OR 'urgent care'/exp OR 'urgent care' OR 'emergency health service'/exp OR 'emergency health service' OR 'emergency department'/exp OR 'emergency department' OR 'ambulatory care'/exp OR 'outpatient department'/exp OR 'ambulatory care' OR 'outpatient department',
3) 'hospital admission'/exp OR 'hospital admission' OR 'treatment outcome'/exp OR 'treatment outcome' OR 'outcome'/exp OR 'outcome' OR 'patient assessment'/exp OR 'patient assessment' OR 'treatment failure'/exp OR 'treatment failure' OR 'time factor'/exp OR 'time factor',
4) 'racemic epinephrine' OR 'racephedrine'/exp OR racephedrine OR 'epinephrine'/exp OR epinephrine OR 'nebulised adrenaline',
5) #3 OR #4
6) #1 AND #2 AND #5
7) #6 AND ([child]/lim OR [infant]/lim OR [preschool]/lim) AND ('article'/it OR 'article in press'/it OR 'review'/it) AND (2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py)
8) #7 AND (2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py)
Search Dates: 2015-2022 (2022); 2022-2026 (2026)

Records identified through database searching n = 50 (2022); n = 28 (2026)
Additional records identified through other sources n = 0 (2022; 2026)

Studies Included in this Review[1-2,7-8]

Citation	Study Type
Asmundsson (2019)	cohort
Elder & Rao (2019)	cohort
Hancock (2023)	cohort
Hester (2019)	cohort

Studies Not Included in this Review with Exclusion Rationale[3,9,14-16]

Citation	Reason for exclusion
Hano (2025)	Wrong outcome: Analyzed return visits to the ED
Hurley (2023)	Wrong comparison: Analyzed hospital admission after the patient had a return visit to the ED within 3 days of the index visit to the ED
Kim (2024)	Wrong comparison: Investigated patients admitted for group versus those discharged from the ED, but not additional interventions received once admitted
Maalouli & Hodges (2021)	Wrong outcome: Development of a risk calculator
Wyly (2025)	Wrong comparison: Investigate pre- and post-clinical pathway implementation

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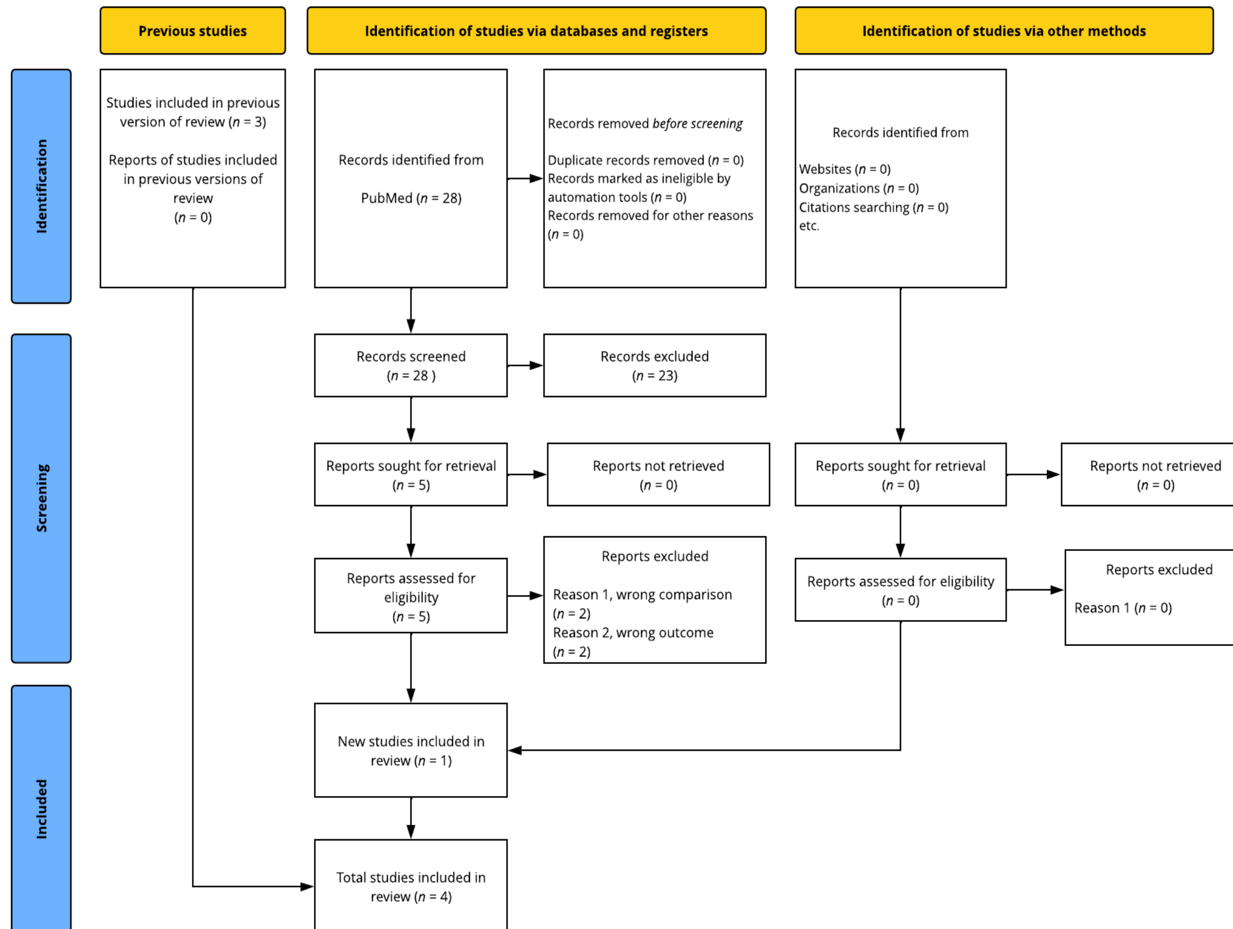
Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[18]



Critically Appraised Topic (CAT): Characteristics associated with treatment after admission for patients with croup

Characteristics of Intervention Studies

Asmundsson et al., 2019

Methods	**Multicenter, cross-sectional observational study based on retrospective chart review**
Participants	**Setting:** USA, Minnesota, three pediatric tertiary care children's hospitals, March 2011 to September 2015 **Number enrolled in the study:** *N* = 628 • **Group 1, Patients with no significant interventions** *n* = 486 • **Group 2, Patients with significant intervention** *n* = 142 **Gender, males (as defined by researchers):** • **Group 1:** *n* = (%) 321 (66.0) • **Group 2:** *n* = (%) 82 (57.7) **Race/ethnicity or nationality (as defined by researchers):** No information **Age, mean/median (SD), months** • **Group 1:** 17.9/17.1 (7.3) • **Group 2:** 17.6/16.5 (6.8) **Inclusion Criteria:** • Evaluated by the participating ED • Treated with at least 1 RE dose • Age 6 months to 5 years • Admitted to the hospital **Exclusion Criteria:** • History of congenital anomalies of the airway • Previous tracheal surgery • Required supplemental oxygen in the ED due to saturation < 90% • Patients directly admitted to the pediatric intensive care unit (ICU) **Covariates Identified:** This study took place in Minnesota; croup tends to be worse in the winter.
Interventions	**Group 1:** Patient admitted to the hospital for croup, no significant intervention after hospital admission **Group 2:** Patient admitted to hospital for croup, patient required one or more significant interventions: • More than 1 RE treatments • Helium-oxygen (Heliox) use • PICU transfer after hospital admission
Outcomes	**Primary outcome(s)/predictors:** • Tachycardia • Tachypnea • Fever (>/= 38°C) • Abnormal pulse oximetry (< 95% on room air) • Doses of RE **Secondary outcome(s):** • Significant interventions (any number of inpatient RE doses, Heliox treatment, transfer to pediatric ICU) **Safety outcome(s):** • None reported
Notes	**Results:** • Of the patients admitted, those who received significant interventions demonstrated age-defined tachypnea (83.9%) in the ED compared to those who did not receive any significant interventions (68.9%), *p* = < .0012. • Of the patients admitted, those who received significant interventions demonstrated age-defined tachycardia (55.1%) compared to those who did not receive any significant interventions (45.5%), *p* = 0.483.

	• ED temperature ≥ 38°C and O_2 saturation did not demonstrate significant differences between the two groups of admitted patients (p = .843 and .728, respectively). • Authors report that tachypnea in the ED and use of radiograph were associated with an increased use of significant interventions **Limitations:** • Of the 628 patients, 40 had multiple visits during the study period, of which one visit was randomly selected to be in the study. • The number of ED initial vitals is <628 because of missing data for some patients • It is unclear if the need for a radiograph equaled causation for or correlation with the need for hospital admission • The authors did not report race or ethnicity data

Elder & Rao, 2019

Methods	Cohort, retrospective

Participants	**Participants:** Patients between 6 months and 6 years of age (inclusive) who presented to the ED with croup and had received two doses of nebulized adrenaline within the ED or prior to arrival.
	Setting: Single tertiary pediatric referral hospital in Sydney, Australia, between January 2011 and August 2016
	Number enrolled in the study: *N* = 108
	• **Group 1, Admit intervention:** *n* = 10
	• **Group 2, Admit no intervention + ED discharge:** *n* = 98
	Gender, males (%):
	• **Group 1:** *n* = 6 (60)
	• **Group 2:** *n* = 75 (77)
	Race/ethnicity or nationality (as defined by researchers):
	• Not reported
	Age, mean in months (SD)
	• **Group 1:** 17.6 (5.4)
	• **Group 2:** 29.4 (16.1)
	Inclusion Criteria:
	• Patients aged 6 months to 6 years
	• Must have received 2 doses of nebulized adrenaline within the ED or prior to arrival
	• Diagnosis of croup
	Exclusion Criteria:
	• Patients were excluded from the study if they received further medical interventions within 2 hours of the second dose of adrenaline, including:
	  ○ Supplemental oxygen
	  ○ Intravenous (IV) fluids
	  ○ Respiratory support
	  ○ Salbutamol administered more frequently than every 3 hours
	Covariates Identified:
	• History of chronic medical condition

Interventions	**Both: 2 doses of nebulized adrenaline in the ED or prior to arrival**
	• **Group 1: Admit and additional interventions required, including:**
	  ○ Additional doses of nebulized adrenaline (10/10 patients)
	  ○ IV antibiotics (2/10 patients)
	  ○ IV steroids (1/10 patients)
	  ○ Admission to ICU (1/10 patients)
	• **Group 2: No additional interventions**

Outcomes	**Primary outcome(s):**
	• Factors which may predict need for further interventions in children with croup:
	  ○ Heart rate
	  ○ Respiratory rate
	  ○ Fever (temperature > 38° Celsius)
	  ○ Stridor at rest
	Secondary outcome(s):
	• None requested
	Safety outcome(s):
	• None requested

Notes	**Results:** • Authors concluded that older patients with no history of a chronic medical condition who have a normal heart rate, normal temperature, and no evidence of

	stridor at rest two hours after the second dose of adrenaline may be suitable for outpatient management • Patients who were discharged from the ED (the 'ED discharge' group) were significantly older (*M* age 32.3 ± 14.0 months vs. 25.9 ± 18.0 months for the 'Admit no-intervention' group and 17.6 ± 5.4 months for the 'Admit intervention' group, *p* = .010) and were less likely to have a chronic medical condition (9% for both the 'Admit no-intervention' group and ED discharge group vs. 50% for the 'Admit intervention' group, *p* = .001). **Limitations:** • Small sample size • Single center • Retrospective review • Subjective outcomes (work of breathing/stridor)

Hancock et al. (2023)

Methods	Cohort
Participants	**Participants:** Previously healthy patients admitted with a diagnosis of croup **Setting:** Free-standing tertiary care pediatric hospital in the United States **Number enrolled into study:** *N* = 238 • **Group 1, No inpatient RE:** *n* = 179 • **Group 2, Inpatient RE:** *n* = 59 **Gender, males (as defined by researchers):** • **Group 1:** *n* = 127 (70.9%) • **Group 2:** *n* = 44 (74.6%) **Race/ethnicity or nationality (as defined by researchers):** Race/ethnicity | No inpatient RE *n* (%) | Inpatient RE *n* (%) African American | 78 (43.6) | 29 (49.2) White | 75 (41.9) | 25 (42.4) Hispanic ethnicity | 13 (7.3) | 5 (8.5) **Age, median in months, (IQR)** • **Group 1:** 15.9 (11 - 24) • **Group 2:** 13.1 (8.3 - 20.3) **Inclusion Criteria:** • Previously healthy patients admitted with a diagnosis of croup as identified by ICD-10 codes J05.0 and J04.2 • Age 2 months to < 7 years • Discharged between January 1, 2016, and December 31, 2019 **Exclusion Criteria:** • Underlying conditions that could affect the disease course: ○ Congenital airway abnormalities, history of tracheostomy or tracheal surgery, complex medical conditions such as Down's syndrome, congenital heart disease, or cystic fibrosis • Patients with a primary diagnosis other than croup • Direct admission to PICU • Transferred patients from the inpatient service at another hospital • No RE received in the emergency department (ED) • Patients with missing data pertinent to the study in the medical record (such as vital signs or RE administration times) **Covariates Identified:** • None reported
Interventions	**Both:** received RE in the ED and were admitted **Group 1:** Did not receive RE after admission **Group 2:** Received RE after admission

Outcomes	**Primary outcome(s):**
	• RE administration after admission
	Secondary outcome(s):
	• Length of stay
	• Observation time
	• Croup re-visits within 7 days
	• Croup readmissions within 7 days
	• Vital signs:
	  ○ Tachycardia*
	  ○ Tachypnea*
	  ○ Fever
	  ○ O_2 saturation
	  ○ Weight
	• Number of doses of RE received*
	• Time between doses
	• Use of steroids
	• Use of imaging
	Safety outcome(s):
	• None reported
	*Outcomes of interest to the Children's Mercy Clinical Pathway or CAT development team

Results	**Results:**
	• There was no difference in inpatient RE administration versus no RE after admission for patients with tachycardia in the ED, OR = 0.89, 95% CI (0.50, 1.61)
	• Patients receiving RE after admission were significantly more likely to have tachypnea in the ED than patients not receiving RE after admission, OR = 1.92, 95% CI (1.05, 3.48)
	• There was no difference in the total number of doses received in the ED between groups:
	  ○ 1 dose only: OR = 1.01, 95% CI (0.51, 2.03)
	  ○ 2 doses only: OR = 0.96, 95% CI (0.52, 1.77)
	  ○ 3 or more doses: OR = 1.07, 95% CI, (0.43, 2.67)
	Limitations (as reported by study authors):
	• Retrospective study design
	• Single-center studies may not be generalizable
	• Variation among providers for RE administration due to the lack of clinical guideline use
	• Patients seen at outside facilities may have a prolonged time between doses due to transportation time
	• Length of stay may be affected by time and day of admission as well as delayed discharge
	• Steroid use before the visit may not have been recorded
	• Did not include patients discharged with a croup diagnosis, only admission
	• Lack of power due to study size
	Limitations (as perceived by reviewer):
	• The group that did not receive RE inpatient was significantly older (15.9 months) than the group that did receive RE (13.1 months), p = 0.045
	• The comparator groups varied in size, with the group that did not receive RE three times larger

Hester, 2019

<table>
<tr><th>Methods</th><th>Cohort, retrospective</th></tr>
<tr><td>Participants</td><td>Participants: Children ages 3 months to 8 years
Setting: 430-bed tertiary children's hospital
Number enrolled in the study: N = 588
• Group 1, admitted inpatient with no inpatient airway intervention: n = 312
• Group 2, admitted inpatient airway intervention: n = 82
• Group 3, discharged from emergency department (ED): n = 194
Gender, males (as defined by researchers):
• Group 1: n = 205 (65.7%)
• Group 2: n = 48 (58.5%)
• Group 3: n = 129 (66.5%)
Race/ethnicity or nationality (as defined by researchers):
• See Table 1: Race
Age, median in months, (IQR): Statistically significant differences in pairwise comparisons. Significance was adjusted for multiple comparisons using Holm-Sidak
• Group 1: n = 17 (10.5-25)
• Group 2: n = 16.5 (11-25)
• Group 3: n = 24 (14-43)
Inclusion Criteria:
• Patients aged 3 months to 8 years with an ED, observation, or inpatient encounter (observation/inpatient)
Exclusion Criteria:
• Patients <3 months of age
• Patients with a diagnosis of asthma/bronchiolitis/pneumonia
• Patients with an alternate primary reason for stridor (e.g., post-extubation).
• Patients directly admitted to the ICU
• Complex Chronic Condition
• Concurrent ICD for asthma/bronchiolitis
• Repeat visit within 7 days
• Diagnosed with non-croup illness
Covariates Identified:
• All demographic covariates in the final adjusted model
• Because it represented the largest group, it used 2 RE doses as the reference group in the multivariate model</td></tr>
<tr><td>Interventions</td><td>• Group 1: admission without airway intervention
• Group 2: admission with airway intervention
• Group 3: discharged from ED</td></tr>
<tr><td>Outcomes</td><td>Primary outcome(s):
• To describe initial RE use, including doses at an outside hospital (OSH) and the ED
• Admission decisions for patients presenting with croup at a large children's hospital
Secondary outcome(s):
• Describe the rate of inpatient RE (IRE)/inpatient airway interventions (IAIs) in patients with croup in the ED and inpatient settings
• Examine potential factors associated with IRE/IAI in admitted patients
Safety outcome(s):
• To provide a more comprehensive assessment of croup outcomes after initial stabilization at an OSH or ED to be used by clinicians in admission decision-making</td></tr>
<tr><td>Notes</td><td>Results:
• Of admitted patients, 20.8% (82/394) had IRE and/or IAI, most commonly additional RE (20.6%, 81/394).</td></tr>
</table>

	• Only 3 patients (0.76%, 3/394) had IAI; 2 required oxygen and 1 required ICU transfer. • No patients required Heliox, intubation, or died. • Overall, 3 patients (3/588 [0.5%]) were treated with antibiotics for suspected concurrent bacterial tracheitis. • Of the sample of patients initially discharged from the ED, 3 had ED revisits within 24 hours: 1 of whom received an additional single RE dose, 2 of whom received no further treatments, and none of whom were readmitted. • Admitted patients without IAI had a 3.1 times greater median cost than patients discharged from the ED. **Limitations:** • Reflects practice at a single tertiary children's hospital and thus results may not be generalizable. • Unable to incorporate standardized respiratory scores (e.g., Westley score); therefore, indications for RE or admission were unknown. • Alternative reasons for admission, such as dehydration or family preferences, were not assessed. • Patients discharged from the ED were, by definition, not able to have an outcome of IRE/IAI. • Dosing for OSH medications was not verified. • This study was underpowered to detect differences in variables of low frequency, such as certain demographic or medical history categories. • To focus on patients whose disposition decision in the ED was discharge vs. hospital admission, and excluded patients whose initial disposition was ICU.

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