Ann & Robert H. Lurie Children's Hospital of Chicago

Croup Algorithm
Emergency Department

GOAL

Decrease % of admissions that do not receive racemic epinephrine after admission

[1]ADMISSION CONSIDERATIONS

(does not substitute clinical judgment)

- Receives **≥3** racemic epinephrine or requires racemic epinephrine more frequently than **Q2 hours x 2 doses** in the ED **and/or**
- Persistent stridor at rest, respiratory distress, tachypnea **or**
- Inadequate hydration **or**
- Need for supplemental oxygen **or**
- Concern for alternative diagnosis

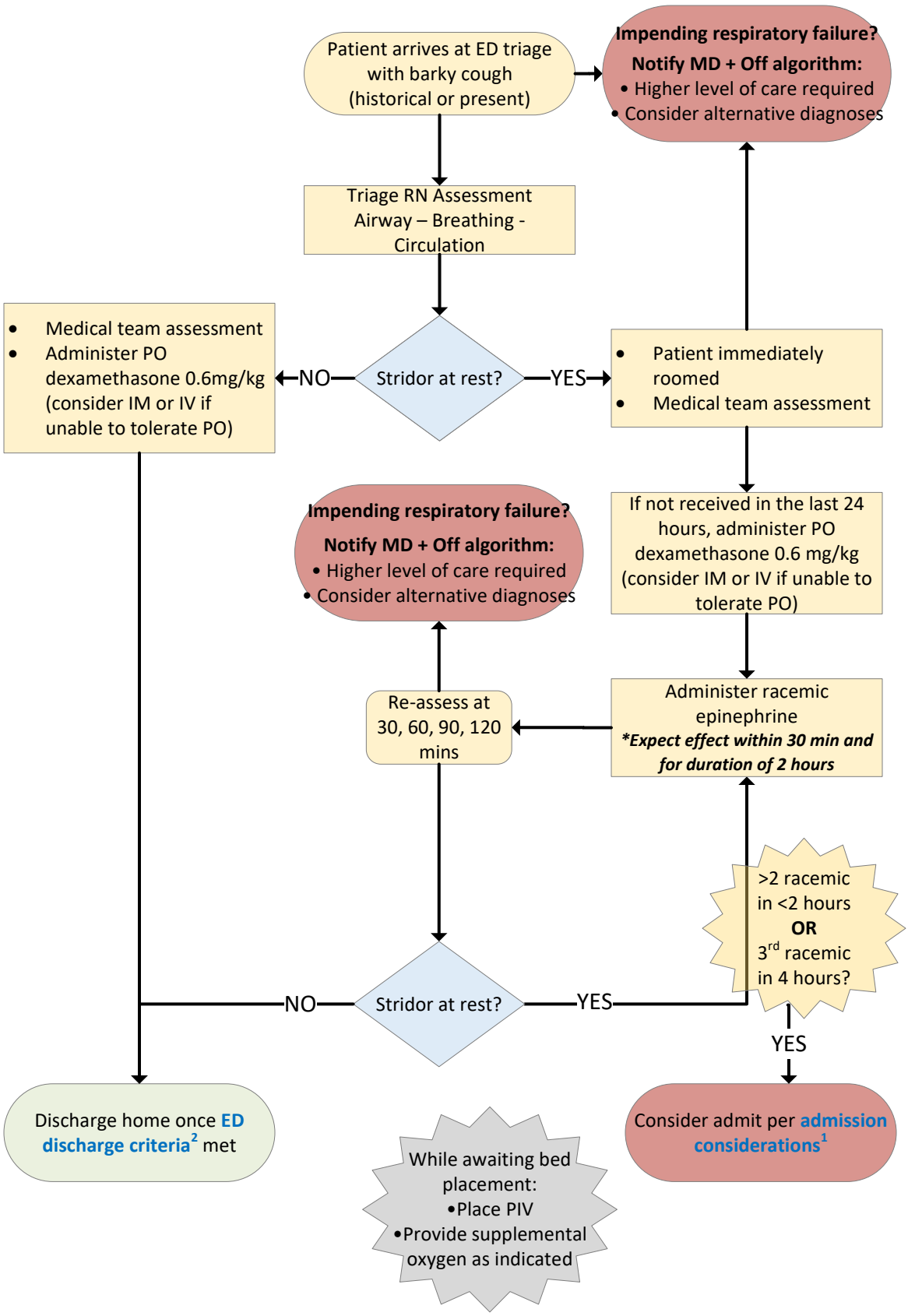
Does not exceed acute care floor care limitations:

- Floor can administer racemic epinephrine **Q1 hour x1 only**
- Floor cannot start heliox or positive pressure ventilation

[2]DISCHARGE CRITERIA

- Receives **≥1** dexamethasone
- **≥2** hours since last racemic epinephrine treatment *(if received)*
- **≤2** racemic epinephrine within **4** hours
- Mild or improved croup symptoms (no or minimal stridor and suprasternal or intercostal retractions at rest)
- Able to talk and feed without difficulty
- No supplemental oxygen or hydration requirement

See more evidence-based recommendations



 Last update: 2024.11.21 JC

This clinical care guideline is meant as a guide for the healthcare provider, does not establish a standard of care, and is not a substitute for medical judgment which should be applied based upon the individual circumstances and clinical condition of the patient.

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Croup Algorithm
Inpatient

GOAL

Reduce length of stay: discharge patients without stridor at rest who meet discharge criteria **6 hours** after last racemic epinephrine

[1]DISCHARGE CRITERIA

- **≥6** hours since last racemic epinephrine treatment
- Mild or improved croup symptoms (no or minimal stridor and suprasternal or intercostal retractions at rest)
- Stable off oxygen
- Able to talk and feed without difficulty
- No IV hydration requirement

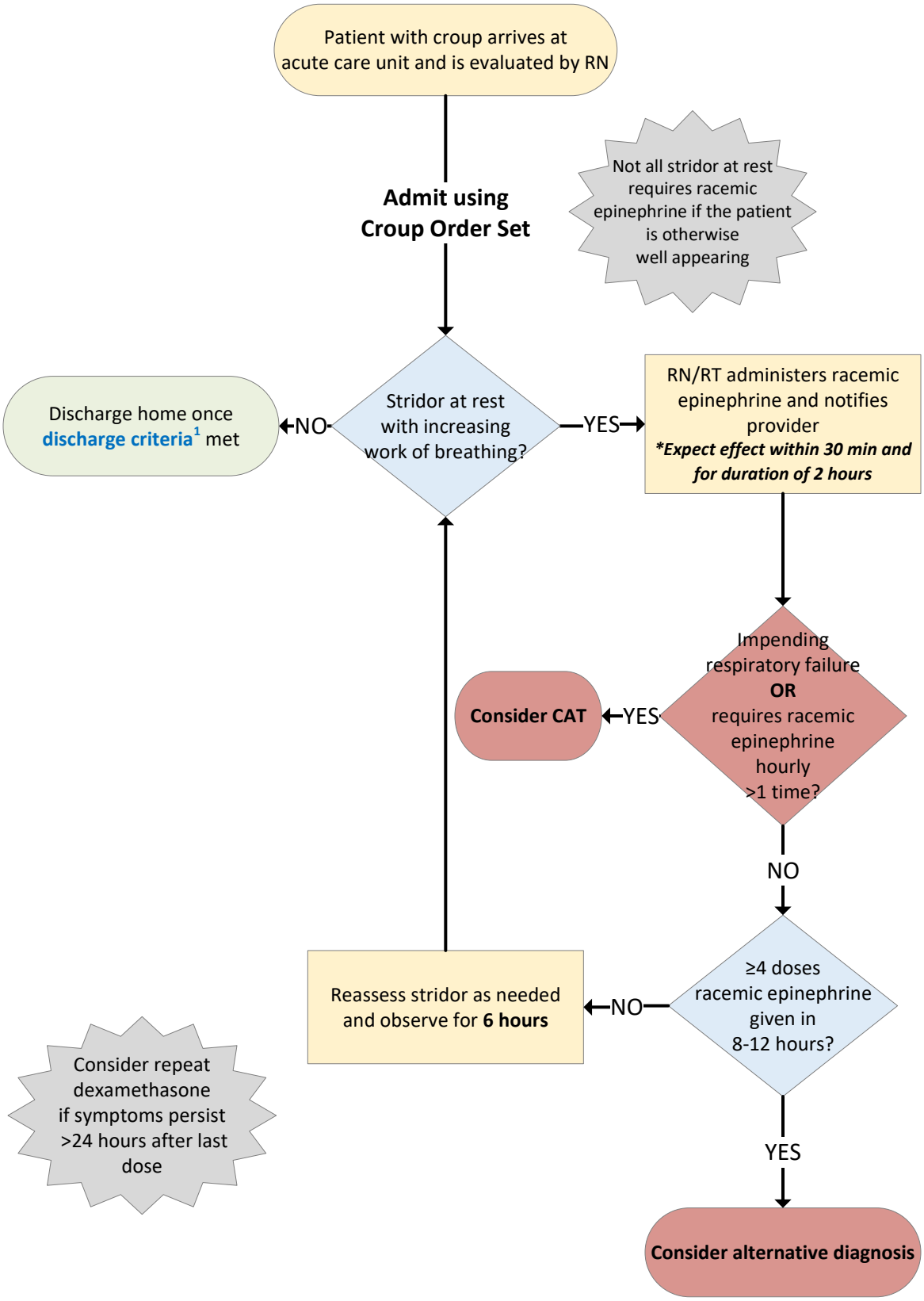
GENERAL RECOMMENDATIONS

- Do not routinely order: imaging, antibiotics, viral testing, other laboratory testing
- Do not use cool mist or humidified air
- See more evidence-based recommendations

ENT REFERRAL & CONSULT

Consider ENT referral/ consult if:

- recommend if age **<1** year, consider if age **<3** years
- history of intubation, history of inpatient ENT consult, prematurity, recurrent croup (**>2** episodes in a year)
- concerns for foreign body and stridor in the absence of other upper respiratory infections



 Last update: 2020.10.19

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Croup Algorithm
Appendix

This guideline is developed based on the best available evidence and local expert consensus for elements of which evidence are inconclusive. Please refer recommendation table below for further details.

Croup CCG Overview

Background: Croup is a viral illness commonly associated with parainfluenza 1-3. It occurs primarily in late winter but can occur year-round. [1, 2]

Inclusion:
- All patients age 6 months to 6 years with primary diagnosis of croup

Exclusion:
- Direct admission from outside hospital or Lurie ED into PICU or OR
- Croup as secondary diagnosis in addition to co-diagnoses of pulmonary edema, bronchiolitis, asthma with status asthmaticus, asthma with acute exacerbation, vocal cord paralysis
- Complex chronic conditions, with the exception of mental retardation, epilepsy, chronic respiratory diseases, congenital anomalies for gastrointestinal, renal, and urologic system, chronic renal failure, chronic bladder diseases, and renal conditions requiring devices or technological support

Outcome measures:
- Proportion of patients who do not receive additional racemic epinephrine after admission from the ED
- Length of stay in inpatient and observation units (hour method)
- Admission rate

Process measures:
- Neck or chest XR use
- Respiratory Viral Panel use
- Antibiotic use
- Total nebulized racemic epinephrine given in the ED before admission
- Time of last racemic epinephrine given to discharge

Balancing measures:
- Length of stay (ED)
- Readmission rates within 3 days vs 7 days
- Return to ED within 3 days vs 7 days
- Critical Assessment Team (CAT) call

Complex chronic condition is defined as "any medical condition that can be reasonably expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or 1 organ system severely enough to require specialty pediatric care and probably some period of hospitalization in a tertiary care center". [3]

Recommendation Table (see final page for grading details)

Recommendation	Strength of recommendation	Quality of evidence
Give PO dexamethasone (0.6 mg/kg) instead of prednisolone to all patients with croup; give IM or IV if patient can't tolerate PO [4-12]. Consider repeat dose if no improvement is noted after 24 hours.	Strong, consensus for repeat dose	Low to moderate
Give inhaled racemic epinephrine for patients with moderate to severe croup symptoms [9, 12, 13]	Strong	High
Observe patient for ≥2 hours after last racemic epinephrine administration in the ED [12, 14]	Strong	Moderate
Do not admit all patients requiring multidose epinephrine [15-17]. Consider symptoms besides absolute number of racemic epinephrine received [15, 17-21]	Strong, consensus	Low to moderate
Discharge patient admitted with croup ≥6 hours after the last dose of racemic epinephrine [18]	Strong, consensus	Moderate
Emphasize follow up visits within the first week after discharge [22]	Weak	Moderate
Do not use humidified air or cool mist [9, 11, 12, 23, 24]	Strong	Low to moderate

Do not routinely use heliox [9, 11, 25]	Strong	Low to moderate
Suggest scoping if meet criteria below [20, 26-28]. Severe cases do not need ENT consult unless airway needs to be secured. - recommend if age <1 year, consider if < 3 years - history of intubation - history of inpatient ENT consult - prematurity, recurrent croup (>2 episodes in a year) - concerns like foreign body and stridor in the absence of URI and symptoms do not improve after several days of treatment	Strong, consensus	Low to moderate
Evaluate for alternative diagnoses for patients who do not follow typical course [29]. Common diagnoses: - foreign body - subglottic stenosis - subglottic hemangioma	Strong, consensus	Low
Do not routinely order imaging [30]	Consensus	Low
Do not routinely order laboratory testing (respiratory viral panel) [1, 2]	Consensus	

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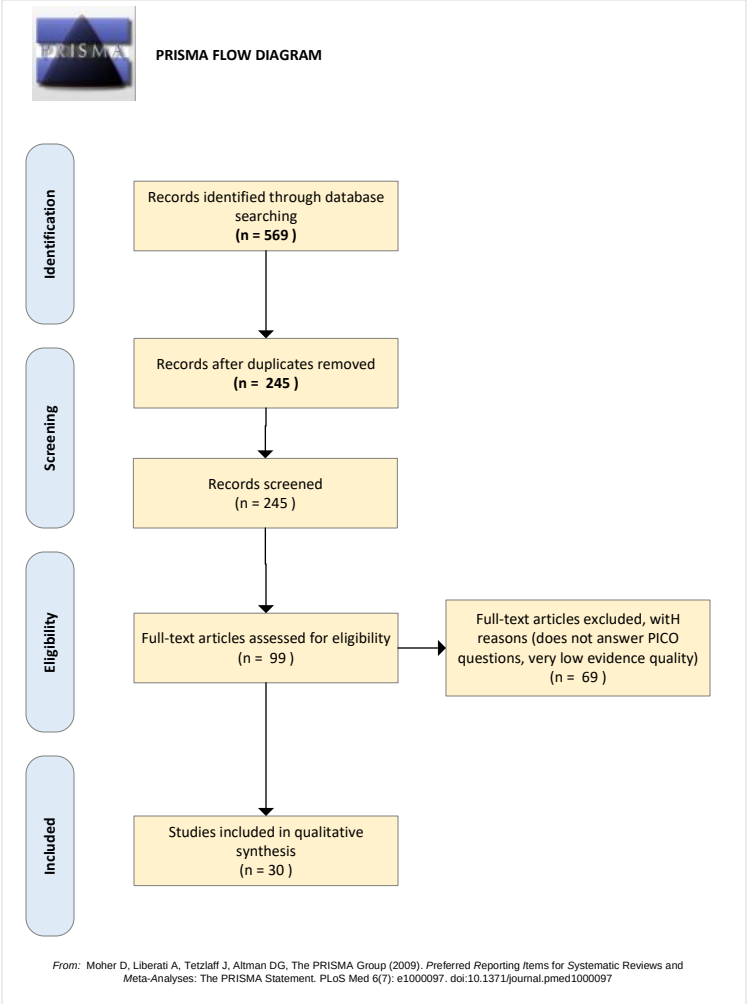

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Rating the Quality of Evidence using GRADE

Assign priori ranking
- Randomized controlled trial (RCT): HIGH
- Observation study (OS): LOW

Determine factors for upgrade or downgrade

Downgrade for:	Upgrade for:
• Design limitations • Inconsistency of results • Indirectness of evidence • Imprecision • Publication bias	• Large consistent effect • Dose response • Confounders only reducing size of effect

Iterative until group consensus achieved

Assign final grade per number of upgrade or downgrade

High	• RCT • OS with 2 upgrades
Moderate	• RCT with 1 downgrade • OS with 1 upgrade
Low	• RCT with 2 downgrades • OS
Very Low	• RCT with ≥ 3 downgrades • OS with ≥ 1 downgrades • Case series/case report

Determine factors impacting recommendations
- Balance of desirable and undesirable effects
- Cost-effectiveness
- Preference of patients

Make recommendations

Strong
vs
Weak

What does our rating mean to our readers?	
High	We are very confident that the effect in the study reflects the actual effect
Moderate	We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different
Low	The true effect may differ significantly from the estimate
Very Low	The true effect is likely to be substantially different from the estimated effect

Design limitations
- Lack of blinding - members involved in study are aware of which arm the patient is allocated
- Lack of allocation concealment – enrolled patients are aware of which group the next enrolled patient will be allocated
- Large losses to follow up
- Incorrect analysis of Intention to treat (ITT)
- Stopped early for benefit
- Selective reporting of measured outcomes (e.g. no effect outcomes) – incomplete or absent reporting of some outcomes and not others on the basis of the results

Inconsistency of results
- Wide variation of treatment effect across studies
- Population varied
- Interventions varied
- Outcomes varied

Indirectness of evidence
- Head-to-head comparison in correct population
- Indirect comparisons
- Different populations – indirectness in population
- Different interventions – interventions delivered differently in different settings
- Different outcomes measured – time differences, use of surrogate outcomes in place of patient important outcomes
- Comparisons not applicable to questions/ outcome

Imprecision
- Sample size lower than calculated optimal size
- Total # of events <300
- 95% CI includes negligible effect and appreciable benefit of harm
- Wide confidence interval
- Confidence interval not reported

Publication bias
- Studies with 'negative' findings remain unpublished

Large consistent effect
- Effect cannot be accounted for by bias common to the study; usually when relative risk are > 5 or < 2

Dose response
- when the result is proportional to the degree of exposure

Confounding only reduce size of effect
- when all possible confounders would only diminish the observed effect. It is likely that the actual effect is larger than the data suggests

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