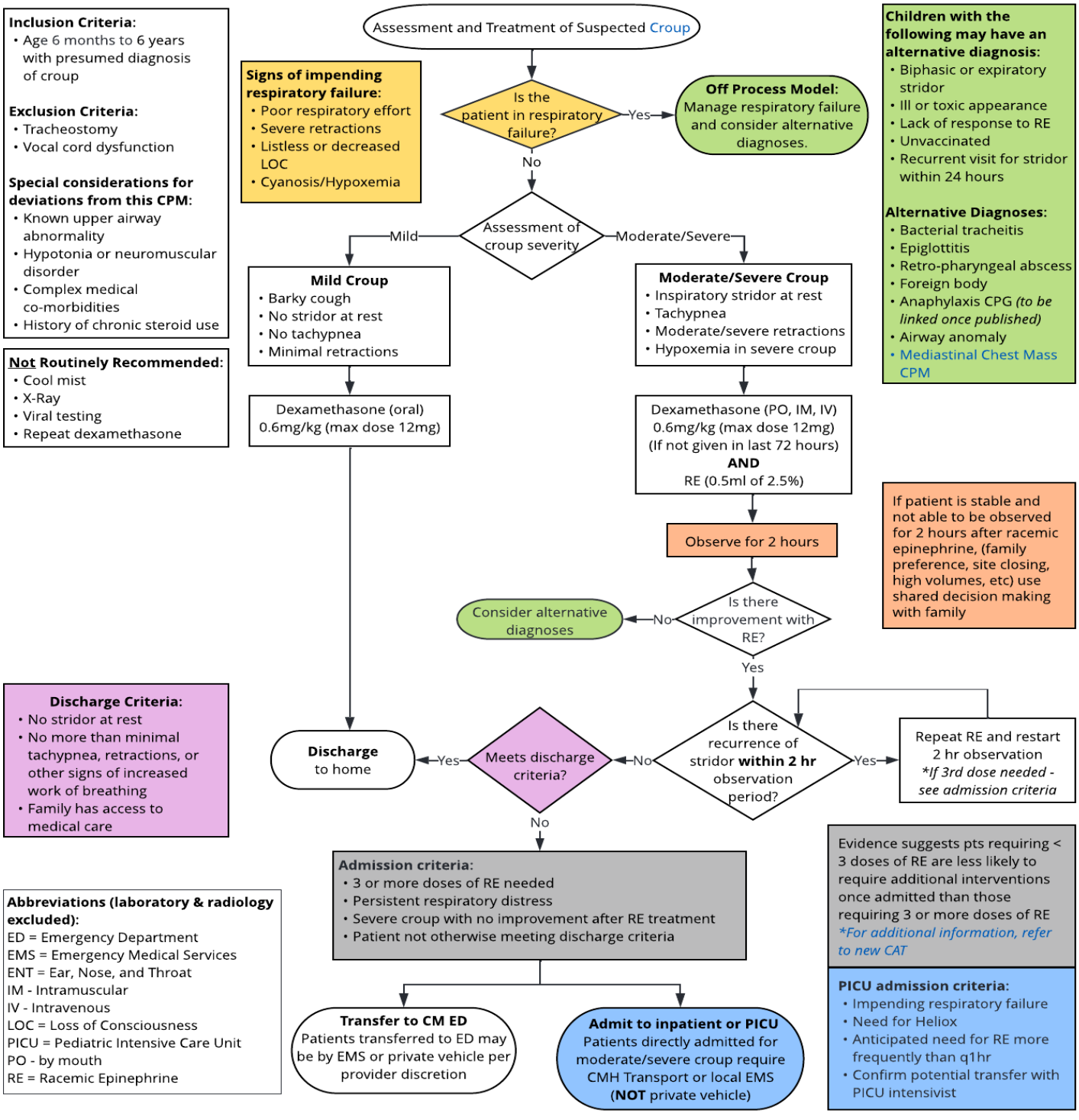
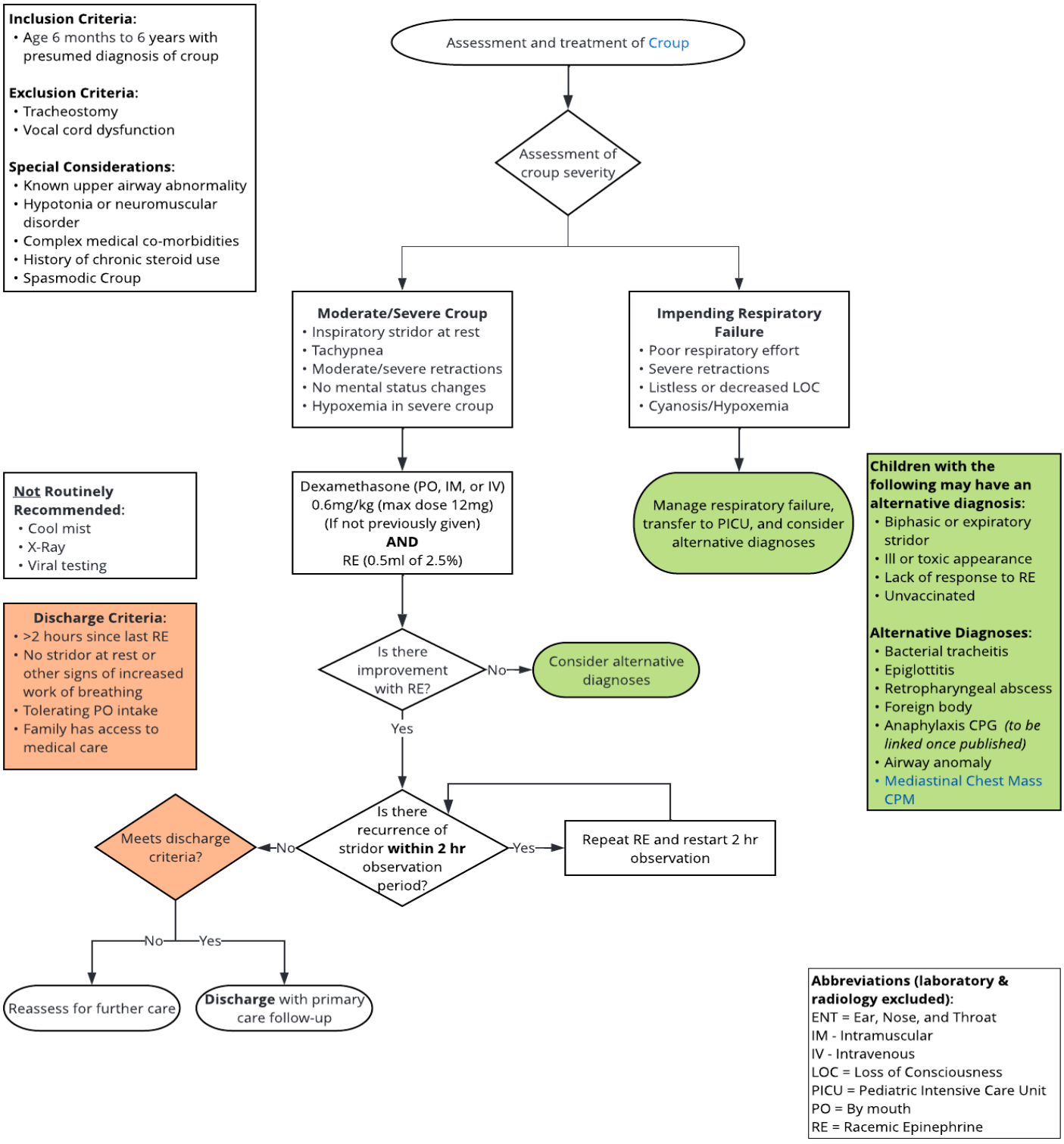
Croup
Care Process Model Synopsis

Outpatient Croup Algorithm



**This care process model does not establish a standard of care to be followed in every case. It is recognized that each case is different, and those individuals involved in providing health care are expected to use their judgment in determining what is in the best interests of the patient based on the circumstances existing at the time. It is impossible to anticipate all possible situations that may exist and to prepare care process models for each. Accordingly, this care process model should guide care with the understanding that departures from them may be required at times.*

Inpatient Croup Algorithm



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Objective of Care Process Model

The objective of this guideline revision is to standardize and improve care for otherwise healthy children diagnosed with croup in the Emergency Departments (ED), Urgent Care Centers (UCC), outpatient settings, and inpatient medical units. Standardization of care may reduce overutilization of chest radiographs, viral testing, and other laboratory testing. It may also decrease unnecessary hospitalization and inpatient length of stay.

Background/Epidemiology

Croup is a common childhood respiratory illness characterized by a barking cough which may be accompanied by inspiratory stridor, hoarseness, and respiratory distress. It is associated with a viral infection and is most prevalent in fall and early winter (Woods, 2015). Croup affects children less than six years old with the peak incidence between 6-36 months. The prevalence of croup occurs in about five percent of children between ages 12 and 24 months. Risk factors include upper respiratory infection (URI), ages less than 6 years, and inadequate immunization. Family history is also a risk factor for croup (Woods, 2015). It is one and half times more common in boys than girls and uncommon in adolescents and infants less than 3 months of age.

Target Users

- Clinical and support staff caring for children with croup in EDs, UCCs, outpatient settings, and inpatient settings.

Target Population

CPM Inclusion Criteria

- Previously healthy patients (ages 6 months to 6 years) with the clinical presentation consistent with the diagnosis of croup.

CPM Exclusion Criteria

- Toxic appearance
- Complex medical co-morbidities
- Hypotonia or neuromuscular disease
- Symptoms suggestive of an alternative diagnosis: (a) expiratory wheeze, (b) drooling or difficulty swallowing, (c) prolonged or recurrent stridor, (d) poor response to treatment
- Known airway abnormalities: (a) vocal cord paralysis, (b) subglottic stenosis, (c) tracheomalacia, (d) laryngomalacia, (e) history of vascular ring or tracheoesophageal fistula

Care Management Recommendations Based on Standards of Care and Expert Opinions

Urgent Care Clinic, Outside Emergency Department, Ambulatory Clinic

- Initial assessment of a patient suspected to have croup includes evaluating respiratory status
- If patient is assessed to be in respiratory failure, the patient is off the process model and provider will manage the respiratory failure as well as evaluate for an alternative diagnosis.
- If patient is not in respiratory failure and the presentation is consistent with croup, they will be assessed for severity of their croup symptoms.
    - Mild patients will receive a dose of dexamethasone (0.6mg/kg (max dose 12mg))
    - Moderate to severe status patients will receive a dose of dexamethasone (0.6mg/kg (max dose 12mg)) AND a dose of racemic epinephrine (RE) (0.5ml of 2.5%)
- For mild status patients treated with dexamethasone and meet discharge criteria, the provider will discharge patient to home. Patient to follow-up with their primary care provider if complications arise.
    - Discharge criteria:
        - No stridor at rest
        - No more than minimal tachypnea, retractions, or other signs of increased work of breathing
        - Family has access to medical care
- For moderate or severe status patients, the provider will assess for improvement in symptoms following the dosing of dexamethasone and initial RE to determine the need for a repeat dose of RE.
    - If there is no recurrence of stridor within two hours after initial dosing, provider will determine if patient is ready for discharge to home:
        - No stridor at rest

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        - No more than minimal tachypnea, retractions, or other signs of increased work of breathing
        - Family has access to medical care
    - Patients not ready for discharge will continue to receive RE as needed and may require admission to inpatient care
- Admission criteria is based on:
    - Three or more doses of RE needed
    - Persistent respiratory distress
    - Severe croup with no improvement after RE treatment
    - Patient is not otherwise meeting discharge criteria
- *If transfer to CMH ED only is required, patient may be transported via private vehicle.*
- *If the patient requires admission to inpatient or PICU, the patient will require transportation via CMH transport or local EMS (NOT by private vehicle).*

Emergency Department (ED)

- Initial assessment of a patient suspected to have croup includes evaluating respiratory status
- If patient is assessed to be in respiratory failure, the patient is off the process model and provider will manage the respiratory failure as well as evaluate for an alternative diagnosis.
- If patient is not in respiratory failure and the presentation is consistent with croup, they will be assessed for severity of their croup symptoms.
    - Mild patients will receive a dose of dexamethasone (0.6mg/kg (max dose 12mg))
    - Moderate to severe status patients will receive a dose of dexamethasone (0.6mg/kg (max dose 12mg)) AND a dose of racemic epinephrine (RE) (0.5ml of 2.5%)
- For mild status patients who meet discharge criteria, the provider will discharge patient to home with a recommended follow-up with their primary care provider.
    - Discharge criteria:
        - No stridor at rest
        - No more than minimal tachypnea, retractions, or other signs of increased work of breathing
        - Family has access to medical care
- For moderate or severe status patients, the provider will assess for improvement in symptoms following the initial dosing of dexamethasone and RE and determine the need for a repeat dose of RE.
    - If there is no recurrence of stridor after initial dosing, provider will determine if patient is ready for discharge to home:
        - No stridor at rest
        - No more than minimal tachypnea, retractions, or other signs of increased work of breathing
        - Family has access to medical care
    - Patients not ready for discharge will continue to receive RE as needed and may require admission to inpatient care
- Admission criteria is based on:
    - Three or more doses of RE needed
    - Persistent respiratory distress
    - Severe croup with no improvement after RE treatment
    - Patient is not otherwise meeting discharge criteria
- PICU admission will be determined by the following needs of the patient:
    - Impending respiratory failure
    - Need for Heliox
    - Anticipated need for RE more frequently than once every hour
    - Consult with PICU intensivist to confirm transfer

Inpatient

- Care begins for patient with croup admitted to general inpatient with assessment by the provider of the severity of croup symptoms.
- Patients admitted for croup most often have moderate to severe symptoms including:
    - Stridor at rest
    - Tachypnea
    - Moderate/severe retractions
    - Hypoxemia in severe croup

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Poor respiratory effort, severe retractions, mental status changes, or cyanosis indicates impending respiratory failure which should prompt acute airway management, transfer to PICU, and consideration of alternative diagnoses.

- Moderate to severe croup status patients will receive 0.6 mg/kg (max dose 12 mg) of dexamethasone if not given previously AND 0.5ml of 2.5% RE
- If there is no improvement in stridor with the dose of RE, provider should consider an alternative diagnosis
- If there is improvement but a recurrence of stridor within the 2-hour observation period, RE dosing should be repeated and restart the 2-hour observation time.
- If there is improvement in symptoms and no stridor, provider to assess if patient meets discharge criteria:
  - Less than two hours since last RE
  - No stridor at rest or other signs of increased work of breathing
  - Tolerating PO intake
  - Family has access to medical care
- Discharge patient if meets criteria and have patient follow-up with primary care provider OR patient does not meet discharge criteria, reassess for further care.

Pediatric Care Unit (PICU)

- Admission to the PICU should be considered for any of the following scenarios but most importantly, any potential transfer will need to be confirmed and approved by the PICU intensivist:
  - Impending respiratory failure
  - Need for Heliox
  - Anticipated need for RE more frequently than once every hour

Questions Posed by the CPM Committee

1. In patients 6 months to 6 years of age with croup (laryngotracheitis) seen in an acute care setting or emergency department, which patient characteristics are indicative of need for hospital admission?

Recommendations from the Croup Care Process Model (CPM) Committee

A conditional recommendation is made for use of racemic epinephrine (RE) dosing as a predictor for hospital admission requiring additional treatment (three or more doses were predictive of additional treatments to the patient once hospitalized), based on the GRADE Evidence to Decision instrument[a] and the Summary of Findings Table[a]. The overall certainty in the evidence is very low[a]. Two cohort studies support the use of RE as standard treatment for croup and demonstrate the need for admission to receive additional interventions once three or more doses of RE are provided in the outpatient setting.

Following a review of additional considerations using the GRADE Evidence to Decision instrument[a], a conditional recommendation is made for dosing of RE (three or more doses) as a predictor for hospital admission in need of further intervention based on feasibility, value, and compliance of all stakeholders.

1. In children with croup, is observation time post racemic epinephrine dosing of 2 hours versus 3 or more hours efficacious in preventing treatment failure?

Recommendations from the Croup Care Process Model (CPM) Committee

While the Croup CPM Committee recommends a two-hour observation period following the administration of a racemic epinephrine dose (0.5 ml of 2.5% solution via nebulizer) in the emergency department, urgent care clinic, or inpatient settings at Children's Mercy, the committee is unable to recommend for an extended observation period beyond two hours per racemic epinephrine dose, based on the Summary of Outcomes Tables (see Table 1 and Table 2). The overall certainty in the evidence is very low[a].

Following a review of additional considerations using the GRADE Evidence to Decision instrument[a], the Croup CPM Committee recognizes the duration of action for racemic epinephrine is approximately 1.5 hours and that the risk and benefits of prolonged observation must be considered. Prolonged observation time may increase healthcare exposure without necessarily improving the value of care, but truncated observation time may lead to unnecessary hospitalizations. Therefore, the committee recommends a two-

hour observation window. In addition, clinicians use clinical reasoning to evaluate a patient's status, including persistent stridor, tachypnea, work of breathing, malaise, and fatigue to comprehensively address the individualized patient's needs.

Measures

- Number of transfers and admissions with primary croup diagnosis
- Length of stay for the hospitalized patient
- Number of doses of racemic epinephrine per patient prior to admission or transfer with primary diagnosis of croup
- Steroid agent, time to steroid, dose, and frequency
- Additional steroid prescribed and provided following admission

Potential Cost Implications

The following potential improvements may reduce costs and resource utilization for healthcare facilities and reduce healthcare costs and non-monetary costs (e.g., missed school/work, loss of wages, stress) for patients and families.

- Fewer critical care transports
- Decreased frequency of admission
- Decreased inpatient length of stay
- Decreased unwarranted variation in care

Potential Organizational Barriers and Facilitators

Potential Barriers

- Variability of acceptable level of risk among providers
- Challenges with access to outpatient care faced by some families

Potential Facilitators

- Collaborative engagement across care continuum settings during CPM development
- High rate of use of CPM
- Standardized order set for Urgent Care Clinic, Emergency Department, Hospital Medicine, and Pediatric Intensive Care

Power Plans

- Croup EDP power plan (see Appendix A)
- Croup Inpatient power plan (see Appendix B)

Associated Policies

- Airway Care and Suction Standing Order
- Helium and Oxygen Administration

Care Process Preparation

This care process was prepared by the Evidence Based Practice Department (EBP) in collaboration with content experts at Children's Mercy Kansas City. Development of this care process supports the Division of Quality Excellence and Safety's initiative to promote care standardization that is evidenced by measured outcomes. If a conflict of interest is identified the conflict will be disclosed next to the committee member's name.

Implementation & Follow-Up

Once approved, the CPM was presented to appropriate care teams and implemented. Care measurements will be assessed and shared with appropriate care teams to determine if changes need to occur. This CPM is scheduled for revision November 2024.

Croup CPM Committee Members and Representation

- Donna Wyly, MSN, RN, APRN, CPNP-AC, PPCNP-BC, ONC | Urgent Care | Committee Co-Chair
- Amanda Nedved, MD | Urgent Care | Committee Co-Chair
- Michelle Dephillips, MD | Emergency Department | Committee Member
- Amanda Montalbano, MD, MPH, FAAP | Urgent Care | Committee Member
- Christine Scoby, DO | Hospital Medicine | Committee Member
- Tony Randall, MHA, RRT-ACCS, RRT-NPS, C-NPT, C-ELBW, CPPS | Transport | Committee Member

MIT Committee Members

- George Abraham, MD | Emergency Medicine, Medical Informatics
- Tammy Frank, RPh, CPHIMS | Medical Informatics - Pharmacy
- Brandan Kennedy, MD | Hospital Medicine, Human Factors Collaborative, Medical Informatics
- Amber Lanning | Medical Informatics – general inpatient
- Tracy Taylor | Medical Informatics – ED, UCC

EBP Committee Members

- Kathleen Berg, MD, FAAP | Hospitalist, Evidence Based Practice
- Andrea Melanson, OTD, OTR/L | Evidence Based Practice
- Kelli Ott, OTD, OTR/L | Evidence Based Practice

Additional Review & Feedback

- The CPM was presented to each division or department represented on the CPM committee as well as other appropriate stakeholders. Feedback was incorporated into the final product.

Care Process Model Development Funding

The development of this care process model was underwritten by the Emergency, Urgent Care, Inpatient, and Evidence Based Practice Departments.

Approval Obtained

Department/Unit	Date Approved
Urgent Care	November 2022
Emergency	November 2022
Hospital Medicine	November 2022
Transport	November 2022
Evidence Based Practice	October 2022

Version History

Date	Comments
February 2016	Original version
November 2022	Updated to reflect more recent literature on predictors of admission for croup and guidance on observation times following dosing of RE

Date for Next Review

November 2024

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Disclaimer

When evidence is lacking or inconclusive, options in care are provided in the CPM and the power plans that accompany the CPM.

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Appendix A EDP Croup CPM Power Plan

Unique Plan Description: EDP Croup CPM EKM
Plan Selection Display: EDP Croup CPM
PlanType: ED/UCC
Version: 10
Begin Effective Date: 02/01/2017 02/01/2017 10:17
End Effective Date: Current
Available at all facilities
Plan Comment: PP_FLEX_IBUPROFEN_ED

EDP Croup CPM EKM
Vital Signs/Monitoring

- ☐ Vital signs
  repeat vital signs (DEF)*
  per unit routine
- ☐ Oxygen/Pulse oximetry
  Target Sat: >/= 90% (Standard), Lower alarm limit: 88, Upper alarm limit: 101

Nutrition/Diet

- ☐ NPO diet

Nursing

- ☐ Gown patient

Laboratory

- ☐ COVID-19 Rapid RT PCR
- ☐ COVID-19

Continuous Medications/Fluids

- ☐ IV placement
- ☐ normal saline fluid bolus
  20 mL/kg, IV, IV Soln, 1 time only (DEF)*
  10 mL/kg, IV, IV Soln, 1 time only

Medications

Mild

- ☐ dexAMETHasone
  0.6 mg/kg, PO, 1 time only [Less Than 20 kg] (DEF)*
  Comments: Max Dose: 12 mg
  12 mg, PO, 1 time only [Greater Than or Equal To 20 kg]
  0.6 mg/kg, IM, 1 time only [Less Than 20 kg]
  Comments: Max Dose: 12 mg
  12 mg, IM, 1 time only [Greater Than or Equal To 20 kg]
- ☐ acetaminophen
  12.5 mg/kg, PO, 1 time only [Less Than 80 kg] (DEF)*
  15 mg/kg, PO, 1 time only [Less Than 66 kg]
- ☐ ibuprofen
  10 mg/kg, PO, 1 time only

Moderate-Severe

- ☐ dexAMETHasone
  0.6 mg/kg, PO, 1 time only [Less Than 20 kg] (DEF)*
  Comments: Max Dose: 12mg
  12 mg, PO, 1 time only [Greater Than or Equal To 20 kg]
  0.6 mg/kg, IM, 1 time only [Less Than 20 kg]
  Comments: Max Dose: 12mg
  12 mg, IM, 1 time only [Greater Than or Equal To 20 kg]
- ☐ racemic EPINEPHrine
  0.5 mL, NEB, 1 time only (DEF)*
  0.25 mL, NEB, 1 time only, Patient weight <10 kg
  Comments: Must be diluted in 3 mL of NS.
  Observe for 2 hours after receiving racemic epinephrine and repeat dose for unresolved or recurrent stridor within 2 hours.(NOTE)*
- ☐ acetaminophen
  15 mg/kg, PO, 1 time only [Less Than 66 kg] (DEF)*

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12.5 mg/kg, PO, 1 time only [Less Than 80 kg]

☐ ibuprofen
10 mg/kg, PO, 1 time only

Topicals

☐ AneCream 4% topical cream
1 application, Topical, Cream, Unscheduled, Needle Sticks, 1 dose(s)

☐ buffered lidocaine 0.9% in J-Tip
0.2 mL, Intradermal, Injection, Unscheduled, PRN Needle Sticks, 1 dose(s)

Non Categorized

Admission may be warranted if 3 or more racemic ephinephrine treatments are required.(NOTE)*

***Report Legend:**
DEF - This order sentence is the default for the selected order
GOAL - This component is a goal
IND - This component is an indicator
INT - This component is an intervention
IVS - This component is an IV Set
NOTE - This component is a note
Rx - This component is a prescription
SUB - This component is a subphase

Appendix B Inpatient Croup CPM Power Plan

Unique Plan Description: Croup EKM
Plan Selection Display: Inpatient Croup CPM
Plan Type: Medical/Surgical
Version: 4
Begin Effective Date:
End Effective Date: Current
Available at all facilities
Plan Comment: Owners: Hospitalists

Croup EKM
Admit/Transfer
- ☑ Admit or Refer to Observation

Vital Signs/Monitoring
- ☑ Historical risk patient assessment
  Modify the Vital Signs order if patient meets criteria
- ☑ Vital signs
  q4h for 24 hours, then q shift (DEF)*
  High historical risk - obtain vitals q4h
- ☑ Weight
  On admission

Nutrition/Diet
- ☐ Regular diet for age
- ☐ NPO Diet Instructions
- ☐ Diets(SUB)*

Nursing
- ☑ Intake and Output
  Strict
- ☑ Isolation
  Contact / Droplet
- ☑ Call Provider
  Call physician for SaO2 < 90%
- ☐ IV placement
- ☐ IV + PO
- ☐ Saline lock IV line when taking adequate PO
- ☐ Heparin flush for central and midlines (per CMH guidelines)
- ☐ Sequential compression device (SCD) placement/assessment
- ☑ PEWS Baseline Assessment

Respiratory
- ☑ Oxygen/Pulse oximetry
  Frequency: Intermittent q4, Target Sat: >/= 90% (Standard), Lower alarm limit: 88, Upper alarm limit: 101
- ☑ Respiratory Care Plan

Continuous Medications/Fluids
- ☐ D5W with 0.9% NaCl and KCl 20 mEq/L
  IV
- ☐ Discontinue IVF from previous encounter

Medications
- ☐ dexAMETHasone
  0.6 mg/kg, PO, 1 time only [Less Than 20 kg] (DEF)*
  Comments: Maximum dose = 12 mg
  12 mg, PO, 1 time only [Greater Than or Equal To 20 kg]
- ☐ racemic EPINEPHrine
  0.5 mL, NEB, q2hr, PRN (DEF)*
  Comments: Must be diluted in 3 mL of NS Notify provider of each dose administered.
  0.5 mL, NEB, 1 time only
  Comments: Must be diluted in 3 mL of NS.

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0.25 mL, NEB, 1 time only [Less Than 10 kg]
Comments: Must be diluted in 3 mL of NS.

☐ acetaminophen
10 mg/kg, PO, q4hr, PRN Fever (DEF)*
Comments: Temp greater than 38.3 C
12.5 mg/kg, PO, q4hr, PRN Fever

☐ acetaminophen
10 mg/kg, Per Rectum, q4hr, PRN Fever (DEF)*
Comments: Temp greater than 38.3 C
12.5 mg/kg, Per Rectum, q4hr, PRN Fever

☐ ibuprofen
10 mg/kg, PO, q6hr, PRN Fever not responding to APAP
Comments: Temp greater than 38.3 C

Immunizations

☐ influenza virus vaccine, inactivated
0.5 mL, IM, Unscheduled, 1 dose(s)
Comments: obtain consent prior to administration.

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