



Croup Clinical Care Guideline Age 6 Mos – 3 Yrs*

*Always check intranet for latest version:

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<p><u>Item</u></p> <p>Clinical Management</p> <p>Prevention</p> <p>Telephone Triage</p> <p>Initial Triage</p> <p>Clinical Assessment</p> <p>Knowledge Base</p> <p>Monitoring</p> <p>Laboratory and Radiology</p> <p>Therapeutics</p> <p>Discharge Criteria</p> <p>Follow-up</p> <p>Measures & Targets</p> <p>Algorithm Croup</p> <p>Admitting Orders</p> <p>Parent Education Material</p> <p>Glossary</p> <p>References</p>	<p>Intended for patients with:</p> <ol style="list-style-type: none"> 1. First or repeat episode 2. Age 6 mos – 3 yrs 3. Principal Diagnosis: Croup (Laryngotracheitis) <p>Exclude patients with:</p> <ol style="list-style-type: none"> 1. Suspicion Tracheitis (laryngotracheal-bronchitis or –pneumonitis) 2. Uncommon or life threatening presentation 3. Chronic Lung Disease (BPD, CF, PAH) or known airway narrowing 4. Recent airway instrumentation 5. History of aspiration 6. Neurological impairment 7. Toxic Appearance 8. Suspicion SBI 9. Immunocompromise 10. Active Varicella or TB 11. Congenital or acquired heart disease 	<p>Indicated:</p> <ol style="list-style-type: none"> 1. Care Guideline use beginning in office, ED or UC 2. Differentiate Croup (laryngotracheitis) from Tracheitis (laryngotracheal-bronchitis or –pneumonitis), a more extensive process 3. Single Dose Corticosteroids 4. Nebulized epinephrine 5. Careful Clinical Monitoring 6. Passive Smoke Avoidance <p>Not routinely Indicated:</p> <ol style="list-style-type: none"> 1. Antibiotics 2. Viral Testing 3. Radiographs(CXR and/or Lateral Neck) 4. Laboratory studies 5. Anti-tussive or decongestant

Clinical Management

1. Prevention

- Droplet precautions for all care settings
- Good hand washing
- Protect high risk patients from exposure
- Eliminate exposure to smoke

2. Telephone Triage

- Activate EMS (911): Severe difficulty breathing (struggling for breath, grunting noises with each breath, unable to speak or cry), blue lips or reduced level of consciousness
- ED Visit (immediate): Underlying heart or lung disease, breathing heard across room, poor fluid intake, T > 105, excessive drooling, inability to lie flat without distress
 - Age < 12 mos, RR > 60, unable to suck or sleep
 - Age > 12 mos, RR > 40, difficulty breathing, not interactive
- Office Visit same day: Worsening cough, some difficulty breathing, poor fluid intake, chronic or underlying illness
- Phone contact with PCP: barking cough, acting normally, good fluid intake

3. Initial Triage

Obtain brief history of presenting conditions and past medical history \ birth (hospitalization, intubation \ mechanical ventilation), sick contacts

Check Immunization Status: HIB, Pneumococcal, Tetanus. Important when considering Epiglottitis or Diptherial Croup

Obtain all pertinent patient history, including onset and duration of symptoms including croup prodrome (rhinorrhea, sore throat, low grade fever, cough) and timing of evidence of upper airway obstruction (hoarse voice, barking cough, audible stridor) and subglottic involvement (aphonia)

Inquire regarding history of congenital or acquired heart disease, congenital or acquired subglottic stenosis, tracheomalacia, tracheal webs, choanal narrowing or atresia, micrognathia, macroglossia

Check current medications and time \ dose of last antipyretic

4. Clinical Assessment

Evaluation of presence of Noninvasive croup versus a more extensive or progressive process

Evaluate hydration status. Evaluate patient using **Croup Score** every 30 – 90 min based on severity (reference figure 1)

5. Knowledge Base

Croup is an acute inflammatory process expressed as laryngotracheitis. Infection begins in the nasopharynx and spreads to the respiratory epithelium of larynx & trachea. Inflammation, erythema and edema of the vocal folds cause hoarseness.

Age: 6 mos - 3 yrs (Mean = 18 mos)
 Duration: 3-7 days, symptoms maximal day 2-3
 Morbidity: Highest first year of life
 Epidemiology: Year round; most common fall and winter

While all medical care providers need to be aware of the potential for extension of the disease process to tracheitis (laryngotracheal-bronchitis or –pneumonitis), it is beyond the scope of this guideline.

Etiology of Croup

Table 1 Etiology of Croup (Laryngotracheitis)

Parainfluenza type 1 (most common) 2, 3
 Influenza A & B
 Human metapneumovirus (hMPV)
 Measles virus
 RSV
 Adenovirus
 Rhinovirus
Mycoplasma pneumoniae
 Enteroviruses
 Herpes Simplex viruses
 ReoViruses

Table 2 Etiology of Tracheitis (laryngotracheal-bronchitis or –pneumonitis)

Bacterial
Staphylococcus aureus
Streptococcus pneumoniae
Haemophilus influenzae
Moxarella catarrhalis
Streptococcus pyogenes

Atypical
Corynebacterium diphtheriae
Cryptosporidium

Viral
 Parainfluenza type 1, 2, 3

Clinical Symptoms Croup

Symptoms increase at night and improve during day
 Hoarse Voice
 Barking Cough (often described as a “barking seal”)
 Stridor (variable, usually inspiratory)
 Respiratory Distress (variable):

- Retractions (suprasternal, intercostal, abdominal)
- Tachypnea
- Tachycardia

Clinical Progress Croup

Day 1-3
 Rhinorrhea
 Sore throat
 Low grade fever
 Mild cough

Day 3-7
 inflammation
 Onset symptoms of upper airway
 Hoarseness
 Barking Cough
 Stridor (variable)
 Respiratory Distress (variable)

Differential Diagnosis Croup

Table 3 Differential Diagnosis Croup

Allergic Reaction
 Bacterial Tracheitis
 Epiglottitis
 Foreign Body Aspiration
 Hemangioma (Subglottic)
 Infectious Mononucleosis
 Laryngeal Diphtheria
 Laryngeal nerve compression
 Paraquat Poisoning
 Peritonsillar Abscess
 Retropharyngeal Abscess
 Spasmodic croup
 Allergic response to viral antigen causing acute non-inflammatory recurrent intermittent swelling of laryngotracheal tissues. Acute nocturnal onset in older child than primary croup, repeat attacks same and consecutive nights
 Subglottic Stenosis
 Trauma
 Tumor \ intracranial process (rare)

Clinical Symptoms Tracheitis

Sudden worsening of symptoms airway is indicative of more severe or invasive disease and warrants immediate specialty consultation.

Aphonia
 Cyanosis
 Prolonged disease process
 Acute onset high fever
 Toxic appearance
 Increased work of breathing with retractions
 Severe stridor
 Tripodding

6. Monitoring:

Figure 1 CROUP SCORE (Modified Westley) [B]

Possible Score 0–17:

<4=mild croup, 4–6=moderate croup, >6=severe croup

Indicators of Disease Severity	Score
Inspiratory stridor	
None	0
Only with agitation or activity	1
At rest	2
Intercostal Retractions	
None	0
Mild	1
Moderate	2
Severe	3
Air Entry	
Normal	0
Mildly decreased	1
Severely decreased	2
Cyanosis	
None	0
With agitation \ activity	4
At rest	5
Level of Consciousness	
Normal	0
Altered	5

Figure 2 Severity Classification

SEVERITY CLASSIFICATION: Follow croup score classification to guide therapy and management:			
Score	Severity	Management	Treatment Considerations
<4	Mild	Outpatient	Supportive ; Consider Corticosteroids
4-6	Moderate	Inpatient / Observation	Corticosteroids Oxygen (for hypoxia) Epinephrine
≥ 6	Severe	Inpatient, Consider ICU	Corticosteroids Oxygen (for hypoxia) Epinephrine Consider Helium oxygen Consider intubation

Clinical Severity Reassessment Schedule

Mild:	Reassess every 4 h, consider discharge
Moderate:	Reassess every 2 h, consider admission
Severe:	Reassess every 1 h, consider ICU admission

Monitoring

- SaO₂ usually normal in croup unless tracheitis present

- Continuous cardiac/pulse oximetry monitoring only recommended for unstable patient or receiving repeat nebulized Epinephrine
- Follow VS to assess response to therapy: T, HR, RR,
- The croup score is felt to be useful to assess the efficacy of interventions, but there is little proof of its clinical utility [B]

7. Laboratory and Radiology Studies

Diagnostic tests only indicated if they will change outcome. Croup is a clinical diagnosis and usually no testing needed

CBC	If concerns SBI or bacterial super- infection
ABG	Suspected/ impending respiratory failure
CXR	Indicated only in atypical illness Classic “Steeple sign” reflects narrowed subglottic space Patchy infiltrate seen in laryngotracheal-bronchitis or – pneumonitis
Lateral Neck Soft Tissue XR:	<u>Only</u> if atypical clinical presentation Epiglottitis: classic “thumb” sign reflects swollen epiglottis Retropharyngeal abscess: widened pre-vertebral space

8. Therapeutics – “Prove it or don’t use it”

Indicated therapies

Corticosteroids [A]

Dosing: Single Dose

Mechanism of action: Long lasting anti-inflammatory agent

Decrease edema in laryngeal

mucosa

Adverse Effects: Risk of progressive viral infection
Risk of secondary bacterial infection
Exacerbate active Varicella or TB

Mask steroid dependant upper airway lesions (hemangioma)

Dexamethasone

[A]

Dose: 0.15 – 0.6 mg/kg PO (preferred), IV, IM

Frequency: Once

Maximum Dose: 10 mg

Peak serum levels: Oral: Within 1 – 2 h

IM: within 8 h

Duration of action: 24 – 72 h

- Note, the taste of oral dexamethasone may not be well tolerated thus the preferred method of administration may be a crushed dexamethasone tablet mixed with vehicle of choice

Nebulized Budesonide

[C]

Equal efficacy to Dexamethasone; expensive
Consider in children with emesis or sever respiratory distress

Prednisolone

[C]

Dose: 1 mg/kg

Prednisone

[C]

Dose:
4 mg/kg/ (equivalent 0.6 mg/kg Dexamethasone)
2 mg/kg/ (equivalent 0.3 mg/kg Dexamethasone)
1 mg/kg/ (equivalent 0.15 mg/kg Dexamethasone)

Nebulized Epinephrine for Croup Score >3, stridor [A]

Mechanism of Action: Stimulation α -adrenergic receptors
Constrict capillary arterioles causing fluid resorption from interstitial space and decreases interstitial edema

Duration of action: \leq 2 h

Efficacy: Racemic & L-epinephrine are equally efficacious [A]

Adverse effects: Myocardial Infarction (rare)

Racemic Epinephrine (1:1 mixture of δ & θ -isomers epinephrine)

Dose: 0.05 mL/kg/dose of 2.25% solution in 2.5mL normal saline via nebulizer over 15 min

< 5 kg = 0.25 mL

\geq 5 kg = 0.5 mL

Frequency: Repeat every 20 min as indicated

Maximum Dose: 0.5 mL

L-epinephrine (use if racemic epinephrine unavailable)

Dose: 0.5 mL/kg/dose of 1:1000 L-epinephrine in 2.5 mL of NS via nebulizer over 15 min repeated every 15-20 min as indicated

Frequency: Repeat every 20 min as indicated

Maximum Dose: 5 mL

The term 'rebound phenomenon' is a misnomer. Epinephrine doesn't change the duration of croup and benefits lasts \leq 2 h

It is safe to send children home from the ED after receiving racemic epinephrine if they have been observed for a minimum of 3 h post therapy

Antipyretics Indicated for T > 38.3°

Acetaminophen

Dose = 15 mg/kg po q 4°

Repeat if home treatment sub therapeutic & TDD < 140 mg/kg

Ibuprofen

Dose = 10 mg/kg po q 6°

Oxygen Utilize supplemental oxygen to treat hypoxia

Other therapies

Mist Humidified air with or without oxygen [C]

Controversial therapy without supporting evidence

- May moisten airway secretions
- May decrease airway inflammation
- May decrease viscosity of tracheal mucus secretions enabling patient to remove them by coughing
- May increase wheezing in laryngotracheitis-bronchitis/pneumonitis

Anti-tussive or decongestant [C]

Antibiotics [A]

No role in uncomplicated croup

Indicated only for bacterial component (tracheitis)

Helium-Oxygen Mixture [B]

Not shown to be more effective than nebulized epinephrine or mist

May be efficacious in patient with severe croup with impending respiratory failure.

9. Parent Education (see Parent Education Attachment)

- Expected clinical course < ten days
- Signs of worsening clinical status and when to notify PCP
- Smoking cessation counseling
- Provide Parent with Patient Education Materials

10. Discharge Criteria

Begin discharge planning at time of initial presentation

- ✓ Assess caretaker ability to provide home care
- ✓ Assess home resources adequate to support care
- ✓ Confirm transportation and telephone
- ✓ Confirm follow-up PCP/designee in specified time frame
- ✓ Complete croup teaching
- ✓ Provide verbal and written instructions to caretakers
- ✓ Assure family awareness indications return
- ✓ Provide 24-h contact number for PCP or designee
- ✓ Assure chart faxed to PCP or designee

Discharge Home

- ✓ Vital signs baseline
- ✓ No hypoxia
- ✓ Able to maintain adequate hydration
- ✓ Patient at baseline level of functioning
- ✓ Presenting condition stabilized or improves
- ✓ Croup score < 4

Patients who have received nebulized epinephrine may be discharged home after a minimum of 3 h if no stridor at rest

Admit Inpatient/ Observation

- ✓ Croup score 4 - 6
- ✓ Continued stridor at rest despite therapy
- ✓ Inadequate hydration
- ✓ Moderate retractions
- ✓ Require supplemental oxygen
- ✓ Vital signs do not return to baseline
- ✓ Condition deteriorates or does not improve

Admit ICU

- ✓ Consider for croup score > 6
- ✓ Escalating stridor at rest despite therapy
- ✓ Patient benefiting from ICU monitoring, treatment, or environment
- ✓ Any patient with impending respiratory failure:
 - SaO₂ < 90% in 40% FiO₂
 - Cyanosis with supplemental oxygen
 - Bradypnea or tachypnea outside normal limits for age
 - Severe retractions

- Hypercarbia

- Evaluate hydration status

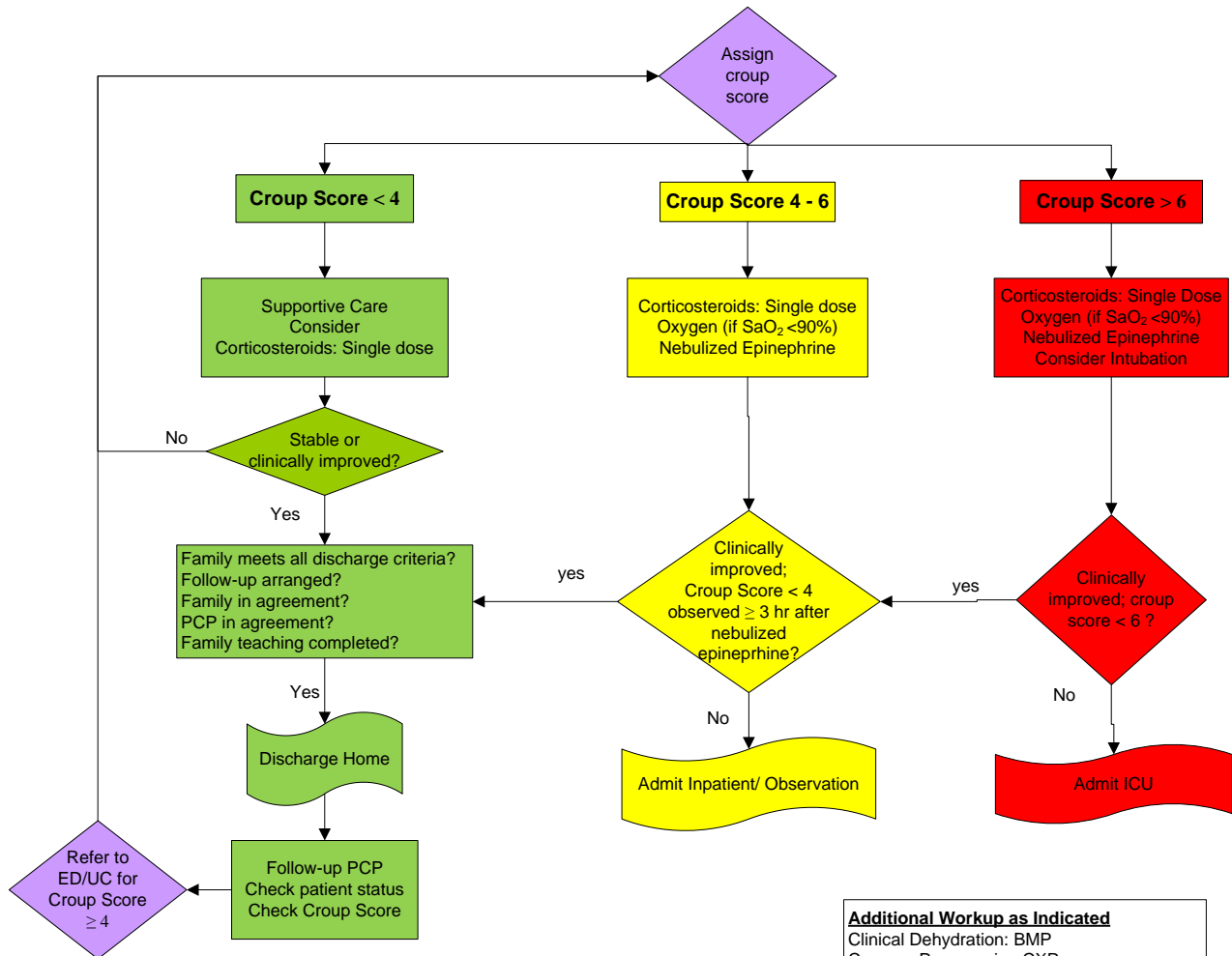
11. **Follow-up**

- With PCP or designee as scheduled
- Evaluate severity of croup
- Evaluate vital signs and oxygen saturation
- Evaluate respiratory status

12. **Clinical Care Guideline Measures & Targets**

	Measures	Target 2009
	Inpatient or Observation	
1	Antibiotics (without coded rationale)	< 25%
2	Radiographs (CXR or Lateral Neck)	< 25%
3	Single Dose Steroid	> 75%
4	Viral Testing	< 25%
5	Laboratory studies	< 25%
6	Readmission within 7 days	< 25%
7	Average Length of Stay (< 48 h)	> 75%
	Outpatients	
1	Antibiotics (without coded rationale)	< 25%
2	Radiographs (CXR or Lateral Neck)	< 25%
3	Single Dose Steroid	> 75%
4	Viral testing	< 25%
5	Laboratory studies	< 25%
6	Anti-tussive or decongestant	< 25%

Figure 3 Algorithm Croup



CROUP SCORE: Modified Westley	
Indicators of Disease Severity	Score
Inspiratory stridor	
None	0
Only with agitation or activity	1
At rest	2
Retractions	
None	0
Mild	1
Moderate	2
Severe	3
Air Entry	
Normal	0
Mildly decreased	1
Severely decrease	2
Cyanosis	
None	0
With agitation/activity	4
At rest	5
Level of Consciousness	
Normal	0
Altered	5
Possible Score	
< 4	0-17
4-6	Mild Croup
> 6	Moderate Croup
	Severe Croup

TREATMENT Croup Score ≥ 4	
Corticosteroids: Single dose only!	
Dexamethasone	
Dose PO, IM, IV:	0.15 – 0.6 mg/kg
Max Dose	10 mg
Onset of action:	6 hours
Duration of action:	24-72 h
Nebulized Epinephrine: Observe 3 h	
Racemic Epinephrine	
Dose: 0.05 ml/kg/dose of 2.25% in 2.5mL NS	
	0.25 ml (wt < 5 kg)
	0.5 mL (wt ≥ 5 kg)
Maximum Dose: 0.5 mL	
Frequency: every 20 min as indicated	
L-epinephrine	
Dose: 0.5 mL/kg/dose of 1:1000 in 2.5 mL NS	
Max dose: 5 mL	
Frequency: every 20 min as indicated	
Oxygen Supplemental oxygen for hypoxia	
Antipyretic for T > 38.3	
Acetaminophen	Dose = 15 mg/kg po q4
Ibuprofen	Dose = 10 mg/kg po q6*
Antibiotics Indicated only for bacterial tracheitis	

Additional Workup as Indicated
 Clinical Dehydration: BMP
 Concern Pneumonia : CXR
 Concern Epiglottitis: Lateral Neck XR
 Concern SBI? BC (> 0.5 ml)
 CBC + automated diff
 Respiratory Compromise: ABG

Indications for Specialty Consultation
 Any Concern for Invasive Disease, including:
 Aphonia
 Cyanosis
 Prolonged disease process
 Acute onset high fever
 Toxic appearance
 Increased WOB with retractions
 Symptoms > 7 days
 Severe stridor

Indications for Admission
 ≥ 3 Nebulized Epinephrine treatments in 3 h
 Stridor at rest despite therapy
 Continued symptoms 4 h post steroids
 Inadequate hydration
 Moderate – severe retractions
 Requires supplemental oxygen
 Condition deteriorates or does not improve
 Cyanosis
 Hypoxia
 Hypercarbia
 Aphonia – consider alternative diagnosis + start antibiotics

Strength of Evidence:

Admitting Orders

Date _____ Time _____ Weight _____ kg

- 1) Admit Inpatient Observation
- 2) Diagnosis CROUP
- 3) Condition Good Fair Serious
- 4) Nursing
 - VS T, BP on admission then per routine
 - Every 4 h
 - Other _____
 - I/O Strict
 - Routine
 - Other _____
 - Monitoring Continuous pulse oximetry
 - Spot check pulse oximetry every shift
 - Cardio Respiratory monitor
- 5) Isolation Precautions
 - Droplet
 - Other _____
- 6) Allergies
 - No known medication or food allergies
 - No known drug allergies
 - No known food allergies
 - _____
- 7) IV
 - None
 - _____ IVF at _____ cc/hr
 - _____ IV bolus; _____ cc over _____ hr(s)
- 8) Labs/Radiology None
- _____
- 9) Medications
 - Oxygen – NC or Blow-by for hypoxia
 - Racemic Epinephrine 0.25mL (< 5kg) for stridor at rest; alert physician *prior* to dose
 - Racemic Epinephrine; 0.5mL (> 5kg) for stridor at rest; alert physician *prior* to dose
 - Dexamethasone (0.15 - 0.6mg/kg) _____ PO (preferred), IV, IM *once (Max 10 mg)*
 - Tylenol (15mg/kg) _____ orally, every 4 h for fever/irritability
 - Ibuprofen (10mg/kg) _____ orally, every 6 h for fever/irritability
 - Other _____

PARENT EDUCATION MATERIALS

Management of Croup

<http://eames.thechildrenshospital.org:6300/psp/poprd/EMPLOYEE/EMPL/e/?url=http%3a%2f%2fhome.mdconsult.com%2fdas%2fpatient%2fview%2f64723655-2>

Tobacco Smoke: English

<http://planettch/patiented/Handouts/PDF/tobaccosmoke-eng-05.pdf>

Tobacco Smoke: Spanish

<http://planettch/patiented/Handouts/PDF/tobaccosmoke-sp-05.pdf>

Please note: Clinical care guidelines are designed to assist clinicians and patients make decisions about appropriate health care for specific clinical circumstances. These guidelines should not be considered inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the same results. The ultimate judgment regarding care of a particular patient must be made by the clinician in light of the individual circumstances presented by the patient and the needs and resources particular to the locality or institution.

GLOSSARY

Abbreviation	Definition
<	Less than
≤	Less Than or equal to
>	Greater than
≥	Greater than or equal to
=	Equals
%	Percent
&	And
ABG	Arterial blood gas
BP	Blood Pressure
BPD	Bronchopulmonary dysplasia
CBC	Complete Blood Count
CF	Cystic Fibrosis
CXR	Chest radiograph
D	Day
ED	Emergency Department Emergency Medical Services
EMS	(911)
FiO2	Fraction of Inspired Oxygen
h	Hour
HR	Heart Rate
HIB	<i>Haemophilus influenzae type b</i>
hMPV	Human metapneumo virus
I/O	Intake and Output
IV	Intra Venous
IM	Intramuscular
KG	Kilogram
Min	minute
Mg	Milligram
mL	milliliter
Mos	Month
NC	Nasal Cannula
PAH	Pulmonary Artery Hypertension
PCP	Primary Care Provider
PO	By mouth
q	every
RR	Respiratory Rate
RSV	Respiratory Syncytial Virus
SaO2	Oxygen Saturation
SBI	Serious Bacterial Illness
T	Temperature
TB	Tuberculosis
TDD	Total Daily Dose
UC	Urgent Care
VS	Vital Signs
XR	X-Ray
Yr	Year

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