# Emergency (ED) Acute Exacerbation of Asthma Pediatric Order Set

**Evidence-based, severity-guided support for managing acute asthma in children, with recommendations on aerosol delivery, pharmacologic therapy, oxygen use, non-invasive support, and environmental impact.**

## PATIENT INFORMATION

| | | | | |
|---|---|---|---|---|
| **Last Name (Legal)** | | **First Name (Legal)** | | |
| **Preferred Name Last First** | | **DOB (dd-mm-yyyy)** | | |
| **PHN** | **ULI Same as PHN** | | **MRN** | |
| **Administrative Gender** | **Male** | **Female** | **Non-binary** | **Prefer not to disclose** | **Unknown** |

## SEVERITY-BASED DECISION SUPPORT

### PRAM (2-17 yrs)

| Parameter | 0 points | 1 point | 2 points | 3 points |
|---|---|---|---|---|
| Suprasternal retractions | Absent | — | Present | — |
| Scalene muscle contraction | Absent | — | Present | — |
| Air entry | Normal | Decreased at bases | Widespread decreased | Minimal/absent |
| Wheezing | Absent | Expiratory only | Inspiratory + expiratory | Absent (silent chest) |
| $O_2$ saturation (%) | ≥ 95 | 92–94 | < 92 | — |

| MILD | MODERATE | SEVERE |
|---|---|---|
| 0-3 | 4-7 | 8-12 |

| Score: | | | |
|---|---|---|---|
| Assessed by *(print)* | Designation | Signature | Date/Time (dd/mm/yyyy hhmm) |

## MONITORING / LABS

| | | | | | |
|---|---|---|---|---|---|
| ☐ | Continuous $SpO_2$ | ☐ | CBC | ☐ | Extended Lytes – Ca, P, Mg |
| ☐ | Continuous HR | ☐ | Arterial Blood Gas | ☐ | Severity score assessment q__h |
| ☐ | Continuous BP (every 5-10 mins) | ☐ | Venous Blood Gas | ☐ | CXR (not generally recommended for Asthma) |

## ACUTE MANAGEMENT (first hour)

### PHARMACOLOGIC THERAPY - Bronchodilators

**MEDICATION DELIVERY OPTIONS**

| MILD | MODERATE and/or SEVERE *not requiring HFNO/NIV* | SEVERE *Requiring HFNO/ NIV* |
|---|---|---|
| ☐ Salbutamol **pMDI** 100mcg/puff with spacer ____ Puffs x3 PRN Shortness of breath<br><br>**Consider:**<br>☐ Ipratropium bromide **pMDI** 20mcg puffs x3<br><br>*- For patients unable to coordinate breaths or generate adequate inspiratory flow, VMN should be considered [3,4]*<br>*- pMDI should be delivered with a spacer to* | ☐ Salbutamol **pMDI** 100mcg/puff with spacer Puffs q20 min x3<br>PRN Shortness of breath<br><br>☐ Ipratropium **pMDI** 20mcg/puff with spacer Puffs x3<br><br>*- For patients unable to coordinate breaths or generate adequate inspiratory flow, VMN should be considered [3,4]*<br>*- pMDI should be delivered with a spacer to increase deposition* | ☐ Salbutamol **pMDI** 100mcg/puff with Spacer Puffs q20min x3<br>PRN Shortness of breath<br><br>☐ Ipratropium **pMDI** 20mcg /puff with spacer Puffs x3<br><br>*For patients on HFNO or NIV: [16]*<br>*- not recommended to disrupt oxygen delivery to deliver aerosol treatment*<br>*- concurrent aerosol treatment with mask/mouthpiece not recommended (in-line delivery recommended)*<br>*- adding flow to the circuit via JN is not recommended due to changes to FIO2 and nuisance alarms* |
| ☐ Salbutamol _____mg q20min PRN X3 via **VMN + Aerosol Reservoir**<br><br>**Consider:**<br>☐ Ipratropium Bromide via **VMN + Aerosol Reservoir**<br>☐ <20 kg: 0.25 mg<br>☐ ≥20 kg: 0.5 mg | ☐ Salbutamol q20min X3<br>via **VMN + Aerosol Reservoir**<br>☐ <20 kg: _____mg<br>☐ ≥20 kg: _____mg<br><br>☐ Ipratropium Bromide via **VMN + Aerosol Reservior**<br>☐ <20 kg: 0.25 mg<br>☐ ≥20 kg: 0.5 mg | ☐ Salbutamol via **VMN in-line** via HFNO or NIV __mg q20min PRN shortness of breath X3<br>☐ Ipratropium Bromide via **VMN in-line** via HFNO or NIV 0.5 mg Shortness of breath ×1<br><br>**Consider:**<br>☐ Continuous salbutamol via **VMN in-line** __mg/hr titrated to symptom management |
| ☐ Salbutamol via **JN** _____mg q20min x3 PRN<br><br>**Consider:**<br>☐ Ipratropium Bromide via JN<br>☐ <20 kg: 0.25 mg<br>☐ ≥20 kg: 0.5 mg<br><br>*JN may be inferior to VMN (clinical outcomes & deposition) and not superior to pMDI [4,7,8,9,10]*<br>*JN is not preferred in patients with respiratory infections due to infection control risk, pMDI & VMN are suitable alternative [20]* | ☐ Salbutamol via **JN** _____mg q20min x3 PRN<br><br>☐ Ipratropium Bromide via JN<br>☐ <20 kg: 0.25 mg<br>☐ ≥20 kg: 0.5 mg<br><br>*JN may be inferior to VMN (clinical outcomes & deposition) and not superior to pMDI [4,7,8,9,10]*<br>*JN is not preferred in patients with respiratory infections due to infection control risk, pMDI & VMN are suitable alternative [20]* | ☐ Salbutamol via **JN** _____mg q20min x3 PRN<br><br>☐ Ipratropium Bromide via JN<br>☐ <20 kg: 0.25 mg<br>☐ ≥20 kg: 0.5 mg<br><br>*For patients on HFNO or NIV: [25,6]*<br>*- not recommended to disrupt oxygen delivery to deliver aerosol treatment*<br>*- concurrent aerosol treatment with mask/mouthpiece not recommended (in-line delivery recommended)*<br>*- adding flow to the circuit via JN is not recommended due to changes to FIO2 and nuisance alarms* |

#### Infection Prevention

In patients with respiratory infections, it is preferred to use pMDI due to risk of secondary exposure. [33]

If nebulizer is needed due to patient inability to coordinate breaths, or lack of inspiratory flow, VMN with mouthpiece & filter or in-line with viral filter is preferred over JN to reduce the risk of secondary transmission. [33]

In patients receiving HFNO it is recommended to place a surgical mask over cannula to reduce the risk of transmission. [33]

#### Environmental Sustainability

VMN + Ultra: Enables continuous delivery in-line with HFNO/BiPAP; reusable; Less plastic waste than disposable jet nebulizers [6-10] [11,12]

pMDI + Spacer: Lower plastic waste and energy use vs disposable jet nebulizers; reusable spacers last months.

## Corticosteroids

| Route | Medication/dose | Select |
|---|---|---|
| Oral/IV | Dexamethasone | 0.6mg/kg (max 16mg) |
| IV | Hydrocortisone | 8mg/kg (Max 400mg) |
| Oral | Prednisons/Prednisolone | 1-2mg/kg (max 60mg) |
| IV | Methylprednisolone | 1-2mg/kg q6h (max 125mg) |

**Oral steroids are recommended if tolerated and for mild/moderate exacerbations as IV has never been shown to have benefit over oral*

## Adjuncts

| Route | Medication/dose | Select |
|---|---|---|
| IV | Magnesium sulfate | 25–75 mg/kg (max 2 g) over 20 min |
| IV | Epinephrine IM (1 mg/mL) | 0.01 mg/kg (max 0.5 mg) q20min ×3 |
| IV | Ketamine (infusion) *for refractory bronchospasm in ED/ICU setting* | ____0.5–1 mg/kg IV bolus (start), _____0.5–1 mg/kg/hr |

***Antibiotics are rarely indicated in the treatment of Acute Asthma Exacerbations [3]*

| Ordering Prescriber *(print)* | Designation | Signature | Date/Time (dd/mm/yyyy hhmm) |
|---|---|---|---|
| | | | |

## REASSESSMENT / MAINTENANCE (post 1-hour)

☐ **Rescore PRAM**

### PRAM (2-17 yrs)

| Parameter | 0 points | 1 point | 2 points | 3 points |
|---|---|---|---|---|
| Suprasternal retractions | Absent | — | Present | — |
| Scalene muscle contraction | Absent | — | Present | — |
| Air entry | Normal | Decreased at bases | Widespread decreased | Minimal/absent |
| Wheezing | Absent | Expiratory only | Inspiratory + expiratory | Absent (silent chest) |
| $O_2$ saturation (%) | ≥ 95 | 92–94 | < 92 | — |

| MILD | MODERATE | SEVERE |
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| Score: | | | |
|---|---|---|---|
| Assessed by *(print)* | Designation | Signature | Date/Time (dd/mm/yyyy hhmm) |
| | | | |

### Considerations

- Clinicians should assess patients at least hourly to guide ongoing symptom management.
- With improvement, increase salbutamol dosing interval progressively: q1h → q2h → maintenance regimen.
- Once control is achieved, resume home controller medications, ensuring the patient can coordinate breathing and device puff.

## PHARMACOLOGIC THERAPY (Continuation) - Bronchodilators

*(continued device selection should be based on clinical considerations from the acute table)*

| MEDICATION DELIVERY OPTIONS | MILD | MODERATE and/or SEVERE *not requiring HFNO/NIV* | SEVERE *Requiring HFNO/ NIV* |
|---|---|---|---|
| | **SCHEDULED DOSES** | | |
| | ☐ Salbutamol **pMDI** 100mcg/puff with spacer _____Puffs Q_____min/hr PRN Shortness of breath<br><br>**Consider:**<br>Ipratropium bromide **pMDI** 20mcg/puff ____puffs q6h | ☐ Salbutamol **pMDI** 100mcg/puff with spacer ___Puffs Q_____min/hr PRN Shortness of breath<br><br>☐ Ipratropium **pMDI** 20mcg/puff with spacer _____Puffs q6h<br>☐ | ☐ Salbutamol **pMDI** 100mcg/puff with Spacer _____Puffs Q_____min/hr PRN Shortness of breath<br><br>☐ Ipratropium **pMDI** 20mcg/puff with spacer _Puffs q6h |
| | ☐ Salbutamol _____mg Q_____min/hr PRN via **VMN + Aerosol Reservoir**<br><br>**Consider:**<br>☐ Ipratropium Bromide 0.5 mg Q6h via **VMN + Aerosol Reservoir** | ☐ Salbutamol via **VMN + Aerosol Reservoir** ___mg Q_____min/hr PRN Shortness of breath<br><br>☐ Ipratropium Bromide via **VMN + Aerosol Reservoir** 0.5 mg Shortness of breath q6h | ☐ Salbutamol via **VMN in-line** via HFNO or NIV _____mg Q_____min/hr PRN shortness of breath x3<br><br>☐ Ipratropium Bromide via **VMN in-line** via HFNO or NIV 0.5 mg Shortness of breath q6h |
| | ☐ Salbutamol _____mg Q_____min/hr PRN X3 via **JN**<br><br>**Consider:**<br>☐ Ipratropium Bromide 0.5 mg q6h via **JN** | ☐ Salbutamol _____mg Q_____min/hr PRN X3 via **JN**<br><br>☐ Ipratropium Bromide 0.5mg q6h via **JN** | Salbutamol via **JN** _____mg q20min x3 PRN Shortness of breath<br><br>Ipratropium Bromide via **JN** 0.5 mg x 3 Shortness of breath |

| Ordering Prescriber *(print)* | Designation | Signature | Date/Time (dd/mm/yyyy hhmm) |
|---|---|---|---|
| | | | |

## RESPIRATORY SUPPORT / SUPPLEMENTAL OXYGEN

☐ Target $SpO_2$ ≥ 94%

☐ Room Air

☐ Nasal Cannula _____L/min

☐ HFNC: L/min (Peds: 1.5–2 L/kg/min; Adults: 30–60 L/min)

- Inline Aerogen Ultra VMN for bronchodilator delivery

☐ NIV/BiPAP: IPAP _____/ EPAP _____

- Inline Aerogen Ultra VMN via T-piece or mask adapter

### Considerations

**HFNO with Cannula (Moderate)**

- In-line with Fisher&Paykel Airvo2 or 3 in combination with the Airvo Neb humidifier adaptor
- In-line with the Vapotherm HVT 2.0 Aerosol Adapter
- If High-flow Nasal Oxygen is being delivered via standalone humidification Aerogen should be on the Dry side of the humidifier at the inlet
- Higher delivery occurs when the patient's inspiratory flow is matched to or greater than flow from the HFNO device (consider reducing the flow of the high flow device)

**Optimal Placement for NIV (Severe)**

- Single Limb Circuit: Between a non-vented mask and the patient side of the leak port (non-vented masks not recommended).
- Dual Limb Circuit: Optimal position would 15cm back from the Wye at the inspiratory limb or between the Wye and the patient, and pre-humidifier

**Reassessment**

- Response to NIV should be monitored at least hourly
- Follow institutional guidelines for need of escalation

## DISPOSITION

☐ Discharge if PRAM ≤ 3 ×2, stable on room air, and education complete.
☐ Admit to Ward
☐ Admit to ICU

## DEFINITIONS

| | |
|---|---|
| pMDI | Pressurized Metered Dose Inhaler |
| VMN | Aerogen Solo Vibrating Mesh Nebulizer |
| Ultra | Aerogen Ultra Aerosol Reservoir with aerosol mask or valved mouthpiece |
| HFNO | High-Flow Nasal Oxygen |
| NIV | Non-Invasive Ventilation |
| DECAF | Dyspnea, Eosinopenia, Consolidation on chest x-ray, Acidemia (pH<7.3), Atrial fibrillation |
| BiPAP | Bilevel Positive Airway Pressure |
| EPAP | Expiratory Positive Airway Pressure |
| FiO2 | Fraction of inspired Oxygen |

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