Asthma Clinical Pathways: Emergency Department & Inpatient

Kristin Welch, MD
Eric Hoppa, MD
Christina Giudice, APRN
Alex Hogan, MD
Anand Sekaran, MD
What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.
Objectives of Pathway

- To standardize management of patients presenting with asthma exacerbation
- To ensure safe transfer of patients from the Emergency Department to Inpatient Unit
- To ensure all patients are discharged with a completed asthma home treatment plan
- To ensure that all eligible patients are started on a daily inhaled corticosteroid
Why is Pathway Necessary?

- In the US, asthma affects 7 million children under 18 years\(^1\).
- In 2010, 58.3% of children with asthma had at least one asthma attack in the previous twelve months\(^2\).
- Nearly 20% of children diagnosed with asthma went to an ED for care in 2009\(^3\).
- Asthma is the third ranking cause of hospitalization for children and one of the leading causes of school absenteeism, approximately 12.8 million school days\(^4\).
- Less than half of all children with asthma have an asthma action plan\(^1\).
- Clinical pathways for asthma can decrease LOS, costs, and unnecessary antibiotic use without increasing rates of readmissions, leading to higher value care\(^5\).
Modified Pulmonary Index Score

- Drives both ED and Inpatient asthma management
- Validated score, including subjective and objective components
- Highly reproducible among different groups of healthcare professionals: physicians, nurses, and respiratory therapists
- MPIS positively correlates with ICU admission, days of continuous albuterol therapy, days of supplemental oxygen, and LOS, with MPIS ≥12 being more highly correlated with ICU admission
# Modified Pulmonary Index Score

<table>
<thead>
<tr>
<th>$O_2$ Saturation (RA)</th>
<th>Accessory Muscle Use</th>
<th>I:E Ratio</th>
<th>Wheezing</th>
<th>Heart Rate</th>
<th>Respiratory Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>Score</td>
<td>Score</td>
<td>Score</td>
<td>&lt;3 yr old</td>
<td>&gt;3 yr old</td>
</tr>
<tr>
<td>&gt;95%</td>
<td>0</td>
<td>None</td>
<td>2:1</td>
<td>0</td>
<td>&lt;120</td>
</tr>
<tr>
<td>93-95%</td>
<td>1</td>
<td>Mild</td>
<td>1:1</td>
<td>1</td>
<td>121-140</td>
</tr>
<tr>
<td>90-92%</td>
<td>2</td>
<td>Moderate</td>
<td>1:2</td>
<td>2</td>
<td>141-160</td>
</tr>
<tr>
<td>&lt;90%</td>
<td>3</td>
<td>Severe</td>
<td>1:3</td>
<td>3</td>
<td>&gt;160</td>
</tr>
</tbody>
</table>
This is the Emergency Department Asthma Clinical Pathway.

We will be reviewing each component in the following slides.
Patients who have a primary diagnosis other than asthma (such as bronchiolitis or pneumonia) are excluded from this pathway.

Inclusion Criteria: ≥1 yrs old, previous diagnosis of asthma or ≥2 previous episodes of wheezing, MPIS ≥5

Exclusion Criteria: <1 yrs old, bronchiolitis or pneumonia as primary diagnosis, chronic cardiac or lung disease other than asthma
• Every patient in the ED should receive systemic steroids, either PO or IM if not tolerating PO

• Dexamethasone may be preferable given can prescribe a single dose lasting 24h. This may be helpful for patient medication adherence and also for toddlers who have difficulty taking PO meds

**Oral Corticosteroids require at least 4 hours to show clinical improvement**

**Systemic corticosteroids should be administered to the patient within 1 hour of presentation**

**Initial Assessment (MPIS ≥5)**

Dexamethasone 0.6 mg/kg (max 16 mg) PO/IM

(Can substitute with prednisolone/prednisone/methylprednisolone 2 mg/kg at initial provider’s discretion. Can omit if already on oral steroids.)
• **MPIS ≤6**: after administration of Albuterol, patients may be discharged from the ED with follow up arranged.
• **MPIS ≥7**: Duoneb (Albuterol 5mg/Ipratropium 500mcg) should be administered
  - After treatment if MPIS ≥7, should get hour-long treatment of Albuterol (weight-based)
  - After treatment, if MPIS ≤6 may get albuterol and may be discharged from ED with follow up arranged
After receiving Duoneb and hour-long Albuterol treatment, disposition is stratified by MPIS

- **MPIS ≤6**: observed and reassessed, may be safely discharged from ED

**Discharge Criteria and Instructions:**
- MDI/spacer teach
- F/u with PCP in 2-3 days
- Medications: Albuterol q4hr
  *Consider Prednisolone/Prednisone* for patients that might benefit from longer steroids. Start 24 hours after Dexamethasone dose.
- **MPIS 7-12:** will require admission to MS Unit, to either PHM or Pulmonary
  - **MPIS 7-8:**
    - Intermittent Albuterol q2h for transfer, consider PIV
  - **MPIS 9-10:**
    - Continuous Albuterol for transfer, consider PIV
  - **MPIS 11-12:**
    - Continuous Albuterol for transfer, PIV recommended

- Patients with MPIS scores ≥9 are recommended to be placed on **continuous albuterol** to avoid missing intermittent dosing during time of transfer

- If MPIS worsens to ≥13, these patients are considered more severely ill and should be stabilized and consider assessment by PICU team prior to transfer to MS unit
If MPIS worsens to ≥13, these patients are considered more severely ill and should be stabilized and consider assessment by PICU team prior to transfer to MS unit.

Patients with an MPIS ≥12 have a 78% probability of being admitted to the PICU.
This is the Inpatient Asthma Clinical Pathway.

We will be reviewing each component in the following slides.
• Patients who have a primary diagnosis other than asthma (such as bronchiolitis or pneumonia) are excluded from this pathway

Inclusion Criteria: ≥1 yrs old, inadequate response to ED asthma treatment (see ED Asthma Pathway)

Exclude Criteria: <1yr old, primary diagnosis of bronchiolitis or pneumonia, active cardiac disease
The following tests and treatments are NOT routinely indicated for the treatment of asthma:

- Ipratropium bromide should not be administered after 24 hours of hospitalization\(^7,8\)
- Chest x-rays (features typically associated with positive chest x-ray findings include fever, no family history of asthma, and localized lung exam findings)\(^7\)
- Antibiotics (unless diagnosed with a bacterial infection)\(^7,8,9\)
• All inpatients will require additional dosing of systemic steroids. There are 2 options, including prednisolone/prednisone or dexamethasone.
  
  • Dexamethasone may be preferable given can prescribe a single additional dose 24h after initial dose in ED. This may be helpful for patient medication adherence and also for toddlers who have difficulty taking PO meds.

• If patient did not have PIV placed in ED and appears dehydrated, consider PIV and initiation of IVFs.

Dexamethasone is not inferior to Prednisone/Prednisolone, comes with other added benefits.\textsuperscript{10,11}
• Use the Asthma-Specific H&P to document asthma severity and control

• Consider ordering medications for bedside delivery on admission

Using EMR reminders of control questions can improve accuracy of asthma severity and control assessment¹²

Medication adherence is one of the most important factors for asthma control, but refill rates for patients with asthma are low.⁷,¹³
**Asthma-Specific H&P**

**HISTORY OF PRESENT ILLNESS**

***

**Current Impairment**
- Patient reports:
  - Daytime symptoms: [Day Symptoms: 21826]
  - Night-time awakening: [Nighttime Symptoms: 21826]
  - Limitation with normal activity: [Limitations: 21826]
  - Albuterol use: [Albuterol Use: 21826]
  - Asthma triggers: [Triggers: 21826]

**Asthma Related Utilization**
- Patient reports:
  - Oral systemic corticosteroids use: [0-5: 140013] times per year.
  - Urgent care/emergency department visit due to asthma in last year: [0-10: 33138]
  - Lifetime hospitalizations for asthma related illness: [0-10: 5044]
  - Lifetime ICU admissions for asthma related illness: [0-10: 5044]
  - Patient [HAS/HAS NOT: 20164] required intubation due to asthma related illness.

**Asthma Plan adherence**
- Patient reports:
  - Using a spacer with MDIs: [yes/no: 23206]
  - Does patient follow well/sick plan > 80% of time: [yes/no: 23206]
  - Last refill of albuterol: [***]
  - Last refill of controller medication: [***]

**Asthma Severity**
- Based on the information provided, **Thomas J Harris** current asthma severity is [asthma severity: 21826]

**Asthma Control**
- Based on the refill of controller medication, **Thomas J Harris** asthma control is [asthma control: 21826]
• Care is stratified across MPIS scores
  • Phase 1: Continuous Albuterol
  • Phase 2: Intermittent Albuterol q2h
  • Phase 3: Intermittent Albuterol q4h
**Albuterol Wean Protocol**

- Wean is directed by Respiratory Therapists
- This allows for prompt weaning of albuterol based on both subjective and objective data
- Protocol is MPIS-driven

**ALBUTEROL WEAN PROTOCOL:**

- RT’s wean Albuterol according to this MPIS-driven protocol
- Wean when two consecutive scores are in appropriate range
- RT’s inform MD/APRN/PA of ALL changes in Albuterol dosing
- Any escalation in care requires an exam by MD/APRN/PA at bedside
- MD/APRN/PA can authorize variance from protocol
If MPIS ≥ 11, Initiate Phase 1

- Continuous albuterol
  - If not tolerating oral steroid, give Methylprednisolone IV
- CR monitor w/continuous pulse oximetry
- Vital signs ≥ q4hr, MPIS q2h
- Initiate Asthma Education
Improvement after Phase 1 (Two consecutive scores in appropriate range)

- Initiate Phase 2 and follow pathway
• Children with an MPIS score ≥13 are considered to be quite ill and may require escalation of care

• Options for escalating care:
  • Increasing Albuterol dosing
  • Adding IV Magnesium Sulfate
  • MET Activation/PICU Consult
  • PICU transfer

If MPIS ≥ 13

- Increase Albuterol to 20 mg/hr if on 10 mg/hr
- Notify attending
- Obtain PICU consult
- Consider Mg sulfate

If improvement?

- Yes
  - Continue care
  - Reassess

- No
  - Consider transfer to PICU

Patients with an MPIS ≥ 12 have a 78% probability of being admitted to the PICU.
MPIS 7-10: Initiate Phase 2

- Intermittent Albuterol treatments q2h
- Using an MDI w/ spacer is preferable as this is likely what patients will be using at home.
- Each albuterol treatment should be used as a teaching opportunity for asthma education and proper MDI technique.
- Start Inhaled Corticosteroids based on Chronic Severity (see appendices)
- Discontinue CR monitor
- Discontinue O2 when RA sat >92%
- Intermittent pulse ox once off O2
- Home treatment plan (including controller ICS therapies) should be resumed
MPIS ≤6: Initiate Phase 3

- Intermittent Albuterol treatments q4h
- MDI w/ spacer is preferable
- If patients are able to tolerate 2x q4h albuterol treatments they can be discharged as this is the regimen that is maintainable by parents at home
- Start Inhaled Corticosteroids based on Chronic Severity, if not yet done
- See Appendix for guidelines for recommendations on controller therapy
- Consider ordering medications for bedside delivery
- Complete Asthma Education
- Supply nebulizer or spacer if needed

Medication adherence is one of the most important factors for asthma control, but refill rates for patients with asthma are low.

7,13
• Patients must meet all criteria prior to being discharged
• Asthma Treatment Plan should be completed and reviewed with family prior to discharge
• Patients should have a total of 3-5 day course of steroids
  • For mild to moderate asthma exacerbations, consider giving a second dose of dexamethasone prior to discharge to complete steroid course – benefits include increased compliance and tolerance
  • For moderate to severe exacerbations, consider ordering oral steroids
• Patients should be screened for the influenza vaccination prior to discharge and administered when appropriate

Discharge Criteria:
- Off supplemental oxygen, MPIS ≤ 5 on q4hr albuterol, hydrated without need for IVFs, asthma home management plan of care complete, asthma education complete and family given copy, appropriate follow up in place

Discharge Medications (to be outlined in Asthma Action Plan):
- Albuterol MDI with spacer: 4 puffs (or 2.5mg via neb) q4hr while awake
- Total oral steroid x3-5 days (prednisone/prednisolone vs 2nd dose of dexamethasone)
- Controller therapy (Appendix C, Appendix D), based on chronic severity (Appendix A, Appendix B)
- Dexamethasone is not inferior to Prednisone/ Prednisolone for mild to moderate exacerbations, comes with other added benefits\textsuperscript{10,11}
- During flu season children >6 months admitted for asthma exacerbation should have their flu vaccination status documented, and should have vaccine offered\textsuperscript{8}
Asthma Action Plan - English

Warning: This patient’s asthma action plan has not been signed!

Asthma Action Plan

Asthma severity:
- intermittent
- mild persistent
- moderate persistent
- severe persistent
- exercise induced bronchospasm

Asthma triggers:
- animal dander
- dust mites
- cockroaches
- indoor mold
- pollen
- cold air
- outdoor mold
- tobacco smoke
- smoke, odors, and sprays
- vacuum cleaning
- exercise
- respiratory infection

Green Zone

Daily Treatment Plan: Have the child take these medicines every day even when the child feels well

<table>
<thead>
<tr>
<th>Inhaled Medication</th>
<th>Inhaled Medication Dose</th>
<th>Inhaled Medication Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Medication</td>
<td>Other Medication Dose</td>
<td>Other Medication Frequency</td>
</tr>
<tr>
<td>Pre-Exercise Medication</td>
<td>Pre-Exercise Medication Dose</td>
<td>Pre-Exercise Medication Frequency</td>
</tr>
</tbody>
</table>
Asthma Action Plan - Spanish
Appendix A: Assessing Asthma Severity and Treatment Recommendations

- Providers may use this tool in conjunction with the Asthma-Specific H&P to determine appropriate stepwise treatment plan

1. Determine asthma control based on standardized questions (which should be documented in the Asthma-Specific H&P)
2. Classify asthma severity
3. Determine appropriate treatment
4. Consult as needed
National Heart, Lung, and Blood Institute’s National Asthma Education and Prevention Program

- Evaluates chronic asthma status, degree of control
- Identifies appropriate asthma treatments for Home Management Plan of Care
- Treatments levels if the patient requires a step up or step down in therapy
- Goals: Reduce impairment and reduce risk

Appendix B: Classifying Severity for Initial Visit

- Establishes asthma severity: intermittent or persistent (mild, moderate, severe) and which step to start patient
Appendix C: Stepwise Approach for Managing Asthma Long-Term

- Therapy is stratified by age and severity
- Assess level of severity (appendix A) and level of control in order to determine whether therapy needs to be stepped up
Appendix D: Estimated Comparative Daily Dosages of Inhaled Corticosteroids For Long-Term Asthma Control

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th>0-4 years of age</th>
<th>5-11 years of age</th>
<th>≥12 years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Budesonide MDI</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>40 mg/puff</td>
<td>1 puff 2x/day</td>
<td>3-4 puffs 2x/day</td>
<td>1 puff 2x/day</td>
</tr>
<tr>
<td>80 mg/puff</td>
<td>1 puff 2x/day</td>
<td>2 puffs 2x/day</td>
<td>3 puffs 2x/day</td>
</tr>
<tr>
<td>Budesonide DPI</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>90 mcg/ inhalation</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>180 mcg/ inhalation</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fluticasone FLO</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1 mg/puff</td>
<td>1-2 puffs 1x/day</td>
<td>0.5-1 mcg/2x/day</td>
<td>1.5-2 mcg/1x/day</td>
</tr>
<tr>
<td>2 mg/puff</td>
<td>1-2 puffs 2x/day</td>
<td>1-2 mcg/3x/day</td>
<td>2-3 mcg/2x/day</td>
</tr>
</tbody>
</table>

*This chart indicates an estimated daily dose based on age and severity of asthma control.

**This chart is intended for clinical reference only and should not be used as a primary source of information.**
Review of Key Points

• Patients with a primary diagnosis of pneumonia or bronchiolitis are excluded from these pathways

• Using the Asthma-Specific H&P on admission in conjunction with Appendix A allows the admitting provider to determine the discharge medication plan on admission

• Respiratory Therapists may independently wean albuterol according to this MPIS-driven protocol. MD/APRN/PA is informed of ALL changes in Albuterol dosing, is required to complete a bedside exam if there is any escalation in care, and can authorize variance from protocol
Review of Key Points

- Inhaled Corticosteroids based on Chronic Severity should be initiated in Phase 2/3 of Inpatient pathway, using the answers in the Asthma Specific H&P and recommendations in Appendix A.
- Every child should be screened for flu vaccine (when appropriate) and given an Asthma Action Plan prior to discharge.
- Patients should be prescribed (when appropriate) an inhaled corticosteroid based on recommendations from National Asthma Education and Prevention Program (guidelines in appendix of pathway).
Use of Order Set

You can choose to either “Admit to Inpatient” or “Place Patient in Observation”. If there are questions on which order is appropriate, please consult your Case Manager.

Note: “Initiate Clinical Pathway: Asthma” is pre-selected. This allows for Quality Metric tracking.
Each phase of the Inpatient Asthma Pathway is listed as an option, based on the MPIS score and, for Phase 1, weight.
Use of Order Set

All medications mentioned on the Inpatient Asthma pathway/algorithm are listed as an option in the order set. Note that all dosing recommendations are easily visible upon selection.

Within each phase, there are suggested orders including some that are pre-checked as they are the standard of care, and others which are not because they are not routinely recommended (for example, X-rays)
Orders for Respiratory Therapists including Initiating Albuterol Wean Protocol and Asthma Education, are pre-checked so that RTs may wean albuterol and family teaching can begin as soon as possible after admission.
Quality Metrics

ED
- Percentage of eligible patients treated per pathway
- Percentage of patients treated for asthma in the ED who are admitted as inpatient or placed in observation status
- Average time from arrival to administration of systemic steroids
- Mean length of stay for patients discharged from the ED (hours)
- Number of transfers to the Pediatric Intensive Care Unit within 12 hours of admission
- Returns to the ED (treat and release) within 48 hours with asthma diagnosis
- Returns to the ED (treat and release) within 7 days with asthma diagnosis

INPATIENT
- % Patients with pathway order set
- % Patients > 5 years old discharged with a prescription for controller medication
- % Patients who were given complete Asthma Action Plan at discharge
- ALOS (days)
- Readmission within 7 days (same diagnosis)
- Readmission within 30 days (same diagnosis)
References

Pathway Contacts

- Kristin Welch, MD, Emergency Medicine
  - kwelch@connecticutchildrens.org
- Eric Hoppa, MD, Emergency Medicine
  - ehoppa@connecticutchildrens.org
- Christina Giudice, APRN, Pediatric Hospital Medicine
  - cgiudice@connecticutchildrens.org
- Alex Hogan, MD, Pediatric Hospital Medicine
  - ahogan@connecticutchildrens.org
- Anand Sekaran, MD, Pediatric Hospital Medicine
  - asekaran@connecticutchildrens.org
Thank You!

About Connecticut Children’s Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgement.

This Educational Module was edited by:
Christina Giudice, APRN
Educational Module Specialist