Steroid Storms: Controversies and Considerations in PEM

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Objectives

• Develop an understanding of the evidence for the use for or against steroids in common, reasonably common, and/or high-risk clinical conditions within pediatric emergency medicine
OUTLINE

• asthma
• bronchiolitis
• croup
• anaphylaxis
• pharyngitis
• meningitis
• hsp
• cautionary tales
• crystallize
ABCs

- asthma
- bronchiolitis
- croup
ABCs

- **asthma?**
- bronchiolitis
- croup
ABCs

• asthma **YES**
• bronchiolitis
• croup
ABCs

- asthma **YES**
- *dex* vs methylprednisolone?
- 1 dose vs 3 vs 5?
- inhaled corticosteroids (ICS)?
ASTHMA: Where does the evidence lead us?

• National Heart, Lung, Blood Institute of NIH guidelines last updated in 2007
  • prednisone PO 1-2 mg/kg/day (max 60 mg/day)

• What about Dexamethasone?
Dexamethasone for Acute Asthma Exacerbations in Children: A Meta-analysis

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KEY WORDS
dexamethasone, prednisone, prednisolone, asthma, status asthmaticus

ABBREVIATIONS
CI—confidence interval

abstract

BACKGROUND AND OBJECTIVE: Dexamethasone has been proposed as an equivalent therapy to prednisone/prednisolone for acute asthma exacerbations in pediatric patients. Although multiple small trials exist, clear consensus data are lacking. This systematic review and meta-analysis aimed to determine whether intramuscular or oral dexamethasone is equivalent or superior to a 5-day course of oral prednisone or prednisolone. The primary outcome of interest was return visits or hospital readmissions.
DEX: Where does the evidence lead us?

- comparable efficacy between 1-2 dose dex and 3-5 doses oral pred
- no difference in return visits or readmissions
- less vomiting
- improved compliance

3 vs 5: Where does the evidence lead us?

A 5- versus 3-day course of oral corticosteroids for children with asthma exacerbations who are not hospitalised: a randomised controlled trial.

ICS: Where does the evidence lead us?

AUTHORS’ CONCLUSIONS: ICS therapy reduces hospital admissions in patients with acute asthma who are not treated with oral or intravenous corticosteroids. They may also reduce admissions when they are used in addition to systemic corticosteroids; however, the most recent evidence is conflicting. There is insufficient evidence that ICS therapy results in clinically important changes in pulmonary function or clinical scores when used in acute asthma in addition to systemic corticosteroids. Also, there is insufficient evidence that ICS therapy can be used in place of systemic corticosteroid therapy when treating acute asthma. Further research is needed to clarify the most appropriate drug dosage and delivery device, and to define which patients are most likely to benefit from ICS therapy. Use of similar measures and reporting methods of lung function, and a common, validated, clinical score would be helpful in future versions of this meta-analysis.


ABCs

- asthma
- bronchiolitis?
- croup
ABCs

• asthma
• bronchiolitis NO
• croup
Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis

Abstract

This guideline is a revision of the clinical practice guideline, “Diagnosis and Management of Bronchiolitis,” published by the American Academy of Pediatrics in 2006. The guideline applies to children from 1 through 23 months of age. Other exclusions are noted. Each key action statement indicates level of evidence, benefit-harm relationship, and level of recommendation. Key action statements are as follows: Pediatrics 2014;134:e1474–e1502.
BRONCHIOLITIS: Where does the evidence lead us?

**CORTICOSTEROIDS**

**Key Action Statement 5**

Clinicians should not administer systemic corticosteroids to infants with a diagnosis of bronchiolitis in any setting (Evidence Quality: A; Recommendation Strength: Strong Recommendation).

**Action Statement Profile KAS 5**

<table>
<thead>
<tr>
<th>Aggregate evidence quality</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>No clinical benefit, avoiding adverse effects</td>
</tr>
<tr>
<td>Risk, harm, cost assessment</td>
<td>None</td>
</tr>
<tr>
<td>Benefit-harm assessment</td>
<td>Benefits outweigh harms</td>
</tr>
<tr>
<td>Value judgments</td>
<td>None</td>
</tr>
<tr>
<td>Intentional vagueness</td>
<td>None</td>
</tr>
<tr>
<td>Role of patient preferences</td>
<td>None</td>
</tr>
<tr>
<td>Exclusions</td>
<td>None</td>
</tr>
<tr>
<td>Strength</td>
<td>Strong recommendation</td>
</tr>
<tr>
<td>Differences of opinion</td>
<td>None</td>
</tr>
</tbody>
</table>
BRONCHIOLITIS: Where does the evidence lead us?

Participant exclusion criteria

1. Asthma or any previous episode of wheezing treated with bronchodilators
2. Chronic cardiopulmonary disease
3. Presence of varicella or recent close contact
4. Severe respiratory distress
5. Recent treatment with oral or inhaled steroids
6. Insurmountable language barrier
7. Any child born at less than 37 weeks gestation who is less than 6 weeks corrected age
ABCs

- asthma
- bronchiolitis
- croup?
ABCs

- asthma
- bronchiolitis
- croup?
  - mild?
  - moderate?
  - severe?
<table>
<thead>
<tr>
<th>Level of Severity</th>
<th>Characteristics</th>
<th>Westley Croup Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Occasional barking cough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None - limited stridor at rest</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>None to mild suprasternal and/or intercostal indrawing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(retractions of the skin of the chest wall)</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Frequent barking cough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Easily audible stridor at rest</td>
<td>3-5</td>
</tr>
<tr>
<td></td>
<td>Suprasternal and sternal wall retraction at rest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Little to no distress or agitation</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>Frequent barking cough</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prominent inspiratory and occasionally expiratory stridor</td>
<td>6-11</td>
</tr>
<tr>
<td></td>
<td>Marked sternal wall retractions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significant distress and agitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barking cough (often non prominent)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audible stridor at rest (occasionally hard to hear)</td>
<td></td>
</tr>
<tr>
<td>Impending</td>
<td>Sternal wall retractions (may not be marked)</td>
<td>12-17</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Lethargy or decreased level of consciousness</td>
<td></td>
</tr>
<tr>
<td>Failure</td>
<td>Often dusky complexion without supplemental oxygen</td>
<td></td>
</tr>
</tbody>
</table>

*Adapted from Bjornson 2005.*
MILD CROUP: Where does the evidence lead us?

A randomized trial of a single dose of oral dexamethasone for mild croup.


Severe croup included in a randomized clinical trial, corticosteroid treatment reduced admission rates by half compared with placebo (35% v. 67%, p < 0.001). A randomized placebo-controlled trial included 720 children with mild croup seen in an emergency department and showed that corticosteroid treatment reduced return medical visits by half (7% v. 15%, p < 0.001), resulted in less stress and loss of sleep by parents, and reduced overall health care costs. Whereas corticosteroids appear to start reducing
ABCs

• HOW MUCH?
  • low-dose (0.15 mg/kg) vs high (0.6 mg/kg)
• HOW?
  • PO vs NEB vs IM
• WHICH?
  • dex vs pred
CROUP: Low-dose vs high-dose dex

- low-dose as efficacious as high-dose
  - symptoms scores and return visits
- fewer side effects

CROUP: route

• equivalence between routes
• oral preferred


CROUP: dex vs pred

- Fifoot AA, Ting JY
  - RDBPCT 2007
    - single dose oral prednisolone (1 mg/kg) as efficacious as single dose low-dose dex (0.15 mg/kg)
- Sparrow A, Geelhoed G
  - RDB controlled equivalence trial 2006
    - single pred less effective than single dose dex in reducing unscheduled repeat visits mild-moderate croup
- Garrbutt et al 2013
  - pred 2 mg/kg/d x 3 days vs dex 0.6 mg/kg (+2 placebo)
  - no differences (unscheduled visit, duration, disturbed sleep)
CASE 1

- 4 year old F BIBEMS with drooling, urticaria, wheeze, vomiting and hypotension.
- Epi
- Would you give steroids?
- I would
CASE 2

- 3 yo F BIBEMS with urticaria and drooling
- Steroids?
ANAPHYLAXIS: where does the evidence lead us?

- Lewis et al
  - no statistical difference in the corticosteroid treated groups re uniphasic vs biphasic reactions
- Lee et al
  - no evidence to support corticosteroid use to decrease biphasic reactions
- 2012 Cochrane review
  - lack of adequate randomized controlled trials (1956-2011)
  - unable to make any recommendations for the use of glucocorticoids in anaphylaxis
- Gruneau et al
  - no difference in bounce back within 7 days or biphasic
CASE 3

- 13 yo GAS+ on day 1 Amoxicillin, NSAID RTC
- ED visit for inability to take PO due to pain
- No drooling
- No trismus
- Kissing tonsils, exudative, no asymmetry
- Steroids?
PHARYNGITIS: where does the evidence lead us?

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Design</th>
<th>Number of Patients</th>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
</table>
| Roy et al³⁶        | RCT          | 40                 | Oral dexamethasone vs placebo                      | • Statistically significant decrease in pain scores at 12 hr for the dexamethasone group.  
|                    |              |                    |                                                   | • No significant reduction in pain at 24 hr, 48 hr, 72 hr, or 7 days.       |
|                    |              |                    |                                                   | • Frequency of hospitalization, return visits, and time to return to normal activities was similar between groups. |
| Olympia et al³⁹    | RCT, double-blind | 150               | Oral dexamethasone vs placebo                      | • In Streptococcus-positive patients, a significant difference was observed in the time to pain relief, the total time with sore throat. |
| Nilan et al³⁵      |               |                    |                                                   |                                                                          |
| Wei et al²⁵        | Systematic review | 743               | Oral dexamethasone vs oral prednisone vs IM dexamethasone vs placebo | • All corticosteroids increased the likelihood of complete pain resolution at 24 hr by 3 times and nearly 2 times at 48 hr. |
CASE 4

- 6 month immunized infant with fever
- bulging fontanelle, vomiting, paradoxical irritability
- WBC 25, CRP 7
- LP results pending
- steroids?
MENINGITIS: where does the evidence lead us?

- AAP and IDSA
- IF BACTERIAL and > 6 weeks
  - dex 0.15 mg/kg IV every 6 hours
  - best before antibiotics
  - at least concurrent
CASE 5

• 4 yo M dx with HSP by pcp 2 days ago
• unable to ambulate
• intermittent severe abdominal pain
• tea colored urine
• steroids?
• for which indication?
HSP: where does the evidence lead us?

- Weiss et al 2007
  - 15 articles
- Cochrane Review 2009
  - 10 studies
- Conflicting evidence
- KDIGO
  - YES, if nephritis
  - NO for prevention
CAUTIONARY TALES?

• cerebral thrombosis
• gi bleeding
• growth restriction
• bacterial tracheitis
• behavioral changes

CAUTIONARY TALES?
SUMMARY

• asthma
• bronchiolitis
• croup
• anaphylaxis
• pharyngitis
• meningitis
• hsp
SUMMARY

YES
asthma
croup

CONSIDER
anaphylaxis
pharyngitis
meningitis
hsp

NO
bronchiolitis
Corticosteroid Use in Management of Pediatric Emergency Conditions

March 2018
Volume 15, Number 3

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References

References