Update on acute asthma: There must be more than just oral corticosteroids!

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Faculty/Presenter Disclosure

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Relationships with commercial interests:

- **Grants/Research Support:** Merck (CAEP Hypoglycemia Study PI), CEMPRA (clinical trial site), MedImmune (clinical trial site) - funds paid to CAEP and University of Alberta.

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- **Consulting Fees:** None.

- **Other:** Employee of the University of Alberta and AHS.

*Note:* all honoraria received by Dr. Rowe are fully donated to the Emergency Medicine Research Group (EMeRG), Department of Emergency Medicine, University of Alberta.
Mitigating Potential Bias

Potential biases are acknowledged and are mitigated by presenting data as follows:

- I do not focus on any specific drug products, have developed the slides myself, and the presentations provide an unbiased overview of all relevant tropics.

- Information presented is evidence-based;

- Recommendations made are supported by evidence or Global Initiative on Asthma (GINA).
Outline

• Diagnosing asthma and “mimics”
• Severity assessment.
• The evidence in asthma guidelines:
  – In-ED management;
  – Post-ED management?
• Predictors of relapse.
• Summary/Take home.
Pathophysiology - Asthma

• Definition: relapsing chronic disease characterized by symptoms of dyspnea.

• Pathophysiology:
  – Primary: Airway inflammation (heterogeneity);
  – Secondary: broncho-constriction (most symptoms);
  – Long-term: may produce inflammatory scarring and fixed obstruction.

• Summary: treatment addresses primary inflammation and secondary bronchospasm.
Making the diagnosis of asthma.

How hard can it be?
35 year-old male with extreme SOB after exposure to cats and campfire on weekend.

- Known asthmatic X 25 years, obese, smoker.
- Symbicort (ran out last week), Ventolin (30).

O/E:
- PR = 120/min
- RR = 30/minute
- T = 36.7 C
- SaO₂ = 88%
- PEF: unable
- Posture: sitting forward
- Speech: words only

Does this person have asthma? Severity?
Background

• Quote: *Asthma* is like love, ...everyone knows what it is, yet few can define it.

• Evidence suggests that asthma misdiagnosis is common (not all that wheezes is asthma).

• Common mis-diagnosis:
  – AECOPD and ACOS;
  – Acute bronchitis/influenza;
  – Anxiety;
  – Obesity;
  – Rare issues: tracheal ring, foreign body, TB, etc.
Diagnosis

• Diagnosis should be made:
  – Based on a clear history of characteristic symptom patterns;
  – Based on variable airflow limitation;
  – Response to anti-asthma medications.
Differentiating asthma from COPD

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Clinical differences between asthma and chronic obstructive pulmonary disease (COPD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asthma</td>
</tr>
<tr>
<td>Age of onset</td>
<td>Usually &lt;40 years</td>
</tr>
<tr>
<td>Smoking history</td>
<td>Not causal</td>
</tr>
<tr>
<td>Sputum production</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Allergies</td>
<td>Often</td>
</tr>
<tr>
<td>Disease course</td>
<td>Stable (with exacerbations)</td>
</tr>
<tr>
<td>Spirometry</td>
<td>Often normalizes</td>
</tr>
<tr>
<td>Clinical symptoms</td>
<td>Intermittent and variable</td>
</tr>
<tr>
<td>Spirometry-2</td>
<td>$\text{FEV}_1/\text{FVC} &gt; 0.7$</td>
</tr>
</tbody>
</table>

# Severity assessment (CAEP/CTS)

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
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</thead>
<tbody>
<tr>
<td><strong>PEFR</strong></td>
<td>&gt; 60% predicted</td>
<td>40-60% predicted</td>
<td>Unable</td>
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<tr>
<td></td>
<td>&gt; 300 L/min</td>
<td>200-300 L/min</td>
<td>&lt; 40% predicted</td>
</tr>
<tr>
<td><strong>FEV-1</strong></td>
<td>&gt; 60% predicted</td>
<td>40-60% predicted</td>
<td>&lt; 40% predicted</td>
</tr>
<tr>
<td></td>
<td>&gt; 2.1 L</td>
<td>1.6-2.1 L</td>
<td>&lt; 1.6 L</td>
</tr>
<tr>
<td><strong>SaO2</strong></td>
<td>-</td>
<td>-</td>
<td>&lt; 90%</td>
</tr>
<tr>
<td><strong>Hx</strong></td>
<td>Increased β-agonists</td>
<td>Partial relief from β-agon</td>
<td>No relief β-agonists</td>
</tr>
<tr>
<td></td>
<td>Exertional dyspnea + cough</td>
<td>β-agonist q 4 hours dyspnea, cough @ rest</td>
<td>β-agonist &gt; q 2 hours</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td>-</td>
<td>-</td>
<td>agitation</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>Diaphoretic</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>Tachycardic</td>
</tr>
</tbody>
</table>
ED (simple) Approach

Acute Asthma Presentation to the ED
Rx in ED and re-assess

Patient unchanged, severe or deteriorates.
Admit to hospital 10%

Patient improves Meets D/C criteria
Discharge home 90%

On ICS Moderate-severe exacerbation
? Rx

Not on ICS Moderate-severe exacerbation
? Rx

Very mild exacerbation PEFR 70-80% @ presentation
? Rx

Patient improves Meets D/C criteria
Discharge home 90%

On ICS Moderate-severe exacerbation
? Rx

Not on ICS Moderate-severe exacerbation
? Rx

Very mild exacerbation PEFR 70-80% @ presentation
? Rx

Patient unchanged, severe or deteriorates.
Admit to hospital 10%
Choosing Wisely: Investigations

• Avoid lab work:
  – Single system disease and order judiciously.

• ABG:
  – Painful and unhelpful;
  – Can be replaced with SaO₂ and VBG (pH, HCO₃ – reliable) if really necessary.
Choosing Wisely: Radiology

• CXR may be ordered to rule out complications (e.g., pneumo-mediastinum/thorax) and/or comorbidities (e.g., pneumonia).

• In Alberta, 44% of all patients receive a CXR with a primary ED diagnosis of asthma.

• In Alberta, patients with a primary diagnosis of asthma receive >70% CXR (range: 0-100%).

• Are they needed, are they safe, and can we do better?
The evidence

- Most guidelines are vague.
- SR presented as poster at CAEP-2015:
  - Five studies were included, in which a total number of 864 asthma patients with a total number of 463 (54%) CXRs were ordered;
  - The overall median positive CXR was 14% (Range: 8-18%).
  - The main positive CXR finding was pneumonia (9.5%), while pneumo-mediastinum/thorax were rare (0%).
## Complications/comorbidities

<table>
<thead>
<tr>
<th></th>
<th>Asthma</th>
<th>Pneumonia</th>
<th>Pneumo-T/M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cough</strong></td>
<td>Common</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td><strong>SOB</strong></td>
<td>Common</td>
<td>Common</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Fever</strong></td>
<td>Possible</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td><strong>Chest pain</strong></td>
<td>Rare</td>
<td>Occasionally</td>
<td>Common and Severe</td>
</tr>
<tr>
<td><strong>Sputum</strong></td>
<td>Clear/scant</td>
<td>Coloured/copious</td>
<td>None</td>
</tr>
<tr>
<td><strong>Wheeze</strong></td>
<td>Diffuse/bilateral</td>
<td>+/-</td>
<td>None</td>
</tr>
<tr>
<td><strong>Crackles</strong></td>
<td>Uncommon</td>
<td>Common (unilateral)</td>
<td>Uncommon</td>
</tr>
<tr>
<td><strong>Auscultation</strong></td>
<td>Equal</td>
<td>A/E may be ↓ (unilateral)</td>
<td>common ↓ A/E (unilateral)</td>
</tr>
<tr>
<td><strong>Response to asthma therapy</strong></td>
<td>Variable</td>
<td>Minimal</td>
<td>None</td>
</tr>
</tbody>
</table>
Recommended approach

- **Avoid CXR** in patients with uncomplicated acute asthma responding to usual acute asthma therapy.

- **Consider CXR** when:
  - Admission to hospital is required.
  - Presentation complicated by fever, sputum production and unilateral A/E findings.
  - Severe chest pain or unilateral A/E findings.
Treatment of acute asthma.

Is there anything more than ventolin?
Finding the evidence

Single best source of evidence for therapy.
Cochrane in-ED asthma treatments:

- Beneficial effect confirmed:
  - MDI + spacers vs nebulization (Cates);
  - Early systemic corticosteroids (Rowe);
  - Inhaled CS (Edmonds);
  - Anticholinergics (Plotnick);
  - Early systemic magnesium sulfate (Rowe).

- Beneficial effect lacking:
  - Antibiotics (Graham);
  - Heliox (Rodrigo);
  - Aminophylline (Belda).

- Insufficient evidence: NIV.

CTS-CAEP Asthma Guideline

• Inhaled SABA:
  – Recommends salbutamol.

• Inhaled SAAC:
  – Recommends IB to reduce admission.

• Systemic corticosteroids:
  – Recommends SCS to reduce admission.

• Adjunctive care:
  – IV MgSO₄, ICS, IM epinephrine, NIV?

Nebulizers vs MDI + Spacers?

Nebulizers vs MDI + Spacers?

Figure 5. Forest plot of comparison: 1 Spacer (chamber) versus Nebuliser (Multiple treatment studies), outcome: 1.3 Duration in emergency department (minutes). [mins].

Nebulizers vs MDI + Spacers?

Summary

• Patients with life-threatening asthma exacerbations were excluded from the studies, so the results cannot be assumed to apply to this group.

• Analysis of the data regarding lung function tests in many papers was complicated by a lack of standardized reporting.

• **MDI + spacer conclusion:**
  - **Children** - superiority proven;
  - **Adults** – no differences vs. equivalence.
Suggested SABA doses

- **GINA (2014):**
  - Not weight based: 4 up to a maximum of 10 puffs/q 20 minutes X 3.

- **CAEP/OHA:**
  - 4-8 puffs/q 20 minutes X 3.
CTS-CAEP Asthma Guideline

• Inhaled SABA:
  – Recommends salbutamol.

• Inhaled SAAC:
  – **Recommends IB to reduce admission.**

• Systemic corticosteroids:
  – Recommends SCS to reduce admission.

• Adjunctive care:
  – IV MgSO$_4$, ICS, IM epinephrine, NIV?

# IB + SABA in the ED

## Review
Combined inhaled beta-agonist and anticholinergic agents in the emergency management of adult asthmatic patients

## Comparison
01 Clinical response AC+SABA vs SABA alone

## Outcome
01 Hospital admissions

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>AC+SABA</th>
<th>SABA</th>
<th>RR (random) 95% CI</th>
<th>Weight</th>
<th>RR (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owens 1991</td>
<td>2/17</td>
<td>4/20</td>
<td>1.54 0.59 [0.12, 2.83]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitzgerald 1997</td>
<td>10/171</td>
<td>19/171</td>
<td>5.90 0.53 [0.25, 1.10]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garrett 1997</td>
<td>28/171</td>
<td>37/167</td>
<td>17.49 0.69 [0.44, 1.08]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diaz 1997a</td>
<td>13/51</td>
<td>11/40</td>
<td>7.76 1.00 [0.56, 1.99]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lin 1998</td>
<td>3/29</td>
<td>10/29</td>
<td>2.79 0.31 [0.10, 1.01]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kamei 1999</td>
<td>4/33</td>
<td>2/31</td>
<td>1.44 1.88 [0.37, 9.54]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>37.98</td>
<td>0.59 [0.56, 0.94]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Test for heterogeneity: Chi² = 4.00, df = 5 (P = 0.40), P = 0%
## Test for overall effect: Z = 2.36 (P = 0.02)

## 02 Multiple dose protocol
<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>AC+SABA</th>
<th>SABA</th>
<th>RR (random) 95% CI</th>
<th>Weight</th>
<th>RR (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karpe 1996</td>
<td>24/192</td>
<td>26/192</td>
<td>13.64 0.32 [0.55, 1.55]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dierk 1997</td>
<td>10/47</td>
<td>11/43</td>
<td>6.65 0.83 [0.33, 1.76]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weber 1996</td>
<td>9/29</td>
<td>10/29</td>
<td>4.97 0.62 [0.26, 1.34]</td>
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<td></td>
</tr>
<tr>
<td>Nakano 2000</td>
<td>5/38</td>
<td>10/26</td>
<td>3.99 0.47 [0.19, 0.67]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rodriguez 2001</td>
<td>13/88</td>
<td>36/52</td>
<td>15.46 0.52 [0.32, 0.85]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solarte 2004</td>
<td>23/99</td>
<td>26/98</td>
<td>17.42 1.07 [0.68, 1.68]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>62.14</td>
<td>0.76 [0.58, 1.00]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Test for heterogeneity: Chi² = 8.13, df = 5 (P = 0.19), P = 18.4%
## Test for overall effect: Z = 1.96 (P = 0.05)

## Total (95% CI)
<table>
<thead>
<tr>
<th>AC+SABA</th>
<th>SABA</th>
</tr>
</thead>
<tbody>
<tr>
<td>362</td>
<td>550</td>
</tr>
</tbody>
</table>
## Test for heterogeneity: Chi² = 11.29, df = 11 (P = 0.42), P = 2.5%
## Test for overall effect: Z = 3.08 (P = 0.002)
Suggested SAAC doses

• GINA (2014):
  – No clear recommendations.

• CAEP/OHA:
  – 4-8 puffs/q 20 minutes X 3.
CTS-CAEP Asthma Guideline

- **Inhaled SABA:**
  - Recommends salbutamol.

- **Inhaled SAAC:**
  - Recommends IB to reduce admission.

- **Systemic corticosteroids:**
  - **Recommends SCS to reduce admission.**

- **Adjunctive care:**
  - IV MgSO$_4$, ICS, IM epinephrine, NIV?

Systemic Corticosteroids

• **During the ED stay**
  – Mainstay of ED asthma treatment.

• **CAEP AIR study:**
  – 96% SABA (3);
  – 85% SAAC (3);
  – 78% of ED patients received SCS.

• What’s the evidence?

SCS - admissions

Review: Early emergency department treatment of adult acute asthma with systemic corticosteroids
Comparison: CS: Any steroid (po, IM, IV, inhaled) vs placebo
Outcome: 01: Admitted to hospital (all times)

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>CS n/N</th>
<th>Placebo n/N</th>
<th>RR (fixed) 95% CI</th>
<th>RR (fixed) 95% CI</th>
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</thead>
<tbody>
<tr>
<td>Littenberg 1986</td>
<td>9/48</td>
<td>23/49</td>
<td></td>
<td></td>
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<tr>
<td>Stor 1987</td>
<td>52/72</td>
<td>65/67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schnall 1988</td>
<td>5/27</td>
<td>12/27</td>
<td></td>
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<tr>
<td>Stein 1990</td>
<td>21/44</td>
<td>23/47</td>
<td></td>
<td></td>
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<tr>
<td>Tal 1980</td>
<td>4/17</td>
<td>4/13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarniere 1993</td>
<td>11/36</td>
<td>19/39</td>
<td></td>
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<td>Connett 1994a</td>
<td>13/19</td>
<td>15/18</td>
<td></td>
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<tr>
<td>Connett 1994b</td>
<td>7/18</td>
<td>12/15</td>
<td></td>
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<td>Rodrigo 1994</td>
<td>4/49</td>
<td>5/49</td>
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<td>Wolfson 1994</td>
<td>17/42</td>
<td>15/46</td>
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<tr>
<td>Lin 1997</td>
<td>7/23</td>
<td>5/22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lin 1999</td>
<td>8/30</td>
<td>11/26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>426</td>
<td>418</td>
<td></td>
<td></td>
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<tr>
<td>Total events:</td>
<td>159 (CS), 209 (Placebo)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for heterogeneity: CH² = 13.85, df = 11 (P = 0.24), P = 0.26%</td>
<td></td>
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</tr>
<tr>
<td>Test for overall effect: Z = 4.25 (P &lt; 0.0001)</td>
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</tbody>
</table>

Summary

• Early is better than late.
• HD not shown to be better than L/MD.
• IV should be restricted to vomiting, obtunded, and intubated patients.
• Use often and without fear of complications.
CTS-CAEP Asthma Guideline

• Inhaled SABA:
  – Recommends salbutamol.

• Inhaled SAAC:
  – Recommends IB to reduce admission.

• Systemic corticosteroids:
  – Recommends SCS reduces admission.

• Adjunctive care:
  – IV MgSO₄, ICS, IM epinephrine, NIV?

Treatment after discharge

Preventing relapses
Case presentation

• 18 year-old female with 3 day history of SOB after URTI.
• Known asthmatic since birth, U of A student, non-smoker.
• Pulmicort (prn), Ventolin (8).
• O/E:
  • PR = 80/min
  • RR = 24/minute
  • T = 37.3° C
  • PEF: 255 L/m (60%)
  • SaO₂ = 96% (RA)
  • Sitting comfortably
  • Responses: sentences
• Based on presentation: admit or D/C?
Follow-up

• Relapse occurs following discharge (6.4% in 1\textsuperscript{st} week) and other evidence suggests treatment plays a role.
• Guidelines recommend follow-up for reassessment and educational reinforcement.
• Follow-up after ED remains less than ideal (first F/U = 19 days; 95\% CI: 18 to 21).
• ED MDs need to ensure patients are covered during the sub-acute phase.
Cochrane post-ED asthma treatments:

- **Beneficial effect confirmed:**
  - Early PO corticosteroids (Rowe);
  - Inhaled CS (Edmonds);
  - Non-pharmacological approaches:
    - Action plans and regular follow-up (multiple).

- **Beneficial effect lacking:**
  - Antibiotics (Graham);
  - Non-pharmacological approaches;
  - Nutritional supplementation.

- **Insufficient evidence:** LABA, LKTs.

CTS-CAEP Asthma Guidelines

- Systemic corticosteroids:
  - Recommends SCS to reduce relapse.

- Inhaled corticosteroids:
  - Recommends ICS to reduce relapse.

- Adjunctive care:
  - Close follow-up, asthma education, smoking cessation, immunizations, AAP.

### Systemic CS: preventing relapses

<table>
<thead>
<tr>
<th>Study</th>
<th>CS n/N</th>
<th>Placebo n/N</th>
<th>RR (fixed) 95% CI</th>
<th>Weight</th>
<th>Relapse Rate RR 95% CI</th>
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<tbody>
<tr>
<td><strong>7-10 day follow-up</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Feil 1983</td>
<td>5/49</td>
<td>10/53</td>
<td></td>
<td>33.03</td>
<td>0.54 [0.20, 1.47]</td>
</tr>
<tr>
<td>Lee 1993a</td>
<td>0/19</td>
<td>1/16</td>
<td></td>
<td>5.57</td>
<td>0.28 [0.01, 6.51]</td>
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<tr>
<td>Lee 1993b</td>
<td>1/17</td>
<td>1/16</td>
<td></td>
<td>3.54</td>
<td>0.95 [0.06, 13.82]</td>
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<tr>
<td>McNamara 1993</td>
<td>2/30</td>
<td>8/26</td>
<td></td>
<td>29.47</td>
<td>0.22 [0.05, 0.93]</td>
</tr>
<tr>
<td>Shapiro 1983</td>
<td>0/11</td>
<td>0/15</td>
<td></td>
<td></td>
<td>Not Estimable</td>
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<tr>
<td>Chapman 1991</td>
<td>3/48</td>
<td>8/45</td>
<td></td>
<td>28.39</td>
<td>0.35 [0.10, 1.24]</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>11/174</td>
<td>28/171</td>
<td></td>
<td>100.00</td>
<td>0.39 [0.21, 0.74]</td>
</tr>
<tr>
<td>Test for overall effect: z=2.86 (P=0.004)</td>
<td></td>
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<tr>
<td><strong>21 day follow-up</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Chapman 1991</td>
<td>10/48</td>
<td>20/45</td>
<td></td>
<td>100.00</td>
<td>0.48 [0.25, 0.89]</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>10/48</td>
<td>10/48</td>
<td></td>
<td>100.00</td>
<td>0.47 [0.25, 0.89]</td>
</tr>
<tr>
<td>Test for overall effect: z=2.32 (P=0.02)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Graph and Table**

- **Graph** shows a comparative analysis between Corticosteroids and Placebo groups over 7-10 and 21-day follow-ups.
- **Table** lists studies, sample sizes, risk ratios, and confidence intervals.
Comparative effectiveness

- IM: 0.21 (0.05, 0.73), PB=62.0%
- PO Long Course: 0.31 (0.09, 0.95), PB=14.1%
- PO Short Course: 0.37 (0.04, 3.38), PB=20.3%
- Placebo: 1.00 (95% CI not applicable), PB=3.6%
Summary

• Unless contra-indicated, systemic corticosteroids should be prescribed for acute asthma at discharge.
• IM corticosteroids as effective as oral agents (advantage: compliance; disadvantage: injection pain/bruising).
• Long course still the recommendation.
• Tapering corticosteroids, not generally felt necessary (several trials to support this).
CTS-CAEP Asthma Guidelines

• **Systemic corticosteroids (SCS):**
  – Recommends SCS to reduce relapse.

• **Inhaled corticosteroids:**
  – **Recommends ICS to reduce relapse.**

• **Adjunctive care:**
  – Close follow-up, asthma education, smoking cessation, immunizations, AAP.

Flow chart – CS + ICS vs CS alone

Emergency Department discharge

Budesonide 1600ug/day X 4 weeks

SABA 2 puffs QID + Prednisone 50 mg OD

Visit: 1
Week: 0

Placebo Turbuhaler/day X 4 weeks

SABA 2 puffs QID + Prednisone 50 mg OD

Rowe BH, et al. JAMA 1999
Relapse

Rowe BH, et al. JAMA 1999

Number at Risk
ICS 89
No ICS 91

ICS

No ICS

Time to Relapse (days)

% Relapse Free

0 7 14 21

89 80 77 77

91 77 74 68

0 10 20 30 40 50 60 70 80 90 100
ICS + CS vs CS Evidence

CTS-CAEP Asthma Guidelines

- **Systemic corticosteroids:**
  - Recommends SCS to reduce relapse.

- **Inhaled corticosteroids:**
  - Recommends ICS to reduce relapse.

- **Adjunctive care:**
  - LABA?, close follow-up, asthma education, smoking cessation, immunizations, AAP.

Flow chart - ICS vs ICS/LABA

Emergency Department discharge

Fluticasone 1000ug/day X 4 weeks

- SABA 2 puffs QID + Prednisone 50 mg OD

Visit: 1
Week: 0
Telephone Week: 10-14 days

Fluticasone 1000ug/Salmeterol per day X 4 weeks

SABA 2 puffs QID + Prednisone 50 mg OD

Telephone Week: 4 weeks

Relapse

Number at Risk
ADVAIR  69  61  56  54
FLOVENT 68  59  55  53

Time to Relapse (days)

% Relapse Free

0  10  20  30  40  50  60  70  80  90  100
Relapse by Prior ICS Use

Spirometry

- These patients had pre-/earliest PEF, discharge PEF and discharge FEV$_1$/FVC recorded.
- AUC $\sim 0.5$ for % predicted PEF, FEV$_1$/FVC, and FEV$_1$ %predicted.
- Even change score failed to predict outcome.
- Conclusion: spirometry unlikely to be helpful in acute asthma.
## Multi-variate LR relapse model

<table>
<thead>
<tr>
<th>Factor</th>
<th>aOR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>1.99 (1.2 to 3.0)</td>
</tr>
<tr>
<td>&gt;24 h of symptoms prior to the ED visit</td>
<td>1.7 (1.35 to 2.3)</td>
</tr>
<tr>
<td>Ever receiving OCSs for asthma</td>
<td>1.5 (1.1 to 2.0)</td>
</tr>
<tr>
<td>ICS/LABA use at presentation</td>
<td>1.9 (1.1 to 3.2)</td>
</tr>
<tr>
<td>Owning a spacer</td>
<td>1.6 (1.3 to 1.9)</td>
</tr>
</tbody>
</table>

Summary

• ED visits are common, vary by region and treatment varies.

• In –ED:
  – SABA/SAAC; SCS; IV MgSO4, ICS and ? NIV.

• Post-discharge:
  – SCS, ICS +/- LABA

• Follow-ups:
  – Delays common and methods of “connecting” patients to providers are under-studied.

• Delivery of non-drug treatments important.
Thank you for staying!

Questions....?