Review: Magnesium sulfate is effective for severe acute asthma treated in the emergency department


Question
What is the effectiveness of intravenous magnesium sulfate in patients with acute asthma who were treated in the emergency department?

Data sources
Studies were identified from the Cochrane Airways Review Group Registry, MEDLINE, EMBASE/Excerpta Medica, CINAHL, and the Cochrane Library; hand searches of 20 high-quality respiratory journals; bibliographies of relevant papers; and contact with authors and content experts.

Study selection
Studies were selected if they were randomized controlled trials or quasi-randomized trials, included adults or children presenting to an emergency department with acute asthma, and compared intravenous magnesium sulfate with placebo.

Data extraction
Data were extracted on study and patient characteristics, hospital admissions, pulmonary function, vital signs, and adverse events.

Main results
27 studies were reviewed for inclusion, and 7 trials (665 patients; 5 of adult and 2 of pediatric patients; 6 from the United States and 1 from India) met the inclusion criteria. Analyses of all patients and of patients with severe asthma showed a reduction in hospital admission rates (Table), whereas no difference was shown for patients with mild-to-moderate asthma. Studies that included all patients showed no differences in measures of pulmonary function (peak expiratory flow rate or FEV₁) or vital signs (heart rate, respiratory rate, or blood pressure). In studies of patients with severe asthma, peak expiratory flow rate improved by 22 L/min (95% CI 27 to 78 L/min; 3 studies) and FEV₁ by 8% of the predicted value (CI 5% to 12%; 3 studies). Data were insufficient to assess adverse events.

Conclusion
Intravenous magnesium sulfate reduces the rate of hospital admissions and improves pulmonary function in patients with severe acute asthma treated in the emergency department.

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Abstract and Commentary also published in ACP Journal Club. 1999;131:36.

Magnesium sulfate vs placebo for hospital admissions among patients with acute asthma at end of study*

<table>
<thead>
<tr>
<th>Patients</th>
<th>Weighted event rates</th>
<th>RRR (95% CI)</th>
<th>NNT (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium sulfate</td>
<td>23%</td>
<td>30% (2 to 49)</td>
<td>5 (3 to 6)</td>
</tr>
<tr>
<td>Placebo</td>
<td>45%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe asthma</td>
<td>51%</td>
<td>44% (29 to 56)</td>
<td>3 (2 to 4)</td>
</tr>
<tr>
<td></td>
<td>91%</td>
<td></td>
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</tbody>
</table>

*Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data in article.

Commentary
The systematic review by Rowe and colleagues is an important addition to the management of acute asthma. Optimal therapy currently consists of bronchodilators with short-acting β-2 agonists, adjunct therapy with ipratropium bromide (in more severe disease), oxygen, and corticosteroids (1). The results of this review indicate that magnesium sulfate reduces hospital admission in patients with an FEV₁ < 30% at presentation or those who do not respond to initial treatment or improve beyond 60% after 1 hour.

It is tempting to extrapolate from these data that all patients with moderately severe acute asthma should receive magnesium sulfate. An important consideration, however, is the discretionary use of adjunct therapies, such as aminophylline (2 studies) and ipratropium bromide (1 study), included in the meta-analysis. Both these interventions have been shown to reduce hospital admission rates without improving lung function (2-4). Until patients with less severe obstruction treated with these therapies show greater benefit with the incremental addition of magnesium sulfate than with placebo, magnesium sulfate should be reserved for patients who fulfill the above criteria.

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References
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