Pediatric Critical Care Literature Review

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Prevalence of Occult Bacteremia in Children Aged 3 to 36 Months Presenting to the Emergency Department with Fever in the Post pneumococcal Conjugate Vaccine Era
Clinical Question

What is the prevalence of occult bacteremia (OB) in well-appearing, previously healthy children, aged 3 to 36 months who present to the emergency department (ED) with fever without source in the post-pneumococcal conjugate vaccine (PCV) era?
Methods

Retrospective study of children presenting to an urban PED over a 3 year period

Children were included if they were

- Aged 3-36 mths
- Febrile
- Previously healthy
- Had no source of infection on examination
- Had a blood culture drawn
- Were discharged from the ED
Methods

8,408 children

21 true positives (bacteraemia rate 0.25%)

159 contaminants (rate 1.89%) rate of 7.6 contaminants for each true positive

Strep pneumo rate 0.17% (14 patients)
Conclusions

- Given the current rate of OB in the post-PCV era, it may no longer be cost-effective to send blood cultures on well-appearing, previously healthy children aged 3 to 36 months who have fever without source.
Emerging Battery-Ingestion Hazard: Clinical Implications
Methods

- Data were analyzed from 3 sources:
  - National Poison Data System (56,535 cases, 1985–2009)
  - National Battery Ingestion Hotline (8,648 cases, July 1990 – September 2008)
  - Medical literature and National Battery Ingestion Hotline cases (13 deaths and 73 major outcomes)
Results

- All 3 data sets signal worsening outcomes, with a 6.7-fold increase in the percentage of button battery ingestions with major or fatal outcomes from 1985 to 2009 (National Poison Data System).

- Ingestions of 20- to 25-mm-diameter cells increased from 1% to 18% of ingested button batteries (1990–2008), paralleling the rise in lithium-cell ingestions (1.3% to 24%).

- Outcomes were significantly worse for large-diameter lithium cells (>20 mm) and children who were younger than 4 years.
Results

- The 20-mm lithium cell was implicated in most severe outcomes

- Severe burns with sequelae occurred in just 2 to 2.5 hours. Most fatal (92%) or major outcome (56%) ingestions were not witnessed.

- At least 27% of major outcome and 54% of fatal cases were misdiagnosed, usually because of nonspecific presentations.

- Injuries extended after removal, with unanticipated and delayed esophageal perforations, tracheoesophageal fistulas, fistulization into major vessels, and massive hemorrhage.
Revised treatment guidelines promote expedited removal from the esophagus, increase vigilance for delayed complications, and identify patients who require urgent radiographs.
Effectiveness of ketamine in decreasing intracranial pressure in children with intracranial hypertension
Clinical question

- Can ketamine be used to alleviate elevated intracranial pressure in the ICU
Methods

Prospective, controlled, clinical trial

All patients were *sedated and mechanically ventilated* prior to inclusion in the study

Children with sustained, elevated ICP (> 18 mm Hg) resistant to first-tier therapies received a single ketamine dose (1–1.5 mg/kg) either:

- To prevent further ICP increase during a potentially distressing intervention (Group 1)
- As an additional measure to lower ICP (Group 2)
Results

- 82 ketamine administrations in 30 patients were analyzed.

- **Overall ICP decreased** by 30% (from 25.8 ± 8.4 to 18.0 ± 8.5 mm Hg) (p < 0.001) and **CPP increased** from 54.4 ± 11.7 to 58.3 ± 13.4 mm Hg (p < 0.005)

- In Group 1, ICP decreased significantly following ketamine administration and increased by > 2 mm Hg during the distressing intervention in only 1 of 17 events

- In Group 2, when ketamine was administered to lower persistent intracranial hypertension, ICP decreased by 33% (p < 0.0001) following ketamine administration
Conclusion

- In ventilation-treated patients with intracranial hypertension, ketamine **effectively decreased ICP** and prevented untoward ICP elevations during potentially distressing interventions, **without lowering blood pressure and CPP**

- These results refute the notion that ketamine increases ICP

- Ketamine is a safe and effective drug for patients with traumatic brain injury and intracranial hypertension, and it can possibly be used safely in trauma emergency situations
5 versus 10 days of treatment with ceftriaxone for bacterial meningitis in children: a double-blind randomised equivalence study
Clinical Question

In patients with the common causes of meningitis who are stable or improving after 5 days of antibiotics, is further antibiotic treatment required?
Methods

Multisite double blinded RCT

2-12 months old with meningitis caused by: *H Influenza; S pneumoniae; N Meningitidis*

If stable at 5 days of antibiotic treatment randomised to further 5 days of ceftriaxone or placebo.
Results

- 496 received treatment with ceftriaxone for 5 days, and 508 for 10 days.

- 2 relapses in 5 day group (one in HIV +ve patient) No relapses in 10 day treatment group

- No bacteriological failures

- Deaths at 190 days 22 (4%) vs 19 (4%)

- Neurological sequelae 26% and 27%
Conclusion

- further antibiotic treatment is not needed in children beyond the neonatal age-group with purulent bacterial meningitis caused or presumably caused by one of the three major pathogens, and in whom the clinical condition is stable or improving by day 5 of treatment with ceftriaxone.
Urinary Tract Infection: Clinical Practice Guideline for the Diagnosis and Management of the Initial UTI in Febrile Infants and Children 2 to 24 months
Background

- UTI’s are now the most common source of occult or serious bacterial infections

- Prevalence of UTI in the 2 to 24 month age group of febrile children with no focus is ~ 5% (Higher in the under 1 yo and lower in the 1-2 yo)
If antibiotics are considered necessary:

- a urine sample should be collected before their administration by catheterization or SPA.
If the febrile infant with no apparent cause is not so unwell as to require immediate antibiotics then the clinician needs to assess the likelihood of a UTI:

- low risk of UTI (circumcised male, age > 12 months, temperature < 39, fever for less than 24 hours) then clinical follow-up without urine testing is sufficient

If the child is not low risk then urine can be collected by:

- SPA or catheter for urinalysis and culture; or
- Convenient sample - if the urinalysis suggests a UTI then a further SPA or catheter specimen should be collected for urinalysis and culture
Collect urine on the unwell or high risk
  - I treat all males the same

Bag specimens are too unreliable to use

There is a role for clean catch but contamination rates may be high.

Ideal hospital samples are SPA and Catheter specimens

Minimise investigations
Multiple Trauma

JAMA. 2011;306(1):40-41

Hydrocortisone Therapy for Patients With Multiple Trauma
(The HYPOLYTE study)
Clinical Question

- Does treatment with stress-dose levels of hydrocortisone diminish the prevalence of hospital-acquired pneumonia, the first cause of infection in trauma patients.
Methods

Multicenter, randomized, double-blind, parallel, placebo-controlled study

Patients with multiple trauma who were older than 15 years 3 months and expected to require mechanical ventilation for more than 48 hours were included in the study

Study drug infusion began within 36 hours of the trauma onset, immediately after the completion of a short corticotropin test

The study’s primary outcome was occurrence of hospital-acquired pneumonia within 28 days of randomization.
Results

Figure 2. Kaplan-Meier Curves for Hospital-Acquired Pneumonia

<table>
<thead>
<tr>
<th></th>
<th>Hydrocortisone</th>
<th>Placebo</th>
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<tbody>
<tr>
<td>No. of patients at risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocortisone</td>
<td>73</td>
<td>76</td>
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<tr>
<td>Placebo</td>
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Comparison of hydrocortisone group vs placebo using a stratified Cox model.
Conclusion

- a stress dose of hydrocortisone for 7 days is associated with:
  - a reduction in the rate of hospital acquired pneumonia at day 28
  - a decreased requirement for mechanical ventilation
  - a reduction in length of ICU stay in trauma patients

- These results need to be confirmed in further studies of trauma patient (they contradict the CRASH data)
A Placebo-Controlled Trial of Antimicrobial Treatment for Acute Otitis Media
Clinical Question

- In patients with acute otitis media – diagnosed using strict diagnostic criteria, does antimicrobial treatment improve symptoms and examination findings
Methods

This was a randomized, double-blind, placebo-controlled study.

Children 6 to 35 months of age with acute symptoms were eligible for our diagnostic screening.

Children in whom acute otitis media was diagnosed per protocol were eligible for inclusion in the study.

Patients were randomly assigned to receive amoxicillin–clavulanate or placebo for 7 days.
The primary outcome was the time to treatment failure, which was a composite outcome consisting of six independent components:

- no improvement in overall condition by day 3
- a worsening of the child's overall condition at any time,
- no improvement in otoscopic signs by day
- perforation of the tympanic membrane at any time,
- severe infection (e.g., mastoiditis or pneumonia)
- any other reason for stopping the study drug at any time
Results

- 319 patients — 161 in the amoxicillin–clavulanate group and 158 in the placebo group

- Treatment failure occurred in 30 (18.6%) who received amoxicillin–clavulanate and in 71 (44.9%) who received placebo (P<0.001)
Results

A  Time to Treatment Failure

No. at Risk

<table>
<thead>
<tr>
<th></th>
<th>Amoxicillin–clavulanate</th>
<th>Placebo</th>
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<tbody>
<tr>
<td>1</td>
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<td>158</td>
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<td>86</td>
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</tbody>
</table>

P < 0.001 by log-rank test
Conclusion

- Half the children in the placebo group did not have treatment failure and two thirds did not need rescue treatment. These findings suggest that not all patients with acute otitis media need antimicrobial treatment.

- The treatment of acute otitis media with an antimicrobial agent that gives adequate bacterial coverage is beneficial.
Comment

- In my practice OM is not diagnosed as rigorously as in this study

- Possible OM should still be treated expectantly
  - Antibiotics should be commenced on those with persistent symptoms (usually at 48hrs)

- Definite OM should be either treated immediately or followed closely and treatment commenced at 48hrs if not improving
Thank you
Fluid therapy in the critically ill


Hypertonic versus normal saline as initial fluid bolus in pediatric septic shock.
Clinical question

What is the efficacy of 3% saline and 0.9% saline infusion as initial resuscitative fluid therapy in children with septic shock
Clinical Question

What is the influence of hypotonic (HT) and isotonic (IT) maintenance fluids in the incidence of dysnatraemias in critically ill children.