Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary

Edited by K Mackway-Jones

Best evidence topic reports (BETs) summarise the evidence pertaining to particular clinical questions. They are not systematic reviews, but rather contain the best (highest level) evidence that can be practically obtained by busy practising clinicians. The search strategies used to find the best evidence are reported in detail in order to allow clinicians to update searches whenever necessary.

Five of the BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary. Four guest BETs submitted from around the world are also shown. Each BET has been constructed in the four stages that have been described elsewhere. The BETs shown here together with those published previously and those currently under construction can be seen at http://www.bestbets.org

Guest BETs
- The Ottawa ankle rules in children
- Belching as a symptom of myocardial ischaemia
- Skull fracture and intracranial injury in children
- Indication for head CT in children with mild head injury

Negative urine analysis to exclude urinary tract infection
Report by Bruce Martin, Specialist Registrar in Emergency Medicine
Checked by Angaj Ghosh, Senior Clinical Fellow

Clinical scenario
A very anxious mother brings her 4 year old daughter to the emergency department concerned about her persistent fever. Examination reveals that she does indeed have a temperature of 37.6°C. She has no obvious signs of localised infection, so you decide that you need to test her urine to see whether she has got a urinary tract infection (UTI). After much coaxing she provides you with a sample but you now wonder if dipstick analysis is sufficient for diagnosis, or whether you ought to arrange for urgent microscopy.

Three part question
In [children with pyrexia with suspected UTI] is [dipstick urine analysis as sensitive as microscopy] in [ruling out infection]?

Search strategy
Medline 1966–08/01 using the OVID interface. (exp adolescence/ OR exp child/ or exp child of impaired parents/ or exp child, abandoned/ or exp child, exceptional/ or exp child, hospitalized/ or exp child, institutionalized/ or exp child, preschool/ or exp child, unwanted/ or exp disabled children/ or exp homeless youth/ or exp infant/ or exp children/ or exp only child/ OR child$.mp) AND (exp Indicators/ and reagents/ OR exp Reagent strips/ OR exp Urinalysis/ OR dipstick.mp) AND (exp Urinary tract infections/ OR urinary tract infection.mp) AND (exp “sensitivity and specificity”/ or “sensitivity and specificity”.mp OR diagnos$.mp OR exp Diagnosis/) LIMIT to human AND english.

Search outcome
Altogether 156 papers found. Of these, one was a recent meta-analysis that included all those papers identified as answering the three part question (table 1)
**Clinical bottom line**
Children who present with fever and who have positive dipstick testing for leucocyte esterase and nitrite should be given antibiotics and referred for further investigation. Dipstick testing would appear to have the sensitivity for children with negative testing to be discharged, with the urine being sent for Gram stain and culture the following day rather than arranging urgent microscopy.


**Search strategy**
Medline 1966–08/01 using the OVID interface. [exp piroxicam/ OR piroxicam.mp OR feldene.mp] AND [exp diclofenac/ OR diclofenac.mp OR voltarol.mp] AND [exp kidney calculi/ OR exp Ureteral calculi/ OR renal colic.mp]

**Search outcome**
Two papers were identified of which one was relevant (table 2).

**Comment(s)**
Both forms of IM NSAID work well with some small advantage in favour of piroxicam in terms of pain relief at 30 minutes. IM voltarol has several notable administration problems that piroxicam does not.

**Clinical bottom line**
IM piroxicam appears to perform better than IM diclofenac for renal colic pain relief. Given it has fewer injection site side effects IM piroxicam should replace IM diclofenac for renal colic.

Three part question
In [renal colic] is [oral fast dissolving piroxicam or IM diclofenac] better [at reducing pain]?

Search strategy
Medline 1966–08/01 using the OVID interface. [exp Diclofenac/ OR exp diclofenac sodium/ OR diclofenac.mp OR voltarol.mp] AND [exp piroxicam/ OR piroxicam.mp OR feldene.mp] AND [renal colic.mp OR exp ureteral calculi/ OR exp renal calculi]

Search outcome
Two papers were identified of which one was found to be relevant (table 3).
Table 5

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sladen A and Zauder HL, 1971, USA</td>
<td>10 fresh water near-drownings.</td>
<td>Prospective (?) No corticosteroid versus methylprednisolone (5 mg/kg/24 h iv divided into 6 equal doses).</td>
<td>Survival</td>
<td>All corticosteroid group survived, all others died.</td>
<td>Consecutive groups. Before and after study does not take account of potential change in other aspects of practice with time. Small numbers.</td>
</tr>
<tr>
<td>Martin CM and Baeren O Jr, 1971, USA</td>
<td>64 cases near-drowning, 29 cases drowning.</td>
<td>Retrospective analysis. Unspecified corticosteroid treatment.</td>
<td>Descriptive analysis</td>
<td>9 cases received corticosteroids - no benefit shown.</td>
<td>Retrospective. Not a controlled trial.</td>
</tr>
<tr>
<td>Corbin DO and Fraser HS, 1981, Barbados</td>
<td>98 near-drownings.</td>
<td>Retrospective analysis of charts.</td>
<td>No outcome measure as all were survivors</td>
<td>66 received unspecified corticosteroids.</td>
<td>Retrospective. No deaths. Therefore a comparison of death rates impossible.</td>
</tr>
<tr>
<td>van Berkum M et al, 1996, Netherlands</td>
<td>125 submersion victims.</td>
<td>Retrospective analysis of charts. Prednisolone (10.6 mg/kg, then 2.5 mg/kg/day; 1.8 d)</td>
<td>Pneumonia</td>
<td>Corticosteroids: no effect on pneumonia.</td>
<td>Retrospective. Not controlled trial. No survival data</td>
</tr>
</tbody>
</table>

Corticosteroids in the management of near-drowning

Report by Bernard A Foex, Specialist Registrar

Clinical scenario

A 15 year old boy was playing in the local canal. He jumped off a small bridge and got his foot caught in an old shopping trolley on the bottom. He was pulled out but he was unconscious and apnoeic. He was given BLS by the paramedics so that when he arrived in accident and emergency he was conscious, tachypnoeic, and centrally cyanosed. He had ronchi and coarse crepitations in both lung fields. You wonder whether he would benefit from intravenous corticosteroids.

Three part question

In a case of [near-drowning], does the [use of corticosteroids] affect [outcome in terms of survival or pulmonary complications]?

Search outcome

Altogether 208 papers were found, of which four randomised controlled trials directly addressed the three part question (table 4).

Comment(s)

This group of trials compared NIPPV with different alternative treatments; oxygen, continuous positive airways pressure (CPAP) or high dose medical therapy. One study showed a benefit in the reduction of intubation rates when NIPPV is compared to oxygen alone, but others have reported evidence of harm with an increased incidence of myocardial infarction in the NIPPV groups. CPAP has already been shown to be of benefit in this patient group.

Clinical bottom line

The evidence for the use of NIPPV in acute pulmonary oedema is moot. At present CPAP is the safer proven option.

The Ottawa ankle rules in children

Report by Man-Cheuk Yuen, Senior Medical Officer

Checked by Fiona Saunders, Specialist Registrar

Clinical scenario
A 5 year old boy attends the emergency department after sustaining a twisting injury to his left ankle. On examination there is swelling and tenderness over the lateral malleolus. You know that the Ottawa ankle rules are applicable in adult patients and you wonder whether they are applicable in children too.

Three part question
In [paediatric patients with blunt ankle injuries] are [the Ottawa ankle rules] sensitive in [detecting fractures]?

Search strategy
Medline 1966–08/01 using the OVID interface. [exp ankle/ or ankle.mp. or exp ankle injuries/ or exp ankle joint/ or exp lateral ligament, ankle/] AND [clinical decision.mp. or exp Decision Support Systems, Clinical/ or exp Decision Support Techniques/ or ottawa.mp.] AND [pediatr$.mp. or paed$.mp. or exp Age Factors/ or age factors.mp. or Child/] LIMIT to human and english

Comment(s)

There is very little evidence on the value of giving intravenous corticosteroids in cases of near-drowning.

Table 7

<table>
<thead>
<tr>
<th>Author, date and country</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darsee JR, 1978, USA</td>
<td>108 consecutive patients presenting to CCU</td>
<td>Questionnaire</td>
<td>Belching as a symptom in patients with confirmed inferior myocardial infarction.</td>
<td>Sensitivity 69%, specificity 84% (no p value given)</td>
<td>Possible bias from direct questioning.</td>
</tr>
<tr>
<td>Logan RL, et al, 1986, NZ</td>
<td>227 consecutive patients presenting to CCU</td>
<td>Questionnaire</td>
<td>Belching as a symptom in patients with confirmed cardiac ischaemia</td>
<td>Positive predictive value of 72% (no p value given)</td>
<td>Possible bias from population chosen, that is, CCU admissions.</td>
</tr>
</tbody>
</table>

Skull fracture and intracranial injury in children

Report by Andrew Munro, Specialist Registrar in Emergency Medicine

Checked by Ian Maconochie, Paediatric Consultant in Emergency Medicine

Clinical scenario

Different emergency departments have different protocols/preferences in the way children with mild or minor head injury are investigated. Some prefer observation plus or minus plain skull radiographs, others use head scan as the first choice modality. The department you are currently working in uses plain radiology. You are concerned that in children with mild head injury with no abnormal neurology and no fracture seen on plain skull films there is a tendency to be falsely reassured that intracranial injury (ICI) is unlikely.

Three part question

In [children with minor head injury] does [absence of skull fracture] predict [absence of ICI]?

Search strategy

Medline 1985–08/01 using the OVID interface. [(exp brain injuries/ or exp cranioencephalic trauma/ or exp head injuries, closed/ or head trauma.mp or head injur$.mp or exp skull fractures/ or skull fracture8.mp) AND (exp child/ or exp adolescence/ or exp child, abandoned/ or exp child, exceptional/ or exp child, hospitalized/ or exp child, institutionalized/ or exp child of impaired

Belching as a symptom of myocardial ischaemia

Report by Jason Smith, Specialist Registrar in Emergency Medicine

Checked by Simon Carley, Specialist Registrar in Emergency Medicine

Clinical scenario

A 60 year old man attends the emergency department with chest pain. He also gives a history of belching since the onset of the pain. His initial ECG is normal. You wonder if the symptom of belching has any prognostic value in the diagnosis of cardiac chest pain, or is more suggestive of a gastrointestinal cause.

Three part question

In [patients with chest pain] is [belching a useful discriminatory symptom] of [myocardial ischaemia]?

Search strategy

Medline 1966 to 08/01 using the OVID interface. [(exp myocardial infarction OR myocardial infarction.mp. OR MI.mp OR exp myocardial ischemia OR myocardial ischemia.mp OR myocardial ischaemia.mp OR exp angina pectoris) AND (exp eructation OR eructation.mp OR belching.mp OR eructonesius.mp)] LIMIT to human and english.

Search outcome

Seven articles were found of which five were irrelevant or of insufficient quality. The two remaining papers are shown in the table.

Comment(s)

There are no randomised trials that answer the question. The best evidence would appear to come from two questionnaire studies, which show that belching is a symptom of myocardial ischaemia or infarction in a significant number of patients. It should not be assumed, therefore, that patients who have both chest pain and belching are more likely to be suffering from a non-cardiac cause.

Clinical bottom line

Belching is a recognised symptom of myocardial ischaemia or infarction.

Parents’ or exp child, preschool/ or exp child, unwanted/ or exp disabled children/ or exp homeless youth/ or exp infant/ or exp only child/ or OR child.$mp or exp pediatrics/ or pediatric.$mp AND (exp tomography scanners, x-ray computed/ or exp tomography, x-ray computed/ or tomography.$mp or CT scan.$mp) AND (exp prospective studies/ or prospective.$mp OR prospectively.$mp) LIMIT to (human and English language and yr=1985–2001).
Indication for head CT in children with mild head injury

Report by Andrew Munro, Specialist Registrar in Emergency Medicine
Checked by Ian Maconochie, Paediatric Consultant in Emergency Medicine

Clinical scenario
It is 9 pm on a Saturday, a 5 year old boy is brought to the emergency department by his mother after an unobserved fall on a trampoline. The mechanism is unclear but he was playing with an older boy. He was not thought to have cried immediately. He has a moderate sized contusion to his occiput but no focal neurology. He has a GCS of 14, opening his eyes to voice only. No skull fracture is identified on plain films. You consider it appropriate to use computed tomography on the basis of his GCS, scalp haematoma and the possibility of loss of consciousness. The on call radiologist thinks it more appropriate to admit for neurological observation. You are concerned that there is an incidence of intracranial injury (ICI) in this group, but have no data to support an argument for early head scanning.

Three part question
In [children who have sustained a mild or minor head injury with a GCS=13–15] do [clinical findings] predict [intracranial injury on computed tomography]?

Search strategy
Medline 1985–08/01 using the OVID interface. [(exp brain injuries OR exp cranioencebral trauma OR exp head injuries, closed) OR (head trauma.mp) OR (head injur$.mp)] AND [(exp adolescence OR exp child OR exp child of impaired parents OR exp child, abandoned OR exp child, exceptional OR exp child, hospitalized OR exp child, institutionalized, OR exp child, preschool OR exp child, unwanted OR exp disabled children OR exp homeless youth or exp infant or exp only child OR child$.mp) OR (exp pediatrics OR paediatric$.mp OR paediatric$.mp)] AND (exp tomography scanners, x-ray computed OR exp tomography, x-ray computed OR tomography.mp OR CT scan$).mp AND (exp prospective studies OR prospective.mp OR prospectively.mp)) LIMIT to (human AND english language AND yr=1985–2001).

Table 9

<table>
<thead>
<tr>
<th>Author, date and location</th>
<th>Patient group</th>
<th>Study type (level of evidence)</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teasdale GM et al, 1990, Glasgow</td>
<td>Sub group in paper of 99 head injured children requiring neurosurgery</td>
<td>Multicentred prospective comparative</td>
<td>Fully conscious and no skull fracture</td>
<td>16% of those with ICI</td>
<td>Incomplete data</td>
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<td></td>
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<td></td>
<td>Impaired consciousness and no skull fracture</td>
<td>0.5% of all attendees with head injury in this category</td>
<td>Not restricted to mild trauma</td>
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<td>CT results</td>
<td>12% of those with ICI</td>
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<td>Clinical factors</td>
<td>Amnesia for event highest sensitivity of 87%. LOC less sensitive at 68%. Absence of amnesia, LOC, focal neurology and headache &gt;89% negative predictive value</td>
<td>Not restricted to mild trauma</td>
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<td>M &amp; M</td>
<td>7.6% of all attendees in this category</td>
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<td>Imaging</td>
<td>M &amp; M</td>
<td>No clear if head trauma seen was scanned</td>
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<td>Surgical follow up</td>
<td>M &amp; M</td>
<td>Not clear if truly prospective</td>
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<td></td>
<td>CT result</td>
<td>M &amp; M</td>
<td>Incomplete clinical data</td>
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<td></td>
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<td>Clinical factors in CT proven ICI</td>
<td>M &amp; M</td>
<td>No available data on interventions required for those with minor head injury</td>
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<td>Half of those with ICI had no symptoms.</td>
<td>M &amp; M</td>
<td>410 children originally identified as 'non-trivial'</td>
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<td>Significantly more ICI in infants &lt;3 months old.</td>
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<td>5/6 had scalp haematoma. Four-fold increase of intracranial haematoma with skull fracture</td>
<td>M &amp; M</td>
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<td>16% of those imaged shown to have ICI</td>
<td>M &amp; M</td>
<td>No restricted to mild trauma</td>
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<td>Skull haematoma</td>
<td>13% of those with ICI had evacuation of haematoma</td>
<td>Real rate of ICI injury on CT probably underestimated as only 31% had CT following pre-existing ED protocol</td>
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<td>M &amp; M</td>
<td>GCS not given</td>
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<td>No deaths</td>
<td>M &amp; M</td>
<td>Not restricted to minor injury</td>
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<td></td>
<td>No CT’s ordered for those not imaged originally, no clinical deterioration for those who had a normal CT originally</td>
<td>M &amp; M</td>
<td>Data not available for 52 patients</td>
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<td></td>
<td>No significant difference in ICI or skull fracture between GCS 13 and 14</td>
<td>M &amp; M</td>
<td>No data on focal neurology</td>
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<td>60% of those with ICI had an improvement in GCS on re-examination (ic &gt;13)</td>
<td>M &amp; M</td>
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<td>67% of those with ICI had no history of LOC</td>
<td>M &amp; M</td>
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<td>Loss of consciousness</td>
<td>M &amp; M</td>
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<td>Change in GCS</td>
<td>M &amp; M</td>
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<td>Difference in GCS</td>
<td>M &amp; M</td>
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<td>Head CT</td>
<td>M &amp; M</td>
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<td>M &amp; M</td>
<td>M &amp; M</td>
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<td>CT scanned trauma centre and were</td>
<td>M &amp; M</td>
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<td>Two week follow up</td>
<td>M &amp; M</td>
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<td>19.1% had ICI, half of whom had no skull fracture</td>
<td>M &amp; M</td>
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<td>M &amp; M</td>
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<td>3.2% had haematoma evacuation, one of whom required long term rehabilitation. All lived</td>
<td>M &amp; M</td>
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</tbody>
</table>
Comment(s)
While no paper directly answered the question, five prospective studies clearly demonstrate ICI occurring in the absence of altered GCS and/or focal neurology. It is also clear that ICI occurs in children whose GCS has improved.

There seems to be no consistent linear relation between other clinical factors and predictability of ICI. Two papers showed that in infants who have no focal signs and no altered mental state the presence of significant scalp haematoma was an indication of increased risk of ICI. The full significance of ICI in asymptomatic head injured children is not clear however as many as one in six asymptomatic infants with ICI may be given neurosurgery.

Clinical bottom line
All head injured children who have a GCS of < 15 should undergo cranial CT. Asymptomatic infants who have head injury and a scalp haematoma should also undergo cranial CT.