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 practicing clinicians. The search strategies used to find the best evidence are reported in detail in order to allow clinicians to update searches whenever necessary. The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary or placed on the BestBETs web site. 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. Eight BETs are included in this issue of the journal.

- Electrical stimulation and Bell’s palsy
- White cell count and diagnosing appendicitis in children
- White cell count and diagnosing appendicitis in adults
- Serum amylase or lipase to diagnose pancreatitis in patients presenting with abdominal pain
- Management of acute ethylene glycol poisoning
- Bed rest after lumbar puncture
- Difficult intubation, the bougie and the stylet
- To stab or slash: the percutaneous dilatation or standard surgical approach to cricothyroidotomy in prehospital care

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Clinical scenario
A 50 year old presents with Bell’s palsy. You have heard that physiotherapy is an effective treatment but wonder whether facial exercises produce a better outcome than treatment with electrical stimulation.

Three part question
In [facial nerve palsy] are [facial exercises better than electrical stimulation] at improving [time to function/facial symmetry]?

Search strategy
Medline and CINAHL 1966–06/02, AMED 1985–04/02 using the OVID interface. Medline and CINAHL: [{facial nerve palsy.mp OR exp facial paralysis OR exp bells palsy}] AND [“trophic stimulation”.mp OR exp physical therapy techniques OR “physiotherapy”.mp OR exp electric stimulation/ OR exp electric stimulation therapy/ OR “electrical stimulation”.mp OR electrotherapy.mp}] LIMIT to human AND English. AMED: {exp peripheral nerve disease} AND {exp electrotherapy}.

Search outcome
Medline and CINAHL: 253 papers were identified, AMED: 17 papers found 11 of which were relevant, but 10 papers were excluded as these described electromyographic feedback (EMG feedback training), which is not a form of electrical stimulation. The remaining paper is shown in table 1.

Comment(s)
No papers were found that involved physiotherapy treatment of Bell’s palsy in the acute setting. The above paper describes significant differences in the outcomes used for patients with long term facial nerve palsy using electrical stimulation, however this was not a rigorous study.

CLINICAL BOTTOM LINE
There is no evidence to suggest that either exercises or electrical stimulation is beneficial to patients with acute Bell’s palsy. Evidence does exist to justify the use of electrical stimulation in patients with long term Bell’s palsy, although the study could have been more rigorous.


White cell count and diagnosing appendicitis in children

Report by Robert Williams, Clinical Fellow
Checked by Kevin Mackway-Jones, Professor

A short cut review was carried out to establish whether a single white cell count has clinical utility in the diagnosis of acute...
appendicitis in children. Altogether 100 papers were found using the reported search, of which four presented the best evidence to answer the clinical question. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Clinical scenario
A 6 year old child presents to the emergency department with a history and examination consistent of appendicitis. On referral, the duty surgeon requests a full blood count. You wonder whether it will aid the diagnosis.

Three part question
In [children with suspected appendicitis] does [a single white cell count] aid [diagnosis]?

Search strategy
Medline 1966–06/02 using the OVID interface. [ (exp Appendicitis OR acute appendicitis.mp) AND (exp Haematological tests OR exp Leukocyte count OR leukocyte count$.mp OR neutrophil count$.mp OR white cell count$.mp OR inflammatory parameter$.mp) AND exp Diagnosis AND (exp adolescence OR exp child OR exp child of impaired parents OR exp child, abandoned OR exp child, exceptional OR exp child, institutionalised 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$.mp OR exp Pediatrics OR pediatric$.mp OR paediatric$.mp) ]]. Limit to human AND English.

Search outcome
Altogether 100 papers were found of which 96 were irrelevant or of insufficient quality. The remaining four papers are shown in table 2.

Comment(s)
The majority of studies looked at absolute values of white cell counts in appendicitis and were of little use in evaluating its use as a diagnostic test. Although the paper by Lau et al is well constructed, it assesses two different ranges for the analysis, which may affect the results. Without data on the numbers within each group, their claim for 100% specificity, and infinite positive likelihood ratio must be interpreted with care.

> CLINICAL BOTTOM LINE
A single white cell count is neither sensitive nor specific in the diagnosis of appendicitis in children.


### Table 1

<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>Farragher D et al, 1987</td>
<td>40 patients, with a 74 months mean interval between onset and starting treatment. Stimulation v no stimulation</td>
<td>Clinical trial</td>
<td>FPRP (Facial Paralysis Recovery Profile)</td>
<td>p&lt;0.0001</td>
<td>Not randomised</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Author, date, and country</th>
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<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doraiswamy NV, 1979, UK</td>
<td>375 children admitted with clinical diagnosis of acute appendicitis 225 found to have acute appendicitis, 50 with a normal appendix, and 100 in whom symptoms resolved spontaneously</td>
<td>Diagnostic test study</td>
<td>WCC&gt;15000 (0–10 years) or WCC&gt;10000 (10–15 years)</td>
<td>Sens 42%; Spec 97%; LR+ 12.5; LR− 0.80</td>
<td>Unclear if blinded; No gold standard; No follow up of non-operative cases</td>
</tr>
<tr>
<td>Miskowiak J and Burcharth F, 1982, Denmark</td>
<td>238 patients admitted with suspected acute appendicitis 74 were below 15 years</td>
<td>Diagnostic test study, blinded</td>
<td>WCC&gt;15000</td>
<td>Sens 19%; Spec 85%; LR+ 1.26; LR− 0.95</td>
<td>No gold standard</td>
</tr>
<tr>
<td>PeltoLA et al, 1986, Sweden</td>
<td>162 children (1.9–15.6) admitted with suspected acute appendicitis</td>
<td>Diagnostic test study</td>
<td>WCC&gt;15000</td>
<td>Histology</td>
<td>Sens 60%; Spec 84%; LR+ 3.75; LR− 0.48</td>
</tr>
<tr>
<td>Lau WY et al, 1989, Australia</td>
<td>1389 patients (1–87), with right lower abdominal pain, consistent with appendicitis 177 children (1–15) Non-operative group followed up at 2 and 6 weeks</td>
<td>Diagnostic test study, blinded</td>
<td>WCC&gt;15000 (group 1–10); WCC&gt;13000 (group 10–15)</td>
<td>Histology</td>
<td>Sens 60.5%; Spec 100%; LR+ INF; LR− 0.35</td>
</tr>
</tbody>
</table>
Clinical scenario
A 24 year old man presents to the emergency department with a history and examination consistent with appendicitis. On referral, the duty surgeon requests a full blood count. You wonder whether it will aid the diagnosis.

Three part question
In [adults with suspected appendicitis] does [a single white cell count] aid [diagnosis]?

Search strategy
Medline 1966–06/02 using the OVID interface. [(exp Appendicitis OR acute appendicitis.mp) AND (exp Haematological tests OR exp Leukocyte count or leukocyte count$.mp OR neutrophil count$.mp OR white cell count$.mp OR inflammatory parameter$.mp or white blood count$)]. Limit to human and English.

Search outcome
Altogether 176 papers were found, of which 171 were irrelevant or of insufficient quality for inclusion. The remaining five papers are shown in table 3.

Comment(s)
All the reviewed studies have the weakness of no gold standard diagnostic test against which to compare the non-operative group. Only one study undertakes follow up of its non-operative group, with a single study formally recognising the fact that some abdominal pain, not requiring laparotomy, may have originated from the appendix. While all the studies seem to produce broad agreement as to the sensitivity and specificity of an isolated white cell count, they are not truly comparable because of the differing selection criteria of patients, age ranges, and clinical management. In addition there is a wide prevalence of disease between the groups.

► CLINICAL BOTTOM LINE
A single white cell count is neither sensitive nor specific in the diagnosis of appendicitis.


Serum amylase or lipase to diagnose pancreatitis in patients presenting with abdominal pain

Report by John Butler, Specialist Registrar

Checked by Kevin Mackway-Jones, Professor

Abstract
A short cut review was carried out to establish whether serum amylase was better than serum lipase in the diagnosis of pancreatitis in patients presenting with abdominal pain. Altogether 320 papers were found using the reported search, of which seven presented the best evidence to answer the clinical question. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Clinical scenario
A 45 year old woman attends the emergency department with a four hour history of acute onset of epigastric pain. She has a history of alcohol use. On examination you can elicit tenderness in the epigastrium but no peritonism. You are concerned that the patient may have pancreatitis. You wonder whether a serum lipase might be better than serum amylase as a diagnostic marker for pancreatitis in this patient.

Three part question
In [patients with abdominal pain] is [a single serum lipase better than a serum amylase] as [a diagnostic marker of pancreatitis]?

Search strategy
Medline 1966–06/02 and EMBASE using OVID interface. [(exp Abdominal pain/ OR abdominal pain.mp) OR {exp...
Pancreatitis/ OR exp Pancreatitis, Acute Necrotizing OR exp pancreatitis, alcoholic/ OR pancreatitis.mp) AND (exp Amylases OR amylose.mp) AND (exp Lipase OR lipase.mp) AND exp Diagnosis OR diagnosis.mp] LIMIT to human AND English.

Search outcome
Altogether 320 papers were found in total of which 313 were irrelevant or of insufficient quality for inclusion. The remaining seven papers are shown in table 4.

Comment(s)
Concern has been expressed about the use of serum amylase to diagnose pancreatitis. Hyperamylasaemia has been reported in numerous abdominal conditions that can be confused with pancreatitis. Acute pancreatitis has also been reported in patients with a normal amylase. The studies mentioned suggest that serum amylase and lipase both have high levels of sensitivity and specificity for pancreatitis, although few studies looked directly at patients attending the emergency department with abdominal pain. On the whole comparative studies show serum lipase to be slightly superior to amylase as a diagnostic marker when used to rule in or out pancreatitis. Further work is needed to look at diagnostic assays in patients attending the emergency department with abdominal pain.

CLINICAL BOTTOM LINE
Serum amylase and lipase are high sensitivity and specific diagnostic markers of acute pancreatitis. Some studies suggest serum lipase is better.

Management of acute ethylene glycol poisoning

Report by Paul Wallman, Specialist Registrar
Checked by Kerstin Hogg, Clinical Research Fellow

Abstract
A short cut review was carried out to establish whether methylpyrazole is better than ethanol and/or haemodialysis in the treatment of ethylene glycol poisoning. Altogether 524 papers were found using the reported search, of which none presented any evidence to answer the clinical question. Two papers reported relevant case series. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these papers are tabulated.

Clinical scenario
A 29 year old man attends the emergency department having ingested an unknown quantity of car anti-freeze liquid. His airway, breathing, and circulation are satisfactory. He is taken intoxicated, has a depressed level of consciousness with no evidence of injury. You have heard that there is a new treatment available and wonder whether this (methylpyrazole) is better than the standard approach of ethanol and/or haemodialysis.

Three part question
In [patients poisoned with ethylene glycol] is [methylpyrazole better than ethanol with or without haemodialysis] at [preserving renal function and reducing mortality]?
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>Borron SW et al, 1999, France</td>
<td>38 acute poisonings of which 11 patients had plasma ethylene glycol concentrations of 0.20 g/l or more</td>
<td>Prospective observational</td>
<td>Death, Serum creatinine</td>
<td>1/38 patients died, 0/7 patients who had a normal renal function at presentation had no further deterioration in serum creatinine</td>
<td>Simple case series, all patients received fomepizole, no controls</td>
</tr>
<tr>
<td>Brent J et al, 1999, USA</td>
<td>23 acute poisonings of which 19 met inclusion criteria including a plasma ethylene glycol concentration of &gt;20 mg per deciliter</td>
<td>Prospective observational</td>
<td>Side effects from fomepizole, Death, Serum creatinine</td>
<td>1/19 patients died, 17/19 underwent haemodialysis as per study protocol, 3/19 had an increased serum creatinine at last study reading</td>
<td>Simple case series, all patients received fomepizole, no controls</td>
</tr>
</tbody>
</table>

**Ethylene glycol poisoning is not common and small number studies are justified.** The studies shown above are observational rather than randomised trials with established practice. Furthermore, in the second study 17 of 19 patients underwent haemodialysis as well as receiving fomepizole. A satisfactory randomised trial with fomepizole and “non-fomepizole” arms is needed. Both the studies shown above were supported by grants from the manufacturers of fomepizole (Antizol).

**Clinical Bottom Line**
There is no evidence comparing the effectiveness of haemodialysis, ethanol, or fomepizole in treating ethylene glycol poisoning. Local guidance should be followed.

**Search strategy**
Medline 1966–06/02 using the OVID interface. (exp Ethylene Glycol or ethylene glycol.mp OR ethylene.mp OR anti-freeze.mp OR antifreeze.mp) AND (exp ethanol or ethanol.mp OR exp Renal Dialysis/ or haemodialysis.mp OR exp pyrazoles or pyrazoles.mp OR fomepizole.mp OR methylpyrazole.mp OR exp antidotes OR antidote.mp OR pyrazol.mp) LIMIT to human AND English.

**Search outcome**
Altogether 524 papers were found of which only two looked at newer treatments and none were comparative. These two papers are shown in table 5.

**Comment(s)**
Ethylene glycol poisoning is not common and small number studies are justified. The studies shown above are observational rather than randomised trials with established practice. Furthermore, in the second study 17 of 19 patients underwent haemodialysis as well as receiving fomepizole. A satisfactory randomised trial with fomepizole and “non-fomepizole” arms is needed. Both the studies shown above were supported by grants from the manufacturers of fomepizole (Antizol).

**Bed rest after lumbar puncture**

**Report by Stewart Teece, Clinical Research Fellow**

**Checked by Ian Crawford, Research Fellow**

**Abstract**
A short cut review was carried out to establish whether a period of bed rest reduces the incidence of headache or other complications in patients undergoing diagnostic lumbar puncture. Altogether 85 papers were found using the reported search, of which five presented the best evidence to answer the clinical question. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

**Clinical scenario**
A 27 year old woman attends the emergency department with a two day history of headache with mild neck stiffness. She appears otherwise well. Her CT scan is normal and you feel that if a lumbar puncture is normal she can be discharged. The duty physician advises you that the patient will require four hours bed rest after the lumbar puncture. The duty anaesthetist overears and says that the patient will be able to go home immediately. You wonder if either of them is right.

**Three part question**
In [patients undergoing diagnostic lumbar puncture] does [a period of bed rest] reduce [the incidence of headache or other complications].

**Search strategy**

**Search outcome**
Altogether 85 papers were found five of which were relevant to the three part question. These are shown in table 6.

**Comment(s)**
Most of the papers have found no statistical significance between the two groups. A rough calculation based on the data available shows that ambulant patients developed headache 31.7% (95% CI 27.4 to 36.1) of the time while those having bed rest suffered from this symptom 35.8% (95% CI 31.3 to 40.3) of the time. The confidence intervals overlap. Any difference between the two groups is likely to be so small that the sample size necessary to reveal it would be huge. The studies excluded patients with preceding headache. However, the question posed is about a patient undergoing a lumbar puncture to aid in the diagnosis of headache. A study by Kuntz et al.* has shown a 21% higher incidence of post lumbar puncture...
symptoms in those with preceding headache. A further study is therefore required to assess the question in patients with pre-existing headache.

CLINICAL BOTTOM LINE
Bed rest does not decrease the incidence of post lumbar puncture headache.


Difficult intubation, the bougie and the stylet

Report by Ian Jones, Registered Paramedic
Checked by Katherine Roberts, Research officer

Abstract
A short cut review was carried out to establish whether a gum elastic bougie is more effective than a stylet at improving the success rate in difficult intubation. Altogether 32 papers were found using the reported search, of which one presented the best evidence to answer the clinical question. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of this best paper are tabulated. A clinical bottom line is stated.

Clinical scenario
A paramedic ambulance is dispatched to a 36 year old woman who has fallen from a horse. On arrival the rider is not wearing a helmet, is unconscious, and has laboured diaphragmatic breathing. A cervical spine injury is suspected and orotracheal intubation is indicated because of the reduced respiratory effort, possible head injury, and the long transport time to the nearest emergency department. The patient has a grade 3 laryngoscopic view (Cormack and Lehane). You wonder whether intubation would be made easier if you had a gum elastic bougie or stylet.

Three part question
In a [restricted view intubation] is the [gum elastic bougie more effective than a stylet] at [improving the intubation success rate]?

Search strategy
Medline and HealthStar 1966-06/02 using the OVID interface. [(exp intubation, intratracheal OR intubat$.mp OR intubat$.mp OR laryngoscope OR laryngoscopy.mp) AND {introducer.mp OR bougie$.mp OR gum elastic.mp OR stylet$.mp}] LIMIT to human AND English.

Search outcome
Altogether 334 papers found of which one was relevant. This is shown in table 7.

Comment(s)
The use of simulated views is less than ideal. Despite this drawback the results clearly answer the question posed. A further study comparing the bougie, the lighted and unlighted stylet in both grade 3 and grade 4 views would be useful.

CLINICAL BOTTOM LINE
The gum elastic bougie is superior to the stylet at increasing the intubation success rate, when tested on simulated grade 3 views.

To stab or slash: the percutaneous dilatation or standard surgical approach to cricothyroidotomy in prehospital care

Report by Ian Jones, Registered Paramedic
Checked by Katherine Roberts, Research officer

Abstract
A short cut review was carried out to establish whether surgical or percutaneous dilatation techniques offer better success rates in emergency cricothyroidotomy. Altogether 114 papers were found using the reported search, of which two presented the best evidence to answer the clinical question. The author, date, and country of publication, patient group studied, study type, relevant outcomes, results, and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Clinical scenario
A paramedic ambulance is dispatched to a 24 year old man who has been ejected through the windscreen of his car. On arrival at the scene the patient is found to have major maxillofacial injuries with a seriously compromised airway. Airway control cannot be achieved by manual techniques and endotracheal intubation is not possible. You decide to attempt cricothyroidotomy and wonder whether the surgical technique is preferable to the percutaneous dilatation technique.

Three part question
In an [adult requiring emergency cricothyroidotomy] is [the standard surgical approach more effective than a percutaneous dilatation method] at [achieving an open airway and minimising complications]?

Search strategy
Medline 1966–06/02 using the OVID interface. [{cricothyroid.mp OR surgical airway.mp} AND {percutaneous.mp OR needle.mp OR surgical}] LIMIT to human AND English.

Search outcome
Altogether 144 papers found of which 142 were irrelevant to the study. The two remaining papers are shown in table 8.

Comment(s)
The study by Johnson et al found statistically significant differences in the insertion times and the subjective ease of use of the procedure, which were both in favour of the surgical approach. This study was of a lower quality than the Eisenburger study, which found no statistically significant differences between the techniques.

Clinical bottom line
There is no convincing evidence that either technique is superior in the prehospital environment. The operator should use the technique with which they are most familiar.


![Table 7](http://emj.bmj.com)

<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>Gataure PS et al, 1996, UK</td>
<td>100 patients undergoing elective surgery randomly split into 2 equal groups. Group 1 were intubated using 2 attempts with a bougie followed by a stylet while group 2 were intubated with 2 attempts with a stylet followed by a bougie. Simulated grade 3 views were used. Bougie v stylet</td>
<td>RCT</td>
<td>Success rate after 2 attempts</td>
<td>48/50 (96%) v 33/50 (66%) p&lt;0.001</td>
<td>Not tested with grade 4 views. The study did not compare lighted stylets against bougies and unlighted stylets. The study used simulated difficult intubations rather than actual difficult intubations</td>
</tr>
</tbody>
</table>

![Table 8](http://emj.bmj.com)

<table>
<thead>
<tr>
<th>Author, date, and country</th>
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<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson DR et al, 1993, USA</td>
<td>Human adult cadavers. SA v PD.</td>
<td>Controlled trial</td>
<td>Insertion success: 86% v 73% (p=0.186)</td>
<td></td>
<td>The use of pig skin instead of human skin.</td>
</tr>
<tr>
<td>Eisenburger P et al, 2000, Austria</td>
<td>40 consecutive unembalmed adult human cadavers, who had died 4–24 hours previously SA v Seldinger cricothyroidotomies</td>
<td>Controlled trial</td>
<td>Insertion success: 70% v 60%</td>
<td>2.2 v 2.4</td>
<td>The use of pig skin instead of human skin. Some of the procedures performed on violated cricothyroid membranes because of lack of cadavers Limited size of the trial</td>
</tr>
</tbody>
</table>
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K Mackway-Jones

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