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. Six BETs are included in this issue of the journal.

Diamorphine or morphine for ischaemic cardiac chest pain

Report by Steve Halford, Specialist Registrar
Checked by H Simpson, Consultant

Abstract
A short cut review was carried out to establish whether morphine is better than diamorphine at alleviating chest pain after an acute myocardial infarction. Altogether 66 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 55 year old man presents to the emergency department with chest pain. An ECG shows changes consistent with acute myocardial infarction. He is given aspirin and oxygen. His thrombolytic therapy is started and in the meantime you wonder whether his pain would be best alleviated by either morphine or diamorphine.

Three part question
In [patients with a myocardial infarction] is [morphine better than diamorphine] at [alleviating chest pain]?

Search strategy
Medline 1966–02/03 using the OVID interface. [(exp chest pain OR exp myocardial infarction OR myocard$.mp OR infarct$.mp OR MI.mp) AND (exp morphine OR morphine.mp OR heroin.mp OR diamorphine.mp OR analg$.mp OR exp analgesics, opioid) AND (exp clinical trials OR exp randomized controlled trials OR randomized controlled trial.mp)] LIMIT to human AND English.

Search outcome
Altogether 66 papers were identified of which only one was relevant. Details of this paper are shown in table 1.

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>Scott ME and Orr R, 1969, UK</td>
<td>118 patients aged 30–79 yrs with moderate to severe chest pain</td>
<td>PRCT</td>
<td>Complete pain relief at 10 min</td>
<td>47% v 32% (p&lt;0.05)</td>
<td>NSD</td>
</tr>
<tr>
<td>Diamorphine 5 mg v morphine 10 mg</td>
<td></td>
<td></td>
<td>Complete pain relief at 30 min</td>
<td></td>
<td>NSD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complete pain relief at 60 min</td>
<td></td>
<td>NSD</td>
</tr>
</tbody>
</table>

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Comment(s)
This is the only paper identified that compares morphine and diamorphine in this clinical situation. The doses were fixed.

▶ CLINICAL BOTTOM LINE
There are no significant clinical differences between diamorphine and morphine in patients with chest pain.


Type of oral corticosteroid in mild to moderate croup

Report by A Corfield, Specialist Registrar
Checked by S Teece, Clinical Research Fellow

Abstract
A short cut review was carried out to establish whether oral dexamethasone is better than oral prednisolone at improving outcome in children with mild to moderate croup. Altogether 139 papers were found using the reported search, of which none presented any evidence to answer the clinical question. It is concluded that there is no evidence available to answer this question. Further research is needed.

Clinical scenario
A 3 year old boy arrives in the emergency department in the early hours of the morning. His mother reports that he has been unwell for 24 hours with a barking cough. On examination he is well and active but has stridor at rest. His temperature is normal, there is no indrawing and oxygen saturations are normal. You know that oral corticosteroids reduce the length of illness and need for hospital admission but wonder whether to use oral dexamethasone or oral prednisolone.

Three part question
In [patients with mild to moderate croup] is [oral dexamethasone better than oral prednisolone] at [improving outcome]?

Search strategy
Medline 1966–02/03 and EMBASE 1980–02/03 using the OVID interface. [exp prednisilone OR prednisilone$.mp OR exp steroids OR steroid$.mp OR exp dexamethasone OR dexamethasone$.mp] AND [exp croup OR croup$.mp OR exp laryngotracheitis OR laryngotracheitis$.mp OR exp laryngotracheobronchitis OR laryngotracheobronchitis$.mp OR exp laryngotraechitis OR laryngotraechitis$.mp] LIMIT to human AND English.

Search outcome
Altogether 139 papers were identified. None answer the question.

Comment(s)
Croup is a common problem in the paediatric population. Oral corticosteroids are as effective as nebulised corticosteroids and are cheaper. Oral dexamethasone has an effective half life of 48 hours compared with 24 hours for prednisolone. Unfortunately there are no data directly comparing the efficacy of these two treatments.

▶ CLINICAL BOTTOM LINE
There is no evidence available to answer this question. Local advice should be followed.

Glucagon in tricyclic overdose

Report by S Teece, Clinical Research Fellow
Checked by K Hogg, Clinical Research Fellow

Abstract
A short cut review was carried out to establish whether the addition of glucagon to standard treatments improves clinical outcome in patients who have taken an overdose of tricyclic antidepressants. Altogether 31 papers were found using the reported search, of which three 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 suspected amitriptyline overdose. She has a Glasgow Coma Scale score of 7, is tachypneic and has a broad complex tachycardia with a blood pressure of 70/30. After intubation and ventilation and sodium bicarbonate she remains tachycardic at 130 although her complexes have narrowed.

Table 2

<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>Rudy JM et al, 1972, Australia</td>
<td>4 year old ingested about 1000 mg imipramine, episode of PEA 1.5 hours duration</td>
<td>Case report</td>
<td>Cardiac status</td>
<td>Improved with 1 mg boluses glucagon</td>
<td>Case report</td>
</tr>
<tr>
<td>Sener EK et al, 1995, UK</td>
<td>25 year old woman. Plasma toxicology - imipramine 3.0 mg/l, desipramine 0.18 mg/l, temazepam 0.25 mg/l</td>
<td>Case report</td>
<td>Blood pressure</td>
<td>No response to 1 mg bolus glucagon. 40 mm Hg systolic rise after glucagons</td>
<td>Multiple drugs ingested in overdose</td>
</tr>
<tr>
<td>Sensky PR and Olczak SA, 1999, UK</td>
<td>36 year old OD-admission toxicology dothiepin 2.58 mg/l, desmethyldothiepin 0.51 mg/l, paracetamol 135 mg/l, diazepam 0.33 mg/l, nortizepam 0.12 mg/l</td>
<td>Case report</td>
<td>Cardiac rhythm</td>
<td>No response to 1 mg bolus glucagon. Broad complex reverted to sinus after 10 mg bolus</td>
<td>Patient also received sodium bicarbonate, phenytoin and isoprenaline and fluid resuscitation</td>
</tr>
</tbody>
</table>

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somewhat and her blood pressure is still low at 80/40. You have heard that tricyclic overdoses may respond to glucagon and wonder whether there is any evidence for this.

Three part question
In [overdose with tricyclic antidepressants] does [the addition of glucagon to standard treatments] improve [clinical outcome]?

Search strategy
Medline 1966–02/03 using the OVID interface. [(exp antidepressive agents OR exp antidepressive agents, tricyclic OR exp desipramine OR exp amitriptyline OR tricycS.af. OR amitripbline.af. OR amoxapine.af. OR clomipramine.af. OR doxepin.af. OR dothiepin.af. OR imipramine.af. OR lofep-piramine.af. OR noritriptyline.af. OR trimipramine,af.) AND (exp glucagon OR glucagon,af.)] LIMIT to human AND English.

Search outcome
Altogether 31 papers found, 28 failed to answer the three part question, the three relevant papers are case reports summarised in table 2.

Comment(s)
Although all three patients received multiple treatments the authors state the improvement in condition was immediately after high dose glucagon administration. No reports of failure to respond to glucagon are found in the literature. This is most probably attributable to reporting and publication bias. Further research is required.

CLINICAL BOTTOM LINE
There is not enough evidence currently available to support the use of glucagon in tricyclic overdose.


Colourimetric CO₂ detector compared with capnography for confirming ET tube placement

Report by K Hogg, Clinical Research Fellow
Checked by S Teece, Clinical Research Fellow

Abstract
A short cut review was carried out to establish whether colourimetric carbon dioxide detectors are as reliable as capnometry at verifying tracheal placement of endotracheal tubes after emergency intubation. A total of 69 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.

**Table 3**

<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>Goldberg JS et al, 1990, UK</td>
<td>62 men aged 18–70 years old, ASA I, II and III. Simulated difficult intubation drill, using laryngoscope to increase larynsoscopy grade</td>
<td>Prospective observational study</td>
<td>3 separate observers recorded time to recognition of tracheal and oesophageal intubation, by observing IR capnography, FEF, end-tidal carbonimetre, and auscultation respectively.</td>
<td>All three methods confirmed correct positioning in 100% (n=51) cases. Colourimetre and capnography were faster than chest auscultation. All oesophageal intubations (n=11) confirmed by all 3 methods. One oesophageal intubation gave mild colour change but correctly interpreted.</td>
<td>Study only used haemodynamically stable patients. Observers were specialist anaesthetic staff as were those intubating. Observers not blinded to other detection methods.</td>
</tr>
<tr>
<td>Anton WR et al, 1991, USA</td>
<td>60 emergency intubations, out with theatre – respiratory failure n=29, CPR n=9, self-extubation n=7, ET tube change n=6, airway protection n=3</td>
<td>Prospective observational study</td>
<td>Observation of colour change in FEF colourimetre within 6 breaths post intubation. Observation of a positive signal from portable TRIMED IR CO₂ detector within 6 breaths post intubation.</td>
<td>Positive signal of exhaled CO₂ produced within 6 breaths by 59 of 60 by FEF detector, and 58 of 60 by TRIMED. Of the 9 CPR patients 5 showed a colour change that was “subtle”, into the brown range. One patient receiving CPR took 20 breaths before a positive signal was received in either.</td>
<td>Doctors were presumably anaesthetists. There were no oesophageal intubations.</td>
</tr>
<tr>
<td>Kelly JS et al, 1992, USA</td>
<td>20 children age 6 months to 8 years undergoing elective anaesthesia</td>
<td>Prospective observational study</td>
<td>Colour change in Fenem CO₂ detector versus IR capnograph reading in 1 spontaneous mask ventilation &amp; post tracheal intubation 10 breaths during each point were monitored</td>
<td>Of total 400 breaths, 398 registered yellow colour in the FEF colourimetre with expiration. This correlated with capnography readings. 2 breaths fell into brown range–both of these during mask ventilation, corrected by mask adjustment 100% in both devices.</td>
<td>All patients haemodynamically stable, with optimal intubating conditions. There were no oesophageal intubations. Participants were specialist anaesthetists. Small numbers.</td>
</tr>
<tr>
<td>Puntervoll SA et al, 2002, Norway</td>
<td>14 female patients undergoing general anaesthesia. All had both tracheal and oesophageal tubes passed. CO₂ y capnography</td>
<td>Experimental study</td>
<td>Detection of tracheal placement. Detection of oesophageal misplacement.</td>
<td>In 5 patients with expired air placed in the oesophagus the colourimetre changed colour.</td>
<td>Not emergency intubation.</td>
</tr>
</tbody>
</table>
Clinical scenario
A 30 year old man is brought to the emergency department with a Glasgow Coma Scale score of 8 after falling down stone steps while drunk. Although he has not vomited, you are concerned that he cannot protect his airway. You decide to do a rapid sequence induction. As you organise and check your equipment, you ask the nurse to bring the departmental capnograph to the bedside. She tells you that it is still in ITU where it was left after transferring the last intubated patient. She does, however, suggest you use a disposable colourimetric CO₂ detector found in the paediatric arrest trolley. You wonder whether you should wait five minutes while the capnograph is brought from ITU, or whether the colourimetric indicator will be just as accurate?

Three part question
In an [emergency intubation] is [a colourimetric carbon dioxide detector as reliable as capnography] at [verifying endotracheal tube placement]?

Search strategy
Medline 1966–02/03 using the OVID interface. [(exp Carbon Dioxide OR end-tidal.mp OR exp Capnography OR carbon dioxide.mp OR capnograph$$.mp) AND (colorimetric.mp OR exp Colorimetry OR colourimetric.mp)] LIMIT to human AND English language.

Search outcome
Altogether 69 papers were found of which four were relevant to the question. Details of these papers are shown in table 3.

Comment(s)
There have been no studies investigating the use of these devices exclusively within the emergency department.

CLINICAL BOTTOM LINE
The clinical CO₂ detector is as accurate as IR capnography at detecting tracheal intubation, but is potentially less accurate at detecting oesophageal intubation.


Glucagon for the treatment of symptomatic β blocker overdose

Report by R Boyd, Consultant

Checked by A Ghosh, Senior Clinical Fellow

Abstract
A short cut review was carried out to establish whether the intravenous glucagon can support blood pressure in β blocker overdose. A total of 51 papers were found using the reported search, of which six 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 25 year old patient presents to the emergency department two hours after taking a significant overdose of propanolol. She is bradycardic and hypotensive despite initial resuscitation with oxygen and intravenous fluids. An ECG shows a sinus bradycardia of 50 bpm. You have heard of treatment with intravenous glucagon but wonder if it has been of any proved benefit.

Three part question
In [symptomatic significant beta-blocker overdose] is [intravenous glucagon] effective at [reversing the induced hypotension]?

Search strategy
Medline 1966–02/03 using the OVID interface. [exp glucagon Or glucagon.mp] AND [(exp adrenergic beta antagonist) AND (exp poisoning OR exp overdose OR poisoning.mp OR intoxication.mp overdose.mp) OR (beta blocker overdose.mp OR beta blocker poisoning.mp)]

Search outcome
Altogether 51 papers were found of which six were deemed relevant. No clinical trials were identified and all the papers available were case reports. Details of these papers are shown in table 4.

Comment(s)
No clinical trials or even case controlled studies have been published. There is therefore only anecdotal evidence for the use of glucagon. The doses of glucagon suggested are higher than the usual therapeutic doses given in hypoglycaemia and

Table 4

<table>
<thead>
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<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterson CD et al, 1984, USA</td>
<td>2 cases of mixed overdose including β blockers</td>
<td>Case report</td>
<td>Survival</td>
<td>Bolus of 12 mg and 4 mg used to reverse cardiogenic shock</td>
<td>Case report</td>
</tr>
<tr>
<td>Weinstein RS et al, 1985, USA</td>
<td>1 case of propanolol overdose</td>
<td>Case report</td>
<td>Survival</td>
<td>80 mg glucagon intravenous given over 18 hours to reverse cardiogenic shock</td>
<td>Case report</td>
</tr>
<tr>
<td>Khan MI and Miller MT, 1985, South Africa</td>
<td>1 case of propanolol overdose</td>
<td>Case report</td>
<td>Survival</td>
<td>Use of 20 mg glucagon to reverse cardiogenic shock</td>
<td>Case report</td>
</tr>
<tr>
<td>Tai YT et al, 1990, Hong Kong</td>
<td>Single case of metoprolol overdose</td>
<td>Case report</td>
<td>Survival</td>
<td>1 mg of glucagon is claimed to have reversed cardiogenic shock</td>
<td>Case report</td>
</tr>
<tr>
<td>O'Mahony D et al, 1990, Eire</td>
<td>One patient after oxprenolol overdose</td>
<td>Case report</td>
<td>Survival</td>
<td>30 mg bolus with 10 mg/h infusion of glucagon, successful resuscitation from β blocker induced cardiogenic shock</td>
<td>Case report</td>
</tr>
<tr>
<td>Mansell PI, 1990, Australia</td>
<td>Single mixed overdose including propanolol</td>
<td>Case report</td>
<td>Survival</td>
<td>Bolus of 4 mg glucagon with an infusion of 10 mg in 3 hours</td>
<td>Case report</td>
</tr>
</tbody>
</table>
this is expensive. No reports of failure to respond to glucagon are found in the literature. This is most probably attributable to reporting and publication bias. Further research is required.

**CLINICAL BOTTOM LINE**

There is not enough evidence currently available to support the use of glucagon in β blocker overdose.

**Clinical scenario**

A 38 year old man presents to the emergency department with moderate to severe non-specific abdominal pain that is colicky in nature. He has no significant past history. Examination reveals mild tenderness but no signs of peritonism. Oral analgesia seems unlikely to control his pain. You speak to a colleague who suggests that you use buscopan (hyoscine butylbromide)—an antispasmodic. You wonder if there is any evidence that this works.

**Three part question**

In [a patient with colicy abdominal pain] is [buscopan (hyoscine butylbromide)] better than [analgesics] at [controlling pain]?

**Search strategy**

Medline 1966–02/03 using the OVID interface. [exp abdominal pain OR (abdominal adj5 pain).af OR (stomach adj5 ache).af OR (exp pain OR pain.af OR ache.af OR exp colic OR colic$.af OR discomfort.af)] AND [exp butylscopolammonium bromide OR butylscopolammonium.af OR buscopan.af OR exp scopolamine OR scopolamine.af OR hyoscine.af OR exp scopolamine derivatives OR hyocine.af] LIMIT to human AND English.

**Search outcome**

 Altogether 31 papers were found of which none were relevant.

**Comment(s)**

There is very little research into the effects of buscopan on any form of pain.

**CLINICAL BOTTOM LINE**

There is no evidence supporting the use of buscopan in non-specific abdominal pain.