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. Each BET is based on a clinical scenario and ends with a clinical bottom line, which indicates, in the light of the evidence found, what the reporting clinician would do if faced with the same scenario again. The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary1 or placed on the BestBETs website. Each BET has been constructed in the four stages that have been described elsewhere.2 The BETs shown here together with those published previously and those currently under construction can be seen at http://www.bestbets.org.3 Four BETs are included in this issue of the journal.

Diagnostic utility of electrocardiogram for diagnosing pulmonary embolism

Report by Ged Brown, Specialist Registrar
Search checked by Kerstin Hogg, Clinical Research Fellow
doi: 10.1136/empl.2005.029041

Abstract
A shortcut review was carried out to establish the diagnostic utility of electrocardiography in patients with suspected pulmonary embolus (PE). Altogether 952 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 (table 1). It is concluded that although there are electrocardiogram (ECG) changes that are more common in PE, the ECG alone is not sufficiently sensitive or specific to rule out or rule in the diagnosis.

Clinical scenario
A 30 year old man presents to the emergency department with a spontaneous onset of atraumatic pleuritic chest pain. He is in a low risk group clinically. The medical registrar suggests that the fact that the ECG is normal makes the diagnosis of PE much less likely. You wonder whether his assertion that a normal ECG will help to exclude a PE is safe.

Three part question
In [a patient presenting with features suggestive of pulmonary embolus] what is [the diagnostic utility of ECG] in [stratifying risk of pulmonary embolus]?

Search strategy

CLINICAL BOTTOM LINE
An ECG alone is of little value in the diagnosis of PE. Its main value is in ruling out other causes of the presenting symptoms, or as part of a risk stratification strategy to inform a further investigative protocol.
Table 1

<table>
<thead>
<tr>
<th>Author, date, country</th>
<th>Patient group</th>
<th>Study type</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rodger M et al, 2000, Canada</td>
<td>212 consecutive patients referred for V/Q or pulmonary angiogram for suspected PE</td>
<td>Prospective validation of previously derived scoring system</td>
<td>Prevalence of 28 ECG abnormalities in those subsequently diagnosed as PE positive (49) or negative (163)</td>
<td>Only 2 abnormalities (tachycardia and incomplete RBBB) significantly more prevalent in PE positive than PE negative patients</td>
<td>Diagnostic utility of ECG scoring system (previously derived in patients diagnosed as PE positive) assessed for validation</td>
</tr>
<tr>
<td>Stollberger C et al, 2000, Austria</td>
<td>168 (derivation) and 139 (validation) inpatients suspected of PE</td>
<td>Prospective derivation/validation study</td>
<td>Risk factors, objective clinical signs, LDH, ECG (‘signs of right heart strain’), arterial blood gases, venography/plinthysmography results and chest x ray recorded</td>
<td>Multivariate logistic regression established those associated with the diagnosis of PE 'PE score' (including ECG signs of right heart strain) developed and validated in second group</td>
<td>PE score performance is reported for 17 different scores in paper. Examples are given below: PE score &gt;0.3 Sn 100%, Sp 79%</td>
</tr>
<tr>
<td>Miniati M et al, 2003, Italy</td>
<td>1100 consecutive patients referred for investigation for PE</td>
<td>Derivation/cross validation study</td>
<td>Objective signs, risk factors, ECG and CXR recorded. Multivariate logistic regression established those associated with the diagnosis of PE</td>
<td>Scoring system (included ECG signs of right heart strain) developed that divides patients into low, intermediate, moderately high, and high groups</td>
<td>Inpatient population only</td>
</tr>
<tr>
<td>Richman PB et al, 2004, USA</td>
<td>Patients assessed for PE over 1 year. 49 with PE compared with 49 without</td>
<td>Observational</td>
<td>ECG changes classically associated with PE</td>
<td>Pre-test probability by group</td>
<td>No prospective validation study (cross validation only)</td>
</tr>
<tr>
<td>Sinha N et al, 2005, USA</td>
<td>Patients undergoing CT pulmonary angiography at a tertiary hospital over 30 months</td>
<td>Retrospective cohort</td>
<td>ECG changes significantly associated with PE</td>
<td>Low 4% Intermediate 22% Moderately high 74% High 98%</td>
<td>Incomplete cohort used in that 252 patients investigated for PE were not used in analysis</td>
</tr>
</tbody>
</table>

ECG, electrocardiogram; LDH, lactate dehydrogenase; PE, pulmonary embolus.

Abstract

A shortcut review was carried out to establish whether increasing the paper speed during ECG recording could improve the accuracy of diagnosis of narrow complex tachycardias. Altogether 256 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 these best papers are tabulated in table 2. It is concluded that increasing paper speed does indeed improve diagnostic accuracy.

Clinical scenario

A 60 year old Asian female, who speaks little English, is brought to the emergency department with what seems to be a three day history of worsening exertional dyspnoea and a 3 hour history of resting dyspnoea with light-headedness. On examination she is apyrexial with a pulse of 150 beats/min, a respiratory rate of 20/min, blood pressure 100/60, and oxygen
saturation 93% in air. A 12-lead ECG is recorded, which reveals a rapid narrow complex tachycardia. Interpretation of P wave activity is difficult because of the rapid heart rate and you cannot be entirely sure whether this is atrial flutter, junctional tachycardia, or sinus tachycardia. You wonder if increasing the ECG speed will help you to make a more accurate diagnosis.

**Three part question**

In [adults with narrow complex tachycardia] does [increased electrocardiograph speed] improve [success in identifying the type of narrow complex tachycardia]?

**Search strategy**

Medline OVID interface 1966 to week 1 July 2005. EMBASE using the Dialog Datasstar interface 1982 to week 4 June 2005. CINAHL, using the OVID interface 1974 to week 1 July 2005. EMBASE, 216 using EMBASE, 8 using CINAHL, and 6 using Cochrane. Only one paper, which had been identified using both OVID Medline and EMBASE, was relevant to the three part question.

**Search outcome**

Using the reported searches, 116 papers were identified using OVID Medline, 216 using EMBASE, 8 using CINAHL, and 6 using Cochrane. Only one paper, which had been identified using both OVID Medline and EMBASE, was relevant to the three part question.

**Comments**

There is a subgroup of patients with narrow complex tachycardia who are difficult to diagnose using the initial 12-lead ECG. A trial of adenosine is often used to aid diagnosis but this often causes significant side effects to the patient and some quite literally heart stopping moments for patient and physician alike. The idea of a simple, quick, non-invasive test such as the 25 mm/s ECG to aid diagnosis is therefore attractive.

The only study to investigate the clinical utility of this strategy suggests that the addition of a 50 mm/s ECG to a standard 25 mm/s ECG improves diagnostic accuracy in narrow complex tachycardia. The study suggests that inappropriate use of adenosine may be reduced by implementing this strategy, as interpreters are more likely to correctly diagnose difficult tracings.

**Table 2**

<table>
<thead>
<tr>
<th>Author, country, date</th>
<th>Patient group</th>
<th>Study type</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accardi AJ et al, 2002 USA</td>
<td>45 patients with difficult narrow complex tachycardia (heart rate range: 150-250 beats/min)</td>
<td>Prospective comparative cohort</td>
<td>Correct ECG diagnosis</td>
<td>63% 25 mm/s standard group v 71% 50 mm/s ECG; difference in means 8.6% (95% CI 2, 15%); p = 0.002</td>
<td>Small numbers</td>
</tr>
<tr>
<td></td>
<td>8 Emergency physicians reviewed the ECGs, blinded to clinical information.</td>
<td></td>
<td>Correct ECG diagnosis of atrial flutter</td>
<td>40% 25 mm/s standard group v 52% 50 mm/s ECG; difference in means 12.5% (95% CI 1, 24%); p = 0.008</td>
<td>Definitive diagnosis was potentially inaccurate</td>
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<td>Correct diagnosis of atrial fibrillation</td>
<td>85% 25 mm/s standard group v 90% 50 mm/s ECG; difference in means 4.5% (95% CI –5, 14%); p = 0.046</td>
<td>Review of 25 mm/sec ECGs was followed by review of 50 mm/sec ECGs two weeks later. The reviewers may have learned more about ECG diagnosis in that time, biasing the results. Intraobserver variability should have been assessed</td>
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<td></td>
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<td>Correct diagnosis of PSVT</td>
<td>73% 25 mm/s standard group v 78% 50 mm/s ECG; difference in means 5% (95% CI –6, 16%); p = 0.18</td>
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<td></td>
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<td>Correct diagnosis of sinus tachycardia</td>
<td>56% 25 mm/s standard group v 81% 50 mm/s ECG</td>
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</table>
Lignocaine as a pretreatment to rapid sequence intubation in patients with status asthmaticus

Report by John Butler, Consultant
Search checked by Rupert Jackson, Consultant
doi: 10.1136/emj.2005.029058

Abstract
A shortcut review was carried out to establish whether pretreatment with intravenous lignocaine is of benefit in asthmatic patients undergoing rapid sequence intubation (RSI). Altogether 157 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 these best papers are tabulated (table 3). It is concluded that there is no good evidence to support the use of lignocaine in this circumstance.

Clinical scenario
A patient attends the emergency department in status asthmaticus. On examination they have a sinus tachycardia at a rate of 150/min, an oxygen saturation of 92% on high flow oxygen, and a pCO₂ of 7.0 kPa. Despite maximal medical treatment they are becoming exhausted. You decide that the patient needs a RSI and continuous mandatory ventilation. You wonder whether the pretreatment with lignocaine will attenuate the respiratory response (bronchospasm) to airway manipulation.

Three part question
In [asthmatic patients who need RSI and ventilation] does [pretreatment with intravenous lignocaine prior to RSI] reduce the incidence of [adverse airway responses]?

Search strategy
Medline OVID 1966 to week 4 June 2005. [exp Asthma OR exp Asthma, exercise induced OR asthma$.mp OR exp Bronchial spasm OR bronchospasm.mp] AND [exp Lidocaine OR lidocaine$ OR lignocaine$ OR lignocaine.mp]. LIMIT to human, English language, and publication year 2000–2005.

Comments
There is no evidence for the use of lignocaine as a pretreatment agent in asthmatic patients needing an RSI.

Steroids in sudden sensorineural hearing loss

Report by Angaj Ghosh, Registrar
Search checked by Rupert Jackson, Consultant
doi: 10.1136/emj.2005.029066

Abstract
A shortcut review was carried out to establish whether steroids are of benefit in sudden onset sensorineural deafness. Altogether 175 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 (table 4). It is concluded that there is insufficient good evidence to recommend early steroid treatment in this condition.

Clinical scenario
A 35 year old man presents to the emergency department with an 18 hour history of a right sided sudden hearing loss. Examination does not reveal a cause. A diagnosis of idiopathic sensorineural deafness is made. Your consultant suggests that a course of prednisolone might be of benefit. You discuss this with the registrar in audiological medicine who does not support this approach. You wonder who is right.

Table 3

<table>
<thead>
<tr>
<th>Author, date, country</th>
<th>Patient group</th>
<th>Study type</th>
<th>Outcomes</th>
<th>Key results</th>
<th>Study weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maslow AD et al, 2000, USA</td>
<td>60 asthmatic patients undergoing intubation</td>
<td>Prospective randomised controlled trial</td>
<td>Lower pulmonary resistance</td>
<td>8.2 v 7.6 cm water (ns)</td>
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<td>1.5 mg/kg lidocaine v saline given 3 min before tracheal intubation</td>
<td>Frequency of airway response to intubation</td>
<td>6/30 v 5/ 27 (ns)</td>
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</tbody>
</table>
Three part question
In [an adult with sudden idiopathic hearing loss] is [early steroid therapy better than no steroids] at improving [time to recovery and outcome]?  

Search strategy
Medline OVID 1966 to week 4 June 2005. [{exp hearing loss, sudden/OR sudden$ adj deaf$.mp. OR sudden adj hearing adj loss.mp.}] AND [{exp steroids/OR steroid$.mp. OR exp glucocorticoids/OR glucocorticoid$.mp. OR corticosteroid$.mp.}] LIMIT to human, English language, and all adult.

Embase OVID 1980 to week 27 2005. [{exp sudden deafness/OR sudden$ adj deaf$.mp. OR sudden adj hearing adj loss.mp.}] AND [{exp steroid/OR steroid$.mp. OR exp glucocorticoid/OR glucocorticoid$.mp. OR exp corticosteroid/OR corticosteroid$.mp.}] LIMIT to human, English language, and adult <18 to 64 years> or aged <65+ years>.


Comments
Idiopathic sudden sensorineural hearing loss has a high (50–70%) spontaneous partial or complete recovery rate; therefore, for a given treatment to be considered effective, a very high success rate must be demonstrated. The studies shown are all small and offer no convincing evidence of recovery rates above those expected.

► CLINICAL BOTTOM LINE
Current evidence does not support the early use of high dose steroids in idiopathic sensorineural hearing loss.


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<th>Table 4</th>
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<tbody>
<tr>
<td><strong>Author, date, country</strong></td>
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<tr>
<td>Wilson WR and Byl FM, 1980, USA</td>
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<td>Moskowitz D et al, 1984, USA</td>
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<td>Cinamon U et al, 2001, Israel</td>
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<td>Kitajiri S et al, 2002, Japan</td>
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<td>Chen CY et al, 2003, Taiwan</td>
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