BEST EVIDENCE TOPIC REPORTS

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

Edited by K Mackway-Jones

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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. The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary[1] or placed on the BestBETs web site. 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] Six BETs are included in this issue of the journal.

- Biphasic or monophasic defibrillation for adult ventricular fibrillation
- Ascorbate for alkali burns to the eye
- Leucovorin (calcium folinate) in "antifreeze" poisoning
- Vasopressin or adrenaline (epinephrine) in cardiac resuscitation
- Is the central venous pressure reading equally reliable if the central line is inserted via the femoral vein
- Oucher or CHEOPS for pain assessment in children

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1 **Carley SD**, Mackway-Jones K, Jones A, *et al*. Moving towards evidence based emergency medicine: use of a structured critical appraisal journal club. *J Accid Emerg Med* 1998;**15**:220–2.
2 **Mackway-Jones K**, Carley SD, Morton RJ, *et al*. The best evidence topic report: A modified CAT for summarising the available evidence in emergency medicine. *J Accid Emerg Med* 1998;**15**:222–6.
3 **Mackway-Jones K**, Carley SD. bestbets.org: Odds on favourite for evidence in emergency medicine reaches the worldwide web. *J Accid Emerg Med* 2000;**17**:235–6.

Biphasic or monophasic defibrillation for adult ventricular fibrillation

Report by Rob Torok, *Specialist Registrar*
Checked by Jeremy Till, *Staff Grade*

Abstract
A short cut review was carried out to establish whether biphasic defibrillatory shocks were superior to monophasic shocks in patients in ventricular fibrillation. Altogether 337 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
An adult is brought into the emergency department following an out of hospital ventricular fibrillatory arrest. Ventricular fibrillation persists despite repeated shocks. You remember reading about biphasic defibrillation and wonder if it offers any advantages.

Three part question
In [an adult in ventricular fibrillation] is [external biphasic shock better than monophasic shock] at [achieving defibrillation]?

Search strategy
Medline 1966–06/03 using the OVID interface. Biphasic.mp AND (defib$.mp OR shock$.mp OR exp electric countershock) LIMIT to human AND English.

Search outcome
Altogether 337 papers were found of which seven related to out of hospital studies relevant to the original question.

Comment(s)
The studies shown in table 1 represent two independent groups of patients. The first two studies are a prospective randomised controlled trial (PRCT) and subsequent subgroup analysis of data from it. The last five studies represent ongoing investigation by a group of researchers with some overlap of patient groups between each study because of differing selection criteria and differing dates of study.

The PRCT provides good evidence for the superiority of biphasic defibrillation over monophasic. Analysis of the data from this study gives an NNT of three for successful defibrillation with first shock, and an NNT of four for successful defibrillation within the first three shocks by biphasic compared with monophasic waveforms. These out of hospital studies follow on from extensive in hospital and animal studies showing the superiority of biphasic defibrillation.

All the studies reported used the Heartstream Forerunner defibrillator with non-escalating 150 J shocks. This device uses an impedance compensating biphasic truncated exponential waveform. Laboratory and hospital based studies show the superiority of biphasic waveforms to be broadly applicable and not confined to this specific example of a biphasic waveform. Work is ongoing to refine which parameters of the waveform influence effectiveness. Evidence should be appraised for the effectiveness of the specific waveform used when selecting a defibrillator. Local considerations will determine when biphasic devices replace monophasic defibrillators.

▸ CLINICAL BOTTOM LINE
Biphasic defibrillation is currently the best treatment for adult VF and should be used when available.

White RD. Early out-of-hospital experience with an impedance-compensating low-energy biphasic waveform automatic external defibrillator. *J Interv Card Electrophysiol* 1997;**1**:203–8.
Poole JE, White RD, Kanz KG, *et al*. Low-energy impedance-compensating biphasic waveforms terminate ventricular fibrillation at high rates in victims of out-of-hospital cardiac arrest. LIFE investigators. *J Cardiovasc Electrophysiol* 1997;**8**:1373–85.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
White RD, 1997, USA	18 SCA patients, 10 VF receiving biphasic shocks	Observational	1st shock efficacy for initial VF episode 1st shock efficacy	70% 82% (CI 70 to 92%)	Small number—an early subset of 2
Poole JE *et al*, 1997, USA & Germany	100 consecutive AED uses. 44 patients received biphasic shocks	Observational	1st shock efficacy for initial VF episode compared with pooled and best monophasic data published	89% (CI 75 to 97%) *v* 63% (CI 60 to 67%) and 77% (CI 70 to 83%)	Descriptive study—no controls. Inclusion of patient data between this and following studies occurs
Gliner BE *et al*, 1998, USA, UK, Italy, Germany	286 consecutive AED uses. 100 patients received biphasic shocks	Observational	1st shock efficacy for initial VF episode 1st shock efficacy for all VF episodes 3 shock efficacy for all VF episodes	86% (CI 78 to 92%) 86% (CI 81 to 91%) 97% (CI 91 to 99%)	Includes patients from reference 2
Gliner BE and White RD, 1999, USA	All AED uses—29 patients treated with biphasic shocks, 87 monophasic Biphasic *v* monophasic	Observational	1st shock efficacy 3 shock efficacy	85% *v* 66% p<0.0001 99% *v* 85% p<0.0001	Retrospective comparing data from differing periods. Includes some data from references 2, 1, and 6
Schneider T *et al*, 2000, Germany, Finland, Belgium	246 SCA patients, 115 in VF Biphasic (54) *v* monophasic (61)	PRCT	ROSC during ALS 3 shock efficacy for initial VF episode 1st shock efficacy for initial VF episode	76% *v* 54% p=0.01 98% *v* 69% p<0.0001 (% relate to biphasic then monophasic) 96% *v* 59% p<0.0001	Randomisation of defibrillation waveform by day rather than episode
White RD *et al*, 2001, USA	35 witnessed VF arrests receiving biphasic shocks	Observational	% ROSC during ALS % ROSC with shocks alone % discharged home	74% 38% 46% including all who required shocks alone	Excludes unwitnessed arrest Includes some data from references 1 and 4
Martens PR *et al*, 2001, Germany, Finland, Belgium	246 SCA patients, 115 VF—54 treated with biphasic, 61 with monophasic shocks—48 MTE, 13 MDS	Subgroup analysis of PRCT	ROSC during ALS 1st shock efficacy for initial VF episode 3 shock efficacy for initial VF episode	76% *v* 54% p=0.024 or 54% p=0.17 96% *v* 54% p=0.0001 or 77% p=0.047 98% *v* 67% p<0.0001 or 77% p<0.021(% relate to biphasic *v* MTE then MDS)	Subgroup analysis of above so small numbers for MDS

Gliner BE, Jorgenson DB, Poole JE, *et al*. Treatment of out-of-hospital cardiac arrest with a low-energy impedance-compensating biphasic waveform automatic external defibrillator. The LIFE investigators. *Biomed Instrum Technol* 1998;**32**:631–44.
Gliner BE, White RD. Electrocardiographic evaluation of defibrillation shocks delivered to out-of-hospital sudden cardiac arrest patients. *Resuscitation* 1999;**41**:133–44.
Schneider T, Martens PR, Paschen H, *et al*. Multicenter, randomized, controlled trial of 150-J biphasic shocks compared with 200- to 360-J monophasic shocks in the resuscitation of out-of-hospital cardiac arrest victims. *Circulation* 2000;**102**:1780–7.
White RD, Hankins DG, Atkinson EJ. Patient outcomes following defibrillation with a low energy biphasic truncated exponential waveform in out-of-hospital cardiac arrest. *Resuscitation* 2001;**49**:9–14.
Martens PR, Russell JK, Wolcke B, *et al*. Optimal response to cardiac arrest study: defibrillation waveform effect. *Resuscitation* 2001;**49**:233–43.

Ascorbate for alkali burns to the eye

Report by Kevin Mackway-Jones, *Consultant*
Checked by Janet Marsden, *Senior Lecturer*

Abstract
A short cut review was carried out to establish whether ascobate drops are useful in the management of alkalis burns to the eyes. Altogether 33 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 22 year old man has been cleaning out an old chemical drum. He attends the emergency department with severe burning in his eyes. He says the drum was marked as NaOH 20%. You arrange for copious irrigation and oral pain relief. You contact the duty ophthamologist who asks to start mydriatics, antibiotic ointement, and ascorbate drops. You do not have the ascorbate drops and wonder whether there is any evidence for their use.

Three part question
In [patients with alkali eye burns] do [ascorbate drops] [reduce short-term symptoms and long-term sequelae]?

Search strategy
Medline 1966- week 1 06/03 using the OVID interface. {[(injury.mp OR exp "wounds and injuries" OR exp burns OR burn$.mp) AND (eye$.mp OR exp eye)] OR (eye injury.mp OR eye injuries.mp OR exp eye injuries OR eye burn$.mp OR exp eye burns)} AND (alkali$.mp OR exp alkalies) AND (ascorbate$.mp OR ascorbic acid.mp OR exp ascorbic acid OR vitamin C.mp)

Table 2

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Brodovsky SC *et al*, 2000, Australia	121 patients with 177 alkali burnt eyes over 11 years.	Retrospective clinical comparison	Time to re-epithelialisation	Delay in grade 2 burns. Trend for longer in 1, shorter in 3 and no difference in 4	Uncontrolled. Very few conservatively treated patients
	Standard alkali protocol (antibiotics, intensive topical corticosteroids, ascorbate, citrate and antibiotics) *v* conservative protocal (antibiotics, short course of corticosteroids)		Final visual acuity	Better in grade 3 burns. No difference in 1, 2, and 4	Conclude that ascorbate and citrate are the effective agent for grade 3 burns without considering the effect of intensive corticosteroid alone

Search outcome
Altogether 33 papers were found of which one was relevant (table 2).

Comment(s)
Ascorbate (and citrate) treatment have been extensively investigated in rabbits but there are no good human data. A randomised controlled trial is mentioned as being underway in papers in 1980, but has not been reported.

▸ CLINICAL BOTTOM LINE
There is no good evidence for the routine use of ascorbate in alkali burns in humans. A well designed randomised controlled trial should be performed.

Brodovsky SC, McCarty CA, Snibson G, *et al*. Management of alkali burns: an 11-year retrospective review. *Ophthamology* 2000;**107**:1829–35.

Leucovorin (calcium folinate) in "antifreeze" poisoning

Report by Angaj Ghosh, *Senior Clinical Fellow*
Checked by Russell Boyd, *Consultant*

Abstract
A short cut review was carried out to establish whether the addition of intravenous calcium folinate to standard (ethanol) therapy reduced the visual complications of antifreeze (methanol and ethyleny glycol). Altogether 12 papers were found using the reported search, of which one animal study 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 man attends the emergency department having deliberately taken 150 ml of "antifreeze". The can of antifreeze has conveniently been brought along and you find it consists of a mixture of methanol and ethylene glycol. The Poisons Centre is contacted. In addition to treatment with ethanol it is suggested that intravenous Leucovorin (calcium folinate) is given. You wonder if there is any evidence to support this recommendation.

Three part question
In [an adult with methanol/ethylene glycol poisoning] is [the addition of intravenous calcium folinate better than ethanol alone] at [reducing the incidence of reduced acuity and retinal oedema)]?

Search strategy
Medline 1996–06/03 using the OVID interface. [exp leucovorin OR folinic acid.mp OR Calcium folinate.mp] AND [exp methanol OR methanol.mp OR exp ethylene glycol OR ethylene glycol.mp OR antifreeze.mp] LIMIT to English.

Search outcome
Altogether 12 papers were found, none of which were relevant to humans. One paper published in two different journals described studies on monkeys and suggested that the results could be extrapolated to humans (table 3).

Comment(s)
In humans methanol toxicity is characterised by a metabolic acidosis and an ocular toxicity that occur coincident with an accumulation of formate in blood. After experimental studies on monkeys, Noker and Tephly hypothesised that folate compounds could decrease formate accumulation after methanol by stimulating formate oxidation or utilisation and suggested a possible use for folates in the treatment of certain cases of human methanol poisoning.

▸ CLINICAL BOTTOM LINE
There is no direct evidence of the usefulness of folates in methanol poisoning in humans. Local policy should be followed.

Noker PE, Tephly TR. The role of folates in methanol toxicity. *Adv Exp Med Biol* 1980;**132**:305–15.

Table 3

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Noker PE and Tephly TR 1980, USA	Cynomolgus monkeys Effects of 5-fTHF or sodium folate following methanol poisoning are assessed	Experimental study	Metabolic acidosis Serum formate level	Did not develop in treated monkeys Lower than in untreated monkeys: ($p<0.05$)	

Table 4

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Lindner KH *et al*, 1997, Germany	40 prehospital VF arrests Randomised to receive either initial dose vasopressin (40 U) or adrenaline (1 mg)	Prospective randomised double blind trial	Restoration of spontaneous circulation GCS on discharge Survival to discharge Spontaneous circulation on admission to hospital 24 hour survival	55% adrenaline *v* 80% vasopressin patients (p=0.18) 10.7 adrenaline *v* 11.7 vasopressin 15 % adrenaline *v* 40 % vasopressin (p=0.16) 35% adrenaline *v* 70% vasopressin (p=0.06) 20% adrenaline *v* 60 % vasopressin (p=0.02)	Only looked at VF Small patient sample All out of hospital arrests with mean emergency team response times of six minutes
Stiell IG *et al*, 2001, Canada	200 patients treated for cardiac arrest in three hospitals. Randomised to receive either initial dose vasopressin (40 U) or adrenaline (1 mg)	Prospective randomised double blind trial	Survival to discharge Presence of pulse and BP for one hour after resuscitation 30 day survival Neurological function at discharge	Vasopressin 12%, adrenaline 14% Vasopressin group 39% Adrenaline group 35% (not significant) No difference between groups No difference between groups	Powered only to show a 20% difference in one hour survival

Vasopressin or adrenaline in cardiac resuscitation

Report by Kerstin Hogg, *Clinical Research Fellow*

Checked by Reddy Mahu, *Clinical Fellow and Ian Crawford, Research Fellow*

Abstract

A short cut review was carried out to establish whether vasopressin is more effective than adrenaline after cardiac arrest. Altogether 44 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 67 year old man has been brought into the emergency department by paramedic ambulance. He was initially in ventricular fibrillation, but now has pulseless electrical activity. He collapsed 15 minutes ago and received immediate bystander basic life support. You wonder whether intravenous vasopressin would be better than adrenaline in this situation.

Three part question

In [cardiac resuscitation] is [vasopressin more effective than adrenaline] at achieving [return of spontaneous circulation and longterm survival]?

Search strategy

Medline 1966–06/03 using the OVID interface. [(exp vasopressins OR vasopressin.mp OR ADH.mp OR antidiuretic hormone.mp) AND (exp epinephrine OR epinephrine.mp OR adrenaline.mp) AND (exp resuscitation OR exp cardiopulmonary resuscitation OR exp Heart arrest OR arrest.mp OR exp ventricular fibrillation OR VF.mp OR ventricular fibrillation.mp OR asystole.mp OR EMD.mp OR electromechanical dissociation.mp OR PEA.mp OR pulseless electrical activity.mp)] LIMIT to human AND English.

Search outcome

Altogether 44 papers were found, only two papers compared the effects of adrenaline and vasopressin (table 4).

Comment(s)

The total number of patients studied remains small. The only RCT looking at hospital inpatients has shown no benefit in administering vasopressin during cardiac arrest.

▸ CLINICAL BOTTOM LINE

Vasopressin and adrenaline are equally efficacious after cardiac arrest.

Lindner KH, Dirks B, Strohmenger H, *et al*. Randomised comparison of epinephrine and vasopressin in patients with out-of-hospital ventricular fibrillation. *Lancet* 1997;**349**:535–7.
Stiell IG, Hebert PC, Wells GA, *et al*. Vasopressin versus epinephrine for inhospital cardiac arrest: a randomised controlled trial. *Lancet* 2001;**358**:105–9.

Is the central venous pressure reading equally reliable if the central line is inserted via the femoral vein

Report by Joel Desmond, *RCS Research Fellow*

Checked by Mahmoud Megahed, *Specialist Registrar*

Abstract

A short cut review was carried out to establish whether femoral central venous lines were as reliable as subclavian or jugular lines at assessing right atrial filling pressure. Altogether 141 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

You have been called to the resuscitation room to see a 67 year old woman who has walked out in front of a bus while shopping in town. She has an obvious closed fracture of her left arm and she is complaining of abdominal pain and central neck pain. You elicit from her husband that she has had two heart attacks in the past and the drugs in her handbag are bendrofluazide, frumil, and lisinopril. Her blood pressure is 90/52 and her pulse is 105. You are concerned that she may be hypovolaemic, but you are aware of the dangers of giving too

Table 5

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Murdoch IA *et al*, 1994, UK	12 children with cardiac pathology undergoing cardiac catheterisation while on assisted ventilation. Mean age 13 months range 0.5–56 months SVC, IVC, and right atrial measurements	Observational cohort study	Comparison of IVC pressure readings compared with SVC and right atrial pressures	SVC to IVC readings were all within 1.2 mm Hg. Right atrial pressure to IVC pressure was always less than 0.7 mm Hg apart.	Young children only, small group of healthy outpatients coming for cardiac catheterisation Supine patients only Range of readings not given
Chait HI *et al*, 1994, USA	33 paediatric cardiac-surgical patients age 2 days to 9 years Insertion of femoral venous catheter, and transthoracic right atrial catheter Mechanical and spontaneous ventilation	Observational cohort study	Comparison of right atrial and inferior venal caval pressure	23 of 31 paired patient readings were the same, 5 were within 2 mm Hg, 3 within 3 mm Hg. All spontaneously breathing readings were within 2 mm Hg. IVC pressures were a mean of 0.71 mm Hg higher than RA pressure	Study contained only children with congenital cardiac abnormalities
Reda Z *et al*, 1995, USA	44 children in ICU with mechanical ventilation	Observational cohort study	SVC pressure compared with IVC pressure		The diagnosis of abdominal distension was entirely subjective.
	Group 1 had no evidence of abdominal distension		Normal abdomen	Mean difference 0.93, max difference 3 mm Hg. (unaffected by high PEEP or mean airway pressures	No attempt was made to measure intra-abdominal pressure
	Group 2 had evidence of abdominal distension		Abdominal distension	50% of SVC to IVC measurements were >3 mm Hg	
Yung M *et al*, 1995, Australia	39 children with both SVC and IVC central venous catheters in place in a paediatric ICU Age range 5 days to 14 years CVP range 3–17 mm Hg	Observational cohort study	SVC compared with IVC pressure	Mean difference 0.33 mm Hg. 22 of 39 pressure readings were equal. 33 of 39 pressures were within 1 mm Hg. 37 of 39 pressures were within 2 mm Hg	Position of femoral lines not verified radiologically and short lines used 3 children spontaneously breathing. 36 ventilated
Yazigi A *et al*, 1996, Lebanon	30 patients post-coronary arterial bypass grafts	Observational cohort study	SVC pressure compared with IVC pressure		Common iliac vein rather than IVC measurement
	Common iliac vein catheter placed at L4 level Measurements before and after extubation		before intubation	Mean difference was 0.79 mm Hg 0.68 (SD) mm Hg	
			after extubation	Mean difference was 0.6 mm Hg 0.93(SD) mm Hg	
Joynt GM *et al*, 1996, Hong Kong	19 critically ill patients mechanically ventilated in ICU	Observational cohort study	SVC pressure compared with IVC pressure	Mean difference is 0.45 mm Hg (CI 0.30 to 0.60)	Patients all supine and ventilated
	Femoral catheter placed close to right atrium in IVC. Confirmed by chest radiograph		Causes of increased difference	Small tendency for increased PEEP and mean airway pressure to increase observed difference	Non-standard— 40–70 cm multi-lumen catheters used Interestingly an intra-abdominal pressure change of 2–22 cm H_20 did not significantly change the differences observed
Nahum E *et al*, 1996, Israel	9 children in a paediatric ICU. 8 were mechanically ventilated	Observational cohort study	Right atrial pressure compared with IVC or common iliac vein pressure	Mean difference 0.22 mm Hg 1.52 (SD) mm Hg. 99.2% of readings were less than 2 mm Hg apart	This is a study in children only 1 patient was excluded due to unreliable venous waveform of the right atrial catheter
	Age 6 months–14 years				
	Measurement of right atrial pressure and abdominal vena cava or common iliac vein. CVP ranged from 3–30 mm Hg		Causes of increased difference	None of increased CVP, mechanical ventilation and abdominal fluid collection increased difference	7 patients had congenital heart defects
Ho KM *et al*, 1998, Hong Kong	20 patients who were mechanically ventilated in ICU Simultaneous monitoring of SVC and common iliac venous pressure, (at L5) using commonly available 20 cm central venous catheters SVC range 3–36 mm Hg	Observational cohort study	SVC pressure and common iliac vein pressure (CIVP)	Mean difference 0.1 mm Hg 1.06 (SD) mm Hg	Patients all supine and ventilated
Walsh JT *et al*, 2000, UK	60 adult patients undergoing right heart studies or angioplasty 28 had impaired LV function and 38 had valvular heart disease	Observational cohort study	Difference between end expiratory right atrial pressure and SVC or IVC measurement	SVC mean difference –0.08 mm Hg (CI –2.2 to 0.38). IVC mean difference –0.23 mm Hg (CI –1.2 to 0.58).	The variability to acute changes were not assessed Range of right atrial pressures found were not reported Inadequate recordings obtained at all recording sites for 5 patients

much fluid to a patient with probable heart failure. You elect to insert a central line for central venous pressure monitoring but she has a neck collar on and so you wonder if placing this via the femoral vein would affect your readings.

Three part question

In [patients requiring central venous pressure monitoring] is [a femoral vein central line as good as a jugular or subclavian line] at [reliability assessing right atrial filling pressure]?

Search strategy

Medline 1966–06/03 using the OVID interface. [(exp Central Venous Pressure OR Central Venous pressure.mp) AND (exp Vena Cava, Inferior OR vena cava.mp)] LIMIT to human.

Search outcome

Altogether 141 papers of which nine were found to be relevant. These papers are shown in table 5.

Comment(s)

There is extensive and consistent evidence that right atrial pressure can be reliably measured using both inferior vena cava and common iliac venous pressure measurements in supine patients. This has been proved in ventilated and spontaneously breathing adults and children. The readings of inferior vena caval measured pressures seem to be around 0.5 mm Hg lower than superior vena caval measured pressure on average and rarely more than 3 mm Hg different. This may not apply to patients with raised intra-abdominal pressure but applies to patients with high PEEP or raised mean airway pressures.

▸ CLINICAL BOTTOM LINE

Inferior vena caval or common iliac venous pressure can be used reliably to measure right atrial pressure and may be regarded as equivalent to readings of superior vena caval pressure.

Murdoch IA, Rosenthal E, Huggon IC, *et al*. Accuracy of central venous pressure measurements in the inferior vena cava in the ventilated child. *Acta Paediatr* 1994;**83**:512–14.
Chait HI, Kuhn MA, Baum VC. Inferior vena caval pressure reliably predicts right atrial pressure in pediatric cardiac surgical patients. *Crit Care Med* 1994;**22**:219–24.
Reda Z, Houri S, Davis AL, *et al*. Effect of airway pressure on inferior vena cava pressure as a measure of central venous pressure in children. *J Pediatr* 1995;**126**:961–5.
Yung M, Butt W. Inferior vena cava pressure as an estimate of central venous pressure. *J Paediatr Child Health* 1995;**31**:399–402.
Yazigi A, Richa F, Madi S. [Comparative measurement of pressure in the abdominal inferior vena cava and in the superior vena cava in adults] [in French]. *Ann Fr Anesth Reanim* 1996;**15**:681–2.
Joynt GM, Gomersall CD, Buckley TA, *et al*. Comparison of intrathoracic and intra-abdominal measurements of central venous pressure. *Lancet* 1996;**347**:1155–7.
Nahum E, Dagan O, Sulkes J, *et al*. A comparison between continuous central venous pressure measurement from right atrium and abdominal vena cava or common iliac vein. *Intensive Care Med* 1996;**22**:571–4.
Ho KM, Joynt GM, Tan P. A comparison of central venous pressure and common iliac venous pressure in critically ill mechanically ventilated patients. *Crit Care Med* 1998;**26**:461–4.
Walsh JT, Hildick-Smith DJ, Newell SA, *et al*. Comparison of central venous and inferior vena caval pressures. *Am J Cardiol* 2000;**85**:518–20.

Table 6

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Beyer JE *et al*, 1990, USA	25 children aged 3–7 who were given morphine or methadone postoperatively had their pain levels assessed using the CHEOPS, Oucher and the analogue chromatic continuous scales.	RCT to assess the effects of giving morphine or methadone postoperatively. All patients had their pain level assessed.	Looked at the postoperative pain scores 2 hourly for 36 hours and the correlation	The Oucher scale and the ACCS were strongly correlated. CHEOPS was only correlated with the Oucher 4 of 26 times and with ACCS 2 of 26 times.	Sample size not justified, only 25 and at each time point not everyone was assessed, ranges from 6–25. Done postoperatively so may not be applicable generally. Preoperative measurement was done 1 to 4 days before, not consistent might forget technique. Order was consistent with CHEOPS then Oucher and then ACCS to prevent the nurses being influenced by the self report scores.
Sutters KA *et al*, 1995, Netherlands	87 children post-tonsillectomy. Children were given either IM ketorolac or IM saline. All children had their level of pain assessed using CHEOPS and the Oucher scale, if they were able.	RCT for treatment group. All patients had their level of pain assessed.	Changes in these scores over time CHEOPS score and Oucher scores after analgesia	The Oucher proved statistically more sensitive to changes in pain levels over time Not all children could complete the Oucher scale postoperatively.	Does not include ages of children even though it states that the CHEOPS has thus been shown to be less reliable in older children. Does not say why children couldn't complete the Oucher. Does not say whether the 2 assessments were done by independent people.
Jacobson SJ *et al*, 1997, UK	56 children aged 5–17. One group received IV morphine plus placebo and the other oral morphine plus placebo. Both groups were assessed for their pain using the CHEOPS, Oucher scale, Faces scale and a five point clinical assessment scale.	RCT (with respect to allocation to morphine treatment group). All patients were pain scaled.	Relation between the pain scales presented by use of a Pearson's correlation and linear regression coefficient.	All pain scales correlated significantly	Little information about the pain scales. Does not say if they used the Oucher picture or numerical scale. Does not tell you if any were unable to use the Oucher scale. There was a single investigator for assessing pain and this may have introduced bias. Does not tell you the order of presentation of the pain scales and if this was random. Uses the CHEOPS in an older age range than it was designed for.

Oucher or CHEOPS for pain assessment in children

Report by Fiona Lyon, *Senior House Officer*
Checked by Debbie Dawson, *Clinical Research Nurse*

Abstract
A short cut review was carried out to establish which of the Oucher or CHEOPS pain assessments were best for assessing pain in children. Altogether 12 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 3 year old child comes into casualty and you need to assess their pain. Would it be better to use the Oucher scale, a self report measure, or CHEOPS, a behavioural pain measure, as at this age using either seems equally valid.

Three part question
In [children] is the [Oucher better than CHEOPS] at [assessing pain]?

Search strategy
Medline 1966-week 1 06/03 using OVID. Cinahl 1982- week 1 06/03 using OVID. {[oucher.mp. AND cheops.mp.] AND [pain.mp. OR exp pain/]} LIMIT to human and English language)

Search outcome
Altogether 12 papers were found. Three of these addressed the subject indirectly, while testing efficacy of analgesia, they are reviewed in table 6.

Comment(s)
The underlying question is whether pain behaviour tools (such as CHEOPS) or self report tools (such as Oucher) are more useable and valid in the assessment of pain in children capable of assessment by both methods. None of the papers addressed the question directly. There seems to be some disagreement as to whether the CHEOPS score correlates to the Oucher score or not. Jacobson *et al* states that they are correlated, but this may be unreliable as CHEOPS was used in an older age range than was intended. Sutters *et al* state that CHEOPS is less reliable in older children, though they do not support this with any evidence. The Beyer study uses the two scales in the correct age range but the study is small and conducted postoperatively and general applicability is therefore moot. Further studies using a larger sample of patients in a wide range of clinical situations are needed.

▸ CLINICAL BOTTOM LINE
There is no evidence to show whether Oucher or CHEOPS is better at assessing pain in children. Local policy should be followed.

Beyer JE, McGrath PJ, Berde CB. Discordance between self-report and behavioural pain measures in children aged 3–7 years after surgery. *J Pain Symptom Manage* 1990;**5**:350–6.
Sutters KA, Levine JD, Dibble S, *et al*. Analgesic efficacy and safety of single dose intramuscular ketorolac for postoperative pain management in children following tonsillectomy. *Pain* 1995;**61**:145–53.
Jacobson SJ, Kopecky EA, Joshi P, *et al*. Randomised trial of oral morphine for painful episodes of sickle-cell disease in children. *Lancet* 1997;**350**:1358–61.