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**Validation of the Ottawa Knee Rule in children** ▶ Previous studies to validate knee rules in children have shown sensitivities of 100% but wide confidence intervals have limited their applicability. This prospective, multicentre study is the largest yet to attempt to validate the best known knee rule in children. Children, aged between 2 and 16 years, presenting to five Canadian paediatric emergency departments with knee injuries sustained in the preceding seven days were assessed by physicians who reported presence or absence of a clinical indication for radiographs according to the Ottawa Knee Rule. Exclusion criteria included superficial lacerations and abrasions. Radiographs were requested at the physician's discretion and interpreted by paediatric radiologists blinded to the knee rule result. A positive outcome was defined as any fracture. Of 750 children enrolled, 70 had a fracture. The Ottawa Knee Rule proved 100% sensitive (95% CI 94.9% to 100%), with a specificity of 42.8% (CI 39.1 to 46.5%). The authors identify several limitations with the study. Almost 389 (34%) eligible children were not enrolled, though the records of the 16 children with fractures found in this group indicate that Ottawa indications for a radiograph would have been met. Not all children had the criterion standard (knee radiograph) applied. It is likely, however, that any fractures missed in these 80 patients, asymptomatic on telephone follow up at 14 days, were clinically insignificant. Overall, 89% of children enrolled had radiographs performed, which seems intuitively to be rather high. The finding that 31% less radiographs would have been performed had the rules been strictly applied is from a post hoc analysis, which might tend to overestimate the reduction. Funding restrictions resulted in early termination of the study, a consequence of which was the small number of children enrolled in the 2-5 years age group. The wide CI (47.8-100%) around the sensitivity of the rule in this group severely limits the validity of applying the rule to children under 5 years. This study has shown the Ottawa Knee Rule to be sensitive in identification of fractures in children aged over 5.

▲ **Bulloch B**, Neto G, Plint A, *et al.* Validation of the Ottawa knee rule in children. *Ann Emerg Med* 2003;42:48-55.

**Nebulised magnesium sulphate for severe asthma in adults** ▶ Previous studies of nebulised magnesium sulphate in asthma have given mixed results. This randomised double blind placebo controlled study enrolled 58 patients with severe exacerbation of asthma presenting to two emergency departments in New Zealand. A severe exacerbation was defined as a forced expiratory volume (FEV<sub>1</sub>) less than 50% predicted 30 minutes after initial administration of 2.5 mg salbutamol via nebuliser. Patients then received 2.5 mg nebulised salbutamol mixed with either 2.5 mg isotonic magnesium sulphate (151 mg) or isotonic saline, on three occasions, at 30 minute intervals. The primary outcome measure was FEV<sub>1</sub> at 90 minutes. Six patients were subsequently excluded on grounds of pneumonia or a previous reported diagnosis of COPD. At 90 minutes, the mean FEV<sub>1</sub> was 51.2% (95% CI 44.5 to 57.9) in the magnesium group and 41.3% (33.4 to 49.2) in the saline group. The difference in the mean FEV<sub>1</sub> between the groups was 0.37L (0.13 to 0.61, p<0.003). The change in FEV<sub>1</sub> between the magnesium and saline groups was greater in patients with a baseline FEV<sub>1</sub><30% predicted at randomisation (0.64 litres, p<0.0001). Patient characteristic data showed that of the 52 patients, 16 had previously been admitted to intensive care and 5 had been intubated before. The mean number of times a β agonist had been used in the preceding 24 hours was 20 times in the magnesium group and 30 times in the saline group, while the mean FEV<sub>1</sub> at presentation was <30% in both groups. Given these data, it

is remarkable that 23 patients were discharged two hours after arrival. Perhaps more remarkable is that only two patients returned within 48 hours. British Thoracic Society guidelines would have recommended more aggressive early intervention in the 24 patients with life threatening asthma and that all patients been admitted with a FEV<sub>1</sub><50% after initial treatment. The finding that nebulised magnesium sulphate seems to be more effective at the severe end of the asthma spectrum, as is the case with the intravenous form, is important. If proved effective, its potential role in the prehospital treatment of life threatening asthma is obvious.

▲ **Hughes R**, Golkorn A, Masoli M, *et al.* Use of isotonic nebulised magnesium sulphate as an adjuvant to salbutamol in treatment of severe asthma in adults: randomised placebo-controlled trial. *Lancet* 2003;361:2114-17.

**Hypertonic crystalloid fluid resuscitation for hypovolaemia** ▶ Few areas of emergency medicine raise such debate as the choice of resuscitation fluid. It has been suggested that hypertonic solutions have a greater ability to expand blood volume and thus increase blood pressure. They can also be administered rapidly with a small infusion volume, but there are theoretical disadvantages. This Cochrane review identified 17 randomised trials (total 839 participants) comparing hypertonic saline to isotonic crystalloid in patients with trauma, burns, or undergoing surgery. Unfortunately, no conclusions could be made regarding benefit or harm of hypertonic solutions as confidence intervals were wide. Until a study large enough to detect a clinically important difference is conducted, the debate looks set to continue.

▲ **Bunn F**, I Roberts I, Tasker R, *et al.* Hypertonic versus isotonic crystalloid for fluid resuscitation in critically ill patients. *Cochrane Library*. Issue 1. Oxford: Update Software, 2003.

**Glucocorticoid insufficiency common in severe sepsis** ▶ This study, which excluded patients with known primary or secondary adrenal insufficiency, confirmed what had been found in previous studies, that about 10% of patients who present to hospital with severe sepsis fail the ACTH stimulation test. This was attributable to occult pituitary disease in 4% and adrenal insufficiency in 5%. Both serum sodium (128 v 138 mmol/L, p<0.05) and glucose (121 v 163 mg/dl, p<0.05) were reduced in these patients. The published results are of the first 100 patients in a larger, prospective trial, which may explain the authors' restraint in drawing conclusions from the results. Adrenal insufficiency should be considered in patients with severe sepsis, particularly if sodium and glucose levels are low.

▲ **Manglik S**, Flores E, Lubarsky L, *et al.* Glucocorticoid insufficiency in patients who present to the hospital with severe sepsis: a prospective clinical trial. *Crit Care Med* 2003;31:1668-75.

**Operative treatment for ruptured lateral ankle ligament** ▶ Acute injury of the ankle is the most common injury seen by emergency departments. This study followed up 317 patients with acute rupture of the lateral ligament of the ankle, verified by arthrography or anterior drawer testing, an average of eight years after randomisation to operative or functional (taping or elastic bandage) treatment. Fewer surgically treated patients reported giving way or recurrent sprains. The anterior drawer test was also significantly less frequently positive in surgically treated patients (30% v 54%). The biggest criticism of the study is that presence of a scar understandably precluded blinding of the surgeons at follow up, which may have introduced bias. The authors acknowledge that resources are not available to operate on all ankles and point out that delayed repair can give as good an outcome as acute repair. They advocate surgery for patients with high functional demands (for example, competitive sports) who experience persistent symptoms.

▲ **Pijnenburg ACM**, Bogard K, Krips R, *et al.* Operative and functional treatment of rupture of the lateral ligament of the ankle. *J Bone Joint Surg [Br]* 2003; 85-B:525-30.

**End tidal carbon dioxide reflects cardiac output from chest compression in ventricular fibrillation** ▶ There has

been much interest in end tidal CO<sub>2</sub> as a marker of perfusion in cardiac arrest. This study on pigs with induced ventricular fibrillation showed that end tidal CO<sub>2</sub> was highly predictive of stroke volume, leading the authors to propose it as a quantitative indicator of efficacy of chest compressions. However, as sodium bicarbonate and epinephrine (adrenaline) both affect end tidal CO<sub>2</sub>, its use in this setting is limited. For the time being, end tidal CO<sub>2</sub> remains a tool to help facilitate decisions about when to stop cardiopulmonary resuscitation. Ensuring correct hand placement, rate and depth of compressions is still the best method of attaining maximal cardiac output during arrests.

▲ **Pernat A**, Weil H, Sun S, *et al.* Stroke volumes and end-tidal carbon dioxide generated by precordial compression during ventricular fibrillation. *Crit Care Med* 2003;**31**:1819–23.

**Rib fractures, pain, and disability** ► Doctors and patients know that fractured ribs are painful, but few studies have looked into the associated length of disability. In this study, patients with radiologically identified “isolated” rib fractures still had significant pain at 30 days and returned to work at a mean of 51 days. Patients with clinically diagnosed isolated rib fractures who did not receive any imaging were not included in the analysis—extent of pain/disability in this group remains unclear. There was no standardisation of prescribed analgesia and the main purpose of the paper seems to be a vehicle for the authors to highlight their previous good results with internal fixation of rib fractures and to propose their next project, minimally invasive absorbable rib fixators.

▲ **Kerr-Valentic MA**, Arthur M, Mullins RJ, *et al.* Rib fracture pain and disability: can we do better? *J Trauma* 2003;**54**:1058–64.

**Topical anaesthetic at triage for children** ► Any intervention reducing time spent in the emergency department by patients is welcome. In this study, children with simple lacerations had either ALA (adrenaline, lignocaine, and amethocaine) or placebo (adrenaline) applied topically to the wounds at triage. The identity of the solution was only revealed to the doctor after (s)he had decided upon the preferred method of closure. Median time spent in the department was 77 minutes in the ALA group and 108 minutes in the placebo group ( $p=0.002$ ). However, the groups differed significantly, with 50% more children sutured and 50% more sedated in the placebo group than in the ALA group. Overall, only 40% of wounds thought to need suture by “experienced” nurses were subsequently closed in this fashion. Better selection of patients requiring suture by an experienced clinician might limit expense and side effects from ALA and may reduce time spent in the department.

▲ **Priestly S**, A Kelly A, Chow L, *et al.* Application of topical local anesthetic at triage reduces treatment time for children with lacerations: a randomized controlled trial. *Ann Emerg Med* 2003;**42**:34–40.

**Put it under the tap** ► Irrigation is acknowledged to be a critical component of wound management. This prospective trial allocated 530 children with simple lacerations to irrigation with either tap water or sterile normal saline. Wounds were subsequently closed in standard fashion. Wound infection rates were similar in both groups (2.8% v 2.9%). The results were presented in the context that the pressure of the tap was 10 times that of a syringe and the volume of tap water administered in 30 seconds was 24 times that in the syringe group. This would seem to present compelling evidence for using tap water, but a note of caution is that the subgroup of foot wounds became infected 4.4 times more often in the tap water group, perhaps because of practicality. Given the considerable potential savings, a large multicentre study would be very useful.

▲ **Valente JH**, Forte RJ, Freundlich LF, *et al.* Wound irrigation in children: saline solution or tap water? *Ann Emerg Med* 2003;**41**:609–16.

**Side impact syndrome in children** ► The authors performed a case-cohort study of consecutive restrained crash victims admitted to a level 1 US paediatric trauma centre between 1991 and 2002. Data were taken from the Crash Injury Research and Engineering Network, which links crash reconstruction to medical notes,

providing an in depth assessment of biomechanical forces leading to injury among restrained occupants. Compared with frontal crashes, children injured in side impacts were more likely to have an Injury Severity Score of over 15 and were more likely to have an Abbreviated Injury Score of two or more to the head, chest and cervical spine. It may come as no surprise that side impacts, which more frequently result in passenger compartment intrusion than frontal collisions, lead to a greater severity of injury. However, it is unclear whether this difference is as great in Europe, where cars are generally smaller than the US. None the less, the pattern of injury described, to the head, neck, and chest (the side impact syndrome) will assist diagnosis and prevention strategy.

▲ **Orzechowski KM**, Edgerton EA, Bulas DL, *et al.* Patterns of injury to restrained children in side impact motor vehicle crashes: the side impact syndrome. *J Trauma* 2003;**54**:1094–101.

**Ophthalmologists are best at examining eyes** ► This study examined records of patients diagnosed with “shaken baby syndrome” and examined by an ophthalmologist at a children’s hospital in Canada. Non-ophthalmologists did not attempt to, or were “unable to” examine the fundus in over half of the 72 cases. When the retina was visualised, non-ophthalmologists were accurate in recognising the presence or absence of retinal haemorrhage in 87%. However, false negatives occurred in 13% of cases. The implications of missing a retinal haemorrhage and subsequent failure to diagnose shaken baby syndrome are so serious that ophthalmological review should be mandatory in the evaluation of all infants with suspected abuse.

▲ **Morad Y**, Kim YM, Mian M, *et al.* Nonophthalmologist accuracy in diagnosing retinal hemorrhages in the shaken baby syndrome. *J Pediatr* 2003;**142**:431–4.

**Underuse of analgesia in very young patients** ► Assessing pain in the very young can be difficult, but can be inferred to be severe in certain conditions, such as displaced fractures and burns. This retrospective study of children’s notes at a US paediatric emergency department found that children aged between 6 and 24 months with these conditions were twice as likely to receive no analgesia than children aged between 6 and 10 years. When analgesia was administered, very young patients were less likely to receive opioids. This problem is almost certainly not unique to this particular department.

▲ **Alexander J**, Manno M. Underuse of analgesia in very young pediatric patients with isolated painful injuries. *Ann Emerg Med* 2003;**41**:617–22.

**Occult head injury common in high risk abused children**

► Almost half of abused children with an acute head injury have evidence of a previous head injury on computed tomography. However, the prevalence of occult head injury remains unknown. In this study, a head CT or MRI scan was performed on children under 2 years presenting to an urban US children’s hospital with injuries suspicious of abuse. Children were excluded if there was evidence of scalp injury or neurological abnormality on physical examination. Of 51 patients enrolled, 19 had an occult head injury (scalp swelling, skull fracture, or intracranial haematoma) identified on scanning. Skeletal survey missed five of these cases. It is a sobering thought that in 14 cases, scalp swelling was missed on physical examination. A second radiographer agreed with the first radiographer’s report in all cases, which makes over-reporting of subtle findings an unlikely explanation for this number. The authors recommend that high risk patients with evidence of injuries suspicious of child abuse should be universally screened with CT for occult head injury in addition to the skeletal survey.

▲ **Rubin DM**, Christian CW, Bilaniuk LT, *et al.* Occult head injury in high-risk abused children. *Pediatrics* 2003;**111**:1382–6.

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