LETTERS

Nitrous oxide can be made more effective and predictable using a closed breathing circuit

We read with interest the study by Babl et al^1 published in the *EMJ* in November 2008.

Central to the protocol and management is the use of clinical assessment to determine adequacy and depth of analgesia/sedation. We agree with this wholeheartedly and support this method as it emphasises the importance of conscious sedation as an adjunct to therapy, rather than unconscious sedation to compensate for inadequate analgesia. However, it is worth recognising that the inspired concentration (in your study stated as 50-70% nitrous oxide) does not relate to effector site concentration (in this case the central nervous system) unless a steady state has been achieved, the period of equilibration being approximately 10 minutes. Without a closed breathing circuit being used there will inevitably be a significant entrainment of air, resulting in a further reduction in real versus expected nitrous oxide concentration. This means that the nitrous oxide concentration achieved in the children in your study will be significantly lower than the settings on the machines would suggest and will be unpredictably variable.

In our experience using a closed mask system (such as a T-piece or close-fitting demand mask) and end tidal gas monitoring provides a breath by breath analysis of end tidal nitrous oxide and oxygen concentration. These are analogous to arterial blood levels and thus reflect much more closely the effector site concentration.

As a second point we note that all eight patients who received codeine (which has a sedative effect) within 2 h of sedation were not excluded from the study, although it was stated in the protocol that those given sedatives would be excluded. We agree with your findings that nitrous oxide is a useful adjunct in conscious sedation in painful procedures in children. We suggest this could be made more effective and predictable delivering nitrous oxide within an anaesthetic closed circuit in the emergency department using end tidal gas monitoring.

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Competing interests: None.

Accepted 24 November 2008

Emerg Med J 2009;26:623. doi:10.1136/emj.2008.070128

REFERENCE

 Babl FE, Oakley E, Puspitadewi A, Sharwood LN. Limited analgesic efficacy of nitrous oxide for painful procedures in children. *Emerg Med J* 2008;25:717–21.

Cricothyrotomy pig model flawed

As an anaesthesiologist, I must respectfully disagree with the conclusion reached by Cho *et al*¹ that "[t]he porcine model is a more useful training tool than the manikin model for cricothyrotomy with PCK (Portex cricothyrotomy kit) because of its reality and similarity to human anatomy."

Animal models have been shown previously to produce poor cricothyrotomy placement accuracy by students.² Manikin models have been shown to reduce cricothyrotomy attempts and improve successful placement rates. One study including manikin models demonstrated that, by the fifth attempt, 96% of participants were able to perform a cricothyrotomy successfully in 40 s or less.³ Another study found the TraumaMan simulator "superior" to using animals for surgical airway placement instruction.⁴

However, one of the most important criteria in determining cricothyrotomy competency is the assurance that a patient will survive after the procedure—a critical factor that the authors cannot measure with their static pig model. Appropriate training methods assess the student's ability to oxygenate and ventilate patients appropriately. One study using a computerised Medical Education Technologies, Inc human patient simulator for emergency hypoxaemia found that cricothyroid cannulae were successfully placed 100% of the time, as confirmed by capnography.⁵

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Competing interests: None.

Accepted 17 December 2008

Emerg Med J 2009;26:623. doi:10.1136/emj.2008.071183

REFERENCES

- Cho J, Kang GH, Kim EC, et al. Comparison of manikin versus porcine models in cricothyrotomy procedure training. *Emerg Med J* 2008;25:732–4.
- McCarthy M, Ranzinger MR, Nolan DJ, et al. Accuracy of cricothyroidotomy performed in canine and human cadaver models during surgical skills training. J Am Coll Surg 2002;195:627–9.
- Wong D, Prabhu AJ, Coloma M, et al. What is the minimum training required for successful cricothyroidotomy?: a study in mannequins. *Anesthesiology* 2003;98:349–53.
- Block EF, Lottenberg L, Flint L, et al. Use of a human patient simulator for the advanced trauma life support course. Am Surg 2002;68:648–51.
- Vadodaria BS, Gandhi SD, McIndoe AK. Comparison of four different emergency airway access equipment sets on a human patient simulator. *Anaesthesia* 2004;59:73–9.

CORRECTION

doi:10.1136/emj.2009.076216corr1

BET1 Is ultrasound or chest x ray best for the diagnosis of pneumothorax in the emergency department? (*Emerg Med J* 2009;**26**:434–5). The first sentence should read "A short-cut review was carried out to establish whether ultrasound is a useful investigative tool in the diagnosis of suspected pneumothorax."