Update in
Anaesthesia

From the journals

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Critical Care - Hypothermia after cardiac arrest

Targeted temperature management at 33°C versus 36°C after cardiac arrest.
Nielsen N, Wetterslev J, Cronberg T et al for the TTM Trial Investigators. *New England Journal of Medicine* 2013; **369**: 2197-206. Available at: http://www.ncbi.nlm.nih.gov/pubmed/24237006.

Therapeutic hypothermia is a established treatment approach for unconscious survivors following out-of-hospital cardiac arrests. This has been included in international resuscitation guidelines based on the improved mortality and neurological outcomes demonstrated in previous studies. However, there has been some debate surrounding the potential limitations of these studies and more specifically the optimum target temperature.

This multicentre international trial set out to compare two target temperatures – the standard 33ºC versus 36ºC ('normothermia') in unconscious patients following cardiac arrest. 950 patients were randomly assigned to one of these target temperatures for a period of 28 hours then gradually rewarmed. This was achieved using either intravascular or surface cooling devices. The end points included all-cause mortality and poor neurological function.

The results showed no significant difference in all-cause mortality in the 33ºC group compared to the 36ºC group (50% vs 48%, p=0.51). Follow-up at 180 days showed the proportion of patients with poor neurological function to be similar between the two groups (54% vs 52%, p=0.78). In addition, a standardised protocol was used in order to guide withdrawal of life-sustaining treatments in study participants.

Overall, the authors state that cooling patients to the traditional 33ºC confers no additional benefit when compared to maintaining a target temperature of 36ºC. They suggest that the active prevention of fever may have more importance than active cooling in this particular patient group. Although targeted temperature control remains important, this study has lead to adoption of a more conservative approach to cooling in most units.

Critical Care - Target blood pressure in septic shock

High versus low blood-pressure target in patients with septic shock.
Asfar P, Meziani F, Hamel JF et al for the SEPSISPAM Investigators. *New England Journal of Medicine* 2014; **370**: 1583-93.

In the initial resuscitation of patients with septic shock, a mean arterial blood pressure (MAP) of at least 65 mmHg has traditionally been targeted as recommended by the Surviving Sepsis Campaign. This study set out to determine whether targeting a higher MAP would result in better patient outcomes.

This multicentre trial was conducted across 29 centres throughout France. 776 patients with septic shock were randomly assigned to the high target group (MAP 80 to 85 mmHg) or the low target group (MAP 65 to 70 mmHg). Following initial fluid resuscitation, vasopressor therapy was titrated according to patient group for a maximum of 5 days. Endpoints included 28-day mortality, 90-day mortality and serious adverse events.

The results showed no significant difference in either 28-day or 90-day mortality between the two groups. Incidence of new onset atrial fibrillation was increased in the high target group compared to the low target group (6.7% vs 2.8%, p=0.02). In addition, patients with chronic hypertension were more likely to require renal replacement therapy when a lower target MAP was used. In both groups, the measured MAP was often higher than the desired target range although

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the authors report that the 'between-group difference' was well maintained.

In conclusion, the authors state that targeting a higher MAP (80 to 85 mmHg) in patients with septic shock does not improve mortality when compared to the standard target MAP (65 to 70 mmHg).

However, in patients with chronic hypertension they argue that targeting a higher MAP may provide additional benefits in terms of renal protection.

Critical Care - Protective ventilation strategy in theatre

A trial of intraoperative low-tidal-volume ventilation in abdominal surgery.

Futier MD, Constantin JM, Paugam-Burtz C et al for the IMPROVE Study Group. *New England Journal of Medicine* 2013; **369:** 428-437.

Use of low tidal volumes for ventilation is an established therapy for management of patients with ARDS in critical care. However, patients undergoing general anaesthesia have traditionally been ventilated using much higher tidal volumes. The role of lung-protective ventilation strategies on patient outcomes following elective surgery remains unclear. This study set out to compare the two approaches in patients undergoing elective abdominal surgery.

This multicentre double-blind trial recruited 400 patients deemed at higher risk of pulmonary complications following abdominal surgery. These patients were then randomised into the lung-protective ventilation group (tidal volume 6-8ml.kg^{-1} ideal body weight, PEEP and recruitment manoeuvres) or the non-protective mechanical ventilation group (tidal volume 10-12ml.kg^{-1}). The primary end point was the occurrence of a major complication in the first 7 postoperative days – these included pneumonia, acute respiratory failure requiring ventilatory support, sepsis and death.

Overall, major postoperative complications were significantly increased in the non-protective group compared to the lung-protective group (27.5% vs 10.5%, p=0.001). The non-protective group also had higher rates of acute respiratory failure requiring non-invasive ventilation (14.5% vs 4.5%, p=0.002). Although hospital stay was slightly reduced in the lung protective group, overall mortality rates were approximately 3% in both groups.

The authors state that intra-operative lung-protective strategies for mechanical ventilation improve outcomes in patients in undergoing abdominal surgery when compared to more traditional approaches. Adoption of lung-protective strategies beyond the realms of critical care may lead to significant improvements in post-operative outcomes in elective surgical patients. Considering the numbers of patients who may potentially benefit from this approach, reduced length of stay and overall complication rate may lead to significant reductions in healthcare utilisation.

Critical Care - Prone ventilation in severe ARDS

Prone positioning in severe acute respiratory distress syndrome.

Guerin C, Reignier J, Richard JC et al. *New England Journal of Medicine* 2013; **368**: 2159-68.

Although previous studies on prone positioning in Acute Respiratory Distress Syndrome (ARDS) have showed improved physiological parameters, no benefit in patient survival has been demonstrated. This trial examined the effect of early prone positioning in patients with severe ARDS on mortality.

Inclusion criteria were:

- ARDS as defined according to the American–European Consensus Conference criteria
- severe ARDS (defined as a PaO_2:FIO_2 ratio of <150 mmHg, with an FIO_2 of ≥0.6, a PEEP of ≥5 cm of water
- intubated and ventilated for ARDS for less than 36 hours.

466 patients were randomly assigned to either prone (intervention) or supine positioning (control). The intervention group were positioned prone for at least 16 consecutive hours per day on standard ICU beds. Prone positioning was stopped once patients could achieve predetermined oxygenation targets whilst supine for at least four hours. The primary outcome was 28-day all-cause mortality.

Prone positioning significantly reduced 28-day all-cause mortality when compared to supine positioning (16.0% vs 32.8%, p<0.001). The 90-day all-cause mortality was also examined and again prone positioning showed significantly improved outcomes (23.6% vs 41.0%, p<0.001). Although the patients in the supine group had slightly higher SOFA scores at baseline, mortality rates remained significantly lower in the prone group following adjustment. There was no significant difference in incidence of complications between the two study groups. It should be noted that the units taking part in the study had significant experience in using this particular prone positioning protocol.

The authors conclude that early prone positioning in prolonged sessions for patients with severe ARDS may significantly improve survival. This relatively large reduction in mortality strongly supports the adoption of this intervention in the management of severe ARDS.

Paediatric Anaesthesia - Supraglottic airway devices in children with known difficult airway

Elective use of supraglottic airway devices for primary airway management in children with difficult airways.

Jagannathan N, Sequera-Ramos L, Sohn L et al. *British Journal of Anaesthesia* 2014; **112**: 742-8.

Supraglottic airways (SGAs) are regularly used in the management of both routine and emergent difficult airways. Although there are many reports of these being used to facilitate fibreoptic-guided tracheal intubation, limited data exists on the use of SGAs are the primary means of managing a difficult airway. The authors of this study set out examine the success rates and adverse events associated with the use of these devices as the primary airway in children with difficult airways.

This study was conducted as a retrospective analysis of data from a single paediatric hospital in the United States. Over a four-year period, 77 272 children received general anaesthesia for a wide range of procedures. 459 patients were reported as having a difficult airway – defined as difficult direct laryngoscopy (Cormack and Lehane grade 3 or above), difficult mask ventilation or both.

The SGA was used as the primary airway in 109 patients with a success rate of 96% (105/109 cases). Two patients required an alternative SGA and two required tracheal intubation using a fibreoptic bronchoscope through the SGA. There were no reported cases of regurgitation of gastric contents, bronchospasm or death. However, there are a number of confounding factors which may have influenced the clinician to opt for tracheal intubation as the primary airway thus excluding these patients from this group. In addition, the retrospective nature of the study limits the reliability of the findings.

The authors propose that SGAs provide an effective option for primary airway management in the paediatric difficult airway population. The relative success of these devices in this patient group may be attributable to the high proportion of upper airway conditions which can successfully be bypassed with SGAs. In addition to being less invasive than tracheal intubation, it provides a useful adjunct to fibreoptic intubation should the need arise (Plan B). Further prospective work in this area is required to support these findings.

Obstetric Anaesthesia - Failed intubation in parturients

Failed tracheal intubation in obstetric anaesthesia: 2 yr national case-control study in the UK.

Quinn AC, Milne D, Columb M, Gorton H, Knight M. *British Journal of Anaesthesia* 2013; **110**: 74-80.

Although the incidence of failed intubation is significantly higher in the obstetric population, the figures quoted are highly variable; often in the region of 1 per 250 cases. At present, there is no national reporting of these events within the UK. The aim of this study was to estimate national incidence and identify risk factors by establishing a surveillance system.

This prospective case-control study obtained data from all consultant-led obstetric units in the UK over a two-year period. For each reported failed intubation (index case), these units provided additional data on the two preceding successful intubations to allow comparison (controls). There were 57 reports of failed intubation which could be extrapolated to estimate incidence in the obstetric population at 1:224 cases (95% CI 179-281).

Multivariate analysis of these cases found that increased age and raised BMI were significant independent predictors of failed intubation. The authors report that for every unit increase in BMI, the risk of failed intubation increased by 7%. Maternal age may reflect the increased incidence of co-morbidities. Airway assessment was often incomplete and the documentation of a Mallampati score was in itself a predictor of increased risk. There was a 2.5 fold increase in rates of failed intubation when trainee anaesthetists were present when compared to consultant colleagues. The standard LMA was used as a rescue airway in the majority of cases (39/57) with one patient requiring a surgical airway. Although there were four reported cases of gastric aspiration in the failed intubation group there were no maternal deaths during this study period.

The study effectively confirms the estimated incidence of failed intubations within the UK obstetric population. The authors highlight the impact of increasing obesity within this group and are keen to support the development of failed intubation drills specific to this specialty.