Editorial

Fluid resuscitation in critically ill African children

When confronted with a sick child with a septic illness, our management is guided by well-established algorithms from the American College of Critical Care.[1] These guidelines recommend that, after assessment of the airway and breathing, haemodynamic instability is treated with fluid boluses of 20ml.kg^{-1}. These boluses should be repeated after re-evaluation of the child's condition and, where indicated, should be repeated to a total of 60ml.kg^{-1} within 15 minutes of their arrival in the Emergency Department. The evidence for these recommendations comes from studies in developed countries where facilities for invasive ventilation are available, allowing fluid administration to be more liberal.[2]

However, a recent large randomised, controlled study has made us question practice that would previously be considered an established gold standard of therapy, in this case administration of fluid boluses to septic children.[3] The FEAST (Fluid expansion and supportive therapy) trial was conducted at six hospitals in sub-Saharan Africa (4 in Uganda, 1 in Kenya and 1 in Tanzania). This impressive trial of over three thousand children was undertaken because of a perception that children in developing areas with sepsis and poor perfusion do not receive prompt aggressive fluid resuscitation therapy that may improve their survival.

The study enrolled children aged between 60 days to 12 years of age, suffering a febrile illness with either impaired consciousness, respiratory distress or both, and with impaired perfusion, indicated by one or more of the following:

- a capillary refill time of 3 or more seconds,
- a lower limb temperature gradient,
- a weak radial-pulse volume, or
- severe tachycardia.

Enrolled children were stratified into two groups; by the inclusion criteria above the majority were poorly perfused, but not hypotension and therefore not 'shocked'. Those with hypotension formed a small minority and will not be described further here. Patients were randomly assigned to receive 20ml.kg^{-1} 0.9% saline or 20ml.kg^{-1} 5% albumin or no bolus of fluid. At 1 hour they were administered an additional 20ml.kg^{-1} 0.9% saline or 5% albumin if they still had signs of poor perfusion. Importantly, children with infective gastroenteritis and severe malnutrition were among those excluded from the study. The primary endpoint was mortality at 48 hours and it was assumed that this would be about 15% in the control (no bolus) group.

All staff underwent triage and emergency life support training. Pulse oximetry and non-invasive blood pressure machines were provided and all other therapies - maintenance fluids, antimalarials, antipyretics, anticonvulsants and transfusion parameters (20ml.kg^{-1} if Hb less than 5.0g.dl^{-1}) - were the same for both treatment groups and the control group.

3170 patients were enrolled with 3141 entering the main (non-hypotensive) arm of the study; however the study was stopped at this stage (short of the planned 3600 patients) due to safety concerns in the intervention groups. The baseline characteristics of the three groups were similar and of note 57-59% had malarial parasites in their blood film, although it is unclear how many of these had malaria as their primary diagnosis. One third in each group were profoundly anaemic with a haemoglobin level below 5g.dl^{-1}. 3-5% were HIV positive. Both bolus groups received 20ml.kg^{-1} in the first hour of treatment, compared to 1.2ml.kg^{-1} in the non-bolus group, demonstrating that fluid protocols were followed accurately in all groups.

The mortality rates at 48 hours were 10.6% in the albumin bolus group, 10.5% in the saline bolus group and 7.3% in the no bolus group. Put another way, children were 1.45 (95% confidence intervals, 1.13-1.86; p=0.003) times more likely to die if given a fluid bolus, compared to the children who received no fluid bolus. This difference in outcome was still clear at 4 week follow-up. There was no difference between the albumin and saline bolus groups. Further analysis shows that children who were not given fluid boluses had better survival in almost all subgroups, including those with malaria, profound anaemia, worse acidosis and higher lactate levels.

This study that has shown clearly that survival of children with poor perfusion due to sepsis in Africa is 33% worse if treated with fluid boluses of albumin or saline. However it is essential that the results are interpreted in the context of this particular study population. There are several aspects of the study that mean the results should not be generalized for other patient populations in other settings.