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Editorial

Pediatric Fluid Prescription, Close Monitoring and Raising Awareness

Intravenous (IV) fluids are frequently used in hospitalized children, mainly to maintain hydration and hemodynamic stability, as well as to replace glucose. In children fluid management in shock remains controversial. Fluid resuscitation is a central component of shock treatment.[1] Historically, low sodium content fluids have been used for both maintenance and deficit replacement. However, there are risks associated with fluid therapy, especially iatrogenic hyponatremia. More recent evidence supports the use of fluid with higher sodium content with adequate glucose to prevent hyponatremia.[2] In children, indications for intravenous fluid should be prescribed under the four broad principles of 1) meeting maintenance requirements, 2) replacing deficit, 3) replacing ongoing losses, 4) resuscitation to correct inadequate circulating volume leading to clinical shock.[3]

Safety measures for a child with an IV infusion include assessing the IV site every hour for patency. In children experiencing shock, accurate assessment of fluid responsiveness is crucial for effective management. Because over- or under-resuscitation can lead to adverse outcomes.[4] Infused volumes and signs of fluid overload should be carefully assessed and documented frequently. For newborns calculate routine iv maintenance fluids using the following formula a) Day 1-60ml/kg/day, b) Day 2- 90ml/kg/day, c) Day 3- 120ml/kg/day, d) Day 4- 150ml/kg/day. Maximum rate at 150ml/kg/day aiming to titrate it down gradually. In pediatrics we give the maintenance IV fluids requirement according to weight in kg (Table-I).

The recommended fluid to be infused as maintenance for well children with normal hydration is: 0.9% sodium chloride with or without 5% glucose + 20mmol potassium chloride /L.[5] Alternative maintenance fluid options include Hartmann's with glucose 5%. The development of hyponatremia is an uncommon but well recognized complication of incorrect fluid prescribing and is often due to excessive fluids being prescribed as well as the prescribing of hypotonic solutions (e.g. 0.18% saline + dextrose).

Monitoring all children on IV fluids should ideally be weighed prior to the commencement of therapy and then measure weight daily after that. Children with ongoing dehydration may need regular weights to assess hydration status. Ensure you request this on the treatment orders. Serum electrolytes and glucose

Table-I: *Calculate routine maintenance fluids using hourly (4/2/1 rule) / the Holliday Segar formula according to weight in kg:*

Weight	Hourly fluid requirements	Daily fluid requirement*
3 – 10kg	4 ml/kg	100 ml/kg
10 – 20kg	40 + 2 ml/kg above 10 kg	1000 + 50 ml/kg above 10 kg
> 20kg	60 + 1 ml/kg above 20 kg	1500 + 20 ml/kg above 20 kg

*100mL/hour (2500mL/day) is the normal maximum amount.

should be checked preferably before commencing the infusion (typically when the IV is placed). Recommended to be repeated at least every 24 hours if IV therapy is to continue. Seek senior medical help if electrolytes are deranged.[6] Stop fluids and check plasma electrolytes if clinical signs suggestive of hyponatremia develop. These features include nausea, vomiting, headache, irritability, altered level of consciousness, seizure and apnoea.[7]

Regarding awareness when prescribing IV fluids in children, pediatric surgeons should remember the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment. They must recognize fluids with a similar sodium concentration to plasma are most appropriate. The safe use of intravenous fluid requires accurate prescribing, and close monitoring of observations including daily weights. Consider consultation with local pediatric team when unsure of which/how much fluid to use, baby is not responding to iv fluids treatment, electrolyte abnormalities, using a non-standard fluid, significant co-morbidities are present, fluid resuscitation >20mL/kg required. The Association of Pediatric Surgeons of Bangladesh should raise awareness about training and educational resources to contribute to the evolution of fluid management.

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