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INTRAVENOUS FLUID USE IN THE ACUTELY UNWELL ADULT MEDICAL INPATIENT

Walker and colleagues stress the importance of proper fluid balance, citing good evidence of harm caused by sodium overload.[1] However the authors exaggerate recent controversies. Although not exactly minutiae, finer points such as the exact concentration of sodium, and relative quantities of sodium and chloride in IV fluids only become important when large amounts are used, as in fluid resuscitation. The daily quantities required to sustain balance in a patient who is unable to take fluids by mouth are not large. As the review[2] cited by the authors states, these are: water 2.2 to 3.2 L (including 'insensible loss' in exhaled water vapour and from the skin); sodium ions: 70–150 mmol; potassium ions 40–70 mmol. These 'average' values are slightly more than the amounts suggested by the GIFTASUP conference.[3] The daily UK recommended dietary salt intake of salt is ~103 mmol (6 g). Excess sodium administration, particularly in the challenged patient with renal water and sodium retention, is harmful. The authors cite a striking review that summarises the adverse effects of salt overload.[4]

The standards used by the authors impose sodium overload. They suggest 'Hartmann's solution should be used, unless there is a specific reason for an alternative fluid choice.' Their local guidelines state 'Hartmann's solution at 1–1.5 mL/kg/hour is the crystalloid of choice for most patients.' No alternative fluid is suggested to provide the water intake needed. Their suggestions would give a 70 kg person more than twice the dietary recommendations of sodium. In fact, we need water as well as salt, and that can only be supplied, in practice, by giving salt-free (dextrose) solutions.

Such fluids risk hyponatraemia, which is real but rare in adults,[5] and perhaps more frequent in children.[6] This doesn't excuse the over-use of fluids containing sodium. Many doctors confuse the different fluids needed for volume replacement (whose composition will resemble plasma) with those for maintenance. The most appropriate intravenous fluid maintenance for a patient unable to eat and drink would not resemble plasma, but would have the volume, sodium and potassium content of urine, with 700 mL of water added to replace insensible loss. Simplification may make a target easy to achieve: but it may be the wrong target. The true target is to replace fluid and electrolyte that has been lost, i.e. urine and then any other abnormal losses.

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We agree with Dr Drummond that our maintenance fluid regime (Hartmann's solution at 1–1.5 mL/kg/hr) leads to administration of 200–350 mmol sodium per day which exceeds the daily sodium requirement of 70–150 mmol. However, we don't believe that this constitutes a major problem when given for a short period.

Sodium is freely filtered by the glomeruli and reabsorbed by the tubular cells to maintain a normal serum sodium level. The daily filtered load of sodium depends on the glomerular filtration rate (GFR). For instance, in patients with a GFR 50–100 mL/min (i.e. 72–144 L/day) and a serum sodium 140 mmol/L, the daily filtered load of sodium is 10080–20160 mmol. Administration of 200–350 mmoL of sodium will increase the filtered load by only 1–3%. In patients receiving a two litre intravenous bolus of 0.9% sodium chloride (i.e. 300 mmol of sodium), sodium excretion may be delayed due to hyperchloraemia-induced renal vasoconstriction and reduced GFR but this is not seen after bolus infusion of Hartmann's fluid.[1]

An alternative to our regime would be to alternate Hartmann's fluid with dextrose 5% which would certainly reduce the sodium load. However, the GIFTASUP guideline states that solutions such as 4%/0.18% dextrose/sodium chloride solution and 5% dextrose solution are not appropriate for resuscitation or replacement therapy except in conditions of significant free water deficit e.g. diabetes insipidus (recommendation two).[2] Furthermore, most patients would need additional potassium and calcium supplementation.

We have not observed any cases of hypernatraemia due to administration of Hartmann's fluid. The most likely reasons are:

1. The majority of our medical and surgical patients on level one wards have adequate renal function to excrete excess sodium.
2. A proportion of patients have additional sodium losses via other routes, i.e. abdominal drains, diarrhoea, sweating etc.

3. The duration of intravenous fluid therapy is limited. In patients who are euvolaemic and haemodynamically stable, a return to oral fluid intake is achieved as soon as possible.

Our fluid guideline is simple and facilitates compliance among junior medical and surgical staff. The most important components of the guideline are the avoidance of 0.9% sodium chloride solution and a daily review of the indication and appropriateness of intravenous fluids.

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HISTORY

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