

PERIOPERATIVE FLUIDS

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There are four reasons for giving intravenous fluids: acute circulatory support, correction of previous losses, replacing ongoing losses and maintenance fluids (Summary box 17.1). Before prescribing fluids, weight, vital signs and fluid requirements are considered (Table 17.2). Dehydration as a percentage loss of total body water is difficult to assess; moderate dehydration (5%) causes low urine output, dry mouth and sunken eyes and fontanelle; severe dehydration (>10%) causes drowsiness, tachycardia and slow capillary refill (>2 seconds). Hyponatraemia (<135 mmol/L) is common, but progression risks an encephalopathy from water movement into the brain. Water diffuses slowly by osmosis, equalising osmotic pressures, or swiftly through aquaporins. Sodium homeostasis maintains intravascular volume through antidiuretic hormone (ADH) and thirst. ADH binds to receptors in the distal nephron, inducing aquaporins and water retention. Increasing plasma osmolarity and hypotension both increase ADH levels. Summary box 17.1 Fluids in children Alexis Frank Hartmann , 1898–1964, paediatrician, St Louis, MO, USA, described the solution; should not be confused with Henri Albert Charles Antoine Hartmann, French surgeon, who described the operation that goes by his name. - - An abundance of free water causes hyponatraemia. Since glucose is metabolised to water, glucose is ignored when calculating tonicity; 0.45% saline in 5% dextrose is considered hypotonic. Hyponatraemia is seen in normovolaemia if ADH rises inappropriately (e.g. surgical stress, trauma, chest infections, head injuries). Clinical problems arise if hypotonic fluids are used to resuscitate or replace losses or if maintenance fluids are given in excess. Restricting maintenance fluids to 50–70% is appropriate after major surgery , gradually increasing the rate daily if sodium levels are not falling. Urine output naturally decreases after major surgery , but a common pitfall is to increase maintenance fluids, predisposing to hyponatraemia. A postoperative fluid bolus is appropriate in hypovolaemia, hypotension or poor peripheral perfusion, but given simply because urine output is low can be inappropriate. If hyponatraemia is mild and asymptomatic fluids are restricted, if symptomatic with headache, lethargy or seizures and the sodium concentration is <125 mmol/L, intravenous 3% saline is given.

Fluids are given intravenously for four reasons: Circulatory support in resuscitating vascular collapse Given as a bolus of 10 or 20 mL/kg 0.9% saline over periods of up to 20 minutes Blood while monitoring the response. Can 4.5% albumin be repeated up to 40 mL/kg then Colloid seek help Replacement of previous fluid and electrolyte deficits Given over a longer period of 0.9% saline 0.15% KCl up to 48 hours with clinical Hartmann's solution and biochemical review Replacement of ongoing losses Or a fluid tailored to the 0.9% saline + 0.15% KCl losses, e.g. 4.5% albumin if Hartmann's solution protein loss is great. Replace losses millilitre for millilitre Maintenance outside the neonatal period Hypotonic 0.18% Plasma-Lyte 148 saline should not Hartmann's solution ± glucose be used outside 0.9% saline + 0.15% KCl ± glucose the neonatal period Vital signs Age Heart rate Systolic blood Respiratory (years) (bpm) pressure (mmHg) rate

(b/min) <1 110-160 70-90 30-40 2-5 90-140 80-100 25-30 5-12 80-120 90-110 20-25
 Maintenance fluid requirements Weight Daily fluid requirement (mL/kg/day) (mL/kg/h) Neonate
 120-150 5 First 10 kg 100 4 Second 10 kg 50 2 Subsequent kg 20 1 Systolic
 blood pressure = 80 + (age in years × 2) mmHg Circulating blood volume = 70-80 mL/kg (90-100
 mL/kg in preterms) b/min, breaths per minute; bpm, beats per minute.

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