Intravenous Fluids - Full Clinical Guideline

Reference no.:CG-ELEC/2023/002

Intravenous Fluid Administration for Adults

- *This guideline is applicable to the majority of patients in UHDB Trust. However there are groups of patients who require more specialist fluid regimes. These groups and information detailing where to access the specialist guidance are listed at the end of the document (Appendix 1).*

- Oral or enteral administration of fluid is optimal. Prescribe intravenous (IV) fluids only if the patient's needs cannot be met any other way.
- Stop IV fluid as soon as it is feasible and safe to do so.
- All patients receiving IV fluids need regular clinical and biochemical monitoring. This includes daily assessment of clinical fluid status and inspection of fluid balance charts. Daily measurement of U&Es should be the default position; in a small number of cases this may not be necessary and less frequent monitoring may be appropriate (needs senior clinical decision). Body weight should be measured twice weekly in the majority of patients receiving intravenous fluids.
- These guidelines are consistent with the NICE document 174 'Intravenous Fluid Therapy in Adults in Hospital' accessed at: http://www.nice.org.uk/guidance/cg174.

Maintenance fluids

This term refers to IV fluids given to patients who cannot meet their needs by the oral or enteral route but who are otherwise euvolaemic.

- Use 4% Glucose / 0.18% Saline (Glucose/Saline) with 20 or 40 mmol/L of KCl at a rate of 1.0 - 1.5ml/kg/hr.
- Consider lower rates of administration (e.g. 0.5 – 0.75 ml/kg/hr) in patients who are older, particularly frail, malnourished or have cardiac or renal disease. Increase this rate only after careful clinical assessment of the patient.
- Use Hartmann's solution when the patient's plasma sodium is ≤ 130 mmol/L and plasma potassium is ≤ 5 mmol/L.
- Use 0.9% Saline with 20 or 40 mmol KCl/L when plasma sodium ≤ 130 mmol/L AND plasma potassium ≤ 3.5 mmol/L.

- It is rarely necessary to prescribe more than 100 ml/hr of maintenance fluid. Prescribing more than 2.5 L per day increases the risk of hyponatraemia.
- Take the volume and composition of fluids used to deliver regular medications such as paracetamol and antibiotics into all calculations of daily fluid requirements.

Measure hourly urine output in critically ill patients – actively manage oliguria (< 0.5 ml/kg/hr)

- For oliguria: give 250 ml boluses of Hartmann's solution *or* 0.9% Saline over 10-15 minutes, and repeat as necessary until hourly urine output improves (>0.5 ml/kg/hr).
- Remember to assess patient for adverse signs of fluid overload **every time** you consider repeating boluses.
- Do not use furosemide to treat oliguria until intravascular fluid deficit has been excluded or treated.
- Do not manage oliguria by simply increasing the hourly rate of infusion. This is **not** an adequate approach to resuscitation.

Rapid volume resuscitation in hypovolaemic patients

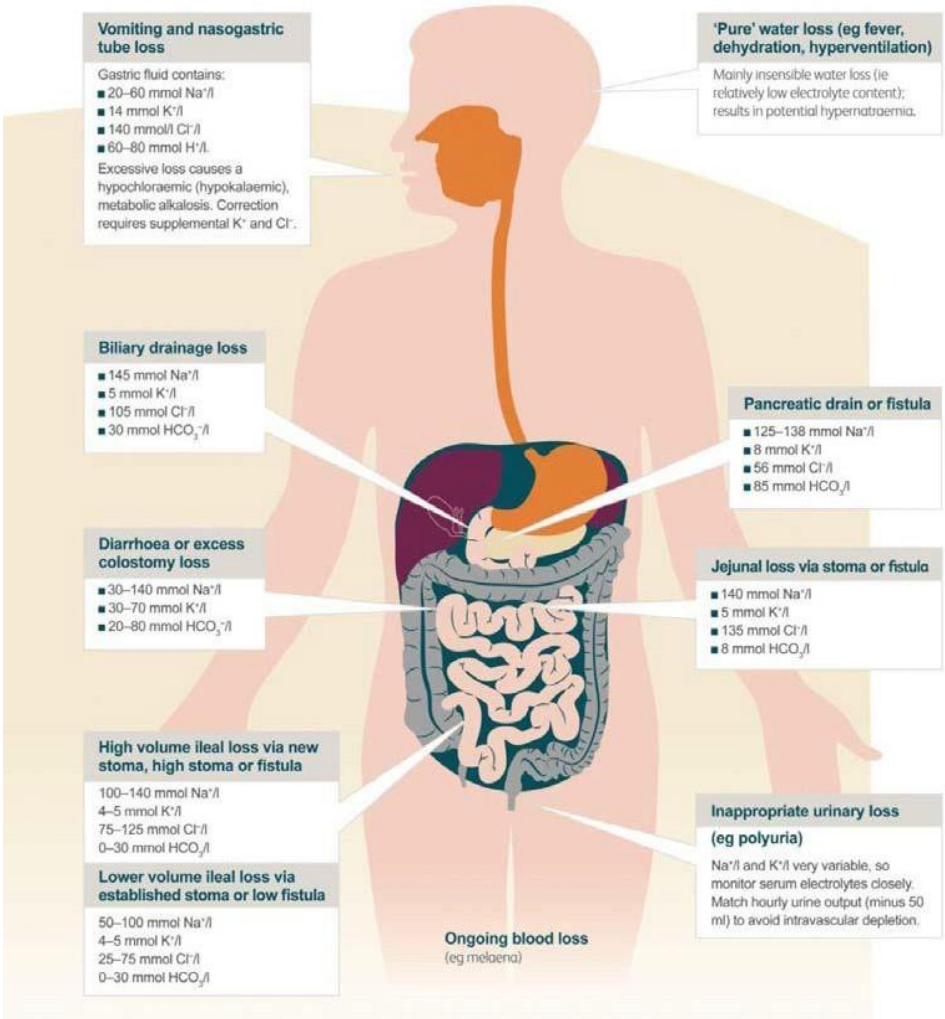
- Use 500 ml boluses of Hartmanns solution or 0.9% Saline administered in quick succession. Use 250 ml boluses in elderly/frail patients initially until fluid tolerance has been determined.
- **Re-assess the patient after every bolus** - look at heart rate, blood pressure, capillary refill time, respiratory rate, oxygen saturation and conscious level.
- Blood products may be required if there is ongoing bleeding (see below).
- Seek senior help if administered volume exceeds 2000 ml without signs of clinical improvement.
- 4.5% Human Albumin Solution is only indicated for fluid losses with high protein content or for resuscitation in severe sepsis (when expert help from Critical Care Staff is required).
- The use of gelatin containing fluids (e.g. Gelofusine or Haemaccel) is **not** recommended.

Replacing fluid deficits

- Adjust the IV prescription (add to or subtract from maintenance needs) to account for existing fluid and/or electrolyte deficits or excesses, as well as ongoing losses (see diagram of ongoing losses below) e.g. increasing IV fluid infusion rate above maintenance rate for those patients who are volume depleted but who are haemodynamically stable.

- Hartmann's solution is suitable replacement for most fluid losses (when plasma potassium is ≤ 5 mmol/L).
- 0.9% Saline with 20 or 40 mmol/L KCl is specifically indicated for losses from nasogastric drainage or vomiting.
- 4.5% or 20% Human Albumin Solution for fluid losses with high protein content.

Figure (from NICE guidance) showing typical electrolyte concentrations in different fluid losses



Transfusion of packed red cells

- Activate the Trust's 'Massive Transfusion Protocol' in patients with massive haemorrhage.
- Transfuse when Hb concentration < 70 g/L or when there is ongoing bleeding with Hb ≤ 100 g/L.
- Transfuse to maintain Hb between 70 – 90 g/L in patients who are critically ill or undergoing major surgery.
- In patients with ischaemic heart disease it ***may*** be safer to maintain Hb between 80 – 90 g/L.
- Diuretics are rarely required "to cover" blood transfusion in surgical patients.
- Transfusion associated circulatory overload (TACO) is the commonest complication of blood transfusion and should be actively sought whenever a patient receives blood products. It is characterised by any four of the following occurring within 6 hours of transfusion
  - acute respiratory distress
  - tachycardia
  - increased blood pressure
  - acute or worsening pulmonary oedema
  - evidence of an positive fluid balance

The Serious Hazards of Transfusion (SHOT) organization provide detailed discussion at http://www.shotuk.org/wp-content/uploads/2010/03/BBTS-2008-Dr-Taylor-TACO.pdf

Documentation Controls

Development of Guideline:	Dr Fraser – Gastro Consultant
Consultation with:	
Approved By:	*Dr Catherine Fraser - August 23 - Reviewed with no changes* Agreed by SMBU2 and Trustwide CGG to be cross-site – Dec 2023
Review Date:	August 2026
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Appendix 1

Exceptions to this Guideline

The following clinical areas/patient groups have fluid management protocols that differ from the general guidance above. Please consult the following specialist documents before prescribing fluid therapy.

Chemotherapy patients

- Where there is a risk of tumour-lysis syndrome, omit Hartmann's solution and omit KCl additives from any fluid prescription.

Contrast induced AKI

- Use the Trust guideline on fluid management in the prevention of contrast induced AKI (on Flo).

Critical Care Units (ICU & SDU)

- Use the local specialist protocols which are available on Flo.

Diabetic patients (on sliding scale insulin infusion)

- Apply the Trust policy for administration of intravenous insulin.
- Consult the guidelines found on Flo governing the treatment of diabetic emergencies (**diabetic ketoacidosis, hyperosmolar hyperglycaemic state).**

Gastrointestinal Bleeding

- Use the local specialist protocols which are available on Flo.

Intra-operative fluid management

- By definition this is not maintenance fluid therapy and this guideline will not apply.

Liver Disease

- Patients with acute liver failure or decompensated cirrhosis present a particular challenge in fluid management. These patients should usually be cared for with specialist liver team input. Do not administer maintenance IV fluids to these patients without reference to local specialist documents (relevant clinical guidelines on Flo are *AKI in cirrhosis, Ascites – cirrhotic, Liver Failure (acute), Spontaneous Bacterial Peritonitis).*

Obstetric Unit

- Apply the local specialist protocol for fluid management in patients with pre-eclampsia and/or eclampsia.

Paediatric patients (< 16 years)

- All patients <16 years must receive 5% Glucose / 0.45% Saline +/- KCl as IV maintenance fluid even if they are admitted to adult ward areas. **DO NOT** use 4% Glucose / 0.18% Saline as this has been associated with fatal cases of hyponatraemia in patients aged 16 or under.
- Rates of fluid administration will be dictated by specialist paediatric formulae.
- Any patient who is admitted to a designated paediatric ward will also receive 5% Glucose / 0.45% Saline +/- KCl irrespective of biological age.

Renal disease

- Patients with kidney disease are at increased risk of fluid overload. This is particularly true for dialysis patients who usually pass reduced amounts of urine.
- All dialysis and renal transplant patients **must** be managed under direct supervision of the renal team.
- **DO NOT** use Hartmann's solution in dialysis patients – the potassium in this fluid poses a risk of hyperkalaemia.
- For patients with kidney disease who need fluid resuscitation, use 250ml boluses of 0.9% saline and reassess the patient after **every bolus** before repeating.
- Daily weights (unless impossible) are very useful to assess cumulative fluid balance.

Appendix 2

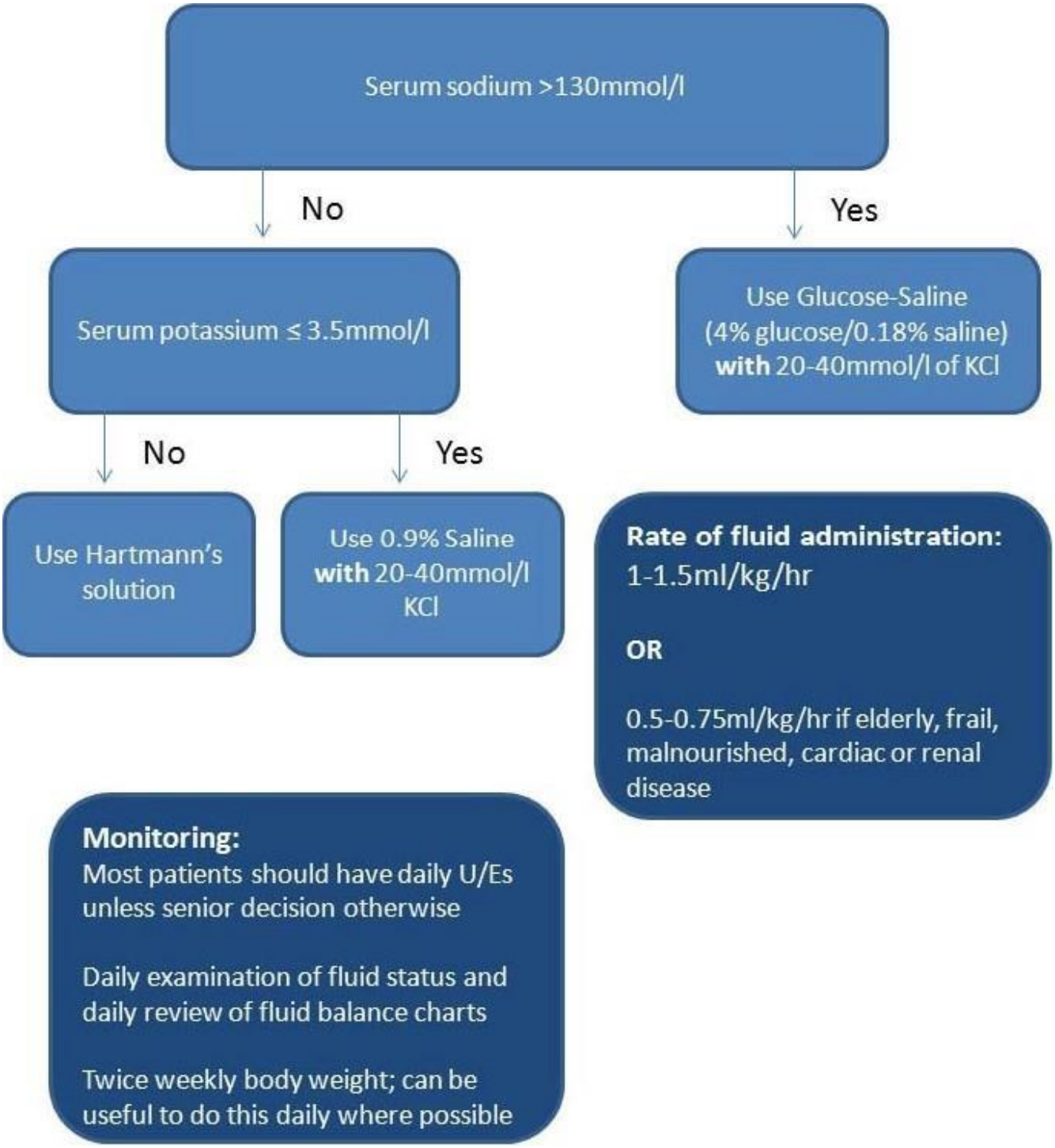
Composition of Common IV Fluids

	Na	K	Ca	Cl	Other	pH	Osmolarity mosm L^{-1}
Crystalloids							
0.9 % Saline	*154*	*-*	*-*	*154*	*-*	*5.0*	*308***
4% Glucose / 0.18% Saline	*30*	*-*	*-*	*30*	*Dextrose 40 g*	*4.0*	*284***
5% Glucose / 0.45% Saline	*75*	*-*	*-*	*75*	*Dextrose 50 g*	*4.0*	*431***
5% Glucose	*-*	*-*	*-*	*-*	*Dextrose 50 g*	*4.0*	*278***
Hartmann's	*131*	*5*	*2*	*111*	*Lactate 29*	*6.5*	*278*
Bicarbonate 8.4%	*1000*	*-*	*-*	*-*	*HCO_3 1000*	*8*	*2000*
***Adding KCl to these crystalloids increases osmolarity by approximately twice the concentration added (ie 40 or 80 mosm L^{-1})*							

Colloids								
	Na	K	Ca	Cl	Other	pH	Osmolarity mosm L^{-1}	COP mmHg
Gelofusine	*154*	*<0.4*	*<0.4*	*125*	*Gelatin 40 g*	*7.4*	*274*	*34*
Albumin 4.5%	*<160*	*<2*	*-*	*136*	*Albumin 45 g*	*7.4*	*290*	*19*
Normal plasma colloid osmotic pressure (COP) ≈ 25 mmHg								

Maintenance fluids

(if patient euvolaemic but unable to meet requirements orally)



Full clinical guidelines for IV fluid administration can be found on Flo and NICE guidelines http:lj www. nice.org.uk/guidance/cg174

Resuscitation