Intravenous Fluid Therapy for Adult patients at RCHT

Introduction

In December 2013 NICE introduced a guideline (NICE CG174) for the provision of intravenous (IV) fluid therapy in adults in hospital, intended to help prescribers safely and effectively assess, prescribe for and review adult patients requiring IV fluids. RCHT has adopted this guideline, with some minor modifications relevant to local practice, and the following provides the core information for all practitioners who prescribe IV fluids or manage patients who may require IV fluid therapy.

The RCHT IV fluid guideline is available on the Documents library and on the Mobile guidelines app.

The guidance is applicable to adults in hospital, but excludes some groups:

- Patients under 16 years
- Pregnant women (but not post-partum women)
- Those with severe liver or renal disease, diabetes or burns
- Patients needing inotropes and intensive care
- Anaesthetised patients undergoing surgery
- Patients with traumatic brain injury

Important changes to IV fluid therapy recommended by the guideline

1. Use of the “5 Rs” and NICE algorithms
2. Accurate prescribing specifying fluid type, rate and volume
3. Not using colloid
4. Using less fluid than traditionally, to prevent fluid overload
5. Focus on stopping IV fluids when no longer required
6. Use of a management plan to prescribe fluid and electrolytes
7. Plan ahead to simplify handovers
8. Monitor chloride in patients receiving fluids with chloride concentrations >120mmol.l⁻¹
9. Prescribe sodium and potassium in a 1:1 ratio (1mmol/kg/day of each)
10. Try and time routine maintenance to be given during the day with a break at night

Clinical approaches to assessing IV fluid needs

The most appropriate method of fluid and electrolyte administration is the simplest, safest and most effective. The oral route should be used whenever possible, and IV fluids can usually be avoided in patients who are eating and drinking. The possibility of enteral tube administration should also be considered.
The clinical approach is based on the “5 Rs” of resuscitation, routine maintenance, replacement and redistribution, with reassessment. Clinical considerations around these elements can be complex, so decisions on the optimal volume, rate and composition of IV fluids must be based on careful, individual patient assessment.

The 5 Rs

**Resuscitation**
IV fluids may need to be given urgently to restore circulation

**Routine maintenance**
For patients who cannot take oral or enteral fluids but will have on-going routine requirements

**Replacement**
Fluids in addition to routine maintenance to meet existing deficits or on-going losses, such as insensible losses in fever, GI losses and drain losses

**Redistribution**
To account for internal fluid distribution, such as oedema seen in sepsis or liver disease

**The 5th R**
Reassessment: a crucial part of IV fluid therapy

The clinical principles can be approached as a series of questions:

1. Does the patient need IV fluid resuscitation?
2. What are the patient’s routine maintenance needs?
3. Can the patient meet fluid and electrolyte needs by the oral route?
4. Does the patient have existing losses that need replacement?
5. What is the patient’s current fluid and electrolyte status?
6. Does the patient have problems with internal redistribution?
7. What fluid shall I prescribe?

**Standard principles for IV fluid therapy**

- Patient’s fluid and electrolyte needs should be assessed and managed at every ward review
- Skilled and competent professionals should prescribe and administer IV fluids, and assess and monitor patients receiving IV fluids
- Therapy should be prescribed with reference to the “5 Rs”
- IV therapy should be provided as part of a protocol (See algorithms in the RCHT or NICE guideline)
- Prescriptions must include the type, rate and volume of fluid to be administered. Fluid and electrolyte prescription must be recorded in the IV fluid management plan for the next 24 hours
• Take into account all other sources of fluids and electrolytes (oral intake, drugs, nutrition, blood products, etc.)
• If possible involve the patient, family or carers in the management plan

Assessment and Monitoring

Initial assessment:
Using the ABCDE (airway, breathing, circulation, disability and exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation.

Indicators of urgent requirement for fluid resuscitation include:

• Systolic BP < 100mmHg
• Heart rate > 90 bpm
• Capillary refill time > 2 secs (and/or cool peripheries)
• Respiratory rate > 20 breaths per minute
• National Early Warning Score (NEWS) ≥ 5

Assess likely fluid and electrolyte needs from the history, clinical examination, current medications, clinical monitoring and laboratory investigations.

History should include previous limited intake, thirst, quantity and composition of abnormal losses (eg drain losses, sweating, vomit: see Diagram of sources of on-going loss), and co-morbidities, including patients who are malnourished and at risk of re-feeding syndrome. Examination should include an assessment of fluid status, including pulse, BP, capillary refill, JVP, presence of pulmonary or peripheral oedema, and postural hypotension. Monitoring should include current status and trends in NEWS, fluid balance charts and patient weight. Laboratory investigations should include status and trends in FBC and U&Es

Reassessment:
If patients are receiving fluids for resuscitation, reassess using the ABCDE approach. Monitor respiratory rate, pulse, blood pressure and perfusion continuously, and measure their blood lactate and/or arterial pH and base excess.

All patients continuing to receive IV fluids need regular monitoring. This should include at least daily reassessment of clinical fluid status, U&Es, and fluid balance charts, along with twice weekly weight measurements.

Note:

• Patients with replacement or redistribution problems may need more frequent monitoring
• Urinary sodium monitoring may be helpful in patients with high-volume GI losses
• Monitor serum chloride daily and reassess IV fluid prescription if hyperchloraemia develops.
• Report clear incidents of fluid mismanagement through the Datix system.
• Reassess fluid status and IV fluid management plan if the patient is transferred to a new ward or location.

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Resuscitation:
If patients need IV fluids for resuscitation, use 0.9% Saline or Hartmann’s solution in 500ml boluses over less than 15 minutes.

Routine maintenance:
For patients requiring routine maintenance alone, restrict the initial prescription to:

- 25 – 30 ml/kg/day of water AND
- approximately 1 mmol/kg/day of potassium, sodium and chloride AND
- 50-100 g/day glucose to limit starvation ketosis. (This quantity will NOT address nutritional needs: see the RCHT Nutrition guideline.

This can be achieved using 0.18% Saline in 4% glucose with 20mmol potassium on day one (use caution if total fluid prescription exceeds 2.5 litres per day as this prescription may increase the risk of hyponatraemia).

Use ideal body weight to assess fluid needs in obese patients.

Consider restricting fluids to 20 – 25 ml/kg/day in frail, older patients, those with renal impairment or cardiac failure, and malnourished patients at risk of refeeding syndrome.

Consider adjusting the prescription to deliver the fluids during daytime hours.

Allow for any fluids taken orally and deduct this volume from the total prescription.

Replacement and Redistribution:
Add to or subtract from maintenance needs to account for existing fluid and/or electrolyte deficits or excesses, on-going losses or abnormal distribution (see Diagram of sources of on-going loss).

Seek expert help for complex fluid and/or electrolyte issues (such as: gross oedema, sepsis, hypo/hypernatraemia, renal, liver or cardiac impairment, post-operative patients, and malnourished patients). The appropriate expert will depend on the clinical situation, but may be the medical registrar, Outreach practitioner, or other specialist.

Further Reading
NICE have produced an online eLearning tool which can be accessed from the following link (you will need to open an account with NICE, which is free)

http://elearning.nice.org.uk/logi n/in dex.php
The Algorithms

The algorithms are available on the Documents library and on the mobile guidelines app.

Algorithm 1: Assessment

The following clinical parameters may indicate that urgent fluid resuscitation is required:

- Systolic blood pressure less than 100 mmHg
- Heart rate greater than 90 beats per minute
- Capillary refill time is more than 2 seconds, or peripheries are cold to touch
- Respiratory rate is more than 20 breaths per minute
- NEWS score is 5 or more
- Passive leg raising suggests fluid responsiveness
Algorithm 2: Fluid resuscitation

Initiate treatment
- Identify cause of deficit and respond.
- Give a fluid bolus of 500 ml of crystalloid (containing sodium in the range of 130–154 mmol/l) over 15 minutes.

Reassess the patient using the ABCDE approach
Does the patient still need fluid resuscitation? Seek expert help if unsure

Yes

Does the patient have signs of shock?

Yes

Assess the patient’s likely fluid and electrolyte needs (Refer algorithm 1 box 3)

No

No

Give a further fluid bolus of 250–500 ml of crystalloid

>2000 ml given?

Yes

Seek expert help

No

An appropriate first line fluid for resuscitation would be:

500ml of Hartmann’s solution, or 500ml of 0.9% NaCl
Algorithm 3: Routine maintenance

**Algorithm 3: Routine Maintenance**

Give maintenance IV fluids
Normal daily fluid and electrolyte requirements:
- 25–30 ml/kg/d water
- 1 mmol/kg/day sodium, potassium, chloride
- 50–100 g/day glucose (e.g. glucose 5% contains 5 g/100ml).

Reassess and monitor the patient
Stop IV fluids when no longer needed. Nasogastric fluids or enteral feeding are preferable when maintenance needs are more than 3 days.

For the first 24 hours an appropriate first line fluid would be:

25-30 ml/kg of 0.18% NaCl with 4% glucose and 20mmol/l potassium
Algorithm 4: Replacement and redistribution

**Existing fluid or electrolyte deficits or excesses**
Check for:
- dehydration
- fluid overload
- hyperkalaemia/hypokalaemia

Estimate deficits or excesses.

**Ongoing abnormal fluid or electrolyte losses**
Check ongoing losses and estimate amounts. Check for:
- vomiting and NG tube loss
- biliary drainage loss
- high/low volume ileal stoma loss
- diarrhoea/excess colostomy loss
- ongoing blood loss, e.g. melena
- sweating/fever/dehydration
- pancreatic/jejunal fistula/stoma loss
- urinary loss, e.g. post AKI polyuria.

**Redistribution and other complex issues**
Check for:
- gross oedema
- severe sepsis
- hypermaturaemia/hyponatraemia
- renal, liver and/or cardiac impairment.
- post-operative fluid retention and redistribution
- malnourished and refeeding issues

Seek expert help if necessary and estimate requirements.

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Prescribe by adding to or subtracting from routine maintenance, adjusting for all other sources of fluid and electrolytes (oral, enteral and drug prescriptions).

Monitor and reassess fluid and biochemical status by clinical and laboratory monitoring.
Diagram of sources of on-going loss:

**Vomiting and nasogastric tube loss**
- Gastric fluid contains:
  - 20–80 mmol Na+/l
  - 14 mmol K+/l
  - 140 mmol Cl-/l
  - 60–86 mmol HCO3-
- Excessive loss causes a hypochloremic (hypokalaemic), metabolic alkalosis. Correction requires supplemental K+ and Cl-.

**Biliary drainage loss**
- 146 mmol Na+/l
- 5 mmol K+/l
- 155 mmol Cl-/l
- 30 mmol HCO3-/l

**Diarrhoea or excess colostomy loss**
- 30–140 mmol Na+/l
- 20–70 mmol K+/l
- 20–80 mmol HCO3-/l

**High volume ileal loss via new stoma, high stoma or fistula**
- 100–140 mmol Na+/l
- 4–6 mmol K+/l
- 75–125 mmol Cl-/l
- 0–50 mmol HCO3-/l

**Lower volume ileal loss via established stoma or low fistula**
- 50–100 mmol Na+/l
- 4–6 mmol K+/l
- 25–75 mmol Cl-/l
- 0–30 mmol HCO3-/l

**Pancreatic drain or fistula**
- 125–138 mmol Na+/l
- 6 mmol K+/l
- 50 mmol Cl-/l
- 65 mmol HCO3-/l

**Jejunal loss via stoma or fistula**
- 140 mmol Na+/l
- 5 mmol K+/l
- 135 mmol Cl-/l
- 8 mmol HCO3-/l

**Inappropriate urinary loss (eg polyuria)**
- Na+/ and K+/ very variable, so monitor serum electrolytes closely.
- Measure hourly urine output (minus 50 ml) to avoid intravascular depletion.

**‘Pure’ water loss (eg fever, dehydration, hyperventilation)**
- Mainly sensible water loss (ie relatively low electrolyte content) results in potential hypernatraemia.