**Procedure: U1p**

**Use of intravenous maintenance and replacement fluid therapy in adults**

This procedure relates to intravenous fluid maintenance in Magnolia the inpatient ward which is part of the Homeward service and fluid replacement in High Secure and Forensic Services

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<tr>
<td><strong>Approved by:</strong></td>
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<td><strong>Title of Author:</strong></td>
<td>Nurse consultant physical healthcare</td>
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<td><strong>Responsible ED:</strong></td>
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|                       | Dr Robert Bates – clinical director Broadmoor High Secure Services |
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## Version Control Sheet

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1.0 Flowchart

NICE
National Institute for Health and Care Excellence

Algorithms for IV fluid therapy in adults

Using an ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation. Assess volume status taking into account clinical examination, trends and context. Indicators that a patient may need fluid resuscitation include: systolic BP < 100mmHg; heart rate > 95bpm; capillary refill > 2s or peripheral cold to touch; respiratory rate > 20 breaths per min; NEWS 25; 45° passive leg raising suggests fluid responsiveness.

Assess the patient’s likely fluid and electrolyte needs:
- History: previous limited intake, thirst, abnormal losses, comorbidities.
- Clinical examination: pulse, BP, capillary refill, JVP, oedema (peripheral/pleural), postural hypotension.
- Clinical monitoring: NEWS, fluid balance charts, weight.
- Laboratory assessments: FBC, urea, creatinine and electrolytes.

Can the patient meet their fluid and/or electrolyte needs orally or enteraly? NO

Does the patient have complex fluid or electrolyte replacement or abnormal distribution issues? NO

Ensure nutrition and fluid needs are met. Also see Nutrition support in adults (NICE clinical guideline 32).

Algorithm 4: Replacement and Redistribution

Existing fluid or electrolyte deficits or excesses:
- Check for:
  - dehydration
  - fluid overload
  - hypokalaemia
  - hypocalcaemia

Estimate deficits or excesses.

Ongoing abnormal fluid or electrolyte losses:
- Check ongoing losses and estimate amounts. Check for:
  - vomiting and N2 tube loss
  - bilious drainage loss
  - high/low volume ileal stoma loss
  - diuretic/excess colostomy loss
  - ongoing blood loss, e.g. melaena
  - sweating/fever/diabetes
  - pancreatic/jejunal fistula stomas loss
  - urinary loss, e.g. post AKI polyuria.

Redistribution and other complex issues:
- Check for:
  - gross oedema
  - severe oesophaegogastric haemorrhage
  - hypoproteinaemia
  - hypocalcaemia
  - renal, liver and/or cardiac impairment.
  - post-operative fluid retention and redistribution
  - malnourished and refractory issues.

Seek expert help if necessary and estimate requirements.

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.

"Intravenous fluid therapy in adults in hospital", NICE clinical guideline 174 (December 2013)
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2.0 Introduction

2.1 Intravenous (IV) fluid therapy is one of the most common treatments provided to adults requiring hospital care (Sherratt, 2014). NICE (2013) guidelines indicate that although intravenous fluid management is complex healthcare professionals prescribing and administering intravenous fluids do not always receive formal training and may be unaware of its importance, benefits and associated risks.

2.2 Evidence suggests that 20 percent of patients receiving IV fluid therapy experience adverse effects as a result of receiving too much, too little or the wrong type of fluid. In some cases inappropriate IV fluid management can have fatal consequences (National Confidential Enquiry into Perioperative Deaths, 1999). A more recent NCEPOD report highlighted that patients were at an increased risk of death within thirty days of having an operation if they had received inadequate or excessive IV fluids in the preoperative period (Findlay et al, 2011).

3.0 Scope

3.1 This procedure relates to intravenous fluid maintenance in Magnolia the inpatient ward which is part of the Homeward service. It does not cover fluid resuscitation in Homeward or local services inpatients wards as patients requiring fluid resuscitation will require care in acute care settings.

3.2 It covers fluid replacement for patients in High Secure and Forensic Services needing fluids to correct water and/or electrolyte deficits or ongoing abnormal losses, such as high-output ileostomies, diarrhoea or vomiting.

3.3 This procedure aims to ensure that healthcare professionals prescribing and administering IV fluids follow best practice as outlined in the NICE (2013) guidance.

4.0 Systems & Recording

4.1 The doctor or non-medical prescriber will prescribe intravenous fluids on the relevant section of the medication chart.

4.2 The administering nurses will check intravenous fluids, record batch number and time of commencement.

5.0 Procedure

5.1 When prescribing IV fluids, remember the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment. Offer IV fluid therapy as part of a protocol (see Algorithms for IV fluid therapy).
5.2 Patients should have an IV fluid management plan

5.3 NICE guidance recommends that IV the “five R’s are used to determine guide of IV fluid therapy prescribing”: See appendix 1:

- Resuscitation
- Routine maintenance
- Replacement
- Redistribution
- Reassessment

5.3.1 **Resuscitation**: this is for patients needing IV fluids urgently to restore circulation to vital organs following loss of plasma in the blood (intravascular volume). This can be caused by excessive external fluid and electrolyte loss as well as bleeding or plasma loss, usually from the gastrointestinal tract, or severe internal losses.

5.3.2 **Routine maintenance**: patients may need IV fluid therapy because they are unable to maintain normal fluid levels orally or by another enteral route. These patients are otherwise well in terms of fluid and electrolyte balance and are haemodynamically stable. Some patients with routine maintenance requirements may additionally be nil by mouth or have reduced oral intake and may need electrolyte supplementation; the maintenance prescription should be adjusted for this. Estimates of routine maintenance requirements are essential for all patients on continuing IV fluid therapy; this is calculated by the patient’s weight, oral intake and any other IV input (outlined in the routine maintenance algorithm).

5.3.3 **Replacement**: this is for patients needing fluids to correct water and/or electrolyte deficits or ongoing abnormal losses, such as high-output ileostomies, diarrhoea or vomiting.

5.3.4 **Redistribution**: some hospital patients have complex fluid and electrolyte balance problems, due to the shift – or lack of shift – of fluid between different body compartments. This is seen particularly in those who are septic, otherwise critically ill, following major surgery or with major cardiac, liver or renal comorbidities. Health professionals should consider whether patients need IV fluids for their fluids to be redistributed correctly. Expert help should be sought to manage IV fluid therapy in patients with complex redistribution needs.

5.3.5 **Reassessment**: health professionals should reassess patients at regular intervals, as part of their monitoring of IV fluid therapy.

5.4 **Assessment and monitoring**

5.4.1 **Initial assessment**:

5.4.1.1 **Using the ABCDE** (airway, breathing, circulation, disability and exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation.
5.4.1.2 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 (e.g. drain losses, sweating, vomit: (see diagram of ongoing losses), 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

5.4.2 Reassessment

5.4.2.1 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.

5.4.2.2 If patients are receiving fluids for resuscitation, reassess using the ABCDE approach. Monitor respiratory rate, pulse, blood pressure and perfusion in accordance with National Early Warning (NEWS) score.

   NB: Patients with replacement or redistribution problems may need more frequent monitoring

5.4.2.3 Urinary sodium monitoring may be helpful in patients with high-volume GI losses.

5.4.2.4 Monitor serum chloride daily and reassess IV fluid prescription if hyperchloraemia develops.

5.4.2.5 Report clear incidents of fluid mismanagement through the IR1 system.

5.4.2.6 Reassess fluid status and IV fluid management plan if the patient is transferred to a new ward or location.
5.4.3 Routine maintenance

5.4.3.1 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 0 50-100 g/day glucose to limit starvation ketosis. (This quantity will NOT address nutritional needs: see 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).

5.4.3.2 For frail elderly, patients with renal impairment or cardiac failure and patients who are malnourished or at risk of refeeding syndrome consider giving less fluid: 20-25ml/kg/ day (NICE 2013).

5.4.3.3 Use ideal body weight to assess fluid needs in obese patients. Allow for any fluids taken orally and deduct this volume from the total prescription.

Never give maintenance fluids at more than 100ml/hour.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Fluid requirement</th>
<th>Rate ml/hour</th>
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<tbody>
<tr>
<td>35-44kg</td>
<td>1200 (500ml 10 hourly)</td>
<td>50ml</td>
</tr>
<tr>
<td>45-54kg</td>
<td>1500 (‘8 hrly’)</td>
<td>65</td>
</tr>
<tr>
<td>55-64kg</td>
<td>1800 (‘7 hrly’)</td>
<td>75</td>
</tr>
<tr>
<td>65-74</td>
<td>2100 (‘6 hrly’)</td>
<td>85</td>
</tr>
<tr>
<td>≥75</td>
<td>2400 (‘5 hrly’)</td>
<td>100 (max)</td>
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5.4.3.4 Preferred maintenance fluids: 0.18%NaCl/4%glucose with or without added potassium. This fluid if given at the correct rate (Table I) provides all water and Na+/K+ requirements until the patient can eat and drink. Excess volumes of this fluid (or any fluid) may cause hyponatraemia.

5.4.3.5 If the serum potassium is above 5mmol/l or rising quickly do not give extra potassium.

5.5 Diabetes

5.5.1 There are no specific guidelines for fluids in diabetic patients it will entirely depend on the blood sugars unless they are experiencing Diabetic Keto-acidosis or Hyperosmolar hyperglycaemic state.

5.6 Electrolyte requirements

5.6.1 Sodium
- Adult requirements are 50–100 mmol/day
5.6.2 **Potassium**

- The adult daily requirements for potassium are 40–80 mmol/L
- Patients with excessive lower GI losses or enteric fistula may have losses requiring more significant replacement.

5.6.3 **Calories:** 50-100g glucose in 24 hours to prevent starvation ketosis. Consult dietician if patient is malnourished.

5.6.4 Magnesium, calcium and phosphate may fall in sick patients—monitor and replace as required.

5.7 **Fluid Resuscitation**

5.7.1 This is for patients needing IV fluids urgently to restore circulation to vital organs following loss of plasma in the blood (intravascular volume). This can be caused by excessive external fluid and electrolyte loss as well as bleeding or plasma loss, usually from the gastrointestinal tract, or severe internal losses. It can also be caused by dehydration. When there is an identified need for fluid resuscitation patients cared for in local services and Homeward intermediate care services will normally be transferred to an acute hospital.

5.7.2 In West London Forensic Services and High Secure Services medical staff may carry out IV fluid resuscitation on site. They should:

- Identify the cause of the fluid deficit and give a fluid bolus of 500 ml of crystalloid (containing sodium in the range of 130–154 mmol/l) over less than 15 minutes e.g. saline 0.9%, Hartmann’s solution or Ringer’s Lactate solution.
- Reassess the patient using the ABCDE approach. Does the patient still need fluid resuscitation? Seek expert help if unsure.
- If the patient has signs of septic shock seek expert advice
- If there are no signs of septic shock give a total of 2 litres of IV fluid as noted in the algorithm below.

**If the patient remains hypovolaemic seek urgent expert advice**
NICE (2013) IV Fluid Resuscitation Algorithm

Using an ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation. Assess volume status taking into account clinical examination, trends and context. Indicators that a patient may need fluid resuscitation include: systolic BP <100 mmHg; heart rate >90 bpm; capillary refill >2s or peripherals cold to touch; respiratory rate >20 breaths per min; NEWS ≥5; 45° passive leg raising suggests fluid responsiveness.

Yes

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 less than 15 minutes.

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

Yes

No

Does the patient have signs of shock?

Yes

No

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

Yes

No

>2000 ml given?

Seek expert help

No

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

6.1 NICE CG 174 recommends that hospitals establish systems to ensure that all health care professionals involved in prescribing IV fluids are trained in the principles covered in the guideline.

6.2 This online learning programme provides learning on all these principles, which will take approximately two hours.


6.3 This can be undertaken in more than one session if required. The tool will resume where you left off.

6.4 Learning outcomes

6.4.1 After completing this learning programme you should be able to:

- Apply current NICE guidance on IV fluid therapy in adults to optimise patient outcomes
- Assess a patient’s fluid status and whether IV fluids are indicated
- Identify a patient’s fluid and electrolyte requirement considering the 5Rs listed in the NICE guidance
- Highlight that patient’s potential risk of complications of IV fluid therapy
- Construct a comprehensive IV fluid management plan, including details of fluid type and duration of therapy, and communicate and agree the plan with the patient and/or carer
- Prescribe appropriate IV fluids safely and accurately (with knowledge of availability and content)
- Review the need for continued IV fluids and stop when no longer required
- Recognise, manage and report critical incidents related to IV fluid therapy.

7 Monitoring

7.1 Pharmacy will conduct quarterly audits of intravenous fluid prescribing –

8 Glossary / Acronyms

| Hyponatraemia. | Low sodium levels “a serum sodium concentration of less than 135 mmol/L” (NICE, 2015) |
9 References


www.nice.org.uk/CG174


https://cks.nice.org.uk/hyponatraemia#topicsummary


http://www.nursingtimes.net/nursing-practice/specialisms/iv-therapy/nice-guidance-on-giving-intravenous-fluids/5067582.article

10. Appendix
**Algorithm 1: Assessment**

Using an ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach, assess whether the patient is hypovolaemic and needs fluid resuscitation.

- Assess volume status taking into account clinical examination, trends and context. Indicators that a patient may need fluid resuscitation include: systolic BP < 100 mmHg; heart rate > 90 bpm; capillary refill > 2 seconds or peripheries cold to touch, respiratory rate > 20 breaths per min; NEWS ≥ 5; 45° 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.

**Algorithm 3: Routine Maintenance**

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

- Give a further fluid bolus of 250–500 ml of crystalloid if necessary.

- 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.

**Algorithm 4: Replacement and Redistribution**

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

- 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 iatrogenic loss
  - diarrhoea/excess colostomy loss
  - ongoing blood loss, e.g. melena
  - sweating/fever/dehydration
  - pancreatic/jejunal fistula/renal loss
  - urinary loss, e.g. post AKI polyuria.

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

- Seek expert help if necessary and estimate requirements.

- 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.

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*Intravenous fluid therapy in adults in hospital*, NICE clinical guideline 174 (December 2013) 
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