POLICY DOCUMENT

Burton Hospitals
NHS Foundation Trust

PRESCRIBING INTRAVENOUS FLUIDS

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Burton Hospitals NHS Foundation Trust

POLICY INDEX SHEET

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REVIEW AND AMENDMENT LOG

Version	Type of change	Date	Description of Change
1	New Policy	July 2014	
2	Review	July 2017	

PRESCRIBING INTRAVENOUS FLUIDS POLICY

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Burton Hospitals NHS Foundation Trust

PRESCRIBING INTRAVENOUS FLUIDS

1. Introduction

1.1 Rationale

Many adult hospital inpatients need intravenous (IV) fluid therapy to prevent or correct problems with their fluid and/or electrolyte status. Deciding on the optimal amount and composition of IV fluids to be administered and the best rate at which to give them can be a difficult and complex task and decisions must be based on careful assessment of the patient's individual needs.

Errors in prescribing IV fluids and electrolytes are particularly likely in emergency departments, acute admission units, and general medical and surgical wards rather than in operating theatres and critical care units. Surveys have shown that many staff who prescribe IV fluids know neither the likely fluid and electrolyte needs of individual patients, nor the specific composition of the many choices of IV fluids available to them. Standards of recording and monitoring IV fluid and electrolyte therapy may also be poor in these settings. IV fluid management in hospital is often delegated to the most junior medical staff who frequently lack the relevant experience and may have received little or no specific training on the subject.

The National Confidential Enquiry into Perioperative Deaths report in 1999 highlighted that a significant number of hospitalised patients were dying as a result of infusion of too much or too little fluid. The report recommended that fluid prescribing should be given the same status as drug prescribing. Although mismanagement of fluid therapy is rarely reported as being responsible for patient harm, it is likely that as many as 1 in 5 patients on IV fluids and electrolytes suffer complications or morbidity due to their inappropriate administration.

There is also considerable debate about the best IV fluids to use (particularly for more seriously ill or injured patients), resulting in wide variation in clinical practice. Many reasons underlie the ongoing debate, but most revolve around difficulties in interpretation of both trial evidence and clinical experience, including the following factors:

- Many accepted practices of IV fluid prescribing were developed for historical reasons rather than through clinical trials

- Trials cannot easily be included in meta-analyses because they examine varied outcome measures in heterogeneous groups, comparing not only different types of fluid with different electrolyte content, but also different volumes and rates of administration and, in some cases, the additional use of inotropes or vasopressors

- Most trials have been undertaken in operating theatres and critical care units rather than admission units or general and elderly care settings

- Trials claiming to examine best early therapy for fluid resuscitation have actually evaluated therapy choices made after initial fluid resuscitation, with patients already in critical care or operating theatres

- Many trials inferring best therapy for fluid resuscitation after acute fluid loss have actually examined situations of hypovolaemia induced by anaesthesia.

1.2 Aim

There is a clear need for guidance on IV fluid therapy for general areas of hospital practice, covering both the prescription and monitoring of IV fluid and electrolyte therapy, and the training and educational needs of all hospital staff involved in IV fluid management.

The aim of this policy, (taken from NICE clinical guideline ref CG174) is to help prescribers understand the:

- Physiological principles that underpin fluid prescribing

- Pathophysiological changes that affect fluid balance in disease states

- Indications for IV fluid therapy

- Reasons for the choice of the various fluids available **and**

- Principles of assessing fluid balance.

It is hoped that this guideline will lead to better fluid prescribing in hospitalised patients, reduce morbidity and mortality, and lead to better patient outcomes.

1.3 Scope

The scope of this Policy excludes patient groups with more specialised fluid prescribing needs. It is important to emphasise that the recommendations do not apply to:

- Patients under 16 years

- Pregnant women

- Patients with severe liver or renal disease, diabetes or burns

- Patients needing inotropes

- Patients on intensive monitoring, (and so they have less relevance to intensive care settings and patients during surgical anaesthesia)

- Patients with traumatic brain injury (including patients needing neurosurgery).

The scope of the Policy does not cover the practical aspects of administration (as opposed to the prescription) of IV fluids. Please refer to Burton Hospitals NHS Foundation Trust Policy number 212; Intravenous Therapy Policy for adults.

The policy will assume that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.

2. Recommendations

2.1 Principles and protocols for intravenous fluid therapy

The assessment and management of patients' fluid and electrolyte needs is fundamental to good patient care.

2.1.1 Assess and manage patients' fluid and electrolyte needs as part of every ward review. Provide intravenous (IV) fluid therapy only for patients whose needs cannot be met by oral or enteral routes, and stop as soon as possible.

2.1.2 Skilled and competent healthcare professionals should prescribe and administer IV fluids, and assess and monitor patients receiving IV fluids.

2.1.3 When prescribing IV fluids, remember the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment.

2.1.4 Offer IV fluid therapy as part of a protocol (**see Appendix 4**: Algorithms for IV fluid therapy).

2.2 Assess patients' fluid and electrolyte needs following Algorithm 1/Appendix 4: Assessment.

2.3 If patients need IV fluids for fluid resuscitation, follow Algorithm 2/Appendix 4: Fluid resuscitation.

2.4 If patients need IV fluids for routine maintenance, follow Algorithm 3/Appendix 4): Routine maintenance.

2.5 If patients need IV fluids to address existing deficits or excesses, ongoing abnormal losses or abnormal fluid distribution, follow Algorithm 4/Appendix 4): Replacement and redistribution.

2.6 Include the following information in IV fluid prescriptions:

- The type of fluid to be administered
- The rate and volume of fluid to be administered.

2.7 Patients should have an IV fluid management plan, which should include details of:

- The fluid and electrolyte prescription over the next 24 hours

- The assessment and monitoring plan.

Initially, the IV fluid management plan should be reviewed by an expert daily. IV fluid management plans for patients on longer-term IV fluid therapy whose condition is stable may be reviewed less frequently.

2.8 When prescribing IV fluids and electrolytes, take into account all other sources of fluid and electrolyte intake, including any oral or enteral intake, and intake from drugs, IV nutrition, blood and blood products

2.9 Patients have a valuable contribution to make to their fluid balance. If a patient needs IV fluids, explain the decision, and discuss the signs and symptoms they need to look out for if their fluid balance needs adjusting. If possible or when asked, provide written information (for example, NICE's Information for the public), and involve the patient's family members or carers (as appropriate).

3. Assessment and Monitoring

Initial Assessment

3.1 Assess whether the patient is hypovolemic. Indicators that a patient may need urgent fluid resuscitation include:

- Systolic blood pressure is less than 100 mmHg
- Heart rate is more 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
- Passive leg raising suggests fluid responsiveness.

3.2 Assess the patient's likely fluid and electrolyte needs from their history, clinical examination, current medications, clinical monitoring and laboratory investigations:

- History should include any previous limited intake, thirst, the quantity and composition of abnormal losses (see Diagram of ongoing losses), and any comorbidities, including patients who are malnourished and at risk of re-feeding syndrome (see Nutrition support in adults [NICE clinical guideline 32])
- Clinical examination should include an assessment of the patient's fluid status, including:
  - Pulse, blood pressure, capillary refill and jugular venous pressure
  - Presence of pulmonary or peripheral oedema
  - Presence of postural hypotension

- Clinical monitoring should include current status and trends in:
    - NEWS or equivalent observation methodology Fluid balance charts including all aspects of input and output
    - Weight

- Laboratory investigations should be undertaken regularly as determined by the patients' clinical condition and include current status and trends in:
    - Full blood count
    - Urea, creatinine and electrolytes.

Reassessment

3.3 If patients are receiving IV fluids for resuscitation, reassess the patient using the ABCDE approach (Airway, Breathing, Circulation, Disability, Exposure), monitor their respiratory rate, pulse, blood pressure and perfusion continuously, and measure their venous lactate levels and/or arterial pH and Intravenous fluid therapy in adults in hospital NICE clinical guideline 174 base excess according to guidance on advanced life support (Resuscitation Council [UK], 2011).

3.4 All patients continuing to receive IV fluids need regular monitoring. The frequency of monitoring will be dependent on the clinical condition of the patient and must be determined by the clinical team responsible for the patient. This should initially include at least daily reassessments of clinical fluid status, laboratory values (urea, creatinine and electrolytes) and fluid balance charts, along with weight measurement twice weekly. Be aware that:

- Patients receiving IV fluid therapy to address replacement or redistribution problems may need more frequent monitoring

- Additional monitoring of urinary sodium may be helpful in patients with high-volume gastrointestinal losses. (Reduced urinary sodium excretion [less than 30 mmol/l] may indicate total body sodium depletion even if plasma sodium levels are normal. Urinary sodium may also indicate the cause of hyponatraemia, and guide the achievement of a negative sodium balance in patients with oedema. However, urinary sodium values may be misleading in the presence of renal impairment or diuretic therapy)

- Patients on longer-term IV fluid therapy whose condition is stable may be monitored less frequently, although decisions to reduce monitoring frequency should be detailed in their IV fluid management plan.

3.5 If patients have received IV fluids containing chloride concentrations greater than 120 mmol/l (for example, sodium chloride 0.9%), monitor their serum chloride concentration daily. If patients develop hyperchloraemia or acidaemia, reassess their IV fluid prescription and assess their acid-base status. Consider less frequent monitoring for patients who are stable.

3.6 Clear incidents of fluid mismanagement (for example, unnecessarily prolonged dehydration or inadvertent fluid overload due to IV fluid therapy) should be reported through standard critical incident reporting to encourage improved training and practice (**see Appendix 2**: Potential Consequences of fluid mismanagement that may be reported as critical incidents).

3.7 If patients are transferred to a different location, reassess their fluid status and IV fluid management plan on arrival in the new setting.

4. Resuscitation

4.1 If patients need IV fluid resuscitation, use crystalloids that contain sodium in the range 130-154 mmol/l, with a bolus of 500 ml over less than 15 minutes.(For more information, **see Appendix 5**: the Composition of commonly used crystalloids table.)

4.2 Do not use tetrastarch for fluid resuscitation.

4.3 Consider human albumin solution 4-5% for fluid resuscitation only in patients with severe sepsis. This should only be done following senior clinical review.

5. Routine Maintenance

5.1 If patients need IV fluids for routine maintenance alone, restrict the initial prescription to (see appendix 3):

- 25-30 ml/kg/day of water **and**
- Approximately 1 mmol/kg/day of potassium, sodium and chloride **and**
- Approximately 50-100 g/day of glucose to limit starvation ketosis. (This quantity will not address patients nutritional needs – See Adult Oral and Enteral Nutrition and Hydration Policy)

5.2 For patients who are obese, adjust the IV fluid prescription to their ideal body weight. Use lower range volumes per kg (patients rarely need more than a total of 3 litres of fluid per day) and seek expert help if their BMI is more than 40kg/m^2.

5.3 Consider prescribing less fluid (for example, 20-25 ml/kg/day fluid) for patients who:

- Are older or frail
- Have renal impairment or cardiac failure
- Are malnourished and at risk of refeeding syndrome.

5.4 When prescribing for routine maintenance alone, consider using 25-30 ml/kg/day sodium chloride 0.18% in 4% glucose with 27 mmol/l potassium

on day 1 (there are other regimens to achieve this). Prescribing more than 2.5 litres per day increases the risk of hyponatraemia. These are initial prescriptions and further prescriptions should be guided by monitoring.

5.5 Consider delivering IV fluids for routine maintenance during daytime hours to promote sleep and wellbeing.

6. Replacement and Distribution

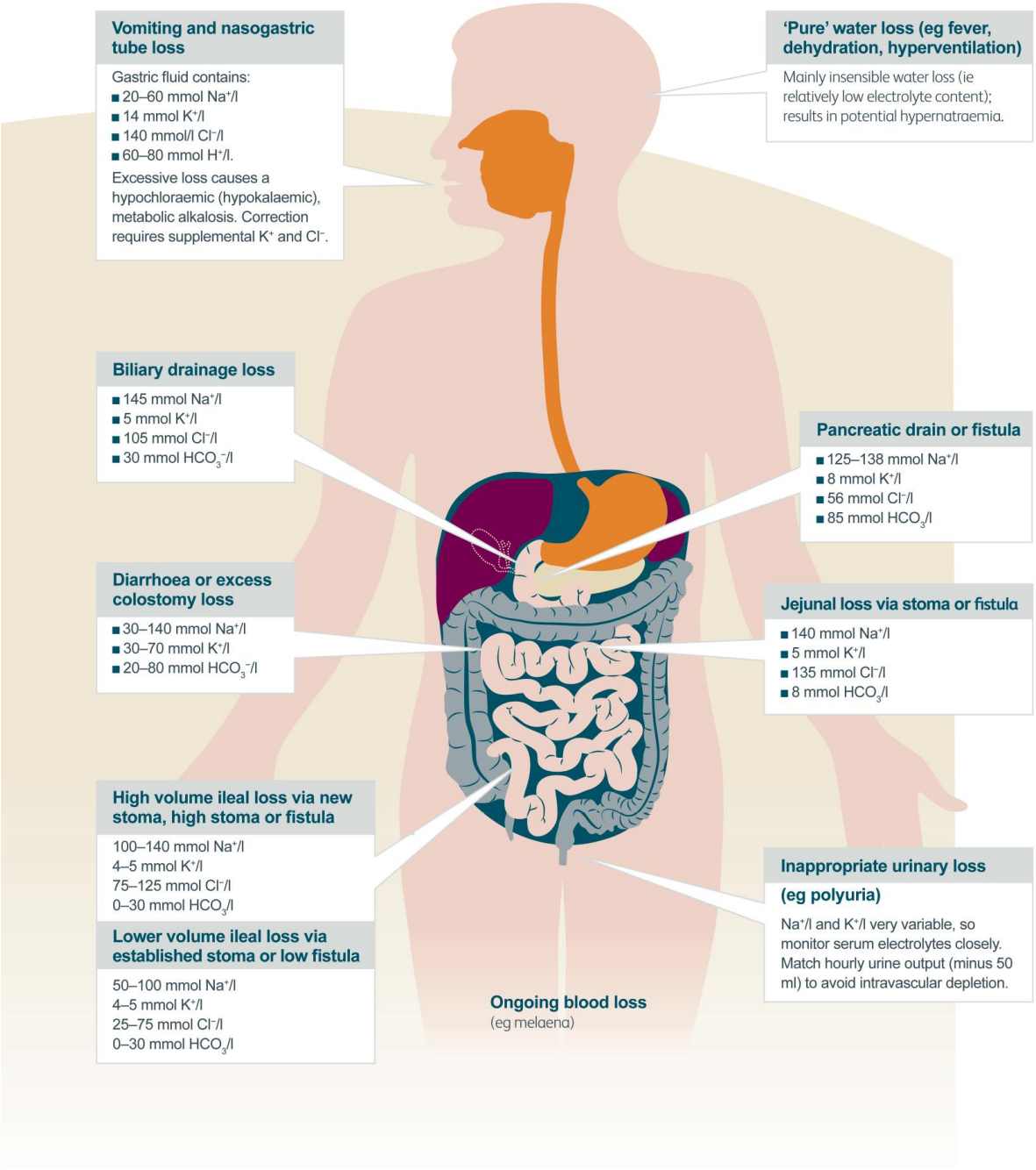
6.1 Adjust the IV prescription (add to or subtract from maintenance needs) to account for existing fluid and/or electrolyte deficits or excesses, ongoing losses (**see Appendix 1**: Diagram of ongoing losses) or abnormal distribution.

6.2 Seek expert help if patients have a complex fluid and/or electrolyte redistribution issue or imbalance, or significant co-morbidity, for example:

- Gross oedema
- Severe sepsis
- Hyponatraemia or hypernatraemia
- Renal, liver and/or cardiac impairment
- Post-operative fluid retention and redistribution
- Malnourished and refeeding issues.

Appendix 1

Diagram of Ongoing losses



Appendix 2

Potential Consequences of fluid mismanagement that may be reported as critical incidents

Consequences of fluid mismanagement	Identifying features	Time frame of identification
Hypovolaemia	• Patient's fluid needs not met by oral, enteral or IV intake **and** • Features of dehydration on clinical examination • Low urine output or concentrated urine • Biochemical indicators, such as more than 50% increase in urea or creatinine with no other identifiable cause	Before and during IV fluid therapy
Pulmonary oedema (breathlessness during infusion)	• No other obvious cause identified (for example, pneumonia, pulmonary embolus or asthma) • Features of pulmonary oedema on clinical examination • Features of pulmonary oedema on X-ray	During IV fluid therapy or within 6 hours of stopping IV fluids
Hyponatraemia	• Serum sodium less than 130 mmol/l • No other likely cause of hyponatraemia identified	During IV fluid therapy or within 24 hours of stopping IV fluids
Hypernatraemia	• Serum sodium 155 mmol/l or more • Baseline sodium normal or low • IV fluid regimen included 0.9% sodium chloride • No other likely cause of hypernatraemia identified	During IV fluid therapy or within 24 hours of stopping IV fluids
Peripheral oedema	• Pitting oedema in extremities and/or lumbar sacral area • No other obvious cause identified (for example, nephrotic syndrome or known cardiac failure)	During IV fluid therapy or within 24 hours of stopping IV fluids

Hyperkalaemia	• Serum potassium more than 5.5 mmol/l • No other obvious cause identified	During IV fluid therapy or within 24 hours of stopping IV fluids
Hypokalaemia	• Serum potassium less than 3.0 mmol/l likely to be due to infusion of fluids without adequate potassium provision • No other obvious cause (for example, potassium-wasting diuretics, refeeding syndrome)	During IV fluid therapy or within 24 hours of stopping IV fluids

Source: This table was drafted based on the concensus decision of the members of the NICE Guideline Development Group

Appendix 3

IV fluid prescription (by body weight) for routine maintenance over a 24 hour period

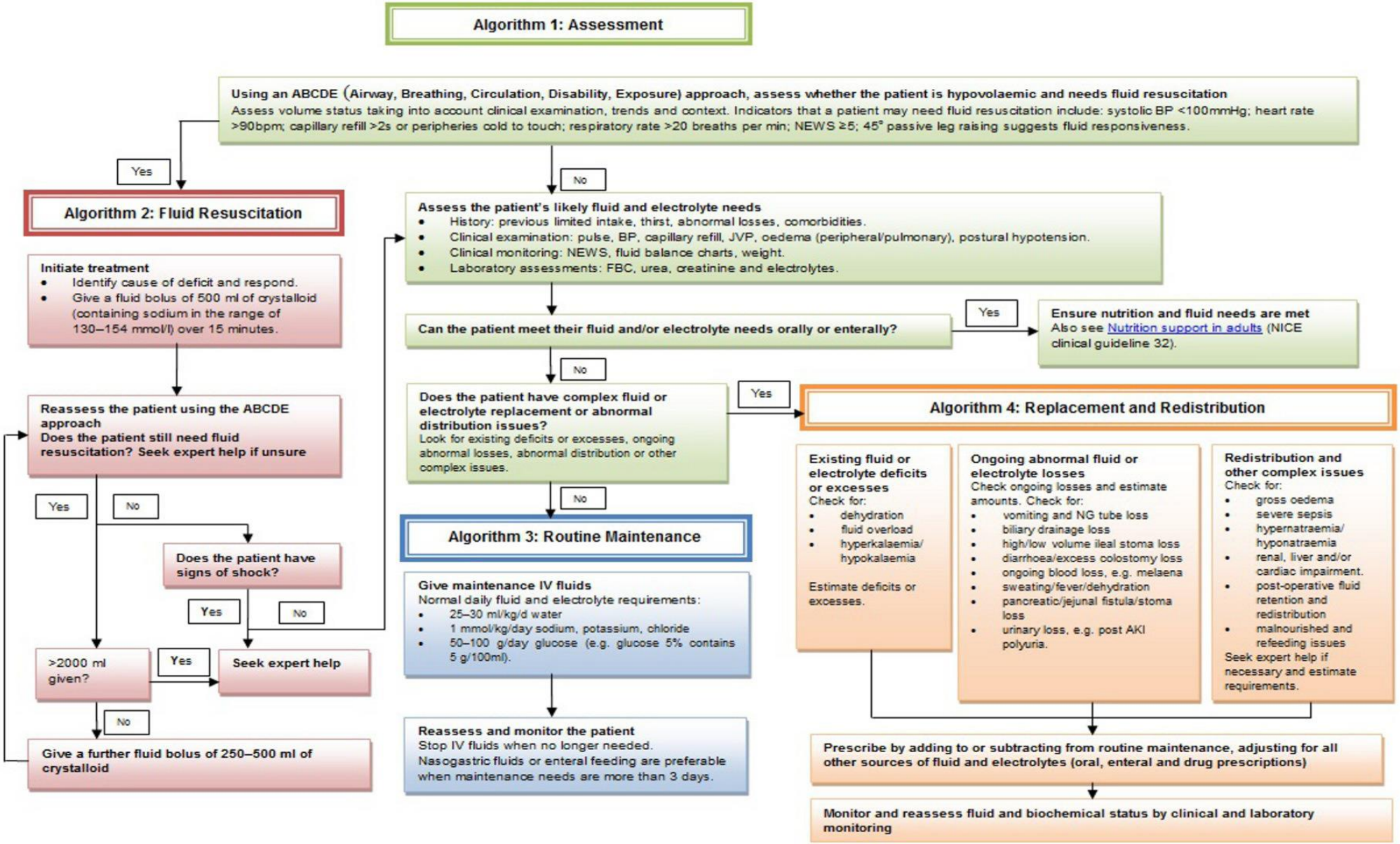
Body weight kg	Water 25-30 ml/kg/day	Sodium, chloride, potassium approx.1 mmol/kg/day of each		Body weight kg	Water 25-30 ml/kg/day	Sodium, chloride, potassium approx.1 mmol/kg/day of each
40	1000-1200	40		71	1775-2130	71
41	1025-1230	41		72	1800-2160	72
42	1050-1260	42		73	1825-2190	73
43	1075-1290	43		74	1850-2220	74
44	1100-1320	44		75	1875-2250	75
45	1125-1350	45		76	1900-2280	76
46	1150-1380	46		77	1925-2310	77
47	1175-1410	47		78	1950-2340	78
48	1200-1440	48		79	1975-2370	79
49	1225-1470	49		80	2000-2400	80
50	1250-1500	50		81	2025-2430	81
51	1275-1530	51		82	2050-2460	82
52	1300-1560	52		83	2075-2490	83
53	1325-1590	53		84	2100-2520	84
54	1350-1620	54		85	2125-2550	85
55	1375-1650	55		86	2150-2580	86
56	1400-1680	56		87	2175-2610	87
57	1425-1710	57		88	2200-2640	88
58	1450-1740	58		89	2225-2670	89
59	1475-1770	59		90	2250-2700	90
60	1500-1800	60		91	2275-2730	91
61	1525-1830	61		92	2300-2760	92
62	1550-1860	62		93	2325-2790	93
63	1575-1890	63		94	2350-2820	94
64	1600-1920	64		95	2375-2850	95
65	1625-1950	65		96	2400-2880	96
66	1650-1980	66		97	2425-2910	97
67	1675-2010	67		98	2450-2940	98
68	1700-2040	68		99	2475-2970	99
69	1725-2070	69		100	2500-3000	100
70	1750-2100	70		>100	2500-3000	100

Add 50-100 grams/day glucose (e.g. glucose 5% contains 5g/100ml).

For special considerations refer to the recommendations for routine maintenance.

Appendix 4

Algorithms for IV fluid therapy



Composition of commonly used crystalloids

Content	Plasma	Sodium chloride 0.9%*	Sodium chloride 0.18%/ 4% glucose[a]	0.45% NaCl/ 4% glucose[a]	5% glucose[a]	Hartmann's	Lactated Ringer's (USP)	Ringer's acetate	Alternative balanced solutions for resuscitation**	Alternative balanced solutions for maintenance**
Na^+ (mmol/l)	135–145	154	31	77	0	131	130	130	140	40
Cl^- (mmol/l)	95–105	154	31	77	0	111	109	112	98	40
$[Na^+]:[Cl^-]$ ratio	1.28–1.45:1	1:1	1:1	1:1	-	1.18:1	1.19:1	1.16:1	1.43:1	1:1
K^+ (mmol/l)	3.5–5.3	*	*	*	*	5	4	5	5	13
HCO_3^- / Bicarbonate	24–32	0	0	0	0	29 (lactate)	28 (lactate)	27 (acetate)	27 (acetate) 23 (gluconate)	16 (acetate)
Ca^{2+} (mmol/l)	2.2–2.6	0	0	0	0	2	1.4	1	0	0
Mg^{2+} (mmol/l)	0.8–1.2	0		0		0	0	1	1.5	1.5
Glucose (mmol/ l)	3.5–5.5	0	222 (40 g)	222 (40 g)	278 (50 g)	0	0	0	0	0
pH	7.35–7.45	4.5–7.0	4.5		3.5–5.5	5.0–7.0	6–7.5	6–8	4.0–8.0	4.5–7.0
Osmolarity (mOsm/l)	275–295	308	284		278	278	273	276	295	389

* These solutions are available with differing quantities of potassium already added, and the potassium-containing versions are usually more appropriate for meeting maintenance needs.
** Alternative balanced solutions are available commercially under different brand names and composition may vary by preparation.
[a] The term dextrose refers to the dextro-rotatory isomer of glucose that can be metabolised and is the only form used in IV fluids. However IV fluid bags are often labelled as glucose so only this term should be used. Traditionally hospitals bought a small range of fluids combining saline (0.18-0.9%) with glucose but several recent NICE/NPSA documents have recommended specific combinations, which are now purchased to enable guidelines to be followed. Glucose–saline combinations now come in 5 different concentrations, and the addition of variable potassium content expands the pre-mixed range to 13 different products. Prescribers must therefore specify the concentration of each component; the term dextrose-saline (or abbreviation D/S) is meaningless without these details. What is specified also impacts significantly on the cost of the product.

Source: This table was drafted based on the consensus decision of the members of the Guideline Development Group.

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