NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Health and social care directorate

Quality standards and indicators

Briefing paper

Quality standard topic: Intravenous fluid therapy in adults in hospital

Output: Prioritised quality improvement areas for development.

Date of Quality Standards Advisory Committee meeting: 27 January 2014

Contents

1 Introduction

This briefing paper presents a structured overview of potential quality improvement areas for IV fluid therapy in adults in hospital. It provides the Committee with a basis for discussing and prioritising quality improvement areas for development into draft quality statements and measures for public consultation.

1.1 Structure

This briefing paper includes a brief description of the topic, a summary of each of the suggested quality improvement areas and supporting information.

If relevant, recommendations selected from the key development source below are included to help the Committee in considering potential statements and measures.

1.2 Development source

The key development source referenced in this briefing paper is:

- Intravenous fluid therapy in adults in hospital. NICE clinical guideline 174 (2013).

2 Overview

2.1 Focus of quality standard

This quality standard will cover the assessment and management of adults' intravenous fluid needs in hospital. Intravenous fluid therapy is the provision of fluid and/or electrolytes directly into the vein. This quality standard will not cover the use of blood or blood products.

2.2 Definition

Intravenous (IV) fluid therapy is a way of replacing fluids in the body by giving them straight into the bloodstream (intravenous means 'into a vein', and is often called a drip). IV fluid contains water, electrolytes (called salts) and glucose (a type of sugar). It is given to stop people becoming dehydrated and to make sure they have the right amount of fluid, salts and sugars in their blood that they need for normal health.

Many adult hospital inpatients need intravenous (IV) fluid therapy to prevent or correct problems with their fluid and/or electrolyte status. This may be because they cannot meet their normal needs through oral or enteral routes (for example, they

have swallowing problems or gastrointestinal dysfunction) or because they have unusual fluid and/or electrolyte deficits or demands caused by illness or injury (for example, high gastrointestinal or renal losses). 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 task, and decisions must be based on careful assessment of the patient's individual needs.

Management

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 because patients in more general areas usually have less cardiovascular monitoring and the staff may have less experience of fluid prescribing. Surveys have shown that many staff who prescribe IV fluids in such areas 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, and staff may fail to reassess and respond to patients' inevitable changes in IV fluid and electrolyte status over time.

Despite the relative complexity of estimating a patient's IV fluid needs, assessment and prescription is often delegated to healthcare professionals who have received little or no specific training on the subject. Prescribing IV fluids is often left to the most junior medical staff, who frequently lack the relevant experience. This problem was highlighted by a 1999 National Confidential Enquiry into Perioperative Deaths (NCEPOD) report, which found that a significant number of hospitalised patients were dying as a result of the infusion of too much or too little fluid. The report then recommended that fluid prescribing should be given the same status as drug prescribing. Unfortunately this has not yet occurred, and although inappropriate fluid therapy is rarely reported as being responsible for patient harm, it remains 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 among IV fluid and electrolyte experts about the best IV fluids to use, particularly for more seriously ill or injured patients. There is

therefore wide variation in clinical practice. Many reasons underlie the ongoing debate, but most revolve around difficulties in interpretation of both trials evidence and clinical experience, including the following:

- 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 resuscitation have actually evaluated therapy choices made after initial resuscitation with patients already in critical care or operating theatres.
- Many trials inferring best therapy for resuscitation after acute fluid loss have actually examined situations of hypovolaemia induced by anaesthesia.

See appendix 1 for the associated algorithms from NICE clinical guideline 174. See appendix 2 for key priorities for implementation from NICE clinical guideline 174.

2.3 National Outcome Frameworks

Tables 1–2 show the outcomes, overarching indicators and improvement areas from the frameworks that the quality standard could contribute to achieving.

Table 1 NHS Outcomes Framework 2014/15

Domain	Overarching indicators and improvement areas
1 Preventing people from dying prematurely	***Overarching indicator*** 1a Potential Years of Life Lost (PYLL) from causes amenable to healthcare* i Adults
4 Ensuring that people have a positive experience of care	***Overarching indicators*** 4b Patient experience of hospital care ***Improvement areas*** **Improving hospital's responsiveness to personal needs** 4.2 Responsiveness to in-patient's personal needs
5 Treating and caring for people in a safe environment and protecting them from avoidable harm	***Overarching indicators*** 5a Patient safety incidents reported 5b Safety incidents involving severe harm or death 5c Hospital deaths attributable to problems in care ***Improvement areas*** **Reducing the incidence of avoidable harm** 5.4 Incidence of medication errors causing serious harm
Alignment across the health and social care system * Indicator shared with Public Health Outcomes Framework (PHOF)	

Table 2 Public health outcomes framework for England, 2013–2016

Domain	Objectives and indicators
4 Healthcare public health and preventing premature mortality	***Objective*** Reduced numbers of people living with preventable ill health and people dying prematurely, whilst reducing the gap between communities ***Indicators*** 4.3 Mortality rate from causes considered preventable*
Alignment across the health and social care system * Indicator shared with NHS Outcomes Framework (NHSOF)	

3 Summary of suggestions

3.1 Responses

In total 13 stakeholders responded to the 2-week engagement (11 December 2013 to 2 January 2014).

Stakeholders were asked to suggest up to 5 areas for quality improvement. Specialist committee members were also invited to provide suggestions. The responses have been merged and summarised in table 3 for further consideration by the Committee.

Full details on the suggestions provided are given in appendix 3 for information.

Table 3 Summary of suggested quality improvement areas

Suggested area for improvement	Stakeholders
Prescribing of IV fluids • Algorithms for IV fluid therapy • Prescribing after initial assessment	SCM, BHC, RCPath, AAGBI, RCA
Reassessment and monitoring of IV fluids	SCM, BHC
IV fluid management plan	SCM, RCA
Training and education	SCM, GHNHSFT, BHC, RCPath, RCA
IV fluids lead	SCM, BHC
Communication with patients	SCM, BHC
Incident reporting	SCM, BHC, RCPath
AAGBI The Association of Anaesthetists of Great Britain & Ireland BHC, Baxter Healthcare Ltd GHNHSFT, Gloucester Hospitals NHS Foundation Trust RCA, Royal College of Anaesthetists RCPath, Royal College of Pathologists SCM, Specialist Committee Member	

4 Suggested improvement areas

4.1 Prescribing of IV fluids

4.1.1 Summary of suggestions

Algorithms for IV fluid therapy

Stakeholders highlighted that prescribing of IV fluids should be as part of a clear management plan and follow the 3 algorithms: resuscitation, replacement or redistribution. They highlighted that prescribers may be unfamiliar with fluid and electrolyte requirements for different clinical situations, leading to inappropriate fluid prescribing. Stakeholders commented that staff should know what regime of treatment they are delivering and deliver it in accordance with the recommended algorithm. Stakeholders commented that standardised fluid prescription algorithms will lead to less variation in practice and would specifically aid junior doctors in consistency of fluid prescribing.

Prescribing after initial assessment

Stakeholders highlighted that the quality of initial assessment prior to prescribing is in need of improvement. They acknowledged that the accuracy of the initial prescription is vital to prevent exacerbation of existing complications and occurrence of future complications. They commented that initial assessment of the fluid and electrolyte needs of patients should be standardised.

4.1.2 Selected recommendations from development source

Table 4 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 4 to help inform the Committee's discussion.

Table 4 Specific areas for quality improvement

Suggested quality improvement area	Suggested source guidance recommendations
Algorithms for IV fluid therapy	**Principles and protocols for intravenous fluid therapy** NICE CG174 Recommendation 1.1.3 (KPI) NICE CG174 Recommendation 1.1.4 (KPI) (Algorithms for IV fluid therapy 1-4)
Prescribing after initial assessment	**Initial assessment** NICE CG174 Recommendation 1.2.1 NICE CG174 Recommendation 1.2.2 (KPI)

Algorithms for IV fluid therapy

Principles and protocols for intravenous fluid therapy

NICE CG174 – Recommendation 1.1.3 (key priority for implementation)

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

NICE CG174 – Recommendation 1.1.4 (key priority for implementation)

Offer IV fluid therapy as part of a protocol (see Algorithms for IV fluid therapy) [appendix 1 of this briefing paper]:

- Assess patients' fluid and electrolyte needs following Algorithm 1: Assessment.
- If patients need IV fluids for fluid resuscitation, follow Algorithm 2: Fluid resuscitation.
- If patients need IV fluids for routine maintenance, follow Algorithm 3: Routine maintenance.
- If patients need IV fluids to address existing deficits or excesses, ongoing abnormal losses or abnormal fluid distribution, follow Algorithm 4: Replacement and redistribution.

Prescribing after initial assessment

Initial assessment

NICE CG174 – Recommendation 1.2.1

Assess whether the patient is hypovolaemic. 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
- National Early Warning Score (NEWS) is 5 or more
- passive leg raising suggests fluid responsiveness

NICE CG174 – Recommendation 1.2.2 (key priority for implementation)

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 refeeding 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
    - fluid balance charts
    - weight.
- Laboratory investigations should include current status and trends in:
    - full blood count
    - urea, creatinine and electrolytes.

4.1.3 Current UK practice

A two phase clinical audit[1] examined the effect of targeted multidisciplinary interventions to improve the process of IV fluid prescribing, administering and monitoring in hospital inpatients. The interventions were targeted at all professional groups in a Trust involved in the process of prescribing and administering IV fluid. The baseline audit phase included 53 patients with 48 in the follow-up group. It was concluded that the process of prescribing, administering and monitoring IV fluid use can be significantly improved through a range of targeted multidisciplinary interventions. However, it was noted that even with targeted interventions, there

[1] Walker et al. (2012) Intravenous fluid use in the acutely unwell adult medical inpatient: improving practice through a clinical audit process Royal College of Physicians of Edinburgh Journal 42:211–5

were still areas of poor performance and the overall IV fluid guideline bundle of care compliance rate was only 22.9%.

4.2 Reassessment and monitoring of IV fluids

4.2.1 Summary of suggestions

Stakeholders highlighted that improved monitoring of fluid requirements was required and prescribing should take into account several key indicators of clinical assessment. They reported that prescribers often do not undertake a clinical assessment including key clinical indicators, and prescribing is often done by junior doctors who have the least experience.

Stakeholders reported that patients receiving fluids need regular monitoring including initial daily assessments of clinical indicators and that this is currently not done consistently.

Stakeholders highlighted that effective and accurate recording and monitoring of fluid requirements ensures prescriptions can be adapted to meet the patient's individual needs. They noted that electronic patient records specifically would assist in improving this practice.

4.2.2 Selected recommendations from development source

Table 5 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 5 to help inform the Committee's discussion.

Table 5 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Reassessment and monitoring of IV fluids	**Reassessment** NICE CG174 Recommendation 1.2.3 NICE CG174 Recommendation 1.2.4 (KPI)

Reassessment

NICE CG174 Recommendation 1.2.3

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 base excess according to guidance on advanced life support (Resuscitation Council [UK], 2011).

NICE CG174 Recommendation 1.2.4 (key priority for implementation)

All patients continuing to receive IV fluids need regular monitoring. 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.

4.2.3 Current UK practice

A two phase clinical audit[2] examined the effect of targeted multidisciplinary interventions to improve the process of IV fluid prescribing, administering and monitoring in hospital inpatients. The interventions were targeted at all professional groups in a Trust involved in the process of prescribing and administering IV fluid. The baseline audit phase included 53 patients with 48 in the follow-up group. It was concluded that the process of prescribing, administering and monitoring IV fluid use can be significantly improved through a range of targeted multidisciplinary interventions. However, it was noted that even with targeted interventions, there were still areas of poor performance and the overall IV fluid guideline bundle of care compliance rate was only 22.9%.

[2] Walker et al. (2012) Intravenous fluid use in the acutely unwell adult medical inpatient: improving practice through a clinical audit process Royal College of Physicians of Edinburgh Journal 42:211–5

4.3 IV fluid management plan

4.3.1 Summary of suggestions

Stakeholders suggested that fluid balance charts should be completed accurately and contemporaneously to increase their usefulness. This should be done at regular intervals over a 24 hour period to enable corrections to fluid prescribing before an imbalance occurs.

These plans should be reviewed by experts in IV fluid management initially. Stakeholders stated that if plans are formalised and reviewed then prescriptions can be adjusted following changing patient needs. They also suggested that an IV fluid management plan could be combined with an early warning system to aid consistency of completion and allow earlier recognition of complications.

Stakeholders acknowledged that IV fluid management plans should be communicated clearly between healthcare professionals in order to ensure that assessment and monitoring is followed through and reviewed regularly.

4.3.2 Selected recommendations from development source

Table 6 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 6 to help inform the Committee's discussion.

Table 6 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
IV fluid management plan	**Principles and protocols for IV fluid therapy** NICE CG174 Recommendation 1.1.6 (KPI)

Principles and protocols for IV fluid therapy

<u>NICE CG174 Recommendation 1.1.6 (key priority for implementation)</u>

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.

4.3.3 Current UK practice

In 2011, The National Confidential Enquiry into Preoperative Deaths (NCEPOD)[3] reported that fluid management was a common problem. A review of 30 day mortality highlighted that 20.5% of patients were considered to have had inadequate pre-operative fluid management compared with 4.7% mortality in those with adequate pre-operative fluid therapy. This report reinforces previous evidence outlining the beneficial effects on outcome of optimisation of fluid status prior to surgery.

[3] NCEPOD report (2011) 'Knowing the risk, A review of peri-operative care of surgical patients'

4.4 Training and education

4.4.1 Summary of suggestions

Stakeholders highlighted that a poor knowledge of physiology of fluids and electrolytes in health and illness leads to inappropriate fluid and electrolyte prescribing, which in turn is likely to increase the risk of fluid related complications. This is especially true for junior doctors who carry out the majority of fluid prescribing.

Stakeholders stated that doctors and nurses must understand the composition of commonly used intravenous fluids in order to ensure that they meet the clinical needs of their patients.

Stakeholders highlighted that hospitals should establish systems to ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained in line with the recommendations in NICE clinical guideline 174, and are then formally assessed and reassessed at regular intervals to demonstrate competence.

Stakeholders noted that there is currently little of no documented routine education or training relating to IV fluid therapy in England, and what does exist is variable in quality and consistency. Efforts to improve the quality and levels of knowledge for IV fluid therapy should be supported through a national curriculum for education and training of healthcare professionals.

4.4.2 Selected recommendations from development source

Table 7 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 7 to help inform the Committee's discussion.

Table 7 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Training and education	**Training and education** NICE CG174 Recommendation 1.6.1 (KPI) NICE CG174 Recommendation 1.6.2

Training and education

NICE CG174 Recommendation 1.6.1 (key priority for implementation)

Hospitals should establish systems to ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained on the principles covered in this guideline, and are then formally assessed and reassessed at regular intervals to demonstrate competence in:

- understanding the physiology of fluid and electrolyte balance in patients with normal physiology and during illness
- assessing patients' fluid and electrolyte needs (the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment)
- assessing the risks, benefits and harms of IV fluids
- prescribing and administering IV fluids
- monitoring the patient response
- evaluating and documenting changes **and**
- taking appropriate action as required.

NICE CG174 Recommendation 1.6.2

Healthcare professionals should receive training and education about, and be competent in, recognising, assessing and preventing consequences of mismanaged IV fluid therapy, including:

- pulmonary oedema
- peripheral oedema
- volume depletion and shock.

4.4.3 Current UK practice

No published reports relating to current practice were highlighted by stakeholders for this quality improvement area.

4.5 IV fluids lead

4.5.1 Summary of suggestions

Stakeholders suggested that all hospitals should have an IV fluids lead. This lead should be responsible for training, clinical governance, audit and review of IV fluid prescribing and patient outcomes. They acknowledged that an IV fluids lead will enable standards to be raised, educational programmes to be mandatory and drive the uptake of the NICE clinical guideline. They stated that the IV fluids lead should be a responsible individual, who is accountable to the Trust Board as this will be most likely to ensure implementation of standards and continuous improvement of IV fluid therapy. A stakeholder noted that regular auditing will identify and highlight issues at board level, enabling corrective action plans to be put in place. Local auditing can then be used to benchmark clinical practice and this in turn could be developed into a national registry.

4.5.2 Selected recommendations from development source

Table 9 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 9 to help inform the Committee's discussion.

Table 9 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
IV fluids lead	**Training and education** NICE CG174 Recommendation 1.6.3 (KPI)

Training and education

NICE CG174 Recommendation 1.6.3 (key priority for implementation)

Hospitals should have an IV fluids lead, responsible for training, clinical governance, audit and review of IV fluid prescribing and patient outcomes.

4.5.3 Current UK practice

No published reports relating to current practice were highlighted by stakeholders for this quality improvement area.

4.6 Communication with patients

4.6.1 Summary of suggestions

Stakeholders highlighted that nurses must be able to explain the plan of care to their patients and obtain informed consent for the delivery of IV fluids and electrolytes. They noted that the potential risks, benefits and harms are poorly communicated from healthcare professionals to patients.

Stakeholders acknowledged the role patients and their relatives could play in the identification and prevention of complications related to fluid therapy if they are educated to look out for signs and symptoms of adverse effects.

4.6.2 Selected recommendations from development source

Table 8 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 8 to help inform the Committee's discussion.

Table 8 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Communication with patients	**Principles and protocols for IV fluid therapy** NICE CG174 Recommendation 1.1.8

Principles and protocols for IV fluid therapy

NICE CG174 Recommendation 1.1.8

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).

4.6.3 Current UK practice

No published reports relating to current practice were highlighted by stakeholders for this quality improvement area.

4.7 Incident reporting

4.7.1 Summary of suggestions

Stakeholders stated that IV fluid related complications should be routinely reported. They highlighted that the incidence of IV fluid related complications is unknown due to lack of reporting. Increased scrutiny and the associated learning from clinical incidents could further drive improvements in practice, reduce the morbidity and mortality, which will bring improvements for patients and reduced costs for the NHS generally.

Stakeholders suggested that routine auditing of incidents for IV fluid therapy could ensure issues are highlighted at board level and enable benchmarking of clinical practice. They also suggested that routine registries could be used to drive up standards.

Stakeholders highlighted that appropriate reporting of fluid-therapy related complications should enable organisations to reflect on the care provided to patients and to optimise their care pathways and ensure staff training and competency. They acknowledged that there is considerable variation in the type of adverse events which are currently reported, how these are investigated, how trends are identified and organisation responses. They stated that development of standards in this area should help to reduce patient harm.

Stakeholders also highlighted that although IV fluids status is that of a prescription only medication they are often not treated in clinical practice as a drug, a consequence of which is a low level of adverse event reporting and lack of understanding of safety considerations associated with IV fluid therapy.

4.7.2 Selected recommendations from development source

Table 10 below highlights recommendations that have been provisionally selected from the development source(s) that may support potential statement development. These are presented in full after table 10 to help inform the Committee's discussion.

Table 10 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Incident reporting	**Reassessment** NICE CG174 Recommendation 1.2.6 (KPI)

Reassessment

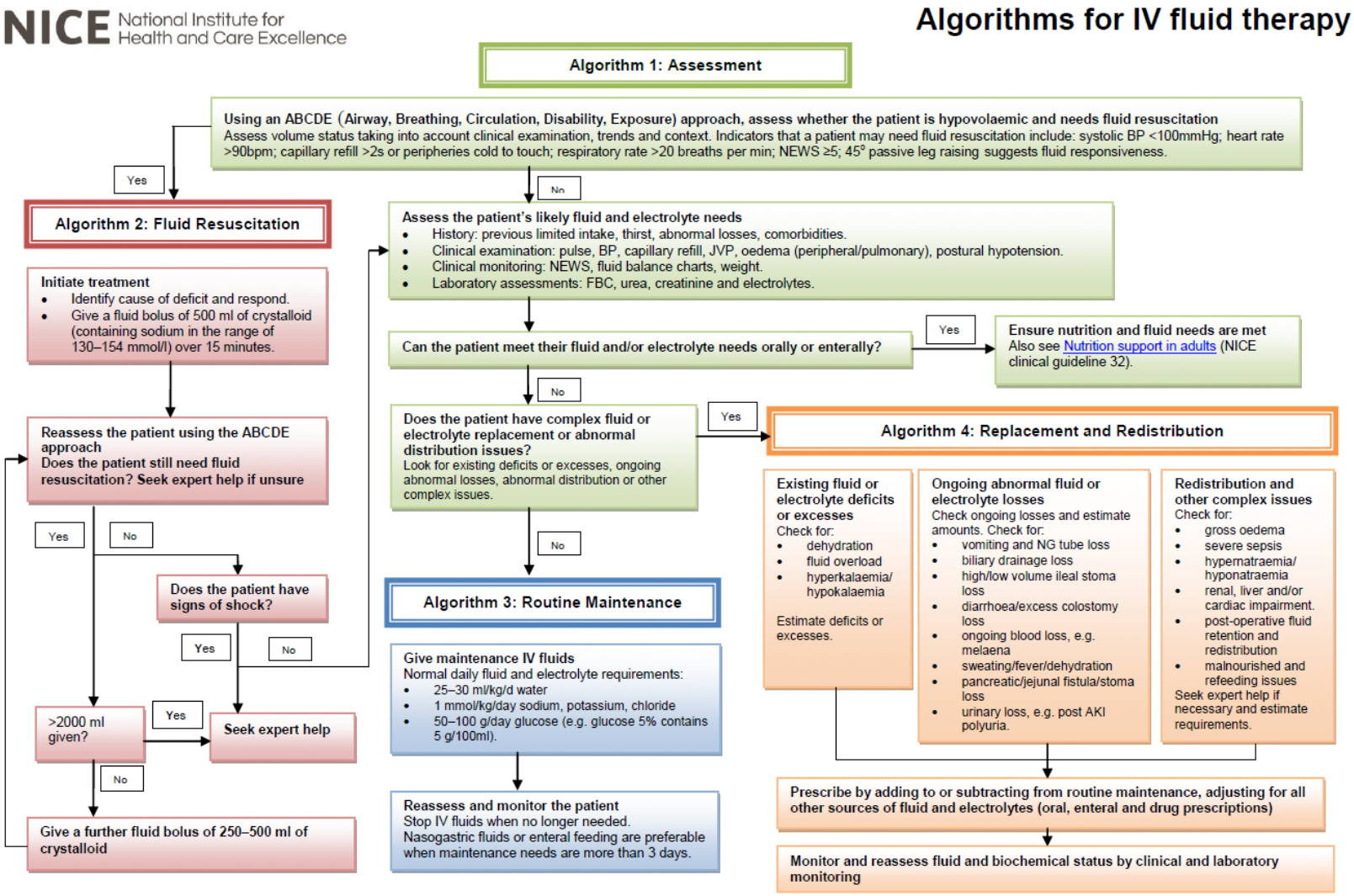
NICE CG174 Recommendation 1.2.6 (key priority for implementation)

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 1 of this briefing paper on Consequences of fluid mismanagement to be reported as critical incidents).

4.7.3 Current UK practice

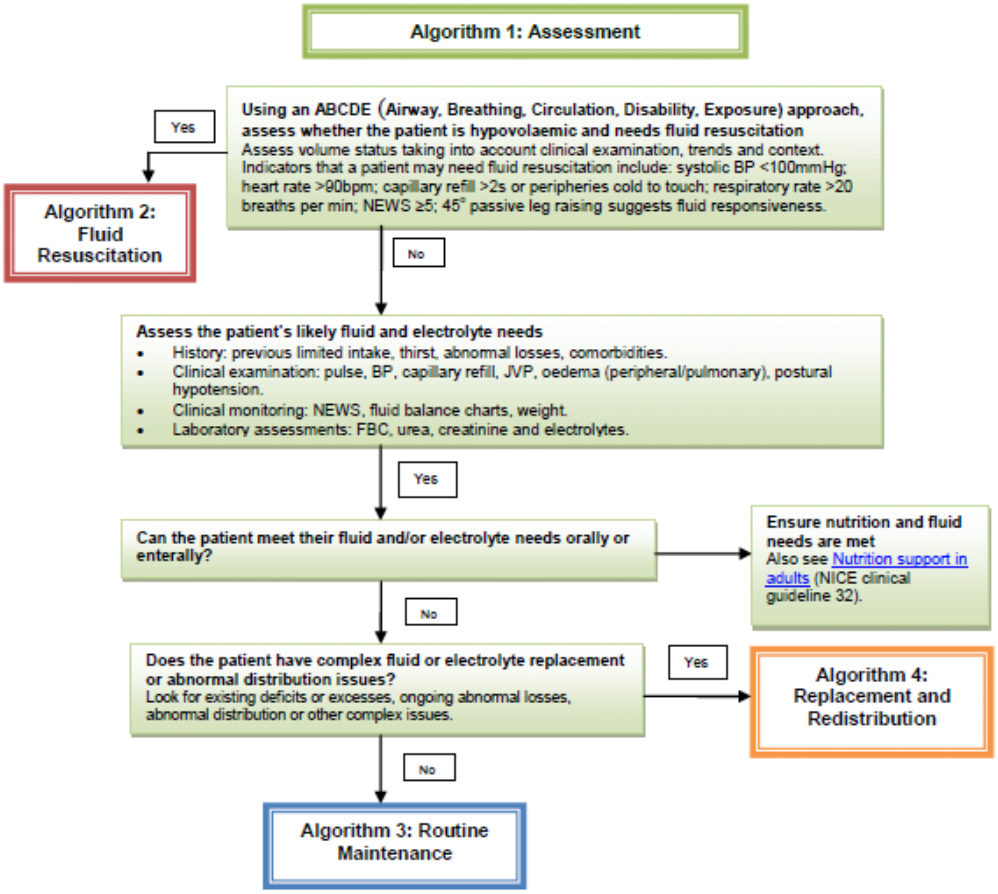
The National Reporting and Learning System (NRLS) managed by NHS England reported over 700 IV medication incidents between 2012 and 2013.

Appendix 1: Additional information

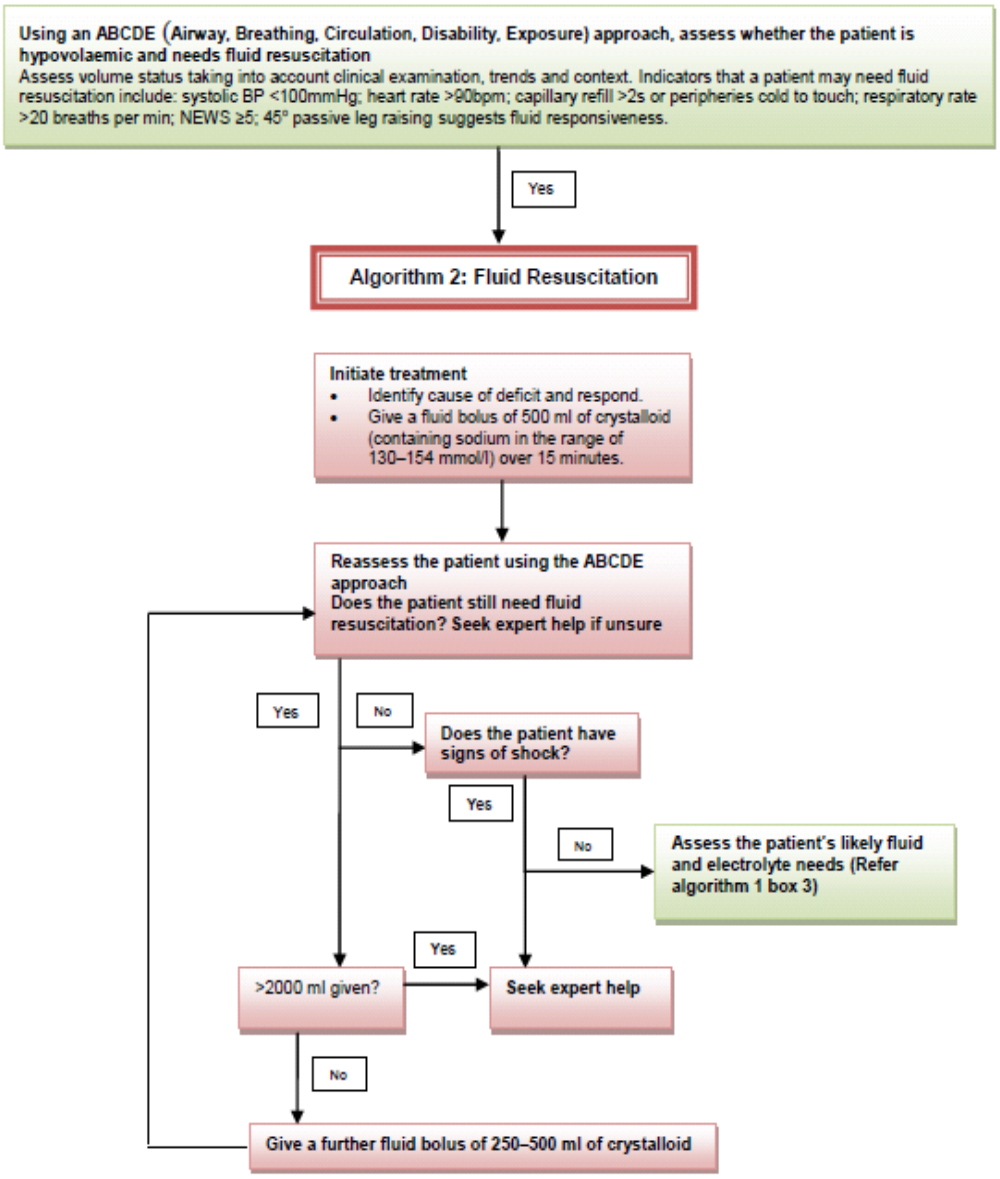


NICE National Institute for Health and Care Excellence

Algorithms for IV fluid therapy

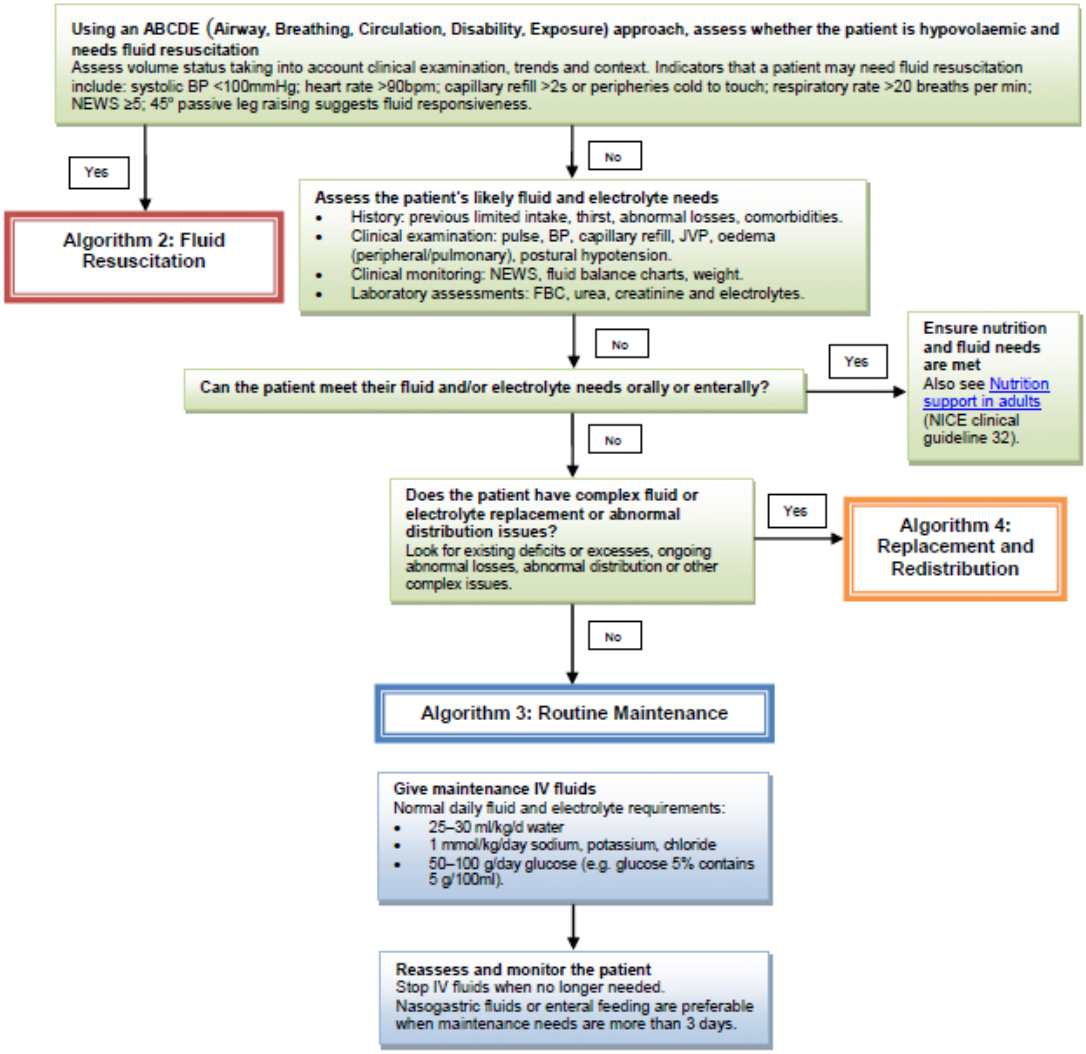


Algorithms for IV fluid therapy



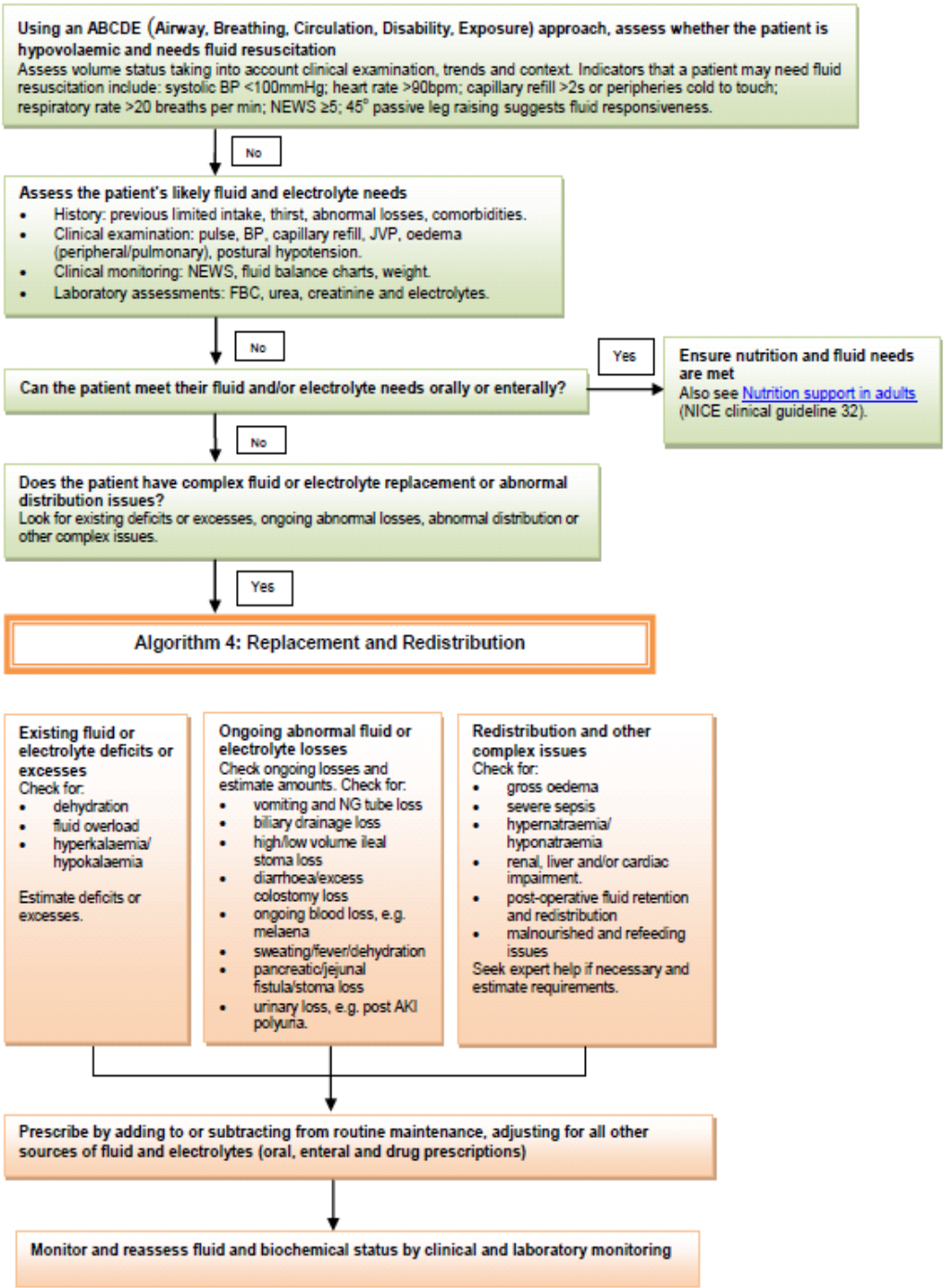
NICE National Institute for Health and Care Excellence

Algorithms for IV fluid therapy



NICE National Institute for Health and Care Excellence

Algorithms for IV fluid therapy



Consequences of fluid mismanagement to be reported as critical incidents

Consequence 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 consensus decision of the members of the Guideline Development Group.

Appendix 2: Key priorities for implementation (CG174)

Recommendations that are key priorities for implementation in the source guideline and that have been referred to in the main body of this briefing paper are highlighted in grey.

Principles and protocols for intravenous fluid therapy

When prescribing IV fluids, remember the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment. [recommendation 1.1.3]

Offer IV fluid therapy as part of a protocol (see Algorithms for IV fluid therapy):

- Assess patients' fluid and electrolyte needs following Algorithm 1: Assessment.
- If patients need IV fluids for fluid resuscitation, follow Algorithm 2: Fluid resuscitation.
- If patients need IV fluids for routine maintenance, follow Algorithm 3: Routine maintenance.
- If patients need IV fluids to address existing deficits or excesses, ongoing abnormal losses or abnormal fluid distribution, follow Algorithm 4: Replacement and redistribution. [recommendation 1.1.4]

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. [recommendation 1.1.6]

Assessment and monitoring

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 refeeding 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:

- National Early Warning Score (NEWS)
- fluid balance charts
- weight.

Laboratory investigations should include current status and trends in:

- full blood count
- urea, creatinine and electrolytes.

[recommendation 1.2.2]

All patients continuing to receive IV fluids need regular monitoring. 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.

[recommendation 1.2.4]

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 Consequences of fluid mismanagement to be reported as critical incidents). [recommendation 1.2.6]

Resuscitation

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 the Composition of commonly used crystalloids table.) [recommendation 1.3.1]

Routine maintenance

If patients need IV fluids for 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**
- approximately 50–100 g/day of glucose to limit starvation ketosis. (This quantity will not address patients' nutritional needs; see Nutrition support in adults [NICE clinical guideline 32].)

For more information see IV fluid prescription for routine maintenance over a 24-hour period. [recommendation 1.4.1]

Training and education

Hospitals should establish systems to ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained on the principles covered in this guideline, and are then formally assessed and reassessed at regular intervals to demonstrate competence in:

- understanding the physiology of fluid and electrolyte balance in patients with normal physiology and during illness
- assessing patients' fluid and electrolyte needs (the 5 Rs: Resuscitation, Routine maintenance, Replacement, Redistribution and Reassessment)
- assessing the risks, benefits and harms of IV fluids
- prescribing and administering IV fluids
- monitoring the patient response
- evaluating and documenting changes **and**

- taking appropriate action as required. [recommendation 1.6.1]

Hospitals should have an IV fluids lead, responsible for training, clinical governance, audit and review of IV fluid prescribing and patient outcomes. [recommendation 1.6.3]

Appendix 3: Suggestions from stakeholder engagement exercise

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
1	SCM1	**Prescribing of IV fluids and electrolytes**	The prescription of IV fluids and electrolytes as part of a clear fluid management plan is a key recommendation of the NICE IV Fluid Guideline. IV fluid and electrolyte prescribing should follow one of the 3 recommended algorithms; resuscitation, replacement or redistribution.	Prescribers are not always familiar with the fluid and electrolyte requirements associated with different clinical situations, for example complex bowel losses, sepsis or heart failure, which results in inappropriate prescribing practices and fluid and electrolyte imbalance.	Incidents of acute kidney injury and episodes of acute pulmonary oedema still occur in clinical practice, which suggests that current management is not optimal. Recent NCEPOD reports suggest incorrect prescribing occurs for 1 in 5 patients in acute settings.
2	SCM1	**Monitoring of fluid requirements**	Improved monitoring of fluid requirements is a recommendation of the NICE IV Fluid Guideline. IV Fluid prescribing should take account of several key clinical indicators including: clinical assessment, blood chemistry results, fluid balance charts and serial weights.	Current prescribing practices are sometimes divorced from clinical assessment and may not be appropriate for the patient's clinical requirements. Electrolyte needs are not always considered, which leads to electrolyte imbalance. Fluid prescribing is usually performed by the most junior member of the medical team and by default they will have the least clinical experience. Fluid balance charts are often poorly completed, weights are infrequently performed and there are fewer clinical indicators available to guide fluid prescribing.	Prescribers may be unfamiliar with the electrolyte composition of the different fluids that are available. More frequent weight measurements would also improve the monitoring of nutrition in hospital.
3	SCM1	**Quality of fluid balance record keeping**	Fluid balance charts have the potential to inform clinical assessment and fluid prescribing, but only if they are completed accurately and contemporaneously. The	Fluid balance charts are often poorly completed in clinical practice, which reduces their usefulness, as a consequence medical staff pay less attention to the charts, which in turn reduces their significance and further contributes to their poor completion. If fluid	Ward rounds often fail to look at the patient's fluid balance chart, which reduces the importance of the document and undermines the imperative to complete the

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			accurate completion of fluid balance charts is recommended in the IV Fluid Guideline.	balance charts received greater attention their importance would be better appreciated and should lead to more accurate completion. The calculation of the patient's fluid balance should take place at intervals across the 24 hour period to enable corrections to be made to fluid prescribing before an imbalance occurs.	chart accurately.
4	SCM1	**Education - knowledge of the fluid and electrolyte needs of patients in health and illness.**	Poor knowledge of the physiology of fluids and electrolytes in health and illness is more likely to lead to inappropriate fluid and electrolyte prescribing, which in turn is likely to increase the risk of fluid related complications.	Doctors must understand the physiology of fluids and electrolytes in order to prescribe correctly and to prevent the complications of poor prescribing. Nurses must understand the physiology of fluids and electrolytes in order to be confident that they are administering fluids and electrolytes that are clinically appropriate for their patients. Nurses have a professional responsibility to understand the treatments that they deliver, the same standards that apply to drug administration should apply to fluid administration. Nurses must be able to explain the plan of care to their patients and obtain informed consent for the delivery of IV fluids and electrolytes. Doctors and nurses must understand the composition of commonly used intravenous fluids in order to ensure that they meet the clinical needs of their patients.	NCEPOD 1999 Extremes of Age made the recommendation that fluid prescribing should have the same importance and rigour as a drug prescription, this is yet to be achieved. Patient representatives involved in the development of the guideline reported that in general nurses were not able to explain the purpose or the duration of their IV fluid therapy. This does not support the notion of informed consent to treatment and suggests both nursing and medical failures to provide adequate explanations to patients.
5	SCM1	**Incident reporting**	IV fluid related complications such as acute kidney injury or heart failure should be reported routinely using the national clinical incident reporting mechanism.	The actual incidence of IV fluid related complications is unknown due to lack of clinical reporting. A complication rate of 1 in 5 has been extrapolated from other recent national reports but these reports deal with sub sets of the hospital population and may not reflect the	Increased scrutiny and the associated learning from clinical incidents could further drive improvements in practice. Improvements in practice

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				true incidence. IV fluid therapy is common in hospitalised patients; accurate data is required to assess the scale and extent of IV fluid related complications. Increased scrutiny could help to raise the profile of this important topic and lead to further improvements in practice.	should hopefully reduce the morbidity and mortality associated with this common therapy, which will bring improvements for patients and reduced costs for the NHS generally.
6	SCM2	**Staff training**	1.6.1 – Hospitals should establish systems to ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained on the principles covered in this guideline, and are then formally assessed and reassessed at regular intervals to demonstrate competence in: Staff have wider roles (on general wards) than that of IV Fluids, I just feel less importance is placed on this aspect of treatment. As a patient I was always educated on my IV drugs and not symptoms of IV fluids and their delivery. In my experience as someone who receives numerous IV fluids over the years, this area is poorly delivered from junior doctors to regular staff nurses, communication about treatment i.e. risks, benefits and harms documenting change. When	Training should be offered to everyone who comes into contact with patients receiving IV fluids, this area is often overlooked by all parties in healthcare from senior doctors, especially junior doctors down to staff nurses and healthcare assistants where learning these cultural habits happens. The offer of regular training for all staff to have the opportunity to attend would dramatically improve care, knowledge, understanding and result in better IV fluid delivery. Currently staff are unable to effectively communicate clearly when introducing IV fluids. This would concern me about their competency.	Personal experience

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			asking staff nurse about IV fluid prescription, I was told I would need to speak with ward sister or junior doctor overseeing my care, this takes up unnecessary time.		
7	SCM2	**Incident reporting**	1.2.6 - 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 Consequences of fluid mismanagement to be reported as critical incidents). Personal level separately, I have experienced reaction which was not necessarily well explained while on an IV fluid alongside IV drug. Presently within the NHS I feel there is culture of under reporting (duty of candour).	Clear incidents of fluid mismanagement should be a primary contributor to further develop staff who will be overseeing someone's care whilst on 'IV fluids' by utilising training and development to better inform staff on the consequences of IV fluid mismanagement. Staff should be freely encouraged to report their concerns, personally I feel there is culture of under reporting (not on my watch) this needs to change. This would benefit all staff caring for people on IV fluids through improved awareness training, knowledge and understanding.	NHS staff should be put under a legal "duty of candour" to own up when mistakes affect patients, a public inquiry into the Mid Staffordshire hospital care scandal will recommend. Personal experience
8	SCM2	**Offer IV fluid therapy as part of a protocol (refer to algorithms)**	1.1.4 – Offer IV fluid therapy as part of a protocol … Its important for staff and patients to know what regime of treatment they are prescribing, delivering/ receiving.	Across hospitals there are many protocols which have local pathways these can conflict, I believe IV Fluids should be looked at in the same way you would look at RESUS i.e. utilising the approach of 5 R's. Through experience many junior staff including doctors	Personal experience

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				in general ward settings don't identity with various forms of IV delivery, each has individual importance (Resuscitation, Routine maintenance, Replacement, Redistribution, and Replacement). Putting people on the correct treatment is vital to reducing harm and unnecessary length of stay.	
9	SCM2	**Assessment and monitoring**	1.1.6 – assessment and monitoring, regular use to record fluid balance should be communicated clearly, and then followed through. In my experience this is often left to the patient to remember/ remind staff about their intake/ output. Currently a lack of regular review by an expert.	Assessment and monitoring, clinical care and the patient experience are often second priority due to staffing levels being compromised due to other ward commitments. Staffing skill mix? Consequences may lead to bad care decisions i.e. not knowing a patients fluid intake/output?	Personal experience
10	SCM3	**Specific IV fluid therapy training for all healthcare professionals involved in the prescription and delivery of IV fluids**	We know that standards of IV fluid administration are poor with problems of both under and over-administration of fluids as well as the use of the wrong type of fluid. Hospitals should therefore ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained on the principles covered in the NICE IV fluids guideline with formal assessment and reassessment at regular intervals to demonstrate competence.	Improving standards of IV fluid management is dictated by standards of staff training.	See full IV fluids guideline
11	SCM3	**Fluid management plans**	Patients should have an IV fluid	Currently most IV fluids are written up with no	See full IV fluids guideline

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			management plan (which includes details of: the fluid and electrolyte prescription over the next 24 hours and the assessment and monitoring plans) and these plans should initially be subject to daily expert review.	formal plan whatsoever and often not subjected to proper review. This leads to problems of poorly considered 'repeat prescription' without due consideration of changing needs.	
12	SCM3	**IV fluid monitoring**	All patients receiving IV fluids need regular monitoring which 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.	Currently standards of monitoring for patients receiving IV fluids are haphazard.	See full IV fluids guideline
13	SCM3	**IV fluid incident reporting**	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.	Although it is widely accepted by clinicians that problems related to poor IV fluid management are common there is little hard evidence on the prevalence of such problems. Setting up properly conducted critical incident reporting of such incidents will permit benchmarking of standards and monitoring of quality improvement.	See full IV fluids guideline
14	SCM3	**IV fluids lead**	All hospitals should have an IV fluids lead, responsible for training, clinical governance, audit and review of IV fluid prescribing and patient outcomes.	To achieve improvement in the 4 key areas suggested above will require every hospital to set up an implementation team led by a suitable individual.	See full IV fluids guideline

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15	SCM4	**IV fluids should be prescribed and administered by skilled and competent healthcare professionals**	IV fluids deserve the same status as drugs. Like drugs, the wrong type or volume of fluid can be harmful.	In most hospitals, fluid therapy is managed by the most junior member of the team who may not have the necessary understanding and experience to assess volume status correctly and to prescribe fluids correctly.	The report "Extremes of age. National Confidential Enquiry into Perioperative Deaths (1999)" contains numerous examples of harm caused by inadequate fluid management.
16	SCM4	**Hospitals should establish systems to ensure that all healthcare professionals involved in prescribing and delivering IV fluid therapy are trained on the principles covered in this guideline, and are then formally assessed and reassessed at regular intervals to demonstrate competence.**	Prescribing the wrong dose or wrong type of fluid can cause patient harm. Adequate training and expertise is necessary for doctors to become competent in fluid management, especially outside the critical care area where less monitoring tools are available.	In most hospitals, fluids are managed by junior doctors. They often rotate and only spent a short period working in one department. Therefore systems need to be in place to ensure that all doctors get the necessary training to become competent in managing iv fluids.	The report "Extremes of age. National Confidential Enquiry into Perioperative Deaths (1999)" contains numerous examples of harm caused by inadequate fluid management.
17	SCM5	**Adequate education**	There is good evidence that understanding and knowledge about fluid management is poor in both nursing and medical practice. Several studies have demonstrated inappropriate fluid prescription in relation to available fluid balance information (e.g. serum electrolyte data, input/output charts, daily weights). Although undergraduate, junior doctor and nursing training	Standardisation of teaching programmes addressing specific knowledge and competencies, with appropriate assessment and competency testing (e.g. at medical and nursing schools, in Foundation and Core training programmes and in specialty training programmes	1. Arieff AI. Fatal postoperative pulmonary edema: pathogenesis and literature review. Chest 1999;115:1371-1377. 2. Walsh SR, Walch CJ. Intravenous fluid associated morbidity in postoperative patients. Ann R Coll Surg Engl 2005;87:126-130. 3. Walsh SR, Cook EJ, Bentley R, et al. Peri-operative fluid management: prospective audit.

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			curricula may include the essential information, it is often piecemeal and rarely consolidated to give practical guidance. In addition competency is not robustly assessed or examined.		International Journal of Clinical Practice 2008;62:492-497. 4. Awad S, Allison SP, Lobo DN. Fluid and electrolyte balance: the impact of goal directed teaching. Clinical Nutrition 2008;27:473-478. 5.Callum KG, Gray AJG, Hoile RW, Ingram GS, Martin IC, Sherry KM, Whimster F. Extremes of age: The 1999 report of the national confidential enquiry into perioperative deaths. London, 1999. 6.Rooker JC, Gorard DA. Errors of intravenous fluid infusion rates in medical inpatients. Clinical Medicine 2007;7:482-485. 7.Powell-Tuck Jeremy, Gosling P, Lobo DN et al. British consensus guidelines on intravenous fluid therapy for adult surgical patients. 8.Leach RM, Brotherton A, Stroud M, Thompson RPHT. Nutrition and fluid balance must be taken seriously. BMJ 2013:346:801-804
18	SCM5	**Appropriate documentation, prescription and delivery of intravenous fluids**	Poor documentation of fluid balance contributes to morbidity and mortality. Less than half of	National standards for monitoring of fluid balance, documentation and prescription of fluids.	See NCEPOD report 1999 and British Consensus Guidelines on intravenous

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			fluid balance sheets are adequately completed and intravenous fluids are often administered at incorrect rates. Indeed, respondents in one study considered the accuracy of fluid rates to be unimportant!		fluid therapy for adult surgical patients 1.Callum KG, Gray AJG, Hoile RW, Ingram GS, Martin IC, Sherry KM, Whimster F. Extremes of age: The 1999 report of the national confidential enquiry into perioperative deaths. London, 1999. 2.Powell-Tuck Jeremy, Gosling P, Lobo DN et al. British consensus guidelines on intravenous fluid therapy for adult surgical patients. www.bapen.org.uk/pdfs/bapen_pubs/giftasup.pdf
19	SCM5	**Involvement of senior medical, nursing and pharmacy staff in prescription and review of fluid management**	Fluid prescription is often delegated to the least experienced members of the medical team, with junior staff responsible for 80% of peri-operative fluid prescriptions.	The accepted practice of delegating fluid prescription to the least experienced member of the clinical team must change, with critical assessment of fluid requirements by senior medical staff during normal working hours. This should minimize the need for out-of-hours prescription during busy on-call periods by doctors who may not know the patient. Advanced nurse practitioners, physicians assistants and pharmacists may have a role in delivering these goals.	See NCEPOD report 1999 and British Consensus Guidelines on intravenous fluid therapy for adult surgical patients 1. Callum KG, Gray AJG, Hoile RW, Ingram GS, Martin IC, Sherry KM, Whimster F. Extremes of age: The 1999 report of the national confidential enquiry into perioperative deaths. London, 1999. 2. Powell-Tuck Jeremy, Gosling P, Lobo DN et al. British consensus guidelines

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					on intravenous fluid therapy for adult surgical patients. www.bapen.org.uk/pdfs/bapen_pubs/giftasup.pdf
20	SCM5	**Reporting of critical incidents and avoidance of harm.**	Reporting of critical incidents with excessive administration of sodium and chloride containing fluids in resuscitation, excessive volumes of water in maintenance regimes or dehydration is infrequent. There is increasing evidence that excessive administration of Na+ and in particular Cl- ions can be associated with adverse clinical effects (e.g. renal impairment, metabolic acidosis, nausea, vomiting). Excessive use of 0.9% normal saline particularly during resuscitation, as opposed to the use of balanced physiological solutions (plasmolyte 148) continues in many centres. Likewise many centres use maintenance regimes containing excess water that engender the risk of pulmonary and peripheral oedema. In nursing homes and hospitals inadequate fluid administration is	There are significant risks from intravenous fluid overload, although these are often unrecognized, because of the difficulty in understanding 'cause and effect' in the context of complex medical conditions. For example, although pulmonary or peripheral oedema due to excessive IV fluid is seen frequently, it is usually rapidly and easily corrected with diuretic therapy. However, the consequent pneumonia developing a few days later and resulting in death after prolonged intensive care, is not recognized as a fluid-related complication. Iatrogenic fluid overload is therefore a rarely reported 'critical incident'. Nevertheless, in the USA, fluid mismanagement has been reported in 17-54% of post-operative patients contributing to about 9000 deaths annually. Dehydration and associated harm is also poorly recognised and rarely reported Reporting of fluid repeated complications is vital to ensure ongoing education and recognition of the consequences of inappropriate fluid manage	Multiple reports from CQC, patient organisations 1.Care Quality Commission. National report on dignity and nutrition October 2011. www.cqc.org.uk 2.Care and compassion? Report of the Health Service Ombudsman on ten investigations into NHS care of older people. Parliamentary and Health Service Ombudsman. February 2011. www.ombudsman.org.uk/care-and-compassion Also see See NCEPOD report 1999 and British Consensus Guidelines on intravenous fluid therapy for adult surgical patients 1. Leach RM, Brotherton A, Stroud M, Thompson RPHT. Nutrition and fluid balance must be taken seriously. BMJ 2013:346:801-804

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			not uncommon but frequently not recognised or reported.		2.Callum KG, Gray AJG, Hoile RW, Ingram GS, Martin IC, Sherry KM, Whimster F. Extremes of age: The 1999 report of the national confidential enquiry into perioperative deaths. London, 1999. 3.Powell-Tuck Jeremy, Gosling P, Lobo DN et al. British consensus guidelines on intravenous fluid therapy for adult surgical patients. www.bapen.org.uk/pdfs/bapen_pubs/giftasup.pdf
21	SCM5	**Reduction of colloid use**	Colloids are more expensive, have potential adverse consequences (renal impairment, allergy, bleeding) and no proven benefit	Reduction in harm Cost effective prescribing	European Medicines agency report http://www.ema.europa.eu/ema/index.jsp?curl=pages/medicines/human/referrals/Hydroxyethyl_starch-containing_medicines/human_referral_prac_000029.jsp&mid=WC0b01ac05805c516f Also 1. Perner A, Haase N, Guttormsen AB et al. Hydroxyethyl starch 130/0.42 versus ringer's acetate in severe sepsis. N Engl J Med 2012;367(2):124-34 2.Brunkhorst FM, Engel C, Bloos F et al. Intensive Insulin Therapy and

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					Pentastarch Resuscitation in Severe Sepsis. N Engl J Med 2008; 358(2):125-39 3.Myburgh J, Finder S, Bellomo R et al. Hydroxyethyl starch or saline for fluid resuscitation in intensive care. N Engl J Med2012; 367:1901-11
22	Baxter Healthcare Ltd	**IV fluid therapy standards are a priority for the hospital trust boards**	Regular auditing will identify and highlight issues at board level, enabling corrective action plans to be put in place. Local auditing can then be used to benchmark clinical practice and this in turn could be developed into a national registry.	History has demonstrated that when an issue is brought to the attention of the hospital Trust Board, improvements are experienced (e.g. MRSA). Where registries are used routinely, inter-hospital comparisons inevitably drive up standards (e.g. The Renal Registry and Atlas of Variation)	http://www.imperial.nhs.uk/patients/ipc/ http://www.renalreg.com/Report-Area/Report%202009/Chap09_Renal09_web.pdf http://www.sepho.org.uk/extras/maps/NHSatlasKidney/atlas.html
23	Baxter Healthcare Ltd	**Education for clinical professionals involved at all levels of prescribing and administering IV Fluid Therapy which is supported through a national curriculum**	As recommended by NICE, education is currently lacking for those involved in IV Fluid prescribing. It is often left to the most junior member of staff with little experience and knowledge. Appropriate prescribing will lead to improved patient outcomes and reduce the number of complications related to IV therapy (as stated by NICE as 1 in 5).	There is currently little or no formal, documented, routine education or training relating to IV fluid therapy throughout England and the training that does exist is variable in quality and consistency.	Algorithms included in the NICE Guidance are a good basis for the training curriculum; however these need to be supported by broader training on the physiology of fluid balance within the body and the different types of fluids available. Lobo et al Clinical Nutrition (2001) 20(2): 125-130 Chung et al. 2012 Intravenous fluid prescribing

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					practices by foundation year one doctors – a questionnaire study.**10.1258/shorts.20121.012041**
24	Baxter Healthcare Ltd	**Inclusion of IV Fluid Therapy training on the curriculum for all pre-qualified clinicians (nurses, doctors, pharmacists)**	As above	IV Fluid therapy is not currently included routinely in basic training of any healthcare professional and yet the management of IV fluids is probably one of the most commonly practiced therapy for hospital based staff	Chung et al. 2012 Intravenous fluid prescribing practices by foundation year one doctors – a questionnaire study.10.1258/shorts.20121.012041 Lobo et al Clinical Nutrition (2001) 20(2): 125-130
25	Baxter Healthcare Ltd	**Education of patients receiving IV fluid therapy in the ward setting**	The opportunity for patients (and their relatives) to play an important role in the identification and prevention of complications related to fluid therapy is a relatively simple solution to minimise adverse events. For example, patients can be educated to look out for signs & symptoms such as swollen ankles, shortness of breath or being able to tolerate oral fluids whilst being administered IV fluids.	Patient empowerment is a priority for improving standards of care in the NHS. There is currently very little educational support available for patients in this clinical area. This is compounded by images of hospital patients attached to an IV infusion frequently seen in the media. As a result, there can be an acceptance that an IV infusion is always required as part of clinical treatment in hospital.	http://www.ew.com/ew/gallery/0,,20321301_20456764_20632272,00.html
26	Baxter Healthcare Ltd	**Recognition of IV Fluids as a prescription medicine and therefore warrants the same care and due diligence as a**	Currently, although the status of IV Fluids is that of a POM, they are not currently routinely recognised as a drug. Therefore	If adverse events are not reported, there is no understanding of the safety of IV fluid prescribing. Approximately more than 60 million units of IV fluids are prescribed every	MHRA Drug Analysis Print for sodium chloride contains 48 different drugs, the report covering the time frame

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		prescription drug, including robust Pharmacovigillance	there is little reporting of adverse events relating to IV fluid therapy which in turn compounds the lack of action to improve practice	year in the UK. It is therefore unrealistic to believe that over a 50 year period, only 1092 adverse reports have been reported (see supporting evidence)	1st July 1963 – 22nd November 2013 reports 2261 reactions, 1092 adverse reports of which 107 were reported as fatal. Considering the volume of use of IV fluids we feel this is under-reported as IV fluids are not perceived as a pharmaceutical agent, as described in the 1999 NCEPOD report of the extremes of age and confirmed by NICE.
27	Baxter Healthcare Ltd	**Appropriate prescribing of the correct fluid (composition, dose and volume) following initial assessment in the first 24 hours of care**	As highlighted by NICE, the initial prescription of IV fluid therapy is vital to prevent the exacerbation of existing complications and the development of future complications	Currently the quality of the initial assessment for fluid requirements is variable, especially in the ward environment, throughout England. Individualised assessment and prescribing is a critical area for improvement in the quality of care for patients	NICE Clinical Guidelines for IV fluid therapy 2013 page 128.
28	Baxter Healthcare Ltd	**Appropriate prescribing of the correct fluid (composition, dose and volume) in subsequent days of treatment through effective monitoring and recording.**	Effective and accurate recording and monitoring of patients fluid requirements is essential to ensure ongoing adaptation of individual prescriptions to meet the patients changing clinical needs. The use of electronic patient records should also be considered within this quality standard.	Maintaining up to date and accurate patient records of U&Es, fluid balance and prescriptions is essential for on-going individualisation of fluid management.	NICE Clinical Guidelines for IV fluid therapy 2013 page 10. *"Despite the relative complexity of estimating a patient's IV fluid needs, assessment and prescription is often delegated to healthcare professionals who have received little or no specific training on the subject. Indeed, the task of prescribing IV fluids is often left to the most junior medical*

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					staff, who frequently lack the relevant experience. This problem was highlighted by a 1999 National Confidential Enquiry into Perioperative Deaths (NCEPOD) report, which found that a significant number of hospitalised patients were dying as a result of the infusion of too much or too little fluid. The report then recommended that fluid prescribing should be given the same status as drug prescribing. Unfortunately this has not yet occurred, and although inappropriate fluid therapy is rarely reported as being responsible for patient harm, it remains likely that as many as 1 in 5 patients on IV fluids and electrolytes suffer complications or morbidity due to their inappropriate administration."
29	Baxter Healthcare Ltd	**The appointment and resourcing of a dedicated "IV Fluid Lead in every hospital of the appropriate grade, with a high level of knowledge and on-going training responsible to and with support from the Trust Board**	As per NICE Clinical Guideline recommendations, an IV fluid lead will enable standards to be raised, educational programmes to be mandatory and drive the uptake of the NICE Clinical Guidelines.	A responsible individual, who is accountable to the Trust Board, will ensure implementation of Standards and continuous improvement.	Where an individual is responsible for management of IV Fluid Therapy in a Trust, standardisation of clinical practice has been observed. The example of NHS Lothian and Fife Health Board can be viewed at this link https://www.eemec.med.ed.a

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					c.uk/pages/fluid-therapy
30	The Association of Anaesthetists of Great Britain & Ireland	**Peri and post operative patients**	They are particularly prone to cell swelling when hypotonic solutions are administered and there is a case for isotonic maintenance therapy.	Need to identify vulnerable patients and implement appropriate therapy/monitoring to prevent seizures/confusion/pulmonary oedema/ death.	Water, water everywhere: standardizing postoperative fluid therapy with 0.9% normal saline. (Editorial). Anesthesia & Analgesia 2010; 110(2): 293.
31	The Association of Anaesthetists of Great Britain & Ireland	**Allergenic fluids**	Patients die or have surgery postponed and are exposed to life-threatening illness when large molecules (colloids) are used.	Need to risk-assess patients and get informed consent including risks.	Marrel J, Christ D, Spahn DR. Anaphylactic shock after sensitization to gelatin. British Journal of Anaesthesia 2011; 107: 647-648.
32	The Association of Anaesthetists of Great Britain & Ireland	**Animal products, e.g. bovine gelatin**	Many patients are vegetarian or have religious objection to bovine products.	Respects patient as individual.	
33	The Association of Anaesthetists of Great Britain & Ireland	**Potassium and magnesium supplements**	Too often disregarded until plasma concentrations fall, putting patient at risk.	Consistent advice about supplementation needed	
34	Royal College of Pathologists	**Assessment of patients' fluid and electrolyte needs**	It is important that appropriate fluid and electrolyte support is provided to all patients. The starting point for this is a correct assessment of the patient's needs.	Approaches to assessment of fluid and electrolyte needs are currently very variable, with considerable differences in clinical practice. NICE guideline CG174 recommends an approach and it is essential to ensure that this is followed in a standardized way for all patients.	

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35	Royal College of Pathologists	**Training and competency assessment**	NICE Guideline CG174 recommends that all hospital healthcare professionals involved in prescribing and delivering IV fluid therapy are appropriately trained in the principles of fluid prescribing.	Trained and competent staff practicing to commonly agreed standards has the potential to reduce fluid and electrolyte related harm to patients. Various training materials are in use, with considerable variation in the type and duration of training and the required frequency of retraining. Requirements for different professional groups are met in different ways. There is no standardized approach to competency assessment following training.	
36	Royal College of Pathologists	**Adverse event reporting**	NICE Guideline CG174 recommends that all IV fluid therapy-related complications are reported.	Appropriate reporting of fluid-therapy related complications should enable organizations to reflect on the care provided to patients and to optimise their care pathways and ensure staff training and competency. There is considerable variation in the type of adverse events which are currently reported, how these are investigated, how trends are identified and organisation responses. Development of standards in this area should help to reduce patient harm.	
37	Royal College of Anaesthetists	**Education of IV fluid prescribers – both at an undergraduate and postgraduate level**	There is poor understanding of IV fluid prescribing across all hospital specialties and levels of trainee doctors. Poor understanding and prescribing is the commonest cause of fluid related complications.	Improve patient safety and improve patient outcome across all hospital specialties	
38	Royal College of Anaesthetists	**Compliance of filling in of fluid charts and ongoing fluid balance. Integration into a MEWS chart (or similar) to help alert when fluid prescribing is likely to**	With increasing pressure on work and care document pathway completion there is a feeling that fluid charts are no longer completed accurately by nursing staff. Daily weights are	Without good record keeping it is difficult to implement better compliance and audit is also very difficult. Combining into a MEWS related chart (weight over / under admission weight) may be advantageous – it will identify when patients will likely to get complications before	

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		cause complications	rarely done yet this is the only reliable way of knowing what is happening to a patient's fluid balance.	they actually get them and score.	
39	Royal College of Anaesthetists	**Standardisation of basic fluid prescribing principles across the hospital setting in the UK**	There is still huge variation between hospitals, specialties, and consultants regarding fluid prescribing. Whilst we would not want it to be totally prescriptive there needs to be core guidance. A consistent fluid prescription chart would help	Junior doctors move hospitals every 6-12 months. There needs to be standardisation across hospitals to enable this. Printable algorithms and pocket sheets would help guide prescribers.	
40	Royal College of Anaesthetists	**Guidance on gelatins and Chloride containing solutions**	They are still used but unclear in which situations they offer advantage	(This may be more appropriate as an area for research than quality improvement)	
41	Faculty of Intensive Care Medicine	**Would be worth recommending a national audit of gelatin and albumin use in intensive care to find out what is being used and how much (plus costs).**			
42	Faculty of Intensive Care Medicine	**Then a PRCT of gelatin versus crystalloid.**			
43	Department of Health	I wish to confirm that the Department of Health will not be making any comments on this engagement exercise			
44	Royal College of Nursing	This is to inform you that there are no comments to submit on behalf of the Royal College of			

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
		Nursing to inform on the above quality standard topic engagement			