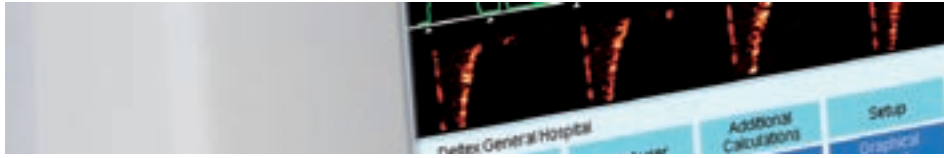




# British Consensus Guidelines on Intravenous Fluid Therapy for Adult Surgical Patients

A summary of implications for Oesophageal Doppler Monitoring (ODM)



The British Consensus Guidelines on Intravenous Therapy for Adult Surgical Patients (GIFTASUP) were released for dissemination to members of participating professional bodies late in 2008 by a cross-disciplinary team chaired by Jeremy Powell-Tuck. The guidelines were developed on behalf of BAPEN Medical, the Association for Clinical Biochemistry, the Association of Surgeons of Great Britain and Ireland, the Society of Academic and Research Surgery, the Renal Association and the Intensive Care Society.

The guidelines represent the latest clinical thinking on fluid management and contain a number of recommendations concerning ODM. Each recommendation has been given an evidence level grade from 1-5 in accordance with the Oxford Centre for Evidence-based Medicine Levels of Evidence, with a score of 1a representing the highest possible level of supporting clinical evidence. Three GIFTASUP recommendations have the highest evidence level:

- 4: Clear non-particulate oral fluids should not be withheld for more than two hours prior to the induction of anaesthesia
- 6: Avoid use of preoperative mechanical bowel preparation
- 13: In patients undergoing abdominal surgery, intraoperative treatment with intravenous fluid to achieve an optimal value of stroke volume should be used where possible as this may reduce postoperative complication rates and duration of hospital stay.

Recommendation 13 cites only ODM evidence. The full recommendations are summarised below, along with their evidence levels. References to the ODM evidence-base are given as cited by GIFTASUP.

## Summary of recommendations:

### Recommendation 1

Because of the risk of inducing hyperchloraemic acidosis in routine practice, when crystalloid resuscitation or replacement is indicated, balanced salt solutions e.g. Ringer's lactate/acetate or Hartmann's solution should replace 0.9% saline, except in cases of hypochloraemia e.g. from vomiting or gastric drainage. Evidence level 1b

### Recommendation 2

Solutions such as 4%/0.18% dextrose/saline and 5% dextrose are important sources of free water for maintenance, but should be used with caution as excessive amounts may cause dangerous hyponatraemia, especially in children and the elderly. These solutions are not appropriate for resuscitation or replacement therapy, except in conditions of significant free water deficit e.g. diabetes insipidus. Evidence level 1b

### Recommendation 3

To meet maintenance requirements, adult patients should receive sodium 50-100 mmol/day, potassium 40-80 mmol/day in 1.5-2.5 litres of water by the oral, enteral or parenteral route (or a combination of routes). Additional amounts should only be given to correct deficit or continuing losses. Careful monitoring should be undertaken using clinical examination, fluid balance charts, and regular weighing when possible. Evidence level 5

## Preoperative fluid management

### Recommendation 4

In patients without disorders of gastric emptying undergoing elective surgery, clear non-particulate oral fluids should not be withheld for more than two hours prior to the induction of anaesthesia. Evidence level 1a

### Recommendation 5

In the absence of disorders of gastric emptying or diabetes, preoperative administration of carbohydrate-rich beverages 2-3 h before induction of anaesthesia may improve patient well-being and facilitate recovery from surgery. It should be considered in the routine preoperative preparation for elective surgery. Evidence Level 2a

### Recommendation 6

Routine use of preoperative mechanical bowel preparation is not beneficial and may complicate intra- and postoperative management of fluid and electrolyte balance. Its use should therefore be avoided whenever possible. Evidence level 1a

### Recommendation 7

Where mechanical bowel preparation is used, fluid and electrolyte derangements commonly occur and should be corrected by simultaneous intravenous fluid therapy with Hartmann's or Ringer-Lactate/acetate type solutions. Evidence level 5

### Recommendation 8

Excessive losses from gastric aspiration/vomiting should be treated preoperatively with an appropriate crystalloid solution which includes an appropriate potassium supplement. Hypochloraemia is an indication for the use of 0.9% saline, with sufficient additions of potassium and care not to produce sodium overload. Losses from diarrhoea/ileostomy/small bowel fistula/ileus/obstruction should be replaced volume for volume with Hartmann's or Ringer-Lactate/acetate type solutions. "Saline depletion," for example due to excessive diuretic exposure, is best managed with a balanced electrolyte solution such as Hartmann's. Evidence level 5 Consensus for the electrolyte content of secretions (Table III) based on Geigy Scientific Tables 24. Evidence level 2a for Hartmann's versus 0.9% saline

### Recommendation 9

In high-risk surgical patients, preoperative treatment with intravenous fluid and inotropes should aim to achieve predetermined goals for cardiac output and oxygen delivery, as this may improve survival. Evidence level 1b

### Recommendation 10

Although currently logistically difficult in many centres, preoperative or operative hypovolaemia should be diagnosed by flow-based measurements wherever possible. The clinical context should also be taken into account as this will provide an important indication of whether hypovolaemia is possible or likely. When direct flow measurements are not possible, hypovolaemia will be diagnosed clinically on the basis of pulse, peripheral perfusion and capillary refill, venous (JVP/CVP) pressure and the Glasgow Coma Scale, together with acid-base and lactate measurements. A low urine output can be misleading and needs to be interpreted in the context of the patient's cardiovascular parameters above. Diagnosis of hypovolaemia: Evidence level 1b<sup>29-35</sup>

### Recommendation 11

Hypovolaemia due predominantly to blood loss should be treated with either a balanced crystalloid solution or a suitable colloid until packed red cells are available. Hypovolaemia due to severe inflammation such as infection, peritonitis, pancreatitis or burns should be treated with either a suitable colloid or a balanced crystalloid. In either clinical scenario, care must be taken to administer sufficient balanced crystalloid and colloid to normalise haemodynamic parameters and minimise overload. The ability of critically ill patients to excrete excess sodium and water is compromised, placing them at risk of severe interstitial oedema. The administration of large volumes of colloid without sufficient free water (e.g. 5% dextrose) may precipitate a hyperoncotic state. Suitable colloid or crystalloid for hypovolaemia: Evidence level 1b Administration of sufficient water: Manufacturers' recommendations: Evidence level 5

### Recommendation 12

When the diagnosis of hypovolaemia is in doubt and the central venous pressure is not raised, the response to a bolus infusion of 200 ml of a suitable colloid or crystalloid should be tested. The response should be assessed using the patient's cardiac output and stroke volume measured by flow-based technology if available. Alternatively, the clinical response may be monitored by measurement/estimation of the pulse, capillary refill, CVP and blood pressure before and 15 minutes after receiving the infusion. This procedure should be repeated until there is no further increase in stroke volume and improvement in the clinical parameters.

Evidence level for flow-based measurements: 1b<sup>51</sup>

For bolus infusion: Evidence level 1b<sup>52</sup>

Volume to be given: Evidence level 5 (consensus)

For suitable colloid: Evidence level 1b

## Intra operative fluid management

### Recommendation 13

In patients undergoing some forms of orthopaedic and abdominal surgery, intraoperative treatment with intravenous fluid to achieve an optimal value of stroke volume should be used where possible as this may reduce postoperative complication rates and duration of hospital stay.

Orthopaedic surgery: Evidence level 1b<sup>29,34</sup>

Abdominal surgery: Evidence level 1a<sup>31-33,35,52-54</sup>

### Recommendation 14

Patients undergoing non-elective major abdominal or orthopaedic surgery should receive intravenous fluid to achieve an optimal value of stroke volume during and for the first eight hours after surgery. This may be supplemented by a low dose dopexamine infusion.

Evidence level 1b<sup>54</sup>

## Postoperative fluid, and nutritional management

### Recommendation 15

Details of fluids administered must be clearly recorded and easily accessible.

Evidence level 5

### Recommendation 16

When patients leave theatre for the ward, HDU or ICU, their volume status should be assessed. The volume and type of fluids given perioperatively should be reviewed and compared with fluid losses in theatre, including urine and insensible losses.

### Recommendation 17

In patients who are euvoalaemic and haemodynamically stable, a return to oral fluid administration should be achieved as soon as possible.

### Recommendation 18

In patients requiring continuing i.v. maintenance fluids, these should be sodium poor and of low enough volume until the patient has returned their sodium and fluid balance over the perioperative period to zero. When this has been achieved the i.v. fluid volume and content should be those required for daily maintenance and replacement of any on-going additional losses.

### Recommendation 19

The haemodynamic and fluid status of those patients who fail to excrete their perioperative sodium load, and especially whose urine sodium concentration is <20mmol/L, should be reviewed.

Evidence levels for recommendations 16, 17, 18 & 19: 1b

### Recommendation 20

In high-risk patients undergoing major abdominal surgery, postoperative treatment with intravenous fluid and low dose dopexamine should be considered, in order to achieve a predetermined value for systemic oxygen delivery, as this may reduce postoperative complication rates and duration of hospital stay.

Evidence level 1b<sup>35</sup>

### Recommendation 21

In patients who are oedematous, hypovolaemia, if present, must be treated (as in Section 6g), followed by a gradual persistent negative sodium and water balance based on urine sodium concentration or excretion. Plasma potassium concentration should be monitored and where necessary potassium intake adjusted.

Evidence level 1b

### Recommendation 22

Nutritionally depleted patients need cautious refeeding orally, enterally or parenterally, with feeds supplemented with potassium, phosphate and thiamine. Generally, and particularly if oedema is present, these feeds should be reduced in water and sodium. Though refeeding syndrome is a risk, improved nutrition will help to restore normal partitioning of sodium, potassium and water between intra and extra-cellular spaces.

Evidence level 5

### Recommendation 23

Surgical patients should be nutritionally screened, and NICE guidelines for perioperative nutritional support adhered to. Care should be taken to mitigate risks of the refeeding syndrome.

Evidence level 5

## Fluid management in acute kidney injury (AKI)

### Recommendation 24

Based on current evidence, higher molecular weight hydroxyethyl starch (hetastarch and pentastarch MW  $\geq$  200 kDa) should be avoided in patients with severe sepsis due to an increased risk of AKI.<sup>69-71</sup>

Evidence level 1b

### Recommendation 25

Higher molecular weight hydroxyethyl starch (hetastarch and pentastarch MW  $\geq$  200 kDa) should be avoided in brain-dead kidney donors due to reports of osmotic-nephrosis-like lesions.<sup>68</sup>

Evidence level 2b

### Recommendation 26

Balanced electrolyte solutions containing potassium can be used cautiously in patients with AKI closely monitored on HDU or ICU in preference to 0.9% saline. If free water is required, 5% dextrose or dextrose saline should be used. Patients developing hyperkalaemia or progressive AKI should be switched to non-potassium-containing crystalloid solutions such as 0.45% saline or 4%/0.18 dextrose/saline. Ringer's lactate versus 0.9% saline for patients with AKI1.

Evidence level 1b

### Recommendation 27

In patients with AKI, fluid balance must be closely observed and fluid overload avoided. In patients who show signs of refractory fluid overload, renal replacement therapy should be considered early to mobilize interstitial oedema and correct extracellular electrolyte and acid base abnormalities.

Evidence level 5

### Recommendation 28

Patients at risk of developing AKI secondary to rhabdomyolysis must receive aggressive fluid resuscitation with an isotonic crystalloid solution to correct hypovolaemia. There is insufficient evidence to recommend the specific composition of the crystalloid.

Evidence level 5



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