Standard post-operative fluid management in adults

Index: Intravenous fluid therapy

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Despite getting plenty of fluids intraoperatively, most patients are usually dehydrated after an operation. There are several reasons for this:

1. Poor oral intake prior to fasting for theatre (e.g., due to anxiety)
2. Prolonged fasting period pre-operatively (e.g., operating theatre delayed)
3. Fluid and blood loss intra-operatively
   - direct blood loss
   - exposure of large internal surfaces to the heat and light of the theatre lights
   - fluid loss from respiration while intubated
4. Post-operative ileus with third space losses of fluid into the bowel (especially after intra-abdominal and bowel surgery)
5. Post-operative intravenous fluid therapy insufficient for maintenance and replacement.

Depending on the type and length of the operation, it is not uncommon for patients to be several litres "dry" in the post-operative period. In fact, unless you have specific knowledge otherwise, it is probably safe to assume that the patient is around 1-2 litres dehydrated. These patients would usually be otherwise asymptomatic. The aim is to rehydrate the patient to euvolaemia over a 24 hour period.

For the post-operative patient without significant symptomatic dehydration:

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### Regimen One (minimally dehydrated)

- **Bag 1**: 0.9% NaCl ("normal saline") + 30 mmoL KCl *then*
- **Bag 2**: 0.9% NaCl + 30 mmoL KCl *then*
- **Bag 3**: 0.9% NaCl *then*
- **Bag 4**: 0.9% NaCl *then*
- **Usual IV maintenance therapy**
- **Rate**: Bags 1 to 4 at 166 mL/h (or q6h)
- **Results**: in 4 litres of saline rich fluid in the first 24 hours.

### Regimen Two (more dehydrated)

- **Bag 1**: 0.9% NaCl ("normal saline") @ 250 mL/h (q4h) *then*
- **Bag 2**: 0.9% NaCl @ 250 mL/h (q4h) *then*
- **Bag 3**: 0.9% NaCl + 30 mmoL KCl @ 166 mL/h (q6h) *then*
- **Bag 4**: 0.9% NaCl + 30 mmoL KCl @ 166 mL/h (q6h) *then*
- **Bag 5**: 0.9% NaCl @ 166 mL/h (q6h) *then*
Fluid volume

Assuming the usual 70 kg previously healthy person, this means you should aim for:

- **4-5 litres** of fluid in the next 24 hours (versus the **euvolaemic maintenance** of around 3 litres);
- After achieve euvolaemia / good hydration, if the patient still needs IV fluids, then the maintenance rate should suffice.

Fluid choice

For someone with a fluid deficit, that fluid is best replaced with saline rich solution. That is:

- either **0.9% NaCl solution** (Normal Saline);
- or **Hartmann’s solution**.

Potassium

Some surgeons say that the body spares potassium post-operatively so potassium supplementation is not required in the first 24 hours. Though this is true for the vast majority of patients, it is not universally true (e.g., and needless to say, it is in those patients that this is not true that will potentially have life-threatening hypokalaemia).

My opinion is that you should give adequate potassium replacement for patients in the first 24 hours post-operatively routinely unless there is a specific reason not to.

In procedures where there is a high likeihood of post-operative ileus (e.g., intra-abdominal surgery and bowel surgery in particular), potassium supplementation is a must as third space losses into the bowel are generally rich in potassium. Hypokalaemia, furthermore, prolongs intestinal ileus.

I would give:

- **1 mmol of KCl per kg of body weight in the first 24 hours**
- ~ 60 mmol KCl (for ordinary adult)
- = 30 mmol KCl in two of the litre bags of fluid (premixed or otherwise)

Additional losses
If a patient has diarrhoea or vomiting, you need to replace this fluid on top of their maintenance and post-operative replacement fluids. You should consider this fluid as both sodium and potassium rich and so a “litre” of vomitus or diarrhoea should be replaced with a litre bag of Normal Saline + 30 mmol KCl.

Third space losses

In patients with an ileus or a small bowel obstruction (or for example, in pancreatitis), there can be large amounts (as in litres and litres) of fluid “lost” to the bowel. This fluid will be sodium and potassium rich.

Usually, you will need to aggressively replace fluid (that is, many litres a day) with saline and often with large amounts of potassium.

Patients who are eating

Usually, patients who are eating but require “supplemental” fluids (i.e., inadequate oral intake) will only require small amounts of fluid. In general, intravenous potassium replacement is not required for these patients (even if they are hypokalaemic, you can usually use oral supplementation).

Try to calculate the amount of water actually required. For example, if they need 1L of water in addition to oral intake, then only give 1 litre in a day (as normal saline or dextrose solution). If no other intravenous access is required and intravenous access is difficult, consider a subcutaneous line (generally a maximum rate of fluid at about 80 mL/h). Do not put a dextrose solution subcutaneously.

Updated: Michael Tam (19 June 2006)