Guideline Title

Fluid Challenge

Summary:
A fluid challenge is the rapid administration of a bolus of fluid in critically ill, generally haemodynamically unstable patients who require rapid correction of an hypovolaemic state. It is essential that an assessment of response to the fluid challenge follows its administration.

Approved by: ICU Medical Director

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Next Review Date: December 2017

Replaces Existing Guideline: Guideline for fluid challenge

Previous Review Dates: 2006, 2011

Background Information:
Acutely ill patients frequently require fluid replacement. Hypovolaemia may be absolute due to overt fluid losses such as gastrointestinal bleeding, or relative due to increases in venous capacitance which result from the effects of inflammatory mediators in sepsis. In either case restoration of the circulating volume to restore oxygen delivery and perfusion to vital organs is essential to prevent multiple organ dysfunction syndrome. Timely delivery is an essential component of therapy. This guideline provides a 4-step process for giving a fluid challenge in the ICU to patients who are hypovolaemic. It involves consideration of:
• Type of fluid
• Rate of administration
• Goal to be achieved
• Safety limits

1. Introduction contains:

The risk addressed by this policy:

Patient Safety

The Aims / Expected Outcome of this policy:

To achieve prompt correction of fluid deficits while minimising the risks of fluid overload.

Related Standards or Legislation

NSQHS Standard 1 Governance

National Standard 4 Medication Safety
2. **Policy Statement:**
   - All care provided within Liverpool Hospital ICU will be in accordance with infection prevention/control, manual handling and minimisation and management of aggression guidelines.
   - Fluid bolus / fluid challenge is not to be initiated without appropriate discussion/review by medical staff and a written prescription for the specific fluid. The only exception is in the case of an emergency, where the prescription will be written during/after immediate resuscitation of the patient.
   - Albumin 20% (or hypertonic saline solutions, such as 3% sodium chloride) are only appropriate in select populations and prescription is restricted to individual patients under the supervision of an ICU Consultant.

3. **Principles / Guidelines**

   A fluid challenge is used as a diagnostic and a therapeutic measure to assess and optimise intravascular volume status of an individual patient.

   **Indications**
   - Patients identified as requiring a fluid challenge who meet the criteria specified in the section below: ‘Common issues prompting review for fluid challenge’.
   - Patients in whom a clinical assessment reveals the following factors that could suggest the need for fluid administration:

   **Dynamic evaluation:** This has greater specificity and is considered more useful than static evaluation. Dynamic methods should be used as a guide during administration of a fluid challenge.
   - Respiratory variations in arterial pressure or stroke volume (during mechanical ventilation in the absence of ventilatory dyssynchrony or arrhythmias).
   - Pulse pressure variation or stroke volume variation with the respiratory cycle.
   - Positive response to fluid challenge.

   **Static Evaluation:** This has limited sensitivity and specificity.

   **Signs of dehydration:**
   - Diminished skin turgor
   - Thirst
   - Dry mouth
   - Hyponatraemia, hyperproteinaemia, elevated haemoglobin and haematocrit.

   **Circulatory signs of hypovolaemia:**
   - Tachycardia (refer to ‘goals to be achieved’ section below).
   - Arterial hypotension (MAP ≤65mmHg)
   - Increased serum lactate
   - Decreased peripheral temperature

   **Decreased renal perfusion:**
   - Concentrated urine output < 0.5mL/kg/hr (refer to ‘goals to be achieved’ section below)
   - Increased blood urea nitrogen relative to creatinine concentration.
   - Persistent metabolic acidosis.

   **Equipment:**
   - Written prescription
   - Fluid to be administered, giving set
   - Appropriate venous access
Procedure:
This method of giving a fluid challenge incorporates 4 decision phases:

i. **Type of fluid**: 
   - Whilst there is no ideal intravenous fluid solution, the choice is best made in consideration of the underlying disease, type of fluid lost, severity of circulatory failure, and in some cases the serum albumin level.
   - Currently evidence supports the use of crystalloids for fluid bolus

Crystalloids
0.9% sodium chloride (Normal Saline): commonly used solution, possibly the least expensive
Hartmann’s: also known as ‘compound sodium lactate, may be used as a fluid bolus but contains potassium and lactate which may be contraindicated in some conditions. Hartmann’s solution is similar to Lactated Ringer’s solution, the ionic values differ.

ii. **Rate of Fluid Administration**: 
   - May be modified depending upon the patient and underlying disease process.
   - It is important to define the amount of fluid to be given over a defined interval (eg: 250-1000mL of crystalloids over 30 minutes)
   - Consider alternative diagnosis and treatment, if response is poor to initial fluid bolus

iii. **Common issues prompting review for fluid challenge**: 
   - The primary problem that prompts the fluid challenge should be identified and quantified.
     - Hypotension secondary to hypovolaemia - clinically demonstrated by a MAP < 65mmHg - 70mmHg (exceptions may occur e.g. untreated hypertensive patient with underlying cerebrovascular disease). Hypotension defined by the clinician according to individual situation.
     - Tachycardia may indicate hypovolaemia, but it has diverse causes and should not be used alone as a trigger for a fluid challenge. Other causes of tachycardia include pain, fever, sepsis, withdrawal of beta-blockers, and other drug withdrawal syndromes.
     - Low urine output secondary to hypovolaemia when urine output is less than 0.5 mL/kg/hr (lean body mass), for a period of at least 2 consecutive hours (partially blocked catheters must be excluded first). However low urine output may be physiological and due to other causes and should be examined carefully before reflexively administering a fluid challenge.
     - Hypovolaemia may be present despite a satisfactory urine output (and haemodynamic stability) and should prompt review of other indices of tissue perfusion, such as skin perfusion and lactate.
     - Low cardiac output secondary to low filling pressures in patients with invasive haemodynamic monitoring.
     - Other dynamic evaluation methods, such as respiratory variation in arterial pressure, are complex and require a deeper understanding of cardiovascular physiology and the methodology and its pitfalls.

iv. **Safety Limits**
   - Monitor for signs of pulmonary oedema secondary to fluid overload, which is a serious complications of fluid administration.
   - Monitor CVP trends as a safety limit in patients who do not have intrinsic heart or lung disease to guide therapy.
   - Use of the navigator machine with targeted CO, CI, MAP and Mean systemic filling pressure (Pms).
   - More invasive haemodynamic monitoring with a pulmonary artery catheter or PiCCO may be considered in patients with intrinsic heart or lung disease.

**Note:**
A fluid challenge may continue until the goal is reached as long as the safety limit is not reached first (see examples below).
Examples:
The following is one example of the critical components of the fluid challenge and its application in a hypothetical patient with arterial hypotension (MAP 60mmHg) and CVP 15mmHg; two possible responses are presented (Vincent, 2006).

<table>
<thead>
<tr>
<th>Example</th>
<th>Example 1</th>
<th>Example 2</th>
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<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>+10mins</td>
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<tr>
<td>Type of Fluid:</td>
<td>Hartmanns</td>
<td></td>
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<tr>
<td>Rate of Infusion:</td>
<td>500mL/30mins</td>
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<td>Clinical Endpoints:</td>
<td>MAP ≥ 70mmHg</td>
<td>MAP 60</td>
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<td>Pressure Safety Limit</td>
<td>CVP 12</td>
<td>CVP 13</td>
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<tr>
<td></td>
<td>Continue</td>
<td>Stop</td>
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Successful fluid challenge | Unsuccessful fluid challenge

4. Performance Measures
All incidents are documented using the hospital electronic reporting system: IIMS and managed appropriately by the service manager and staff as directed.

5. References / Links

Author: ICU Staff Specialist (R Calcroft), ICU-CNC (S. Shunker)
Reviewers: Director-ICU, ICU – Staff Specialists, ICU NM, ICU NUMs, CNE’s, CNS’s, Pharmacists.
Endorsed by: A/Prof M. Parr, Director- ICU