

# Central venous oxygen levels (ScvO<sub>2</sub>) for fluid optimisation in high risk surgical patients

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|----------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Submission date</b><br>26/06/2011   | <b>Recruitment status</b><br>No longer recruiting | <input type="checkbox"/> Prospectively registered<br><input type="checkbox"/> Protocol                       |
| <b>Registration date</b><br>24/01/2012 | <b>Overall study status</b><br>Completed          | <input type="checkbox"/> Statistical analysis plan<br><input type="checkbox"/> Results                       |
| <b>Last Edited</b><br>08/04/2016       | <b>Condition category</b><br>Surgery              | <input type="checkbox"/> Individual participant data<br><input type="checkbox"/> Record updated in last year |

## Plain English summary of protocol

### Background and study aims

Fluids are routinely given to patients undergoing surgery to make up for fluid losses during the operation. The patient's cardiac output (the amount of blood pumped by the heart) can be monitored to guide fluid treatment, but this requires expensive equipment. In all high-risk patients a thin tube is placed into a large vein in the chest (central venous catheter) for the measurement of blood pressure and for giving drugs. The levels of oxygen and carbon dioxide in the central venous blood can be measured using blood sampled from the central venous catheter. Changes in these levels could be used as markers of changes in cardiac output without the need for expensive equipment. In this study we want to investigate whether changes in these two markers can be used to assess changes in cardiac output.

### Who can participate?

High-risk patients aged over 50 undergoing major open abdominal surgery.

### What does the study involve?

Arterial and central venous catheters are placed for the monitoring of the patients' arterial and central venous blood pressure, respectively. Cardiac output is monitored by connecting the arterial catheter to a monitor. Blood samples for blood gas analysis are drawn from the arterial and central venous catheters in any patient being given fluids to increase their cardiac output. Levels of oxygen and carbon dioxide are measured from the blood samples and cardiac output is recorded. Another set of blood samples is taken and cardiac output is measured 5 minutes after the fluids have been given. In each patient we perform up to three measurements of the changes in cardiac output and oxygen and carbon dioxide levels in response to fluid treatment.

### What are the possible benefits and risks of participating?

The additional blood being taken for the purpose of this study is 24 ml. This small amount is extremely unlikely to alter blood transfusion requirements as the average blood loss for open abdominal surgery is more than 500 ml.

### Where is the study run from?

James Cook University Hospital (UK).

When is the study starting and how long is it expected to run for?  
October 2010 to October 2011.

Who is funding the study?

1. James Cook University Hospital Trust (UK)
2. NIHR Comprehensive Local Research Networks Flexibility and Sustainability Funding (UK)

Who is the main contact?

Dr Jost Mullenheim

## Contact information

### Type(s)

Scientific

### Contact name

Dr Jost Mullenheim

### Contact details

Intensive Care Unit  
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## Additional identifiers

### Protocol serial number

10/H0906/61

## Study information

### Scientific Title

Can changes in central venous oxygen saturation and central venous - arterial partial pressure of carbon dioxide difference predict changes in stroke volume in high risk surgical patients?

### Study objectives

We hypothesise that the trend in central venous oxygen levels (ScvO<sub>2</sub>) and/or central venous - arterial partial pressure of carbon dioxide (CVA- pCO<sub>2</sub>) difference in response to fluid challenges can be used to assess changes in stroke volume (SV) and hence cardiac output (CO). This will be investigated in 25 high-risk patients undergoing major surgery in which CO monitoring is deemed necessary

### Ethics approval required

Old ethics approval format

### Ethics approval(s)

Newcastle & North Tyneside 1 Research Ethics Committee, 05 November 2010, ref: 10/H0906/61  
Amendments, 09/12/2010

**Primary study design**

Observational

**Study design**

Single-centre clinical pilot study

**Study type(s)**

Treatment

**Health condition(s) or problem(s) studied**

Improving outcomes in high-risk surgical patients

**Interventions**

1. All patients enrolled in the study will receive standard anaesthetic care: after induction of anaesthesia with a hypnotic drug (propofol or thiopental) all patients will receive a balanced anaesthetic consisting of a volatile anaesthetic which is added to the inspiratory gas, muscle relaxant and opioid. An arterial and central venous catheter will be placed for monitoring of arterial and central venous blood pressure respectively. SV and hence CO will be monitored by connecting the existing arterial catheter to a LiDCO® monitor. Haemoglobin will be maintained  $> 8\text{g/dl}$ ,  $\text{SaO}_2 \geq 94\%$ , heart rate  $< 100\text{ bpm}$ , mean arterial blood pressure  $60\text{--}100\text{ mmHg}$  and temperature at  $36\text{--}37^\circ\text{C}$ . The ventilator will be set to achieve a  $\text{pCO}_2$  of  $4.5\text{--}5.5\text{ kPa}$ . Postoperative analgesia will be provided via epidural or patient controlled analgesia. Similar to other intraoperative fluid optimisation studies SV and hence CO optimisation will be performed after induction of anaesthesia and placement of catheters.

To answer the proposed research question blood samples for blood gas analysis will be drawn simultaneously from the arterial and central venous catheter (2 ml each) in any patient in whom administration of a fluid bolus to increase SV and hence CO is planned. Three consecutive measurements of  $\text{ScvO}_2$ , central venous and arterial  $\text{pCO}_2$  will be performed from the same blood sample and the average will be calculated and used for further statistical analysis. Immediately after any series of blood samples SV and hence CO will be recorded. Each fluid bolus will contain of 250 ml colloid (Gelofusin® or Volulyte®) i.v. given over 2 minutes. Another set of blood samples will be taken and SV and hence CO will be measured 5 minutes after the fluid bolus has been given. In each patient we will perform up to three consecutive serial measurements of SV and hence CO in response to a fluid bolus and, concurrently, the two surrogate variables  $\text{SvcO}_2$  and  $\text{CVA-pCO}_2\text{-diff}$ . Thus, in each study participant we will take up to 12 blood gas samples (one arterial and one central venous sample before and after a fluid bolus, maximum of three serial measurements in response to three consecutive fluid boluses). Thus, the maximum of additional blood being taken for study purpose is 24 ml. This small amount is extremely unlikely to alter transfusion requirements as average blood loss for open abdominal surgery is more than 500 ml

**Intervention Type**

Other

**Phase**

Not Applicable

**Primary outcome(s)**

The correlation between changes of stroke volume and hence cardiac output with changes in central venous saturation and central venous arterial partial pressure of carbon dioxide difference, respectively

**Key secondary outcome(s)**

Sensitivity and specificity of pulse pressure and stroke volume variation and pleth variability index (PVI) to predict an increase of cardiac output by at least 10%

**Completion date**

01/10/2011

**Eligibility****Key inclusion criteria**

1. Elective major open abdominal surgery (gastrointestinal, urological, gynaecological or vascular procedures with an expected duration of at least 90 minutes)
2. Requirement for invasive haemodynamic monitoring including arterial and central venous blood pressure and CO measurement
3. More than 50 years of age and at least one of the following:
  - 3.1. Renal impairment (serum creatinine > 130 µmol/l)
  - 3.2. Diabetes mellitus
  - 3.3. Aged 65 years and over
  - 3.4. Presence of a risk factor for cardiac or respiratory disease:
    - 3.4.1. Exercise tolerance ≤ 6 metabolic equivalents (METs)
    - 3.4.2. Anaerobic threshold ≤ 14 ml/kg/min
    - 3.4.3. Past medical history of ischaemic heart disease
    - 3.4.4. Heart failure
    - 3.4.5. Moderate or severe valvular disease
    - 3.4.6. Chronic obstructive pulmonary disease (COPD)
    - 3.4.7. Radiographically confirmed chronic lung disease (COPD, fibrosis)

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Adult

**Sex**

All

**Key exclusion criteria**

1. No consent
2. Pregnancy
3. Emergency surgery

4. Vascular surgery involving aortic cross clamping
5. Allergy to Gelofusin® and Volulyte®
6. Laparoscopic surgery

**Date of first enrolment**

01/10/2010

**Date of final enrolment**

01/10/2011

## Locations

**Countries of recruitment**

United Kingdom

England

**Study participating centre**

**James Cook University Hospital**

Middlesbrough

United Kingdom

NE6 5SE

## Sponsor information

**Organisation**

James Cook University Hospital (UK)

**ROR**

<https://ror.org/02vqh3346>

## Funder(s)

**Funder type**

Hospital/treatment centre

**Funder Name**

James Cook University Hospital Trust (UK)

**Funder Name**

## Results and Publications

**Individual participant data (IPD) sharing plan**

**IPD sharing plan summary**

Not provided at time of registration