

## Standard Operating Procedure

### North Bristol - Emergency Anaesthesia for Major Trauma

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<b>Distribution:</b>	Severn Major Trauma Network, Trauma Team Leaders, Trauma Team, Anaesthetic Consultants and 3 <sup>rd</sup> o/c trainees, Anaesthetic Assistants, Trauma Team Airway Nurse
<b>Related guidelines:</b>	
<b>Further information:</b>	
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#### Aim

To provide safe and effective emergency anaesthesia for major trauma patients in North Bristol NHS Trust.

#### Objectives

- Define indications for emergency anaesthesia in major trauma
- Describe the procedure for performing rapid sequence induction of anaesthesia (RSI) in major trauma patients
- Describe the procedure for failed intubation
- Describe maintenance of anaesthesia

## Background

Southmead hospital is a Major Trauma Centre within the Severn Network that receives patients with life threatening injuries from trauma. They are managed upon arrival by the multidisciplinary trauma team, led by a consultant trauma team leader (TTL).

A key role within the trauma team is that of the anaesthetist ("3<sup>rd</sup> on call", Bleep 9034). They are a minimum of ST5 level in their training and will have received appropriate orientation to this document and the resuscitation bays.

Emergency anaesthesia for the major trauma patient is a high risk intervention that has significant potential benefits. Anaesthesia in the non-theatre environment for a patient population that often have unstable cardiovascular and respiratory systems can result in unnecessary morbidity and mortality if performed poorly.

The purpose of this standard operating procedure is to provide a consistent, standardised approach to emergency anaesthesia. Thus reducing the cognitive load required to deliver it and the potential for human error – therefore significant patient harm can be avoided.

## Rapid Sequence Induction (RSI) of Anaesthesia

Rapid sequence induction of anaesthesia (RSI) in major trauma is performed to prevent aspiration of gastric contents in patients who are inadequately starved; to stabilise physiology; and to facilitate investigation and treatment. The essential features of RSI are safety, pre-oxygenation, intravenous induction (using a pre-determined induction dose), insertion of a tracheal tube prior to mechanical ventilation of the lungs and transfer to radiology or definitive care. It is imperative to avoid hypoxia, hypercarbia, hypotension and aspiration during the procedure.

## Indications for RSI

RSI is indicated when the benefits outweigh the potential risks – this is a clinical judgement. The decision to RSI will be made by the Trauma Team Leader and the trauma team anaesthetist(s).

Possible indications for RSI include, but are not limited to, the following categories:

- A. Airway** – Obstruction or impending obstruction. This would include a reduced conscious level with loss of airway reflexes, seizures resistant to treatment or head injuries. *A Glasgow Coma Score (GCS) less than 15 is an indication to consider RSI to optimise oxygenation and ventilation. A GCS <9 is significant and mandates RSI in all but the most exceptional of cases.*
- B. Breathing** – Oxygenation and ventilation are inadequate or potentially inadequate.
- C. Clinical course** – e.g. the patient with multiple contaminated open fractures that will be heading to theatre imminently; anaesthesia will facilitate further investigation and management.

In massive haemorrhage, anaesthesia will allow continued resuscitation, but consideration should be given to administration of blood products to counteract the instability of induction.

In some circumstances anaesthesia can be administered for humane reasons, e.g. extreme pain from significant burn injuries.

In making the decision to perform an RSI, numerous risks must be considered:

- **Anticipated difficult airway** – any indication of a difficult airway pre-induction will have to be carefully considered. Increased anxiety of the intubator can affect performance; tendency to use less drug or attempt to intubate too early (thus not allowing muscle relaxant to work) will clearly hamper the RSI process and further increase the possibility of a failed intubation attempt.
- **Personnel** - Are the most appropriate personnel available to perform the procedure? If not how long until they are available?
- **Resources** – Are any additional resources essential to the process that are not present?

## Preparation

Briefing:

- When responding to a major trauma the trauma team leader will provide a briefing of the inbound patient.
- It may be possible after the initial brief to determine if anaesthesia is required. At this time the RSI checklist can be used to guide preparation (Appendix A).
- It is the responsibility of the anaesthetist to check the presence of equipment they may wish to use.

Environment:

- The majority of major trauma patients are received into a resuscitation bay in the Emergency department. (Appendix B) Ensure there is 360 degree access to the patient, (if further interventions are required e.g. thoracostomy)
- Low noise level – allows effective team communication.

Equipment

- Full monitoring (ECG, NIBP, SpO<sub>2</sub>, EtCO<sub>2</sub>). Ensure monitoring is switched on, particularly the End tidal CO<sub>2</sub> module as it takes several minutes to warm up.
- Confirm wall suction is working with appropriate sized “yankauer” suction catheter attached and placed on the right hand side of the patients head.
- The ventilator should be tested to confirm suitable initial settings and the correct tubing is attached and the circuit tested for any leaks.
- Airway equipment should be placed on top of the airway trolley ready for use.

Minimum layout:

- Laryngoscope [size 3 and 4 blade]
- Bougie – routinely passed to the anaesthetist by the Airway nurse for use during all intubations.
- Tracheal tube [cuff tested]
- Catheter mount and filter

- 10 ml syringe
  - Alternative smaller tube [cuff tested]
  - 2 x nasopharyngeal airways
  - 1 x oropharyngeal airway
  - Bag-mask connected to O<sub>2</sub> tubing, side stream EtCO<sub>2</sub> attached. (Mapleson “C” circuit available if desired)
  - Nasal cannula
- Confirm availability of:
    - Airway “Plan B” - I-gel, Supreme LMA, Classic LMA.
    - Alternative laryngoscope [alternative blade size/type].
    - Anticipated difficult airway equipment e.g. Airtraq, C-Mac.
    - Airway “Plan D” - Difficult airway kit [surgical cric./ surgical airway]
  - Identify roles:
    - Manual in-line stabilisation, if suspected cervical injury.
    - 1<sup>st</sup> Intubator
    - 2<sup>nd</sup> Intubator (Either Bleep 9030 anaesthetic consultant or TTL)
    - Airway Nurse – airway equipment, cricoid pressure and external laryngeal manipulation.
    - Drug delivery

## Drugs

The drugs used for induction and their quantities will be based upon clinical assessment and the practitioners experience of their use. This must include consideration of drugs recently given for analgesia and procedural sedation in the pre-hospital phase of care.

It is strongly recommended that Ketamine is used as the induction agent of choice in major trauma. This is because of its’ relative haemodynamic stability and wide therapeutic margin – 10-20% context specific overdose is unlikely to cause problems.

The following regimes are strongly recommended:

→ **Standard “3:2:1”**

Fentanyl **3mcg/kg**, Ketamine **2mg/kg** and Rocuronium **1mg/kg**

→ **Hypovolaemic “1:1:1”**

Fentanyl **1mcg/kg**, Ketamine **1mg/kg** and Rocuronium **1mg/kg**

If severe hypovolaemia is suspected fentanyl may be omitted, in some circumstances it may be appropriate to administer a paralysing agent alone.

Simultaneous administration of blood products to support blood pressure is strongly recommended rather than vasopressor/ inotrope use.

→ **Anticipated difficult intubation**

In the majority of trauma patients reversal of the muscle relaxant is not an option.

“Can’t intubate, **CAN** ventilate”: a supraglottic device can be used temporarily.

“Can’t intubate, **CAN’T** ventilate”: **A SURGICAL AIRWAY** is an appropriate solution.

→ **Rescue drugs**

Vasopressors should be avoided in favour of appropriate induction/ maintenance doses and blood products. The use of vasopressors for the management of hypotension due to hypovolaemia in trauma is associated with increased mortality. For exceptional circumstances vasopressors and inotropes are available in the emergency department..

→ **Specific circumstances**

On occasion it may be appropriate to use a propofol/ opiate based induction regime. E.g. Isolated head injuries.

→ **Procedural sedation to facilitate induction**

Some patients may be agitated and uncooperative. They will require incremental sedation to facilitate pre-oxygenation and induction. Small doses of the planned induction drug e.g. 10-20mg Ketamine boluses titrated to effect. 1-2mg Midazolam can be used, particularly in head injured patients. In all cases caution must be exercised and you must be in a position to immediately maintain the airway and provided ventilation.

→ **Maintenance**

Continued fentanyl boluses and Propofol infusions are available for maintenance of anaesthesia. The CT scanner is close to the resuscitation bays: Do not delay a transfer to scan to await infusions to be commenced. If not immediately available maintenance can be achieved with ongoing boluses of ketamine (10min intervals) and opiate. Alternatively a fentanyl midazolam “bolus” regime can be used.

Regular administration of muscle relaxants is appropriate in major trauma patients.

## Patient preparation

- In the trauma patient with possible C-spine injury the head should be placed in the neutral position with manual in line immobilisation, and any spinal immobilisation (including collars) removed.
- Optimal positioning for patient. The obese patient may require “ramping” with head and chest elevated above the level of the patient’s navel.
- Ensure two large bore intravenous access are available and flushed. Intraosseous devices can be used for all anaesthetic drugs, ensure all drugs are flushed in.
- Simultaneous resuscitation with blood products may be required for haemodynamically compromised patients.
- Any history and examination are ideally performed before anaesthesia, but in some cases the urgency for airway control will take precedence. Particularly:
  - Glasgow Coma Score
  - Pupillary size and response
  - Any evidence of chest injuries. (Anticipating the need for thoracostomies).
  - Abdominal tenderness and guarding

- Neurological function distal to significant limb injury
- Limb movement
- Pre-oxygenation for 3 minutes – preferably by bag valve mask (BVM). If agitated: face mask with reservoir bag +/- incremental sedation (midazolam or ketamine, need to reduce subsequent induction doses) may be used. In instances of respiratory distress augmentation of ventilation with BVM can be used, but is notoriously difficult.
- Pre-oxygenation with significant maxillo-facial injuries should be done in a comfortable position for the patient, but such that they can rapidly be re-positioned to facilitate intubation.
- Consider apnoeic Oxygenation via Nasal cannulae. On induction of anaesthesia flow is increased to 15 l/min.

## Conduct – predicted steps in the process

- Decision to RSI
- Appropriate people alerted
- Pre-oxygenation commenced
- Equipment assembled
- Challenge response checklist (Appendix A)
- Induction drugs administered
- Nasal cannula to 15l/min (if used)
- Cricoid pressure (if used)
- Laryngoscopy and intubation
- Confirm tracheal tube placement and secure
- Cricoid pressure released
- Patient assessment performed
- Prepare for transfer

## Post intubation checks

Perform a rapid re-assessment of the patients Airway, Breathing, Circulation, and Disability. The following should be actioned and communicated to the TTL and scribe:

- Confirmation of tracheal tube position: Bilateral chest movement, auscultation, continued CO2 trace on monitor and direct visualisation at the time of intubation.
- Monitor values: – SpO2, NIBP, ECG, EtCO2. Peak ventilation pressures and minute ventilation.
- Set NIBP to a 3 minute cycle. This often requires repeating as the monitor resets when disconnected from the base unit.
- ANY subsequent changes to ventilator settings or maintenance drugs.
- Complete RSI audit form.

## Actions on:

### Difficult intubation

As per the difficult airway society guidelines (Appendix D)

Any additional “difficult airway” equipment, e.g. C-mac Video laryngoscope, is available via the theatre co-ordinator or on-call anaesthetic assistant lead. Delay in procuring equipment needs to be balanced against the urgency of the anaesthesia requirement.

### De-saturation

1. Confirm oxygen supply by tracing from cylinder to tracheal tube.
2. Confirm correct tube placement with EtCO<sub>2</sub> and auscultation of the chest
3. Confirm adequate cardiac output – NIBP, pulse, EtCO<sub>2</sub>
4. Exclude/ treat pathology
  - a. Pneumothorax +/- tension (Often predictable, peak pressures/ minute ventilation on ventilator may suggest a problem)
  - b. Anaphylaxis
  - c. Bronchospasm of other cause e.g. asthma
  - d. Malignant hyperpyrexia

### Hypotension

Exclude the following causes of hypotension post induction:

1. Drug induced vasodilation.
2. Tension Pneumothorax – *Treatment involves finger thoracostomy anterior to the mid axillary line in the fourth intercostals space on the affected side. If suspected and unilateral decompression does not relieve the problem repeat on the opposite side of the chest. If performed in a sterile manner with skin prep the thoracostomy may be converted to a formal chest drain.*
3. Hyperventilation – *In low cardiac output states a raised intrathoracic pressure will impede venous return and hence a hypotensive state.*
4. Myocardial impairment – direct injury, hypovolaemia, pericardial effusion.

## References

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4. Cook TM, Woodall N, Harper J, Bengner J. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 2: intensive care and emergency departments. *Br J Anaesth*. 2011 May;106(5):632–42.
5. Henderson JJ, Popat MT, Latto IP and Pearce AP. Difficult Airway Society guidelines for management of the unanticipated difficult intubation. *Anaesthesia*. 2004; 59: 675–694
6. Intensive Care Society. Standards for Capnography in Critical Care. London: Intensive Care Society, 2009. Available from [http://www.ics.ac.uk/intensive\\_care\\_professional/standards\\_and\\_guidelines/capnography\\_guidelines](http://www.ics.ac.uk/intensive_care_professional/standards_and_guidelines/capnography_guidelines).
7. Nolan JP & Clancy M . Airway management in the emergency department *Br J Anaesth* 2002;88:9-11.
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## Appendix A – RSI checklist

The purpose of the checklist is to:

- Allow a defined period of pre-oxygenation
- Check that all the necessary equipment is present and working
- Ensure the position of the patient is ideal for intubating
- Reduce the chance of failed intubation

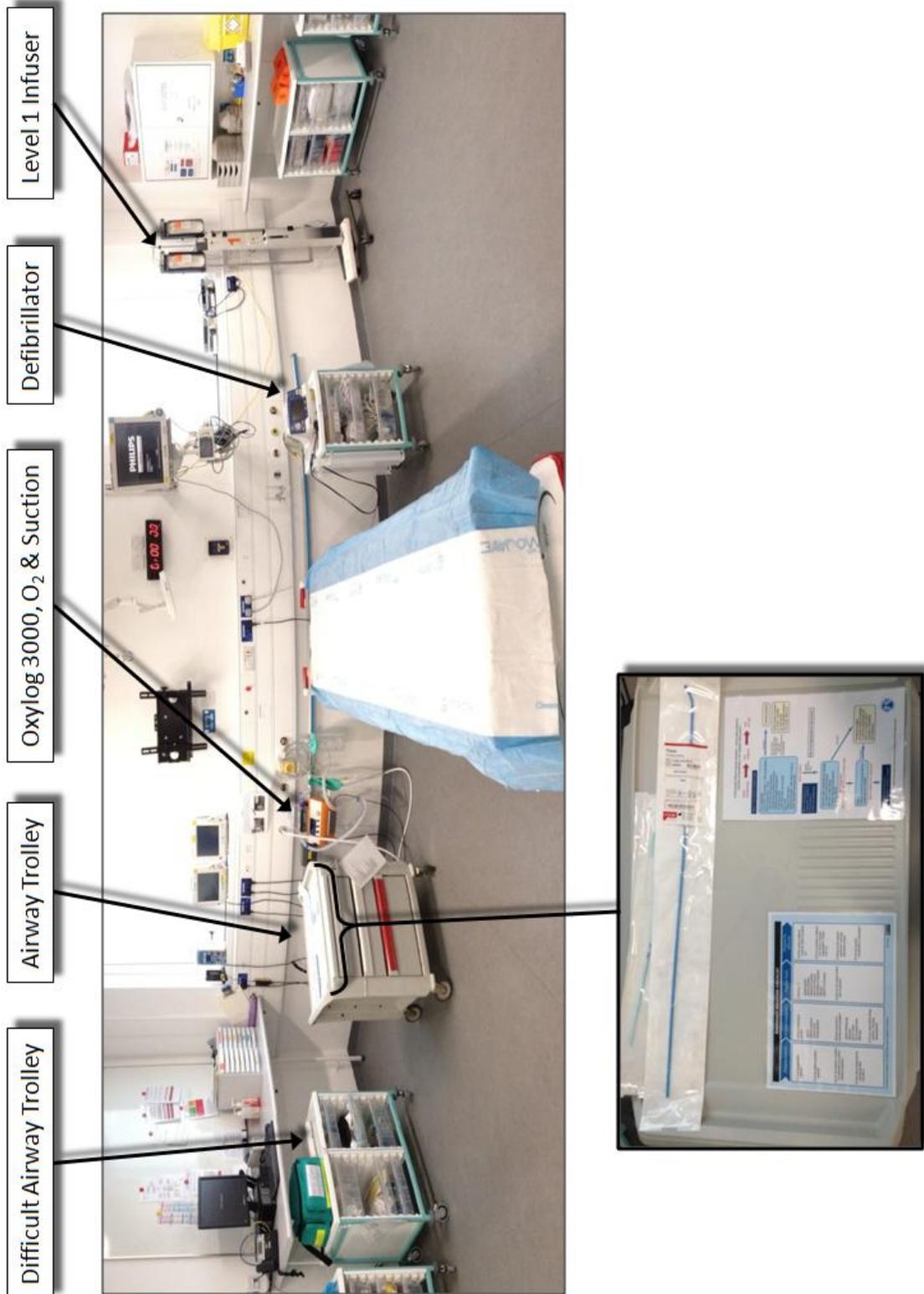
While talking through, ensure the patient has a tightly applied reservoir mask/ BVM and that the reservoir is moving with respiration.

EMERGENCY INTUBATION CHECKLIST	
Prepare Patient	Prepare Equipment
Prepare Team	Prepare for difficulty
<input type="checkbox"/> Is preoxygenation optimal?  <input type="checkbox"/> Is the patient's position optimal?  <input type="checkbox"/> Can the patient's condition be optimised any further before intubation?  <input type="checkbox"/> How will anaesthesia be maintained after induction?	<input type="checkbox"/> What monitoring is applied? <input type="checkbox"/> ECG <input type="checkbox"/> Blood pressure <input type="checkbox"/> Sats probe <input type="checkbox"/> Capnography  <input type="checkbox"/> What equipment is checked and available? <input type="checkbox"/> Self-inflating bag <input type="checkbox"/> Suction <input type="checkbox"/> 2 ET tubes <input type="checkbox"/> 2 laryngoscopes <input type="checkbox"/> Bougie  <input type="checkbox"/> Do you have all the drugs required, including vasopressors?
<input type="checkbox"/> Who is ...? <input type="checkbox"/> Team leader <input type="checkbox"/> First Intubator <input type="checkbox"/> Second Intubator <input type="checkbox"/> Cricoid Pressure <input type="checkbox"/> Intubator's Assistant <input type="checkbox"/> Drugs <input type="checkbox"/> MILS (if indicated)  <input type="checkbox"/> How do we contact further help if required?	<input type="checkbox"/> If the airway is difficult, could we wake the patient up?  <input type="checkbox"/> If the intubation is difficult, how will you maintain oxygenation? (Plans A,B,C,D)  <input type="checkbox"/> Where is the relevant equipment, including alternative airway?  <input type="checkbox"/> Are any specific complications anticipated?

 RTIC Severn

This Checklist is not intended to be a comprehensive guide to preparation for intubation

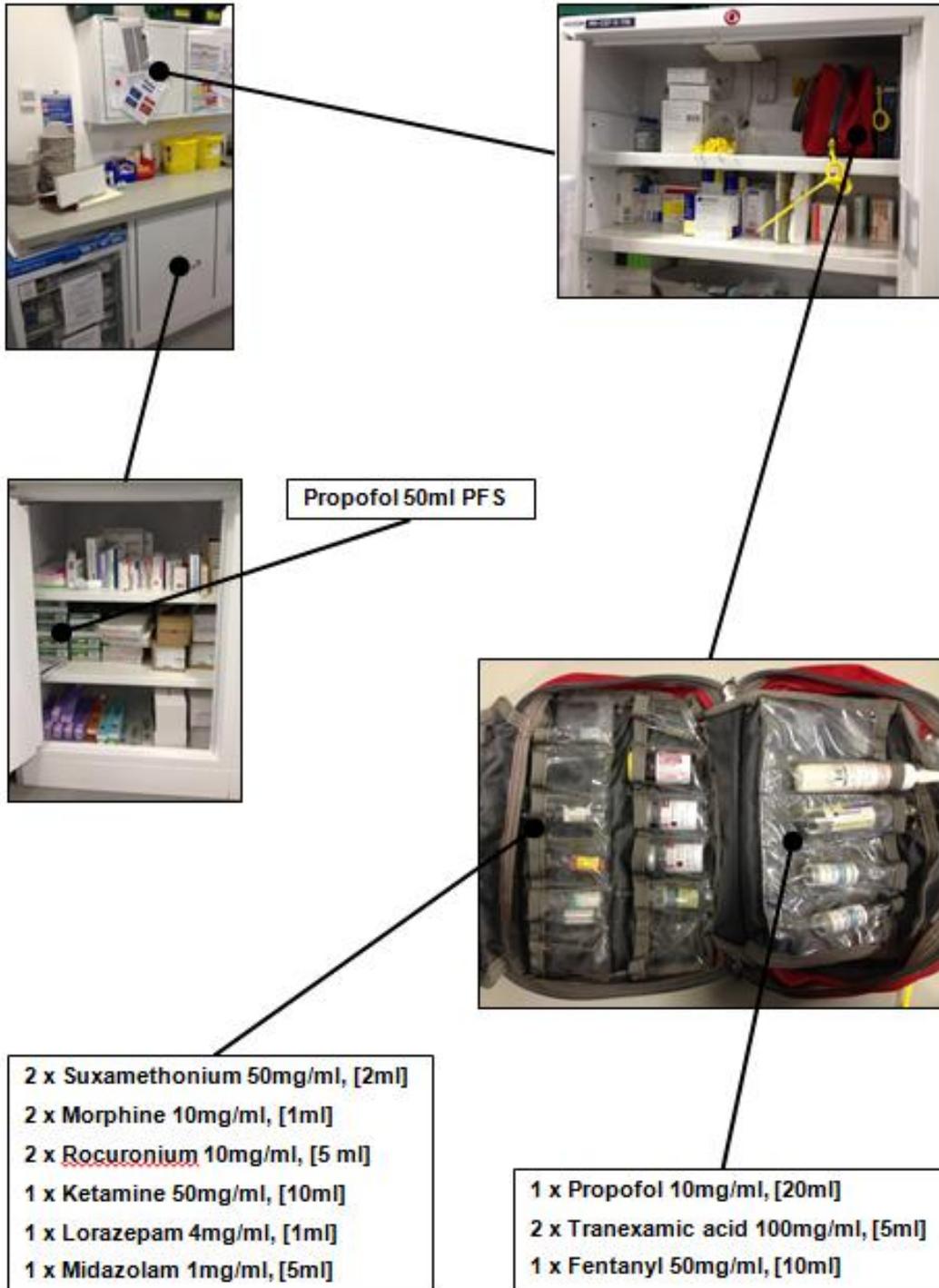
## Appendix B – “Resus 1” layout



## Appendix C – NBT Emergency Department RSI drug roll

The emergency department stock drugs for emergency anaesthesia in a “drug roll”.

The contents are listed and displayed below. The airway nurse will collect a drug roll and any other drugs specified from the drug cupboard(s) in Resus.



## Appendix D – Difficult airway

(Adapted from DAS unanticipated difficult intubation during RSI of non-obstetric patient)

