Section 4: Emergency anaesthesia

Edited by
Dr Carol Peden

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# Grade of anaesthetist and consultation for emergency cases

**Dr T Simpson**

### Why do this audit?

The skills of the anaesthetist should be matched to the physiological and pathological status of the patient. High risk patients (ASA 4 or 5) anaesthetised or operated on out-of-hours by junior trainees have a poor outcome. This may be due to inappropriate decisions to operate or failure of trainees to appreciate when senior help is required. Out-of-hours operating by trainee staff was criticised in the first *Who operates when?* NCEPOD report. The most recent report recognised much improvement but noted that out-of-hours operating still remains largely the province of trainee doctors.

### Best practice: research evidence or authoritative opinion

Junior anaesthetists should not anaesthetise cases involving:
- children under 20 kg
- ASA 4 or 5 patients
- isolated areas

Without direct supervision by a consultant or senior SpR except for procedures with which they are extremely familiar.

The decision to operate at night should involve a senior anaesthetist and should not be made by junior trainees only.

The supervising consultant and their degree of involvement should be documented on the anaesthetic record.

### Suggested indicators

- % cases of emergency surgery on children under 20 kg where the consultant or senior SpR with paediatric experience was present.
- % cases of ASA 4 or 5 in which consultant or senior SpR was present.
- % cases at night in which consultant or senior SpR was present or consulted.
- % cases involving procedures or equipment, at which consultant or senior SpR was present.
- % anaesthetic records with name and supervision level of consultant.

### Proposed standard or target for best practice

- 100% of emergency paediatric cases (< 20 kg) should have a consultant or senior SpR with paediatric experience present.
- 100% of cases of ASA 4 or 5 should have a consultant or senior SpR present.
- 100% of cases started after midnight should fit the NCEPOD definition for urgent or emergency status; a consultant or senior SpR should be present or have been consulted in 100% of cases. Auditors may decide to exclude some procedures with which both anaesthetic and surgical trainees are extremely familiar; though such exclusions and reasons for them should be explicit.
- 100% anaesthetic records should include the name and supervision level of responsible consultant.
### Suggested data to be collected
For all cases in above groups, the presence/absence of senior anaesthetist should be recorded. If not present, was case discussed with a senior and if not why not? Was the senior easy to contact? Who made the decision for the case to go to theatre?

### Common reasons for failure to reach standards
- Trainee anaesthetist feels senior help not required or fails to recognise severity of illness of patient.
- No daytime emergency/routine list time available.
- No senior help available.
- Poor communication in advance about situations requiring senior help or lack of guidelines for referral to senior colleagues.

### Related audits
- 4.2 – Timing of emergencies on the 24-hour clock
- 9.3 – Staffing for paediatric anaesthetic services

### References
Timing of emergencies on the 24-hour clock

Dr C H Laxton

Why do this audit?
Out-of-hours operating, particularly after midnight, may result in a poorer outcome for patients. Senior surgical and anaesthetic involvement is reduced. There are also implications for training in view of the reduction of junior doctors’ hours. NCEPOD has repeatedly suggested that all emergency patients should have prompt access to theatres, critical care facilities and appropriately trained staff, 24 h per day every day of the year; whereas non-emergency cases should be managed within the standard or extended working day. The British Orthopaedic Association has also recommended that all hospitals have daily, consultant-led trauma lists.

Best practice: research evidence or authoritative opinion
A daytime operating theatre for emergency surgery provides a significant reduction in operations after midnight. Delays in waiting for theatre are reduced and patients may be operated on at the clinically most appropriate moment. Emergency operating lists during the day can allow excellent supervision and, therefore, greater training opportunities. More complex cases are operated on in normal working hours, and operative experience is not diminished.

Suggested indicators
% of emergency cases performed between 0800 h and 1800 h.
% of emergency cases performed between 1800 h and 2400 h.
% of emergency cases performed between 2400 h and 0800 h.
% of cases started after midnight which are true emergencies as defined by NCEPOD (immediate life-saving operations, where resuscitation is simultaneous with surgical treatment).
Number of urgent or other non-emergency cases as defined by NCEPOD started after midnight with reasons.

Proposed standard or target for best practice
The suggested target of best practice should be that 60% or more of emergency cases are started between 0800 h and 1800 h, with 5% or fewer emergency cases starting between 2400 h and 0800 h.
100% cases starting after 2400 h should be classified as an ‘emergency’ as defined by NCEPOD or reasons for variance documented.
These targets may be redefined after the initial audit.

Suggested data to be collected
Time of the start and finish of all emergency procedures on the 24-hour clock.
Surgical specialty.
Operation type.
NCEPOD classification.
ASA grade of patient.
Reason for the procedure being performed after 1800 h or after 2400 h.
Grades of all surgeons and anaesthetists present.
# Emergency anaesthesia

## 4.2

<table>
<thead>
<tr>
<th>Common reasons for failure to reach standards</th>
<th>Decision making at junior level of surgeon and/or anaesthetist.</th>
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<tbody>
<tr>
<td></td>
<td>No daytime emergency theatre.</td>
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<td>No theatre availability due to lack of theatre staff.</td>
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<td>Over-running routine lists.</td>
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<td></td>
<td>No emergency anaesthetist or surgeon available during the day.</td>
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<td>Emergency theatre list fully booked – if this occurs regularly then more emergency sessions should be planned.</td>
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<td></td>
<td>Patients not ready for theatre during a daytime session (e.g. not starved, investigations not ready, not resuscitated).</td>
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## Related audits

| 4.1 – Grade of anaesthetist and consultation for emergency cases |

## References

|---|-------------------------------------------------------------------------------------------------------------------------------------|
## Adequacy of resuscitation before emergency surgery

Dr C J E Day

### Why do this audit?

The overall mortality of anaesthesia and surgery is low, but this conceals a much higher mortality rate in groups such as patients undergoing urgent or emergency surgery. Tissue hypoperfusion leads to organ failure and mortality rate increase as the number of organs failing increases.\(^1\) There is now growing evidence that adequate preoperative resuscitation of patients with a high risk of dying may improve outcome.\(^2\)

### Best practice: research evidence or authoritative opinion

Organ perfusion is difficult to measure in most organs. Organ function (e.g., urine output) will only indicate severe hypoperfusion. Heart rate (HR), BP, cardiac output (CO) or central venous pressure (CVP) do not indicate adequate resuscitation. Plasma lactate and mixed venous oxygen saturation (SvO\(_2\)) are probably the best objective measures of adequate resuscitation.\(^3,4\) Newer non-invasive cardiac output monitoring systems may become established in this context.

### Suggested indicators

\(\%\) patients presenting for emergency surgery who were adequately resuscitated in the opinion of the auditor and the anaesthetist. This should take into account all available information such as plasma lactate and SvO\(_2\). If these are not available then response to induction of anaesthesia and HR, BP and urine output may identify gross under-resuscitation.

### Proposed standard or target for best practice

100% patients should be adequately resuscitated prior to anaesthesia. In some circumstances this may not equate with full restoration of circulating volume and tissue perfusion. For emergency patients as defined by NCEPOD,\(^4\) full resuscitation may only be possible or desirable after the surgical procedure has been started (e.g., ongoing massive haemorrhage). NCEPOD defines emergency operations as immediate life-saving operations, where resuscitation is simultaneous with surgical treatment. Inevitably this will require a judgement to be made perhaps involving several people reviewing the same case.

### Suggested data to be collected

Plasma lactate and SvO\(_2\). If these are not available then HR, BP and the response to induction of anaesthesia can be used. Urine output may also be a useful indicator.

### Common reasons for failure to reach standards

- Inadequate preoperative assessment or monitoring.
- Unavailability of preoperative high dependency or intensive care facility.
- Insufficiently experienced staff involved in decision making and/or treatment.
Related audits

4.4 – Management of the emergency laparotomy
4.5 – Perioperative fluid status in peritonitis

References

Management of the emergency laparotomy

Dr C A Seller

Why do this audit?

To date there is remarkably scant evidence on the management of the emergency laparotomy and no gold standard exists per se.

Emergency laparotomies are being carried out in older, sicker patients, who are at greater risk of perioperative complications and have mortality rates greater than those presenting for elective surgery.1,2

The time for preparation of these patients may be anything from minutes to several hours and there are numerous challenges associated with the appropriate management of these cases. Elderly patients presenting for emergency laparotomy with significant co-morbidities and reduced physiological reserve will tolerate the anaesthetic/surgical insult poorly.3,4 Age and ASA status are significant predictors of survival.2

Best practice: research evidence or authoritative opinion

Timely access to effective surgery by experienced operators following efficient preoperative resuscitation should be the gold standard for the management of the emergency laparotomy.

Problems associated with management are delays in diagnosis and appropriate patient selection for emergency laparotomy.

Intraoperative monitoring to a level recommended by AAGBI is essential for the safe conduct of anaesthesia; there is substantial evidence that it reduces the risks of perioperative incidents and accidents.1

Fluid imbalance may result in significant morbidity and mortality. Early recognition and appropriate treatment of fluid imbalance is essential as intraoperative hypotension and hypoperfusion are major factors in postoperative mortality.1 Perioperative hypotension should be treated vigorously. Particular care is required when general anaesthesia is combined with epidural analgesia in the presence of sepsis.1

Epidural analgesia has significant benefits to the patient in the perioperative period6 and has been demonstrated to attenuate the physiological response to surgery and improve postoperative outcome.7 However, the sickest individuals are often too unstable, or the surgery too urgent to permit its use.

Temperature conservation helps to maintain body temperature and aids recovery.6 Hypothermia and its ensuing complications should be avoided.8

There is a need for improved postoperative care facilities in the UK, it has been shown that a significant percentage of patients who need ICU/HDU care do not receive it.1,3 Emergency laparotomies constitute a significant ICU/HDU case-load in an environment where there is already limited capacity.

Suggested indicators

Reasons for patient delay for attending theatre.

% patients during emergency laparotomy who were adequately resuscitated in the opinion of the auditor and the anaesthetist. This should take into account all available information such as heart rate (HR), invasive cardiovascular monitoring and urine output.

% patients receiving invasive cardiovascular monitoring.

Management strategies for treating intraoperative hypotension, e.g. fluids, pressors etc.

Management strategies for perioperative analgesia and hypothermia.

% patients requiring ICU/HDU who received it.

Outcome: 30 day mortality.
## Emergency anaesthesia

### Proposed standard or target for best practice

- 100% patients should undergo emergency laparotomy at an appropriate time following the decision to operate.
- 100% patients should have monitoring essential and appropriate for the safe conduct of the surgery and anaesthetic.
- Hypotension and hypothermia should be treated promptly and appropriately.
- If indicated and safe the patient should have an epidural sited for perioperative analgesia.
- 100% patients must have access to ICU/HDU care if needed.

### Suggested data to be collected

- Patient: age, ASA grade and co-morbidities.
- Perioperative values of the following: HR, BP, urine output, central venous pressure, haemoglobin, core temperatures.
- % patients with invasive cardiovascular monitoring.
- Methods for managing perioperative hypotension.
- Methods of heat conservation.
- Strategies for analgesia.
- Length of operation.
- Postoperative care – ward/ITU/HDU; planned/unplanned admission.
- Available/unavailable ITU/HDU bed.
- Outcome: patient discharge/death at 30 days.

### Common reasons for failure to reach standards

- Delay in access to timely surgery.
- Inadequate perioperative assessment.
- Inadequate perioperative monitoring (including invasive cardiovascular monitoring).
- For emergency patients as defined by NCEPOD, full resuscitation may only be possible or desirable after the surgical procedure has been started.
- Unavailability of postoperative high dependency or intensive care facilities.

### Related audits

- 4.3 – Adequacy of resuscitation before emergency surgery
- 4.5 – Perioperative fluid status in peritonitis

### References

Perioperative fluid status in peritonitis

Dr S Martindale

Why do this audit?

Perioperative hypovolaemia is associated with poorer outcome. Perioperative fluid management of the high risk surgical patient is a challenging area of clinical practice. Patients still arrive in the anaesthetic room with evidence of untreated hypovolaemia which may contribute to ischaemia and multiorgan dysfunction.1–3

Best practice: research evidence or authoritative opinion

Previous studies have emphasised the importance of optimal fluid provision to improve oxygen delivery and reduce complications.4–7 This involves the titration of fluids to physiologically relevant biometric end-points that can be monitored and responded to in the intraoperative setting. Hypovolaemia may be present despite normal systemic and filling pressures.2 Accurate dosing of fluid therapy in peritonitis requires monitoring of arterial blood pressure and blood flow. Maintenance of mean arterial pressure (MAP) above a critical organ perfusion level defined by reference to an individual’s preoperative MAP, should be a basic goal of any fluid resuscitation scheme. Non-invasive cardiac output monitoring may become more widely indicated both pre- and intraoperatively.

Suggested indicators

% patients who have the following prior to coming to theatre:
- intravenous infusion started
- MAP within ± 20% of premorbid MAP
- record of hourly urine output
- serial urea and electrolytes
- base excess and/or lactate.

% patients who have the following while in theatre and recovery:
- proper record of fluid infused
- central venous pressure (CVP) and/or pulmonary artery occlusion pressure (PAOP) measurement in response to fluid challenge
- MAP within ± 20% of premorbid MAP
- serial record of base excess and/or lactate
- record of adequate urine output.

% patients who required > 20 ml/kg/h in the first 30 min after induction in order to maintain MAP and/or CVP.

Proposed standard or target for best practice

The first ten indicators above should be true in 100% patients.

0% patients should require > 20 ml/kg fluid in the first 30 min after induction to maintain their systolic blood pressure.

There may be cases in which patients are extremely sick and do not meet all of the standards above despite large amounts of fluid transfused. This will be reflected by the ASA grade, but in addition the case should be discussed with the attending anaesthetist.
### Suggested data to be collected

- ASA grade.
- Operation type.
- Age and weight of patient.
- Presence of complete fluid record including urine output preoperatively and perioperatively.
- MAP prior to and at 5 min after induction.
- Type and amount of fluid given preoperatively, in the first 30 min after induction, and during the remainder of the operation.
- Preoperative electrolytes.
- Preoperative and intraoperative arterial blood gas.
- Use and timing of more complex cardiovascular monitoring, e.g. CVP, pulmonary capillary wedge pressure or cardiac output monitoring.

### Common reasons for failure to reach standards

- Difficulty in gauging and accurately replacing perioperative fluid losses because of unseen losses.
- Fear of pushing fluids too hard because of the risk of causing pulmonary oedema.
- Circulatory failure due to sepsis, and consequent difficulty in maintaining systolic blood pressure and urine output despite large fluid transfusion.

### Related audits

- 4.3 – Adequacy of resuscitation before emergency surgery
- 4.4 – Management of the emergency laparotomy

### References

Use of cell salvage in emergency surgery
Dr A M Cohen

Why do this audit?
Blood transfusion can be life saving. However, there is widespread acceptance that unnecessary transfusion with homologous (‘bank’) blood should be avoided wherever possible. The reasons for this include:

- recognition of the hazards of transfusion (infection, incompatibility, immunomodulation)
- increasing expense of blood
- increasing concern about scarcity of blood.

Transfusion of autologous blood should therefore be used in all appropriate circumstances. Cell salvage is the only realistic autologous transfusion technique available in the emergency patient. Cell salvage can also ameliorate potential difficulties of rapid red cell availability in the massively bleeding patient.

Best practice: research evidence or authoritative opinion
Several authorities recommend the use of intraoperative cell salvage in emergency surgery where expected blood loss is greater than 20% total blood volume (approximately 1 litre for most adults).1,2 Contraindications to cell salvage consist of circumstances which may result in a contaminated product for infusion, including sepsis and malignancy. Cell salvage can now be used in obstetric practice if a Leukogard or similar filter is included. These contraindications continue to be debated and, as such, are relative.

Suggested indicators
% of emergency procedures, with either predicted or actual blood loss greater than 1 litre, in which cell salvage equipment was used, excluding those where a (locally agreed) contraindication to cell salvage is present.

Proposed standard or target for best practice
In emergency procedures with no contraindication to cell salvage, where blood loss exceeds 1 litre, the administration of cell saved blood should approach 100%. In those procedures where predicted blood loss is greater than 1 litre, but actual blood loss is less than one litre, a reservoir for collection of blood for cell salvage should be used in most (if not all) cases, even though subsequent processing of blood may not be deemed necessary.

Suggested data to be collected
- Basic patient details.
- Operative details.
- Total measured blood loss.
- Was a cell saver reservoir used? Was it set up before or during surgery? Volume of blood collected.
- Was blood processed? What volume of processed blood was transfused? Was blood washed or unwashed before transfusion? Identity of cell salvage operator (nurse, ODP, anaesthetist etc).
- If cell salvage not used, then why not (equipment not available; trained operator not available; contraindication; other reason – state).
- Number of red blood cell (RBC) units cross-matched. Number of RBC units transfused intraoperatively.
- Preoperative and postoperative Haemoglobin.
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**Common reasons for failure to reach standards**
- Cell salvage equipment not available.
- Trained operative not available.
- Blood conservation deemed low priority.

**References**


Management of patients for fractured neck of femur surgery

Dr R M Grummitt

Why do this audit?

About 60,000 operations for fractured neck of femur are performed annually in the UK and this figure is predicted to double within 20 years. Most patients are female, over 80 years of age and many have existing cardiorespiratory disease. 30-day mortality is around 10%, higher in males, and has remained unchanged for 20 years. Factors known to affect mortality are age, existing co-morbidities and surgical delay. Regional anaesthesia may be beneficial. Cardiovascular or respiratory morbidity occurs in 21% and is associated with higher mortality.

Best practice: research evidence or authoritative opinion

All patients should be assessed and anaesthetised by senior staff.

Operation should be carried out within 24 h of admission during daylight hours.

Regional anaesthesia should be considered whenever possible.

Suggested indicators

% of patients:
- investigated adequately prior to surgery
- fluid resuscitated prior to surgery
- operation within 24 h of admission
- postponed by anaesthetist due to inadequate preparation
- death within 30 days of surgery
- incidence of cardiovascular or respiratory complications.

Proposed standard or target for best practice

100% patients should be adequately assessed and resuscitated prior to surgery.

100% patients should have operation during the day within 24 h of admission and be anaesthetised by experienced doctors.

< 5% patients should be postponed at short notice due to inadequate preparation.

< 10% of patients should die within 30 days of surgery. Reasons for individual patient mortality may be sought by case note review.

< 20% of patients should suffer major cardiorespiratory morbidity. Reasons for major morbidity may be specifically investigated if required.

Suggested data to be collected

% of patients with full blood count, urea and electrolytes and ECG available at preoperative visit.

Use of preoperative IV fluids.

Time of operation.

Anaesthetic technique and reason for choice.

Grade of surgeon and anaesthetist.

Incidence of postoperative chest infection and heart failure.

30 day mortality.
## Emergency anaesthesia

### Common reasons for failure to reach standards

- **Organisational:**
  - Insufficient time to operate within 24 h of admission.
  - Senior staff not available.

- **Clinical:**
  - Further resuscitation or treatment required prior to surgery.
  - Confused or demented patient unable to comply with recommended treatment.

### References


ICU/HDU admission after emergency surgery
Dr J Silsby, Dr F Reynolds

Why do this audit?
There is evidence of inadequate intensive care provision in the UK.1 After major surgery appropriate HDU/ICU admission may benefit certain patients. Scarcity of beds often leads to transfer between hospitals, delays in admission to HDU/ICU and providing ICU care in recovery wards.2 Patients already in HDU/ICU beds may face premature discharge to make beds available. When patients are prematurely discharged (which is more common at night), there is evidence that these patients are at higher risk of a poor outcome.3 Accurate data is required to quantify need and plan the best use of this expensive resource.

Best practice: research evidence or authoritative opinion
Risk of anaesthesia is associated with age, ASA grade, co-morbidity and surgical procedure undertaken.4 Department of Health (DH) guidelines may be used to identify patients who may benefit from life supporting interventions in ICU and lower risk patients needing monitoring in HDU.5

Suggested indicators
<table>
<thead>
<tr>
<th>% patients who have had emergency surgery and fit DH guidelines5 for HDU/ICU care who are:</th>
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<tbody>
<tr>
<td>▪ sent to a general ward and are not admitted to HDU/ICU</td>
</tr>
<tr>
<td>▪ inappropriately retained in recovery or theatre until an HDU/ICU bed is available</td>
</tr>
<tr>
<td>▪ transferred to another hospital for HDU/ICU care.</td>
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</table>

| % patients who have had emergency surgery who are discharged from HDU/ICU back to a general ward while still fulfilling criteria for HDU/ICU care. |

Proposed standard or target for best practice
The target for best practice should be that of patients who fit criteria for HDU/ICU care after emergency surgery:

| ▪ 0% should go to a general ward |
| ▪ 0% should be inappropriately retained in recovery or theatre while a bed is made available |
| ▪ 0% should be transferred to another hospital for HDU/ICU care unless to a regional unit for specialist care |
| ▪ 0% of patients discharged to the ward from HDU/ICU after emergency surgery should still fulfil criteria for HDU/ICU care. |
### Emergency anaesthesia

#### Suggested data to be collected
- Patients denied HDU/ICU care because of lack of beds. Not routinely collected in many hospitals, this can easily be collected from the recovery room records.
- Patients transferred because of lack of beds.
- Patients discharged from HDU/ICU prematurely (day/night split).

#### Common reasons for failure to reach standards
- Lack of appreciation of severity of condition; lack of use of DH guidelines
- Inadequate HDU/ICU resource.
- No general ward bed to discharge HDU patients fit to be transferred to ward.

#### Related audits
10.1 – Estimation of demand for critical care beds

#### References