

Anaesthesia at Role 4

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Abstract

The contribution of anaesthesia to the care of injured military personnel at Role 4 is described with particular emphasis on the working relationship between the Royal Centre for Defence Medicine and the civilian department of anaesthesia. The implications for operating theatre activity are discussed.

Philosophy and Infrastructure

The aims of anaesthesia at Role 4 may be described as a horizontal integration with the care given in operational theatres, the current focus of which is Op HERRICK. While easily stated this is not without its challenges.

The clinical care of military personnel was concentrated at Selly Oak Hospital (SOH) but in June 2010 this hospital relocated to the new Queen Elizabeth Hospital Birmingham (QEHB).

The Department of Anaesthesia of University Hospital Birmingham NHS Trust has 75 consultants, 30 of whom have intensivists duties distributed across four critical care units, containing a total of 100 beds. Military patients constitute just one per cent of the Trust's population but are resource intensive - arrangements exist with the Defence Medical Services and local NHS Trusts to manage increased numbers of patients during periods of heightened activity in theatres of conflict.

The new QEHB theatre complex has 23 in patient operating theatres and during busy periods up to four of these may contain military casualties. Surgical care is dominated by ortho-plastics, hand and maxillo-facial surgeons with the input of general and urology surgery as necessary. The medical care of every military in-patient is reviewed at a weekly military ward round, which is a multi-disciplinary meeting starting at 0800hrs. Involving as many as 20 NHS and Tri-service clinicians with support staff every military casualty has all aspects of their present and future progress considered and plans made for ongoing surgery or key investigations.

One of the authors (PW) participates in the first 'sit down' part of the ward round. The presence of a civilian consultant anaesthetist allows observations or comment to be made in relation to current clinical issues and to take note of any preceding or forthcoming events that have particular relevance for anaesthesia. In particular his presence allows prompt and ongoing liaison with the Defence Professor of Anaesthesia, the Army Subject Matter Expert (SME) in pain and the consultant pain nurse responsible for the military ward.

Patient admissions and theatre allocation

Injured personnel arrive in Birmingham via the RAF Critical Care Air Support Team (CCAST) or via routine aeromedical evacuation flights. By definition the first group require critical care and because of the rapid transit times from Afghanistan are still in the 'damage control phase' of their surgical journey.

For the anaesthetist back in the UK the process will often start with a phone call - a message that casualties are expected and will need further care that day or night. The surgical teams and trauma co-ordinators meet up in the 'bunker' - in reality a secure room in theatres - but with the addition of a series of white boards it has become a co-ordination centre (Figure 1). The new patients are on the boards with details summarised from the aeromed signals, injuries listed and teams allocated. On admission to QEHB CCAST patients enter the critical care unit (CCU) where an immediate assessment of their injuries and physiological status are made prior to continued stabilisation or immediate surgery - in most cases this is the '2nd look' following their resuscitative surgery at Role 3.

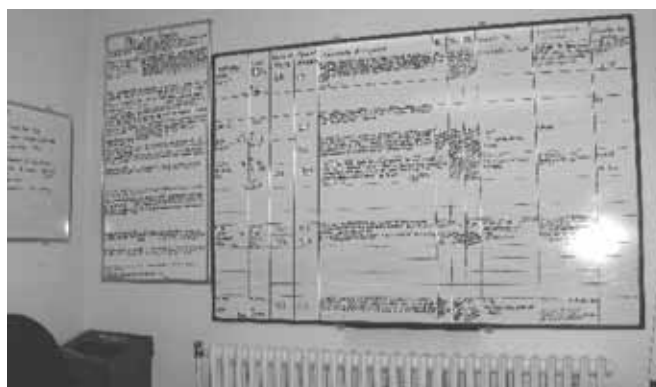


Figure 1. The 'Bunker'

Less severely injured aeromed admissions are admitted directly to the military ward, where an early review of their wounds is undertaken in the very likely event that within 2-8 hours they will also be in an operating theatre having their wounds inspected, and initial surgical management carried out. The theatre bunker is not only essential in the planning of 'casualty surges' but is indispensable in the daily planning of theatre lists for both military and civilian trauma patients. Planning meetings held daily at 1230 and 1630 help to ensure that the normal theatre activity is maintained.

Anaesthesia

For those patients admitted to CCU their initial visits to theatre are characterised by rigorous attention in continuing to manage the lethal triad of coagulopathy, hypothermia and acidosis. Their surgery takes place in a designated emergency theatre under direct consultant surgical and anaesthetic supervision. The early care is an extension of the process carried out at Role 3 and initial theatre trips are often time critical if control of the lethal triad is to be maintained.

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There is significant use of blood and blood products – in particular fresh frozen plasma which is administered with packed red cells, most often in a 1:1 ratio, as practised during their haemostatic resuscitation in Role 3 [1]. When necessary platelet and cryoprecipitate preparations are also utilised.

Critical care staff will undertake the changing of invasive monitoring and vascular access lines, however when the first surgical intervention is contemporaneous with the patients admission these may be undertaken in the operating theatre. At this time fine bore nasogastric feeding tubes are inserted and a feeding regime established, which in intubated patients continues uninterrupted. As their wounds evolve the concept of damage control surgery continues until such time as they are ready for transfer to the military ward and restorative surgery.

For the less severely injured aeromed admissions there is the occasional unexpected ‘surprise’ when the dressings come down under anaesthesia. These patients are cross-matched prior to surgery and it is made clear to all – and the junior medical staff in particular – that there is no such thing as ‘just a dressing change’.

The complex nature of the ballistic wounds means that as the patients condition stabilises multiple surgical interventions are the norm. Particular challenges for anaesthesia include establishing and maintaining intravascular access, pain control and avoiding prolonged perioperative starvation. Trust policy limits preoperative omission of solids to 6 hours, while clear fluids are permitted up to 2 hours before surgery. Anaesthetic considerations are summarised in Box 1, while Figures 2 and 3 reveal aspects of the surgical activity for all the military patients during February 2010, demonstrating some of the resource and clinical implications of managing these patients. The six casualties whose theatre time exceeded 10 hours are of particular note. One patient required 45 hours of surgery - his operative interventions continued in the following month. His situation is not unique – Table 1 details timings for three severely injured casualties treated in 2009.

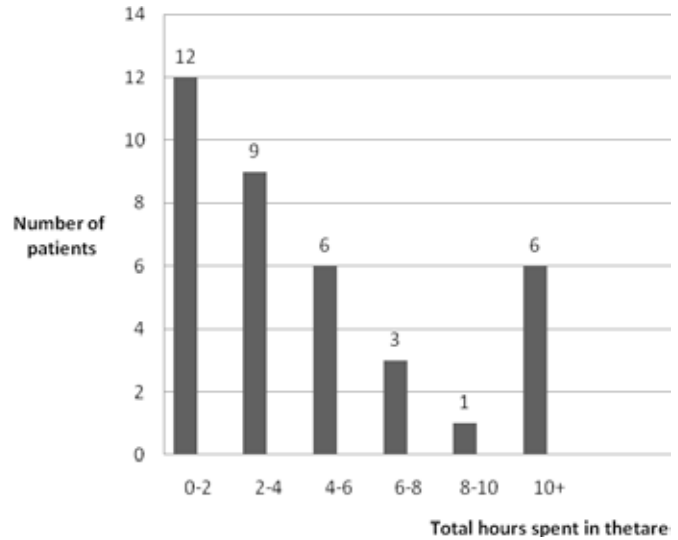


Figure 2: Total time required in the operating theatre for patients undergoing surgery in February 2010

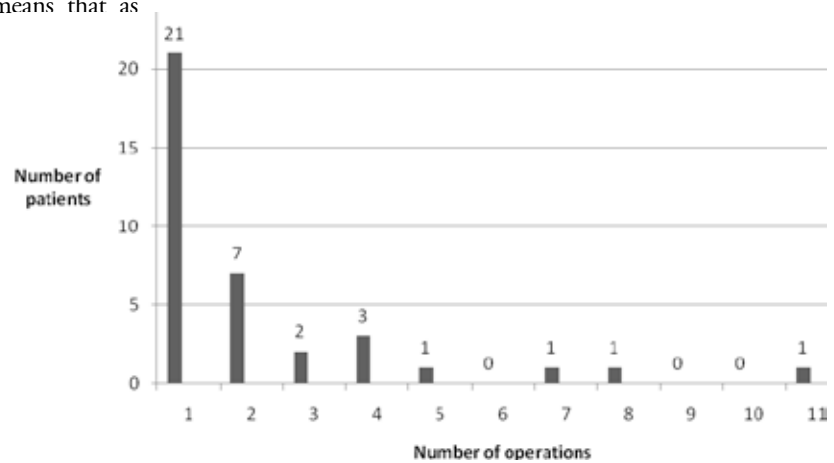


Figure 3: Number of surgical operations performed on patients undergoing surgery in February 2010

Critical Care

- Damage control surgery - manage the lethal triad: acidosis, coagulopathy, hypothermia
- Haemostatic resuscitation as per current CGO
- Surgery is time critical
- Sepsis – inotrope support
- Renal function - K+ monitoring
- Blast lung – complex ventilatory strategies may be required

Military Ward

- Recent transfer from intensive care – medically still challenging – high dependency
- Reconstruction – prolonged procedures
- Non opiate naive – high dose opiate background analgesia
- Practical conduct of PNB regional anaesthesia made harder by stabilisation and negative pressure dressings
- Epidural anaesthesia / analgesia not possible with unstable spinal fractures
- Accentuation of tourniquet effect
- Blood loss easily underestimated
- Temperature control

Box 1 Essential features of anaesthesia in Role 4 patients

| | A | B | C |
|--|--|---|--------------------------------|
| Number of operations | 27 | 11 | 9 |
| Total time in operating theatre (to nearest hour) | 75 hours | 33 hours | 17 hours |
| Time required per operation | shortest 1hr 15 mins longest 6 hours | shortest 1hr longest 8hrs 30 mins | shortest 1 hr longest 3 hrs |

Table 1: Time utilised for three patients (A, B and C). (Data kindly supplied by Professor K. Porter)

Postoperative Care

Critically injured patients are returned directly to the CCU. Non-critical patients are admitted to the recovery unit and returned to the ward when vital signs and analgesia are ensured. During awakening ‘flashbacks’ can be a problem requiring sensitive management from recovery staff.

Despite their 'non-critical' status many of the patients on the military ward can present challenging medical problems. In an effort to provide a standardisation of care there are a number of protocols that are followed, in to which anaesthesia has had an input. Maintaining vascular access is a frequent issue and consequently peripherally inserted central catheter (PICC) lines (inserted under local anaesthesia by interventional radiologists) are used for maintenance fluids and repeat anaesthesia.

Perioperative Analgesia

This is managed by the acute pain team, lead by a consultant nurse, supported by a number of military and civilian consultant anaesthetic colleagues, including the Army SME in pain. Considerable attention has been given to the pain management of military patients. This has been well described elsewhere in this journal [2] but since that publication there have been further advances, particularly in respect of producing clinical guidelines and increased audit activity.

A multimodal analgesic regime is prescribed for military patients and is described in detail in an analgesia document which is available on the Trust intra-net. Continued use is made of Peripheral Nerve Blockade (PNB) and epidural catheters sited in Role 3 [3] and where their removal is unavoidable replacement or substitution with a suitable alternative is often attempted. The department has two Sonosite (Sonosite Inc. Bothell, WA, USA) ultrasound machines available and a cadre of ultrasound trained anaesthetists who are available to assist in catheter placement. This has proved invaluable – particularly where complex reconstructive surgery to an upper limb has been undertaken.

Epidural analgesia has despite some initial reticence concerning the risk of infection proved beneficial in patients with bilateral leg amputations. In these injuries the use of femoral and or sciatic catheters can be limited by the high nature of the amputation sealed with bulky negative pressure dressings. In such a setting identification of complications associated with epidural regional analgesia can also be problematical – one practical development is the 'four and no more' rule, devised in an attempt to ensure that any patient suspected of having an epidural haematoma is MRI scanned within 4 hours of suspicion (Box 2).

Research and development

The contribution of anaesthesia to the patient's onward progress does not stand still. A series of acute pain team initiatives have simplified the management of regional anaesthesia. The promotion of regional techniques will strengthen in the near future with the introduction of a military pain fellow who will be attached to the unit for nine months at a time. This is one marker of success to drive the developing policy of regional anaesthesia for limb trauma as the default analgesic method of choice [4].

We will consider an epidural infusion to be established in 4 hours. The initial sensory level (if any) and motor function should be recorded in the patients notes (on an anaesthetic record). Thereafter:

1. An awake patient should be assessed 4 hourly
2. At each assessment the nurse should ask 4 questions:
 - i. Is there an increase in motor block?
 - ii. Is there back pain?
 - iii. Is there an increase in / development of a sensory level?
 - iv. Are there any other new abnormal/ unexpected symptoms i.e. bladder / bowel issues / increased pain in a previously comfortable limb.
3. Positive answer to any one of the 4 questions - call the anaesthetic SpR as per 'S4 pain call' agreement - while awaiting response - **STOP THE INFUSION.**
4. Repeat examination by SpR 4 hours after infusion stopped. If no improvement or further deterioration in neurology - patient needs **EMERGENCY MRI.**

Box 2: Diagnosis of Epidural Haematoma – The '4 and no more' Rule

The management of patients in the operating theatre increasingly resembles the clinical guidelines for operations (CGO) employed in Role 3, an example of which is the near patient monitoring of coagulation with thromboelastography. This is available within CCU and the operating theatre suite. It is anticipated that this initiative will have the potential for more accurate administration of blood products, particularly in respect of the use of FFP [5].

It is anticipated that the present system of care will continue to evolve as the QEHB matures with the constant aim of making the 8000 mile journey from Bastion to Birmingham as seamless as possible.

References

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