

A PERSONAL VIEW – 6 MONTHS IN A FOB

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Abstract

General Duty Medical Officers (GDMOs) may deploy within days of completing their Entry Officers Course thereby missing the pre-deployment training undertaken by the Regiment that they join. They can be attached to a unit that they have never worked with and it is often the first time that they have worked in isolation. There is a steep learning curve both medically and militarily. GDMOs have to rapidly learn about medical resupply, environmental health, casualty evacuation and be prepared for the ethical and moral decisions they will have to make, especially when treating local nationals. This article describes the experiences of GDMOs from 16 Medical Support Regiment in Forward Operating Bases on Operation Herrick 8 in Helmand Province, Afghanistan. It aims to show that with careful thought and preparation future GDMOs can overcome any shortcomings in their pre-deployment training or difficulties they may face when working in a FOB.

This article is based on a presentation by the author at the Clinical Training Day Conference at the Permanent Joint Headquarters in November 2008.

Background

Within a few weeks of finishing the Entry Officers Course at the Defence Medical Services Training Centre, the author deployed as the Medical Officer (MO) for Battle Group (BG) Northwest (5 Scots) in the Forward Operating Base (FOB) in Musa Qal'eh (MSQ) in Northern Helmand Province on OP HERRICK 8 (Figure 1). FOB MSQ was an austere environment with limited amenities and a tenuous supply chain (Figure 2); it controlled over 10 outlying Patrol Bases in the Area of Operations, equating to over 1000 soldiers.



Figure 1. The FOB at Musa Qal'eh

Apart from the MO, the medical team at MSQ consisted of a Medical Sergeant and 3 Combat Medical Technicians (CMTs) and the exceptionally demanding combat tour, during which the BG was engaged in constant contact with the enemy, presented the FOB medics with innumerable challenges. Logistically the Regimental Aid Post (RAP) had few assets on arrival and co-ordination of re-supply was difficult. Medically, three mass casualty incidents (following a suicide bomb against the Afghan National Police, an Improvised Explosive Device (IED) aimed at an Afghan Army patrol and a Taliban indirect fire incident)

provided a stream of local national (LN) and Afghan National Security Forces (ANSF) casualties. There was a steady, but lesser, stream of injured International Security Assistance Force (ISAF) soldiers and an outbreak of viral gastroenteritis which affected 43 people at its height. This gastroenteritis outbreak underlined the importance of health and hygiene management in an austere environment with limited stores, as well as the management and continuation training of medical staff across the battle group.

Working as a MO in a Forward Operating Base in Helmand Province is a challenge that will face many junior doctors in the forthcoming years. This descriptive narrative is drawn from the experiences of several MOs and CMTs from 16 Medical Regiment deployed during Herrick 8. It describes the lessons learnt during this tour at the FOBs and aims to offer pointers for subsequent deployed personnel.



Figure 2. The inside of the Regimental Aid Post

Lessons Learnt

Pre-deployment Training and Preparation

All medical personnel deployed to FOBs must have a thorough and extensive knowledge of the 9-LINER and MIST reporting systems (Figure 3). There were instances during Herrick 8 when ground call signs used the 9-LINER to categorise patients incorrectly, resulting in the Medical Emergency Response Team (MERT) being deployed inappropriately. The MIST handover

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9-LINE MESSAGE INCIDENT MANAGEMENT **3b**

9-LINE provides the information needed to request CASEVAC. A MIST message is given at handover between each successive level of care.

TEMPLATE	Explanatory notes	EXAMPLE
1.	1. Exact pick-up location	1 - Grid
2.	2. Radio freq and call-sign at pick-up site	12345678
3. A	3. Number of patients by priority: A + no. of urgent non-surgical (evac within 2hrs)	2 - 123.50
B	B + no. of urgent surgical (inc trauma: immediate evac needed)	M20
C	C + no. of priority (evac within 4hrs)	3 - A1
D	D + no. of routine (evac within 24hrs)	B2
E	E + no. of convenience (evac whenever possible)	D2
4.	4. Special equipment needed (eg. ventilator, extrication equipment)	4 - Nil
5. L	5. Number of patients by type: L + no. of stretcher cases (=litter)	5 - L3
A	A + no. of walking cases (=ambulatory)	A2
6. N	6. Security at pick-up site: N = no enemy troops	6 - E
P	P = Possible enemy troops	7 - Red
E	E = Confirmed enemy troops in area (use caution)	smoke
X	X = Currently engaged with enemy troops	8 - A
7.	7. Marking of pick-up point (smoke, panels, etc.)	D
8. A	8. Patient's political status (number not required) A - Coalition military	9 - Nil
B	B - Coalition civilian	All then
C	C - Non-coalition military	encrypted
D	D - Non-coalition civilian	as tactically
E	E - Enemy prisoners of war	dictated
F	F - High Value Target	
9.	9. NBC contamination N = Nuclear/radiological B = Biological C = Chemical	

THIS IS A NATO SYSTEM: PRIORITIES AT SERIAL 3 DO NOT FIT TRIAGE SIEVE SYSTEM

MIST MESSAGE INCIDENT MANAGEMENT **3c**

The MIST message is given at handover between each successive level of care

- M** Mechanism of injury
- I** Injuries or illness found or suspected
- S** Signs
 - Respiratory rate
 - SpO₂
 - Pulse rate (and rhythm if abnormal)
 - Blood pressure
 - Glasgow Coma Scale
- T** Treatment given

The MIST handover takes no more than 20-30 seconds
All members of the receiving team are to listen
If CPR is in progress or the airway is obstructed allow the clinical care at the next Role to start first

is essential when handing over patients to the MERT team. A hand written MIST report should accompany each patient, as it is this report that gives the clinicians at the Role 2E facility at Camp Bastion the most information about the casualty and allows them to prepare appropriately. The MIST report should follow directly after the sending of a 9-LINER.

All MOs should be prepared to deal with a large number of both medical and trauma paediatric cases. Possession of Advanced Paediatric Life Support skills with re-fresher training prior to deployment is advised. A working knowledge of paediatric drug doses and the mnemonic 'WETFAG' written on the RAP wall along with drug doses (Tables 1 & 2) was helpful.

Factor	Calculation
W Weight (kg)	2 x (Age + 4)
E Energy (J)	4 J/kg
T Tube (ETT) internal diameter (mm)	4 + (age/4)
F Fluid bolus	20ml/kg crystalloid
A Adrenaline	0.1ml/kg of 1:10,000
G Glucose	5ml/kg of 10% dextrose

Table 1. WETFAG

Body weight	Fluid requirement per day	Fluid requirement per hour
First 10kg	100 ml/kg	4 ml/kg
Second 10kg	50 ml/kg	2 ml/kg
Subsequent kg	20 ml/kg	1 ml/kg

Table 2. Paediatric Fluid Requirement

A working knowledge of tropical medicine and the diseases prevalent in the area of deployment is essential. Cases of malaria, leishmaniasis and shigella all presented to FOB MOs during Herrick 8. A tropical medicine textbook to use as a reference may be worth packing.

Medical Equipment

The current medical day-sack (both the 558 and 559 medical modules) were incompatible with Osprey Combat Body Armour and not adequately designed to allow easy access to all areas when treating casualties. Almost all medics operating on the ground had purchased their own and a Statement of Requirement has been submitted to address this. The medical bergens widely used in theatre were the Camelbak and Blackhawk models. At the start of Herrick 8 the majority of the FOBs were poorly prepared to receive paediatric trauma. An audit of paediatric kit in FOBs by 16 MR identified shortfalls which are being addressed. Most of the FOBs should now have adequate paediatric equipment but MOs should be prepared to improvise or 'adapt' equipment to make it more 'child friendly'

Medical Resupply of FOBs

During Herrick 8 supply of medical materiel to FOBs was conducted through Battle Group G4 personnel, which had its teething difficulties at the beginning of the tour. Medical resupply is highly specialised and works best when the G4 chain is familiar with medicines and equipment. 5 SCOTS overcame this problem by appointing a store man dedicated to dealing just with medical resupply requests. Medical resupply improved in the second half of the tour when the BG became familiar with medical requests, however, this process can be further improved by education of the BG G4 chains about medical resupply. This can be augmented by the involvement of the Medical Regiment's Quartermasters at Camp Bastion where extensive knowledge of medical materiel can be used to support the BG G4 chain.

Figure 3. 9-LINER and MIST Report Template (taken from Clinical Guidelines for Operations)

Medical Liaison Officers

Medical Group Liaison Officers (LOs) were embedded in all BGs and provided a greater situational awareness to the Med Gp planning and execution process, which allowed the Med Gp to have a better appreciation of the situation across Helmand and enable more responsive medical support. The Med LOs can also provide vital support to the medical officer in FOBs as long as they have a sound understanding of the running of a RAP, medical resupply and the Medivac process. They can often serve as the link between the BG ops room and the RAP when coordinating the evacuation of casualties which can be invaluable, especially when dealing with mass casualty situations as it means that the medical team can concentrate solely on treating patients.

MERT

The casualty should be disconnected from all monitoring equipment and oxygen cylinders prior to lifting the patient on to the transport helicopter (CH47) wherever possible, otherwise items such as D size oxygen cylinders and regulators and ended up back at the R2E in Bastion or Bhost hospital in Lashkar Gah (LKG). They can be difficult to locate and 'repatriate'. The coordination of casualty extraction worked best when the RAP had only one point of contact within the BG Ops room, such as the Tactical Air Control Party (TACP) who notified us when it was 'wheels up' from Bastion. This gives ample time to transport the patient to the Helicopter Landing Site (HLS) and if the patient needs further interventions, informing the TACP allows the CH47 to be held off before calling it in when the patient was actually at the HLS.

This ensured that the MERT was on the ground for the minimum amount of time. Difficulties arose when too many people were involved with MERT requests and when there was poor consultation with the medical staff on when they were happy to move the patient. This led to calling in the MERT when the patient was not stable or packaged correctly causing the CH47 to be on the ground for longer than necessary.

Moral and Ethical Decision Making

Local nationals will present at FOBs for medical care and difficulty ensues when they do not meet the strict eligibility matrix for casevac back to R2E at Camp Bastion. At the beginning of the tour the MERT would pick up critically ill patients who required life, limb or sight saving surgery irrespective of whether the injuries were directly caused by ISAF forces. The MERT would tend to casevac local national patients directly to LKG, but the most seriously injured usually went to Bastion. At times, the Bastion R2E was almost overwhelmed by LN patients and the eligibility matrix became stricter, resulting in seriously injured local nationals not being picked up by the MERT. Civil-Military Co-operation (CIMIC) allowed us to give the patient or family members a good will payment so that they could pay for a taxi to transport them to Bhost Provincial Hospital or the NGO Italian Emergency hospital in LKG. This is clinically far from ideal and emotionally difficult, but at least helps patients who otherwise would not receive any medical care at all. Future MOs should be aware of these moral and ethical challenges before being deployed and prepare for them accordingly. For example, it is incredibly difficult asking a patient who probably has severe internal bleeding to travel several hours by road knowing that they require surgery within two hours in order to survive.

Environmental Health

Environmental health (EH) issues are inevitably passed onto the medical staff. Although EH issues such as pest control are not a medical issue, future MOs should be prepared to offer

advice and incoming medical staff should make sure they have a copy of the Environmental Health Handbook which should be available in each RAP.

Operational Planning

The ground commander and the MO must understand where the MO is located to deliver best effect. It must be acknowledged the MO supports the population from the most advantageous position to suit the tactical and clinical situation. This is ordinarily where the centre of mass of his Population at Risk (PAR) is, rather than defaulting to the FOB location, where, at times, the minority of the PAR may be. It is imperative that the RAP should be fully involved in the planning of all operations. The MO and medical staff should be aware at all times where call signs are operating on the ground and what the casevac plan is. The medical staff should be consulted about the casevac plan in all situations. Being involved in the planning means that the MO can be sure that the best medical care is being afforded to each operation, for example, by providing extra CMTs to support a Company plus Op or mobilising the RAP for a BG Op.

CMTs

All our CMTs applauded any relevant clinical placements they received prior to deployment. Particular praise was given to Accident and Emergency placements, where they were able to get 'hands on' training. They felt this worked best when the medical practitioner they were 'shadowing' understood their clinical needs and skill set. Working with 'Amputees in Action' was invaluable as the scenarios they completed were ideal preparation for Herrick 8. It is the MOs responsibility to make sure that the CMTs working with them collate a detailed logbook of the clinical cases they see and the skills they acquire whilst on tour. A CMT portfolio is currently being developed which will make this easier and make sure that all CMTs have a clinical record of the work they have carried out.

Conclusion

This article mentions some of the 'lessons learnt' whilst on Herrick 8. It is not meant to be exhaustive but to provide some talking points and guidance for MOs who are due to deploy to FOBs in the future. All MOs will find that there is a steep learning curve as it is often the first time, that as a junior doctor, you have worked in isolation. Enthusiasm, team work, professionalism and retaining a sense of humour will enable it to be a truly rewarding experience.

References

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National Institute of Academic Anaesthesia Showcase 2009

The first Academic meeting in conjunction with the Department of Military Anaesthesia and Critical Care (DMA & CC) and the National Institute of Academic Anaesthesia (NIAA) took place at the Royal College of Anaesthetists in London on 21st September 2009. This meeting attracted delegates from as far afield as continental Europe and provided an opportunity for the Military to showcase research to a mixed military and civilian audience. Ultimately we aimed to explore opportunities for civil and military cooperation while also stimulating military personnel to participate in future projects.

Presentations were made in both oral and poster formats; topics presented orally included laboratory based research undertaken at Porton Down as part of the Combat Casualty Care programme and clinical research into pain, sepsis, coagulation, simulation, acute lung injury and resuscitation strategies following blast injury and are included below.

Military Difficult Airway Equipment Evaluation

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16 Air Assault Medical Regiment; Op HERRICK 8 and 10

Introduction: Military trauma patients often present some of the most difficult airway challenges through blast, fragmentation and penetrating trauma to the head, face and neck. Managing these cases using traditional methods and instruments can be challenging. The purpose of this in-theatre evaluation during Herrick 8 and 10 at the Role 3 Hospital at Bastion and during Medical Emergency Response Team missions was to identify novel airway devices that could potentially rescue a difficult airway scenario from deteriorating or even prevent it. **Methods:** Devices evaluated were Glidescope Ranger, GlideRite Endotracheal Tubes, Glidescope Stylet (Verathon Medical), McGrath 5 (Aircraft Medical), and Airtraq (Prodol). Evaluation was made utilising a bespoke questionnaire distributed to Anaesthetists, Operating Department Practitioners (ODP) and Emergency Physicians. 20 forms were completed. Anaesthetists and ODPs were also interviewed. **Results:** In terms of assembly, ease of insertion and of obtaining a glottic view, there is little to choose between each device. Differences become pronounced when comparing clarity of glottic view, speed of intubation and ease of intubation. The Glidescope and Airtraq are comparable but the McGrath performs poorly and was not favoured by the majority. For both video laryngoscopes, a rigid preformed stylet is obligatory. The majority of intubations were conducted utilising the GlideRite ET tubes which were considered to contribute significantly to success. **Recommendations:** For in-hospital use: Glidescope Ranger with adult and paediatric batons with single use blades 1,2,3,4 and rigid stylet. For prehospital use, Airtraq Regular and Small. The GlideRite ETT is recommended for all intubations.

Simulation in Defence Anaesthesia

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Introduction: Simulation in Healthcare is gaining popularity and was recently recognised in the Chief Medical Officer's annual report[1]. Within the DMS, the Surgeon General has proposed that collaboration with the NHS be explored. Previous surveys of civilian anaesthetists revealed support for simulation[2]. This survey investigates the opinions of serving UK Military Anaesthetists on the use of simulation in general and in pre-deployment training. **Methods:** An electronic questionnaire was

piloted and sent via an email link to all military anaesthetists on the database of the Defence Consultant Adviser in Anaesthesia. A reminder was sent after 28 days. Open questions underwent qualitative content analysis. **Results:** The response rate was 83/185 (45%). 81/83 agreed with the concept of simulation and 62/83 had attended a simulation course. Only 38/82 had experience with team resource management. Important features of simulation included scenarios that were realistic (25/83), specific to the military setting (47/83) and specific to military equipment (36/83). 42/82 had used a simulator to instruct. 74/77 would be prepared to train on a simulator prior to deployment with trauma (19/55) and massive haemorrhage (15/55) being requested most frequently. **Conclusion:** Simulation in healthcare is welcomed by many in Defence Anaesthesia providing the environment is realistic, scenarios are specific to military operations and candidates have experience with deployed medical equipment. Simulation has a role in pre-deployment training exercises such as HOSPEX and in delivering the Military Anaesthesia Module. Issues to address are agreed standards of delivering courses with credible faculty and methods of summative assessment.

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A force protection audit: Anti-malarial chemoprophylaxis following evacuation from Afghanistan.

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Introduction: Malaria is endemic within Afghanistan, and Helmand province is a seasonal high risk area. UK Forces entering Afghanistan between 01 March and 01 November are prescribed standard anti-malarial chemoprophylaxis (AMC) of Proguanil and Chloroquine. These should be commenced one week before entry and continued for four weeks post deployment. Failure to comply with AMC increases the risk of malaria[1]. In 2007 an audit showed that 50% of casualties evacuated to the Role 4 received an appropriate AMC prescription[2]. This study was designed to re-investigate the AMC prescribing practice for Op Herrick casualties. **Methods:** The study was performed at the Role 4 in Birmingham between 01 Mar and 31 May 2009. The aeromed signal log was used to retrospectively identify casualties evacuated to the Role 4 from Afghanistan. Inpatients are admitted onto the prescribing information communication system (PICS), which records all prescribed and administered drugs. Using PICS a retrospective AMC search was performed on each casualty for: Proguanil,

Chloroquine, Doxycycline, Mefloquine, Atovaquone and Malarone. **Results:** 122 casualties were evacuated to the Role 4, of which 61% (74) were admitted onto PICS. Only 4% (3) of these inpatients received appropriate post-exposure AMC: one received Proguanil and two received Doxycycline. Further investigation revealed that the Doxycycline was prescribed for uro-genital infection. No allergy or sensitivity to AMC was recorded. **Conclusions:** Awareness of the need to continue with AMC following evacuation to the Role 4 remains poor. There is no benefit from starting AMC at the Role 4 if casualties have been non-compliant whilst deployed. On arrival in the UK, all casualties must be questioned about their AMC compliance and post exposure medication prescribed on PICS.

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Have I had Blood? We do not tell patients!

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Background: We have in place a trust wide policy of written consent for transfusion of blood and blood components. In order for this to be informed consent, patients must be told about the indications, risks and benefits and of any alternatives available. There are no guidelines however, on whether a patient should be informed that they have, at any point actually received a transfusion of blood products. In view of the potential risks from transfusion we decided to ask the question, 'Are patients told about any blood products they have received during their hospital admission'. **Methods:** During one month in 2008 we audited 32 paediatric and adult cardiac surgical patients by interview technique. We asked three simple yes/no questions. 'Did the patient know if they had been transfused?', 'Had they been informed if they had or had not been transfused?', and 'Should they be told about transfusions received?' **Results:** A total of 32 patients or carers were interviewed, 23(72%) adults and 9(28%) children. 24(75%) had received a blood product transfusion. 9(37.5%) patients knew they had been transfused. Only 4(17%) of our transfused patients were formally informed that they had received blood products. Out of a total of 32 patients, 28 thought that they should be told if they had received a transfusion or not increasing to 100% of our patients after potential risks were outlined.

Conclusion: Despite the potential immediate and future risks from transfusion our audit shows that we are still not advising patients when they have been transfused. We are not legally bound to inform but ethically are we not obliged?

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Does Placing Two Prehospital Fluid Warmers in Series Increase Output Temperature Significantly?

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Introduction: Battlefield resuscitation of major haemorrhage remains the highest priority of the Defence Medical Services [1]. Coagulation disorders are temperature-dependant and related to enzyme dysfunction, platelet dysfunction, and increased fibrinolytic activity [2]. Coagulation is strongly inhibited by hypothermia. Heat loss during the resuscitation phase is primarily caused by administering cold fluids. We tested the new prehospital "Buddy Lite" system from Belmont. **Methods:** We connected two "Buddy Lite" fluid warmers in series and infused fluids at 3.2°C (packed red blood cells / thawed plasma) and at 21°C (reconstituted lyophilised plasma), at 1m and at 300mmHg pressure through a 8.5Fr Swan introducer. We then measured the input and output temperatures.

Results:

Fluid	Input Temp (°C)	Flow Rate (mls/min)	Output Temp (°C)	
			Single	Double
Blood Product	3	180 (Gravity 1m)	14	20.1
Blood Product	3.2	280 (Pressure bag 300mmHg)	12	18.4
Lyophilised plasma	21	180 (Gravity 1m)	31	37
Lyophilised plasma	21	280 (Pressure bag 300mmHg)	26.5	32

Conclusions: In clinical situations where a patient requires blood products quickly (traumatic PEA, massive shock), fluid warming can still be undertaken at high flow rates (1 unit of blood in less than 60 seconds) in the prehospital environment (MERT, role 1) with two Buddy Lite systems.

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Completing The Cycle: Re-Audit Of Pain Management During RAF Aeromedical Evacuations From Op Herrick (Afghanistan) Jan To June 2009

CL Flutter, MJ Ruth

Objectives: The aeromedical evacuation (AE) of injured and ill personnel provides the link in the chain between the field hospital and continuing care in the UK. Pain management should be considered an essential aspect of patient care during transfer and should integrate with that provided both in the field hospital and the receiving UK hospitals. Earlier audits in this area have led to the implementation of an aeromed pain management algorithm, dedicated documentation and training. This audit evaluates the effect of these measures. **Methods:** A retrospective analysis of 212 case notes from AE transfers between OP HERRICK and the UK were reviewed. Patient type, pain scores, analgesia provision and qualification of escorts were recorded. **Results:** Improvements were demonstrated from the 2008 data in the numbers of patients

with unsatisfactory levels of pain (moderate or severe) at all stages of their aeromedical transfer (26.7% to 15.1%), especially those with battle injuries (43.8% to 18%). Improvements were also demonstrated in analgesic provision. Those with unsatisfactory levels of pain were predominantly orthopaedic (89%) and without battle injuries (57%). Sixty percent were accompanied solely by nursing escorts and the minority had an epidural (2.7%) or continuous peripheral nerve block (13.5%). **Conclusions:** The results are encouraging but these improvements need to be sustained. Patients at risk of developing unsatisfactory levels of pain in flight should be identified as part of their assessment by the AE team at the discharging hospital and their pain management should be optimised prior to transfer. Pain may be exacerbated in flight and they should be provided with adequate rescue analgesia. AE escorts should be appropriately trained to manage their pain effectively and must document all assessments and interventions.

Acute Lung Injury Model

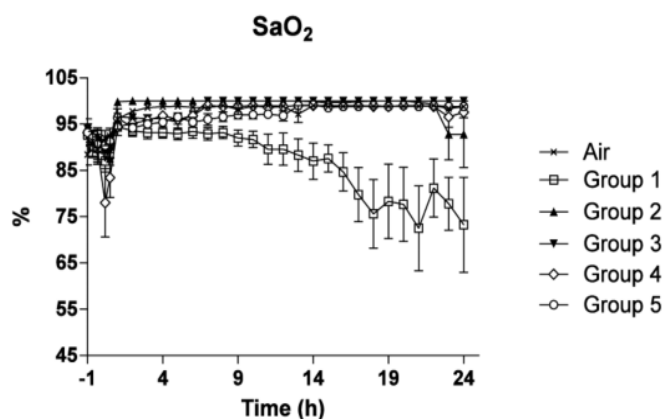
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Ninety years ago the use of chlorine and phosgene gas in warfare caused over 90,000 deaths and an estimated 1.2 million casualties.

The recent use of chlorine gas against an unprotected civilian population in Iraq highlights the need for continued research into medical countermeasures against poisoning by these toxic industrial chemicals. Phosgene remains one of the most lethal chemicals produced in large-volume, with the potential for widespread accidental or intentional exposure. Such a release into a densely populated urban area would result in mass casualties with local health care systems being rapidly overwhelmed. There is a need, therefore, for evidence based treatment guidelines to inform the clinical management of such cases. We have established a reproducible model of acute lung injury (ALI) following inhalation of phosgene using a terminally anaesthetised, instrumented large pig model. This model allows the clinical assessment of ALI over 24 hours using human intensive care equipment and, therefore, the assessment of treatment strategies, both intensive (protective ventilation; oxygen supplementation) and commercial off the shelf (COTS) drugs (steroids; β -agonist; Furosemide). Our primary outcome measures were survival to 24 hours and blood oxygenation. Both protective ventilation and oxygen supplementation strategies significantly improved survival (from 30% to 100%) and blood oxygenation. The COTS treatments were not effective against our primary outcome measures. Supportive treatment strategies requiring intensive care facilities were effective at improving survival following phosgene exposure. These are labour and cost intensive and there remains a need for pharmacologic interventions which could be given much earlier in the time course of the injury. So far we have investigated single treatments only but planned future work will look at combining treatments in a more clinically relevant manner as well as looking at the longer term outcome of the intensive strategies.

Changes in SaO₂ in animals exposed to phosgene alone (Group 1) (n=10) (Ct 2416 ± 110 mg min m⁻³) or phosgene followed by treatment with O₂ (n=5 per group) (FiO₂ 0.80 immediately (Group 2) or 6 hours (Group 3) post exposure; FiO₂ 0.40, 6 (Group 4) or 12 hours (Group 5) post exposure). Mean ± SEM. All treatment groups had significantly increased SaO₂ from 7-24 hours compared with Group 1 (p<0.05).



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Sugammadex, a new selective relaxant binding agent: a review of its activity in phase 3 studies

A Bom

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Sugammadex is a modified γ -cyclodextrin, which reverses the effects of the steroidal neuromuscular blocking agents (NMBAs), rocuronium and vecuronium, by encapsulation. Phase 3, active-controlled studies show that sugammadex rapidly reverses moderate (administration at reappearance of the second twitch) or deep (at 1-2 post-tetanic counts) neuromuscular blockade (NMB) (Table) [1], providing the opportunity to maintain NMB at any desired level throughout surgery. In contrast, the acetylcholinesterase inhibitors allow only slow recovery when administered during deep levels of NMB (Table).

Sugammadex 16 mg/kg also rapidly reverses NMB when administered 3 minutes after rocuronium 1.2 mg/kg, with a favourable recovery time when compared with spontaneous recovery from suxamethonium 1.0 mg/kg [2]. Mean (SD) time from administration of NMBA to recovery of the first twitch response to 10% was 4.4 (0.7) minutes in the rocuronium/sugammadex group versus 7.1 (1.6) minutes in the suxamethonium group (P<0.001) [2]. The combination of rocuronium, which allows rapid onset of NMB, followed by rapid reversal with sugammadex, may offer a new opportunity for use in rapid sequence intubation.

Sugammadex provides rapid and reliable reversal from any depth of NMB induced by rocuronium and from moderate and deep NMB induced by vecuronium.

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The studies described in this abstract were sponsored by Schering-Plough.

NMBA dose (mg/kg)	Sugammadex dose, mg/kg	Median (range) time to TOF 0.9	Neostigmine dose, µg/kg	Median (range) time to TOF 0.9
Administration at T2 after last NMBA dose (moderate blockade)				
Rocuronium 0.6	2	1.4 (0.9-5.4)*	50	17.6 (3.7-106.9)
Vecuronium 0.1	2	2.1 (1.2-64.2)*	50	18.9 (2.9-76.2)
Administration at 1-2 post-tetanic counts after last NMBA dose (deep blockade)				
Rocuronium 0.6	4	2.9*†	70	50.4†
Vecuronium 0.1	4	4.5*†	70	66.2†

*P<0.0001 vs neostigmine; †geometric mean data presented

Time (min) to recovery of the train-of-four ratio to 0.9 (TOF 0.9) in studies evaluating sugammadex versus neostigmine reversal of moderate or deep NMB [1]

Battlefield Analgesia 2009 – ten years on

De Mello WF, Hemmings V

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A revised evidence based version of the 1999 [1] guideline on advanced battlefield analgesia by non-anaesthetists is provided (see Table 1). Analgesia is considered only after the Primary Survey of BATLS 2008 has been satisfied. The analgesics from intravenous/oral paracetamol through to intravenous/opioids based on a 0 to 3 pain assessment score. The addition of a neuropathic pain guideline would encourage the early use of co-analgesics (amitriptyline, pregabalin, lidocaine 5% plaster). We propose that this revised guideline on advanced battlefield analgesia could be used by medics, nurses or doctors who may not be trained in acute pain management, but who are called to provide analgesia on the battlefield.

1. Hocking G, de Mello WF. Battlefield analgesia – an advanced approach. JR Army Med Corps 1999; 145:116-8

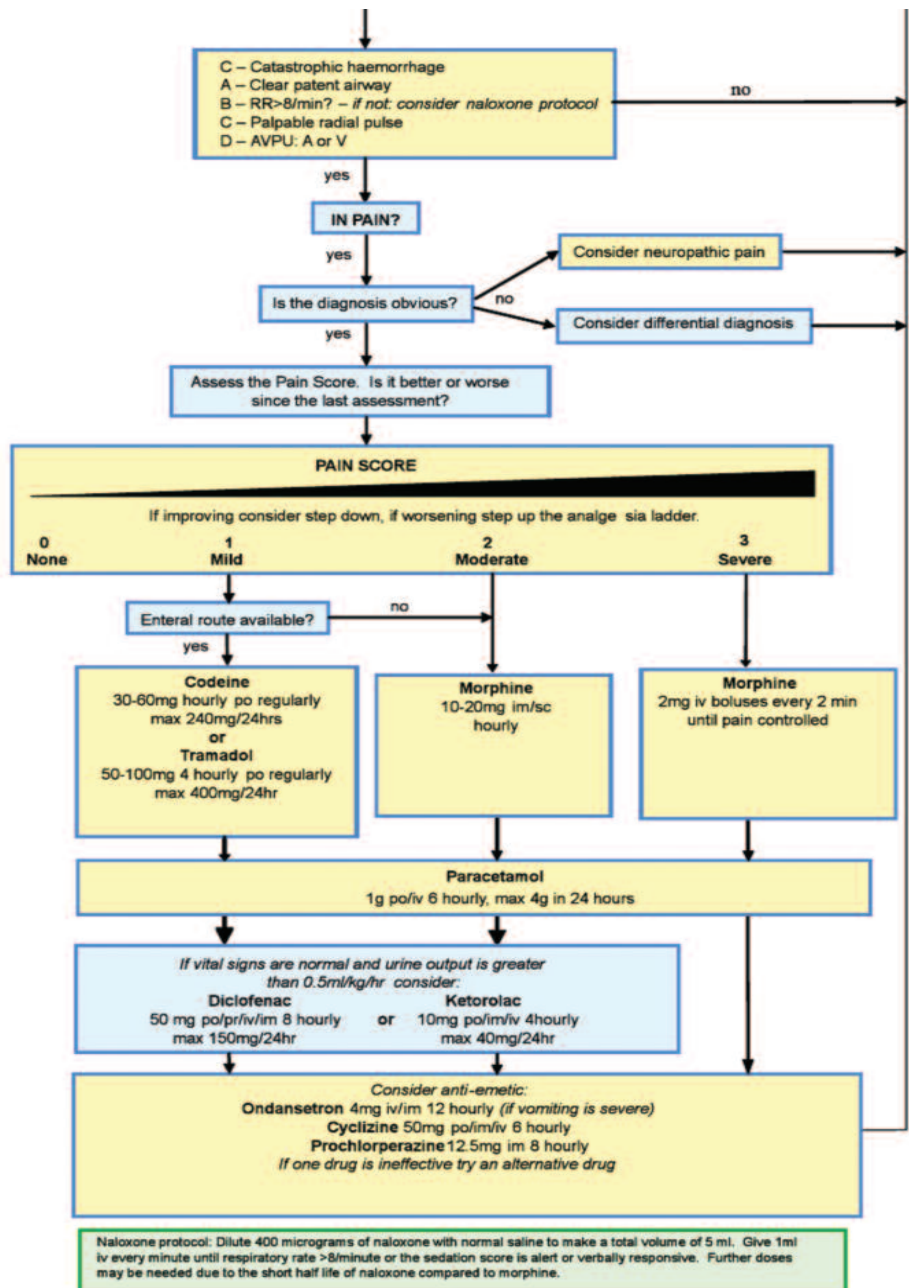


Table 1: Revised 2009 Battlefield Advanced Analgesia Guideline