

MILITARY INTENSIVE CARE PART 1. A HISTORICAL REVIEW

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Introduction

At time of writing the UK Defence Medical Services have two deployed field hospitals (Iraq and Afghanistan) providing care to UK forces, contractors and, depending on the setting, local military and civilians. Both these hospitals include an intensive care unit.

Military critical care faces challenges not encountered in routine civilian practice. The resuscitation protocols and procedures described in this journal will present a well resuscitated patient to the ICU but further care will be needed. Managing the critically injured patient is expensive in resources and resource management is a significant issue at the end of a long logistic chain. This and other constraints have shaped the development of military critical care but it shares many developmental milestones with civilian practice. This paper presents some of the cross roads in critical care development.

Critical Care Development.

The development of military and civilian ICU is closely linked and can be traced through previous conflicts and other events.

Early Twentieth Century Conflicts

WWI

In 1918, Captain WB Cannon (US Army Medical Corps) in his seminal paper – *The preventive treatment of wound shock* - described the physiology of shock including (perhaps) the first description of SIRS; secondary shock due to ‘toxicity’ causing increased capillary permeability. He also described the use of crystalloids and colloids, including hypertonic colloid solutions, given orally, rectally or intravenously until there was sufficient urine output. In the field hospitals of the first World War, “shock wards” were established to care for the seriously injured. They were staffed by specially trained medical officers and nurses and Canon recommended that these staff should be free from other duties that might distract them from this task. (It must be noted that advanced respiratory care was not provided in these units) [1].

WW2

During World War II, shock wards were re-established and there were significant advances in blood transfusion and resuscitation. The concept that surgery was part of resuscitation was developed. The use of antibiotics helped save many lives. There were problems with logistics: a decision had

to be made during the Africa campaign as to whether to give the limited supply of antibiotics to the wounded or those with venereal disease. The latter got them thus returning people to duty and maximising the fighting strength of the Army.

Korea

The utilization of the helicopter during the Korean War resulted in improved evacuation times. Another step forward was the introduction of the Kolff-Brigham kidney. Major Paul Teschan, a doctor with the U.S. Army took one of the machines from the Walter Reed Army Hospital to a MASH (Mobile Army Surgical Hospital) unit in Korea where, under difficult field circumstances, he reduced mortality in military casualties with renal insufficiency [2].

Social Changes

The evolution of intensive care in the UK has been reviewed by the Intensive Care Society [3] Ridley et al note that major social changes took place after WWII including the establishment of the National Health Service in 1948. Hospitals became larger in the 1950s and 1960s, clinicians more specialised and expertise in managing the severely ill developed.

Copenhagen Polio Epidemic

In 1952 there was a major polio epidemic in Copenhagen. During this Professor Ibsen gathered all the patients suffering from respiratory insufficiency into one area (the hospital Gym), and used endotracheal intubation followed by an immediate tracheostomy, to allow prolonged Intermittent Positive Pressure Ventilation (IPPV). This was provided by medical students using a bag system. Although by modern standards this could be described as primitive, many of the features of this system hold true for a modern Intensive Care Unit (ICU) [4].

Respiratory Care Units

Over the next few years more conditions were treated using this technique and more respiratory care units were established. Treating respiratory insufficiency meant patients survived to reveal underlying illnesses such as sepsis [5].

More Recent Conflicts

Vietnam

This was the first major conflict after IPPV had become normal practice in civilian hospitals and saw the introduction of Bird respirators to field hospitals resulting in improved survival for those with pulmonary insufficiency [6]. Patients were not concentrated in one area but were managed in various locations as the evacuation hospitals were not established for an Intensive Care Unit. None the less, at 24th Evacuation Hospital a system of ‘graduated nursing’ was put in place, with all the sickest patients in one area of the unit, looked after by a dedicated staff [7].

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After the experience in Korea, a Renal Unit was dispatched to Saigon (629th Medical Renal Detachment) although it only treated 24 patients, all of whom had developed renal failure several days after wounding. The ARF seen so often in previous conflicts occurred less frequently, possibly due to the rapid evacuation of casualties to hospital care, and the widespread use of intravenous fluids in aggressive resuscitation. This did bring its own problems, with 'wet lung' ('Da Nang Lung') being a cause of death amongst the severely injured [8,9].

Vietnam was considered an atypical conflict since the Americans had total air supremacy. This allowed rapid evacuation to Field Hospitals which had become static, were provided with more robust accommodation than tentage, and were able to develop over time the capability to meet clinical need.

The Cold War

In the 1970s and early 1980s the bulk of the UK Armed Forces were focused towards the threat of a conflict in Europe. During the 1970s it was estimated that a conflict between the Warsaw Pact and NATO forces would generate 32,000 UK casualties during an 8 day period. The premise of 'hold and treat' of the 1950s was revised into an evacuation chain that extended from the front line back across the English Channel to National Health Service and UK military hospitals.

Military hospitals had two functions: the provision of treatment that would permit a casualty to return to duty immediately or after a short period (72 hours), and the provision of the minimum treatment necessary to enable the casualty to survive evacuation to the next line of hospitals. Hospital documentation would only have been initiated for surgical cases, thereby avoiding an administrative task for the low priority casualties (for whom the basic field medical record was to be used). The wards were designed for post-operative cases only, but the anticipated number of casualties precluded the establishment of separate intensive care facilities.

Oman 1970s

In 1972 a British Army Surgical Team deployed to Salalah [10], to support the troops providing assistance to the Sultan of Oman's Armed Forces. Initially the unit had no intensive care, but by 1975 an Intensive Care ward had been set up with ventilation and invasive monitoring facilities, after a case where lack of these contributed to a patient's death.

Falklands War 1982

When Argentine forces invaded the Falkland Islands in the South Atlantic on 2 April 1982 there was no formal planned evacuation chain to provide medical support to such a conflict. The main medical challenge was the organisation of an evacuation chain over a distance of almost 8000 miles.

Due to the expeditionary nature of this campaign, lightly equipped medical units were sent ashore, without intensive care facilities but supported by Royal Naval assets offshore. One of the major difficulties was locating casualties and prompt evacuation to a medical unit was therefore difficult. 43% of casualties waited more than 10 hours from wounding to surgery [11].

Where the force landed at San Carlos there was only one building: this was converted into an Advanced Surgical Centre and was bombed with the loss of life, but continued in use with two unexploded bombs in its roof. Life-saving surgery was performed before the patients' transfer to hospital ship.

As the land operation moved East, Advanced Surgical Centres were established at Fitzroy (including 2 surgical teams) and Teal Inlet. Each Field Surgical Team consisted of a surgeon, anaesthetist, resuscitation officer, 4 operating theatre technicians and a clerk. They were supported by a holding

section of a medical officer and 18 nurses and medical assistants to provide nursing and postoperative care [12].

The Advanced Surgical Centres were designed to provide basic surgical care for those patients who would have died if their operation had been delayed until transfer to the hospital ship. SS Uganda, a cruise ship, was requisitioned and converted into a dedicated hospital ship. SS UGANDA did have an intensive care unit with 20 beds and 5 ventilators although at times Royal Marine bandmen were used to ventilate patients by hand.

1990-91 Gulf War

The 'First' Gulf War (1990-1991) for the liberation of Kuwait was a huge expeditionary deployment of UK forces from bases in the UK and Germany to Saudi Arabia, a very different response to that planned to meet the threat from Eastern Europe. The war was characterised by armoured warfare fought over open spaces with few constraints to movement. There was a continual perceived threat from nuclear, biological and chemical weapons.

Over a period of 3 months a complete medical service of 4 hospitals, a hospital ship, 5 field ambulance units and numerous smaller units were deployed. Much of the equipment for the medical services had been orientated towards the short, intense war scenario of the Cold War with the consequent large casualty predictions that limited medical care to evacuation and transport back to UK. Furthermore scales of equipment and drugs had been designed in the 1940s with little revision to accommodate the needs of modern medicine or casualties resulting from disease.

The huge distances and mobility of the anticipated land operations dictated the layout of the medical plan. Casualties were evacuated to Regimental Aid Posts (RAP) and then to dressing stations. The field ambulance dressing stations were reinforced with field surgical teams to provide expert surgical resuscitation to the most seriously injured casualties.

32 Field Hospital was established in its forward position on 20 January 1991. It comprised a reception/triage area, an eight-bay resuscitation area, a minor treatment area, an eight-table operating theatre and 200 beds in 4 wards. This was supported by a pathology and radiology departments [13]. 32 Field Hospital used its recovery areas and operating theatres for post operative ventilation, resulting in prolonged recovery stays and delays to operating [14].

Casualties were then moved by C130 to the 600 bed General Hospitals; '33' at Jubail and '205' at Riyadh. After further treatment they were flown back to UK in VC10s or Tristars.

The Balkans: Croatia and Bosnia

The UK Army Medical Services were initially involved in the Balkans through the provision of a field ambulance unit to support a UN peace-keeping force in Croatia in 1992. The civil war expanded to Bosnia and the UK provided an armoured infantry battalion with supporting logistics to assist the UN in the movement of food and other humanitarian relief. A composite medical unit was formed from 1 Armoured Field Ambulance and a Medical Support Team (MST) from 22 Field Hospital. The MST was established in prefabricated huts in Vitez to provide surgical cover to the UK force.

A second MST deployed in July 1995 to Divulje Barracks in Split. Here they set up a resuscitation department, an operating theatre and a 20-bed ward, supported by laboratory and X-ray services.

The signing of the Dayton peace accord, resulting in the deployment of a large number of troops in a NATO led operation to implement the agreement. The UK deployed a number of medical units.

A small hospital facility was established in Sipovo under command of 16 Armoured Field Ambulance. A number of visits to other nations' military field hospitals were undertaken during this deployment exposing the extensive use of expandable, containerised medical shelters that seemed to offer some advantages compared to the tent-based systems in use in the British Army. By 1996 Sipovo was becoming the focus for hospital support. This was augmented with a containerised surgical unit (made by GIAT industries) in 1997 which included an ICU. In 1999 the hospital became a multi-national facility (Multi-national Integrated Medical Unit, MIMU) with staff being provided from UK, the Netherlands, Canada, Czech Republic and Iceland. This facility provided a service more aligned to that provided by a District General Hospital in UK than a 'Cold War' field hospital and closed in 2004.

The Balkans: Kosovo

The situation in Kosovo deteriorated in 1998. This was followed by a series of diplomatic and military initiatives leading to the deployment of land forces in 1999. The UK initially deployed a composite medical unit based on 2 Armoured Field Ambulance that included a surgical resuscitation capability from 23 Parachute Field Ambulance with an intensive care capability.

In June 1999, 22 Field Hospital was deployed to support the insertion of a peace implementation force from Macedonia to Kosovo. The unit set up a 50 bed field hospital in a disused prison in Lipljan. This facility was redeployed to the British military sector in Pristina in November 1999 and remained in use until the middle of 2001 when the UK DMS and US Army agreed to combine Role 3 medical resources in the US base at Camp Bondsteel.

Structural Changes

The Ministry of Defence conducted several reviews of expenditure during the 1990s to achieve savings from the reduced threat of a war in Europe as a result of the break-up of the Soviet Union. These included Options for Change, Front Line First and the Defence Costs Study (DCS) [15].

DCS 15 closed all independent military hospitals managed by the Army and created two regular field hospitals (33 and 34 Field Hospital) in addition to 22 Field Hospital.

A major review of the equipment and training of Intensive Care units in the late 1990's put modern ITU into UK Field Hospitals and it was used to good effect during the Balkans campaigns as outlined above.

The Second Gulf War - Iraq 2003

The Gulf conflict in 2003 saw the first deployment of large Field ITUs by the British Army. 34 Field Hospital set up near the front line in Iraq with 4 level 3 beds and 4 level 2 beds, and a team of 4 ITU consultants supported by dedicated ITU nurses and physiotherapy.

202 Field Hospital in Kuwait had a similar capability, with the addition of a further 4 ventilated beds saved in reserve for their attached neurosurgical team.

The RN provided off shore maritime support through RFA ARGUS and her embedded Primary Casualty Receiving Facility (PCRf). The PCRf provided the capability of 10 ICU and 20 HDU beds.

The intention was for the field hospitals to provide up to 48 hours of level 3 treatment as a maximum (Level 3 patients need monitoring and support for two or more organ systems, one of which may be basic or advanced respiratory support) during which time the RAF Critical Care Aeromedical Support Team would evacuate the patient to the UK. This worked well for the British Serviceman, but there were difficulties with Iraqi casualties and those of other nationalities and hence many patients stayed for longer (15).

Summary

ICU is a product of clinical developments, technological advances, social changes and history. Military ICU reflects all of these as well as deployed operational experience. Having considered how military ICU got to where it is, the next article will consider current practice.

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