AUSTRALIAN MILITARY MEDICINE

August 1998

Volume 7 Number 2

Australian Military Medicine Association

Statement of Objectives

The Australian Military Medicine Association is an independent, professional scientific organisation of health professionals with the objectives of:

- promoting the study of military medicine
- bringing together those with an interest in military medicine
- disseminating knowledge of military medicine
- publishing and distributing a journal in military medicine
- promoting research in military medicine

Membership of the Association is open to doctors, dentists, nurses, pharmacists, paramedics and anyone with a professional interest in any of the disciplines of military medicine.

The Association is totally independent of the Australian Defence Force.

Volume 7 Number 2, August 1998

Editorial

Maintaining ADF Health Services readiness

Russ Schedlich

At 1030 am on Tuesday, 5 May 1998, the larger of the Navy's two tankers, HMAS WESTRALIA, was proceeding out of the Gage Roads off Perth on the way to a SE Asian deployment, with 98 men and women looking forward to a variety of work and play over the following six weeks. A major fuel leak occurred in one of the main engines, deep in the bowels of a cavernous engine room space. Repairs were started. Five minutes later, a second leak occurred on the other engine, but this time fuel sprayed onto hot machinery and ignited into a huge fireball. At the time this occurred, there were eight people in the engine room. Four escaped, three suffering significant smoke inhalation. The ship was sent to emergency stations, and its emergency medical organisation of two medical sailors and six advanced first aiders was mobilised. Faced with a total of seven casualties, they worked as a team for the next three hours stablising and treating the injured, and preparing for the management of the missing. Assistance was provided by medical staff from HMAS STIRLING and a number of ships in company. A further two casualties were sustained during the firefighting effort, and all five injured were flown to hospital in Perth. The four missing, sadly, died.

In August 1998, a submarine earthquake occurred just north of the coast of Papua New Guinea, causing slippage of the nearby ocean surface. A tsunami was generated, which crashed into the shore as a 10 metre wave, devastating the towns and villages, and causing many deaths and injuries. A request to the Australian Government for assistance came, and within 48 hours, an ADF surgical team was mobilised and despatched to Vanimo. Over the next twelve days, this team treated the injured, often dealing with gangrenous wounds presenting many days too late, with the consequent tragic need for amputation.

These two incidents highlight the high state of readiness that is expected of the Defence Health Service (DHS), both in dealing with the ADF's own disasters and those of the Region. This level of readiness is required not only of formed units (ships, etc), but of the Service as a whole, to achieve the mobilisation of a number of disparate units and individuals so as to come together to provide a comprehensive emergency service. These calls come out unexpectedly and almost always at short notice, and every time the Service delivers. They come out as taskings additional to those already under way - the surgical presence in Bougainville continues, as do other health support activities of the ADF.

There has been a major shake up of the DHS in the last twelve months, occasioned by the Defence Reform Programme which has, as its aim, the redirecting of Defence effort to the combat and combat support roles, and the outsourcing of as much as practicable of the other roles of the ADF. Unfortunately, as so often seems the case in peace time, health services are seen by many to be in the latter group. Thus, much of the support area of the DHS is about to be closely scrutinised for civilianisation or commercialisation. Following the inevitable downsizing, we will have to rely more and more on our Reserves.

The Reserves provide us a valuable and loyal service, there is no doubt, but they do have their limitations. Their availability is constrained by personal and employment factors, often meaning they are not available at short notice or for long periods of time. This creates significant complications in deploying them, with delay in initial deployment occurring and frequent rotation being required. This adds to the cost and complexity of operations. Further, in the case of some categories of medical assistants, there are no civilian equivalents outside the Permanent Forces.

In these times of change and downsizing, we must ask ourselves how long are we going to be able to rely on the voluntary contribution of our Reservists. Will the ADF be embarrassed at some time in the future by not being able to respond to requests for the provision of health support? Will we have to go the UK way of compulsory call out of Reservists when surge capacity is needed? Will at some time in the future we be facing the declining capability that has forced the UK Defence Forces to seriously re-evaluate recent changes to their Health Services?

Only time will tell

Reference:

1. Warden J. Military medical services to be restored *BMJ* 1998;317:166 (18 July)

President's Message

Nader Abou-Seif

There are many aspects of health care, medicine and support to those in distress, which are taken for granted. These are not considered when one thinks of the resources that are necessary for the day to day management of various situations. Military Medicine falls into this category. The general community and, indeed, often the military community may underplay it's importance. When, however, a situation arises when support in the field, or care for those in distress is required then it is expected. Expected at short notice and at it's most efficient even in the most isolated or desperate situation.

Recent events in Papua New Guinea have once again showed the capability of those practitioners of this under-rated specialty to which we, as members of AMMA, are committed. Congratulations on a job well done should go to those who responded in difficult circumstances in support of those affected by the tsunami which struck PNG last month.

In my last 'President's Message', I wrote of passion and its role in the practice of Military Medicine. Once again, I am moved to respect those whose commitment stands out in an age when more and more people consider their work to be defined by 'working hours'. Recently while trying to arrange a Tri-Services Meeting in Melbourne, the response from a number of people to the information that the meeting was on was "It looks like a good meeting, but it's on a week-end." This is a challenge to us. How can we kindle a passion? Is there a way around this? Can we encourage people to bring a stronger commitment with them? I would like to think that the thirst for knowledge, the need to share other people's experiences and to discuss the ways current issues are affecting us all could never be sated. I ask you all for your help, suggestions and advice on how we can do it better. I have seen the quality and abilities of our membership and I hope that AMMA has the resources to provide a focus for ongoing development and fellowship within the Australian Military Medicine community.

I would like, also, to farewell and welcome a Patron of the Association. First of all, to farewell Air Vice Marshal Graeme Moller, and to thank him for his patronage of the association during his period as Surgeon-General. We, as an association, have been fortunate to have as our first three Patrons, members who have supported the establishment and growth of AMMA. I welcome our new Patron, Major-General John Pearn, who has recently been appointed as Surgeon General. I look forward to AMMA's continued growth under his patronage.

This issue of the journal is the last before this year's National Meeting and Annual General Meeting. I look forward to seeing as many of you in Sydney in October as possible for what promises to be a fascinating and varied program and an opportunity to renew and develop friendships among our colleagues in the Military Medicine community.

New Senior Medical Appointments for the ADF

On 5 June 1998, the Chief of Defence Force, General John Baker, announced the promotions of four senior Reserve Medical Officers to date 1 June 1998. The promotions were to fill senior medical positions created under the Defence Reform Programme.

Colonel John Pearn of Queensland was promoted to the rank of Major General and appointed as Surgeon General Australian Defence Force.

Captain Peter Habersberger of Victoria was promoted to the rank of Commodore and appointed as Assistant Surgeon General ADF (Navy).

Colonel Robert Atkinson of South Australia was promoted to the rank of Brigadier and appointed as Assistant Surgeon General ADF (Army).

Group Captain Bruce Short of New South Wales was promoted to the rank of Air Commodore and appointed as Assistant Surgeon General ADF (Air Force).

New Patron for AMMA

As a result of the changes to the higher structure of the ADF Health Services and the retirement of Air Vice Marshal Graeme Moller, the new Surgeon General, Australian Defence Force, Major General John Pearn has accepted the Association's invitation to become its Patron.

Major General Pearn is a Professor of Paediatrics at Queensland University and is a prolific writer on military medicine, particularly its history.

AUSTRALIAN MILITARY MEDICINE ASSOCIATION
7TH ANNUAL SCIENTIFIC CONFERENCE
16-18 OCTOBER 1998
SWISS-GRAND HOTEL, BONDI BEACH, SYDNEY

Call (03) 6247 1850 to register
Email: paulaleishman@trump.net.au

Original Article

Understanding weapons effects. A fundamental precept in the professional preparation of military physicians[1]

A.M. Smith, R.F. Bellamy[2]

Short of participation in medical support of actual combat, there is no optimal educational medium to facilitate competence in the precepts of wartime casualty care. Consequently, there have been periodic calls for "military specific curricula" to help orient medical officers to the differences between the unique science of military medicine, and the practice of medicine in a peacetime military. Ultimately, any such military specific course of study should facilitate its students' understanding of the medical impact of weapons systems. The insights gained will foster a greater understanding of the entire spectrum of casualty care systems in war.

Whereas the profession of combat arms has traditionally focused its attention upon the relationship between weapons, ammunition, and their targeting, a concurrent appreciation for the impact of munitions upon human targets, and the wounding process, would benefit military physicians. Empowered with a better understanding of the physical impact of specific weapons, physicians can better comprehend the rationale for their tactical utilisation. Further endowed with a knowledge of the special requirements for management of resulting combat injuries, medical officers may logically develop a greater appreciation for medical logistics needs as well. This level of professional insight will permit them to competently assess the intrinsic assets and liabilities of the casualty treatment continuum supporting operational plans, and thereby assist combat commanders in becoming better informed "consumers" of medical care services.

Weapons Effects

The military value of contemporary armaments is primarily adjudged by their effectiveness in producing physical trauma. Through the combined destructive forces of projectiles, blasts and incendiary agents, the judicious employment of today's combat weapons may create a diverse and widely distributed spectrum of personnel damage. Rationally, however, the goal of modern warfare is not necessarily to annihilate an adversary, but more directly to reduce an enemy's capability for further resistance. Whether through intimidation or physical damage, the military usefulness of weapons must ultimately be judged in terms of their contribution to this objective. Indeed, the proportion of non-lethal injury may have an even greater impact on operational success than the absolute number of deaths among an opponent's forces.

Observations on the fear that men develop relative to specific weapons are unfortunately quite limited. While the extent to which military effectiveness correlates with the potential for generating fear is a concept not well understood, history suggests that its role can occasionally be pivotal. For example, whistles were added to some aerial bombs during World War II specifically for psychologic effect. Perhaps the best example of a weapon system designed for the purpose of intimidation was the German

---

1 Smith AM, Bellamy RF. Understanding weapons effects. A fundamental precept in the professional preparation of military physicians. *Aust Mil Med* 1998; 7(2):4-10

2 A.M. Smith, BA, MD, FACS, Dip Am B Urol
Captain Arthur Smith, MC, USNR, is Clinical Professor of Surgery and Clinical Professor of Military and Emergency Medicine at the Uniformed Services University of the Health Sciences, Bethesda, Maryland. He is also Professor of Surgery (Urology) at the Medical College of Georgia, Augusta, Georgia.
R.F. Bellamy, BA, MD, FACS, Dip Am B Th Surg
Colonel Ronald Bellamy, MC, US Army (Ret) is Military Medicine Editor, Textbook of Military Medicine, Office of the Surgeon General of the US Army, The Borden Institute, Walter Reed Army Medical Centre, Washington DC. He is also Associate Professor of General and Thoracic Surgery and Associate Professor of Military and Emergency Medicine at the Uniformed Services University of the Health Sciences. Between 1979 and 1985, he served as Director of Combat Casualty Care Research at the Letterman Army Institute of Research, The Presidio, San Francisco, California.
Address for Correspondence: Professor A.M. Smith, Division of Hospital and Clinics, Section of Urology, Medical College of Georgia, Augusta, Georgia, 30912-4050, USA

"Stuka" dive bomber of World War II. When diving on its target, a wind driven siren attached to its wing was activated. Known as the "Jericho Siren", an ear-piercing shriek was produced which was loudest just before the bomb exploded. Likewise, some of the appeal of chemical weapons lies in their presumed psychologic effects as well. Except for chemical agents, however, the design of pre-nuclear weapons was not significantly influenced by psychologic considerations.

The character of modern weapons is ever changing, however, and considerable advances have been made in broadening and increasing their effectiveness. Furthermore, the principles of their use have been expanded. Given the often unique constitution of each tactical situation, these improvements, together, may provide an increasingly greater variety of options for operational commanders. Regardless of the methods employed, the time honoured axiom remains valid: increasing the proportion of wounded among adversary forces is a very effective "force reducer".

Effective antipersonnel weapons cause not only multiple casualties in a population of troops, but may also inflict multiple wounds in each of their affected targets. In evaluating the potential effectiveness of a new exploding missile, the principal question to be asked is: "How far does it go in expanding the *fragmentation envelope*?" Rephrased in the context of intensity of injury: "How can more hits be produced without reducing the summation of damage - by creating too many minor hits and too few major hits?"

From the perspective of weapons designers, exploding missiles carry a far greater probability of hits than solid projectiles of the same size. From a medical standpoint, a weapon producing multiple random wounds is more likely to injure a critical organ than a single injury caused by an aimed missile such as a rifle bullet. Furthermore, by creating greater numbers of casualties among opposing forces, many with multiple wounds, the enemy force will not only be weakened, but the logistic needs of their medical services will be increased. This may often evolve at the expense of the combat arms, since more enemy logistical resources and personnel will need to be withdrawn from offensive operations to care for the injured and facilitate their evacuation.

Weapons Effectiveness: The Tactical Impact

As a tactical situation changes, differing degrees of injury intensity may vary in their military impact. In one situation, where enemy capabilities for replacement are not great, as in the attack on an isolated strong point, weapons capable of only transient impairment of efficiency, although affecting a substantial part of the enemy force, may be of greater tactical value than weapons causing more permanent wounds to a much smaller number. Alternatively, in another situation, a premium may be placed on lethal or permanently disabling effects. Stated otherwise, are 10 casualties, losing 10 days each, equivalent to 100 losing one day each? The dilemma may be re-defined as weighing immediate tactical advantage against a long term effect upon manpower.

The expenditure of ammunition by various military forces has been reasonably well recorded. It has thus far proven impractical, however, to relate a given expenditure of munitions to a given number of enemy casualties, much less relate them to a particular type of weapon. Nevertheless, penetrating wounds of the body surface have historically caused 90% of combat trauma injuries in land warfare (in the civilian sector, where blunt injuries predominate, penetrating wounds comprise only 25 to 50 per cent of trauma cases). Blast, burns, and blunt trauma account for the other 10% of injuries experienced in land combat. [In naval warfare, the predominant form of injury is thermal. During the Falklands war, for example, 34% of British naval casualties at sea were burns.]

In most conventional land wars, wounds caused by fragment penetrations have historically outnumbered bullet wounds. Wounds from explosive fragmentary munitions have accounted for between 44 and 92 percent of all surgical cases. Under circumstances where fragments predominate, and weapons cannot be aimed at particular body regions, missiles tend to be randomly distributed in space, and hits are a function of the frequency and extent to which the various regions of the body are exposed. Today, even terrorists may utilise explosive fragmentation devices that are as sophisticated as those used in modern warfare.

Under certain warfare conditions the ratio of fragment to bullet injuries may reverse. During combat at close quarters, where ambush and sniping are frequent, directed fire may increase, and hits upon vital areas may be more frequent. These include: military operations in urban environments; light infantry actions - such as Vietnam where 50% of the casualties had bullet wounds; low intensity warfare; counter-insurgency actions; and jungle warfare. These differences in bullet versus fragment distributions are important to recognise, since bullets are more likely to kill their victims than fragments from explosive munitions such as artillery shells or grenades (33 versus 10 to 20 per cent).

As a result of the ongoing perfection of a class of anti-personnel munitions known as fuel-air explosives (FAE), future wars will probably have even higher proportions of casualties with primary blast injury as well. In addition, if larger numbers of troops serve in armoured

fighting vehicles, the proportion of burns in land warfare will also increase. Due to exposure of crew members to battle damage fires, burns have constituted an important component of wounds seen in the protracted armour operations of the past (20 to 40 per cent). Armour casualties may experience more than burn injuries, however. They are also prone to the combined impact of blast injury, toxic gas inhalation, and tissue wounds from both the penetrators of anti-armour munitions and the shrapnel fragments emanating from the defeated armour.

The nature of war wounds is always prone to continuing change with the development and use of new weapons systems. Innovations such as futuristic laser-charged particle beams and high powered microwaves, for example, are now just beginning to demonstrate their impact as well.

Explosive Fragmentation Munitions: What Are They?

The prototype of the exploding munition is the shell. Originally composed of a hollow metal casing, explosive powder was packed within, along with a fuse for ignition. Depending upon the shell design, various kinds of fragments, projectiles, chemicals, or other agents were dispersed upon explosion. In older designs, fragments of the shell casing created most of the damage. Subsequently, artillery forces incorporated shrapnel to increase the antipersonnel effectiveness of explosive munitions. A shrapnel ball contained explosive as well as many small lead spheres (the shrapnel) packed in resin. Blasted out of the shell at detonation, the lead spheres greatly increased the number of projectiles from the explosive munition. Subsequently, more specialised modern exploding munitions evolved, such as hand grenades, rockets, bombs and mines.

Depending upon the size and design of the explosive munition, several thousand metal fragments may be produced upon detonation. Fragments radiating from the detonation site may retain their wounding potential for up to several hundred metres. Such munitions can also injure through blast and burning effects. A casualty close to the point of detonation of an explosive weapon, although extensively injured by the mutilating effects of a high concentration of fragments, may also sustain blast and burn injuries. Most of these casualties die immediately from multiple high energy transfer wounds, while some die from traumatic amputations caused by the dynamic blast over-pressure. The majority of the surviving wounded, however, these generally located distant from the explosion site, will have multiple, relatively low energy-transfer wounds caused by fragments of variable size with low impact velocities. At one British Army Hospital during the 1991 Gulf War, 81% of the casualties suffered from fragment wounds. An average of nine low energy transfer wounds were inflicted per patient!

Two antipersonnel fragment families exist; one older and "random", and the other modern and "improved".

Older "Random" Fragmentation Munitions

The older fragment family is the product of detonation of artillery shells and large calibre mortar bombs. Natural fragmentation of the projectile casing results in fragments varying in size from dust particles to metal pieces weighing more than 1 000 grams. Initial fragment velocities may be very high (as much as 1 500 to 1 800 metres per second), but decline rapidly because of the poor aerodynamic characteristics of their irregular shape. Some fragments have a limited effective range and poor tissue penetrating power. Others, as a consequence of heavy mass and high kinetic energy, may penetrate deeply and cause massive damage. Because of their irregular shape and ragged edges, fragments produced by random fragmentation munitions often cause wounds with jagged shape due to the drag of the projectiles within soft tissues.

Improved Fragmentation Munitions

On future conventional battlefields, the majority of wounds will likely result from "improved" military fragmentation munitions (IFMs). The development of these newer improved munitions required a design in which the "shell" broke up into fragments smaller than those associated with random fragmentation munitions. In reality, the size of a fragment that will cause a casualty is surprisingly small - several hundred milligrams only! One of the earliest examples of the implementation of the IFM concept was the "pineapple" hand grenade of World War I (although some believed that this design characteristic resulted primarily from a desire to give the soldier a rough surface to grip).

IFMs designed post World War II usually incorporate etched fragmentation plates or notched wire fragmentation coils. Some IFMs are filled with preformed rods - hardened steel bits packed inside the munition, which are expelled when it explodes (a "canister shot", for example, is a shotgun-like container that can hold thousands of pre-formed rods or slugs).

Modern (improved) fragmentation munitions, such as contemporary hand grenades, small mortars and antipersonnel mines, contain either multiple uniformly constructed metallic spheres, or aerodynamically fashioned dart-like arrow shaped projectiles (flechettes), all of which have been designed for great penetration. Detonation of these munitions disperses a large number of such small pre-formed fragments. Weapons designers have expended considerable

effort in producing a consistent fragment size, which offers an optimum compromise between range, velocity, probability of hit, and target wounding effectiveness. Their aim is to incapacitate by inflicting multiple low energy "transfer" wounds to areas not protected by modern helmets and body armour. Although the mechanical injury may be quite modest among surviving casualties who reach surgical facilities, many will have multiple wounds, often heavily contaminated with clothing, soil and skin.

An example of an improved conventional munition of the Vietnam era was the "beehive round", a 105 mm antipersonnel round filled with 8 800 flechettes. The flechettes were released from the shell at a time determined by the fuse setting, and their aerodynamic properties allowed them to pass through helmets and armoured vests more easily than irregular fragments.

Another improved conventional munition, the cluster bomb, acts as a cargo carrying munition. It contains many small sub-munitions that in turn are filled with numerous small pre-formed fragments - the size and shape of which have been designed to cause a large number of casualties. Even more recent updates to this class of munitions are the US Army's Multiple Launch Rocket System (MLRS) munition containing 644 M77 submunitions, and the 155 mm Howitzer artillery projectile containing 64 M42 and 24 M46 submunitions. When a cluster munition is detonated, (either before or upon the carrier's impact), its submunitions or bomblets are disseminated over the surrounding terrain. When they explode, the fragments are dispersed over a much wider area than would have been affected if the same mass of potential fragments had been derived from a single thick walled shell casing. The fragments of such weapons tend to be small and numerous, with the expressed purpose of achieving not only the high probability of a wound, but multiple wounds to each casualty. They are also fairly regular in shape, ensuring adequate range and consistent performance.

The most modern improved conventional munitions have combined antipersonnel with anti-materiel potential. The latter characteristic is obtained by incorporating a shaped charged warhead into each of the individual submunitions. When the munition detonates, fragments from the side walls are disseminated in a radial direction around the armour piercing jet produced by the shaped charge warhead. Such cluster munitions, incorporating dual purpose sub-munitions, were used with great effectiveness in the Persian Gulf war.

Other Fragmentation Threats

Following the surface or subsurface detonation of an explosive munition, secondary missiles are also produced from objects within the environment, such as dirt, rocks, trees, or debris from buildings. The nature of the secondary fragments is generally unpredictable. They tend to be irregularly shaped, with a wide range of masses and impact velocities, and may have considerable potential to cause injuries. In the aerial bombing of cities, for example, secondary missiles often cause the greatest volume of casualties. The wounds created by secondary missiles, however, may become badly contaminated. A landmine, for example, creates high velocity secondary missiles from the ground in which it is buried. It is therefore likely that any severe wounds created will also be filled with dirt, pebbles and even chunks of plants.

The Wounds Created by Fragmentation Munitions

Penetrating missiles may cut, crush and lacerate tissues directly in the missile's path. When penetrating the skin, an antipersonnel fragment of low mass and low velocity causes an injury confined principally to the immediate track of the missile through the soft tissue. The visible passage created in the tissue includes the wound of entrance, and if it completely passes through the tissue, the wound of exit as well. These low energy transfer wounds arise simply from the cutting and crushing action of the projectile as it penetrates the tissues. Faster moving heavy missiles have more energy to transfer, and have the potential to cause more tissue damage. This damage is caused not only by direct contact between the missile and the tissue, but by tissue being violently thrown away from the missile's path through it. The radial stretching and tearing of tissue around the missile's track is known as "cavitation".

The impact velocity of a projectile can occasionally be a misleading indicator of its potential for injury. All projectiles cut, crush, bruise and displace tissues. Some projectiles, by virtue not only of speed but also their shape, may undergo a tumbling motion within the tissues. This induces further indirect injury to tissues not directly in their path. The radial or peripheral stretching and tearing induced by such projectiles, or "temporary cavitation", is variable, and is a consequence of increasing levels of transferred energy. The excess energy or fragment motion may induce merely a bruise around the missile path, or alternatively, a grossly explosive effect such as a shattering of the heart or skull radial to the missile path. Even if cavitation is not immediately lethal, its contribution to the occurrence of war wound infection is widely overlooked.

All war wounds are contaminated from the outset by soil, clothing, and skin. Fragments and any other projectiles with sharp irregular surfaces have been shown to cut clothing materials and skin efficiently, and also transfer notable quantities of these contaminants into wounds. Low velocity projectiles regularly transfer such ragged pieces of clothing and skin

contaminants into wounds. When the fragment velocity is raised and a temporary cavity is formed by the projectile, the nature of clothing contamination is further altered. Fibres and large pieces of material may be finely shredded and rapidly dispersed due to the formation of the temporary cavity, resulting in contamination of tissues far distant from the permanent wound track. If the temporary cavity involves the exit wound, substantial quantities of material may also be sucked *into* the wound from the exit hole, creating even greater widespread contamination, and the potential for infection at multiple sites.

Describing conditions in the Korean War, one historian noted:

> *"Even UN soldiers arrived in hospitals with most wounds . . . grossly contaminated with field dirt, leaves of rice plants, and crumbs of human excrement plainly visible in some of them. Wounded North Korean prisoners of war showed the same problem in exaggerated form, their injuries frequently infested with hordes of maggots."*[1]

Bullets and their Wounds

Both the design and construction of a bullet determine the kind of wound created. The wounding effects of deforming hollow point and soft-nose hunting ammunition, for example, which change shape after penetrating tissue, are noticeably different and potentially more devastating than those of non-deforming bullets. Most bullets are long and thin, and are spun along their long axis to provide stability, and accuracy. After entering soft tissue, however, spin stabilisation is overcome and bullets become unstable. They may tumble and turn through 180 degrees, thus increasing the surface area of tissue presenting to the forward moving missile. This results in significantly greater tissue damage. If the wound track through tissue is long enough, all bullets will tumble. As a bullet tumbles, it may become deformed or break up - especially if it contacts hard, high density bone.

Bullet wounds in the battlefield are generally caused by fully jacketed military ammunition as defined by the Hague Declaration of 1899. The latter prohibited the use of any "bullet which expands or flattens easily in the human body". To meet this requirement, bullets designed for military use are comprised of lead and steel components clad within a metal jacket. As a result, it has been suggested that designers of military small arms, ostensibly formulating bullets to prevent flattening deformity of the missile, use alternatives such as bullets which readily fragment in order to cause equivalent tissue effects.

Even if not designed as such, many bullets may nevertheless fragment at close range if they strike bone. The tendency to break-up is governed by the construction of the bullet, principally the thickness of the jacket and the efficiency of the base in preventing extrusion. The disruption of the bullet into small pieces produces irregular fragments, each with large potential for energy transfer. A temporary cavity around the fragmenting bullet will be associated with multiple diverging wound tracks. Multiple lacerations of the tissues surrounding the original wound track are the result. If the victim's skeleton is damaged by a missile as well, the fragmented bone may provide an even larger number of secondary fragments. When scattering bone fragments are combined with bullet fragmentation, widespread disruption of soft tissues is produced within the vicinity of the bone - including any adjacent blood vessels, nerves and other soft tissues.

Blast Injuries from Fuel-Air Explosives

An explosive munition, on detonation, produces a transient pressure that can propagate through the air at an initial velocity exceeding the speed of sound. It may rupture eardrums and severely bruise and rupture both the lungs and other gas filled organs (such as the intestines), leaving no tell-tale external marks on the victim. Very high overpressures can also cause air to be pumped into a victim's circulation, causing dangerous and often fatal air embolism of the heart and cerebral blood vessels. It can also liberate fragments of debris from the environment that may act as penetrating missiles. Furthermore, the mass of moving blast wind may forcibly blow the casualty against solid objects in the area, thereby inducing blunt injury as well.

A typical Fuel-Air Explosive (FAE) consists of a cylindrical container of a liquid fuel, such as ethylene oxide or propylene oxide, the walls of which are scored so that the container can break apart in a controlled manner. It also contains a burster charge located at the center, which extends along the long axis of the container. When the burster charge detonates, the contents of the fuel container will be dispersed as a mist-like disk shaped fuel-air cloud over the ground. It flows around objects such as trees and rocks, and into structures or field fortification ventilation systems. Next, a small secondary charge ignites the fuel-air mixture. The vast dimensions of the FAE cloud ensure that the blast effects will occur over a much wider area than that affected by any conventional explosive munitions. The FAE blast wave can go around corners, penetrating the apertures in bunkers, the open hatches in armoured fighting vehicles, and the hollows of trenches and foxholes. In Afghanistan, such FAE munitions, labelled vacuum bombs, comprised a significant proportion of the munitions dropped by Soviet aircraft. Since the Vietnam War, FAE weapons have been improved so that their blast

effects now rival that of a small tactical nuclear warhead.

Other Military Specific Injuries

There are other mechanisms of injury predominantly confined to the military spectrum. These include *burns* from napalm, incendiaries, flame munitions, and white phosphorus. *Crush injuries* also occur in greater abundance in the military setting. The implications of crush injury extend to needed repair of skin, bone, muscle, blood vessels, and nerves, as well as the possibility of treatment for kidney failure, a common result of this form of trauma. In addition, military *inhalation injuries* may result. These occur from breathing the byproducts of ammunition and plastics combustion, and inhalation of particulate metallic aerosols (such as "chaff" which may be released to cloud electromagnetic transmissions of attacking missiles). Other inhalation injuries result from the breathing of rocket fuel combustion fumes, and environmental obscurant agents such as picric acid and anthracene - all common to the modern battlefield, with few equivalents in peacetime.

Implications for Delivery of Medical Services

Most peacetime models and experiences are of limited value when preparing medical officers for service in the combat setting. Many of the enormous peacetime technical advances in modern surgery - those which have transformed the outlook for patients born with congenital abnormalities, or those suffering from such degenerative conditions as arthritis, heart disease, and cancer - do not have immediate application on the battlefield! The wartime phenomena of large numbers of casualties which are generated simultaneously, many bearing multiple wounds and concurrent injuries from the entire spectrum of militarily unique weapons, are not ordinarily seen in peacetime medical practice. They differentiate and complicate casualty management in the military medical field system. As a noted authority in combat medical care once noted: "The practice of medicine and surgery in peacetime prepares physicians for war as well as police department duty would prepare infantry for combat, or as well as commercial aviation experience prepares pilots for close air support in wartime".[2]

There are undeniably fundamental differences, oftentimes forgotten, between medical treatment practices in peacetime and those employed in war. Indeed, the very nature of warfare precludes a neat transformation in place from such successful peacetime models of healthcare. These are best exemplified by two contrasting hypothetical examples:

- In the peacetime setting, a victim of urban violence who sustains a perforating soft tissue wound of the thigh by a 9 mm pistol bullet, is often rapidly transferred by emergency medical services, within minutes, to a civilian trauma hospital designed to provide a full spectrum of needed care. Within these centres, in response to multiple demands of such nature, effective treatment methods have evolved. These efforts are commonly supported by the general availability of teams of multi-disciplinary consulting specialists, buttressed by sophisticated medical imaging techniques such as CT scanning and NMR (nuclear magnetic resonance) scans. The most modern broad spectrum antibiotics are often administered within minutes of wounding. Finally, there is access to well staffed intensive care units, where changes in patients' conditions can be intensively followed for days and weeks, often without time limits.
- A military rifleman, recently sustaining a similarly located thigh wound following the nearby explosion of a rocket propelled grenade, perhaps complicated by blast injury to his lungs and white phosphorus burns of his torso, lies in a muddy field heavily contaminated with human and animal wastes elsewhere across the globe. Because of tactical and logistical limitations, the soldier may have remained in that muddy field for many hours before being retrieved, causing his general condition to worsen, and bacteria in his wounds to multiply. He may then be deposited, with a group of other bleeding wounded, at a military evacuation hospital which is so busy that only 5 minutes can be allotted to the immediate care of each casualty. Subsequently, he may be entered into a protracted evacuation chain entailing temporising increments of treatment. This process may involve multiple transfers and the passage of a significant amount of time until arrival at a definitive care facility.

The contrast between the two hypothetical examples is self evident, yet directly relevant to the unique characteristics of the professional practice of military medicine in the operational setting. Indeed, the historical record readily confirms that military physicians must periodically provide their treatments in such a setting of physical and logistic austerity as denoted in the second example, and further carry them out in the incremental or echeloned fashion typical of military field medical systems. These require medical judgements far removed from those utilised in peacetime!

Unfortunately, military surgeons have traditionally received their indoctrination to wartime surgery by "on-the-job training" within the combat zone. In contrast to clinical practices

during peacetime, surgeons have had to become reoriented to various historically validated special techniques for rendering rapid but often only "adequate" care to victims of massive military wounds and massive trauma. US Army surgeon Captain Richard Hornberger of the 8055th Mobile Army Surgical Hospital (MASH) in Korea, speaking as Richard Hooker, pseudonymous author of M*A*S*H, provided meaningful perspective on this one phase of reality during the early surgical reception of combat casualties:

> *"Meatball surgery is a specialty itself. We are not concerned with the ultimate reconstruction of the patient. We are concerned only with getting the kid out of here alive enough for someone else to reconstruct him. Up to a point we are concerned with fingers, hands, arms and legs, but sometimes we deliberately sacrifice a leg in order to save a life, if the other wounds are more important. In fact, now and then we may lose a leg because if we spent an extra hour trying to save it, another guy in the preop ward would die from being operated on too late. . . . Our general attitude around here is that we want to play par surgery on this course. Par is a live patient".*[3]

Summary

Sustainability during combat operations is a paramount concern of every operational commander. His judgements will often determine whether his war-fighting concepts and plans are supportable. Since health maintenance and casualty management programs are crucial underpinnings of any operational plan, the structure and operation of combat medical services must be thoroughly integrated with tactical operations. Therefore, the decision for a specific form of supporting activity in any given manoeuvre, such as medical support, is ultimately the commander's responsibility!

As a commander weighs the various benefits and tradeoffs associated with a combat casualty support program, he must also assess the cost of such support in terms of the competing demands of an essentially logistical function for portions of his offensive assets, as well as their impact upon his tactical mobility. For these decisions, the operational commander is beholden to his medical staff for informed advice. The inherent differences between wounding agents, as well as the unique logistical requirements for management of combat-unique casualties, within a setting of austerity and restricted support, must therefore be clearly recognised - not only by professional medical authorities, but by the line commanders who depend upon their counsel and support.

The ground rules for practising the precepts of combat medical support differ from those utilised in peacetime military medical practices. It is therefore incumbent upon medical officers to become well informed resources for their operational counterparts. An understanding of weapons effects is an important facet of that required knowledge base, in order to facilitate a functional transition from the procedures and expectations of peacetime medical practice to the realities of combat.

References

1. Cowdrey AE. The Medic's War. The US Army in the Korean War Series. Vol 4. *Center of Military History, US Army*, 1987: p87
2. Llewellyn CH. Education and training for war surgery. *Mil Med* 1990; 155:192
3. Hooker, R. "M*A*S*H". New York, *Wm. Morrow & Co*, 1968: p188

Review Article

Stress and peacekeeping. Experiences in Rwanda[1]

P.G. Warfe[2]

Mr Chairman, distinguished guests, ladies and gentlemen.

It's a great pleasure for me to be here participating in this joint Veterans' Affairs and ADF presentation on stress and peacekeeping. Most of all, I'm pleased to be here to provide a military perspective which will cover a case study on the sort of stress to which peacekeepers may be exposed. Then I wish to describe to you some of the initiatives the ADF has taken recently to prevent both acute stress and post traumatic stress disorder in our Service personnel. In doing so, I hope that my part in today's proceedings will form a useful backdrop to our distinguished visitor, Professor Lars Weisaeth.

So, firstly I will spend about ten minutes describing some of our experience in Rwanda, and, specifically, the Kibeho massacre.

The Rwanda Experience

As you know, there had been an escalating guerrilla war in the central African republic of Rwanda which culminated in a ferocious genocide of mainly the ethnic group of Tutsis in April 1994. An estimated half to one million civilians were massacred and two million refugees fled the country, leaving about one million internally displaced people residing in the Internally Displaced Persons (IDP) camps. Following the genocide there was a three month civil war won by the Rwanda patriotic front in July 1994.

In August, the United Nations passed a resolution to increase the UN's assistance mission in Rwanda to 5 500 peacekeeping military called the United Nations Assistance Mission in Rwanda (UNAMIR). That month, the Australian medical contingent to UNAMIR was deployed to provide health care to the peacekeeping force. Its secondary role was to provide humanitarian support from within spare capacity. Our contingent of over three hundred comprised both inpatient and outpatient medical and surgical services. It was supported by a logistics company and an infantry company for self protection. Australia maintained this level of support to UNAMIR for a year, involving two contingents each for six months.

Kibeho Camp

Returning to Kibeho, the victorious Rwandan Patriotic Army always believed that many of the perpetrators of the genocide and the former Rwandan government forces had taken refuge in the IDP camps. The camps represented to them both a focus of criminals who deserved the most severe punishment, and also a military threat.

Kibeho is an old Catholic mission station built along a ridge line at the highest point of which, in the North, is a church. Moving south there was the Zambian company Headquarters and platoon position. Further to the South was an old mission complex, termed the compound.

The anniversary week of the 1994 genocide, the seventh to the fourteenth of April, was declared a national week of mourning. Fears of revenge/retaliation attacks caused the populations of IDP camps to increase. Anti UN demonstrations occurred in Kigali. The demonstrators were poorly organised but they kept asking the question 'Where was UNAMIR during the genocide?' On Tuesday the 18th of April at 0300 hrs two battalions of RPA surrounded Kibeho camp. The RPA used the expedient measure of firing shots in the air to move the IDPs along. One woman was shot in the hip and ten people, mostly children, were trampled to death. Many injuries were caused from running into protective concertina barbed wire.

The situation was relatively calm but unstable. Staff Officers at Headquarters UNAMIR worked frantically to plan the reinforcement and medical support to the Zambians. We also made plans to brigade UN

---

1 Warfe PG. Stress and peacekeeping. Experiences in Rwanda. *Aust Mil Med* 1998; 7(2):11-14
This Paper is based on an address to the DVA/ADF Seminar held at the Australian War Memorial on 12 February 1998.

2 Colonel Peter Warfe is a military physician specialising in Tropical and Preventive Medicine. He has served in Papua New Guinea, North West Europe with NATO forces and in the United States of America. He is a graduate of the Army's Command and Staff College and is currently serving as the Director Clinical Policy in the Defence Health Service Branch, Canberra. In 1995 Colonel Warfe acted as the Force Medical Officer and commanded the Australian Contingent to the United Nations Assistance Mission in Rwanda. For outstanding achievement as the Contingent Commander to Rwanda he was awarded the Conspicuous Service Cross.
Address for correspondence: Colonel P.G. Warfe, CSC, Headquarters Australian Defence Force, Canberra, ACT, 2600

transport assets to assist in the removal of the IDPs. The 32 person medical team arrived at Kibeho about 0930 hrs the next day. It comprised medical and evacuation sections as well as an operations command post and organic security of two infantry sections.

That morning the Deputy Force Commander, the Colonel Operations and I visited Kibeho camp to assess and defuse the situation on the ground. Thousands of people were packed along the ridge line in an area about a kilometre and a half long and two to three hundred metres wide. The ten dead from the panic of the previous day were lying out in the open. The conditions in the camp were deteriorating rapidly. The Force Commander visited Kibeho and held talks with UNAMIR troops and representatives of the UN agencies. At 1730 some IDPs attempted to snatch RPA weapons. The RPA opened fire killing twenty and wounding sixty. There were reports of IDPs fighting amongst themselves with machetes.

The Massacre

Saturday the 22nd of April was the day of the Kibeho massacre. There had been a lot of killing during the night. The IDPs were in poor condition. This was the fifth day that no food had been distributed to them. At midday people were running to find shelter from an approaching thunderstorm and this created panic. The sudden mass movement was interpreted by the RPA as an attempt to break the cordon, so they opened fire into the crowd and continued firing for an hour killing around 130 people.

All day long our medical team worked furiously treating those whom they believed had a chance of survival. At 1600 the UN helicopters were finally granted permission to land at Kibeho. Medical supplies were brought in and the wounded were air-lifted out. At the same time about 22 RPA marched in formation down the road from the church singing and chanting. They usually sang when conducting physical training in the early mornings in Kigali. Many enjoyed the singing but they didn't know the words which were usually 'We killed the Hutu. Who will we kill next?'

The platoon stopped, turned towards the Zambian compound and cocked their weapons. Two Australian private soldiers in the bunker nearest to them thought that they would be overrun and killed. A Lance Corporal ordered his section to fix bayonets, but in fact the RPA began firing into the crowd causing another breakout attempt. There was so much firing that the Australians suspended their medical work and sought cover in the bunkers.

The crowd surged against the cordon and the RPA responded by opening fire with heavy machine guns and rocket propelled grenades. A number of RPA soldiers moved through the fallen bodies, bayoneting or shooting the wounded. Many of the IDPs were rounded up, marched away as if under arrest and shot. All of this action was witnessed by our infantrymen who were extremely frustrated but determined to protect the medical personnel.

At first light the next day, Australian medical personnel conducted a count of injured and dead. Using pace counters they counted some 4 000 dead and 650 wounded.

Returning to Kibeho, on Monday the 24th of April approximately 1 700 IDPs were reported to remain in the *Medicins sans Frontièrres* compound in Kibeho camp. The Australians ventured into the compound throughout the day and eventually removed the bodies of 42 dead. This was a most unpleasant business as some of the dead had been gnawed by dogs, and rats had taken shelter inside some of the body cavities. They were buried in a mass grave. Eventually the remaining IDPs dispersed to their home communes where once again many sadly faced illegal jailing and killing.

The Psychological Aftermath

As you can imagine many of our troops were angry and frustrated by what they had witnessed at Kibeho. So we put in place a comprehensive stress management program which included debriefing by commanders, doctors, psychologists and the padre. In addition, just before our return to Australia, group and individual debriefings were conducted by Army psychologists and everyone has been followed up by letter at the six, and twelve month marks back home.

I was particularly concerned about feelings of anger and hatred amongst the troops. And therefore the possibility of individuals exacting retribution from the RPA back in Kigali which would have undoubtedly invoked a furious response. I visited Kibeho again, and while not condoning what the RPA had done, I tried to put it into some perspective within the overall tragedy of Rwanda.

In the aftermath we identified around a dozen troops who appeared to be having difficulties resolving the experiences to which they had been subjected, and at least one required psychiatric support on return to Australia. Furthermore, I believe that there are a small number under current care at the National Centre for War Related Post Traumatic Stress Disorder. This point illustrates one of the major problems that confronts the ADF. That is our inadequate systems for data capture. Those who served in Rwanda were from all three Services including the Reserves. Since our return to Australia we have been following up Contingent members but it has been very difficult to keep in touch with those who have departed the ADF and those who have self referred for ongoing care.

Certainly, some of the Contingent are suffering post traumatic symptoms. However, initial analysis suggests that the level of

symptoms is considerably less than those reported after civilian populations have been exposed to traumatic events. In fact, the incidence of PTSD in Rwanda veterans is consistent with PTSD rates in emergency service personnel.

The Stress of Peacekeeping

In summary ladies and gentlemen, more than half of the Australian contingent served during that savage month at Kibeho. The contingent's planning, presence, military discipline and compassion saved many hundreds of lives and almost certainly prevented a catastrophe during both the massacre, and the final sad days of the siege.

Clearly, the message is that peacekeeping may be much harder than you expect, as it will invariably involve dangerous and unpredictable people. Accordingly, such humanitarian relief operations may be very stressful and a number of supporting military, UN and Non Government Organisation personnel will require professional and timely stress debriefing as a result. Certainly, Rwanda is a crazy place of never ending contrasts and I'm not surprised that some people are having difficulties coming to grips with their experiences. It is however important to note that the Contingent provided first rate health support to UNAMIR, the United Nations civilian agencies, and humanitarian support to the people of Rwanda. The efforts of both contingents have ensured that the Australian contribution was judged as an outstanding success and enhanced the reputation of the Australian Defence Force, and the Nation, in the eyes of the international community.

I was privileged and humbled to work with so many fine people from the three Services and the Reserves. I believe that the success of this seminar will be measured by how well we care for the Rwandan Veterans in future, and perhaps more importantly, what collaborative, proactive steps we take to prevent severe stress reactions and PTSD in future deployments.

Issues for the Future

Well, what of the future? I would like to be able to identify those at risk of severe stress reactions and perhaps PTSD. I would like to see instituted aggressive prevention programs and timely active interventions. Of equal importance we need a comprehensive and effective method of national follow up in order to render the most appropriate support in a compassionate, and efficient manner. And I'm sure that this valuable collaborative seminar with DVA will go a long towards achieving these goals.

Research

For our part the ADF has been conducting through the 1st Psychology Research Unit, a longitudinal study designed to understand the effect on Defence Force personnel of exposure to traumatic events during peacekeeping deployments. The study is examining the complex relationships between social support networks, attitudes towards emotional expression, psychological vulnerability, and the interaction of all these factors over time.

This study involves following up 600 Rwanda Veterans matched with a control group of individuals who have not served on UN deployments. The study instruments include measures of: the levels of post trauma distress, the level of trauma experienced, social support, attitudes and coping strategies.

It should be noted that the study is being conducted as part of normal follow up procedure we have in place for ADF members after deployment overseas. The personnel have been surveyed at four month, twelve month and twenty-four month intervals after their return to Australia. Results are expected to be published before the end of the year.

Commanders' Guide

The second important ADF initiative I wish to share with you this afternoon is the development of a commanders' guide on operational stress management. This was designed to demystify the topic and to present information in a straight forward manner. It covers sources of stress while emphasising prevention and post deployment management as well as training.

I am pleased to report that while hardly on the Sydney Morning Herald's best sellers list, it has been very well received throughout the ADF and also by other community organisations including police, fire fighters and the various state emergency services. In addition, it has been warmly welcomed by our American, British and Canadian partners and the document has been adopted by the Department of Peacekeeping Operations in the United Nations.

Collaborative Course

The third ADF initiative I would like to discuss is the development of a collaborative course on traumatic stress syndromes developed between the ADF, DVA and the National Centre for War Related Post Traumatic Stress Disorder last year. The aim of the course is to reduce the incidence of chronic PTSD and, where PTSD cannot be prevented, minimise the disability associated with the disorder by providing personnel involved in the counselling of ADF members with skills in identification and management of traumatic stress syndromes.

The initial course conducted was multi-disciplinary involving health service officers, psychologists, social workers and chaplains. The key to the success of this course was that it comprised a practical phase in which the

attendees were able to interview and interact with patients suffering PTSD.

The other key feature was the breadth and depth of experience of the visiting lecturers which included leading authorities in the field. There was also a section on the commander's perspective. This included presentations from previous commanders of peacekeeping forces and the Commander Australian Theatre. Arrangements are currently underway to develop the next course to held at the National Centre in September this year.

Conclusion

Ladies and gentlemen, this afternoon I have tried to demonstrate that peacekeeping may be more stressful than the notion held by the uninitiated that it is some sort of paid vacation in an exotic location. Members of the ADF have suffered, and will continue to suffer, acute stress reactions and PTSD as a result of Peacekeeping Operations. The ADF has recognised this and is conducting research, developing publications, and instituting training programs as a result. For the future we will need to standardise and integrate our health, psychology, human science research, occupational health and safety, and compensation functions in order to better prevent, follow up and manage operational stress. The collaboration I have shown you between the Australian Defence Force, the Department of Veterans Affairs and the National Centre is an excellent start.

History

Australian doctors at war. A literature review. Part Two: After Gallipoli[1]

S. Due[2]

Introduction

After the evacuation of Gallipoli, the AIF was reorganised in Egypt, and divided in two. The larger part, I Anzac Corps, under the Australian General Birdwood, was moved to France in March 1916. The smaller part, comprising II Anzac Corps, under the New Zealander General Godley, and later including the famous Anzac Mounted Division under General Chauvel, remained to protect Egypt, and to pursue the enemy in Sinai and Palestine. However a number of Australian doctors, who had enlisted with the RAMC, had already seen service in both these theatres of war.

World War I (1914-1918) (continued)

The Western Front

The AIF arrived in France and were trained there in time to take part in the battle of the Somme in July 1916. While the number of dead and injured at Gallipoli had been appalling (Australian losses were over 8 000), the Somme was a slaughterhouse. On the first day of the Somme offensive, 60 000 British troops fell, a number equal to the total Australian losses for the war. In the first few days of its first action on the Somme (23-27 July 1916) the 1st Division AIF, at Pozieres, suffered 5 000 casualties. It was replaced by the 2nd Division AIF, which suffered 3 500 casualties in a few days. By 3 September 1916, when the Australians were replaced by Canadians, I Anzac Corps had lost 23 000 men in the space of 6 weeks.[42] The AIF divisions still had nearly two years of fighting in France ahead of them.

From early in the war a number of Australian doctors served in France, mainly with the RAMC but also in other units, notably the Australian Voluntary Hospital.[110-113] This unit was raised in England under Lt-Col W.L.E. Eames, who had served with the NSW Army Medical Corps in the Boer War. It hurried into action, and was on active service in France by 29th August, 1914 (war was declared on the 4th August). A number of Australian medical women made their way to France and served in hospitals run by women independently of the army (see below). After Gallipoli many more Australian doctors went to France with the AIF.

There are several good first-hand accounts of Australian doctors' experiences in France. Most notable is that of R.M. Allan, whose letters home were published by his father.[114] A number of shorter contemporary accounts appeared, mainly in the University medical journals and in the *Medical Journal of Australia*. These included articles by doctors Dawson,[115] Fooks,[116] MacLaurin,[117] McLean,[118-120] Ramsden[121] and Stacy.[122-123] The outstanding writer in this group is A.L. McLean, whose beautifully composed pieces rank with the best writing of the war. Gassed twice in France in 1918, McLean died of tuberculosis in Sydney in 1922 while still in his thirties. He left uncompleted a superb fictional or dramatised account of soldiers in France which was published posthumously.[124]

Several doctors published reminiscences of the Western Front in later life: F.A. Maguire after ten years recalled the confusion of life near the front;[125-126] R.L. Forsyth gave a lively account of his experiences at Villers-Bretonneux after more than twenty years;[127] A. Birnie recounted his experiences vividly after an interval of fifty years;[128] and C. Huxtable devoted thirty pages of his recent autobiography to his World War I experiences from when he joined the RAMC in 1914 - after an interval of over 70 years.[129]

Mesopotamia

The British campaign in Mesopotamia ended with the surrender of their army at Kut to the Turks in 1916, after a siege of several months. A British force had been sent, early in 1916,

---

1 Due S. Australian doctors at war. A literature review. Part Two: After Gallipoli. *Aust Mil Med* 1998; 7(2):15-20
This is the second part of a two part series. The first part was published in December 1997
Address for correspondence: Mr S. Due, Library, The Geelong Hospital, Box 281, Geelong, Victoria, 3213. E-mail: due@gh.vic.gov.au
2 Stephen Due is the Chief Librarian at the Geelong Hospital.

in an unsuccessful attempt to rescue the besieged troops, and with it were several Australian medical officers. The main work by an Australian doctor in this campaign is R.M. Allan's *Mesopotamia and India.*[130] Allan also wrote a short piece for the *Medical Journal of Australia.*[131] In addition there are articles by H.M.Moran,[132] and A.G.Anderson.[133] A small unit of the embryonic Australian Flying Corps also served in Mesopotamia. One of their pilots was Dr G.P. Merz of Melbourne, who was killed by Arabs after a forced landing.[134]

Sinai and Palestine

Compared with the grim scenes which awaited the AIF in France, the campaigns of the divisions which stayed to protect Egypt, and to fight in Sinai and Palestine, appear in a relatively romantic light. Certainly the legendary exploits of the Australian Light Horse brigades of the Desert Mounted Corps, who were brilliantly led and repeatedly victorious, captured the Australian imagination, and their story has been told and retold with great pride.

An important medical work from this campaign is *The Desert Trail*, by 'Scotty's Brother'.[135] This gives a detailed account of medical life in the desert war, in addition to fulfilling admirably its purpose as a memorial for the author's brother and the men of the Light Horse. The same gifted author, under his real name of C. Duguid, records his experiences of desert warfare at Gaza in a chapter of his autobiography.[136] J. Brown, who was serving with the RAMC near the Suez Canal when he was taken prisoner by the Turks, wrote a book recording his experiences.[137]

Medical Women and World War I

Women who were doctors were not allowed to serve as medical officers in the Australian armed forces in World War I. Perhaps partly because of their determination to serve no matter what obstacles were put in their way, the efforts of these women have been more extensively recorded than those of medical women in World War II. A. Mitchell estimates that fourteen of Australia's one hundred and twenty-nine medical women made their own way to the war, and joined various British units.[59] There are accounts of the work of three Australian doctors - Cooper,[138] DeGaris,[139-140] and Bennett[141] - who served with the Scottish Women's Hospitals in Serbia. Other Australian medical women served in England and France: the *Australian Dictionary of Biography*, and the article by Mitchell,[59] give brief accounts of the war service of Phoebe Chapple (RAMC England and France), Eleanor Bourne and Vera Scantlebury Brown (Endell Street Military Hospital), and Lucy Gullett and Hannah Sexton (France).

Unit Histories and Unit Publications

Unit histories are listed by Tregellis-Smith *et al*, along with some of the other unit publications, including honour rolls and newspapers.[5]

World War II (1939-1945)

Most readers will be familiar with the broad outlines of World War II, which will therefore not be recapitulated here. Australian military casualties were less in this war than in World War I (in round figures 40 000 dead compared with 60 000), while the number of men and women who served in the armed forces was greater (about 700 000 compared with 400 000). However the total destruction of human life in World War II (55 000 000) was far greater than that of any previous war, and included a high proportion of civilians (over 50%).[142]

At the height of World War II, the Australian armed forces included about two thousand five hundred doctors,[143] amounting to more than one third of the medical profession in Australia.[144] Succinct histories of the medical services in this war were written by G. Jacobson,[145] and in a shorter version by A.J. Sweeting,[146] in the *Australian Encyclopaedia* (unfortunately this was not included in the current edition of the *Encyclopaedia*). A masterly overview of Australian military medical experience in the war was given in a short article by A.S. Walker, the official historian.[147]

The Official History

The official Australian medical history of the Second World War was written by Allan S. Walker. It comprises four volumes produced over sixteen years, the last volume being completed by others after his death, and published in 1961.[148] Like Butler before him, Walker produced a monumental work compiled largely from military and personal records. However Walker's work is organised somewhat differently. He devotes his first volume to clinical experiences at war. He then devotes one volume to the Middle East and Far East, and one volume to the Island campaigns. His final volume covers medical services in the RAN and RAAF. Like its predecessor, Walker's history is a work of great authority, celebrating national pride and individual heroism.

The Middle East

Early in the war Australian troops went to the Middle East to support the British Army, and there they helped defeat the Italian forces in the Western Desert. Part of the Australian

force was then sent to help defend Greece against the Italians and Germans. The allies were defeated and retreated to Crete, which in turn was taken by the Germans in May 1941. A total of 2 065 Australians were captured in Greece, and a further 3 109 on Crete. Three doctors - Thomas,[149-150] Le Soeuf,[151] and King[152] - wrote of their experiences in the campaign, the latter two being taken prisoner by the Germans.

Meanwhile, German reinforcements in the Western Desert forced British and Australian troops to retreat, some being left behind in April 1941 to defend the fortress of Tobruk. A book by J. Devine is devoted to his experiences at Tobruk,[153] a subject also covered by I. Wood in his autobiography.[154] Two journal articles by doctors at Tobruk, S.J.M. Goulston[155] and C. Morlet,[156] capture something of the atmosphere of the siege. At the same time, British and Australian troops invaded Syria from Palestine. A full-length book by M. Kent Hughes, who was a radiologist serving with the RAMC, describes her experiences in this theatre of war.[157]

The Far East : Malaya - Singapore - Prisoners of War

British and Australian troops were rapidly defeated in Malaya when Japan entered the war. Two doctors wrote about their experiences in the retreat to Singapore: A.P. Derham in an article,[158] and T. Hamilton in his book.[159] When Singapore fell, on 15 February 1942, over 15 000 Australians were taken prisoner.[160] Cobcroft notes that of these, 87 were medical officers.[160] In all the Japanese took 22 000 Australian prisoners, from early 1942 onwards. It is testimony to the brutality of their captors that by the end of the war, three and a half years later, over 8 000 of these prisoners were dead, and many of the remainder were crippled for life.

The contributions of Australian doctors who were prisoners of war of the Japanese are celebrated in a relatively large number of books and articles, the best of which have found a wide audience. It was said by McWhae[143] that the one of the greatest achievements of the medical service in this war was its work among the prisoners on the Burma-Siam railway: 'if it had not been for their medical officers . . . few would have survived'. The most notable published works are those by the senior officers Coates[161-167] and Dunlop.[168-171] In addition there are a number of pieces, including journal articles and full-length books, by other Australian medical officers in Japanese captivity, each of whom makes a valuable contribution to the literature.[172-190] There are a number of second-hand reports not referred to here. A useful reference work is the recent publication by Brenda Heagney, which lists all the medical officers at Changi and on the railway.[191]

New Guinea

The Japanese advance continued south through the islands of the Dutch East Indies to Timor and New Guinea, where it was finally halted in the now legendary campaign in the Owen Stanley Ranges. Notable works by doctors about their experiences in the New Guinea campaign are those by Robinson,[192,193] Steward,[194] and Kingsley Norris.[195-196]

Air Force Medical Officers

Two doctors who served in the RAAF in World War II have published their experiences recently in some detail. They are W. Deane-Butcher[197] and C. Roe.[198]

Unit histories

There are a number of published medical unit histories from this war, ranging from professionally written works to those which are largely collections of anecdotes. These are listed by Tregellis-Smith *et al.*[5]

The Regimental Medical Officer in World War II

This is a subject which deserves more attention in the literature than it has received. Fortunately there are several full-length books, by Regimental Medical Officers Richards,[187] Robinson,[193] Steward,[194] and Thomas.[199] There are short pieces by Patterson,[200] Robinson[192] and Braithwaite.[201]

Medicine and literature in World War II

A. Meares, who was a RMO in New Guinea, published several poems inspired by the landscape there which reflect his experience of war.[202] Two novels by Australian doctors came out of the war: the surgeon H.M. Moran wrote a novel about the life of a Sydney GP, culminating with his death in England in the blitz;[203] and Mary Kent Hughes wrote a well-rounded story set in the Middle East, which was the scene of her war service as a radiologist.[204] She also wrote a war poem 'The Troopship . . .'

But where the sea meets sky our cruiser lies
And over it appears the Southern Cross
The pointers first, twin lamps above the sea
Then all five stars bright like the star of old
Which lit the stone-capped hills of wild Judea.
But then the message was of joyous birth,
And now of noise, home-hunger, wounds and death.

Mary Kent Hughes, RAMC
on a troopship coming home.[205]

Korean War (1950-1953)

Medical services in the Korean War are described by McIntyre in the official history of Australian involvement in this conflict.[206] There are also contemporary articles by Davis,[207] and Gandevia *et al.*[208]

Malaya (1950-1960) and Vietnam (1962-1973)

The official medical history of Australia's involvement in Southeast Asian conflicts 1948-1975 by B. O'Keefe (with an appendix by F.B. Smith on Agent Orange) was published recently.[209] This is a major work in the tradition of the previous official histories. The author presents a detailed but readable, coherent picture of medical services in the Malayan Emergency and the Vietnam War.

The medical aspects of the Vietnam War were covered extensively at the time by Brass.[210-212] Articles on military medical experiences were published by Cole,[213] Crawford,[214] Gurner,[215-216] Knight,[217] Leslie,[218] and Smithurst.[219-220] In addition, there were civilian medical personnel who formed what were known as the Australian Surgical Teams. Their experiences were recorded by Grove,[221] Santamaria,[222] and Villiers.[223]

More recent conflicts

Since Vietnam, Australian doctors have been involved officially and unofficially in a number of regional conflicts, and there are published accounts of medical experiences in Timor,[224] Somalia,[225-227] Afghanistan,[228-229] Iraq,[227] Bosnia,[230-231] and Rwanda.[233-236]

References

(Note: References are numbered from the previous article in this two part series)

110. Horne G. With the Australian Voluntary Hospital in France. *Med J Aust* 1916; 1(25):479-82.
111. Parker TE. Medical officer's experiences at the front. *Aust Military J* 1915;6(2):246-7.
112. Burness PB. The Australian Voluntary Hospital. *Sabretache* 1974;16:182-188.
113. Harris H. With the Australian Voluntary Hospital abroad. *Med J Aust* 1914;1(22):511-2.
114. Allan RM. *Letters from a young Queenslander*. Brisbane: Watson, Ferguson & Co.; 1915.
115. Dawson JB. Experiences in a British military hospital. *Med J Aust* 1917;1(23):479-85.
116. Fooks EVR. Impressions and experiences with the Royal Army Medical Corps in France. *Med J Aust* 1916;1(8):153-5.
117. MacLaurin C. War surgery at the front. *Med J Aust* 1917;1:503-5.
118. McLean AL. The work of a Regimental Medical Officer in the Royal Army Medical Corps. *Med J Aust* 1916;1(3):47-9.
119. McLean AL. The rise of a casualty clearing station. *Med J Aust* 1917;1:221-3.
120. McLean AL. The work of a casualty clearing station. *Med J Aust* 1917;1:309-312.
121. Ramsden EM. Some notes on the work being done by a field ambulance in France. *Med J Aust* 1917;1:371-374.
122. Stacy HS. No2 Australian Casualty Clearing Station in France. *Med J Aust* 1917;1:437-440.
123. Stacy HS. Notes from the No.2 Casualty Clearing Station. *Med J Aust* 1916;2: 175-9.
124. McLean AL. *War vistas*. Sydney: Australasian Medical Publishing Company; 1928.
125. Maguire FA. Medical services in the field. *Med J Aust* 1927;Suppl:49-53.
126. Maguire FA. German breakthrough : medical problems of March 1918. *Reveille* 1931;4(6): 10, 27.
127. Forsyth RL. Villers-Bret. : a medical officer's impressions. *Reveille* 1939;12(8): 32-3.
128. Birnie A. With the RAMC in the Great War : by a Regimental Medical Officer. *Alfred Hosp Clin Reports* 1967;14:1-11.
129. Huxtable C. *From the Somme to Singapore : a medical officer in two world wars*. Kenthurst, NSW: Kangaroo Press; 1987. 168p.
130. Allan RM. *Mesopotamia and India : a continuation of "Letters from a young Queenslander"*. Brisbane: Watson, Ferguson & Co.; 1916. 190p.
131. Allan RM. Experiences in Mesopotamia. *Med J Aust* 1917;1(25): 523-5.
132. Moran HM. A doctor-sahib in Mesopotamia. *Sydney University Medical Journal* October 1916;11:88-92.
133. Anderson AG. With the RAMC. *Speculum* 1916 Oct:(96):147-9.
134. Cutlack FM. Mesopotamia - the first Australian airmen on service. In: *The Australian Flying Corps : in the western and eastern theatres of war 1914-1918 (Official history of Australia in the war of 1914-1918, volume VIII)*. St. Lucia : University of Queensland Press; 1987: 1-13.
135. Scotty's Brother [sic]. *The desert trail : with the Light Horse through Sinai to Palestine* Adelaide : W.K. Thomas; 1919. 129p.
136. Duguid C. Doctor at war. In: *Doctor and the aborigines*. Adelaide : Rigby; 1972: 59-74.
137. Brown J. *Turkish days and ways*. Sydney: Angus and Robertson; 1940. 288p.
138. Williams LM. Behind the front line in Serbia (1916-1917). In: Williams LM. *No easy path : the life and times of Lilian Violet Cooper MD, FRACS (1861-1947) : Australia's first woman surgeon.* Brisbane: Amphion Press; 1991:49-74.
139. DeGaris MC. With a Scottish Women's Hospital in Macedonia. In: *Clinical notes and deductions of a peripatetic*. London: Bailliere, Tindall and Cox; 1926:146-173.
140. DePoi C. Mary Clementina De Garis. *Chiron* 1990;vol. no. unknown:50-55.

141. Manson C, Manson C [sic]. The Kaiser's war. Part three in their book: *Doctor Agnes Bennett*. London: Michael Joseph; 1960: 71-120.
142. World War II. In: *The Australian Encyclopaedia*. 6th ed. Volume 8. Terrey Hills, NSW: Australian Geographic Society; 1996:3151-3175.
143. McWhae DM. The medical profession of Australia and the war. *Med J Aust* 1948;2:337-342.
144. Australian doctors and the war [editorial]. *Med J Aust* 1941; 1:553-4.
145. Jacobson G. World War II - medicine and medical services. In: *Australian Encyclopaedia*. 2nd ed. Sydney: Angus & Robertson, 1958: volume 9: 481-5.
146. Sweeting AJ. World War II. 4.Medicine and medical services. In: *Australian Encyclopaedia*. Vol 8. 5th ed. Sydney: Australian Geographic Society, 1988:3143-5.
147. Walker AS. The following wind of history. *Med J Aust* 1954;2:81-87.
148. Walker AS. *Australia in the war of 1939-1945. Series 5 (Medical)*. Canberra: Australian War Memorial; 1952. 4 vols: *Clinical problems of war, Middle East and Far East, The Island Campaigns, Medical services of the R.A.N. and R.A.A.F*
149. Thomas P. *Army doctor : the reminiscences of a West Australian army medical officer during the World War 1939-1945*. Perth: J. Pilpel; 1981. 109p.
150. Thomas P. The World War 1939-1945. In: *A doctor looks back*. Perth: J. Pilpel, 1984: 161-252.
151. LeSouef L. *To war without a gun*. Perth: Artlook; 1980.
152. King A. A tuberculosis medical officer in Stalag IV A 1942-45. In: Proust AJ, *History of tuberculosis in Australia, New Zealand and Papua New Guinea*. Canberra: Brolga Press; 1991: 239-41.
153. Devine J. *The Rats of Tobruk*. Sydney: Angus & Robertson; 1943. 119p.
154. Wood IJ. *Discovery and healing in peace and war*. Toorak : the author, 1984.
155. Goulston SJM. A regimental aid post in Tobruk. *Med J Aust* 1942;1:494-496.
156. Morlet C. With the Australian Army Medical Corps in two sieges: ANZAC and Tobruk. *Med J Aust* 1943;2:221-224.
157. Kent Hughes M. *Matilda waltzes the Tommies*. Melbourne: Oxford University Press; 1943.
158. Derham P. Singapore and after : a brief historical survey of the activities of the Australian Army Medical Corps in Malaya. *Med J Aust* 1946;2:397-401.
159. Hamilton T. *Soldier surgeon in Malaya*. Sydney: Angus & Robertson; 1957.
160. Cobcroft MD. Merry Christmas, Major Clarke! *Med J Aust* 1992;157:775-780.
161. Coates AE. *The Albert Coates story*. Melbourne: Hyland House; 1977.
162. Coates AE. An address. *Med J Aust* 1942;1(3):63-7.
163. Coates AE . The doctor in the jungle prison camps. *Speculum* 1946;(150):26-8.
164. Coates AE. Clinical lessons from prisoner of war hospitals in the Far East (Burma and Siam). *Med J Aust* 1946;1:753-760.
165. Coates AE . Fundamental principles in medical practice. *Med J Aust* 1946;2(22):757-63.
166. Coates AE . A prisoner of the Japanese. *Proc Med Leg Soc Vic* 1946;5:22-41.
167. Coates AE. Surgery in Japanese prison camps. *Aust N Z J Surg* 1946;15(3): 147-158.
168. Dunlop EE. Clinical lessons from prisoner of war hospitals in the Far East. *Med J Aust* 1946;1:761-766.
169. Dunlop EE. Reflections 1946 and 1991. In: McCormack G, Nelson H. *The Burma-Thailand railway*. St. Leonards, NSW: Allen & Unwin 1993:144-50
170. Dunlop EE. Medical experiences in Japanese captivity. *Br Med J* 1946;2:481-6.
171. Dunlop EE. *War diaries of Weary Dunlop : Java and the Burma- Thailand railway 1942-1945*. Melbourne: Nelson; 1986.
172. Brennan DJ. Malaya and Singapore revisited. *Med J Aust* 1970; 2:1257-1258.
173. Brennan DJ. Dramatic struggle for lives. *NSW Doctor*. 1995(Dec):10-2.
174. Brennan DJ. Heroes and mere mortals. *NSW Doctor*. 1996(Feb):7.
175. Duncan IL. Life in a Japanese prisoner-of-war camp. *Med J Aust* 1982;1:302-306.
176. Duncan IL. Makeshift medicine : combating disease in the Japanese prison camps. *Med J Aust* 1983;1:29-32.
177. Duncan IL. Medicine in war. *General Practitioner*. 1993; 1(16):17
178. Eddey HH. Prisoner-of-war camps in Borneo. *Med J Aust* 1946; 2:403-404.
179. Fagan KJ. Surgical experiences as a prisoner of war. *Med J Aust* 1946;1:775-776.
180. Firkins P. *Borneo surgeon : a reluctant hero : the story of Dr. James P. Taylor*. Carlisle WA: Hesperian Press, 1995.
181. Harvey C. Medical aspects of the Singapore captivity. *Med J Aust* 1946;1:769-772.
182. Hinder DCC. Prisoners of war : long-term effects. *Med J Aust* 1981;1:565-566.
183. Kell D. *A doctor's Borneo*. Brisbane: Boolarong Publications, 1984.
184. Marsden ATH. Observations by a pathologist during three and a half years as a prisoner of war in Malaya and Thailand. *Med J Aust* 1946;1:766-769.
185. Mills RM. *Doctor's diary and memoirs, Pond Party, F Force, Thai-Burma Railway*. New Lambton, NSW: The author, 1994
186. Poidevin L. *Samurais and circumcisions*. Adelaide: The author; 1985.
187. Richards R. *The survival factor*. Kenthurst, NSW: Kangaroo Press; 1989.
188. Stenning SEL. Experiences as a prisoner of war in Japan. *Med J Aust* 1946;1:773-775.

189. White JG. Administrative and clinical problems in Australian and British prisoner of war camps in Singapore, 1942 to 1945. *Med J Aust* 1946;2:401-403.
190. White JG. Reminiscences : Changi 1942-5. In: Attwood H.(ed), *Occasional papers in medical history.* Melbourne: Medical History Society; 1984:35-38.
191. Heagney B. *The long days of slavery : fellows and members of the RACP who were prisoners-of-war in South-East Asia.* Sydney: RACP, 1996.
192. Robinson B. Battlezone medicine. *SALT* 1943; 7(8):36-8.
193. Robinson B. *Record of service : an Australian medical officer in the New Guinea campaign.* Melbourne: Macmillan; 1944.
194. Steward HD. *Recollections of a Regimental Medical Officer.* Melbourne: Melbourne University Press; 1983.
195. Norris FK. The New Guinea campaign. *Med J Aust* 1945;2:425- 431.
196. Norris FK. *No memory for pain.* Melbourne: Heinemann; 1970. .
197. Deane-Butcher W. *Fighter squadron doctor : 75 Squadron, Royal Australian Air Force, New Guinea, 1942.* Gordon, NSW: The Author; 1989.
198. Roe C. *Reminiscences of my time as a medical officer in the Royal Australian Air Force from 1943 to 1946 in World War II.* Brisbane: The author; 1988.
199. Thomas P. *A doctor looks back.* Perth: J. Pilpel, 1984.
200. Patterson S. A Regimental Medical Officer. In: *The Ordinary Doctor.* Brisbane: Amphion Press; 1990:125-129.
201. Braithwaite P. The Regimental Medical Officer. *Med J Aust* 1943;1:137-142.
202. Meares A. *How distant the stars.* Melbourne: Cheshire; 1947. 21p.
203. Moran HM. *Beyond the hill lies China.* Sydney: Dymock's Book Arcade; 1945. 272p.
204. Kent Hughes M. *Dust of Nineveh.* London: Heinemann; 1946.
205. Kent Hughes M. [The troopship]. In: *Matilda Waltzes with the Tommies.* Melbourne: Oxford University Press; 1943:108.
206. McIntyre D. Australian Army Medical Services in Korea. In: O'Neill R. *Australia in the Korean War 1950-53, Volume II.* Canberra : Australian War Memorial, 1985: 570-85.
207. Davis NC. Surgical aspects of the Korean War, March 1951 to February 1952. *Med J Aust* 1952;2:367-373.
208. Gandevia B, Hughes ESR, Webb R. Medical and surgical aspects of the Korean campaign, September to December 1950. *Med J Aust* 1951;2:191-197.
209. O'Keefe B, Smith FB. *Medicine at war : medical aspects of Australia's involvement in Southeast Asia 1950-1972.* St. Leonards, NSW : Allen & Unwin, 1994.
210. Brass A. Foreign medical aid to South Vietnam. *N Engl J Med* 1967;277(15): 789-93.
211. Brass A. *Medicine in South Vietnam today.* Sydney: Australasian Medical Publishing Co.; 1967. Originally published in 8 parts in consecutive issues of the *Medical Journal of Australia,* February to April 1966.
212. Brass A *Bleeding earth : a doctor looks at Vietnam.* Melbourne: Heinemann; 1968.
213. Cole WH. The anaesthetist in modern warfare : experience with the First Australian Field Hospital in South Vietnam. *Anaesthesia* 1973;28(2):113-7.
214. Crawford A. Army war surgery in Vietnam. *Med J Aust* 1969;1: 648-652.
215. Gurner CM. The RAAMC at war : 1966-1971. *Med J Aust* 1971;Suppl:35.
216. Gurner CM. Medical services in Vietnam. *Ahead: Aust Health Educ Advisory Digest* 1971;8:6-8.
217. Knight RJ. Reception and resuscitation of casualties in South Vietnam. *Lancet* 1972;2:29-31.
218. Leslie DR. War surgery in Vietnam. *Aust Army J* 1971;(265):25-30.
219. Smithurst BA. A physician in Vietnam. *Med J Aust* 1969;1:652-654.
220. Smithurst BA. Medical experience at an Australian field hospital in Vietnam. *Med J Aust* 1972;2:651-653.
221. Grove G. Background to the Australian surgical teams in Vietnam. *Med J Aust* 1967;2:331-3.
222. Santamaria J. The wider view. *Med J Aust* 1967;2:341-342.
223. Villiers JD. A second look. *Med J Aust* 1967;2:342-345.
224. Scott-Findlay J, Smith FS. A Timor experience in war and civilian trauma. *Med J Aust* 1976;2:90-2.
225. Duncan DJ. Operation restore hope : military medical practice in Somalia. *Med J Aust* 1993;159:739-44.
226. Robins AM. An Australian medical perspective on aeromedical evacuation and casualty management during the Somali war. *Aust Mil Med* 1996;5(2):6-9.
227. Warfe PG. Military medicine and peacekeeping. *Defence Force J* 194(104):60-7.
228. Farmer I. Experiences in a war zone. *Aust Fam Phys* 1995; 24(12):2197-202.
229. Laming A. Afghanistan tragedy: public health and human suffering. *Aust Fam Phys* 1995; 24(12):2191-5
230. Brennan DJ, Hobson C, Bolton P et al. Medical relief in central Bosnia. *Med J Aust* 1994; 161(11/12):675-9.
231. O'Brien D. Letter from Bosnia. *Australian Medicine* 1995 Sep 4; 7(16):1,3.
232. Atkinson R. Light blue in Darkest Africa : Operation Tamar : ASC UNAMIR II. *Aust Mil Med* 1995; 4(1):23-6
233. Miller P, Pearn J, Marcollo S. Radiology in Rwanda. *Australas Radiol.* 1995; 39(4):337-42.
234. Pearn J. War zone paediatrics in Rwanda. *J Paediatr Child Health.* 1996;32:290-5.
235. Pearn J. *Reflections of Rwanda : a selected photo-archive of service with the Forward Surgical Support Team....* Herston Qld: Amphion Press, 1995.
236. Ramsey W, Bridgford LR, Lusby RJ, Pearn J. The Australian Medical Support Force in Rwanda. *Med J Aust* 1995; 163:646-51.

Abstracts from the Literature

Submitted by Andy Robertson

Higgins I. Benchmarking in health care: A review of the literature. *Australian Health Review* 1997; 20(4):60-9

This paper provides a review of the 10 significant publications related to benchmarking in health care. The discussion which follows is presented according to four headings: what the study did, how the study was conducted, what was learnt from the experience, and what the implications were for health care generally. The findings of this review are reassuring in that all studies provided valuable information, in terms of clinical practice and the health care service or the benchmarking process. They highlight the importance of the maintenance of quality health care, the reduction of health care costs and the need for improved efficiency and effectiveness in providing health care.
Comment: As we all struggle with change, this article provides useful advice on best practice and benchmarking.

Sweeney AW. The malaria frontline. Pioneering malaria research by the Australian Army in World War II. *Med J Aust* 1997;166(6):316-9.

Documents at the Australian Academy of Science and the United States National Academy of Sciences reveal that wartime research by the Australian Army at Cairns had a significant impact on United States malaria research programs, as well as providing a scientific basis for drug control of malaria.

Keller TM. A roentgen centennial legacy: The first use of the x-ray by the U.S. military in the Spanish-American War. *Mil Med* 1997;162(8):551-4.

The year 1996 marked the centennial of the advent of the roentgen ray in the United States. The compelling value of this novel scientific discovery by Professor Wilhelm Roentgen of Wurzberg, Germany, to image the previously arcane depths of the living human body was astounding and recognised as a major advance. This report details the work of some key personnel and developments in the science of warfare that confirmed the great promise of the X-ray in the diagnostic armamentarium of military surgeons (a leading proponent being Professor Nicholas Senn, the founder of the Association of Military Surgeons of the United States) in this last American conflict of the 19th century.
Comment: Anti-malarials and X-rays: two fundamentals of military medicine in the 20th century. These interesting articles trace their early development and use in war.

Submitted by Fabian Purcell[1]

Willy C, Sterk J, Schwarz W, Gerngross H. Computer assisted training program for simulation of triage, resuscitation, and evacuation of casualties. *Mil Med* 1998;163(4):234-8

Screen based simulation is an emerging modality with much promise and application to ADF health personnel. This article from the April edition of Military Medicine represents one of the first reports of Simulation usage in Military Health training.

Although still in German language it represents a CD-Rom, 20Mb, 16 bit program requiring a IBM compatible 386 processor or better, certainly within the grasp of most home and work place hardware.

The program is structured in five phases. These are:

1. Introduction (45min)
2. Principles of Triage (45min)
3. Principles of Adequate Resuscitation (45min)
4. Casualty simulation exercise involving 5 patients and varying injuries including gunshot injuries, burns and orthopaedic problems. All injuries are from conventional warfare.
5. Test phase, which is automatically assessed, often involving a larger scenario

Parameters that can be altered include airway management (guedels-IPPV), Fluid Management (type and rate), emergency procedures (eg. ICC,)

[1] Dr Fabian Purcell is an Anaesthetic Provisional Fellow at the Southern Health Care Network Simulation Centre. Melbourne. He is also a Lieutenant in the Australian Naval Reserve and Secretary of the Australian Military Medicine Association.

dressings and analgesic regimes. Physiological changes occur in real time, further patient medical record data can be retrieved and warnings of patient deterioration are given as screen based messages.

Some obvious flaws include the absence of blood pressure recordings and the restriction to conventional warfare injuries. Both these issues will be dealt with in later software upgrades.

The authors also make some contentious statements such as:

> 'One way to ensure that combat-eligible physicians gain experience with sufficient numbers of severe trauma cases is to use a compute- aided instruction program'

No training modality does this though screen based simulation packages such as these will enhance the theoretical knowledge of participants. Only high fidelity battlespace simulation, (not yet a reality) might allow sufficient practice of combat casualty care to ensure competence via simulation modalities.

Another disputable concept is that the whole range of 'traumatologic/accident clinical pictures' is covered by the day to day spectrum of treatment in surgical, anaesthesia and intensive care departments at a military hospital. True enough if you never leave that department and treat everything that arrives. However clinical training is predicated on random personal experience This means individual experience and treatment of, specific patterns of injury and uncommon crisis may vary markedly between clinicians. This problem is improved but not overcome by prolonged training periods.

Overall this is an informative and interesting article clearly articulating the program's functions, strengths and limitations. An English version is eagerly awaited.

Volume 7 Number 2, August 1998

AMMA Update

News and information for members of the Australian Military Medicine Association
Edited by Andy Robertson

Update needs information from all three Services and the civilian membership, so it can reflect all activities of AMMA's membership.
Updates can be faxed to the Assistant Editor on (08) 9553-2600 or
e-mailed to Andrew.Robertson.125850@navy.gov.au or agrobert@vianet.net.au

Successes

The following AMMA members have achieved success through honours, awards, promotions, publications, etc.

Defence Force Promotions

The following AMMA members have been selected for promotion in the Defence Forces:

- COL John Pearn to MAJ-GEN and posted as SGADF
- CAPT P. Habersberger, RANR to CDRE and posted as Assistant SGADF- Navy
- COL Atkinson to BRIG and posted as Assistant SGADF - Army
- GRCAPT Short to AIR-CDRE and posted as Assistant SGADF - Air Force
- WGCDR Helen Doherty to GPCAPT and posted to DHSB.
- LCDR Alison McLaren, RAN to Commander.
- FLTLT Seah to SQNLDR and posting to SMO RAAF PEARCE
- Defence Force Movements

The following AMMA members have posting/deploying to new roles and functions:

- COL Andy O'Neill and WGCDR Russell Searle retiring to private practice
- LEUT Mark Bolt deployed to Iraq in Mar 98. He is the UNSCOM SMO for the next six month tour.

AMMA Conferences

1998 Conference

The 7th AMMA Scientific Conference will be held in Sydney on 16 to 18 October 1998.

AMMA Contacts

For all general AMMA enquiries contact the Secretariat:

Leishman & Associates
Tel: *(03) 6247-1850*
Mobile: *0412 875 390*
Fax: *(03) 6247-1855*
Email:paulaleishman@trump.net.au

Research Grants

Details of the AMMA Research Grant programme are included in this journal. The applications for the 1998 grant have now closed. Members are reminded that applications for the 1999 Research Grant must be received by 30 April 1999. Further details on the Grant can be obtained from:

Janet Scott:
Tel: (08) 8272-7399

Journal

Journals for 1998-9 will be published as follows:

Issue	Copy Deadline
December 1998	31 October
April 1999	28 February
August 1999	30 June

All queries regarding the Journal should be directed to:

Russ Schedlich
Tel: *(02) 9563-4504*
Mobile: *0412 286 740*
Fax: *(02) 9563-4519*
Email:
n01m@mc.navy.defence.gov.au

Library

The Association's Library has moved to the Fleet Medical Officer's office, Maritime Headquarters Sydney. Any member who wishes to browse through the Library (and visit the Librarian for coffee) is welcome to call.

Books from the library are available for loan of up to 12 weeks. Contact:
Russ Schedlich
Tel: *(02) 9563-4504*
Mobile: *0412 286 740*
Fax: *(02) 9563-4519*

Conference and Meeting Calendar

Date	Conference	Location	Contact Number
4-6 September 1998	International Conference on Military Medicine	Bregenz, Austria	43-5574-4922-249
5-10 September 1998	World Congress Orthopaedic Surgery and Traumatology Conference	Sydney, NSW	(02) 9684-6823
11-15 October 1998	RACGP Meeting	Melbourne, VIC	(03) 9826-8676
16-18 October 1998	***7th AMMA Conference***	***Sydney, NSW***	***(03) 6247-1850***
21-23 October 98	Health Information Management Conference	Brisbane, QLD	(07) 3864-5873
18-21 November 1998	10th HIV Medicine Conference	Newcastle, NSW	(02) 9382-1656
19-20 November 1998	Endocrinology Conference	Melbourne, VIC	(03) 9550-2537
21 November 1998	Innovation and Achievement Seminar	Sydney, NSW	(02) 9845-2342
22-25 November 1998	Medical Research Conference	Hobart, TAS	(03) 6224-3773

AMMA ON THE NET

A few useful Internet addresses:

Royal Australasian College of Physicians	http://www.racp.edu.au/
Health Communications Network	http://hcn.net.au/
Medical Conferences	http://www.pslgroup.com/medconf.htm
International Society of Infectious Diseases	http://www.isid.org
NEJM Journal Watch	http://www.jwatch.org
Medical Journal of Australia	http://www.library.usyd.edu.au/MJA/
Aviation Medicine Homepage	http://www.ozemail.com.au/~dxw/

CONTRIBUTIONS

for the December issue should be sent to:

The Editor
Australian Military Medicine
PO Box 730
PYMBLE NSW 2073

Deadline is 31 October 1998

Instructions for Authors:
Articles submitted for publication in *AMM* should conform to the following guidelines:

- two hard copies should be submitted, typed double-spaced on A4 paper (single-side)
- if possible, an electronic copy on an IBM formatted 3.5 inch floppy disc in a standard word processing programme should be submitted
- the text in both hard and electronic copies should be unformatted
- references in the text should be numbered consecutively as they are cited and annotation of the references should accord with the style given in *Index Medicus*. Where there are seven or more authors, list only the first three then *et al*. For example:

  Szilagyi M, Dawson RM. Phosgene - A research review. *Aust Mil Med* 1995; 4(2):16-19
- figures and tables should be submitted separately with an indication in the text as to where they should be located
- the originals of all photographs, ECGs, EEGs etc should be submitted to allow high quality reproduction

Articles submitted may be subject to peer review. Articles which have been published elsewhere will only be considered if they are of importance to the field of military medicine, and publication will only proceed with the prior approval of the original publisher.

Australian Military Medicine
Volume 7 Number 2
August 1998

The Australian Military Medicine Association
Patron
Major General J. Pearn
Surgeon General, Australian Defence Force

President:	Nader Abou-Seif
Secretary:	Fabian Purcell
Journal Editor:	Russell Schedlich
Assistant Editor:	Andrew Robertson

TABLE OF CONTENTS