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Journal of Military and Veterans' Health

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The Journal of the Australian Military Medicine Association

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Journal of Military and Veterans' Health

Australian Military Medicine Association

STATEMENT OF OBJECTIVES

The Australian Military Association is an independent, professional scientific organisation of health professions 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.

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Inside this edition

This Edition of the Journal of Military and Veterans' Health has an array of papers considering operational and strategic issues confronting military health services in this region.

Infectious disease has always been a significant cause of non-battle casualties throughout the history of warfare and the more recent history of peacekeeping and humanitarian missions. Being able to deploy a microbiology laboratory to assist in the diagnostic and management process of tropical disease is a dream for many who have faced the challenges of decision making in an information poor environment. More recently the capability has assumed greater need with emerging risks of biological threat assessment and management. While principles of health support and logistic management apply, the kit is diverse and sensitive requiring specific knowledge and solutions to ensure capability in the field. Inglis et al apply logistic expertise in the establishment of the capability for deployment of field medical microbiology in Sri Lanka.

The unfortunate association of the development of reconstructive surgery during times of war has produced a silver lining of improved management of disfiguring injuries and deformities among civilian communities in addition to improvements in veteran outcomes. Daryl Tong and colleagues provide a valuable and readable background on the development of a specialty that is becoming core to military medicine and dentistry. It is difficult not to be impressed by the recollections of the pioneers of maxillo-facial surgery. It is equally difficult to believe that the authors have no conflict of interest in the unabashed New Zealand connections.

So what is RAAAKERS™? It is a model of organisational analysis that has been used to inform a seachange in the structure of Defence Health Services. RAAAKERS™ was developed by Durant-Law, and his paper with Burnett from DSTO outlines the findings used to inform the recommendations for change in the Defence Health Services Directorate that were contained in the Alexander Review. The acceptance of these recommendations has led to the recent creation of the Joint Health Command.

Submarine escape and rescue is a highly specialised area of Defence capability with specific medical implications. *JMVH* has been fortunate to have received approval from The Seapower Centre (Australia) to republish a brief history of this field that appeared for readers of *Semaphore*.

Professor Peter Leggat has provided a review of the popular handbook by John Murtagh of General Practice. There are few texts in this field. Professor Leggat has conducted his characteristic detailed review to inform those considering purchase. Professor Leggat has also reviewed another new edition of what has been a required desk text for military health practitioners, the 2008 CDC Health Information for International Travel.

The history of the first HMAS *Perth* in the Battle of the Sunda Straits is a great Naval story. Fred Skeels was there in 1942 returning for the remembrance in 1992 on the second HMAS *Perth*. He is a great character and author of *Java Rabble*, recalling this battle and the journey of the survivors. *Java Rabble* is reviewed by Dr. Andrew Robertson.

The Journal is very appreciative of Neil Westphalen for providing an Obituary for Bruce Cheffins and. Mike Dowsett for recalling Sandy Ferguson. These recollections are of the typically colourful and adventurous life in military health, no doubt resonating with many of the readers of *JMVH* while celebrating the lives and service to Australia of these two great contributors to naval medicine in peace and war.

Finally, *JMVH's* Instructions to Authors are included. These appear daunting, however, the Journal is committed to assisting new authors to publish and the Editorial team is available to provide guidance and support if required. Contact can be made through editorial@jmvh.org.

President's message

I am writing this message several days after the completion of another highly successful AMMA conference. Held in Hobart over the weekend 17-19 October, some 300 delegates attended, supported by over 30 trade exhibitors. As always, the quality of the papers that were read was exceptionally high, and this is a tribute to the expertise and dedication of those people who are involved in military and veterans' health.

A full conference report will be provided in the next edition of *JMVH*, but two of the highlights were the attendance of Vice Chief of the Defence Force (VCDF), Lieutenant-General David Hurley, and the address provided by the Surgeon General Australian Defence Force (SGADF), Major-General Paul Alexander. With the health services now within the VCDF group, General Alexander's outline of the new structure and the planned development and implementation of changes was nicely complemented by the short address provided by General Hurley at the conference dinner.

The Association's Annual General Meeting was also held during the conference period. Two constitutional amendments were passed by the meeting, these having been previously posted on our website.

At the AGM, Council noted that the Association is facing increased financial pressure in the near term. This has arisen as a result of its commitment to develop and publish *JMVH* as an internationally recognized high-quality peer review journal. The costs of both establishing the journal and continuing its publication are significantly higher than under the previous format, and to date AMMA has not yet secured any additional external funding to support its publication. Advertising within the Journal has also not been at a high enough level to significantly offset costs.

Both the Editorial Board and the AMMA Council will be redoubling their efforts to attract and retain both commercial and non-commercial sponsorship. Successful achievement of this is vital to ensure the continued publication of *JMVH* in its current form.

Council is also in the process of developing a three-year financial plan, which will take into account these additional costs and will define better the measures that the Association will need to pursue to ensure its viability.

While increases to these costs in the future are inevitable (and the AGM approved an increase to the full membership fee to $140), Council is determined to ensure that the Association remains affordable to its broad church of membership.

To that end, Council will take on board the feedback that was provided at the AGM, specifically in relation to a tiered structure of membership that endeavours to recognize individual affordability. In the process of developing this proposal the membership will be approached for its views.

In relation to its conferences, Council will continue to work to ensure that value for money is provided. Direct sponsorship of these events contribute significantly to reducing fees and Council will continue to work on its relationship with those companies that support us. We will also look to other opportunities to join with organisations that have similar interests as our experiences in the past show that these events provide significant opportunities for the Association to increase its membership, as well as assisting in reducing costs.

I would also like to take this opportunity to thank Scott Kitchener for his hard work during his four years' membership of Council. Scott decided not to renominate for Council this year, and is instead taking on the rôle of Managing Editor of *JMVH*.

I would like to welcome Neil Westphalen to Council; Neil has agreed to be our Treasurer, a position that will be critical over the next 6-12 months. Greg Mahoney has agreed to formally take on the rôle of Professional Development Officer and he will be working on the development of concepts for the Association to improve the way it supports research, study and knowledge development for its members.

Nader Abou-Seif and Janet Scott will continue in their previous rôles of Vice President and Secretary respectively, and with the other members of Council we will all continue our efforts to grow and strengthen the Association.

Next year's annual conference will be held at the Gold Coast Conference and Exhibition Centre from 30 October to 1 November. I have no doubt that it will again be an exciting and stimulating event. Details will be posted on the Association's website, and I look forward to seeing you all there.

Russ Schedlich

Letters to the Editor

Dear Sir

I read with great interest a most commendable paper by LTCOL Kerry Clifford on *Defence Health Service or Health Advice Agency*: "*An alternative reality to the Stevens Review*" in Vol 16 Number 3

What is refreshing is that the alternatives brought up were in fact debated by the Committee in South Australia that then provided a submission to the "Stevens Review". To have a single separate service which is similar to South Africa was one view. The second was to embed within one service which is the US Marines model and the third was to evolve what we have, which has hitherto occurred.

The implicit aim of Defence Health is to provide the medical resources to enable the ADF to be operational. To that end the success story in Australia has been the part time Force (which is not in Reserve) which has enabled professionals to maintain their skills in their clinical practices and teaching hospitals and then deliver as required, which may be under threatening and arduous conditions. Commercial enterprises may have a role but in general principle mercenary forces will only perform when the pay is good and the threat level is low. Those driven by National interest, wearing the uniform, will do, and have done, a great deal more than that.

The continued challenge is to develop that the partnership of the full and part time Medical Force drawing on the success story of the last 105 years. It is evolving and it is working but given the expanding knowledge and technology in medicine the specific challenge is how to manage, recruit, retain and career progress the part time Force with due regard to all the other competing civilian interests. Whatever system we utilise this needs continued enormous effort in this regard.

Yours sincerely

Robert Atkinson AM RFD
Brigadier

Emeritus Consultant in Military Surgery
Councillor of the Royal Australasian College of Surgeons

Logistic aspects of a deployable molecular microbiology laboratory

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Abstract

A molecular diagnostic laboratory was deployed overseas in response to a suspected emerging infectious disease in Sri Lanka in early 2008. The equipment and procedures used are established technology, well within the capability of a large hospital laboratory. However, the main obstacles to operating these systems in a resource-limited, tropical environment are better understood with reference to the logistic envelope of demand, distance and duration. Careful attention to basic logistic principles contributed to the success of this laboratory deployment and established a foundation for future technical enhancements. The lessons learned have further implications for pathology support operations and field hospital planning.

Introduction

Infectious diseases cling to military campaigns with a predictable inevitability. It has been clear that infection contributes a major proportion of diseases and non-battle injuries ever since the introduction of formal epidemiological analysis to military medicine. As recently as the initial NATO deployment into Afghanistan, allied forces estimated that infections contributed around 12% loss of combat availability[1]. Despite recent technical advances, it has proved difficult to insert advanced diagnostic capability into a theatre of operations and sustain clinical microbiology support for the duration of deployment. The reasons are many. In general they reflect the mismatch between a heavy burden of endemic and epidemic infectious disease on the one hand, and the diagnostic tools available to allied defence health units on the other. A specific reason for this is the increasing reliance of civilian public health on highly centralized laboratories where molecular diagnostic tests can be performed with high capacity, high throughput equipment and specialized staff. Very little diagnostic molecular microbiology is performed outside the larger population centres. This challenge has been particularly evident in the remote communities of tropical northern Australia. An operational concept was developed for a deployable biological threat assessment capability during a series of studies in the West Kimberley[2]. The portable molecular diagnostic tools used became the platform for an emerging infectious disease response in Sri Lanka. The scientific and technical aspects of that deployment were an application of existing technology[3]. A far bigger challenge was resolution of the logistic obstacles to an overseas deployment. Previous attempts to operate a limited version of this platform in Brazil were unsuccessful[4]. The purpose of this paper is to describe the logistic solutions that were developed and explore the reasons for previous failures in order to develop a concept of operations for field-deployable molecular microbiology.

Methods and logistic process

Existing laboratory infrastructure. Outside Colombo, the clinical microbiology laboratories in Sri Lanka lack advanced diagnostic capability. In Peradeniya, there were none of the molecular microbiology facilities Australian teaching hospitals expect to operate. This lack of molecular and other advanced microbiological equipment meant that the field deployable laboratory had to be completely self-sufficient apart from a single conventional incubator.

Method development.

The methods used to set up from scratch were developed around equipment believed to be sufficiently robust to operate in an austere laboratory environment after transfer by international freight, including surface shipment at ambient temperature and unpacking. Real-time thermal cyclers were avoided, molecular methods pared down to their barest minimum, and laboratory procedures tested to find their weak points. Procedures were rehearsed with the equipment and reagents planned for use in Sri Lanka. Four key methods were chosen: preliminary culture of organisms using selective bacteriological agar, DNA extraction, DNA amplification and amplicon resolution. Scientific procedures were as previously described[3]. In brief these were as follows: clinical bacterial isolates were obtained from two hospitals in Sri Lanka and subcultured on the bacteriological media normally used for preliminary isolation from clinical samples. Environmental samples were cultured on selective agar made from reagents brought in with the deployable laboratory according to a previously published recipe[4]. Bacterial DNA was extracted from these bacterial cultures as described [3]. These solutions were used to provide template material for the polymerase chain reaction (PCR). Instead of running the amplified DNA product through gels in the conventional manner, PCR products were run in a disposable microfluidic lab chip. The results were analysed using the bioanalyser software (Expert 2100, Agilent Technologies, Waldbronn, DE).

Logistics.

Preparations were made to operate in a restricted range of molecular microbiology tests at an extended distance from the sending base without resupply, repair or trouble-shooting support for a period of up to one week. Survivability was planned into the operation by duplication of critical consumables, small equipment items, and alternate onward shipping arrangements. Pre-departure testing to failure and repeated mission rehearsal enabled refinement of the protocols and identification of critical reagent requirements. This assisted plans for international shipment of equipment, frozen, refrigerated and ambient temperature reagents and the corresponding travel arrangements for laboratory staff. The list of materials required was converted into a laboratory manifest, and then into a series of contents lists for each freight package. These were governed by temperature requirement, weight, quarantine clearance, anticipated import duty and potential for substitution. The logistic nodes and links are shown in Figure 1.

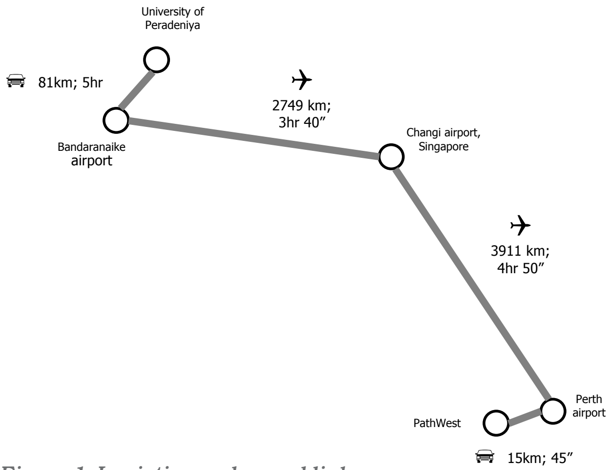

Figure 1: Logistics nodes and links

Table 1: Shipping arrangements for deployable laboratory equipment, reagents and other supplies

Contents	Temperature	Agency	Customs	Cost
Equipment: Bioanalyser Thermal cycler Heating block Vortex mixers Automatic pipettes Other non-consumables	ambient	Freight forwarder, Chamber of Commerce, & return freight forwarder	Carnet (exemption from duties)	\$528 (Carnet) \$1108 (return)
Laboratory consumables, Non-perishables including agar concentrate	ambient	Courier	Standard, formalities by courier	\$2015.68 Inclusive of all 3 couriered packages
Cold sensitive laboratory Consumables including lab chip reagents	1-4°C	Courier, as above	Standard, formalities by courier	Included in above sum
Frozen perishable reagents including PCR reagent components	-20°C	Courier, as above	Standard, formalities by courier	Included in above sum

Notes

The equipment trunk was dispatched as soon as the Carnet was ready, one week before the last possible date of arrival in Sri Lanka in order to coordinate with personnel arrival at the international airport. Laboratory reagents and consumables were dispatched just prior to that and couriered through to the final destination to arrive during working hours and therefore reduce the risk of interruption of the cold chain.

Results

Plans to send a scientist and a pathologist from Perth had to be revised due to the deteriorating security situation and the corresponding Australian government travel advisory. The pathologist travelled to Sri Lanka without an accompanying scientist. His preparation had therefore to include the entire proposed PCR method, the ability to train others in its operation and troubleshooting i.e. complete self-sufficiency. In view of this, we chose a single DNA target and a corresponding PCR protocol. This simplified the protocol development and reagents list. However, the reagents, consumables and equipment needed still required a total of four boxes – three at different temperatures, and a trunk for the laboratory equipment (See Table 1 on page 7).

A customs certificate or "carnet" was obtained to help reduce customs duty payments. This was deemed necessary even though the equipment was due for return to Perth and the reagents were for non-commercial use. Air freight costs were reduced by packing the equipment in an aluminium-reinforced trunk, to reduce the risk of damage during transit. On arrival we were able to confirm that the electronic equipment was intact and functional, but one non-essential consumable (bovine serum albumin; BSA) had been removed and two small equipment items damaged during progress through Customs (lab chip priming station retainer clip, and minishaker restrainer bar). No explanation was given, but there was sufficient backup in the reagent manifest to proceed as planned. Protocol rehearsal prior to departure enabled improvisation to overcome the minor equipment damage. Selective agar was prepared from dried ingredients on arrival. Field surveys were conducted on the day of arrival and the following day, allowing early inoculation of environmental samples from rice terraces and a rubber plantation.

The deployable molecular diagnostic laboratory was successfully set up in Peradeniya in January 2008 and ran for one working week, until the exhaustion of all molecular reagents. The three-step molecular protocol (extraction, amplification and resolution) was run for the first time on day two, using clinical isolates assembled in Peradeniya. One of these isolates was used to obtain positive controls. Though positive and negative results were obtained from the first chip, a single false positive control result indicated possible carry-over during chip inoculation or shaking. This latter possibility was considered most likely due to a missing component of the mini-shaker which had disappeared during transit. Subsequent chips were more carefully secured with masking tape, and there were no further false positive results. Six chips were run without interruption. The seventh was affected by a power outage during loading of the marker ladder and was therefore abandoned. Results provided preliminary confirmation of melioidosis in two patients. Direct testing of soil suspension supernatants produced several positives from a rice terrace and a rubber plantation. Further primary isolation from soil preparations was not possible due to time constraints. Three local staff were trained to use the standard procedures from start to finish in a see one, do one, train one format.

Discussion

This was the first time a molecular method has been used for the detection of melioidosis in Sri Lanka. We operated a small molecular diagnostic laboratory overseas, demonstrating its feasibility and clinical value[3]. Six consecutive lab chips were run successfully. Local staff were given hands-on training in these methods and demonstrated proficiency in running all stages in a series of standard procedures. A larger group of staff were able to see how easily these procedures could be performed. The loss of an experienced scientist from the deploying team restricted the range of tests that could be operated, and emphasised the value of having a range of laboratory skills to call upon. Reliance on one member of the visiting staff reduced the survivability of the deploying laboratory. On the other hand, this also gave skills transfer a greater urgency. A larger team would have allowed greater flexibility of operation, improved supervision of local staff as they trained with the equipment and would have enabled concurrent operations with greater sample processing efficiency and even shorter time to completion. Interestingly, it is now possible to see the failure to produce PCR results during a previous expedition to north eastern Brazil in terms of dependency on unfamiliar local equipment, the more cumbersome gel–based resolution of PCR products and communication in a second language. The success of the present deployment underscores the importance of operational self-sufficiency and mission rehearsal using the precise reagents and equipment intended for the specific expedition.

Future capacity-building expeditions will be required to expand the limited repertoire developed during this first deployment, which could be regarded as a reconnaissance-in-depth. As such it explored a series of logistic obstacles to an international laboratory response to an emerging infection. Logistics is the time-sensitive placement of mission-critical resources. The logistic challenges faced included the need for responsiveness, simplicity, economy, flexibility, balance, foresight, sustainability and survivability. Our use of a robust system capable of operating in austere laboratory conditions after lengthy transit was vindicated by obtaining readable results on our first complete run, despite the loss of small components and a reagent en route. Careful attention to controls, particularly a positive reading from a negative control and repetition of the first chip run enabled correction and adjustment to the procedure and a series of successful runs from that point. We doubt that a real-time thermal cycler would have produced satisfactory results without a lengthy installation and validation period in these conditions. Rugged, real-time thermal cyclers are available to military establishments or possibly as prototype devices. These hold some promise for the future, but were not yet available to us for use in the Sri Lanka expedition. There is a well-recognised mismatch between the main emerging infectious disease hotspots and the best laboratory response capacity[6]. We were able to adapt commercially available equipment to address some of this technology discrepancy. However removal of the bovine serum albumin concentrate from the reagent shipment during transit prevented us from dispensing additional PCR mastermix and restricted us to a maximum of 96 assays. There was sufficient pre-dispensed mastermix in the original set of imported reagents to run the assay for four consecutive days.

The lessons learned during the Sri Lanka expedition can be applied to military health operations. Very few such deployments are as short as one week or focus on a single infectious disease entity. However, the commoner and more serious infections can often be predicted in many theatres of operations prior to deployment. The laboratory can therefore build up a stock of specific reagents suited to the appropriate PCR methods. Just as a field hospital has a culminating point based on a number of procedures or beds available, the laboratory has a maximum test capacity. An alternative option for operation over extended periods in tropical conditions is shipment of laboratory reagents in freeze-dried form; a service currently available from some of the larger reagent suppliers. In epidemic conditions it may be possible to triage the use of scarce reagents while still providing health commanders high quality, specific diagnostic support. Our experience in Sri Lanka suggests that capacity could be substantially increased for surge response by use of a second thermal cycler and bioanalyser set. This would increase test flexibility, guard against equipment failure and more than double throughput. The portability of the equipment platforms we used enabled us to operate independently of the sending base for a week. Longer term laboratory operations would require resupply, a two-way cold chain, confirmatory test back up and quality assurance support. Additionally, a compact UPS with a reserve capacity of at least 15 minutes would guard against temporary power outages or brownouts as were experienced in this deployment. At present, reliance on support from the sending base is often used to provide basic diagnostic capability. The initial diagnostic test results become irrelevant by the time they reach the treating physician, even if they reliable. We recognise that an unusual mixture of logistic and laboratory skill was required to deploy the molecular laboratory, but a measure of its success was due to the deliberate choice of simple and streamlined procedures, robust equipment and a comprehensive set of controls. The main criticism of the procedures we deployed and operated in Sri Lanka was their lack of flexibility. The test repertoire was tightly restricted and very focused. Flexibility was provided by the training and experience of the operators. Significant expansion of the test repertoire will be needed for military laboratory deployments. The priority diagnostic test capability should be based on the small range of infectious diseases commonly associated with humanitarian disasters, which are also common in locations where the Defence Forces deploy to support United Nations operations. The added complexity of operating a range of diagnostic options will place a greater training and quality control burden on military laboratory staff since deployed laboratories operate beyond the reach of conventional civilian laboratory accreditation processes. Close cooperation with teaching centre and reference laboratories in the national sending base will be required to ensure consistency of molecular results delivered in a deployed setting.

In conclusion, a molecular diagnostic laboratory was successfully assembled, prepared and deployed in a demanding, resource-limited overseas environment. The procedures used are easily adaptable to a variety of monoplex and multiplex diagnostic PCR tasks. The lead time of one month's preparation for deployment was dictated by a combination of training needs, freight times and customs formalities. The extended distance over which we operated meant that the supply chain was stretched over two long-haul flights, an overnight stopover and a lengthy road journey. Further work needs to be done educating Customs and other officials in internationally agreed standards for shipment of diagnostic reagents and support equipment. Customs and quarantine formalities remain a critical failure point in the laboratory deployment process.

Acknowledgements

The expedition was funded by the World Health Organisation through their Lyon office. Agilent Technologies Australia loaned the bioanalyser and provided lab chip reagents. We are grateful to colleagues at PathWest Laboratory Medicine WA and the University of Peradeniya for their help during this deployment, to Anne Hoskins for help with compliance documents and to Dr Shalinie Perera for transport arrangements in Sri Lanka.

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Plastic Kiwis – New Zealanders and the development of a specialty

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Abstract

Background

The First World War saw the evolution and development of three great surgical specialties: orthopaedic surgery, thoracic surgery and plastic/maxillofacial surgery. This last specialty came of age during the carnage of some of the bloodiest battles in history and required a close relationship between plastic surgeon and dentist in the management of facial injuries. Whereas the plastic surgeon dealt with the soft tissues, the hard tissue structures of the teeth and facial bones were managed by dental surgeons who, in turn, worked closely with the dental technicians who manufactured the appliances used to fix and immobilise the facial skeleton. The pioneers of facial plastic surgery included Harold Gillies, Percy Pickerill and later Archibald McIndoe and Rainsford Mowlem – four plastic surgeons with strong New Zealand connections.

Purpose

This article is an historical appreciation of the development of plastic and maxillofacial surgery especially during the First World War with a particular emphasis on the pioneers of the specialty from New Zealand.

Methods and Materials

Web-based on-line search engines (PubMed, Medline, and Google), and hand-searches of major journals and texts were performed.

For web-based on-line searches the following key words were used to identify relevant publications: world war one, plastic surgery, facial injuries, Gillies. An English language restriction was applied.

Conclusion

Many of the techniques and procedures currently taught to trainees in plastic and maxillofacial surgery were developed during the First World War and refined in the Second, with pioneers such as Gillies, Pickerill and McIndoe laying the foundations of surgical technique through their hard earned experiences treating war injuries. It is somewhat ironic that four imminent practitioners in plastic and maxillofacial surgery should hail from New Zealand given the small population of the country at the time.

Conflict of interest

The authors declare no conflict of interest and have not received any material or monetary gain in the preparation of this article.

Introduction

In the Herbert Moran Memorial lecture at the 2002 Annual Scientific Congress of the Royal Australasian College of Surgeons, it was stated that the development of craniomaxillofacial surgery could be traced back to the First World War 1. Particular mention was made of Gillies and his role in the development of Plastic and Maxillofacial Surgery and also to Harvey Cushing and the development of neurosurgery as a specialty. It was further mentioned that British military surgeons of the time were more prepared for the First World War than their continental counterparts due to their involvement and experiences in the South African or Boer War (1899-1902). However, despite that experience, no country (including Great Britain) was truly prepared for the sheer number and severity of battlefield casualties, soon to become legendary and which would help define the sense of human suffering in the First World War.

In terms of face and jaw surgery, it may be surprising to find that some of the pioneers of in this field were New Zealanders. This historical vignette is aimed at “fleshing out” who these surgeons were and giving some background to each person and their name.

Pioneering Days - The First World War

The First World War saw the evolution and development of three great surgical specialties: orthopaedic surgery, thoracic surgery and plastic/maxillofacial surgery. Injuries to the face became more common with the development of trench warfare as it was the head and shoulders that were often the most exposed. Prior to the First World War, management of injuries to the face and jaws remained primitive at best and were not widely recognised as a "mainstream" branch of surgery.

During the early stages of the war, the acknowledged leaders in the infant field of maxillofacial surgery were Germany and France. No doubt as a result of observations by German medical authorities of the mostly unsuccessful outcomes of face and jaw injuries from then recent conflicts like the Balkans War in 1913, hospitals in Berlin, Strasbourg, Hanover and Düsseldorf were already prepared to receive face and jaw injuries by 1914[2]. Among the more eminent maxillofacial surgeons of the time were Professor Christian Bruhn and Dr August Lindemann at the Düsseldorf Hospital, and Hippolyte Morestin at the Val de Grâce Hospital in Paris. Lindemann and Bruhn would later publish their experiences of gunshot injuries to the jaw which were seen at the Düsseldorf Hospital, their work no doubt being available to medical services of both allies and central powers alike [3]. The Germans in particular were quick to establish a multidisciplinary approach to face and jaw injuries involving teams of surgeons, dentists and dental technicians to manage various aspects of the surgery and reconstruction, which in time would become a template for other nations to follow.

Serendipity had a part to play, it seems, in launching one of the greatest surgical careers of the 20th century. According to Gillie's biographer, in 1915 an American dentist by the name of "Bobs" Roberts, serving with the American Ambulance at Neuilly (American involvement was strictly voluntary at this stage as the United States of America did not enter into the war until 1917) had a copy of Lindemann's textbook and lent it to a promising young New Zealand-born British surgeon, remarking "*why don't you take this work up?*" [4]. The young surgeon was of course Harold Gillies, serving at the time as a volunteer with the Red Cross in France and who subsequently wrote "*I felt I had not done enough to help the wounded and that I must bestir myself … I realised that I had struck a branch of surgery that was of intense interest to me. My first inspiration came from the few pictures in that German Book*".

The First World War indeed followed the Hippocratic dictum that "war is the greatest school of surgery", as many pioneering techniques and innovations were developed by surgeons out of necessity and by trial and error. There were no comprehensive reference materials or more experienced colleagues to consult with – the field of plastic and maxillofacial surgery at that stage was truly in its infancy and the surgical principles of the time were inadequate to deal with the types of injuries involving the face and jaws. Contemporary photographs of soldiers with facial injuries are available and some of the post-operative outcomes are truly astonishing given the physiologic state of the soldier patient, wound contamination, the lack of antibiotics and inadequate intraosseous fixation (Figures 1–3)

Figure 1.

Figure 2.

Figure 3.

Figure 1–3: Pre- and post-operative photographs of a soldier with a jaw injury sustained during 1918. The cosmetic result is as good as can be expected given the management at the time. (University of Otago Health Sciences Library)

Custom made dental appliances and a detailed knowledge of dental occlusion were paramount in the adequate fixation and immobilisation of facial fractures, as no satisfactory means of internal fixation of bony fractures existed at the time. External fixation using pins and frames was considered state of the art, often using dental appliances as an anchorage point for these appliances (Figures 4 and 5).

Figure 4 & 5: Midface skeletal traction device utilising a dental appliance fitted to the maxillary dentition. Although the quality of figure 4 is poor, it gives an overall appreciation of the appliance in situ. (By kind permission of Dr Harvey Brown)

Many nations of the British Empire answered the call to arms for King and Country during the First World War, contributing not only troops but also medical teams to work with the British on the Western Front or based in the United Kingdom. In the area of plastic and maxillofacial surgery, Gillies was widely regarded as the leader but he was not the only surgeon of distinction. Plastic and maxillofacial surgeons from the Dominions who worked with Gillies at the Queen's Hospital at Sidcup included Captain Fulton Risdon of Canada, Colonel Henry Newland from Australia and Major Percy Pickerill from New Zealand[4]. Equally impressive surgeons from the United States of America included Vilray Blair, Robert Ivy and Varaztad Kazanjian – Kazanjian being afforded the accolade as the "miracle man of the Western Front" for his oral and maxillofacial reconstructive work. Kazanjian was given further recognition by being decorated personally by King George V himself after the war[5]. However there is little doubt that the great achievement of Gillies was to bring so many surgeons (and patients) to one place. In an infant specialty this allowed for a growth of experience in managing different facial problems that was unparalleled anywhere; it is difficult to learn alone and Gillies himself said that it was harder to get a good case than hide a bad one.

Recognition - The Second World War

A little over twenty years later, the world was once again plunged into global conflict and medical services were mobilised to meet the requirements of the military. Plastic surgery by this stage had become a bona fide specialty in its own right; although many of the surgeons who worked in the maxillofacial units during the First World War had returned to their pre-war surgical practices, a few continued on with plastic surgery in their respective countries.

Gillies was still the doyen of the art but others, such as Archibald McIndoe, Tommy Kilner and J. Barrett Brown would establish names for themselves in the next global conflict.

At the beginning of the Second World War, the four recognised specialist plastic surgeons in the United Kingdom (known as the "the big four") were Harold Gillies, Tommy Kilner, Archibald McIndoe and Rainsford Mowlem [6,7] . As three of the "big four" were originally Kiwis (Gillies, McIndoe and Mowlem), New Zealand has great claim to fame in the development of the specialty. Furthermore McIndoe, like Mowlem, graduated MBChB from the University of Otago before travelling abroad for further surgical training (see below). The Kiwi connection through Gillies was very important in shaping at least the early careers of his younger colleagues.

Gillies and Kelsey Fry (who had been a front line medical officer before joining Gillies at Sidcup) were asked by the British Ministry of Health to make planning arrangements for specialised plastic and maxillofacial units mainly for civilian air raid casualties. The War Office had plans to form an Army Maxillofacial Hospital but only if the numbers justified the formation [4]. The re-opening of Sidcup was considered, but the risk of air attack (it was under the bomber route to London) precluded this and a dispersed plan was agreed.

Gillies remained the Civilian Consultant in Plastic Surgery to the British Army, based at Rooksdown Hospital, Basingstoke, but recommended McIndoe to succeed him as the Civilian Consultant Plastic Surgeon to the Royal Air Force (RAF) with a subsequent appointment at the Queen Victoria Hospital, East Grinstead. Mowlem was similarly appointed as a Civilian Consultant with the RAF and was based at Hill End Hospital in St Albans [6,8]. Kilner, who like Kelsey Fry had worked at Sidcup, worked at Roehampton.

During the Battle of Britain in the summer of 1940 most of the air battles were fought over South East England and the majority of the airmen requiring plastic surgery were sent to East Grinstead, which would be a major factor in establishing the reputation of East Grinstead as a plastic and maxillofacial unit and also make McIndoe a household name.

Figure 6: Harold Gillies as a volunteer medical officer in the Red Cross, 1915 (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

Sir Harold Gillies (1882 -1960)

Harold Delf Gillies was the youngest of eight children, born in Dunedin on 17 June 1882. His father was a successful surveyor and business man who later became a member of parliament and his mother was a niece of Edward Lear – the famed author, illustrator and artist who wrote *A Book of Nonsense* and popularised the use of limericks – a connection perhaps explaining Gillies' own fondness for the genre, as evidenced in the frontispiece of Gillie's Principles and Art of Plastic Surgery which he wrote with Ralph Millard [9].

Gillies was educated at Wanganui Collegiate School before travelling to England to receive his medical training at Gonville and Caius College, Cambridge, qualifying in 1904. After further training at St Bartholomew's Hospital in London he quickly acquired his MRCS and LRCP in 1908 and FRCS in 1910, whereupon he joined Sir Milsom Rees, the preeminent Ear, Nose and Throat surgeon of the time, as his surgical assistant [7,10].

Apart from medicine, Gillies was gifted in other areas such as golf, fly-fishing, water colour painting and violin, prompting his biographer to write "*It was as if the gods had exempted him from the need to serve any of the apprenticeships*" [4].

Gillies was to need all his artistic talents to combine with his medical skills in the dark days ahead.

When war was declared in 1914, both plastic and maxillofacial surgery were unknown entities in many of the medical services of the various armed forces, with perhaps the exception of Germany. Gillies volunteered as a medical officer with the Red Cross in 1915 (Figure 6) and as described earlier, was shown Lindemann's text by an American dentist, although there is some anecdotal evidence that suggests it was not Lindemann's text but rather a French book on rhinoplasty that was lent to Gillies [11].

Recognising the potential need for such surgery, Gillies managed to persuade the Director General of Army Medical Services, Sir Alfred Keogh, to provide a unit for receiving casualties with facial injuries. In 1916 Gillies was posted to the Cambridge Military Hospital, Aldershot "for special duty in connection with plastic surgery" [6].

In these early days of the unit, the fear of disbandment was often at the forefront of Gillies' mind and he went so far as to have self-addressed casualty labels printed out of his own pocket so that wounded soldiers requiring his services could be sent to him directly. He need not have worried: following the Battle of the Somme he received over 2000 casualties requiring his services. The sheer numbers quickly overwhelmed the 200 bed facility at Aldershot and a new hospital was rapidly planned, opening as the Queen's Hospital at Sidcup, Kent in June 1917 which was to become, in modern parlance, the centre of excellence for the treatment of facial injuries (Figure 7).

Figure 7: The Queen's Hospital, Sidcup, County Kent. Note the horse-shoe layout with various departments radiating from a central receiving area. (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

As the mark of a great surgeon, Gillies was aware of his limitations and when Kelsey Fry suggested to Gillies "*…I"ll take the hard tissues. You take the soft…*" a partnership was cemented, not only between the two men but also between dentistry and medicine. It illustrated the unique nature of treating face and jaw injuries where often the boundaries were blurred, as described by Anson in the History of the New Zealand Dental Corps during the Second World War: "*… it is impossible to label a case as purely medical or purely dental when destruction of half the face occurs*" [4,12]. Among the many innovations developed by Gillies, the one for which he is perhaps most famous is the invention of the tube pedicle flap, which to Gillies' great disappointment was independently developed by ophthalmic surgeon Vladimir Filatov of Odessa and Hugo Ganzer of Berlin [4,6,13]. Despite this independent development of the tube pedicle, Gillies certainly had a major part to play in its acceptance and utilisation for reconstruction. Later in life, Gillies reflected that his claim to fame was the establishment of a set of principles that formed part of his seminal work with Ralph Millard – *The Principles and Art of Plastic Surgery* [9]. Gillies also displayed a great deal of compassion towards his soldier patients and often "broke the rules" concerning the relationship between officers and other ranks. He was known to have played cards with the men after a long day of operating and according to Private R Evans of the Hertfordshire Regiment, whose jaw had been avulsed, he thought it remarkable that "*…ordinary soldiers received as much care as officers*" [4]. Exuding an outwardly calm and supremely confident manner, Gillies gave, above all, hope to soldiers with facial disfigurement, acknowledging not only the surgical aspects of management but also their psychosocial needs as well. Interestingly Captain Tommy Rhind NZMC, another Kiwi surgeon who served under Pickerill at Sidcup, expressed his unease about the light-hearted way in which Gillies treated his patients. Perhaps history has shown that Gillies was right and, indeed, an early pioneer of a less distant doctor-patient relationship.

The First World War earned Gillies the well deserved accolade of "father of modern plastic surgery" and although he may not have been the easiest person to work with at times, this remarkable surgeon has left a legacy of innovation and surgical prowess that few could equal – then and now.

Henry Percy Pickerill (1879-1956)

Pickerill's association with New Zealand was not due to birthplace or training but rather as the first Dean of the School of Dentistry at the University of Otago.

Born in Hereford, England on 3 August 1879, the eldest and only surviving son of the family, Pickerill was educated locally in Hereford before receiving his dental and medical education at the University of Birmingham [14].

The University of Birmingham was the first university in the United Kingdom to offer a BDS degree and Pickerill became the first graduate from this programme in 1904. Prior to graduating with his BDS, Pickerill had already done a two year apprenticeship in dentistry (as was the norm) and successfully gained the LDSRCS (Eng) in 1903.

Due to common courses in both dental and medical curricula, Pickerill was able to complete the requirements for the MBChB and graduated in 1905, quite an accomplishment having gained three qualifications in such a short time.

He was to continue this trend adding the MDS and MD degrees again from the University of Birmingham in 1911. It remains an anomaly however that Pickerill did not attain a membership or fellowship from one of the Royal Colleges of Surgeons during this time and anecdotally perhaps was to ultimately disadvantage him in terms of peer recognition later in life.

At the tender age of 28, Pickerill became the Director of the newly opened Otago Dental School and Hospital in Dunedin, New Zealand in 1907 and shortly after became the first Dean of the Dental School. His academic prowess and personal drive was well suited for the position and Pickerill quickly established himself as a prolific author, researcher and teacher on a wide range of subjects including cariology, oral physiology and oral and maxillofacial surgery.

Pickerill was appointed to establish a jaw unit for No 2 NZ General Hospital based at Walton-on-Thames, south-west of London in 1917 and his association with Gillies during the First World War began when he and the NZ Face and Jaw unit was transferred to the Queen's Hospital at Sidcup in 1918 (Figure 8).

Figure 8: Major Henry Percy Pickerill, NZMC (By kind permission of Dr Andrew Bamji, Curator, Gillies Archives, Queen Mary's Hospital, Sidcup UK)

The NZ section at Sidcup not only treated NZ soldiers but also other British and Empire soldiers as well and Pickerill earned a well deserved reputation as a first rate plastic and maxillofacial surgeon. One may argue that due to his dual training in dentistry and medicine, Pickerill was a more complete plastic and maxillofacial surgeon than Gillies. Pickerill did not in fact want to go to Sidcup and did so under duress, perhaps this sowed the seeds of later disagreement with Gillies as it is clear that due to strong personalities a rivalry developed between the two surgeons, especially when Pickerill became better known for procedures in his own right such as reconstruction of the upper lip[7]. It is of interest to note that by the time Pickerill published his text on facial surgery in 1924 based on his time at Sidcup there is no acknowledgement of Gillies at all or any other of the section leaders[14]. Pickerill continued on as a plastic and maxillofacial surgeon and for many years was the sole surgeon in Australasia to limit his practice in this field[6].

Pickerill's youngest son Paul would follow in his father's footsteps and see action in the Second World War as an officer of the NZ Dental Corps. His paper on the treatment of maxillofacial cases presenting at a casualty clearing station[15] was so complete and informative that it was used as a reference for dental officers in the field after the war[12].

Sir Archibald McIndoe (1900-1960)

Although too young to have been surgically involved alongside Gillies and Pickerill in the First World War, for some the name McIndoe is just as synonymous with plastic surgery as Gillies (Figure 9).

Figure 9: Sir Archibald McIndoe (www.historylearningsite.co.uk)

Archibald Hector McIndoe was born in Dunedin on 4 May 1900, the second of four children[6]. He was educated at Otago Boys High School (where the science building has been named after him) and completed his medical degree at the University of Otago with high honours, winning the junior clinical medical and senior clinical surgical prizes. McIndoe continued his success by receiving the first fellowship offered to New Zealand by the prestigious Mayo Clinic where he subsequently trained in abdominal surgery and no doubt would have stayed on as a member of Faculty if he had not been lured to London on the promise of a Professorship in Surgery (which never eventuated). Jobless, living in a basement flat with his wife and child, these were dark times for McIndoe until his first cousin, the newly knighted Sir Harold Gillies, offered a chance to join his plastic surgery clinic and helped secure a junior post at St Bartholomew's Hospital in London.

Like Gillies, McIndoe trained in a different field of surgery but entered into plastic surgery by opportunity – an opportunity that would lead to greatness.

In 1938, Gillies indicated to the Ministry of Health that McIndoe should succeed him as the Civilian Consultant Plastic Surgeon for the RAF and perhaps of "the big four" Mcindoe was the first experiencing serious surgical action owing to the Battle of Britain and the RAF's early involvement in the Second World War.

McIndoe's surgical expertise was in managing aircrew who survived baling out or crash landing from blazing aircraft and led to a reputation as the leading expert in burn injuries. Like another famous surgeon, Ambroise Paré (1510-1590?), who revolutionised gunshot wound injuries by not pouring boiling oil into the wound 16, McIndoe and Gillies defied standard protocols of treating burn injuries with tannic acid (McIndoe was almost violent in his opposition) and instead recommended the use of saline bath immersions as an initial treatment, following observations that pilots who baled out into the sea fared better in wound management. Like Gillies, McIndoe had no time for class structure and ceremony (perhaps a down-under trait) and treated officers and other ranks equally. However, he went one step further in his holistic approach by insisting that his patients become part of the local community and to have the local community take part in the psychosocial rehabilitation of these disfigured airmen[17].

Together with his aircrew patients, the "Guinea Pig" club was formed, poking fun at the experimental nature of many of the procedures undertaken for his patients, a not-so-funny aspect harking back to the First World War pioneering days of plastic and maxillofacial surgery (Figure 10).

Figure 10: Men of the Guinea Pig Club surrounding Sir Archibald McIndoe (sitting at piano) (www.historylearningsite.co.uk)

McIndoe deservedly became a household name and rose to great prominence in his surgical career not only as a plastic surgeon but also as a teacher and inspiration to a new generation of plastic surgeons, including Tord Skoog from Sweden and Paul Tessier from France[18]. The relationship between McIndoe and Gillies became cooler as McIndoe became more famous. Perhaps Gillies was stung by the success of his former protégé, who not only was a superb surgeon but was also politically aware and "acceptable" among the surgical elite at the Royal College of Surgeons of England. More an indictment on personalities rather than merit, the contrast between the two surgeons was dramatically highlighted in 1956 when Gillies failed to be elected to the Council of the Royal College of Surgeons of England whereas McIndoe was elected as vice-president that year [4]. Such was his involvement at the Royal College of Surgeons, McIndoe would have become the next president had it not been for his untimely death at the age of 60[18].

Rainsford Mowlem (1902 -1986)

Mowlem was born in Auckland on 21 December 1902 and perhaps is the least known among the kiwi plastic surgeons. Educated at Auckland Grammar, he was at the University of Otago medical school at the same time as McIndoe but was his junior by one year, graduating MBChB in 1924[6]. Like the vast majority of colonial doctors at the time, Mowlem travelled to the United Kingdom for further medical training and qualified FRCS in 1929. He started his career as a general surgeon but was introduced to plastic surgery as a locum at a hospital where Gillies had some patients. Mowlem went into partnership with Gillies and McIndoe before the Second World War and became established as one the "big four" which no doubt helped secure his appointment as a Civilian Consultant plastic surgeon for the RAF along with McIndoe (Figure 11).

Figure 11: Rainsford Mowlem (Author's personal collection, original source unknown)

Under Mowlem, the plastic and maxillofacial unit at Hill End, St Albans became a teaching centre throughout the war, although not quite reaching the level of recognition of East Grinstead. Mowlem was small in stature but in not in skill and was known as a meticulous surgeon and an excellent teacher but could be brusque at times[19,20]. He was a strong influence in the founding of the British Association of Plastic Surgeons, becoming president in 1950 and 1959.

Mowlem never returned to New Zealand but was very kind to Australian and New Zealand postgraduates who worked with him and no doubt kept up the down-under profile among his British colleagues.

Mowlem was not a prolific writer but among his few works of note was his monograph on bone grafting in which he describes the osteogenic potential of the cancellous portion of bone grafts[21]. Disillusioned by the bureaucracy of the recently adopted National Health Service in Great Britain, Mowlem opted for early and complete retirement and spent the rest of his life in Spain, dying at the age of 83, respected by his colleagues and pupils but not quite reaching the pantheon of fame as his older colleagues Gillies and McIndoe.

Four New Zealanders, whose work span two global conflicts, either largely unknown or mistaken for Englishmen, have contributed to the early days of plastic and maxillofacial surgery through their expertise, innovation and personalities to establish the specialties among the conservative surgical fraternity at the time.

Such names as Gillies and Kelsey Fry are indelibly imprinted on the annals of war surgery in the First

World War, whereas McIndoe is synonymous with his management of burn injuries and the formation of the Guinea Pig Club during the Second World War. Rainsford Mowlem, the junior partner, although known and respected among his colleagues remains less recognised except for those familiar with surgical history. Perhaps the least known outside New Zealand is the figure of Percy Pickerill, a brilliant academic and skilful surgeon who nonetheless, perhaps by an unorthodox approach to his surgical career, did not find acceptance among his surgical peers but deservedly should take his place alongside Gillies in his pioneering maxillofacial work during the First World War.

As to why New Zealanders feature so prominently in the early days of plastic and maxillofacial surgery can only be surmised. Perhaps it is a field of surgery that attracts innovative and highly practical people – a "down-under" trait one may say, or perhaps it is merely fate that surgeons from the Dominions should send their best and brightest overseas. And who said kiwis cannot fly?

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Applying the RAAAKERS™ framework in an analysis of the command and control arrangements of the ADF Garrison Health Support

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Abstract

Australian Defence Force Garrison Health Support operate in a complex relationship between a geography-based National Support Area (NSA) health care model, in which most of the medical resources and staff are owned by the single services; deployable capabilities, also owned by the Single services; and a National health care system that provides primary, secondary and tertiary health care both to the NSA and to deployed forces.

The Alexander Review, amongst other things, was required to inform the development of a command and technical control structure for health units that optimizes operational efficiency and effectiveness, and clarifies accountability to the Service headquarters and other Groups in the ADF. The RAAAKERS™ (Responsibility, Authority, Accountability, Awareness, Knowledge, Experience, Resources and Systems) framework was used as an analysis tool to assist in understanding the main command and control stress points in the Defence Health Services Division (DHSD). Structured interviews with many of the key staff of DHSD allowed the RAAAKERS™ construct to probe into the alignment of elements related to command capability, such as the Responsibility, Authority and Accountability attributes, and those associated with elements of control, such as the KERS attributes. In particular the paper shows how data from the interviews enabled construction of RAAAKERS™ metrics to highlight problematic areas related to technical control and to a lack of alignment in Responsibility, Authority and Accountability in some areas of DHSD.

The Viable Systems Model (VSM), developed by operations research theorist Stafford Beer, is a model of the organisational structure of any viable or autonomous system. As an additional analysis tool for the Alexander Review, VSM techniques were used to study Garrison Health Support and to determine the structure of the five internal systems needed for viability. This preliminary study also indicated stress points in the technical control aspects of Garrison Health Support and provided some support to the findings of the RAAAKERS™ investigation.

Introduction

In March 2008 a Review into health support to the Australian Defence Force (ADF) was announced with MAJGEN Paul Alexander as head.

One of the purposes of the Review, colloquially known as the Alexander Review, was to:

"Inform the development of a command and technical control structure for health units that optimizes operational efficiency and effectiveness, and clarifies accountability to the Service headquarters and other Groups. This structure must comply with baseline clinical governance standards for patient safety, provider competency and reporting;"

The Defence Science and Technology Organization (DSTO) was engaged to provide lines of evidence in the report with respect to this requirement. In this paper a novel technique for measuring command and control capability is outlined and the related results from a study of Defence Health Services Division (DHSD) are presented. The RAAAKERS™ framework was used as an analysis tool to assist in understanding the main command and control stress points in the DHSD. RAAAKERS™ stands for Responsibility, Authority, Accountability, Awareness, Knowledge, Experience, Resources and Systems and was created by one of the authors (Durant-Law) as a way of representing the main attributes associated with management of a large or complex enterprise. This case study is the first time it has been applied to a real situation.

As described here RAAAKERS™ was used in the Alexander Review to shed light on command and control issues.

It may also be thought of more generally as a diagnostic approach for effective management of organisations. RAAAKERS™ may be contrasted with the Balanced Scorecard (BSC)[1]. The BSC is based on the perception of the firm as a largely stand alone profitability machine, which needs to be optimized to reach maximum efficiency[2]. It can provide a systematic tool for combining financial and non-financial performance indicators in one measurement system, but it does not offer anywhere near the same degree of insight into command and control as does RAAAKERS™. More interesting is Drucker's Five Most Important Questions self-assessment book and tool[3]. As part of a high level environmental scan of an organisation this asks the questions:

- What is our mission?
- Who is our customer?
- What does the customer value?
- What are our results?
- What is our plan?

It can be viewed as a guide for Boards of Management to enable them to stay focussed at the strategic level. However it lacks the level of detail necessary for the Alexander Review requirement to look into efficiency and effectiveness of Health command and control. Neither the BSC nor Drucker's approach capture the complexities of the Garrison Health Support environment where the single Services and DHSD have overlapping areas of responsibility.

Background

The Alexander Review also considered recommendations from previous reviews into the ADF Health Services, including the Stevens review conducted in 2004[4]. Clifford[5], in re-considering the Stevens review and its terms of reference, identifies command and control as central issues for the ADF Health Services. In particular Clifford argues that the decision to maintain the ADF Health Services long-standing command and control arrangements - in which the single services often have command of health capabilities and materiel whilst the DHSD was given technical control – leads to inherent difficulties for DHSD to meet its mission.

In this context the analysis reported here may be seen as providing detailed information and diagnostics on the current (mid 2008) model of command and control within DHSD.

The next section describes how data from the DHSD was gathered for the RAAAKERS™ framework and key results are presented. Based on the findings, Command and Control measures of effectiveness are also computed and discussed in terms of the insight these provide to the Alexander Review.

Data Gathering

Structured interviews were held with the senior managers and managers of the key directorates within DHSD. Each interview focussed on a questionnaire based on the eight attributes in the RAAAKERS™ framework. For each attribute a series of relatively straightforward questions probed the respondent for their judgement on how well their work area rated against that element. A summary question for each section was used as a data assurance technique to safeguard the overall score assigned to a RAAAKERS™ element. This method allowed the data to be gathered in approximately ½ hour for each interviewee.

Table 1 shows the guidance provided to the interviewees on the elements in the framework. Note the definitions of, and distinctions between, knowledge and experience in the table. In RAAAKERS™ knowledge refers to understanding of a field of endeavour gained through study or past training, while experience refers to the application of this knowledge in the context of the work currently undertaken (in this case by DHSD).

Results and Interpretations

The RAAAKERS™ data obtained for DHSD is summarised in this section. Table 2 shows a summary across the work areas surveyed [1].

As Table 2 shows Accountability is the one element that scores in the high range. However Figure 1, which plots Accountability and Authority across the work areas, shows that the Authority to go with this accountability is often lacking. Note that in Figures 1 and 2, lines join the data points for ease of viewing though the variables are not continuous.

Table 1: RAAAKERS™ Elements explained

RAAAKERS™ Attribute	Questionnaire Guidance
Responsibility	This section looks at attributes related to the sphere or extent of your activities and roles as head of a unit. It seeks to find out how you view your responsibilities, how well defined they are, to whom you are responsible, and how others see your responsibilities.
Authority	This section asks about the authority you have to carry out your roles and responsibilities. This relates to the amount of control you have, both within the work unit and outside, over tasks and activities that you rely on to carry out your role.
Accountability	This section asks about how accountable you are for the outcomes of your work unit. In this section we are particularly interested in misalignment in accountability and responsibility - for example when you may be accountable for an outcome over which you have little control.
Awareness	This section relates to the awareness you and your staff have of the state, activity, status or situation of your own work unit and those with which you deal with on a regular basis or those who you rely upon. For example, knowledge of the state of readiness of medical staff in an Area Health Service or in the Reserves is a type of awareness at the operational level, as is changes in the situation with respect to recruitment or retention of medical staff at the strategic.
Knowledge	This section relates to the knowledge available to you to assist in performance of your duties. This knowledge is closely related to the "Familiarity, awareness, or understanding gained through experience or study" and pertains to medical, academic, or military training and experience that can be brought to bear on the tasks and activities of the unit.
Experience	This section relates to the experience of staff available to you to assist in performance of your duties. In this context experience refers to familiarity and practice in working in the DHSD to achieve its outcomes. In contrast with the knowledge referred to in the previous section this is about how medical, academic or military know-how can be applied in the ethos, work structures and business processes of the DHSD.
Resources	This section relates to the resources available to you in your work unit and to the resources of other units that you rely upon. These resources can include access to personnel, and budget $ to run programs, perform training and attract and retain staff.
Systems	This section relates to the systems available to you in your work unit. These could include information systems, communication systems and systems for induction or on-the-job training.

Table 2: RAAAKERS™ Summary for DHSD

	RAAAKERS™ Attribute	Possible	DHSD
1	Responsibility	5	2.8
2	Authority	5	3.0
3	Accountability	5	3.9
4	Awareness	5	3.0
5	Knowledge	5	3.3
6	Experience	5	3.1
7	Resources	5	2.7
8	Systems	5	1.4
	Total Score	**40**	**23.6**

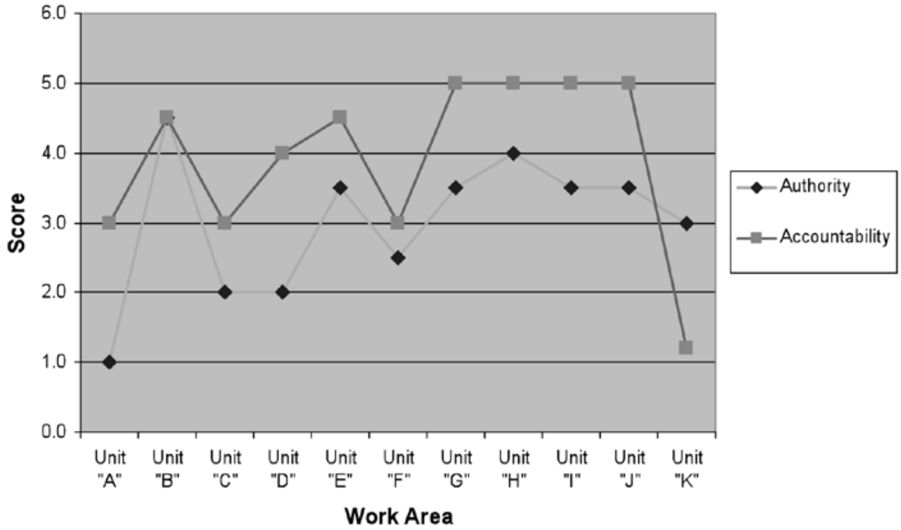

Figure 1: DHSD Authority vs Accountability

In order to further explore the implications of the data the following section outlines a basis for measurement of command and control capability. This is used to compute Command and Control measures of effectiveness for the areas surveyed in DHSD.

Command and Control Measures of Effectiveness

The current definition of Command and Control (C2) for the ADF is "Command and control is the system that empowers designated commanders to exercise lawful authority and direction over assigned forces for the accomplishment of missions and tasks."[6]. *Command* and *Control* are seen as separate but mutually reinforcing constructs[7] with Command defined as "the creative expression of human will necessary to accomplish the mission" and Control as "those structures and processes devised by command to enable it and to manage risk"[8].

For the RAAAKERS™ framework we propose that *Command* capability is strongly related to the elements Responsibility, Authority and Accountability and that *Control* capability is related to the attributes Knowledge, Experience, Resources and Systems. We further propose that it is the *minimum* value of the set {R, A, A} which determines the overall Command capability represented by these elements. This conjecture was tested in the questionnaire. At the end of the questions relating to the first three elements – Responsibility, Authority and Accountability - a separate question asked to what extent these three elements are in alignment and sufficient to enable the work area to carry out its roles and responsibilities. In all but one case the answer to this was a value close or equal to the minimum of the set {R A, A}.

This approach is similar to the Balanced Command Envelope (BCE) of Pigeau and McCann[9]. This provides a method for describing those human attributes essential for command in the context of three command dimensions: competency, authority and responsibility. Pigeau and McCann write "We posit that the level of competency, authority and responsibility held by individuals in Command should ideally lie within a *Balanced Command Envelope*, a volume within the Command Space that balances the attributes in the three dimensions".

The value for *Control* capability was taken to be the average of the set {K, E, R, S}. We argue that these elements of the RAAAKERS™ framework are closely related to the "structures and processes devised by command to enable it and to manage risk" and are important elements that enable a control capability. The average is used in the absence of any published guidelines in this area.

These definitions allow us to compute Command, Control capabilities or measures of effectiveness (MoE). Table 3 shows the values across the work areas surveyed. It also gives a combined "Command and Control" MoE which is taken to be the product of the individual MoEs. The data has been normalised to lie in the range 0-1 where the scale ranges from zero to maximum capability for the measure in question. Figure 2 plots the values in Table 3.

Table 3: Command and Control MoEs by Work Area for DHSD

	Unit	Command	Control	C2 Capability
1	"A"	0.10	0.38	0.04
2	"B"	0.80	0.60	0.48
3	"C"	0.40	0.54	0.21
4	"D"	0.40	0.44	0.17
5	"E"	0.60	0.55	0.33
6	"F"	0.40	0.58	0.23
7	"G"	0.70	0.46	0.32
8	"H"	0.80	0.68	0.54
9	"I"	0.50	0.59	0.29
1	"J"	0.70	068	0.47
1	"K"	0.24	0.51	0.12
	Overall Average Score	**0.51**	**0.54**	**0.29**

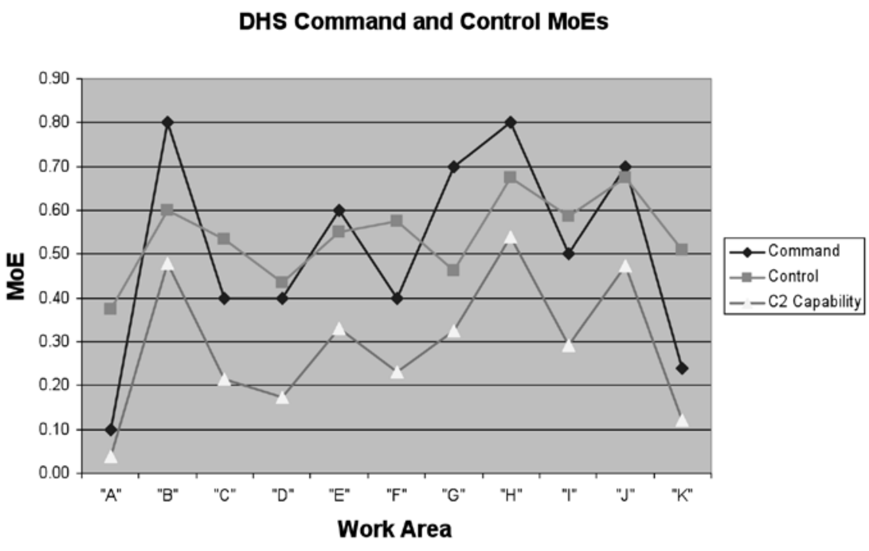

Figure 2: Command and Control MoEs by Work Area for DHSD

It is apparent from Table 3 and Figure 2 that there are substantial problems with command and control across the areas surveyed. Work area "A" in particular, which is one of the central elements in DHSD, has particularly low scores reflecting low RAAAKERS™ element ratings for this unit.

The overall average C2 MoE for DHSD of 0.29 (according to the traffic light analogy of Table 2) reflects an overall issue with command and control for DHSD.

In order to get a different perspective on these findings, and on the functioning of the Garrison Health Support more generally, we looked at Garrison Health Support through the lens of the Viable Systems Model.

A Viable Systems Model Analysis

The Viable Systems Model (VSM) was created by operations research theorist Stafford Beer[10,11]. In this work he attempted to define the principles that underpin all viable or autonomous organisations –

defined as those entities capable of functioning and adapting successfully in a changing environment. VSM belongs to the field of Organizational Cybernetics - the use of effective methods for studying and controlling organizations.

The VSM has been used both as a way of understanding and diagnosing organisational problems and as means of organisational design. It provides a completely different view of an establishment to that provided by the organisational chart, and provides a different vocabulary (based on cybernetics rather than top-down command and control) for describing this view.

Beer used the VSM approach in Project CyberSyn, an ambitious attempt to provide the equivalent of a nervous system to an entire national economy [12]. This was Chile in the early 1970s where the government of Allende attempted to apply techniques from Beer to manage an economy beset with command and control problems. CyberSyn involved the use of Telex machines to daily transmit data relating to factory output, logistics flows, and other indicators such as rates of absenteeism. A single computer stored the data for inspection by the Government.

A fascinating review of Beer's career is given in reference 13. This includes advice offered in 1970 to the administrator's of the British National Health Service (NHS). In this Beer diagnosed the NHS in the following terms:

". . . three monolithic blocks: the hospitals, general practices, and local health authorities . . . an introverted organization, preoccupied with its own antecedents, its internal power struggles, its levels of status, its costs and its wages, which solves its management problems in equations of political factors and psychological stress".

His analysis led to a suggested reformulation of the way hospitals should be run, based on *information*, within a health service run on *regulative* lines.

In the VSM a viable system needs to have five key systems in place in order to operate effectively. These are: Implementation, Co-ordination, Control, Intelligence and Policy. The purpose of each of these systems is described in Table 4.

Table 4: Key Systems for Viability in the VSM

System	Function
1. Implementation	This system contains several primary activities. Each System 1 primary activity is itself a viable system due to the recursive nature of these systems. These are concerned with performing a function that implements at least part of the key transformation of the organisation.
2. Co-ordination	This system represents the information channels and bodies that allow the primary activities in System 1 to communicate between each other and which allow System 3 to monitor and co-ordinate the activities within System 1.
3. Control	This system represents the structures and controls that are put into place to establish the rules, resources, rights and responsibilities of System 1 and to provide an interface with Systems 4/5.
4. Intelligence	This system comprises those parts of the System-in-Focus which are concerned with Future plans and strategies in the context of environmental information. It also performs an intelligence function.
5. Policy	This system is responsible for policy decisions within the organisation as a whole to balance demands from different parts of the organisation and steer the organisation as a whole.

A preliminary VSM diagnosis of Garrison Health Support was performed using the methods given by Walker [14]. The purpose was to identify the five systems (See Table 4) needed for viability for Garrison Health Support, and to map the existing structure and work units onto these systems.

The first step in this process that defines the boundaries of the system-in-focus was in some respects the most difficult. This is due to health units on a base being under command of a different system – for example the Army – but still part of the Garrison Health Support system. In the analysis this was glossed over and units were considered to consist of the medical staff, materiel and facilities in the nine Area Health Services plus sundry other Health units such as CAMU (Canberra Area Medical Unit). In addition Health capability deployed on operations was not considered part of the system. This is because the Garrison Health Support was viewed as the raise-train-sustain function for Command Joint Operations Centre (CJOC) and the deployed Commander having command and control of all deployed capability.

Table 5 shows a summary of the VSM sub-system analysis for Garrison Health Support.

Table 5: The VSM systems for DHS

	System 1	System 2	System 3	System 4	System 5
Role	**Primary activities – operational units**	**Regulation and tactical planning**	**Operations Planning & Control**	**Future Plans, Research, Program development**	**Overall Policy**
JHSA Units	The nine AHS Three Health Units	SHOs and BMs in the AHS	Health Services Branch Health Reserves for each service under SGADF	Strategic Health Policy and Plans Branch Defence Health Consultative Groups	Head DHS SGADF DGHS, DGHPP

AHS – Area Health Service; SHO – Senior Health Officer; BM – Business Manager SGADF – Surgeon General ADF; DGHS – Director General Health Services; DGHPP - Director General Health Policy and Plans; JHSA – Joint Health Support Agency

This preliminary analysis produced the following results. Firstly Garrison Health Support as constituted when the study was carried out had the necessary systems for viability. Secondly a more detailed work unit breakdown than that shown in Table 5 showed that one work element of DHSD was spread across Systems 2, 3 and 4. This is possibly an indication that autonomy is fragmented for this area. Interestingly this was also the unit that showed up with the lowest RAAAKERS™ scores and C2 MoEs.

Conclusion

In support of the need in the Alexander Review to look at command and control arrangements in the ADF Health Services we have presented an analysis based on RAAAKERS™ and an analysis based on the VSM. The RAAAKERS™ data, and the measures of effectiveness which are calculated from the data, indicated problems with command and control. These are exacerbated by lack of support in decision-making tools and data for management purposes. Primary amongst a number of issues were that many senior staff felt they were accountable for outcomes over which they little authority and that there was in consequence a lack of unity of command. The VSM provided support for some of the findings from the RAAAKERS™ analysis and bears further investigation as a diagnostic tool for complex organisations.

The results provide strong support for the ideas put forward by Clifford[5] who also saw command and control as central issues for the ADF Health Services.

The head of the review, MAJGEN Alexander, used the results as a line of evidence in a submission to the Chiefs of Service Committee (COSC) recommending a number of changes to the ADF Health Services. COSC accepted the preliminary findings of the Review and agreed to create Joint Health Command and the position of Commander Joint Health as the first step to achieve unity of command.

The results presented here, and the degree to which they were understood, accepted and used by MAJGEN Alexander, suggests that RAAAKERS™ is a viable diagnostic framework for the types of problems under investigation. We believe that it is sufficiently generic to be applicable across a number of domains including Defence operations.

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Submarine escape and rescue: a brief history

Nick Stewart

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The disaster which befell the Russian submarine Kursk in August 2000 caught the world's attention and became a galvanising event in drawing renewed focus on submarine safety in the new century. Public empathy worldwide seemed to be driven by the belief that when a submarine goes down there is little that can be done for the crew. However, the history of successful submarine escape and rescue is as long as the history of the submarine itself.

As submarine capabilities were gradually introduced in various navies around the world, a common question also emerged: what can be done in the event of a submerged accident that disables the submarine and prevents it returning to the surface? Essentially the answers remain the same.There are two options available for the crew of a submergeddisabled submarine (DISSUB); escape or rescue. Escape is the process where the DISSUB's crew leaves the boat and reaches the surface without external assistance; while rescue is undertaken by outside parties who remove the trapped crew from the submarine.

At the dawn of the modern submarine age the initial focus was given to escape. Appearing around 1910 the first escape systems were derived from the breathing apparatus used by coal miners. These used a soda-lime cartridge which binds large quantities of carbon dioxide, cleaning the air breathed. The system utilised in the first submarine escape was the German Dräger breathing apparatus, used when the submarine U3 sank in 1911.[1] A number of similar systems followed; with the Davis Submarine Escape Apparatus (DSEA) being adopted by the Royal Navy in 1929 and the Momsen Lung used by the United States Navy

(USN) until 1957.

These escape systems remained prevalent until 1946 when the Royal Navy held an inquiry into escape from sunken submarines. The inquiry found no difference in survival rate between those who used a DSEA to escape and those that did so unaided.[2] As a result the DSEA was replaced with the 'free ascent' or 'blow and go' technique. Free ascent involved the crew member beginning the ascent with compressed air in their lungs. During the ascent the submariner breathed out at a controlled rate, allowing air to escape. This was a continual process, as the air expanded in the lungs due the decreasing pressure experienced en route to the surface. To limit the chance of being affected by decompression sickness, the escapee would use the bubbles of expelled air to judge the ascent by staying behind the smaller bubbles. To aid in the escape, a crew member might also use a life jacket or buoyant ring. In this case the rate of ascent was more rapid, which required the submariner to blow more rapidly throughout the journey to the surface. Buoyancy assisted free ascent continues to be practiced by Royal Australian Navy (RAN) submariners at the Submarine Escape and Rescue Centre at HMAS Stirling in Western Australia.

After a brief flirtation with free ascent, the USN implemented the Steinke Hood in 1962. Literally a hood with a plastic face mask attached to a life jacket, the Steinke Hood allowed the crew member to breath air trapped in the hood on their ascent following escape. Breathing in the trapped air reduced the chances of contracting the bends if the user breathed normally.

Free ascent and the Steinke Hood were favoured for their ease of use, but both systems had one glaring flaw: they failed to provide protection from the elements once the submariner reached the surface. This was apparent in 1950, when HMS *Truculent* sank following a collision with a merchant vessel within sight of the British shore. All of the 72 crew made it to the surface but only 15 survived with the rest swept out to sea by the tide and lost. These shortcomings were again evident with the *Kosmsomlets* disaster in 1989. Of the Soviet submarine's 69 crew, 34 of those who made the ascent to the surface later died from hypothermia, heart failure or drowning.

In the 1990s a large percentage of the world's navies operating submarines, including the RAN, replaced their existing escape systems with either the British developed Submarine Escape Immersion Ensemble (SEIE) or local versions of that design. Using trapped air, similar to the Steinke Hood, the SEIE covers the user completely and importantly, provides thermal protection. Further, the suit has an inbuilt life raft that, once on the surface, can be linked to other life rafts. The suit allows for an escape from 185 metres.

Prior to 1939 it was generally considered that if the crew could not escape the DISSUB then there was little that could be done to rescue them. During the 1920s some navies, in particular the USN, used salvage type operations with some success. However, these early rescue operations were conducted under ideal conditions which seldom occurred in practice. Often the amount of damage suffered by the submarine was unknown, which meant the submarine could not be moved as it might break apart in the process. Time was also a factor as the crew would have only three days of air at the most. Unfavourable conditions on the surface would prevent a salvage operation being carried out, as was the case in 1927 with the American submarine *S-4* when gale force winds prevented the rescue from commencing in time. Due to the difficulties involved, salvage was abandoned as a means of rescue.

Thinking on submarine rescue changed dramatically in 1939 with the sinking of USS Squalus. During seagoing trials an equipment failure resulted in the flooding of Squalus' aft torpedo room, engine rooms and crew's quarters killing 26 of the boat's 59 crew instantly. Quick work by the remaining submariners prevented further flooding but the boat, now disabled, came to rest 74 metres below the surface. Since Squalus was carrying out the exercise in company with her sister ship, USS Sculpin, the DISSUB was quickly located and the alarm raised. What followed was the first true and, to this day, only successful submarine rescue.[3]

The submarine rescue ship Falcon arrived on site with submarine salvage and rescue expert Lieutenant Commander Charles B 'Swede' Momsen, USN, on board. Momsen, the man who invented the Momsen Lung, employed the newly developed McCann Rescue Chamber to great effect. The chamber was a large steel bell that was lowered from a surface vessel to cover the submarine's escape hatch. Once attached it was possible to reduce air pressure and open the hatch to allow the trapped submariners to climb aboard. Using the chamber the 33 surviving crew members were rescued in four trips. The McCann Rescue Chamber System remains in servicein several contemporary navies, including the USN and the Turkish Navy.

Submarine rescue philosophies evolved further in the 1960s following the loss of two American nuclear powered submarines, US Ships *Thresher* and *Scorpion*, despite both boats being lost in waters that precluded escape or rescue. After considering a variety of options, including submarines with in-built escape pods (similar to the Russians) and submarines with front ends that could be blown to the surface, the USN developed the Deep Submergence Rescue Vehicle (DSRV). Entering service during the 1970s the DSRV, a manned mini-sub that mates with a DISSUB's hatch and could carry 24 people at a time, offered great flexibility. With two built, one is maintained in an operational state so it can be flown in a C-5 cargo plane to a port nearest the DISSUB. It can then be placed onboard either a modified US or allied submarine. Operating from a submarine means that rough surface conditions or ice is less likely to adversely affect rescue operations.

US Navy DSRV with HMAS Rankin in Hawaii (RAN)

US Navy DSRV with HMAS Rankin in Hawaii (RAN) Other navies followed the lead of the USN and developed their own portable rescue capabilities. The Royal Navy's LR5 Submarine Rescue Vehicle (SRV) is similar to the DSRV in most aspects but instead of using a modified vessel the LR5 uses a ship of opportunity as the Mother Ship. The LR5 is part of the UK's multifaceted Submarine Rescue Service which also includes the Submarine Parachute Assistance Group (SPAG) and the *Scorpio* Remote Operated Vehicle (ROV). Composed of selected staff members from the submarine escape training tank and rapidly deployable, the SPAG functions as a first–on-site capability that provides assistance to a DISSUB or to those who have escaped. The obvious benefit of the SPAG is that timely assistance and coordination can be provided in order to avoid another *Truculent* or *Kosmsomlets*. The primary function of the *Scorpio* is to inspect and survey the DISSUB on the ocean floor. It can also clear debris from the site and record data such as water temperature, which is then used to assist in deciding on a suitable rescue strategy.

Both the LR5 and DSRV are nearing the end of their lives with each expected to be replaced by new systems by the end of 2008. The LR5 will be replaced by the NATO Submarine Rescue Service (NSRS), a system developed jointly by Britain, France and Norway, while the USN is developing the Submarine Rescue Diving and Recompression System (SRDRS). Both systems are similar and will carry out rescue operations in three phases; reconnaissance, rescue and crew decompression. The reconnaissance stage will involve an ROV locating the DISSUB and recording data before a manned vessel conducts the rescue. The final stage, crew decompression, will involve a Transfer Under Pressure (TUP) chamber which enables the rescued submariners to be transferred from the rescue vehicle directly to a decompression chamber, thus preventing exposure to any unsafe atmospheric changes.

While many of the developments in submarine rescue have been driven internationally, the RAN has taken the initiative in designing its own rescue system. Prior to 1995 the RAN had no organic submarine rescue system but did have a standing agreement with the USN for use of a DSRV in any emergency situation involving an RAN Oberon class submarine. The introduction of the Collins class coincided with the development of the Submarine Escape and Rescue Suite (SERS) which includes the Australian SRV Remora,the SRV's launch and recovery system, and decompression chambers with a TUP capability.

The capability to conduct a rescue is vital but counts for little if nations are unable to employ elements of another's rescue capability, where that equipment might be better suited than their own. This was revealed in the post-Kursk disaster analysis. In the disaster's aftermath the International Submarine Escape and Rescue Liaison Organisation (ISMERLO) was formed, with the primary objective to help coordinate future submarine rescue missions. Through its website, a nation with a DISSUB can note what assets are available, while nations that are capable can respond. With over 40 countries now operating submarines the role ofISMERLO is critical. This is reflected in the fact that the organisation is an intrinsic part of submarine rescue exercises around the world, such as the NATO-sponsored BOLD MONARCH. The RAN also helps to promote regional cooperation on submarine rescue through its participation in Exercise PACIFIC REACH, the triennial Asia-Pacific submarine rescue exercise.

In summary, early submarine operations relied on escape as the preferred method of recovering submariners from a disabled submarine. However, accidents and practical experience proved that rescue was also necessary. Momsen and other advocates of submarine rescue championed advancements in rescue systems, life support and recovery coordination. So if the unthinkable happens today, the chances of a successful rescue are significantly greater than they have ever been.

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John Murtagh's General Practice Companion Handbook

John Murtagh

**4th edn, xxxviii + 441 pp, paperback (plastic cover) with illustrations, ISBN13: 978-007013628-1, Sydney, McGraw Hill, RRP: AUD150, 2007 (Reprinted 2008).*

Reviewed by Peter A Leggat MD

In 2006-2007, the Australian Government estimated there were 25,564 general practitioners (GPs) in the country.[1] There would be few GPs who did not have a textbook by John Murtagh in the bookcase of their practice. For those GPs wanting a portable ready reference, then the fourth edition of the *John Murtagh's General Practice Companion Handbook* is a "must-have" manual. First published in 1996, the fourth edition of *John Murtagh's General Practice Companion Handbook* contains a Preface, About the author, Laboratory reference values, Normal values-diagnostic guidelines, a list of Abbreviations, a table of Contents, and an A-Z of general practice conditions listed alphabetically. There is no index as the table of Contents is a comprehensive alphabetical listing of all the conditions discussed. There is also no bibliography nor a glossary. The handbook is presented with a durable plastic cover printed in full colour as an 18 x 11.5 cm manual, which would easily fit into the clinical/suit coat pocket or briefcase/handbag.

The backcover suggests that the handbook is targeted to the "medical student or an experienced professional, a rural or urban practitioner, a clinician or researcher". *John Murtagh's General Practice Companion Handbook* appears to be primarily aimed at general practitioners or registrars in general practice. It would also be useful if provided to students undertaking courses in general practice as an adjunct to standard major reference textbooks in general practice and clinical medicine. The concise A-Z style means the handbook is consistent in presentation and easy to read. The conditions discussed are highlighted at the top of the page, which helps the reader find the condition for which they are looking. The incorporation of extensive boxes, tables and figures is helpful. There are however no colour plates of "spot" diagnoses, which is a pity. There is also a missed opportunity to put information on the major general practice emergencies on the inside front and back covers, which might be useful to consider in a future edition.

John Murtagh's General Practice Companion Handbook literally runs A-Z from Abdominal pain to Zoonoses. It targets the more common general practice conditions and is fairly comprehensive in this field. Readers should not expect to find detailed information on the more exotic conditions, such as emerging infectious diseases or many of the travel-related diseases such as malaria. None-the-less, the handbook does contain an integrated section on 'Travel medicine and tropical infections', which provides a useful overview of some of the travel-related illnesses and some of the more notable tropical diseases such as melioidosis. Some readers may feel the need to consult a dedicated handbook of travel or tropical medicine.[2,3] The manual is probably also largely limited to the Australian audience, but possibly could be utilised in New Zealand.

Professor John Murtagh, AM, MD, BSc, BEd, FRACGP, DipObstRCOG, is Professor in General Practice at Monash University, Melbourne, Australia. He also holds related positions at the University of Melbourne and the University of Notre Dame in Perth, as well as being a GP at the East Bentleigh Medical Group. Professor Murtagh is considered to be one of the elder statespersons of general practice in Australia. He publishes frequently in the medical literature, as well as contributing to his suite of textbooks, a number of which have been recognised internationally, including *Practice Tips*.[4]

The production of the fourth edition of the *John Murtagh's General Practice Companion Handbook* is a credible effort. It is now an established and a worthy member of textbooks dedicated to general practice. The cost is not prohibitive and it has little competition in the field of general practice.

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Java Rabble

Fred Skeels OAM

Victoria Park: Hesperian Press; 2008. (ISBN 978-0-85905-419-5: 151 pages)
Reviewed by Dr Andrew Robertson

In September 2000, I reviewed 'Proud Echo' by Ronald McKie for *Australian Military Medicine* [1]. 'Proud Echo' narrated the history of the Battle of Sunda Straits, and of the events that followed, from the accounts of individual sailors. On the night of 28 February – 1 March 1942, the United States heavy cruiser, USS HOUSTON, and the Australian light cruiser, HMAS PERTH, having survived the disastrous Battle of Java Sea, sailed from the port of Batavia to force a passage through the Sunda Strait, when they met a major Imperial Japanese Navy (IJN) task force. After a fierce battle of several hours duration, both Allied ships were sunk.

Fred Skeels OAM, an 18 year old gunner on HMAS PERTH at the time, narrates the story of the lead-up to the battle, the battle itself and the aftermath of the sinking, including his experiences as a prisoner of war. Fred Skeels was one of the 229 out of 681 officers and men who returned home, with 357 killed in action and 105 dying as prisoners of war.

The book is well-written and compelling to read. The book is essentially in two parts. The first part relates to Mr Skeels' service on HMAS PERTH up until her sinking. The second part, which occupies the majority of the book, details his experiences as a Japanese prisoner of war, firstly in Java, then on the construction of the Burma side of the notorious Thai-Burma Railway, and, finally, after being moved through Saigon and Singapore, as a worker in a coal mine in Japan itself. The constant battle to stay alive under horrendous conditions, the impact of disease and starvation on the men, their final release and the aftermath post-war, including the need for psychological support, are well portrayed in this book.

'Java Rabble' reminds us of the major psychological and physiological impacts that prisoners of war may undergo, particularly if the captors are brutal, and the support that may be needed on their repatriation. Mr Skeels' memoir is worth reading by all those interested in Australia's war at sea in World War II and in the experiences of the prisoners of war.

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CDC Health Information for International Travel 2008

*Edited by Paul M. Arguin, Phyllis E. Kozarsky and Christie Reed**
**2008 Edition, (xiv) + 627 pp, Paperback, GBP19, ISBN 978-0-323-04885-9, Atlanta, USA, Elsevier Mosby, 2008.*
Reviewed by Peter A Leggat MD

Travel medicine is an area that needs to be informed by accurate information concerning the epidemiology, management and prevention of disease and injury amongst travellers. It is a discipline that is constantly changing as the patterns of disease and injury evolve. The 2008 Edition of the Centers for Disease Control and Prevention's (CDC) CDC *Health Information for International Travel*, commonly referred to as the "Yellow Book", satisfies the need for a highly respected international reference source of information on major disease and injury issues relevant to the pre- and post-travel consultation. Many readers will be familiar with the excellent online version of this reference.[1] This 2008 Edition of the CDC *Health Information for International Travel* has a Preface, a list of 93 CDC Contributors, a list of eight External Contributors, Acknowledgments, a table of Contents, a List of Tables (42), a List of Maps (24), nine Chapters, and a comprehensive Index. There is no Foreword. References are given by section. The cover is attractive with a yellow theme, consistent with the "Yellow Book"; however on first glance the photograph chosen for the cover could suggest a diving medicine publication.

Chapters include "Introduction", "Pre- and Post-travel general health recommendations", "Geographic distribution of potential health hazards to travelers", "Prevention of specific infectious diseases", "Yellow fever vaccine requirements and information on malaria risk and prophylaxis, by country (yellow pages)", "Non-infectious risks during travel", "Conveyance and transportation issues", "International travel with infants and young children" and "Advising travellers with specific needs". The *CDC Health Information for International Travel* is easy reading and has an infectious disease focus common to these types of references. Highlights include the excellent structure of each section, maps and the provision of key and further readings. At 249 pages, nearly half of the textbook, the chapter on prevention of specific diseases is one of the most comprehensive of any travel medicine reference book. Other items of interest include the sections on visiting friends and relatives and humanitarian aid workers, as well as the latest on Avian influenza. It may have been useful to include more discussion on first aid, safety, finding medical assistance abroad, emergency assistance and aeromedical evacuation, and travel insurance.

Little information is given concerning the editors; however they are from the highly respected CDC, US Department of Health and Human Services. Interestingly, although there are 93 listed CDC contributors and eight external contributors and despite *Health Information for International Travel* being used as an international reference, there are no contributors outside North America and only one of the external contributors was from outside the USA.

The *CDC Health Information for International Travel* is an essential reference for all physicians and nurses working full-time or part-time in travel medicine. It would easily fit into the briefcase or desktop library, although it is quite heavy for its size. Its main competitor is the well-known World Health Organization publication, *International Travel and Health*,[2] now the "blue book", which is a much more compact publication giving only the essential information for travel health advisers and with a website presence as well. The Guide[editor note: it is not clear whether 'The Guide' refers to the CDC publication or the WHO publication, author to clarify] will also appeal as a reference textbook to general practitioners and general practice staff, especially those who are called upon to occasionally provide travel health advice, and other health professionals with an interest in travel medicine. Academic and research departments of travel medicine should also consider the reference as an essential textbook for their libraries and postgraduate courses in travel medicine. This 2008 edition of the *CDC Health Information for International Travel* remains the definitive work in the exclusive international portfolio of standard reference textbooks in travel medicine.

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Bruce James Cheffins, Surgeon Lieutenant RAN 1965-1971

8 January 1940 – 14 March 2008

CMDR Neil Westphalen, RAN

Dr Bruce James Cheffins died at the Fremantle Hospital on 14 March 2008, as the result of a vehicle accident. He left behind his wife Andrae, sons Peter and Richard, daughters Bridget and Susie, and four grandchildren. His RAN service was noteworthy for his compassion and leadership aboard HMAS *Perth* (DDG 38, Captain P.H. Doyle RAN) during her first Vietnam deployment from October 1967 to March 1968.

Bruce Cheffins was born on 8 January 1940 in the family home at Subiaco WA, to Harold and Lavinia, the second of two children. Following his schooling at Perth Modern School, Bruce studied medicine at the then-new medical school at the University of Western Australia, in the second student intake. During this time he met Andrae and they married at CASubiaco on 1 May 1965.

At that time Bruce had recently entered the RAN as an undergraduate, on 13 January 1965. He undertook his internship at Fremantle Hospital and was promoted to Surgeon Lieutenant on a short service commission on 1 April 1966. He commenced full-time service on 25 May 1967, when he joined HMAS *Perth*.[1]

LIEUT Bruce Cheffins, probably aboard HMAS PERTH, 1967

At that time HMAS *Perth* was working up for her first Vietnam deployment (the second by an RAN guided missile destroyer), on which she sailed from Sydney on 2 September 1967 to relieve HMAS *Hobart*.

HMAS Perth sailing from Sydney Harbour on her first Vietnam deployment (AWM NAVY14006)

During gunnery exercises off Subic Bay she was asked for medical assistance from the oiler USS *Neches* (AO 47). Surgeon Lieutenant Cheffins confirmed the patient had appendicitis and took him back to HMAS Perth for a rapid return to Subic Bay.[2]

HMAS Perth (right) alongside HMAS Hobart in Subic Bay, Sep 67 (AWM NAVY14110)

HMAS *Perth* arrived in the Area of Operations on 26 September and had her first fire mission the same day, in support of US Army elements in the northern Binh Dinh province of South Vietnam. Three days later she was reassigned to duties with the cruiser USS St Paul (CA 73) (relieved by CA 148 Newport News on 17 October) and the US destroyers Collett (DD730), Edwards (DD 619), Morton (DD 948), Goldsborough (DDG 20) and Berkley (DDG 15). These ships had recently received fire from coastal batteries in the Cape Lay area (about five nautical miles north of the Demilitarised Zone, or DMZ), and as a result were conducting counter-battery and suppressive fire missions. After joining them HMAS Perth expended up to 400 rounds a day over the next three weeks.[3]

On the morning of 18 October USS Newport News and HMAS *Perth* were off Chau Khe, about 150 nautical miles north of the DMZ. They had just identified a group of suspected Water Borne Logistic Craft (WBLCs) as fishing junks when they came under fire from 12 or more coastal defence batteries, at a range of 16,500 yards. The two ships immediately altered course and had begun counterbattery fire when HMAS *Perth* was hit by a 85mm or 100mm semi-armour-piercing round, which glanced off the rear of the after five-inch gun mount (Mount 52), penetrated 01 deck forward of the turret and exploded in the registered publication vault.[4]

Unidentified (and very young) stoker, and below-deck damage from shell hit, HMAS Perth, 18 Oct 67. The shell exploded in the registered publications vault on the right (note the blown-out door frame). Also note the width of the passageway. (AWM NAVY14761)

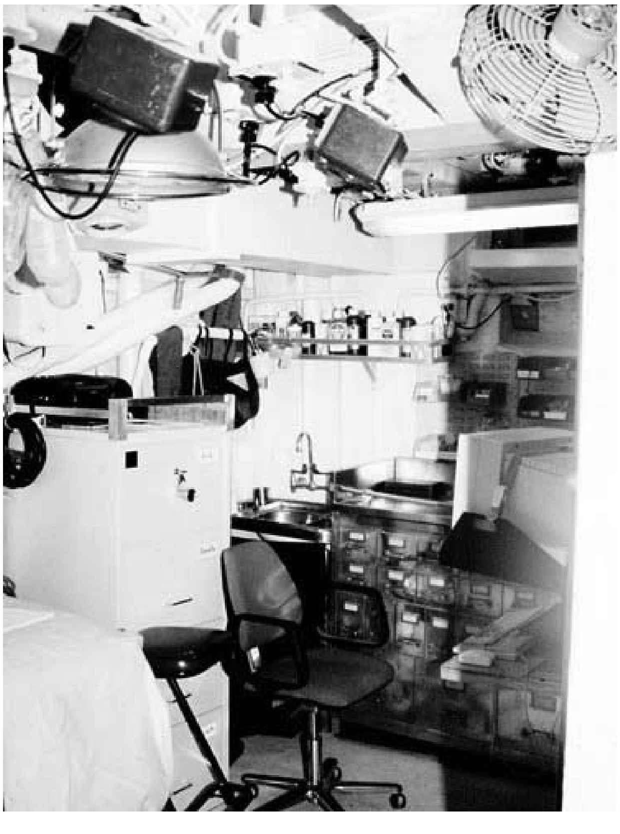
Shell hit, HMAS Perth, 18 Oct 67. Entry hole in 01 deck forward of Mount 52 after ricochet. (AWM NAVY14773)

Although the ensuing fire was quickly extinguished and it was decided the ship could remain on station, Surgeon Lieutenant Cheffins, Leading Seaman Sick Berth Attendant John Wilden and the first aid parties had four (later seven) casualties, who had been moving along the main passageway when she was hit. The injuries included shock, burns, concussion and shrapnel wounds. Two were later evacuated by helicopter to the US carrier Oriskany (CVA 34), thence to the USN hospital at Subic Bay in the Philippines.[5]

Rear Admiral Combs USN (right, in doorway) examines the damage, probably at Subic. Left to right: possibly Commander A.F. Lade RAN (HMAS Perth); Captain P.H. Doyle RAN (Commanding Officer HMAS Perth), and Chief Petty Officer Coxswain S.J. Parke (who was one of the wounded crew members). (AWM NAVY15107)

The difficulties in managing these cases aboard HMAS Perth should not to be underestimated. DDG's were originally designed by the US Navy as aircraft carrier escorts, which permitted the centralisation of all health services on the carrier – a mode of operation which often did not apply to the RAN. As a result the DDG sickbay was a very small compartment on the starboard side midships, sandwiched between the cafeteria forward, the Chief Petty Officer's mess aft, the weather deck outboard, main passageway inboard, and the number 2 fire (boiler) room immediately below. It was not practicable to use the sickbay to treat more than one patient at a time, and those who required bed rest had to be sent to their own bunk. Stowage space was minimal and noise from the fire room below made patient examination somewhat hit-and-miss.[6]

As a result, the cafeteria was used as the battle dressing station. In this case, access from the damaged area to the sickbay entailed using a passageway that did not allow ready movement two abreast (let alone stretchers), and were in any case full of damage control personnel.



Sickbay HMAS Perth, 1996. The photo was taken through the entry door, looking aft. To the left is the patient examination couch, with the lower end folded to permit access. Forward of the couch (out of sight) was a filing cabinet for medical documents and a small desk. Aft of the couch is another file cabinet for medical documents. Across the aft bulkhead is the sink and storage cabinet. Behind the door on the right was a drug fridge and wall-mounted laptop computer. Although the equipment had been updated over the preceding 20 years, the lack of space is evident. (Author)

Passageway HMAS Perth, 1996. This photo was taken from the same place as the previous one, looking aft. Beside the width of the passageway, of note is the Oxy-viva and Paraguard stretcher, located outside the sickbay for lack of space. (Author)

Toxic gas casualty exercise, cafeteria HMAS Perth, 1996. The cafeteria was located forward of the sickbay. Of note is the number of people required to manage two casualties in the space available. (Author)

Shortly thereafter HMAS *Perth* picked up five survivors from a sinking junk during a fire mission of the Red River; two more were picked up by USS *Newport News* but another was taken by a shark. Surgeon Lieutenant Cheffins' strong moral sense ensured they were treated compassionately, notwithstanding HMAS *Perth's* own recent casualties.[7]

Recent correspondence received by Bruce's son Peter from Commander Geoffrey Furlong RAN (Rtd) recounts the incident:

> I was the Gunnery Officer of HMAS *Perth* on the Vietnam deployment, and I felt that you might like to hear of one incident onboard the ship in which Bruce demonstrated with his medical skills his concern for people, even though they were on the "other side" in that war.
>
> The ship's radar detected a trawler which was steaming south, close to the coast, and we proceeded north at high speed to intercept this craft. At the same time, we called in a US Navy A10* aircraft to identify and attack it if she proved to be an enemy vessel. As we closed from a range of about 10 miles on a bright clear day, we saw that the A10 had hit the vessel and it was sinking. As we neared the trawler, it sank and left the surviving members of the crew floundering in the water.
>
> Unfortunately, due to the explosions and the blood in the water, many sharks had been attracted to the area and were attacking the survivors. We attempted to shoot some of the sharks who were endangering the men in the water but many of the crew were taken. I suppose we managed to rescue just over half of the twenty or so who had been swimming towards us.
>
> The reason that I mention it at all is to emphasise the compassionate care of Bruce and his medical team as they provided first aid to the shocked and wounded and bleeding survivors as they were brought on board and then taken below for follow up and surgical treatment.
>
> Bruce's obvious compassion was infectious, and the sailors took their lead from him and treated the survivors with dignity and kindness. He made a big impression on all of us that day.[8]

Having fired 13,351 rounds and coming under fire on three more occasions, HMAS Perth returned to Sydney on 10 April 1968. Surgeon Lieutenant Cheffins was posted ashore to HMAS Cerberus from 20 May 1968 and was granted a two year extension to his short service commission from 13 January 1969. Following a posting to the destroyer escort HMAS Derwent from September to November 1969, he returned briefly to Cerberus before joining the Junior Recruit Training School at HMAS Leeuwin in Fremantle as the medical officer from 2 March 1970.

Sickbay staff HMAS Leeuwin, 1970 (original at Fleet Base West Health Centre, HMAS Stirling)

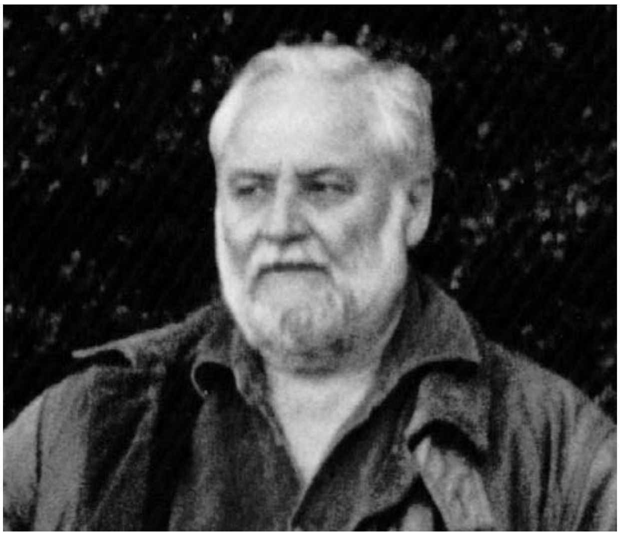
Rear row: Sick Berth Attendant P.T. Millen, Leading Mechanician L. Chaplin-Ardagh, Sick Berth Attendant M.L. Bell, Sick Berth Attendant T.R.A. Elvard

Middle row: Leading Mechanician J.G. Flood, Leading Sick Berth Attendant S.F. Reilly, Leading Cook A.E. Petty

Front row: Sick Berth Petty Officer J.L. Chapman, Senior Sister C.T. Scarfe RANNS, Surgeon Lieutenant B.J. Cheffins RAN, Sick Berth Chief Petty Officer (X-ray) R.J. Chilby

After he left the RAN on 5 May 1971, Dr Cheffins joined the WA Mental Health Service, as a residential medical officer for hostel patients at Graylands and Heathcote Hospitals, until his retirement in 1996. It was during this time that his compassion towards those in need of assistance, and his ability to engage with people from all walks of life, were called on in stressful conditions not dissimilar to those he had already encountered off Vietnam (Graham C. pers comm., 05 Sep 2008).

* It is not certain what aircraft type CMDR Furlong refers to, but it is likely he meant the A-1 Skyraider, a carrier-borne piston attack aircraft. The 'Spad' first entered USN service in 1946 and was still pivotal to Vietnam combat operations in the mid-to-late 1960's. The A-10 Thunderbolt II is a US Air Force attack aircraft that did not enter service until 1977.



Dr Bruce Cheffins, France, 2002 (Cheffins family)

Bruce Cheffins was held in high regard by those with whom he worked, both in the Navy and the WA Mental Health Service. His life priorities were his family, medicine, travel and cooking.[9]

Bruce James Cheffins was buried on 22 March 2008 at the Karrakatta Cemetery, alongside his parents.

Acknowledgement

I would like to thank the Cheffins family for their assistance with this obituary.

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Surgeon Captain 'Sandy' Ferguson AM VRD RFD RANR RTD

13 January 1917 – 29 May 2008

Dr Michael Dowsett

"Sandy" Ferguson graduated in Medicine at Melbourne University in 1942 and following his residency at The Alfred Hospital was commissioned as a Surgeon Lieutenant in the Royal Australian Naval Reserve in 1943. Prior to studying medicine he had tried to commence a naval career and having been accepted to join the Naval College at the age of 13 found his career cut short when the Commonwealth Government closed the College as an economy measure.

Following a short period at HMAS CERBERUS he was posted to HMAS MANOORA, an infantry landing ship and saw active service in the South West Pacific taking part in the landings at Rabaul, Leyte, Lingayen Gulf and Balikpapan.

He continued his naval service following WW2 in the Naval Reserve and was promoted to Surgeon Captain in 1968. He served as the District Naval Medical officer at HMAS LONSDALE until its closure in the early 1990s and then continued seeing patients at HMAS CERBERUS on a weekly basis.

At the end of WW2 he was appointed Medical Superintendent of the Alfred Hospital and Honorary Anaesthetist at Prince Henry's, the Royal Women's and the Repatriation General Hospital at Heidelberg.

"Sandy" had a lifetime association with the Hawthorn Football Club. His father, Tom, played for the club and "Sandy" joined as the club's medical officer in 1950. He was President of that club from 1952 to 1967. His 15 year tenure as President was recognized at Hawthorn with the opening of a stand at their Glenferrie home ground and named the "A.S.Ferguson Stand" by the Governor of Victoria in 1968.

Sandy was very active in the ex-service community and was President of the Naval Association of Australia from 1975 until 1990. He led the Melbourne Anzac Day march in 1992.

He was an Honorary Life Member of the Australian Military Medicine Association, the Victorian Football League, the Hawthorn Football Club, the Naval Association of Australia and the Melbourne Naval Centre.

He was appointed a Member of the Order of Australia in 1989.

1. Purpose and scope

The Journal of Military and Veterans' Health is a peer reviewed journal published by the Australian Military Medicine Association. The aim of the journal is to promote excellence in the discipline of military and veterans' health, to promote research and to inform and educate all those practicing as health professionals or who have an ongoing interest in this area. The scope of the journal covers all aspects of health of service personnel from enlistment and service within a military organisation to post service health care as a veteran. Environmental and related aspects of employment are included in this scope so that the journal provides a unique forum for discussion and research related to a wide range of health issues arising from exposure to military environments. This scope is very broad including, for example, mental health, trauma, health training and effects of environment on health.

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Electronic submission of manuscripts is mandatory.

Manuscript requirements

Manuscripts submitted to the Journal of Military and Veterans' Health must conform with the *Uniform requirements for manuscripts submitted to biomedical journals* (*www.icmje.org*).

2. Categories of manuscripts

The Journal of Military and Veterans' Health publishes articles related to health of military personnel and veterans within two broad areas of interest:

Research and practice related	Informative and commentary
Original Research/Original Articles	Editorials
Short Communication	Letters to the editor
Review articles	Biographies
Reprinted Articles	History
Case Studies	Obituaries
Abstracts from the Literature	Book reviews
	Commentary
	View from the Front

Each issue may not contain all categories of articles. The word limit does not include text in the abstract, references, figures and tables. The requirements for submission categories, which are peer reviewed, are summarised below:

Category	Maximum word count	Maximum number of	
		Tables and/or figures	References
Editorials	1000	1	3
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Short communication	1500	3	10
Review article	5000	8	60
Case studies	1000	3	10
Letters to the editor	800	2	10
History	3000	6	20
Commentary	1500	3	10
View from the Front	2000	5	20
Obituaries	200	1	4

Original research

This category is the primary mode in the journal for communication of findings from original research studies.

Short communications

This category is for communicating the findings from small-scale research studies however other subject material will be considered.

Review articles

Authors who wish to submit a review should first contact the editors to determine its suitability for publication in the journal. The editors encourage authors to submit systematic reviews for publication.

Reprinted articles

This section will include full length copies of articles reprinted with permission from other journals. These articles must be keynote and valuable contributions to health issues in the military and veterans' areas. Readers are invited to email details of papers that should be considered for this category. Any proposal should be accompanied by a short commentary (maximum 200 words) outlining why this historical paper was important in shaping some aspect of military or veteran health practice. The commentary will be published with the keynote article.

Case studies

This category is primarily designed to present details of interesting or unusual clinical cases and a summary is required with a limit of 100 words. The text should be presented using the following headings; background, history, examination findings, special investigations, discussion including differential diagnosis. The article should succinctly illustrate important points.

Abstracts from the literature

This category will include abstracts of seminal work published in other journals which is related to the scope of the Journal of Military and Veterans' Health. Readers are invited to email references to papers that are considered to be valuable to healthcare professionals and others in the military and veterans domains. The editors acknowledge that many of our readers may not have facilitated access to comprehensive reference libraries.

Letters to the Editor

Letters may comment on material that has recently been published in the journal or may address new topics, such as use of new equipment or instrumentation in the field or a new technique applicable to preventive medicine. Where the subject matter is directed towards a previous publication the editors will usually send the letter first to the authors of the original paper so that their comments may be published at the same time as the letter.

Editorials

Submissions are encouraged for publication in this category and these will be subjected to the peer review process. Topics of interest must fall within the scope of the Journal of Military and Veterans' Health. Guest editorials may be invited from time to time by the editor; suggestions for topics for editorials should be directed to the editor.

Biographies

Biographical accounts of the work of individuals who have made outstanding contributions to the health and care of military personnel and veterans will be considered for publication. If you wish to submit a biographical article the editor should be consulted prior to preparation of the article. The editorial board may solicit such articles directly.

History

Articles describing notable themes related to health and care of military personnel and veterans are invited for publication. The scope is broad and could include, for example, the conduct and outcome of military operations, effect of climate, improvements in trauma care, surgical techniques and mental health. The article should focus on health care delivery and practice as the main theme and may compare changes from earlier practice to those in use today. The editorial board may invite such articles directly however if you wish to submit a manuscript the editor should be consulted in advance. The style of this category will be the same as that applied to a review article.

Obituaries

The editorial board will accept obituaries for individuals who have served as health professionals within the Australian Defence Force. These have been very successful in the British Medical Journal (BMJ) to provide information to the wider health readership. Guidance for preparing an obituary can be found on the BMJ web site, *www.bmj.com* (e.g. *BMJ* 1995;311:680-681 (9 September) and *BMJ* 1995;311:143-144 (15 July)). Obituaries should be submitted within one month of death and will be subject to editing if required.

Book reviews

Reviews of publications which have a direct focus on military and veterans' health for educational, informative, reference or other reasons will be invited. The author/s would be expected to be independent, have considerable experience and/or a track record and a direct involvement in the field which is addressed by the publication.

Commentary

Commentaries will be short articles which provide incisive, informative and balanced comment on current health issues. The editors may invite commentary on a research paper published in the same edition of the journal. All commentary articles will be peer reviewed and the article style will be that of an editorial.

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This category will consider submissions from health individuals at the front line of health care and health delivery to serving personnel and veterans. These articles should be topical, recent, may contain an individual's personal view of a health delivery system and will be subject to peer review.

3. Editorial policy

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The Journal of Military and Veterans' Health publishes original work describing health related research studies. Submitted manuscripts must not have been published or submitted for publication elsewhere, either in whole or in part. This applies to both paper and electronic methods of publication but not to abstracts presented to scientific meetings. Authors planning to submit review articles should first contact the Editorial Office to ensure the appropriateness of the subject material.

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Two or more referees are assigned to review each submission (except for Book Reviews and Reprinted Articles). Acceptance of original articles is based on significance, originality, scientific quality and interest to the Journal of Military and Veterans' Health readership. If the submission is accepted for publication, editorial revisions may be made to aid clarity and understanding without altering the meaning. Authors are given the opportunity to nominate reviewers whom they believe are expert and impartial in their area of interest.

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We define a clinical trial as "Any project that prospectively assigns human subjects to intervention and comparison groups to study the cause-and-effect relationship between a medical intervention and a health outcome (ICMJE definition). These should be registered, including early phase uncontrolled trials (phase I) in patients or healthy volunteers (WHO Recommendation)".

The Journal of Military and Veterans' Health requires all clinical trials to be registered with a registry that is accessible to the public (at no charge); is searchable using standard, electronic (internet) means; is open to all prospective registrants at minimal or no cost;

validates registered information; identifies trials with a unique number; and includes basic information related to the researchers and the trial.

The Journal of Military and Veterans' Health requires all clinical trials to be registered with a registry that is accessible to the public (at no charge); is searchable using standard, electronic (internet) means; is open to all prospective registrants at minimal or no cost; validates registered information; identifies trials with a unique number; and includes basic information related to the researchers and the trial.

If you are submitting a randomised controlled trial, add the registration number of the trial and the name of the trial registry in the acknowledgements section of your manuscript. Other trial registers that currently meet all of the International Committee of Medical Journal Editors (ICMJE) and World Health Organization (WHO) requirements can be found at http://www.icmje.org/faq.pdf.

Registries that meet these criteria include:

- Australian Clinical Trials Registry (www.actr.org.au/)
- US National Library of Medicine (sponsor) (www.clinicaltrials.gov)
- The International Standard Randomised Controlled Trial Number registry (www.controlled-trials.com)
- The National (UK) Research Register (www.update-software.com/national/)
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Language

All manuscripts must be written in English. Spelling and phraseology should be to either standard English or standard American usage and should be consistent throughout the manuscript. Contributors with a non-English native language are encouraged to seek the help of a competent linguist who is familiar with medical terminology prior to submission. It is the author's responsibility to have the language revised before submitting the work for publication. Only minor language revisions are provided after submission.

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Receipt of all submitted papers is acknowledged by email. Manuscripts are initially assessed by the editors and then sent for external review to experts in the field. The corresponding author will be notified by email when a decision is reached. To aid in the peer review process we invite authors to suggest potential reviewers, with their contact details, in the cover letter.

Software and format

The manuscript must be supplied in Microsoft Word in .doc format (Word 2007 file format not accepted at this point in time) or in rich text format. Files prepared in other packages will only be accepted and considered provided they are compatible with Microsoft Word and that any reformatting is minor. Files prepared in various desktop publishing proprietary formats will not be accepted.

4. Organisation of manuscripts

Papers will differ in structure depending on category. These instructions refer to sections of manuscripts independent of category where these sections are included. For original research articles the structure should follow the order below with each section beginning on a new page. Reviews should commence with an abstract and then be organised such that the information is presented in a logical sequence with informative headings and sub-headings related to the content.

Title page

The manuscript should be preceded by a title page which includes the following information:

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- Name, address, title, highest qualification, affiliation and contact details (email, postal address, telephone and fax) for each author
- Identify corresponding author
- Identify (email) address for correspondence (corresponding author)
- Short running title (maximum 50 characters including spaces)
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Abstract

The abstract for original articles should be structured under the following headings: Background, Purpose, Material and Methods, Results, Conclusion. The Background must be a maximum of two sentences. Maximum length of the summary should be 250 words with three to five key words or phrases included below the abstract or summary.

Conflict of Interest and funding

Authors are responsible for recognising and disclosing financial and other conflicts of interest that may bias or could be perceived to bias their work. They should acknowledge in the manuscript all financial support for the work and other financial or personal connections to the work. Each author must complete the conflict of interest and funding section of the Authors Process form.

Introduction

It should be assumed that the reader does not have a comprehensive knowledge in the field and you should therefore provide a concise account of the background (including relevant literature references) and reasons for this study.

Materials and methods

Descriptions of any techniques and methods must provide sufficient detail such that a reader can replicate the procedures. Methods that have been published elsewhere should not be described in detail and should be referenced to the original work

Statistics. A full description of the statistical methods used should be provided.

Results

Description of results, while concise, should permit repetition of the procedures and direct comparison with similar data by others. Data should not be repeated unnecessarily in the text, figures and tables and appropriate selection of significant figures for numerical data presentation should be applied. Significance should be expressed as values of probability. Where appropriate, results should be presented as figures rather than tables of data.

Discussion

The discussion should not simply reiterate the results presented; the authors should present their analysis and conclusions with reference to the current knowledge base related to this work. Any assumptions on which conclusions may be based should be stated and there should be some discussion of strengths and weaknesses of the research.

Acknowledgements

These should be brief and should include references to sources of support including financial, logistical and access to material not commercially available. Any individuals named must be given the opportunity to read the paper and approve their inclusion in the acknowledgements before the paper is submitted.

References

A list of references should be provided starting on a new page. Only published references or those genuinely in press should be included.

Tables (including legends to tables)

Tables are to be placed at the end of the manuscript in order of appearance in the text with one table per page. Captions to tables should be short and concise, not exceed one sentence and be on the same page as the table.

Illustrations

These are to be submitted as a separate electronic file for each image.

5. Preparation of manuscripts

Style

References. A standard English dictionary should be used (e.g. Oxford English Dictionary 2007) for spelling or hyphenation of non-medical terms and Dorland's Illustrated Medical Dictionary (WB Saunders, Philadelphia) is recommended for medical terms. A source for general style including grammar, punctuation and capitalisation is the *Style manual for authors, editors and printers*, Sixth edition 2002 (John Wiley and Sons, Australia).

Numbers. Use numerals for all units of measure and time and for all sets of numbers (e.g. 1 m, 2 hours, 5 years, 4%, 2 of 6 observations). Spell out the numbers one through nine only for general usage (e.g. "we had two opportunities"). Spell out numbers beginning a sentence.

Abbreviations. Abbreviations should be kept to a minimum to avoid confusion with readers who may not be familiar with the subject material. Only standard abbreviations, as listed in a style manual or accepted internationally for use within a subject area, may be used without definition. Terms used frequently within a manuscript may be abbreviated however these should be spelled out at first citation with the abbreviation in parenthesis. Abbreviations in speciality areas must conform to accepted use in that area.

Layout. Headings and sub-headings should be consistent throughout the article and conform to the style used in articles previously published in the journal. No text should be underlined. Prepare the manuscript with double-spacing and allow margins of 2.5 cm.

Tables

Tables should be on separate pages at the end of the paper (following the References section) and be capable of interpretation without reference to the text. They should be numbered consecutively with Arabic numerals (e.g. Table 1). A concise, descriptive caption must be provided for each table. Units in which results are expressed should be given in brackets at the top of each column and not repeated on each line of the table. Ditto signs are not acceptable. An indication should be provided in the manuscript as a guide to indicate where the table should be inserted.

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- Images containing text
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- Figure width (single column)
  -- mm
- Figure width (double column)
  -- mm
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  Between 0.5 and 1.0 point

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The following symbols should be used in the order given to reference footnotes:

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The list of references should appear at the end of the manuscript. References should be numbered consecutively in the order in which they are first mentioned in the text. References in text, tables and legends should be identified by Arabic numbers and appear in the text in superscript, for example text[1] or text[2-4] or text[5,6-7]. Where punctuation (e.g. comma, period) follows a reference number then the punctuation should appear after the reference.

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An example of the reference system is as follows:

1. Quail G. Asthma in the military. *Aust Mil Med 2000; 9(3):129-137.*

Units of measurement

The International System of Units (SI) must be used. For values less than zero enter a zero before the decimal point e.g. 0.123. The style should include a solidus e.g. mg/L.

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Use of abbreviations should be minimised. Spell out non-standard abbreviations at their first mention in the text followed by the abbreviation in parentheses. Avoid uncommon abbreviations and jargon.

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