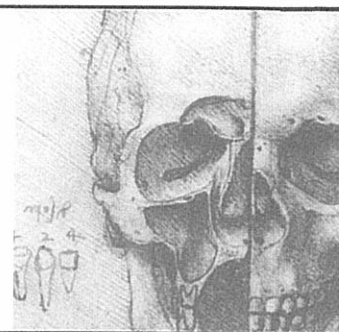
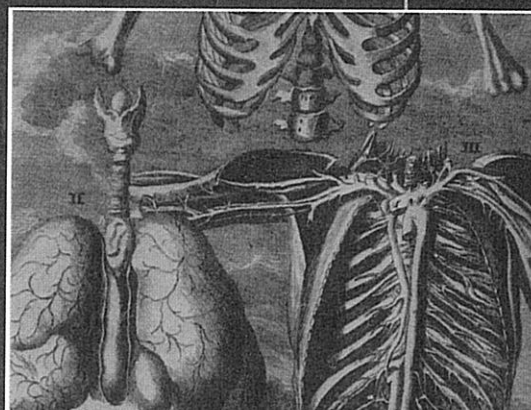


# AUSTRALIAN MILITARY MEDICINE



APRIL 2005 - Volume 14 - Number 1



# VALE

## AMAN DRAYA 02 APRIL 2005

It is with the greatest sadness that Australian Military Medicine records the deaths of nine Australian Defence Force personnel in the crash of a Navy Sea King helicopter at Aman Draya on the island of Nias, off Sumatra, Indonesia, on the 2nd of April 2005.

Leading Seaman Scott Bennet, aircrewman, NSW

Lieutenant Matthew Davey RANR, medical officer, ACT

Lieutenant Matthew Goodall RAN, observer, NSW

Sergeant Wendy Jones, medic, Queensland

Lieutenant Paul Kimlin RAN, pilot, ACT

Lieutenant Jonathan King RAN, pilot, Queensland

Squadron Leader Paul McCarthy RAAF, medical officer, WA

Flight Lieutenant Lynne Rowbottom RAAF, nursing officer, Queensland

Petty Officer Stephen Slattery, medic, NSW

Serving in HMAS Kanimbla, these men and women had been providing disaster relief to Aceh since the devastating earthquake and tsunami on Boxing Day 2004. On their way home after three months away, they were turned back from Singapore after the second major earthquake in the area occurred on 28 March 2005.

They were called in to provide initial medical and humanitarian support to a remote village that was otherwise almost inaccessible. In carrying out this task, their helicopter came down for reasons currently unknown.

ADF personnel are often in the forefront of promoting Australia in the region through the work that they do in support of ordinary people. In peacetime, this is most frequently in the form of providing medical support – either to individuals or to whole populations. For health personnel, they are doing what they have dedicated their lives to do. And so often, aircrew are providing the means to deliver that care.

Australia has lost nine of its finest. The military health community is all the less for the taking of five of its young, talented and dedicated core.

To those who have lost loved ones and friends, the Association extends its heartfelt condolences and sympathy.

**We will remember them.**





## AUSTRALIAN MILITARY MEDICINE ASSOCIATION

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<b>Council Member</b> .....	Andrew Robertson

## STATEMENT OF OBJECTIVES

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

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

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

The Association is totally independent of the Australian Defence Force.

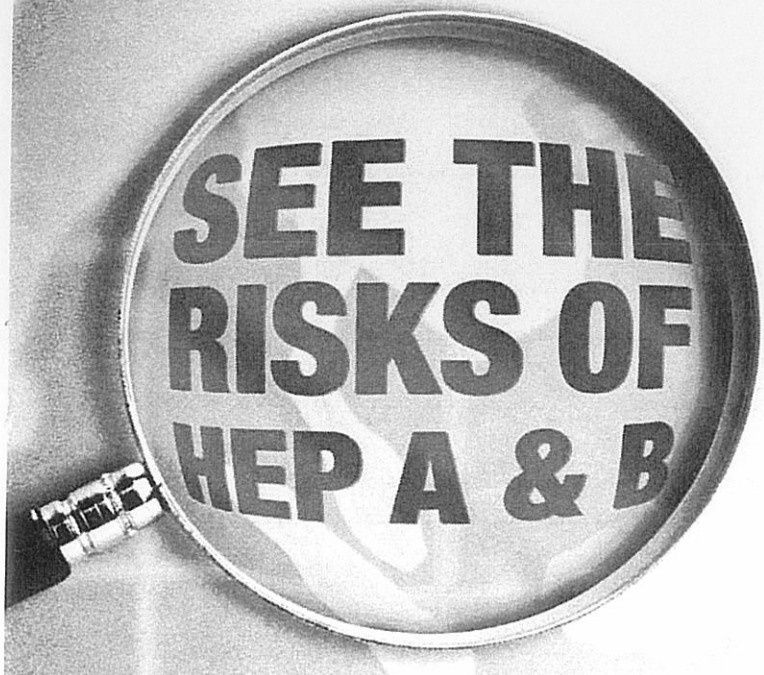
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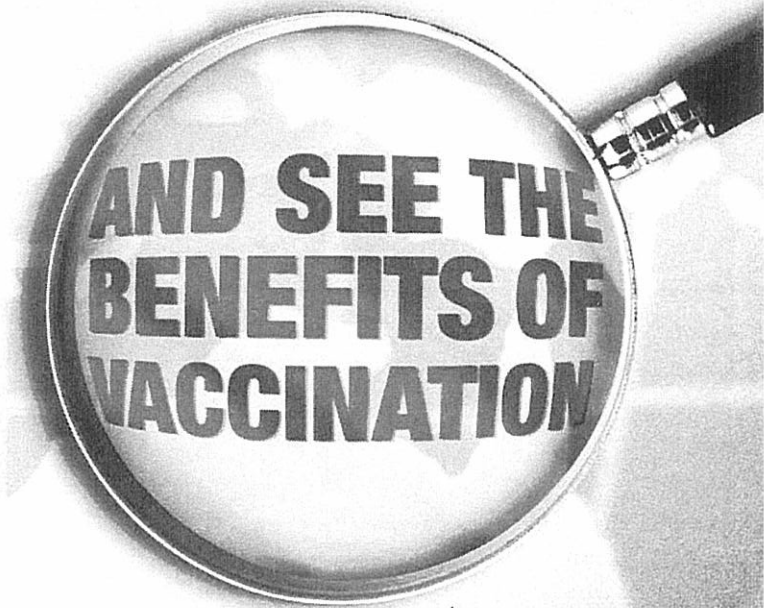


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# EDITORIAL

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## Jenny Graham

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The recent Asian Tsunami has resulted in an unprecedented number of Australia military medical personnel on deployment throughout the world providing both health care to our deployed forces and humanitarian support. Currently, health staff are providing services in the Solomon Islands, the Middle East Area of Operations and Indonesia. Australia's contingent of personnel involved in Operation Tsunami Assist worked tirelessly from HMAS Kanimbla, the ANZAC Field Hospital and the Banda Aceh Public Hospital.

The ANZAC Field Hospital was established as part of the Banda Aceh Public Hospital in the first week of January to run the surgical and infectious disease wards while the hospital's staff gradually returned to work. Prior to the Tsunami, the facility had functioned as the city's largest public hospital and medical training college. The Tsunami resulted in massive losses of hospital staff as well as significant damage to the facility, requiring a massive clean-up that is still under way.

To acknowledge the hard work of our permanent and reserve health personnel, the journal will be publishing a themed edition in November dedicated

to the Tsunami operation. Authors are encouraged to send in manuscripts for publication, dealing with any aspect of their support to the Operation. Manuscripts detailing health personnel's experience and working environment are particularly sort.

On a different note, this edition marks my first as the new editor. In this role, I have begun to introduce new procedures to streamline the publication of articles and letters in the journal. Prospective authors are encouraged to read the new Instructions to Authors at the end of this edition before preparing their manuscripts. These new procedures will reduce the time between manuscript submission and publication, by shortening the refereeing process. Other changes will appear over coming issues, to ensure that the journal continues to promote the study and dissemination of military medicine.

**Jenny Graham**

# PRESIDENT'S MESSAGE

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## Russell Schedlich

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Well, a new year is upon us again. And as always seems to be the case, the festive season brought upon many of us not-so-festive activities.

The Boxing Day 2004 Aceh earthquake and resulting tsunami was one of the worst disasters of modern history. It was almost surreal to watch the damage and casualty reports increase in the days following, and in the end the scale of the tragedy was probably never in doubt, given that the epicentre of the quake lay just off one of the most densely populated areas of the world.

The initial media reports, perhaps not surprisingly, focussed on the events and likely casualties of the tourist areas of the region, and a key focus for the western world during this period lay there, as the inevitable personal tragedies that touched many countries unfolded.

It seemed to take a little longer for the realisation that, devastating as the events in tourist areas were, the real disaster lay among the flattened coastal region of southern Sumatra. Where whole families and communities were literally wiped off the face of the earth, leaving an impact that may take generations to repair.

Commendably, once it became clear that there were grave problems in these regions, the world's disaster response agencies swung into action, and we have seen a response on a magnitude not seen for many years, if ever.

Australia's contribution was commensurate with its economic and geographic position. The Australian Defence Force was in the forefront of the response, both in terms of actual ADF deployments and in terms of the provision of both leaders and staff for the civilian disaster response. The military demonstrated once again it has the capacity to both provide and train the elements of health disaster capability.

The affected region of the Indian Ocean must now, with our help, rebuild itself. In so doing, it can only be hoped that the leaders of our region will not avoid the requirement to warn, protect, plan and prepare for these types of disasters. Work has started in this area, but it must be completed and sustained.

### CONFERENCE 2005

The Association's annual scientific conference will be held in Launceston, Tasmania, from 14 to 16 October 2005. Planning is well underway for this event, which promises to be hugely successful, as are all our conferences.

This year AMMA is working to develop a joint conference concept with the Australasian College of Tropical Medicine. Because of our region of interest, tropical medicine is a key factor in military operations and a key interest area for military medicine. A joint conference will help to enhance the Association's focus in this area, and will offer mutual benefits to both AMMA and ACTM.

The venue is the Grand Chancellor, situated in the heart of the city, and only a short walk from the many attractions of the area, including the Gorge, the Penny Royal Mill, the Queen Victoria Museum and the James Boag Brewery. Launceston is also a stepping stone for tours of northern Tasmania and the central highlands region.

Travel to Launceston can be conventional by air or, for those wanting a little bit more adventure (or pining for their younger days!), by sea, with the "Spirits" providing services to Devonport from both Sydney and Melbourne. As did our last conference in Tasmania, this one offers the opportunity to build a holiday around the academic activities.

Of course, it will not all be beer and skittles. Two days of papers will be preceded by a workshop and tour at the Australian Maritime College.

Make sure that you pen these dates in your diary, and please sharpen your pencils to write those all important papers that make our conferences the success they always are.

I look forward to seeing you there.

**Russell Schedlich**



# ABSTRACTS

## Article Review

Colonel Darrell Duncan, MBBS, Grad Dip HI

**HODGETTS, TJ; GREASLEY, LA; 2003**

**Impact of Deployment of Personnel with Chronic Conditions to Forward Areas. *Journal of the Royal Army Medical Corps*; Vol 149, pp 277-283**

**Aim:** To identify reasons for inappropriate deployment of soldiers with chronic conditions to an operational environment.

**Setting:** Two British Army field hospitals in Kuwait, 08 February to 17 March 2003, during a period of troop concentration prior to war fighting (Operation Telic).

**Population:** All British military personnel on land during the concentration phase, rising to an estimated 28,000 troops.

**Methods:** Real time electronic record maintained of all cases presenting to 22 and 33 Field Hospitals judged to be inappropriately deployed.

**Results:** 50 sequential cases were analysed. 34% were downgraded prior to deployment. Of those who were P2 FE, 85% were judged to have required protection from deployment by downgrading. 20% of all cases had a history of chronic asthma, and of the asthmatics 60% (6/ 10) were not downgraded. 18% of all cases were deployed while waiting for secondary care investigation or review that should have ensured protection from deployment. No patient had an existing 'FT' (forward temperate) or 'LT' (lines of communication temperate) grading: but in four cases it was predictable that the patient's underlying condition would be adversely affected by deployment to a desert environment. In five cases it was identified that the inappropriate deployment could be attributed to clinical management within the civilian sector, with a consequent failure to institute the necessary downgrading process.

**Conclusions:** Review of the medical grading process is needed to protect those soldiers who are awaiting outpatient opinion or definitive diagnosis from investigation, and to provide an employability grading that matches a soldier's fitness for operational role.

**Comment:** Hodgetts and Greasley provide an interesting snap shot of what is no doubt an age old and certainly not unique problem. A pilot program reviewing Australian Army personnel evacuated for medical reasons from OPERATION ANODE (Solomon's Island) identified

5 out of 12 cases that were evacuated for known pre-existing conditions. At least two of these were assessed as having been inappropriately deployed on the basis of a retrospective chart review (unpublished data- COL Duncan).

It is of course easy to be wise in retrospect. It is accepted that the assessment of medical fitness for deployment includes an element of risk management. To provide a more balanced view, it would be of value to know how many people deploy with pre-existing condition who do not become a casualty from their condition. Further study into the application of the medical assessment process and better definition of the risks of deployment with specific clinical conditions is required to better inform medical officers as they make these decisions.

**SMITH T JIMENEZ D SMITH B ET AL**

**The postwar hospitalization experience of Gulf War Veterans Participating in US Health registries. *J Occup Environ Med* 2004; 46: 386-397.**

In response to concerns that Gulf War veterans were experiencing increased morbidity resulting from wartime exposures in the Gulf War, the Department of Veterans Affairs and the Department of Defense (DoD) initiated clinical registries to provide systematic health evaluations for self-referred Gulf-War veterans. The authors used Cox's proportional hazard modelling with data from all DoD hospitals to estimate the probability of hospitalization resulting for any cause, resulting from diagnosis in a major diagnostic category, and resulting from a specific diagnosis of interest. After adjusting for other risk factors, registry participants were 1.43 times more likely to have a postwar hospitalisation than registry non-participants (95% CI 1.40-1.46). These findings support the hypothesis that registry participants were more likely to experience postwar morbidity than veterans who chose not to enrol in the health registries.

**Comment:** Little news here. Those who registered are likely to think that they were at greater risk of needing follow up care from their Gulf War service. It follows that they will indeed have increased utilisation of health care.

DEVLIN JJ

**Evaluation of a contingency blood donor program on U.S. Navy submarines. Mil Med. 2004 Apr;169(4):292-7.**

**Objective:** Because the role of submarine warfare is shifting from strategic deterrence to littoral force projection, submarine providers will be required to manage combat trauma. Currently, submarine providers have only crystalloid available for the reversal of hemorrhagic shock. A proposal program to provide blood products on submarines was evaluated

**Methods:** Existing military emergency blood transfusion protocols were reviewed. The restrictions of donation/transfusion onboard submarines were considered.

**Results:** A protocol to provide screening for, implementation of, and a reporting system for contingency blood donation and transfusion onboard submarines was created. The protocol contains all the safeguards of existing U.S. Navy contingency donor programs with the exception of pretransfusion infectious disease testing and cross-matching. However, because the program does not require laboratory capability, it can be implemented by an independent duty corpsman onboard a submarine

**Conclusion:** This protocol provides blood for the reversal of hemorrhagic shock onboard submarines in the event of traumatic injury.

**Comment:** *The extremely controlled environment of a submarine negates some of the arguments against a just-in-time blood donation system. If all the crew get adequately screen prior to setting out on a mission, and there is no opportunity for them to alter their infectivity status in the meantime, then it might be a goer. The other problems identified with the practicality of a donor register is that it is just too hard to find the pre-screen donors in an emergency: no such problems on a submarine. Just how likely is it, though that a submarine is going to be damaged enough to cause injuries requiring transfusion and for the boat to remain sufficiently intact for such support to be practical, but not enough to cause the boat to be unfit for human habitation or for medical care. Is the lack of immediately pre-transfusion screening of sufficient concern to just stick with fluid replacement?*

DE RAAD J, REDEKOP WK.

**A comparison between two systems for pre-employment medical assessment in the Royal Netherlands Army by a randomized, controlled study. Mil Med. 2004 Jun;169(6):437-43.**

In 1998, the basic medical requirements for the Royal Netherlands Army were introduced as a standard for the assessment of the medical suitability of military personnel, consisting of 43 dichotomized points of judgment. This system replaced the old physical capacity, upper limbs, locomotion, hearing, eyesight, and emotional and mental state system, based on the detection of diseases and infirmities. We compared the two different examination systems for their ability to identify suitable recruits. For the latter purpose, we used the two operational measures of availability and health care costs. We performed a randomized, controlled study in which 352 soldiers were monitored for 2 years after being declared fit by one of the pre-employment medical assessment systems in question and having passed their general military training. We found that the pre-employment medical assessment system was the dominant factor for predicting the number of days fit-for-duty, as well as for the health care costs incurred. Those declared fit by the new system showed a statistically significant higher mean number of days fit-for-duty (648 compared with 612) and incurred significantly lower mean health care costs (6396 compared with 746 Euro). In this study, we were not able to uncover the mechanism by which the "basic medical requirements" examination system led to an improvement in outcome. For the present, this mechanism is interpreted because of differences between the two systems.

**Comment.** *A very interesting system, and one that the ADF could well look at. There is a list of 43 capabilities, such as Can do without medication for 1 month; able to dig 1 m<sup>3</sup> / 2 hours on an incidental basis; able to carry 5kg for 2 hours every day; able to lift 20kg 150 times every hour, and so on. Some of the requirements seem generous, and some appear difficult to assess – such as the ability to withstand exposure to a relative humidity of less than 35% and more than 90% for more than 4 hours. Nevertheless, by looking at job requirements primarily, rather than disease or disability states, then Dutch do seem to have produced a better outcome. Reduction of health care costs from 746 euros to 396 euros is pretty impressive.*



APPLE J, HARE P, CRERAR C, WALKER E, WILSON J, BROWN C, MOSES K, HENDRICKSON T, FIELD D, HOFFMAN E, PEDRUS P, MILLER J, SMITH B. **Implementing a smallpox vaccination program aboard an aircraft carrier. Mil Med. 2004 Jun;169(6):455-60.**

**Objective:** To determine the feasibility of implementing a smallpox vaccination program aboard an aircraft carrier in conjunction with anthrax vaccination.

**Methods:** Retrospective review of smallpox vaccination program conducted from January 17, 2003 to February 19, 2003. Morbidity and loss of manpower were the major endpoints.

**Results:** There were 5,204 sailors available for vaccination. There were 243 (4.7%) medical exemptions and 24 administrative exemptions. During the program, 4,931 sailors were vaccinated. There were five reportable complications. Three sailors had autoinoculation, one sailor had localized cellulitis, and one patient had a positive beta human chorionic gonadotropin during vaccination. None of the complications required medical evacuation. Only two sailors required time off from duty.

**Conclusions:** Smallpox vaccination can be accomplished rapidly and safely aboard an aircraft carrier. There was not an increase in adverse events compared to historical data despite the close-quarter conditions. Smallpox and anthrax vaccinations can be completed simultaneously with minimal morbidity.

**Comment:** The bit that I am most interested in is the exemptions. 243 medical exemptions and 24 'administrative' exemptions. In my discussions with US authorities, it seems that people can get exemptions for a variety of reasons, including religious objection. If exempted, they can still remain in the military and proceed with deployment to an area that has been determined to require a particular vaccination for force protection reasons. The Australian position, that personnel must be vaccinated for them to be fit for deployment, is not the way they do business. There was one refusal of vaccination, but what happened to this person is not detailed.

BRITT TW, DAVISON J, BLIESE PD, CASTRO CA. **How leaders can influence the impact that stressors have on soldiers. Mil Med. 2004 Jul;169(7):541-5.**

The present review addresses the importance of leader behaviours in influencing the extent to which various stressors soldiers experience (e.g., high workload and lack of sleep) are related to different types of strains (e.g., psychological health, poor job satisfaction, and low morale). Research conducted by the Walter Reed Army Institute of Research (WRAIR) in the area of leadership is reviewed. Researchers at the WRAIR have examined the role of leadership as a predictor of stress, as a buffer against the negative effects of stress, and as a variable that predicts or enables variables that have been found to decrease the adverse effects of stress (e.g., role clarity, self-efficacy, and job engagement). A key strength of the WRAIR program of research is the use of multilevel modelling to examine how perceptions of leadership at the unit level are related to unit and individual soldier well-being and motivation.

**Comment:** Strong leadership is good for psychological wellbeing. Role clarity, job engagement and self-sufficiency are parameters that are related to health outcomes throughout industry, not just the military. Walter Reed research has focused on supportive roles by leaders and task clarification. There is much more work to be done on aspects that is perhaps more military in nature: self-sacrifice and cohesion to a common goal. The need for predictive diagnostic tool for units and individuals at risk of stress related poor outcomes is clear.

HAURET KG, KNAPIK JJ, LANGE JL, HECKEL HA, COVAL DL, DUPLESSIS DH.

**Outcomes of Fort Jackson's Physical Training and Rehabilitation Program in army basic combat training: return to training, graduation, and 2-year retention. Mil Med. 2004 Jul;169(7):562-7.**

Basic trainees at Fort Jackson, South Carolina, who were unable to continue basic combat training (BCT) because of a serious injury were assigned to the Physical Training and Rehabilitation Program (PTRP). Between January 3, 1998 and July 24, 2001, 4258 trainees were assigned to the PTRP. Using a retrospective cohort study design, return to training and BCT graduation rates were evaluated. PTRP graduates were compared with matched non-PTRP graduates for 2-year retention in the Army. More



PTRP women than men were discharged from the PTRP (60% and 48%, respectively,  $p < 0.01$ ). Of PTRP trainees returning to BCT, 10% and 12% of men and women, respectively, were discharged from the Army compared with overall Fort Jackson discharge rates of 9% and 15% for men and women, respectively. Comparing PTRP graduates to matched non-PTRP graduates, there were no differences in 2-year retention for men (14.9% and 14.7%, respectively;  $p = 0.93$ ) or women (26.6% and 30.1%, respectively;  $p = 0.19$ ). Despite the high discharge rate in the PTRP, the BCT discharge rate for trainees who successfully rehabilitated was similar to the overall discharge rate at Fort Jackson. The 2-year retention in service for PTRP trainees who graduated from BCT was similar to that of non-PTRP trainees.

**Comment:** *A very interesting study indeed. I am not aware of similar studies elsewhere, and there was no attempt to set the US experience in a global context in this paper. Approximately half of all trainees who were removed from their basic training course for medical reasons were discharged without every completing the training. However, those who were able to be returned to the training program and graduate had a career that was no different from their non-injured peers. There were assessments according to sex and age, but not by diagnosis. Young females had the highest discharge rate once being assigned to the PTRP. Older females had the same rate as males.*

**ROBINSON JR, FULTON-KEHOE D, FRANKLIN GM, WU R. Multidisciplinary pain center outcomes in Washington State Workers' Compensation. J Occup Environ Med. 2004 May;46(5):473-8.**

We conducted this study to evaluate the clinical and disability status of injured workers 4.6 years after undergoing multidisciplinary pain centre evaluation, comparing subjects who received treatment to subjects who were evaluated only. Three hundred injured workers were selected for a telephone survey; 150 had received pain centre treatment and 150 had been evaluated but not treated. The survey included the SF-12, and questions about subjects' pain intensity and current work status. A workers' compensation database indicated the disability status of subjects. The response rate was 50%. In multivariate analyses, treated and evaluated-only subjects did not differ significantly in disability status, pain intensity, SF-12 scores, or current work status. At 4.6 years follow up,

there was no evidence that pain centre treatment affects either disability status or clinical status of injured workers.

**Comment:** *Watch out multidisciplinary pain centres. A few more hits like this and your popularity could take a pounding.*

**BRUGHA R, DONOGHUE M, STARLING M, NDUBANI P, SSENGOOBA E, FERNANDES B, WALT G. The Global Fund: managing great expectations. Lancet. 2004 Jul 3;364(9428):95-100.**

The Global Fund to fight AIDS, Tuberculosis, and Malaria was created to increase funds to combat these three devastating diseases. We report interim findings, based on interviews with 137 national-level respondents that track early implementation processes in four African countries. Country coordinating mechanisms (CCMs) are country-level partnerships, which were formed quickly to develop and submit grant proposals to the Global Fund. CCM members were often ineffective at representing their constituencies and encountered obstacles in participating in CCM processes. Delay in dissemination of guidelines from the Global Fund led to uncertainty among members about the function of these new partnerships. Respondents expressed most concern about the limited capacity of fund recipients--government and non-government--to meet Global Fund conditions for performance-based disbursement. Delays in payment of funds to implementing agencies have frustrated rapid financing of disease control interventions. The Global Fund is one of several new global initiatives superimposed on existing country systems to finance the control of HIV/AIDS. New and existing donors need to coordinate assistance to developing countries by bringing together funding, planning, management, and reporting systems if global goals for disease control are to be achieved.

**Comment:** *Australia recently announced a contribution to the Global Fund: \$24 million over 3 years. This is pitiful compared to most of our peers. Australia is likely to be faced with a very substantial disaster in PNG and also throughout the Pacific over the next 10 years from the spread of AIDS. Some estimates are putting a figure of 100000 HIV positive people in PNG in that time unless massive inroads are made in prevention.*

LEACH J.

**Why people 'freeze' in an emergency: temporal and cognitive constraints on survival responses.** *Aviat Space Environ Med.* 2004 Jun;75(6):539-42.

**Background:** Many witnesses attest that victims of a disaster often perish despite reasonable possibilities for escaping because their behaviour during the initial moments of the accident was inappropriate to the situation. Frequently witnesses report victims 'freezing' in the face of danger.

**Objective:** The aim of this paper was to identify the possible factors underpinning 'freezing' behaviour in disaster victims.

**Methods:** Witness testimonies, survivor debriefings, and official inquiry reports from shipwreck and aircraft emergencies were analysed for their behavioural content.

**Results:** It was found that 'freezing' behaviour was a frequently cited response by witnesses to a disaster. 'Freezing' causes evacuation delays which increase the danger, establishing a closed loop process and further extending evacuation delays. This behaviour can be accounted for by considering the temporal constraints on cognitive information processing in a rapidly unfolding, real-time environment.

**Conclusion:** Cognitive limitations help to explain why survival training works and why there is a need for a survival culture to be developed. They also highlight the need to understand the behaviour of children under threat as being different from that of adults due to the different stages of their neurological and cognitive development. There are implications for the development of proactive, rather than passive, life support equipment.

**Comment:** Evacuation standards from aircraft are based on the principle that the aircraft can be completely cleared of passengers within 90 seconds. The inherent delays in the human response as cited in this article are bad enough. We are about to get aircraft with a capacity of 700 or more people. How long does it take to embark all these people? This article emphasises the need for training in survival procedures. These does seem to be impractical for the vast bulk of the populace – from cost, from the impact it would have on those prepared to fly, from the cognitive learning principles that suggest it will only be effective, if at all, for a short period of time. Automated hatch opening, rescue systems that seek out and assist passengers, revisiting life support equipment design to better take into account human fallibility are all canvassed. Some will no doubt come to pass.

LINDHOLM M, DEJIN-KARLSSON E, WESTIN J, HAGSTROM B, UDEN G.

**Physicians as clinical directors: working conditions, psychosocial resources and self-rated health.** *Occup Med (Lond).* 2004 May;54(3):182-9.

**Background:** Physicians in clinical directors' positions fulfil their commitments in demanding work environments characterized by organizational changes and economic cutbacks. Little is known about the self-rated health of this group.

**Aim:** To investigate whether self-rated health was associated with psychosocial working conditions, professional networks, job support, social networks and social support, sick leave and salary in Swedish physicians working as clinical directors.

**Methods:** A self-reported questionnaire was sent to 373 clinical directors. Odds ratios (ORs) were used for estimating the bivariate association between self-rated health and psychosocial resources.

**Results:** A total of 274 clinical directors agreed to participate in the study. The response rate was 73%. The clinical directors exposed to high job demands had a significantly higher probability of low self-rated health [OR = 3.4 and 95% confidence interval (CI) = 1.6-7.0] than those who were not in this situation. Furthermore, participants who were exposed to high job demands had an increased risk of low self-rated health (OR = 3.8 and 95% CI = 1.8-8.1) irrespective of available social support inside or outside work. High average working hours more than doubled the risk of low self-rated health (OR = 2.2 and 95% CI = 1.1-4.4)

**Conclusion:** The job demands on physicians in clinical directors' positions may exceed ordinary means of support with consequent adverse effects on self-rated health. More research is needed to investigate the interaction between job demands and support systems in this group of health care workers.

**Comment:** Most findings of people in high demand / high prestige jobs does not suggest objective or subjective reported health status is adversely affected. However, combining high demand with low emotional support will have an adverse effect. If this is combined with moving into an area that the individual is not keen on, reducing clinical or research duties in favour of management, or adding new tasks on top of existing demand, and for duties where there has been inadequate preparation and training, it could well be a recipe for poor self-reported health. The implications for the ADF are clear.

**FRANZBLAU A, WERNER RA, YIHAN J.**  
**Preplacement nerve testing for carpal tunnel syndrome: is it cost effective? J Occup Environ Med. 2004 Jul;46(7):714-9.**

Is not hiring otherwise-qualified workers who have an abnormal post-offer preplacement (POPP) median nerve test a cost-effective strategy to reduce workers' compensation expenses related to carpal tunnel syndrome (CTS)? We performed a retrospective dynamic cohort study based on 2150 workers hired at a company between January 1996 and December 2001 and who underwent POPP median nerve testing. Workers were followed until they left the company or until follow-up ended in May 2003. Results: Thirty-five cases of work-related CTS occurred during follow-up, and 9.13 cases could have been avoided. However, if the company had not hired workers with abnormal POPP nerve test results, it would have suffered a net loss of \$357,353. Conclusion: Not hiring workers with abnormal POPP nerve tests to reduce costs of work-related CTS is not a cost-effective strategy for employers.

**Discussion:** *Cost-effective? How about ethical? How do they know the 9 cases could have been avoided? The mean tenure of those with abnormal POPP nerve test results did not differ from those with normal nerve conduction pre-employment. In the introduction the issue of whether denying employment to those with slowed median nerve conduction is legal, with respect to the Americans with Disabilities Act, this was not further addressed. And it won't be, given the decisive result economically against such testing.*

**THORNE CD, KHOZIN S, MCDIARMID MA.**  
**Using the hierarchy of control technologies to improve healthcare facility infection control: lessons from severe acute respiratory syndrome. J Occup Environ Med. 2004 Jul;46(7):613-22.**

Health care facilities need to review their infection control plans to prepare for the possible resurgence of severe acute respiratory syndrome, other emerging pathogens, familiar infectious agents such as tuberculosis and influenza, and bioterrorist threats. This article describes the classic "hierarchy of control technologies" that was successfully used by occupational and environmental medicine professionals to protect workers from illness and death during the resurgence of tuberculosis in the 1990s. Also discussed are related guidelines from

building and equipment professional organizations and novel infection control techniques used successfully by various hospitals in Asia, Canada, and the United States during the 2003 severe acute respiratory syndrome epidemic. Taken together, they suggest a framework upon which a comprehensive infection control plan can be crafted to prevent the spread of deadly infectious agents to health care workers (clinicians and paraprofessionals), uninfected patients and visitors.

**Comment:** *Lots of good practical experience and advice here: engineering controls, work practices and education with PPE as a supplement.*



## ARTICLES

# Previous asthma and methacholine reactivity in defence force recruit screening.\*

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**ABSTRACT**

Screening for bronchial asthma remains a difficult but important aspect in the evaluation of health in potential recruits for the Australian Defence Force (ADF). Current regulations allow acceptance of subjects with a past history of asthma but who have been asymptomatic and have not required treatment for three years. Bronchial challenge tests may be used in an attempt to clarify a doubtful diagnosis. The findings of methacholine reactivity assessment in a group of 310 potential recruits referred for a consultant opinion have been examined.

Despite being asymptomatic and demonstrating normal spirometry, half the group showed an abnormal degree of reactivity with 17% having brisk reactivity. Importantly, 17% of a group currently acceptable under current regulations showed brisk reactivity. In determining whether the current guidelines are appropriate, it is essential to determine the subsequent service record of those recruits with persisting brisk reactivity who commence military service.

**KEYWORDS**

asthma recruit screening bronchial reactivity

**INTRODUCTION**

Current standards for health in recruits in the Australian Defence Force are high. The presence of asthma is a cause for rejection given the high incidence of morbidity from this condition under a variety of adverse environments. Whilst the diagnosis of current active asthma does not usually present a problem, the situation with regard to recruits with a past history of asthma is unclear<sup>1</sup>. This is especially complicated by the fact that many cases of childhood asthma appear to remit in the teenage years and some of those cases will relapse in later life.

Screening for asthma at the recruit medical assessment stage therefore should try to maintain a high level of fitness and health in those recruits accepted by detecting active asthma and recognising those applicants with a recognised potential for developing asthma under certain circumstances.

Since bronchial asthma represents the inflammatory modulation of intrinsic bronchial reactivity to a degree that causes symptomatic airflow

obstruction, the assessment of bronchial reactivity has been used as a means of detecting an underlying asthmatic situation. Potential recruits who are referred for a consultant opinion as to the presence of or likelihood of developing asthma often have an assessment of bronchial reactivity in an attempt to provide a scientific basis for an opinion.

This paper analyses the findings in 310 potential recruits referred for an opinion concerning asthma in whom methacholine inhalation was used to assess bronchial reactivity.

**MATERIALS AND METHODS**

The potential recruits were mainly referred by the medical officers of a Recruiting Unit (usually ADFRU-Melbourne) between 1995 and 2002. Of the 310 subjects, 63 were female. The mean age was 20.2 years with a range of 16 to 46 years. A brief cardio-respiratory history was taken and physical examination and basic initial spirometry using standard techniques were performed. Reactivity to methacholine aerosol was carried out using the established technique of the laboratory. This involves a vital capacity inhalation and a three second breath-

\*Presented at the 12th Annual AMMA Conference, Adelaide, October 2003. (Weary Dunlop Award winner)<sup>1</sup>

hold of a saline aerosol as a control and then methacholine hydrochloride in saline solutions of increasing concentration from 0.25mgm/ml to

50mgm/ml. The aerosols were generated from Hudson™ nebulisers driven by oxygen at 8 litres/min. The FEV1 was recorded three minutes after each inhalation. From these data points a dose response curve of FEV1 and methacholine concentration was derived and the concentration of methacholine to produce a 20% fall in FEV1 computed and expressed as the PC20. Bronchial reactivity was classified as absent (PC20 >50mgm/ml), moderate (PC20 4-50 mgm/ml), brisk (PC20 <4mgm/ml) and very brisk (PC20 < 1mgm/ml).

On the basis of past history, the presence or absence of symptoms and use of anti-asthma medication, the subjects were divided into the following groups:

- A. Definite past history, current symptoms, medication within three years (n=24)
- B. Definite past history, no symptoms or medication within three years (n=167)
- C. No past history, suggestive symptoms, no medication use (n=5)
- D. No past history, suggestive symptoms and medication within three years (n=4)
- E. Exertional symptoms only, no medication (n=25)
- F. Exertional symptoms only, medication used (n=9)
- G. Allergic rhinitis, vague breathlessness, medication used (n=8)
- H. Allergic rhinitis, vague breathlessness, no medication (n=16)
- I. Vague history, no current symptoms, no medication (n=41)
- J. Vague history, no current symptoms, medication used. (n=11)

## RESULTS

All subjects had a normal physical examination and normal initial spirometry. Sixty-four subjects (21%) admitted to cigarette smoking.

In 156 subjects (50%), methacholine reactivity was considered to be absent. In 103 subjects (33%) reactivity was moderate and in 51 subjects (17%) it was brisk with 15 of those subjects (5% of the whole

cohort) exhibiting very brisk reactivity. The distribution of bronchial reactivity within the subgroups is shown in the table. This shows that instances of brisk or very brisk reactivity could be demonstrated in all asymptomatic subgroups. In Group B, 78 subjects (47%) showed absent reactivity and 23 subjects (14%) showed brisk reactivity.

## DISCUSSION

Current guidelines allow subjects with a past history of asthma and no medication requirements or symptoms for three years to be accepted for enlistment. Since about 10% of a "normal" population demonstrate reactivity in the PC20 8-50mgm/ml range, bronchial reactivity alone is not a basis for rejection except for specialised branches of service such as submariners, divers and surface finishers.

All of the members of Group B would meet the current standards for acceptance since they had been asymptomatic for three years with no medication requirement and yet 23 (14%) had persisting bronchial reactivity well into the asthmatic range and a further 40% had moderate reactivity. It would be logical to consider those subjects with persistently elevated reactivity at increased risk of relapse in appropriate circumstances such as exposure to bronchial irritants or stress. Those of group B who demonstrated an absence of reactivity have presumably a low risk of relapse. Within their number may be some in whom the original diagnosis of asthma was incorrect.

Exertional wheeze was the reason for referral in 34 subjects (groups E and F). Bronchial reactivity was brisk in only 6 subjects suggesting that in this group, mechanisms other than asthma were operating. Methacholine is thought to act as a non-specific bronchial smooth muscle constrictor. Factors leading to bronchial mucosal swelling such as oedema would cause exertional wheeze in the presence of a negative methacholine response. Such swelling may have an allergic basis ("bronchial eczema") or result from abnormalities in circulatory control.

Subjects with allergic rhinitis are well recognised as often having elevated bronchial reactivity and of the 24 subjects in this sub-group, 11 demonstrated some degree of elevation although only one subject had brisk reactivity.

Bronchial challenge procedures are not "asthma tests". Depending on the provoking agent used, they

may provide information about airway inflammatory processes or bronchial muscle dysfunction<sup>2</sup>. Methacholine is non-specific since several conditions other than asthma have been shown to have increased methacholine reactivity<sup>3,4</sup>. It is thought to provide some insight into the likelihood of inducing bronchoconstriction upon exposure to dusts, fumes, respiratory infections, severe exertion or stress and as such should have a role in screening for respiratory health.

It remains unclear as to whether the current guidelines are appropriate or need modification. Are they too liberal or too strict? The US Department of Defense appears to be considering more rigorous criteria for subjects with a past history of asthma<sup>5</sup>. The need for modification could be clarified by considering the subsequent service record of those subjects with a past history of asthma and persistently elevated bronchial reactivity who were accepted for enlistment under the current regulations.

## CONCLUSION

This study raises a number of issues concerning the role of bronchial reactivity testing as part of recruit screening for applicants with a past or suggestive history of bronchial asthma. Before tightening or relaxing the present guidelines, the subsequent service performance of those successful applicants with persisting bronchial reactivity requires examination.

## ACKNOWLEDGEMENTS

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## TABLE

The distribution of reactivity to inhaled methacholine aerosol in 310 recruits grouped according to clinical status. See text for classification of Groups A to J and for definitions of degree of reactivity.

		Absent	Moderate	Brisk	
Very Brisk					
Group	A	4	8	12	5
	B	78	66	23	5
	C	2	0	3	1
	D	2	1	1	0
	E	17	3	5	2
	F	4	4	1	1
	G	5	2	1	0
	H	8	8	0	0
	I	29	7	5	1
	J	7	4	0	0

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# ARTICLES

## Management of Clavicular Fractures in the Soldier – Throw Out the Recipe Book

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### ABSTRACT

Fractures of the clavicle are very common and often effectively managed non-operatively, especially when they occur in the middle third. Mal-union is the expected outcome, which fortunately does not usually produce a significant functional limitation in the general population (1). In soldiers, however, there may exist a subgroup of the population in whom traditional non-operative management and results may impart a disability, which may then affect performance, and a subsequent downgrading of their PULHEEMS Employment Standard (PES). Given their requirement to carry heavy packs and webbing, and the physical demands of their profession, there has been discussion favouring the increased use of internal fixation.

This paper discusses the classification of clavicular fractures and their prognosis in the general population. The options of operative and non-operative methods of treatment are compared for each fracture type. Mid-clavicular fractures, which are the most common in the general population, may benefit from open reduction and internal fixation (ORIF) in soldiers with a view to minimising the degree of malunion. The outcome of ORIF needs to be balanced nonetheless against the complication rate associated with operative intervention, so as to inform the reader of the balance of factors associated with such decision making.

### KEYWORDS

Clavicle, fracture, clavicular, military, soldier, defence force, non-union, mal-union

### INTRODUCTION

Fractures of the clavicle represent a common fracture in the general community, estimated to be involved in 5% to 12% of all adult fractures (1-4). There is currently no data collection on specific fractures in the Australian Defence Force (ADF), but there is no reason to suspect that it is any less common in this group.

It is important to appreciate the distinction between the subtypes of clavicular fractures, as each will behave differently, and have different implications on soldiers' recoveries. Whilst malunion with good clinical function is usually the rule of a healing clavicular fracture, many will go on to non-union, or give a poor functional result despite healing within

acceptable limits.

Soldiers, like elite athletes, may represent a unique subgroup of the population for whom even slight anatomical defects may become functionally significant (5). Any soldier that is required to carry a pack and webbing may become symptomatic of any mal-union if it produces a prominence under their straps. Other situations that may require consideration include those members who wear harnesses, being paratroopers, pilots and loadmasters. This paper will review the current literature on the management of clavicular fractures, their treatment in the wider community, and discuss various aspects of their treatment that may be relevant to the soldier.

### EVALUATION

The clavicle is a bony structure linking the axial skeleton with the upper appendicular skeleton, and is very close to vital neurovascular structures and the

apices of the lungs. It contributes to about 30° of the range of motion of the shoulder girdle, and is important for complete shoulder elevation (1).

Making the diagnosis of a fractured clavicle is usually quite straightforward, with pain and swelling in the region following mild to severe trauma. Stress fractures of the clavicle have also been reported in the literature, although they are exceedingly rare, and associated with sportsmen performing repetitive actions (6). The patient may hold the ipsilateral arm close to the trunk. Examination should include a complete neurovascular examination of the ipsilateral upper limb looking for brachial plexus or subclavian vessel injury, as well as a close examination of the skin overlying the fracture site. "Inside-out" compound fracture wounds may appear to be a simple graze after the skin flap has closed over, and bleeding ceased. An AP X-ray view of the clavicle is usually all that is required, but should include the sternoclavicular joint and the entire shoulder girdle to rule out other associated injuries. Stress radiographs may be required to evaluate distal third fractures and their ligamentous injuries, and oblique X-rays may be useful to confirm the diagnosis if in question. An estimation of the shortening of the clavicle, if any, and degree of comminution should also be made.

## CLASSIFICATION

Clavicular fractures have traditionally been classified according to their position along the length of the clavicle, being in the proximal, middle and distal thirds (7, 8). It is reported that between 75 and 80% for all clavicular fractures occur in the middle third (8).

## PROXIMAL THIRD FRACTURES

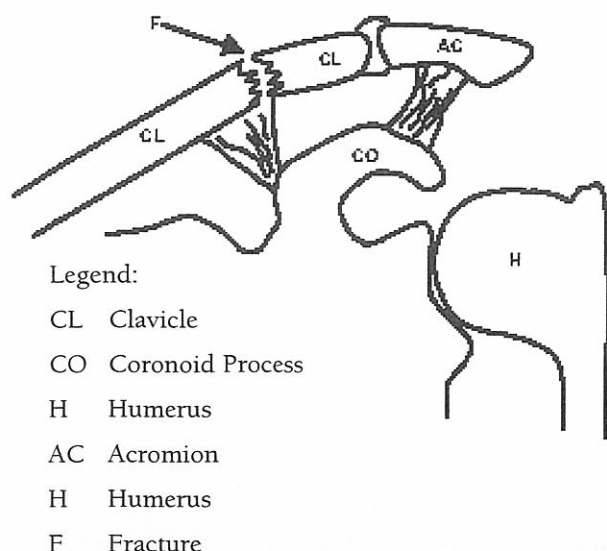
Fractures of proximal (medial) third of the clavicle are rare. There is a very strong ligamentous complex around the proximal end, so any displacement is usually minimal, and results with non-operative treatment can be considered to be good (1).

For completeness, it is worthy to note that dislocations of the sternoclavicular joint can occur. They are usually either external or internal, relative to the sternum. If external, they can usually be managed non-operatively, whilst internal dislocations should be regarded as an emergency, as they reduce the size of the thoracic outlet, and can compress vital structures (9, 10). In both cases, orthopaedic consultation should be sought.

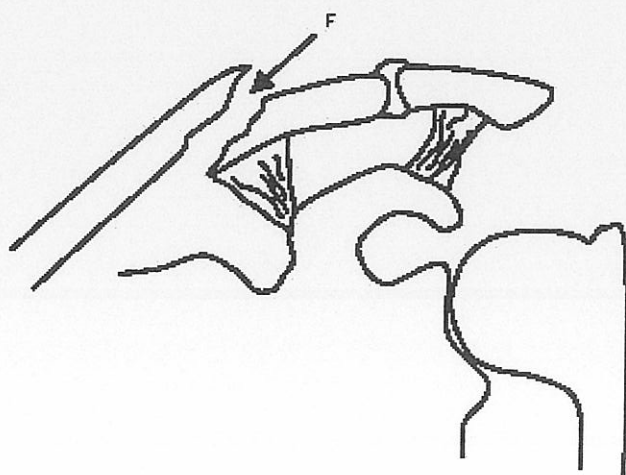
## DISTAL THIRD FRACTURES

Fractures of the clavicle near its distal end, comprising about 18% of all clavicular fractures, are sub-classified into three subtypes according to Neer (11). Type I fractures (Figure 1) occur without damage to the coracoclavicular ligaments, the fracture being located just distal to the ligamentous attachment. The intact ligament "holds down" the proximal end of the fracture in close apposition to the distal end, and so these fractures usually heal adequately without operative intervention (7, 11-13). However, in a long-term follow-up study of non-operatively managed fractures of this type, 11% of patients reported persistent symptoms of pain, and 33% healed with some deformity owing to excessive callous. For a soldier carrying a pack, this may become problematic, with the straps of the pack rubbing against any lump. This may be an indication for a non-acute operation, to excise excess callous and/or bony prominence once the fracture is healed.

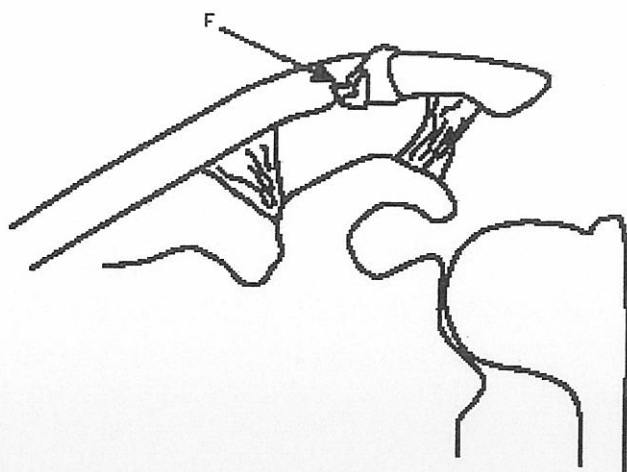
**Figure 1: Type I distal clavicular fracture**



Type II fractures (Figure 2) occur just proximal to the coracoclavicular ligament, allowing the proximal end of the fracture is allowed to become elevated. It is therefore prone to non-union, with rates reported around 20 to 30 % (12, 14-17). For this reason, internal fixation is generally recommended even in the normal population (2). There is no reason to suspect that this indication would be any less relevant in the military setting.



Type III fractures of the distal clavicle (Figure 3) are intraarticular, and involve the joint space of the acromioclavicular joint. In the past these have thought to be predisposed to developing a painful non-union (7, 11), yet in a recent small study, 14 patients with Type III fractures were managed conservatively and none of them displayed radiographic evidence of non-union (12). Resection of the lateral end of the clavicle, once an adequate period of time has passed with non-operative treatment, is an effective method of treating this complication should it occur (18).



### MIDDLE THIRD FRACTURES

By far the majority of clavicular fractures, 70% to 80%, occur in the middle third (2, 19), and the treatment of these is probably the most controversial. Treated non-operatively, they are resistant to non-union (between 0.8% and 5%) but mal-union is common (about 30%) in the adult population (3, 11, 20-24). In almost any other bone in the body, such results would suggest that open reduction and internal fixation (ORIF) would be the treatment of choice. The functional result in the general population however is very good despite these high rates (13, 23), although the recovery may take some time (21).

If we take our example of the soldier, however, it may be proposed that any degree of mal-union or risk of non-union is unacceptable given their higher demands on their clavicles and shoulders. It is for this reason that we need to carefully examine our treatment regimes for these types of fractures.

The standard method of performing ORIF of a midshaft clavicle fracture is by the application of a plate and screws. It is not without risks, though. Interestingly, ORIF acutely increases the non-union rate, and is associated with a high rate of complications – between 12% and 20% of all ORIF's of the clavicle will suffer at least one complication (25-27). These complications include infection, plate breakage, and of course, non-union, and all complications are increased in the non-compliant population, and in severely comminuted or shortened (>2.4cm) fractures (28-30). Indeed, studies of performing ORIF to acutely fractured clavicles report non-union rates of between 6% and 12%, and mal-union rates of 12%, although these were on patients who had severely displaced fractures with comminution to begin with (25). We are left, then, with the quandary – damned if we do, and damned if we don't (ORIF).

**Table 1: Indications for ORIF of acute clavicular fractures**

Absolute	Compound fracture requiring debridement
	Association with neurovascular compromise
Relative	In the multitrauma patient
	In a "floating" shoulder

There is little argument with regards to the accepted indications for ORIF of acutely fractured clavicles (Table 1) (7, 31). In the soldier, though, we



need to consider ways in which we can minimise the risk of non-union and mal-union to an acceptable level. Clearly, ORIF of these fractures is not a solution, as it actually increases the rate of non-union. Mal-union rates, however, are reduced with ORIF, and as this is an important consideration for a soldier, we may feel compelled to recommend acute ORIF, despite the high risks of the procedure (Table 2).

**Table 2: Non-operative vs operative management complications of middle third clavicular fractures**

Non-Operative Complications	Operative Complications
Mal-union (30%)	Mal-union (12%)
Non-union (0.8 – 5%)	Non-union (6 – 12%)
Functionally poor result	Infection
	Neurovascular compromise
	Miscellaneous surgical complications
	Functionally poor result

See text for references

Alternatively, we may look at maximising non-operative treatment initially, and resorting to ORIF only after non-operative management has failed. Mal-union and non-union of the clavicle can be well treated by osteotomy, bone grafting and internal fixation (28-30), although in the soldier the plates may need to be removed before they can return to full

duties (5).

## CONCLUSION

The modern soldier places enormous demands on his or her shoulders and clavicles, and a mal-united or non-united clavicular fracture can disable them considerably. One should therefore regard clavicular fractures in the military perhaps more seriously than amongst the general population. Operative management may be absolutely indicated in a setting of multiple trauma and neurovascular compromise and relative contraindications both strong and moderate are increasing as our knowledge of the demands placed on the upper limb in the soldier expand. Personnel who require optimal use of the upper limb may benefit from a procedure that restores the clavicle to length and maintains an anatomic reduction, provided that complications of non-union and delayed union are avoided. Fractures of the middle third of the clavicle are the most common, and subtleties of their treatment can be lost if practitioners follow a "recipe book" approach to their management. Accurate collection of data on the incidence and treatment of these fractures in the ADF should be a priority.

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# ARTICLES

## Assessing operational readiness of the Australian Army's health capability

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### ABSTRACT

A key role for the Operational Health Advisers in the Australian Defence Forces is to provide advice to their respective Commanders on the preparedness for operations of the health assets assigned to them. From an Army perspective, other Corps and Unit types have a defined process to assess this.

There is no defined method of determining the preparedness of Army health elements to undertake their operational role.

The components that contribute to the assessment of preparedness to provide Army operational health support are:

- Individual and collective preparedness for military service in an operational environment
- Individual skills, knowledge and attributes to perform professional and trade tasks
- Ability of the health capability team to perform the tasks expected of the team.

The individual and collective assessment for military service on operations is covered by extant Army policy and procedures.

The assessment of individuals and health capability teams to undertake their health specific duties is not performed in a structured or comprehensive manner.

In the civilian health care environment the equivalent processes include:

- Credentialing of health care providers
- Accreditation processes
- Health service audits.

These activities need to be undertaken in a systematic way so health advisers at all levels can be comfortable when they tell their Commanders that the health capability assigned to them is ready to provide operational health support. It is suggested that this system would include:

- Compliance with extant currency and credentialing requirements.
- The introduction and application of a competency based log book where an individual's experience is documented and this contributes to the assessment of the individual's readiness.
- A comprehensive accreditation process that allows the comparison of a health capability team against a benchmark standard for training, equipment and experience.
- A process that includes external review of the performance of a health capability under simulated conditions as well as appropriate chart reviews of actual care provided.

The details of such a system should be developed in conjunction with the range of trades and professions and trialed in exercises over the coming 12 to 24 months.



# ARTICLES

## Analysis of occupational health referral patients, in the IAF occupational health consult service clinic

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### ABSTRACT

An enormous amount of literature has been published on aviation physiology, most of it dealing exclusively with aircrew. Only rarely are the occupational problems of ground personnel addressed. An occupational health consult service referral clinic was established in the Israeli Air Force in 1993.

We present a retrospective analysis of periodic and fitness-for-work examinations of 1472 medical encounters of ground personnel between the years 2000-2002 who were examined in this clinic.

An upward trend is seen concerning the total number of visits in the clinic in the last decade.

The four most common causes of fitness-for-work examinations were: musculoskeletal (29%), respiratory (17%), neuropsychologic (13.9%) and skin (12%) problems.

The four most common causes of periodical examinations visits were: crane operators (38.7%), noise surveillance (34.4%), solvent exposure follow up (13%) and hydrazine exposure follow up (6.4%).

In 15% of all the examinations, health impairment was found leading for complete disability to the required job, and 26% of examinations resulted in partial work restriction recommendations.

The activity described in the occupational health consult service clinic reflects the special occupational hazards in military aviation ground personnel occupations.

### KEYWORDS

morbidity, occupational health clinic, military aviation, ground personnel.

### INTRODUCTION

Occupational medicine has its roots in ancient history. It began in the era of Hippocrates, and became a specialty, due to the efforts of Paracelsus, Georgius Agricola and Bernardino Ramazzini (1,2,3).

In Ramazzini's famous book, "De Morbis Artificum", written in the 18th century, many diseases caused by exposures at work were described, including the occupational diseases of painters, potters and glassmakers (3).

Aviation medicine, on the other hand, has only recently been established. An enormous amount of literature has been published on aviation physiology,

most of it dealing exclusively with aircrew. Only rarely are the occupational medical problems of ground personnel addressed, despite the fact that in the aviation industry, pilots and other aircrew comprise only 10-15% of the total aviation industry workforce, whereas ground personnel make up the remaining 85-90% (4,5,6).

Furthermore, ground personnel are exposed to a variety of occupational hazards (physical, chemical, biological, psychosocial and ergonomics) which demand special consideration (7).

Since 1993, an occupational health consult service referral clinic has been active in the Israeli Air-Force. Due to increasing demand, it has been operated on a regular basis by an occupational health specialist, for the past 3 years.

The aim of this article is to present the results of a

3 year-work in the occupational health clinic of the Israeli Air-Force, the number of visits, the distribution of the causes of visits and the results of visits in term of job restrictions recommendations.

## **MATERIALS AND METHODS**

### **Data Collection:**

The Israeli Air Force occupational health consult service referral clinic was opened in 1993. During the first years and up to the year 1999, it was partially operated by occupational physicians belonging to the military reserve forces. In 1999, an occupational health specialist physician began working in the clinic the clinic one day per week.

Up to 1999 all periodic checkups were conducted in the Air Force base primary care clinics by primary care physicians. Since 1999 these physicians are being qualified to make medical monitoring for some of the occupational hazards required by law, after short, but intensive, medical training, and are working under the supervision of the occupational health section in the IAF headquarters.

The primary care physicians are directed to refer any abnormal result to the occupational central clinic for further follow up. Workers exposed to certain occupational hazards, such as hydrazine, ionizing radiation, and crane operators are under medical surveillance only in the occupational health consult service referral clinic.

Fitness-for-work examinations are done by the occupational specialist only after referral from the Air Force base primary care clinics.

### **Data source:**

The medical record file of each employee includes questionnaires concerning medical and occupational history, the results of medical examinations, laboratory tests, medical specialist evaluations, diagnoses, recommendations, description of treatment and prescriptions.

### **Study design:**

The data concerning the visits in the occupational health consult service referral clinic between years 2000-2002 was compiled from the medical record files, by the occupational health specialist physician of the Israeli Air Force (IAF).

The number of visits to the central occupational health clinic per year was counted, and data concerning the cause of visit and the result of each visit collected and analysed.

### **Categorisation of visits objectives:**

The visits objectives were categorised into two main groups: periodic examinations and fitness-for-work examinations.

### **Periodic examinations subclassification:**

Periodic examinations were subclassified according to the occupational hazards to which aviation ground personnel were exposed (solvents, noise, dust, hard metals, pesticides, hydrazine, radiation, chrome and crane operators).

### **Fitness-for-work examinations subclassification:**

Fitness-for-work examinations were subclassified according to the body systems (musculoskeletal, respiratory, neuropsychologic, dermatologic, ophthalmologic, cardiovascular, gastrointestinal, hematologic, endocrine, others).

### **Categorisation of medical outcome of the medical encounters:**

The results of visits were divided into 3 groups in term of work fitness:

1. Waiver to continue the same occupation without restrictions.
2. Waiver to continue the same occupation with partial restrictions.
3. Recommendation to change occupation.

## **RESULTS**

The number of consultations completed in the occupational health clinic has grown in the last decade (Figure 1). The number of consultations has been almost duplicated between the years 2000, and 2002, and has been raised from 369 encounters in the year 2000 to 537 in the year 2001 and 700 in the year 2002.

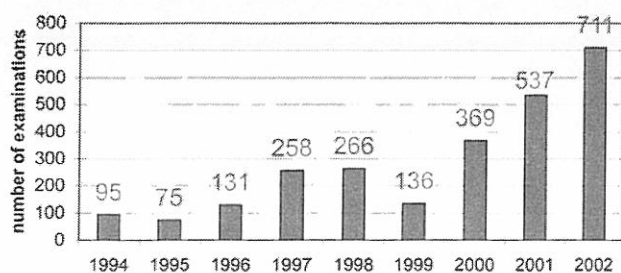
The 815 periodic examinations and 656 fitness-for-work examinations which were done between the years 2000-2002, comprised 55.4% and 44.6% of the total number of visits respectively.

The distribution of the 815 occupational periodic examinations according to the different occupational hazards is shown in Figure 2. The four most common categories were: crane operators (38.6%), noise surveillance (34.5%), solvent exposure (12.9%), and hydrazine (5.7%).

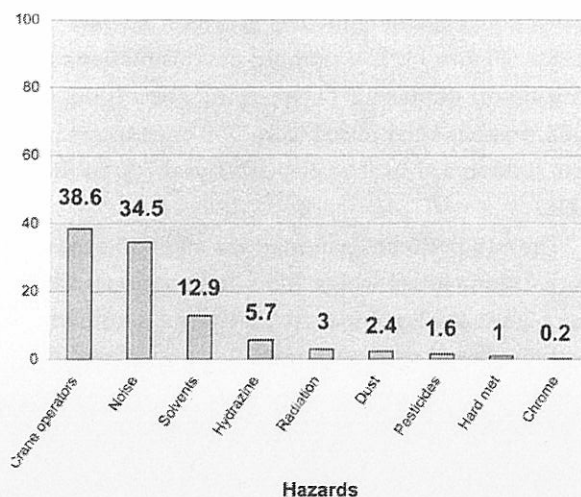
The most common complaints in fitness-for-work examinations were musculoskeletal (30.1%), respiratory (16.6%), neuropsychologic (13.9%) and skin problems (11.6%) as shown in Figure 3.

Health impairment leading to work change recommendation was found in 15% of the examinations (Figure 4), whereas most of the workers were found able to continue with their job, with minor restrictions or without any limitation.

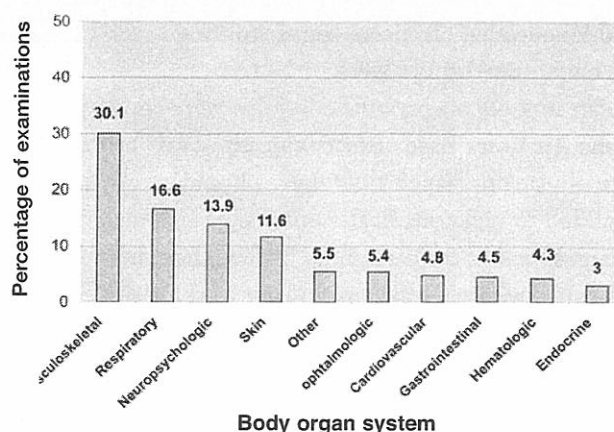
**Figure 1: Number of consultations in the Israeli Air-Force central occupational health consult service clinic 1994 - 2002**



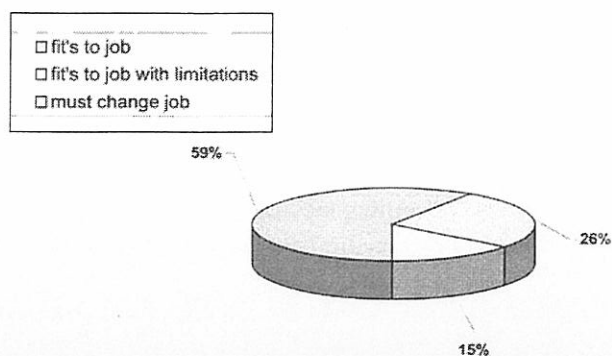
**Figure 2: Distribution of the occupational hazards seen in the occupational health consult service referral clinic among the periodic examinations between the years 2000-2002.**



**Figure 3: Distribution of the body organ systems among fitness-for-work examinations between the years 2000-2002.**



**Figure 4: Distribution of the recommendations specified by the occupational health consult service referral clinic in fitness-for-work and periodical examinations between the years 2000-2002.**





## DISCUSSION

An upward trend is seen concerning the total number of visits in the Israeli Air Force occupational health consult service referral clinic in the last decade.

### Periodic examinations:

The most common subgroups of periodic examinations were crane operators, noise solvents and hydrazine surveillance. This finding accords with Air Force ground personnel being commonly exposed to these hazards.

The most common occupational disease, both in and out of the aviation industry, is noise-induced hearing loss. Over 50% of airport maintenance workers who were exposed constantly to aircraft noise were found to have hearing loss (8).

The high number of visits of crane operators can be explained by the requirement for a special license from an occupational specialist for this job.

Hydrazine surveillance reflects the special aviation environment in military operations. Servicing modern combat aircraft involves replacing, emptying and filling the hydrazine units carried on board of aircrafts. Hydrazine is being used as a fuel for emergency power units which supply power to the plane when the engine fails (7).

The increase of environmental monitoring to other occupational hazards, such as benzene, kerosene, strontium chromate, flour and more, predicts an upsurge of additional periodic examinations in the near future.

### Fitness-for-work examinations:

The four most common groups of health problems seen as the cause of visits at the occupational health consult service referral clinic in fitness-for-work examinations are musculoskeletal, respiratory, neuropsychologic and skin problems.

The military aviation environment has special features compared with civilian counterparts (7). Aviation military ground personnel are exposed to great strain, due to the special military aviation environment. Lifting and carrying heavy objects may lead eventually to musculoskeletal complaints (7).

Low back pain is known as the most common musculoskeletal complain, both in the general population and in the work force with over 50% of adults reporting an attack some time in the past (8,9,10).

Additionally, it is the most common cause of restricted activity for those under 45 years old (11), the same age group of the ground personnel employed

in the Israeli Air Force. In agreement with our results, research on military populations indicates that musculoskeletal-related disorders represent the most prevalent source of outpatient visits, lost work time, and disability (12).

The most common medical problem encountered by the occupational physician at Ben Gurion airport during fitness-for-work assessments for aviation ground personnel was low back pain (20.6%) (13) and the overall musculoskeletal problems reached 33.5% (7), which is consistent with our results.

Fueling of military aircrafts, repairing and cleaning of aircraft parts, the talc used on flotation gears (life vests), the use of polyurethane foam, ammunitions maintenance chemicals such as solvents, degreasing agents and paints, emission from aircraft engines, hydrazine treatment in emergency power units, requirement to be ready for an instantaneous shift from peacetime to combat operations, put ground personnel at risk for respiratory, skin, and neuropsychologic injuries (7).

Skin diseases account for 30-50% of all reported occupational diseases in the United States (14,15) and are considered a major occupational disease (16). Skin problems are also a major issue in the occupational health clinic as shown.

Occupational asthma is one of the most frequent work-related diseases (17), and the most common occupational lung problem (18).

The exact prevalence of occupational asthma is unknown (19), and is estimated between 2-6% of all cases of asthma (17, 20), with wide prevalence variations between different chemicals exposures (21).

The high percentage of fitness-for-work examinations due to respiratory disability (16.6%) can be associated with the vast variety of respiratory hazards and with recruitment of soldiers having pre-existing asthma. Israeli soldiers who were recruited to the Israeli military service with preexisting asthma, were at a higher risk for respiratory complaints (22). Also, a significant proportion of adult-onset asthmatics may have occupational causation, while an even larger proportion have aggravation of underlying asthma (22,23).

Neuropsychologic complaints were found in 13.9% of fitness-for-work examinations, 70% of them were "headache" complaint. Headache is most prevalent among persons younger than 55 years (24). Both physical and mental work were strongly associated with frequent headache (24). Analysis of pain complaints and psychological distress among soldiers

in specialty military medical clinics in Israel showed that headache was the second most common pain complain with a positive linear relationship with psychological distress (25). Headache is one of the most common complaints due to occupational exposure to organic solvents (26).

The military Air Force environment, including mental and physical stress, psychological distress,

exposure to chemical, especially organic solvents, and the young age of Air Force ground personnel, explain the high incidence of headache complaint in the occupational health clinic.

The activity described in the occupational health consult service referral clinic reflects the special occupational hazards in military aviation ground personnel occupations.

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# ARTICLES

## Assessing operational readiness of the Australian Army's health capability

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### ABSTRACT

A key role for the Operational Health Advisers in the Australian Defence Forces is to provide advice to their respective Commanders on the preparedness for operations of the health assets assigned to them. From an Army perspective, other Corps and Unit types have a defined process to assess this.

There is no defined method of determining the preparedness of Army health elements to undertake their operational role.

The components that contribute to the assessment of preparedness to provide Army operational health support are:

- Individual and collective preparedness for military service in an operational environment
- Individual skills, knowledge and attributes to perform professional and trade tasks
- Ability of the health capability team to perform the tasks expected of the team.

The individual and collective assessment for military service on operations is covered by extant Army policy and procedures.

The assessment of individuals and health capability teams to undertake their health specific duties is not performed in a structured or comprehensive manner.

In the civilian health care environment the equivalent processes include:

- Credentialing of health care providers
- Accreditation processes
- Health service audits.

These activities need to be undertaken in a systematic way so health advisers at all levels can be comfortable when they tell their Commanders that the health capability assigned to them is ready to provide operational health support. It is suggested that this system would include:

- Compliance with extant currency and credentialing requirements.
- The introduction and application of a competency based log book where an individual's experience is documented and this contributes to the assessment of the individual's readiness.
- A comprehensive accreditation process that allows the comparison of a health capability team against a benchmark standard for training, equipment and experience.
- A process that includes external review of the performance of a health capability under simulated conditions as well as appropriate chart reviews of actual care provided.

The details of such a system should be developed in conjunction with the range of trades and professions and trialed in exercises over the coming 12 to 24 months.



## INTRODUCTION

The combat units of the Australian Army have relatively well defined measures of their readiness for operations. Infantry units prior to their deployment to East Timor are assessed by the Land Command Battle School's Combat Training Centre in a series of test scenarios designed to confirm they have reached a minimum acceptable level of operational proficiency. Artillery units have long been assessed through the artillery chain of command using the Army Training and Evaluation Programs (ARTEPS) process. Armoured units have a graded series of range practices that ensures their sub elements are capable or operating in the tactical environment. There is no formal system in place to provide this same assessment for the health capability of the Australian Army.

## AIM

The aim of this paper is propose a system for assessing the operational readiness of the Australian Army health capability.

## PURPOSE

The purposes of a system for assessing the operational readiness of the Army's health capability are envisaged to include:

- Providing a system to allow Commanders from platoon to Unit level to consistently assess the status of their health capability.
- Providing a system to allow Formation and above health staff to assess health elements in order to provide advice to their Commander on the operational readiness of the health capability.

At Unit and below level, this assessment could be used to assist the planning of training programs. At Formation and Force level, these assessments will help discharge the clinical governance function of senior health officers.

## COMPONENTS OF HEALTH READINESS

The Land Warfare Doctrine Centre's Doctrine Wing describes 'readiness' as:

'Readiness denotes a force's ability to be committed to operations within a specified time. Readiness refers to availability and proficiency of personnel and availability and serviceability of equipment, facilities and consumables.'

This leads operational health readiness to being broken down into the following components:

- Individual military skills proficiency
- Individual health specific skills, knowledge and attitudes
- Collective ability of health elements to undertake their assigned tasks.

The assessment of individual military skills proficiency, such as weapon handling and field craft, will not be explored in this paper. They are well covered in extant instructions such as the Army Individual Readiness Notice<sup>1</sup>

## INDIVIDUAL ASPECTS

The Australian Council for Safety and Quality in Health Care defines 'credentials' as:

The qualifications, professional training, clinical experience, and training and experience in leadership, research, education, communication and teamwork that contribute to a medical practitioner's competence, performance and professional suitability to provide safe, high quality health care services.<sup>2</sup>

They define 'competence' as:

The demonstrated ability to provide health care services at an expected level of safety and quality<sup>3</sup>

The Defence Health Policy Directive Number 822<sup>4</sup> deals with the assessment of currency and competency of health employment categories and qualifications. For medical and dental officers the implementation of competency based career structures will include some level of review of basic credentials for practice. This system will not include specific credentialing for procedures or cover their scope of practice. These issues are organisation specific<sup>5</sup>. A health directive covering the scope of practice for ADF Nursing Officers is under development (personal discussion with Land Headquarters Staff). For other health professions, the ADF tends to rely on recognition by the relevant professional bodies to accept the qualifications of disciplines such as physiotherapy, pharmacy, radiology and pathology as a minimum standard for ADF service.

For the health trades (medical assistants, operating theatre technicians, pathology technicians and others), the Army relies on the initial employment training to provide the skills, knowledge and attitudes required. There have been moves over the years to introduce competency based log books to record experiential training and as an aid to document currency in skill taught, however this approach has not been completely adopted as yet.

For the purposes of determining the operational readiness of an individual to perform the health specific tasks of their position, there are two elements:

The underlying formal education and training required. This equates to the credentialing and competency processes referred to above.

The experiential training that builds on the formal education and builds on this to enable the health care provider to cope in the operational environment.

The underlying formal education of individuals is relatively easy to determine. An individual's personal file should contain evidence of the formal qualifications held, including military health trade courses.

It is more problematic to set the minimum standards for experiential training and currency requirements for skills and procedures. For example, medical assistants were trained to insert peripheral venous lines on what was known as the advanced assistant medical course. This skill is now trained on the advanced medical assistant course or an advanced module after the end of the basic medical assistant course. Irrespective of when the skill was trained, how should this skill be maintained? There are no universally accepted standards of how often an individual should insert a peripheral line to be deemed competent at a point in time to do perform this procedure, and of course even the most experienced operator may not successfully establish a line in a given patient at a given time.

Accepting that standards cannot be defined to this level, experiential training following gaining formal qualifications is still a valuable component of being prepared for employment on operations. The nature of the experience gained following education should prepare the individual for operations. The nature of this experience will vary with the profession. For medical and dental officers, the assessment of competencies includes an experiential component such as the participation in relevant continuing education programs. For other groups, mission critical tasks should form the basis to assess individual readiness. These tasks would be determined on the basis of the more challenging tasks that might be required in the operational environment. For example:

- Nursing officers who will be assigned to work in deployed operating theatres should have experience in working in an emergency theatre situation.

- Scientific officers and pathology technicians should have experience in undertaking cross matching procedures.
- Radiologists should have experience in the radiology of patients with multi system trauma.
- Medical assistants should have experience in resuscitating patients with multi system trauma.

This list is not meant to be exhaustive. Each health trade or profession would need to have a range of experience identified as providing the requisite experience.

## COLLECTIVE ASPECTS

The closest equivalent to the assessment of a team's operational readiness in the non-military environment is arguably the accreditation process. Health services accreditation is generally seen to be a system of self regulation of health services involving an independent agency defining and monitoring standards for the participants in the scheme<sup>6</sup>. This process is widely implemented around the world, with the number of programs around the world doubling every five years since 1990<sup>7</sup>. Hurst<sup>8</sup> ascribes some of this popularity to the quality assurance movement in health care.

Accreditation should not be seen as the 'be all and end all', with questions being raised about benefits that come from the process. Shaw<sup>9</sup> discusses the accreditation leading to improvements in organisational processes but little evidence of benefits in terms of outcomes and clinical processes. An approach to assessing operational readiness based on the accreditation process would seem to be a reasonable starting point.

The JP 2060 Concept has identified health capability teams as the smallest elements that can provide an operational capability. Implied in the term 'team' is that the capability of the team is more than the sum of the individual members. This notion of the value of the collective effort can be extended to the contribution of each of the teams to the output of sub units and units.

Given the nature of military health support, including the frequent changes to personnel and the integration of reserve members and teams into the structure, Army health capability teams are not static, nor would these be an achievable goal to set for a unit. Some of the general military training is aimed at providing individuals with the skills to move in and out of teams quickly and individuals who can 'pull



together' a small group into an effective team quickly will tend to be identified as potential leaders.

Assessment of the operational readiness of health capability will need to involve consideration of how well the component teams work from a team specific perspective as well as their contribution to sub unit and unit performance.

It is suggested there should be two phases to the collective assessment:

A process and document review. This would include reviewing standard operating procedures for completeness and any other relevant documentation such as ward standing orders and clinical guidelines. If the assessment is being done in the context of an exercise or operation, the relevant orders and instructions would form part of this phase.

An observation phase. In this phase, the health element is observed in the deployed environment. People with relevant background and experience compared to the elements being observed would conduct this stage. The element could be observed conducting their normal training program or specific 'assessment scenarios' could be injected into the exercise to assess selected aspects. For example, the requirement for the environmental health team to conduct vector control activities could be initiated through exercise play, as could a mass casualty scenario. This phase would require co-operation and co-ordination between the assessing team and the exercise directing staff.

## OUTLINE CONCEPT OF ASSESSMENT SYSTEM

The proposed system for the assessment of the operational readiness of health capability elements could be applied to any health capability element, including elements in a non health services unit such as a battalion regimental aid post. The system has three elements:

Credentials and Experience Check: Confirmation of the individual skills, knowledge and attitudes of the

personnel, compared to the requirements of the position they are posted against. This would include a review of the formal qualifications and credential held as well as a review of competency log books and records of any experience related to strategic alliances.

Process and Document Check: A process and document review of relevant documents such as standard operating procedures, orders and instructions, clinical guidelines and health policy and doctrine.

Direct Observation: A 'survey' of the element providing health services in the deployed environment. This is akin to the Australian Council of Health Care Standards (ACHS- see <http://www.achs.org.au/>) accreditation process. An internal survey could be conducted by Commanders using organic resources to allow training needs to be identified and deficiencies in personnel to be quantified.

Senior headquarters should mandate this process and facilitate the provision of external surveyors as part of pre-deployment work up and at regular intervals in negotiation with formation headquarters. There would be a set of core criteria and elements for each component, with additional details tailored to the unit and the operational environment as appropriate. A key issue to be determined would be whether to contract out such a review process (perhaps to the ACHS) or to use ADF resources.

## CONCLUSION

The setting of standards and monitoring performance is a key task of the health staff. The system proposed would allow the operational readiness of health capability elements to be assessed in a consistent and reliable manner. Although a system where the accreditation process would be compulsory is proposed, the intention remains educational and developmental rather than punitive<sup>10</sup> (Hurst, 1997, p94). This would allow the process to inform training programs as well as provide an assessment of the operational readiness of the elements concerned.

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Abbreviations mean different things to different readers. Abbreviations are only to be used after the complete expression and the abbreviation in brackets has appeared. For example, the Australian Defence Force (ADF) may then be referred to as the ADF.

### Figures

All figures must be mentioned in the text consecutive order and must be numbered with Arabic numerals. Captions giving the figure number and a brief description, preferably only one or two sentences, must be included with each figure. The caption should be understandable without reference to the text. It is preferable to place any key to symbols used in the artwork itself, not in the caption. Ensure that symbols and abbreviations used in the text agree with those in the artwork.

### Tables

Tables should be used when the data cannot be presented clearly narrative, when many numbers must be presented, or when more meaningful interrelationships can be conveyed by the tabular format. Tables should supplement, not duplicate, information presented in the text and figures. Tables should be simple concise.

Tables may be created using a word-processor's mode or table format feature. The table format feature is preferred. Ensure that each data entry is in its own table cell. If the mode is used, separate columns with a single tab and use a feed (return) at the end of each

row. Tables should be numbered consecutively with Arabic numerals and placed in the text near the point of first mention. Each must have a brief (one phrase or sentence) title that describes the contents. The title should be understandable without reference the text. Details should be put in footnotes, not in the body of the table.

Define non-standard abbreviations in footnotes. Table footnotes should be given letter designations and be cited in the table by italic superscript letters. The sequence of letters should proceed by line rather than by column. If a reference is cited the text and in a table, a lettered footnote which refers to the numbered reference in the text should be inserted in the table. In setting up tables, authors should keep in mind the journal's column widths 8.25 or 24 cm, and should make tables conform to the limitations of these dimensions.

### Nomenclature

Registered trademark names should be capitalised whenever used. Trade and trivial names should not be capitalised. SI units are to be used for all articles. Any normal ranges should also be included.

### ILLUSTRATIONS

General Considerations. All graphics in the journal will normally be black and white. Colour pictures may be published for exceptional reasons, on application to the Editor.

All graphics must be created in digital format and included at their appropriate locations in the manuscript word-processor text file close to the point of first mention. In general, graphics should be copied from the graphics program window and pasted directly into the manuscript text file at the correct size. The author should make sure that the graphic is at the appropriate resolution (see below) before copying and pasting. If the graphics need to be resized later, they should be resized in the graphics program and then pasted into the manuscript; the original should be removed. The author should not resize graphics after they are pasted in Word or WordPerfect. This is true regardless of the graphic formats: cdx, tif, eps, pdf, etc. The author should not use the "insert" function in Word to place the graphics.

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The quality of the graphics in the Journal depends on the quality of the originals provided by the author.



Figures cannot be modified or enhanced by the Journal production staff. The graphics files pasted into the manuscript word-processor file are used in the production of the Journal. Any flaws or non-uniform lines will be reproduced in the published article. Images produced from continuous-tone graphics such as photographs should have high contrast.

#### Size

Graphics must fit a one- or two-column format on the Journal page. *For efficient use of Journal space, single column graphics are preferred.*

Single (preferred)	Double Width
minimum 10.5 cm	
maximum 8.25 cm	17.8 cm (7in.)
Maximum depth 24 cm	24 cm (9.5 in.)

For best results, submit graphics in the actual size at which they should appear in the printed edition. Original graphics which do not need to be reduced to fit a single or double column will yield the best quality. Lettering should be no smaller than 4.5 points. Helvetica or Arial fonts work well for lettering. Lines should be no thinner than 0.5 point. Lettering and lines should be of uniform density and the lines unbroken. If the submitted artwork must be reduced, larger lettering and thicker lines should be used so that, when reduced, the artwork meets the above mentioned criteria.

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Black and white line art 1200 dpi  
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#### REFERENCES

References should be in accordance with the "Vancouver" system (see MJA 1991; 155: 197-202, or [www.mja.com.au/public/information/uniform.html](http://www.mja.com.au/public/information/uniform.html)). References in the text should be numbered consecutively as they are cited and should appear as superscript numbers (e.g. text<sup>1,2</sup>). References are collated at the end of the article. Annotation of the references should accord with the abbreviations used

in Index Medicus. Where there are seven or more authors, list only the first three then use et al. Authors are responsible for reference accuracy. An example of the reference system is as follows:

1. Quail G. Asthma in the military. Aust Mil Med 2000; 9(3):129-137.
2. Bowden M. Black Hawk Down. New York: Atlantic Monthly Press; 1999.

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