



# AUSTRALIAN MILITARY MEDICINE ASSOCIATION

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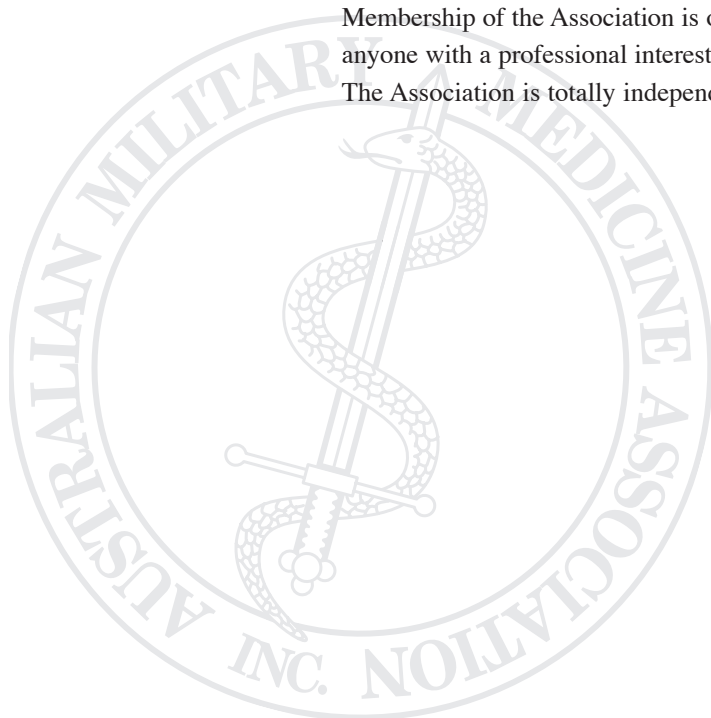
## STATEMENT OF OBJECTIVES

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.





*You are invited to attend the*

# **2006**

## **Defence Health Services and Australian Military Medicine Association Conference**

**“MILITARY HEALTH – THE CHALLENGES”**

to be held at the

**BRISBANE CONVENTION AND EXHIBITION CENTRE,  
BRISBANE, QUEENSLAND**

from **THURSDAY, 19 OCTOBER 2006**

to **SUNDAY, 22 OCTOBER 2006**

This year AMMA has joined with Defence Health Services to present Australia's premier military health Conference. Recognising the ever broadening role the health professions play in supporting military activities across the world and in varying operational environments, this Conference will showcase the research, professionalism and operational capability achievements of those health professional who are associated with the military.

For further information, including how to register, please visit the AMMA website [www.amma.asn.au](http://www.amma.asn.au) or contact:

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## AUSTRALIAN MILITARY MEDICINE ASSOCIATION

# ANNUAL GENERAL MEETING

The AMMA Annual General Meeting will be held on Saturday 21 October from 13.00-14.00 at the Brisbane Convention and Exhibition Centre.

## AGENDA

1. Apologies
2. Previous Minutes from AGM\*
3. Annual Report
  - 3.1 President's Report
  - 3.2 Secretary's Report
  - 3.3 Journal Editor's Report
  - 3.4 Treasurer's Report
    - 3.4.1 Acceptance of the 2006 Auditors Report
4. Announcement of newly elected Council
5. Any Business of which notice has been given
  - 5.1 Membership for Retiring Members
6. General Business
7. Next AGM

\*The draft minutes of the 2005 AGM can be found on the AMMA website at [http://www.amma.asn.au/meetings\\_AGMmin.php](http://www.amma.asn.au/meetings_AGMmin.php)

# EDITORIAL

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## Scott Kitchener

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This has been a year of change for the Journal. After a long and colourful career, CAPT Jenny Graham has departed from active service with the ADF and also her role on the AMMA Executive as the Editor of the Journal. She not only will be, but had been sorely missed – a tribute to her efforts during service to the Association. Prior to her departure the Executive discussed and accepted a proposal to establish an Editorial Board recognising the significant logistic effort required to produce this publication. Concurrent with this move will be a level of rigour that will further elevate the Journal into the scientific health literature. The strength of submissions to the Journal, the Annual Conference and the growth of the Association both support this direction. The Board will accommodate the close association of military and veteran's health and the increasingly academic nature of this field in Australia by including representatives from the Universities actively researching and teaching the field.

The President of the Association will sit as Chair through the initial stages of governance from the Editorial Board. The Board will then review the publication process for the Journal towards an efficient means of disseminating scientific and academic information of military and veteran's health in addition to documenting the activities of the Association. Towards the latter, accepted abstracts of the AMMA 2006 Conference will be published in the next edition of the Journal and will appear in future years as an annual supplement to the Journal.

Your suggestions and advice will be sought at the Annual Conference in Brisbane. Comments are also welcomed per email.

Finally, this edition includes the usual eclectic mix of papers reflecting the diverse nature of health care practice in the military. Papers range from historic contributions to contemporary issues in military health of sports medicine, nutrition, surgery and occupational health. My sincere thanks to the authors of these papers and other contributors who have submitted papers not yet published in the Journal.

Thank you for your continued support of *Australian Military Medicine*.

**Scott Kitchener**

# PRESIDENT'S MESSAGE

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## Dr Russell Schedlich

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As we go to press, the Australian Military Medicine Association/Defence Health Services joint Organising Committee are putting the final touches to the programme for the 2006 AMMA/DHS conference being held at the Brisbane Convention Centre from 19 to 22 October. The Organising Committee has been working tirelessly to put together a Conference that is packed full of high quality papers as well as providing delegates the opportunity to mix with their colleagues in a relaxed environment.

The DHS and AMMA came to an agreement early this year to co-host this conference, with AMMA being given the responsibility for management under the guidance of a joint Organising Committee.

We are honoured that the Defence Minister, Dr Brendan Nelson, will be opening the Conference. Being responsible for the political leadership of the ADF as well as being a medical practitioner, Dr Nelson is sure to provide a unique perspective on military medicine in his Opening Address.

The Conference has an impressive list of Australian and international keynote speakers, including Australian of the Year Professor Ian Frazer, who will read papers on a wide variety of military medical matters.

This will be an event not to be missed, and I look forward to catching up with you all in Brisbane.

Members of the Defence Health Service continue to work at a high pace to support operational and exercise deployments of the ADF, and the level of activity remains undiminished.

There is continuing focus on the risks of deployments, particularly on those that impact on the long term health of veterans. The 2006 conference will be our opportunity to support the scientific and professional development of the science of military medicine and health.

*Australian Military Medicine* is also undergoing significant change. Council agreed last year to join with the Defence Health Service, the Centre for Military and Veteran's Health and other professional bodies involved in support research and study into military medicine and health to establish an Editorial Board to guide the development of the journal and to provide editorial support for its publication.

The new Editorial Board consists of:

Russ Schedlich, President AMMA,  
Editor-in-Chief  
Scott Kitchener, Grants Officer, AMMA  
Peter Leggat, Defence Health Services  
Keith Horsley, Department of Veteran Affairs  
Graeme Cannell, Defence Health Services  
Malcolm Sim, Monash University  
Bob Stacy, CSR

The Board will be meeting during the Conference to map out concepts and a plan for the evolution of the journal with a view to having it internationally recognised as a forum for publication of research and comment on military and veteran's health.

The Board will be pleased to receive any thoughts on how best this may be achieved.

I look forward to catching up with you all at the Conference in Brisbane in October.

**Russ Schedlich**

# EDITORIAL BOARD

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## DR RUSSELL SCHEDLICH

Russ Schedlich graduated from the University of New South Wales in 1979 and started working in the Royal Australian Navy the following year. After time at sea and in major shore Establishments, he specialised in underwater medicine, and in 1986-88 undertook a posting to the Institute of Naval Medicine in the United Kingdom. Returning to Australia, he served as Fleet Medical Officer from 1989-90 and then completed a Master of Public Health the following year. In 1992, he was appointed Medical Officer-in-Charge of Balmoral Naval Hospital, and the following year joined Maritime Headquarters to develop the concept, design and operational development of the Primary Casualty Reception Facilities in the Navy's ex-USN amphibious transport ships. In 1996 he was for the second time appointed as Fleet Medical Officer, being promoted to Captain shortly afterwards. In September 1998, he was given the additional position of Head Naval Health Branch. In December 1999, Russ transferred to the RAN Reserves after nearly 23 years of service, and following 12 months in a civilian capacity at Fleet Base East Medical Centre, HMAS Kuttabul, moved to Broken Hill as Director Medical Services, Far West Area Health Service. In August 2004, he transferred to the NSW Health Department in the medical workforce area, grappling with issues around medical practitioner and specialist numbers and their education and training. Lifestyle beckoned in 2006 after his three children left home, and he is now Executive Director Medical Services in Rockhampton, living in a beach front unit and once again contemplating the sea.

## LTCOL SCOTT KITCHENER

LTCOL Scott Kitchener is a Reserve Consultant in Tropical Medicine and Clinical Research. He holds a position as Associate Professor at the Centre for Military and Veterans Health in addition to Principal Research Fellow at the James Cook University School of Tropical Medicine and Public Health. His civilian work includes research and post-graduate teaching at University of Queensland, research at the Wesley Research Institute and private practice as a Public Health Physician. He has been a member of AMMA since inception, recently being elected to the Executive.

## LTCOL PETER LEGGAT

Joined the Australian Regular Army in 1987. He was posted to various units, including the historic 2 Field Ambulance in Townsville. Lieutenant Colonel Leggat is currently serving in the Defence Health Services, Army Reserve, Queensland, and is the nominee of the Head, Defence Health Service, on the Board of Australian Military Medicine. His day jobs are Associate Professor and Acting Director of the Anton Breinl Centre for Public Health and Tropical Medicine, James Cook University and Visiting Medical Officer at 5 Aviation Regiment, Townsville.

## DR KEITH HORSLEY

Specialist Adviser (Health Studies) with the Department of Veterans' Affairs. He has been involved in research of Korean War veterans, Vietnam War veterans, Nuclear Test participants, and those involved in F-111 maintenance. He is a graduate from the University of Queensland in medicine and public administration.

## PROF. MALCOLM SIM

Professor Malcolm Sim is an Occupational Physician who is Director of the Monash University Centre for Occupational and Environmental Health (MonCOEH). His main research interests include the human health effects of occupational and environmental chemical and other exposures, occupational disease surveillance, veterans' health and exposure assessment in epidemiological studies.

## LTCOL GRAEME CANNELL

Graeme Cannell graduated from the University of Queensland with qualifications in science and a doctorate in biological chemistry. Subsequently he completed other postgraduate studies in education, management and information technology. His career has covered 30 years in research with interests in toxicology, pharmacology, mathematical modelling, organ perfusion, cell culture and analysis. He has served in the Reserves for 23 years and holds the position of SO1 Research within Defence Health Services.

## **LTCOL BOB STACY**

As one of the founding members, Bob Stacy is no stranger to AMMA. He has worked within the areas of human factors and military medicine for over 32 years supporting large organisations, including Defence, Telstra, BHP and Melbourne Health. He was the winner of the 2004 Eric Wigglesworth National OHS Education Medal, and is a Research Fellow of the University of Ballarat and a Fellow of the Safety Institute of Australia. Bob has a Bachelor of Science in Physiology and Human Performance from the University of New England; a Master of Science in Ergonomics and Human Factors from the Loughborough University of Technology, in the UK; and a Doctorate from the University of Ballarat in OHS and organisational development. Bob is currently working with CSR as their Group Manager Occupational Health and Safety.



# ARTICLES

## Nutritional Determinants of Bone Health: Implications for the Australian Defence Force

Christine Booth PHD<sup>a</sup> Julia Carins<sup>b</sup>

**Key Words:** bone health, nutrition, military, training, calcium, vitamin D

### ABSTRACT

The importance of dietary calcium in the prevention of poor bone health and osteoporosis in later life is well recognised and two National Diet Surveys have highlighted the problem of many Australian women eating insufficient calcium. Surveys of ADF trainees revealed 10 % of Army recruits (mostly male) and 20 % of female officers-in-training at risk of not meeting their calcium requirements – mostly due to not eating enough dairy foods. Although the eating habits of female officers-in-training appear to have improved over the last 10 years, many of the women still fall short of meeting their calcium requirements. Furthermore, female recruits are more at risk of bone-related injury than males. This paper discusses the nutritional determinants of bone health of most relevance to the ADF, describes some current US and Australian military research and makes some recommendations for prevention of poor bone health among ADF personnel.

### BACKGROUND

Changed physical training regimes, improved management of sporting activities and gender-related changes to other physical activities (for example marching), are having a positive effect on reducing injuries during training<sup>1</sup>. However, two other important areas of preventive action remain to be addressed, namely improved neuromuscular co-ordination (through specific training exercise and psychosocial approaches)<sup>2</sup> and improved bone health.

Bone health is becoming an increasingly important public health issue in Australia. Osteoporosis affects about 30 per cent of postmenopausal women, with more than half of these suffering bone fractures<sup>3</sup>. It is also becoming more of a problem for men. The prevalence

has been predicted to increase in the next generation and the effects of osteopenia (reduced bone mass) are already being seen more in younger people<sup>4</sup>. Current research tells us the best protection against poor bone health is appropriate resistance exercise, a life-long calcium-rich diet and avoidance of smoking and excessive alcohol consumption. This paper discusses the nutritional determinants of bone health of most relevance to the ADF, describes some current US and Australian military research and makes some recommendations for prevention of poor bone health among ADF personnel.

### NUTRITIONAL DETERMINANTS OF BONE HEALTH

Calcium is an essential nutrient and is the major cation of bone. Bone is a living tissue, which is continually being broken down and rebuilt. To enable this process, bone has a requirement for not only calcium, but also for an energy supply, and other nutrients including phosphorus, protein, ascorbic acid, copper, fluorine, iron, magnesium, manganese, vitamin D, vitamin K and zinc<sup>5,6</sup>. Adequate amounts of these nutrients are essential for bone health.

Inadequate calcium consumption contributes to several disorders, osteoporosis being the most commonly studied disorder. An effective deterrent against osteoporosis related fractures appears to be the achievement of maximal skeletal mass or peak bone mass by early adulthood<sup>7</sup>, and it appears that a lifetime pattern of adequate calcium intake seems to produce the most benefit.

The skeleton serves as the primary reserve for calcium, and is indirectly affected by dietary calcium intake and the amount of calcium lost from the body as either urine or sweat. Estimates of calcium requirements have only recently included amounts needed to replace calcium losses through sweat. This has led to an

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increase in calcium intake recommendations in recent revisions of the FAO/WHO<sup>8</sup> and US/Canadian recommendations<sup>9</sup> and the draft revisions to the Australian/New Zealand recommendations<sup>10</sup>.

The current Australian RDI for calcium for adults are shown in Table 1. This recommendation accounts for the large calcium reserve in the skeleton and the fact that negative calcium balance may have to continue for many years before bone failure occurs and also incorporates a margin of safety to meet obligatory losses in 90 per cent of the population<sup>11</sup>.

**TABLE 1.** Current Australian RDI for Calcium<sup>11</sup>

Age Bracket (yrs)	Male RDI (mg/day)	Female RDI (mg/day)
16-18	1000	800
19-64	800	-
64+	800	-
19-54	-	800
54+	-	1,000

To be able to meet the RDI, the National Health and Medical Research Council (NHMRC) gives advice on food groups and lifestyle patterns that will provide nutrients in adequate amounts. Calcium is found predominately in dairy foods, but smaller amounts can be found in bony fish, legumes, certain nuts, fortified soy beverages and breakfast cereals<sup>3</sup>. To obtain adequate calcium, the NHMRC recommends three serves per day of dairy foods<sup>3</sup>.

Australian and New Zealand recommendations for calcium requirements are currently being reviewed. Draft recommendations have followed the approach used by the US of setting a recommended dietary intake based on the Estimated Average Requirement (EAR).

The proposed recommendations for adults are shown in Table 2.

**TABLE 2.** Proposed Australian/New Zealand Recommendations for Calcium Intake<sup>10</sup>

Age Bracket (yrs)	Male RDI (mg/day)	Female RDI (mg/day)
14-18	1,300	1,300
19-50	1,000	1,000
51-70	1,000	1,300
70+	1,300	1,300

It is worth noting that the proposed recommendations are substantially higher than the current Australian RDI, therefore estimates of dietary insufficiency made in the later sections of this report would be even greater if, or when the new recommendations are adopted.

Furthermore the new recommendations equate to the need to consume an extra serve of dairy product per day (ie 4 serves per day).

There are a number of nutritional issues other than calcium intake that impact on bone health. Some of these nutrients or food components enhance or impede calcium absorption, or increase calcium losses from the body. Others affect bone health by mechanisms not closely linked to calcium intake.

One nutrient of great importance for bone health is vitamin D, a promoter of calcium absorption, it enhances absorption during times of need or reduced calcium intake. Vitamin D can be obtained through the diet, or via skin synthesis when exposed to sunlight<sup>6</sup>.

Adequate protein is essential for bone health as well as for many other aspects of metabolism. High protein intakes have been shown to increase urinary calcium excretion<sup>3</sup>, but there is controversy surrounding the notion that high protein diets can be detrimental to bone health. It is likely that a diet containing a moderate level of protein (1-1.5 g per kilogram body weight) is optimal<sup>6</sup>.

Sodium intake has been linked to urinary calcium excretion, and considering the societal trend of low calcium and high sodium intakes<sup>6</sup> there is a potential for high sodium intake to adversely affect bone health. However the evidence is not conclusive that high sodium intakes necessarily adversely affect bone health<sup>12</sup>.

Phosphorus is an essential building block of bone, and is therefore required in adequate quantities to ensure healthy bones. However there is concern that too much phosphorus could be harmful to bone. The replacement of milk drinks with carbonated beverages may also contribute, due to lowered calcium and concomitant elevated phosphorus intakes<sup>6</sup>.

Vitamin K protects against age related bone loss via vitamin K dependent -carboxylation of certain bone proteins, including osteocalcin<sup>13</sup> — the major non-collagenous protein incorporated in bone matrix during bone formation. The ratio of undercarboxylated osteocalcin (a protein with low biological activity) to total osteocalcin is thought to be the most sensitive

marker of vitamin K status<sup>14</sup> and both low dietary vitamin K<sup>6</sup> and increases in undercarboxylated osteocalcin<sup>15</sup> have been linked to low BMD in women. Adequate vitamin K status limits urinary calcium excretion, and enhances vitamin D mineralisation and calcium deposition<sup>16</sup>.

High levels of caffeine in the diet are detrimental to bone health. Caffeine reduces calcium absorption and increases urinary losses. A study found that as coffee intake increased, milk consumption decreased<sup>17</sup>, compounding the problem.

Consumption of large amounts of alcohol is also detrimental to bone health. Alcoholism is a risk for bone health due to poor nutrition, malabsorption of nutrients, the potential for liver disease, direct toxicity to osteoblasts and increased risk of falls<sup>6</sup>. The notion of potential health benefits from moderate alcohol intake is quite popular, and it appears that moderate alcohol intake could be beneficial to bone health<sup>18</sup>.

## MILITARY RESEARCH INTO BONE HEALTH

The importance of dietary calcium in relation to stress fractures in military personnel is unclear. Studies have reported that calcium intake<sup>19</sup> or supplementation<sup>20</sup> was not associated with the risk of developing stress fractures in military recruits, but dietary calcium intake in injured and control groups was relatively high in these studies.

Poor vitamin D nutrition might be an important bone health factor among certain groups of ADF personnel, including those personnel who live in the southern states of Australia and submariners. Total sunlight deprivation for 68 days was reported to result in a large decrease in serum vitamin D among submariners<sup>21</sup>. Submariners and other ADF shift-workers may be at further risk of poor bone health due to altered circadian rhythm and resultant 'glucocorticoid-induced osteoporosis'<sup>22</sup>. Also of interest is the role of vitamin D in the promotion of neuro-muscular coordination. Poor vitamin D status is associated with impaired balance and muscular strength<sup>22</sup>. This is important when considering the role of poor neuro-muscular coordination in the high incidence of falls, trips or slips among ADF personnel<sup>2</sup>.

Lower bone density was found to be a factor in predisposing male<sup>23</sup> and female<sup>24</sup> members of the US Marine Corps to the development of fractures. Also in the US, female recruits were found to have disproportionately higher numbers of stress fractures

than male recruits undergoing similar training regimes<sup>25, 26, 27</sup>. The incidence of stress fractures among female recruits in the UA Army was 4.7%. Quantitative ultrasound (QUS) measurements of the heel was found to identify those women at highest risk of stress fracture. The relative risk (RR) for stress fracture among those women in the lowest quintile for the QUS measure, speed of sound, was 6.7. The subgroup most at risk was those women who smoked and didn't exercise (RR = 14.4).<sup>28</sup>

Lower bone mineral density has been found among athletes who lose calcium through profuse sweating without a compensatory increased intake of dietary calcium<sup>27</sup>. This could be an important consideration when considering the calcium requirements and bone health of ADF personnel operating in tropical environments.

The results of two military trials should be available later this year. The first, being conducted by the Creighton University Osteoporosis Centre, aims to determine if calcium and vitamin D intervention can reduce stress fracture incidence by at least 50% in female Naval recruits during basic training and to examine the potential mechanisms for increasing bone adaptation to intense mechanical loading<sup>29</sup>. Over three years they aim to enrol 5,200 participants and compare the stress fracture incidence between placebo-treated and calcium/vitamin D treated women. The second, the ADF bone health survey, is being conducted by DSTO-Scottsdale under Task ARM 04/145. It aims to determine the prevalence of key risk factors, including diet, exercise, bone turn-over, bone mineral density and anthropometry, and to relate these risk factors to injuries. The survey will be completed during 2006 and these data will be used as the basis for the design of strategies for the prevention of bone-related injuries within the ADF.

## Dietary calcium intake of ADF trainees over 10 years

Dietary intake data has been recorded for Army recruits in 1998<sup>30</sup> (first survey) and 2003<sup>31</sup> (second survey) and for female officers-in-training at ADFA in 1993<sup>32</sup> (first survey) and 2003<sup>33</sup> (second survey). The gender and age breakdown of the groups surveyed is presented in Table 3 and the mean dietary intakes of calcium and the estimate of risks are presented in Table 4.

**TABLE 3.** Gender and age breakdown for the dietary intake surveys over 10 years

	Army Recruit Training Centre			Australian Defence Force Academy		
	Mean	Range	n	Mean	Range	n
First survey	21 NA	17 – 36 NA	91 males 16 females	19	17 - 22	73 females
Second survey	22 30	18 – 33 19 - 46	51 males 7 females	20	18 - 35	67 females

**TABLE 4.** Mean daily dietary calcium intakes for Army recruits and female officers-in-training over a ten-year period

	Army Recruit Training Centre: Male & female recruits		Australian Defence Force Academy: female officers-in-training	
	Mean ± SD	Probability estimate of inadequacy*	Mean±SD	Probability estimate of inadequacy
First survey	1214 ± 498	12 %	754±373	29 %†
Second survey	1110 ±370	10 %	894 ±248	20 %

\* The probability approach recognises that the RDI overestimates the calcium requirements for almost all individuals in the Australian population.

† Because the raw data was not available for probability analysis, the percentage of respondent’s with dietary intakes below 75% of the RDI for calcium is given as an approximation.

It appears that the (mostly) male Army recruits and female officers-in-training had mean daily calcium intakes similar to their civilian peers as recorded in the 1995 National Nutrition Survey: 1101 mg and 750 mg respectively<sup>34</sup>. In each survey the under consumption of dairy foods was the major contributing dietary factor to poor dietary calcium intake for those individuals at risk of consuming inadequate dietary calcium. For example, in the case of the most recent survey of female officers-in-training, all those who consumed less than the recommended amount of calcium had consumed less than the recommended three serves of dairy foods per day.

Because three different dietary intake methods were used in the four surveys, a statistical comparison of these data is inappropriate. Similarly these data can not be directly compared with the Australian National Survey data. The apparent increase in calcium consumption by female-officers-in-training equates to an extra half-serve of dairy food per day. While this may be encouraging, many female officers-in-training still fall short of current Australian dietary recommendations. Both the national Dietary Surveys 1983 and 1995 and the results detailed here show that low calcium intakes are more likely associated with

women than men. This may indicate that women either may be more likely to avoid dairy foods than men or that their food intake is so low that it affects calcium intake, or both<sup>33</sup>. The conclusion drawn in the 1993 survey, that a pre-occupation with weight control among the female officers-in-training results in under consumption, is most likely still valid among the 2003 study cohort<sup>33</sup>.

**CONCLUSIONS AND RECOMMENDATIONS**

Current research indicates the best protection against poor bone health is appropriate resistance exercise, a life-long calcium-rich diet and avoidance of smoking and excessive alcohol consumption. Female trainees appear to be at higher risk of poor bone health than their male peers. ADF personnel undergoing training, that involves high levels of physical activity, and may additionally be conducted in hot conditions, have an increased requirement for calcium. Submariners, personnel engaged in prolonged periods of ‘shift’ work, and personnel living for extended periods in cold southern or northern climates may have additional bone health risk factors related to poor vitamin D status and altered diurnal rhythm. Most importantly, young trainees with inappropriate dietary habits may be setting

themselves up for a life time of inadequate calcium intake and a much higher risk of osteoporosis in later life. Under consumption of dairy products was the main reason for poor dietary intake of calcium by trainees. The following recommendations are designed to assist in the prevention of poor bone health among ADF personnel.

The need to consume adequate dietary calcium should be promoted as part of a nutrition education program. An holistic approach to nutrition education is needed. Such a program would not only include some formal lecture material for trainees and instructors, but also involve staff and management of the various food providers on Defence sites. In particular, trainees need specific instruction in making appropriate food choices to meet the nutritional demands of arduous activities. Health promotions aimed at reducing the prevalence of smoking and excessive alcohol consumption should also point out the negative impact on bone health and the resultant increased risk of injury. Education at the beginning of a trainee's military career will help promote good dietary habits over their time in the ADF.

Sufficient and good range of dairy foods should be provided within the mess and should include low-fat varieties. Similarly, dairy products should be included in the 'hot boxed' meals provided to trainees outside the mess. Inclusion of low-fat milk drinks in vending machines and at commercial outlets on Defence sites should be encouraged. Trainees should be encouraged to eat three or four serves of low-fat dairy foods each day. Although calcium is found predominantly in dairy foods, smaller amounts can be found in fish products where the whole bones are consumed, in legumes and certain nuts or in fortified soy beverages or breakfast cereals. It is recommended that tinned salmon also be provided within the mess and other food outlets on Defence sites.

Additional sources of calcium such as supplements should be considered for ADF personnel engaged in strenuous physical activity in hot climates, particularly where combat ration packs (CRP) are the major source of nutrition and where dairy products are not readily available. Bioavailability from non-food sources (e.g. supplements) depends on the dosage and whether they are taken with a meal. Efficiency of absorption of calcium from supplements is greatest at doses of ~500 mg. Calcium citrate, calcium carbonate and tricalcium phosphate are suitable supplements, which compare well with milk in terms of calcium bioavailability when consumed with a meal<sup>10</sup>.

There needs to be an ongoing program of monitoring the dietary intake of ADF personnel, with a particular focus on the nutrients most likely to have a negative affect on capability, such as the nutritional risk factors for bone health discussed in this report.

#### ACKNOWLEDGEMENTS

The authors would like to thank staff at DSTO-Scottsdale, Canberra Area Medical Unit-Duntroon and the Australian Recruit Training Centre who cheerfully provided assistance with data collection and project administration.

#### DECLARATION

There was no conflict of interest with respect to the use of the survey data quoted in this review. The review was sponsored by the Defence Health Services Branch and funded by the Department of Defence in accordance with the Defence Science & Technology Organisations (DSTO) research tasking process. The sponsor gave no direction regarding the publication of this review. DSTO management authorised the release of this manuscript for publication.

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# ARTICLES

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## Employment in the Australian Army after Anterior Cruciate Ligament Reconstruction – A Pilot Study of 3 Year Postoperative Outcomes

CAPT Peter Weinrauch M.B.B.S. (Qld)<sup>a</sup>

COL Peter Sharwood RFD. M.B.B.S.(Qld), F.R.A.C.S. F.A.Orth.A.<sup>b</sup>

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### ABSTRACT

This study examines the military employment of soldiers in the Australian Regular Army 3 years after Anterior Cruciate Ligament (ACL) reconstruction. Patients undertaking ACL reconstruction were more likely to be assessed as medically unfit for military service compared to a control group undertaking an unrelated procedure (extraction of wisdom teeth), however overall discharge rates were not affected. 71% of patients undertaking ACL reconstructions were considered fit for military service 3 years after surgery, allowing their participation in active operational duty.

### INTRODUCTION

Injuries sustained during training or sports represent a substantial health problem within the Australian Defence Force (ADF), resulting in significant casualty rates and reduced employment capability.<sup>1</sup> For military patients sustaining tears of the Anterior Cruciate Ligament (ACL), non operative management has been associated with reduced occupational capacity and lower rates of return to unrestricted military service compared to operative management.<sup>2</sup> Bellmont et al. (1999) demonstrated 94.3% of U.S. Army Aviators post ACL reconstruction returned to service with only 2.3% requiring medical discharge after primary reconstruction.<sup>3</sup> Edwards et al. in a retrospective review of active duty military patients 2.35 years after ACL reconstruction however found only 78/ 112 (78%) had returned to full unrestricted service.<sup>4</sup> Cullison et al. similarly demonstrated the rate of medical discharge 29

months after autogenous patella tendon ACL reconstruction to be 23%.<sup>2</sup> Revision ACL reconstruction is associated with inferior outcomes for military employment, with only 60% of U.S Army Aviators returning to service.<sup>3</sup>

The impact of ACL rupture on future military employment and prediction of employability in the Australian Defence Force (ADF) after reconstruction has to date not been assessed. This pilot study retrospectively examines the employment of soldiers in the Australian Regular Army 3 years after ACL reconstruction.

### PATIENTS AND METHODS

The study group consisted of all patients who underwent primary ACL reconstruction at 2 Health Services Battalion between July 1997 and September 1999 identified retrospectively from operation logbooks. Only male patients serving full time in the Australian Regular Army (ARA) at the time of operation were included. 38 patients satisfied these criteria for inclusion in the study. The operations were performed by 4 Orthopaedic Surgeons utilising either autogenous patella tendon or hamstring graft according to surgeon preference and individual patient assessment. Adjunctive arthroscopic procedures such as chondroplasty, meniscal repair or partial meniscectomy were performed where indicated during ACL reconstruction.

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The control group consisted of 40 consecutive patients who underwent an unrelated procedure (dental extraction) at the same hospital between July 1997 and October 1997. The same inclusion criteria were applied to the control group.

The study protocol was granted approval by the Australian Defence Human Research Ethics Committee (ADHREC) prior to data collection.

Preoperative Medical Employment Classification (MEC) Scores effective July 1997 were retrospectively obtained from the Army Health Records Department. Current MEC scores for patients still serving in the Australian Defence Force or MEC on discharge was similarly obtained. The current military employment status of all patients was determined by database review.

**RESULTS**

Table 1 provides an overview of the results obtained.

The average time to follow up was 3.4 +/- 0.75 years in the ACL Group and 4.35 +/- 0.05 years in the Control Group. At final review, equivalent numbers of patients from both groups remained within active military service (20/ 38 ACL Group; 21/ 40 Control Group), and an equal number of patients had discharged (7/ 38 ACL Group; 7/ 40 Control Group).

10/ 38 (26%) patients in the ACL group and 2/ 40 (5%) patients in the Control group at final review were considered unfit for military service on medical grounds, and had been discharged or were in process of discharge (p<0.02; Fisher Exact Test). 27/ 38 (71%) of the ACL Group and 38/ 40 (95%) of the Control Group were considered on medical grounds to be fit for military service, including active operational deployment. Two patients who were previously considered unfit for military service on medical grounds prior to ACL reconstruction were assessed as fit for service at final review.

No patients were lost to follow-up.

**Table 1:** Military service and Medical Fitness for Military Employment

	ACL	
	Reconstruction	Control
Number patients	38	40
F/Up (Years)	3.4	4.35
Discharged	7 (18.4%)	7 (17.5%)
Active Service	20 (52.6%)	21 (52.5%)
Inactive Service	11 (28.9%)	12 (30.0%)
Medically unfit for service*	10 (26.3%)	2 (5.0%)
Medically fit for service	27 (71.1%)	38 (95.0%)

\* p < 0.02

**DISCUSSION**

The results of this study demonstrate that patients with ACL deficient knees are at 3 years post reconstruction more likely to be assessed as medically unfit for military service compared to the control group selected. The correlation between ACL reconstruction and medical fitness observed in this study does not however directly establish a cause and effect relationship as patients are often assessed as unsuitable for military service on the grounds of greater than one condition, and review of the discharge medical examination findings was not conducted.

ACL reconstruction has not been demonstrated to result in an increase in the overall rate of discharge from active military service. The majority (71%) of patients undertaking ACL reconstruction were considered fit for military service 3 years postoperatively, allowing their participation in active operational duty if required.

It should be understood that the results of this study relate only to patients who have undertaken ACL reconstruction, and the employment outcomes for military patients with ACL deficient knees managed non-operatively has not been assessed. Limitations of this study include the small number of subjects evaluated and the retrospective methodology.

This study provides a pilot for the conduct of a comprehensive prospective trial into the employment outcomes after ACL rupture in the Australian Defence Force.



**ACKNOWLEDGEMENTS**

The authors wish to acknowledge the advice provided by Lt Col Turner in preparation of the manuscript.

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# ARTICLES

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## Does attending the same Doctor improve outcome in Chronic Disease

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### ABSTRACT

The value of attending the same medical practitioner in achieving optimal patient care, compliance with treatment and a favourable outcome is generally accepted and there are many publications to support this concept. Most however concerns patient satisfaction and there is little written of an objective nature. Asthma and diabetes allow measurement of an outcome end point and so asthma was chosen to study. This work formed part of an evaluation of asthmatic patients in a general practice setting at the former 6 RAAF Hospital Laverton.

Seven parameters were quantitated by doctors and patients and the results show clearly that continuity of care by a single practitioner achieved a more favourable outcome in the majority of cases.

Much has been written about the doctor-patient relationship and indeed the success of treatment appears to some extent to depend on the commitment of both parties to work together for the best possible outcome. A 1990 study<sup>1</sup> found that over 90% of general practitioner (GP) visits were to the same doctor, however since then this has appeared to have decreased<sup>2,3</sup>.

There is some evidence that continuity of care by a skilled empathetic practitioner is an important contributor to quality of care in family practice and is likely to lead to a more favourable outcome as measured by improved compliance with treatment, patient knowledge of their complaint and greater involvement in their own care than if patients moved from doctor to doctor.<sup>3,4</sup> Indeed, continuity of care is central to the philosophy and teaching of family practice<sup>5</sup>. However, much of the discussion has been of a subjective nature and there are few studies reported which compare treatment outcomes in a group of patients attending one as against random practitioners and in these reports, the results are frequently inconclusive.

Chronic diseases such as diabetes and asthma lend themselves to comparative studies of measurable parameters in relation to treatment outcome. O'Connor<sup>6</sup> found that in adults with diabetes, those patients who identified a regular doctor were more likely to have better glycaemic control and to have received more recommended elements of care.

### AIMS OF STUDY

1. to determine whether those patients who attend the same practitioner demonstrate a greater degree of control of their asthma symptoms and a more favourable treatment outcome than was seen in a group of patients with no particular doctor.
2. to compare the degree of understanding of asthma and of the drugs prescribed in the two groups.
3. to evaluate and compare patients' management of an acute episode of asthma in the two groups.

### METHOD

The study formed part of an overall evaluation of the standard of care provided for patients with asthma. It was conducted in a general practice setting - the Out Patients Department at 6 RAAF Hospital Laverton.

Approval for the project was first obtained from the Australian Defence Medical Ethics Committee.

Letters were then written to all eight general practitioners working in the practice inviting them to ask their patients with asthma to join the study. It was emphasised that in addition to evaluating the quality of care, the exercise was to be undertaken to ascertain the severity of asthma in the Australian Defence Force (ADF), and evaluate management, with a view to optimising quality of care. In all but one case patients accepted the invitation.

Participating patients presented to the investigator and all agreed to sign a consent form. Subjects were

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assured that their responses would be known only to the assessor; they then completed a 25 part questionnaire based on the Asthma Management Plan (AMP Handbook)<sup>7</sup>. The assessor was on hand to clarify any questions. At interview, respiratory function tests both before and after bronchodilatation with salbutamol were performed in accordance with the recommendations of Pierce and Johns<sup>8</sup>.

The results were collated and analysed. Confidence Intervals for proportions were calculated using the Exact Method. Where indicated, percentage response and p values were also derived.

In order to quantify the results, acceptable answers to the six questions in which scoring is possible were constructed using the AMP Handbook and standard respiratory medicine texts. Marks were awarded according to the degree of accuracy of the answers provided.

Questions so quantified were:

- what do you understand by the term asthma?
- what do you think happens in an asthma attack?
- what is the value of the peak flow meter?
- how do you manage an attack?
- what are the actions of drugs you use for asthma?
- when do you take your drugs ?

The severity of asthma was graded as mild, moderate or severe

### Patient Assessment of Severity

Patients were asked to consider severity of their asthma in light of:

- number and frequency of symptoms
- early morning symptoms
- impact on work and lifestyle
- dependence on medication
- requirement of medical treatment

If they thought their asthma well controlled and caused minimal disability patients were encouraged to grade it as mild.

If despite complying fully, asthma disrupted their work or lifestyle, they should grade it as severe. For those who considered they did not fall into either group, it was suggested they grade it as moderate.

### Medical Assessment of Severity

For patients assessed by a respiratory physician (32 cases), an indication of severity was provided in their report. Their work-up included a methacholine challenge in most cases.

GP medical assessment was based on:

- occurrence of symptoms
- extent of disability
- medical treatment and its frequency
- medication required
- evaluation of pre and post beta agonist respiratory function tests

Asthma considered mild if:

- episodic, infrequent, only with recognised trigger factors, quickly resolved requires minimal and infrequent medication
- forced expiratory flow rate > 75% of predicted value between exacerbations and minimal response to beta agonists

Asthma severe if:

- debilitating symptoms occur daily or if long term steroid therapy required.
- respiratory function tests (RFTs) indicative of severe obstructive airways disease

Patients not conforming to these criteria were considered to have moderate asthma

Doctors initial impression of severity was compared with symptoms found at audit together with results of respiratory function tests.

### MODEL ANSWERS TO QUESTIONNAIRE:

#### Definition of asthma:

a condition characterised by symptoms of wheeze, cough and tightness in chest which results from increased responsiveness of airways to certain stimuli that cause constriction of the airway and increased bronchial secretions<sup>9</sup>

marks awarded if response included in lay terms the following features:

- symptoms of wheeze, cough and tightness in chest
- variable air flow obstruction
- increased responsiveness to stimuli

**Mechanism:**

answer: irritation causes bronchial passages to contract and secretions to accumulate within the air passages

a pass recorded if mentioned one of: irritation causes secretions, bronchial constriction

**Value of Regular Peak Flow Measurements**

Answer: the device measures volume of air that can be forcibly expelled from the lungs and so gives an indication of current respiratory function and effect of beta agonists

**Management of an Attack:**

Patients were asked to describe their actions in the event of an asthma attack. The Asthma Management Handbook Guidelines<sup>7</sup> was used to establish the appropriateness of their management and their action plan was scored in accordance with the Guidelines.

For mild asthma as judged by symptoms, attendances frequency of medications, RFTs and notes on severity; judicious use of salbutamol and obtaining medical advice promptly if problem persisted was the appropriate answer. For the more severe asthmatic, the above plus the use of the peak flow meter and use of

cortico-steroids in accordance with physician’s instructions was the required answer.

Marks were awarded in accordance with the Asthma Management Handbook.

**RESULTS**

There were ten females and thirty six males in the study which is consistent with the patient population in the practice.

Ages ranged from 18-55 years. This too reflects the age range on the Base.

In this report, figures represent percentages unless specified.

**ATTEND SAME DOCTOR**

Fifty four percent of patients sought to attend the same doctor where possible.

Thus: n= 25 in the same doctor group  
n= 21 in the random doctor group

**RELATIONSHIP WITH TREATING DOCTOR**

93 % reported a good relationship with their treating doctor.

**TABLE1. PERSONALIZED ASTHMA MANAGEMENT PLAN**

	Same doctor	Random doctor
Action plan	92	50
No action plan	8	50

**TABLE2. SEVERITY OF SYMPTOMS**

Intensity	Same doctor		Random doctor	
	Patient assess	Doctor assess	Patient assess	Doctor assess
Mild	76	76	86	86
Mild-moderate	8	4	7	0
Moderate	8	12	7	14
Severe	8	8	0	0

**TABLE 3. SEVERITY CHANGE VS DOCTOR ATTENDED**

Intensity change	Same doctor	Random doctor
Increased	32	9
Decreased	0	24
Unchanged	68	67

**PATIENTS CURRENTLY SMOKING**

Smoking was marginally less common (12%) in the same doctor compared to the Random Doctor group (19%) but was not statistically significant (p=0.686).

**FREQUENCY OF SYMPTOMS**

There was no correlation between frequency of symptoms and attendance in the two groups (p=0.834).

**TABLE 4. MANAGEMENT OF AN ASTHMA ATTACK**

Management	Same doctor		Random doctor	
	n	% response	n	% response
Appropriate	20	80	10	48
Barely adequate	5	20	10	48
Inadequate	0		1	4

The response each patient described was scored by the Assessor according to the method previously described. It was noted that patients with the same doctor managed better.

**TABLE 5. KNOWLEDGE ASSESSMENT**

**(A) VALUE OF PEAK FLOW READING (WHAT IS VALUE OF PEAK FLOW METER?)**

Score	Same doctor	Random doctor
Maximum	44	33
Pass	34	24
Nil	32	43

**(B) DEFINITION OF ASTHMA (WHAT DO YOU UNDERSTAND BY THE TERM ASTHMA?)**

Score	Same doctor	Random doctor
Maximum	24	19
Pass	76	38
Nil	0	43

**(C) LUNG CHANGES IN AN ATTACK (WHAT DO YOU THINK HAPPENS IN AN ATTACK?)**

Score	Same doctor	Random doctor
Maximum	32	29
Pass	64	47
Nil	4	24

## DISCUSSION

There was a relatively low number of patients that attend the one doctor (54%), in the study. This may be related to the frequency with which defence force personnel move, between bases and thus do not have sufficient time to establish a therapeutic relationship with a doctor. Patients with mild disease were almost equally divided between those attending the same doctor and those not. Of the nine with more severe disease, five had a particular doctor but the numbers are too small for the difference to be clinically significant.

It is reassuring to record that 93% had a positive relationship with their doctor. This equates with the data published by Papagiannisa<sup>10</sup> who found that overall patient satisfaction as 88.3%. Some bias exists as the presence of the investigator at the time of response may have influenced some patients.

Attending the same doctor was more likely to result in better management of symptoms and receiving a personalised plan (tables 1,4). These findings are consistent with those of Foreno<sup>11</sup> who found that a group of adolescents with a regular GP were more likely to have their lung function measured and an AMP than those with no family doctor.

There was a remarkable similarity in doctor and patient assessments of the severity (table 2) with patients having more severe asthma opting to attend one doctor. Medical review classified more cases into the moderate and severe groups than did patients.

In the ADF, members medically unfit face discharge from the Service. It is not surprising therefore that patients tendered to grade their asthmas as less severe than their doctor (table 2). It is reassuring that those individuals with severe asthma endeavoured to attend the one doctor.

The benefit of attending the same doctor is illustrated by finding that no patient in the Same doctor group worsened in the period between initial presentation and final assessment whereas 24% did in the Random group. Further, 32% in the Same doctor group improved in contrast to 9% in the Random group (table3).

Satisfactory management of an attack was much more likely if patients attended the one doctor  $p=0.039$ . (table 4) This observation supports the findings of Sweeney<sup>12</sup> that lack of continuity of care was associated with additional morbidity.

The Same doctor group clearly outscored the random group in all aspects of asthma education. In particular, if

the marks for questions on the knowledge tested by asking for a definition of asthma (table 5b) and lung changes that produce symptoms (table 5c) are combined, only 2% of patients in the Same Doctor group failed in contrast with 38% in the Random group.

Evaluation of responses to mailed questionnaires lend support to the hypothesis that patients attending the same doctor are more likely to receive preventive health instruction<sup>5,8,13</sup>. In this study the presence of the assessor whilst the questionnaire was completed helped eliminate any ambiguity and provided a consistency in the grading of responses. It is clear that those who routinely attended the same doctor had a significantly greater understanding of asthma and its pathophysiology. In addition they were more likely to describe a personalised asthma management plan and manage an attack more satisfactorily.

Given that patients could reasonably expect better care from the same doctor, it is interesting to speculate why 50% now visit different general practitioners. Convenience, time constraints, a simplistic view of medicine and a preference for specific doctors for certain complaints are some of the reasons proposed. Factors outside the patient's control may also operate for example, availability of a certain doctor in a group practice or the use of a deputising service after hours. Stokes et al<sup>14</sup> conducted a postal survey of 1,500 family practitioners in three countries concerning the value they placed on continuity of care under three aspects: ability to provide different types of care, importance of this and their attitude towards continuity of care. They found that in all aspects they placed high value on being able to so provide ( $p < 0.001$ ).

Whilst it is clear that in the study sample, continuity of care by the one practitioner achieved a more favourable outcome in the majority of case, it should be noted that this is not a randomised trial and so the results should be viewed in this context.

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# ABSTRACTS

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## Article Review

Dr Andrew Robertston

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**Need JT, Mothershead JL. Strategic National Stockpile program: implications for military medicine. *Mil Med.* 2006 Aug;171(8):698-702.**

The Strategic National Stockpile (SNS) program, managed by the Centers for Disease Control and Prevention, Department of Health and Human Services, is designed to deliver critical medical resources to the site of a national emergency. A recent interagency agreement between the Department of Defense and the Department of Health and Human Services indicates that military medical treatment facility commanders should be actively engaged in cooperative planning with local and state public health officials, so that reception, storage, distribution, and dispensing of SNS materials as a consequence of an actual event could occur without disruption or delay. This article describes the SNS program and discusses issues of relevance to medical treatment facility commanders and Department of Defense medical planners and logisticians.

*Comment: The National Medical Stockpile in Australia has been similarly developed by the civilian Department of Health and Ageing. Further discussions between Defence and the jurisdictions on its deployment at a State level are required.*

**Ackermann D, Chapman S, Leask J. Media coverage of anthrax vaccination refusal by Australian Defence Force personnel. *Vaccine.* 2004 Dec 2;23(3):411-7.**

**BACKGROUND:** During February 2003 a number of Australian sailors were returned home from their deployment to the Persian Gulf after refusing anthrax vaccination. This paper examines the media coverage of this episode as a case study in how controversies about vaccine safety escalate. **METHODS:** Frame analysis of articles from major Australian newspapers (n=83) and transcripts of radio and television news and current affairs programs (n=22) to identify the main supportive and oppositional themes used in reportage and media debate. **FINDINGS:** Initially, the major news frames were supportive of the vaccine refusing soldiers, and conveyed a sense of distrust of the government's actions. These initial themes were rapidly re-framed and

new dominant discourses appeared. First, sailors went from brave whistleblowers to being portrayed as deserters and cowards. Second, proponents shifted from their portrayal as faceless regulators to personal risk takers embodied in a well-respected Major General having the vaccine. Third, the voluntary nature of the vaccine was emphasised, thus dousing the flames of implied coercion. **CONCLUSION:** Marked shifts in the representation of vaccine opponents and proponents possibly contributed to the rapid diminishment of media interest in the story.

*Comment: For all those involved, this was an interesting episode in managing risk and getting clear messages across.*



# BOOK REVIEW

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## Constant Care<sup>a</sup>

Reviewed by CAPT RMSG John Knight (Retired)

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The subtitle of the book is **“The Royal Australian Navy Health Services, 1915 to 2002.”**

The dedication is to the memory of all Medical and Dental Officers and Sick Berth Staff who were killed in action or died on active service in World War Two.

John Jeppeson was well known to the Medical officers of the Port Melbourne Division of the RANR when was working in Navy Office in Melbourne in the late 1960s and early 1970s. This book was written with the encouragement of the late Surgeon Rear Admiral S. J.Lloyd, usually referred to as “Noisy”. Both men had an interest in the history of the RAN and Jepp produced an anthology of memoirs and old and newer “instructions” covering 1915 to 2002. Most of the book is devoted to war experiences of sickberth staff at sea and afloat with an occasional medical officer’s report.

It is now over thirty years since the sickbayman took on his, and now her, new name.

Constant Care is a book to dip into and see the differences between the past and the present. In both times the patient came first.

For all Health Professionals associated with the RAN and RANR this book should be on their reading list. There will be something that they knew nothing about.

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<sup>a</sup> Lieutenant Commander J.C. Jeppeson OAM, RFD, RANR Retired

# INSTRUCTIONS FOR AUTHORS (2006)

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## Ethics

Articles that contain the results of human and/or animal studies will be accepted for publication only if it is made clear that a high standard of ethics was applied in carrying out the investigations. Papers reporting clinical studies should, where appropriate, contain a statement that they have been carried out with ethical committee approval. Papers disregarding the welfare of experimental animals will be rejected.

## Manuscript Requirements

**General Considerations.** Hardcopy manuscripts should be printed on one side only. All manuscripts should be double-spaced including text, references, tables, and legends. Number all pages sequentially starting with the title page and continue in the following order: abstract, text, experimental section, references, tables, figure legends and figures.

Manuscripts should be kept to a minimum length. The rationale and objectives of the research should be stated in the introductory sentences of the manuscript. The background material should be brief and relevant to the research described. Detailed or lengthy descriptions of routine experimental procedures should be avoided in the introductory and discussion sections. Authors should state their conclusions or the significance of their

findings following the discussion of results. Conclusions should also be summarised in order to place the authors' research in proper perspective.

Authors should write in clear, concise English. The responsibility for all aspects of manuscript preparation rests with the authors. Extensive changes or rewriting of the manuscript will not be undertaken by the editors.

The title page should include the article title; list of authors, including details of their full name, military rank, post-nominals, position and institutional address; and an abstract of the article (150-200 words). Contact details for the principal author, including postal address, e-mail address, telephone and fax numbers, should also be included.

Headings and sub-headings should be consistent throughout the article and conform with articles previously published in the Journal. No text, references, or legends to figures or tables, should be underlined.

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.

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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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