



- Rehabilitation in the Australian Defence Force
- Stress and Immune Mediators In The Canadian Armed Forces
- 2019 AMMA Conference Abstracts

The Journal of the Australasian Military Medicine Association



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**2020** AMMA  
Conference

**8 – 11 OCTOBER**

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Ambulance arriving at 2GHB deployed in the field. Courtesy of Colonel Murray Hayes, RAADC

# Journal of Military and Veterans' Health

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The Australasian 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.

JMVH is published by the Australasian Military Medicine Association

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**ISSN No. 1835-1271**

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# Editorial

## After the war

The theme for this year's AMMA conference is "After the War: Repatriation, recovery and public health". The impetus for this theme was the realisation that 100 years ago, in 1919, our forebears were just coming to terms with the fact that the Great War, the War to end all Wars, was finally over. Repatriation of service men and women back to Australia was a key focus of the government, as was the recovery from the economic and public hardships from the war. Rehabilitation of the 137,000 wounded was also a key focus. To complicate this further, pandemic influenza had spread around the world in the second half of 1918 and continued in 1919, with an estimated 100 million deaths. While initial transport of the personnel back to Australia, under the control of Lieutenant General Monash, proceeded well, with all troops largely home by September 1919, the other key elements of the repatriation system were in their infancy and progressed far more slowly. The term 'Repat' quickly acquired pejorative connotations in some quarters, with soldiers venting their frustration in various papers. A short story in the Sydney Mirror observed that if Repat officials 'had as much silk as they have method they wouldn't have enough to make a necktie for an ant'.<sup>1</sup> Given the sheer numbers involved, it is interesting to ponder how Australia would fare under similar circumstances 100 years later, even given the support systems that have grown up over that period.

The Journal now has a new website - <https://jmvh.org/> - with enhanced search capability and a full coverage of all the issues over the last 28 years. I would encourage all our readers to visit the website to find articles of interests. Podcasts are likely to be added in 2020. The issue themes for 2020 are also listed, and I would encourage authors to submit articles on Transition to Civilian Life (April 2020), Global Health Security (July 2020) and Preparing for Conflict and Disaster (October 2020).

Our fourth issue of 2019 primarily addresses the abstracts of papers presented at the 28th AMMA Conference. There are also three excellent articles – a timely review of rehabilitation in the ADF, a review of stress mediators in military physical performance and a salient respiratory disease case study. We continue to get a good range of articles, but other military and veterans' health articles are always very welcome and we would encourage all our readers to consider writing on their areas of military or veterans' health interest. We would particularly welcome papers based on the presentations at the conference, but welcome any articles across the broader spectrum of military health.

**Dr Andy Robertson, CSC, PSM**  
**Commodore, RANR**  
**Editor-in-Chief**

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1. Payton P. 'Repat': A concise history of repatriation in Australia. Department of Veterans' Affairs; Canberra: 2018.

In reply to Dr Worswick's article 'Medical Officer Training – An Infantryman's Perspective' JMVH Vol. 27, Number 3, as an Army Medical Level 2 Doctor from a similar Royal Australian Infantry Corps background with non-regimental experience in Recruit, Officer and overseas training of foreign forces, I can unequivocally say the training of the Army's uniformed health workforce, when compared to how well the Army trains its other members, is not good, not average, not adequate... it is just poor overall. The one exception being the Army School of Health ADF Medical Technician course currently producing wonderfully trained clinicians to a baseline level of competency.

By way of some simple examples, the Army Standing Instruction for Personnel (ASIP), Part 8 Chapter 9, mandates numerous civilian competencies a deployable (to field or operations) Medical Level 2 Treatment Team Medical Officer, a Nursing Officer in a treatment team and a Medical Technician in a treatment team must have. Currently, there is no discernible effort or output at Formation level (17 Brigade) that controls resources to centrally supervise, coordinate, fund and deliver these competencies to ensure the Army's health workforce meets these mandated civilian competencies. The net result is that very few, if any, clinicians posted to these roles have achieved the Army specified requirements for its deployable health workforce. This is a poor outcome for our treated soldiers.

Furthermore, the iSTAT point of care biochemical test machine (complete with cartridges) has finally made its way into Close Health Units so that our deployable treatment teams can identify reversible causes to inform treatment of cardiac arrest in accordance with the ALS/ALS2 Australian Resuscitation Council guidelines. iSTAT is a game changer; the proverbial turning 'night into day'. When a similar transformational piece of equipment arrives in an Infantry, Cavalry or Engineering unit e.g. night vision devices or weapon sights, a deliberate effort

is made from the Special Projects Office responsible for procurement of the equipment, together with CATC and the allocation of unit resources (time and personnel) to ensure bulk numbers of personnel are effectively trained in the new equipment system. Concurrently, training institutions are targeted to ensure it incorporates training for future throughput. The Q system is trained in maintenance and repair. In contrast, in Health there is no plan, coordination or measured outcomes for iSTAT implementation. The same applies to countless other pieces of medical equipment entering or have entered service – oxylog ventilators, tempus pro, ultrasound, MRX, etc.

Overall, the collective organisation, integration and delivery of training to achieve individual competencies and to ensure there is a baseline competency for 'how, when and for whom' an effect is delivered e.g. understanding a weapon system function, pulling the trigger at the right target and right time, is something the rest of Army generally does exceptionally well... except Health. Other groupings with similar technical requirements to health that straddle civilian and military governance, think aeronautical engineering, are light years ahead of Health – boards of inquiry into previous catastrophic failures have forced them to be.

Doctor Worswick's article into Army Medical Officer Training should not only prompt action for remediation of the training shortfalls for medical officers, particularly in the PGY1-4 space, given a seismic change in the civilian medical PGY 1 and 2 training environment from 20 years ago post the foundation of the fellowship of emergency medicine, but also prompt organisational reform for development of a 'training culture' within the Army health workforce more aligned to that of the wider Army.

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# Rehabilitation in the Australian Defence Force

Neil Westphalen

## Introduction

This article follows previous papers by the author, regarding occupational and environmental medicine in the Australian Defence Force (ADF).<sup>1,2,3,4,5</sup> They assert that high rates of workplace illness and injury indicate the need to improve the management of hazards associated with ADF workplaces, with better emphasis on prevention. This assertion has been independently supported by a recent Productivity Commission report, indicating that the current compensation and rehabilitation system for both current- and ex-serving ADF members requires fundamental reform.<sup>6</sup>

The author's previous papers advocate that the ADF's health services should be premised on an occupational health-based systems model. This would require reassessing the fundamental inputs to capability<sup>7</sup> for both Joint Health Command (JHC), and Defence's Work Health and Safety Branch. The current state of the ADF's occupational and environmental health services, and the small number of civilian specialist occupational and environmental physicians, suggest that a mature holistic and sustainable model would take at least 10–15 years' sustained effort.

This article expands on the author's previous papers, with respect to the ADF's rehabilitation services for ill and injured ADF members, prior to acceptance of their work-related conditions by the Department of Veterans' Affairs (DVA).

## Vocational rehabilitation in Australia

The Macquarie Dictionary defines 'rehabilitation' as: *'the use of medical, social, educational or vocational measures or a combination of these to train or retrain someone who has a disability as a result of illness or injury'*.<sup>8</sup>

The 2011 AFOEM Position Statement: *Realising the Health Benefits of Work* sets out the economic and social imperatives to ensure that everyone who is capable of working should be supported to do so.<sup>9</sup> It reflects the fact that being at work has been recognised to be an important social determinant of

health. The nature of that work is discussed in the 2013 AFOEM companion Position Statement *What is Good Work?*<sup>10</sup>

To date, the AFOEM *Health Benefits of Good Work* Consensus Statement has over 200 Australian signatories. These include organisations such as the Australian Federal Police, the Business Council of Australia, Comcare, Qantas, the NSW State Insurance Regulatory Authority and Virgin Australia.<sup>11</sup> These signatories do not include the ADF.

Additional evidence since the 2011 Position Statement reinforces its assertion that work is good for optimising people's health and wellbeing, and work absence because of illness or injury is not. Furthermore, it documents emerging evidence of the growing adverse effects that a lack of 'good' work has on mental health. It highlights the need for an emphasis on promoting recovery at work practices, which require better integration between health services and employers.<sup>12</sup>

The Royal Australasian College of Physicians (RACP), and its Faculties of Occupational and Environmental Medicine (AFOEM), Rehabilitation Medicine (AFRM), and Public Health Medicine (AFPHM), therefore, advocate the implementation of the RACP *National Vocational Rehabilitation Policy*.<sup>13</sup> This document notes that there is a strong scientific evidence base for many aspects of vocational rehabilitation: in fact, it states that there is more evidence of its positive cost-benefits than for most health and social policy areas, which contributes to a sound business case for this approach.

The policy also describes how vocational rehabilitation is an idea and an approach as much as a formal intervention or service, based on the concept that being at work can be therapeutic and have a positive impact on health. This suggests that the barriers to vocational rehabilitation do not pertain to particular impairments, but to the lack of guaranteed access to customised plans of timely support and development.

As participation in the workforce requires ongoing good health and management of illness, injury and disability, the RACP *National Vocational*

*Rehabilitation Policy* states that treatment services have an essential but not isolated role alongside vocational rehabilitation programs, as an enabler for workforce participation and productivity.<sup>14</sup>

Furthermore, the policy states that the principles and practice of vocational rehabilitation are fundamentally the same for work-related and other comparable health conditions, irrespective of whether they are classified as injury or disease. Work is not only a goal, it is generally therapeutic and an *essential* part of rehabilitation.

Finally, the RACP *National Vocational Rehabilitation Policy* refers to the urgent need to improve vocational rehabilitation interventions for mental health conditions, which have become the largest and fastest growing cause of long-term civilian incapacity. Promising approaches include healthcare that incorporates a focus on return to work, workplaces that are willing to accept such cases, and early intervention to support workers to stay at work in order to prevent long-term incapacity.

### Civilian rehabilitation

As common health problems account for about two-thirds of civilian long-term sickness absence and incapacity benefits, the RACP *National Vocational Rehabilitation Policy* states that they should receive high priority. Among other considerations, this would mean that *every* health professional who treats patients with common health problems (such as musculoskeletal and mental health conditions) should also assume responsibility for their rehabilitation and occupational outcomes. This implies that general practitioners in particular should be at the forefront of civilian vocational rehabilitation.

Yet, the author has previously noted that neither the RACGP nor the Australian College of Rural and Remote Medicine (ACRRM) refer to a role for general practitioners with respect to rehabilitation, in particular, assessing the limitations posed by workplace hazards when returning ill and injured workers to work, or to assessing and monitoring their patient's return to normal employment, or if this is not possible, ascertaining their suitability for alternative employment.<sup>15</sup>

The author has also previously noted that the '2016 Core Skills unit' of the RACGP's *Curriculum for Australian General Practice*, has very limited rehabilitation guidance. Although the 'contextual units' in military medicine and occupational medicine both refer to rehabilitation, it has also been noted that these documents only consist of 2–3 page

summaries, with very limited guidance as to the actual skills required. Furthermore, as previously indicated, only 2.4 per cent of all presentations to civilian general practitioners in 2013–14 were work related.<sup>16</sup>

Hence, it seems reasonable to assert that even in the civilian setting, general practitioners lack the skills, experience and currency required to provide vocational rehabilitation. They *can*, however, identify patients who require specialist hospital- or workplace-based rehabilitation expertise, on the same terms as their other patients who require specialist treatment.

To this end, the author has previously described how specialist occupational and environmental physicians can not only set the pace and direction of workplace-based rehabilitation, but also negotiate with employees, employers, clinicians and other stakeholders to achieve optimal return-to-work outcomes.<sup>17</sup>

In addition, the mission of the AFRM is to train, accredit and support medical practitioners in the management of functional loss, activity limitation or participation restriction arising from illness and injury.<sup>18</sup> Rehabilitation physicians have an essential role with respect to providing specialised *hospital*-based rehabilitation services, following admission and treatment for acute illness or injuries resulting in significant disability, such as strokes, spinal cord damage and limb amputations.

### The ADF Rehabilitation Program (ADFRP)

The ADF's *Defence Health Manual* has extensive policy guidance for the provision of rehabilitation services for ill and injured ADF personnel. These references describe the ADFRP,<sup>19</sup> the relevant governance arrangements,<sup>20</sup> the health procedures for its delivery<sup>21</sup> and the management processes for entitled ADF reservists.<sup>22</sup>

These references indicate that the attributes of a personalised rehabilitation plan for an ADF member may include one or more of the following:

- Case management, utilising a Rehabilitation Activities Schedule, which is an agreement between the member, a Program Case Manager (PCM), and a Workplace Rehabilitation Representative (WRR).
- Functional capacity evaluations.
- Vocational assessment and rehabilitation.
- Clinical and psychological measures, such as in- and outpatient clinical services, aids and

appliances, physical training, physiotherapy, counselling and psychosocial training.

However, a striking characteristic of all these references is that they describe the ADFRP as an *occupational* rehabilitation program, without any references to occupational and environmental physicians. It is therefore inferred that the ADFRP is premised on its clinical rehabilitation services being delivered by general practitioners, despite their aforementioned limitations.

Furthermore, rather than conceptualising vocational rehabilitation as an idea and an approach as much as a formal intervention or service (per the RACP *National Vocational Rehabilitation Policy*), these references are almost exclusively process-driven, and thereby reliant on large numbers of PCMs and WRRs. These processes are not only highly bureaucratic (and therefore expensive): they also preclude giving common health problems high priority per the RACP *National Vocational Rehabilitation Policy*, even though they may account for about two-thirds of preventable long-term sickness absence and incapacity benefits, in this case funded by DVA.

Regarding the latter, DVA spent \$5.3 billion on treatment services for Service-related conditions in 2017–18, plus another \$7.4 billion on non-health disability services and compensation.<sup>23</sup> The RACP policy document therefore implies that effective rehabilitation services for current and ex-serving ADF members could save DVA up to \$4.9 billion per year.

### Rehabilitation and medical suitability for deployment

Before 2000, each Service had their own processes for assessing their members' medical suitability for employment and deployment. In Navy's case, all its members were assigned to one of eight Medical Categories (MEDCATs) such that:

- MEDCATs 1 to 4 were suitable for sea / deployment; MEDCATs 5 to 8 were non-deployable
- personnel with at least one medical restriction for more than 28 days were MEDCAT 2 to 8.<sup>24,25</sup>

All three single-service processes were replaced by the ADF Medical Employment Classification (MEC) System in 2000, which was last revised in 2011. ADF members with medical restrictions for more than 28 days now undergo a MEC Review, which assigns them to one of five MECs (divided into 20 sub-MECs), in accordance with the relevant joint and single-Service references.<sup>26,27,28,29</sup>

Although the current ADF MECs and previous Navy MEDCATs are not all directly comparable, they can be used to accurately ascertain the overall deployability status of Navy members, and the existence of at least one medical employment restriction for more than 28 days. Figure 1 describes the Navy MEDCAT status of all Navy members as of 30 June 1996, while Figure 2 describes the ADF MEC status of all Navy members as of 1 March 2019.

Figure 1: Navy Personnel MEDCAT Status as of 30 June 1996 (Per Cent)<sup>30</sup>

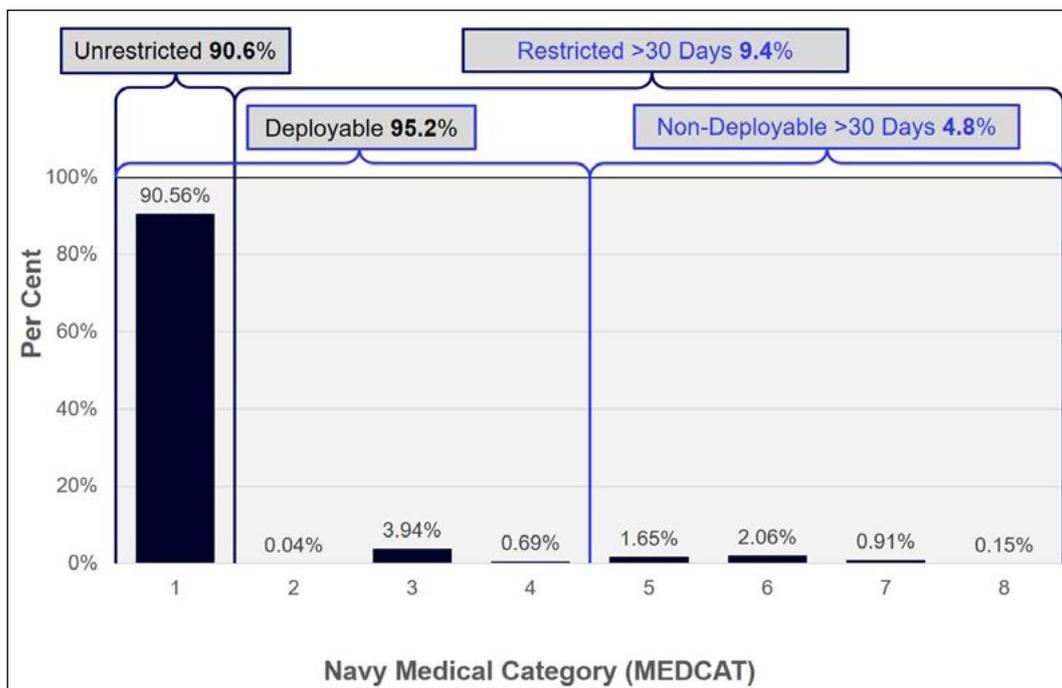
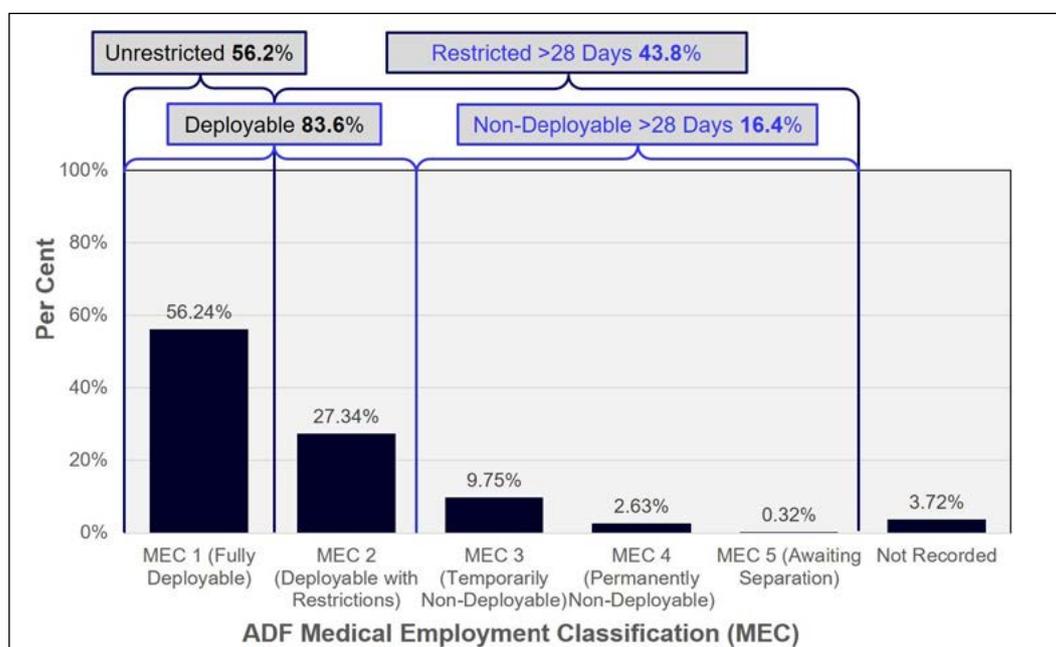


Figure 2: Navy Personnel MEC Status as of 1 March 2019 (Per Cent)<sup>31</sup>

In short, Figures 1 and 2 indicate that the proportion of Navy personnel deemed not medically suitable for sea for more than 28 days increased from 4.8 per cent in 1996 to 16.4 per cent in 2019, while the proportion of Navy members with at least one medical restriction for more than 28 days increased from 9.4 to 43.8 per cent.

Though the reasons why clearly merit further investigation, they do suggest that the introduction of the ADFRP in 2006 and its subsequent iterations have not been particularly successful with respect to actually returning ill and injured Navy personnel to normal seagoing duties. Although comparable historical data has not been found for the other two services, it also seems likely that their medical deployability figures would be similar.

#### Rehabilitation and the ADF's garrison health services

Previous papers describe how JHC provides primary health care and other health services for non-deployed ADF personnel, in accordance with the extant Garrison Health Service Level Agreement between the Vice-Chief of the ADF, and the single-Service Chiefs.<sup>32</sup> Although variations to the treatment services provided by the ADF can be authorised by the Defence Minister (in order to maintain fitness for duty while reflecting the facilities available), all Service Level Agreements to date have otherwise only specified compliance with the *Health Insurance Act 1973*, and the *National Health Act 1953*.

While this ensures that the standard of non-deployed treatment services for ADF personnel is comparable to that provided for the general civilian community, previous papers describe how JHC garrison health services did not include occupational and environmental physicians as part of their multidisciplinary rehabilitation teams: in fact, the garrison health service contract specified that all civilian primary care physicians require either a RACGP or ACRRM Fellowship. Although the contract has recently been amended to include occupational and environmental physicians, the shortcomings posed by the current ADFRP guidance, among the other deficiencies inherent to using a *treatment-service-based* health care model for a *workforce* population, will continue to preclude their utilisation at their full potential.

This is despite the author's previous estimation (given the current absence of data),<sup>33,34</sup> that:

- About 30–40 per cent of ADF clinical presentations are for generally preventable musculoskeletal injuries. Perhaps half of these cases are work related (typically related to manual handling or slips / trips / falls); the remainder are most likely sports-related.
- Another 30–40 per cent of 'garrison' clinical presentations are for generally preventable work-related mental health issues. Perhaps half of these cases lack psychological robustness for whom the ADF has been a poor career choice;

the remainder are quite likely to be just as psychologically robust as other ADF members are, but are not coping with excessively demanding or otherwise dysfunctional workplaces or personnel management practices.

Hence, perhaps *half* of all ADF primary care presentations are for work-related conditions, compared to this paper's earlier statement that only *2.4 per cent* of civilian primary presentations are work-related.<sup>35</sup>

In summary, the ADFRP has significant limitations in its current form, in particular its reliance on general practitioners to provide clinical rehabilitation services. Its effectiveness is further limited by bureaucratic processes that generally preclude their timely application to common health conditions that may account for about two-thirds of preventable long-term sickness absence and incapacity benefits funded by DVA. The three-to-fourfold increase in the proportion of Navy members with at least one employment restriction and/or considered non-deployable constitutes further evidence that the ADFRP is not working effectively with respect to returning them (and probably their Army and RAAF peers) to normal duties.

However, given the appropriate policy support among other enablers, military and civilian occupational and environmental physicians can complement garrison general practitioner colleagues with respect to the diagnosis and treatment of workplace-related musculoskeletal and mental health disorders, assessing medical suitability for employment and deployment, and managing *workplace*-based ADF rehabilitation. The same applies to AFRM practitioners regarding *hospital*-based ADF rehabilitation.

### Conclusion

With ADF personnel arguably exposed to the most diverse range of occupational and environmental hazards of any Australian workforce, high rates of preventable workplace illness and injury indicate the need to improve the management of occupational and environmental health hazards, with better emphasis on prevention than treatment.

This suggests that the ADF's health services should be premised on an occupational-health-based systems model, with revised fundamental inputs to capability that would lead to a range of genuinely holistic, sustainable and fit-for-purpose health services over the next 10–15 years.

Among its other attributes, the proposed model would reflect the *National Vocational Rehabilitation Policy* instituted by the RACP and its rehabilitation, public health, and occupational and environmental medicine faculties. This would entail including occupational and environmental physicians in the garrison health contract in order to complement garrison general practitioner colleagues, not only regarding the diagnosis and treatment of workplace-related musculoskeletal and mental health disorders, and assessing medical suitability for employment and deployment, but also managing workplace-based rehabilitation.

The proposed model would also reflect the 2011 AFOEM Position Statement: *Realising the Health Benefits of Work*, which sets out the economic and social imperatives to ensure that every ADF member who is capable of working would be supported to do so, or, if this is not possible, facilitating their timely and empathetic transition to suitable civilian employment.

As far as possible, the nature of ADF employment should also reflect AFOEM's companion Position Statement: *What is Good Work?* by joining other employers in accepting that being at work is an important social determinant of health. It is essential that this be pursued not just as an end unto itself, but also to enhance ADF operational capability through improved personnel utilisation.

### Author

Dr Neil Westphalen graduated from Adelaide University in 1985 and joined the RAN in 1987. He is a RAN Staff Course graduate and a Fellow of the RACGP, AFOEM and the Australasian College of Aerospace Medicine. He also holds a Diploma of Aviation Medicine and a Master of Public Health.

His seagoing Service includes HMA Ships *Swan*, *Stalwart*, *Success*, *Sydney*, *Perth* and *Choules*. Deployments include DAMASK VII, RIMPAC 96, TANAGER, RELEX II, GEMSBOK, TALISMAN SABRE 07, RENDERSAFE 14, SEA RAIDER 15, KAKADU 16 and SEA HORIZON 17. His Service ashore includes clinical roles at *Cerberus*, *Penguin*, *Kuttabul*, *Albatross* and *Stirling*, and staff positions as J07 (Director Health) at the then HQAST, Director Navy Occupational and Environmental Health, Director of Navy Health, JHC SO1 MEC Advisory and Review Services, and Fleet Medical Officer.

Commander Westphalen transferred to the Active Reserve in 2016.

## Disclaimer

The author used some of the information in this article to lead a RACP submission to the aforementioned Productivity Commission's veteran's rehabilitation and compensation inquiry.<sup>36</sup> However, the views expressed in this article are his alone, and do not represent those of the RACP, the RAN or any other organisations mentioned.

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  - Collective training;
  - Facilities;
  - Supplies;
  - Major systems;
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- 25 Navy MEDCATS were defined per ABR 1991 *RAN Health Service Manual* Vol 1 Chap 9 Annex A, 1998 as follows:
  - Medical Category 1: Fit for duty anywhere.
  - Medical Category 2: Fit for duty anywhere except in a malarious or potentially malarious area.
  - Medical Category 3: Fit for duty ashore or for sea in a ship carrying a full-time medical branch sailor of POMED4 or LSMED4 rank [now referred to as POMED / LSMED Clinical Managers].
  - Medical Category 4: Fit for duty ashore or for sea in a ship carrying a full-time medical officer.
  - Medical Category 5: Unfit for sea, fit for anywhere ashore.
  - Medical Category 6: Unfit for sea, fit for duty anywhere ashore except in a tropical or remote area.
  - Medical Category 7: Fit for restricted duties ashore under medical supervision. Posting is subject to Director General Navy Health Services recommendation.
  - Medical Category 8: Under hospital or inpatient care: unfit for all duties.
- 26 ADF *Military Personnel Manual* (MILPERSMAN), Part 3, Chapter 2 'Australian Defence Force Medical Employment Classification (MEC) System', (only available on Defence intranet)
- 27 ADF Health Manual (HLTHMAN) Vol. 3 *Retention Standards*, Chapter 1 'Medical Employment Classification System', (only available on Defence intranet)

- 28 Australian Book of Reference 1991, *RAN Health Services Manual*, Chapter 8 'The Australian Defence Force Medical Employment Classification System and the Maritime Environment', (only on Defence intranet, last revised c2013, presently undergoing revision)
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- 32 Westphalen, N, 'Primary health care in the Australian Defence Force', *Australian Defence Force Journal*, Issue Jul 2017, Issue 202, pp. 91–7, available from [http://www.defence.gov.au/adf/adfj/Documents/issue\\_202/Westphalen\\_July\\_2017.pdf](http://www.defence.gov.au/adf/adfj/Documents/issue_202/Westphalen_July_2017.pdf)
- 33 An 'occupational aetiology' checkbox was added to the Defence e-Health System for ADF primary health care providers in July 2018 (JeDHI Helpdesk email 'Defence eHealth System - Occupational Aetiology - Quick Reference Guide [SEC=UNCLASSIFIED]' dated 1503 12 July 2018 refers). However, it seems no guidance has so far been provided for users to ensure consistency as to what should and should not be considered work-related. Furthermore, workplace- and sports-related injuries are not recorded separately.
- 34 See Pope, R, and Orr, R. 'Incidence rates for work health and safety incidents and injuries in Australian Army Reserve vs full time soldiers, and a comparison of reporting systems', *Journal of Military and Veteran's Health*, April 2017, Vol 25 No 2; pp 16–25, available from <https://jmvh.org/wp-content/uploads/2017/07/Original-Artical-Incidence-rates.pdf>  
This paper indicates that only 11 to 19 percent of all Army Reserve and Regular work-related injuries and illnesses are being reported to the ADF's Workplace Health, Safety, Compensation and Reporting (WHSCAR) system. It seems likely that WHSCAR reporting by the other Services would be comparable.
- 35 Further information supporting these estimates is in Westphalen, N, 'Primary health care in the Australian Defence Force', *Australian Defence Force Journal*, July 2017 Issue 202, pp. 91–7, available from [http://www.defence.gov.au/adf/adfj/Documents/issue\\_202/Westphalen\\_July\\_2017.pdf](http://www.defence.gov.au/adf/adfj/Documents/issue_202/Westphalen_July_2017.pdf)
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# Stress and Immune Mediators In The Canadian Armed Forces: Association Between Basal Levels and Military Physical Performance

Hans Christian Tingstad

## Abstract

**Purpose:** This study aimed to determine if an association exists between basal levels of stress and immune mediators and military physical performance among Canadian Armed Forces members (CAF).

**Methods:** Blood samples from 219 CAF members (86 women and 133 men), were analysed for levels of cortisol, C-reactive protein (CRP), Adiponectin, INF- $\gamma$ , TNF- $\alpha$ , IL-1 $\beta$ , IL-2, IL-6, IL-8 and IL-18. Grip strength, aerobic capacity and performance on six military physical performance tests (sandbag fortification, escape to cover, picking and digging, picket and wire carry, stretcher carry and vehicle extrication) were also assessed. A composite score for total performance was computed, based on rank scores from the six tasks.

**Results:** The results from the linear regression analysis showed that higher CRP values were associated with lower total performance scores (slope -23.0,  $p \leq 0.05$ ), a slower picking and digging time (slope 45.75,  $p \leq 0.05$ ), lower aerobic capacity (slope -71.81,  $p \leq 0.05$ ) and shorter plank time (slope -21.82,  $p \leq 0.05$ ). A positive association between IL-2 values and grip strength was also observed (slope 20.83,  $p \leq 0.05$ ). Adiponectin values were positively associated with plank time (slope 21.42,  $p \leq 0.05$ ), but negatively associated with grip strength (slope -8.27,  $p \leq 0.05$ ).

**Conclusion:** The results from this study suggest that high levels of immune mediators (like CRP) could be a marker of decreased military physical performance.

**Key Words:** inflammation, inflammatory cytokines, immune mediators, C-reactive protein, adiponectin, physical performance, Canadian Armed Forces

## Introduction

Members of the armed forces are expected to maintain a high physical capacity, to be able to carry out physically demanding tasks on a frequent basis, and to meet minimum physical employment standards. Over the last decades, research has documented evidence of an association between increased levels of stress and immune mediators and a decline in physical performance. For example, elevated basal levels of C-reactive protein (CRP), IL-1 $\beta$ , TNF- $\alpha$ , and IL-6 have been linked to functional decline and a decrease in general physical performance.<sup>1-3</sup> Brinkley et al,<sup>4</sup> found that CRP levels were negatively associated with grip strength and performance on a Short Physical Performance Battery (balance test, timed walk, repeated chair stands) in an adult population (>55 years), and the association was age

independent. Some studies have also suggested that IL-18 may be associated with a decrease in physical performance in the elderly population.<sup>5</sup> Studies have also shown that high adiponectin levels could be negatively associated with lower physical performance and muscle strength in an elderly population.<sup>6, 7</sup> Toth and Matthews,<sup>8</sup> observed a negative association between CRP levels and both myosin heavy chain and mixed muscle protein in a large population, consisting of men and women with a wide age range, suggesting muscle protein metabolism could be part of the association linking high levels of inflammatory cytokines to a decrease in physical performance.

Members of the armed forces are at an increased risk of stress exposure.<sup>9, 10</sup> The everyday life of a military service member often entails stressors, such

as physical and environmental stress stemming from occupational tasks, concern about potential relocation, deployment in combat operations and the strive for promotion.<sup>11</sup> Studies by Pflanz and Sonnek,<sup>11</sup> and Pflanz et al,<sup>12</sup> showed that as many as 26% of US Air Force service men and women reported to suffer from work related stress. 15% reported that work stress was causing them significant emotional stress. High stress levels have been linked to an increase in the production of inflammatory cytokines.<sup>13, 14</sup> Previously published results from our group have also shown that CRP levels in the Canadian Armed Forces (CAF) increase with age, and we also observed an increase of inflammatory cytokines with age.<sup>15</sup> CAF members are required to possess a minimum physical capacity to carry out occupational tasks and meet minimum physical employment standards; however, no previous study has investigated the association between basal levels of immune mediators and physical performance on a discrete test battery among members of the armed forces. Therefore, the purpose of this study was to determine if an association exists between basal levels of cortisol, adiponectin and inflammatory cytokines, and performance on a discrete battery of military physical performance tests in a representative sample of the CAF. Based on previous findings, it was hypothesised that levels of stress and immune mediators would be negatively associated with military physical performance.

## Methodology

### Participants

In order to assess the association between levels of cortisol and cytokines and military physical performance in a military population, blood draws were collected from a representative sample of regular force CAF members (n=219). All blood samples and measurements were collected as a part of the development of a new physical employment standard for the CAF. All participants were pre-screened prior to taking part in the study, where resting blood pressure and heart rate were recorded, and participants completed the Physical Activity Readiness Questionnaire (ACSM, 16) and the Risk Stratification Questionnaire (ACSM, 17). Participants having any medical conditions or restrictions limiting their ability to perform physical tasks were excluded from the study. Also, participants identified as 'high risk' according to the Risk Stratification Questionnaire (symptomatic or known cardiovascular, pulmonary or metabolic disease). Pregnant women were also excluded from participating in the study. The study was conducted following the guidelines of the Helsinki Declaration and received ethics approval from Defence Research

and Development Canada's Human Research Ethics Board and The University of Ottawa Research Ethics Board.

### Anthropometric data

Height was measured using a Seca 213 Portable stadiometer (Seca Industries, Hanover, Maryland, USA). Hip and waist circumference were measured using a standard measuring tape. Waist circumference was measured at the superior edge of the iliac crest, and hip circumference was measured at the widest part of the buttocks. Body weight was measured using a standardised and calibrated professional grade digital weighing scale (Health-o-meter, Alsip, Illinois, USA). Body composition was estimated through bioelectrical impedance analysis, using the InBody 520 (BioSpace Technologies, Los Angeles, USA), previously validated against Dual Energy X-ray Absorptiometry.<sup>18</sup> Body composition was estimated in the morning, and participants were asked to refrain for exercise prior to arrival, and to arrive well hydrated. The body composition analysis gave an estimate of lean body mass (LBM) and fat mass and, based on these estimates, body fat percentage (BF%) was calculated. BMI was calculated by dividing body weight by height squared (weight (kg)/height<sup>2</sup> (m)).

### Blood sample collection

Participants were instructed to be fasted, avoid consuming caffeinated beverages and nicotine during the 2 hours prior to testing, and not to exercise or consume alcoholic beverages for 6 hours prior to testing. Blood samples were collected in the morning, upon arrival in the laboratory, by a qualified laboratory technician. All blood samples were collected before any exercise testing was performed. Blood samples were collected in 6 mL EDTA tubes and immediately placed on ice until centrifugation at 2428 x g. Plasma was separated in 2 mL aliquots and stored in a -80oC freezer until analysis.

### Blood sample analysis

All blood samples were analysed for levels of cortisol, adiponectin, CRP, INF- $\gamma$ , TNF- $\alpha$ , IL-1 $\beta$ , IL-2, IL-6, IL-8 and IL-18. These markers were selected based on having a high detection rate in this specific population, and previous studies showing these specific markers to be associated with physical performance in the general population.<sup>1, 2, 5, 7</sup> Cortisol was measured using a Parameter Cortisol Assay (R&D Systems, Minneapolis, MN, USA), while CRP and adiponectin were measured using a Human C-Reactive Protein ELISA and the Human Adiponectin Platinum Sandwich ELISA kit (Affymetrix

eBiosciences, San Diego CA USA). All assays were performed as instructed by the manufacturer. Each plate had a standard curve in duplicate and all plates were read at 450 nm in the Elisa plate reader FilterMax F5 Multimode microplate reader (Molecular Devices, Sunnyvale CA). The SoftMax Pro 6.2.2 (Molecular Devices, Sunnyvale CA) software was used to determine the levels of cytokine in the unknown, using the standard curve found on each plate. The levels of IFN- $\gamma$ , TNF- $\alpha$ , IL-1 $\beta$ , IL-2, IL-6, IL-8 and IL-18 were determined using the Procarta Plex Multiplex Immunoassay (Affymetrix eBiosciences, San Diego CA USA). Samples were prepared and used as instructed by the manufacturer of the kits. Standard curves were run on each plate together with unknowns. The plates were read on the luminex MAGPIX instrument (Affymetrix eBiosciences, San Diego CA USA) and the cytokine levels for each unknown were extrapolated from the standard curves using the Procarta Plex analyst software with either a 4 or 5 parameter logistic curve of the standards. The same procedures and assays used to determine cortisol and cytokine levels in plasma have been used in previous publications,<sup>19, 20</sup> and the coefficients of variation of the standards were 5.6% (IFN-  $\gamma$ ), 4.5% (TNF- $\alpha$ ), 3.1% (IL-1 $\beta$ ), 3.6% (IL-2), 9.8% (IL-6), 4.5% (IL-8), 5.6% (IL-18), 13.8% (adiponectin), 13.2% (CRP) and 11.6% (cortisol).

### Physical capacity and military physical performance measures

Military physical performance was measured on six military specific tasks. These tasks were sandbag fortification (lifting and moving sandbags), escape to cover (obstacle course resembling an escape to cover under fire task), picking and digging (separate picking and digging simulators), pickets and wire carry (resembling carrying equipment for a fence erection) and stretcher carry and vehicle extrication (resembling extracting a wounded service member from a disabled car). A more detailed description of each task can be found in Tingelstad et al.<sup>21</sup>

Performance on the sandbag fortification, escape to cover, picking and digging, and pickets and wire carry task was measured as time to complete the task. For the stretcher carry and vehicle extrication task performance was measured as maximal load lifted and carried. Total performance was calculated by ranking each individual score and giving it a percentile score (best performance = 100, lowest performance = 1) based on rank order. To estimate aerobic capacity, a multistage 20-meter shuttle run test was used. This test has previously been validated and found to accurately represent a measure of aerobic capacity,<sup>22</sup> and the procedures for the tests are described in the CF EXPRES Operations Manual.<sup>23</sup> The level attained

and the number of stages completed on that level was recorded and converted into total distance covered (m). Grip strength was used as a measure of upper body strength. Grip strength has been found to be a valid predictor of total upper body strength in young adults<sup>24</sup> and was measured using a Smedly Analog hand dynamometer (Smedly TTM, Tokyo, Japan). The procedures for grip strength measurement can be found in the CF EXPRES Operations Manual.<sup>23</sup> Following standard protocol, grip strength was measured twice for both left and right hand, and the highest recorded measurement for each hand was summed and used as the measure of grip strength.

Abdominal muscular endurance was measured using a maximal prone plank time (seconds) protocol. Having forearms and toes place on the ground, participants were asked to lift their hips of the ground and maintain a neutral spine. The test was terminated when the participant failed to maintain a neutral spine. Detailed descriptions of procedures are found elsewhere.<sup>25</sup> Each participant's physical performance measures and blood sample were collected on the same day.

### Statistical analysis

Due to non-normal distribution, all cytokine values were log<sub>10</sub> transformed before any statistical analyses were performed. As men and women are held to the same physical employment standard and performed the same physical performance test, male and female data were combined into one cohort. Multiple linear regression analysis was used to determine the association of cytokine levels on military physical performance. With age, sex and BF% being covariates of both cytokine levels and performance,<sup>26-30</sup> the regression model was adjusted for these factors. Results from the linear regression analysis were presented as slope and standard error. Significance level was set to  $p \leq 0.05$ . All statistical analyses were performed using SPSS 23.0 (IBM SPSS Statistics for Windows, Version 23.0, IBM Corp, Armonk, NY).

### Results

Performance data and blood samples from a total of 219 CAF members were made available for this analysis. A detailed description of participant characteristics can be found in Table 1. The results from the blood sample analysis showed a low detection rate of IL-1 $\beta$ , IL-6 and TNF- $\alpha$ . Only 4%, 4% and 2% of men, and 5%, 6% and 3% of women had measureable values of IL-6, TNF- $\alpha$  and IL-1 $\beta$  respectively. Due to the low rate of measureable values, these inflammatory cytokines were excluded from further analysis.

**Table 1:** Descriptive statistics of participants. Data presented as mean±SD.

	Total (n=219)	Women (n=86)	Men (n=133)
Age (years)	36.5±10.1	37.4±8.7	35.9±10.9
Height (cm)	170.6±8.9	162.6±5.8	175.8±6.2
Weight (kg)	79.1±15.8	69.0±11.8	85.7±14.6
BMI (kg/m <sup>2</sup> )	27.1±4.4	26.1±4.0	27.7±4.1
Body Fat (%)	24.6±8.9	29.4±8.2	21.6±8.0
Waist Circumference (cm)	90.6±11.8	84.8±10.0	94.2±11.4
Cortisol (ng/ml)	38.87±34.55	38.85±38.91	38.89±31.60
CRP (µg/ml)	7.10±9.10	7.07±9.10	7.11±9.14
Adiponectin (µg/ml)	12.67±9.94	17.90±10.12	9.24±8.20
IL-18 (pg/ml)	85.64±37.30	79.58±34.18	89.60±38.82
IL-2 (pg/ml)	6.50±4.20	7.42±6.33	5.89±1.48
IL-8 (pg/ml)	6.43±23.57	9.25±37.29	4.59±2.70
IFN-γ (pg/ml)	9.42±6.96	10.47±10.65	8.73±2.98

Results from the multiple linear regression analyses are found in Table 2. There were no observed associations between cortisol, IL-18, IL-8, IFN-γ or any of the physical performance measures recorded. Higher CRP levels were associated with a decrease in military physical performance. A negative association was observed between CRP levels and: aerobic capacity (p≤0.05), plank time (p≤0.05), picking and digging performance (p≤0.05) and total performance

(p≤0.05). A negative association between adiponectin levels and grip strength (p≤0.05), was observed; however, higher adiponectin levels were also associated with an increase in plank time (p≤0.05). Interleukin 2 was found to be positively associated with grip strength (p≤0.05), where higher IL-2 levels indicated better grip strength. No other association between cytokine levels and physical performance were observed.

**Table 2:** Linear regression results, adjusted for age, sex and body fat percentage, showing the association between immune mediators and military physical performance.

	Total Performance Score	E2C (sec)	P&D (sec)	P&W (sec)	SC (kg)	VE (kg)	SBF (sec)	GS (kg)	AC (m)	PT (sec)
<b>Cortisol</b>	6.23 (15.25)	0.13 (1.44)	0.70 (36.95)	7.08 (8.60)	-4.23 (6.21)	-1.05 (3.70)	0.50 (9.01)	-1.96 (2.97)	-41.63 (55.85)	-0.03 (8.50)
<b>CRP</b>	-23.0 (8.88)*	0.42 (0.88)	45.75 (22.05)*	3.72 (5.37)	-6.84 (3.75)	-2.56 (2.92)	5.75 (5.54)	-2.74 (1.92)	-71.81 (36.27)*	-21.82 (5.49)*
<b>Adiponectin</b>	-0.98 (15.78)	-0.18 (1.39)	-25.50 (37.90)	-7.11 (8.67)	-3.91 (6.14)	-1.76 (3.71)	-8.19 (9.33)	-8.27 (3.00)*	-5.35 (56.60)	21.42 (8.62)*
<b>IL-18</b>	0.06 (0.15)	-0.02 (0.01)	0.22 (0.37)	-0.07 (0.09)	0.01 (0.06)	0.01 (0.04)	-0.12 (0.09)	0.03 (0.03)	-1.09 (0.58)	-0.08 (0.09)
<b>IL-2</b>	16.33 (54.70)	1.74 (5.70)	-140.96 (127.54)	50.18 (27.80)	-20.27 (17.08)	0.56 (12.84)	12.21 (28.80)	20.83 (9.48)*	225.88 (184.80)	-18.68 (31.27)
<b>IL-8</b>	2.40 (30.87)	-0.48 (3.05)	-75.95 (83.14)	24.07 (17.30)	-5.30 (10.89)	3.45 (7.52)	-9.00 (17.10)	-2.89 (6.42)	149.09 (109.64)	-15.09 (16.40)
<b>IFN-γ</b>	7.93 (53.48)	2.05 (5.14)	-112.21 (134.06)	24.71 (28.72)	-16.71 (16.20)	-3.29 (12.47)	-6.33 (27.01)	5.55 (11.65)	57.95 (240.33)	-42.174 (28.62)

Results are presented as slope and std error. \*p>0.05. TPS, total performance score; E2C, escape to cover; P&D, picking and digging; SC, stretcher carry; VE, vehicle extrication; SBF, sandbag fortification; GS, grip strength; AC, aerobic capacity; PT, plank time; CRP, C-reactive protein; IL-18, interleukin 18; IL-2, interleukin 2; IL-8, interleukin 8; IFN-γ, interferon gamma.

## Discussion

Members of the CAF are required to possess a minimum physical capacity to perform occupational duties; however, the high stress exposure associated with being a member of the armed forces could potentially have a negative impact on military physical performance. This study is the first to investigate if an association exists between basal levels of cortisol, adiponectin and inflammatory cytokines and performance on a discrete physical performance battery in the CAF. Results showed a negative association between CRP levels and military physical performance, where high levels of CRP were associated with a decline in total performance, picking and digging time, plank time and aerobic capacity. Higher adiponectin levels were associated with lower grip strength, but improved performance on the front plank task. Based on these results, there seems to be an association between levels of inflammatory cytokines and military physical performance, which could potentially mean that individuals with high levels of stress and immune mediators might be at a disadvantage when it comes to performing military tasks and physical performance tests.

### C-reactive protein and military physical performance

C-reactive protein is an acute phase protein, produced by the liver during the initial stage of an inflammatory reaction, and is a potent marker for the presence of an inflammatory reaction.<sup>31, 32</sup> Previous studies in the elderly population have suggested a negative association between CRP levels and physical performance. Similar results were observed in CAF members. The results from the multiple linear regression analyses showed a negative association between CRP levels and aerobic capacity, plank time, picking and digging performance and total performance (Table 2). Few studies have assessed the association between inflammatory cytokines and physical performance in a military population, but studies from the general population have found similar results. Taaffe et al,<sup>1</sup> found that higher CRP levels were associated with poorer grip strength. They also observed a trend towards lower CRP levels in people with faster walking speeds. A cross-sectional study conducted by Norman et al,<sup>33</sup> showed an independent inverse relationship between CRP levels and handgrip strength. The inverse association between CRP and grip strength did not reach significance in our cohort ( $p=0.156$ ). However, CRP levels were found to be inversely related to performance on the picking and digging task, plank time and aerobic capacity. The results from this study seem to indicate a negative

association between CRP levels, independent of age, sex and adiposity and military physical performance.

### Adiponectin and military physical performance

The adipokine adiponectin plays a crucial role in glucose regulation and lipid metabolism,<sup>34</sup> and is considered to have anti-inflammatory effects.<sup>35</sup> High plasma concentrations of adiponectin have also been associated with a lower BMI and lower waist circumference.<sup>36, 37</sup> Based on the association between high levels of adiponectin and lower BMI and waist circumference, we expected, if any, a positive effect of adiponectin on physical performance in this military population. Instead, an inverse relationship between adiponectin levels and grip strength was observed (Table 2) suggesting high adiponectin levels to be negatively associated with physical performance. Previous research has found similar results in studies in an elderly population, where a significant inverse relationship between physical performance, muscle strength and adiponectin levels have been shown.<sup>6, 7</sup> It is therefore likely that the negative relationship between adiponectin and physical performance could be explained by an inverse relationship between adiponectin levels and body mass, and more specifically LBM,<sup>36</sup> rather than a direct negative effect of adiponectin on physical performance. As previously described, adiponectin levels increase with a decrease in BMI and body mass. This has been associated with a decrease in LBM in the elderly population.<sup>6, 7</sup> Unpublished data from our lab showed a negative correlation between adiponectin levels and LBM in a military population, which could explain the inverse relationship found between adiponectin levels and grip strength in this study (the current study was a part of a large research project, and the LBM data points will be published in a future publication). Participants with higher adiponectin levels also recorded a better plank time, compared to participants with lower adiponectin levels. This could also be explained by an inverse relationship between adiponectin levels and body mass. Previous studies have shown a negative correlation between plank times and body mass, where people with a higher body mass (i.e. lower adiponectin levels) had a lower plank time.<sup>38</sup> Based on these results, it seems that rather than having a direct effect on physical performance, changes in adiponectin level could serve as a marker of change in body composition, which could again affect physical performance.

The results from this study are not able to determine the specific cause of the association between inflammatory cytokines and military physical

performance. If one were to speculate, it is known that mental and physical stress exposure itself can affect physical performance,<sup>39</sup> and clear evidence exists of a connection between stress level, immune system activation and release of inflammatory cytokines.<sup>13, 14</sup> It is also known that inflammation and pro-inflammatory cytokines play a role in muscle wasting, and high levels of cytokines like TNF- $\alpha$  and IL-1 $\beta$  measured in muscle tissue, have been associated with muscle wasting and a decrease in muscle mass.<sup>40</sup> It is therefore possible that high levels of pro-inflammatory cytokines in circulating plasma could be a marker of an ongoing inflammatory reaction in the muscle, rather than high levels of cytokines in circulating plasma having a direct negative effect on physical performance. These are only speculations of potential pathways linking inflammatory cytokines and physical performance, and more research is required to clarify the cause and effect of inflammatory cytokines on physical performance. However, based on these results, strategies to decrease inflammation and levels of inflammatory cytokines, could be beneficial to improve military physical performance. Several anti-inflammatory drugs are available (e.g. corticosteroids, Aspirin), which have been found to decrease levels of pro-inflammatory cytokines.<sup>41</sup> Regular physical exercise<sup>42</sup> and sufficient sleep<sup>43</sup> have also been shown to be beneficial to decrease levels of pro-inflammatory cytokines. This study was not designed to answer such questions; however, potential anti-inflammatory strategies and their effect on military physical performance should be elucidated in future studies.

### Limitations

The models used in this study to determine the association between cortisol and cytokine levels and military physical performance were adjusted for age, sex and adiposity, which are all known to affect cortisol and cytokine levels. Other factors, such as fasting status,<sup>44</sup> ethnicity<sup>45</sup> and medication (e.g. aspirin),<sup>46</sup> can also affect cortisol and cytokine levels, but due to this being a secondary analysis of previously collected data, we were unable to control for these variables.

There are also several factors affecting the rate of transcription, translation and breakdown of cytokines (e.g. exercise,<sup>47</sup> acute stress exposure,<sup>13</sup> as well as their circadian fluctuation<sup>48</sup> and differences in half-life. CRP's half-life is ~19 hours,<sup>49</sup> whereas IFN-gamma has a half-life of only a few minutes.<sup>50</sup> Certain cell types contain cytokines prepackaged in

vesicles, which can be released immediately upon stimulation.<sup>51</sup> Therefore, cytokine levels measured in blood samples collected in the morning might not be a perfect representation of plasma values later in the day. There are also known limitations to bioelectrical impedance analysis, used to determine body composition. Obesity level, body geometry, total body water and body water distribution are all factors known to influence the results of bioelectrical impedance analysis.<sup>52</sup> However, this participants sample did not have a high level of obesity or BMI (Table 1), and were encouraged to drink water prior to and throughout the data collection day, so the impact of these factors on body composition should be minimal. To follow up on this, a controlled study should be performed comparing physical performance between people with normal and high basal cytokine levels, as well as collecting blood samples pre- and post-exercise. Research has shown that regular evaluation of hormone levels can be a tool used in preventative and personalised medicine,<sup>53, 54</sup> and future studies should investigate the potential of using regular evaluation of stress and immune mediators as a tool to predict changes in military physical performance.

### Conclusion

This study is the first to assess the association between basal levels of cortisol, inflammatory cytokines and performance on a discrete physical performance battery in a military population. There was no observed association between cortisol, IL-18, IL-8, IFN- $\gamma$  and any of the outcomes of the military physical performance test. However, CRP levels were negatively associated with total military physical performance, aerobic capacity, plank time, picking and digging performance and adiponectin levels were negatively associated with grip strength, confirming the hypothesis. On the other hand, adiponectin levels were also positively associated with plank time, and IL-2 was positively associated with grip strength. Even though more research is needed to confirm these results, the results of this study seem to indicate an association between CRP levels and military physical performance. The potential negative effect of pro-inflammatory cytokines on military physical performance could be a part of the explanation of why certain CAF members might struggle to meet the physical employment standard. Based on these results, developing strategies to decrease inflammation in CAF members with high levels of pro-inflammatory cytokines, could help to improve military physical performance.

## Acknowledgments

The authors would like to acknowledge the members of the Canadian Armed Forces Directorate of Fitness – Human Performance Research and Development team who collected the original data for this study, as well as for their support in the development of the current manuscript.

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# Upper Respiratory Tract Infection Symptoms as a Herald Sign of Metamizole-Induced Neutropenia

Adir Sommer

## Abstract

Metamizole is an analgesic and antipyretic drug commonly prescribed in various countries. In young adults living in overcrowded conditions, such as soldiers in training camps, upper respiratory tract infection (URTI) symptoms are common and metamizole is frequently used for treatment. This report describes a severe metamizole-induced neutropenia in a 19-year-old infantry recruit who presented with non-specific URTI symptoms. The article briefly reviews the adverse reaction and describes its incidence as reflected in various studies. The aim is to raise awareness among healthcare providers regarding the possible early symptoms that may indicate the development of this idiosyncratic adverse reaction following metamizole consumption.

**Keywords:** Metamizole, neutropenia, agranulocytosis, idiosyncratic reaction

## Background

Metamizole was previously reported to be among 11 drugs that accounted for more than 50% of drug-induced (non-chemotherapy related) agranulocytosis cases<sup>1</sup> and was banned in the USA in 1977, followed by similar restrictions in Japan, New Zealand, Singapore and other countries. Nevertheless, it is still available in some countries as an over the counter (OTC) drug<sup>1</sup>. Numerous studies worldwide have examined the incidence of the phenomenon, suggesting that only a minority of cases (around 10%) occur in children and young adults and almost double in women<sup>2</sup>. The results are quite consistent, with the exception of a Swedish study from the early 2000s that demonstrated significantly higher incidence of approximately 1 case per 1 400 treated patients. However, it was later noted that the study was based on inaccurate sales data from local pharmacies and, therefore, it was unclear how reliable the results were<sup>3</sup>. Recent studies demonstrated drug-related agranulocytosis incidence ranging from 0.46 to 1.63 cases per 1 000 000 person-days of use<sup>2</sup>.

## History

A 19-year-old infantry recruit at the Israeli Defense Forces (IDF), was admitted to a medic with symptoms including general weakness, diffuse headache and sore throat for the past three days accompanied by a 39.6°C fever. The patient was generally healthy, with no regular medications nor reported sensitivity or allergy to past substances or drugs. The medic

consulted by phone with a physician that was based in a remote post and was instructed to follow the patient's symptoms and to administer analgesics that were at his disposal. The patient was administered one tablet of metamizole by the medic. It is important to note that in Israel, metamizole is considered an OTC drug and can be purchased with no prescription. Military medics can administer up to four tablets of metamizole at once without consulting a physician. Upon receiving the tablets, medics instruct the patients to keep at least six hours between each tablet consumption and advise not to consume more than one tablet at a time. The next day, the patient returned to the medic with no relief and accompanied with a 40°C fever. Due to the lack of improvement in the patient's symptoms and the ongoing fever, the medic consulted again with the physician who instructed him to refer him to the nearest emergency room/department (ER/ED) for further investigation and treatment.

## Examination and clinical findings

The patient represented to the ER with the same above-mentioned symptoms and a normal physical examination except for general weakness. Measured blood pressure was 97/47 mmHg with a heart rate of 86. Fever of 39.1°C was measured and blood oxygen saturation was normal. Chest x-ray imaging and general urine test were normal. Laboratory finding indicated normocytic anaemia (HB 9.7 gr/dL, HCT 28.9%, RBC 3.9 \*10<sup>6</sup>/ul) and neutropenia

(WBC  $0.47 \times 10^3/\text{ul}$ , NEUT  $0.01 \times 10^3/\text{ul}$ ) with a slight INR extension (1.6). Platelet count was normal ( $164 \times 10^3/\text{ul}$ ). During his hospitalisation, a bone marrow examination was performed, showing a hypocellularity of 1% (normal range 30–70%), without an indication of bone marrow blasts. A manual blood smear test was also performed without any sign for peripheral blood blasts. The patient was admitted to the intensive care unit (ICU) due to a suspected maturation arrest of the blood lines, resulting in deep neutropenia accompanied by fever of unknown origin and hemodynamic instability, and was placed in protective isolation. Serology tests for common viruses including HIV were negative. Blood, stool and urine cultures were negative, and nasal swab for common respiratory viruses was also negative. Abdominal ultrasound and a second chest x-ray were performed and returned normal. Later physical examination revealed minor bilateral enlarged cervical lymph nodes without lymphadenopathy at any other site. In consultation with an ear, nose and throat (ENT) specialist, and in view of the anamnesis and physical examination, it was agreed that the patient may suffer from acute tonsillitis/pharyngitis. The patient was administered Filgrastim (granulocyte colony stimulating factor [G-CSF]), and started a doxycycline, ceftriaxone and meropenem regimen. Nevertheless, no fever reduction within the next 24 hours was achieved. At the family's request, the patient was transferred to a hospital closer to his home and was examined again by an ENT specialist who concluded he was suffering from acute pharyngitis, without any sign for peritonsillar abscess. Laboratory exams still pointed to leukopenia ( $0.7 \times 10^3/\text{ul}$ ), with neutropenia ( $0.02 \times 10^3/\text{ul}$ ), anaemia (10 gr/dL) and increased C-reactive protein (CRP) (217 mg/L). A chest and sinuses computational tomography (CT) scan returned normal with no sign for deep infection nor an abscess formation. An antifungal treatment (Fluconazole) was started concurrently with Filgrastim. The following day, the fever was gone and laboratory tests showed hyperleukocytosis (HB 11.17 gr/dL, WBC  $31.45 \times 10^3/\text{ul}$ , NEUT  $25.6 \times 10^3/\text{ul}$ , PLT  $828 \times 10^3/\text{ul}$ ). During hospitalisation and later ambulatory follow-ups, blood lines returned to normal. It was concluded that due to the proximity of the metamizole consumption, the patient suffered from an idiosyncratic drug-induced severe neutropenic event. In a thorough anamnesis, the family mentioned that at the age of 14, the patient suffered from a similar event of fever and neutropenia that led to hospitalisation and extensive investigation, concluding a drug-induced adverse reaction due to the consumption of metamizole several days before symptoms occurred. It is important to note that during that 5-year time

period, the patient reported metamizole consumption several times without any adverse reaction.

### Discussion and conclusions

Idiosyncratic drug reaction (IDR) is an 'adverse reaction that does not occur in most patients treated with a drug and does not involve the therapeutic effect of the drug... (the adverse reaction) is unpredictable and often life threatening'<sup>4</sup>. It is a Type B (hypersensitivity) adverse drug reaction (ADR), representing 10–15% ADRs and is independent of drug dosage. The mechanism remains unclear and reflects multifaceted interactions of metabolic factors and genetic predispositions. Neutropenia is defined as an absolute neutrophil count (ANC)  $<1500/\text{microL}$  while agranulocytosis is defined as ANC = 0. ANC is calculated as  $\text{WBC [cells/microL]} \times \% [\text{polymorphonuclear neutrophils (PMNs) + bands}] \div 100$ . Agranulocytosis is a rare condition with a reported incidence ranging from 1–5 cases per 1 000 000 persons per year with 70% of cases related to drug consumption. The onset is usually delayed and can occur as late as one month after the drug has been discontinued. Clinical presentation is usually oral ulcerations, and/or a sore throat with or without fever. Neutrophil count usually returns to normal within several weeks of drug withdrawal<sup>1</sup>. Metamizole is an analgesic, spasmolytic and antipyretic drug commonly in use since the 1920s. The drug can induce production of antineutrophil antibodies and induce direct toxicity towards the progenitor cells in the bone marrow<sup>5</sup>. When taking into consideration the common pharmaceutical alternatives to metamizole, mainly acetaminophen and various NSAIDs derivatives, other factors beside the risk of neutropenia should be considered. A comparison between short-term treatment with aspirin, diclofenac, acetaminophen and metamizole showed that mortality risk due to agranulocytosis, aplastic anaemia, anaphylaxis and upper gastrointestinal complications was similar between metamizole and acetaminophen and substantially lower than the risk with aspirin and diclofenac (7 and 23 times less, respectively)<sup>6</sup>. There is insufficient information in the literature regarding the teratogenic effects of metamizole in pregnancy and other pregnancy outcomes, but evidences suggest that, particularly in comparison to NSAIDs, it does not appear to be teratogenic<sup>7</sup>. Therefore, while metamizole is an efficient analgesic and antipyretic drug; drug-induced neutropenia should be kept in mind when prescribing this medication. The drug's severe adverse reactions and associated mortality rate are significantly lower than those of the various acetaminophen and NSAIDs derivatives are. However,

although it is very rare, the chance of developing neutropenia due to the consumption of the drug is higher compared to acetaminophen and NSAIDs. Due to its idiosyncratic nature, it is not possible to predict when a patient will develop the phenomenon and under what dosage, whatsoever. Although there is no effective way to detect the patients whom are at high risk for metamizole-induced neutropenia – previous neutropenic episodes put the patient at higher risk for a recurrent future event. Moreover, it is suggested that treatment duration should be kept as short as possible and that patients should seek medical attention if they develop fever, sore throat or mouth sores. Upon being examined by a physician, it should be considered whether an urgent blood test is needed for excluding acute neutropenia. In addition, the case demonstrates the importance of electronic medical records (EMRs) sharing among healthcare organisations as in the case of the Israeli military computerised patient records (CPR) and other civilian EMRs. Should the electronic records be shared, the previous neutropenic event of the patient might have been easily detected.

### List of abbreviations

ADR – Adverse drug reaction  
ANC - Absolute neutrophil count  
CPR – Computerised patient records  
CT – Computational tomography  
EMR – Electronic medical record  
ENT – Ear, nose and throat  
ER – Emergency room  
ICU – Intensive care unit  
IDF – Israeli Defense Forces  
IDR – Idiosyncratic drug reaction  
INR – International normalised ratio  
NSAID – Non-steroidal anti-inflammatory drug  
OTC – Over the counter  
PMN – Polymorphonuclear neutrophils  
URTI – Upper respiratory tract infection  
WBC – White blood count

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### A Data-Driven Approach to Better Outcomes for our Veterans' Health and Wellbeing

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#### Abstract

Over the past 100 years, the Department of Veterans' Affairs has applied a range of technologies to support veterans and their families. The focus of the recently established Data and Insights Branch is to ensure that DVA's substantial data assets are fully utilised to support the transformation of the department into a data-driven organisation supporting the wellbeing of our veterans and their families.

DVA has developed a Strategic Research Framework that details the analytical and research priorities and principles for DVA to focus future research and data gathering efforts. This supports a more proactive approach to commissioning research that has actionable outcomes, which can be effectively translated into policy and program directions.

Under the Framework, DVA aims to procure high-quality research to underpin effective service delivery and facilitate the department's move from an illness to a wellbeing frame of understanding veterans, and focuses on commissioning research into the wellbeing and health needs of veterans and their families. This targeted research will bridge gaps in our knowledge base, enabling us to better understand the needs of our clients and proactively anticipate future veteran needs and the services that best support those needs.

As noted in the Australian Institute of Health and Welfare's Veteran Profile report and the Productivity Commission's A Better Way to Support Veterans Draft Report, previous research efforts have been primarily healthcare focused. Through the Framework, DVA will broaden its scope to also support research that addresses significant information gaps in the education, employment, justice, housing, safety, finance and social support domains.

The Framework signals a shift in how DVA contemplates research in the context of advanced data analytics, with a focus on using innovative, dynamic approaches to identify emerging trends and needs. This requires DVA to take a more proactive approach to commissioning research, and managing the data and insights created through research as a deliverable to DVA in its own right.

An excellent example of this new direction is DVA's deployment of a Priority Investment Approach model for Veterans that describes how the DVA client sub-populations are expected to evolve, and the total future lifetime demands associated with different cohorts of clients (veterans and partners/dependants). While the initial focus of the model will be operational, its scope will soon be expanded to support the examination of population wellbeing over time, thus representing a new way of using data to inform policy, program evaluations and service design.

A central objective of the Framework is to ensure that commissioned research results in measurable benefits in terms of policy, program and service impact. As part of the aim to achieve more strategic research investment, DVA is looking to support applied research that, wherever possible:

- is end user focused and addresses the needs of veterans and their families
- results in impact and translation
- uses existing data sets and research outcomes
- is collaborative and builds critical mass by drawing on multiple disciplines from multiple research institutions to address challenging research questions

This will position DVA with a comprehensive, reliable and accessible evidence base that will enable it to formulate policy and business strategy and make effective service delivery decisions to support lifetime wellbeing for Australian Veterans and their families.

The Framework recognises the challenges faced in bridging the research policy gap and underlines the need for research to realise benefits for DVA, ensuring that research funded demonstrates measurable benefits to achieve an identifiable policy or service objective. Implementation and monitoring of the Framework will focus on ways to improve engagement between research providers and policy makers and strategies to help improve uptake and use of research findings.

#### Biography

*Dr Paul Nicolarakis is Chief Data Officer and Assistant Secretary of Data and Insights at the Department of Veterans' Affairs. After completing degrees in medicine and neuroscience at Sydney University and his residency at Royal Prince Alfred Hospital, Paul began exploring the interface between health, data and policy, seeing him lead an award winning aged care electronic medical record start up prior to joining Microsoft as their analytics clinical lead, engaging with senior health leaders across Asia-Pacific and the Middle East. Prior to his current role, Paul served as*

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### A Systematic Review of Parent–Child Interventions for Trauma-Impacted Parents Towards Parenting Support for Australian Defence Force Veterans with PTSD

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#### Abstract

**Background:** Studies of the intergenerational impact of parental trauma disorders, including Veteran PTSD, on children, demonstrate high correlations between frequency and intensity of PTSD symptomatology and poorer outcomes in children's short and long-term psychosocial wellbeing. A primary mediating factor of the impact of intergenerational trauma on children is an attuned parental or carer relationship during times of overwhelm or cumulative events. Despite this knowledge, studies suggest that child-focused parenting support for Australian Veterans and partners with trauma disorders are lacking in our current support system. Furthermore, Australian Veterans with mental health difficulties demonstrate low help-seeking behaviours and can experience barriers to accessing trained helping professionals due to distance, travel incapacity and impact of PTSD symptoms.

**Methods:** A comprehensive search of literature pertaining to research outcomes for existing parent–child interventions with trauma-impacted parent populations was undertaken. A systematic analysis was undertaken to determine the efficacy of such interventions.

**Results:** Results of the analysis exploring currently available child-focused parenting interventions for

trauma-impacted parents in the Veteran and non-Veteran space will be shared.

**Conclusion:** Current parent–child interventions in the wider trauma-impacted parent population may be useful in informing program protocols to meet the parenting support needs of Veterans suffering PTSD and their partners in Australia towards mitigating impacts of intergenerational transmission of trauma.

#### Biography

*Katrina is a Clinical and Counselling Psychologist, a member of the Australian Psychological Society, a Fellow of both the APS College of Clinical Psychologists and College of Counselling Psychologists and is a supervisor for General and Clinical Psychology Registrars.*

*Katrina has a special interest in single, cumulative and complex PTSD across the lifespan and the impact of trauma and adjustment on family, workplaces and wider systems. Katrina has worked therapeutically and systemically with children and adolescents, families, adults and workplaces for around 20 years and has established two private practice clinics. She has been clinical and project consultant for private, non-government and government organisations.*

*Katrina is a member of the Golden Key International Honour Society for her Master of Psychology work including her thesis; Proposed criteria for Developmental Trauma Disorder, DSM-V: Manifestations and implications for a rural Australian Child and Adolescent Mental Health Service. Katrina was awarded a 2019 Australian Rotary Health scholarship co-funded by Rotary District 9790, RSL Vic (Preston Sub-Branch) and the University of Newcastle, Priority Brain and Mental Health Research Centre for her current research towards assisting Veterans and their children with PTSD.*

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### A Workload Monitoring System that Calculates Neck Forces in Fast Jet Pilots

**Dr Phil Newman**<sup>1</sup>, Dr Wayne Spratford<sup>1</sup>, Mr James Wallace<sup>1,2</sup>

<sup>1</sup> University of Canberra Research Institute for Sport and Exercise

<sup>2</sup> Institute of Aviation Medicine/ Fighter Fit

#### Abstract

**Purpose:** Neck pain in fast jet pilots is an international concern. Helmet design, head checks and high G manoeuvres are thought to contribute. In order to understand neck pain and neck forces in

fast jet pilots, this study sought to build a model to predict the forces acting at the neck and evaluate the efficiency and accuracy of the subsequent algorithm using only head coordinates and Gz flight data from helmet-mounted inertial sensors.

**Methods:** Lab derived model: Three-dimensional motion data was collected using the VICON camera system from RAAF fast jet pilots performing common 'head checks' while seated on an F/A-18A ejection seat. Pilots were modelled wearing 2 helmet types (HGU-55/P and JHMCS). Dynamic graphical models were derived using OpenSim software. The OpenSim model calculated forces at each cervical segment for 1-9Gz conditions.

Three ensemble learning algorithms – linear regression, k-nearest neighbours (kNN) and adaptive boosting – were deployed and trained five times on random stratified samples of 75% of the OpenSim model dataset to establish an algorithm that could predict segment moments at C1, C4 and C7, using only head coordinates and Gz. The resultant algorithms were tested on the remaining 25% of the OpenSim dataset and the best model identified based on predictive accuracy and efficiency.

Real time flight model: Head position coordinates and Gz values were obtained from helmet-mounted sensors during 42 sorties involving 7 pilots over 7 days. Unfiltered raw data from flight was analysed by the most accurate machine learner and the resultant predicted cervical spine moments collated.

**Results:** The Adaptive boosting learner performed best (R2=0.994, RMSE=1.129), kNN (R2=0.981, RMSE 2.013), and linear regression was least accurate (R2=0.533, RMSE= 9.953). Predictive errors were in the range 0.7–3%. The kNN algorithm was selected for predicting the real flight data to balance efficiency and accuracy. 42 samples from sorties totalling 223 minutes of flight were analysed successfully by the machine learner. Predicted moments at 3 cervical segments, duration, frequency and direction were determined for all flights in less than 5 minutes.

**Conclusion:** The results demonstrate that neck forces can be measured in dynamic flight environments. Helmet design, Gz and pilot head posture each influence the magnitude of neck forces.

Operational relevance: From this system, both neck muscle and joint loads can be determined, within a manoeuvre, within a sortie, within a training week or longer. This technology will enable instructors and health staff to quantify neck workloads of pilots and review technique in order to better understand flight-related neck pain. Helmet design can also be modelled using this system.

### Biography

*Phil has had significant experience as a Sports Physiotherapist over 27 years in a range of clinical roles including international sports teams, public and private practice, emergency department physiotherapy, academia and in the Australian Defence Force. Phil has contributed significantly to injury prevention efforts within the military and community by developing and implementing injury surveillance, analysis and screening systems. Along with teaching and research roles at the University of Canberra, Phil remains clinically active running a part-time private practice. Phil is a current academic member of UC Research Institute for Sport and Exercise (UCRISE).*

*Phil's Research interests are in sports, military and musculoskeletal injury, particularly medial tibial stress syndrome, neck and back pain in high performance jet pilots, dynamic contributions to joint stability in the knee, injury prediction using machine learning methodology, and clinical prediction. These interests have allowed him to form strong international connections and collaborations.*

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## ADF Dentists: A Role in the Recovery and Repatriation of ADF Personnel

[SQNLDR Alistair Soon](#)<sup>1,2,3</sup>, [FLTLT Emma James](#)<sup>1</sup>

*1 Royal Australian Air Force*

*2 Wynnum-Manly Oral Health Centre, Metro South Oral Health*

*3 Forensic and Scientific Services, Health Support Queensland*

### Abstract

The primary role of an Australian Defence Force (ADF) dentist is to provide dental services to maintain the oral health of all ADF personnel whether in the garrison environment or in the deployed environment. ADF dentists are well trained in many areas of dentistry to allow them to perform their primary role; however, one of the lesser-known areas that an ADF dentists are trained in, is forensic dentistry. In fact, all ADF dentists are trained in forensic dentistry as part of their Dental Level (DL) 1

to 2 career structure; this means that every uniform dentist has some familiarity with the process of forensic dental identification.

Forensic dental identification is one of the three primary identifiers endorsed by INTERPOL (International Criminal Police Organisation) in DVI (Disaster Victim Identification). These identification procedures provide an error free objective method for obtaining a positive identification, and are used in situations such as mass fatalities (more than three deceased), remains that are fragmented or unrecognisable and in all aircraft accidents. Several countries have utilised their military dentists for mass fatality incidents, such as the USA, Canada and Singapore.

In an event of a military mass fatality incident, the ADF does not have a full dedicated organic mortuary affairs capability and limited specialist capability. Hence, any positive identification of ADF personnel (if required in the Area of Operations (AO)) would be conducted by AFP (Australian Federal Police), contractors or coalition forensic specialists. When positive identification does not occur in the AO, remains are repatriated as either 'unconfirmed identity' or 'unknown', and are subsequently identified in accordance with the requirements of the State or Territory coroner. In the USA, there is a dedicated military mortuary situated at Dover Air Force Base where military personnel killed in action are usually identified and processed before they are returned to their families.

The ADF does have dedicated military units, such as the Unrecovered War Casualties – Army (UWC-A) and Historic Unrecovered War Casualties – Air Force (HUWC-AF), which are tasked to find, recover and identify ADF personnel lost in past conflicts such as WWI, WWII and the Korean Conflict. Both of these units utilise ADF reserve dentists for their specialised forensic dentistry skills.

The advantages of utilising ADF dentists (permanent or reserve), in any mass fatality incident, are that many of the ADF dentists are able to deploy in short notice, are security vetted, and are usually medically, dentally and physically fit for the task (as part of individual readiness). Many of the ADF dentists also have the experience in living and performing in austere environments.

Handheld portable x-ray units are also available as part of the ADF dental deployable kit, which is an important tool in forensic dentistry. Although, many ADF dentists may not have ongoing forensic

dentistry exposure and experience, in a large-scale mass fatality incident, ADF dentists still have sufficient forensic dentistry knowledge to augment the civilian forensic dental capability. It is beneficial for ADF dentists to train and work with their civilian counterparts in forensic dentistry field to maintain competency.

There is, perhaps, an underutilisation of ADF dentists in the field of forensic dentistry. Instead of having contractors or coalition forensic specialists to identify our ADF personnel, ADF dentists, in particular those with postgraduate qualifications in forensic dentistry are equally capable in performing the same duties. The skill and equipment that the ADF dentists have in forensic dentistry, if ever called upon to use them in a military fatality incident, allows expedited and accurate recovery and repatriation of ADF personnel fallen on duty.

### Biographies

*Squadron Leader Alistair Soon is a RAAF Specialist Reserve Dental Officer with No. 2 Expeditionary Health Squadron. He completed his Bachelor of Dental Science from The University of Melbourne, and Master of Forensic Medicine from Monash University. He is a Member of the Faculty of Forensic & Legal Medicine of the Royal College of Physicians, and a Fellow of the Australasian College of Legal Medicine.*

*Alistair practises general dentistry at Metro South Oral Health (Queensland Health), and forensic dentistry at Forensic and Scientific Services Health Support Queensland (Queensland Health). He is credentialed with the scope of clinical practice to provide specialist-level forensic odontology in the state of Queensland. Alistair was involved in several DVI (Disaster Victim Identification), including as the Odontology Team Leader in an air crash incident, and has presented on this field locally and internationally, including at an INTERPOL DVI Conference in Lyon (France).*

*Alistair is involved with the Historic Unrecovered War Casualties – Air Force (HUWC-AF), and has peer-reviewed several Unrecovered War Casualties – Army (UWC-A) forensic odontology caseworks.*

*In his free time away from work, he enjoys spending quiet time with family, and reading online watch blogs.*

*Flight Lieutenant Emma James graduated from James Cook University with a Bachelor of Dental Surgery in 2015; she was sponsored by the Royal Australian Air Force in the Undergraduate Program from 2012 onwards. Upon graduation, she was posted to RAAF*

Base Williamtown where she has been posted to both Joint Health Command and now No. 2 Expeditionary Health Squadron.

Emma deployed on Operation HIGHROAD in 2017 in the position of Staff Officer to Commander Task Group Afghanistan. During this deployment, she worked directly for the Brigadier in a deployed joint headquarters environment, gaining broad exposure to the NATO mission in Afghanistan.

In 2018, Emma began a secondary employment outside of the RAAF as a Visiting Dental Officer at the John Hunter Forensic Medicine Unit. In this position, she assists the Coroners of Northern NSW in identifying unidentified bodies through their dental records. She is currently studying a Master of Public Policy and Leadership through UNSW Canberra and enjoys travelling both overseas and locally with her husband Josh.

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## Army THRIVE: A New Mental Health and Wellbeing Approach for the Australian Army

LTCOL Kylie Tuppin<sup>1</sup>

<sup>1</sup> Australian Army

### Abstract

The impact that a workplace can have on a person's wellbeing is significant and well documented. This is particularly true for the Australian Defence Force (ADF), which in recent years has participated in number of reviews and research programs examining the mental health and illness trajectories of its current and former serving members. Considered alongside other initiatives, such as cultural reform, the Australian Army this year launched its Army THRIVE mental health and wellbeing program. This program recognises that Army has a responsibility to ensure new Army members develop their wellbeing to not just cope but also thrive, both during their service and when transitioning back to the community, while doing its best to protect them against the risks of military service.

Initially developed as a response to a number of different strategic mental illness considerations (such as the ADF Mental Health and Wellbeing

Strategy 2017–2022), Army THRIVE has flipped the conventional approach to mental illness on its head, and instead focuses on the wellbeing of its people in conjunction with other positive Army programs such as Human Performance and Good Soldiering. Army THRIVE uses a dimensional approach to define mental health and mental illness and harnesses the theory of positive psychology, specifically its five 'PERMA' tenants of (1) positive emotions, (2) engagement (or 'flow'), (3) relationships, (4) meaning and (5) accomplishment, to operationalise wellbeing. At the same time, it enhances the knowledge and skills around managing the risks to mental health associated with service. Army THRIVE is thus designed to address three key goals: (1) change the language of mental health and wellbeing of the Australian Army from a duality approach of illness (or lack therefore) to a more nuanced language of positivity and thriving, (2) establish a framework for the conceptual approach and governance of wellbeing initiatives, and (3) provide a toolbox for Army commanders and individuals to both manage the risks to mental health for members and develop skills towards managing their own wellbeing throughout their lifespan. This program will achieve this through three lenses: the individual, the team and the organisation.

This presentation will cover the theoretical foundations of Army THRIVE, including the dimensional approach to mental health and mental illness, and the PERMA tenants of positive psychology as applied to the Australian Army. It will specifically cover the journey of introducing a new approach to wellbeing, the organisational use of a new lexicon, new metrics and measurements for thriving, and type of user uptake and feedback.

### Biography

LTCOL Kylie Tuppin currently serves as a senior psychologist in the Australian Army. Throughout her career she has worked in recruitment and selection, training, clinical assessment and counselling, service delivery management and, more recently, in strategic personnel and health policy. She has deployed in support of military operations to Afghanistan, Iraq, East Timor and Bougainville. Kylie holds master's degrees in Clinical Psychology and War & Psychiatry, and is a PhD candidate in Organisational Psychology at the University of New South Wales.

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### Augmentation and Enhancement of Military Personnel for Military Advantage – An Impending Future of Super-Soldiers but also Super-Risks

**Dr David Heslop<sup>1</sup>**

*1 UNSW Sydney*

#### Abstract

Current momentum in military research efforts has opened the possibility for both the enhancement but also augmentation of military personnel for the purpose of achieving advantage over rivals. Rapid technological advances are currently breaking ground well ahead of prudent commentary and consideration of impacts on human society, ethics, geopolitics and military operations. This has potentially allowed friend and foe alike to exploit opportunities to develop completely novel countermeasures and defences, but also develop new threats in Chemical, Biological, Radiological and Nuclear (CBRN) military operations. Emerging rivalries between great powers is reducing barriers and increasing impetus for competition in this area of capability development. Two recent technological developments driving CBRN medical countermeasure research are highlighted as examples. How such developments impact on capability competitions – in other words, driving new arms races – in near-peer rivals is discussed. The profound potential impacts of these new technologies on the fundamentals of human existence as we understand it today are highlighted, alongside a broader consideration of the philosophical, ethical and moral dimensions of this situation.

#### Biography

*Dr David Heslop is an Associate Professor at the School of Public Health and Community Medicine at UNSW Sydney. He retains military responsibilities as SO1 Public Health and Occupational Medicine at Army Headquarters. He is a clinically active vocationally registered General Practitioner, registered Occupational and Environmental Medicine Physician with the Royal Australasian College of Physicians, and a fellowship candidate for the Academy of Wilderness Medicine. During a military career of over 15 years, he has deployed into a variety of complex and austere combat environments, and has advanced training in Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) Medicine. He has worked as an SMO, OC and CBRNE medicine SME for SOER and SOHQ from 2012–2019. His research interests lie in*

*health and medical systems innovation and research. He is a chief investigator on the NHMRC Centre for Research Excellence Integrated Systems for Epidemic Response (ISER), and undertakes collaborative research exploring evaluation of the medical aspects of high risk and high consequence environments through a novel computational modelling and simulation effort with DST Group, and various emergency response and CBRNE related teaching and research activities with industry and government organisations.*

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### Blunt Injury and Penetrating Injury: Effects of Impact Speed

**Dr Timothy Paul Hutchinson<sup>1</sup>, Dr Jeffrey K Dutschke<sup>1</sup>**

*1 Centre for Automotive Safety Research, University of Adelaide*

#### Abstract

**Introduction:** Experiments are conducted in which something representing a human strikes (or is struck by) a blunt object. Measurements are taken that reflect the likely severity of injury: acceleration, force and deformation over the milliseconds of impact, and summaries of these, such as maximum acceleration. The experiment may be focused on the effectiveness of protective equipment. An instrumented headform might strike a vehicle exterior or interior, or a helmeted headform might strike a floor, for example.

Conditions of an impact in the real world may differ from those in the experiment in respect of speed (which is probably the variable of most interest), mass, stiffness and so on. Yet, it will be desired that the results of the experiment are relevant to the real world. The Head Injury Criterion (HIC) is a well-known method of summarising the acceleration of a headform; how much will HIC increase by if impact speed is doubled, for example.

Theory is fairly primitive, surprisingly. The cost of experimental work is appreciable, so data is sparse. Maximum use needs to be made of what there is.

Theory and implications for data analysis: Suppose we assume an equation for the forces acting between the human and the object. (A simple example would be that force is proportional to distance of deformation.) Is it possible to work out the consequences, in the

sense of equations for outputs (such as maximum acceleration, HIC, and maximum deformation) in terms of inputs (such as impact speed, mass and stiffness)? For some assumed equations, the answer is yes.

The Hunt and Crossley equation is an important example describing human acceleration when striking something deformable such as sheet metal or foam polymer. This includes the linear spring as a special case. The general form has a type of nonlinearity (a power function with exponent  $n$ ) and damping. If the Hunt and Crossley equation describes the force, then various outputs are power functions of various inputs, with exponents that are determined by  $n$ .

An important limitation on the applicability of such theory is bottoming out, which refers to great increase of force consequent on (for example) cushioning becoming completely crushed. Consequently, as well as danger from high stiffness, there is danger in a cushion (of given thickness) being too soft.

Experiments are also conducted in which something representing a human is penetrated by a projectile. Measurements might include the length and volume of the cavity representing a wound. Theory about the forces acting is different from the blunt injury case, but issues concerning data are very similar. Force may be a power function (with exponent  $q$ ) of the speed with which a projectile is moving through a medium. Then distance of penetration is a power function of impact speed (and the exponent is  $2 - q$ ).

**Examples:** Power functions are convenient for data description and analysis: take the logarithm of the input and output variables and a straight line is predicted; estimate the slope; from the slope,  $n$  or  $q$  can be calculated.

Examples of data description and analysis will be given for three types of data.

- An instrumented headform (a proxy for a human head) hits something deformable, such as a helmet lining.
- A low-mass object hits an instrumented proxy for a human chest, which deforms.
- A projectile penetrates into a simulant of human tissue.

The usefulness of experiments on injury is increased by data analysis that is based on credible theory. Prediction can be made of results in conditions – for example, at impact speeds – that are not directly tested in experiments.

### Biography

*Jeffrey Dutschke has been a Research Fellow at the Centre for Automotive Safety Research (CASR), University of Adelaide, since 2015. He completed his PhD there in 2012, his thesis being on understanding the criteria used to assess head injury in impact testing. On returning to the CASR after experience in a start-up software company in Canada, Jeffrey's work has included analysis of mass accident data, at-scene crash investigation, mathematical modelling and biomechanics.*

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### Case Study: Fighting the War Years On; an Australian Soldier's Rehabilitation Journey after an Improvised Explosive Device Blast

Dr Sonia Jones<sup>1</sup>

1 ARES

#### Abstract

Rehabilitation of the wounded soldier injured in combat remains a challenging and prolonged process. Patient outcomes are strongly linked to the severity of the injury, but also shaped by a complex interaction of psychological and social factors. This case report is unique in that it does not only show the arduous nature of physical recovery, but competing psychological and social issues that arose as a result of combat trauma.

The soldier was repatriated from Afghanistan after the protected mobility vehicle he was travelling in detonated a pressure borne improvised explosive device. It details his journey from point of injury and strategic evacuation to Australia where he underwent numerous operations on his lower limbs and arm. It describes aspects of his physical rehabilitation and how it was complicated by a diagnosis of post-traumatic stress disorder and traumatic brain injury years after the incident. While recovering from his injuries he also successfully campaigned to have his foreign earnings (tax-free income and service allowance entitlement to personnel deployed overseas) derived from a period of leave due to accident exempt from tax.

This report will discuss aspects of his management

and how health professionals, together with the enduring support of Commanders, are responsible for the provision of rehabilitation that addresses the biopsychosocial needs of the patient recovering from injuries due to combat.

### Biography

*Sonia Jones is a Junior Doctor at Royal Darwin Hospital. She has served with the Australian Regular Army as a physiotherapist and deployed to Afghanistan. She transferred to the Army Reserves while she completed a Bachelor of Medicine, Bachelor of Surgery and Masters in Medicine. Sonia is happily married to an Infantry Platoon Sergeant and is a mum to Coco and Jett.*

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## Casualties of War: Understanding our Past Sacrifices to Enable our Future Decisions

**LTCOL Anthony Pay**<sup>1</sup>

*1 Joint Capability Group*

### Abstract

Casualties of War: Understanding our past sacrifices to enable our future decisions – will inform the audience of the casualty conflict information from many conflicts over the last 100 years, trending all data so that realisable patterns can be identified and formulated in such a way that it can inform future health planning decision making for the Australian Defence Force in all operational theatres it is likely to serve.

Defence uses many tools to help understand current and historic events to assist in predicting future military scenarios. One example of this within health service delivery is casualty calculators. These are far more useful and reliable when they are contemporary and employ the most recent conflict data. As a result of an associated activity, Project Global Endeavour, Defence is doing comprehensive casualty analysis of past historic conflicts over the last 100 years, in order to refine our ability to predict and plan for future conflict health possibilities and outcomes.

This presentation will examine casualty data from the last century, including World War I, World War II, the Korean Conflict, Vietnam War and Operation Enduring Freedom, to name a few. It will analyse the casualty information from the consideration of casualty rates, mortality rates and morbidity rates. By examining relationships between the data, it will mark observations and in particular trends. A key analysis component of this presentation will be

reviewing the data in comparison of the many major conflicts and trending this over the last 100 years.

The areas of key interest will demonstrate observed trends surrounding winning and losing, adversary and own force ratios and defending nation's data versus remote nation assistance. In doing so the presentation will also delve into chemical and nuclear warfare, as well as short duration invasions contrasted with long duration campaigns. At this stage of research development, the presentation will collate observations only, and not draw conclusions. However, the current data presented will proffer some compelling analysis and understanding of casualty dynamics upon the battlefield.

The work to date is in its early stages, but will contribute to a more advanced and responsive casualty calculator for future health planning.

### Biography

*LTCOL Anthony is the principal lead officer for Project Global Endeavour. His most recent career milestones include being awarded Head Cadet of the Australian Command and Staff College (Reserve) in 2013 after which he worked as Career Manager in Directorate of Reserve Officer Career Management in 2014. He took up Command of 3 Health Support Battalion on promotion to Lieutenant Colonel from 2015 to 2017. In 2018, he worked in Head Quarters, Joint Health Command and he now leads Project Global Endeavour from 2019 for Joint Capability Group.*

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## Chamber of Secrets- Applying the Gas Laws Up and Down

**Ms Pip Rice**<sup>1</sup>

*1 Tasmanian Health Service*

### Abstract

Our small Diving and Hyperbaric Medicine specialists, Defence Reserve personnel and civilian health professionals are set to make new waves in underwater and aviation medicine in the city of Hobart, Tasmania.

As part of the Tasmanian Health Service (THS) at the Royal Hobart Hospital (RHH), Tasmania's only Tertiary hospital, there are future opportunities to be explored in the fields of hyperbaric and hypobaric medicine as a new state-of-the-art, 66 tonne, rectangular multi-compartment chamber, is commissioned in late 2019. The new \$689 million RHH Redevelopment Project includes a \$12 million investment in hyperbaric medicine, introducing the only dual-capability (to pressurise and depressurise)

chamber in the Southern Hemisphere, and just the 5th one of its' kind globally.

This presentation will discuss current hyperbaric capabilities and the possibilities that can be opened with the new hypobaric chamber, including aviation and space medicine, world-class research and potential academic and commercial partnerships, and with defence in underwater medicine and RAAF.

Tasmania is a beautiful state, with both recreational and commercial diving industries. While scuba diving is a very safe sport and popular Australian past time, some potentially serious incidents occur (approximately 1 in 10 000 dives). Hyperbaric chambers provide the emergency treatment required for decompression and gas bubble injuries, as well as diabetic hypoxic wounds, soft-tissue radiation injury, anaerobic necrotising infections, gas poisonings, osteomyelitis, radiation proctitis/cystitis, central retinal arterial occlusion and sudden sensory hearing loss.

Originally opened in 1966, the Diving and Hyperbaric Medicine Unit is the only public hyperbaric facility in Tasmania. It has undergone several face-lifts, notably in 1992, 2016 and now in 2019. We will look at the history of these chambers over this time.

In 2018, approximately 1960 hyperbaric patient treatments occurred, including 40 out-of-hour emergencies. The new hyperbaric multiplace compartment will take up to 10 seated patients and enable these treatments to be significantly higher should the need arise.

The hypobaric compartment will seat 6–8 people and provide aerospace or altitude research and training to simulate the effects of high altitude on the body. This could then have application to high altitude, space and extreme medicine research and testing, as well as commercial and defence training.

This is an exciting time for all clinicians that work and care for the public under pressure. The contemporary use of such a unique piece of equipment will be dynamic, progressive, underpin the advancement in this specialised field and elevate patient care to new heights!

### Biographies

*Although a mother of four young girls, Pip Rice has been a nurse with a dynamic career over 24 years. From a graduate nurse exposed to the Port Arthur Massacre, through to working in Diving and Hyperbaric medicine, and a clinical nurse educator in Perioperative Services.*

*Pip is currently on Project secondment as Clinical Lead to a Statewide Infusion Pump Procurement for*

*the Tasmanian Health Service. As well as being an active Army Reserve Nursing Officer, she enjoyed the opportunity to put her military logistics training to good use earlier this year in the civilian setting. This was with a deployment to support the Tasmanian Fire Service effort in the Incident Management Team, as part of the State Special Emergency Management Plan Intraoperability Arrangements, when Tasmania had disastrous fires across the State.*

*Carol Baines is a Registered Nurse with 30 years clinical experience in ICU and hyperbaric medicine. Currently on the inactive Naval Reserve, Carol has experience with submarine rescue and clinical research.*

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## Changes in Mental Health Status Over Time in Deployed and Non-deployed ADF Members: The Role of Transition

**Dr Miranda Van Hooff<sup>1</sup>, Dr Ellie Lawrence-Wood<sup>1</sup>, Ms Jenelle Baur<sup>1</sup>, Professor Alexander McFarlane<sup>1</sup>, Dr Stephanie Hodson<sup>2</sup>, Colonel Nicole Sadler<sup>3</sup>, Ms Helen Benassi<sup>4</sup>, Dr Stuart Howell<sup>1</sup>, Ms Maria Abraham<sup>1</sup>, Ms Marie Iannos<sup>1</sup>, Dr Craig Hansen<sup>1</sup>, Dr Amelia Searle<sup>1</sup>, Professor Richard Bryant<sup>5</sup>**

*1 Centre for Traumatic Stress Studies, University of Adelaide*

*2 Open Arms Veterans and Families Counselling*

*3 Phoenix Australia Centre for Posttraumatic Mental Health*

*4 Department of Defence, 5University of New South Wales*

### Abstract

The current presentation focuses on the shifts in mental health status over a five-year period (2010–2015) among both deployed and non-deployed ADF members who have transitioned out of regular 'full-time' service compared to those who remain in the Regular ADF. Similar to other international military and veteran studies, results indicate that most people report good mental health following discharge from active military service, with some individuals, particularly those who remain in the ADF, even showing a remission in symptoms to

the point where they had no disorder in 2015. Of those who do go on to develop problems, anxiety disorders and posttraumatic stress disorder were the disorder types that were most likely to worsen following transition (most likely as a function of sensitisation of neural processes that occur following initial exposure to stressful events). ADF members who were most likely to worsen from no disorder or sub-syndromal disorder in 2010, to probable disorder in 2015, reported problematic anger in and a greater number of deployment exposures or lifetime trauma in 2010 and were not officers. Those reporting higher resilience were less likely to show a decline in their mental health over time. Results also indicated a picture of increasing severity of both mental and physical symptoms from military service to transition out of full-time military service, suggesting that emerging psychological distress is likely to be a significant driver of an individual's decision to discharge or be medically discharged from military service. This presentation highlights the significance of sub-syndromal symptoms in their own right and highlights the need to think about mental health as a continuum, rather than a mental state at a discrete period of time. The presentation will end with a discussion of the implications of these findings for mental health screening and assessment among a military workforce.

### Biography

*Dr Miranda Van Hooff is the Director of Research at The University of Adelaide's Centre for Traumatic Stress Studies. During her career, she has led several large-scale longitudinal studies of trauma-exposed populations, including child and adult survivors of a major Australian bushfire, children hospitalised with significant burn injuries, and children exposed to lead. Since 2009, her research has focused on the mental health of Australian military and emergency service personnel. Dr Van Hooff was Chief Investigator of the Transition and Wellbeing Research Programme, Australia's most comprehensive study to examine the impact of contemporary military service on the mental, physical and social health of current and ex-serving ADF personnel and their families. She was also the lead researcher on two seminal research programs establishing the prevalence in ICD-10 mental disorder in the 2010 Regular ADF workforce and the South Australian Metropolitan Fire Service in 2014. Dr Van Hooff collaborates with numerous Commonwealth and state-based organisations including the Departments of Veterans Affairs (DVA) and Defence, the SA Metropolitan Fire Service, The Road Home, The Royal Society for the Blind and Assistance Dogs Australia.*

*Dr Van Hooff has authored over 50 peer-reviewed journal articles and 20 government reports for DVA and Defence.*

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## Combat Health Support Training for Damage Control Resuscitation and Surgical Teams: Exercise Abbeville 2019

LTCOL Anthony Chambers<sup>1</sup>

*1 3rd Health Support Battalion*

### Abstract

The 3rd Health Support Battalion is Army's provider of specialist health support within 17 Brigade. The role of the unit is to force generate a specialist health capability and to raise-train-sustain a reserve specialist health workforce in support of Army and the ADF's tasks and operations.

Preparing health specialists to provide high-quality combat health support on operations is challenging for defence forces such as the ADF, where the national incidence of penetrating trauma and levels of violence involving firearms is very low. There is also a need to provide more junior military health specialists with the knowledge, lessons and experience possessed by more senior health specialists in the ADF who have had the opportunity to deploy as on operations in the Middle East Area of Operations.

For these reasons, 3 HSB developed Exercise Abbeville as an activity within its training program targeted at medical, nursing and paramedic specialists from all three services considered likely to deploy within a Role 2+ health facility environment.

The intent of Exercise Abbeville was to provide individual and team training for resuscitation and surgical team members in order to enhance their theoretical knowledge of damage control trauma management principles, create a forum for the exchange of knowledge, lessons and experience from more experienced specialists to the more junior, to provide an opportunity for networking and mentoring for health specialists within all three services, and to allow participants to develop critical teamwork and other non-technical skills in a challenging and realistic simulated environment.

This presentation will detail the conduct of Exercise Abbeville, the key outcomes achieved, participant feedback and areas for improvement for future activities.

### Biography

*LTCOL Anthony Chambers is the Commanding Officer of the 3rd Health Support Battalion. He has been an active member of the Australian Army Reserve for 24 years. He has seen operational service on multiple deployments to Timor-Leste, Bougainville, Banda Aceh, Iraq, Afghanistan and the Ukraine.*

*In his civilian role, he is a general surgeon specialising in Surgical Oncology and is the Head of the Department of General Surgery at St Vincent's Hospital Sydney.*

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## Conducting Surveillance and Monitoring of Musculoskeletal Injuries Among Military Personnel – Case Study in Developing a Tool for Fast Jet Aircrew

**Mr James Wallace**<sup>1,2</sup>, Dr Phil Newman<sup>2</sup>,

Dr Wayne Spratford<sup>2</sup>, Dr Peter Osmotherly<sup>3</sup>,

Dr Tim Gabbett<sup>4</sup>

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### Abstract

**Introduction:** Both surveillance and monitoring of musculoskeletal (MSK) injuries and complaints are vital in keeping military personnel in peak condition and minimising operational impact. Reliable and valid surveillance measures are important for all aspects of MSK injury prevention including: establishing the size and severity of the problem, identifying risk factors for MSK injuries/complaints, and evaluating the effectiveness of interventions aimed at reducing risk of MSK injuries/complaints. Additionally, monitoring is important for facilitating the early identification of MSK complaints and injury, allowing early intervention, minimising performance decrement and maximising operational capability.

However, in order to capture reliable and valid MSK injury/complaints surveillance and monitoring data from military personnel, consideration must be given to their complexities such as their often remote and international locations; tendency to train and operate despite pain or functional limitations; inconsistent ability to modify their training/operations; and variable access to appropriate medical personnel. Fast jet aircrew (FJA) are an example of military personnel who are affected by such complexities, and commonly suffer from MSK injuries/complaints, particularly neck and back pain, which reduces performance and operational capability. Within the current FJA literature, there is variability in definitions used to discriminate a recordable MSK complaint or injury, and inconsistency as to what domains should be considered when determining overall severity. The objective of this study was to develop an appropriate tool that could be used for the monitoring and surveillance of MSK injuries/complaints among FJA.

**Methods:** For part one of the study, 18 international experts were invited to participate in a modified Delphi study. Invited experts were those who were: a) the primary/contact author of research published with in last 5 years pertaining to MSK complaints/injury among FJA, b) involved with the topic with the NATO Aircrew Neck Pain Working Group, or c) identified by a member of the recent NATO Aircrew Neck Pain Working Group. Those who volunteered were asked to put forward (round 1) and then agree upon (rounds 2–3): the descriptors of what constituted a MSK complaint; which definitions of recordable injury should be captured; and what domains are important for determining the overall severity of a MSK complaint in FJA. Consensus was considered achieved when agreement was >75%. Part two of the study involved developing the surveillance and monitoring tool based upon the consensus reached by the experts. Part three involved seeking feedback from a variety of FJA regarding the usability and comprehension of the tool.

**Results:** Eleven experts from eight nations responded to round one, and nine responded to rounds two and three. Consensus was achieved for: 8 descriptors that defined what constitutes a MSK complaint; 6 separate definitions of a recordable injury; and 14 domains important for determining the overall severity of a MSK complaint. Feedback was sought from 10 FJA of varying experience and rank, which shaped the development of the final tool.

**Conclusions:** Undertaking valid and reliable surveillance of MSK injuries/complaints in military personnel can be difficult. However, the results of this study have allowed for the robust development

of a tool used for the monitoring and surveillance of MSK complaints among FJA and consider the complexities of military personnel. This tool will be important for future prospective epidemiological studies, and enable higher quality studies with the aim of reducing the risk of MSK injury/complaints among FJA. Future work will involve a prospective study for validation, evaluation of psychometric properties and item reduction.

### Biography

*James Wallace is an APA titled Sports Physiotherapist and APA titled Musculoskeletal Physiotherapist. He works for the RAAF Institute of Aviation Medicine (IAM) as a Human Performance Specialist, and is overseeing the design, implementation and evaluation of RAAF Air Combat Group's (ACG) Fighter Fit. Fighter Fit is a multi-location high performance unit that consists of a team of Physiotherapists, Exercise Physiologists and Physical Training Instructors that work with RAAF ACG fighter aircrew. Fighter Fit is playing an integral role in addressing the current high risk of neck and back injury among RAAF ACG fighter aircrew. James is also currently undertaking a PhD through the University of Canberra Research Institute for Sport and Exercise (UCRISE), which is focused on better understanding neck pain, and its potential risk factors, among fighter aircrew.*

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## Could Unmanned Remote-Controlled Patient Retrieval Systems be a Reality in Future Wars?

**Dr Abhilash Chandra**<sup>1</sup>, Mr Will Visser<sup>2</sup>

<sup>1</sup> Ashford Vascular Clinic

<sup>2</sup> Brokk Australia Pty Ltd

### Abstract

Wars in the future will be very different to current or previous wars. There is no clarity about nuclear armament within the Middle East and Iran. Tensions between USA, China and Russia are high with military and trade embargos. Because of these factors, Allied Forces may not have the degree of air superiority in the future as with Iraq and Afghanistan. However, priority still has to be in the care of the injured soldier

on the battlefield. Current dedicated air and ground evacuation platforms have been designed, manned and equipped to provide en route medical care to patients being evacuated. A lack of air superiority will cause more difficulties in evacuating the injured soldier from the point of injury as aggressively as in the past because these evacuation platforms will be more at risk. Immediate medical evacuation may not be possible, and the injured soldier may need prolonged care on the battlefield. An efficient and effective medical evacuation system needs to be tactical, operational and strategic. Unmanned vehicle-patient retrieval systems will need to be an important consideration in the development of future medical evacuation platforms and provide joint interconnectivity, especially from the point of injury within the area of operations to the combat surgical hospital. Among other things, these evacuation systems will require incorporation of technologies such as robotics, mechatronics, 5G communication technology with cyber protection, and remote patient monitoring systems using virtual and augmented reality technologies to interact with and augment current evacuation platforms to allow rapid and effective medical evacuation in austere environments. Unmanned vehicle retrieval systems (containing a medic to provide life-saving supportive care) will significantly reduce the size of the deployed medical footprint; thereby, reducing the risk to enemy fire and lowering the risk to helicopter and medical personnel. Ensuring survival of the injured patient will require continuing the already robust en route medical care continuum from the point of injury, and improving on the evacuation logistics. Unmanned Ground Vehicles (UGV), such as the remote-controlled robot system Brokk®, have over 40 years of operating in extremely hazardous and austere environments, and will be a strong candidate for being established as an UGV ground evacuation platform. Brokk were gold medallists in the ELROB 2018 European Land Robot Trial Search & Rescue and MedEvac category. Unmanned Aerial Vehicles (UAV), such as the Cormorant (Tactical Robotics Ltd), an unmanned, single-engine, vertical take-off and landing aircraft, has demonstrated potential for an UAV air evacuation platform. Remote patient monitoring systems such as Proximie, an augmented reality technology integrated with telehealth, will enable provision of medical and surgical expertise remotely to the medic and patient in the UGV or UAV. Autonomous drone swarms can provide protection of the UGV and UAV patient retrieval systems against an enemy. The technology for unmanned, remote-controlled vehicle-patient retrieval systems in future conflicts exist today, and must be incorporated into the medical evacuation algorithms in future conflicts.

### Biography

*Dr Abhilash Chandra BSc, MSc, MBBS (Hons), PhD, FRACS (General), FRACS (Vascular)*

*Dr Chandra is a General and Vascular Surgeon, and has a special interest in Trauma Surgery. His clinical practice is based in Adelaide. He is a Captain in the Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians.*

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### Defence Relationship Health – Deployment Impact Experience. Study of the Impact of Deployment on Intimate Relationships of Australian Army Personnel

**Ms Kerri-Ann Woodbury**<sup>1</sup>, Professor Vivienne Tippet<sup>1</sup>, Professor Ian Shochet<sup>1</sup>

<sup>1</sup> *Queensland University of Technology*

#### Abstract

The Australian Defence Force is an insular sub-culture defined by mateship, hierarchy, unquestioning loyalty and strict discipline. This workplace culture can make intimate relationships difficult for military personnel and their intimate partners and characterises an environment different from mainstream culture. When an overseas war-like deployment is added, this may result in a volatile mix of experiences that strain partnerships in ways not usually explored by traditional relationship health analyses. The crux of this research is that deployment to war zones has the potential to affect intimate relationships; either through the facilitation of increased emotional resilience or by damaging the relationship.

To address the challenges associated with this unique environment, this research answered these questions:

- How to establish an understanding of the unique relationship challenges faced by ADF personnel and their loved ones during and after deployment to a war-like zone.
- Does Bowen Family Systems Theory (BFST) Differentiation of Self (DoS) and Adult Attachment

Patterns (AAP) adequately reflect elements of intimate relationship resilience during and after deployment?

Qualitative semi-structured interviews were undertaken with deployed Australian Army personnel and their intimate partners (n=19): the participants were interviewed separately to their intimate partner. There were three longitudinal interviews in total for each participant, and they took place during (1) during deployment, (2) one month post-deployment and (3) 6–12 months after deployment. Thematic analysis was undertaken of this data as a whole, to gain an understanding of the challenges of deployment. In addition, select case studies were analysed, which determined the applicability of AAP and BFST DoS to this cohort.

Analysis and results uncovered that AAP and DoS do play a part in determining the resilience of an intimate relationship interrupted by deployment. Individuals with a secure style of attachment and higher DoS weather the storm of deployment more successfully than those with an anxious-avoidant attachment style and low DoS. In addition, the major themes revealed with regard to unique relationship challenges for deployed couples were general military life, the effects of the deployment on the family and communication.

This project has provided a unique opportunity to prospectively identify relationship stressors brought about by deployment for Australian Army personnel, and to identify previously unexplored key indicators of relationship stress and relationship strength in this setting. This research will have implications for individuals and employers of intimate couples touched by military deployment. The evidence suggests that closer attention to DoS and AAP may make the process of relationships interrupted by deployment easier through self-reflection and resilience. It is important to make this investment, as the role of loved ones supporting deployed personnel is well known. In addition, the cost to Defence of intimate relationship breakdown can include lost working time, non-deployable assets and increased monetary costs from increased health care and removals costs.

### Biography

*Kerri-Ann Woodbury is an academic at the Queensland University of Technology, where she teaches Paramedic Science in the Faculty of Health. Kerri-Ann is a Registered Nurse with 18 years' experience across public, private and military health care settings, including as a Nursing Officer in the Australian Army. In addition, Kerri-Ann's PhD thesis,*

*Examining the impact of deployment on the intimate relationships of Australian Army personnel and their partners, is currently under examination.*

*Kerri-Ann is married to an Australian Army veteran who has 15 years' service, and was medically discharged in late 2016 with PTSD. She is his carer, a mother to two children and stepmother to two more. The impact, challenges and growth brought about by years of PTSD in her family are at once heart breaking, devastating, life affirming and absolutely worthwhile. Life is now different, but that does not mean it is not worth living.*

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### Dental Treatment of Military Working Dogs – A Potential Force Enabler

**FLTLT Anita Lim**<sup>1</sup>

*1 Officer Training School*

#### Abstract

The dental team is a potential force enabler of ADF Security Forces capability through the provision of emergency and routine dental treatment to ADF Military Working Dogs. This presentation will look at a recent case of endodontic treatment performed on an Air Force Military Working Dog by an Air Force Dental Officer and Dental Assistant, under the supervision of a civilian Veterinarian. The legislative requirements and current constraints will be examined, in addition to a discussion of the possible broader treatment modalities that could be provided to ADF Military Working Dogs in the field and garrison environments.

#### Biography

*FLTLT Anita Lim joined the Air Force in 2012 as an undergraduate Dental Officer. She has been posted to RAAF Base Amberley and RAAF Base Tindal, and is currently posted to Officers' Training School. Anita has a special interest in the areas of Oral Medicine and orofacial pain.*

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### Dermatology in the Australian Defence Force- A Model for the Employment of Non-Critical Care Specialists in Defence

**Dr Keng-ee Thai**<sup>1,2</sup>

*1 Radies Dermatology*

*2 1st Health Support Company, 3rd Health Support Battalion*

#### Abstract

The current emphasis of military medicine in the Australian Defence Force is binary: that is the provision of a deployable battlefield trauma and critical care service, and force preservation in terms of general practice care at the garrison level. Outside of these contexts, medical problems are dealt with by external referral to the civilian sector. As a result, there are multiple uniformed specialists across the three services that are not otherwise utilised, as they do not readily fit either roles. They represent an under-utilised clinical resource that, if correctly employed, can result in significant clinical benefit to ADF members, cost saving to Joint Health Command, and even a deployable role in combat and non-combat operations/exercises in addition to current requirements.

The specific example provided here is that of an Army Reserve dermatologist providing specialist dermatology care to ADF members at a military base health centre. The service represents a significant time and cost-efficient way to provide specialist-level medical care in the context of force protection, fully funded via Joint Health Command providing Army Reserve Training Salaries. Patients are directly referred to the dermatology clinic from various health centres in the region. The members are cared for as per any other military patient, the standard of care is identical to the service provided in the private sector, but without the considerable cost of an external referral.

The dermatologist was also able to deploy on an international Humanitarian Aid and Disaster Relief (HADR) exercise in the context of Exercise Pacific Partnership. The tasking represented another way that 'non-deployable' specialists can make a contribution to the national strategic interest through a military context.

The same clinical model may be applied to other surgical and medical specialists in the ADF, outside of a deployed context. It allows the ADF to make use of a pre-existing pool of reservist clinicians to the benefit of service members, potentially resulting in

a healthier workforce, greater levels of deployability and at considerable cost savings. The mechanism for such specialist services can already be supported by existing organisational structures with no special provisions. Furthermore, it offers another opportunity for reservist specialist medical officers to serve and work within ADF, especially those who are never on an Order of Battle.

### Biography

*MAJ Thai is an Army Reserve Officer posted to 1st Health Support Company, Randwick Barracks. He is the principal dermatologist at two private dermatology practices in Sydney. He is an Associate Editor of the Australasian Journal of Dermatology.*

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## Developing Specialist Medical Capability in the Navy

**Captain Ian Young**<sup>1,2</sup>

*1 Royal Australian Navy*

*2 Frankston Hospital, Peninsula Health*

### Abstract

The ongoing development of Role 2 to Role 3 capability for the ADF is key for operational health support. The author will discuss the challenges and progress of specialist health capability development in the Navy for the current ships and how the Maritime and Joint Amphibious Trauma System integrate with the Land Trauma System. This presentation is designed to stimulate thought and conversation on the way forward for an integrated joint operational health capability.

### Biography

*Ian is a comprehensive Orthopaedic Surgeon and permanent serving Captain in the Royal Australian Navy. He has deployed to Afghanistan, Iraq, Indonesia, Papua New Guinea and Bougainville. His main interests are shoulder, hip, knee and trauma surgery, especially military trauma. He is the Director of Specialist Medical Capability for the Navy in Canberra and a consultant orthopaedic surgeon at Frankston Hospital in Melbourne.*

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## Development and Validation of a Multidisciplinary Team Training and Assessment Program for the Maritime Role 2 Enhanced (MR2E) Environment

**CMDR Martin D Richardson**<sup>1,2</sup>, LEUT Jason R Watterson<sup>1,3,4</sup>, Prof Debra Nestel<sup>2,5</sup>, CMDR John Vassiliadis<sup>1,6,7,8</sup>, CPO Matthew Wood<sup>1,9,10</sup>, Prof Simon Cooper<sup>11</sup>, LCDR Paul Wirth<sup>1</sup>, LEUT Andrew Hall<sup>1</sup>, CMDR Tammy Thomas<sup>1</sup>

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*10 Department of Community Emergency Health and Paramedic Practice*

*11 School of Nursing and Health Professions, Federation University*

### Abstract

**Background:** Training of multidisciplinary health care professionals in the RAN has, for some time, relied on short periods of training but primarily on the health professional gaining skills in their main clinical practice area. Training delivered by the RAN has included simulation training in both the designated training establishment and at sea. The intention of these training programs has been to bring together highly skilled health care professionals to provide them with the necessary team skills to work together when required. Development of a simulation-based training and assessment tool that is able to support the Certification of the MR2E Health Teams aligns Navy Health Service with other RAN unit readiness routines. Simulation has evolved over the years to

a level that it can now be used as an assessment to determine the preparedness of Health Teams and Professionals in support of an austere environment.

### Research questions/aims/objectives:

1. Identify a suitable Simulation Assessment Tool that can align with the NATO Certification Requirements.
2. Develop the Curriculum and Scenarios to use to assess the MR2E Health care teams.
3. Utilise a validated and reliable tool for assessment of team training in the simulated environment or clinical environment

**Methods:** This project will include a mixed methods approach to evaluation, taking into consideration the development of a training curriculum and research evaluating the development and efficacy of a team and platform evaluation tool.

**Expected outcomes:** It is expected this project will produce the following outcomes.

- Tool validation
- Team certification
- Platform certification (MR2E on LHD)
- Generalisation/Replication of the training and evaluation across ADF and international militaries.

**Conclusion:** The outcomes for this educational work will provide a strong evidence base for the ongoing delivery of the program for NHS professionals, as well as providing an evidence base with which other militaries can train.

**Keywords:** Multi-model learning, Simulation, Educational research, Team training, Certification

### Biography

*Martin Richardson is an internationally recognised surgeon with an interest in shoulder, knee and trauma surgery. He treats the whole spectrum of shoulder problems with expertise in arthroscopic shoulder surgery as well as total shoulder replacements, including reverse shoulder replacements. Martin also treats sporting conditions of the knee as well performing joint replacements of the hip and knee.*

*He is an acknowledged leader in the field medical education and holds the position of Associate Professor from the University of Melbourne through the Department of Anatomy and Cell biology. He is also a member of the Royal Australian Navy where he holds the rank of Surgeon Commander. He has actively served in Afghanistan.*

*Martin graduated with honours from the University of Melbourne in 1986 and completed a Masters of*

*Surgery in 1990. On completion of his orthopaedic training in 1994, he undertook fellowships with renowned knee surgeon Mr John Bartlett and Prof Simon Bell (Shoulder and Elbow). He also completed a research fellowship at The Shriners Hospital in Portland, Oregon, USA. Martin has recently been awarded a Masters of Surgical Education from the University of Melbourne.*

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## Early Sequential Microcirculation Assessment in Shocked Patients as a Predictor of Outcome

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Prof Mark Midwinter<sup>3</sup>

*1 University of Queensland*

*2 Royal Brisbane and Women's Hospital*

*3 Jamieson Trauma Institute*

### Abstract

**Objectives:** A dysfunctional microcirculation appears to be universal in all forms of shock and is often dissociated from global haemodynamic parameters. Persistent microcirculatory derangements may reflect ongoing tissue hypoperfusion and organ injury. The extent of the initial microcirculatory dysfunction and subsequent resolution could potentially predict clinical outcomes. We sought to evaluate the microcirculation early in a heterogeneous shocked patient population. The resolution of the microcirculation with standard therapy was observed, correlated with other measures of tissue perfusion and global haemodynamic parameters. Finally, the relationship between the evolution of the microcirculation over twenty-four hours and the clinical outcome was evaluated.

**Design:** We prospectively recruited patients with all forms of shock based on global haemodynamic parameters and evidence of organ hypoperfusion.

**Setting:** A 30-bed adult, tertiary centre, general intensive care unit.

**Patients:** 82 patients diagnosed with shock were recruited.

**Measurements and main results:** Following the diagnosis of shock, recruited patients underwent an examination of their sublingual microcirculation

using Sidestream Dark Field Imaging (SDF) (n=82). The median age of patients in the study was 66 years old (IQR 54-71), with an APACHE II of 27 (IQR 20-32) confirming the severity of critical illness. Microcirculatory parameters included Percentage Perfused Vessels (PPV), De Backer Score and a heterogeneity index in those patients with septic shock, according to the second consensus guidelines. Additional Parameters collected included: temperature, heart rate and arterial pressure, cumulative fluid balance and vasopressor use. Arterial blood samples were withdrawn at the time of microcirculatory assessments, providing HCO<sub>3</sub>, lactate concentrations, PaO<sub>2</sub> and PaCO<sub>2</sub> measurements. We were able to demonstrate a statistically significant improvement in PPV and the heterogeneity index. This improvement was mirrored by other biomarkers of perfusion; however, the global haemodynamic parameter changes were not significantly different over the twenty-four hour period. The demonstrated very early improvement in the microcirculation was not predictive of an improvement in acute kidney injury (AKI), length of stay, ICU or hospital mortality.

**Conclusions:** Early sequential evaluation of the microcirculation in a heterogenous cohort of shocked patients, demonstrated early statistically significant improvement in the percentage of perfused vessels and microvascular heterogeneity. These improvements were mirrored by traditional biomarkers of organ perfusion; however, the changes in global haemodynamics were not as pronounced in this early phase. Early improvement in the microcirculation did not predict clinical outcome.

### Biography

*Dr Anthony Holley BSc. MBCh. DipPaeds. DipDHM. FACEM. FCICM.*

*Anthony is an intensivist at Royal Brisbane and Women's Hospital. He is a senior lecturer with the University of Queensland and is Vice-President of the Australian and New Zealand Intensive Care Society. He is an examiner for the College of Intensive Care Medicine of Australia and New Zealand. Anthony has authored eight book chapters and 40 peer-reviewed publications. He is a supervisor of intensive care training at the RBWH. Anthony serves as a representative for the National Blood Authority Critical Care Group in developing the Australian Patient Blood Management Guidelines. He is registered as a part-time PhD candidate, investigating burns resuscitation. Anthony is a serving Commander in the Royal Australian Navy Reserves and has deployed on multiple occasions, including six tours to Iraq and Afghanistan.*

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## Establishment of Best Practice Framework for Peer-Led Younger Veteran (Current and Former Serving) Wellbeing Programs

**Ms Cath Allen<sup>1</sup>, Mr Ben Webb<sup>1</sup>**

*1 Veterans Centre Sydney Northern Beaches (VCSNB)*

### Abstract

The Veterans Centre Sydney Northern Beaches (VCSNB) model is a concept developed to provide a collective impact to the region, predominantly serviced by individuals and organisations from the region. The boundaries of our region align with Government's Northern Sydney's Primary Health Network (Northern Beaches, North Sydney and Hornsby). To effectively implement this solution, the Veterans Centre acts as a conduit, referring current and former ADF members and their families to the most appropriate services for their given circumstances. This can only be achieved by collaboration with Australian Defence Force, Government Health, Department of Veterans Affairs, Ex-Service Organisations and Community Organisations.

Since the VCSNB presented at the last AMMA annual conference, work has continued to build an effective and collaborative peer support program. Recently, the VCSNB in collaboration with Being (NSW peak lived experience mental health consumer group) received a DVA Grant to establish a best practice framework for establishing and maintaining a 'Veterans' Wellbeing Program' led by volunteers with a lived experience; project duration is from 1 April 2019 to 26 Feb 2020.

VCSNB leads the design and implementation of the veteran volunteer capability-training framework and scalable peer led (with lived experience) mental health wellbeing programs for the vulnerable cohort of Veterans and their families

BEING is leading the project in reviewing, developing and evaluating the best practice framework to set up scalable peer led (with lived experience) mental health wellbeing programs for the vulnerable cohort of Veterans and their families.

To demonstrate a robust and scalable framework suitable for rural, regional and capital locations, with and without a military presence, the following three locations have been selected:

- Dee Why VCSNB (currently being piloted)
- Coffs Harbour VCMNC (trial program in location with an established veterans' network)
- Murrumbidgee establish a program in location

The independent evaluation of this project is crucial to ensure a best practice framework is produced; a foundations program where volunteers go through a suitability test and fundamental training for working in the veteran's community. To achieve this, we have engaged with the following trusted stakeholders:

- Phoenix Australia – advice and guidance
- Western Sydney University – review and research guidance for the development of the wellbeing program
- PWC – quality assurance of the project framework as well as the research objectives and methodologies

The 2010 ADF Mental Health Prevalence & Wellbeing Study indicated that lifetime prevalence rates of mental disorders are higher in the ADF than in the general population. Australian Institute for Health and Welfare 2018 study on the incidence of suicide among serving and ex-serving ADF members highlights the importance of the transition process, particularly when at-risk groups like young veterans are included. The project is aligned with the Government's commitment to improving transition processes from the defence forces to civilian life.

The VCSNB strongly believes in, and demonstrates, genuine collaboration to support veterans and their families. For this project we have engaged with Legacy, Soldier On and Veteran Sports Australia to collaborate with volunteer foundations training, producing Wellbeing Informed Volunteers through our training capability framework. These volunteers can then complete professional develop training specific to their organisation and role. Involvement of ADF personnel will ensure currency, appropriateness of training and knowledge of ADF support services.

This project will help to facilitate early intervention and community integration through young veteran peers (current and former service) utilising their, and their networks, knowledge. These volunteers will fill a crucial role acting as a conduit connecting young veterans to a holistic range of services.

### Biography

*Cath Allen is the Project Coordinator for the VCSNB Wellbeing Program. She has developed, designed, implemented and evaluated peer support programs both within first responder organisations as well as post service programs. She has extensive experience in developing and delivering Mental Health training programs that have trauma-informed practices embedded into the content. Cath is passionate about ensuring support programs for military are contextualised to veteran experiences, while engaging families to participate and develop skills/knowledge of networks to holistically support their military family member.*

*Benjamin Webb is the Centre Manager at the VCSNB. Ben enlisted in the Australian Army in 2001 and was deployed to Afghanistan in 2009/2010. Ben sustained many injuries through his service and was medically discharged in 2013. After undergoing his own rehabilitation, Ben has been actively working to professionalise the veteran community; providing timely and effective support to current and former servicemen, servicewomen and their families.*

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## Establishment of Clinical Practice in Remote Locations

**Joanne Carr**<sup>1</sup>

*1 International SOS*

### Abstract

**Introduction:** An increasing number of Health Commands in the US and other allied militaries are turning to the private sector to support remote post's Garrison services, including health care. Some of the challenges for these outposts include the ability to cost effectively deploy and maintain suitable clinical staff, and the requirement for repatriation of patients with injuries or illnesses that are unable to be treated at the local facilities.

**Discussion:** In 2017 the US Army appointed Dynacorp International as the provider of Garrison services on Kwajalein Island, which is situated in the Pacific Ocean and is part of the Republic of the Marshall Islands. Kwajalein Atoll began transitioning from a heavy military presence to a missile defense radar installation approximately 15 years ago. As

a result of the transition, many of the services to maintain the radars and the island were outsourced to US Government contractors.

The US Army found that it was more expensive to run a 12-bed hospital with deployable military medical assets (e.g. physicians and nurses) than to allow the hospital to be Government Owned but Contractor Operated. The US Army has outsourced a number of its non-combat bases in order to focus its limited resources on the critical combat zones and seek efficiencies its non-critical operations.

When Dynacorp took over the Garrison contract in 2017 and needed to partner with a health services provider – they subsequently approached International SOS to manage the health requirements for their contract. International SOS was able to utilise its global resource pool to ensure positions were filled and rotated, ensuring a solid foundation of staff for the island.

On taking over the contract there were several areas in need of improvement, including clinical governance, and ensuring that the medical processes and protocols were updated. International SOS Medical Directors were able to review and provide recommendations for improving the processes and protocols used in the health facilities, ensuring contractual expectations from the US Government were met, and improvements instigated by the transition manager on the ground.

The existing process for medical repatriations from the island also needed to be updated. International SOS was able to facilitate improvements to this service through both its relationship with the US Tricare contract and its highly developed Assistance Centre network. The global network of 26 Assistance Centres manages cases from point of notification through to the Aeromedical Evacuation process and ensures that receiving care is coordinated with the appropriate level of clinical information. Air ambulance movements in particular require a high degree of capability and coordination between the aviation, administration, operations, logistics, security and medical elements of an organisation

A central component of the ability to coordinate evacuations or repatriations is ensuring a Medical Evacuation Response Plan (MERP) is in place prior to the event. For Kwajalein, the MERP was implemented as a priority when International SOS took over the contract and was put into practice numerous times in the first twelve months. The MERP is fully controlled and coordinated by Global Assistance Centre network, which operate 24/7/365.

**Conclusion:** US and allied Health Commands are outsourcing some of their non-combat medical

services to private contractors, saving cost and enabling the efficient use of finite resources. Industry partners like International SOS have well established systems, governance structures, and processes in place to maintain remote clinical care in a variety of challenging environments. Utilising this expertise provides a sustainable capability by deploying international-standard medical care from a global network of healthcare specialists.

### Biography:

*Joanne Carr has over three decades of experience in a variety of nursing roles including surgical, paediatric, adult haematology oncology, and primary health care.*

*In 2012 Joanne was part of the initial team working with Border Force and Department of Defence to establish the medical clinic for the Regional Processing Centre in Nauru. This experience extended to providing 24/7 emergency and primary health care for adult and paediatric patients on both Nauru and Manus Island.*

*In January 2018, Joanne was deployed to the Kwajalein Atoll as International SOS' Transition Manager for the US Department of Defence LOGCAP IV contract for Garrison Health Services. She was the lead health specialist for contract transition for services provided by Kwajalein Hospital*

*Following the successful transition on Kwajalein, Joanne then moved on to Georgetown, Guyana as the Health Services Manager for a new project with Exxon. This role included implementation of the International SOS Liza Project Phase 1 medical services. The services in this contract included the primary health care clinic, an ambulance for US expatriates, onshore and offshore retrieval, and medical evacuations.*

*Joanne has extensive experience in coordinating medical evacuations with International SOS Assistance Centres in Australia and the United States.*

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## Health Certification: The Role of Observer Mentors in Preparing Deployable Health Assets for Military Operations

**LTCOL Greg Brown<sup>1</sup>**

*1 3rd Health Support Battalion (Australian Army)*

### Abstract

Initially copied from the United Kingdom's Ministry of Defence long standing Hospital Exercises (HOSPEX), the Australian Army HOSPEX has grown from

humble beginnings involving small teams with niche capabilities to an interdisciplinary team with the ability to span both the land based trauma system and joint spaces.

During this presentation, LTCOL Brown will describe where the 3rd Health Support Battalion's (Health Certification Team) has come from, how the model has changed from 'one-off assessments' to that of using an 'observer-mentor' framework that extends beyond the exercise period, what activities the HCT has conducted (using 2019 as an example), and where the future of health certification lies.

Specific topics will include: the evolution of moulage and training props as tools to strike an efficient yet effective balance between fidelity and immersion; the differences between activities conducted in the integral, close and general spaces; the role of non-clinicians in health certification; and what future developments can be expected within the HCT as the nature of military deployments evolve.

### Biography

*LTCOL Greg Brown NSC is an Australian Army Reserve Nursing Officer with a combined 24 years of accumulated regular and reserve service. He has deployed on a number of occasions and undertaken military exchanges and mentoring activities with both the UK and Malaysian forces.*

*Initially commencing his military career as a Combat Engineer, LTCOL Brown's postings since commissioning include 1st Fd Hosp, 1CSSB, 4RAR (Cdo), 1HSB and HQJOC. He was awarded the Nursing Service Cross for his roles with the ANZAC Field Hospital and the Parachute Surgical Team in Banda Aceh in response to the 2004 Boxing Day Tsunami.*

*A dual emergency and intensive care qualified nurse, Greg's civilian role now sees him as a paramedic and senior manager with the ACT Ambulance Service. He is married with two teenage daughters.*

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## Health Service Use by Post 1975 Veterans with an Accepted Disability of Post-Traumatic Stress Disorder: A Cluster Analysis

**Dr Anna Moffat**<sup>1</sup>, Professor Elizabeth Roughead<sup>1</sup>, Ms Emmae Ramsay<sup>1</sup>, Dr Lisa Kalisch-Ellett<sup>1</sup>, Associate Professor Nicole Pratt<sup>1</sup>

<sup>1</sup> University of South Australia

### Abstract

**Background:** Health service use is likely to vary among veterans with PTSD; however, the extent of variation in care is not known. This study aimed to determine the variation and extent of use of health services by veterans with an accepted disability of PTSD.

**Methods:** The cohort included veterans who served post 1975, were eligible for all DVA funded health services, had PTSD as an accepted disability prior to July 2015, and were alive at the 30th June 2016. Cluster analysis was used to assign veterans to groups based on their use of health services for mental illness or pain. After the clusters were defined, the frequency of use of the following medications and health services was compared across clusters: opioids and other pain medications, antipsychotic medication, antidepressant medication, anxiolytic medication, smoking, alcohol abuse, substance abuse, GP care plans, GP mental health attendances and back pain

**Results:** The cohort comprised 2286 veterans, among which five clusters of health care utilisation were identified. One cluster, representing 14%, had the highest proportion of mental health service use, with an average of 12 psychiatrist claims, 16 GP claims and one hospitalisation for PTSD per year. Two clusters with regular psychiatry claims (4 per year on average) and representing a further 13% of the total cohort, were characterised by frequent (weekly or more) physiotherapy or exercise physiologist claims. The largest cohort was cluster four (43% of cohort). Veterans in cluster four based on their claims, appeared relatively well, seeing their GP quarterly and with only two psychiatrist claims per year on average. Cluster five was the oldest cohort. This cluster had similarly low rates of mental health claims as cluster four but more physical morbidity as identified by medicine use.

**Conclusion:** Our study highlights the heterogeneity in health service use by post-1975 veterans with

an accepted disability of PTSD. These results have important implications for health care planning and resource allocation with significant health utilisation required for up to one-sixth of veterans with PTSD. Results showed the significant role that primary care physicians have in supporting veterans with PTSD.

### Biography

*Dr Anna Moffat has a background in psychology and a career that has focused on projects that partner service delivery and research to improve health outcomes. She has been working with the Veterans' Medicines Advice and Therapeutics Education Services (Veterans' MATES) program at the University of South Australia for over three years.*

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## How does the Achilles Tendon Respond to a Pack March? Exploring the Relationship between Vascularity and Tendon Cross-Sectional Area

LT Harry Roesch<sup>1</sup>

<sup>1</sup> University of South Australia – School of Health Sciences

### Abstract

**Background:** The Achilles tendon (AT) adapts to exercise load over time by increasing in diameter. This results in a stronger and more resilient tendon. Load is essential in maintaining the health and function of the tendon; however, excessive load is a recognised driver for tendon injury. Pack marching is an arduous activity that is quite unique to the military population. Injuries associated with pack marching commonly involve the lower limb and this includes injuries to the AT. Although acute injuries due to slips and falls occur, the majority of injuries to the AT are due to overload resulting in tendinopathy. Achilles tendinopathy is characterised by pain, swelling and reduced function. It can be costly with an adverse impact on combat effectiveness and the time and resources required for optimal rehabilitation. Ultrasound is a diagnostic modality that can detect structural changes and identify the presence of vascularity in the tendon. Although the normal AT is relatively avascular, the clinical interpretation of vascularity findings on

ultrasound in the tendons is controversial. It has been established that the presence of vascularity does not necessarily mean that pain is present, but it does indicate tendon pathology. Therefore, tendinopathy may be present before symptoms are detected. The aim of this study was to explore the vascular behaviour and associated cross-sectional area changes of the normal, asymptomatic Achilles tendon in response to a pack march. An improved understanding of the AT response can aid physical training program design to reduce the likelihood of tendon overload and injury.

**Methods:** Participants (n=22) conducted a 7.7km pack march carrying 35kg on a sealed road in a time of 1 hour 16 minutes (approximately 6kmh<sup>-1</sup>). The cross-sectional area 20mm proximal to the calcaneus (CSA) was recorded the day before the pack march, immediately after the pack march and three days later. Vascularity was also assessed using Doppler at these intervals and recorded as either present or absent.

**Results:** None of the 44 tendons demonstrated vascularity before the pack march. Immediately after the pack March 38 (86%) tendons demonstrated vascularity and three days after the pack march it was still present in 10 (23%) tendons. Immediately after the pack march, the CSA decreased by 2% for the tendons with vascularity and 6.4% without vascularity. The CSA increased by 4.7% in those with vascularity and by 10.2% in those without vascularity three days after the pack march.

**Conclusions:** Although this was a small sample, this study suggests that those tendons with and without vascularity findings at three days post pack march behaved differently following loading with respect to CSA measurements. The CSA change was more rapid in the group without vascularity findings at day three compared to the group with vascularity. Vascularity is recognised as a feature of tendon pathology and it may be inferred that those tendons with vascularity at day three were less adaptable to the pack march load and may require more time to recover. Therefore, are the findings of vascularity at three days after activity an early indicator of tendon pathology not evident at rest (asymptomatic pathology) or is it a normal compensatory mechanism to support the metabolic requirements of the tendon under load?

### Biography

*Lieutenant Harry Roesch is a Physiotherapist and Army Reservist posted to the 3rd Health Support Battalion. He completed a Bachelor of Physiotherapy, Bachelor of Health Sciences (Honours) and Master of Musculoskeletal and Sports Physiotherapy. He has*

*a clinical interest in lower limb tendon injuries and commenced a PhD at the University of South Australia investigating the acute morphological and mechanical responses of the Achilles and posterior tibialis tendons to exercise.*

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### How Urgent is an Urgent Craniotomy in The Deployed Military Context? A Retrospective Observational Study

**Brigadier Michael Reade<sup>1</sup>**

*1 Joint Health Command, Australian Defence Force*

#### Abstract

Current civilian guidelines for the management of traumatic acute subdural and extradural haemorrhage recommend surgery as soon as possible. However, until recently, such guidelines suggested delays of up to four hours were acceptable, based on a single study (Seelig et al, NEJM, 1981) that found a four-hour threshold separated patients who had an excellent neurological recovery from those who died. The four-hour rule guided disposition of neurosurgical assets in coalition military operations in Afghanistan as recently as 2014. However, based on data from 1981, the four-hour rule was of questionable relevance: it was derived in civilian hospitals with mostly blunt trauma in an era that predated widespread CT scanning, effective prehospital resuscitation, and in which palliation was most likely applied at a different threshold given the scarcity of intensive care resources. Of 25 studies published 1968–2018 identified in a systematic review, 19 concluded shorter delays were not associated with better survival or neurological outcome and 6 found delays of <3-5 hours associated with improved outcomes. None examined predominantly penetrating and blast trauma in the military context.

This study (published as Shackelford, del Junco, Reade et al, Neurosurg Focus, 2018), a collaboration between the Australian Defence Force and the United States Military Joint Trauma System, analysed combat casualties recorded in the US Department of Defense Trauma Registry, 2005–2015 who had undergone a craniotomy in a deployed surgical facility

in Iraq or Afghanistan. Post-operative mortality was assessed using Cox proportional hazards modelling, with time to craniotomy considered as quintiles of elapsed time from injury. Time quintiles were dichotomised into early v delayed by defining cut-points at the maximum value of each quintile (i.e. quintile 1 vs 2-5, quintiles 1-2 vs 3-5, etc.). Other confounders considered were location of craniotomy (Role 2 vs Role 3 facility), use of head CT, US military status, age, maximum head Abbreviated Injury Severity, Injury Severity Score (ISS) and year of injury.

Complete data was available for 213 patients, whose mean age was 25 years, 45% of whom were wounded by explosives / 39% gunshot, and who had a median ISS of 25. Median (IQR) time to craniotomy was 265 (165–510) minutes. Few patients (14%) died in hospital, but the median (IQR) discharge GCS was 9 (3–15). Mortality was significantly lower when the time to craniotomy was within 5.33 hours of injury (quintiles 1–3) relative to longer delays (quintiles 4–5), adjusted hazard ratio=0.28, 95% CI=0.10–0.76, P=0.012. No other time threshold showed a significant difference in adjusted mortality.

The results of this study do not validate the four-hour rule in a military penetrating trauma population, as there is insufficient data to evaluate whether even more rapid access to surgery would have had mortality benefit, or whether functional neurological outcomes might have been improved. Further, the study evaluates only the 'average' patient, not individuals who might have a particular requirement for early surgery. However, the study is the best available evidence that 5.33 hours should not be exceeded, as (on average) mortality is significantly increased when this occurs. For military neurotrauma, 5.33 hours is therefore the planning limit, not the goal, of the trauma system. Most published audits of civilian trauma systems do not meet this benchmark.

#### Biography

*Professor Reade is an intensive care physician and anaesthetist in the Australian Defence Force, since 2011 seconded to the University of Queensland as the inaugural Professor of Military Medicine and Surgery. From 2015–2018, he was the Director of Clinical Services the Regular Army's only field hospital and has deployed nine times, including twice to Afghanistan and three times to Iraq. He now holds the rank of Brigadier, with appointments as Director General Health Reserve – Army and Assistant Surgeon-General – Army. His research interests are trauma systems design, fluid resuscitation in trauma and coagulopathy.*

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## 'In the Midst of Chaos, there is also Opportunity.' A Review of Military Veterans Use of Complementary and Alternative Medicine

**Maj Brendan Wood**<sup>1</sup>

*1 Auckland University of Technology (AUT)*

### Abstract

**Introduction:** The chaos in which we find ourselves in the 'midst' of, is the devastating effects of the 'signature wounds' experienced by veterans of contemporary operations. The wars in Iraq and Afghanistan have produced hundreds of thousands of military veterans suffering from psychological and physical injuries. High rates of post-traumatic stress disorder (PTSD) and chronic pain have led many to explore Complementary and Alternative Medicine (CAM) health measures. Veterans seek alternative management strategies for chronic pain and PTSD with many turning to CAM as an adjunct to conventional treatment and as a means to overcome the traditional pharmacological intervention as well as gaining self-management of their conditions. This is leading to an increasing interest in CAM and the need for improved access to CAM modalities within the veterans and military health systems to decrease symptoms and improve the lives of veterans suffering from the 'wounds of war'.

**Methodology:** A review of the literature by electronic searches of EBSCO CINAHL and MEDLINE within the Auckland University of Technology (AUT) library electronic databases was conducted. Keywords included 'military medicine' AND 'complementary medicine' OR 'alternative medicine' OR 'complementary AND alternative medicine'. The application of pre-determined inclusion and exclusion criteria was included.

A date limitation of ten years, 2008–2018 was applied. I was only able to review articles published in English and required articles to have full text available.

An exclusion of single conditions or specific therapies was also applied which reduced the initial pool by five. Seventeen articles met the inclusion criteria.

Thirteen quantitative studies, only two articles came from qualitative studies, a journal editorial and government report from 2017 were also included.

The qualitative studies included observational studies, systematic literature reviews, clinical trials synthesis and CAM user's population surveys.

While no geographical restriction was applied, all articles found were based in the United States of America, which is, of course, appropriate as the largest populations of veterans are identified there.

**Results:** There is little evidence of research into CAM use by veterans in Australasia. Some veterans experience a level of dissatisfaction with the care they receive in the traditional health care model. Veteran's desire to attain a level of self-management and a reduction in pharmacological intervention by the inclusion of CAM therapies in their treatment. The lack of a global definition and a definitive list of CAM interventions prevents cross evaluation of the available research.

Over 200 systematic reviews of CAM found the methodological quality of many Randomised Control Trials (RTC) was rated as being poorly constructed. Although RCTs remain the gold standard of evidence in western medicine, the application of RTC in CAM ignores the qualitative outcome in the improvement of general wellbeing for military veterans.

While a plethora of quantitative studies on the demographics of CAM use is available, there is little qualitative research, which articulates veterans' experiences of CAM use and satisfaction. The emergence of a significant population of injured veterans with chronic pain and PTSD has not been mirrored with the availability of validated alternative treatment options that satisfy the desire for complementary or alternative treatments.

**Conclusion:** Can the incorporation of CAM therapies provide the compassionate aspect of patient care that is sometimes missing in today's medicine? The desire to categorise CAM therapies within a western medical framework may be hindering veterans' ability to access to CAM to address a desire of more self-management of the chronic and lasting effect of combat trauma. It will take reflection, moral courage and empathy to transform the current situation into one of a holistic approach to the whole being. Our long-suffering heroes deserve nothing less.

### Biography

*Major Brendan Wood has been engaged in the delivery of emergency ambulance services and the training and development of health and military leaders at an operational and strategic level for over 35 years.*

Between 2015 and 2014, he undertook a period of Regular Force engagement with the New Zealand Army. Concluding with an appointment as the Chief Instructor of the Defence Health School. He has served in the New Zealand Defence Force (NZDF) for over 30 years and is a Major in the RNZAMC. He completed operational deployments and eight years Regular Force service.

Brendan is currently employed by the Auckland University of Technology (AUT) as a Senior Lecturer and Military Programme leader. He practices as a paramedic and volunteer with St John, New Zealand and is an appointed member of the St John National Clinical Governance committee. He is a Commander of the Order of St John (CSt.J) and hold the New Zealand Distinguished Service Decoration (DSD).

Brendan currently holds a Bachelor of Health Science in Paramedicine; Post Graduate Certificate in Education; Certificate in Tertiary Teaching; Graduate Certificate in Emergency Management and a Post Graduate Diploma in Health Science.

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### Imaging a Military Working Dog in a Field Hospital

LTCOL James Nol<sup>1</sup>

<sup>1</sup> Hq 17 Bde

#### Abstract

Military Working Dogs provide unique capabilities in the theatre of war. With the Global War on Terrorism, it is their ability in detecting improvised explosive devices, which has seen their number and scope of their missions expanded.

Military Working Dogs perform duties such as vehicle and building checks, route and minefield clearing, cache sweeps, crowd control and cordon searches. Often, the scale of a particular theatre of war means conventional veterinary support may or may not be readily available to the soldier's best friend. As such, situations in which medical treatment would have to come from the handler or medical providers are likely. Therefore, it is important for military medical clinicians especially Radiographers to have an understanding of emergent medical conditions and

the best protocols to provide best diagnostic outcome required to identify the best clinical pathway for the veterinary patient.

A HQ 17 Brigade project lead and researched by LTCOL Nol has setup the scope for a new clinical to provide diagnostic Imaging Support for Military Working Dogs in a field hospital, setting guidelines for best imaging practice, X-ray positioning and views for common medical conditions expected in a battlefield and protocols for anaesthetic restraints.

This presentation will convey lessons learnt from the implementation of the project at Talisman Sabre 2019 and outlay the procedure guidelines and outcomes.

#### Biography

LTCOL James Nol – HQ 17 Bde; A/Prof Advanced Imaging, School of Medicine, Western Sydney University; Operations Director Medical Imaging – Blacktown / Mt Druitt Hospitals NSW. Founder, Developer and Coordinator of the Postgraduate Master's Degree – Advanced Imaging – MRI; School of Medicine, Western Sydney University.

Education: Medical Radiation Practice, Medicine, Radiology, Radiobiology, Master of Public Health, PhD.

Awards: NSW Health Baxter's Quality Awards 2004, and Finalist of three quality and innovation projects; the latest award was on for Introducing MR Screening as a Frontline Diagnostic Tool in Sep 18. Winner of the WSLHD Chief Executive Innovation Award 2018

Presentations: Presented at Trauma 2006 and other conferences including RANZCR, ASMIRT and other National and International conferences. Guest Speaker at the 2015 Health Round Table, 2nd Digital Conference Sydney 2016, New Zealand Medical Imaging Conference 2017, and Australian Biomedical Engineering Conference 2018.

Innovations: Creator of Open Access, Radiology Reporting on Demand, X-ray Paper Printing in Australia and multiskilling programs for Medical Radiation Practitioners.

Current Project: Originator of the MR Screening Concept.

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### Investigating the Utility of Mental Health First Aid Training for Families Supporting an Ex-service Personnel with a Mental Health Condition

**Dr Justine Evans**<sup>1</sup>, Dr Madeline Romaniuk<sup>1</sup>,  
Ms Rebecca Theal<sup>1</sup>

*1 Gallipoli Medical Research Foundation*

#### Abstract

A concerning proportion of Australian Veterans experience mental health problems, including depression, substance use disorder and post-traumatic stress disorder (PTSD). These conditions can have negative effects across the family system, including spouses, children and parents. Families of veterans may take on a carer role, which can lead to an increased likelihood of developing mental health conditions themselves. Mental Health First Aid (MHFA) is a 2-day, 12-hour training program designed to teach participants about general mental health, chronic psychological conditions, behavioural warning signs of distress, and provides information on referring to focused mental health services. To date there have been no published studies examining the utility of delivering MHFA training to family members of veterans.

A pilot study run by the Gallipoli Medical Research Foundation aimed to determine whether the completion of MHFA training would lead to changes in mental health literacy, social distancing attitudes towards mental illness, stigmatising attitudes towards mental illness, as well as carer distress and burnout, in family members of veterans. The study utilised a non-controlled, longitudinal repeated measures design, with measurement of outcomes at three time points (pre-intervention, post-intervention and three-month follow up).

The presentation will report on the findings of this study evaluating the outcomes of taking part in a MHFA workshop for family members of veterans. There will also be discussion regarding the feasibility of implementing this training with family members of veterans

#### Biography

*Dr Justine Evans is a Clinical Psychologist who currently works as a Research Officer at Gallipoli Medical Research Foundation (GMRF). She completed a Bachelor of Behavioural Science and a Bachelor of Criminology and Criminal Justice and went*

*on to complete a Doctor of Philosophy in Clinical Psychology. Since 2014, Justine worked at the Greenslopes Private Hospital, Keith Payne Unit (KPU), providing individual and group clinical psychology assessment and intervention to patients with Post Traumatic Stress Disorder (PTSD) and associated comorbidities. In 2016, she was part of the Keith Payne Unit (KPU) multidisciplinary team that was awarded a grant to conduct a pilot study examining the efficacy of Cognitive Processing Therapy as an individual treatment approach within the hospital's Trauma Recovery program. She is currently the Principal Investigator on a three-year DVA funded randomised control trial examining the effectiveness of group based CBT-I and IRT for the treatment of PTSD and Insomnia in Veterans. Dr Evans has presented research on the topics of trauma and PTSD at national and international conferences.*

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### Longitudinal ADF Study Evaluating Resilience: History, Methodology, Highlights and Lessons Learnt

**Ms Carolina Casetta**<sup>1</sup>, **Dr Lisa Dell**<sup>2</sup>

*1 Department of Defence*

*2 Phoenix Australia – Australian Centre for Posttraumatic Mental Health*

#### Abstract

Joint Health Command (JHC), on behalf of the Australian Defence Force (ADF), has conducted the Longitudinal ADF Study Evaluating Resilience (LASER-Resilience) since 2009, in collaboration with Phoenix Australia: Centre for Posttraumatic Mental Health. The LASER-Resilience program of research has been a longitudinal study of the psychological and environmental factors that contribute to or erode the resilience of ADF members. Data was collected upon enlistment or early in training, for members who enlisted between Nov 2009 and Dec 2012. Individuals were followed up over five time points in their early career, resulting in an analytic sample of over 5 000 individuals. Presentation 1 of the LASER-Resilience symposium will introduce the methodology of the project, the context in which the study was initiated and will highlight the significant commitment the Department of Defence and Phoenix Australia have made in exploring the resilience of

ADF members. This presentation will provide context for the nine reports produced for LASER-Resilience, the results of which will be discussed in more detail over Presentations 2 and 3 of this symposium. This symposium will also discuss project highlights, lessons learnt and challenges of conducting a longitudinal study in the ADF context.

### Biographies

*Ms Carolina Casetta is a Registered Psychologist and the Senior Research Officer in the Mental Health Research and Evaluation Team within Joint Health Command. Ms Casetta has extensive experience in managing and conducting strategic research in the ADF context and was awarded an Australia Day Medal for her work as the Defence lead on the Longitudinal ADF Study Evaluating Resilience (LASER-Resilience). She has provided significant technical and research project management expertise on numerous ADF mental health research projects, including the Transition and Wellbeing Research Programme and the translation of relevant research findings.*

*Dr Lisa Dell is a Senior Research Fellow in the Department of Psychiatry at the University of Melbourne. Lisa has a background in psychology and completed her PhD in the area of workplace stress and emotional intelligence. Lisa specialises in working with military and high-risk industries, with over 15 years' experience in leading research and evaluation projects in this area. Of note, Lisa has contributed extensively to the Australian Guidelines for the Treatment of Acute Stress Disorder and Posttraumatic Stress Disorder, the evaluation of Department of Veterans' Affairs (DVA) Mental Health Initiatives, and DVA's Scientific Health and Wellbeing Evidence Schema research project. Lisa currently leads the Longitudinal ADF Study Evaluating Resilience, the National Health and Medical Research Council partnership grant study of Intensive Prolonged Exposure therapy, the international consortium developing an outcome scale for moral injury, and an evaluation into a national suicide prevention program.*

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## LASER-Resilience Patterns and Predictors of Wellbeing Report: Identification of Mental Health Trajectories in Early Military Career and Their Contributors

**Ms Carolina Casetta<sup>1</sup>, Dr Lisa Dell<sup>2</sup>**

*1 Department of Defence*

*2 Phoenix Australia – Centre for Posttraumatic Mental Health*

### Abstract

The ADF Joint Health Command have commissioned Phoenix Australia to produce nine reports based on LASER-Resilience data, seven of which have been presented in detail at previous AMMA conferences. This presentation will focus on the eighth report, 'Patterns and Predictors of Wellbeing', which was the first LASER-Resilience report to utilise data from all five time points. Through latent class growth analysis Phoenix Australia were able to identify the different trajectories (profiles) that participants had in terms of psychological distress, posttraumatic distress, anger and sleep impairment. Further analysis investigated which situational and individual factors contributed to individuals belonging to certain trajectories in these psychological outcomes. The factors investigated included exposure to potentially traumatic events, coping and adjustment style and physical health (e.g. sleep and alcohol consumption). This presentation will discuss the outcomes of these analyses in detail. The implications of this report will be discussed in Presentation 3 of this symposium, along with the implications from the entire research program.

### Biographies

*Dr Lisa Dell is a Senior Research Fellow in the Department of Psychiatry at the University of Melbourne. Lisa has a background in psychology and completed her PhD in the area of workplace stress and emotional intelligence. Lisa specialises in working with military and high-risk industries, with over 15 years' experience in leading research and evaluation projects in this area. Of note, Lisa has contributed extensively to the Australian Guidelines for the Treatment of Acute Stress Disorder and Posttraumatic Stress Disorder, the evaluation of Department of Veterans' Affairs (DVA) Mental Health Initiatives, and DVA's Scientific Health and Wellbeing Evidence Schema research project. Lisa currently leads the Longitudinal ADF Study Evaluating Resilience, the National Health and Medical Research Council partnership grant*

*study of Intensive Prolonged Exposure therapy, the international consortium developing an outcome scale for moral injury, and an evaluation into a national suicide prevention program.*

Ms Carolina Casetta is a Registered Psychologist and the Senior Research Officer in the Mental Health Research and Evaluation Team within Joint Health Command. Ms Casetta has extensive experience in managing and conducting strategic research in the ADF context and was awarded an Australia Day Medal for her work as the Defence lead. She has provided significant technical and research project management expertise on numerous ADF mental health research projects, including the Transition and Wellbeing Research Programme and the translation of relevant research findings.

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### The LASER-Resilience Summary Report: Key Findings and Themes from a Ten-Year Research Program Evaluating Resilience in Early Military Career

**Ms Carolina Casetta<sup>1</sup>, Dr Lisa Dell<sup>2</sup>**

<sup>1</sup> Department of Defence

<sup>2</sup> Phoenix Australia – Centre for Posttraumatic Mental Health

#### Abstract

The final presentation of this LASER-Resilience symposium will discuss the ninth and final report that JHC has commissioned Phoenix Australia to produce for LASER-Resilience: the 'LASER-Resilience Summary Report'. This report summarised the key findings from the previous eight reports and consolidated these findings into eight major themes, which emerged consistently across the entire program of research. This presentation will describe these themes in detail, their relevant implications and how these themes align with the existing Defence

Mental Health and Wellbeing Strategy (2018–2023) and relevant training, programs and initiatives. This presentation will also discuss the status of the Translation and Knowledge Transfer of these results to enable application and potential improvement to relevant policy, trainings, programs and practice.

#### Biographies

Ms Carolina Casetta is a Registered Psychologist and the Senior Research Officer in the Mental Health Research and Evaluation Team within Joint Health Command. Ms Casetta has extensive experience in managing and conducting strategic research in the ADF context and was awarded an Australia Day Medal for her work as the Defence lead on the Longitudinal ADF Study Evaluating Resilience (LASER-Resilience). She has provided significant technical and research project management expertise on numerous ADF mental health research projects, including the Transition and Wellbeing Research Programme and the translation of relevant research findings.

Dr Lisa Dell is a Senior Research Fellow in the Department of Psychiatry at the University of Melbourne. Lisa has a background in psychology and completed her PhD in the area of workplace stress and emotional intelligence. Lisa specialises in working with military and high-risk industries, with over 15 years' experience in leading research and evaluation projects in this area. Of note, Lisa has contributed extensively to the Australian Guidelines for the Treatment of Acute Stress Disorder and Posttraumatic Stress Disorder; the evaluation of Department of Veterans' Affairs (DVA) Mental Health Initiatives, and DVA's Scientific Health and Wellbeing Evidence Schema research project. Lisa currently leads the Longitudinal ADF Study Evaluating Resilience, the National Health and Medical Research Council partnership grant study of Intensive Prolonged Exposure therapy, the international consortium developing an outcome scale for moral injury, and an evaluation into a national suicide prevention program.

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## Longitudinal Physical and Psychological Health in Military Service

**Dr Helen Kelsall**<sup>1</sup>, Dr Jing Xie<sup>1</sup>, Professor Andrew Forbes<sup>1</sup>, Professor Alexander McFarlane<sup>2</sup>, Professor Malcolm Sim<sup>1</sup>

<sup>1</sup> Department of Epidemiology and Preventive Medicine, Monash University

<sup>2</sup> Centre for Traumatic Stress Studies, University of Adelaide

### Abstract

**Background:** Recognition is emerging of important comorbidities and long-term relationships between physical and psychological health in military and veteran populations. The aim was to investigate the longitudinal relationships between physical disorders (musculoskeletal disorders (MSD), multi-symptom illness (MSI)) and psychological disorders.

**Methods:** A cohort of 1990–1991 Gulf War veterans and a randomly sampled military comparison group of Australian Defence Force personnel who were in operational service at the time of the Gulf War but not deployed to that conflict was assessed at Wave 1 (2000–2002) and Wave 2 (2011–2012). All Wave 1 participants, excluding those reportedly deceased, those who declined further follow up and those with no valid mailing address (n=2779), were invited to participate at Wave 2. At both waves, a postal questionnaire asked about military service and demographic characteristics, any reported doctor-diagnosed or treated MSD, symptoms, the post-traumatic stress disorder (PTSD) Checklist (PCL), and Alcohol Use Disorder Identification Test (AUDIT). A modified Centers for Disease Control definition was used to define MSI. The Composite International Diagnostic Interview (CIDI v.2.1) assessed psychological disorders in the past 12 months using DSM-IV criteria. Incident cases of physical disorders and psychological disorders were defined as participants who did not meet criteria for a health outcome at Wave 1 but met these criteria at Wave 2. We used multivariable Poisson regression to assess the bidirectional associations between physical and psychological disorders.

**Results:** Overall participation at Wave 2 was 1390/2779 (50.0%); 99.8% completed a health questionnaire including 1356 male participants who were included in these analyses.

The adjusted incident rate ratio (IRR) for any reported MSD at Wave 2 was higher for those with, compared to those without, CIDI-defined 12-month

major depression 1.7 (95% CI 1.1–2.6) at Wave 1. The adjusted IRR for any reported MSD at Wave 2 was not significantly different for those with, compared to those without, PTSD or alcohol dependence/abuse, at Wave 1. The adjusted IRR of incident alcohol dependence/abuse 2.40 (1.4–4.2) at Wave 2 was higher for those with, compared to those without, any MSD at Wave 1. The adjusted IRR of incident PTSD or major depression at Wave 2 was not significantly different for those with, compared to those without, any MSD at Wave 1.

The adjusted IRR of MSI at Wave 2 was higher for those with, compared to those without, CIDI-defined 12 month PTSD IRR 3.3 (1.8–6.0), major depression 2.1 (1.3–3.5) and alcohol dependence/abuse 1.8 (1.0–3.3), at Wave 1. The adjusted IRR of incident PTSD 3.7 (2.2–6.3), major depression 2.0 (1.2–3.2), and alcohol dependence/abuse 2.1 (1.1–3.8) at Wave 2 were increased for those with, compared to those without, MSI at Wave 1.

**Conclusions:** Longitudinally, major depression was found to be a risk factor for the development of any MSD and having any MSD was a risk factor for the development of alcohol/dependence abuse. Psychological disorders, in particular PTSD and depression, were found to be a risk factor for the development of MSI and the presence of MSI was a risk factor for the development of psychological disorders, in particular PTSD and depression. These findings highlight important longitudinal physical and psychological associations in this 1990–1991 Gulf War era military cohort, which have important implications for longer-term health and for prevention, treatment and management of these conditions.

### Biography

*Dr Helen Kelsall is a public health physician / epidemiologist and a Senior Research Fellow in the Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University.*

*Helen has been active in veterans' health research for over 15 years and undertook her PhD in this field. She was a lead investigator on the Australian Gulf War Veterans' Cohort Study, and on other collaborative studies investigating physical, psychological and social health and wellbeing in military and veteran populations. She was Lead Investigator together with Prof Malcolm Sim on the Physical Health Status Report of the Transition and Wellbeing Research Programme and an Investigator on the Impact of Combat Study. Her research also includes exposure, risk factor and health outcome assessment in other occupational*

groups, including long-term injured workers. Helen is a member of the Editorial Board and a Sub-Editor on the *Journal of Military and Veterans' Health*.

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### Malaria and Vector Borne Diseases Surveillance in Papua New Guinea Defence Force Personnel and their Families at PNG Military Facilities

**LTCOL Alyson Auliff<sup>1</sup>**, LTCOL Peter Kaminief<sup>2</sup>

<sup>1</sup> ADF Malaria And Infectious Disease Institute

<sup>2</sup> Health Services, Papua New Guinea Defence Force

#### Abstract

Maintaining the health of Defence personnel in the tropics is an important challenge especially in areas with intense malaria and other vector-borne disease transmission. Of concern to both the Papua New Guinea Defence Force (PNGDF) and the Australian Defence Force (ADF) is the unknown incidence and transmission of vector-borne diseases (VBD) such as malaria, arboviruses, scrub typhus and filariasis in PNGDF deployment and training areas. Through a collaborative operational research approach between PNGDF and ADF a baseline epidemiological survey was conducted between Mar and Apr 2019 at Lombrum Naval Base, Manus Island and Moem Barracks plus outposts in Wewak, PNG to ascertain the prevalence, exposure rate and infection risk of malaria and VBD in PNGDF personnel and their families at these military establishments. The study includes a local insect vectors survey and a cross-sectional survey for malaria and other causes of febrile illness and G6PD deficiency rates using rapid diagnostic tests, microscopy, PCR and serological methods. The VBD epidemiological survey findings will reveal the malaria, VBD and G6PD deficiency status in the military facilities, and inform the availability, implementation and effectiveness of diagnostic, prevention and treatment policies and tools. Specific findings of the survey including the prevalence of symptomatic and asymptomatic malaria, and G6PD deficiency rates in PNGDF personnel and their families, as well as main vectors at these locations will be presented.

#### Biography

LTCOL Alyson Auliff is the Commanding Officer of the Australian Defence Force Malaria and Infectious Disease Institute. She has a PhD in molecular parasitology that was focused on determining the genes responsible for drug resistance in *Plasmodium vivax* malaria. Her international health engagement experience has been on malaria and vector-borne disease surveillance studies in East Timor, Indonesia, Papua New Guinea, Solomon Islands, Vanuatu and Vietnam. She has received a Fulbright and Chief of Army scholarship and is currently seconded part time to the Department of Foreign Affairs and Trade IndoPacific Centre for Health Security.

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### Medical Imaging Moving Towards a New Paradigm

**LTCOL James Nol<sup>1</sup>**

<sup>1</sup> Hq 17 Bde

#### Abstract

In the 1930s, X-ray Tomography emerged as the 'golden diagnostic tool' in medical imaging. It took 37 years for the technology to become computerised, and the first prototype of Computed Tomography (CT) developed in 1967. In the 1980s mass production of CT scanners started, and CT quickly became the new golden diagnostic tool. Since then, dependence on CT technology has increased dramatically, with more than 5 million CT examinations performed in Australia in 2018.

CT has developed significantly since the 1980s to become faster and employ lower radiation. However, other powerful imaging techniques completely avoiding the use of ionising radiation have continued to develop. Ultrasound and Medical Resonance Imaging (MRI) have emerged and matured, with MRI now leading the way as the newest and most promising technique for ionising-radiation-free medical imaging.

Many diagnoses previously regarded as the exclusive domain of CT are now much better assessed using ultrasound or MRI. Since 2017, a NSW Health facility in Western Sydney has demonstrated that the diagnostic confidence of MRI overtakes CT by 90% for stroke and is equal or higher in confidence for

assessment of abdominal organs, appendicitis and for all musculoskeletal and neurology imaging.

Radiobiology and epidemiological studies have proven that in cases where the sensitivity of CT scan is low, the risks are much higher than the benefits. MRI and ultrasound do not have this limitation.

The National Cancer Institute and the Food & Drug Administration of the USA clearly indicates that there is a risk of developing fatal cancers in 1/2000 exposures to CT scans. That is not counting the ionisation of human cells that developed non-fatal cancers, chronic disease and the early onset of dementia. An Australian study conducted at Melbourne University studied 11 million records of Australians aged 19 years and younger, and found that Australians who received CT scans developed 24% more cancers than those who did not receive a CT scan. This percentage rate increased by 16% for every additional CT scan.

In 2009, The MAYO Clinic has estimated that in the USA, 29 000 future cancers (approximately 2% of the cancers diagnosed annually in the United States) could be related to CT use.

If ionising radiation is not the answer, where do we go from here? What will be the impact on the ADF, especially where MRI is not an easily deployable capability?

This presentation will convey the outcomes of an analytical study of capabilities required in a field hospital in comparison to the requirements in garrison, and outlay the different possible pathways for future consideration.

### Biography

*LTCOL James Nol – HQ 17 Bde; A/Prof Advanced Imaging, School of Medicine, Western Sydney University; Operations Director Medical Imaging – Blacktown / Mt Druitt Hospitals NSW. Founder, Developer and Coordinator of the Postgraduate Master's Degree – Advanced Imaging – MRI; School of Medicine, Western Sydney University.*

*Education: Medical Radiation Practice, Medicine, Radiology, Radiobiology, Master of Public Health, PhD.*

*Awards: NSW Health Baxter's Quality Awards 2004, and Finalist of three quality and innovation projects; the latest award was on for Introducing MR Screening as a Frontline Diagnostic Tool in Sep 18. Winner of the WSLHD Chief Executive Innovation Award 2018*

*Presentations: Presented at Trauma 2006 and other conferences including RANZCR, ASMIRT and other National and International conferences. Guest*

*Speaker at the 2015 Health Round Table, 2nd Digital Conference Sydney 2016, New Zealand Medical Imaging Conference 2017, and Australian Biomedical Engineering Conference 2018.*

*Innovations: Creator of Open Access, Radiology Reporting on Demand, X-ray Paper Printing in Australia and multiskilling programs for Medical Radiation Practitioners.*

*Current Project: Originator of the MR Screening Concept.*

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## Military to Civilian Transition: Theoretical and Practical Challenges in Optimising and Measuring Wellbeing, Growth and Adaptation

**Dr Paula Dabovich<sup>1</sup>, Dr Harold Kudler<sup>2</sup>, CMDR Iain Beck<sup>3</sup>, Dr Julie Coulthard<sup>4</sup>**

*1 The Australian Army, The University of Adelaide*

*2 Duke University Medical Centre, Department of Psychiatry and Behavioural Sciences*

*3 Canadian Armed Forces Transition Group, 4Defence Research and Development Canada*

### Abstract

Centuries of practical experience inform the training of civilians to become effective military members but less is known about how to enable a warrior's transition and re-integration to civil society. Current transition programs focus on veteran-specific benefits and services and post-military educational and career opportunities. Recently, Wounded Warrior programs have been launched which focus on physical and mental health challenges and moral injury. Despite the combined efforts of military leadership, medical experts, chaplains, family programs, national and state/province programs and non-governmental Veterans Service Organisations, transition out of the military can feel more like walking a plank rather than crossing a sturdy bridge. Absent is a coherent theory to guide transition for veterans and their families. This session brings together the conceptualisations of leaders in military and veterans' programs of Canada, Australia and the United States to offer new directions in optimising transition and measuring their efficacy. They conceptualise transition as a developmental challenge and opportunity which

demands examination and negotiation of core values developed in the course of military service (from group to self-directed priorities), and measures success in terms of wellbeing and adaptation rather than the mere presence or absence of symptoms or diagnoses. Significant time will be allotted for interaction with the audience.

### Biography

*Dr Paula Dabovich is an officer in the Australian Army Medical Corps, Adjunct Senior Lecturer with the School of Public Health, and Visiting Fellow with the Centre for Traumatic Stress Studies at the University of Adelaide. After completing her PhD in examining the experiences of those undergoing rehabilitation and transition from the Australian Army, she continues to work in support of those peripheral yet integral (or once integral) to the military's fighting force: families, veterans and those in rehabilitation and transition from the military. Dr Dabovich has a strong interest in the ways medicine and the military have historically shaped leading developmental theories and how these have further informed major public health advances over the past 100 years. She is a graduate of the Royal Military College Duntroon, a member of South Australia's Veteran and Veteran Health Advisory Councils, as well as the National Centre for Veterans' Health Advisory Council, New South Wales.*

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## Mitigating the Risk of Flying-Related Neck Pain – The RAAF 'Fighter Fit' Program

**WGCDR Carlos Almenara**<sup>1</sup>

<sup>1</sup> RAAF - HQAC

### Abstract

**Introduction:** A report on the prevalence of neck and back pain in fast jet aircrew by the Royal Australian Air Force (RAAF) Institute of Aviation Medicine (IAM) identified the risk of musculoskeletal injury (MSKI) in fast jet aircrew as High. The RAAF Air Combat Group (ACG) tasked a steering group to implement mitigation strategies to reduce this risk so far as reasonably practicable. The ACG Fighter Fit program was developed with the purpose of adapting best available sports-science strategies to the fast jet MSKI problem.

**Methods:** The RAAF has implemented a proactive risk-mitigation strategy for fast jet aircrew musculoskeletal injury (MSKI) based on the elite athlete model. Through collaboration with various academic organisations, RAAF has drawn on best available sports-science evidence to design and implement a program targeting pre-injury intervention and management strategies. Research partnerships have been established with IAM, the NATO Aircrew Neck Pain Working Group, University of Canberra, ADF Defence Science and Technology Group, and other local partners. Based on scientific recommendations, drawn primarily from parallel fields in elite sports, the RAAF MSKI project team has developed tools for communicating the science-based strategy elements to operational leaders (such as the Injury Prevention Spectrum), and applied key design principles in contextualising the scientific advice to operational needs. This operational approach, and a focus on organisational responsibility for workforce compliance with the mitigation strategies, set this program apart from previous efforts.

**Results:** While implementation and validation efforts continue, the ACG Fighter Fit program has produced positive early trends, with an observed 64% reduction in the average duration of time loss injuries, and 53% reduction in the occurrence of time loss injuries. Importantly, a 600% increase in aircrew initial reports to clinicians indicates an important cultural shift.

**Conclusions:** ACG Fighter Fit strategies appear to be providing some positive early observations. The first interpretation of these observations is that there is a strong trend in the right direction as far as length of time lost per injury, and number of injuries, despite a 6-fold (or 600%) increase in the rate of reporting/presentation to medical staff. The second interpretation is that this increased rate of reporting implies a big cultural shift towards trust/acceptance of the program. A systematic risk management process best on best available evidence and recommendations, with design principles to contextualise the science to the operational and individual needs, have been a key factor in the success to date.

### Biography

*WGCDR Almenara is a fighter pilot and flying instructor with operational experience in the F/A-18 Hornet. He has extensive experience in flying instruction, particularly in the Introductory Fighter Course syllabus on the Hawk-127 aircraft. He has instructed both in Australia and in the UK on exchange with the RAF. He commenced an injury prevention program for trainee fighter pilots, while the Executive*

Officer at 76SQN, RAAF Williamtown, and later established the Air Combat Group Fighter Fit program as the Executive Officer of 78 Wing. He is currently posted to the Headquarters Air Command A9 (Safety) Directorate as Deputy Director Human Performance.

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### Moral Injury within the RAAF and the Role of Chaplains: Exploratory Findings

**Rev. Dr Chaplain (WGCDR) Lindsay Carey<sup>1</sup>**

**Rev. Chaplain (SQNLDR) Timothy Hodgson<sup>1</sup>**

*1 ADF – Joint Health Command*

#### Abstract

Moral injury (MI) is gaining greater recognition as a trauma related syndrome that can be multifaceted involving physical, psychological, social and existential/spiritual symptoms (Jinkerson, 2016, Carey, et al, 2016). It is believed to be caused by significant moral dissonance following perceived violations of deeply held moral beliefs by oneself or betrayal by trusted individuals (Shay, 2002; Litz et al, 2009; Hodgson & Carey, 2017). This paper will present an initial study into moral injury and preliminary research findings gained from currently serving RAAF veterans. The research approved by the University of Queensland and the Australian Defence Force Human Research Ethics Committee (ADHREC), with the assistance of La Trobe University, sought to identify if any evidence exists of MI within the Australian military context by collecting, documenting and analysing self-reported data obtained from deployed RAAF personnel. A 'Modified Military Moral Injury Questionnaire' (M3IQ) was developed based on previously validated MI scales to consider any evidence of potential moral injury. The overall findings indicate that a number of RAAF military personnel have been exposed to, or involved in, a potentially morally injurious event (PMIE) of one type or another, and some remain troubled by their experience post-deployment due to experiencing one or more morally injurious events (MIEs). This research also sought to consider the potential rehabilitation and recovery role of military chaplains in conjunction with other health care personnel for addressing MI as a community public health issue (Carey & Hodgson, 2018; Carey et al, 2018). Finally, recommendations are provided for the development of a pastoral restorative model to help facilitate the rehabilitation of military personnel who may be suffering moral injury.

#### Biographies

Dr Lindsay Carey, MAppSc, PhD, is Head of Public Health and Health Promotion Disciplines and Senior Research-Fellow with the Palliative Care Unit, School of Psychology and Public Health, La Trobe University, Melbourne. Dr Carey served as RAAFSR Chaplain at Laverton (2001–2017), undertaking attachments at Wagga Wagga, East Sale and Butterworth. He is currently Senior Chaplaincy Research Advisor to Joint Health Command (2018–). He has previously served as Research-Fellow for 'Caring for Caregivers' (Victoria), the RACGP Evaluation Program (Victoria), plus Chaplaincy-Researcher Northern General Hospital Sheffield (UK) and National Research-Fellow with the Australian Health & Welfare Chaplains Association (now 'Spiritual Care Australia'). He is an Honorary Scholar, Duke University (US), and Life Member of 'Spiritual Care Australia'. In 2018, he was acknowledged in the Australian Research Report as 'National Field Leader' for his research into religion and public health.

Rev. Tim Hodgson, MTh, MIntSecStud, has served as a Specialist Reserve Chaplain and Permanent Air Force Chaplain for a total of twelve years, with deployments to the Middle East and Timor-Leste. He is currently the Executive Officer of Uniting Care, South Australia, while also undertaking his doctorate in Moral Injury with the Department of Religious Studies, University of Queensland, St. Lucia, Queensland.

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### Navy Employability and Deployability 1996–2019: What's going on?

**Dr Neil Westphalen<sup>1</sup>**

*1 RAN Reserve*

#### Abstract

This presentation briefly compares the employability and deployability of Navy personnel as of 30 June 1996 with that as of 31 March 2019, with questions for the audience to follow.

#### Biography

Dr Neil Westphalen graduated from Adelaide University in 1985 and joined the RAN in 1987. He

is an RAN Staff Course graduate and a Fellow of the Royal Australian College of General Practitioners, the Australasian Faculty of Occupational and Environmental Medicine and the Australasian College of Aerospace Medicine. He also holds a Diploma of Aviation Medicine and a Master of Public Health.

His seagoing service includes HMA Ships *Swan*, *Stalwart*, *Success*, *Sydney*, *Perth* and *Choules*. Deployments include *DAMASK VII*, *RIMPAC 96*, *TANAGER*, *RELEX II*, *GEMSBOK*, *TALISMAN SABRE 07*, *RENDERSAFE 14*, *SEA RAIDER 15*, *KAKADU 16* and *SEA HORIZON 17*. His service ashore includes clinical roles at *Cerberus*, *Penguin*, *Kuttabul*, *Albatross* and *Stirling*, and staff positions as *J07 (Director Health)* at the then *HQAST*, *Director Navy Occupational and Environmental Health*, *Director of Navy Health*, *Joint Health Command SO1 MEC Advisory and Review Services*, and *Fleet Medical Officer*.

Commander Westphalen transferred to the Active Reserve in 2016.

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## Optimising Military Health Intelligence Planning by Leveraging Non-Military Health Intelligence

**Dr Irene Lai<sup>1</sup>**

<sup>1</sup> International SOS

### Abstract

**Introduction:** Health intelligence reports assessing foreign medical systems and capabilities, infectious and environmental health threats, and medical evacuation logistics are required to assist military planners when deploying forces at any stage of the Force Generation cycle. Whether in support of active operations, exercises, training or humanitarian projects, this information is often not readily available from current military health intelligence, particularly in novel or austere environments. Established and credible non-military health organisations that have been operating in these locations over an extended period of time will have current health intelligence for such environments. The knowledge is usually highly detailed and covers a broad geographic area. When used in conjunction with the available military health information the medical intelligence planning is optimised.

**Discussion:** Non-military health intelligence can come from a variety of types of organisations from the private sector and NGOs. Private medical assistance companies operate in diverse geographies supporting business travellers, expatriates on assignment and remote site mining/oil & gas operations. Medical Capability Reports written by International SOS physicians are an example of how health intelligence from such organisations can be leveraged to optimise military planning. These Reports have been used by the US Department of Defence for many years and cover a wide range of information, including:

- country medical risk rating
- local accident and injury data
- infectious disease profiles
- environmental health risks, including local fauna
- overall country level standard of care
- city and region specific standard of care
- inpatient and outpatient capabilities
- health system indicators
- recommended medical facilities
- medical evacuation options including air ambulance and commercial airlines.

In addition to the static report, any changes to the background risk such as an outbreak of an infectious disease, a natural disaster or a security incident are posted in real time via a rapid alert system.

Since 2011, International SOS has delivered over 400 Medical Capability Reports covering locations in more than 150 countries. The intelligence is gathered from over 1000 physicians and medical experts around the world based in International SOS 24/7 Assistance Centres and from over 600 onsite clinics and remote sites. A dedicated global assistance network team conducts regular medical provider visits to verify the capabilities and credentials of local providers. A dedicated Medical Information & Analysis Team makes sure the reports are dynamic and up to date with the latest information by continuously monitoring the global health landscape for disease outbreaks, disasters, vaccine updates, public health developments and changes to national and international guidelines.

**Conclusion:** Leveraging the knowledge of civilian medical assistance organisations can be a valuable resource to support military health intelligence, mitigate medical risk and assist medical planners in achieving optimal medical and preventative outcomes.

### Biography

*Dr Lai is Medical Director for Medical Information and Analysis, International SOS. She provides technical and practical guidance to the organization and its clients globally, on topics ranging from infectious and non-communicable diseases, travel health, public health, disaster preparedness and response, medical risk and wellness.*

*Irene joined International SOS in 1997, as a Coordinating Doctor in the Singapore office. Since then she has experienced different roles within the group during postings in Sydney, Australia and Jakarta, Indonesia.*

*Irene's medical degree is from the University of Sydney, and she is a Fellow in the Faculty of Travel Medicine of the Royal College of Physicians and Surgeons Glasgow. She trained primarily in internal medicine and clinical research, working in a number of hospitals in Sydney before practicing at Northwestern Memorial Hospital, Chicago and then New York University Medical Center. She holds current medical licenses in Australia and Hong Kong.*

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### Pacific Partnership 2019 – Working with the Parteira (Midwives) in Timor-Leste

**WGCDR Kelley Stewart<sup>1</sup>**

*1 ACT Board of the Nursing and Midwifery Board*

#### Abstract

A presentation honouring the power of women in Timor-Leste. Women as mothers and midwives, and the provision of pregnancy, birthing and postnatal care in a new nation with limited resources – sharing the experiences of a midwife deployed to Timor-Leste as part of the ADF contribution to the United States Navy's Pacific Partnership 2019 (PP19).

We often take modern interventions as routine in Australia. Have you thought what you do with your Doppler if your ultrasound gel stocks were limited or how would you augment labour if there were no IV pump? Placentas – surprising stories and reactions when sharing what we both think is normal.

The presentation includes the presenter's experience of visiting three different maternity clinics in Timor-Leste; at Vera Cruz and Becora clinics in Dili, and the Gleno Clinic in the mountains. What preventive medicine is in place and the amazing work they do with so very little. Plus an overview the presenter's experience of assisting delivery of a Helping Babies Breathe® train-the-trainer course, and resuscitation

babies you fill with water (a course designed by the American Academy of Pediatrics).

This presentation is aimed to make us reflect on our own routine practices and what is considered safe care through an Australian midwife's eyes that have been opened to the extraordinary power of women as mothers and midwives in Timor-Leste.

**What is PP19:** The Australian Defence Force (ADF) contributes planning and command staff and individual augmentees to the US Navy's Pacific Partnership (PP) missions. PP began in response to the 2004 tsunami that devastated parts of South and Southeast Asia, evolving from an emphasis on direct care (often using the USS MERCY) to one focused on enhancing partnerships through host nation subject matter expert and civil-military exchanges. PP19 is the 14th iteration in a series of multilateral humanitarian assistance disaster relief response missions in the Indo-Pacific region that aim to increase stability and security in the region, foster new and enduring partnerships, strengthen existing relationships, improve disaster preparedness and enhance collective disaster response efforts among all participants.

**How was I involved:** I contributed to the planning of this mission as a Gender Advisor – ensuring the UNSCR 1325+ considerations regarding Women Peace and Security were included, and also assisted in logistics support for the ADF personnel contributing to the execution of the mission as Individual Augmentees at the various port visits for the mission once under way. I attended the visit to Timor-Leste as a Midwife. The health component of this visit included midwifery, family nurses and general medicine, optometry, dental and pharmacy.

**Midwifery work as part of PP19:** I visited three clinics run by the Ministry of Health – Vera Cruz and Becora Clinics in Dili and the Gleno Clinic up in the mountains. I also assisted in the Helping Babies Breathe train-the-trainer course at the National Institute of Health (INS).

I will be sharing my experiences of attending two births, as well as antenatal and postnatal care at these clinics. I will discuss my experience of talking to midwives (through interpreters) about their lived experience of providing midwifery care in the Timor-Leste public health system, and some of the interesting routine interventions and not-so-routine tests available to them. I will discuss their industrious use of scant supplies, the frustrations as well as some of the funny stories we shared – what is done with placentas.

## Biography

WGCDR Kelley Stewart joined the RAAF in 1993 as an Environmental Health Officer. She undertook Base ENVHO duties at RAAF Edinburgh, Williams and East Sale; Health roles at 6 Hospital and HQ Training Command; and Safety roles at ADFA, Air Force Ground Safety and Defence Safety Management Agency. WGCDR Stewart deployed to the MEAO in 2006 as the OIC of the Medical Flight at AMAB.

After transferring to the inactive reserve in 2007, she was twice elected to be a Councillor at Mitchell Shire including two terms as Deputy Mayor. She completed her Masters of Public Health (Defence) and had her research on Breastfeeding Rates in the ADF published in the *Journal of Human Lactation*.

In 2011, WGCDR Stewart recommenced active duty in DGPERS-AF Diversity and authored the Air Force's Diversity Guide for Supporting Breastfeeding at Work and had Air Force accredited as a Breastfeeding Friendly Workplace. She completed a Bachelor of Midwifery in 2013 and is now appointed as a practitioner member on the ACT Board of the Nursing and Midwifery Board of Australia.

WGCDR Stewart completed the ADF Gender Advisor course for Talisman Sabre 2017 and is posted as Deputy Gender Advisor at HQJOC.

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## Peer Outdoor Support Therapy (POST) for Veterans Post Traumatic Growth

Liz McNeill<sup>1</sup>

<sup>1</sup> Flinders University

### Abstract

**Background:** The positive outcomes that are achieved by peer-to-peer support are enhanced by the credibility gained by the lived experience of those involved in the program delivery. Not a new idea but an enormous advantage in effecting behaviour change when influenced by powerful life-changing advice. The familiarity of the staff with frustration, background and situation, regardless of cause, service or branch, creates a safe, non-judgemental environment with common language, experiences and memories. Outdoor peer-to-peer learning delivered in remote localities by individuals who have lived the context provides participants with the opportunity to disengage from daily life, re-engage with nature and explore thoughts and patterns affecting behaviour without interruption.

**Aims:** The aims and objectives of the Trojan Trek program are twofold.

1. To develop in the participants, through joint and individual challenge:
  - an understanding of how thoughts and feelings influence behaviour
  - exposure to various strategies which will bring about positive change
  - suggested individual responses which are effective in achieving the aim
  - enhance self-esteem.
2. To quantitative measurement via four measures at two time intervals, pre and post trek.

**Method:** Although called a trek, the journey is cerebral more than physical and marks the start of a new approach to life and relationships. Treks are run in SA and Qld and are of six-day duration. The time is spent in the bush around open fires with no distracting devices. The program is of 15 formal sessions interspersed with driving and discussion during travel and at campsites. Other less thought provoking relaxing activities are also part of the program. The remoteness and peace of the environment helps to slow thoughts and re-ground participants. Supportive and explanatory conversations are initiated by facilitators and mentors during travel and around the fire at night. Non-prescription drugs and alcohol are banned.

Some years have enabled a 3-month follow up assessment to be collected as well as the pre- and post-assessment. 2018 has seen the first 6-month follow up of one South Australian trek, with 12-months follow up to be complete Oct 2019.

- The Depression Anxiety Stress Scale-21 (DASS-21)
- The Positive and Negative Interactions Scale (PNI)
- The General Self-Efficacy Scale (GSE)
- The Life Satisfaction Questionnaire (LSQ).

**Results:** Quantitatively, post-trek measurements have been statistically significant ( $p = \leq 0.05$ ) following pre-trek day one baselines, especially on the DASS21. Various elements of the Life Satisfaction Questionnaire such as sleep quality, mental health, feeling a part of the community and overall life satisfactions also showed improvements, which are statistically significant.

Qualitatively, hearing first-hand examples of how others have emerged from victim to embrace post-traumatic growth, aids in the belief that they too can do it. Part of the change from post-traumatic stress to post-traumatic growth is the ability to recognise

and utilise the variety of tools on offer to identify and change unhelpful responses and behaviour.

**Discussion:** The degree of success of post-traumatic growth following the six-day experience is demonstrated when many participants return as mentors due to the significant changes it has made in their lives. Mentors can then become trainers/facilitators as they have shifted their focus from 'victim to warrior'. Post-traumatic growth is also observed and experienced by spouses, families and friends. Through the experience, trekkers become 'brothers' and 'sister' in arms once more, enabling the provision of support post trek to continue enhanced by social media contact.

The presentation will illustrate both qualitatively and quantitatively the examples of post-traumatic growth arising from the treks.

### Biography

*Liz is an ex-ADF midwifery university lecturer with an interest in post-traumatic growth in birthing mothers, health professionals and veterans. Her exposure to the Trojan's Trek program was initially as a medic for a SA female trek in 2016 resulting in a lasting impression upon seeing the growth that participants demonstrated after the 5 days out bush.*

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## Pelvic Health of Australian Female Military Personnel: An Exploration of Key Issues and Association with Occupational Performance

**Dr Simone O'Shea**<sup>1</sup>, Professor Rod Pope<sup>1</sup>, Associate Professor Rob Orr<sup>2</sup>, Dr Katherine Freire<sup>1</sup>

<sup>1</sup> School of Community Health, Charles Sturt University,

<sup>2</sup> Tactical Research Unit, Bond University

### Abstract

**Background:** Women are increasingly assuming non-traditional, more physically demanding and diverse roles within military forces. A larger female workforce necessitates comprehensive consideration of the unique health requirements for women working in a wide range of military contexts. Pelvic health is a key area where the care and support needs between

sexes vary because of differences in genitourinary anatomy and function.

Pelvic health issues, such as pelvic floor dysfunction (i.e. incontinence, pelvic organ prolapse), affect approximately one-third of Australian women compared with less than 5% of men. Identified risk factors for pelvic floor dysfunction include childbearing, constipation, increasing age, joint laxity, high-load carriage and high-impact physical activity. The unique physical work requirements of many military roles mean that personnel undertake high levels of physical training and load carriage. For servicewomen this may place them at an even higher risk of pelvic floor dysfunction than women in non-military contexts, particularly during childbearing years and beyond. Similarly, other genitourinary conditions, such as urinary tract infections, are a more significant health issue for female military personnel and can impact on their occupational health and performance.

Therefore, understanding the types and prevalence of pelvic health issues, as well as associated risk factors and impacts on occupational health, safety and performance, is essential to planning strategies that will support the ongoing success of female military personnel.

**Aims:** This presentation will explore what is currently known about the pelvic health of women working in military contexts; examine the specific risk factors for female pelvic health conditions, and consider the relationships between pelvic health and occupational health, safety and performance.

**Method:** Published studies of relevance to the aims were identified through searches of journal databases and consultation with experts in the field. Findings of relevance were extracted and synthesised to provide an overview of current knowledge on the topic.

**Results/Discussion:** While reproductive health issues for female military personnel have been increasingly researched in recent years, very few studies have investigated other aspects of female pelvic health. Genitourinary symptoms such as urinary tract infections are quite common, with reports that 30.4% of women in the US Armed Forces experience them compared with only 3.5% of men. Similarly, in a US military survey, 26% of female soldiers reported experiencing urinary incontinence during physical activity. In addition, one-third of those who reported urinary incontinence also reported that they needed to modify or stop the aggravating activity, demonstrating that occupational performance is affected. Of concern is that the most common strategies used to manage urinary incontinence – restricting fluid intake or postponing voiding – may

lead to more serious health issues such as heat illness.

Differences in genitourinary anatomy, poor sanitation conditions and more challenging toileting practices, particularly during field exercises or deployment, are likely to increase the risk of urinary symptoms and infections in servicewomen. Female military personnel have also been reported to be less likely to seek medical attention for genitourinary symptoms because of limited women-specific health services and female medical staff, embarrassment and poor confidentiality.

Further research is required to more broadly investigate female pelvic health in military contexts, including the types, severity, prevalence and their coexistence in this population, the strategies used to manage these conditions in military contexts, and the impacts of female pelvic health conditions on occupational performance.

These findings provided background for the development of a survey on pelvic health for women in the Australian Defence Force. Preliminary findings from this survey will be discussed, if available, alongside the findings from published studies

We acknowledge the support of the Defence Health Foundation for this research.

### Biography

*Simone is an experienced physiotherapy practitioner-researcher with a strong clinical background in women's health, physical activity and chronic health condition management. She developed an interest in the pelvic health of female military personnel after working clinically with a number of women from her local Army barracks.*

*Simone has published eight peer-reviewed journal articles and a book chapter, and presented her findings at Australian and international conferences. She was a Menzies Foundation Scholar in the Allied Health Sciences and recently won a 'Most Outstanding Poster' prize at the World Confederation of Physical Therapy Congress (2017). Simone has recently returned to research role following a period of career interruption associated with parenthood to four children.*

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## Physical Characteristics of New Zealand Army, Navy and Air Force Officer Trainees' Pre and Post 6-Week Joint Officer Induction Course (JOIC)

**Mr David Edgar**<sup>1,2</sup> Nicholas. Gill<sup>1</sup> & Matthew Driller<sup>1</sup>

<sup>1</sup> Faculty of Health, Sport and Human Performance, University of Waikato, Hamilton NZ

<sup>2</sup> New Zealand Defence Force, Wellington, New Zealand

### Abstract

**Introduction:** The physical fitness levels of recruits and officers entering the military have become a major focus for defence forces worldwide. While there is a plethora of research from other countries, there is a paucity of research focused on the physical performance of recruit and officer training in the New Zealand Defence Force. The focus of this study was to characterise the New Zealand Army, Navy & Air Force officer trainees' pre and post a 6-week joint induction course (JOIC), and enhance physical performance through a high performance mind-set.

**Methods:** 116 participants (Army; n= 75, Navy; n= 25, Air Force; n=16) were tested for physical performance pre and post 6-week JOIC. Testing consisted of a 2.4km run, upper body strength endurance (press-ups and curl-ups), body weight and Y-balance musculoskeletal screening. The Mcleans POMs perceived mood state and sleep monitoring questionnaire was administered weekly, in conjunction with actigraphy sleep watch monitoring for the duration of the course.

**Results:** At baseline, Army performed significantly better in the 2.4km run and press-ups when compared to the other services ( $p < 0.05$ ), with Navy performing significantly better in curls ups. Following the JOIC, there were significant improvements in 2.4km run time ( $676 \pm 83$  s to  $625 \pm 82$  s,  $p = 0.02$ ), press-ups ( $25 \pm 11$  reps to  $32 \pm 11$  reps,  $p = 0.04$ ) and curl-ups ( $41 \pm 21$  to  $56 \pm 38$ ,  $p = 0.01$ ). There were no significant pre to post changes in any other measures. Sleep monitoring indicated two specific groups were evident over the 6-week period; those that slept more than 6 hours and those that slept less than 6 hours per night.

**Conclusion:** Army recruits possessed superior baseline markers of physical fitness when compared to Navy and Air Force recruits. Across all services, following a 6-week JOIC, significant improvements were found for aerobic fitness, upper body strength

and core endurance. Sleep was considerably lower than the healthy accepted norm of 8 hours per night.

**Take home message:** Appropriate training program design and an enhanced performance approach is critical to ensure significant improvements across all measures of fitness following a 6-week JOIC. More sleep is likely to enhance physical performance and cognitive function.

### Biography

*David Edgar is the NZDF S&C / Performance Science SME for NZDF Performance Health Team. David has a background in both Defence and elite S&C / sport science with professional rugby and sport. Has held various head S&C positions from ITM Cup to Super Rugby, and internationally with Samoa during two rugby world cups, leading the physical performance and sports-science programs. He has also won the IRB Sevens World Series with Samoa. David has spent time working in professional rugby in Japan and continues involvement with super rugby.*

*David's current focus of work with NZDF is Enhanced Physical Performance, through a 'High Performance Mind-set', to improved general fitness and physical performance and reduces injury rates of NZDF personal. The performance health team have also been implementing a number of initiatives over the last couple of years to improve health, reduce injury, mentor PTIs and work closely with commanders to ensure new performance strategies are scientifically advanced and based on practice-based learning. David holds a Master's Degree and is currently working toward a PhD in the area of Enhanced Physical Performance and Recovery in the NZDF.*

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## Physical Health of Transitioned ADF and Regular ADF members in 2015 in the Transition and Wellbeing Research Programme

**Dr Helen Kelsall**<sup>1</sup>, Dr Miranda Van Hooff<sup>2</sup>, Dr Ellie Lawrence-Wood<sup>2</sup>, Professor Alexander McFarlane<sup>2</sup>, Dr Stephanie Hodson<sup>3</sup>, COL (Reservist) Nicole Sadler<sup>4,5</sup>, Ms Helen Benassi<sup>5,6</sup>, Dr Craig Hansen<sup>2</sup>, Professor Malcolm Sim<sup>1</sup>

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<sup>4</sup> Phoenix Australia Centre for Posttraumatic Mental Health, University of Melbourne

<sup>5</sup> Rehabilitation and Psychology Branch, Joint Health Command, Department of Defence

<sup>6</sup> Australian National University

### Abstract

**Introduction:** Military service can involve exposure to physical and psychological stressors. Each year, a proportion of service men and women choose to leave or are discharged from military service. There has been little systematic research into the health and wellbeing of military personnel after they leave the services. The aim was to compare the physical health and wellbeing of Transitioned Australian Defence Force (ADF) members with Regular ADF in 2015.

**Methods:** 4326 Transitioned ADF (transitioned out of full-time regular service in the period January 2010–December 2014) (18% response rate) and 8 480 Regular 2015 ADF (42%) completed a survey questionnaire that included questions on symptoms, doctor-diagnosed medical conditions, respiratory health, service-related injuries, pain, sleep problems, lifestyle risk factors, self-perceived health and quality of life and health service use. Physical health of Transitioned ADF was examined in relation to transition status (Ex-Serving, Active Reservist, Inactive Reservist), Department of Veterans' Affairs (DVA) client status (DVA client, non-DVA client), and type of discharge (medical discharge, non-medical discharge). Data were statistically weighted to be representative of each population. Logistic regression was used to compare differences in prevalence between groups and odds ratios with 95% confidence intervals (OR, 95% CI) were reported, adjusting for possible confounding factors.

**Results:** Transitioned ADF reported a higher mean number of symptoms (mean 16.4 v 11.8), similar numbers of medical conditions (mean 1.9, SE 0.1 v 1.5, SE 0.3), were more likely to report some medical conditions (a circulatory condition, high blood pressure, a musculoskeletal/connective tissue condition, chronic low back pain, a nervous system condition, and hearing loss), any injury type (OR 1.35, 95% CI 1.03-1.77), a slightly higher mean number of injury types (mean 1.11, SE 0.02 v 0.96, SE 0.03), and poorer self-perceived health and quality of life compared to 2015 Regular ADF. Service-related injuries were more likely to have been sustained during training than on deployment in both groups. Transitioned ADF were less likely to report use of any health services in the past 12 months compared to 2015 Regular ADF (OR 0.61 95% CI 0.44, 0.83).

In Transitioned ADF, poorer physical health outcomes overall were reported in DVA clients compared with non-DVA clients. A similar pattern was observed in Ex-Serving compared with Active Reservists or Inactive Reservists and in those who had been medically discharged compared with those discharged for other reasons.

**Conclusion:** This was one of the first studies internationally to investigate a comprehensive range of physical health indicators in recently transitioned military personnel. Overall, Transitioned ADF were more likely to report poorer physical health across domains, some subgroups appeared particularly at risk.

### Biography

*Dr Helen Kelsall is a public health physician / epidemiologist and a Senior Research Fellow in the Monash Centre for Occupational and Environmental Health, School of Public Health and Preventive Medicine, Monash University.*

*Helen has been active in veterans' health research for over 15 years and undertook her PhD in this field. She was a lead investigator on the Australian Gulf War Veterans' Cohort Study, and on other collaborative studies investigating physical, psychological and social health and wellbeing in military and veteran populations. She was Lead Investigator together with Prof Malcolm Sim on the Physical Health Status Report of the Transition and Wellbeing Research Programme and an Investigator on the Impact of Combat Study. Her research also includes exposure, risk factor and health outcome assessment in other occupational groups, including long-term injured workers. Helen is a member of the Editorial Board and a Sub-Editor on the Journal of Military and Veterans' Health.*

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## Post-Traumatic Stress Disorder versus Post-Traumatic Stress Injury: What's in a Name?

**Mrs Emily Jallat<sup>1</sup>**

*<sup>1</sup> Department of Defence*

### Abstract

Post-Traumatic Stress Disorder (PTSD) is a trauma-induced condition that is associated with high health care usage and costs, as well as long-term disability. Enabling those affected to seek diagnosis and treatment and removing barriers to care is, therefore, a significant priority. In the last few years, an argument has been made that changing the name of the condition to Post-Traumatic Stress Injury (PTSI), and hence removing the word 'disorder' may remove some barriers to seeking diagnosis and help for affected individuals. This paper provides the historical, scientific and medical basis for the use of the existing term, and argues that there is a lack of evidence that altering the name would have an appreciable benefit for affected individuals. It is concluded that serving and ex-serving ADF members and their families affected by PTSD would be better served by holistic approaches to improve education and awareness, encouraging help seeking as early as possible and further high-quality research to improve evidence-based treatment and rehabilitation services that are recovery focused.

### Biography

*Mrs Emily Jallat was appointed as the Director of the Australian Defence Force Centre for Mental Health in August 2018. She is an endorsed clinical psychologist; holds a master's degree in Clinical and Neuropsychology from the Universite Aix-Marseille, France and completed her undergraduate psychology degree in England. She started her career as a teacher with a teaching degree from the University of Sydney. Mrs Jallat has travelled and worked in Australia and Europe in a variety of sectors. Prior to joining the Department of Defence, she was Head of Clinical Governance at Benestar (formally DTC). She is passionate about providing cutting edge promotion, prevention and treatment programs to ADF personnel.*

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## Prehospital Antibiotics – A Narrative Review and Rationale to Change ADF Practice

**Brigadier Michael Reade**<sup>1</sup>

*1 Joint Health Command, Australian Defence Force*

### Abstract

Current US military Tactical Combat Casualty Care (TCCC) guidelines recommend administration of antibiotics by prehospital medics (or wounded casualties themselves) for all open combat wounds: if able to swallow oral medications, 400mg moxifloxacin, and if not, 1g ertapenem intravenously or intramuscularly. The Australian Defence Force does not currently implement this practice. These divergent guidelines warrant review.

Brief (usually <24 hour) courses of prophylactic broad-spectrum antibiotics are routinely employed in the hospital management of minor to moderate civilian penetrating trauma with features suggesting particular risk, including with wounds contaminated with organic matter, where there is a suspected retained foreign body, deep punctures into the foot through footwear, or where there are high-risk patient factors e.g. diabetes mellitus or immunodeficiency. In all cases, antibiotics are recognised as only an adjunct to adequate wound debridement. The evidence for this practice in the civilian context is, however, sparse.

In contrast, several observational studies of combat wounds guide military practice. Antibiotics given within 3 hours of wounding resulted in fewer infections in casualties with extremity wounds during the Falklands War (Jackson, JRAMC, 1984). Gerhardt et al (Prehosp Emerg Care, 2009) reviewed 53 patients with penetrating combat wounds, finding infection developed within 48 hours in 7% of those given antibiotics at a prehospital battalion aid station, compared to 40% in those who did not receive prophylactic antibiotics (number needed to treat 3, 95% CI 2–14). In the largest series published to date, Naylor et al. (J Trauma Treat, 2018) examined records of 6 662 patients with gunshot wounds given (n=782) or not given (n=5880) prehospital prophylactic antibiotics. Antibiotic administration was associated with a significantly higher survival rate (96.2% v 92.8%, p<0.001).

There are several theoretical concerns over a policy of prehospital antibiotics for penetrating combat trauma, including inducing antibiotic resistance in both the individual and the population, that the risk of anaphylaxis might outweigh possible benefit, and that prioritising antibiotic administration might distract from more beneficial tasks. While all valid concerns, each of these factors would have influenced the outcomes of the above studies, which nonetheless, showed antibiotics conferred net benefit.

Implementing a prehospital antibiotic guideline appears challenging. Schauer et al (JSOM, 2018) examined records of 550 patients with open wounds from combat in Afghanistan 2013–2014, finding only 54% received antibiotics, and that only 11.1% of these were compliant with recommendations. An audit of 5 142 patients treated by Israeli prehospital teams (Benov et al, Mil Med 2018) found only 8.2% received antibiotics as mandated. Clearly, combat requires prioritisation of tasks, and many of these patients did well just to survive. Nonetheless, both studies suggested scope for improved practice through training.

On balance, there is sufficient evidence for the Australian Defence Force to implement a policy of prehospital antibiotic administration for open combat wounds. Antibiotic choice should be determined by common pathogens in the area of operations and should be mindful of the risk of inducing unwarranted patterns of antibiotic resistance. In many circumstances, first-generation cephalosporins (e.g. cephazolin) are likely to be more appropriate than the current US TCCC preference.

### Biography

*Professor Reade is an intensive care physician and anaesthetist in the Australian Defence Force, since 2011, seconded to the University of Queensland as the inaugural Professor of Military Medicine and Surgery. From 2015–2018, he was the Director of Clinical Services the Regular Army's only field hospital and has deployed nine times, including twice to Afghanistan and three times to Iraq. He now holds the rank of Brigadier, with appointments as Director General Health Reserve-Army and Assistant Surgeon-General-Army. His research interests are trauma systems design, fluid resuscitation in trauma and coagulopathy.*

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## Project Wantok Haus Sik

Lieutenant Colonel Ben Butson<sup>2</sup>, Squadron Leader Andrew Pearson<sup>3</sup>, Brigadier Michael Reade<sup>1</sup>

*1 Joint Health Command, Australian Defence Force*

*2 2nd General Health Battalion, Australian Regular Army,*

*3 Health Services Wing, Royal Australian Air Force*

### Abstract

The training ADF clinicians receive in tertiary Australian civilian hospitals is excellent, but does not cover many of the skills required in a deployed military hospital. Most surgery in Australia is performed on stable patients, making use of advanced diagnostic modalities followed by minimally invasive techniques – far from the realities of battlefield surgery. Most Australian clinicians treat few patients with penetrating trauma or tropical disease. If they do, most have the assistance of subspecialist colleagues, CT, MRI, interventional radiology and advanced pathology. Even high-fidelity simulated training scenarios are poor substitutes for real-life experience. Consequently, the ADF requires a different environment in which to mentor its clinicians in the skills required for deployed clinical practice.

The Australian Government 2017 Foreign Policy White Paper affirmed Australia's commitment to intensified engagement with Pacific neighbours to support the long-term economic prospects and security within the region. This whole-of-government 'Step Up' in the Pacific currently has few health components.

Australia has a longstanding close partnership with Papua New Guinea (PNG), manifested through civilian health engagements with the specialist medical colleges, Department of Foreign Affairs and Trade – sponsored visits of clinical teams – and through charitable organisations. Nonetheless, many health challenges remain. With only 0.6 doctors / 1000 population, PNG falls well below the World Health Organization recommended ratio of 2.5/1000. Maternal mortality is 100 times that in Australia. Nearly 25% of the population visit hospitals each year due to malaria. Trauma rates are twice the admission rate of even malaria, with approximately 30% penetrating trauma (largely arrow and gunshot wounds), 3–6 times the proportion in Australian hospitals. Wewak hospital, serving the largest province outside Port Moresby, has only two surgeons, one obstetrician and one anaesthetist on staff. Lorengau hospital on Manus Island has only three doctors, with no specialist surgeon, obstetrician

or anaesthetist. All have excellent training similar to the Australian postgraduate model, with many having worked in Australian hospitals, but with skills attuned to local conditions.

The PNG Defence Force (PNGDF) Health Service provides primary care to military members, dependents and local civilians near major bases, and operational health support to its largely light infantry and patrol boat forces. Busy and varied primary care practices keep clinicians from engaging with local hospitals to maintain trauma and other advanced skills. As sole practitioners, attending other forms of continuing medical and nursing education is challenging.

Supported by the Defence Cooperation Program of the Defence International Policy Division, a proposal is under review that might deploy ADF clinicians to work in civilian hospitals in Wewak and Manus Island, and in nearby primary care clinics of the PNGDF. Teams of approx. six ADF clinicians and allied health practitioners would deploy for one month each, with a continuous presence between February and December each year. The focus would be on surgery, but all disciplines would be required. ADF clinicians would work alongside PNG military and civilian mentors, including participation in after-hours on-call duties.

Benefits to the ADF would be enhanced deployable health capability through better skilled clinicians tested in a realistic, mentored, operational environment; greater assurance for health planners of the ability to deploy an enduring surgical effect; and enhanced engagement with the PNGDF. Benefits to the PNGDF would similarly be better skilled clinicians, closer working relationship with civilian hospitals, and enhanced access to medical procedures and elective surgery for PNGDF members. Risks, including creating a culture of dependency and an inability to support the operation in the long term, can all be mitigated. The project offers a substantial opportunity for enhanced engagement by all ADF clinicians, full-time and part-time, in an operation of genuine international value.

### Biography

*Professor Reade is an intensive care physician and anaesthetist in the Australian Defence Force, since 2011, seconded to the University of Queensland as the inaugural Professor of Military Medicine and Surgery. From 2015–2018, he was the Director of Clinical Services the Regular Army's only field hospital and has deployed nine times, including twice to Afghanistan and three times to Iraq. He now holds the rank of Brigadier, with appointments as Director*

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### RACP Productivity Commission Submission: Veteran Compensation and Rehabilitation

[Dr Neil Westphalen](#)<sup>1</sup>

*1 RAN Reserve*

#### Abstract

In March 2018, the Federal Government announced a Productivity Commission inquiry to examine whether the compensation and rehabilitation system for current and ex Australian Defence Force members is fit for purpose. It also reviewed the Department of Veteran's Affairs regarding its governance arrangements, administrative processes and service delivery.

This paper summarises the Productivity Commission draft Report released for public comment in Dec 2018, as well as the submission thereto by the Royal Australasian College of Physicians in Feb 2019. The latter advocated the following roles for occupational physicians.

- Introducing a best practice occupational health-based strategic model that reflects current and ex-ADF members as a workforce / post workforce population.
- Leveraging their experience of civilian worker's compensation systems throughout Australia and New Zealand, to provide advice on replacing the current DVA compensation schemes with a single scheme.
- Participating in Expert Medical Advisory Panels (EMAPs), similar to one introduced by the Queensland Department of Natural Resources, Mines and Energy as part of its response to the recent accelerated silicosis epidemic, which would provide occupational and environmental medicine advice to the ADFs' strategic-level work health and safety committees.
- Assisting with the introduction of a comprehensive workplace injury and illness reporting system.

- Facilitating local command compliance with the Work, Health and Safety Act.
- And last, but especially not least, providing workplace-based clinical treatment, rehabilitation and compensation claim assessments for ill and injured ADF members.

#### Biography

*Dr Neil Westphalen graduated from Adelaide University in 1985 and joined the RAN in 1987. He is an RAN Staff Course graduate and a Fellow of the Royal Australian College of General Practitioners, the Australasian Faculty of Occupational and Environmental Medicine and the Australasian College of Aerospace Medicine. He also holds a Diploma of Aviation Medicine and a Master of Public Health.*

*His seagoing service includes HMA Ships Swan, Stalwart, Success, Sydney, Perth and Choules. Deployments include DAMASK VII, RIMPAC 96, TANAGER, RELEX II, GEMSBOK, TALISMAN SABRE 07, RENDERSAFE 14, SEA RAIDER 15, KAKADU 16 and SEA HORIZON 17. His service ashore includes clinical roles at Cerberus, Penguin, Kuttabul, Albatross and Stirling, and staff positions as J07 (Director Health) at the then HQAST, Director Navy Occupational and Environmental Health, Director of Navy Health, Joint Health Command SO1 MEC Advisory and Review Services, and Fleet Medical Officer.*

*Commander Westphalen transferred to the Active Reserve in 2016.*

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### Select Reproductive Health Outcomes in Australian Veterans of the Middle East Conflicts 2001– 2010

[Miss Rachelle Warner](#)

#### Abstract

Anecdotally, infertility among serving (particularly) female ADF members and veterans is a growing concern. Reproductive health is of central importance to the structure of people's lives and fundamental to human identity. Increasingly, the importance of reproductive health is recognised at individual, societal and global levels. This paper addresses

reproductive, pregnancy, foetal and infant outcomes in an exclusively Australian military cohort.

### Biography

*Miss Rachele Warner is a toxicologist and environmental risk assessor educated at the University of Sydney and RMIT University in Melbourne. She is currently undertaking her PhD at the University of Adelaide School of Medicine under Prof Michael Davies and A/Prof Susan Neuhaus studying the effects of deployment on the reproductive health of ADF veterans. Her research interests are broad – she was an associate investigator on the Jet Fuel Exposure Syndrome Study and has previously studied the effects of jet fuel and noise on the central auditory nervous system, the effects of prenatal exposure to toluene on foetal development and the genotoxic and mutagenic effects of herbal medicines.*

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## Short Term Gains v Long Term Problems: The Use of NSAIDs in Lower Limb Injuries

**Mr Joshua Sherwood**<sup>1,2</sup>

*1 Defence Health Organisation, Joint Support Component Command, New Zealand Defence Force*

*2 Dunedin School of Medicine, University of Otago*

### Abstract

Lower limb injuries are a common presentation for military health care providers to manage. These injuries are often managed with non-steroidal anti-inflammatory drugs (NSAIDs) due to their demonstrated effective analgesic properties, which allow an earlier return to activity and work. NSAIDs are not a benign treatment; their negative effects on the gastrointestinal tract are well documented; however, their benefits are often considered to outweigh their harms. NSAIDs effect on the injuries they are used on are not well understood. Animal studies have shown that NSAIDs inhibit tendon and tendon to bone healing, especially when used during the inflammatory phase of tissue repair. Most of the human research is in the area of bone healing and demonstrates that NSAIDs appear to interrupt bone remodelling. There was one study on ankle sprains, which demonstrated that NSAIDs result in an earlier return to work, though they also result in decreased range of motion and increased joint instability. The literature suggests that there are potentially long-term negative consequences to NSAID use in lower limb injuries. This creates an ethical dilemma for health care providers; should short-term gains trump a potential long-term increase in injury risk.

This is especially difficult for military providers as they are often under pressure to return soldiers, sailors and airmen to duty as expediently as possible with potential career limiting results for the patients if they do not. The data should help guide these decisions; there is little evidence that NSAIDs do not have negative effects on healing and some evidence that they do. There is also evidence that alternative analgesics such as paracetamol are equally effective for some injuries. NSAIDs should be avoided until further studies are able to demonstrate the long-term effects of short-term use. If they must be used, they should be withheld until after the inflammatory phase. The overarching goal should always be to do what is in the best interests of the patient.

### Biography

*Corporal Joshua Sherwood is a passionate and motivated RNZAF Flight Medic with an interest in exercise medicine and emergency and austere medicine, especially in the aeromedical retrieval setting. He joined the RNZAF in 2010, graduating the New Zealand Defence Health School as a Medic in 2013, before training a Flight Medic and completing his Bachelor of Health Science in Paramedicine over the following years. He continues his pursuit of evidence-based practice and hopes to conduct research in the exercise medicine field in the future.*

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## Summer in the Tropics: A Non-Seasonal Influenza Outbreak Case Study

**LTCOL Stewart Holmes-Brown**<sup>1</sup>

*1 Joint Health Unit North Queensland*

### Abstract

In the summer of 2019, long before the seasonal influenza vaccine was widely available, Lavarack Barracks was the site of a non-seasonal influenza outbreak. Initially confined to one unit, over just a week, the number of suspected (and subsequently confirmed) cases rapidly accelerated, threatening all resident units at Lavarack and necessitating the involvement of numerous stakeholders.

This presentation will outline the lifecycle of the outbreak, and the actions taken at various stages

throughout its span to curb the spread of disease. The effectiveness of the policy guiding outbreak management in Garrison Health, along with the role of the Outbreak Management Committee, will be discussed. Finally, lesson learnt and potential improvements to policy and outbreak management protocols will be discussed.

### Biography

*LTCOL Stewart Holmes-Brown is the first incumbent of the Senior Medical Officer (SMO) position at Joint Health Unit North Queensland. He is a Fellow of the Royal Australian College of General Practitioners, and a Fellowship Candidate of the Royal Australasian College of Medical Administrators. He has served in SMO roles at the Company, Battalion and Task Force levels, in Army and Joint Health Command, domestically and on Operations.*

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## The Development and Progression of Suicidal Ideation and Behaviour Over Time: The Results from the Transition and Wellbeing Research Programme

Professor Richard Bryant<sup>4</sup>, Dr Ellie Lawrence-Wood<sup>1</sup>, Ms Jenelle Baur<sup>1</sup>, Professor Alexander McFarlane<sup>1</sup>, Dr Stephanie Hodson<sup>3</sup>, Colonel Nicole Sadler<sup>2</sup>, Ms Helen Benassi<sup>5</sup>, Dr Stuart Howell<sup>1</sup>, Ms Maria Abraham<sup>1</sup>, Ms Marie Iannos<sup>1</sup>, Dr Craig Hansen<sup>1</sup>, Dr Amelia Searle<sup>1</sup>, Dr Miranda Van Hooff<sup>1</sup>

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### Abstract

In recent years, our understanding of the magnitude and factors associated with completed suicides as well as suicidal thoughts and behaviours in Australian serving and ex-serving populations has expanded considerably (McFarlane et al, 2010; Van

Hooff et al, 2018; AIHW, 2018). Available research has highlighted that while for some individuals there are protective factors associated with being a current serving ADF member, suicide risk can increase as individuals transition out of full-time military service. However, as much of this research has been cross-sectional, it has previously not been possible to identify causality or how risk factors may change over time. The Transition and Wellbeing Research Programme longitudinal cohort has provided a unique opportunity to match suicidality data in this population across two time points (2010 and 2015). This presentation will examine changes in suicidality (thoughts and plans) in the longitudinal cohort, and the impact of factors such as transition out of full-time ADF service and the existence of probable mental disorder on the development and progression of the severity of suicidality over time.

### Biography

*Colonel Nicole Sadler joined Phoenix Australia – Centre for Posttraumatic Mental Health in July 2017 and she is the Head of the Policy and Service Development portfolio. Through her 23-year career as a full-time Army psychology officer, she developed considerable expertise in military mental health, including in the issues and challenges for serving and ex-serving military personnel and their families, and the systems and services to improve and maintain mental health and wellbeing within high-risk populations. Nicole has worked in psychology service provision, training, research, policy development and strategic planning, and has deployed in support of numerous Australian Defence Force operations, and she held the senior psychology position within the Australian Army for four years.*

*Nicole continues to serve as a Colonel in the Army Reserves and she is one of the Defence investigators on the joint Departments of Veterans' Affairs and Defence Transition and Wellbeing Research Programme. She has a Master of Psychology (Clinical) degree and is currently undertaking a PhD through the University of Adelaide, investigating suicide ideation and behaviours in serving and ex-serving Australian Defence Force personnel.*

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## The Effects of Long-Term Military Boot Wear on Ankle Joint Function

Mr Jacques Rousseau<sup>1</sup>, Associate Professor

Wyatt Page<sup>2</sup>, Dr Sally Lark<sup>2</sup>

<sup>1</sup> New Zealand Defence Force

<sup>2</sup> Massey University

### Abstract

**Background:** Acute inversion ankle sprain injuries are one of the most common injuries in military populations; however, the aetiology as to why the ankle joint is so vulnerable is uncertain. We investigated the possibility that chronic wearing of the high cut military boot for prolonged periods served to weaken the ankle joint and cause changes in balance and muscle activity and therefore, be a major contributor to the high number of ankle injuries.

**Methods:** One hundred and fifty newly enlisted male recruits volunteered to participate (age  $22.2 \pm 2.8$  years; weight  $80 \pm 11.4$  kg; height  $178.8 \pm 6.3$  cm). Each new recruit was expected to have a base level of fitness and be injury free at the time of enlistment. They were assessed for ankle joint function in the dominant leg (preferred kicking leg) before being issued with military boots and commencing any military training and reassessed following 12 months of military training. Ankle dorsiflexion and plantarflexion strength (Newtons) and strength endurance were assessed by isokinetic contractions using a Biodex system 4 Dynamometer at  $60^\circ/\text{s}$  and  $120^\circ/\text{s}$ . Passive inversion and eversion ranges of movement were assessed with a bubble inclinometer. Ranges of motion for the ankle joint (plantarflexion/dorsiflexion) were recorded on the Biodex system with the subjects' foot strapped in the plantar/dorsiflexion footplate. The stork balance test was performed with eyes closed on a force platform. Postural sway (movement of Centre of Pressure; CoP) was quantified using 95% ellipse area and magnitude of movements in anterior-posterior and medial-lateral directions were assessed. Bipolar surface electrodes were used to record the Electromyographical activity of tibialis anterior (TA), medial and lateral gastrocnemius of the supporting limb using area under the curve, mean signal and variability about the mean. The results from the pre- and post-tests were compared by paired samples t-test, while repeated measures analysis of variance was used to compare activity between muscles. Significance set at  $p < 0.05$ .

**Results:** Post 1-year of boot wear there were significant decreases in plantar flexion strength ( $p = 0.019$ ) and endurance strength ( $p = 0.015$ ),

inversion/eversion range ( $3.7^\circ$  and  $3.0^\circ$  respectively), and plantarflexion/dorsiflexion isokinetic range of motion by  $4.2^\circ$ . All participants significantly increased (~double) the 95% ellipse area ( $p < 0.05$ ). There was also a significant increase ( $p < 0.05$ ) in the anterior-posterior movement of CoP compared with medial-lateral sway. There were significant increases in gastrocnemius activity (Gastrocnemius-Medial (Gas-M):  $p = 0.001$ ; Gastrocnemius-Lateral (Gas-L):  $p = 0.006$ ) and variability (Gas-M:  $p = 0.020$ ; Gas-L:  $p = 0.011$ ) in pre- than post-balance test. In contrast, no difference was observed in TA muscle activation ( $p = 0.231$ ) and variability ( $p = 0.431$ ) between pre and post boot wearing for 1 year. In addition, TA activation was significantly greater than Gas-M and Gas-L in both pre- and post-balance test ( $p < 0.001$ ).

**Conclusions:** After 12 months of boot wear during military training, there is a significant decrement in strength and endurance particularly for the plantar flexors, which would normally provide power in dynamic activities and resilience to fatigue. This was mirrored by a decrease in ankle range of motion over which maximum force could be developed, which reduces ankle function and increases the risk of injury. Balance is significantly compromised, with larger movement of the CoP in the anterior-medial direction. It appears TA remains active while activity of the Medial and Lateral Gastrocnemius increases indicating an increase in work to maintain stability. It appears habitual wearing of the military boot causes the ankle to rely on the boot for stability causing a decrease in functional ability and the ankle joint to become 'lazy'.

### Biography

Jacques Rousseau was born in South Africa, June 1961. He has completed a Bachelor's degree in Physical Education and a postgraduate degree in Clinical Exercise Physiology. Jacques joined the South African Defence Force, completing basic infantry training and graduating from the Officers Training Course as a lieutenant. Jacques worked as a physical training officer as well as serving in the Angolan war. For many years, he worked alongside the South African Special Forces developing specialised training, rehabilitation and wellness programmes. In 1996, he was promoted to the rank of Lieutenant Colonel and appointed as Acting Director of South African Defence Force Ancillary Health Services. In 1999, Jacques and his family immigrated to New Zealand where he accepted a sport and exercise science lecturing position at Massey University, Wellington. During this time, he founded and managed the Massey University Cardiac Rehabilitation exercise programme and completed a Master's Degree in Sport and Exercise

Science. Jacques has co-authored published papers regarding exercise and health as well as co-authoring a book: 'Get up and Go' that describes the benefits of exercise for health. Jacques enlisted in the NZ Army in 2011 and is currently employed as the NZDF Exercise Physiologist.

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### The Longitudinal Mental, Physical and Neurocognitive Impacts of Deployment to the MEAO: Results from the Impact of Combat Study

**Dr Ellie Lawrence-Wood**<sup>1</sup>, Professor Alexander McFarlane<sup>1</sup>, Mr Andrew Lawrence<sup>1</sup>, Colonel Nicole Sadler<sup>2</sup>, Dr Stephanie Hodson<sup>3</sup>, Professor Richard Bryant<sup>5</sup>, Associate Professor Mayuresh Korgaoknar<sup>6</sup>, Professor Jeffrey Rosenfeld<sup>7</sup>, Dr Helen Kelsall<sup>7</sup>, Professor Malcolm Sim<sup>7</sup>, Ms Maria Abraham<sup>1</sup>, Ms Jenelle Baur<sup>1</sup>, Dr Stuart Howell<sup>1</sup>, Dr Craig Hansen<sup>1</sup>, Ms Marie Iannos<sup>1</sup>, Dr Amelia Searle<sup>1</sup>, Dr Miranda Van Hooff<sup>1</sup>, Ms Helen Benassi<sup>4</sup>

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#### Abstract

This presentation presents findings from the Impact of Combat Study, which documented the mental, physical, and neurocognitive health and wellbeing of a cohort of ADF members deployed to the Middle East Area of Operations between 2010–2012. It will examine how the effects of combat exposure and deployment on a range of mental and physical health indices may develop over time. In any occupation where there is a likelihood of repeated stress exposure, it is important to document the effects of this over the longer term. While the majority of people will maintain resilience, health effects of deployment often may not manifest until many

years later. Participants in this study completed self-report measures of mental and physical health, and a subset of those in high-risk roles also undertook a range of additional objective tests of physical and neurocognitive health at three time points: prior to an index deployment, post-deployment and again 3–5 years later. Findings show rates of psychological and physical symptoms and disorder increased over time in the cohort, with an increased proportion scoring above screening thresholds, though the proportion meeting criteria for probable disorder remained low. There were clear differences in the symptom trajectories of those who were more psychologically symptomatic at the third wave compared to those who remained relatively symptom free. Consistent with the findings regarding symptomatic distress and disorder, there were also differences in the trajectories of markers of biological health and neurocognitive function among those with and without elevated mental health symptoms at wave 3. Overall, findings indicate that on both self-report and objective measures, minor degrees of distress and related biological and neural dysregulations that can be detected prior to deployment appear to be an indicator of risk of further dysregulation after the deployment cycle. Even relatively minor shifts at post-deployment appear to represent a substantial risk for the emergence of sub-syndromal or full disorder over time.

#### Biography

Dr Ellie Lawrence-Wood is a senior research fellow at the Centre for Traumatic Stress Studies, University of Adelaide. She has been an investigator on several project grants and consultancies, including the Transition and Wellbeing Research Programme, and was the Lead Investigator on the Impact of Combat Study specifically. She has played a key role in the Middle East Area of Operations (MEAO) Prospective Study, a large-scale project focusing on the psychological, physical and neurobiological impacts of deployment to the MEAO among ADF personnel; and the Mothers in the MEAO study, a follow up to the Military Health Outcomes Program (MilHOP) Health Studies, aimed at understanding the specific health and psychosocial wellbeing impacts of deployment, for Australian mothers deployed to the MEAO. In addition to her research, she is the current Chair of the Clinical Advisory Committee, and a Director on the Board of Management for the Operation Flinders Foundation, a South Australian based charitable organisation that runs a world leading wilderness adventure program for young people at risk. Dr Lawrence-Wood has co-authored over 19 peer-reviewed published journal articles and abstracts, as well as 7 reports commissioned for government and industry. She

regularly presents at national and international conferences.

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### The Past, Present and Future of Army's Specialist Health Capability: A Commander's Perspective

LTCOL Anthony Chambers<sup>1</sup>

*1 3rd Health Support Battalion*

#### Abstract

Following the restructure of Army's deployable health capability, Army's specialist health capability is maintained within the 3rd Health Support Battalion. 3 HSB is comprised of health specialist reservists encompassing a broad range of medical, nursing, allied health, scientific, environmental health and paramedic specialisations. The role of the unit is to force generate a specialist health capability and to raise-train-sustain a reserve specialist health workforce in support of Army and the ADF's tasks and operations.

3 HSB is a unique unit within 17 Brigade, with a national footprint and subunits spread over six states. The unit maintains a high-tempo, deploying a large number of its members on overseas operations each year, while continuing to provide task support to other units and major exercises.

Providing specialist health support with a reserve workforce that is dispersed and dislocated is challenging. This is particularly the case in the recruitment of key high-value specialists, and the maintenance of high levels of both individual and clinical readiness. Maintaining high levels of engagement with reserve members as well as developing a training program that fully prepares them to provide high-quality health support on operations is also an enduring challenge.

In this presentation, the Commanding Officer of the 3rd Health Support Battalion will provide his personal insights and reflections during his tenure providing command, management and leadership to the unit, including the challenges faced in meeting Army's demand for specialist health support and possible future directions.

#### Biography

*LTCOL Anthony Chambers is the Commanding Officer of the 3rd Health Support Battalion. He has been an active member of the Australian Army Reserve for 24 years. He has seen operational service on multiple deployments to Timor-Leste, Bougainville, Banda Aceh, Iraq, Afghanistan and the Ukraine.*

*In his civilian role, he is a general surgeon specialising in Surgical Oncology and is the Head of the Department of General Surgery at St Vincent's Hospital Sydney.*

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### The Story of an Able Seaman in WWII on His Dog Watch

WGCDR Peter Hurly

#### Abstract

How an extraordinary Royal Naval Able Seaman, who led a dog's life and who, without any formal training, was able to support his shipmates in their times of physical and mental stresses.

A historical presentation of an able seaman who instinctively knew how to support his shipmates in their times of need. He became so well known that when he died, a message went out to the entire Royal Navy of his passing. Coincidentally this presentation also highlights some of the challenges faced by some of the medical staff during his service life.

#### Biography

*Peter Hurly was born in South Africa and studied pharmacy and subsequently medicine. National service with the South African Medical Corps and subsequently SA Medical Services where he saw active service.*

*Peter moved to New Zealand and joined New Zealand Army. He left to go into private practice and became a Reserve Officer with the RNZAF until 2003 when he joined Regular Force.*

*He has a Diploma in Aviation, certificate in aeromedical retrieval and Master's in Aviation Medicine. He is a Fellow of the Royal New Zealand College of GPs and Australasian College of Aerospace Medicine and a Member of AMMA council as Treasurer and NZ representative.*

*Peter was awarded the Order of St John and more recently, the Distinguished Service Decoration.*

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### Training War-Time Surgeons in a Peace-Time ADF

**Dr Kyle Bender<sup>1</sup>**

*1 Australian Defence Force - Medical Specialist Program*

*2 Australian Army - 2GHB*

#### Abstract

For centuries, developments in surgical practice have been closely tied to military surgical experiences. Hippocrates himself declared that 'he who wishes to be a surgeon should go to war'. Until as recently as the second Gulf War. The skill sets of highly trained civilian surgeons were readily transplantable into military practice and skills learned on the battlefield were equally translated back to civilian surgery. In more recent years, however, we have seen the skills required of civilian surgeons change. Modern developed world surgical practice, and subsequently, surgical training, focuses on multidisciplinary, super specialised, minimally invasive, non-operative and robotic surgery. This evolution of surgical practice and technique has been wonderful for patients in well-resourced, high-volume metropolitan centres but has resulted in a large and growing divide between the skills of an Australian civilian surgeon and those required of the deployed surgeon in an ADF field hospital in a kinetic battlespace.

Modern general surgical trainees in Australia completing the nationally recognised FRACS (Fellowship of the Royal Australasian College of Surgeons) complete their training with an advanced set of skills. They are expert laparoscopic surgeons, consultative multidisciplinary team members, skilled endoscopists and well-educated surgical oncologists. As such, they are well prepared for the day-to-day work of the modern civilian surgeon. Conversely, the ADF military general surgeon needs to be proficient at damage control urology, gynaecology, vascular, thoracic, head and neck and abdominal surgery. Furthermore, they must manage all of the breadth of emergency surgical presentations, both traumatic and otherwise, without the aids of laparoscopic or endoscopic equipment, interventional radiology, the veritable smorgasbord of subspecialists available in a civilian tertiary centre or a seemingly endlessly resourced ICU. They need to be able to 'just cope' like the previous generation coped.

This is a new phenomenon. Never before in the history of surgery have the requirements of military

and civilian surgeons been so far removed from one another. Never before have well trained civilian surgeons, even those at the top of their game, been so unprepared for battle. The question that we need to answer is: 'How do we bridge the gap?'. Certainly, the best training for war is the experience of war itself, but we are at peace at present and we need to ensure that we are ready for war when it occurs.

Broadly speaking, there are several strategies for training and clinical sustainment of surgical specialists available to the peacetime ADF. Some of these are being employed while others are not. Options include domestic and international civilian placements, operational deployments with allies, domestic and international training courses, and military exercises. Each has advantages and limitations. Carefully combined and curated, there may just be enough opportunity for our surgical specialists to gain the experience that they need to be ready for war should the need arise.

Even through the most recent conflicts, the surgeons available to deploy had been trained in an era that set them up for success on the battlefield. Additionally, given that the ADF has been busy with operations since the early 1990s, most of the deployable surgical workforce had either deployed themselves or worked with someone with first-hand experience of battlefield surgery. As we enter a period of operational downtime and this workforce ages and is replaced by more junior colleagues, the ADF will inevitably lose this corporate knowledge. It is therefore paramount that we find a way to raise and sustain a workforce with the skills required for modern warfare, so that when we are required, we are up to the challenge to provide our soldiers, sailors and airmen the surgical backup that they deserve.

#### Biography

*Dr Bender graduated with an MBBS from UNSW in 2009. He completed his internship and residency at Wagga Wagga Base Hospital from 2010–2012. He was commissioned as an Army Reserve Medical Officer in 2012 before undertaking training in the specialty of General Surgery with the Royal Australasian College of Surgeons achieving the FRACS in 2017 with training based at Royal North Shore and Lismore Hospitals. In 2018 Dr Bender transferred from the Reserves into the Australian Regular Army under the ADF Medical Specialist Program and was promoted to the rank of Major. He is posted to 2GHB in Brisbane where he is the full-time General Surgeon for the Army working closely with Army Reservists to provide surgical capabilities for major exercises and operations utilising the Army Role 2E Field Hospital.*

*Dr Bender has clinical interests in trauma, acute surgery and upper GIT surgery as well as surgical education. He is a Senior Instructor on the RACS EMST program and has a passion for the improvement of surgical, particularly trauma, education in Australia. He currently lives with his wife and son in Sydney and works at the Northern Beaches Hospital as the General and Acute Surgery Fellow.*

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### Veteran Homelessness: Lessons Learned From 10 000 Nights of Emergency Accommodation

Mr Nathan Klinge<sup>1</sup>

<sup>1</sup> RSL Care SA

#### Abstract

Since 1915, RSL Care has been meeting the accommodation and care needs of South Australia's most vulnerable Veterans, originally managing homeless veterans back from the beaches of Gallipoli through to today where we cater for a variety of veterans from WWII, Korea, Vietnam and Australia's contemporary operations.

Through our homeless veteran program (Andrew Russell Veteran Living), we have provided well over 10 000 nights of emergency and longer-term accommodation to contemporary veterans who are homeless or at risk of homelessness, and we also support older homeless veterans through our two aged care facilities located in metropolitan Adelaide.

Drawing on real-life examples this presentation will discuss the reasons why veterans find themselves in situations of high-risk accommodation, and it will discuss the significant complexities involved in meeting the long-term accommodation needs of the most vulnerable members of South Australia's veteran community.

This discussion will include real-life examples of veterans made homeless through:

- domestic violence
- substance abuse
- family break down

- unemployment
- mental health and suicidal ideation
- complex health care needs
- diseases of ageing
- imprisonment and home detention.

Through this presentation, attendees will gain an insight into the nature and depth of homelessness issues for the veteran community of South Australia, and a spotlight will be shone on what is otherwise a reasonably hidden corner of our national framework for managing veteran health and wellbeing issues after the war has ended.

The presentation will conclude by highlighting the aspirational but achievable goal of obtaining functional zero homelessness for Adelaide's homeless war veterans.

#### Biography

*With over 23 years of full-time military experience, and now being employed as a CEO in aged care, Nathan has served in a variety of leadership, management and training positions. Nathan spent most of his military career as a Commissioned General Service Officer within the Royal Australian Army Medical Corps and having discharged from the Regular Army in 2014, he remains a member of the Army's Active Reserves. In 2014, Nathan assumed the position of Director Development for RSL Care SA, and was then appointed as CEO in 2015.*

*Nathan serves as a Director on a variety of not-for-profit boards, and he represents veterans' health issues on SA Health's Veterans Health Advisory Council, and as Co-Chair of Southern Adelaide Local Health Network's Consumer Advisory Group. Nathan is passionate about meeting the accommodation needs of vulnerable veterans, and about helping older vulnerable veterans' transition successfully into aged care.*

*Nathan has three teenage daughters, and no hot water.*

## Virtual Reality (VR) Exposure Therapy in the Role of Repatriation of Veterans' with Post-Traumatic Stress Disorder (PTSD)

Dr Abhilash Chandra<sup>1,2,3</sup>, Mr Steve Cook<sup>2</sup>,

A/Prof Edward Palmer<sup>2</sup>

<sup>1</sup> Ashford Vascular Clinic

<sup>2</sup> University of Adelaide

<sup>3</sup> Artificial Environment Simulations Pty Ltd

### Abstract

Post-traumatic stress disorder (PTSD) is a debilitating mental health disorder that can develop after a person has experienced severe traumatic events. It is often accompanied by other mental health disorders, such as anxiety and depression, which can dramatically reduce the quality of life of a patient. Many military veterans suffer from PTSD symptoms when exposed to images, sounds or other stimuli that trigger memories of combat. Treatment for PTSD has varied over the years; from medication to psychotherapy to simple exercise. Graded exposure therapy is a specific cognitive-behavioural psychotherapy technique that is used in the treatment of PTSD. This can improve PTSD symptoms and have a positive impact on related disorders. Frequent exposure to simulated combat experiences allows patients to grow more comfortable with these triggers, to a point where these stimuli no longer provoke negative reactions. Virtual Reality (VR) environments and experiences are becoming more realistic with technological advancement and play more of a role in psychological treatment modalities such as graded exposure therapy. Complete visual immersion into a 'virtual environment' can convince the brain of an individual that what he or she is experiencing is real. VR graded exposure therapy helps patients face their fears by exposing them to stressful events in controlled VR environments. VR enables simulated combat experiences used in exposure therapy to

be as realistic as possible, without endangering the participants physically. Patients are able to experience visual, auditory, olfactory and tactile stimuli during the VR 'situational' simulations, all of which are delivered in safe and controlled conditions. Patient physiological responses can be monitored during the exposure therapy, and training is provided to the patients to help develop coping skills in specific situations. Repeated exposure to combat situations in VR has also been demonstrated to have a measurable impact on a person's physical response to stressful environments, i.e. pre-conditioning. Exposure therapy may result in a reduction in heart rate, cortisol levels and other biological indicators of panic. There are also suggestions that VR can do more than help veterans recover; VR can also prevent new recruits from developing PTSD later. VR pre-conditioning of military personnel can help soldiers adapt to combat in simulated environments, so they are less traumatised by the experience when they encounter the real thing.

In summary, VR technology offers a complementary way to traditional treatment of PTSD, and is improving the way health care professionals treat mental health conditions.

### Biography

*Dr Abhilash Chandra BSc, MSc, MBBS (Hons), PhD, FRACS (General), FRACS (Vascular)*

*Dr Chandra is a General and Vascular Surgeon, and has a special interest in Trauma Surgery. His clinical practice is based in Adelaide. He is a Captain in the Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians.*

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## Can 10 Weeks of Shoe Wear Reverse Years of Neuromuscular Adaptation due to Military Boot Wear?

Jacques Rousseau<sup>1</sup>, Associate Professor Wyatt Page<sup>2</sup>, Dr Sally Lark<sup>2</sup>

<sup>1</sup> New Zealand Defence Force

<sup>2</sup> Massey University

### Abstract

**Background:** Previous comparisons of boot versus shoe wear have always been acute 'one-off' measures, and do not account for any habitual wear physiological adaptations. This study compares lower limb biomechanical and muscle electrical activity of habitual boot wearers pre- and post-10 weeks of flexible shoe wear.

**Methods:** Sixty-five habitual boot wearing Regular Force military male personnel (age:  $37.6 \pm 10$  years; height:  $1.76 \pm 0.4$  m; mass:  $84.5 \pm 11$ kg) were measured for lower limb (tibialis anterior, medial and lateral gastrocnemius strength, fatigue and range of motion pre- and post-10-week flexible shoe wear. In addition, muscle electrical activity (EMG) and postural balance via centre-of-pressure area were also recorded. Work fatigue was measured as the percentage of work in the first third relative to work in the last third of the endurance test.

**Results:** Post-10 weeks from transitioning from a minimum of two years habitual boot wear to shoe wear, all participants significantly improved their balance, as shown by a decrease in the 95% ellipse area ( $p < 0.001$ ). There was also a significant decrease ( $p < 0.001$ ) in the anterior-posterior and medial-lateral movement of Centre of Pressure (COP). There were significant decreases in gastrocnemius activity (Gastrocnemius-Medial (GAS-M):  $p = 0.019$ ; Gastrocnemius-Lateral (GAS-L):  $p = 0.001$ ) and variability (GAS-M:  $p = 0.020$ ; GAS-L:  $p = 0.011$ ) in the post-shoe wear balance test. In contrast, no difference was observed in tibialis anterior (TA) muscle activation ( $p = 0.367$ ) and variability ( $p = 0.151$ ) between pre and post shoe wearing for 10 weeks. In addition, TA activation was significantly greater than GAS-M and GAS-L in both pre- and post-balance test ( $p < 0.001$ ). There were significant increases in plantar flexion strength ( $p < 0.001$ ), dorsiflexion strength ( $p < 0.001$ ), inversion/eversion range ( $4.9^\circ$  and  $5.2^\circ$  respectively), and plantarflexion/dorsiflexion isokinetic range of motion by  $3.8^\circ$  after wearing shoes for 10 weeks. Work fatigue of the plantar flexors significantly decreased ( $p < 0.05$ ).

**Conclusions:** The results indicate an increased stabilisation by transitioning to habitually wearing a flexible shoe after years of boot-wear maladaptations. The implications may lead to decreased lower limb injuries associated with prolonged boot wear.

### Biography

Jacques Rousseau was born in South Africa, June 1961. He has completed a Bachelor's degree in Physical Education and a postgraduate degree in Clinical Exercise Physiology. Jacques joined the South African Defence Force, completing basic infantry training and graduating from the Officers Training Course as a lieutenant. Jacques worked as a physical training officer as well as serving in the Angolan war. For many years he worked alongside the South African Special Forces developing specialised training, rehabilitation and wellness programmes. In 1996, he was promoted to the rank of Lieutenant Colonel and appointed as Acting Director of South African Defence Force Ancillary Health Services. In 1999, Jacques and his family immigrated to New Zealand where he accepted a sport and exercise science lecturing position at Massey University, Wellington. During this time, he founded and managed the Massey University Cardiac Rehabilitation exercise programme and completed a Master's Degree in Sport and Exercise Science. Jacques has co-authored published papers regarding exercise and health as well as co-authoring a book: 'Get up and Go' that describes the benefits of exercise for health. Jacques enlisted in the NZ Army in 2011 and is currently employed as the NZDF Exercise Physiologist.

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## Gambling Prevalence among Active Duty Military Personnel: Evidence from a Systematic Scoping Review

Dr Megan Whitty<sup>1</sup>

<sup>1</sup> Australian National University

### Abstract

Wagering and games involving chance are widely accepted within defence culture, as in broader society, as legitimate 'recreational activities'. Many types of gambling have historically been popular among defence members as a means to combat the stress, boredom and isolation that soldiers can experience. With casinos often found in close proximity to military

bases, and poker and other forms of social gambling played in barracks stationed around the world, gambling has a diverse and colourful association with defence downtime. However, interest in, and concern over, the possibility of high prevalence and undetected harm associated with gambling disorder (GD) in military settings is evident in the appearance of international media attention, published evidence, and independent research being conducted into GD within veteran and defence populations (Bray, 1992, etc.).

There is now well-accepted support for GD to be recognised as a serious issue, affecting the health and wellbeing of a significant number of veteran and defence service members and not simply an innocuous pastime (Whyte; Dighton, 2018). Indeed, the National Defence Authorization Act passed into United States (US) federal law in 2018 mandatory GD screening into routine health checks in the US Department of Defence (DoD).

The international evidence base for gambling in the military has emerged predominantly from North America and often focuses exclusively on veterans (refs). Research reporting the prevalence, sociodemographics, and psychiatric comorbidities of at-risk veterans (refs), has focused particularly on the apparent link between GD and combat specific post-traumatic stress disorder (PTSD) (Dirk, 2005). In the US, for example, researchers have found that military experiences and post-deployment stressors may be associated with higher rates of GD among veterans (Amy W, 2017). The current assumption is that 'gambling addiction is underdiagnosed and undertreated among vets' (refs). How this corresponds to active-duty populations is less well studied, as it is much more difficult to find information on active-duty defence personnel from peer-reviewed literature.

This review was designed to systematically identify and describe all available research that addresses gambling within active-duty defence personnel from the literature. The primary objective was to examine the extent of evidence relating to gambling prevalence and associated harm within active-duty Anglophonic defence settings (US, Canadian, UK or ANZAC) and to provide a systematic overview and synthesis of the disparate sources. The secondary objective was

to reflect upon the research in terms of the policy environment and to identify research opportunities that are most likely to have a significant positive effect on military health policy across countries.

A scoping review methodology was employed to capture the breadth of information available in the area (Arksey & O'Malley, 2005; Levac, Colquhoun & O'Brien, 2010). This systematic and yet flexible approach allows for the mapping and assessment of emerging evidence with no restrictions on the resource materials. It is a well-placed first step for understanding new under-reviewed areas for research development. Furthermore, given its rigour and transparency, scoping methodology results can be a useful foundation for informing future policy.

Search terms were intentionally broad to capture as much relevant literature as possible, yielding 317 references for further processing. The final sample (n = 11) of sources all originated from the US and mainly from a quantitative operational research perspective. Findings suggest that, while an evidence base does exist, its origins are overwhelmingly constrained to studies of the US Military.

This is the first systematic review investigating the reported prevalence of gambling disorder among members in active service in a specific set of defence populations. A significant research gap exists regarding the prevalence of gambling disorder among active-duty defence personnel.

### Biography

*Dr Megan Whitty holds a PhD in Public Health research from Charles Darwin University (2017) and completed her BA (Hons.) in Anthropology at the University of Melbourne (2006). Megan is an experienced qualitative researcher currently working at the Australian National University's Centre for Social Research and Methods as a research fellow within the Centre for Gambling Research.*

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## Immersive Environment Training for Combat Health Service Personnel – An Unlimited Potential

Dr Abhilash Chandra<sup>1,2,3</sup>, Mr Steve Cook<sup>2</sup>,

A/Prof Edward Palmer<sup>2</sup>

<sup>1</sup> Ashford Vascular Clinic

<sup>2</sup> University of Adelaide

<sup>3</sup> Artificial Environment Simulations Pty Ltd

### Abstract

Combat health training within the military environment can be dangerous, time-consuming and costly. Current training strategies are only realistic in some (not all) aspects of training, mainly because of occupational health and safety constraints. Immersive technologies such as Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) can enhance the current training options that are available to Defence, as they have the potential to make training more efficient and cost-effective.

An unlimited variety of highly detailed and customised simulations can be built into immersive game engines such as Unity3D, which can provide a full range of realistic scenarios for military health training. Hardware platforms such as HTC Vive (for VR), or Microsoft HoloLens 2 (for AR) can be used to immerse combat health personnel in these software-generated simulations. Individuals or teams can perform clinical procedures in realistic 'virtual' battlefield conditions safely.

The advantages of these artificial environment simulations are enormous. They have a much smaller footprint, can be used anywhere, significantly simplifies conduction of effective training in shorter timeframes and in multiple settings. They allow unlimited rehearsals of single and numerous procedures by individuals or teams. Simulations designed for individuals can significantly improve dexterity, economy of movement and clinical decision-making as candidates have an unlimited opportunity to perform, practice and rehearse these procedures, thereby developing muscle memory, neuroplasticity and automaticity. These simulations have the ability to improve clinical outcomes by gamification of the procedure to incorporate instant fails, establishing milestones and incorporating narratives into the system. Simulations designed for team-training scenarios emphasise on technical and non-technical aspects of health care provision to patients, and subsequently promote the concept of building 'expert teams' rather than 'teams of experts'. Immersive technologies also allow assessment of the candidate's

performance during the simulation. The assessor will be able to view exactly what the candidate is able to see throughout the scenario. Developing these simulations into standardised formats will enable formative and summative assessments to be performed to enable career advancement. Multiple algorithms, which mimic clinical complications, can be incorporated within simulations to allow assessment of the candidate's ability to cope with complex but realistic clinical scenarios.

The ability to acquire and post-process biometric variables (including physiological responses of the candidate to the challenging scenarios using wearable device technology) as well as multiple monitoring strategies pre-built into the game engine on a cloud-based data platform allows multiple 'angles of analysis' of candidates (e.g. single-person single-point measurements versus single-person multi-point measurements versus multi-person multi-point measurements). This allows assessors to look at candidate stress management strategies in different environments while undertaking different tasks, and allows the ability to benchmark individual candidate progress.

Deep machine learning (DML) and Artificial Intelligence (AI) algorithms can be used (in the future) to predict the performance of candidates in different environments. An example where this may be important is a Commander's ability to predict how a particular Medic or Medical Officer will cope in specific austere environments, which therefore, may impact deployability of the individual. Immersive technologies can allow pre-conditioning exposure therapy to reduce the risk of PTSD in predeployment personnel. This approach can help prepare medics and medical officers to better cope with the confusion and chaos of the battlefield, and can expose them to a range of scenarios not easily replicated with traditional methods. A number of ethical scenarios can also be built into the simulations to further prepare candidates for battlefield scenarios.

The range of benefits offered by using immersive technologies as simulations within combat health is enormous, and we should look at using these to train combat health professionals of the future.

### Biography

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*Dr Chandra is a General and Vascular Surgeon, and has a special interest in trauma surgery. His clinical practice is based in Adelaide. He is a Captain in the Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians.*

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### Is Normal Saline Normal Enough? – Which Crystalloid or Colloid Solution is the Fluid of Choice for Pre-Hospital Resuscitation?

**Corporal Joshua Sherwood**<sup>1,2</sup>

*1 Royal New Zealand Air Force*

*2 Auckland University of Technology*

#### Abstract

**Introduction:** Fluid resuscitation is an important part of pre-hospital medicine. In-hospital research investigating which fluids are best for resuscitation is extensive and suggests that normal saline is inferior to other products and could be causing unnecessary mortality. The matter of which crystalloid or colloid is the fluid of choice for pre-hospital fluid resuscitation needs to be resolved as the current standard of care in New Zealand paramedicine is normal saline.

**Methods:** A structured review of the literature was carried out by searching the ScienceDirect, CINAHL and MEDLINE databases. The search terms used were 'paramedic OR ems OR emergency medical service OR prehospital OR pre-hospital OR ambulance OR emergency medical technician OR EMT' AND 'intravenous fluid therapy' AND 'crystalloid OR colloid OR saline' AND 'resuscitation'.

**Results:** Balanced solutions such as lactated ringers and PlasmaLyte appear to be the fluid of choice in the septic or critically ill patient. Trauma patients, however, appear to respond better to colloid solutions, with Hextend producing the best results.

**Discussion:** Balanced fluids have a reduced incidence of mortality and acute kidney injury in the critically ill patient when compared to both unbalanced crystalloid and colloid solutions. This is partly due to a reduced incidence of acidosis and associated physiological derangement. Colloids such as Hextend seem to be superior in trauma due to their high oncotic pressure, which results in less fluid being required which reduces hemodilution, coagulopathy and fluid overload.

#### Biography

*Corporal Joshua Sherwood is a passionate and motivated RNZAF Flight Medic with an interest in exercise medicine, and emergency and austere medicine, especially in the aeromedical retrieval setting. He joined the RNZAF in 2010, graduating the New Zealand Defence Health School as a Medic in 2013, before training a Flight Medic and completing his Bachelor of Health Science in Paramedicine over the following years. He continues his pursuit of evidence-based practice and hopes to conduct research in the exercise medicine field in the future.*

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### ISSUE DATES AND DEADLINES

Volume	No	Issue Date	Submission Deadline	Advertising Deadline
<b>January 2020 – Free Papers</b>				
28	1	January 2020	1 October 2019	1 December 2019
<b>April 2020 – Transition to Civilian Life</b>				
28	2	April 2020	1 January 2020	1 March 2020
<b>July 2020 – Global Health Security</b>				
28	3	July 2020	1 April 2020	1 June 2020
<b>October 2020 – Preparing for Conflict &amp; Disaster   2020 AMMA Conference Abstracts</b>				
28	4	October 2020	As per AMMA Conference Submission Process	1 September 2020

The Editor would be delighted to receive articles for consideration on these themes. However, please note that although these are the suggested themes, we encourage authors to continue to submit articles on a range of topics on military medicine and veterans' health including operational articles. Categories for the above include: Original Research/Original Articles, Short Communication, Review Articles, Reprinted Articles, Case Studies, Abstracts from the Literature, Biographies, History, Book Reviews, Commentary and View from the Front. Please submit via the JMVH website [www.jmvh.org](http://www.jmvh.org) just click the 'Submit your article' button on the home page. Ensure you read the 'Instructions to Authors' that can also be found on the JMVH website by clicking on the 'AUTHORS' tab. Should you have any queries in relation to submitting to JMVH, please do not hesitate to contact JMVH Editorial Office on +61 3 6234 7844 or [editorial@jmvh.org](mailto:editorial@jmvh.org)



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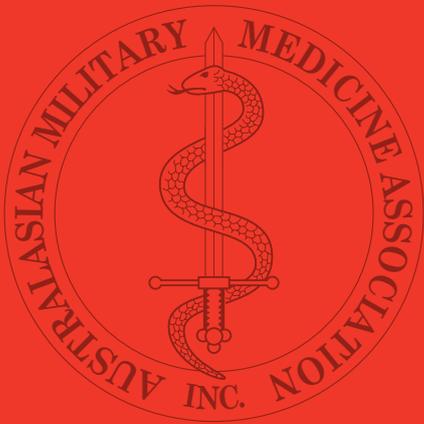


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