



- An Overview to Military Medical Ethics
- Agent Orange Reviewed
- AMMA 2021 Conference Abstracts

The Journal of the Australasian Military Medicine Association





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Front Cover: "Operation Tonga Assist 2022", Photo Courtesy Department of Defence

Operation TONGA ASSIST 22 is the Australian Defence Force's (ADF) contribution to the Department of Foreign Affairs and Trade (DFAT)-led effort to support the Government of Tonga following the eruption of Tonga's Hunga Tonga-Hunga Ha'apai underwater volcano on 15 January and subsequent tsunami. HMAS Adelaide arrived in the Tongan capital of Nuku'alofa on 26 January to deliver more than 250 pallets of humanitarian and disaster relief stores. Embarked ADF and Republic of Fiji's Military Forces personnel are working side-by-side supporting clean-up efforts on the island of Atata. HMAS Supply departed its homeport of Sydney on 6 February with more than half a million litres of fuel and humanitarian and disaster relief stores. The 173-metre long Auxiliary Oiler is designed to re-supply other ships and is available to help sustain vessels from partner nations delivering assistance to the Government of Tonga. Air support to Operation TONGA ASSIST 22 has included air reconnaissance to assess damage using P-8A Poseidon maritime patrol aircraft, while more than 119 tonnes of humanitarian and disaster relief stores have been delivered using C-17A Globemaster III and C-130J Hercules transport aircraft.

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

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- Bringing together those with an interest in military medicine
- Disseminating knowledge of military medicine
- Publishing and distributing a journal in military medicine
- Promoting research in military medicine

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

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# Editorial

Fellow readers of JMVH,

I would like to welcome you back to the face-to-face fold. It was great to see so many of you at our recent AMMA 2021 in Melbourne in early April 2022. This long-awaited event allowed many old and some new friendships to be renewed or brokered. We hope to see many of you back again for AMMA 2022 in Hobart in October.

I would also like to take the chance to welcome you back to our new issue of the JMVH which highlights several very interesting articles as well as publishing the abstracts from our recent AMMA scientific meeting and the poster presentations.

LTGEN Bricknell and AIRCDRE Story provide us with a thought-provoking review article on military medical ethics, very pertinent in our current environment. Next comes a timely reminder of the ever-present threat of CBRN weapons with de la Monte and Goel's review on the neurological effects of Agent Orange, provoking us to reflect on the implications this may have of conflicts going forward. Shanks then shines a light on the ever-present threat of Malaria and lessons learnt in WWII, this helps us reflect on the impact of infectious diseases in conflict and focuses our thoughts on other current and emerging infections and pandemics that may impact on our ability to defend our nation. I hope you enjoy this issue and consider submitting articles for publication in our journal.

**Associate Professor Martin Richardson**  
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# An Overview to Military Medical Ethics

M Bricknell, R Story

## Abstract

This paper provides an overview of military medical ethics (MME). It intends to inform military medical professionals on the breadth of the subject, including important subordinate topics, in preparation for further study. The paper opens by introducing core concepts at the intersection of medical and military ethics. It then examines the ethical issues that arise during conflict, focusing on obligations under international humanitarian law (IHL) and the Geneva Conventions. While MME might be most challenging during conflict, many issues also arise during healthcare practice in garrison healthcare. This includes biomedical research on military subjects or within military scientific laboratories. It also emphasises the need for strategic policy and education programs in MME. The paper concludes by identifying issues for further debate covering civil–military relations in complex emergencies and humanitarian crises, medical rules of eligibility, mitigation of risks to military healthcare workers, uses of technical medical knowledge to inform future military weapons and accountability for transgressions of MME. The comprehensive reference list provides a guide to sources for further study.

**Conflicts of interest:** Both authors are members of the Editorial Board of the *Journal of Military and Veterans' Health*. This paper has been independently reviewed.

## Introduction

Military medical personnel may face very challenging ethical decisions during operational deployments. A study of senior British military medical personnel with experience of leading a field hospital over multiple deployments in Afghanistan found that there were frequent ethical issues associated with the following topics: allocation of limited resources (e.g. blood), balancing resources between international military patients and Afghan patients, complying with policies on eligibility for medical care, transfer of Afghan patients to local hospitals, and treating local women and children.<sup>1</sup> A review of ethical issues arising from UK military assistance during the Ebola crisis in West Africa found a comparable range of challenges covering medical rules of eligibility, consent and experimental treatment regimes.<sup>2</sup> Similar observations on ethical challenges in military medical practice have been reported from many other nations, including the USA,<sup>3</sup> Canada,<sup>4</sup> Australia,<sup>5</sup> France,<sup>6</sup> Germany,<sup>7</sup> Sweden,<sup>8</sup> Turkey<sup>9</sup> and Pakistan<sup>10</sup>. There has also been a substantial increase in academic papers published on military medical ethics (MME) over the past 2 decades as a result of significant concerns over the ethical challenges faced by military health professionals during recent military operations.<sup>11</sup> Reflecting this background, in 2015, all member states of the International Committee of Military Medicine

endorsed the *Ethical Principles of Health Care in times of Armed Conflict and other Emergencies*, drafted under the aegis of the International Committee of the Red Cross (ICRC), as an international consensus on core ethical principles.<sup>12</sup>

This paper provides an overview of issues in MME and international humanitarian law (IHL) that impact the practice of military healthcare professionals including those that constrain their role as a member of the armed forces. The paper introduces core concepts at the intersection of medical and military ethics. It then examines the ethical issues that arise during conflict, focusing on obligations under IHL and the Geneva Conventions. While MME might be most challenging during conflict, many ethical issues in military healthcare practice arise in garrison healthcare. Ethical issues in this setting include confidentiality, consent and biomedical research on military subjects or within military scientific laboratories. This paper emphasises the need for strategic policy and education programs in MME and concludes by identifying issues for further debate. We hope this provides a primer for military healthcare professionals to guide further studies in the domain, including references to textbooks<sup>13–16</sup> and academic papers. Readers are encouraged to refer to the sources cited for further examination of the topics identified in the paper. The list is indicative rather than comprehensive, though the sources have

been deliberately selected to reflect perspectives from the widest number of countries practicable.

The paper will use the term 'military medical ethics (MME)' to cover the ethical principles and practice that apply to all healthcare workers in the armed forces (doctors, nurses, allied health professionals and non-professional military personnel assigned to medical duties). The term 'professional' is used to cover all healthcare workers whose licence and accountability for practice is defined by a non-military professional regulatory body (e.g. doctors, dentists, nurses, pharmacists, paramedics). This contrasts with military personnel without professional qualifications who are assigned to medical duties (e.g. non-registered medics and designated first aiders) and so only accountable to military authorities through military law.

### Core concepts

Medical practice is governed through the intersection of law, ethics and morality. Law prescribes a non-discretionary course of action. Ethics is the set of principles that govern a person's activities or behaviours, often codified by professional regulation. Morality is determined by individual conscience.<sup>17</sup> Across many cultures, there is a long history of prescribing the ethical standards by which doctors and other healthcare professionals practice their art through law or regulation. Medical ethics starts with the dictum 'first do no harm', though this is incorrectly attributed to the Hippocratic Oath.<sup>18</sup> This is commonly reinforced by Beauchamp and Childress's four principles of bioethics: autonomy (the right of competent adults to determine their treatment), beneficence and its corollary non-maleficence (favourable outcomes for patients with minimal harms) and justice (fairness on the basis of equality and non-discrimination).<sup>19</sup> Many national health professional organisations publish guidance on ethics; however, there is variation in the ethical frameworks of countries' medical bodies.<sup>20</sup> Health ethics has an international dimension<sup>21</sup> and many international bodies such as the World Health Organization,<sup>22</sup> United Nations Children's Emergency Fund<sup>23</sup> and the World Medical Association<sup>24</sup> also publish guidance.

Ethics for healthcare professions contrasts with the 'military profession' that has the ultimate function of applying lethal force against a nation's enemies to achieve political objectives. Military ethics concerns the moral challenges and dilemmas of professional military practice.<sup>25</sup> Even in war, there should be limits to the use of violence. This is commonly separated into 'jus ad bellum', the legality of states to go to war, and 'jus in bello', the use of military force

during hostilities. The latter is guided by the laws of armed conflict (LOAC) or IHL. Beyond the conduct of war, many aspects of military service constrain the freedom of armed forces personnel beyond that enjoyed by citizens. Examples include the duty to follow a legal order, restrictions on freedom of expression, and the legal authority to kill on behalf of the state. Thus military health professionals have rights and duties that are unique to their profession and are also subject to military law throughout their service in the armed forces, including when off duty.

MME lies at the intersection of medical and military ethics. Military healthcare professionals are, arguably, bound by a more extensive range of laws and ethical principles, both domestic and international, than any other group. Although employed in the armed forces, military healthcare professionals will be accountable to their national healthcare professional regulatory bodies for their ethical practice. For example, Australian doctors are subject to the national law that regulates health practitioners<sup>26</sup> as administered by the Australian Health Practitioner Regulatory Authority (AHPRA). As military officers, they are subject to the Australian Military Justice system,<sup>27</sup> and when deployed, the Australian Defence Doctrine Publication (ADDP) *06.4 Law of Armed Conflict*<sup>28</sup> and relevant IHL. This 'dual loyalty' lies at the heart of MME. Examples include balancing the humanitarian need to care for casualties from conflict and the military need to ensure empty beds in military hospitals for military patients, maintaining patient confidentiality against the need for military commanders to know the fitness of their personnel, and restrictions on medical personnel undertaking combat duties. Military healthcare professionals must base the resolution of ethical issues on relevant principles from both the healthcare and military professions.<sup>29</sup> This topic continues to be extensively debated in the military medical literature by both academic ethicists and practitioners.<sup>30, 31</sup> The concept of dual loyalty also applies to other healthcare professionals with institutional obligations like healthcare managers, occupational physicians and prison doctors.<sup>32</sup>

Military medical practice is underpinned by the principle that medical facilities and personnel are fundamentally neutral actors undertaking humanitarian roles and are afforded protection under IHL. Medical personnel (encompassing all healthcare workers and personnel assigned to medical duties) are not parties to conflict and thus have rights and duties. These principles extend from the conflict setting into the wider military environment and reflect the application of medical ethics into the unique context of military service. The



potential for a clash between ethical principles of the healthcare and military professions has led to debate over the relative primacy of each ethical framework.<sup>33</sup> Misunderstandings of these duties can lead to prosecution under military law, as in the UK case of a junior Air Force doctor who believed that the UK military deployment to invade Iraq in 2003 was illegal. A court martial convicted him of disobeying orders by refusing to undertake preparatory training and deploy to Iraq in 2005.<sup>34</sup> Failure to follow ethical guidance can result in the removal of a professional licence to practise. This occurred to a UK doctor due to concerns over his reports of injuries sustained by a detainee in Iraq, though the fairness of that decision has been challenged.<sup>35</sup>

### Military medical ethics during conflict

In the latter half of the 19th Century, the Red Cross movement and the Geneva Conventions established the duty of states to provide medical care to the injured on the battlefield based on medical need and the neutrality of medical services.<sup>36</sup> The 'state' usually delivers this through a military medical service with healthcare personnel, though this burden may be shared through multinational cooperation and commercial contracting. Therefore, it is not contrary to medical ethics for healthcare workers to be employed in support of the armed forces as long as their duties comply with medical ethics and IHL. Healthcare workers in many countries may be required, as part of national conscription, to join the armed forces and thus, work within military medical services may not be voluntary. It is also ethical for civilian healthcare workers to conscientiously object to military duties, though the state may enforce other obligations during war.<sup>37</sup>

Military healthcare professionals should not be involved in policy decisions about 'going to war', except to organise the medical plan required to support the mission (including civil-military planning for healthcare for all casualties from conflict). The four Geneva Conventions of 1949 and associated protocols of 1977 provide the foundations for IHL 'in war'. The ICRC provides commentaries on these conventions<sup>38</sup> and a searchable database to enable easy access to relevant sections by topic.<sup>39</sup> In summary, these require that parties to conflict (state armed forces and non-state armed groups) ensure that anyone (combatant, prisoner, shipwrecked or civilian) who is wounded or sick 'shall be treated humanely and shall receive, to the fullest extent practicable, without distinction except on medical need, and with the least possible delay, the medical care and attention required by their condition'.<sup>39</sup>

The ICRC guidance for armed forces on protecting healthcare<sup>40</sup> and guidance on the responsibilities of healthcare personnel working in armed conflicts and other emergencies,<sup>41</sup> both published in 2020, provide excellent practical information for the conduct of military health professionals during operations. These include suggestions for military medical planning and civil-military cooperation to mitigate the health consequences of war. Medical personnel and facilities should be regarded as neutral, respected and protected from harm. Military medical personnel and facilities may use the Geneva emblems (Red Cross, Red Crescent and Red Crystal) to identify them as protected entities. Military medical personnel, and those assigned to medical duties, must also carry a card that identifies their role. Military medical personnel may use 'light individual weapons' in their own defence, or in the defence of the wounded and sick in their charge. They are prohibited from renouncing their protection (i.e. they may not choose to become combatants). Medical or scientific experiments on the wounded or sick are forbidden unless directly for the patients' benefit and consistent with generally accepted medical standards.<sup>42</sup> This adds an additional level of scrutiny over the ethical review process for military medical research on protected persons in conflict environments compared with a civilian emergency environment. As an example, over the past decade, the UK Defence Medical Services has introduced procedures to balance the need for rapid approval of medical research with scrupulous ethical oversight.<sup>43</sup> Military healthcare personnel and commanders of medical units must know these principles and be prepared to challenge any order that might compel them to contravene the rules of medical ethics as they are protected from punishment under IHL.<sup>44</sup> Military healthcare personnel need to be specifically aware of the application of IHL to the following topics: impartial provision of emergency care;<sup>45</sup> medical rules of eligibility;<sup>46</sup> rights of specific groups of patients (especially prisoners<sup>47</sup>); decisions to withdraw curative treatment in the face of catastrophic injuries;<sup>48</sup> protection afforded to medical personnel;<sup>49, 50</sup> right to bear arms and self-defence; identification of medical units and personnel; and specific prohibitions that apply to medical personnel (such as the banning of medical experiments). Many of these provisions will be contained in national military law and are also covered during generic training in LOAC.

### Military medical ethics in garrison

Issues in MME in garrison (or non-combat) situations that apply to armed forces personnel as employees are very similar to 'dual-loyalty' ethical issues in

occupational medicine, forensic medicine, mental health and medical management. The military healthcare professional has duties to both their patients and their employer. This may be amplified by provisions in military law that place duties on all military employees for their behaviours plus specific obligations that protect national security. The basic principle of autonomy continues to apply to consent within the clinical 'doctor-patient' relationship.<sup>51</sup> However, a patient's perception of freedom of choice over medical treatment might be constrained by rank or other power differentials in this relationship.<sup>52</sup> This might be exacerbated by restrictions on the source of health providers due to control of access to care outside the military health system. Finally, military personnel may need preventive medicine measures as a condition of their specific employment or role (e.g. vaccinations, antimalarial prophylaxis), which requires their informed consent<sup>53</sup> or is a mandatory requirement for military service.<sup>54</sup> There are similar risks associated with confidentiality. An individual's health status may have significant implications for their military role, thus requiring a system for reporting an individual's health status outside the clinical domain.<sup>55, 56</sup> While clearly applicable for physical health conditions (e.g. a broken bone), this also applies to mental health conditions and 'social health' (e.g. drug or alcohol misuse, family breakdown). There will be other situations in which it may be necessary to break patient confidentiality for public health purposes, such as monitoring an infectious disease outbreak. While much emphasis on the academic debate for MME is placed on compliance with IHL, the non-operational component of MME must not be neglected given that the majority of a military healthcare professional's clinical career is likely to be spent on garrison duties.

Applying appropriate ethical oversight is essential in biomedical research on military personnel, especially when undertaken by military research institutions. There have been occasions where biomedical research conducted by military personnel has been unethical or even barbaric.<sup>57, 58</sup> While the examples of experiments conducted by German and Japanese military medical personnel during World War II are well known, there are more recent examples of ambiguous military medical experiments conducted during the Cold War.<sup>59-61</sup> The power differential between researchers and subjects is even more apparent if there are rank or other potential sources of coercion (loss of pay etc.) that could undermine true informed consent.<sup>62</sup> Military biomedical research might also be conducted for 'offensive military' purposes, such as developing new weapons (e.g. chemical or biological agents). It would be contrary

to the ethical duties of healthcare professionals for them to be involved in this research both as a result of the Geneva Conventions but also under the prohibition of the use of medical knowledge to violate human rights and civil liberties.<sup>24</sup> Furthermore, military biomedical research may be classified on the grounds of national security, limiting independent oversight. These issues require very carefully constructed governance arrangements to ensure that both the subjects and the institutions are protected from harm or allegations of research misconduct.<sup>59, 60</sup>

The breadth of individual topics and the number of academic publications published over the past two decades<sup>11</sup> imply that challenges in MME are inevitable and should be mitigated through strategic policy on this subject for military medical services that covers the gap between policy issued by national professional regulatory bodies and its application within a military environment.<sup>63, 64</sup> As an example, the North Atlantic Treaty Organisation (NATO) doctrine publication on military medical support uses the term 'ethic\*' on 10 occasions, referring to the obligation to comply with IHL and national laws and regulations.<sup>65</sup> This document implies that members of the NATO Alliance should have underpinning guidance on MME for their armed forces. This guidance should cover MME both on military operations and in garrison within a governance framework for the whole system.<sup>66</sup> It is notable that the US Department of Defence has recently published such a policy for the US Armed Forces.<sup>67</sup>

### Training and education in military medical ethics

Military healthcare professionals need to be taught about medical ethics as part of their clinical education, which especially applies within military healthcare institutions.<sup>68, 69</sup> Military medical personnel also require specific training on applying IHL and general medical ethics during armed conflict for their duties.<sup>70</sup> This should be considered as an essential component of the educational curriculum for training for their role and should be reinforced as part of the preparation for any military deployment.<sup>71, 72</sup> This training should be adapted for both the context of deployment and the individual's role. The UK experience has shown that it is particularly important for senior military medical leaders (the Deployed Medical Director) to rehearse their duties in making difficult ethical decisions and in the supervision of compliance with IHL by their subordinates.<sup>1</sup> This has been reiterated for more recent operations.<sup>73</sup> In addition to didactic teaching, a number of

commentators have advocated the importance of problem-based learning for military and military medical ethics using actual case scenarios as a tool for discussion and to influence behaviours and attitudes of participants.<sup>74-76</sup> The King's Centre for Military Ethics has recently published a smartphone app that provides a suite of scenarios in MME that can be used for small group learning in a physical or virtual teaching environment<sup>1</sup>.

Education and training for the ethical challenges of military medical practice may reduce the risk of 'moral injury' after exposure to crisis environments.<sup>77</sup> Moral injury has been defined as 'perpetrating, failing to prevent, bearing witness to or learning about acts that transgress deeply held moral beliefs'<sup>78</sup>. Whether moral injury is distinct from, or a subset of, post-traumatic stress disorder is not yet evident. Research suggests that pre-deployment preparation covering ethically challenging decisions and how such decisions could make individuals feel might have some protective effect.<sup>79</sup> Military health professionals may experience situations that have the potential to cause moral injury due to their role in caring for sick and injured patients in challenging circumstances.<sup>80</sup> These same risk factors have also informed the extrapolation of advice about preventing moral injury in a military setting to civilian healthcare workers during the current COVID-19 crisis.<sup>81</sup>

### Topics for debate

The previous paragraphs summarise key topics within the domain of MME. However, there are also topics for debate and further discussion—perhaps the most important concerns different definitions of 'humanitarian'. Since the creation of the Red Cross movement to establish the role and neutrality of medical services to treat wounded combatants and prisoners of war, the definition for a 'humanitarian' organisation has narrowed to cover the principles of impartiality, humanity, neutrality and operational independence.<sup>82</sup> This means that state-based organisations that undertake humanitarian work (including armed forces units) lie outside this definition because they are, de facto, instruments of the state as a security actor. This has particular implications for the conduct of military medical units and the importance of ethical decision-making in the use of military medical capabilities to provide healthcare for non-military populations during complex emergencies and humanitarian crises.<sup>83</sup> The planning for medical support during Iraqi-led security operations during the battle for the city of Mosul in

2016 is a recent case example of the complexity of civil-military medical planning, including the use of commercial and NGO medical services.<sup>84</sup>

The next topic for debate concerns the process of writing and applying 'medical rules of eligibility'.<sup>85,86</sup> As well as examining the balance between humanitarian obligations versus meeting the military mission, there is also a potential clash in the application of triage for the 'selection' of emergency patients for military healthcare between prioritisation based on clinical need versus prioritisation on the basis of ability to benefit clinically. This clash is at the heart of clinical decision-making for a mass casualty event. We suggest that the topic of 'risk to military healthcare workers' has not yet been significantly debated. This issue concerns the legality of a military order that would compel military healthcare professionals to be exposed to the risk of significant injury, illness or death and how this risk is compared to other military personnel or equivalent civilian healthcare workers. There was some debate on this subject in the context of the risk of contracting an infectious disease in response to Ebola<sup>2,87</sup> and it is likely to emerge in the reflections on the COVID-19 pandemic.<sup>88</sup> The topic applies both in the context of the initial treatment and retrieval of casualties from the front line and in the provision of personal protective equipment (body armour, helmets, protective clothing, etc.), especially in circumstances of short supply. A further topic is the use of technical biomedical knowledge by military health professionals for 'security purposes'. This covers research for 'defensive' security purposes such as antidotes to chemical weapons or vaccines against biological weapons. It becomes more challenging if military health professionals use their technical knowledge to support 'offensive' security objectives such as military intelligence, research into new weapons (e.g. biological or chemical agents, novel use of the electromagnetic spectrum) or biological augmentation of human performance (e.g. drugs to reduce the demand for sleep or to improve mental performance, especially if they have side effects). Finally, there is a debate over the accountability for transgressions of legal or ethical norms, including the chain of oversight from senior leadership. This has been most prominent in the debate concerning the involvement of military healthcare professionals in advising and monitoring the health status of prisoners undergoing interrogation.<sup>89</sup>

Alongside these topics, there has been a call for breadth<sup>90</sup> and clarity in the academic analysis of MME.<sup>91</sup> Open discussions on these topics may improve civil-military relations between military medical services and humanitarian organisations,<sup>92</sup> and inform non-military ethical practice in

<sup>1</sup> This is available for both IOS and Android by typing 'military medical ethics' into their relevant 'app store'.

humanitarian crises.<sup>93</sup> This might also cover the ethics of using health capabilities for a primarily diplomatic purpose rather than humanitarian reasons, especially if military medical units are employed to care for civilian patients.<sup>94, 95</sup>

### Conclusion

Overall, this paper has provided an overview of military medical ethics (MME) and its implications for the practice of healthcare workers within a military health system. The paper opened by introducing core concepts at the intersection of MME. It then examines key ethical issues that arise during conflict, focusing on obligations under international humanitarian law (IHL) and the Geneva Conventions. While MME might be most challenging during conflict, it is important not to ignore those issues that may arise during clinical practice in garrison healthcare. This includes biomedical research on military subjects or within military scientific laboratories. The paper concluded by emphasising the need for training and

education in MME and identifying issues for further debate. It is argued that this subject is relevant in the broader context of military ethics for military leaders and of equal importance to biomedical clinical subjects for military healthcare workers. There are widely agreed fundamentals based on IHL, especially the Geneva Conventions and general medical ethics. However, the foundational challenge of 'dual loyalty' between professions can create tensions for ethical medical practice. It is unlikely that either the legal system or the professional regulatory system would accept ignorance as a defence. Therefore this is an important topic for the education of military healthcare professionals.

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# Agent Orange Reviewed: Potential Role in Peripheral Neuropathy and Neurodegeneration

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## Abstract

Agent Orange, a dioxin-containing toxin, was used as a herbicide during the Vietnam War. Agent Orange exposure was initially linked to congenital disabilities among Vietnamese civilians residing near aerially sprayed regions. Years later, returning South Korean and United States (US) Veterans exposed to Agent Orange exhibited increased rates of malignancy, cardiovascular disease, diabetes and congenital disabilities in their offspring. Growing evidence that herbicides and pesticides contribute to chronic diseases, including neurodegeneration, raises concern that Agent Orange exposures may have increased the risk for later development of peripheral or central nervous system (CNS) degeneration. This article reviews published data on the main systemic effects and the prevalence rates, relative risks, characteristics and correlates of Agent Orange-associated peripheral neuropathy and CNS dementia-associated diseases. The critical findings demonstrated that relatively high levels of Agent Orange exposure increased the risk of developing peripheral neuropathy, either alone or as a cofactor complication of diabetes mellitus, and likely contributed to the pathogenesis of CNS degenerative diseases, including Alzheimer's, Parkinson's and vascular dementias. Given the protracted interval between Agent Orange exposure and disease emergence, additional research is needed to identify mechanistic correlations of related neurological disorders, including lifestyle cofactors.

**Key words:** Agent Orange; veteran; neuropathy; dementia; Vietnam; Korea; herbicide; diabetes; US Military; dioxin

## Agent Orange: The back story

Agent Orange was a potent synthetic herbicide that was mainly used to defoliate enemy territory during the Vietnam War. Chiefly manufactured by Monsanto and Dow Chemical, the herbicide contained equal proportions of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), together with trace quantities (0.05 to 50 parts per million) of the dioxin, 2,4,7,8-tetrachloro-p-dioxin (TCDD). The health dangers of Agent Orange have been linked to contamination of 2,4,5-T stocks with TCDD. Agent Orange was the most commonly used Rainbow Herbicide in the Vietnam War era. Its name stemmed from the storage of the herbicide in readily identifiable 55-gallon drums marked with an orange band.

In 1962, the United States (US) Air Force initiated the Rainbow Herbicide (green, pink, purple, blue, white, orange) spraying missions in South Vietnam.

Agent Orange was introduced in 1965, and its use increased between 1966 and 1969. However, reports linking Agent Orange to congenital disabilities<sup>1</sup> halted its use by April 1970. C-123 aircraft were used for Agent Orange spraying missions because they achieved rapid, broad and intense coverage (i.e. 3 gallons per acre over 340 acres within just a few minutes).<sup>1</sup> It is estimated that over 11 million gallons of Agent Orange were sprayed via Operation Ranch Hand, accounting for over 60% of the total recorded herbicide applications during the Vietnam War.<sup>1</sup> Between 1965 and 1971, when most of the spraying occurred, 10% of South Vietnam was sprayed once, while 30% or more of the region was sprayed repeatedly.<sup>1</sup> After the spraying program was terminated, the nearly 2.2 million remaining gallons of Agent Orange were either incinerated at sea or deposited on Johnston Island, an atoll in the Pacific Ocean.

Among the approximately 3 million Americans who served as military personnel in Vietnam, the majority were men born between 1941 and 1950. More than 85% were White, and just over 10% were Black. Recruits from lower socioeconomic and educational backgrounds experienced more direct combat fighting and had higher rates of mortality.<sup>1</sup> Allied forces, including approximately 320 000 South Korean military service members,<sup>2</sup> served alongside the Americans. US military personnel were exposed to Agent Orange by several means. Approximately 1250 served in the Operation Ranch Hand branch of the US Air Force and were assigned to aerial spraying of herbicides. Another 950 Army Chemical Corps-trained soldiers sprayed herbicides on the ground.<sup>1</sup> Unknown numbers of military personnel participated in small-scale backpack or buffalo turbine spraying.<sup>1</sup> A fourth source of exposure occurred from dispensing small buckets of Agent Orange along the perimeters of base camps to curb vegetation growth. The US soldiers were prohibited from entering zones sprayed by Operation Ranch Hand for at least 1 month to limit the risk of enemy fire. However, tens of thousands of troops were positioned within 0.5 km of those regions within days of the spraying mission's completion, a phenomenon that could account for the bulk of Agent Orange exposures.

### Agent Orange exposure-related maternal and foetal health concerns

During the war, laboratory test reports and individual accounts emerged concerning the potential danger of chemical herbicides. Vietnamese civilians were heavily exposed to the herbicides because over 80% of the population resided in rural areas that had been sprayed,<sup>1</sup> and the villagers consumed locally grown crops that had been sprayed. For years, the aftermath of the Agent Orange spraying included high rates of congenital disabilities among Vietnamese offspring and alarmingly high rates of malignancies and respiratory ailments in young US veterans. Such disease reports, together with the suspicion that TCDD and possibly other engineered components of Agent Orange were the cause, inspired population-based studies to assess correlations, causality and timelines.

In a study of 30 Vietnamese women in whom pre-war pregnancies and deliveries were all normal, most of the post-war pregnancies terminated in stillbirth, pre-term delivery or delivery of infants with major anomalies including deformed immobile limbs, visual, hearing and other sensory function impairments, and disabilities in learning and cognition. Affected women came from heavily sprayed areas in Vietnam. Agent Orange was deemed the likely cause due to the

temporal relationships between the exposures and spikes in congenital disabilities.<sup>3</sup> A subsequent meta-analysis of 13 Vietnamese and 9 non-Vietnamese studies linked occurrences of congenital disabilities to Agent Orange exposures with an overall relative risk (RR) of 1.95.<sup>4</sup> Spina bifida was included among the congenital disabilities.

Parental exposures to Agent Orange increased the risk of congenital disabilities in both non-Vietnamese (RR=1.29) and Vietnamese (RR=3.0) civilians.<sup>4</sup> Higher rates of maternal exposures led to increased rates of teratogenesis in offspring, whereas male exposures predominantly led to mutagenesis/malignancies.<sup>4</sup> Agent Orange's toxic effects likely differ in males and females. Independent findings suggest that Agent Orange mediates gender-dependent toxic injury via endocrine system disruption. For example, in a case-control study, saliva and serum samples from North Vietnamese mothers residing in dioxin hotspots had elevated levels of salivary cortisol (1.89 vs 1.10 ng/ml) and cortisone (10.8 vs 7.74 ng/ml), and serum cortisol (94.2 vs 66.3 ng/ml) and cortisone (26.7 vs 22.0 ng/ml) relative to controls from dioxin-free regions.<sup>5</sup> A later cohort of 51 mother-infant pairs showing altered CNS neuronal activity during the quiet sleep phase and attendant poor communication ability manifested by abnormalities in early childhood gaze behaviour, highlighted the role of breast milk as a vehicle for perinatal exposure to TCDD.<sup>6</sup>

### Agent Orange: Increased rates of malignancy and other chronic diseases in veterans

The spikes in rates of malignancies, including increased rates of carcinomas and soft tissue sarcomas, in Vietnam War veterans drew further attention to the potentially severe adverse health effects of Agent Orange. Systematic investigations led the US Department of Veterans Affairs (VA) to conclude that Agent Orange exposure had either a causal role or increased the risk of developing chronic B-cell leukaemia, non-Hodgkin's lymphoma, Hodgkin's disease, multiple myeloma, prostate cancer, soft tissue sarcomas and chloracne. Skin malignancies, including basal cell carcinoma and locally aggressive skin cancers, also occurred at higher rates in veterans of Operation Ranch Hand.<sup>7</sup> In contrast, the rates of malignant melanoma did not increase. Apart from malignancies, Vietnamese veterans who handled herbicides had higher rates of hypertension, cardiac disease, gastrointestinal ulcers, sexually transmitted diseases, benign fatty tumours and various dermatologic conditions, including skin rashes with blisters, changes in skin colour and increased sensitivity to light compared with non-herbicide handlers.<sup>8</sup> However, those

studies have limited value since definitive exposure doses and durations were not documented.

Among enlisted ground personnel, high levels of dioxin exposure via Operation Ranch Hand increased overall mortality due to chronic liver disease and cirrhosis or cardiovascular disease, including atherosclerosis and coronary artery occlusion,<sup>9</sup> increased rates of blood glucose abnormalities (RR=1.4 ) and diabetes mellitus (RR=1.5), with shortened onset times to diabetes.<sup>10</sup> The increased cardiovascular mortality rates were attributable to higher rates of underlying cardiovascular disease and diabetes mellitus. Despite multisource evidence that Agent Orange exposures via Operation Ranch Hand had broad deleterious effects on health, difficulties with data reproducibility, including confirmation of increased morbidity and mortality from lung cancer and congenital disabilities,<sup>11</sup> continue to fuel the controversy. More research is needed to confirm and mechanistically understand the role of Agent Orange as a mediator of this diverse array of diseases across the lifespan.

### Agent Orange exposure and increased risk of peripheral neuropathy

Several large-scale studies provided information about the rates and characteristics of peripheral and central nervous system diseases that arose in South Korean and US Vietnam War veterans years after being discharged from military service. For the most part, the studies emphasised dose-effects of the exposures and whether the peripheral nerve disease corresponded to mononeuropathy, polyneuropathy or complications of diabetes mellitus. Despite limitations due to their retrospective bases, reliance on subjectively reported exposures, and

data acquisition via symptom surveys rather than evidence-based or direct examinations, the studies provided longitudinal assessments. In addition, they attempted to characterise the nature of peripheral neuropathies based on estimated Agent Orange or TCDD doses. Data extracted from four representative studies are summarised in Figures 1–4.

In a study of 1224 middle-aged (45–64) Korean military veterans who served for 7–25 months between 1963 and 1973, the rates of all peripheral neuropathies, mononeuropathy and neuropathy with diabetes mellitus were compared with those in 154 control veterans who had not participated in the Vietnam war<sup>2</sup> (Figure 1). Neuropathies were diagnosed by neurologists 25–35 years after the reported exposures, and the findings were linked to TCDD levels in stored blood samples. The war veterans and controls had similar mean body mass indices and they regularly consumed similar amounts of alcohol and tobacco (heavy use via smoking). The percentage of war-service veterans diagnosed with peripheral neuropathy (12.3%) was significantly higher than in the control group (3.3%; OR = 2.39), and over a broad range of TCDD blood levels, the rates of peripheral neuropathy were between 5–20 times higher than for mononeuropathy or neuropathy due to diabetes mellitus (Figure 1). In addition, the rates of diabetes plus peripheral neuropathy were significantly higher in war-serving veterans (1.7%) than controls (0.7%), whereas the rates of mononeuropathy were similar for the two groups (1.1% vs 1.3%). The sub-analysis failed to demonstrate higher rates of peripheral neuropathy, mononeuropathy or neuropathy with diabetes with increasing blood levels of TCDD, suggesting that the 2,4-D and 2,4,5-T exposures via Agent Orange rather than the TCDD dioxin contaminant produced

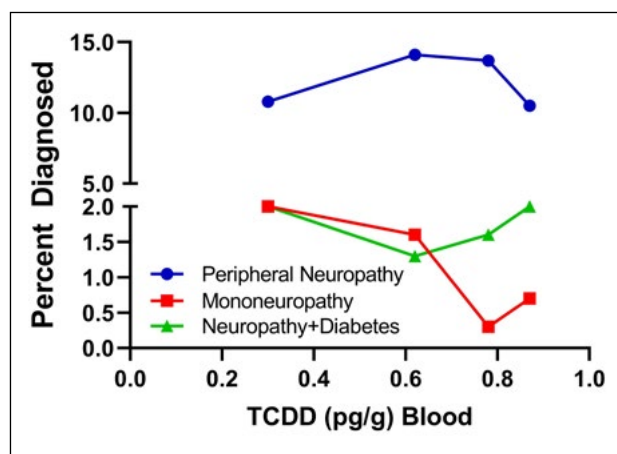


Figure 1: Rates of peripheral neuropathy, mononeuropathy and neuropathy with diabetes in Korean veterans of the Vietnam War.<sup>2</sup> Neuropathies were diagnosed clinically 25–30 years after the Agent Orange exposures, and TCDD levels were measured in stored blood samples. The graphs depict prevalence rates of the neuropathy subtypes. Statistical comparisons were made with controls. The lack of a TCDD dose-dependent effect argues against a role for that proposed contaminant as a mediator of peripheral neuropathies in soldiers exposed to Agent Orange, and instead, the data support a pathogenic role for the herbicide constituents.

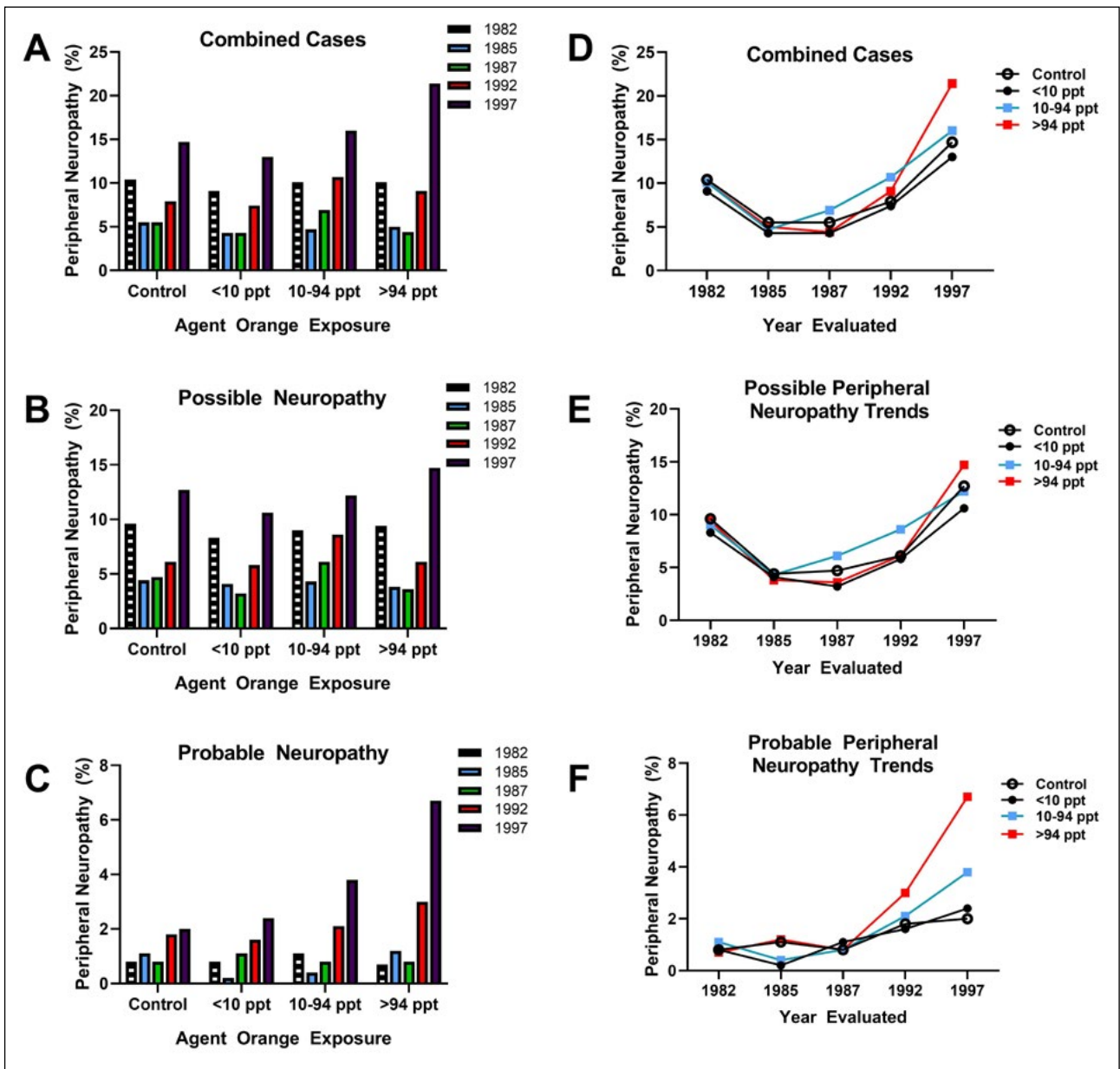


Figure 2: Comparative analysis of Agent Orange/TCDD exposure levels in relation to peripheral neuropathy rates over time. Data were extracted from a study of veterans of Operation Ranch Hand in which peripheral nerve function was assessed over time from 1982 to 1997. Neuropathies were categorised as possible or probable. 13 A) Rates of combined (possible + probable) peripheral neuropathy, B) possible neuropathy and C) probable neuropathy diagnosed in 1982, 1985, 1987, 1992 and 1997 in controls and veterans exposed to less than 10 parts per trillion (ppt), between 10–94 ppt or greater than 94 ppt of Agent Orange and TCDD. The largest effect size was detected in veterans diagnosed with C) probable neuropathy in which dose-dependent increases in prevalence were detected at the 10–94 ppt and >94 ppt exposures. Panels D–F display the same data by showing comparative shifts in D) combined, E) possible and F) probably neuropathy over time with comparisons across exposure doses. F) Clearly with ageing, higher exposures doses were associated with higher rates of probable neuropathy.

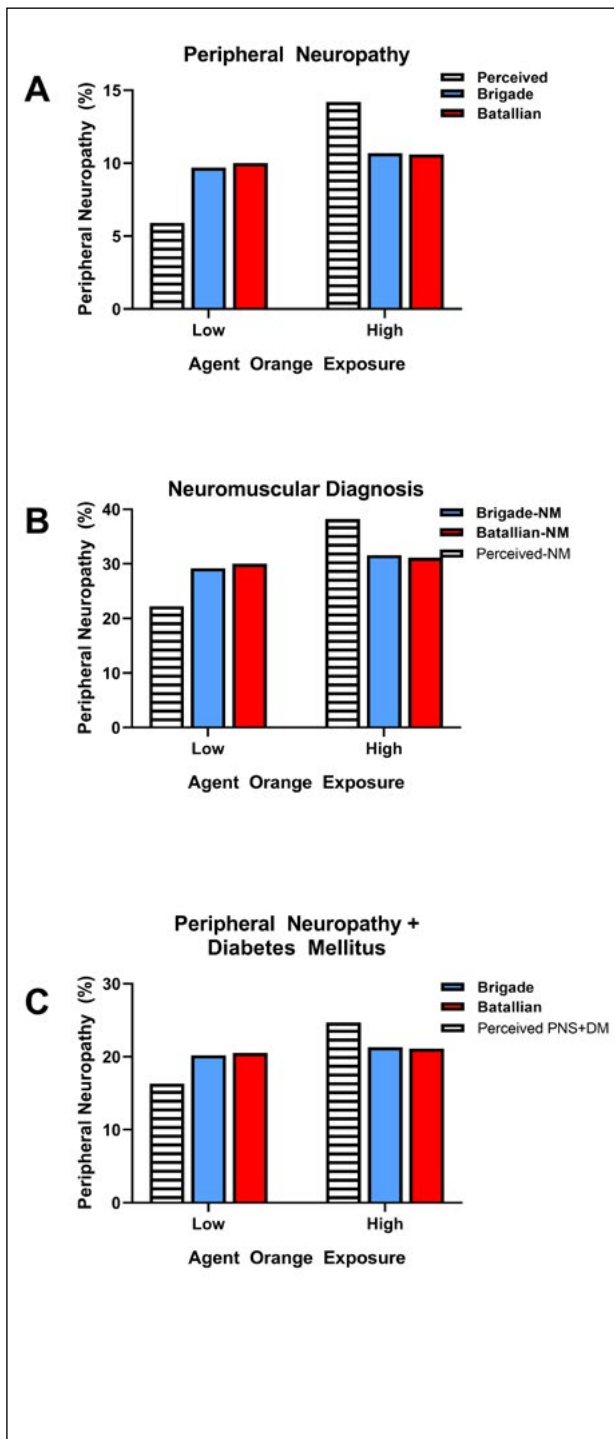


Figure 3: Rates of A) peripheral neuropathy, B) neuromuscular diagnoses and C) peripheral neuropathy with diabetes mellitus among Korean veterans of the Vietnam War. Data were collected via questionnaires, and comparisons were made among veterans whose perceived exposures to Agent Orange were low or high. The brigade versus battalion comparisons were made to evaluate rates in veterans who served in tactical units versus the broader population. A) High perceived exposures were associated with higher rates of peripheral neuropathy than low perceived rates. In contrast, no differences were detected between low and high exposures in brigade and battalion veterans. Rates of B) neuromuscular diagnoses and C) peripheral neuropathy + diabetes mellitus was not established in perceived low versus high Agent Orange exposures. However, rates of neuromuscular and peripheral neuropathy + diabetes diagnoses were similar in brigade and battalion veterans with low or high levels of Agent Orange exposures.

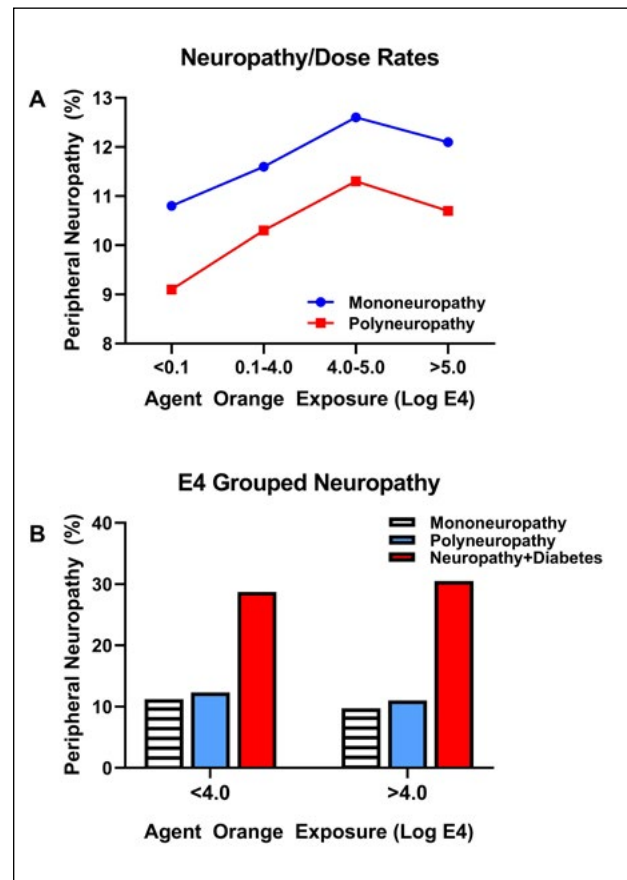


Figure 4: A) Impact of Agent Orange exposure doses on rates of mononeuropathy and polyneuropathy in Korean veterans of the Vietnam war. E4 corresponds to the exposure opportunity model. The line graphs depict parallel exposure dose-dependent increases in rates of both mononeuropathy and polyneuropathy diagnosed by neurological examination. Note the plateaus at the highest doses for both categories of neuropathy. B) Analysis of grouped data based on threshold Agent Orange exposures showed additive effects of peripheral neuropathy in veterans with neuropathy and diabetes mellitus but not the effect of threshold Agent Orange exposures, i.e. low versus high.

the neurotoxic/degenerative effects on the peripheral nervous system.

Diabetes mellitus is a major cause of peripheral neuropathy. Twenty-five years of Type 1 or 2 diabetes leads to symptomatic peripheral neuropathy in up to 50% of afflicted individuals; however, almost 7% become symptomatic within the first year of diagnosis. Despite these extraordinary figures, the rates of peripheral neuropathy among diabetics are vastly underestimated since many cases appear to be asymptomatic or escape clinical detection. Combining all of its manifestations, the estimated prevalence of neuropathy among people with diabetes is 90%.<sup>12</sup> Since the increased rates of diabetes mellitus among Agent Orange-exposed veterans would likely have contributed to any measured increases in peripheral neuropathy rates, studies focusing on Agent Orange-associated neuropathies must weigh the confounding role of Type 2 diabetes as a causal factor before concluding that Agent Orange had independent neurotoxic effects on the peripheral nervous system.

More definitive insight into the role of Agent Orange as an agent of peripheral neuropathy emerged from a study of US Air Force Vietnam War veterans assigned to Operation Ranch Hand. From 1962 to 1971, the program was responsible for spraying thousands of gallons of Agent Orange over rural Vietnam. Michalek et al. performed 5-year longitudinal check-ups and lifetime analyses of the veterans' medical records and used formal neurological and electrophysiological testing to characterise the presence and nature of peripheral neuropathy. They also assessed whether the presence of peripheral neuropathy was possible (bilateral symptoms associated with absent Achilles reflex, abnormal ankle vibratory sense or abnormal pinprick) or probable (two or more of the above symptoms).<sup>13</sup> The investigators used stored blood samples to measure dioxin levels. Results were analysed by sub-dividing the 1000 veteran participants into four exposure-level groups based on blood dioxin levels as follows: no exposure; low-level exposure (<10 parts per trillion (ppt) of dioxin); next highest level (10-94 ppt) and highest level (>94 ppt).

Although the early period evaluations showed no significant differences in nerve conduction or severity of neuropathy between Agent Orange-exposed and control veterans, veterans exposed to the highest or near-highest doses had significantly higher probable symmetric peripheral neuropathy rates than controls and low-exposure veterans (Figure 2). Although there was no evidence of a diabetes cofactor effect on rates of peripheral neuropathy, it

is noteworthy that the rates of diabetes (50%) and pre-diabetes (80%) were very high, such that by the last time point of the study, 87.5% of the highest-level Agent Orange-exposed veterans diagnosed with peripheral neuropathy also had diabetes mellitus. Therefore, it is likely that Agent Orange exposures at high levels caused both peripheral neuropathy and diabetes, either separately or as combined disease processes. Further analysis of the nature of peripheral neuropathies revealed that the Operation Ranch Hand veterans had high rates of small fibre stocking-glove type peripheral neuropathy rather than large fibre neuropathy.

In 2013-2014, Yi, et al. catalogued the occurrences and characteristics of self-reported peripheral neuropathy among 114 562 Korean veterans of the Vietnam war.<sup>14, 15</sup> In the 2013 study, data pertaining to Agent Orange exposures and perceived symptoms were obtained by questionnaire. The participants were stratified into highest exposures (involved in spraying the herbicide), moderate exposures (present during the spraying), low exposures (indirect contact but present in sprayed regions) and no exposure (no reported contacts). Those categorisations corresponded to proximity-based exposure indices and were based on the E4 exposure opportunity model. The rates of peripheral neuropathy were significantly higher in the high (14.2%) versus low (5.9%) perceived exposure group (Figure 3) and the calculated odds ratios increased with exposure levels.<sup>14</sup> Further comparisons between brigade (narrow group with tactical area responsibility) and battalion (broader company serving at the same time) demonstrated approximately 10% prevalence rates of peripheral neuropathy (Figure 3A), 30% prevalence of neuromuscular diagnoses (Figure 3B) and approximately 20% prevalence of peripheral neuropathy with diabetes mellitus (Figure 3C) for each but no appreciable intergroup differences.

The main findings in this study were that: 1) veterans who had perceived high exposures had a 2.5-fold increase in the odds of developing peripheral neuropathy; 2) the odds of having peripheral neuropathy were 1.8 times higher in the low perceived compared with no perceived exposures; 3) the odds of having peripheral neuropathy were 2.8 times higher in the moderate and 3.9 times higher in the high perceived compared with the no perceived exposure group. The pitfalls of this study are related to fundamental design flaws (subjective, survey, recall-based), lack of details about the nature of peripheral neuropathies and finding that all of the significant differences were based on self-perceived exposures.

In their 2014 extended study, Yi et al. collected data from 111 726 Korean veterans using a medical database and categorised disease using the International Classification of Diseases (ICD-10) codes rather than self-reported conditions. The peripheral neuropathies were categorised as mononeuropathy (damage to a single nerve) or polyneuropathy (damage to multiple peripheral nerves).<sup>15</sup> The rates of mononeuropathy were consistently higher than polyneuropathy; however, both increased with Agent Orange exposure levels, although they plateaued at the highest range (Figure 4A). In contrast, when the data were grouped based on a threshold exposure opportunity index (E4) no differences were detected with respect to the rates of mononeuropathy, polyneuropathy or neuropathy with diabetes. However, the added impact of diabetes mellitus was evident in cases of mononeuropathy and polyneuropathy (Figure 4B). By combining disease classifications and degrees of exposure, intergroup distinctions regarding risks and rates of peripheral neuropathy were lost. Since data were collected from insurance claim records, granular but significant details about the nature and severity of neuropathy may have been overlooked or unavailable.

### Potential role of Agent Orange in CNS neurodegenerative diseases

Recent evidence suggests that Agent Orange exposures may predispose to Alzheimer's disease (AD) and Parkinson's Disease (PD),<sup>16, 17</sup> the two most prevalent age-associated forms of neurodegeneration. Given that most AD and PD cases are considered sporadic in occurrence rather than genetic, the search for environmental and lifestyle cofactors and causal mechanisms continues. This strategy is essential because positive outcomes would offer opportunities to prevent or remediate disease. Both PD and AD have been linked to pesticide and other toxin exposures in humans and experimental models.<sup>18-22</sup> Therefore, the concept that Agent Orange exposure can increase the risk for AD and PD is not farfetched. In light of their strong incident correlations with ageing and the fact that Vietnam War veterans are rapidly ageing, the potential cofactor role of Agent Orange is a reasonable consideration.<sup>23</sup>

Evidence that rates of these diseases may be increased among veterans exposed to Agent Orange was provided by functional neurologic examination studies demonstrating PD-related abnormalities, including higher tremor and rigidity scores, altered basal ganglia function and lower facial expression scores relative to controls.<sup>17</sup> With regard to AD, plasma amyloid beta levels were elevated in Agent Orange-exposed Korean veterans of the Vietnam War.<sup>17</sup> A

recent systematic analysis of the US Veterans Health Administration database demonstrated twofold higher rates of dementia in Agent Orange-exposed (5%) compared with random unexposed veterans (2.5%), and 1.25 years earlier onset of disease.<sup>24</sup> Apart from its neurotoxic effects, Agent Orange-associated cognitive decline may have been mediated by cerebral infarction due to cardiovascular disease or chronic ischaemia secondary to brain microvascular disease and hypoperfusion.<sup>25</sup> Both atherosclerosis and small vessel disease are consequences of diabetes mellitus.

### Mechanisms of Agent Orange toxicity in plants

The two main synthetic herbicide constituents of Agent Orange, 2,4-D and 2,4,5-T are phenoxyalkanoic acids that structurally mimic indole-3-acetic acid (IAA), the most abundant natural plant growth hormone or auxin. 2,4-D has been studied more than 2,4,5-T and was shown to function as an IAA agonist that, when combined with IAA, has dose-dependent differential effects manifested by altered growth, senescence or death of plants. Its high-dose toxic effects are ultimately mediated by altered regulation of auxin-responsive genes such as rate-limiting enzymes involved in the biosynthesis of plant stress hormones. The pathophysiologic effects of 2,4-D are attributable to limited ability for metabolism and degradation, which prolong its half-life in cells. Corresponding increases in stress hormones promote cellular injury due to oxidative stress and oxygenation of polyunsaturated fatty acids (lipoxygenases).<sup>26, 27</sup> Inhibition of plant lipoxygenase compromises host defences and growth and metabolic processes.<sup>27</sup> Consequences include cellular build-up of reactive oxidative species and death of the plants.<sup>28</sup>

### Potential mechanisms of Agent Orange-related nervous system diseases

The mechanisms of 2,4-D and 2,4,5-T mediated diseases of the peripheral nervous system (PNS) and CNS are under investigation. However, limited data from experimental models suggest that 2,4-D's effects in plants and the PNS are similar and its cytotoxic effects target supporting epineural, perineural and Schwann cells in a dose-dependent manner. In this regard, using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay, investigators demonstrated that 2,4-D exposures increased oxidative stress in peripheral nerve sheath cells by increasing superoxide generation and reducing antioxidant mediators.<sup>29</sup> Consequences included G1 cell cycle arrest, restricted growth and increased DNA damage.<sup>29</sup>

Regarding the CNS, studies in rats showed that 2,4-D adversely impacts brain structure and function across the lifespan. Exposures in the early postnatal period significantly reduced brain weight along with DNA and protein content by early adolescence. Higher doses and prolonged exposure periods compromised brain lipid expression by reducing gangliosides, which are needed for inter-neuronal connectivity and communication<sup>30</sup> and myelin lipid levels of monohexosylceramide and sulfatide. The alterations in myelin lipid composition were associated with white matter fibre loss in the corpus callosum and entorhinal cortex.<sup>31</sup> Neurobehavioral consequences of early developmental exposures to 2,4-D include excessive spontaneous motor activity mimicking serotonin syndrome and hyperactivity in the open field.<sup>32</sup> In adults, 2,4-D exposures diminished ambulation and rearing and promoted excessive grooming.<sup>32</sup> In older rats, 2,4-D reduced locomotion and rearing and increased immobility in the open-field test, effects that were associated with reduced striatal levels of serotonin and reversed by 5-hydroxytryptophan (5-HTP), the precursor of serotonin.<sup>33</sup>

Essentially, the neurotoxic effects of 2,4-D differ with developmental stage and age, but one common thread is that it has adverse effects on myelin and related cell types. Myelin is needed for efficient conductivity and neurological function. In addition, damage to myelin exposes axons, rendering them more vulnerable to toxins present in extracellular fluid. Of further interest is that 2,4-D reduces sulfatide in white matter. A similar abnormality occurs in neurodegeneration mediated by other agents and mechanisms,<sup>34-37</sup> and importantly, declines in white matter lipid sulfatide due to reduced synthesis or increased degradation correlate with cognitive-motor impairments. In addition, ceramide conversion to glucosyl- or galactosylceramide is the intermediary step in generating sphingomyelin. A 2,4-D-associated decline in hexosyl(Gluc and Gal)-ceramide reflects the build-up in ceramide, which is neurotoxic and promotes apoptosis and compromises the generation of sphingomyelin, which has critical structural and functional roles in the plasma membrane and myelin.<sup>36</sup>

2,4-D's neurotoxic effects mimic other chemical herbicides, including paraquat, which is widely

used in agriculture. Paraquat causes both CNS and PNS damage by increasing reactive oxidative species and free radicals,<sup>38</sup> and like 2,4-D, it damages myelin. Mechanistic studies have shown that paraquat damages myelin by inhibiting myelin gene expression via the Wnt-beta-catenin pathway, reducing promoter activation of myelin protein gene expression.<sup>38</sup> Furthermore, paraquat-induced motor impairments in rats have been linked to loss of dopaminergic neurons in the substantia nigra.<sup>39</sup> Comparable studies have yet to be performed in relation to 2,4-D, and consequently, it is not known if the mechanisms of myelin loss resemble those identified for paraquat. Myelin deficiency compromises nerve conductivity and impairs both PNS and CNS functions. These effects could account for the signs and symptoms of peripheral neuropathy and cognitive-motor dysfunctions observed in ageing Vietnam War veterans exposed to Agent Orange.

## Conclusion

Agent Orange exposure is associated with increased rates of congenital disabilities, malignancies, cardiovascular disease and diabetes mellitus. However, an additional long-term consequence that has received little attention is its potential role as a mediator of chronic degenerative diseases of the PNS and CNS. This review analyses the evidence that Agent Orange can increase the risk of peripheral neuropathy and additively impact the neurological effects of diabetes mellitus. Agent Orange's potential contribution to CNS degenerative diseases, including Alzheimer's, Parkinson's and vascular dementias, is of particular interest in light of the rapidly ageing population of Vietnam War veterans. Given the protracted intervals between the Agent Orange exposure and disease emergence, additional research is needed to identify mechanistic correlates of related neurological disorders.

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# Malaria During Special Forces Operations in the Indo-Pacific Region During the Second World War

G. D Shanks

## Abstract

Although Special Forces may expect high casualty rates, such highly-trained soldiers cannot afford infectious disease losses. During World War II, malaria often determined the extent of special operations simply by limiting the time a unit could be deployed in a tropical jungle before fever incapacitated it. During the Allied campaign against the Imperial Japanese Army in Burma in 1943–1944, long-range penetration patrols by both the United States (US) Army (Merrill's Marauders) and British/Indian Army (Chindits) were heavily affected by malaria, causing the majority of their disease casualties. In the Australian Imperial Force, 2/2 Independent Company were eventually evacuated in late 1942 after months in East Timor with essentially all survivors infected with malaria. Chemoprophylaxis remains the best preventive intervention to keep heavily exposed soldiers free of malaria symptoms. Improved regimens that are better tolerated and last for extended periods are still required.

Special Forces operations are often of such short duration that infectious disease incubation periods minimise mission impact. This is not true for long-range penetration patrols that may last for weeks, such as in Burma and East Timor during World War II. In several cases, malaria and other infections such as scrub typhus and dysentery largely determined the interval before the infantry became combat ineffective. In the Indo-Pacific region, rugged jungle terrain remains the site of ongoing guerrilla warfare and is often where conventional military units cannot be usefully deployed. Special Forces units designed to move lightly across challenging geography may be considered in such situations. However, planners need to have realistic expectations about what even very fit and highly-trained military specialists can do under such circumstances. The historical records of Merrill's Marauders (US Army) and the Chindits (British/Indian Army) in Burma 1943–1944, as well as the Australian Imperial Forces 2/2 Independent Company in East Timor in 1942, are briefly reviewed in regards to their malaria experience. Malaria was a devastating illness for all three units and severely compromised their combat effectiveness. Malaria remains a current threat in many parts of the Indo-Pacific. Better medical countermeasures are still needed to maintain Special Forces as a military option in the region.

## Merrill's Marauders in Burma

*'Concomitant with increasing fatigue, [and] acquirement of other diseases, such as the dysenteries, morale began to deteriorate and malaria discipline suffered greatly. No attention was paid either to clothing, repellent, or the use of atabrine. As this process went on, the impression of the medical officers was that a large number of men deliberately exposed themselves or at least welcomed the incurrence of malaria infection.'* MAJ Maurice Seltzer (1944).<sup>1</sup>

Merrill's Marauders (Composite Unit 5307, later 75th Rangers) was the only combat infantry unit deployed in the China-Burma-India (CBI) theatre by the US Army during World War II.<sup>2</sup> The military intent was to spearhead a north-to-south offensive of large bodies of US equipped Chinese Nationalist Army soldiers to clear the tenuous logistical link from Indian ports into southern China over the mountains of northern Burma<sup>3</sup> (see Figure 1). In a series of three jungle operations by 3000 infantry soldiers supported by their Chinese and Kachin allies but supplied only by variable airdrops from February to July 1944, an entire Imperial Japanese Army division was largely neutralised, and the key Myitkyina airfield was captured. However, Merrill's



Figure 1: US Infantry Regiment (Provisional Unit 5307, later 75th Rangers) known as Merrill's Marauders crossing a stream in the Kumon Mountains of northern Burma in March 1944. US Army official photo, now in public domain

Marauders then disintegrated as a formed unit from tropical disease casualties and starvation and was never reconstituted following the prolonged siege of Myitkyina. Controversy still exists about the unit's unconventional mission, high casualty rate and widely-perceived inadequate recognition for its accomplishments.<sup>3</sup>

Even in retrospect, it is difficult to give a complete account of Merrill's Marauders malaria experience. However, it was unquestionably high and severely affected combat effectiveness.<sup>1</sup> Malaria was a problem for Merrill's Marauders even before starting their mission because nearly one-third of its members were veterans from the Solomon Islands campaign who were already infected with malaria. During the training phase, 7.4% per week of the soldiers became malaria casualties in India due to previous infections — removing men as unfit for duty with a history of three successive malaria attacks would have largely eliminated one of three infantry battalions if that proposed policy had been enforced.<sup>1</sup> Few deaths resulted from malaria (unlike scrub typhus in the pre-antibiotic era). However, nearly all 5307th Unit's members contracted malaria in Burma, of which 296 (10%) are listed as having been evacuated primarily for malaria. Another 950 men were evacuated as ill, for which most, if not all, had some malarial component. The bar for malaria evacuation was high, requiring a fever exceeding 102°F for three successive days despite quinine treatment.<sup>3</sup> Variably drug-

suppressed (usually with atabrine, aka mepacrine) malaria in Merrill's Marauders was more typical of prisoners of war along the Thai–Burma Railway than in other Allied units as there was no medical policy enforcing regular atabrine suppression in CBI until August 1944, long after its worth was recognised on Guadalcanal and New Guinea.<sup>4, 5</sup> CBI's theatre-wide malaria rate fell from 320/1000 men to 20 over the course of one year, largely reflecting the disciplined use of the unpopular but effective mepacrine daily chemoprophylaxis.<sup>4, 6</sup> It turned men's skin yellow and was reputed to cause many other adverse events; however, it also unquestionably prevented malaria and was a decisive difference between the Allies and the Japanese whose medical supply system had collapsed.

## Chindits in Burma

*'Statistically considered, Special Force met a more dangerous enemy in disease than in the Japanese Army. Clinically analysed, it was more severely injured by malaria and dysentery than by bullets and grenades. Tactically appraised, its battle worthiness was determined by its medical discipline more than by its courage.'* COL (later MAJGEN) W J Officer RAMC (1946)<sup>7</sup>

The birth of modern British Special Operations includes the World War II experience of the Chindits, who evolved into a long-range, light infantry force sent in multiple small columns behind enemy lines in Burma to disrupt Japanese supply lines in coordination with an offensive by conventional forces. The first Chindit force (Operation Longcloth) in February to April 1943 was most remarkable for its casualties as nearly one-third of the force did not make it back across the Irrawaddy River to India (2182/3000 survived, 600 of which were unfit for any further service; see Figure 2). Those too ill to continue were ordered to be left behind with no hope of air evacuation and the predictable adverse effects on unit morale and cohesion. The second Chindit force (Operation Thursday, February to August 1944) formed an entire infantry division (20 000 men, nominally the 3rd Indian Division) and was better supported by air supply and some medical evacuation. The casualties were again high (1396 killed, 2434 wounded, half of the survivors were hospitalised).<sup>7</sup> The success of the Chindit Operations was clearly qualified and has since been debated, especially in regards to how much or little it diverted enemy forces from their main effort against Assam in India.<sup>6, 8, 9</sup>

Because of multiple causes of infection in the tropics, it is difficult to evaluate how much of the immense



Figure 2: British/Indian Army troops on a riverbank in Burma in 1943 during original Chindit long-range penetration patrols under Operation Longcloth. Photo from UK National Army Museum NAM. 2006-12-105-6 1943, now in the public domain.

tropical disease problems experienced by the Chindits was explicitly due to malaria. LTCOL John Masters, a staff officer and temporary commander of the Chindit 111 Brigade in Burma, was well aware that some malaria breakthroughs resulted from the deliberate failure of men to take atabrine regularly. Casualties of 111 Brigade at the beginning of June 1944 (82 dead, 206 wounded, 49 missing) were nearly matched by those evacuated with disease (318), much of which was due to malaria. Although poor chemoprophylaxis discipline contributed to the malaria epidemic, in Master's opinion, the rapid rise of sickness in the summer of 1944 among the Chindits resulted from their general debility,

which had accumulated during an excessively long campaign (beyond the initial 90 days planned).<sup>7, 8</sup> In a medical review of 111 Brigade (nominal strength of 4000 soldiers) one month later, during July 1944, it was found that 4.3% had been killed, 9.8% were wounded, 46.5% were sick or wounded — enough to require evacuation — and only 4.4% (about one company equivalent) were functional. Malaria formed 61% of 111 Brigade's medical casualties, and its illness rates were higher than any other unit. West African soldiers in the Chindits had half the malaria casualties seen in 111 Brigade. However, this was also true of the Gurkhas from Nepal, suggesting that this diminution was due to better chemoprophylaxis discipline among the tribal soldiers and not genetic/immune resistance.

Regardless of its genesis, the mid-1944 malaria epidemic in the Chindits was a major limitation on human resources and thus combat effectiveness (see Figure 3). Based on a medical survey by the Deputy Director of Medical Services that the Theatre Commander ordered in July 1944 to determine if operations could continue in the face of such disease, it was estimated that most men had lost 28–42 pounds of body weight, most had been treated for malaria seven (minimum three) times while behind enemy lines and only about one-quarter were capable of any useful military effort. From three brigades nominally of 11 200 soldiers, 1300 were killed, wounded or missing, 7500 were sick enough to require medical evacuation and only 3400 could be listed as fit for duty. Just as Merrill's Marauders had collapsed from cumulative disease casualties driven by malaria, the Chindits followed the same trajectory shortly thereafter in Burma.<sup>7</sup>

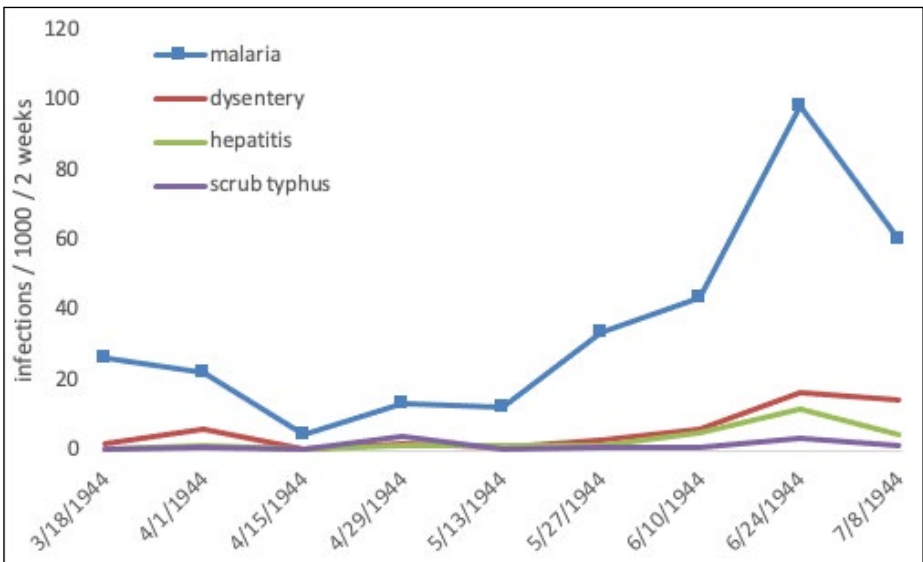


Figure 3: Chart showing medical casualty rates per 1000 soldiers by infection (malaria, dysentery/diarrhea, hepatitis, scrub typhus) in Chindit Special Force March to August 1944 by fortnight. From Deputy Director Medical Services report.<sup>7</sup>

## Australian Army in East Timor

*'As the men went down like flies with malaria, Dunkley begged and borrowed to treat his sick patients and began investigating what could be done to stem the spread of the illness. Dunkley's recommendation to move the entire unit to the mountains west of Dili saved the company from certain capture.'*<sup>10</sup>

Three Australian Imperial Force infantry battalions were placed as sentries in the outer island defence of Australia in 1941 in New Britain, Ambon and East Timor. All collapsed quickly in the face of the Imperial Japanese Army's centripetal offence of early 1942. The malaria history of the survivors from Rabaul, New Britain, was horrific, with those falling behind due to malaria being massacred at the Tol Plantation.<sup>5</sup> In East Timor, many of the soldiers of the 2/2 Independent Company were able to retreat from the Dili airfield into the surrounding hills and conduct a guerrilla campaign throughout 1942 with the help of local East Timorese allies<sup>10</sup> (see Figure 4). So surprising was this that Australian radiomen in Darwin were sceptical of the force's actual existence when a signaller on East Timor in April 1942, finally able to repair a small radio, sent out a statement of the company's survival with an urgent request for boots, quinine, money and ammunition, given in that order of priority.<sup>10</sup> Supplying the cut off soldiers by ship from Darwin was hazardous due to Japanese air attacks and resulted in the loss of HMAS Armidale. The small band of Australian soldiers with its East Timorese allies fought on for several months. However, increasing antiguerrilla activities of the Imperial Japanese Army and its retaliation against civilians necessitated the eventual evacuation of the sick and starved company survivors at the end of 1942.

Malaria had caused many casualties among the 2/2 Independent Company in East Timor. The first two platoons arrived in Dili in mid-December 1941. By early January 1942, it was estimated that 80% had malaria requiring the medical officer, CAPT Roger Dunkley, to set up a make-shift hospital housing for up to 80 patients, which had to be moved frequently to avoid the enemy.<sup>10</sup> Relapsing malaria became a recurring theme as there were insufficient antimalarials to do anything other than suppress the acute attacks as they occurred at nearly monthly intervals. It is estimated that 40 of the 248 men of the 2/2 Independent Company were killed on East Timor in combat/accidents; however, none died of malaria, despite nearly all having been infected.



*Figure 4: 2/2 Independent Company of the Australian Imperial Force in East Timor in 1942 showing burning houses with local fighters armed with spears. Australian War Memorial photo AWM 127992, now in the public domain.*

Small special operations missions usually last only a few days prior to rapid exfiltration and recovery, placing little emphasis on infectious diseases with several days' incubation period. However, the historical record of World War II suggests that when larger bodies of troops are sent behind enemy lines, such as Merrill's Marauders and the Chindits in Burma, their health and combat performance can be degraded rapidly by indigenous tropical diseases such as malaria. Casualties, especially when they cannot be evacuated, become much more than a medical or logistical difficulty — sick and particularly dying comrades place an enormous strain on unit morale and cohesion when it is most critically needed. Bypassed units that converted to guerrilla warfare, such as the 2/2 Independent Company in East Timor, slowly starved when cut off from food supplies and sickened when deprived of malaria medications. Great Power competition is a current political reality across the island nations of the Indo-Pacific Region, and comfortable assumptions about future wars may no longer hold true. Special Operations often are confronted by great challenges and have to succeed by innovative means rather than brute force. Studying previous tropical campaigns can guide the anticipation of medical scenarios beyond those garrison forces face. Many such campaigns were determined by tropical infectious diseases such as malaria, arguing for continued development of improved medical countermeasures against such natural biological threats, particularly for those Special Forces units deployed into geographically difficult areas.

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### “All In The Same Boat; Beginning To Row In The Same Direction” – Lessons Learned Through Qualitative Community Consultation Evaluating the Impact of Lived Experience in a Mental Health Service

Dr Stephanie Hodson<sup>1</sup>, [Ms Leonie Everett](#)<sup>1</sup>

<sup>1</sup> *Open Arms - Veteran And Families Counselling, Canberra, Australia*

#### Abstract

Open Arms – Veterans and Families Counselling (Open Arms) was founded by veterans in direct response to the mental health impacts of the Vietnam War. Open Arms started its life as the Vietnam Veterans Counselling service and the service has its origins in a peer-to-peer model of mental health support founded on shared lived experience.

The national Community and Peer Program was launched in November 2019, building on this history and the Vietnam Veteran peer support legacy. Open Arms currently employs 56 lived experience veteran and family mental health peer workers. Open Arms Peer Workers connect with clients and the community through their shared lived experience of mental health and recovery, and military service, either as an ex-Australian Defence Force member or a family member. In walking alongside veterans and family members, Open Arms Peers promote hope, offer a positive model of recovery, de-stigmatise mental health issues, build help-seeking behaviours and provide a trusted bridge to clinical care.

As mental health Peer Workers, Open Arms Peers deliver services in collaboration with clinicians in the Community and Peer Teams. Between July and September 2019, Open Arms conducted a Post Implementation Review evaluation of the Community and Peer Program. This paper will share the 16 lessons learned through the Post Implementation Review, with a focus on strengthening integration with mental health service system. One of the key recommendations from the Review was the importance of centralising the voice of lived experience consumers and carers in the design, planning, implementation and evaluation of services.

This paper will discuss the way in which Open Arms has embraced a grass roots, community-led, appreciative inquiry based participatory design approach to the ongoing evaluation and continuous improvement of the Community and Peer Program.

A finding from this evaluation has been the learning that the Community and Peer Program is bringing Ex-Service Organisations and Community networks together to identify shared approaches to suicide prevention.

Finally, the paper will share the outcomes of community consultation and some of the ‘stand-out’ moments for Open Arms Peers, clinical leaders, executive leadership and community members in implementing this new capability, including strengthening the military cultural competency of all Open Arms staff members and key community stakeholders.

Open Arms plans to utilise this approach to co-design to develop an interactive Lived Experience Framework. The planned approach to this critical work will be presented.

#### Biography

*Leonie Everett is the National Director of Open Arms Community and Peer Program.*

*Over the last 18 months Leonie has brought her experience in mental health, management and leadership, strategic planning, program development, community engagement and knowledge of lived experience peer support to the team driving the nationwide implementation of the Program. Previously Leonie has worked in whole of community suicide prevention and postvention initiatives, with a specific focus on youth mental health and the role of school environments in health promotion, mental health intervention and recovery from trauma and crisis. Leonie is a passionate advocate for embedding lived experience input at all levels to inform service improvement and innovation.*

*Dr Stephanie Hodson, CSC*

*Dr Hodson is the National Manager, of Open Arms - Veterans Families Counselling Service. She has worked for 25 years in military mental health, first as an Army Psychologist and now managing a national community mental health service. In her career she has been an investigator on numerous military mental health research programs and is currently focus on service enhancement and building workforce capacity within mental health service systems.*

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### A Proposed Enhanced Medic Skillset For Treatment At Point Of Injury In The Future Operating Environment

[A/Prof Charles Pilgrim](#)<sup>1</sup>, Dr Abhilash Chandra<sup>1</sup>, Dr Andrew Pearson

<sup>1</sup> 3rd Health Support Battalion | Australian Army, East Malvern, Australia

#### Biography

*A/Prof Pilgrim completed fellowships in Upper GI surgery at The Alfred and Hepatobiliary and Pancreatic surgery at the Medical College of Wisconsin (USA) and has a PhD from Peter MacCallum. He has appointments at Cabrini Hospital, The Alfred (HPB and Trauma) as well as Frankston and Peninsula Private hospitals and is a serving military surgeon and lieutenant colonel in the Australian Army. He is an associate professor at Monash University and a senior trauma instructor/examiner for the Royal Australasian College of Surgeons. He is a member of the Academy of Surgical Educators and the Section of Academic surgery with the College of Surgeons and sits on the education committee of the Australian New Zealand Association for Surgery of Trauma*

**No consent to publish abstract**

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### Adelaide's Innovative History With X-ray Technology: From The Braggs To Micro-X

[Dr Abhilash \(Abe\) Chandra](#)<sup>1</sup>

<sup>1</sup> Western Hospital, Henley Beach, Australia

#### Abstract

Adelaide is not a place often associated with the pioneering of x-ray technology. X-rays were discovered by Professor Wilhelm Röntgen in Germany in November 1895. His iconic radiograph "Hand mit Ringen" (22 December 1895) successfully demonstrated the ability to x-ray the bones of a hand. He published his research in 'Nature' on 23 January 1896. This information was published in Australian newspapers by 31 January 1896. Professor William Bragg, the University of Adelaide Professor of Mathematics and Experimental Physics, replicated Röntgen's experiments, and used his apparatus to image and diagnose a comminuted left elbow fracture of his six-year-old son, Lawrence Bragg, in February 1896. This is believed to be the first clinical x-ray radiograph taken in Australia.

Lawrence Bragg joined his father in the Physics Department of Adelaide University at the age of 15 and the pair went on to work together studying the characteristics of x-ray absorption and diffraction. Together, they discovered the 'Bragg Peak' in 1904, now the basis of proton therapy. William and Lawrence Bragg were jointly awarded the 1915 Nobel prize in physics based on this x-ray research that was performed in Adelaide.

120 years later, an Adelaide-based start-up company (Micro-X) secured a world first with the launch of a medical product whose x-ray tube uses a field-emission, 'cold' cathode to replace the heated filament which has been the electron source in every x-ray tube since Röntgen's. Micro-X Ltd was founded in 2011 by Mr Peter Rowland, the current Managing Director, to commercialise this revolutionary x-ray technology which uses Micro-X's patented Carbon Nanotube (CNT) technology to miniaturise x-ray tubes and allow precise, electronic control of x-ray emissions.

Micro-X's first product, the Carestream DRX Revolution Nano, is an ultra-lightweight, fully-integrated digital bedside imaging cart and was launched globally in 2018 (won an international Good Design Award). Product sales were boosted in 2020 by the huge global demand for mobile chest x-rays to diagnose and monitor pulmonary infiltration associated with severe COVID-19 progression and Micro-X's medical x-rays are now in service in 30 countries around the world.

Micro-X was awarded a two-part Capability and Technology Demonstrator Contract for the ADF in 2014 for a full-performance mobile x-ray unit for deployed military hospitals and a backscatter x-ray imager for standoff imaging and assessment of Improvised Explosive Devices. These contracts led to two new products for Micro-X: 1) The Micro-X 'Rover' is the purpose-designed x-ray system for military deployed hospitals and humanitarian aid; and 2) The Micro-X counter-IED 'X-Ray Camera' for rapid EOD assessment. The Rover Mobile x-ray unit received US FDA510(k) clearance in 2019 and is now the radiology solution for the ADF's replacement Deployable Health Capability under JP2060. The Rover was also the winner of the Land Forces 2021 National Innovation Award. The Micro-X X-ray Camera has progressed to full-scale engineering development and first user trials are expected late in 2021.

The future for Micro-X is very bright in the medical imaging area. Micro-X has funding from the Medical Research Future Fund for the development of a mobile 'Brain CT Scanner' that could be fitted to any land

or air ambulance for pre-hospital stroke diagnosis. The Company is examining the project feasibility to expand the 'Brain CT Scanner' into a 'Trauma Series CT' which could be deployable for military hospitals. Micro-X is also exploring the opportunity to develop a deployable Micro-X 'Angiography Suite' for military hospitals. These would increase the capability of the ADF to deploy Role 3 Field Hospitals. Micro-X developed an alliance with Western Hospital in Henley Beach in early 2021 to aid in research and development of clinical applications of the Micro-X clinical products.

### Biography

*Dr Chandra is a General and Vascular Surgeon. He has a special interest in Trauma Surgery. His clinical practice is based in Adelaide. He is a Major in the Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians, as well as making new technologies for extrication and treatment of combat casualties in future conflicts.*

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## ADF Epidemiology Support to the COVID-19 Response, National Incident Room, Commonwealth Department of Health

Lieutenant Colonel Peta Mantel<sup>1</sup>

*1 Department Of Defence, Australia*

### Abstract

In early 2020, the Commonwealth Department of Health approached Department of Defence requesting specialist health support to assist in the emerging novel coronavirus outbreak overseas. In early February, CMDR Chloe Ryan, a Naval Medical Officer, and myself (LTCOL Peta Mantel, Army Clinical Epidemiologist) were seconded to the National Incident Room (NIR) for an initial period of six weeks. My role was to assist the Department of Health and the Whole of Government in assessing the health threat and risk of importation of COVID-19 from overseas. This role evolved over the coming months with the subsequent spread of COVID-19 around the globe and the advice required to mount a domestic public health response. This subsequently resulted in Australia imposing a suite of border closures which ultimately resulted in the full closure of international borders.

By early March 2020, Australia was experiencing sustained community transmission of COVID-19 so there was a pivot towards domestic operations. At this point my role moved from assessing the risk of importation to managing the domestic epidemiology team in the National Incident Room. My team's role was to assess the epidemiology of COVID-19 among the population and provide advice through the Communicable Disease Network of Australia, to the Australian Health Protection Principal Committee and National Cabinet.

As this was an evolving situation requiring sustained long term operations the NIR had to reshape and grow to enable the team to run 24/7 operations to support the need of senior decision makers. My team of six analysts quickly grew to a team of over 20 during the year with a combination of epidemiologists and data analysts from over ten different government agencies. There were numerous challenges we faced during the year ranging from the need to keep senior Government leadership informed of the evolving situation while managing the need for data from each jurisdiction in the absence of automated reporting mechanisms. We had to develop user-friendly interfaces on the web to keep the general population informed as well as keep data readily accessible for the purposes of epidemiological analysis.

By late 2020, discussions had commenced on the reopening of borders. This started with the Trans-Tasman bubble arrangements between Australia and New Zealand in which we developed epidemiological criteria for the safe reopening for quarantine free travel. On the back of this body of work we started to focus back on country risk assessments, similar to what we had undertaken earlier in the year. This required the standing up of a new dedicated capability to take on this significant and ongoing workload and the opportunity to go in and lead this team during it's development was definitely rewarding.

While my initial secondment went from six weeks to 11 months, it was definitely the most demanding and by far the most professionally rewarding of my career. Upon reflection there were a lot of benefits to both the ADF and the Department of Health during the year, the most important being the strengthening of the relationship between the two departments. It is envisaged this relationship will continue well into the future.

### Biography

*LTCOL Peta Mantel is a clinical epidemiologist with the Australian Army. She has a Masters in Clinical Epidemiology with Merit and a Masters in Applied Science (Environmental Health). Over 25 years in*

the Australian Army she has gained a wealth of experience in domestic and international health threats. She has worked as a senior environmental health officer for the United Nations in Timor Leste and the Peace Monitoring Group in Bougainville, Papua New Guinea. She has also deployed as the Deputy Chief Inspector of the biological weapons inspection team in Iraq in 1998 as part of the United Nations Special Commission on Iraq. Over the past decade she has focused on infectious disease threats to deployed personnel and has led the health intelligence support to ADF humanitarian assistance and disaster response operations. In 2020, she was seconded to the Commonwealth Department of Health to lead the COVID-19 epidemiology team in the National Incident Room. In this role she was initially responsible for assessing the risk of importation of COVID-19 into Australia and later moved on to lead the domestic epidemiology outputs team. Her interest lies in pandemic warning and the early detection of the emergence of pathogens with pandemic potential.

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### ADF Operational Clinical Readiness Pathways: A strategy for optimising deployed specialist health capability

Dr Andrew Pearson<sup>1</sup>, Dr Kyle Bender<sup>2</sup>,  
Dr Adam Mahoney<sup>2</sup>

<sup>1</sup> HQ Health Services Wing, RAAF Amberley, Australia

<sup>2</sup> General Health Battalion, Brisbane, Australia

#### Abstract

The Australian Defence Force (ADF) recruits general surgeons to provide deployable emergency and damage control trauma surgery. The skills required of the deployed general surgeon are broad and there is a growing discrepancy between the skills utilised in civilian surgical practice and those required on the battlefield. An Operational Clinical Skill Set (OCSS) has been drafted and proposed, outlining in detail the skills that could be expected from the deployed general surgeon. We present a new process of 'Operational Clinical Readiness Pathways'. This pathway involves the appraisal of individual surgeons' existing skills against the OCSS and the subsequent development of a tailored Clinical Development Package to enhance the clinicians' skill set.

In order to facilitate the development of an individualised Clinical Development Package, the ADF could produce a compendium of approved Clinical Development Experiences (CDEs). CDEs would likely include appropriate and militarily relevant surgical courses and high yield clinical attachments, both domestically and abroad. These experiences would be vetted and pre-approved by the ADF and then individually selected by the surgeon with an understanding of the skills they are likely to develop. This is in keeping with modern adult education principles of competency based and self-directed training with relevant assessment at the point of reappraisal.

This concept may assist in the recruitment and retention of surgeons by offering valuable clinical experiences. In the absence of high tempo deployments, this training continuum of skill development and maintenance will provide an enhanced and enduring damage control surgery capability to the ADF.

#### Biography

WGCDR Andrew Pearson is a consultant General Surgeon with subspecialty training in liver and pancreatic surgery. WGCDR Pearson studied both physiotherapy and medicine at the University of Sydney. He undertook RAAF sponsorship for post graduate medical training and subsequently completed his ROSO with postings to Tindal and Richmond. Following this, WGCDR Pearson returned to surgical training and completed his training in General Surgery and post fellowship training in liver/pancreas surgery at Royal North Shore Hospital in Sydney. WGCDR Pearson remains a full-time member of the RAAF on the Medical Specialist Program. He has deployed on a number of occasions on both war like and humanitarian missions. WGCDR Pearson's interests include acute care and trauma surgery as well as complex surgery of the liver, pancreas and biliary system. WGCDR Pearson also has a specific interest in developing future military surgeons and ensuring ADF surgeons have appropriate training prior to deployment. WGCDR Pearson resides in Sydney and works at Hornsby Ku-Ring-Gai hospital where he is the head of the department of general surgery.

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### ADF SPEC Demographics... and Why They Should Count

Dr Neil Westphalen<sup>1</sup>

*1 Royal Australian Navy, Palmerston, Australia*

#### 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 (2013-2016).*

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

**No consent to publish abstract**

### An Autonomous Patient Retrieval Pod: Simpson's Donkey of the 21st Century

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#### Abstract

It is the unspoken rule with soldiers never to leave behind any of their own combat casualties. This concept has been represented and demonstrated time and time again. The stretcher bearer, Private John "Simpson" Kirkpatrick, is probably the most famous soldier to have served in the Australian Army. His heroic actions in ferrying wounded soldiers on his donkeys from the frontline to the beach for three and half weeks at Anzac Cove, Gallipoli

in 1915 before being shot himself are legendary. Many other "Simpsons" have come and gone since in the numerous conflicts that Australia has been involved in. Australia and the Allied forces have been fortunate to have air superiority in all armed conflicts since World War II. This has enabled rapid CASEVAC and MEDEVAC of combat casualties, which has in turn resulted in greatly enhanced survival rates. In the future, Australia and the Allied forces may not enjoy the same degree of air superiority in conflicts if regional peer or near peer forces are involved. The current patient extrication systems, which includes Rotary and Land-based evacuations, may prove to be too risky. Our injured servicemen and servicewomen may not be able to be extricated from the point-of-contact in a timely fashion, and subsequently may not survive their injuries. Alternative means of evacuation of injured personnel needs to be developed. This may be using remote-controlled or autonomous vehicles such as Brokk, Rheinmetall, Milrem, and HDT Global. However, none of these systems offer any protection to the combat casualty once they have been extricated from the point-of-contact. I have been working with the University of South Australia's Future Industries Institute to develop a Patient Retrieval Pod (the Next Gen Simpson - NG Simpson). This Pod would have the capability of providing protection for the injured patient immediately after the extrication process. The Pod would be compatible with the above-mentioned remote-controlled or autonomous vehicles (NG Simpson and his donkeys). The addition of NG Simpson and his donkey's to the ADF Health Capability in the future may be important in saving lives of injured ADF and Allied Forces personnel.

#### Biography

*Dr Chandra is a General and Vascular Surgeon. He has a special interest in Trauma Surgery. His clinical practice is based in Adelaide. He is a Major in the Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians, as well as making new technologies for extrication and treatment of combat casualties in future conflicts.*

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### An Ethics of Care Approach to Combat Casualties

Dr Joshua Armstrong

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#### Abstract

Military environments are often considered to be part of the masculine domain. Despite the appearance of unregulated violence, there are considerable limitations on the conduct of soldiers at war, and many conventions and laws govern their behaviour. These legal frameworks have been developed to maintain a sense of common humanity, prevent unnecessary destruction, and limit the effects on uninvolved civilians. Absent from those frameworks are the considerations of the relationships between those affected and any reason why one should provide care to civilian casualties and allied forces.

The ethics of care on the other hand is a feminist ethic inspired by the importance of emotions, and the development and fostering of relationships as means of ethical decision making. An ethics of care demonstrates that there are limits to impartiality in the treatment of combat casualties and that there are moral harms associated with conventional humanitarian law that require examination. When examined from an ethics of care perspective, fundamental policies of international conflicts such as the impartial treatment of casualties becomes ethically questionable. From an ethics of care perspective there is a morally compelling reason to treat compatriots and allies at a higher priority than for enemies, despite conventions to the opposite. Calls for justice-based or objective measures of combatant injuries ignore the familial bonds of military units and role of interdependency within them and pose the risk of moral harm to force soldiers to treat enemies ahead of their own barring significant disparity in wounds.

An ethics of care would also find the use of stratified levels of care that position enemies as prisoners of war ahead of allied forces unethical and would provide a morally compelling reason as to why civilians and allied forces deserve direct treatment from military forces.

#### Biography

*Joshua is a medical intern and current masters of bioethics student at the University of Sydney. He has a keen interest in military medical ethics and the distinction between wartime and peacetime medical ethics. He is a current Graduate Medical Scheme student and previously served as a Pharmaceutical officer at 2 GHB.*

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### An Operational Clinical Skill Set for the ADF General Surgeon: a proposal and proof of concept

Dr Kyle Bender<sup>1</sup>, Dr Emily Smartt, Dr Adam Mahoney<sup>1</sup>, Dr Andrew Pearson<sup>2</sup>

*1 Australian Army - 2GHB, Brisbane, Australia*

*2 Royal Australian Air Force - HSW, Brisbane, Australia*

#### Abstract

##### Background:

Modern developments in civilian surgical practice have driven a shift in general surgeons' experience towards subspecialised and minimally invasive approaches whilst military surgery continues to rely on a breadth of skills and traditional open techniques. Defining the specific skills required of general surgeons in the Australian Defence Force in an Operational Clinical Skill Set (OCSS) will allow comparison to skills obtained in civilian practice and development of training strategies to ensure individuals are ready for military deployments.

##### Purpose:

This paper drafts an OCSS which can be formalised through consultation with the wider ADF General Surgery Community. The OCSS aims to enhance ADF healthcare provision by:

- Guiding development of training systems such as 'Operational Clinical Readiness Pathways'.
- Aiding self-directed learning for ADF General Surgeons by defining expectations.
- Informing the chain-of-command of individuals' skill profiles during nominations for specific tasks.

##### Method:

The OCSS was drafted after a scoping review of literature reporting case mix data from deployed military field hospitals and reference to the course manual of the Definitive Surgical Trauma Care course. Coalition partners' available equivalent skillsets were also reviewed.

##### Results:

Ten publications were identified and required skills were summarised. These skills were collated into

seven categories; Trauma Management Principles, Head, Neck & Face, Chest, Abdomen & Pelvis, Limbs & Vascular and Burns & Soft Tissue.

### Conclusion:

An OCSS has been drafted proving the feasibility of this process for the ADF. It is hoped that this General Surgery OCSS will enhance ADF surgical care and guide other health specialties through OCSS development.

### Biography

*Dr Bender is a General Surgeon employed full-time by the Australian Army within the ADF Medical Specialist Program. He has clinical areas of interest including trauma, military and upper GIT surgery. He has deployed on exercise and operations with the ADF and has an interest in enhancing the way general surgeons are prepared for deployment in their role as military surgeons.*

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## Army Health Restructured 2022 and Beyond - Understanding the Past to Solve Emerging and Future Challenges

### Colonel Toni Bushby<sup>1</sup>

<sup>1</sup> Directorate of Army Health, Army Headquarters, Canberra, Australia

### Abstract

The last complete review of Army Health Services (AHS) was in 2010 to enable the Combat Health Restructure (CHR). Following a COSC decision in 2008, the mandated transfer of responsibility for the provision of single Service Garrison Health Services (GHS) to JHC and the dissolution of traditional doctrinal structures represented an upheaval for the single Services, and their subordinate formations. The decisions affecting health service delivery across the ADF towards the end of the last decade were provocative and contentious. Understanding the history of those decisions and acknowledging the cause of tensions informed planning for the 2020 Army Health Capability Establishment Review (CER). The 2020 AHS CER represents the most significant review conducted on the health enterprise since

the Kinghorne review in 2010. The introduction of a suite of new capabilities and technologies will fundamentally change the way the Army generates, deploys and operates in partnership with our joint, coalition and regional partners. Furthermore, the increased focus on the land force contribution to the joint force, and a recognition of opportunities in and across multiple domains, present a significant challenge to the health enterprise. As an Army-in-Motion, it is imperative we anticipate changes that provide

advantage and act to ensure our Army health capabilities are designed, structured and ready for future challenges and meet directed requirements. The focus of this presentation will be to outline the where from, where now and where to next, to ensure that the reasons for change are well articulated to those who will implement and lead this transition into the future; as well as to capture these pearls for consideration by those who will review the system again in the coming years.

### Biography

*Colonel Bushby commenced her appointment as Director Army Health in September 2019. A Nursing Officer by background, her postings have included 2nd Field Hospital, 1 and 3 Combat Service Support Battalions, 5th Aviation Regiment, Robertson and Simpson Barracks Health Centres, Headquarters Joint Operations Command, Officer Career Management Army and SO1 Health Policy at Joint Health Command. She was both an instructor and subsequently the Commanding Officer at the Army School of Health, and was the SO1 Health Workforce and Capability at the Directorate of Army Health prior to her current appointment.*

*She has served operationally in East Timor, Afghanistan and Kosovo in both rotary wing aeromedical evacuation and resuscitation team roles, and has qualifications in Health Services Management, Vocational Education and Training, Emergency Nursing and Pre-hospital Care. Colonel Bushby is an Associate Fellow of the Australasian College of Health Services Management and a member of the Australian College of Nursing. She is a passionate advocate for combat health care within the land domain and for all health craft groups within it.*

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## Australia Requires an Enhanced CBRN Capability for Patients Who Survive Beyond 24 Hours

Brigadier Michael Reade<sup>1</sup>

*1 Australian Defence Force, Brisbane, Australia*

### Abstract

Australia's military and civilian capabilities in the immediate management of a chemical, biological, radiological or nuclear (CBRN) exposure, whether accidental or deliberate, in terms of decontamination and clinical care in both the prehospital and early hospital phases of management have been extensively dealt with elsewhere. This is appropriate, as it is usually in these phases that the greatest number of lives can be saved, and the disruption to society minimised. However, the clinical care of CBRN patients who survive beyond the first 24 hours has received comparatively little attention.

Military authorities might perceive that civilian poisons information services or critical care physicians will have the required expertise to provide advice for such casualties, and vice versa. In reality, the specific late syndromes caused by several agents are almost never encountered in either military or civilian clinical practice, and the treatments employed are either experimental, or have been inherited from wartime experience that is now more than a century old. Examples in the public domain include:

1. Nerve agent Intermediate Syndrome, with an onset of cranial nerve palsy, proximal muscle weakness and respiratory failure 24-48 hours after exposure and recovery after 5-15 days;
2. Nerve agent axonal degeneration, with centrally progressing demyelinating polyneuropathy beginning 2 weeks after exposure and recovery after 6-12 months, if ever;
3. Neuropsychiatric effects of the Novichok nerve agents persisting weeks to months;
4. Experimental stoichiometric and catalytic bioscavenger treatments for Novichok nerve agents, along with experimental neuroprotective agents such as GM1 monosialoganglioside, poly(ADP-ribose) polymerase (PARP) inhibitors (e.g. benzamide), ryanodine receptor antagonists (e.g. dantrolene), NMDA receptor antagonists (e.g. dizocilpine and ketamine), all with mechanisms unrelated to classic atropine-like antidotes;
5. Optimal treatment of the immunosuppression caused by exposure to mustard agents;

6. Haematological effects caused by the arsenic in Lewisite, and the effectiveness vs. toxicity of chelators of arsenic including dimercaprol (British Anti-Lewisite), dimercaptosuccinic acid, and 2,3-dimercapto-1-propanesulfonic acid; and
7. Delayed acute respiratory distress syndrome caused by exposure to the pulmonary agents, including chlorine, ammonia, phosgene and Lewisite.

Responsibilities for various elements of Australia's planned response to a CBRN event are outlined in the Commonwealth "Health CBRN Plan" dated November 2018. Australian civilian Poisons Information Centres are the only agency allocated the responsibility of providing "high quality, up-to-date and evidence-based information regarding the risk assessment, management and treatment of human poisoning to the general public and health care professionals", yet few (if any) civilian toxicologists will have access to all of the classified information required to provide the full spectrum of advice required. While the Defence Science and Technology Group is to "provide scientific advice, technical and laboratory support", DST Group employs few clinicians. The ADF is tasked only to "provide logistical support". The UK demonstrated the value of military technical and clinical expertise in the contribution of its Defence Science and Technology Laboratory staff to the protracted hospital response to the 2018 nerve agent poisonings in Salisbury (DSTL Annual Report, 2018/19). Australia would be well advised to develop a similar collaboration between civilian and military agencies to curate expertise in the clinical management of the late phase of CBRN casualties.

### Biography

*Brigadier 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. As the Director General Health Reserve - Army, since 2019 he has been responsible for technical regulation of specialist clinical personnel in the Australian Army. His research interests are trauma systems design, fluid resuscitation in trauma and coagulopathy. His frozen platelet trial program, conducted with the Australian Red Cross, aims to improve worldwide access to this vital component of trauma resuscitation.*

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## Bipolar Disorder and PTSD in the ADF: Estimating Prevalence From Defence Electronic Health System Records: Part One, The Bipolar Disorder Audit

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### Abstract

The 2018 Mental Health Prevalence, Mental Health and Wellbeing Study, of the Transition and Wellbeing Research Programme, explored the prevalence of mental disorders among ADF members who had transitioned from regular ADF service between 2010 and 2014. The study found there was a high (9.8%) twelve month prevalence of Bipolar Disorder in persons who had transitioned out of the ADF between 2010 -2014. This was more than four times the Australian civilian rate and more than two times the highest published military rate. Our study aimed to determine whether there was a similar prevalence of Bipolar Disorder among serving members of the ADF, to that described in the 2018 Mental Health Prevalence study, via a review of the Defence Electronic Health System (DeHS) records. The method, results of the audit and recommendations for future action will be described.

### Biography

*Dr Duncan Wallace has been a consultant psychiatrist since 1990, practising mainly in public hospitals with special interests in emergency departments, rural psychiatry, telepsychiatry and military psychiatry.*

*Dr Wallace is a Commodore in the Navy Reserve and has extensive operational experience. He was Director-General Naval Health Reserves from 2012 to 2015. Dr Wallace was appointed to his current position as psychiatrist at the Australian Defence Force Centre for Mental Health, at HMAS Penguin, Sydney, in 2010. In March 2018, he was appointed*

*as the inaugural chairman of the RANZCP Military and Veterans' Mental Health Network and is now a member of the RANZCP Military, Veterans and Emergency Services Personnel Network Committee. He has been a Visiting Medical Officer at St John of God Hospital, North Richmond since 2015 and is an Adjunct Senior Lecturer in Psychiatry at the University of NSW.*

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## Bipolar Disorder and PTSD in the ADF: Estimating Prevalence From Defence Electronic Health System Records: Part Two, The PTSD Audit

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### Abstract

Prevalence rates for PTSD in serving and ex-serving members of the Australian Defence Force (ADF) have been found to be significantly higher than the general population. Identifying the prevalence of PTSD, and the treatments that were provided to the serving population, will assist in planning and implementing Mental Health initiatives and psychosocial support for serving, transitioning and veteran populations. We describe the results of a retrospective audit of the Defence Electronic Health System record to determine the period prevalence of PTSD, analyse demographic and treatment data and assess for an association with Bipolar Disorder.

### Biography

*Diana McKay is a fulltime psychiatrist in the Australian Army, currently posted to Joint Health Unit- Central Australia. She became interested in military psychiatry whilst working in private practice,*



seeing both current serving members and veterans. Her clinical interests include perinatal psychiatry, anxiety disorders, disaster psychiatry and trauma disorders. She has completed further education in health management and educational studies, and maintains a strong interest in teaching

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### Broken Arrow: On the Frontline of Veteran Complex Needs

Miss Pip Weiland<sup>1</sup>, Mr Doug Scott<sup>2</sup>, Mr Chris Maddison<sup>1</sup>, Mr Vijay Singh<sup>2</sup>

*1 Open Arms, Brisbane, Australia*

*2 Open Arms, Melbourne, Australia*

#### Abstract

In February 2018, Open Arms Veterans and Families Counselling introduced the service stream of clinical care coordination to address the rising demand of veteran complex needs including housing instability, interpersonal violence, substance misuse, comorbid physical injury, and family breakdown. Since June 2020, there has been approximately a fifty percent increase in this demand for service. A dramatic shift from the therapeutic goals of esteem and self-actualisation to the basic Maslow physiological needs has emerged. A small, dedicated team of Open Arms psychologists, social workers and mental health nurses are the frontline to this response, assisting veterans and their families to navigate the labyrinth of public and private systems, ex-service organisations, and non-government organisations. This presentation will explore the precipitating and perpetuating factors related to complex presentation with reference to case studies. Open Arms services, including Clinical Care Coordination and the Crisis Accommodation Program will be discussed. Further collaboration is required to promote and support longer term housing and mental health supports from a broad range of service sectors, with the aspiration of working together to promote prevention.

#### Biography

*Chris Maddison is a Psychologist and works at Open Arms in Brisbane as the Assistant Director Clinical Coordination.*

*Vijay Singh is a Clinical Psychologist and works at Open Arms in Melbourne as the Assistant Director Clinical Coordination.*

*Doug Scott is a Health and Community Psychologist who has worked in the mental health sector for the past 30 years. Doug has previously worked at the Australian Psychological Society as the Executive Director of Professional Practice and led teams of psychologists at Services Australia. A career highlight has been conducting training on suicide prevention and trauma counselling for the National Centre against Violence in Mongolia. Doug is a Senior Lecturer at Monash University and is the Regional Director at Open Arms – Victoria / Tasmania.*

*Pip Weiland CSC commissioned in the Australian Army Psychology Corps in 2003, and during her 17 year career performed diverse roles across clinical, operational, research and staff positions. She completed her military service as the Commanding Officer 1st Psychology Unit, and is now the Regional Director South Queensland Open Arms, where she continues to support veteran and family mental health. Pip has a special interest in psychological resilience and mental health issues associated with exposure to combat.*

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### Burn Resuscitation - Do We Know What We Are Doing?

CAPT Anthony Holley<sup>1</sup>

*1 Royal Australian Navy, Brisbane, Australia*

#### Abstract

Each year in Australia, approximately 1% of the population sustains a thermal injury. Although those with severe burns requiring admission to a specialised intensive care units constitute a numerically small group (300/year in Australia and New Zealand) they are at risk of considerable morbidity and mortality. There is little high-quality evidence to guide clinical practice, which may in part explain the substantial variation in approach and outcomes. In order to evaluate critical care practices in severe burn injury patients in Australian and New Zealand burn referral intensive care units, we utilised a case vignette based survey of practice for ICU patients with severe burns.

All intensive care specialists at the eight-designated burn referral intensive care units in Australia and New Zealand were invited to respond to a questionnaire conducted between April and August 2018. A 65% response rate was achieved. Almost

all (95%) of respondents would use a recognised resuscitation formula and in 74% of cases this would be the Modified Parklands formula (3-4 ml crystalloid/kg/% burn in 24hr). However, there was significant variation in formula interpretation, type of fluids employed and physiological targets. Thirty two percent of respondents would use colloids in the initial 24-hours and in 81% of cases this would be 4% albumin. Forty nine percent of intensivists would modify resuscitation in the presence of an inhalational injury, however the modification was an increase in fluid use in 67.5% (10-50% increase in volume infused), while the remaining 32.5% would decrease the resuscitation volume. Fifty percent of respondents would perform a bronchoscopy. Substantial heterogeneity existed among the respondents with respect to haematological targets, time to commencement of nutrition, debridement completion, tracheostomy and the use of oxandralone or beta-blockade.

Intensive care specialists from burns referral centres report substantially different management strategies in critically ill patients with burns. These variations in practice may influence outcome. Prospective studies examining treatments and outcomes across different centres are warranted. We have subsequently conducted a gap analysis to evaluate the current burn registries available in Australasia and conclude that a dedicated registry would assist research and bench marking for this relatively rare disease.

### Biography

*Associate Professor Anthony Holley  
BSc. MBCh. DipPaeds. DipDHM. FACEM. FCICM*

*Anthony is a senior staff intensivist at Royal Brisbane and Women's Hospital. He is an A/Professor with the University of Queensland School. Anthony is currently the ANZICS President and an examiner for the fellowship of the College of Intensive Care Medicine of Australia and New Zealand. Anthony has authored eight book chapters and 49 peer reviewed publications. He is an instructor for BASIC and an EMST (ATLS) course director. Anthony has, in conjunction with colleagues, developed both the Current Concepts in Critical Care and Trauma Traps courses. Anthony serves as a representative for the National Blood Authority Critical Care Group in developing the Australian Patient Blood Management Guidelines and serves on the Australian National Steering Committee for the COVID-19 Clinical Evidence Taskforce.*

*Anthony is a serving Captain in the Royal Australian Navy in the role of Director Navy Health-R. He has extensive operational experience having deployed*

*on multiple occasions, including to Afghanistan twice, the Persian Gulf, Iraq for four tours, border protection duties, to the 2020 bushfires aboard HMAS ADELAIDE and most recently is serving as the Senior Medical Officer for Operation COVID-19 Assist on the Joint Task Group 629.3.*

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## Clinical Education of Close Health medics

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*1 Australian Defence Force, , Australia*

*2 University of Melbourne, Melbourne, Australia*

*3 Epworth Hospital, Melbourne, Australia*

### Abstract

Reflective learning is becoming an ever increasing part of clinical education (1, 2). Benefits of reflective practice include encouraging self-directed learning and is becoming part of continued training in health professions (3-7). Medics within 1st Close Health are expected to provide health care independently or as a team member in a number of environments. Reflective learning could help medics use previous clinical experiences in austere settings. To facilitate and encourage reflective practice, a portfolio based upon Gibbs' 1988 model of critical reflection and experiential learning (8) was developed and introduced.

Medics were to identify clinical situations, reflect and identify learning points prior to discussing with a senior clinician.

Members of 1CHB were surveyed in the usage of the portfolio.

Usage of the portfolio differed amongst the companies of 1CHB, but included garrison augmentation, civilian clinical placements and field tasks. The majority of medics felt that the portfolio covered most or some of the medic's scope of practice. Medics did not feel that the portfolio layout was easy to use and was too large and overwhelming. Defence doctors and nurses were most commonly utilised for case review discussions. Medics were comfortable and familiar with conducting reflective practice. Small group led sessions were identified by medics as the preferred option to complete case-based discussions. Medics did not feel that the portfolio helped them identify

strengths or weaknesses in their clinical practice, however half of medics felt that using the portfolio had helped them identify their learning needs. Many medics did not use, or were unaware they could use, the portfolio to contribute towards their annual CPD requirements.

Views of non-medic respondents was also sort in this study, with attitudes and usage differing amongst the companies. Few felt that the portfolio helped them determine the clinical skills of medics or influence choices when selecting medics for specific tasks. Non-medic responders appeared to see value in the portfolio, suggesting it provided a centralised area for medics to maintain records of clinical skills achieved and CPD, however found it too large and complex to be able to utilise for the purpose of assessing clinical competency of medics, particularly for non-clinical supervisors.

Overall, it appeared that the intent of the portfolio, reflective practice, was not known to the majority of medics. Major factors that impacted the uptake and engagement appeared to be; understanding the value of reflective practice and its use to improve clinical competence, size of the portfolio, engagement from clinical supervisors and time restraints. Medics appeared keen to work with defence doctors and nurses to improve skills and knowledge.

Engagement with the portfolio may be improved by reducing the complexity and size, offering an electronic version and consolidating with other credentialing requirements.

### Biography

*Medical Officer 1st Close Health Battalion, based in Darwin. ACRRM fellowship candidate. Interested in rural and remote medicine and sports medicine. Previously conducted research in Proteomics focussing in mass spectrometry and biomarker discovery and clinical research in atrial fibrillation, diabetic retinopathy and retinal disease.*

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## Comparing and Contrasting the Delivery of Humanitarian Surgeries Via Land Versus Sea Platforms, PP08, PP12 PNG, Philippines, Indonesia Aboard USNS Mercy and on PP19 Fly In Fly Out Vietnam

[Cmdr John Mchugh](#)<sup>1</sup>

*1 Royal Australian Navy, , Australia*

### Abstract

I compare the service provision capability of OMFS surgery on three missions on Pacific Partnership, a humanitarian mission aboard USNS Mercy a large US Navy Hospital ship and contrast with recent Fly in Fly out operations such as to Vietnam in 2019

### Background:

I deployed and provided ship based service provision on PP08, PP12 to PNG , Philippines, Indonesia aboard USNS mercy and on a Fly in Fly out to Phu Yen General Hospital Vietnam in 2019.

### Objectives:

To assess, compare and contrast the delivery of humanitarian surgeries via both land and sea platforms, assess impact training of host nation medical personnel (such as providing SMEE- subject matter exchanges) and assess future directions in the current geopolitical environment and cost effectiveness

### Methods:

I compare types of surgery, ie hemi mandibulectomies, meningoencephaloceles, cleft lip and palate, parotidectomies, branchial cysts, post traumatic treatments across both platforms that I undertook either as sole surgeon or as a surgical team.

### Findings and Conclusions:

Future provisions indicate that fly in fly out operations may be more cost effective and have a greater significant impact on the sharing of knowledge with host nations. There are however significant advantages in terms of materiel on a military hospital ship and impact factors associated with such a platform in range of procedures and associated geopolitical implications.

### Biography

*CMDR McHugh is a Maxillofacial and Cosmetic Surgeon practicing in NSW. He has deployed over the last sixteen years as a Surgeon overseas with both on USNS Mercy as well as with the ADF. He also performs garrison health surgery in Australia*

*in OMFS . He has also had experience in delivering health support/ humanitarian Surgery in the Amazon Basin with the Guyanese Defence Force and Trauma Experience in South Africa.*

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### Collective Training For The PCRf- Lessons Learnt

CAPTAIN John Vassiliadis<sup>1</sup>

<sup>1</sup> RAN, SYDNEY, Australia

#### Abstract

The aim of this presentation will be to explore how we have developed and implemented the PCRf CERTEX.

We will describe the SADL process (systems approach to defence learning), our curriculum development, implementation and lessons learnt.

We will describe how we have liaised with TSG(Training Support and Governance) and how we have managed to create a learning management package which is unique in Navy.

We feel that this talk will be of interests to all three services and the training package has been created in such a way that it will be useful to all three services as they deploy on navy health platforms.

#### Biography

*John Vassiliadis is senior Emergency Physician who practices in a quaternary teaching/trauma/burns/spinal hospital in Sydney Australia (Royal North Shore Hospital). Teaching is his passion and strength, always striving to be engaging, relevant and inclusive. He is a Simulation Medicine Educator and a Clinical Associate Professor at the University of Sydney Medical School. In his role of Director of Prevocational Training he mentors and educates over 160 junior doctors each year at Royal North Shore Hospital. His research interests include airway management and patient safety in critical care environments. He has been an officer in the RAN since 2002 having deployed and serving on a number of ships and involved in medical education to anyone who is willing to listen*

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### Dental Fitness Classification - A Risk Based Approach

LTCOL Anthony Craig

#### Abstract

On 01 July 2020 the ADF implemented a risk-based Dental Fitness Classification (DFC) system through the release of DHM Volume 2 Part 11 Chapter 1—Dental fitness.

The previous DFC system was a treatment-based classification with a uniform recall interval of 12 months for a periodic dental examination (PDE). The four classifications were reflective of the current intra-oral disease state and did not address risk factors for oral disease and its progression. The new DFC system not only assesses past history of disease but it also considers oral health risks that may result in accelerated progression of oral disease and heighten the risk of a member becoming a dental casualty when remote to the Garrison environment.

A member's recall interval for a PDE is individualised, allowing members to be recalled at 3, 6, 12 or 24 month intervals according to their oral health risk factors. The risk analysis is guided by medical history, social factors, military history and present state and history of oral pathology. The new DFC provides greater autonomy for Defence dentists to provide individualised risk-based care to our members. It also communicates to Command the risk that a member will become a dental casualty on deployment in the absence of oral health interventions.

This discussion will look at DFC allocations since the policy was implemented, the associated PDE intervals, and any unintended consequences evident thus far.

#### Biography

*LTCOL Craig was a sponsored undergraduate student and completed his undergraduate training in 2007 before completing a Master of Clinical Dentistry (Implant Dentistry) in 2013. He is the Head of Corps, Royal Australian Army Dental Corps and is currently posted to Garrison Health Operations, Joint Health Command as the Staff Officer Grade 1, Dental. Previous postings have included 3rd Combat Service Support Battalion, 1st Health Support Battalion, 2nd General Health Battalion and Joint Health Unit – South Queensland. LTCOL Craig has deployed on OP Render Safe and has spent time providing dental services in Germany and Papua New Guinea on Exercises Long Look and Olgeta Warrior respectively. He is a keen sportsman and enjoys spending time with his wife Daina and their three young children.*

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### Dentistry at Sea - Making Waves Today and Beyond

LEUT Jessica Kuk<sup>1</sup>, LCDR Shannon Godfrey<sup>1</sup>

*1 Royal Australian Navy, Sydney, Australia*

*2 Royal Australian Navy, Cairns, Australia*

#### Abstract

The Australian Defence Force defines its role in the ever-dynamic global context as the defence of Australia's sovereignty and national interests in order to maintain security and prosperity. Chief of Navy's Plan Pelorus 2022 sees the continuation of Task Group deployments, steering away from the typical single ship deployments of the recent past, in order to project a sustained joint force to fight and win at sea. Consequently, more service personnel are deployed simultaneously and often for extended periods. In a pervasive and protracted COVID-19 environment, where access to shore services – even within the National Support Base – is riddled with obstacles, dentistry at sea is ever important in collaborative health support to enable capability.

Since its establishment in 1919, the Royal Australian Navy Dental Branch has seen shifts in its role and purpose, especially in the sphere of deployed dentistry. This presentation will touch on how Navy Dentistry has evolved in the twenty-first century and the role of the deployed dental team at sea in the future.

A 'prestige' has traditionally been associated with having a dental team afloat using portable dental units; Commands touted teams as capability enablers, and indeed medical evacuations have been avoided during operational tasking thanks to an embarked dental team. This is particularly crucial for 'ship-stoppers' in the maritime environment, where there is huge logistical burden and financial cost to replace a deployed member. Deployments were not necessarily part of a task force and dental teams provided risk mitigation for long deployments away from the Australian station, such as Middle East rotations or Exercise RIMPAC.

In the last five years, this trend has been consolidated. Mobile dental teams continue to serve the role of capability enablers through prevention or management of acute dental emergencies and support to health staff. However, they primarily operate from a fixed dental surgery afloat within

a large Joint Task Group that comprises multiple fleet platforms and substantial elements from other Services and organisations. These deployments can see the Task Group away months at a time from the Australian station with over 1000 personnel aboard a single vessel. The team must coordinate with other embedded task group elements regarding transport of patients if ships are sailing in company and in vicinity, or align appointments with port visits alongside. This too must be negotiated around movement and 'exercise' plans in order to decrease risk to mission.

There are considerations unique to the sea environment that include limited physical space, sea state and stability of platforms, and equipment failure with no access to dedicated technicians. Dental officers also must appreciate risk and consequence of all treatment options when treating patients, without access to specialist services. Even beyond the dental surgery, the dental team supports the deployed hospital, especially in resuscitation capability and sterilisation.

As our Navy continues to upscale our presence in the maritime environment, will the deployed dental team remain as pertinent as ever in relation to Defence personnel staying Fit to Bite, Fit to Fight?

#### Biography

*LCDR Shannon Godfrey joined the Royal Australian Navy as an undergraduate dentist while studying at the University of Melbourne. LCDR Godfrey served in various fleet units as a Fleet Mobile Dental Officer, ranging from frigates to tankers, on a number of exercises and operations. During that period, she attained Fellowship with the Royal Australian College of Dental Surgeons and enjoyed working part-time in civilian practice. The most rewarding part of LCDR Godfrey's career was mentoring junior Navy dental officers at HMAS Stirling, prior to a staff officer role within the policy realm. LCDR Godfrey is currently the Fleet Dental Officer and is responsible for managing the Fleet Mobile Dental Teams, as well as assessing and advising Command and deployed health personnel on fleet dental issues.*

*LEUT Jessica Kuk joined the RAN as an undergraduate dentist studying at University of Adelaide. She began her Naval dental career under mentorship of LCDR Godfrey, prior to serving as a Fleet Mobile Dental Officer on both LHDs and HMAS Sirius. LEUT Kuk is currently enjoying a posting to HMAS Cairns, providing dental support to crews of hydrographic survey and patrol vessels, whilst studying a Master of Science in Medicine (Pain Management) Orofacial Pain.*

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### Development of a Tabletop Exercise for Navy Health PCRFB training

Captain Ian Young<sup>1</sup>

*1 Directorate of Navy Health, Canberra, Australia*

#### Abstract

As part of the Navy Health Education Learning Matrix (HELM), a Tabletop Exercise (TTX) was developed to provide training to personnel in preparation for deployment in the Primary Casualty Reception Facility (PCRFB). The objectives of the TTX are for participants to understand the flow of casualties through the ship and within the PCRFB and to understand the communication requirements within PCRFB and command. The TTX is part of a PCRFB Certification Exercise (CERTEX) to prepare personnel and teams prior to deployment. The purpose of this presentation is to describe the creation and implementation of this new training activity.

#### 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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### Health Professionals Feeling Valued By Air Force. Health Professionals Creating Value With Air Force

Mr Alan Turner<sup>1</sup> GPCAPT Andrew Johnson<sup>1</sup>, SQNLDR Sally Faulks<sup>1</sup>

*1 Health Services Wing, Medical Specialist Program, ADF. Amberley, Australia*

#### Abstract

Working alongside junior Air Force health professionals, WgCDR Al Turner kept hearing the same concerns: they sought more support and connection in their day-to-day roles, they weren't getting enough clinical exposure to maintain their skills and, perhaps most concerningly, that they didn't feel valued by the organisation at large. As a result of these discussions, he floated the idea of a mentoring program amongst senior Full-time and Part-time Medical Officers to become mentors to their junior colleagues. The response was overwhelmingly supportive and, with that, the Health Professional Engagement Program – Air Force (HPEP-AF) was born. Along the way, SQNLDR Sally Faulks and GPCAPT Andrew Johnson, who shared Al's passion, came together to form the HPEP-AF Leadership Team.

Starting out with thirty Medical Officer mentor pairs, the Program evolved rapidly throughout 2021. Responding to feedback from participants, the HPEP-AF Leadership Team arranged Career Pathway forums with trusted experts and facilitated monthly peer support sessions for junior Medical Officers to share concerns and develop common solutions. The benefits of connecting with colleagues, supporting each other, and sharing knowledge were immediately felt across the spectrum of participants.

The pilot year of HPEP-AF demonstrated the potential of engagement with health professionals for Air Force. The benefits of effective employee engagement on morale, productivity and retention are well-documented and the positive impact on the Full-time force will be evident in years to come.

Engagement with the Part-time force has become increasingly challenging in recent times. Many Part-time Air Force health professionals joined to provide their specialist skills in the deployed environment, and the opportunities to do so are less prevalent than they once were. Through participation in HPEP-AF programs in 2021, it became clear that Part-time health professionals can provide value to Air Force in a raft of other ways.

HPEP-AF has already clearly demonstrated that better engagement of Air Force health professionals has many benefits; not just for individuals, but also for the organisation as a whole. What began with a group of motivated individuals, seeking forgiveness rather than permission, has grown into a formalised program. HPEP-AF has now been endorsed at the highest levels of Air Force Health and is helping to inform organisational strategies to engage Part-time members with their Full-time counterparts.

This initiative is an example of what can be achieved when health professionals across the force have passion, determination and seize opportunities as they present. Come along on the journey of HPEP's evolution and future direction and take the opportunity to engage with us via a facilitated Q+A session with senior tri-service representatives to explore the potential of engagement initiatives such as HPEP-AF across Defence health.

### Biography

*GPCAPT (Prof) Andrew Johnson MBBS, MHA, MConfMgtResol, FRACMA (Distinguished).*

*Andrew is a Medical Leader and Manager working at the Townsville Hospital and Health Service, a Professor with the College of Medicine and Dentistry at James Cook University and an Honorary Professor with the Australian Institute of Health Innovation at Macquarie University. He is a Censor of the Royal Australasian College of Medical Administrators and has been a long-term member of the Education and Training committee, a leader in curriculum reform, a former member of the College Council and Board, and a supervisor of training and preceptor. He has been recognised as one of a handful of "Distinguished Fellows" of the College for his work in medical workforce and patient safety, and has twice received international awards for his innovations in safety and quality. Andrew has been the lead author of five book chapters and lead or senior author on several peer reviewed publications and conference abstracts and is a regular for invited and peer reviewed presentations at national and international meetings. Recent studies in Conflict Management and Resolution have led to accreditation as a mediator and coach. His current major area of interest is in conflict competence, mentoring and coaching. After leaving the Permanent Air Force in 1995 as a SQNLDR, Andrew has spent over 25 years as a hospital executive, some of that time in RAAFSR. He has re-joined Air Force as a part-timer in 2021, bringing his civilian experience in safety, quality and leadership coaching back to Defence.*

*WGCDR (Dr) Alan Turner B Med, B Sci (Physics Hons), MPH&TM, FACEM, FRACGP, FACAsM, DipAvMed.*

*Alan currently works in staff specialist positions at the John Hunter Hospital Emergency Department and the Hunter Retrieval Service in Newcastle. He is a Director of Emergency Medicine Training and a current member of the Australasian College of Emergency Medicine, Emergency Medicine Certificate and Diploma Council. Currently in his 28th year of full-time service with the Royal Australian Air Force, Alan has been a fully qualified member of the ADF Medical Specialist Program for almost two years. Prior to embarking upon his Emergency Medicine training, Alan served in several Air Force postings, including Chief Instructor at the Institute of Aviation Medicine and Officer-In-Charge of Number 3 Aeromedical Evacuation Squadron Detachment Amberley. Alan deployed on operations to Kuwait, Afghanistan on two occasions and, most recently, to Burnie, Tasmania, in support of Operation COVID19 ASSIST. Alan's strong interest in both well-being and the implementation of positive organisational change have been strong drivers in his efforts to establish the Health Professional Engagement Program - Air Force.*

*SQNLDR (Dr) Sally Faulks BSc (Hons), MBBS, FRACGP.*

*Sally is a full-time Medical Officer in the Royal Australian Air Force. She was recruited through the Graduate Medical Scheme in 2009 and served in various Health Services Wing and Joint Health Command positions, deploying on Operation Accordion in 2018. She is currently posted to Joint Health Command Canberra as Military Assistant to Commander Joint Health/Surgeon General Australian Defence Force. Sally completed her general practice training in 2018 and is now working towards fellowship with the Royal Australasian College of Medical Administrators. She is currently studying a Masters in Public Health/Health Leadership and Management. Sally also gained qualifications in Executive and Business Coaching, and looks forward to expanding her coaching skillset and experience. She is passionate about mentoring and development of the Air Force health workforce, culminating in her role on the Health Professional Engagement Program leadership team.*

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### DVI (Disaster Victim Identification) – Utilisation of DVI Trained Joint Military Police and Forensic Dentistry Trained ADF Dental Officers

MAJ John Cunningham<sup>2</sup>, [SQNLDR Alistair Soon](#)<sup>1</sup>

<sup>1</sup> Royal Australian Air Force, Australia,

<sup>2</sup> Australian Army, Australia

#### Abstract

Disaster Victim Identification (DVI) is a method used to identify victims of mass casualty incidents. The International Criminal Police Organization (INTERPOL) DVI Guide is used in situations, such as mass fatalities (more than 3 deceased persons), remains that are fragmented, and in all aircraft accidents. The INTERPOL DVI Guide is the standard adopted by many countries, including Australia. DVI tends to be associated in the civilian setting, where mass fatalities resulting from natural disaster or accidents; however, DVI could also occur in a military-like setting, where mass fatalities occurred in a military or peacekeeping area involving hostilities.

In a disaster or emergency, the Australian Defence Force (ADF) could be called upon to assist state/territory government through the Defence Assistance to the Civil Community (DACC) as part of the Commonwealth Whole of Government Assistance. In the past and even at present, the ADF frequently assists in providing medical, logistics, and engineering resources, but rarely been utilised in a DVI operation. The ADF DVI capability is limited, hence in an event of a military DVI, the ADF does not have a full dedicated organic mortuary affairs capability; and if positive identification of ADF personnel is required in the Area of Operations (AO), it would likely be conducted by AFP (Australian Federal Police), contractors or coalition forensic specialists. The ADF, however, does not lack DVI trained personnel, such as those in the Joint Military Police Unit (JMPU) and Health Units.

JMPU is a tri-service unit, providing an “intelligence-informed, responsive, mission orientated and preventative Policing capability to support Commanders of all levels”. Although JMPU has DVI-trained military police, they are rarely involved in any domestic or international DVI event. Military police complete their DVI training at the level expected of Queensland Police Service (QPS) or AFP. The Provost Marshal ADF (PMADF) has a seat in the Australia and New Zealand Police Advisory Agency DVI

Committee (ADVIC), and is also the appointed ADF DVI capability coordinator. JMPU has deployable military DVI equipment, which could be deployed in domestic and international environments, on its own or to augment civilian police.

ADF Health members, in particular the Dental-Level 2 (DL 2) dental officers, are all trained in forensic dentistry as part of their career progression. Forensic dentistry is one of the three primary identifiers endorsed by INTERPOL in DVI. Primary identification by forensic dentistry, although there are some limitations, is one of the fastest methods. The advantages of utilising ADF dental officers (permanent or reserve), in any DVI event, are that many of the ADF dental officers are able to deploy at short notice, are security vetted, and are usually medically, dentally, and physically fit for the task (as part of individual readiness). Many ADF dental officers also have the experience in working in an austere environment. Many dental units in the ADF also has the Digital Dental Imaging System (DDIS), which includes handheld portable x-ray unit, an important tool in forensic dentistry, which could augment the JMPU deployable DVI or state/territory civilian police DVI capabilities.

DVI trained joint military police and forensic dentistry trained ADF dentists, although have their own limitations, they have the ability to augment civilian police and mortuary staff in most phases of local or international DVI, and even DVI in an austere environment. The rapid positive identification process using forensic dentistry allows to expedite the accurate recovery and repatriation of deceased, including ADF members in a military DVI scenario. In this time of uncertainty, it is worthwhile exploring ADF DVI capability in preparation for any future disasters.

#### Biography

*SQNLDR Alistair Soon is a RAAF Reserve Dental Officer with No. 1 Expeditionary Health Squadron. Alistair practises general dentistry at Metro South Oral Health (Queensland Health), and forensic dentistry at Forensic and Scientific Services (Queensland Health). Alistair was involved in several DVI (Disaster Victim Identification), including as the Odontology Team Leader in air crash incidents, and has presented locally and internationally, including at INTERPOL and NATO conferences. Alistair is involved with the Historic Unrecovered War Casualties – Air Force in forensic dentistry. He deployed as a dental officer on Operation Highroad during the COVID-19 pandemic.*

*MAJ John Cunningham joined the British Army in 1983. In 2007, he laterally transferred to the Australian Army. On arrival in Australia as a Captain,*



Major Cunningham was the Deputy Director of Operations for HQ ADF Investigative Service (ADFIS). He deployed to Iraq and Afghanistan in 2008 and 2009, and in 2010 as the OIC ADFIS Middle East Area of Operations. He was awarded the CJTF633 Silver Commendation for his specific work in relation to processing and repatriation of Australian fallen comrades in Afghanistan. In January 2012, he was promoted to Major, and is currently the Officer Commanding, Joint Military Police Station Brisbane.

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### Evaluating a Supervisor-Led Extension to Self-reflection Resilience Training at the Royal Military College: A Controlled Trial Randomized by Platoon

Miss Madison Kho<sup>1</sup>

<sup>1</sup> Macquarie University, Australia

<sup>2</sup> Curtin University, Australia

#### Abstract

The trial evaluated the added benefit of a supervisor-led extension to a promising self-reflective approach to resilience training. The extension used supervisors to encourage and guide the application of resilience training content following everyday stressful activities. Participants were military officer cadets (N = 168), randomized into two conditions by platoon. The control condition received the original self-reflection resilience training only (n = 85) and the intervention additionally received a supervisor-led extension to the program (n = 83). Participants completed assessments of depression and anxiety symptoms, and perceived stress at four time points over five months. Cadet performance scores were also obtained. Findings indicated that participants who received the supervisor led extension demonstrated better psychological outcomes earlier, than cadets in the control condition. However, at the final time point, both conditions had equivalent levels of mental health symptoms and perceived stress. The intervention condition demonstrated better average performance than the control condition, for the performance measure most relevant to the activity in which the extension was applied. Mechanisms for the effectiveness of the extension were also explored and implicated the effects of the intervention occurred via increased perceived supervisor support. This research demonstrates the effectiveness of a scalable

resilience intervention and captures the added benefit of a supervisor-led extension in promoting resilience. It also reiterates the importance of supportive supervision in promoting resilience, and presents resilience training extensions as an opportunity to facilitate routine supportive supervisory interactions.

#### Biography

Madison is a registered psychologist completing a combined Doctorate of Philosophy/Masters of Organisational Psychology at Macquarie University. She has been involved in research investigating the efficacy of resilience training and the impact of work stressors on psychological health of employees in a range of professions including military, health practitioners, and veterinarians

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### Evaluating Effectiveness of a Comprehensive, Multidisciplinary Healthcare Service for Veterans: a Pilot Study from the National Centre for Veterans' Healthcare

Ms Rebecca McFarlane<sup>1</sup>, Dr Michelle Cunich<sup>2,3,4</sup>, Ms Kirsty Chapman<sup>1</sup>, Mr Brendan Bott<sup>2,3</sup>, Ms Johanna Castle<sup>1</sup>, Ms Eileen van Dijk<sup>1</sup>, Dr Cameron Korb-Wells<sup>1</sup>, Professor David Handelsman<sup>4</sup>

<sup>1</sup> National Centre For Veterans' Healthcare, Concord Repatriation General Hospital, Sydney Local Health District, Concord, Australia,

<sup>2</sup> Charles Perkins Centre, Faculty of Medicine and Health (Central Clinical School), University of Sydney, Camperdown, Australia,

<sup>3</sup> Sydney Health Economics Collaborative, Sydney Local Health District, Camperdown, Australia,

<sup>4</sup> ANZAC Research Institute, Concord Repatriation General Hospital, Sydney Local Health District, Concord, Australia

#### Abstract

##### Background:

Increased military operations over recent decades have created a new cohort of contemporary veterans. Whilst contemporary veterans share many military experiences of previous generations, their needs differ from that of preceding cohorts. Many interrelated mental and physical health issues impact significantly on veterans' quality of life, with

increased demands on healthcare. The National Centre for Veterans' Healthcare (NCVH) – the first multi-disciplinary integrated health service for veterans in Australia – was established in August 2019 to address unmet comprehensive care needs of contemporary veterans. A prospective cohort study of veterans at the NCVH has been undertaken to evaluate application of a person-centred framework within an integrated model of healthcare.

### Methods:

All veterans referred to the NCVH service were invited to participate in the evaluation study. Participants completed surveys on experience and satisfaction with the NCVH, their quality of life (EQ5D5L and AQoL) and healthcare utilisation at defined intervals prior to, during, at completion and later post-treatment. The primary outcome was to determine satisfaction with the NCVH as a service in providing integrated ambulatory care to veterans. Secondary outcomes were to establish whether the service provides adequate and comprehensive healthcare services to optimise care for contemporary veterans with complex needs.

### Results:

Fifty-six veterans consented to participation in the pilot study from August 2019 to August 2020, comprising veterans and discharging personnel from all ADF branches (Army 53%, Navy 37%, Air Force 7%, Reservist 4%), with an average age of 45 years (range 20-78 years), mostly men (81%). At referral to the service, 80% of participants reported unemployment due to poor health. There was a high prevalence of mental health issues among participants (80%) and substance use (38%), along with injuries (70%) and chronic pain (77%). Several psychosocial issues were also apparent, including social isolation (61%), domestic stress (39%), financial hardship (39%), and homelessness (20%). The primary outcome, satisfaction with the NCVH service, was rated as excellent (79%), good (16%) and undecided (3%) at completion of treatment, and, at the 3-month follow-up, rated as excellent (88%) and good (12%). Improvements were reported in ability to undertake usual activities (moderate-severe impairment reduced from 71% to 51%,  $p < 0.01$  for trend), pain/discomfort (moderate-severe symptoms reduced from 82% to 60%,  $p < 0.01$  for trend) and anxiety/depression (moderate-severe symptoms reduced from 82% to 60%,  $p < 0.01$  for trend) at the completion of integrated care, with these effects sustained 3-months following discharge. Patient's self-rating of their health improved from an average 37.5 to 52.7 (on 100-point scale,  $p < 0.01$ ) at 3-months post-treatment.

### Conclusions:

The pilot NCVH service demonstrated effective delivery of an integrated multi-disciplinary ambulatory care service for Australian veterans. There were demonstrable improvements in several domains of participants' quality of life that were durable at 3-month post-discharge follow-up. A high level of satisfaction with the NCVH service was reported by participants.

### Biography

*Rebecca McFarlane is a Case Manager at the National Centre for Veterans' Healthcare (NCVH) at Concord Repatriation General Hospital (CRGH), Sydney Local Health District. She has a Bachelor Degree from the University of Sydney, in Applied Science: Exercise Physiology. Rebecca has rehabilitation experience working with both current serving and ex-serving ADF members. She worked on base with JHC as an external rehabilitation consultation for the ADF Rehabilitation Program. In 2019, the NCVH service was conceptualised as the first Australian service to provide comprehensive integrated care to the veteran community, with Rebecca joining the team as a Case Manager. Rebecca has an interest researching multidisciplinary veteran healthcare outcomes and person and family centred care and satisfaction.*

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## Forward Movement of Surgical Assets to Address Non-Compressible Truncal Haemorrhage

A/Prof Charles Pilgrim<sup>1</sup>, Dr Simon Hendell<sup>1</sup>, Dr Noel Eatough, Dr Marty Graves

<sup>1</sup> *The Alfred, Australia*

### Biography

*A/Prof Pilgrim completed fellowships in Upper GI surgery at The Alfred and Hepatobiliary and Pancreatic surgery at the Medical College of Wisconsin (USA) and has a PhD from Peter MacCallum. He has appointments at Cabrini Hospital, The Alfred (HPB and Trauma) as well as Frankston and Peninsula Private hospitals and is a serving military surgeon and lieutenant colonel in the Australian Army. He is an associate professor at Monash University and a senior trauma instructor/examiner for the Royal Australasian College of Surgeons. He is a member of the Academy of Surgical Educators and the Section of Academic surgery with the College of Surgeons.*

**No consent to publish abstract**

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### Health Planning for Complex Operations – Using the Casualty Estimator (CasE) and the Battle of Balikpapan 1945

Ltcol Anthony Pay<sup>1</sup>

*1 Joint Capability Group, Canberra, Australia*

#### Abstract

Health planners must ensure that the commander is aware of the health implications of any course of action (COA) and undertake detailed health planning in support of the operational or tactical plan. Health decision support such as advice on casualty estimates has typically relied on the experience and presentiment of the health planner. The Global Endeavour Casualty Estimator (CasE) tool provides an additional science based method to assist health planners.

The Battle of Balikpapan (July 1945) was Australia's largest amphibious operation involving around 30,000 Australian Army troops, many RAN ships and wings from the RAAF along with considerable US support. The final step of Operation Oboe, the battle was part of a campaign to liberate Borneo from Japanese forces during WW2. Analysing the Battle of Balikpapan (1945) through the lens of the CasE tool provides an opportunity to assess principle health planning aspects with a focus on casualty estimation in a real time setting. This historical analysis invites health planners to consider their casualty assessment against actual events and CasE.

Global Endeavour is a dynamic and agile project delivering a suite of decision support tools with the epithet of one tool, many applications, better decisions. Decision support focuses on casualty estimation, operational demand analysis and longitudinal workforce planning.

Ultimately, the availability of a modern casualty estimation (Global Endeavour CasE) tool adds a valuable weapon to the arsenal of the health planner in providing decision support to the Commander.

#### Biography

*LTCOL Anthony Pay is a leading expert in health planning decision support tools with a focus on casualty estimation, workforce sustainment and operational demand analysis. A Staff College Graduate (2013), LTCOL Pay was Commanding Officer of 3 HSB (2015-2017) delivering medical personnel support to multiple operations. Following a staff appointment to JHC where he was instrumental*

*in the introduction of the ADF Credentialing Report to support the tracking of health professional credentials, LTCOL Pay was appointed Project lead for Global Endeavour. In this role, LTCOL Pay has developed an innovative and unique set of decision support tools including modernising support to casualty estimation within the ADF. For his pioneering work, LTCOL Pay was awarded Gold Commendation in 2020.*

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### Health Programs For Civilians During the Vietnam War – A Historical Reflection

Dr Paul Byleveld<sup>1</sup>

*1 NSW Health, Australia*

#### Biography

Dr Paul Byleveld is a specialist in water, sanitation, hygiene and public health. He has experience with the Red Cross, the Australian Government and the United Nations High Commissioner for Refugees in humanitarian emergencies resulting from conflict, violence, natural disasters and disease outbreaks. Paul has completed deployments working in Africa, the Middle East, South Asia, South East Asia and Pacific. In Australia, Paul works with New South Wales Ministry of Health. He is currently a team leader the New South Wales Health COVID-19 Public Health Response Branch.

Colonel Paul Byleveld is an Army Reserve member of the Royal Australian Army Medical Corps. He is currently the Senior Advisor Environmental Health in the Directorate of Army Health, Army Headquarters. He has enjoyed a diverse career in technical, instructor and staff roles. Colonel Byleveld has operational experience as an Environmental Health Officer in Papua New Guinea, East Timor, and Indonesia. He is a faculty member of the Uniformed Services University of the Health Sciences' Graduate Certificate Program in Global Health and Global Health Engagement (and recently completed the Certificate himself).

**No consent to publish abstract**

### Improved Musculoskeletal Model of Care in a Deployed Military Hospital

Captain Ian Young<sup>1</sup>, Captain Jennifer Donaghe<sup>2</sup>, Major Matthew Laughlin<sup>3</sup>, Colonel Joseph Alderete<sup>2</sup>

<sup>1</sup> Directorate of Navy Health, Canberra, Australia

<sup>2</sup> San Antonio Military Medical Center, San Antonio, USA

<sup>3</sup> Carl R. Darnall Army Medical Center, Fort Hood, USA

#### Abstract

The multidisciplinary Role 3 Musculoskeletal (MSK) Clinic at the Baghdad Diplomatic Support Centre (BDSC) Role 3 Combat Support Hospital provides a combined assessment for new referrals by a physiotherapist and orthopaedic surgeon. Complex patients are also reviewed in the MSK Clinic by the orthopaedic surgeon at the request of the physiotherapist as required. Immediate or early access to orthopaedic opinion and outpatient procedures provides optimised patient care.

The purpose of this paper is to describe and assess the improved provision of care for musculoskeletal conditions in an outpatient setting of a deployed facility. The MSK Clinic provided multidisciplinary assessment and treatment by the deployed physiotherapist and orthopaedic surgeons.

This is a retrospective review of all BDSC MSK Clinic patient encounters over a 6-month period, from 1 July 2020 to 31 December 2020 using the electronic medical record. The number of new patient assessments, patient encounters, conditions seen and outpatient procedures such as corticosteroid injection and dry needling will be reviewed. Trend analysis of the most common presentations will be discussed. The efficient management of patients and the ability for immediate surgical referral will be reviewed. No formal outcome measures were used.

#### 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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### Improving Responses to Veteran Suicide Risk - Embedding the SafeSide Framework for Recovery-Oriented Suicide Prevention at Open Arms – Veterans & Families Counselling

Ms Jennifer Veitch<sup>1</sup> Dr Grant Pegg<sup>1</sup>

<sup>1</sup> Department Of Veterans' Affairs, Canberra, Australia

#### Abstract

Open Arms – Veterans & Families Counselling (Open Arms) have commenced the transition of their risk assessment framework from a categorical approach to a person-centred, prevention-oriented, and recovery-focused framework based on risk formulation and safety planning. The framework, developed by developed by Dr Anthony Pisani Associate Professor of Psychiatry (Psychology) and Paediatrics at the University of Rochester Centre for the Study of Prevention of Suicide (Rochester, NY, USA), reflects contemporary thinking in suicide prevention. Open Arms has entered into a partnership with SafeSide Prevention, to implement this recovery-oriented framework.

This presentation will firstly focus on implementation, providing a summary of findings from a qualitative analysis into the nature and extent of the influence of the SafeSide Framework introduction in Open Arms. Specifically speaking to the professional, structural and cultural factors that influence the application of the SafeSide Framework, and the meaning, significance and pattern of use of the SafeSide Framework in the day to day activity of Open Arms clinicians and mental health peer workers.

The presentation will then summarise available research literature and industry standards, speaking to the role, impact and client/service outcomes where peer workers are involved in delivery of support services to clients at increased risk for suicide. Focussing specifically on the role of peer workers in risk assessment and management, and the leading national and international models of service and practice frameworks facilitating clinician and peer worker delivery of collaborative integrated care to clients.

The SafeSide Framework, based on leading best practice, guides practitioners in the assessment of both vulnerabilities and strengths, and facilitates the development of plans to mitigate risk and extend supports. The transition to a risk formulation-based approach is a key component of the improvement journey taking place within Open Arms and the

broader Department of Veterans' Affairs (DVA). Challenges and strengths in the integration of this framework in an Australian setting will be explored and future directions highlighted.

Open Arms is the cornerstone of the Government's veteran mental health support and suicide prevention response, delivering free and confidential, nation-wide counselling and support for over 38,000 current and ex-serving ADF personnel and their families annually. The SafeSide approach reflects the needs of Open Arms clients and has strong alignment with DVA Principles of Prevention, Recovery and Optimisation, as articulated in the 'Veteran Mental Health and Wellbeing Strategy and National Action Plan 2020-2023'.

### Biography

*Grant Pegg is a registered medical practitioner and has previously worked as a General Practitioner and in mental health services in Queensland. Grant was the Assistant Secretary of the Prescription Medicines Authorisation Branch for the Therapeutic Goods Administration during the initial approval of COVID-19 vaccines and treatments. He was previously the Assistant Secretary of the Pharmacovigilance and Special Access Branch, responsible for post-market medicine and vaccine safety. Grant recently joined the Department of Veterans' Affairs as the National Manager of Open Arms - Veterans and Families Counselling.*

*Jennifer Veitch is an innovative leader within the Department of Veterans' Affairs who combines her expertise in clinical leadership and insight into service delivery to inspire cultural change through transformational business strategies as the Executive Director of Strategic Development in the Mental Health and Wellbeing Services Division. Recently embarking on her Doctorate to contribute to the body of research on interventions for suicide risk in the Australian veteran community, as a Psychologist she has over 25 years of experience in the areas of veterans mental health, complex trauma, domestic and family violence, child protection, and women's health.*

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## Integrative Approaches for Musculoskeletal Health and Chronic Pain in Veterans: Overview and Results from a Pilot Feasibility Study

Professor Jon Wardle<sup>1</sup>, Associate Professor Romy Lauche<sup>1</sup>, Mr Andrew McLintock<sup>1</sup>, Dr Roderick Martin<sup>2</sup>

<sup>1</sup> Southern Cross University, Lismore, Australia

<sup>2</sup> Go2 Health, Everton Park, Australia

### Abstract

#### Background:

Musculoskeletal conditions and nervous system conditions are often inter-related and make up the top 10 health conditions suffered by recently deployed Australian military personnel. Chronic pain from these conditions is significant, with nearly half of personnel recently deployed to Middle East operations reporting some degree of chronic low back pain after their return and over two-thirds reporting some degree of chronic muscle pain. Conventional treatment of these conditions can often be ineffective, and in some cases may be harmful. However, some CM approaches demonstrate promising clinical evidence for these conditions, including in military populations, and have been explicitly proposed and recommended by organisations such as the NATO Science and Technology Organization as a potential solution to addressing these major health issues within military health systems. Global surveys have found use of complementary medicine by military personnel and veterans to be significantly higher than complementary medicine use in the civilian population. Some military health systems have responded to this high level of use by integrating complementary medicine into health care delivery, with 83% of US military treatment facilities and 88% of Veteran Health Administration facilities offering some form of complementary medicine. There is also evidence that some CM have been effective in addressing the healthcare needs that disproportionately affect military personnel and veterans. However, despite significant levels of integration of CM into military health care delivery in other countries (Science and Technology Organization, 2017) there appears to have been little integration of CM into the treatment of Australian military personnel and veterans. This presentation presents an overview of integration of complementary medicine into military and veteran health, and presents an overview and results of the first feasibility trial of integrating complementary

medicines in a veteran population for the treatment of musculoskeletal pain and disorders.

### Methods:

This pragmatic randomised trial 39 participants were recruited through Australia's largest clinic focusing on veteran health (Go2 Health, Everton Park, Queensland). Participants were assigned to the different arms via block randomisation and were randomised to either treatment according to DVA protocols (Usual Care) or Usual Care plus complementary medicine (Integrative Care). The complementary medicine (Integrative Care) intervention included acupuncture, massage, naturopathy and yoga, with data collected at baseline, 8, 12 and 26 weeks.

### Results:

The trial resulted in small to moderate effect sizes for Integrative Care compared to Usual Care in pain severity (PDI 0.59), pain interference (PDI 0.66), pain self-efficacy (PSEQ 0.11) and overall (EQ-5D 0.23), physical (SF-26 0.23) and mental health (SF-36) quality of life indices. The percentage of participants who reported clinically important improvements after 12 weeks, as indicated by a pain reduction of at least one third on the Brief Pain Inventory, was 30% in the Integrative Care group, and 16.7% in the Usual Care group. A larger trial is required to confirm results.

**Conclusion:** The Integrative Care intervention was feasible and safe, with a small number of adverse events only. Conducting a trial within a health care facility created several challenges with regards to participant and data management, which needs to be addressed in future trials. The intervention resulted in a larger reduction in pain intensity in the Integrative Care Group compared to Usual Care, with a moderate effect size. The feedback from participants was overall positive, highlighting the potential for Integrative Care programs to manage chronic pain in veterans.

### Biography

*Jon Wardle is Professor of Public Health and Director of the National Centre for Naturopathic Medicine at Southern Cross University. In addition to clinical qualifications, Jon has postgraduate qualifications in public health, law and health economics and holds visiting positions at Boston University, Chinese University of Hong Kong and Oxford University. Jon has published over 200 research publications, has leadership positions in the Public Health Association of Australia and American Public Health Association, and leads several World Federation of Public Health Associations and World Health Organization initiatives in integrative medicine, health policy,*

*primary health care and developing health research capacity in developing countries. Jon has worked on integrative veteran health projects in Australia, India and the United States. Jon also works on traditional and Indigenous medicine, public health and primary health care policy with numerous governments, non-government organisations and international bodies*

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## JP2060-3: The Next Generation Australian Defence Force (ADF) Deployable Health Capability.

LTCOL Mark Bali<sup>1</sup>, Ms Amany Wahba<sup>2</sup>

<sup>1</sup> Australian Defence Force- Land Systems Division, Russell, Australia

<sup>2</sup> Saab Australia, South Melbourne, Australia

### Abstract

In September 2020, the Australian Department of Defence contracted Saab Australia (Saab) to deliver a modular Deployable Health Capability (DHC) under the Australian Government's Joint Project 2060 Phase 3 - Health Clinical Care (JP2060-3). The new DHC utilizes an innovative 'systems approach' to create a modular, flexible and scalable capability that delivers comprehensive and quality clinical care across the spectrum of ADF operations, from conflict to Humanitarian Assistance and Disaster Relief.

Saab, in partnership with Aspen Medical, Philips Healthcare, Ventia, Marshall Land Systems and Global Defence Solutions, will deliver and sustain some 550 modules, supporting scalable, deployable role-based health facilities and evacuation effects for the ADF. The modules will be configured to generate Role 2 and Role 2 (E) effects such as surgical, critical care and enhanced diagnostic imaging. The project will also expand the ADF's deployable Role 3 specialist effects. Additionally, rapidly deployable Role 1 facilities with light-scale field surgical effects and modular evacuation kits will enhance continuity of care through the deployed health system. Saab's DHC Support Centre, a logistics and maintenance hub is being constructed near Ipswich, QLD, to support the new capability.

The Defence project team in partnership with Saab are now well progressed with the detailed planning required to deliver the DHC. Central to this process are dozens of Subject Matter Experts from across the ADF health community who have and continue

to guide the refinement of system design whilst also adjusting processes and policies to extract the best outcomes from the new system. This collaborative approach will facilitate the DHC entering service with the Army and Air Force during the 2023 to 2025 period. Navy will be brought into the program progressively as they refresh on-board medical systems in future years.

Under JP2060 Ph 3, Saab is establishing a DHC Centre of Excellence (DHC CoE) in Victoria. The CoE will incorporate a team of subject matter experts to design and deliver a product portfolio of flexible and scalable medical modules for the local and global defence markets. The core capabilities of the CoE will include mobile deployable role-based health facility designs, asset and project management, and partnerships with academic and research organisations for the development of innovative deployable health products and solutions. The CoE will create an avenue for the ADF to enhance its deployable health capability through continual technology refresh. It will increase Australian Industry Content by increasing engagement with local suppliers and partners, and promote the Australian DHC to the export market.

### Biography

*LTCOL Mark Bali is an Army Officer with over 20 years' experience in operations, training and capability development. His background is military combat engineering, but since 2001 he has streamed toward capability development. His interest in improving military innovation has led to the completion of a Masters of Business, Masters of Military and Defence Studies and a PhD in Chemistry. His current role is as the Staff Office Grade 1 Deployable Health Capability in Army HQ where he acts as the Joint Sponsor Representative for JP2060-3 and other deployable health development efforts.*

*Mrs. Amany Wahba trained and worked as a Medical Laboratory Scientist for 10 years in the areas of haematology, biochemistry and transfusion medicine in private pathology in Melbourne. She has held sales and diagnostics management roles within the scientific industry for 20 years and now works for Saab Australia as the Sales Director for Medical Solutions. Her current role is to provide support for the deployable health capability project JP2060- phase 3 and managing the strategic framework for Saab's Centre of Excellence to help promote Australian Industry Capability.*

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## Knee Injury is One of the Most Frequently Experienced Traumas in the ADF. What is the Best Imaging Pathway to Obtain a Highly Confident Diagnosis?

Ltcol - Associate Professor James NOL<sup>1</sup>

*1 HQ 17 Brigade, Randwick, Australia*

### Abstract

There are many different pathways employed by clinicians for the diagnosis of knee injuries and pathologies. Based on availability of the different modalities, clinicians refer patients to imaging to help obtain a reliable diagnosis. If all modalities were freely available and accessible, what would be the best pathway? What are the outcomes of employing a low specificity modality? What is the best Evidence-Based pathway?

This presentation will outline the main two options for Knee Imaging.

1. Radiographic studies (X-Ray and CT): These are always inconclusive. They will not show intra-articular and ligamentous injuries. There is a role for these in acute trauma where bone injury is strongly suspected and needs to be better characterised. There is, however, no useful role for either of these modalities in acute and chronic trauma injuries, where soft-tissue or ligamentous injury is considered more likely and there is no useful role for either modality for chronic conditions likely due to soft tissue and articular cartilage pathology. CT arthrography on the other hand, may provide limited details when no other options are available. However the procedure is invasive, and it is not recommended for acute traumatic injuries, and only outlines soft-tissue structures within the knee rather than showing internal characteristics.
2. MRI. A Fast MR Screening examination producing 2 sequences within 5 minutes for a knee in the Turbo Suite, employing Simultaneous Multi-slice acquisition performed in 5 minutes, will detect all injuries (bone and soft tissue) with higher accuracy than CT and x-ray. A Fast MR Screening of the knee will ensure the detection of meniscal tears, cruciate ligament tears, collateral ligamentous injuries, osseous and chondral lesions, occult fractures and dislocations, bone marrow oedema or 'bone bruise' and articular cartilage lesions.

This raises the question of the relevance of referring every single patient to a knee x-ray as a first line imaging modality, then follow up with referral to CT as the second in-line modality, and then eventually to MRI when a specialist or a surgeon gets involved?

The cost of Imaging is tripled, and patient management delayed going through the imaging roller coaster.

Fast MRI provides low-cost imaging with high diagnostic confidence as well fast-tracked clinical intervention which is the golden rule for trauma and pathology conditions.

### Biography

*Academic and educational background:*

- *Medical Radiation Practice, Medicine, Radiology, Radiobiology, Master of Public Health, PhD.*
- *Founder, Developer, Coordinator and Senior Lecturer of the Postgraduate Master's Degree – Advanced Imaging – MRI; School of Medicine, Western Sydney University.*
- *Presenter and guest speaker and numerous national and international conferences.*
- *Secretary and core organising member of the Military Regional Health Advisory Group Clinical Evenings since 2010.*

*Awards:*

- *Winner of the NSW Health Baxter's Quality Awards 2004.*
- *Finalist of three other quality and innovation projects,*
- *Winner of the WSLHD Innovation Award "2018" for Introducing MR Screening as a Frontline Diagnostic Tool.*
- *October 2019, hosted the Inventor of the MRI Dr Raymond Damadian at the WSU and ASMIRT Symposiums October 2019.*

*Innovations:*

- *Originator of the Open Access Concept which has been in operation since April 2004.*
- *Originator of the General X-ray Paper Printing in Australia. In operation since 2004.*
- *Originator of the Radiology Reporting on Demand which has been in operation since October 2007.*
- *Originator of the multiskilling program for Medical Radiation Practitioners in Australia.*
- *The originator of the MR Screening Concept, establishing Fast MRI sequences for different clinical presentations.*

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## Known Knowns, Known Unknowns: Update On Women's Mental Health in the Military

[LTCOL Diana McKay<sup>1</sup>](#), [Dr Carolyn Nas Jones<sup>1</sup>](#), [SQNLDR Carmel Newitt<sup>1</sup>](#)

*1 JHC, ADF, Australia*

### Abstract

In 2019/2020 women comprised 19.2% of the total permanent ADF, with individual services having a female participation rate in permanent service between 14.9% to 24.6% (1). With all ADF roles now open to women, what do we know about current and former servicewomen's mental health? To date, there is only limited research specifically exploring this topic. This presentation will synthesise current Australian and international research on current serving and veteran women's mental health conditions, including post-traumatic disorder, suicide, and higher prevalence mental disorders. There will be specific exploration of perinatal disorders, which can impact service members and their families. Noting what is known, both from research and clinical experience, and what is not yet known, the presenters will consider future steps to further support service women being 'Fit to Fight, Fit to Work, Fit for Life'.

### Biography

*LTCOL McKay and CMDR Nas Jones are full-time psychiatrists within the ADF, working in two of seven tri-service positions created nationally. SQNLDR Newitt is poised to attain her fellowship in psychiatry and become the third full-time ADF psychiatrist. All are passionate about providing high quality care to serving members with mental health issues.*

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## Meta-Analysis of Deployment-Related Demands and Resources For Emotional Resilience, Cognitive Functioning and Job-Performance in Military Personnel

Dr Gavin Hazel<sup>1</sup>

*1 Macquarie University, Sydney, Australia*

### Abstract

Operational deployment reflects a significant period in military service. The nature of military deployment means that military personnel are faced with a range of stressors including potentially traumatic events and a range of other high frequency, albeit lower intensity demands (e.g., sleep disruption, morale challenges, prolonged separation from social supports, difficult living conditions). Our current understanding of the effects of military deployment experience is restricted to piecemeal meta-analyses investigating a narrow group of deployment demands (e.g., potentially traumatic events) and outcomes (e.g., post-traumatic stress).

This meta-analysis presented here aims to expand this knowledge base via a large scale synthesis of the breadth and relative associations of deployment demands and resources related to eight outcomes: post-traumatic stress, depression, anxiety, psychological distress, burnout, capacities for resilience, job performance, and cognitive functioning. This meta-analysis considered two-hundred eighty-three eligible studies (N=3,058,436) were included.

Several key findings emerged: firstly, deployment-related resources were as important as demands to deployment outcomes, but comparatively understudied; secondly, resources dominantly associated with clinical and non-clinical mental health outcomes were: adequate sleep on deployment, positive motivational orientation, and use of a variety of coping strategies. Additionally, job performance was often positively associated with resources that were interpersonal in nature; and, thirdly, non-traumatic demands impose important risks to personnel, but the strongest correlates of outcomes were emotional and cognitive processes, rather than objective adversity.

This presentation will provide an overview of the meta-analysis and report of the main results of the analysis including: clinical and non-clinical indicators of emotional resilience; performance; and cognitive function. These findings have implications for research, prevention, and personnel screening.

For example, the potential benefit of post-deployment screening may benefit from a greater emphasis on the detection of emotional experiences related to guilt and shame.

This research has been funded by DST Group Human Performance Research Network (HPRnet) to apply a multi-systems approach to investigate demand and resilience resource profiles within the at-sea deployment setting. The research is being undertaken by Macquarie University, Curtin University and the Leibniz Institute for Resilience Research.

### Biography

*Dr Gavin Hazel is a Postdoctoral Research Fellow at Macquarie University working on a longitudinal project examining the critical factors that affect resilience and job performance in Navy personnel during maritime operations. This project is being conducted in partnership with DTSG, DNC and an international advisory group. Gavin is an experienced education and capability development professional, specialising in the area of mental health, wellbeing, and resilience. Gavin has worked as a research academic, a senior Defence research scientist and a mental health projects and programs manager.*

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## Military Employment Classification - One Policy, Three Standards

Colonel Rod Petersen<sup>1</sup>, Major Bob Worswick<sup>1</sup>

*1 Army, Australia*

### Abstract

Sailors, soldiers and airmen are the foundation of the Australian Defence Force's (ADF) combat power and a key role of the ADF Joint Health Command is to ensure the health preparedness of ADF personnel for operations – i.e. that ADF personnel are 'fit to fight'. In practical terms, this is achieved by assessing ADF members against medical standards that reflect the occupational and environmental demands of military service. All ADF members are assigned a Military Employment Classification (MEC) based on functional capability standards established in the Military Personnel Manual (MILPERSMAN). While there is a single, authoritative source for MEC, in practice this is applied differently across the three Services. This presentation will review the application of the MEC system by the three Services and explore

the implications that may arise from the inconsistent application of a common health standard.

### Biography

*Major Worswick served as an infantry officer before becoming a doctor. He trained as a rural generalist, attaining dual fellowships through ACRRM and RACGP; and completed the Advanced Diploma in Emergency Medicine through ACEM.*

*COL Petersen enlisted in the ARES a long time ago and moved to the full time Army five years ago. He originally worked as a rural GP and brickie's labourer finally becoming a Fellow of the College of O&G in the new Millennium. He has around 80 publications with more than 1000 citations. He has managed a number of tertiary hospital units and start-up medical school as Associate Dean Teaching and Learning. He is currently the SO1 MECARS within JHC.*

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## Military Psychiatrists: A new role in the ADF.

Dr Carolyn Nas Jones<sup>1</sup>, LTCOL Diana McKay<sup>2</sup>

<sup>1</sup> RAN, Australia

<sup>2</sup> ARA, Australia

### Abstract

In the 2016 Defence White Paper the decision to employ uniformed psychiatrists was made, and in 2019 CMDR Carolyn Nas Jones became the first of a potential workforce of 6 full time uniformed Psychiatrists. She is posted to JHU-CNSW. LTCOL Diana McKay is also a psychiatrist and joined fulltime in 2020, and is posted to JHU-CA. In this presentation we will discuss the role of the military psychiatrist from a historical perspective, and share our experiences in establishing our roles so far. Considering the vast scope of potential work and the ever present dual role, we will discuss how we can be best employed and future plans to shape this new opportunity to support members and command in the ADF.

### Biography

*CMDR Nas Jones re joined the RAN in 2019, having previously served as an undergraduate medical student and MO from 1993-2003. CMDR Nas Jones continued to work at the Balmoral Naval Hospital where a large part of her work was caring for service*

*men and women who were medically returned from active duty. In this role she developed an interest in Psychiatry, and went on to begin psychiatry training in 2005, obtaining her FRANZCP in 2010 and her Certificate in Psychiatry of Old Age in 2014. CMDR Nas Jones worked as a Staff Specialist and VMO, and is completing a Master's in Forensic Mental Health through the University of NSW. She is currently posted to JHU-CNSW.*

*LTCOL Diana McKay is a psychiatrist posted to JHU-Central Australia. Initially joining RANR, she transitioned to fulltime service in 2020. She has worked in public and private psychiatry, with special interest in anxiety disorders, perinatal psychiatry and education. LTCOL McKay has a Masters in Health Management from UNSW and a Graduate Certificate in Educational Studies (Higher Education) from the University of Sydney. She is an Honorary Associate Professor in the Faculty of Medicine, Health and Human Sciences at Macquarie University.*

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## Morale factors in a small war; Operation Enduring Freedom

Mr Peter Sleeth<sup>1</sup>

<sup>1</sup> Victoria University, Melbourne, Australia

<sup>2</sup> La Trobe University, Melbourne, Australia

<sup>3</sup> Royal Australian Air Force, Canberra, Australia

### Abstract

Small wars are wars that are waged by nation-states against lesser powers, colonial insurrections, and insurgencies. Operation Enduring Freedom was the first US led small war since Vietnam. "Small wars" by definition, and location, are far off, as revealed by the Soviet-Afghan war, where every passing year revealed worsening morale. This article deals with how morale is paramount in a particular small war; Operation Enduring Freedom.

### Biography

*Peter Sleeth is a Lecturer in Public Health, Victoria University, Melbourne, a PhD Candidate, Department of Archaeology and History, La Trobe University and a serving member of the Royal Australian Air Force. Peter's research area is the history of military medicine, with a particular focus on battlefield casualty care and public health measures since the late 19th century.*

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### 'More important than winning': a retrospective online research survey evaluating the effects of participating in an adaptive sports program for wounded, injured and ill Australian Defence Force veterans

Dr Or Sqnldr Anna Lewis<sup>1,2,3</sup>

1 ADF Sports Cell, Adaptive Sports Program, Canberra, Australia

2 1EHS RAAF Amberley, , Australia

3 Sports Focus Physiotherapy, Northbridge, Australia

#### Abstract

The Australian Defence Force (ADF) Adaptive Sports Program offers participation in recreational and competitive sport to wounded, injured or ill ADF veterans, with the aim of supporting rehabilitation, recovery and social reintegration. There has been limited research on the impact of sport participation on the physical and mental health and wellbeing of ADF veterans.

This study was designed to investigate the effects of adaptive sports program participation on individuals' physical and mental health and wellbeing. Ethics approval was granted from the Departments of Defence and Veterans' Affairs Human Research Ethics Committee on 27 June 2019.

A survey was designed to evaluate the effects of the program participation on health and wellbeing outcomes. The survey consisted of 22 multiple-choice questions (an additional free-text response was included later.) Five questions collected information on serving status, gender, service, age at date of proposed discharge and number of deployments undertaken whilst actively serving.

Six questions asked participants about their level of engagement in the program, their subjective evaluation of their rehabilitation progress, and their intention to continue participating in the program or partnership programs such as Veteran Sport Australia.

Eleven questions asked about activities that promote or maintain health and wellbeing, including exercise, eating, social interaction and leisure for personal health.

All survey responses were de-identified and aggregated.

The survey was sent to 210 ADF Adaptive Sports Program participants enrolled in events from 2018-2020.

Of 60 participants (29% of eligible participants) who provided consent and responded to the survey, the majority 78% (n=47) were male. Sixty-seven per cent (n=40) were former-serving members and 68% (n=41) will transition from the ADF under the age of 45 years. A greater proportion of participants had served on three or more deployments, 47% (n=27) compared to no deployments 27% (n=16).

Among the 60 respondents, 78% reported that they engaged more in physical activity after participation, and 89% reported that they had experienced a positive effect on their rehabilitation pathway through their participation. Ninety-two per cent of participants reported they were likely to recommend the ADF Adaptive Sports Program to other veterans. The majority of participants reported a high level of self-care on measures for physical health as well as social activity and mental health outcomes.

On free text answers, two responses encapsulated the aims of the program:

"Place more emphasis on the activity; participation and connections are more important than winning or being the best at something".

"The program is about recovery and not winning medals..."

Some respondents commented on the benefits of the ASP:

"Having a team of other wounded veterans playing adaptive sports gives a safe place to talk to each other".

"Adaptive sports give better chances of a level base line so despite variations of injury you can play the sport at the same level..."

This was the first formal evaluation of the ADF Adaptive Sports Program. Preliminary findings demonstrate the program provides opportunities for health-promoting activity and helps veterans experience the physical, emotional and social benefits of sport. Evidence supports the importance of the collective interconnection of the three key domains of physical, mental and social health and wellbeing to enhance rehabilitation, recovery and reintegration.

A known limitation of this study is selection bias due to the retrospective survey study design, which may not be a true representation of this population.

Further research is needed to identify outcomes for the wider group of program participants, to ensure the sustainability and effectiveness of the Adaptive Sports Program.

### Biography

*Dr Anna Lewis completed her undergraduate physiotherapy and post-grad sports physiotherapy degrees in Melbourne. After a move to Sydney in 2001, she obtained a 3-month locum position at HMAS Kuttabul where she stayed for the next 12 years. During this time, she established a clinical pilates program to assist ADF members with injuries to recover and rehabilitate through a clinical pilates exercise program. This led to a doctoral research study investigating the effects of clinical pilates for members of the ADF with chronic low back pain. She joined the RAAF as a Specialist Reserve Physiotherapist in 2008 and, is currently the OIC of the Role 2 Physiotherapy 1EHS RAAF Amberley, Principal Research Investigator for the Adaptive Sports Program, Head Physiotherapist for the ADFRU and provides Physiotherapy subject matter input to other discrete projects. She completed a Master of Public Health in 2016, was seconded to NSW Health as a team lead for contact tracing during 2020 and recently deployed as a Health Planner to OP COVID19 Assist.*

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## Navigating the Menopause

SqnlDr Fatima Ashrafi<sup>1</sup>

<sup>1</sup> Avicenna Health, Brisbane, Australia

### Abstract

Menopause matters as every day women are going through menopause; it is a natural part of woman's life. In 2020, 45.9 million women worldwide are over 55 including world leaders and ordinary women. In 1900 average life expectancy was 48 yrs, now 80 or more.

Genitourinary syndrome of menopause (GSM) describes the multiple changes occurring in the external genitalia, pelvic floor tissues, bladder and urethra, and the sexual sequelae of loss of sexual function and libido, caused by hypoestrogenism during the menopause transition and post menopause. These changes primarily occur in response to reduced oestrogen levels and ageing, and do not settle with time. There is also increased bone loss; for 20 years after menopause, 50% of bone

will be lost. Almost all women experience symptoms at menopause. Hot flashes last 3 to 5 yrs but can last up to 10 yrs so do not say tough it out. Most women find these symptoms manageable and choose not to have treatment. When symptoms are severe or prolonged, there are a range of ways to manage them.

Hormone replacement therapy (HRT) was first introduced in the 1940s. Use became widespread in the 1960s, fostered by the erroneous concept that the menopause was a hormone deficiency disorder, and that replacement would make women 'feminine forever. HRT has got contraindications and side effects; now we know that HRT or Menopausal hormone therapy (MHT) is the most effective treatment for menopausal vasomotor symptoms and is safest in recently menopausal women

It is important to have appropriate screening prior to starting and use the lowest effective dose consistent with treatment goals. We should use Oestrogen E2 for women without Uterus. With Uterus combined MHT is used. Transdermal E2 may reduce VTE risk. The use of testosterone therapy, alone or with MHT, is supported in carefully selected postmenopausal women with sexual interest or arousal disorders. As women live more than one third of their lives after menopause, it is important that this important chapter of life be managed effectively.

Key words – Menopause, Genitourinary syndrome of menopause (GSM), Hormone replacement therapy (HRT), Menopausal hormone therapy (MHT), Estrogen E2, Venous Thromboembolism (VTE)

### Biography

*Dr Fatima Ashrafi has practiced obstetrics and gynaecology for 25 yrs. She is Fellow of Royal Australia and New Zealand College of Obstetricians and Gynaecologists, Royal College of Surgeons Edinburgh & Royal College of Obstetricians and Gynaecologists, UK.*

*She is a committed clinician and gives compassionate & competent care to patients.*

*Dr Ashrafi has worked with Queensland Health since 2006. In 2013, she joined Flying Obstetrician Gynaecologist (FOG) based in Roma. She found it very satisfying to serve the women living in remote and rural areas.*

*She has a passion for education, research, and training. Currently she is a senior lecturer and examiner with the University of Queensland School of Medicine, Australian Medical Council and RANZCOG.*

*Currently she works as a Squadron Leader with Australian Airforce (Reserve), has her own Private*

*practice, and regularly works in regional, rural, and remote areas.*

*She reads avidly. She is involved in professional development activities to ensure her practice is up to date with current developments in the specialty.*

*She loves being a mother. Caring for her children gives her unspeakable joy. The children saw her enthusiasm and passion in serving patients and people and have chosen to follow a career in medicine.*

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### Neck Of Femur Bone Stress Injuries in Infantry Trainees: A synopsis and presentation of two case studies.

Mrs Carney Garland<sup>1</sup>

*1 Serco, Singleton, Australia*

#### Abstract

A neck of femur stress fracture is a high risk bone stress injury especially in young fit, healthy individuals. A neck of femur bone stress injury (NOF BSI) usually develops due to overtraining and cumulative loading. Susceptible individuals may have a reduced capacity to manage the relative increases in load associated with Infantry training. An increase in training load, volume and intensity commonly occurs in the 3-4 week period prior to initial presentation of hip pain.

A cluster of these bone stress injuries was noted at the School of Infantry during 2016/17. In 2018 a collaborative effort was made to identify potential causative factors and clinical guidelines for treatment and management as well as implementing changes to the training and PT program. This is a difficult task: there is no simple answer explaining the increased incidence of these injuries and therefore hard to prevent them from happening in the first instance. That said, a number of collective changes were made to the training program at the Australian Recruit Training Centre and School of Infantry. A clinical pathway was created to assist staff when infantry trainees presented with hip pain. An education program was put into place for all staff and trainees at the School Of Infantry. Interestingly the collective of these changes brought about a complete 100% reduction in the occurrence of NOF BSI during 2019. However there has been a resurgence in NOF BSI in 2020, particularly after the initial period of lock down from COVID 19.

The danger with these injuries is the potential for a stress fracture to become a true fracture and NOT picking them up in the early stages of BSI. Presenting symptoms for a NOF BSI can be vague and nondescript. Not all trainees present with functional deficits, however most will present with an antalgic gait. As there is no one clinical test to diagnose a NOF BSI, a thorough history and clinical assessment is used to establish a degree of suspicion for the medical staff to refer for MRI, which is the preferred investigation to identify these injuries.

Once diagnosed a NOF BSI can be well managed with conservative Physiotherapy and rehabilitation.

There has been a total of 31 NOF BSI from 2016-21 inclusive (4 female and 27 male)

This presentation will discuss NOF BSI, with specific reference to the School of infantry incidence over the past 5 years, the injury prevention and education in place and will present 2 very different case studies.

#### Biography

*Carney Garland graduated in 1989 with a Bachelor of Applied Science in Physiotherapy. She has worked in the public hospital system in New South Wales and the private sector in the Northern territory, including providing physiotherapy to the people of Groote Eylandt. Leaving the Territory, she joined Singleton Health Centre at the School Of Infantry in 2002, where she continues to work in a clinical role. Carney has a passion for Injury Prevention and has worked towards reducing preventable injuries through the course of her career, doing clinical Research from 2012 -14 which assisted in establishing an injury prevention program at the School Of Infantry. In 2016 there was an influx of bone stress injuries in the neck of femur in Infantry trainees, which has led her to focus on these injuries. Her aim has been to assist in identifying plausible causative factors, identifying the injuries as early as possible and managing them with current evidence based treatment. Her work in this area has resulted in being presented with an Australian Defence Force Silver Level Commendation in 2018. She would like to take this opportunity to share some of her findings over the past few years.*

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### No Black Swans or Silver Bullets: Medical Fitness in 7th Combat Brigade - An Evidence Based Approach to Retention and Transition

Lieutenant Colonel Daniel Belanszky<sup>1</sup>

*1 Army - Headquarters 7th Combat Brigade, Gallipoli Barracks, Enoggera, Australia*

#### Abstract

Headquarters 7th Combat Brigade commenced a detailed review of medical fitness across the Formation in 2021, with the aim of establishing an evidence-based approach to design and implementation of diverse and targeted measures to decrease injury, improve rehabilitation and retention, and reduce long-term mental health risks for medically separating personnel.

Medical fitness is an essential requirement for a fighting force. The medical employability and deployability of personnel have a significant bearing on capacity to force generate military capability and contributes to workforce issues associated with underlying workforce hollowness within a combat brigade. Not the least of these issues is the administrative and health care resources required to manage personnel requiring treatment and rehabilitation for long term, complex or chronic injuries. Importantly, the involuntary medical discharge of personnel from injuries sustained during training, on operations, or attributed to both, not just affects retention but is likely to have life-long physical and mental health implications for a veteran's lifestyle and wellbeing. While contemporary reporting indicated an increase in the prevalence of medically downgraded personnel, with an associated rise in the incidence of mental health conditions, theories on the nature and cause of this increase were largely anecdotal.

The review included quantitative analysis of PULHEEMS data for non-deployable personnel categorised MEC: J31, J32, J34, J40, J51 and J52. The analysis found that Locomotion (L7) related injury is the primary cause of non-employable/deployable personnel and medical discharge. Stability (S7) and locomotion (L7) combined cause greater than 50% of capability loss, while 75% of medical discharges have a stability (S7/S8) determination. This presentation will explore findings from the review and discuss causal factors, preventative measures, rehabilitation, and mental health implications of injury management. Meta analysis and further collaboration is required to understand precipitating factors including:

recruitment standards; the efficacy of preventative measures, treatment, and rehabilitation regimes; and the nexus between comorbidities, chronic pain and mental health.

#### Biography

*Lieutenant Colonel Daniel Belanszky graduated from the Royal Military College, Duntroon and was allocated to the Royal Australian Army Medical Corps in December 1991. His postgraduate qualifications include a Master of Public Health (QUT) and Master of Military and Defence Studies (ANU). During a career spanning 30 years he has worked extensively in the planning and delivery of operational health capability and is currently the Senior Health Officer of the 7th Combat Brigade.*

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### Novel Approaches To Point Of Injury Care Utilizing Robotic And Autonomous Systems

A/Prof Charles Pilgrim<sup>1</sup>, Prof Mark Fitzgerald<sup>1</sup>

*1 The Alfred, MELBOURNE, Australia*

#### Biography

*A/Prof Pilgrim completed fellowships in Upper GI surgery at The Alfred and Hepatobiliary and Pancreatic surgery at the Medical College of Wisconsin (USA) and has a PhD from Peter MacCallum. He has appointments at Cabrini Hospital, The Alfred (HPB and Trauma) as well as Frankston and Peninsula Private hospitals and is a serving military surgeon and lieutenant colonel in the Australian Army. He is an associate professor at Monash University and a senior trauma instructor/examiner for the Royal Australasian College of Surgeons. He is a member of the Academy of Surgical Educators and the Section of Academic surgery with the College of Surgeons.*

**No consent to publish abstract**

## NZDF Wellbeing Impacts in the COVID-19 Pandemic Environment

Colonel Clare Bennett<sup>1</sup>

*1 NZDF, Wellington, New Zealand*

### Abstract

The impact of the COVID-19 pandemic for the operation of the NZDF and role in our national response has been significant. This has presented a range of challenges to our force and our broader Defence Community professionally and personally. A range of initiatives have been introduced to foster wellbeing, enhance access to support, and monitor wellbeing over time. This presentation provides a summary of how we have supported and monitored the health and wellbeing of our people over the last 18 months, and areas of current and emerging challenge and opportunity.

### Biography

*Colonel Bennett joined the New Zealand Defence Force as a Psychologist. After serving in a range of operational, research, policy and strategy roles she transferred to the Reserves to work in broader government and then returned to the RF as the Chief Mental Health Officer. In 2019 she moved into the role of Director of Integrated Wellness in the Directorate of Health, NZDF.*

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## Obstetric History, Pelvic Health and Military Occupations: a Study of a Cohort of Australian Female Military Personnel and Veterans

Dr Simone O'Shea<sup>1</sup>, Dr Kate Freire<sup>2</sup>, Professor Rod Pope<sup>1,3</sup>, Associate Professor Rob Orr<sup>3</sup>

*1 Charles Sturt University, Albury, Australia*

*2 Three Rivers University Department of Rural Health, Albury, Australia*

*3 Tactical Research Unit, Bond University, Gold Coast, Australia*

### Abstract

#### Background:

Pregnancy and childbirth have been shown to be key risk factors for pelvic health issues, such as urinary

incontinence, in women. Approximately 85% of women will become pregnant within their lifetime; therefore, long term pelvic health, and the impacts it can have on the lives and lifestyles of women, needs to be considered. With a growing number of women joining the Australian Defence Force (ADF), the physical requirements of many military roles, as well as the likelihood that many women will have children during their Service, the relationships between obstetric history, pelvic health and military service warrant consideration.

#### Aim:

The aim of this investigation was to explore the relationships between obstetric history and pelvic health in a cohort of Australian female military personnel and veterans.

#### Method:

A cross-sectional anonymous online survey was conducted in adult biological females who had actively served in the ADF for at least six months. The survey explored the pelvic health of female military personnel, including the prevalence, types, severity, and risk factors for pelvic health issues, as well as management strategies and occupational impacts. This paper focuses on findings related to obstetric history, pelvic health, and military service.

#### Results:

A total of 491 active servicewomen (60%) and veterans (40%) participated in the survey (52.7% Army, 25.7% Air Force, and 21.4% Navy). 71% of respondents had been pregnant, with a mean of three pregnancies reported (range 1 – 10), and a mean of two during Service (range 0 – 8). The mean number of births servicewomen experienced was 1.9 (range of 0 – 9), and vaginal delivery accounted for 71% of all births. The most common pregnancy and/or perior post-natal pelvic health complications reported were perineal tears (20%), pelvic pain (17%), urinary incontinence (15%), episiotomy (14%), and sexual dysfunction (11%). Of those women reporting complications, one third experienced ongoing issues that affected their subsequent military work (i.e. modifying usual duties, delayed return to work).

Parous women were more likely to report concerns about their pelvic health (80.4%) than nulliparous servicewomen (56.1%). Parity was also linked with prevalence of pelvic health symptoms, including urinary urgency, urge urinary incontinence, stress urinary incontinence and pelvic organ prolapse.

### **Discussion:**

The survey found it is common for female ADF personnel to experience pregnancy and childbirth during Service, and a small proportion of those women experience complications that influence their return to and/or subsequent work within the military. Consistent with other studies of female pelvic health in general populations, parity had a relationship with prevalence of pelvic health symptoms, such as urinary incontinence and pelvic organ prolapse. This has implications for the growing population of women in the ADF, and suggests that providing support to pregnant and post-partum members may provide long term benefits to both servicewomen and the ADF.

### **Conclusion:**

Pregnancy and childbirth is a particular time unique to females that can have a significant effect on pelvic health. Given the physically demanding nature of many military roles and annual fitness assessment requirements, support and management of female personnel during pregnancy, as well as their post-partum return to work planning and preparation needs to recognise the potential pelvic health implications to enable them to efficiently and effectively return to their roles.

### Biography

*Simone is a Physiotherapist with over 20 years of clinical and academic experience. She currently works as a Lecturer in Physiotherapy at Charles Sturt University, which she juggles around raising her four children and some clinical roles. She has strong clinical and research interests in collaborative health care, therapeutic exercise, rehabilitation, chronic health condition management and female pelvic health. She is grateful to the Defence Health Foundation for funding this research on pelvic health in female military personnel.*

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## Operation COVID-19 Assist - Findings from the ADF Deployment Experience Survey

Ms Cate Chesney, Colonel Nianne Bennett,

Ms Rena Kaur, Jenny McGee

1 Department of Defence, Australia

### Abstract

Operation COVID-19 ASSIST (OP C19A) saw the deployment of thousands of ADF personnel in support of the Australia Government response to the COVID-19 Pandemic. Defence support included contact tracing, planning support to state and territory government, assisting law enforcement agencies, support tasks and assisting in health care facilities. In November 2020, the OP C19A Deployment Experiences Survey was distributed to ADF personnel who had deployed in support of OP C19A. The survey sought to identify and better understand operational stressors associated with working in a pandemic environment, with the goal to better inform mental health screening needs. This presentation will discuss findings from this survey, including the potentially traumatic events and stressors unique to this operation and the groups identified most at risk of mental health concerns. The findings can be used to inform on similarities and differences across different operational environments, and assists in identifying how policy and practice can be implemented to facilitate mental health support that is tailored to operational requirements.

### Biography

*Cate Chesney is currently the Assistant Director Occupational Mental Health Surveillance within Joint Health Command. Her section is responsible for providing data summaries and surveillance reports on operational mental health data for ADF members. The section is also the technical authority of the Joint Health Command PULSE, an Organisational climate survey. Ms Chesney joined the Department of Defence as a graduate in 2008 and has worked in many mental health domains since this time, including operational mental health surveillance, resilience training, unit climate, and mental health research.*

*Colonel Nianne Bennett is an Army Psychologist who has worked across clinical, selection and assessment, training, research, disaster responses and operational support throughout her military career. She is the current Director of Mental Health and Strategy in Joint Health Command and leads the implementation, evaluation and continuous improvement of the Defence Mental Health and Wellbeing Strategy. In this role she also leads the development of operational mental health and surveillance initiatives to support ADF personnel across their career and whilst deployed.*

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## Oral Oddities - Two Case Reports

Dr Danica Zhan<sup>1</sup>

*1 Royal Australian Navy, Australia*

### Abstract

Two cases are presented to illustrate the dental practitioner's role in promptly identifying atypical presentations in the military setting and following a systematic and comprehensive approach towards investigation and management to ensure deployable dental fitness and capability is maintained.

#### **Case 1. Atypical Presentation of Odontogenic Pain**

Orofacial pain can present as a significant diagnostic and management challenge due to its complex pathophysiology and multitude of pain referral patterns. Detailed history, examination, and multidisciplinary input may be required to differentiate between odontogenic and non-odontogenic pain and avoid unnecessary irreversible interventions.

A 41-year-old male Navy member recently presented at the Stirling Dental Clinic with intractable orofacial pain.

Symptom onset commenced following a dental appointment one-week prior, where a mental nerve block was administered for polishing of the lower right second premolar (tooth 45). The pain was a continuous 4/10 dull ache in the right mandible, near the injection site, with increasingly frequent episodes of a 10/10 sharp pain that radiated to his right ear and maxillary sinus. There was an associated temporal headache and sleep was interrupted. Tramadol relieved the pain but rendered the member Temporarily Medically Unfit for four days, after which the 10/10 episodes subsided, and pain medication was no longer required. The 4/10 dull jaw ache and associated headache remained.

The psychosocial, medical, and dental history was otherwise unremarkable.

Oral examination revealed a lightly restored dentition that responded positively to vitality testing on two separate occasions. On the second occasion, vitality testing on the unrestored lower right first premolar (tooth 44) reproduced the patient's aggravated symptoms, bringing him to tears with a 10/10 earache and headache. A slight radiolucency was observed at the distal apex of the lower first molar (tooth 46).

Odontogenic pain is typically well-localised to the affected tooth, and therefore diagnosis was complicated by the member's unusual presentation which appeared to involve varying divisions of the

trigeminal cranial nerve. Differential diagnoses included tooth 45 defective filling (which was excluded following its replacement), tooth 46 pulpal necrosis (which conflicted with its positive vitality responses), and trigeminal neuralgia or post-operative neuropathy (rare conditions).

Prior to conducting irreversible root canal treatment, the member was referred to an Oral Medicine Specialist to exclude non-odontogenic causes. A mandibular CT scan confirmed an abscess at tooth 46 which subsequently resolved following root canal treatment.

#### **Case 2. Hypoglossal Nerve Palsy**

The hypoglossal cranial nerve innervates tongue musculature. Palsy of this nerve can affect tongue movement, appearance, and speech and swallowing function. Due to the association between cranial nerve palsies and malignancy, with the potential to impact deployable capability, identification of abnormal tongue morphology and mobility should prompt the clinician for a detailed history and examination.

Marked atrophy and dorsal ridging of the right hemi-tongue was observed in a 24-year-old male Navy member who recently presented at the Stirling Dental Clinic for his periodic dental examination. The left hemi-tongue was comparatively hypertrophic, with deviation to the affected side on protrusion.

The member was aware of his tongue's atypical appearance for as long as he could remember and had noted no significant changes, symptoms, functional limitations. The psychosocial, medical, and dental history was unremarkable.

An MRI from the Oral Medicine Specialist revealed atrophy of the right hemi-tongue with fatty replacement, confirming a diagnosis of chronic right hypoglossal nerve palsy. No intracranial cause was identified, and with adequate compensation from the contralateral hypoglossal nerve, no further specialist follow-up was recommended.

Despite the non-sinister diagnoses, these cases reinforce the importance of recognising atypical presentations in a military setting, and the need for a thorough history and examination for accurate diagnosis and management to maintain deployable dental fitness.

### Biography

*Lieutenant Danica Zhan, BDS (Hon I)*

*Lieutenant Danica Zhan is a Dental Officer in the Royal Australian Navy. She began her service under sponsorship as an undergraduate dental student at*

the University of Queensland in 2016 and has since then enjoyed postings across Australia. She was recently deployed at sea for three months for Indo-Pacific Endeavor 2021 on HMAS Canberra, and is currently the Senior Dental Officer at Larrakeyah Defence Precinct, NT.

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### Osteoarthritis and Arthroplasty in Australian Military Personnel

Dr Georgina Waters<sup>2</sup>, Mr Andrew Mattin<sup>2</sup>

1 Fiona Stanley Hospital, Perth, Australia

2 Royal Australian Army, Perth, Australia

#### Biography

Georgie is an orthopaedic trainee in Perth, Western Australia. She is a medical officer in the Royal Australian Army Reserves with a keen interest in the current and future health of military members.

**No consent to publish abstract**

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### Physical Loading, Pelvic Health and Military Occupations: A Study of a Cohort of Australian Female Military Personnel and Veterans

Dr Simone O'Shea<sup>1</sup>, Dr Kate Freire<sup>2</sup>, Professor Rod Pope<sup>1,3</sup>, Associate Professor Rob Orr<sup>3</sup>

1 Charles Sturt University, Australia

2 Three Rivers University Department of Rural Health, Albury, Australia

3 Tactical Research Unit, Bond University, Gold Coast, Australia

#### Abstract

##### Background:

Higher impact and loaded physical activities (i.e., running, load carriage) have been implicated as risk factors for female pelvic floor dysfunction, such as urinary incontinence. Military occupations often include tasks and roles that require high levels of endurance, strength, load carriage, and physical training. Therefore, female military personnel are at risk of pelvic health issues, which could impact their health and occupational performance.

##### Aim:

The aims of this investigation were to determine the types of physical loading undertaken by servicewomen within the Australian Defence Force (ADF) and explore the relationships with their pelvic health.

##### Method:

A cross-sectional anonymous online survey was conducted in adult biological females who had actively served in the ADF for at least six months. The survey explored the prevalence, management strategies, and occupational impacts of female pelvic health issues, along with experiences of physical activity and loading.

##### Results:

A total of 491 active servicewomen (60%) and veterans (40%) participated in the survey (52.7% Army, 25.7% Air Force, and 21.4% Navy). Servicewomen regularly participated in work related exercise (mode: 5 days/week) and recreational exercise (mode: 2 days/week), including aerobic training (45%), work-related physical tasks (37.5%), circuit training (36.5%), and load carriage (21%). With increased frequency of work-related exercise, there was a trend towards a higher prevalence of urinary tract infections.

Half the respondents reported engaging in lifting/carrying tasks at least weekly, predominantly for physical training or normal operational duties within their role. Loading typically lasted 1 – 2 hours, and predominantly involved loads under 25kgs. However, 40% of women also reported carrying additional loads (typically <15kgs), such as weapons/body armour, during these work tasks. Half the respondents reported they felt adequately prepared and fit enough for these tasks. The frequency of load carriage varied slightly between Services, with over half of women with Army service (58%) reporting participating in lifting tasks weekly or more, compared with 47% and 37% of women serving in the Navy or Air Force, respectively. No differences in prevalence rates were identified for common pelvic health symptoms between those who engaged in lifting/carrying tasks at least weekly and those performing these tasks fortnightly or less. However, the only women who reported frequent episodes of faecal incontinence (n = 9) participated in lifting at work at least weekly.

Pelvic health factors affected the ability of 47% of servicewomen to participate in physical loading tasks at work occasionally to sometimes, and 11% frequently to always. Physical loading tasks were also commonly identified to aggravate pelvic health symptoms, such as urinary incontinence. In addition, one third of respondents believed work-related

physical loading negatively influenced their pelvic health, and another third believed it exacerbated pre-existing pelvic health conditions.

### **Discussion:**

Physical loading activities are a common feature of military work for servicewomen. Whilst the prevalence of pelvic health symptoms did not appear to differ significantly between those participating in lower and higher levels of physical loading at work, responses from this cohort of servicewomen and veterans suggest a bidirectional relationship between pelvic health and physical loading that influences their occupational performance.

### **Conclusion:**

With physical fitness and physical training being vital for military personnel, female pelvic health factors that could impact on this training, and training factors that could impact on pelvic health, must be considered. Strategies to mitigate female pelvic health concerns and downstream impacts on physical occupational performance could include pelvic health screening and monitoring, specific pelvic health education and training programs, as well as graded physical conditioning programs.

### **Biography**

*Simone is a Physiotherapist with over 20 years of clinical and academic experience. She currently works as a Lecturer in Physiotherapy at Charles Sturt University, which she juggles around raising her four children and some clinical roles. She has strong clinical and research interests in collaborative health care, therapeutic exercise, rehabilitation, chronic health condition management and female pelvic health. She is grateful to the Defence Health Foundation for funding this research on pelvic health in female military personnel.*

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## Recognition and Responses to Intimate Partner Violence (IPV) in Support Services for Current and Ex-Service Military Personnel and Families in Australia

Dr Sean Cowlshaw<sup>1</sup>, Ms Jennifer Veitch<sup>2</sup>, Dr Carol O'Dwyer<sup>1</sup>, Ms Anne-Laure Couineau<sup>1</sup>, Dr Laura Tarzia<sup>3</sup>, Mr Jeremy McCarthy<sup>1</sup>, Ms Nicole Pollock<sup>2</sup>, Ms Sara Shortt<sup>2</sup>, Ms Carmen Jose<sup>2</sup>, Professor Meaghan O'Donnell<sup>1</sup>, Professor David Forbes<sup>1</sup>

*1 Phoenix Australia Centre For Posttraumatic Mental Health, Melbourne, Australia*

*2 Open Arms – Veteran's & Families Counselling, Canberra, Australia*

*3 University of Melbourne, Melbourne, Australia*

### **Abstract**

International studies indicate that Intimate Partner Violence (IPV) is a significant concern among current and ex-serving military personnel, and thus they highlight the need for initiatives to address violence used by current or former personnel, as well as IPV victimisation (or exposures) encountered in military and veteran-specific contexts. However, there has been limited empirical attention to IPV among current and former personnel outside the U.S., and this presentation will describe a preliminary research project that has addressed IPV in support services for current and ex-service personnel and families in Australia. This project has initially considered perspectives of service providers, and has involved two parts: (1) a quantitative survey of mental health practitioners (n = 214) who provide services on behalf of Open Arms; and (2) follow-up semi-structured interviews with a subsample of these providers (n = 16). The presentation will initially summarise findings from the survey analyses, which will indicate areas of confidence and low self-efficacy as reported by providers, and provide evidence regarding the frequency of encounters with clients who disclose both IPV use and exposure. These analyses will also indicate typical clinical practices reported by service providers that relate to IPV (e.g., identification strategies and typical responses to clients who disclose IPV). The presentation will also describe themes that emerged from the qualitative interviews, and provide accounts of the different understandings of IPV among service providers, while illustrating military specific factors that may influence violence and complicate processes of risk assessment. The final part of this presentation will

then position these findings in relation to the policy context for Open Arms and comparable support services in Australia, and discuss implications for practice and future research.

### Biography

*Sean Cowlshaw is a Senior Research Fellow with the Phoenix Australia Centre for Posttraumatic Mental Health, in the Department of Psychiatry at the University of Melbourne. Sean's research is focused on improving recognition and responses to complex psychosocial issues and mental health problems, with a particular emphasis on addictive behaviours, posttraumatic mental health issues, as well as IPV. His recent work has addressed the identification and response to these issues within various health service settings, including primary care, mental health and addiction services, as well as high risk occupational environments.*

*Jennifer Veitch is the Assistant National Manager at Open Arms - Veterans & Families Counselling. Jennifer is a Psychologist with significant experience in clinical leadership, having worked extensively in the areas of mental health, complex trauma, domestic and family violence, child protection, and women's health. Her practice wisdom grounds and drives her passion for leading practice change and service innovation. One area of more recent focus has been her work in leading a number of significant reforms within Open Arms to improve service level responses to at-risk veterans and their families.*

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## Recovering Soldier Recovery Centres

Major Jeff Kolka<sup>1</sup>

*1 Australian Army, Brisbane, Australia*

### Abstract

Soldier Recovery Centres (SRC's) were raised in 2012 to provide support, engagement and assistance to complex Wounded, Injured or Ill (WII) ADF members. SRC's offer two programs: a Return to Work Program (RTWP) that aides WII soldiers returning to a trade within service; and a Transition Support Program (TSP) that provides assistance and support to those no longer suitable of serving due to injury or illness. These programs provide a holistic, non-clinical

approach to facilitating soldier's achieving their respective goals.

Whilst those involved with the SRC's have been full of noble intentions and good ideas, aspects of the program have not always been evidence informed. There has also been no evidence based, critical examination of whether the programs contribute to successful rehabilitation and retention or transition of participants. With the recovery and transition outcomes of WII ADF members being a somewhat contentious public and political conversation there appears to be little appetite to be overly critical of SRC's when they are working hard to aide soldier recovery. Conversely, it should be argued that SRC's should be more highly scrutinised to achieve the best possible outcomes for WII members and reduce potential obstacles of retention and transition.

The four existing biopsychosocial pillars on which SRCs are founded are evidence based, however provide limited guidance of what underpins a 'successful' recovery or transition. The first step in evaluating SRC program effectiveness is to develop a framework of key outcomes that the RTWP and TSP can be assessed against. These proposed frameworks have been designed to assess participants' management of physical issues, improving cognitive function, developing sense of purpose and self-worth, enhancing sense of belonging, and building supportive networks within Defence and the wider community. A key requirement across both programs is to equip WII members so that they are more prepared, more proactive and better skilled in dealing with the uncertainty and change of transitioning to civilian life or back to their workplace.

Once key outcomes had been identified further consultation and research was conducted to identify reliable and valid outcome measures. Two outcome measures were selected for use across both the RTWP and TSP, namely the World Health Organisation – Five Wellbeing Index (WHO-5) and the Resilience Scale for Adults (RSA). These measures were supplemented with the Personal Growth Initiative Scale (PGI-II) for the TSP only, and the Brief Resilience Scale BRS for the RTWP only.

This presentation will outline the key outcomes identified for SRC programs, the reasons behind the selection of the four outcomes measures, and results seen from recent programs delivered. Recommendations will be provided that a longitudinal follow up of SRC participants is necessary to evaluate the long-term impacts of program content. In turn, long lasting behavioural change, if any, may also be identified. Possible benefits of further research

include better health and wellbeing analysis across the ADF leading to improved retention, improved health of those who have transitioned and potentially reducing the financial burden of supporting medically transitioned members.

### Biography

*Captain Jeff Kolka was commissioned as an Officer in the Royal Australian Army Medical Corps in 2005. He graduated from Griffith University with a Bachelor of Physiotherapy/ Bachelor of Exercise Science and has fourteen years' experience as a physiotherapist across military and civilian environments in Australia, on deployment and in the United Kingdom. On top of deploying on Op Slipper in 2010 he has delivered health services in several remote localities around Australia and to refugees at the Manus Island Regional Processing Centre. CAPT Kolka has also extensive experience in the areas of sports, with leading international sports physiotherapists, and occupational health. Though this he has recognised the importance of a holistic approach to overall health and wellbeing in the prevention and management of injury and illness.*

*Captain Kolka is currently the Officer-in-Charge of Soldier Recovery Centre – Brisbane, Headquarters 7th Combat Brigade.*

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## Remote Evacuation During COVID-19: Logistics to Coordinate during Pandemic Restrictions

Dr Mark Parrish, Ms Judy Swann, Dr Andrew Ebringer<sup>1</sup>

<sup>1</sup> International SOS, Macquarie Park, Australia

### Abstract

#### Introduction

The coordination of an air ambulance evacuation in a remote location is challenging in the best of circumstances. In a global pandemic, it requires flawless teamwork from a variety of stakeholders working in partnership to coordinate the medical and logistical requirements.

International SOS started as an evacuation company over 35 years ago and has since broadened to provide holistic workforce resilience support to corporate, non-profit and government organisations across the globe.

In 2020, we assisted over 73,000 COVID-19 related cases. Spanning across 153 countries, we performed 246 air ambulance movements for COVID-19 patients & 631 for other patients, totalling 9,690 flight hours, and operated 32 charters with 2,000 passengers

#### Discussion

Meeting the regulations set out by origin and destination countries require a high degree of capability and coordination. Within the organisation that includes coordination between the medical, operations, logistics and security elements of the organisation. Starting with the medical and travel recommendations, it then includes details such as submitting emergency visa applications, understanding local protocol and approved flight times, and managing the medical requirements on the ground while planning for the movement. The security perspective includes safe transportation and contingency plans based on risk tolerance.

Using government cases to demonstrate each component of an evacuation, this presentation will share in more detail the components of medical, security, and logistical coordination needed to ensure a successful evacuation in a remote location in a COVID environment.

#### Conclusion

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

Evacuations in a remote operating environment require a unique skillset including the ability to integrate with government in a cohesive manner. Experience has shown that detailed planning, local knowledge, community relationships, utilisation of personnel experienced in operating in remote environments, and reliable and redundant logistics and equipment are essential in achieving a successful outcome.

### Biography:

Dr Mark Parrish is the Regional Medical Director Pacific and ANZ for International SOS, responsible for all health support, consulting and advisory services across the region. He is based at the International SOS office in Sydney.

Prior to this role Mark was in London with International SOS, where he led the Northern Europe team and grew the consulting business; before this he was in Australia with International Health and Medical Services, a subsidiary of International SOS, heading up a team of 500 health professionals

providing healthcare across Australia's Immigration Detention network.

Mark previously worked for Microsoft's Health Solutions Group covering the Asia and Middle East regions. He was also a Healthcare Consultant with IBM Global Business Services; CEO of North Shore Private Hospital (a large private hospital within a tertiary public teaching hospital in Sydney); General Manager of Hornsby Hospital (a major metropolitan hospital in Northern Sydney); and had a number of roles in the Royal Australian Navy and Royal Navy around the world including the Antarctic, Arabian Gulf, Caribbean, Mediterranean and Pacific.

Mark is a keen cyclist, photographer and adventurer, having travelled, explored and climbed in the Hindu Kush in Afghanistan and Pakistan, the Himalaya and the Chinese Pamirs.

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### Research to Reality: Resilience Training in the Australian Defence Force

Colonel Nianne Bennett<sup>1</sup>, Major David Clarke, Major Sarah Watson, Major Kelly Koens

*1 Department of Defence, Australia*

#### Abstract

Resilience training is an important component in preparing and supporting Australian Defence Force (ADF) personnel to manage the realities of service life. BattleSMART is the ADF's primary resilience training program and is provided to serving members at various career points, most notably at the point of ab-initio training and as part of pre-deployment preparation. Recently, a comprehensive review of BattleSMART was completed to ensure the training provided to ADF personnel aligns with best practice resilience training. This presentation will discuss the findings of the review, and present recommendations for Defence in progressing resilience training. This includes development of an organisational framework informed by research and the introduction of a stepped training model to allow resilience skills to be progressed and developed across career milestones. The presentation will also discuss the practical application of the resilience training review, including the implementation of a trial using BattleSMART across ADF training establishments

and the initial findings from this. Finally, the presentation will consider how the outcomes of the review, and the translation of research to reality reflect how continuous improvement principles are being applied.

#### Biography

*Colonel Nianne Bennett is an Army Psychologist who has worked across clinical, selection and assessment, training, research, disaster responses and operational support throughout her military career. She is the current Director of Mental Health and Strategy in Joint Health Command and leads the implementation, evaluation and continuous improvement of the Defence Mental Health and Wellbeing Strategy. In this role she also leads the development of operational mental health, resilience and mental health surveillance initiatives to support ADF personnel across their career and whilst deployed.*

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### Serving and Ex-Serving Australian Defence Force Members Who Have Served Since 1985: Suicide Monitoring 2001 to 2019

Ms Louise Gates<sup>1</sup>

*1 Australian Institute Of Health And Welfare, Canberra, Australia*

#### Biography

*Louise Gates is a Group head in the Primary, Maternal, Veterans and First Responders Group at the Australian Institute of Health and Welfare.*

*Louise is a professional statistician with over 20 years' extensive experience in the provision of statistical advice and leadership. She has worked extensively with key Commonwealth, State, not for profit and academic organisations to provide quality health information to inform decision-making. She has led numerous new and innovative projects involving the managing and reporting of sensitive data with great success.*

**No consent to publish abstract**

## Smartphone Tele-Assessment platform to Enable Superior Remote Monitoring and Diagnosis of Postural and Functional Control in Total Knee and Hip Replacements

Dr Oren Tirosh<sup>1</sup>, Professor Nilmini Wickramasinghe<sup>1</sup>, Associate Professor Tran Phong<sup>2</sup>, Associate Professor John Zelcer<sup>1</sup>

<sup>1</sup> Swinburne University Of Technology, Hawthorn, Australia

<sup>2</sup> Western Health, Footscray, Australia

### Abstract

Knee injury is responsible for 10% of all ADF hospital admissions. A noted bottleneck in the recovery from Total Hip (THR) and Knee (TKR) Replacement is the return to appropriate functional control. The current standard clinical pathway involves frequent face to face functional assessments such as standing balance and the timed-up-go (TUG) tests over a period of three months. This is not only costly and difficult to manage, especially for isolated and disadvantaged populations, but if not done successfully could lead to poor clinical outcomes and low patient satisfaction. We designed and developed ARIADNE (Assist foR hIp AnD kNEe), a pervasive tele-assessment solution that integrates a web-based repository system coupled with the motion sensor data captured from a smartphone to perform remote clinical tele-assessment to assess postural and functional control to support post-surgery THR and TKR recovery. The aims of this project are to: (1) test the reliability of the tele-assessment system in measuring balance and time-up-go, and (2) to explore the tele-assessment user usability and fit to purpose.

During testing the clinician uses their computer web browser to connect to patient's smartphone ARIADNE app. The patient places their smartphone at the lower back using a belt and rubber band. Once connected the clinician instructs the patient to perform the task while collecting acceleration data from the smartphone. Following this, the clinician then analyses the acceleration data by calculating the medio-lateral and anterior-posterior average acceleration magnitude and root means square (AAMml and AAMap, RMSml, and RMSap respectively) to measure body sway (greater values represent greater sway), and the time to complete the TUG test.

Aim-1: reliability of ARIADNE, 12 healthy participants (6 males age  $28.14 \pm 3.32$  years; and 6

females age  $23.50 \pm 0.72$  years) were assessed during 2 sessions with 1 week apart for balance standing on both legs and on one leg for 20 second, and for TUG. The repeated measures ANOVA showed non-significant differences in all balance measurements ( $p=0.41$ ) between week 1 and week 2 assessments. High correlation coefficient between week 1 and 2 were found for all measurements,  $r = 0.81, 0.76, 0.82,$  and  $0.50$  for AAMml, AAMap, RMSml, and RMSap, respectively). A t-test showed non-significant differences in the time to complete the TUG test between week 1 and 2 ( $7.42 \pm 1.02$  and  $7.52 \pm 1.08$  seconds, respectively,  $p=0.60$ ) with high correlation  $r=0.81$ .

Aim-2: To assess the benefits, fit for purpose and efficiency, effectiveness and efficacy of the platform. This aim is in progress. We are collecting usability questionnaire data from 20 THR and TKR patients. Directional data to date suggests that the ARIADNE solution performs as well if not better to standard care methods in general and is most helpful for lockdown contexts when no face to face contact can take place. We will use the UTAUT framework to explore this.

Our designed solution ARIADNE, represents an original and unique approach to telehealth rehabilitation in orthopaedic care. To date, current telehealth solutions in this space do not address tele-assessment, which means that there is a significant limitation in the current post-operative critical 12 weeks period for THR and TKR patients. Hence, ARIADNE not only addresses this key void but also serves to potentially help to address a major conundrum facing healthcare delivery around THR and TKR; namely, the fact that current services will be unsustainable by 2030. By including a co-design approach and assessing ARIADNE as fit for purpose, we will have a unique tele-assessment solution that can be used for THR and TKR patients and potentially beyond, thereby also serving to leapfrog Australian telehealth initiatives.

We acknowledge the Australian Defence Health Foundation Grants for Medical Research that funds this project.

### Biography

PhD in Human Movement (Deakin, Australia), MSc in Rehabilitation Therapy (Queens, Canada), BED Physical Education (Wingate Institute, Israel). 22 years of clinical and research in gait and posture working at gait laboratory at the Royal Children's Hospital, Melbourne Australia, and now is a senior lecturer in biomechanics at Swinburne University of Technology. Oren interest involve the understanding of human movement in sport and medical applications

and to develop tools for clinicians and coaches to simplify data capture, analysis and interpretation. Exceptional experience in developing technology including telehealth to analyse human movement. Examples of Oren's work include the development of textile sensor sock to measure plantar pressure, motion sensors with biofeedback application to reduce stress fracture, development of GaitaBase and PromsBase web repository systems for gait analysis and patient reporting outcome measures, and tele-assessment platform to measure balance and functional performance.

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### Strategic Health Impacts of Climate Change on ADF Personnel and Operations Throughout Australia and the Pacific

CAPT Nathan George<sup>1</sup>

<sup>1</sup> University of New South Wales, Sydney , Australia

#### Abstract

Climate change has now been declared the most significant health threat of the 21st century. Simultaneously it is being assessed as the most significant threat multiplier of the modern era. As increasingly dire warnings detail the rapidly contracting window to address future impacts, current research indicates that climate change is already having significant and escalating, detrimental effects. At the nexus of climate change, global health, and national security, these effects are generating increased risk to socio-political and economic stability through negative individual and population health outcomes. The resulting strategic impact will have both direct and indirect ramifications for Australian Defence Force (ADF) personnel and the nature of current and future operations. National security organisations seek to anticipate and mitigate risks to stability and prosperity through strategic assessments of relevant geopolitical, environmental, and socio-demographic information. Integration of climate change as a fundamental planning consideration will enable accurate assessment of climate effects on the regional operating environment and future ADF capability. Inherent in this capability assessment are climate related health impacts on personnel and operational sustainability required to achieve the long-term national security agenda.

Initial phases of the current research clarified how climate related health impacts on personnel and operations can be conceptualised across three key areas. Disease migration presents a direct risk to personnel, the broader Australian population, and through human and vector cross border migration throughout the Pacific region. Food and water security presents a direct risk to Pacific Island populations and an indirect and escalating risk to regional stability through challengers to basic living conditions. Extreme weather events of both acute types, such as cyclonic event, and chronic types, such as protracted heat wave and associated drought, produce cascade climate effects. These primary, secondary, and tertiary cascade effects have myriad direct and indirect health impacts in individuals and populations across both civilian and military demographics. Climate related health impacts will escalate personnel protection requirements on training and deployments, which will further be exacerbated by operational tempo in support of defence aid to the civil community and humanitarian aid and disaster relief. Manning of contingency force elements throughout high-risk weather season represents a pre-emptive response this demand which will increase tempo, demand on personnel, and risk to climate related health exposure in addition to conventional military roles.

To advance understanding of this interdisciplinary nexus of climate related strategic health impacts, the current research is employing system dynamic modelling as an iterative approach to align research conclusions with assumption-based planning methods. The approach demonstrates robust potential for both strategic and operational planning through increasing granularity as analysis transitions from broad scale qualitative deductions towards specific detailed required in qualitative impact and risk assessments required for mission planning. Whilst still in the formative stages, this body of work seeks to build on a systematic review of climate related health impacts to personnel and operations throughout Australia and the Pacific. This will result in an iterative framework, using system dynamic modelling, to analyse specific impacts as they apply to strategic risk. In full, the work seeks to align research outcomes advising on the growing risk of climate related health impacts with useful inputs to Australia's long-term strategic agenda.

#### Biography

CAPT Nathan George commenced his academic career through a Bachelor of Psychology with Honours in clinical psychology, focused on the psychological and physiological tension release mechanisms of self



- harm behaviours. Drawn to human development within the international community, CAPT George transitioned to a Master of International Studies, completing a thesis on the use of conventional socio-cultural intelligence collection to expedite post-conflict security and stability operations.

Seeking practical experience in post-conflict environments, CAPT George undertook two years of training and work with development agencies in provincial Cambodia. This generated shaped pursuit of formal training in security, leadership and logistics resulting in military service. Commissioned in 2014 as a General Service Officer for the Royal Australian Army Medical Corps, CAPT George served in the 1st Close Health Battalion, the Army School of Health, the Australian Army Research Centre, and the 3rd Health Support Battalion.

CAPT George was selected for the University of New South Wales Future Health Leaders program as a candidate for the Doctorate of Public Health in 2018, and the Chief of Army Scholarship in 2020 for his ongoing academic work on the strategic health implications of climate change on ADF personnel and operations throughout Australia and the Pacific.

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### Supply Chain Innovations That Pave The Way for the Reliable Supply of Medicinal Maggots and the Provision of Maggot Therapy in Military and Disaster Care Settings.

Dr Frank Stadler<sup>1</sup>

<sup>1</sup> MedMagLabs, School of Medicine and Dentistry, Griffith University, Gold Coast, Australia

#### Abstract

In war, soldiers and many more civilians are injured resulting in wounds either from direct trauma or from surgical interventions. All too often, these wounds are heavily contaminated, contain large amounts of dead or non-viable tissue, and become infected. Rapid and repeated debridement and infection control is critical but difficult to achieve in the austere care setting with limited resources. With likely future conflicts in mind, the US Department of Defense no longer believes it can ensure evacuation within an hour of injury. This means that casualties will need to be cared for extended periods in the field

under challenging conditions before they can be evacuated for advanced care. What makes matters worse, antibiotic resistance is common in these care settings further limiting treatment options.

Maggot therapy is the application of disinfected fly larvae to debride wounds, control infection, and promote wound healing. The treatment has a long history dating back to ancient times and tribal medicine. There is also a strong connection to the military setting. The military surgeon Dominique-Jean Larrey observed the benefit of maggots during the Napoleonic war in Egypt. John Zacharias actually encouraged and applied maggots to wounds in the US Civil War. However, modern maggot therapy arose from the battle fields of WW1. The orthopedic surgeon William S. Baer was posted to the Western Front where he observed that badly injured soldiers who had not received care for days were in remarkably good condition when their wounds were colonized by maggots. These observations of the infection control and healing properties of blowfly maggots led to the first medicinal maggot production and clinical treatment program at Johns Hopkins. Maggot therapy was then widely used in the 1930s and early 40s before it fell out of favour when antibiotics became available.

Although maggot therapy is perfectly suited to the austere care environment, as the observations of military surgeons through the ages confirm, it has never been utilized as a wound care modality in modern military medicine. While prejudice, disgust, and overconfidence in conventional medicine can be blamed in part, the major barrier that cannot be addressed with education or sensitization of military physicians and nurses, has been the lack of a supply chain that would ensure reliable forward supply.

Research at MedMagLabs, Griffith University, has established that supply chains can be developed that achieve reliable supply of high-quality medicinal maggots in the most austere of environments. Depending on the care setting and access to resources, medicinal maggots may be produced at the point of care with basic local materials and expertise, or they may be produced in purpose-built mobile laboratories that can supply larger quantities of medicinal maggots to field hospitals. Finally, the shelf life of medicinal maggots could be lengthened from one to two days at the moment to longer than a week. This would allow for longer distribution times to the point of care. It would also permit troupes to take provisions of medicinal maggots along to high-risk deployments that likely result in casualties and prolonged field care.

This presentation will make the case for maggot therapy in military medicine, discuss the necessary supply chain innovations, showcase what has been achieved to date at MedMagLabs and what R&D is still required.

### Biography

*Dr Stadler is the lead investigator at MedMagLabs, Griffith University, where he leads a \$260,000 Humanitarian Grand Challenge funded research project concerned with the production of medicinal maggots and the provision of maggot therapy in conflict-affected communities and other compromised healthcare settings. From 2008 to 2013, Dr Stadler coordinated a multi-million dollar portfolio of research at the National Climate Change Adaptation Research Facility. Before this, he curated the Biological Sciences Museum at Macquarie University and operated his own environmental education business.*

*He holds a PhD from Griffith University in maggot therapy supply chain management, and a Bachelor of Science with first-class Honours from Macquarie University.*

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## Supporting Military and Police Operations and Exercises in Australia and the Pacific Region

Ms Judy Swann<sup>1</sup>

<sup>1</sup> International SOS, Macquarie Park, Australia

### Abstract

#### Introduction

International SOS supports the operational requirements of the Australian Defence Force and visiting forces from the United States, Fiji, Japan, France, Indonesia and Singapore through medical services and COVID-19 testing in Australia and through deployed medical support in Papua New Guinea and Solomon Islands.

#### Discussion

International SOS is supporting the operational objectives of militaries and police across the Pacific region. Our focus and approach provides support to the critical operational enabling functions of primary health care services, COVID quarantine and testing, and the provision of medical support for field exercise training. Providing medical services that are reliable,

rapid and in line with military and police command structures allows the military and police to focus on achieving their core strategic objectives in the region.

Our support is diverse and includes:

- Provision of quarantine, health support and COVID testing to over 1000 US military personnel in the Northern Territory for Talisman Sabre 2021.
- The extension of this service for US, Singaporean and Indonesian troops to support the Australian Government's international arrival quarantine requirements.
- Support to Operation TONGA ASSIST through Rapid Antigen Testing and PCR tests of ADF and international troops arriving in Australia – these include military personnel from Japan and France.
- The deployment of specialised medical personnel and dedicated air medical arrangements to support international police and military personnel in Solomon Islands.
- Dedicated clinics and range of specialised medical personnel in Papua New Guinea to support the Australian Federal Police.

Also, through our Tricare overseas program (TOP) we were able to offer continuity of care to US military personnel whilst in Australia on training exercises. Under our TRICARE Overseas Program (TOP) contract, International SOS provides health care, assistance and specialty referrals to more than 500,000 US military personnel and their dependents outside of the United States. Since 1998, International SOS has performed integrated aeromedical evacuations on behalf of the US Armed Forces and coordinate patient movement with the military medical liaison office and military transport agency, which may include air ambulance, helicopter, commercial aircraft and ground ambulance transportation.

#### Conclusion

Leveraging our unique experiences and operational understanding built through many years of supporting the ADF in Australia, plus our previous COVID-19 quarantine experience, and our US military Tricare program, we are able to provide health support services suitable to achieving optimal medical and preventative outcomes.

The provision of medical support, quarantine and testing facilities and supporting complex training exercises in remote operating environments requires a unique skillset including the ability to integrate with government in a cohesive manner. Experience

has shown that a detailed understanding of military Command and Control arrangements, comprehensive planning, local knowledge, community relationships, utilisation of personnel experienced in operating in remote environments, and reliable and redundant logistics and equipment are essential in achieving a successful outcome.

### Biography:

Dr Judy Swann is the Head of Military Health Services at International SOS. Judy is responsible for the Defence, Paramilitary, Naval Maritime and peace-keeping sectors within the Pacific region.

Judy has a decorated career with the Australian Department of Defence. Specifically, Judy has been involved with Australia's COVID-19 response, Pacific Islands police and military forces and the Pacific Islands Maritime Security Program. Judy holds an Order of Australia Medal, several official Defence commendations and has completed doctoral studies in the police and military forces of the South Pacific.

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## Taking a Military Occupational Patient History

Dr Neil Westphalen<sup>1</sup>

*1 Royal Australian Navy, Palmerston, Australia*

### 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 (2013-2016).*

*Commander Westphalen transferred to the Active Reserve in 2016. Comments regarding this and previous articles are most welcome.*

**No consent to publish abstract**

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## Technology as an Enabler to Scale Operational Health Support in Remote and Challenging Settings: Session (Operational Health Support)

Mrs Sanja Marais<sup>1</sup>

*1 Aspen Medical, Hendra, Australia*

### Abstract

This presentation describes the Operational Health Support role that technology plays in the delivery of healthcare services in remote and challenging settings. With the onset of COVID-19 many bricks and mortar services had to move to digital locations, many in a matter of days. Business had to scale their platforms rapidly and health providers had to reinvent the way in which they reach their patients as the luxury of face-to-face meetings and consultations diminished.

In the fight against COVID-19 we have seen that big data is key in enabling contact tracing efforts and robust technology solutions provided business the ability to scale.

Some of the key technology enablers that changed the way businesses operated ranged from mobile internet solutions, to create secure networks for GP practices, quarantine teams and vaccinators. What previously would have taken a full IT infrastructure team a day could be set up in minutes out of the box. Moving on premises solutions to the cloud enabled newly formed remote Telehealth teams to operate 24/7. Digitising paper forms enabled important health information for staff and clients to be recorded and reported on in real time and the use of smart wearables like contact tracing devices meant providers could keep big companies operational. Some providers are currently piloting smart glasses to deliver training and induction remotely.

The success of operations and many of the projects delivered were underpinned by robust, secure technology solutions. Some of the solutions have been in place for long periods of time and others had

to stand up in a very agile way. The industry has seen how technology becomes not only an enabler, but a differentiator for healthcare delivery.

Finally, the paper will discuss the potential to take these rapid learning and practical outcomes to the field in support of military operations.

### Biography

*An experienced and accomplished technology and innovation leader, program and change manager with over 11 years' experience in the Australian health sector. She offers a unique blend of executive acumen, global stakeholder management and integrated solutions development expertise. As General Manager Technology and Innovation at Aspen Medical, she has built a responsive IT environment that consistently delivers results by aligning technology and innovation with business goals. This has brought substantial improvement in operational and clinical service delivery, standardisation and business/systems performance. In addition, she has effectively raised IT's visibility within the organisation by bringing technology decisions and a robust cyber security framework to the forefront of crucial Executive Committee discussions. Sanja's career includes multiple leadership roles including her current position as CEO of the Aspen Medical RTO. She currently leads a highly skilled IT team in implementing complex systems and application development projects for prominent private and public sector clients.*

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## The Assessment of Change in Mental Health Status Among Australian Defence Force Personnel Returning From Deployment

Dr Jenny McGee, Rena Kaur, Cate Chesney, Colonel Neanne Bennett<sup>1</sup>

<sup>1</sup> Department of Defence, Australia

### Abstract

While a large number of studies have explored the relationship between military deployment and mental health outcomes, few have looked at factors associated with change in mental health outcomes.

Using K10 and PCL measures collected on almost 5,000 ADF personnel during routine RtAPS (Return to Australia Psychological Screen) and POPS (Post-operation psychological Screen) screens, this paper

explores:

- How the true extent of change in mental health status at the individual level can be underestimated if examined in terms of overall percentage change within a population
- Factors associated with the greatest change in mental health status following return from deployment
- Predictors of improving and deteriorating mental health status
- The implications of measuring change as a continuous vs categorical outcome

The implications of the findings for both screening programs and clinical practice will be discussed.

### Biography

*Dr Jenny McGee has a degree in medicine and a passion for research and making effective use data. She has a PhD in Epidemiology and Population Health and is currently working in the Directorate of Strategy and Operational Mental Health in Joint Health Command.*

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## The Australian Defence Force (ADF) National Health Security - Current Problems and Potential Strategies For Improvement

Dr Abhilash (Abe) Chandra<sup>1</sup>

<sup>1</sup> Western Hospital, Henley Beach, Australia

### Abstract

Australia and the Australian Defence Force (ADF) face significant challenges in light of provision of adequate health care to Australians in the event of future disasters, climate crises or war.

There is a significant deficit in resources and capabilities related to the provision of national security to Australians in the events of such crises.

These vulnerabilities would also extend to the area of health care provision, and impact on the ability of health support personnel (and medical officers) to provide care to patients.

A detailed SWOT analysis of Australia and the ADF conducted by Professor John Blaxland in 2020 highlighted a number of significant weaknesses and

threats in terms of national security.

Analysis from the perspective of the ADF Health Support Personnel and Medical Officers (MOs) accentuate the impact the deficiencies would have on supporting Australia's people and National Interests.

The most concerning problems would be the poor recruitment into, and relatively high attrition of Health Support Personnel and MOs out of the ADF.

Although the health system in Australia is quite advanced, the capability for Australia to cope with the disaster or war is limited. With the ADF, this health support capability is significantly less developed as there is a large dependence on the civilian reserves population.

The ADF has had health deployment experiences in the Middle East and Africa given the location of previous conflicts. This had resulted in relative neglect to the local Indo-Pacific region where future conflicts are likely to occur. This has been highlighted by several groups in the past 12-to-24 months.

Australia has limited sovereign capabilities (defined as "the ability to design, build, sustain, upgrade and export Australian built ..., in Australian ...by Australian workers" - Forster, M 2017), thereby making Australia's capacity to respond to extended periods of war or crisis difficult.

Several recommendations have been made about how changes to Health Support within the ADF will significantly improve the Force Preservation of the ADF, and the positive impact it will have on Australia in the longer term.

Australia needs to strengthen ADF endurance and resilience, and improve the skill set of ADF Health Support Personnel in the face of different types of military and civilian injuries. Taking on strategies such as what the Japanese Defence Force has would help improve the ADF Health Support Capability.

Australia needs to take into account potential prolonged security challenges and seriously consider Universal National Service for Australians. This could be within the ADF, or as part of other Government or Non-Government Organisations (such as SES, AusAID, AUSMAT) to ensure that the Australian people have a greater chance of survival in the case of war, disaster, or crisis.

These views are my own and do not represent the views of the ADF.

### Biography

*Dr Chandra is a General and Vascular Surgeon. He has a special interest in Trauma Surgery. His clinical practice is based in Adelaide. He is a Major in the*

*Australian Army. He is interested in developing novel ways in training surgical principles and techniques to the next generation of clinicians, as well as making new technologies for extrication and treatment of combat casualties in future conflicts.*

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## The Future of the ADF's Medical Sterilisation Capability

CAPT Gyu Hwi Lee<sup>1</sup>

*1 Australian Defence Force, HMAS Cerberus, Australia*

### Abstract

Medical sterilisation is a critical capability within the ADF's R2E Hospitals and is a requisite to carrying out a variety of medical procedures. The capability is used in various settings including field hospitals, emergency Humanitarian Aid and Disaster Relief (HADR) settings, other austere military medical environments and is delivered by the Central Sterilisation Supply Detachment (CSSD) within surgical teams. Following the Army Employment Category Review and Endorsement Meeting (ECREM) in 2019, this capability was handed over to Dental Assistants (DENTASSTs) from Operating Theatre Technicians. Likewise, this capability has been recently inherited by DENTASSTs in the RAAF. Navy has noted the potential for the MR2E capability to be enhanced by filling selective Fleet positions with a CSSD trained Senior DENTASST. In light of these changes, it was proposed that a rationalised in-house approach at the ADF Dental School would result in a more streamlined training process and maximise Tri-Service interoperability in the deployed environment. Consequently, the ADF Sterilisation Course (ADFSTC) was developed and was recently added to the nationally-recognised scope of training for the Department of Defence. The presentation will discuss the training framework and intended learning outcomes of the ADF Sterilisation Technician Course for DENTASSTs who will deliver the ADF's future sterilisation capability.

### Biography

*CAPT Gyu Hwi Lee is the Second-In-Command of the Australian Defence Force Dental School since January 2021.*

*CAPT Lee joined the Army in 2015 and commissioned as a Dental Officer in the Royal Australian Army Dental Corps. His postings include 2nd General Health*

Battalion (2GHB) and has worked at Enoggera Dental Centre, HMAS Cairns Health Centre and Amberley Health Centre. His operational deployments include Operation COVID Assist in 2020.

CAPT Lee is graduate of the University of Melbourne. He holds a Bachelor of Biomedicine (Degree with Honours) and a Doctor of Dental Surgery. He is currently appointed Treasurer of the RAADC and has a passion clinical dental practice and education.

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### The Next Generation of Orthopaedics Surgeons Will Not Be Fit For ADF Service

LTCOL Mark Clayer<sup>1</sup>

*1 Self Employed, Adelaide, Australia*

#### Abstract

##### Introduction

The ADF uses the Hoffman 2/3 external fixateur for stabilisation of pelvic and long bone fractures. This device is rarely used in civilian practice as it has been superseded by new technology. The next generation of Orthopaedic Surgeons may not have the skills needed to use this device.

##### Methods

Orthopaedic Surgical Trainees in SA were asked to complete a questionnaire on their use of the Hoffman external fixateur for the preceding 12 months. Those approached were limited to those in their last 3 years of training.

##### Results

Nine responses were received (100% participation). Of the 9, 1 had not used the the Hoffmann at all in the last 12 months. Of the remaining 8, 2 had not used the device for long bone or pelvic injuries in the last 12 months. Of the remaining 6, none had used the device for pelvic or humeral fractures, 4 had used it for femoral fractures a total of 6 times (only one more than once) and 5 had used it for tibial fractures a total of 7 times (two on two occasions).

##### Conclusions

The ADF expects Defence Surgeons to be proficient in the use of the Hofmann external fixateur to stabilise long bone and pelvic fractures. This study identifies a problem with this expectation. Consideration should therefore be given to either introducing an

ADF sponsored Course for ADF Surgeons to learn how to use the device or update ADF inventory to include unreamed humeral, femoral and tibial nails for long bone fracture management.

#### Biography

LTCOL Clayer is an ADF Army Orthopaedic Surgeon since 1999 and enlisted in the RAAC in 1980 before Corps transferring to RAAMC in 1996. He has deployed on OP Warden, Render Safe and Okra. He is posted to 3HSB as a clinical advisor and member of the clinical certification team.

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### The Nurse Practitioner Model of Care Project Within Joint Health Unit Southern NSW

LTCOL Nerida Mcmanus<sup>1</sup>, Mr John Mikhail<sup>1</sup>, Mr Leith Aitchison<sup>1</sup>, MAJ Joanne Briggs<sup>1,2</sup>, LTCOL Jane Currie<sup>2</sup>

*1 Joint Health Unit Southern NSW, Australia*

*2 Directorate of Army Health, Australia*

#### Abstract

In January 2021 Joint Health Unit Southern NSW (JHU SNSW) commenced a Nurse Practitioner (NP) model of care project to increase access to primary health care for ADF members within the ACT. Replacing the existing "sick parade" paradigm, the NP model of care has increased access to primary health care services, particularly unscheduled care, through a NP led walk-in clinic.

A NP is a registered nurse educated, qualified and authorised to function autonomously and collaboratively in an advanced and extended clinical role. The NP role includes the assessment and management of patients using advanced nursing knowledge and skills that includes: initiation of diagnostic investigations, prescribing of medications and direct referral of patients to on and off-base health care professionals. Working collaboratively with the Health Centre's General Practitioners (GP), are adding value to JHU SNSW through their ability to provide holistic healthcare in:

- Diagnosis and treatment of a variety of health related conditions
- Initiating and receiving appropriate referrals from health professionals

- Ordering and interpreting the most appropriate tests to assist in diagnosis and management
- Prescribing appropriate and necessary medications

The pilot project is a joint initiative of Joint Health Command (JHC) and the Directorate of Army Health (DAH).

This presentation will outline the project, showcase how the NP's work to the top of their scope of practice in JHU SNSW and highlight the benefits of the NP in Garrison Health. Constructive discussion regarding the role of the NP in both Garrison Health and the Operational setting is welcome.

### Biography

*LTCOL Nerida McManus CSC is currently the Commanding Officer of the Joint Health Unit Southern NSW. LTCOL McManus has extensive experience both within her clinical specialty, as well as in staff officer and command and leadership roles with postings to 1 HSB, 2 HSB, 3 CSSB, 7 CSSB, 2 GHB, JHC and HQJOC. Her Operational experience includes deployments on Operation Anode, Operation Catalyst and Operation Astute. In addition to her qualifications, LTCOL McManus is an Associate Fellow of the Australasian College of Health Service Management and has nil affiliations to declare.*

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## The Role of Ex-Service Organisations in Veteran Wellbeing

Dr Carolyn Deans<sup>1</sup>, Mr Ben Webb<sup>1</sup>

<sup>1</sup> RSL Victoria, Melbourne, Australia

### Biography

*Carolyn Deans PhD MAPS LTCOL is a Clinical Psychologist with expertise in military and veterans mental health, trauma focussed interventions, and resilience. She is the Mental Health Advisor to RSL Victoria, responsible for governance and program design. Carolyn is a Reserve Army Psychologist with 22 years service, works in private practice, and is an Adjunct Senior Lecturer at Victoria University, Melbourne. She is the founding Committee Member of the APS Interest Group for Military and Emergency Services Psychology.*

**No consent to publish abstract**

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## The Use of Digital Mental Health Coaching Applications For Veterans

Dr Loretta Poerio<sup>1</sup>, Prof Nicole Pratt<sup>2</sup>

<sup>1</sup> Department Of Veterans' Affairs, Canberra, Australia,

<sup>2</sup> University of South Australia, Adelaide, Australia

### Biography

*Dr Poerio is a Clinical Psychologist who has practised in the field of psychology in both clinical and management roles for over 25 years. Dr Poerio has worked in across a range of organisations including the University of Sydney, Department of Defence, Centrelink, Veterans and Veterans' Families Counselling Service, and the Commonwealth Department of Human Services. Dr Poerio is currently the Senior Mental Health Adviser, Department of Veterans' Affairs, and also operates a part-time private clinical practice.*

*Dr Poerio has a deep connection with the military. She worked as a Psychologist and clinical supervisor for the ADF in Darwin, her husband served the Army for 27 years, and her daughter is in the Air Force.*

*Prof Nicole Pratt is an Associate Professor and Deputy Director of the Quality Use of Medicines and Pharmacy Research Centre, University of South Australia. She is a member of the Drug Utilisation Subcommittee of the Australian Department of Health Pharmaceutical Benefits Advisory Committee.*

*Nicole leads the evaluation of the Department of Veterans Affairs, Veterans' Medicines Advice and Therapeutics Education Service (Veterans' MATES) program which uses administrative claims data to develop and evaluate interventions to improve use of medicines in the veteran population.*

**No consent to publish abstract**

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## The Use of Magnetic Resonance Imaging in Dentistry

Ltcol Victor Tsang<sup>1</sup>

<sup>1</sup> RHAG-NSW, SYDNEY, Australia

### Abstract

Dental caries and many other oral diseases can't be detected by visual examination alone and it has been recommended to have dental radiographs periodically (annually or biennially) for that reason. Studies have shown that repeated dental x-ray irradiation increases the risk of cancer (Hall et al 2008). Hwang reviewed a total of 2158 dentistry-related studies and concluded that there was a significant correlation between dental x-ray

irradiation and salivary gland cancer, thyroid cancer and brain tumours (Hwang et al 2018). An alternative imaging technique such as Magnetic Resonance Imaging (MRI), which provides the same if not better diagnostic data and images without ionising radiation, should be offered. This presentation is an introduction into the advanced imaging technique of MRI for use in dentistry. MRI is a non-invasive procedure with emission of any ionizing radiation and the images can be highly sensitive and specific. The history and the physical principle of the MRI will be present following with examples of the application of MRI in various branches of dentistry including detection of carious lesion, assessment of pulpal tissues whether reversible or irreversible pulpitis, diagnosis of diseases of Temporomandibular Joint, early detection of oral tumours and cystic lesions in oral pathology, assessment of status of soft tissue and bone inflammation and infection. Also include a case of face representation and brain translocation of amputation phantom limb pain. Further research is needed to assess the applicability and accuracy of this technology for dentistry as well as cost-benefit aspects of MRI imaging in Military Medicine.

### Biography

*Biography- July 2021*

*8267411 Lieutenant Colonel Victor Tsang*

*Royal Australian Army Dental Corps*

*Lieutenant Colonel Tsang obtained Bachelor of Dental Surgery at Sydney University in 1983. He has maintained private dental practices in Sydney and Gosford from 1988 to the present.*

*Lieutenant Colonel Tsang joined the Australian Army Reserve in 1989. Currently Lieutenant Colonel Tsang is SO1 and Dental Advisor supporting the NSW Regional Health Advisory Group. Lieutenant Colonel Tsang has also served as the Secretary and Treasurer of the NSW Military Health Symposium Organising Committee annually from 2006 to the present.*

*Lieutenant Colonel Tsang is a Fellow of the International Pierre Fauchard Dental Academy. He has lectured for the Advanced Medical Technician Course at the Army School of Health, for the James Cook University Postgraduate Diploma of Implantology and for DIO Corporation's International Digital Academy. He has regularly supported the training of Defence Health personnel through presentations at the annual Military Health Symposium and at Clinical Training Evenings.*

*Lieutenant Colonel Tsang currently in his second year of the degree of Master of Medicine in Advanced Imaging (MRI) at Western Sydney University*

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## Tonga '22: Managing COVID-19 in The Maritime Environment for a Successful Operational Deployment

LTCR Shannon Godfrey<sup>1</sup>

*1 Royal Australian Navy, Sydney, Australia*

### Abstract

On Saturday 15 January 2022 the Hunga Tonga Hunga Ha'apai volcano erupted in Tonga, with an ensuing tsunami causing additional destruction across the area. The following day, the Government of Tonga agreed to offers from Pacific neighbours, including the Government of Australia, to work in partnership to respond to the disaster. On Monday 17 January 2022, two days after the volcanic eruption, HMAS Adelaide sailed from Sydney with members of Ship's company in support of the Department of Foreign Affairs and Trade-led effort. Adelaide's first stop was Brisbane, where an efficient embarkation of humanitarian assistance and disaster relief (HADR) stores, vehicles, and additional personnel occurred. Adelaide was soon on her way to Tonga, arriving on station on 26 January 2022.

At that time, the Kingdom of Tonga had zero COVID-19 cases. In contrast, the average PCR positive results per day in NSW were over 25,000 and Adelaide was navigating a COVID-19 outbreak on board. Two 'Whole of Ship' PCR testing evolutions were conducted prior to departing the Australian Station and new COVID-19 positive cases who were identified prior to sailing were disembarked. Working hard to limit spread through the Ship, it was imperative that Adelaide not be responsible for transmission of COVID-19 to the Tongan population; this was ensured by complying with strict COVID-safe measures during all interactions on Tongan soil.

Operational highlights include working alongside Partner Nations to deliver HADR, Adelaide demonstrating COVID-safe berthing alongside the Tongan capital Nuku'alofa, and essential work on various islands. The transfer of over 200 personnel and an enormous consignment of amphibious assets was conducted at sea to HMAS Canberra, who arrived on station in early March; a first such endeavour between the two LHDs.

When Adelaide returned in mid-March, overwhelmingly successful in her mission to support Tonga with HADR, no new COVID-19 positive



cases were identified by Whole of Ship PCR testing evolutions. These occurred at seven days and at 24 hours prior to arrival at Fleet Base East in Sydney.

The presentation will focus on COVID-19 management protocols adapted by Adelaide, how and why these evolved over the course of the deployment, and what the next step might have looked like if containment had been less effective. The importance of various Departments working closely together to support personnel in isolation accommodation while their colleagues carried on with duties to sustain both the safe operation of the Ship and the mission itself in a Host Nation reeling from a natural disaster.

### Biography

Shannon joined the Royal Australian Navy when studying at the University of Melbourne Dental School. After an initial shore posting to HMAS Cerberus, she served in various fleet units as a Fleet Mobile Dental Officer, ranging from frigates to tankers to amphibious platforms, on a number of exercises and operations. During that period, she attained Fellowship with the Royal Australian College of Dental Surgeons and enjoyed regular part-time work in civilian practice. Following time as the Fleet Dental Officer last year, LCDR Godfrey joined HMAS Adelaide as the Head of the Medical Department. She enjoys learning to fly, chatting to the wildlife around her Canberra home, and burritos.

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## Understanding Navy deployment at SSea: Qualitative investigation of Demands, Resources, and Resilience

Dr Gavin Hazel<sup>1</sup>

<sup>1</sup> Macquarie University, Sydney, Australia

### Abstract

Performance and retention are critical issues in the current operational environment for the ADF. The current maritime surface environment missions and operational tempo present a range of demands to crews that could not only impact on their cognitive functioning and job performance during deployments, but may also affect their emotional resilience. To date, there has been limited exploration of job demands and resources in the Navy context, particularly in relation to personnel resilience and performance during at-sea deployment.

The qualitative research reported on in this presentation is part of a larger program of investigation seeking to identify the effects of at sea-deployment with a focus on identifying the critical job demands, job resources, as well as personal demands and resources, that affect personnel outcomes.

Semi-structured interviews of 25 Navy personnel (ranging across job role, responsibilities, and platforms) were conducted to determine: (1) key demands at sea that potentially affect wellbeing and performance, and (2) key resources at sea that support wellbeing and performance. Qualitative analysis has been undertaken to identify the key themes and critical factors affecting resilience and performance of Navy personnel in the at-sea deployment setting.

Our exploration of the stressors and strains of deployment experiences indicated that the domains of recovery, coping, communication, and help seeking offer the greatest potential when it comes to reducing demands and supporting effective adaptation to the Navy deployment environment.

Our qualitative data, also drew attention to the criticality of leadership and supervision for organising and augmenting resources (at the individual and structural levels). The support provided by peers and extended social networks was also seen as a significant contributor to assisting individuals to better cope with work and personal concerns.

This study addresses a current gap in our research understanding of the effects of Navy deployments on the wellbeing and performance of personnel. The intent of this study is to provide rapid and much needed representation of how deployment experience, from the perspective of experienced and diverse experts, impacts upon personnel.

This research has been funded by DST Group Human Performance Research Network (HPRnet) to apply a multi-systems approach to investigate demand and resilience resource profiles within the at-sea deployment setting. The research is being undertaken by Macquarie University, Curtin University and the Leibniz Institute for Resilience Research.

### Biography

*Dr Gavin Hazel is a Postdoctoral Research Fellow at Macquarie University working on a longitudinal project examining the critical factors that affect resilience and job performance in Navy personnel during maritime operations. This project is being conducted in partnership with DTSG, DNC and an international advisory group. Gavin is an experienced education, training and capability development professional, specialising in the area of mental health, wellbeing, and resilience. Gavin has worked as a research*

academic, a senior Defence research scientist and a mental health projects and programs manager.

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### Understanding Suicide Crisis Among Defence-Related Persons: A Novel Data Linkage Study

Dr Carla Meurk<sup>1,2</sup>, Dr Duncan Wallace<sup>3</sup>, Dr Lisa Wittenhagen<sup>1,2</sup>, Dr Diana McKay<sup>4</sup>, Dr Jon Lane<sup>5</sup>, Dr Andrew Khoo<sup>6</sup>, Dr Michael Lam<sup>7</sup>, Dr Megan Steele<sup>1,2</sup>, A/Prof Ed Heffernan<sup>1,2,7</sup>

<sup>1</sup> Queensland Centre For Mental Health Research, Wacol, Australia

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<sup>3</sup> Australian Defence Force Centre for Mental Health Mosman, Australia

<sup>4</sup> Joint Health Command, Australian Defence Force, Canberra, Australia

<sup>5</sup> University of Adelaide, Adelaide, Australia

<sup>6</sup> Toowong Private Hospital, Brisbane, Australia,

<sup>7</sup> Queensland Forensic Mental Health Service, Metro North Hospital and Health Service, Brisbane, Australia

#### Abstract

##### Background:

Rates of mental illness and suicide among current or ex-serving members of the ADF have been well described and are a significant concern. However, there remains limited understanding of suicide crisis presentations. This is a significant knowledge gap given that an estimated 20% of transitioning Australian Defence Force (ADF) members report suicidal ideation or having made suicide plans or attempts. Data linkage is an underutilised tool for examining suicidality and poses unique opportunities for understanding and enhancing pathways to care.

##### Objectives:

In this presentation, we will discuss the data linkage process that we have undertaken and share our learnings and the opportunities identified to improve the use of administrative data to examine mental health problems, and suicidality among Defence-related persons.

##### Methods:

The data linkage study is built around the Partners in Prevention (PiP) linked data study, a population-wide study that comprises a cohort of approximately

70,000 Queenslanders who were the subject of a suicide-related call to police or ambulance between 2014 and 2017. Data have been linked to multiple health datasets for the period 2013–2018 amounting to linkage to over 7 million health records. The PiP-Defence extension has three aims: 1) to identify “Defence-related persons” (current serving, ex-serving members of the ADF, their partners or dependents) within the PiP study cohort; understand the extent of service demand for Defence-related persons on police and paramedics in Queensland, including sociodemographic and health characteristics, health service utilisation and outcomes; 2) undertake further linkage with Department of Defence records to examine occupational and deployment characteristics of current and ex-serving ADF members; and 3) translate findings into meaningful service improvements.

##### Findings:

We will discuss the data linkage process, including ethics, research governance, and management of privacy and security considerations, progress to date and information about data that will be available for analysis. We will share learnings to assist others who may be considering undertaking data linkage studies of their own within mental health or across other health areas.

##### Conclusions:

Using linked data to examine suicide-related contacts with police or paramedic responders by Defence-related persons offers a unique insight into the needs of this cohort and, importantly, will identify opportunities for crisis interventions tailored to their needs.

#### Biography

Dr Carla Meurk is a Principal Researcher at Queensland Centre for Mental Health Research and honorary senior fellow at The University of Queensland. She is coordinator of the Partners in Prevention: Understanding and Enhancing First Responses to Suicide Crisis Situations project and chief investigator of the Defence Health Foundation funded ‘PiP-Defence’ extension. Carla has a particular interest in suicide prevention, and the use of novel non-clinical crisis care services and care pathways. She has particular expertise in multijurisdictional data linkage and complex research governance.

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### Understanding Suicide Related Contacts Between Defence-Related Persons And Queensland Police Service: Provisional Findings From The Partners In Prevention - Defence Extension

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#### Abstract

Contact with police in the context of a mental health or suicide crisis may pose a risk for arrest and/or subsequent criminal justice involvement. International evidence suggests possible links between military service and criminal justice involvement, which may be explained by a variety of factors, including traumatic brain injury, traumatic experiences and post-traumatic stress disorder.

However, the area remains underexamined, with no Australian research to date investigating these suicide-related contacts between Defence-related persons and police. In this presentation, we will discuss provisional findings on demographic, health characteristics and health services utilisation of the Partners in Prevention (PiP) - Defence extension cohort which is extracted from a population-wide study cohort of approximately 70,000 Queenslanders who were the subject of a suicide-related call to police or ambulance services between 2014 and 2017.

#### Biography

*Dr Duncan Wallace has been a consultant psychiatrist since 1990, practising mainly in public hospitals with special interests in emergency departments, rural*

*psychiatry, telepsychiatry and military psychiatry.*

*Dr Wallace has extensive operational experience as a Medical Officer in the Navy Reserve. He is a Commodore in the Royal Australian Naval Reserve and was Director-General Naval Health Reserves from 2012 to 2015.*

*Dr Wallace was appointed to his current position as psychiatrist at the Australian Defence Force Centre for Mental Health, at HMAS Penguin, Sydney, in 2010. In March 2018, he was appointed as the inaugural chairman of the RANZCP Military and Veterans' Mental Health Network and is now a member of the RANZCP Military, Veterans and Emergency Services Personnel Network Committee. He has been a Visiting Medical Officer at St John of God Hospital, North Richmond since 2015 and is an Adjunct Senior Lecturer in Psychiatry at the University of NSW.*

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### We Are and Can Provide for Service Women. A Perspective from a Physiotherapist and Exercise Physiologist

Miss Nadia Feltrin, CAPT Xiaobei Ye

1 ADF - Army, Australia

#### Abstract

The Lavarack and Robertson Physiotherapy Pregnancy Service and Postnatal Care was set up in 2019 and 2020 in Lavarack and Robertson Health Centres. This service delivers three main effects: the physiotherapy pregnancy exercise class, the social interaction and support between service women during and after their pregnancy, and postnatal return to exercise pathway. The presentation will include the current evidence in exercise in pregnancy and return to running, the service model in Lavarack and Robertson Health Centre, and recommendations on future ADF service and policy change for pregnancy service. This presentation aims to draw the attention from ADF health practitioners and commanders on pregnancy care and share the information and knowledge that two authors have developed in the past few years.

#### Biography

*CAPT Xiaobei Ye is a Physiotherapy Officer posted to Robertson Health Centre, JHU-CA. Her previous postings include 1st Close Health Battalion and 2nd*

General Health Battalion. She graduated from The University of Melbourne with Bachelor of Biomedicine and Doctor of Physiotherapy. She worked in a Victorian hospital upon her graduation. She completed Graduate Certificate in Emergency and Disaster Management from Central Queensland University. She is studying Master of Public Health and Master of Health Leadership and Management with The University of New South Wales. She is passionate in advocating Physiotherapy's early rehabilitation effect in the Army. Her interests are include gender equality, human performance, soldier welfare and public health especially in disease and injury prevention, health policy and health surveillance.

Miss Nadia Feltrin is an Accredited Exercise Physiologist with ESSA. She moved up to Townsville in 2016 to commence employment at the Exercise Physiologist at Lavarack Barracks. She graduated from Southern Cross University with a Bachelor of Exercise Science and Nutrition. Her interests within working in the ADF include assisting female soldiers in developing their strength and conditioning in relation to their job, pre and post-natal care and assisting ADF members return to their full physical health.

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### Why Might the Australian Defence Force Require a Role 3 hospital?

Brigadier Michael Reade<sup>1</sup>, Lieutenant Colonel John Salter<sup>1</sup>

<sup>1</sup> Australian Defence Force, Brisbane, Australia

#### Abstract

Australian strategic guidance mandates that the Australian Defence Force must maintain scalable response options to meet both the full spectrum of military threats and to respond to natural disasters, independent of assistance from other nations if required, and that the health element of these options must include "health care support from the point of injury through to specialist in-theatre care". Civilian trauma systems have, for many decades, recognised the benefits of integrated trauma systems in which smaller hospitals providing general medical, orthopaedic and surgical care are networked with large, multispecialty trauma centres, with patients transported to the most appropriate centre using sophisticated triage decision-making that balances speed of transport with availability of the required

clinical service. Role 2E hospitals have great utility in integrated trauma systems in reducing time to treatment for casualties that fall within their scope of practice. However, they rely heavily on effective prehospital triage and access to Role 3 specialties. Optimal performance is difficult to achieve. Even in the mature military integrated trauma system in Afghanistan, initial treatment of the most severely wounded patients in a multispecialty Role 3 hospital, compared to a Role 2 hospital, was associated with a significantly lower mortality.<sup>1</sup> Role 2/2E hospitals have little or no capacity to treat patients with neurotrauma, facial trauma, significant peripheral vascular injury, or ophthalmic trauma, which together comprised 16.7% of the surgical workload in deployed US hospitals in Iraq and Afghanistan.<sup>2</sup> Most of these wounds would have threatened "life, limb or eyesight".

If the Australian Defence Force is to provide independent health support to operations, it must therefore have timely access to the medical specialties found in a Role 3 hospital. Based on analysis of casualty data from both combat and humanitarian operations, the 2019 Joint Health Command Role 3 Study concluded that 6 "Core" (always deployed) and 8 "Ancillary" (deployed if required by particular circumstances) specialties would be required. Core specialties include neurosurgery, maxillofacial / head and neck surgery, vascular surgery, ophthalmology, radiology (interventional and diagnostic) and internal medicine. Ancillary specialties include burns / plastic surgery, ENT surgery, obstetrics / gynaecology, diagnostic pathology / transfusion medicine; multidisciplinary mental health (psychiatry and psychology); public health; paediatrics; cardiothoracic surgery; and urology. The principles underlying these choices were 1. the requirement not to surpass host nation capabilities during disaster relief operations; 2. the understanding that reconstructive surgery that can be delayed will be performed outside the Area of Operations; 3. the increasing availability of telemedicine to provide non-procedural specialist advice to deployed clinicians from Australia; and 4. the 2007 Oslo Guidelines, to which Australia has agreed, which prioritise the use of civilian medical assets in disaster response, using only military clinicians as a last resort.

Having defined the need for a Role 3 hospital, the scope of its required clinical specialties, and the feasibility of generating and sustaining such an organisation, the ADF is about to embark on a detailed analysis of the required Fundamental Inputs to Capability. Primary amongst these considerations will be an examination of novel methods of employing specialist

clinical staff, based on both the ADF Total Workforce System and a Whole of Government approach.

### Biography

*Brigadier 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. As the Director General Health Reserve - Army, since 2019 he has been responsible for technical regulation of specialist clinical personnel in the Australian Army. His research interests are trauma systems design, fluid resuscitation in trauma and coagulopathy. His frozen platelet trial program, conducted with the Australian Red Cross, aims to improve worldwide access to this vital component of trauma resuscitation. Brigadier Reade led the clinical team providing input to the Joint Health Command Role 3 Feasibility Study.*

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### Potential application of innovative, topical, multimodal pain relief in situations associated with military combat and mass disasters

Lt Col Steven Jeffery<sup>1</sup>

*1 306 HSR, British Army, United Kingdom*

#### Abstract

The ideal analgesic for military use should have a predictable action, no side effects, a long duration of action, a readily available antidote, be easily administered and be easily stored and transported.

A Combat Medic Healthcare Specialist will typically carry a backpack styled bag. Aid bags are available from many different manufacturers, in many different styles. Oral Transmucosal Fentanyl Citrate (Fentanyl Lozenge) is currently provided to deployed personnel as part of the operational immediate care requirement for pain relief. Side effects associated with ingestion can include:

- a. Respiratory depression increasing reliance on airway support.
- b. Constriction of the pupils resulting in visual impairment and potentially inhibit head injury diagnosis.

The goal in treating a casualty with mild-to-moderate pain is to provide pain relief that does not affect sensorium as this allows individuals to facilitate their own medical care and/or evacuation. Respiratory depression associated with Fentanyl administration may result in the requirement for airway support and bespoke MEDEVAC care that may not be readily available due to operational constraints. Combat injuries are often filthy, with embedded dirt containing multidrug resistant microbes such as *Acinetobacter* species initiating a chain of infection related challenges which can continue for significant periods post injury. Timely topical, multimodal administration of anaesthetic, adrenaline and antimicrobial agents may have potential to reduce the unnecessary application of pain suppressants and prevent early wound infection pre-emergency care.

Tri-Solfen® has been developed by Medical Ethics Pty Ltd, a Melbourne based company. This highly innovative veterinary product contains a mixture of short acting (lidocaine) and long acting (bupivacaine) local anaesthetics, together with adrenaline (to reduce bleeding) and cetrimide (a common antimicrobial agent). It was initially developed to provide pain relief for lambs after mulesing but has been widely

adopted throughout the livestock industry for other procedures that require pain relief. David Connolly, NORTHERN Territory Cattlemen's Association president, said the use of pain relief in the cattle industry not only delivered better animal welfare outcomes, but also helped increase productivity.

Medical Ethics is now developing this unique technology (known as Medi-solfen®) for pain management and infection prevention in the treatment of both acute and chronic wounds in humans:

In addition to military conflicts, disaster situations such as earthquakes, floods and conflicts might happen in areas where access to a regular hospital or treatment centres might be hours away or not available at all. The provision of effective analgesia for mass casualties needs to be simple in its scope and application, supporting the principle of providing the greatest good for the greatest number in the safest way. A product like Medi-Solfen® has the potential to become a critical component of the basic medicines supplied. It is ideally suited to such applications because it is cheap, portable and able to be applied immediately by rapidly trained lay personnel. It would provide a means of promptly treating wounds that otherwise may remain untended for prolonged periods of time particularly in war-torn or third-world countries. Indeed, in many cases such wounds may not receive any other anaesthetic. The monitoring of such casualties may need to rely on minimally trained personnel using simple clinical parameters. The benefits of having a cheap, simple to use product to relieve pain, minimise bleeding and protect against infection in these circumstances are considerable. Medi-Solfen® has the potential to act as the 'front line' pain relief for topical wound care product for victims of trauma throughout the world.

#### Biography

*Lt Col Jeffery has over 35 years of experience as an active duty burns and plastic surgeon in the British Army. He has undertaken numerous operational tours, including four in Afghanistan. He is also Professor of Wound Study at Birmingham City University and visiting Professor at Cardiff University. Back in 2000 he spent nine happy months as burns fellow in Perth WA.*

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### Research activity in the Dept of Clinical Studies and Surveillance, ADFMIDI

MAJ Fiona McCallum<sup>1</sup>, LTCOL Ken Lilley<sup>1</sup>, CAPT Christopher Moller<sup>1</sup>, LT Jessica Chellappah<sup>1</sup>, CAPT Samantha Nind<sup>1</sup>

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#### Biography

*MAJ McCallum is a Scientific Officer/Veterinarian. She joined the Australian Defence Force Malaria and Infectious Disease Institute (ADFMIDI), Brisbane, Australia in 2010, and currently heads the department of Clinical Studies and Surveillance (CSS).*

**No consent to publish abstract**

### Role of RSDL in Management of Acute Sulfuric Acid Burns in Rabbit Model

Messele Fentabil<sup>1</sup>, Poojya Anantharam<sup>2</sup>, Dr Laura Cochrane<sup>4</sup>, Ling Claytor<sup>4</sup>, Vladimir Savransky<sup>5</sup>, Mulu Gebremedhin<sup>1</sup>, John Mikler<sup>3</sup>, John Barry<sup>5</sup>

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#### Abstract

##### **Background:**

There is a trend of increasing cases of acid attacks in various parts of the world which could lead to significant burn injury or even death. An increase in acid attacks with readily available acids, such as sulfuric acid, has prompted additional investigation of the RSDL® (Reactive Skin Decontamination Lotion Kit) as an emergency intervention to decontaminate the skin to diminish the consequences of sulfuric acid burn injury when water is not available. RSDL Kit is an accepted chemical warfare agent decontaminant which has been shown to effectively remove or neutralize CWAs (Chemical Warfare Agents) from the skin.

##### **Objective:**

The purpose of this study was to investigate the efficacy of the kit in a rabbit model of acute sulfuric acid burn injury, including the wound healing process, as compared to the current emergency treatment of water irrigation for dermal decontamination.

##### **Methods:**

Rabbits were randomly assigned to 1 of 3 treatment groups. Each rabbit received six individual dose sites of sulfuric acid for a duration of 30 seconds each. Group 1 rabbits were not decontaminated post sulfuric acid exposure while Group 2 and Group 3 rabbits were decontaminated via water irrigation or with the RSDL Kit after sulfuric acid exposure. The wounds in the three groups were observed at Days 3, 15 and 21. Punch biopsy and histopathology was performed on Day 3, 15 and 21 and reported.

##### **Results:**

Both groups (RSDL Kit and Water) performed similarly at decontaminating sulfuric acid. Microscopically, all wounds in all the groups had full-thickness epidermal and dermal necrosis. The pH of the wounds decontaminated with RSDL kit and water were higher than the untreated control group. While erythema persisted longer in the RSDL kit and water decontamination group to Day 21 compared to the control, wound areas treated with RSDL kit and water were significantly smaller. Edema developed by Day 3 for all groups of wounds and resolved by Day 15. Necrosis started in the control group and the RSDL kit group (to a lesser degree) by Day 3, but by Day 15 and 21, all wounds had necrosis.

Based on the necrosis observed in all wounds, there was no evidence of wound healing in any of the groups regardless of the day the wounds were biopsied. Compared to Group 1 (no decontamination), the scoring of wounds from the water and RSDL kit decontamination groups were not different.

##### **Conclusion:**

While RSDL kit and water decontamination were similarly effective in reducing the wound size and increasing the pH of the wound by Day 3 compared to the control, the histopathology data demonstrated that microscopic characteristics of tissue injury across all groups were similar and showed no signs of wound healing after a strong corrosive acid exposure. It is notable that RSDL kit was safe and non-inferior to water at decontaminating the wounds. Therefore, the RSDL kit may be an alternative decontamination method in absence of immediate access to water.

### Biography

*Laura Cochrane is currently the Senior Director of Global Medical Affairs for Emergent BioSolutions based in the UK with a long history in CBRN research and development. Early in her career, following her studies at the Royal Military College of Canada in Chemical and Materials Engineering she was furthered her studies with the Department of National Defence in Aerospace engineering later moving across Canada in a CBRN research capacity.*

*She continued her working career in CBRN across industry and cross government collaborations in research roles across partnerships with various institutions including Department of Foreign Affairs Canada, Defence Research Canada, EU Commission and Global Defence programs across NATO partner member states.*

*She has an extensive career in research development, enhanced by post graduate education at St. Andrews University with recent certifications at Cambridge University and London School of Economics. She also continues to maintain OPCW training with the Asser Institute in Disarmament and Non-proliferation of WMDs.*

*She is currently supporting activities in Biological and Chemical Threat medical preparedness with Emergent BioSolutions, and continues to publish, lecture, including support to the NATO Biological Warfare Defence Awareness Course. and speak on medical countermeasures across high risk pathogen disease areas, including but not limited to Smallpox, Anthrax, Botulism and Chemical Warfare threats.*

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## The Utility of Health System Insights in the Australian Defence Force

Dr Jessica Marshall, Tomy Hwang, Emily Whitney, Poornima Senthuren, Clare Whittingham, Shufang Zheng, Michael Corlis, Jason Kerr, Paul Grant, Dr Shahd Al-Janabi, Alison Harriden, BRIG Isaac Seidl

*1 Department Of Defence, Australia*

### Abstract

People are fundamental to Defence capability; poor health, illness or injury may pose a risk to a serving member's overall health readiness,

which consequently impacts upon the operational capability of the Australian Defence Force (ADF). Adoption and utilisation of data may be one way the ADF can reduce the likelihood of these risks. Data in the ADF healthcare context refers to volumes of medical administrative data (i.e., data routinely collected as part of care delivery) created by the adoption of electronic health systems. Collection of such large volumes of data - for conversion into relevant critical insights - has until recently been too costly and time consuming, thus preventing its use for predicting and solving health-related problems. Data - when used accurately and proactively - has the potential to improve access to and quality of care for ADF members by allowing for: (a) identification of health risk areas; (b) monitoring and evaluation of health initiatives; and (c) assessments of force health readiness. In short, the introduction of the Defence e-Health System in 2014 may be instrumental not only for assisting the ADF in maintaining medical records and delivering integrated health care, but also in provision of timely, reliable, and evidence-based information for decision-making. The purpose of this presentation is to outline one process by which Defence has begun to incorporate data into its health system in order to derive insights in line with its Digital Health Strategy.

Acknowledging the different health data and analytic needs across Defence, the capabilities of data processing can be organised into four quadrants, ranging from reactive to proactive reporting (low to high reporting maturity) and health system data to health system insights (low to high analytics maturity). This organisational flow allows flexibility to move from raw data description to hypothesis testing - informing decision making proactively - on an as needs basis.

Actioning this flow, begins with the collection of raw, unprocessed health system data (e.g., a log of an ADF member presenting at a clinic because of an injury). This type of product has the lowest level of analytics maturity and - alone - is of little value because it requires contextual, background and technical knowledge to aggregate and manipulate into information. To derive value from this raw data, the consecutive step involves querying, mining and exporting of historical data to shape reactive reporting. This form of reporting primarily relies on descriptive analytics (e.g., how many ADF members presented with the same injury in 2021?). We posit that such reporting is useful in aiding strategic communications: characterising and surveying the health of the force - promoting population health statistics and identifying potential health priorities.



Diving deeper, utilising advanced (e.g., regression) and new (e.g., machine learning) analytical methods provides the capability to test hypotheses to derive insights. This proactive, higher level of analytics maturity works to support ongoing monitoring and surveillance efforts, diagnostics (e.g., identifying injury aetiology), preventative medicine (e.g., identifying risk factors for injury), and reduction of adverse events (e.g., flagging potential adverse reactions). Predictive reporting may prevent illness and injury through intervention with forward looking clinical and policy decision-making, therefore potentially reducing medical discharge and improving quality-adjusted life years for ex-serving members.

ADF member health and Defence health service delivery enables/supports overall Force readiness and capability. Combining data analytics with outcome driven insights further support the enabling of capability and in maintaining a ready, responsive and resilient Defence Force. With these insights, the ADF can continue to accurately report and predict the health status of its members on a whole-of-ADF level, while making data driven policy decisions focussed on statistically proven priority areas.

### Biography

*Dr Jessica Marshall is a recent graduate from Melbourne University, where she completed her Doctorate investigating the genetic and pharmacological targeting of Heat Shock Protein 72 on a novel mouse model of Alzheimer's disease. Her research was funded by the Australian Dementia Research Foundation, in affiliation with the Baker Heart and Diabetes Institute and the Florey Institute of Neuroscience and Mental Health. Since joining the Department of Defence, Jessica has worked in the National Security space as a Policy Officer, before moving into the Joint Health Command, as a Health Insights Officer.*

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## Thematic Analysis of Remote Programme Management and its Potential Application to Best Practice in Defence Global Healthcare Engagement

Dr Laura McCrae<sup>1,2</sup>, Colonel Simon Horne<sup>1,3</sup>,  
Dr Leo Wood<sup>4</sup>

*1 Academic Centre of Defence Healthcare Engagement, UK*

*2 Royal Navy, UK*

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### Abstract

#### **Purpose:**

Defence Healthcare Engagement (DHE) requires significant collaboration between stakeholders to develop programmes and increase UK influence internationally. Remote Programme Management (RPM) is a civilian mitigation strategy used in the humanitarian sector. The COVID19 pandemic has caused unparalleled disruption to international travel and compelled DHE activity not in direct response to COVID to be mainly conducted remotely.

#### **Method:**

In 2020 the authors undertook a literature search of all open access relevant articles on the topic of RPM. The authors applied a qualitative thematic analysis to these articles, using codes to extract key themes.

#### **Results:**

Eighteen articles relating to RPM covering international organisations, governmental organisations non-governmental organisations were reviewed by the authors. The thematic analysis highlighted key themes running throughout the literature.

RPM was indicated predominantly for security concerns; however, access restriction, usually governmental, was also commonly cited.

Several different strategies were featured throughout the reviewed literature:

- Develop relationships at a strategic level
- Understand the local networks and their capacity
- Develop community acceptance of the programme
- Develop community partnership arrangements

It is important to anticipate a high likelihood of requiring RPM and accommodating it early within

the planning stages and foster collaboration with the in-country/implementing team.

Novel technological support in the form of web-based monitoring or mobile phone monitoring apps have helped with monitoring and evaluation of programmes remotely. There is an increasing reliance on triangulation with multiple sources and the use of third-party monitoring. It also offers an opportunity for real-time feedback from direct beneficiaries with much shorter timescales than traditional methods.

Concerns for the risks of the use of RPM were increasing security risks to in-country workers and difficulty upholding humanitarian principles without direct oversight. Although these risks are not directly relevant to DHE content, the risk of reduced situational awareness and advocacy when maintaining remote relationships certainly can undermine projects.

### Conclusions:

Lessons gleaned from the RPM literature should be applied to future DHE work. The aim of DHE is often to produce persistent engagement to foster and maintain key strategic relationships. Remote working is well suited to preserving “shallow” relationships, which can then be developed into less frequent deeper engagement opportunities.

Recent events have demonstrated rapid adaptation to virtual working globally. A hybrid model of initial small virtual meetings to build relationships and shape projects can make subsequent face-to-face engagements more meaningful and effective. An enduring partnership maintained virtually can greatly aid monitoring and evaluation of DHE activity. As these strategies are developed, they should be incorporated into defence engagement doctrine and shared with partner nations as a template for best practice.

### Biography

*Surg Lt Cdr Laura McCrae works as a senior Emergency Medicine trainee in the Royal Navy. As a General Duties Medical Officer, she served onboard a Type 23 frigate in the Arabian Gulf and RFA Argus, a Primary Casualty Receiving Facility. Laura also joined the US Navy on Pacific Partnership 2010, a multi-national humanitarian and disaster response training exercise. Before returning to Scotland to complete her Emergency Medicine training, she worked in Emergency Medicine in Taranaki, New Zealand and Darwin, Australia. She is currently completing a global health fellowship with the Academic Centre for Defence Health Engagement and is part of the Military Global Health Engagement course faculty.*

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## Trauma Indexes and Indicators in the Pre-Hospital Environment - Evaluating Potential Utility for Paramedics

Kate Bohmer<sup>1,2</sup>, Wayne Harris<sup>1</sup>, Auston Rotheram<sup>1</sup>, Peter Lucas<sup>1</sup>, Rachael Berry<sup>1</sup>

<sup>1</sup> University Of Tasmania, Hobart, Australia,

<sup>2</sup> NSW Ambulance, Sydney, Australia

### Abstract

#### Objective:

Availability of practical, validated prognostic scoring tools could assist paramedic clinical decision making in cases of haemorrhagic shock. Appropriate scoring tools have not been tested in the pre-hospital setting. This study evaluated the potential utility of six trauma scoring tools and blood glucose levels (BGLs).

#### Methods:

A retrospective database review involving 12,562 trauma patients between 1st January 2018 and the 31st December 2018 was conducted. De-identified electronic patient clinical data from a state-based ambulance service were examined. A Shock Index (SI), Modified Shock Index (MSI) and Reverse Shock Index (RSI) were calculated for all patients. An Age SI was calculated for those aged  $\geq 55$  years, and a Shock Index Paediatric Adjusted (SIPA) for patients aged 4-16 years.

#### Results:

The SI and RSI tools were able to be calculated for the greatest number of cases (84.4%). MSI was calculable for 80% of trauma cases, while AgeSI and SIPA were calculated in 92.5% and 68.9% of target cases, respectively. Significant differences in the number of cases deemed severe were found between SI and age-specific tools. The incidence of trauma was similar in males (49.6%) and females (49.4%).

#### Conclusions:

A validated prognostic shock index can be a useful indicator of severe injury in the pre-hospital setting. Both the SI and RSI are practical tools for the detection of shock states, and warrant consideration for incorporation into paramedic trauma practice guidelines. In trauma situations, paramedics should

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consider patient age, however, more research is required in this area.

### Keywords:

Emergency medical services, paramedic, pre-hospital trauma care, shock, trauma index, shock index

### Biography

*Kate Bohmer graduated with a Bachelor of Paramedicine from the University of Tasmania (UTAS) in 2018. Kate has a keen interest in research and this drew her to undertake an honours degree in paramedicine at UTAS. At the end of 2019 she completed her Honours research thesis, which focused on validated and simple trauma tools for assessing haemorrhagic shock in the prehospital setting. She is presently working in Sydney as a qualified paramedic with the New South Wales Ambulance Service. Kate is very passionate about her chosen career as a*

*paramedic and aims to one day in the near future return to research and possibly expand her Honours thesis into a PhD. By returning to research, she hopes to actively contribute to improving pre-hospital care and knowledge. She is planning on undertaking further paramedic training to become an Intensive Care Paramedic.*

*In her spare time Kate is an accomplished Harpist who has won many music competitions and she has performed with the Tasmanian Symphony Orchestra. Kate is a keen tennis player and has represented Tasmania in both junior and senior state teams. Kate's other interests include fitness, travelling and bush walking.*

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## TAILORED MEDICAL AND HEALTH SERVICES FOR DEFENCE AT HOME AND ABROAD









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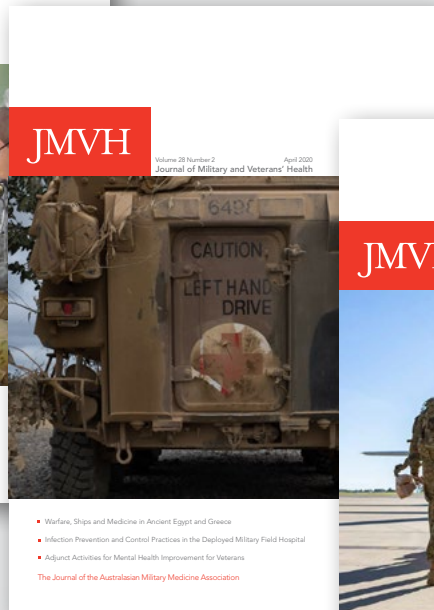
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