

JMVH

Volume 28 Number 4

October 2020

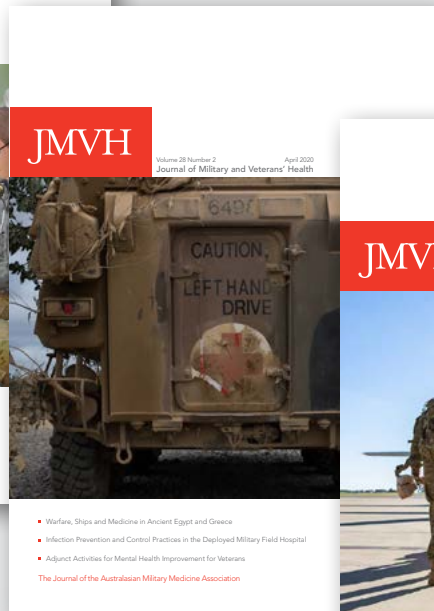
Journal of Military and Veterans' Health



- Emergency Medicine Comes of Age in the ADF
- Post-Traumatic Stress Disorder and Killing in Combat: A Review of Existing Literature
- 2020 Conference Abstracts

The Journal of the Australasian Military Medicine Association





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The Journal of Military and Veteran's Health is a peer reviewed quarterly publication published by the Australasian Military Medicine Association.

Authors are invited to submit articles of relevance to the Editor for consideration for publication in the Journal of Military and Veterans' Health (JMVH).

Categories include:

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Short Communication

Review Articles

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Case Studies

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STATEMENT OF OBJECTIVES

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

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

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

JMVH is published by the Australasian Military Medicine Association

227 Collins Street Hobart Tas 7000 Australia

Ph: +61 3 62347844

Email: editorial@jmvh.org

ISSN No. 1835-1271

Editorial

Whither reality?

As we prepare for our first virtual conference, we probably face it with some trepidation and some anticipation. As a consequence of COVID-19, many of us have become denizens of the virtual world, jumping from videoconferences to webinars to Zoom family catch-ups. Some of these changes have been productive—allowing people to meet quickly and easily, or undergo a medical consultation without the need to travel—and will no doubt remain. However, the human element remains and we all benefit from developing our relationships and networks when we can meet in person. This year, that option hasn't been possible, but we can still listen to an excellent range of diverse speakers—both local and international—discuss their papers and be involved in panel deliberations. This is also likely to be a feature of future hybrid conferences, where speakers present from afar and those who can't attend in person can listen in. Hopefully, the personal element will return and we can enjoy the presentations in real life and the social interactions that surround them. Let's hope that 2021 allow us to build on this virtual foundation with some real face-to-face time.

This issue is traditionally devoted to the AMMA Conference abstracts in the lead up to the meeting. This will again be a feature; however, we are fortunate to have an increasing number of excellent articles available as well. The role of emergency medicine in the Australian Defence Force, the benefits of peer support staff for veterans, and the role of polypharmacy in Post-Traumatic Stress Disorder (PTSD) are all addressed in this issue. The links between killing in combat and PTSD are also examined. Finally, Viking warfare and medicine, and the military history of tourniquets are both explored.

The Journal continues to welcome articles on a range of military and veterans' health topics and I would encourage everyone to consider submitting their papers. As people prepare their presentations for the Conference, I would ask people to consider the next step of turning that well-researched presentation into a journal article. A great deal of excellent research, applied science, reviews, case studies and historical papers never see the light of day and we always appreciate the contributions that flow from the conference. I look forward to seeing you all virtually at the end of November 2020.

Dr Andy Robertson, CSC, PSM
Commodore, RAN
Editor-in-Chief

Benefits and Employment and Care for Peer Support Staff in the Veteran Community: A Rapid Narrative Literature Review

C Deans

Abstract

Background: Veteran services increasingly use peers to support other veterans. There are hypothesised benefits for the service users, service system and peers.

Purpose: This rapid narrative literature review sought recommendations for the employment of veteran peers via related reviews: one on the use of mental health peers, and one on the use of veteran peers irrespective of setting.

Method: Searches were conducted using PsycINFO and PubMed databases for peer-reviewed articles over the past decade.

Results: Part A of the search returned 117 articles. Article categories were: case studies, single program evaluations, descriptive pieces, literature reviews and employment. There were no outcome evaluations with control or comparison groups. Part B of the search returned 20 articles. Article categories were: case studies, peer, consumer and employment experiences. There were no pre-post program evaluations.

Conclusion: There is limited evidence for the benefits of mental health peers or veteran peers. From the current literature, some anticipated benefits and recommendations for the employment of veteran peers can be derived. Anticipated benefits include engagement with providers, social support, stigma reduction, client engagement, program completions and peer benefits. Considerations for employment include principles, selection, training, staff roles, organisational considerations, consumer access and peer care.

Key words: veteran, mental health, peer, employment, benefits, care

Introduction

A peer ('peer', also known as a 'lived-experience peer', 'peer supporter', 'peer-support worker', 'wellbeing responder', etc.) can be described as a person with a lived experience of adverse events, who offers support and/or services to other people with similar circumstances considered to be less progressed in their life journey.

The use of a peer model emerged within the addiction recovery and mental health settings. There are hypothesised benefits for the service users, mental health service systems and peers themselves.

Within the veteran space, peers have been used for a variety of reason. For example, the United States Veterans Affairs have experimented with peer mentors

for homeless or incarcerated veterans.⁴ There has also been some use of peers for physical health conditions, such as recovery from cardiovascular disease.⁵

However, the most effective use of veteran peers has been in the mental health field in assisting veterans with mental health difficulties in accessing and participating in care. However, there appears a paucity of research studies to guide organisations serving veterans as to what benefits an organisation can gain from the use of peers. There is also little guidance on the process of selecting and employing peers, how they might be trained and utilised, how to reduce risk to peers, how to distinguish between the role of peer and mental health professional, and how to ensure proper care for both the peer and the veteran they support.

Method

A *rapid narrative literature review* was conducted to determine the benefits of employing peers and the risk and protective factors relevant to their selection, training and mental health support. The research questions were:

1. What are the benefits and risks to mental health support organisations in employing mental health peers to work with those who have mental health difficulties within the veteran community?
2. What are best practice or consensus considerations for the selection, training, employment and care of peers within the veteran community?

A rapid narrative literature review is a literature review with the following limitations:

Rapid: The scope of search terms was narrowed to a specific set that would yield a manageable number of documents to review within the timeline. The current search was limited to information in relation to the use of peers who have a lived experience of mental illness. A review was conducted of documents written within the last decade (2009–2019) only. A search of the reference list of articles was made if the list contained references within the last decade. PsycINFO and PubMed databases were searched for articles retrieved within the past decade (2009–Dec

2019). Only English language articles from peer-reviewed journals were included.

Narrative: No meta-analysis of data was made and only limited categorisation of materials completed, and there is no table outlining all references. A narrative review describes and critically analyses the state of the science on the topic.

The search was conducted in two parts in order to ensure that best practice or consensus statements were retrieved from the mental health peer setting, both within and external to veteran organisations.

Firstly, a search for evidence related to frameworks for selecting, employing and utilising mental health peers was conducted. Search terms used were based on a previously developed framework for best practice in organisational peer-support models—that is, the use of work colleagues to provide mental health support to their colleagues.⁶ This commonly occurs within first responder organisations. Results were reviewed to inform the utilisation of peer support within a mental health or welfare service.

Secondly, a search was conducted for any literature related to peer support and mental health in veteran populations, both in Australia and internationally. This search removed the necessity for articles to include information on goals, selection, training, employment or care of peers, to ensure that any published veteran peer program was reviewed.

Table 1. Search variables for the literature review on veteran mental health peers

SECTION	LITERATURE SEARCH VARIABLES			
	Bracket 1 (Title)	Bracket 2 (Subject terms)	Bracket 3 Part A (Title)	Bracket 3 Part B (Title)
Target demographic	'Peer support'	'Mental health'		
Goals of peer support			Goals Risk Pathways	
Selection			Selection Assessment Criteria	
Training and accreditation			Training Accreditation Skills Referral Standards	
Professionals			Governance Supervision	
Role			Role	
Access			Access	
Self-care			Self-care	
Evaluation			Evaluation	
Veterans				Veteran*

Results

Part A: General mental health peer-support literature overview

The search returned 117 articles and abstracts were reviewed for their relevance to this literature review. Articles were grouped inductively according to the type of information provided. These groups are described in further detail below.

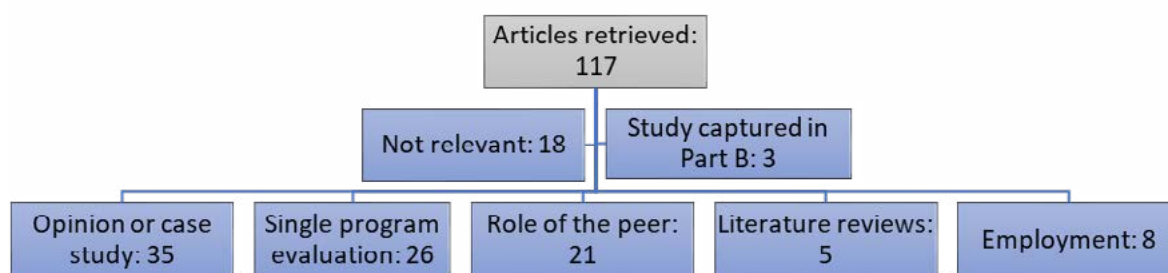


Figure 1. Articles retrieved according to search in Table 1, Part A.

Opinion piece or case study

Much of the literature on mental health peer support appears to be in the early stage of development. Many of the articles retrieved were descriptions of single intervention designs. Several others were opinion pieces regarding the burgeoning field of peer support and the inconsistencies in interpretation of the goals, role and utility of peers in mental health services.⁷

Single program evaluation

Some of the single program interventions also had preliminary evaluation, including some with 12-month follow up.⁸ However, the process for evaluation of interventions remains in its infancy, with several qualitative studies, few control group measurements and many evaluations of low power or quality.

Role of the peer

The role of the peer changes according to organisational needs. Some organisations use peers separate to a multidisciplinary team, in voluntary education or advice roles,⁹ for example, one study discusses the importance of peers pursuing their own recovery journey, thus their work being a form of professional development.¹⁰ A number of authors commented on the lack of role clarity for those working as peers.^{11, 12} All articles, except one identified, used a qualitative approach, looking at the experience of peers already volunteering or working,

and sometimes the allied health staff working with them, to identify the core elements of the role.

There appears to be consensus in the literature regarding the role of a peer as qualitatively different from that of professional and para-professional staff working in mental health. The unique nature of the lived-experience worker uses self-disclosure and personal interaction in a person-centred (or recovery-centred) philosophy. One article described how the occupational identity of a peer evolves through the interaction between their lived experience, their training and their engagement in the practice environment.¹³ It may be that this is more important for the peer, as most paid staff enter a program with an established sense of professional/occupational identity. Thus, time spent allowing for the development of this occupational identity should be a core component of a peer induction program.

Literature reviews

A review of the peer-reviewed and grey literature on mental health peers within health organisations from 1995–2010 concluded that randomised trials to date used variable outcome measures and showed inconsistent findings as to any benefit of peers, with some potential increase in social support for consumers.¹⁴ There was limited data on the benefit of engaging in a peer role, including aiding their recovery process. Given the comprehensiveness of that study, the current literature review focused only on literature published subsequent to that review.

A meta-synthesis of qualitative studies on the impact of support work on peers found two important themes: reframing of identity, and therapeutic use of self.¹⁵ Firstly, peer work allows for a reframing of the past to give meaning to peers' suffering and experiences. Secondly, peers identified the unique aspect of their role as being able to use their self-disclosure in a therapeutic way. This results in challenges related to boundaries but also has the benefit of a unique role in the system. Another study focused on the experiences of peers, their non-peer colleagues and the recipients of peer-support services,¹⁶ with similar conclusions. A further review looked at outcomes for online peer support for young people with mental health problems.¹⁶

A 2018 general review of the literature on peers concluded that a lack of evidence precludes strong recommendations from being made.¹⁷ However, the author provides a summary of areas for consideration in developing a program: role, boundaries, professionalism expectations, supervisory direction, training and support needs.

Employment of peers

A large scale Delphi study of the opinions of peers obtained a list of factors addressing the role, benefits, barriers and support needs.¹⁸ Poor career prospects were considered a barrier to taking up the role. Benefits included improved peer wellbeing, making a contribution, pay, learning and social connectedness. Support needs were consistent with other material, including training, support and supervision, and an organisation that values and enables peer work to occur. Peer work is considered unique and separate to mental health work, with a focus on personal disclosure, connection with consumers and two-way benefits to the interactions. Peers were explicit that the organisation needs to support those aspects for the program to be beneficial.

A systematic literature review and large scale Delphi study of peers and experts in Portugal¹⁹ assessed statements consistent with those in the published Delphi study on the use of peers in high-risk organisations (employees who support other colleagues in times of exposure to critical incidents).⁶ This resulted in a list of key statements that support a peer framework within the following categories: (a) goals and principles of peer support; (b) selection of peers; (c) training and accreditation; (d) role of mental health professionals; (e) role of peers; (f) access to peers; (g) looking after peers; and (h) program evaluation.

A consensus of all US states who were using peers within their government mental health services²⁰ outlines 25 principles of peer support,

including clarity in role, competencies, training and certification. This statement makes several recommendations regarding training:

- trauma-informed care training for peers
- a train-the-trainer program for peer-support specialists
- a peer-support code of conduct that guides peer work
- training for non-peer staff in recovery-focused care
- access to consumer-run organisations that support peers.

This focus on training for the whole workforce, not just peers, ahead of a peer program, is backed up by a systematic literature review on barriers to successful peer implementation.²¹ This identifies organisational culture as the main barrier to integrating peers into a mental health workforce, followed by training and role definition barriers.

One study described the development of the peer-support workforce within the South Australian Government mental health care system.²² This model identified similar training and preparation steps to the above review articles. It provides detail on the knowledge and skills requirements identified for peers within this system, including the need for an understanding of a social justice and recovery model in which the peer can deal with stigma and discrimination, promote recovery and social inclusion, and research and share information on mental health support services. It also emphasises self-care strategies, the ability to set boundaries, recognise own triggers and maintain wellness. Another study describes a training program for peers that covers these concepts.²³ One quantitative study found that teaching basic counselling skills to peers increases their use of nonspecific therapy skills without reducing acceptance of their role or perceived empathy by the consumer.²⁴

One framework for the employment of peers was developed within the UK health service.²⁵ It combined recommendations from an expert panel of peers and peer supervisors with the known literature at the time. This aimed to strike a balance between the need for quality control in service delivery and the need to maintain the peer as an informal source of support. The five principles developed include: supporting the development of a relationship based on shared experiences; ensuring mutuality and reciprocity; the application of experiential knowledge; enabling peers to exercise leadership and choice in their role; and empowering peers to make use of their strengths.

Part B: Veteran-specific mental health peer-support literature overview

Twenty articles were retrieved regarding veteran peer programs. One study was from Australia and one from the UK; the remaining studies were from the US, with overlap in authors and programs studied.

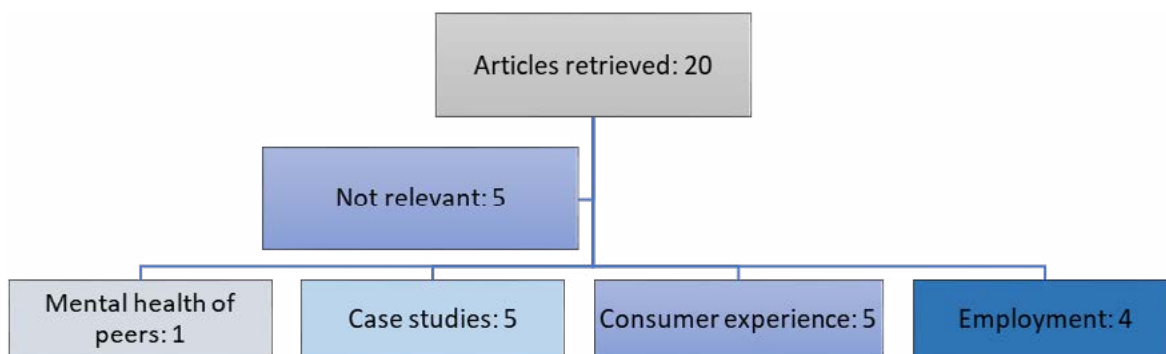


Figure 2. Articles retrieved according to search in Table 1, Part B.

Case studies

Five case studies of the implementation of peers into mental health services were described. Two innovative uses of peers were described, including the use of peers to improve engagement in online therapy and peer telephone support.^{26, 27} Two studies described the use of peers to engage hard-to-reach veterans in rural areas or post-incarceration.^{28, 29} The consumer experience of a peer-support group facilitated by a peer, also focused on gaining assistance from non-trained peers, is described in two studies that do not differentiate between the benefits of a peer and the benefits of being in a peer-support group.^{30, 31}

Mental health of peers

One article described the impact on peers working in populations with poor mental health. The study used quantitative measures and found that mental health and burnout outcomes were similar to mental health professionals and para-professionals working in the same organisation.³²

Consumer experience

Along with anticipated changes from an outdoor education style program (for example, personal competence), one study also found changes in mental health symptom reporting when the program was peer-led.³³ A report on an inpatient PTSD

treatment program, which was supplemented by peers, found that symptoms and recovery attitudes are affected by perceived support from peers, other participants and other staff in equal measure.³⁴ However, another study found that peers conducting a pre-treatment intervention resulted in greater completion rates than those conducted by mental health professionals.³⁵ When asked about their experience of a peer program at a specialist veteran mental health clinic, consumers reported themes associated with a reduction in barriers to entry at the facility, such as being a welcoming face and connecting veterans with staff.³⁶

Employment of peers

A case study of the implementation of a peer program stressed the need for organisational buy-in of a program and suggesting organisational change strategies to assist with this.³⁷ A study looking at peer support for homeless veterans investigated the actual rate of use of a peer service by consumers. The authors found that approximately once-a-month contact with peers was the most common rate of usage, with older veterans more likely to engage with peers.³⁸ Two studies of peer programs found that recovery attitudes are positively associated with the receptivity of peer work by the organisation's non-peer staff.^{39, 40}

Table 2. Veteran-specific peer articles identified.

Country	Authors	Setting	Participants	Method	Outcomes
US	Azevedo, Ramirez (29)	Veteran peer-support groups for sequelae of violent, traumatic experiences	29 peer-support group participants, 1 peer specialist	Qualitative	Key themes: violence in military training not acceptable in civilian life; peer support creates the trust to speak freely; skills are taught to defuse violence; veteran peer-support specialist relationship is multidimensional.
AUS	Bird (32)	Australian peer outdoor support therapy program for contemporary veterans	14 veterans in a peer-led outdoor education activity	Quantitative (no control group) and qualitative	Reductions in depression, anxiety and stress maintained to two-month follow up. Key themes: sense of shared identity, involvement, belonging, increased self-determination and personal competence.
US	Chinman, Shoi (36)	Peer-support technicians in the Veterans Administration	Nil	Development of protocol	N/A
US	Ellison, Schutt (37)	Homeless veterans with mental health conditions and substance use	50 veterans receiving peer support	Quantitative (no control group)	Consider yardsticks of monthly services for up to 6 months. Consider varying levels of intensity according to need.
US	Jain, Hernandez (27)	Peer-support program for veterans in rural areas	Case study	Qualitative	N/A
US	Jain, McLean (33)	Residential rehabilitation program for veterans with PTSD	55 PTSD inpatients receiving peer support	Quantitative (no control group)	Greater perceived support from peers, other veterans and staff were associated with improvements from intake to discharge in recovery attitudes and PTSD symptoms.
US	Joseph, Hernandez (25)	Peer-support telephone outreach	Case study of program recruiting 34 veterans	Quantitative (no control group)	23% of veterans contacted ultimately engaged in the peer-support groups; this subpopulation was receiving no other mental health care.
US	Nelson, Lusk (34)	CBT Pre-treatment intervention	352 participants in a CBT pre-treatment group	Quantitative (Program Support Assistant as control group)	Use of peers predicts completion in pre-treatment group overuse of program support assistants.
US	Park, Chang (31)	Veterans Health Administration (VHA) peer-support specialists	152 peers	Quantitative (no control group)	Peers reported similar levels of emotional exhaustion, depersonalisation and personal accomplishment to published scores for VHA mental health workers.
US	Ray, Kemp (26)	Computer-delivered CBT	24 veterans with depression or anxiety	Qualitative	Key themes: veteran preferences for use of peers in practical aspects emotional support and application of learning to 'real life' problems.
US	Simmons, Fincke (28)	Veterans who are post-incarceration	Case study	Study protocol	N/A
US	Stefanovics, Drebing (38)	VHA peer-support specialists and supervisors	141 peers and 146 peer supervisors	Quantitative (no control group)	Level of perceived receptivity was high for peers and supervisors and correlated with recovery attitudes.
UK	Weir et al. 2019	Peer-support workers at a specialist veteran mental health clinic	18 veterans, peers or clinicians	Qualitative	Key themes: positive first impression, understanding professional friend, helpful and supportive connector, an open door.
US	Shepardson, Johnson (39)	VHA primary care mental health integration service	7 peers, 6 peer supervisors, 12 clinicians	Qualitative	Key barriers: program functioning, administrative support, role confusion, negative stakeholder attitudes. Key facilitators: administrative support, program functioning, team cohesion, stakeholder buy-in, access/visibility, evidence of success.
US	Kumar, Azevedo (30)	Outpatient program for veterans with PTSD	29 participants with PTSD	Qualitative	Key themes: acceptance of PTSD into daily life and identity; structural and emergent support.

Discussion

Limitations of this study

As described, this study was restricted to a rapid narrative review in order to determine the current status of the field rapidly. This brings necessary limitations in the scope of articles that can be obtained and reviewed. While the field of peer support is mostly limited to work conducted since the early 1990s, there is potential that some early instructive work has not been reviewed. In addition, the review is limited to a description of publications. While it attempts to distinguish case studies—that is, descriptions of single peer programs with no evaluative content—it does not make any other attempt at evaluating the quality of the studies. To more accurately make evidence-based decisions regarding future programs, it may be useful to subject the field to more rigorous testing of the quality of evidence.

The field of veteran peer support is a burgeoning one; however, a lag between the use of peers and rigorous review of outcomes remains. As with all new fields, a focus on case studies, training and initial qualitative understanding of the benefits comprise a large majority of the studies. Despite the widespread consensus of the need to adequately support peers, there are almost no studies aimed at measuring psychological risk to peers in their role. However, there are several consensus positions in regards to the implementation of a peer program, which are supported by limited but consistent findings. These relate to the activities of a veterans mental health peer, the perceived benefits and some guidance on the employment of peers.

Veteran-specific tasks

In relation to the use of peers, specifically within the veteran space, there do not appear to be any published findings that suggest the general guidelines for mental health peers would differ. A veteran peer straddles the divide between a peer who has a specific *lived experience* of mental health difficulties and an organisational peer who has a lived experience of working in the same organisation. In this case, a veteran peer may not have a mental health history, but has an experience of going through the process

of transition out of military life. There is no current research that investigates the qualitative difference of this process. In the meantime, consensus on the activities of a peer includes two essential points that may have to be interpreted for the veteran peer to accommodate their specific context:

- self-disclosure about their own recovery journey in a therapeutic way
- personal, informal interaction in a person-centred way.

Perceived benefits

Although there is no current evidence for the benefit of peers, there does appear to be consensus on a number of perceived benefits of peer programs to consumers:

- increased engagement with services
- increased social support
- reduced mental health stigma and discrimination
- increased perceived support from the service
- engaged hard-to-reach clients
- improved recovery attitudes
- increased completion rate for centre programs.

In addition, within the general mental health setting and with the used of peers who have a lived experience of a mental health disorder, there are additional perceived benefits to peers operating in the role:

- pursue own transition journey
- reframing their mental health difficulties in a recovery model
- social connectedness.

Employment of peers

A synthesis of information from the general mental health peer field, removing factors which are not relevant to a veteran environment, is listed in Table 3.

Table 3. Synthesis of best practice framework for veteran mental health peers

Goals and principles	Selection	Training and accreditation	Role of mental health professionals	Role of peer supporters	Organisational issues	Client access to peers	Looking after peer supporters
<ul style="list-style-type: none"> · Provide empathic listening ear · Provide low-level psychological intervention · Advocate for peers in disputes · Identify peers who may be at risk · Facilitate access to professional help · Encourage compliance with treatment · Support the functioning of individuals · Promote physical and mental health 	<ul style="list-style-type: none"> · Application and selection process · Approval by members of the target group · Approval by mental health professionals · Must be a member of the veteran population 	<ul style="list-style-type: none"> · Standardised and refresher training · Supervision · Information about support services · Active listening skills · Simple psychological techniques · Trauma-informed care · Recovery framework · Self-care and boundaries · Time to develop 'peer' identity 	<ul style="list-style-type: none"> · Participate in training and supervision of peers · Be in charge of the peer program 	<ul style="list-style-type: none"> · No clinical or professional responsibility · Discuss every case with a mental health professional · Maintain appropriate confidentiality · Capacity to make a direct referral to a professional · Tailor service to the needs of the clients · Maintain balance of org goals and not being 'part of the system' · Support a relationship based on shared experiences and reciprocity · Continuing support as long as it is beneficial 	<ul style="list-style-type: none"> · Peer code of conduct · Organisational support for unique peer role · Training for non-peer staff in peer role · Integrated with other veteran programs · Established duration and frequency of the program · Established clear goals linked to outcomes · External independent evaluation · Peers exercise leadership and choice in their role · Access to ex-service organisations 	<ul style="list-style-type: none"> · Peers are the initial point of contact of the organisation · Be able to select a peer from a pool · Available on-call in a defined schedule 	<ul style="list-style-type: none"> · Regular consultation with other peers · Regular supervision with a professional · Able to gain access to information from a professional at any time · Offered mental health support · Offered help managing boundaries in self-disclosure

Conclusion

This article provides a summary of evidence-informed guidelines for the selection, training and employment of peers within veteran settings, and may be useful for organisations who are considering the employment of veteran peers. There is a need for research that can establish the benefits of peer programs, either in comparison to organisations who do not have programs or in comparison to other initiatives that organisational resources could be used for, including the use of paid staff.

*Corresponding Author: Carolyn Deans
carolyn.deans@unimelb.edu.au*

Authors: C Deans¹

Author Affiliations:

1 Phoenix Australia

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Viking Warfare, Ships and Medicine

N Westphalen

Introduction

Previous articles describe the development from prehistory to the end of the Roman Empire, of a cycle whereby increasing trade necessitated larger and more efficient ships to transport merchandise and better weapons to defend or attack them; both of which facilitated more trading opportunities.^{1,2,3} It was not until the 18th century that Western medicine had developed sufficiently for its role as an enabler of this cycle to be recognised, which made possible the European settlement of Australia.⁴

While the technical developments in weapons, ships and medicine driven by this cycle often developed independently in multiple regions worldwide, they remained closely linked throughout Western history in particular. This article describes, for better and for worse, the technical and other developments in warfare, ships and medicine during the Viking Age from 500 to 1200 CE.

For the purpose of this article, the term 'Viking' refers to people who left Scandinavia, while 'Norse' refers to those who stayed behind.

Viking warfare

The factors driving the Viking expansion beyond Scandinavia remain a subject of debate. Possibilities include the power vacuum left by the collapse of the Western Roman Empire in 476 CE; retaliation against the expansion of Christianity; agricultural failures within Scandinavia; and a lack of land for second sons and beyond to inherit. However, the focus on raiding rather than other more peaceful alternatives suggests that a lack of commodities for the Vikings to trade, combined with a plethora elsewhere, provided at least some of the initial motivation.⁵

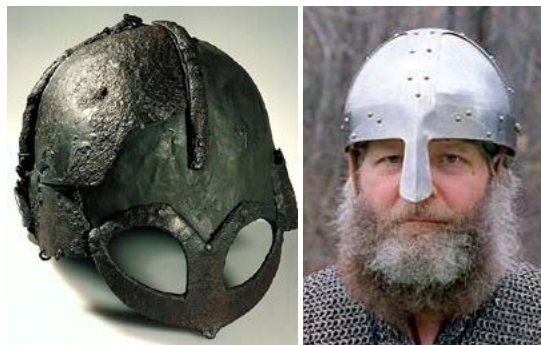
Scandinavian society did not form the unified kingdoms of Norway, Sweden and Denmark until near the end of this period. Until then, individual leaders ranging from local chieftains to earls and kings, teamed up to conduct hit-and-run attacks throughout Europe in search of slaves and places to plunder. These eventually led to the establishment of overwintering bases for further raids, resulting in the founding of several full-fledged Viking territories in the Baltic, Russia, Britain, Ireland,

France and southern Italy. The Viking Age ended with their progressive acceptance of Christianity and assimilation within the populations they had first raided and then settled among.⁶

Viking warriors closely identified with their swords, which were difficult to make and therefore rare and expensive. They were family heirlooms with names such as 'Leg Biter' and were frequently richly decorated using silver and/or copper inlay to form beautiful geometric patterns, animal motifs or, in the late Viking Age, Christian icons. At around 900 mm long, Viking swords were designed for one-on-one combat, where added length gave the user an advantage compared to the old Roman *gladius*, which was designed for fighting in densely compacted formations.⁷

Vikings also used circular wooden shields edged with leather, with a central boss of iron to protect the hand. These were large enough to cover the body yet light enough to be used offensively (for example by ramming the edge into their opponents' face to break noses, jaws and teeth). They also used mail armour, which was lighter and allowed greater mobility than plate armour.⁸

Other Viking weapons included axes, daggers or short-swords (the *seax*, the signature weapon used by the Saxon tribes that invaded Roman Britain from 400 CE), spears, and bows and arrows. These were generally (but by no means always) used by poorer warriors who could not afford a sword.⁹



Left: Viking helmet found Gjermundbu, Norway 1943, dated c1000 CE.¹⁰ Note the absence of horns.

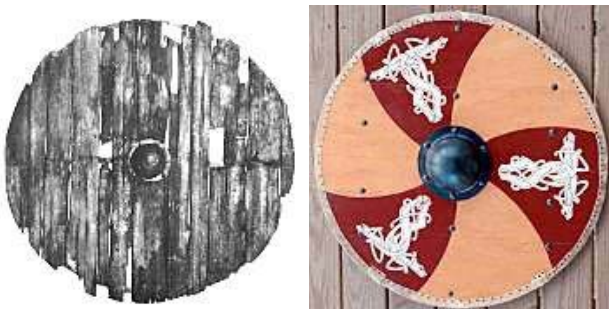
Right: Replica Viking spangenhelm helmet.¹¹ Note the nose guard.



Viking swords—c750–950 CE—found in the River Meuse near Den Bosch, Aalburg and Wessem in the Netherlands¹² Note the decorations on the pommels, in particular the gold inlay on the uppermost sword.



Replica Viking seax, c700 CE.¹⁹



Left: Original shield from the Gokstad ship found 1880, dated c890 CE.¹³ Note the wooden planking and iron boss in the middle.

Right: Replica Gokstad shield (front).¹⁴ Note the leather binding to protect the edge and hold the planks together.

Bottom: Replica Gokstad shield (rear).¹⁵ Note the central handgrip is covered by the boss.



Axe head found at Mammen, Denmark, found 1868, dated 971 CE.²⁰ Note the silver inlay, suggesting its probable use as ceremonial purposes.



Battle axes, Bayeux Tapestry, 1100 CE.²¹ Harold Godwinson is standing between two axes (one his own), while being offered the crown of England after the death of King Edward the Confessor in January 1066. Note the long handles.



Left: Viking mail shirt, found Gjermundbu, Norway in 1943, dated c1000 CE.¹⁶ The style is similar to a modern T-shirt.

Right: Gjermundbu mail shirt (closeup).¹⁷ Each ring is interlinked with four neighbours. There are two types of ring: one solid and one riveted. A shirt this size would have had up to 15 000 rings and weighed about 6kg.¹⁸

Viking ships

The Scandinavian history of shipbuilding began in the Neolithic period (12 000–4500 BCE), although there is an ongoing debate as to whether the first boats began as dugouts to which additional planks and ribs were added, or as reindeer hides stretched over an antler or bone (later wooden) frame. The oldest plank-built boat in northern Europe is a double-ended 22-man paddle canoe, found in a bog at Hjortspring in southern Denmark in 1921. Dated to c350 BCE, she had two side planks on each side

sewn to a central plank and two block stems, held together with combination ribs/beams with the latter acting as rather perch-like thwarts.²²

The Nydam ship, discovered in 1859 and dated to c310 CE, is considered seaworthy enough to have undertaken attacks on Roman Britain. She still has a central plank rather than a proper keel, with five strakes on either side held together with iron rivets, making her the oldest known clinker-built vessel. The ends of each strake are inset ('rabbeted') to the bow and stem pieces. There was no sail, but places for 30 rowers on proper thwarts.²³

In 1939, the remains of a Viking ship burial were found at Sutton Hoo in Suffolk, UK, dated to c625 CE. Although the wood had not survived, the outline of the ship was preserved in the soil. As it is unclear whether she could be sailed as well as rowed, a replica was under development at the time of writing to ascertain her rowing and (possible) sailing qualities. Likewise, it is also unclear whether the Kvalsund ship, discovered in Norway in 1920 and dated to c690 CE, could also be sailed as well as rowed.²⁴

Hence, the earliest Viking ship known to carry sail is the Oseberg ship, which was discovered in 1903 and dated to c820 CE. However, the Gokstad ship (discovered in 1880 and dated to 890 CE), is probably a more representative active seagoing vessel, as demonstrated by several replicas that have undertaken open-ocean voyages to as far as North America. The Gokstad ship has 16 oar ports on each side that could be shuttered, and 32 shields, which indicated her use for warlike purposes.²⁵

Viking warships were valuable, not just for their prestige and monetary value but also their future utility. Although such battles were rare, Viking naval combat therefore entailed gaining control of an opponents' ship (and their valuables) by hand-to-hand fighting without damaging the ship or her gear.²⁶

To this end, Viking sea battles were usually fought in protected fjords or otherwise sheltered waters, where ships could be rafted together to form floating 'islands'. Helmsmen manoeuvred for the most favourable position to board the outermost ships, while the crews shot arrows and spears as they drew together. As each defeated ship was cleared of her crew, she was set adrift while the victors boarded the next ship making up the 'island'. Meanwhile, smaller boats swarmed around the main battle to finish off anyone who ended up in the water.²⁷

However, the key to Viking warship effectiveness pertained more to their combination of shallow draft and enhanced seaworthiness, to enable fighting ashore. The former enabled Vikings to navigate inland waters that could not be reached by their opponents, while also allowing them to quickly land their crews and pick them and their loot up afterwards; the latter gave them the strategic mobility to attack overseas shore targets that otherwise could not be reached from home.²⁸

These attributes led to the Vikings developing ocean-going cargo ships or 'knarrs' (also 'knörrs') from 1000 CE. These used the same clinker-built construction as warships, but with heavier lines for sailing instead of rowing. Knarrs became the basis of the northern European 'cog' ships from 1200 CE.²⁹

A key limitation regarding Viking open-ocean voyages relates to their navigation. As they had no compasses, charts or speed logs, it seems likely they relied on hopping between known landmarks (facilitated by chants and rhymes as aide-memoires), aided by their knowledge of sun and stars, wave, wind and cloud patterns, and marine flora and fauna. Vikings also restricted their operations to the summer months, noting that their ships had no shelter for their crews, and—*notwithstanding* their enhanced seaworthiness—the fact that they were still essentially large open boats that were susceptible to being swamped and sunk.³⁰



Hjortspring boat found 1921, dated c350 BCE, National Museum of Denmark.³¹



Hjortspring boat model, National Museum of Denmark.³² Note the combination rib/paddle thwarts. The purpose of the projections at either end remains unknown.



Replica Viking Age iron boat rivets and washers.³⁵ Each rivet was inserted from the outside of the hull while red-hot so the bottom edge of the uppermost plank or 'strake' overlapped the top edge of the strake below. A washer was placed over each rivet inside the hull and hammered in place.



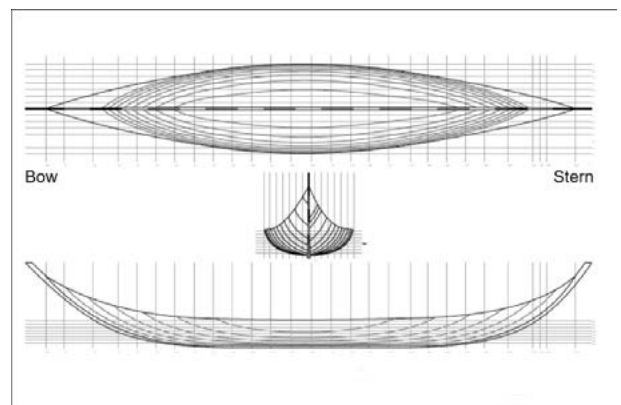
Nydam ship, found 1859, dated c310 CE, State Archeological Museum, Schleswig, Germany.³³ Note the clinker strakes.



Sutton Hoo ship burial site found 1939, dated c625 CE.³⁶ Note that, although the wood had not survived, the clinker construction of the hull and the ribs have been preserved in the soil. Also, note the iron rivets.



Nydam ship replica Nydam Tveir.³⁴ Note the steering oar on the starboard quarter and absence of a sail.



Replica Sutton Hoo burial ship lines.³⁷



Model, Kvalsund ship, found 1920, dated c690 CE.³⁸ Note the rowlocks and thwarts, and absence of a mast and sail. The bow is to the left.



Gokstad ship found 1880, dated c890 CE.⁴¹ Note the oar ports, loose deck planking and absence of decorative carving. The bow is to the right.



Oseberg ship found 1903, dated c820 CE.³⁹ Note the bow decorations, loose deck planking and absence of rowing thwarts.



Gokstad ship oar port covers.⁴² The port slot at 10 o'clock in the upper photo is for the oar blade.



Oseberg ship closeup.⁴⁰ Note the stem carvings and rivets.



Gokstad replica Viking at Chicago after crossing the Atlantic, 1893⁴³



'Skuldelev 1' knarr, one of five vessels found near Roskilde, Denmark in 1962, dated 1030 CE.⁴⁴ Note the broader beam and heavier lines compared to the Gokstad ship.



Replica Skuldelev 1 knarr Otta.⁴⁵ Note the absence of oars—or crew shelter.



Representation of a knarr in bad weather.⁴⁶ Note the absence of crew shelter, the knee-deep water in the cargo area amidships—and the two bailers.

Viking medicine

During the pre-Christian Viking Age, most Scandinavians relied on self-aid or local people deemed to have supernatural abilities who inscribed magical runes combined with chants and charms. One Norse saga describes how a young woman's health was at first ruined through the use of improper runes, and then restored by correct ones carved on whalebone and placed under her bed. Magic could also prevent healing: in one saga, the warrior Eidur says that wounds inflicted by his sword 'Sköfnung' would not heal unless they were rubbed with Sköfnung's healing stone.⁴⁷

To these ends, Norse poetry had numerous charms for the maintenance of health in daily life. These originated from Germanic prehistory, when wise-women and conjurers recited their incantations against the spirits of disease, while sufferers from diverse illnesses called upon gods such as Thor, Odin or Freyr for a return of health.⁴⁸

Notwithstanding their reliance on magic, burial site studies suggest that at least some of the population had a long life and good health. For example, skeletal remains from Skeljastadir in Iceland from 1000 to 1200 CE indicate that the population was generally healthy. They also show that their teeth show considerable wear but few caries, most likely because their diet had coarser food, fewer refined foods and much less sugar compared to modern western diets.⁴⁹

Nevertheless, consistent with the infectious disease hazards inherent to the first settlements elsewhere, epidemics of smallpox, dysentery and leprosy are also recorded in the Norse literature and confirmed by their burial sites. These epidemics followed wherever they went; a mass grave at the winter camp used in 873–874 by the Viking Great Army at Repton England mostly consisted of adult males, and although several had battle injuries, many of the remainder had likely succumbed to disease.⁵⁰

The Vikings' fatalism towards such cases is demonstrated by a saga describing a protracted period of disease at Lysufjordur in Greenland, where the role of the healthy was limited to helping the sick prepare for death. Another saga tells the story of a man who had booked passage from Iceland to Norway, who was prevailed upon to take a relative with leprosy with him. He took his sick kinsman ashore and killed him, before returning to the ship to take his passage.⁵¹

From such beginnings, the Vikings' progressive conversion to Christianity also brought acceptance

of Roman medicine, as advocated by Galen of Pergamon (129–c216 CE). A previous article described how Galen had studied in Smyrna and Alexandria and worked at a gladiator school before becoming a prolific writer of medical treatises that were translated into many languages.⁵²

Although he had gained considerable anatomical knowledge by treating wounded gladiators, a ban on human cadaver dissection from c250 BCE until after 1300 CE meant Galen's research was otherwise limited to Barbary apes and pigs. He erred regarding the role of the veins in returning blood to the heart, while a misunderstanding of his writings regarding the need to drain abscesses led to a belief that 'laudable pus' was a positive sign of wound healing.⁵³

Furthermore, Galen supported the Greek *Corpus Hippocraticum* regarding the idea that illness was caused by imbalances of the four bodily fluids (or humours) of phlegm, yellow bile, black bile and blood. This idea was coupled with the four qualities of heat, cold, wet and dry, which underpinned all treatments for the next 1500 years. Among other shortfalls, this led to the use of bloodletting as a treatment and the view that diseases such as malaria were caused by bad air from rotting animal and plant matter.⁵⁴

The later Viking Age, therefore, saw medicine becoming a vocation and profession on comparable terms as the rest of Europe. The best-known Viking physician was the Icelander Hrafn Sveinbjarnarson (c1166–1213), who was highly regarded for his skills.⁵⁵

Hence, medical treatment included lancing, cleaning wounds, anointing, bandaging, setting broken bones, preparing herbal remedies (including local herbs) and midwifery. The Icelandic Grágás ('Grey Goose') law book dated prior to 1262, states that one must hold harmless a person who bled or cauterised someone for the good of their health, suggesting these treatments were also used.⁵⁶

The saga literature and forensic studies of skeletal remains both show that people survived serious battle injuries. They also confirm that surgery was performed from time to time, some of which was successful.⁵⁷

The sagas tell of several forms of battlefield first aid, such as throwing shields over the wounded to protect them from further injury and calling pauses during longer fights to allow men to bind their wounds. One saga describes how a warrior was struck by a blow that cut through his shoulder such that his lungs fell out. He was bound up and cared for until the battle was over and then carried home for treatment.

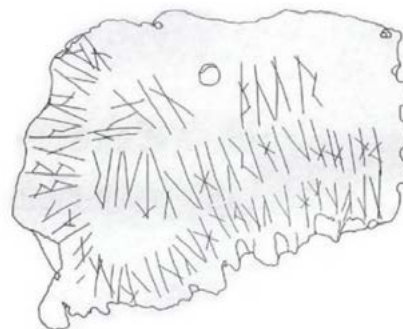
Another saga described an unusual diagnostic technique for abdominal wounds, where a casualty was given a hot broth containing leeks and onions among other herbs. The smell of the broth from the wound indicated a perforated viscus, thereby confirming it was fatal. Some skeletal remains confirm such stories by showing both healed and unhealed battle injuries in the same skeleton.⁵⁸



Skull split open by a sword slash, c1100 CE.⁵⁹ This rather graphically demonstrates the need for helmets.



Skull fragment with runes, worn as a protective amulet, found Ribe, Denmark, dated c700–800 CE.⁶⁰



Skull fragment sketch showing the following runes:
'Ulf and Odin, and High Tyr, is help for Bur, against these pain and Dwarf sword, Bur'⁶¹

Conclusion

The Scandinavians' initial focus on raiding rather than more peaceful alternatives suggests that a lack of commodities to trade provided at least some motivation to engage in opportunistic attacks throughout Europe in search of plunder and slaves. Over time, these raids led to the establishment of seasonal and then permanent Viking settlements, which were eventually assimilated into the local populations.

This process was facilitated by the Vikings' ability to move large numbers of men over long distances for extended periods. This was based on the development of ships of shallow draft that nevertheless could make oceanic voyages. The former capability allowed the Vikings to raid shore targets that were otherwise inaccessible by sea, yet preventing counterattack by seagoing opponents, while the latter gave them the strategic mobility to strike such targets at long ranges from home. It should also be noted that none of this would have been possible without an excellent understanding of logistics.

The development of overwintering bases led to permanent Viking settlements, which required ships of progressively increasing cargo capacity. These ships led to the settlement of Iceland, Greenland and North America, and became the basis of northern European shipbuilding from 1200 CE.

However, the Viking settlement of North America was abandoned, most likely in the first instance because their ships still lacked a true all-weather seagoing capability, while the absence of oceanic navigation aids limited their crews to sophisticated yet still inadequate coastal navigation techniques. Furthermore, the generally comparable weapons technology of Viking settlers and the Native American populations opposing them, combined with the latter's force of numbers, probably made the formers' presence unsustainable.

Subsequent transatlantic voyages from the mid-15th century onwards suggest that from a medical viewpoint, Viking voyages probably did not entail enough time at sea for their crews to develop deficiency disorders such as scurvy. It also seems likely that their crew sizes—particularly for the knarrs—were generally too small for infectious diseases such as typhus and dysentery to pose a threat, except when they were assembled in large numbers for extended periods ashore.

Rather than the mutually supportive close-quarter tactics used by the Romans and Greeks, the Vikings' focus on raiding led to a high level of reliance on

the fighting skills of individual warriors, resulting in weapons that were primarily intended for one-on-one combat. Although swords were therefore the weapon of choice, their scarcity and expense led to alternatives such as axes, short-swords, spears and bows and arrows.

Viking sea battles were rare and were generally fought in the same manner as ashore, apart from the victors cutting each ship adrift from their attached neighbours before boarding the next one. Unlike the Greeks and Romans however, one of the Vikings' priorities was to capture their opponents' ships intact. The ongoing more-or-less universal inability to swim meant that ending up in the water would have been fatal, even without fighters in small open boats to finish them off.

Therefore, the only wounded would have been those of the victors. Although the proximity to shore would have greatly facilitated their treatment, the Vikings' initial reliance on the supernatural led to a highly fatalistic attitude to health care, until their acceptance of Christianity brought with it Galenic medicine on comparable terms as the rest of Europe.

Like the Romans, Viking surgical capabilities—if not their anaesthetics, analgesia and post-operative wound care—would have then compared fairly well with modern practice, at least for limb injuries and minor wounds. However, like the rest of Europe, their acceptance of Galen's humoral theories (in particular the miasmatic theory of infectious disease) continued to stymie medical science for another 300 years.

Author

Dr Neil Westphalen graduated from Adelaide University in 1985 and joined the RAN in 1987. He is a RAN Staff Course graduate and a Fellow of the 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 July 2016.

Disclaimer

The views expressed in this article are the author's and do not necessarily reflect those of the RAN or any other organisations mentioned.

Corresponding Author: Neil Westphalen,
neil.westphalen@bigpond.com

Authors: N Westphalen^{1,2}

Author Affiliations:

1 Royal Australian Navy Reserve

2 Navy Health Service, C/O Director Navy Health

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Emergency Medicine Comes of Age in the ADF

M Little, J Williams, A Holley, A Parkin, D Ward, C Balfour, B Butson, D Cooksley, A Pearce

Abstract

Background: Emergency medicine is a well-established specialty in Australia and New Zealand. The Australian Defence Force (ADF) has progressively identified the value of this discipline across a range of domestic and deployed activities, with EM trainees and fellows deploying on a range of ADF exercises and operations since 1991. In 2017, Operation OKRA (Iraq) saw the first ADF deployment of specialist emergency physicians (EPs) in a dedicated EP position as the Senior Medical Officer and lead clinician of a deployed health facility.

Purpose: This narrative review seeks to highlight the skills and abilities EPs bring to the ADF, as well as opportunities for the future.

Conclusion: ADF EPs are increasingly providing key clinical capabilities within Role 1, 2 and 2E facilities on exercises and overseas deployments, and have established the requirement for EP inclusion in the manning of future deployed facilities. Involvement of EPs in ADF technical and clinical governance at all levels will enable these specialists to provide advice to commanders as well as clinicians, and influence policy and future ADF health capability development

Key words: Emergency physician, emergency medicine, ADF

Introduction

The Australasian College for Emergency Medicine (ACEM) was formed in July 1983, with the first fellows passing Fellowship of the Australasian College for Emergency Medicine (FACEM) exams in 1986. The National Specialist Qualification Advisory Committee subsequently recognised emergency medicine as a medical specialty and the FACEM as the appropriate specialist qualification in 1993. Emergency medicine is now an established and respected civilian practice specialty in Australia, New Zealand and worldwide. The Australian Defence Force (ADF) has progressively identified the value of this discipline across a range of domestic and deployed activities, with emergency medicine trainees and fellows deploying on a spectrum of ADF exercises and operations since 1991. In 2017, Operation OKRA (Iraq) saw the first ADF deployment of EPs in a dedicated EP position as the Senior Medical Officer (SMO) and lead clinician of a deployed health facility. This narrative review seeks to highlight the skills and abilities EPs bring to the ADF, as well as opportunities for the future.

International military experience with emergency medicine

Other nations have been deploying military EPs for many years. United States (US) Army EPs contributed to health support during the US assault

on Panama (Operation Just Cause) in 1989.¹ Muck et al., in their review of EPs in the US military, reported that since 2001, Operation Iraq Freedom (OIF), Iraq and Operation Enduring Freedom (OEF), Afghanistan have been the first conflicts that EPs fully participated as an integral part of the military health system.² During these conflicts, the roles of the EPs have evolved, such that EPs are now the most frequently deployed medical specialists in the US Army and Airforce.³ In these conflicts, EPs have been deployed to Role 1, 2, 2E and 3 health facilities, leading resuscitation of major trauma cases, as well as managing non-battle casualties. Gerhardt et al. retrospectively reviewed data from a US battalion aid station (Role 1) which was augmented with EPs during a one-year deployment to Iraq.⁴ During this time, 85% of all battalion aid posts were clinically led solely by primary care physicians. Combat units served by an aid station with an EP had a battle casualty rate of 22.2% with a case-fatality rate of 7.1%. This can be compared to a theatre-wide battle casualty rate of 6.7%, and associated case-fatality rate of 10.5%. Although these data suggest an association between EPs working in a Role 1 and improved survival in the setting of a higher casualty load, as a retrospective study, the authors are unable to prove that the presence of EPs improved outcomes.

EPs have been frequently requested by US special operations forces to provide both clinical care in austere environments, as well as training of medics and medical support for mission planning. Approximately 40% of all US critical care aeromedical evacuation (AME) teams include EPs. These teams have enabled the rapid movement of severely injured soldiers out of theatre (93% arriving in Germany within 72 hours of injury), with a marked reduction in mortality.² EPs also provide value in command roles. Muck et al. reported that in the recent conflicts in Iraq and Afghanistan, EPs had significantly impacted military medical preparation, evacuation platforms and hospital commands in a way never previously experienced in US military history.²

While militaries should excel at managing battle casualties, data from all conflicts shows that non-battle casualties are numerically more significant. The ratio of deployed US service members hospitalised for disease and non-battle injuries (DNBI) to those with battle injuries has steadily reduced from 8.5 (WW1) to 2.4 (Vietnam); however, during OEF and OIF, DNBI casualties outnumbered battle casualties by a ratio of 3:1.⁵ EPs are ideally placed to help manage this workload alongside deployed general practitioners and the junior medical officer workforce.

Bebarta and colleagues reported on 1745 casualties managed by EPs in the emergency department (ED) of a Role 3 US military hospital deployed to Iraq from 2007–2008.⁶ Of those, 429 were diagnosed with emergent medical conditions and 203 with acute surgical pathology. Disposition of these patients is summarised in Table 1.

Table 1: Disposition of patients seen in the Emergency Department

Disposition	Emergent cases seen in ED (n = 632)
Discharged from ED	291 (46%)
Admitted to ward	180 (28%)
Admitted to ICU	106 (17%)
Admitted to operating room	34 (5%)
Died	10 (1.6%)

ED = Emergency Department, ICU = Intensive Care Unit. Adapted from Bebarta et al.⁵

Table 1 demonstrates that only a small minority (5%) were transferred to the operating room for surgery. The three most common diagnoses in the ED presentations were abdominal complaints (17%),

orthopaedic injuries (12%) and headache (6%). Emergent medical conditions included meningitis, pulmonary embolism, overdose, gastrointestinal bleeding, acute myocardial infarction, chest pain and atrial fibrillation. Of the emergent cases, 374 required laboratory work, 248 required x-rays, 226 required CT scans and 37 required ultrasound investigations. A small number of patients required procedures such as intubation, central venous access, procedural sedation, regional anaesthesia, joint or fracture reduction, and the use of advanced cardiac life support (ACLS) drugs and inotropes. These are all core skills and part of the standard EP scope of practice.

Training skills

The ACEM has provided structured training, standards and professional recognition for EPs in Australia and New Zealand since 1984. Despite the bulk of training occurring in the ED during the five-year training program, trainees are rotated to other specialties, including intensive care medicine, anaesthesia, surgical, paediatrics and general medicine including medical specialties. Optional special skills rotations may be completed in areas such as retrieval medicine, toxicology, psychiatry, hyperbaric medicine and general practice. During core terms in the ED, registrars undertake training in clinical care provision for a diverse range of presentations and procedures including trauma, critical illness, clinical teaching and management of the ED, all under the direct supervision and mentorship of EPs.⁷ The evolution of emergency medicine training has contrasted with that of specialties previously tasked with resuscitation. Anaesthetic training now mandates only a three-month module of critical care, and there is no requirement for emergency medicine exposure. Australasian intensive care training gives a six-month option of emergency medicine and six months of internal medicine. The differences in training may lead to differences in confidence and capability to manage the varied emergency presentations to a military health facility on operations or exercises.

Australasian emergency physicians in civilian practice

EDs are often challenging and busy environments. A 2017 survey of 39 ACEM-accredited EDs in Australasia found 7.16 million patients were collectively treated in that year.⁸ EPs are specialist generalists, who are not only trained to diagnose and manage a wide range of individual acute pathologies but adopt a team- and systems-based approach to acute healthcare delivery in order to maximise

efficiency and patient safety. In a modern ED, an EP may be guiding resuscitation of critically ill patients, dealing with fast-track patients, managing inpatients in the ED observation wards, as well as managing patients in remote locations through telemedicine. They are accustomed to operating in chaotic environments with limited clinical information, so flexibility and acceptance of the requirement to make decisions with limited information are essential personal attributes. The ACEM policy on clinical privileges demonstrates a wide potential scope of practice (see Appendix A).⁹

Specific roles

In most major hospitals, trauma teams have been established, and EPs typically lead the initial trauma response. They will oversee the initial resuscitation and management of seriously and critically injured patients, activate trauma teams and coordinate specialist team responses as required. In a military setting, the presence of specialist EPs will enable surgical teams to continue operative work while the routine workup of trauma patients continues. In one US study, surveyed surgeons were of the opinion that only surgeons should manage trauma patients on presentation. When asked about providing initial trauma care, only 60% of the surgeons surveyed felt comfortable with providing this initial care, compared to 84% of EPs surveyed.¹⁰

As well as major trauma, EPs are managing many less severe cases of trauma. They regularly provide safe procedural sedation to allow fractures to be aligned, dislocations reduced and lacerations repaired without patients needing admission and care in an operating theatre. In Australia, there are guidelines for both paediatric and adult procedural sedation in the ED.¹¹ In one prospective study, 2623 patients in 11 emergency departments received procedural sedation over a three-year period and by implication, substantially decreased demand for operating theatre time and post-theatre ward beds.¹²

EPs are also heavily involved in training and clinical mentoring of junior medical and nursing staff. Most EDs in Australasia have extensive training programs for both emergency medicine trainees and junior staff rotating through the ED. There are set training program requirements produced by the ACEM.⁷

The nature of emergency medicine experience and exposure has allowed for the evolution of other essential roles outside of the ED, including aeromedical retrieval services. This includes the provision of initial clinical advice to referring clinicians, the planning, coordination and conduct

of retrievals, as well as leading retrieval systems. The combined ACEM, Australian & New Zealand College of Anaesthetists and College of Intensive Care Medicine policy on the transport of the critically ill, stipulates that prehospital and retrieval medical staff need to have the prerequisite skills and knowledge to provide the highest level of care in these environments and for the patients they are likely to encounter.¹³

EPs undergo training and examination in leadership in disaster planning and training, with a significant number being leaders or members of Australian Medical Assistance Teams (AUSMATs). EPs have been deployed on every international AUSMAT deployment for at least 13 years, including Jogjakarta 2006, Pakistan 2010, Christchurch 2011, Tacloban 2013, Vanuatu 2015, Fiji 2016, Bangladesh 2017, PNG 2018 Samoa 2019 and PNG 2020. EPs as AUSMAT members were embedded for the entire ADF Pakistan Assist 2 deployment in 2010.¹⁴ EPs serving on maritime platforms, including ADF EPs, were deployed in teams in response to the summer 2019–2020 bushfire crisis in Australia. In April 2020, a combined AUSMAT/ADF team deployed to NW Tasmania to run a regional hospital ED as part of the COVID-19 response. This involved the deployment of both AUSMAT and ADF EPs. The ACEM policy on disaster health sciences emphasises that EPs should be involved in all aspects of disaster planning, management and patient care.¹⁵

Every major ED in Australia has an EP as the director (college requirement for training accreditation). This person will usually be managing one of the larger departments in a hospital (from a staffing perspective), as well as being one of the few departments that provides a dedicated 24/7 service to the community. Many EPs will have significant administrative roles that frequently focus on processes-of-care and quality assurance activities.

Up to 5% of all ED presentations are due to poisoning and envenoming.¹⁶ As such FACEM training has a heavy focus on this area. The majority of clinical toxicologists in Australia are EPs, supporting a national poisons information service, as well as the running of inpatient toxicology services in many hospitals. They are experts in the management of poisoned and envenomed patients and the use of antidotes and antivenoms, and many have specific training in chemical, biological, radiation and nuclear exposure in patients, and explosive (CBRN-E) threats. EP toxicologists are also extensively involved in the training of other clinicians, as well as research; textbooks have now standardised the approach to a poisoned patient for clinicians in Australasia.¹⁶

Evolution of emergency physicians contributions to the ADF

During the late 20th century, as the operational tempo for the ADF was increasing, some fulltime ADF ACEM advanced trainees and fellows began deploying to several military operations. The capability these doctors brought with them was recognised early by their commanders as providing a significant increase to the General Duties Medical Officer skill set that had been the previous standard.

Military deployments, including conflict, peacekeeping and humanitarian aid have occurred in locations such as East Timor, Solomon Islands, Iraq, Afghanistan, Indonesia and Pakistan. The roles EPs have filled included Regimental Medical Officer, Resuscitation Medical Officer, AME Medical Officer and SMO, as well as intensive care consultant. During these deployments, it has become increasingly clear that along with the generalist skill set of ACEM trainees and fellows, their advanced skills were useful in the provision of medical care to deployed troops.

It was also recognised that the skills and experience gained by ACEM trainees on operations, when appropriately supervised, was valuable. ACEM has notably approved Category T (special skills) accreditation for army emergency trainees serving two terms in the NATO Role 2 hospital in Afghanistan, in August 2011 and February 2016

The rapid expansion of the pool of ADF SERCAT 5 FACEMs since 2016 has seen EPs recurrently deployed on operations most commonly as resuscitation specialists in Role 2 facilities. Prior to this, completion of courses such as early management of severe trauma (EMST) had sufficed for posting into these roles. EPs are now recognised as an essential part of advanced resuscitation and shock/trauma teams deployed on exercises and operations.

Emergency physicians and the Australian Army

Within Army's R2E facility, EPs lead resuscitation and trauma teams and provide clinical leadership and mentoring for all clinicians in the ED. Other roles performed by EPs in the R2E include retrieval specialist and facility director of clinical services. The Army's R2LM (light manoeuvre) facility is a small, mobile resuscitation and surgical facility in which an EP provides similar clinical and leadership expertise to that found in civilian resuscitation rooms. EPs also provide similar clinical and leadership expertise to various army units such as special operations and regional force surveillance units that are

operationally active. Every Army medical officer during initial training (Medical Officers Introductory Course) receives a week's tuition and mentoring from EPs in skills such as assessment and management of battle casualties.

Emergency physicians and the Royal Australian Navy

The Royal Australian Navy (RAN) has increasingly recognised the importance of EP contributions to the ADF. With the acquisition of Landing Helicopter Dock (LHD) vessels HMAS *Canberra* and *Adelaide*, came the capability to provide Maritime Role 2E medical care in a dedicated facility at sea. This significantly enhanced capability is delivered onboard RAN ships by the Maritime Operational Health Unit (MOHU), a unit that augments the ships' posted medical crews in periods of increased operational tempo. Specialties assembled within the MOHU consist of emergency medicine, anaesthesia, surgical, intensive care medicine and AME. The EP role within this team is the provision of casualty reception, resuscitation and management of mass-casualty (MASCAL) events, and critical care retrieval and transfer. In other circumstances, where high acuity trauma is considered possible but unlikely, EPs may be deployed without the full complement of MOHU specialists.

The care of divers and submariners is another significant priority for clinicians within the navy context. ADF EPs are well placed to fill roles within the resuscitation phase of such an event pending definitive hyperbaric care by hyperbaric specialists, a role in which some EPs have subspecialised.

Emergency physicians and the Royal Australian Air Force

Royal Australian Airforce (RAAF) EPs, like Army EPs, work in their role of initial casualty assessment and treatment in the Air Force (AF) R2E facility, as well as often providing overall clinical leadership in the facility as director of clinical services. They also deliver key components of the new 'Resuscitative Surgical Capability' (RSC), a small eight-person, rapidly deployable and highly mobile advanced resuscitation and damage control surgery asset which can also integrate with a Role 2E. EPs are involved in training AME teams and serve as members of RAAF Military Critical Care AME Teams (MCATs) that undertake long-distance transfers of high-dependency and critically ill or injured patients. RAAF EPs have also been at the forefront of helping develop advanced military pre-hospital care capability and pre-veterinary Military Working

Dog (MWD) emergency care and AME. RAAF EP's are available to deploy with Army or Navy and have done so recently on exercise and deployments overseas.

There are other roles available to RAAF EP's along the managerial pathway within Director-General Health Reserves-Air Force (DGHR-AF) including clinical and regional director/deputy director positions. The most relevant clinical director role is CD Emergency Medicine and AME. The regional directors have a crucial role in recruiting, mentoring and integration with the regional health advisory groups (RHAG).

The future of emergency physicians in the ADF

EPs have a broad clinical scope in civilian practice and offer ADF a highly-skilled specialist workforce. The value of the EP has been increasingly identified by health commanders and has been reflected by aggressive recruitment to numbers that are now able to sustain essential operations realistically.

It is increasingly common for positions on deployment to be occupied by EPs independent of the service they represent. EPs from Army and RAAF have deployed onboard LHDs in support of MOHU and Navy AME. Navy and RAAF EPs have deployed with the Army to Afghanistan and Iraq. It may therefore be appropriate to recommend that all EPs within the ADF are trained to a common standard for essential activities such as hyperbaric, critical care transport and aviation medicine.

As the ADF continues to move to a joint-force and command model, EPs of all services are increasingly deploying side-by-side, as seen on Operation OKRA. During this deployment, EPs provided resuscitative care to critically ill patients, inpatient care, training and mentoring to deployed health personnel, from both Anzac forces and coalition militaries. These specialists, as the SMO on Operation OKRA provided specialist medical advice to commanders.

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The value of EPs might be enhanced with additional training for these specialists to further develop their understanding of the military procedures and command structure. EPs will need to actively engage with commanders at all levels to understand their needs as well as promote their skills and abilities in the ADF.

Conclusion

Emergency medicine is a relatively new and evolving specialty, characterised by a broad scope of practice, and the requirement of a range of procedural skills EPs have expertise in leading resuscitation and trauma teams, flexibility, leadership of multidisciplinary teams and time-critical decision-making abilities in chaotic environments with limited clinical information. ADF EPs are increasingly providing key clinical capabilities within Role 1, 2 and 2E facilities on exercises and overseas deployments, and have established the requirement for EP inclusion in the manning of future deployed facilities. Involvement of EPs in ADF technical and clinical governance at all levels will enable these specialists to provide advice to commanders as well as clinicians, and influence policy and future ADF health capability development.

Corresponding Author: Mark Little

Mark.Little@health.qld.gov.au

Authors: M Little¹, J Williams², A Holley², B Butson³, A Parkin⁴, D Ward⁵, C Balfour⁶, D Cooksley⁷, A Pearce^{8,9}

Author Affiliations:

1 Cairns Hospital

2 Royal Brisbane and Women's Hospital

3 Townsville Hospital

4 PA Hospital

5 Holy Spirit Northside

6 Medstar

7 Sunshine Coast University Hospital

8 Royal Adelaide Hospital

9 MedSTAR Retrieval Services

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Appendix A: ACEM POLICY ON PRIVILEGES FOR EMERGENCY PHYSICIANS. (www.acem.org.au)

The clinical privileges of an emergency physician extend to direct clinical patient care, the supervision of junior medical staff, clinical support duties and risk management activities. These activities include, but are not limited to, quality assurance, teaching, research and participation in activities that relate to the maintenance of professional standards, and professional College activities to further Emergency Medicine. Emergency Medicine is not solely practiced in the ED and, by the mutual agreement of the appropriate authority, emergency physician clinical privileges may extend outside the ED and may include:

- Clinical assessment of the deteriorating patients
- Clinical work in short stay units.
- Clinical work in diagnostic units.
- Clinical work in medical assessment units.
- Clinical work in toxicology services.
- Duties under the local Mental Health Legislation.
- Transporting patients outside the hospital premises such as interfacility transports.
- Clinical work in intensive care.
- Clinical work in rapid response teams (e.g. MET Call or Code Blue).
- 'Hospital in the Home'.
- Clinical work in telemedicine.
- Clinical work in other inpatient services as negotiated locally.
- The collection of medico-legal specimens or performing forensic medical examinations.
- Duties related to organ and tissue donation.
- Duties related to child protection.
- Outpatient services

Psychotropic Polypharmacy in Australian Vietnam War Veterans with Post-Traumatic Stress Disorder: A Descriptive Cohort Study

R Theal, S McLeay, J Gibson, B Lawford, R Mellor

Abstract

Background: Pharmacological management of complex psychological conditions and physical comorbidities in Vietnam veterans can be challenging, particularly when there are multiple prescribing clinicians.

Purpose: To investigate the incidence of psychotropic polypharmacy in a cohort of Australian Vietnam veterans with post-traumatic stress disorder (PTSD).

Methods: Subanalysis of data from a cross-sectional study of Vietnam veterans conducted at Gallipoli Medical Research Foundation from 2014–2015. Relationships between psychotropic polypharmacy and health outcomes were assessed, and anticholinergic burden scores calculated.

Results: Of 160 participants with PTSD, 107 (66.9%) were treated with psychotropic medications, with 53 (33.1%) prescribed two or more. The most common combination was antidepressants with anxiolytics (21.5% of those treated). Polypharmacy was significantly associated with PTSD symptom severity ($p < 0.01$), comorbid depression ($p < 0.05$) and current suicidality ($p < 0.01$). Anticholinergic burden scores ranged from 0–7, with 37.5% of participants classed as medium risk (score = 1–2) and 16.9% as high risk (≥ 3).

Conclusion: Psychotropic polypharmacy prevalence in Australian Vietnam veterans with PTSD is high. This condition is commonly refractory to pharmacotherapeutic intervention, often leading to trials of combination therapy without supportive scientific evidence. Further research would be beneficial in evaluating potential efficacy versus harm of combination therapies to assist in rationalising prescription of multiple medications.

Conflict of Interest: No conflicts of interest to declare.

Introduction

Post-traumatic stress disorder (PTSD) is a complex mental health condition that can develop after exposure to a traumatic event, characterised by intrusive memories, significant changes in mood and behaviour and avoidance of reminders of the traumatic event.¹ Australian guidelines recommend evidence-based trauma-focused psychological treatments (TFPs) as first-line therapy for PTSD, followed by pharmacotherapy as second-line treatment when patients are unable or unwilling to engage in psychotherapy, have severe comorbidities or insufficient response to psychotherapy.²

However, these guidelines are limited for the use of psychotropic medications in treating PTSD. Although selective serotonin reuptake inhibitors (SSRIs) are

recommended as the first choice of psychotropic drug class for PTSD treatment, there is insufficient evidence to recommend one SSRI over another or for the indication of other drug classes.²

Where SSRIs are not effective, new generation and older tricyclic antidepressants are recommended as second-line pharmacotherapy, with the addition of an antipsychotic, as adjunctive medication may be indicated when symptoms have not responded adequately.² However, there is insufficient evidence to recommend antipsychotics in general practice settings.³ Benzodiazepine use in this patient population is associated with harm, and only one drug (paroxetine) is approved for the treatment of PTSD by the Therapeutic Goods Administration (TGA) in Australia.

The absence of compelling evidence for the efficacy of medications and lack of approved options presents a prescribing challenge for clinicians, often further complicated by numerous psychological and physical comorbid conditions. Thus, the likelihood of psychotropic polypharmacy (i.e. concomitant prescription of multiple psychotropic medicines) in patients with PTSD is high, especially when several prescribing clinicians are involved in a patient's care.

Polypharmacy increases the risk of adverse drug events and drug interactions⁴ leading to increased morbidity and mortality. In older individuals, psychotropic polypharmacy is further complicated by reduced drug clearance capacity, multiple coexisting pathologies and overall polypharmacy. In one United States (US) study, 50% of veterans over 65 years had at least one prescribing problem such as high-risk prescribing, adverse drug-drug or drug-disease interaction,⁴ while another found over one-third of veterans with PTSD were on two psychotropic medications, with 10% on three or more.⁵

The prevalence of any psychotropic polypharmacy in the general Australian population has been reported to be up to 15%, with the most common class combinations including benzodiazepines.⁶ In Australian veterans, previous studies have reported on the prevalence of antidepressant-related drug interactions⁷ and analgesic use in veterans with musculoskeletal pain,⁸ but data on overall psychotropic prescribing for PTSD is lacking. This study aimed to investigate the incidence of psychotropic polypharmacy in a cohort of Australian Vietnam veterans with PTSD, to evaluate the appropriateness of medication prescription based upon current Australian clinical guidelines, and to determine the clinical risk associated with polypharmacy.

Methods

Data were available from the PTSD Initiative study⁹ performed at Gallipoli Medical Research Foundation (GMRF), Brisbane, Australia, between 2014 and 2015. Participants were male veterans who had served in the Australian or New Zealand armed services in Vietnam during the Vietnam War. Participants were recruited via the veteran mental health unit at Greenslopes Private Hospital, online advertising, print media and word of mouth. All participants provided written informed consent.

PTSD diagnosis was determined by specialist psychiatric evaluation using DSM 5 criteria. Major depressive disorder (MDD), generalised anxiety disorder (GAD), alcohol and substance abuse, and suicide risk were determined using the Mini International Neuropsychiatric Interview (MINI).¹⁰

Excessive alcohol consumption and alcohol use disorders were also screened for using the Alcohol Use Disorders Identification Test (AUDIT)¹¹ and general medical screening questionnaires. Sleep disturbances were determined by a structured sleep history questionnaire.¹² Daytime sleepiness was assessed with the Epworth Sleepiness Scale (ESS).¹³ Cognitive functioning and impairment were screened with the Montreal Cognitive Assessment (MoCA).¹⁴ Diagnosis of comorbid medical conditions were determined through medical screening questionnaires.

Symptoms of PTSD, depression, anxiety and stress were assessed using the Clinician-Administered PTSD Scale for Diagnostic and Statistical Manual of Mental Disorders-5 (CAPS-5)¹⁵ and the Depression, Anxiety, Stress Scale-21 (DASS-21).¹⁶

Current medication lists were obtained from participants, who were also asked to report the indication for each drug—where known. Medications were coded according to their Anatomical Therapeutic Chemical Classification (ATC) class¹⁷ with specific interest in medications used for the nervous system (code N), excluding anaesthetics (N01). Lithium (N05AN) was considered its own class, and to more accurately determine within-class polypharmacy, all benzodiazepines within the hypnotic and sedative class (N05CD) were included with anxiolytics (N05B). Certain cardiovascular-related drugs known to be prescribed off-label for anxiety disorders were also assessed, including beta-blockers (C07A) and prazosin (C02CA01).

Relationships between psychotropic polypharmacy and several health outcomes (PTSD severity, daytime sleepiness, cognitive impairment, depression, stress and anxiety severity, and previous treatment) were determined by Fisher's exact test or linear regression analysis, where appropriate. Anticholinergic burden scores were calculated as a measure of anticholinergic side-effect risk, based upon medication lists.¹⁸

The study was approved by the Greenslopes Research and Ethics Committee (13/53), the Department of Veterans' Affairs (014/002), The University of Queensland (2014000174), and the Queensland University of Technology (9339361).

Results

Demographics

Of the 299 enrolled participants who underwent psychiatric evaluation (Figure 1), 160 were diagnosed with PTSD. Mean age of participants was 68.5 (SD, 4.2) years, with a mean CAPS-5 score of 15.7 (9.8) (Table 1).

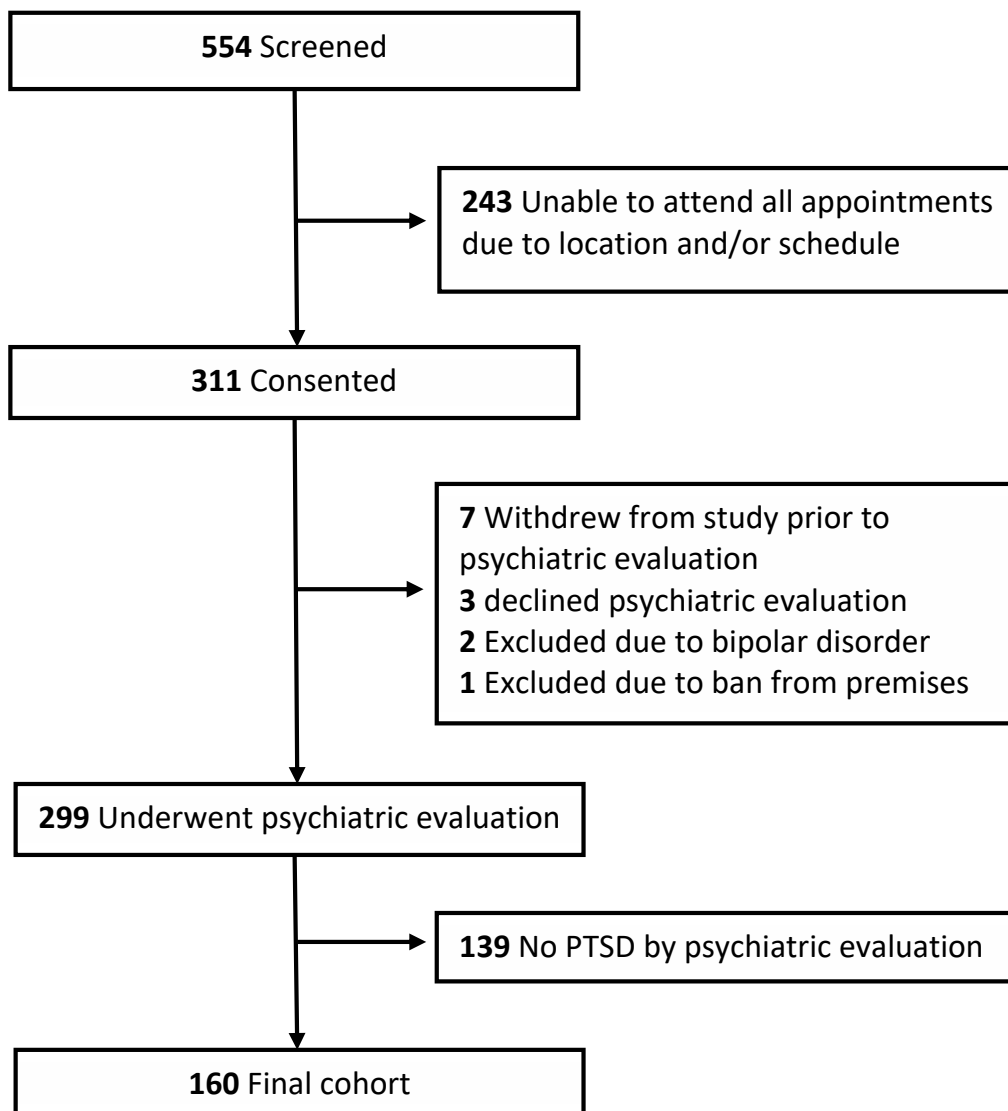


Figure 1. Study Design

Table 1. Participant demographics

Demographic		Mean \pm SD (range), or n (% participants)
Age (years) ^a		68.5 \pm 4.2 (60-88)
CAPS-5 total symptom score ^a		15.7 \pm 9.8 (0-56)
Highest education level	University	36 (22.5%)
	Year 11-12	34 (21.2%)
	Year 10	29 (18.1%)
	<Year 10	27 (16.9%)
	Vocational	32 (20%)
	Not reported	2 (1.2%)
Total number of any medications		5.9 \pm 3.9 (0-16)
Number of participants with >5 medications		80 (50%)
Number of psychotropic medications	0	53 (33.1%)
	1	54 (33.8%)
	2	32 (20.0%)
	3	9 (5.6%)
	4	9 (5.6%)
	5	3 (1.9%)
Ever sought help from ^b	Psychologist	66 (41.2%)
	Psychiatrist	115 (71.9%)
	Both psychologist & psychiatrist	62 (38.8%)
Comorbid	Major depression	22 (13.8%)
	Generalised anxiety disorder	12 (7.5%)
	Epilepsy (any past diagnosis)	6 (3.8%)
	Parkinson's disease	0 (0%)
	Obstructive sleep apnoea	67 (41.9%)
	Regular pain	86 (53.8%)
Sleep Disturbance	Nightmares	142 (88.8%)
	Self-reported poor sleep	103 (64.4%)
DASS-21 scores ^c	Depression score	6.4 \pm 5.0 (0-21)
	Anxiety score	6.2 \pm 4.5 (0-20)
	Stress score	10.4 \pm 4.8 (0-21)
Current suicide risk		31 (19.4%)
Alcohol use	Abuse	3 (1.9%)
	Dependence	22 (13.8%)
	For sleep	26 (16.2%)
AUDIT score category	Low (0-7)	86 (53.8%)
	Risky (8-15)	55 (34.4%)
	High (16-19)	12 (7.5%)
	High, likely dependent (\geq 20)	7 (4.4%)
Substance use	Abuse	0 (0%)
	Dependence	1 (0.6%)
MoCA ^c		26 \pm 2.6 (19-30)
ESS	Total score	8.9 \pm 5.4 (0-24)
	Score \geq 10 (excessively sleepy)	60 (37.5%)

^aFrom n=159; ^bIncomplete data; ^cfrom n=158

Supplementary Table S1. Drug combinations (any polypharmacy)

	Opioids	Anti-epileptics	Anti-parkinson	Anti-psychotics (excluding lithium)	Anxiolytics (includes benzo-diazepines)	Hypnotics & Sedatives	Anti-depressants	Psycho-stimulants	Lithium
Opioids	1 (0.9%)	3 (2.8%)	-	3 (2.8%)	5 (4.7%)	2 (1.9%)	9 (8.4%)	-	-
Anti-epileptics	3 (2.8%)	-	-	3 (2.8%)	2 (1.9%)	-	11 (10.3%)	-	1 (0.9%)
Anti-parkinson	-	-	-	-	1 (0.9%)	-	2 (1.9%)	-	-
Anti-psychotics (excluding lithium)	3 (2.8%)	3 (2.8%)	-	-	5 (4.7%)	4 (3.7%)	14 (13.1%)	-	1 (0.9%)
Anxiolytics (including benzo-diazepines)	5 (4.7%)	2 (1.9%)	1 (0.9%)	5 (4.7%)	3 (2.8%)	4 (3.7%)	23 (21.5%)	-	-
Hypnotics & Sedatives (excluding benzo-diazepines)	2 (1.9%)	-	-	4 (3.7%)	4 (3.7%)	-	10 (9.3%)	-	-
Anti-depressants	9 (8.4%)	11 (10.3%)	2 (1.9%)	14 (13.1%)	23 (21.5%)	10 (9.3%)	10 (9.3%)	1 (0.9%)	1 (0.9%)
Psycho-stimulants	-	-	-	-	-	-	1 (0.9%)	-	-
Lithium	-	1 (0.9%)	-	1 (0.9%)	-	-	1 (0.9%)	-	NA

Note: Values presented as count (% total treated, n=107). Counts of zero are given as “-” for ease of reading. Shaded cells: within-class polypharmacy.

Participants were prescribed an average number of 5.9 (3–9) medications and had previously sought help for their mental health more frequently from a psychiatrist rather than psychologist (71.9% vs 41.2%; Table 1). Almost half had an AUDIT score in the risky or high categories (46.2%), with 16.2% using alcohol to help get to sleep, and 13.8% diagnosed as currently alcohol dependent, while other substance use was low.

According to the MINI, 13.8% had current, recurrent or melancholic comorbid MDD, and 7.5% had GAD (Table 1). Almost 1 in 5 (19.4%) had a current suicide risk. Over half (53.8%) reported suffering recurring pain, and 41.9% had been previously diagnosed with obstructive sleep apnoea (OSA).

Psychotropic polypharmacy

Of the 160 PTSD participants, 107 (66.9%) were prescribed psychotropic medications, with 53 (33.1%) prescribed two or more (Table 1). Polypharmacy was significantly associated with CAPS total symptom

severity score ($p<0.01$) and comorbid depression ($p<0.05$), but not comorbid GAD. There was no significant difference in psychotropic polypharmacy rate between those who had sought help from a psychiatrist and those who had not; however, there was an increased odds ratio of 3.0 (95% CI 1.5-6.4) of polypharmacy for those who had previously sought treatment from both a psychologist and psychiatrist.

Antidepressants were the most commonly prescribed psychotropic class (86.0% of those treated), followed by anxiolytics (23.4%; Table 2). Antiepileptics, antipsychotics, opioids, hypnotics and sedatives were all prescribed at similar rates (11.2-15.9%). Of those prescribed antidepressants, almost 70% were taking a single SSRI or serotonin-norepinephrine reuptake inhibitor (SNRI; $n = 61$). The remaining veterans ($n = 17$, 18.5%) were prescribed mirtazapine ($n = 4$), amitriptyline ($n = 3$) tricyclic ($n = 3$) or atypical antidepressants ($n = 1$), monoamine oxidase inhibitors ($n = 12$) or were taking two antidepressants ($n = 10$, 10.8%).

Table 2. Number of psychotropic medications prescribed within each class

Drug class	ATC code	n	% Pharmacotherapy treated participants with PTSD (n=107)	(% Total participants with PTSD [n=160])
Antidepressants	N06A	92	86.0%	(57.5%)
Hypnotics & Sedatives (excluding benzodiazepines (N05CD))	N05C	12	11.2%	(7.5%)
Antiepileptics	N03A	17	15.9%	(10.6%)
Antipsychotics (excluding lithium)	N05A	16	15.0%	(10%)
Opioids	N02A	15	14.0%	(9.4%)
Anxiolytics (including benzodiazepines (N05CD))	N05B	25	23.4%	(15.6%)
Antiparkinson	N04	2	1.9%	(1.3%)
Psychostimulants	N06B	1	0.9%	(0.6%)
Dementia	N06D	1	0.9%	(0.6%)
Lithium	N05AN	1	0.9%	(0.6%)

Note: No participants were on migraine medications (N02C), and those on other analgesics (N02B, n=36) were either on paracetamol (PRN for pain) or low-dose aspirin (for cardiovascular reasons). Only one person was on a drug classed in other nervous system drugs (N07), which was varenicline for nicotine addiction (N07BA03).

Supplementary Table S2. Two class or within-class polypharmacy (2 prescribed psychotropic medications)

	Opioids	Anti-epileptics	Anti-parkinson	Anti-psychotics (excluding lithium)	Anxiolytics (includes benzodiazepines)	Hypnotics & Sedatives	Anti-depressants	Psycho-stimulants
Opioids	-	1 (0.9%)	-	-	1 (0.9%)	1 (0.9%)	2 (1.9%)	-
Anti-epileptics	1 (0.9%)	-	-	-	-	-	5 (4.7%)	-
Anti-parkinson	-	-	-	-	-	-	1 (0.9%)	-
Anti-psychotics (excluding lithium)	-	-	-	-	-	-	1 (0.9%)	-
Anxiolytics (includes benzodiazepines)	1 (0.9%)	-	-	-	-	-	10 (9.3%)	-
Hypnotics & Sedatives	1 (0.9%)	-	-	-	-	-	4 (3.7%)	-
Anti-depressants	2 (1.9%)	5 (4.7%)	1 (0.9%)	1 (0.9%)	10 (9.3%)	4 (3.7%)	2 (1.9%)	1 (0.9%)
Psycho-stimulants	-	-	-	-	-	-	1 (0.9%)	-

The most commonly prescribed combination of psychotropic medications was antidepressants with anxiolytics (21.5% of those treated for PTSD), followed by antidepressants plus antipsychotics (13.1%), antiepileptics (10.3%), or hypnotics and sedatives (9.3%). Opioids were prescribed with antidepressants in 8.4% of the treated population, and combinations of hypnotics/sedatives with an antipsychotic (3.7%) or anxiolytic (3.7%) (Supplementary Table S1).

Within-class polypharmacy was most common for antidepressants, with 9.3% of those treated prescribed two antidepressants (80% also on an additional class of psychotropic; Supplementary Tables S1 and S2). Table 3 presents all within-class combinations. The most common combinations included an SSRI or TCA with mirtazapine (Supplementary Table S3).

Table 3. Within-class polypharmacy drug combinations

Class	^a Total	Drug combinations (n)	Indication	Comorbid disease
Opioids	1	Paracetamol/codeine + oxycodone/naloxone (1)	Pain + Peripheral neuropathy	GAD, MDD, OSA
Antidepressants	10	Agomelatine + mianserin (1)	PTSD + PTSD	-
		Amitriptyline + escitalopram (2)	NR + NR	-
		Doxepin + venlafaxine (1)	Sleep + NR	-
		Mirtazapine + desvenlafaxine (3)	NR + NR	OSA
			Dep + Dep	OSA
		Mirtazapine + duloxetine (1)	NR + NR	OSA
		Mirtazapine + escitalopram (1)	NR + NR	MDD, Suicide risk, OSA
		Mirtazapine + venlafaxine (1)	NR + NR	MDD, Suicide risk, OSA
		Dep + Dep	Suicide risk, OSA	
		NR + NR	GAD, OSA	
Anxiolytics	1	Diazepam + oxazepam (1)	NR + Sleep	-
		Diazepam + flunitrazepam (1)	Sleep + Sleep	Suicide risk, OSA,
		Flunitrazepam + buspirone (1)	Sleep + NR	OSA

GAD = Generalised anxiety disorder; MDD = Major depression disorder; NR = not reported; OSA = Obstructive sleep apnoea

Supplementary Table S3. Three or more class or within-class polypharmacy, including a list of drug combinations, presented in order of prevalence

3 class or within-class combinations (n=9)					n	Drug combinations
Antidepressant (n=8)	+ Anxiolytic (n=5)	+ Opioid		2	Fluoxetine + diazepam + oxycodone/naloxone; Moclobemide + lorazepam + paracetamol/codeine	
		+ Anxiolytic		1	Escitalopram + diazepam + oxazepam	
		+ Antipsychotic		1	Venlafaxine + oxazepam + seroquel	
	+ Hypnotic/sed		1	Mirtazapine + diazepam + zopiclone		
	+ Antiepileptic (n=2)	+ Opioid		1	Duloxetine + perindopril + paracetamol/codeine	
+ Antipsychotic		1	Fluvoxamine + pregabalin + quetiapine			
	+ Antidepressant (n=1)	+ Antiepileptic		1	Escitalopram + mirtazapine + lamotrigine	
Anxiolytic (n=1)	+ Anxiolytic	+ Antiepileptic		1	Diazepam + flunitrazepam + valproate	
4 class or within-class combinations (n=9)					n	Drug combinations
Antidepressant (n=9)	+ Anxiolytic (n=5)	+ Antidepressant (n=4)	+ Antiepileptic	1	Escitalopram + diazepam + amitriptyline + pregabalin	
			+ Antiparkinson	1	Desvenlafaxine + nitrazepam + mirtazapine + ropinirole	
			+ Antipsychotic	1	Venlafaxine + temazepam + doxepin + quetiapine	
		+ Hypnotic	1	Venlafaxine + diazepam + mirtazepine + zopiclone		
		+ Anxiolytic	+ Opioid	1	Sertraline + buspirone + flunitrazepam + buprenorphine	
	+ Antipsychotic (n=4)	+ Hypnotic/sed (n=3)	+ Antidepressant	1	Escitalopram + quetiapine + zopiclone + amitriptyline	
			+ Anxiolytic	1	Escitalopram + risperidone + zopiclone + diazepam	
			+ Opioid	1	Venlafaxine + pericyazine + zopiclone + tramadol	
		+ Lithium	+ Antiepileptic	1	Desvenlafaxine + quetiapine + lithium + carbamazepine	
5 class or within-class combinations (n=3)					n	Drug combinations
Antidepressant (n=3)	+ Antipsychotic	+ Antidepressant (n=2)	+ Anxiolytic	+ Hypnotic/sed	1	Desvenlafaxine + quetiapine + mirtazepine + oxazepam + zopiclone
				+ Opioid	1	Mianserin + pericyazine + agomelatine + flunitrazepam + oxycodone
		+ Antiepileptic	+ Opioid	+ Opioid	1	Amitriptyline + chlorpromazine + gabapentin + oxycodone/naloxone + panadeine forte

Table 4. Reported off-label drug use

Class	^a Total Prescribed	Drug	Indication
Antiepileptic	2 (11.2%)	Valproate (2)	PTSD
Antipsychotics	5 (33.3%)	Pericyazine(1), quetiapine (1) Quetiapine (2) Risperidone (1)	PTSD Sleep Anxiety/Depression
Opioids	1 (6.7%)	Oxycodone/naloxone (1)	Sleep
Anxiolytics	10 (71.4%) ^a	Alprazolam (1), buspirone (1), diazepam (4), lorazepam (1), oxazepam (3)	Sleep

^a From total participants prescribed benzodiazepines not indicated for sleep

When two psychotropics were prescribed, the most common class combination was an antidepressant with an anxiolytic (9.3%) or antiepileptic (4.7%; Table 4). For psychotropic polypharmacy of \geq three ($n=21$), the most common combinations included an antidepressant and anxiolytic (13/ 21; 61.9%) or two antidepressants (8/ 21; 31%) (Supplementary Table S3). Antipsychotics were also commonly included in the multi-drug regimens (10/21; 47.6%), and most commonly when ≥ 4 psychotropics were prescribed.

Indications and off-label use

Drug indications were reported by participants for 56.5% of psychotropic prescriptions, excluding antidepressants. Remaining drug indications were unknown or not reported. Where reported—within antiepileptic, antipsychotic, opioid and anxiolytic drug classes—6.7% to 71.4% of prescriptions were used off-label (Table 4). Sleep difficulties (77.8%) and PTSD (16.7%) were the most common indications for the use of off-label prescriptions.

Eleven (6.9%) participants were taking a beta-blocker and 5 (3.1%) were on prazosin. Although more than half of veterans taking beta-blockers did not report the indication ($n=6$), all reported hypertension, previous myocardial infarction (MI) or angina, suggesting that beta-blockers were most likely prescribed for cardiovascular dysfunction.

Side effects

No association was found between psychotropic polypharmacy and sleepiness (ESS) or cognition (MoCA) scores (both $p>0.05$).

Contraindications

Of the 22 participants who were alcohol dependent, 5 (22.7%) were prescribed benzodiazepines (4 used alcohol to get to sleep and had OSA, and 3 were suicidal), and one was on an opioid (tramadol).

Only one participant was considered to have substance dependency, whose medications included buprenorphine for chronic pain. Those who were suicidal were significantly more likely to have psychotropic polypharmacy ($p<0.01$).

Anticholinergic burden

Anticholinergic burden scores ranged from 0–7, with over half of participants scoring one or more: 37.5% with a medium risk score of 1–2, and 16.9% with a high-risk score of ≥ 3 .

Discussion

In this small cohort of Australian Vietnam veterans with PTSD, the prevalence of psychotropic polypharmacy was over twice that of the general Australian population; 33.1% compared to 15%.⁶ Additionally, half of the veterans with PTSD were prescribed more than five medications of all classes. The high prevalence of psychotropic (and overall) polypharmacy highlights the complex prescribing challenges for this patient group, who often present with comorbid psychological disorders, chronic pain and sleep disorders. Unsurprisingly, this study demonstrated a significant association between psychotropic polypharmacy and increased PTSD severity, comorbid MDD and increased suicide risk. Pharmacological therapy for PTSD also presents challenges for clinicians due to a lack of drugs approved for the treatment of PTSD, and limited research on concurrent use of multiple drugs.^{19, 20}

Antidepressants were the most common class of medication included in polypharmacy combinations, in contrast to the general Australian population, for whom benzodiazepines are most common.⁶ Anxiolytics (including benzodiazepines) were most frequently added to antidepressants. Concurrent with Australian and international guidelines, the majority of participants on antidepressants were prescribed first-line or second-line

pharmacotherapy recommendations. In some cases, two antidepressants were prescribed; however, these cases were possibly more complex as most were also prescribed additional classes of psychotropic medications. While treatment course was unknown, it is probable that participants taking second-line antidepressants, antipsychotics and multiple classes of psychotropic medications did not respond to first-line PTSD treatment recommendations.

Although antipsychotics may be considered for patients with poor response to pharmacotherapy, international guidelines²¹ do not recommend using antipsychotic medications due to insufficient evidence and the risk of potentially serious side effects. Nonetheless, off-label antipsychotic use is commonplace in individuals with PTSD.¹⁹ The most common indications for antipsychotics and other off-label prescriptions in this cohort were sleep difficulties and PTSD. Similarly, in the US, sleep was one of the most common reasons for the use of second-generation antipsychotics in veterans with PTSD.²²

In this study, participants reported experiencing nightmares (88.8%), not sleeping well (64.4%), feeling excessively sleepy (37.5%), and 41.9% had a previous diagnosis of OSA. Gold-standard treatment of PTSD may help improve sleep-related symptoms, but often does not resolve sleep disturbance completely,²³ potentially resulting in increased polypharmacy and prescribing off-label drugs. In this cohort, sleep problems were indicated for almost one-third of the total reported psychotropic drug indications. Furthermore, sleep problems were indicated for approximately 70% of reported off-label drug use. Despite this, there is a lack of randomised controlled trials comparing or combining pharmacological and behavioural therapies for insomnia in this population.¹⁹

Almost one-quarter of psychotropic pharmacotherapy treated participants reported taking anxiolytics including benzodiazepines, and when duration was reported for benzodiazepine and hypnotic drug treatment for sleep, most reported many years of use (2–42 years), in contrast to current guidelines.^{2,24} Benzodiazepine use exceeding one month is not recommended,² and long-term use is associated with physical dependence, increased risk of falls, negative impact on cognitive function and increased risk of dementia.²⁵ Withdrawal from benzodiazepines can also result in serious side effects and requires careful monitoring. In the US, benzodiazepine use is discouraged in veterans with PTSD due to lack

of evidence for their efficacy and significant side effects.²¹ Benzodiazepines have been associated with increased PTSD severity, depression, aggression and poorer outcomes following psychotherapy in patients with PTSD.²⁶

In addition to antipsychotic and benzodiazepine-related adverse effects, drugs including certain antidepressants and opioids contribute to overall anticholinergic burden resulting in an increased risk of cognitive impairment, falls and mortality.¹⁸ In our cohort, over half of the participants had a medium or high risk of anticholinergic adverse drug-related events based on the anticholinergic burden score.¹⁸ Consideration of anticholinergic burden and other drug-drug or drug-disease interactions is challenging when receiving care from multiple clinicians and is particularly relevant for patients unaware of the indication for which a medication is prescribed. In this cohort, only 55% of patients reported the indication for their prescription, suggesting a lack of patient knowledge surrounding their prescriptions. The Australian Government's digital health record system allows access to patient health records and prescription history; however, it is not inclusive of all medical records due to significant patient opt-outs and missing historical data. Therefore a thorough medical history is essential prior to prescribing new drugs, particularly benzodiazepines or anticholinergic medications for patients with PTSD; specifically in those with comorbid sleep or substance use disorders.

This is the first study reporting overall psychotropic medication use in Australian Vietnam veterans with PTSD. Inclusion of comorbid diagnoses and actual polypharmacy rates are major strengths of the study, as previous studies using government prescribing data generally have not reported comorbid conditions, make assumptions on medication use based on prescription data and may not capture non-subsidised prescribing. Furthermore, this study provided data on drug indications, demonstrating a significant proportion of off-label drug use.

A limitation of this study was that daily dose information was not captured; therefore, we were unable to use more complex drug interaction risk calculators. Although treatment duration was recorded for some prescriptions, longitudinal prescription data were unavailable, precluding the ability to assess treatment course. Future studies would benefit from collecting more detailed prescription dose and frequency data. Longitudinal studies may also be valuable to identify patterns in pharmacotherapy for treatment-resistant PTSD.

Conclusion

This small cohort of Australian Vietnam veterans with PTSD had a high prevalence of psychotropic and overall polypharmacy despite limited evidence supporting the efficacy of psychotropic medications for the treatment of PTSD. A significant proportion of patients were prescribed medications with little efficacy and associated with harmful outcomes for off-label indications. Further research is required to provide improved prescribing guidelines, particularly in complex, treatment-resistant PTSD cases. Development, assessment and promotion of user-friendly drug or psychological alternatives for PTSD treatment are paramount.

Acknowledgements

This paper is presented on behalf of the PTSD Initiative at the Gallipoli Medical Research Foundation and is a subanalysis of the data derived from a larger funded body of work. The Queensland Branch of

the Returned and Services League of Australia (RSL) funded the PTSD Initiative, Sullivan Nicolaides Pathology and Queensland X-Ray provided in-kind support, and the Australian Government Department of Veterans' Affairs provided transport for eligible participants.

Corresponding Author: R Mellor

MellorR@ramsayhealth.com.au

Authors: R Theal¹, S McLeay¹, J Gibson²,

B Lawford^{2,3,4}, R Mellor¹

Author Affiliations:

1 Gallipoli Medical Research Foundation, Veterans Mental Health Institute

2 Greenslopes Private Hospital, Keith Payne Unit

3 Queensland University of Technology, Faculty of Health and Institute of Health and Biomedical Innovation

4 University of Queensland Faculty of Medicine and Biomedical Sciences

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Post-Traumatic Stress Disorder and Killing in Combat: A Review of Existing Literature

V Aldridge, H Scott, R Paskell

Abstract

Background: Killing during combat is a unique experience and, for the majority, is limited to military service. For those working with military and veteran populations, it is essential to be able to understand this experience and any psychological ramifications.

Purpose: This review provides a synthesis of existing literature, addressing the specific question: what is known about the relationship between post-traumatic stress disorder and killing in combat? It summarises what is known of the relationship between these variables and the clinical implications of these findings.

Method: A search of existing literature was conducted in a systematic manner in 2017 using electronic databases. A critical appraisal tool was used to inform data extraction and guide the literature review.

Results: The literature suggests that those who kill during combat are more likely to report symptoms of PTSD; however, disparity exists as to the statistical significance of this relationship. Factors such as gender and victim characteristics may be influencing factors.

Conclusion: The impact of killing during combat must be considered when working therapeutically with military and veteran populations. Future research should aim to recruit military participants from different populations and address some of the difficulties with recruitment—ensuring samples are representative and generalisable.

Key words: Post-traumatic stress, combat, killing, military, veteran

Conflict of interest and acknowledgements: This literature review was completed within the context of a research article thesis submission as partial requirement for the professional doctorate in clinical psychology under the supervision of Dr Helen Scott, Staffordshire University and Dr Rachel Paskell, Avon and Wiltshire Mental Health Partnership Trust. There was no funding for this project, and there are no conflicts of interest.

Introduction

Military trauma is reported to result in higher levels of psychological distress than other traumatic events.¹ Post-traumatic stress disorder (PTSD) is one possible consequence faced by those from all nations of experiencing military trauma. Recent literature identified that 20% of Australian veterans and 17% of United Kingdom (UK) veterans, who had deployed overseas, met criteria for PTSD.² In a United States (US) study of Iraq war veterans, 17% were found to meet criteria for PTSD.³

A recent UK paper identified that rates of PTSD, common mental disorders and alcohol misuse are higher amongst veterans who deployed to conflicts when compared with those who did not deploy⁴

suggesting that deployment is a factor that increases the risk of mental disorders. Active deployment is expected to increase the risk of exposure to a traumatic event and therefore, subsequent mental health difficulties. Exposure to more intense combat¹ and exposure to life-threatening situations⁵ are known combat-related risk factors for PTSD. These types of trauma events support a more traditional view that PTSD develops from a fear-based trauma. However, more recent evidence demonstrates that PTSD encompasses many different emotions, for example, guilt, shame and anger, not solely fear.⁶ This has led to changes in how PTSD is classified—the Diagnostic and Statistical Manual (DSM-5) removed PTSD from the anxiety disorder classification and placed it under its own category titled ‘Trauma and Stressor-related Disorders’.⁷

Research into PTSD and the origins of psychological distress in combat veterans supports this notion. Several stressor types that do not constitute life-threatening situations have been found to correlate with PTSD; such as witnessing atrocities, the loss of close friends and the act of killing.⁸ Carrying out a traumatic act, such as killing in combat, has been identified as equally psychologically damaging when compared to being subjected to trauma.⁹ Clinicians began to notice that engaging in killing had a psychological impact on the veteran population as early as the 1970s.¹⁰

Despite being trained to kill, evidence suggests that the act of killing in combat can cause significant psychological distress. The impact of psychological distress is reflected in the high rates of suicide in this population. The United States Department of Veterans Affairs¹¹ estimated 22 veterans died by suicide every day in the year 2010; accounting for 22.2% of all suicides in the US that year. Litz et al. sought to explain some of the intricacies present in the psychological distress of combat veterans. They concluded that psychological distress occurs due to an internal conflict that arises when actions 'transgress deeply held moral beliefs',¹² that is, the event violates the moral beliefs and expectations that the person has.¹³ This is often referred to in the literature as a moral injury. Litz et al. assert that inner conflict often leads to feelings of guilt and shame.¹² A recent review identified the role of shame in suicide risk in a US help-seeking veteran population, concluding that shame accounted entirely for the effects of PTSD on suicidal ideation.¹⁴ This raises questions about what risk factors are involved, that means those with PTSD also experience shame. Given the theoretical assumptions that Litz et al. present, shame is assumed to be present for those who carry out transgressive acts, such as killing.¹² To understand the complexities of this relationship fully, it is essential to explore the factors involved in the relationship between PTSD and killing.

The psychological distress caused by PTSD can have a long-term impact on veterans and cause difficulties when adjusting back to civilian life.¹⁵ Individuals with military-related PTSD have been shown to have a higher tendency for isolation,¹⁶ less social inclusion,¹⁵ and heightened aggression.¹⁷ In a study of Iraq and Afghanistan combat veterans receiving medical care, an estimated 25–56% reported difficulties with social functioning, productivity, community involvement and self-care.¹⁵ Sayer et al. importantly note that many of these identified difficulties lie outside the traditional role of healthcare,¹⁵ therefore, highlighting the need for professionals to be trained specifically to work with the complexities present in this population.

Studies have shown that while deployment increases the risk of PTSD, there are protective post-traumatic factors. In a study of US active-duty military personnel, PTSD symptoms were less likely to occur when support was received from individual, family and community sources.¹⁸ Specifically, self-efficacy, family coping, spouse/partner support, financial resources and religious participation, all moderated the relationship between stressful deployment experiences and PTSD symptoms.¹⁸ It is important to note that not all ex-serving personnel will struggle with PTSD.

This review aims to provide a synthesis of existing literature, addressing the specific question: what is known of the relationship between post-traumatic stress disorder and killing in combat? For this purpose, the focus is on serving military and veteran populations. Killing during combat is a unique experience and, for the majority, is limited to military service. Therefore, clinicians working with this population must understand the psychological factors involved in military-related PTSD.

Method

Search strategy

A systematic search of existing literature was conducted. Several databases were selected through the following host websites: EBSCOhost, Web of Science and Cochrane. The databases included; PsychINFO, PsychARTICLES, AMED, CINAHL Plus, SPORTDiscus, MEDLINE, PsychBOOKS and eBook Collection. Grey literature was consulted by searching Ethos, an online host for unpublished dissertations. Reference lists from key texts were also hand searched.

The literature search was conducted in August 2017 using the following search terms: (PTSD OR post-traumatic stress disorder OR posttraumatic stress disorder OR post traumatic stress disorder) AND (combat OR military OR war OR veteran OR arm* force OR deployment OR deployed) AND (kill* OR atrocity* OR fatal OR taking life OR exec* OR transgressive act). A start date of 1980 was applied as a limiter, as this was when PTSD was first included in the Diagnostic and Statistical Manual (DSM).

Studies were included in this review if the participants had a diagnosis of PTSD or had completed a valid measure of PTSD as part of the research process. To be included, the study also had to report on the direct relationship between PTSD and killing in combat; additionally, the killing had to be a variable. Studies were excluded if they were not published in the English language due to a lack of translational

resources. Additional exclusion criteria included participants that were not currently serving military personnel or veterans, and any with participants under the age of 16 years; as this review focuses on a population that has served legitimately in the military and not as child soldiers.

The initial search produced 1 420 articles. Of these, 768 duplicates were removed. The first author was solely responsible for all stages of the search process.

Data extraction and quality considerations

The critical appraisal tool used to inform data extraction was compiled by the first author in line with recommendations by Young and Solomon¹⁹ and the Strengthening the Reporting of Observational

Studies in Epidemiology checklist (STROBE).²⁰ Despite each of these being a comprehensive guide to reviewing literature, it was not possible to utilise one tool as both included several questions unrelated to the method of the studies reviewed. In addition to Young and Solomon's guidelines, the STROBE checklist provides specific guidance on the critical appraisal of observational studies.²⁰

To provide a measure of quality, each study was assessed in respect of whether it addressed each of the questions on the checklist. This was rated on a scale of 'Yes', 'Partial' or 'No' and each was assigned a score from 2–0, which was used to rate the degree to which each study met the conditions of each question.

Table 1: Summary of study design, strengths and limitations

Author and Place	Participants and Setting	Measures	Findings	Strengths	Limitations
Pietrzak et al., 2011 USA	N = 285 Mean age 33.4yrs. Male and female. Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans.	Combat Experience Scale (38). Posttraumatic Stress Disorder Checklist-military version (PCL-M; 39).	Killing significantly associated with re-experiencing symptoms. 45.6% of respondents with PTSD reported killing compared to 15% without PTSD.	Method. Clear results. Confidence intervals. Considered existing literature.	No power calculation. Not representative. Not generalisable.
Shea et al., 2016 USA	N = 206 93% male. Mean age 33.79yrs. National Guard and Reserve members Iraq or Afghanistan. 9.2% met criteria for PTSD.	Clinically-Administered PTSD Scale for DSM-IV (CAPS) (40). Exposure to combat - self-report measure developed by author. Anxiety and depression subscales - Brief Symptom Inventory (BSI; 41).	Having killed not significantly associated with PTSD symptoms of numbing, avoidance, re-experiencing or hyperarousal.	Clear analysis. Acknowledged limitations. Inter-rater reliability good.	Skewness and Kurtosis violated. No confidence intervals. Not generalisable. No power calculation.
Tripp et al., 2016 USA	N = 68 91% male. Mean age 32.31yrs. OEF and OIF veterans. 57% met PTSD criteria.	Deployment Risk and Resilience Inventory (DRRI; 38). Clinician-Administered PTSD Scale for DSM-IV (40). Beck Depression Inventory – II (BDI-II; 42). Alcohol Use Disorders Identification Test (AUDIT;43). Timeline Followback (TLFB;44).	Killing significantly associated with CAPS total severity. Killing = significantly higher mean CAPS score.	Clear analysis. Accounted for missing data. Accounted for confounder. Confidence intervals.	Not generalisable. Reduced statistical power.

Author and Place	Participants and Setting	Measures	Findings	Strengths	Limitations
Maguen et al., 2013 USA	N = 227 84% male. Mean age 34.1yrs. OEF and OIF veterans. All met DSM-IV criteria for sub-threshold or full PTSD.	PCL-M (39). DRRI (38). Participants asked specifics about nature of 'killing'.	Those who killed had twice the odds of more severe PTSD symptoms when compared to those who did not kill. Characteristics of person killed significant.	Confidence intervals. Discussed power. Clear analysis. Considered confounders.	Not generalisable. Recruitment unclear. Sample taken from previous research. Not representative.
Pitts et al., 2014 USA	N = 345 82% male. Mean age 27.97yrs. Army combat medics. Iraq or Afghanistan veterans. 9% probable PTSD.	PCL-M (39). CES (38). Aftermath of Battle Scale (45). Author developed measure of killing.	Those who reported killing were more likely to report symptoms of PTSD. Killing not a predictor of PTSD.	Clear data collection method. Considered implications of findings.	Recall bias. Not generalisable. 2 year follow-up not reported in results or discussion.
MacNair, 2002 USA	N = 1638 Vietnam-era veterans. 2 groups: those who killed (639) and those who did not (963).	Mississippi Scale for Combat-Related PTSD (MCS;46). One item from the National Vietnam Veteran Readjustment Study questionnaire pack.	Mean score on MCS for those who killed higher than those who did not. When battle intensity held constant = killing still predictive.	Considered confounding factors. Stratified sample. Clear analysis. Recognises limitations.	Data not collected for this study design. Did not consider what the findings add. No confidence intervals.
Maguen et al., 2009 USA	N = 1200 Subsample n = 259 Male only. Vietnam veterans.	Measure of killing developed by authors. MCS (46). Minnesota multiphasic Personality Inventory-2 PTSD Keane Scale (MMPI-PK;47). Peri-traumatic Dissociative Experiences Questionnaire (PDEQ;48). Structured Clinical Interview for DSM-III-R (SCID;49). Combat exposure measure developed by authors. Violent behaviour measure developed by authors.	Those who killed combatants scored higher on all symptom measures. Those who reported killing civilians scored higher on MCS. Significant relationship between MCS and killing.	Clear analysis. Considered confounders. Considered what results add to existing evidence.	Not representative. Lacks generalisability. No power calculation. No confidence intervals reported.

Author and Place	Participants and Setting	Measures	Findings	Strengths	Limitations
Maguen et al., 2010 USA	N = 2797 94% male. Mean age 28yrs. 40% reported having killed. OIF soldiers only.	Primary Care PTSD Screen (PC-PTSD; 50). Patient Health Questionnaire (PHQ-9; 51). AUDIT (43). Dimensions of Anger (DAR;52). Relationship problems -developed by authors. Direct and indirect killing – developed by authors.	Direct and indirect killing was a significant predictor of PTSD after controlling for combat exposure.	Accounted for confounders. Large sample size. Representative. Clear analysis. Reported confidence intervals.	Not generalisable. Regressions did not explain a large percentage of the variance. No power calculation.
Van Winkle & Safer, 2011 USA	N = 376 Male only. Vietnam veterans.	Combat exposure variables - developed by author. Inferred combat exposure questions - developed by author. Questions about killing - developed by the author. MCS (46). Questions on domestic physical violence – developed by author.	Inferred measure of killing significantly predicted PTSD. Direct measure of killing significantly predicted PTSD. Killing highly correlated with witnessing trauma.	Possible confounders accounted for. Clear analysis. Authors recognised limitations.	Bias in recruitment. Not representative. No power calculation. No confidence intervals.
Goldstein et al., 2017 USA	N = 383 Female only. Mean age 49.3yrs. 34.5% met PTSD criteria. 15% reported killing in combat.	Eight-item military trauma exposure self-report measure – author developed. PTSD Checklist for DSM-5 (PCL-5;53). PHQ-9 (51).	Killing others not significantly associated with PTSD.	Clear analysis. Generalisable. Consider what the results add to existing literature. Results clearly defined. Large sample size.	Bias in recruitment. Not representative. No power calculation. No confidence intervals.

Results

All of the studies in this review were recruited from US populations. It is not possible to conclude with certainty why there is a lack of literature from other nations on this topic—it may be due to social and political differences between nations that have influenced the direction of military research, although this would need further investigation.

All ten studies in this review used quantitative methodology and were observational, with a cross-sectional design. One study used a comparison group to compare combat veterans who killed with those that did not.²¹ The remainder completed regression analyses on the whole participant sample.²²⁻³⁰ A summary of the participants, design and findings for each study can be found in Table 1, along with the main strengths and limitations.

There was disparity amongst the studies on the relationship between PTSD and killing. Seven of the articles reported a significant relationship between having killed in combat and PTSD symptom severity;^{21-26, 29} meaning, those who killed in combat were more likely to report significantly greater severity of PTSD. Three of the studies did not find a significant relationship.^{27, 28, 30} One study by Pietrzak et al. looked at four PTSD symptom clusters; identified as re-experiencing, avoidance, dysphoria and hyperarousal symptoms.²⁴ Only re-experiencing symptoms were significantly associated with having killed in combat. One study also found that the characteristics of the person killed (e.g. age) were an important factor.²⁶ Specifically, having killed a woman, child or elderly person meant that the individual who killed was 4.6 times more likely to report a high degree of PTSD symptoms.²⁶

Participants

Participants in most of the studies were recruited from specific conflicts, with only one study not recruiting from a specific war or military operation.³⁰ Comparison between conflicts proves challenging due to differences in the type of warfare, fighting conditions, type of combat and purpose of warfare. Some evidence does suggest, however, that Vietnam, Iraq and Afghanistan veterans endorse similar frequencies of taking the life of enemy combatants and civilians.²² Therefore, the participants across the studies in this review are comparable in terms of the frequency of killing experienced during combat; supporting their comparison for this review.

Most of the studies recruited both male and female participants.^{23, 24, 26–29} The percentage of males ranged from 82–94%. Although high, this figure is reflective of the reported percentage of males serving in the US military, which was recorded in 2015 to be 81%.³¹ Two studies recruited only male participants,^{22, 25} and therefore do not wholly reflect the actual military population. The percentage of women serving in the US military is reported to have increased since the year 2000.³¹ The role of women within the forces has also changed, with women more recently being in front-line combat roles. This would explain why any data prior to this time has a higher percentage of male participants. Although, it would be expected that some females would have been eligible had the studies sought to recruit them. Goldstein et al.³⁰ recruited only female participants—also a limitation—however with a large sample size (n=383) it provides the opportunity to consider any gender differences, which would otherwise be limited by the small number of female participants in the other studies.

It is interesting to note, that the study by Goldstein et al. found no significant relationship between killing in combat and severity of PTSD.³⁰ Though the sample size of 383 was large, the percentage of those that endorsed having killed in combat was relatively low at 3.9% (n=15). The most commonly experienced trauma type was sexual harassment (65.3%). As such, it should be queried whether the findings reflect the low rate of having killed in combat.

Only four of the studies can be said to have recruited samples through methods that meant the sample was representative.^{21, 23, 28, 29} In two of the studies, all serving personnel were eligible for participation on return from active deployment to Iraq²³ or Iraq and Afghanistan²⁸. They were recruited at post-deployment health screening assessments, which are

mandatory and, therefore, it is not expected that these samples are representative of the returning military populations studied. In the study by MacNair,²¹ the sample was a large stratified random sample, which is also anticipated to yield a representative sample of Vietnam veterans.

The method of participant recruitment affected the representativeness of the sample in four of the studies.^{22, 24, 26, 27} In particular, Maguen et al. drew on a subsample of participants who had to live within a specified distance of the interview sites; this resulted in bias at the recruitment stage.²² As such, the sample was not representative of the wider population. Similar geographical difficulties were evident in the studies by Goldstein et al.,³⁰ Maguen et al.²⁶ and Pitts et al.²⁷ whereby participants were recruited from specific geographical locations. Despite this limitation, the study by Goldstein et al. was not limited to any specific conflict and therefore, is likely to be more representative of the female military population within the areas the researchers recruited from.

Pietrzak et al. chose a sample that was the first 1 050 names, alphabetically ordered, of prospective eligible participants.²⁴ This was due to practical constraints and a high number of eligible veterans. The result strongly limits the representativeness of this sample as it is not random.

Design

The limitation with a cross-sectional design is that it cannot infer causality. When collecting data at one specific time point, it is not possible to know whether certain factors have made an individual more or less likely to develop PTSD as it is not possible to know whether, for example, PTSD was present before the act of killing. It is recognised that causality is often difficult to ascertain and that many other variables, some of which may be confounding factors, would need to be considered. Six of the studies included in this review accounted for possible confounding variables in their design.^{21–23, 25, 26, 29}

Analysis

Most studies referred to whether there was missing data, with four of these removing it before analysis,^{23, 27, 28, 30} potentially causing bias in the studies. On observation, all studies that removed missing data appeared to have a sufficient sample size,^{23, 27, 28, 30} although absent of power calculations this is not certain. Three of the four studies have sample sizes between 300 and 400 with the number of variables ranging from between 6 and 12.^{27, 28, 30} The study by

Maguen et al., however, has a considerable sample size of 2 797 with only seven predictor variables.²³ This may have influenced the findings, as a large sample could result in a large probability of obtaining significance, even when the effect is small. Indeed, the final mode in this study accounted for a small proportion of the variance, which may reflect this limitation.

It is likely that the researchers removed missing data prior to analysis due to completing a regression, which requires a full dataset with no missing data.³⁴ Three studies made no reference to missing data.^{21, 24, 26} Maguen et al. did not account for or identify the percentage of missing data and included participant responses that had some data missing in their analysis.²² While it is not possible to definitively state that the missing data influenced the results, it is a limitation of this study that it is not addressed.

What appeared to be consistent across most articles is that participants that had killed during combat were more likely to report PTSD symptoms.^{21-27, 29} They also had higher mean PTSD symptom severity scores when compared with participants that did not report killing.²⁹ Pietrzak et al. found that 45.6% of participants with PTSD reported killing compared to 15% of participants without PTSD (n=285).²⁴ In the discussion of this study, Pietrzak et al. identified the difficulty in determining the directional relationship between these variables. They allude to whether individuals with PTSD are more likely to kill during combat due to their symptoms, compared to the assumed direction of developing PTSD by those who have killed in combat.²⁴

Characteristics of person killed

Two of the studies investigated the characteristics of the person killed as a predictor variable.^{22, 26} Maguen et al. (2009) used data from the National Vietnam Veterans Readjustment Study (NVVRS) study,²² while Maguen et al. (2013) recruited only Iraq and Afghanistan veterans.²⁶ Results from the Vietnam veterans study concluded that where participants reported killing civilians, women, children, the elderly or prisoners during combat, their PTSD symptom severity score was higher.²² There was, however, a low number of participants endorsing the items for having killed each of these particular groups (civilians 3%, women, children or elderly 13%, prisoner 2%); therefore, inferences should be treated cautiously. In the study by Maguen et al., which recruited 227 participants, 39% reported having killed another person. Of these, 50.7% reported killing enemy combatants, and 48.5% reported killing both enemy combatants and at least one other type of person

(child, women, male civilian, elderly or detainee).²⁶ With a larger percentage of respondents endorsing these items, they found that having reported killing a woman, child or elderly person resulted in that individual being 4.6 times more likely to have a high rate of PTSD symptoms.²⁶

During more recent conflicts, where the enemy are unmarked and often in urban areas, the likelihood of harming civilians is increased.³⁴ Previous research into atrocities, such as killing civilians, suggests such acts correlate with negative emotions (e.g. guilt).³⁵ This is particularly true when the traumatic event involves acts that violate deeply held moral beliefs.¹² Guilt has also been suggested to precipitate the development of PTSD,⁹ which may account for the difference in PTSD symptom severity. For individuals reporting having killed women, children, the elderly or prisoners,^{22, 26} their PTSD symptom severity scores may be higher due to feelings of guilt.

Despite the cautionary interpretation, the findings highlight how specific characteristics of those killed may play a role in determining the severity of PTSD. Clinicians should therefore, consider the killing experience that military or veteran clients bring with them. The context is an important consideration; for example, the evidence suggests a scenario in which civilians are killed might lead to greater severity of PTSD. Clinicians should be mindful of the impact that the characteristics of the person killed may have on the individual responsible, with acknowledgement that killing children, the elderly, detainees or civilians may result in greater PTSD severity.

PTSD symptoms

Several articles report a differing relationship between specific PTSD symptoms and killing in combat.^{22, 24, 28} Pietrzak et al. considered four symptoms, namely re-experiencing, avoidance, dysphoria and hyperarousal.²⁴ The results demonstrated that killing in combat was only related to re-experiencing symptoms. It is a limitation that in this study, they neglected to consider symptoms outside of these four categories. The findings are also in contrast to the results of Shea et al., which similarly investigated the same four symptoms. Interestingly, their study also focused on Iraq and Afghanistan veterans; however, the results showed no significant relationship between killing in combat and any of the PTSD symptoms investigated.²⁸ Maguen et al. included peri-traumatic dissociation as one of the variables. They found that when controlling for general combat experiences, killing both combatants and non-combatants significantly predicted peri-traumatic

dissociation. In the discussion, they propose that killing another human may increase the likelihood of peri-traumatic dissociation because of the profound sense of unreality associated with this act.²² They go on to suggest that peri-traumatic dissociation may, as such, serve to shut down or minimise the feelings associated with the act of killing, which then interferes with processing, leading to the development of PTSD. While the findings on different PTSD symptoms and killing in combat are limited to results from only three studies in this review, they do provide foundations for the future consideration of specific factors involved in killing, such as the emotional experience at the time.

Discussion

In summary, the studies in this review had both differences and similarities when considering the relationship between PTSD and killing in combat. Most of the studies acknowledged that killing in combat correlated with higher PTSD symptom scores; although three did not find this relationship to be statistically significant. The inconsistency between some of the findings would suggest that the link between killing in combat and PTSD requires further attention and exploration. What differentiates these findings, aside from the limitations of the studies in this review, may be influencing factors, such as degree of combat exposure or gender. However, these factors need further investigation.

Some of the studies found a difference in the relationship between killing in combat and different PTSD symptoms, such as re-experiencing symptoms.²⁴ Additionally, concerning the killing of civilians, specific characteristics of the person killed were important, such as whether they were children, women, the elderly or prisoners. This was shown to correspond with a higher reporting of PTSD symptoms.²² It was beyond the scope of the studies included in this review to determine the factors involved in the killing of these specific types of people that resulted in more severe PTSD presentations. Further examination of other potentially relevant variables is needed.

Overall, all the studies met at least half of the critical appraisal tool questions, although none were without their limitations. Most of the studies were limited by the representativeness of the sample, lack of generalisability and lack of transparency about statistical power. Nearly all studies chose to recruit participants that had served in specific conflicts such as the Vietnam War or the conflict in Afghanistan. Existing literature has shown the degree of combat exposure to be a significant predictor of PTSD.³⁶

These studies have, however, recruited from a Vietnam veteran population, whereby symptoms have had longer to surface and may therefore present differently to current serving and recently returned veterans, making the findings less generalisable to the US military population as a whole. There are also geographical limitations within some of the studies. Some of the reasons for this may be down to resources as was the case in the study by Pietrzak et al., whereby only the first 1050 were contacted due to the length of time it would take to sort through over 200 000 eligible veterans.²⁴

Clinical implications

Although it is difficult to conclude that a significant relationship exists between killing in combat and PTSD based on the disparity in the studies, some salient points can be highlighted. The majority identified that an individual who killed in combat is more likely to report symptoms of PTSD. This alone indicates the need for clinicians working with serving military personnel and veterans to ask about killing in combat during assessment.

It is also essential to consider the context in which killing in combat occurred, particularly the characteristics of the person killed and specifically how these factors have impacted on the person who killed. Not considering these factors may result in assessment and formulation processes that neglect to account for the inner conflict and emotional distress. This would also indicate a need for interventions to be responsive to individual need. Traditionally, PTSD was assumed to result from exposure to life-threatening situations,³⁷ therefore, the person who kills emotional distress may derive from a very different set of processes. Within this, it should not be assumed that having killed during combat is the same for everyone. The studies in this review show that different contexts account for differing symptom severities.

Future research

Future research should utilise longitudinal research designs and baseline measures of PTSD, which may be more useful in determining whether killing in combat is a valid predictor of PTSD. Research should aim to recruit participants that are more representative of the populations studied. Several studies have drawn on data collected around the 1980s; there are more up to date military populations that could be recruited from in order to gain current data. It would be necessary, considering the difference in combat experiences between nations and differences in cultural perceptions of killing, for research to be

conducted outside of the US population. This would allow for comparisons across nations and a greater exploration of the factors involved in the relationship between PTSD and killing in combat.

Limitations

There are some limitations to this review which need to be considered. The search strategy did not produce studies outside the US population, and thus, the findings are limited to this nation. Similarly, several studies used data from the same Vietnam War sample with others focusing on Afghanistan and Iraq veterans. This has produced an overview of findings that does not account for other conflicts or those deployed on other military operations.

It is also a limitation that the studies used for this review were all a cross-sectional design. This limits the ability to infer the direction of the relationship between variables, but also to comment on the chronicity of PTSD. When taking data at one point in time, with no indication as to the time that has elapsed since a traumatic event, it is difficult to know whether participants would meet a PTSD diagnosis.

Conclusion

Overall, the evidence for the relationship between PTSD and killing in combat appears complex. Research identifies that those who kill during combat are more likely to report PTSD symptoms.

Disparity exists over whether this relationship is statistically significant, however several studies have shown that those who killed during combat reported a significantly greater severity of PTSD. There are factors such as victim characteristics and gender, which may influence the course of this relationship. The limitations of the studies included in this review should be taken into consideration. The majority, although not all, were limited by lack of a representative sample and generalisability.

There is, sufficient evidence to conclude that the relationship between PTSD and killing in combat is essential to consider. Clinicians should address the topic of killing during combat in their assessments and formulation in order to gain a greater understanding of the origins of a client's distress. Future research should aim to unravel the complexities of this relationship by considering potential influencing factors. Research should aim to provide evidence that is representative, generalisable and from different nations.

Corresponding Author: V Aldridge, vealdrige@hotmail.com

Authors: V Aldridge¹, H Scott¹, R Paskell²

Author Affiliations:

1 Staffordshire University;

2 Avon and Wiltshire Mental Health Partnership NHS Trust

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Innovations from the Battlefield: Tourniquets

D Maher

Abstract

Background: Despite its use from Alexander the Great's war with Persia to current conflicts in the Middle East, the tourniquet has been considered both a lifesaver and invention of the Devil. This poor reputation developed through several conflicts, from the US Civil War to Vietnam. Concerns and unfortunate dogmas from these conflicts persisted, and tourniquets were not recommended in civilian practice. Despite this, tourniquets returned to military use in the 1990s via US Special Forces, who aggressively advocated their use.

Purpose: The purpose of this paper was to review the history of the tourniquet, its use and success in recent conflicts in the Middle East, and how this success has translated to both civilian medical services and the general public's increasing awareness.

Results: Data collected in field hospitals in Iraq have shown pre-hospital tourniquet use was associated with increased haemorrhage control. No early adverse outcomes related to tourniquet use were reported. The US Army Institute of Surgical Research (2006) reported higher survival rates in patients with pre-hospital tourniquet use compared to hospital application (89% vs 78%). Similar outcomes are reported in civilian practice: during the Boston Marathon bombings, 27 tourniquets were applied, with no adverse outcomes reported.

Conclusions: When evidence from recent Middle East conflicts is examined, tourniquets are consistently highlighted as a safe, effective method for controlling severe bleeding from extremity injuries. Today, they are considered a life-saving device and innovation of recent conflicts, and are issued to all deploying servicepersons.

Key words: tourniquet, military medicine, military history, extremity injury, pre-hospital

Introduction

Each conflict requires new ideas, flexibility and agility; as does the medical response to war. Following almost two decades of war in the Middle East, it is challenging for a weary public to identify many positives from these conflicts. One favourable outcome is the progress that has been made in the treatment of injured soldiers and civilians.

Injuries experienced in the Middle East conflicts have differed from those injuries from previous conflicts. In previous wars, most soldiers were wounded by bullets and chemical agents, such as mustard gas.¹ The emphasis on operations conducted on foot in Afghanistan has resulted in an influx of Dismounted Complex Battle Injuries (DCBI).² DCBIs represent a collection of polytraumatic injuries, including bilateral high transfemoral amputations, open pelvic fractures and severe upper extremity injuries.² Medical and technologic advancements made during recent conflicts have enabled more wounded service members to survive DCBIs despite their complexity.^{2,3}

An authoritative paper published in *Surgery* reviewed combat casualty care statistics throughout military operations in both Afghanistan and Iraq. It found that from 2001–2017, mortality rates were reduced by 44%.³ The increasing survival rate of soldiers with DCBIs is due in part to the progress made in haemorrhage control in a period known as the 'platinum ten minutes': the ten minutes immediately following injury.⁴ One critical tool in effectively managing extremity haemorrhage in this short period is the tourniquet.

A tourniquet is a constricting or compressing device used to control venous and arterial circulation to an extremity for a period of time. Despite its use from Alexander the Great's war with Persia, to today's war in Afghanistan, tourniquets have been considered both a lifesaver and an invention of the Devil.

History of the tourniquet

The first documented use of a tourniquet was not for preventing exsanguination—severe blood loss—

but rather was used by Hindu physicians in the 6th century BCE to treat Greek troops bitten by snakes unfamiliar to physicians.⁵ Its use soon became more common, with Romans using narrow bronze straps to control bleeding.⁶ It was at this point that the tourniquet started to develop a low opinion that persists today. Galen, the best known of the Roman surgeons, criticised the use of tourniquets as simply forcing more blood from a wound and this opinion was repeated for many years and even centuries later.⁶

Tourniquet development continued to be documented over the next several centuries. In 1674, Etienne Morel, a French army surgeon often credited with the first unambiguous claim of battlefield tourniquet use, described a tourniquet used at the siege of Besancon, France.⁷ The tourniquet included a belt that went through a woodblock. A stick was used in the loop of the belt around the limb and twisted as a windlass.⁷ This was known as a block tourniquet and provided the basis for the much-improved device of Petit, early the next century. Petit, one of Paris's foremost surgeons, invented a new screw device for which he coined the word tourniquet, from the French *tourner*, to turn.⁷ It required no assistant and could be released readily and reapplied.

The first recorded recommendation for issuing a tourniquet-like device to soldiers occurred during the US Civil War by Samuel Gross in 1862.⁸ Unfortunately, many criticisms of its use arose during this conflict, often as the result of inadequate training or delays in the transport of patients to field hospitals, which frequently took days. Given these delays, the rudimentary surgical training, wound contamination and lack of antibiotics, limb amputation was frequent and would subsequently be attributed to the use of tourniquets.⁸ World War I saw a similar attitude develop, where a British medical manual, *Injuries and Diseases of War*, spectacularly criticised tourniquets and those who used them: 'The systematic use of the elastic tourniquet cannot be too severely condemned. The employment of it, except as a temporary measure during an operation usually indicates that the person using it is quite ignorant both of how to stop bleeding properly and also of the danger to life and limb caused by the tourniquet.'⁹

In World War II, allied surgeons, Wolff and Adkins, looked at over 200 wounded service members who had tourniquets applied.¹⁰ Their research resulted in them being among the staunchest advocates of the use of tourniquets in combat casualty care after they

found not a single case of gangrene, thromboembolic events or nerve damage directly attributable to the use of such devices.¹⁰ They concluded that properly applied extremity tourniquets reduced blood loss, were associated with a low risk of complications and saved lives. Following this conflict, tourniquets continued to be used in Korea and, to a lesser extent, Vietnam. Some medical professionals believed that their use may lead to more amputations, which contributed to their falling out of favour with both civilian and military medical personnel.¹¹

With such an extensive and storied history, one may ask why tourniquets are viewed as a medical innovation following a period of war in the Middle East. While tourniquets have been used to control traumatic haemorrhage for millennia, their use has long been debated, and opinions on their effectiveness to prevent haemorrhage while minimising long-term injury and tissue damage have alternated between robust support and absolute denigration.

The leading cause of potentially preventable deaths on the battlefield in Vietnam was exsanguinations from compressible extremity injuries, representing approximately 7–9% of US casualties.¹ Another set of data, recorded by a deployed surgeon, estimated that over 2600 lives, or 7.4% of casualties, may have been saved with better pre-hospital care, specifically tourniquets.¹¹ Despite this, concerns and unfortunate dogmas outweighed any endorsement or lessons learnt from past conflicts, and civilian trauma experts did not recommend tourniquets. Consequently, they fell out of favour with the military so-much-so that in a report to The Red Cross they were described as 'an instrument of the devil that sometimes saves a life' and viewed as a last resort intervention.¹²

In the 1970s and early 1980s, medics at the US Army's basic medical specialist course were instructed that in almost all instances, amputation would follow tourniquet use and that a tourniquet should only be used after direct pressure, limb elevation and pressure point application had been employed and failed by the continuation of bleeding.¹³ This highlights the thinking at the time: the decision to use a tourniquet was one to sacrifice a limb to save a life. This doctrine was reinforced in *Emergency War Surgery*, a prescribed military surgery textbook that stated, 'Tourniquets are rarely needed for the control of haemorrhage and should be used only when all other methods fail. A tourniquet properly applied can save life but endanger limb'.¹⁴ This opinion was repeated in further revisions of the text and

were widespread among both military and civilian professionals for the remainder of the century.

The turning of the tide

Despite their widespread criticism, tourniquets returned to military use. In 1991, Operation Desert Storm lasted just over one month, leaving no time and minimal data to refine casualty care. A retrospective analysis of wounds treated in hospital indicated that of the 143 soldiers injured and actively treated in US Army hospitals during Operation Desert Storm, three soldiers (2.1%) died.¹⁵ Each case presented with haemorrhage from limb injuries contributing to the cause of death.¹⁵ Following this, US Special Forces began to use tourniquets aggressively. Their use would be justified and supported in a series of publications by Mabry, a US Army Special Operations Forces medical officer, who compared the outcomes of casualties with and without tourniquet use.¹⁶ Mabry's research suggested that 7% of fatalities could be attributed to penetrating extremity trauma.¹⁶ Other cases where wounded soldiers survived extremity injuries, 'pre-hospital haemorrhage control through the application of a tourniquet was crucial'.¹⁶

This work attracted the attention of Captain Frank Butler, a former Navy Seal platoon commander, ophthalmologist and Director of Biomedical Research for Naval Special Warfare Command. He and others organised efforts to critically assess and analyse the needs of tactical combat casualty care. After reviewing Mabry's work from Somalia, and Wolff and Adkin's World War II findings, Butler recommended testing tourniquets to perfect the design.¹⁷ Tourniquets continued to be screened and tested in 2003, prior to Operation Iraqi Freedom. Recognising that waiting for further information and testing results could result in needless loss of life, Army Surgeon, General Kevin Kiley, recommended the Combat Application Tourniquet (CAT) as standard issue for all US service members deployed on operations.¹⁷

Analysis of Special Operations Forces casualties killed in action during the Global War on Terrorism from 2001–2004, revealed that 13% of casualties died from traumatic limb haemorrhage amenable to a tourniquet.¹⁸ Up until this point, little training was provided in the use of tourniquets, but in 2004, liberalised use was encouraged.¹⁸

Early results were positive. In a retrospective case-control study, Beekley et al. reported that 57% of deaths may have been prevented by earlier tourniquet use in a Baghdad hospital.¹⁹ Equally importantly, no adverse outcomes, including subsequent

amputation, were attributable to tourniquet use.¹⁹ A prospective study, also in Baghdad, reviewed 2828 casualties. The survival rates were higher for those who had pre-hospital use of tourniquets compared to those with hospital use (89% vs 78%), higher with use before shock onset versus after shock onset (96% vs 4%), and higher with tourniquet use versus without tourniquet use (87% vs 0%).²⁰

Further evidence from the remainder of the campaign underscored the importance of battlefield tourniquet application. A trade-specific, retrospective analysis reviewed records of 313 cavalry scouts wounded in action across both Iraq and Afghanistan.²¹ Tourniquet application was recorded in 24 (7.7%) of cases for open fracture, vascular insult or traumatic amputation.²¹ When tourniquets were applied, 96% of soldiers survived their battlefield injuries.²¹

This cumulative military experience overwhelmingly supports the liberal use of pre-hospital tourniquets. Experience from the recent Middle Eastern conflicts suggests that tourniquets may be routinely used to control severe extremity haemorrhage safely and effectively, with strong evidence to support their life-saving capacity for limb-injured casualties. These developments have triggered recent reconsideration of the role of tourniquets in civilian trauma.

Civilian EMS adoption

Retrospective studies, along with the personal experiences of medics and resus teams in Iraq and Afghanistan, have resulted in a rethink of pre-hospital care in civilian trauma. Battlefield injuries may have similar characteristics to civilian traumatic injuries resulting from motorcycle accidents, natural disasters, agricultural incidents and terrorist attacks. Consequently, lessons from the care of military trauma injuries can be translated for the civilian environment to improve the quality of trauma care that civilian practitioners can offer their patients. The medical director of the Mayo Clinic Trauma Centre, Dr Donald Jenkins, retired from the Air Force to head the National Trauma Institute, estimates that over half of American ambulances now carry tourniquets and properly train staff to use them—a considerable improvement from the previous decade.²² Civilian data analysing tourniquet use in rural North America found them to be safe and effective in controlling haemorrhage in 98% of cases, echoing findings from the battlefield.²² Tourniquets are relatively inexpensive and are now carried by many paramedics, similar to how deployed military personnel carry a tourniquet on their person.²²

It is not only people with medical backgrounds who are using tourniquets to aid those afflicted by traumatic incidents. The 2013 Boston Marathon bombing killed three and wounded hundreds.²³ As people lay badly bleeding in the smoke after the bombings, rescuers used improvised tourniquets made from belts and other materials to tie off bleeding and severed limbs. In the hours following the attack, pictures flooded social media sites showing victims being carried from the scene with severed limbs, clamped by tourniquets. The Boston Trauma Collaborative reported that out of 66 patients with extremity injuries, 27 tourniquets were applied. All 27 patients survived.²³

This increasing public awareness of the role of tourniquets may have arisen from the military's experience in the Middle East. Dr Mooney, the Trauma Director at Boston's Children's Hospital at the time of the Boston Marathon bombings, advised that some children's lives would have been lost at the scene without the use of tourniquets by EMTs and civilians.²⁴ He went on to say, 'These kid's lives were saved by the first responders... That's sort of an Iraq and Afghanistan thing, that people have started to re-learn that tourniquets are OK. Ten years ago, it was a total no-no'.²⁴

Conclusion

Many lessons have been learnt from two decades at war, with tourniquet use potentially being the most critical medical lesson. A growing body of evidence shows that tourniquet use for severe bleeding from extremity injuries is a safe, cost-effective measure for reducing mortality and morbidity. The challenges presented in controlling life-threatening extremity haemorrhage in the field or civilian practice leave little margin for error. Effective medical leadership should focus on providing solutions for first responders who face the potentially dire situation of maintaining life until further medical support is available. Tourniquets are one such effective solution.

Corresponding author: Dominic Maher
d.maher@aflred.org.au

Authors: D Maher¹

Author Affiliations:

1 The Alfred Hospital

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Organisational Learning in Military Medicine

AIRCDRE Amanda Dines

Abstract

There is a widespread view that war and conflict lead to significant clinical advances in trauma medicine because of advances in military medicine. While it would be expected that members of the medical profession would rise to a new clinical challenge, this presentation will argue that aspects of the organisational practice of medicine in the military result in faster innovation and adoption than in civilian clinical practice. New methods of bibliometric analysis can illustrate this diffusion of knowledge by time, geography and impact.^{1,2,3} However, there is also concern that these advances regress during periods of peace.⁴

The presentation will describe how the 'audit cycle' can be used to identify the 'artefacts' of clinical innovation in military medical systems; concentrating on publicly available material from UK, USA and NATO sources. The first stage is 'setting standards'. This ranges from mandatory training in basic first aid through to clinical practice guidelines for healthcare professionals at every stage in the casualty evacuation pathway. The second stage is 'monitoring standards' at both the individual and system level, including credentialing and performance evaluation of field training. The third stage is measuring outcomes. This requires the comprehensive patient registries that the US and UK established to track the clinical outcomes of all trauma patients. The final stage of the clinical system is 'modifying standards', which summarises the role of clinical leadership across the trauma system, including the editorial processes that change and communicate standards for clinical practice.

However, the role of concepts and doctrine as the military tool for capability development is the unique process that delivers organisational learning in military medicine. The presentation will discuss the importance of medical doctrine at both a national and international level to provide the foundations for the design and operation of the military medical system. There is no civilian equivalent that provides such unifying direction to healthcare professionals across the care pathway for patients. This perspective of the whole military health system can provide a strategic perspective of the individual elements that must be maintained and nurtured during periods of relative peace so that they can be rapidly rejuvenated during periods of intense clinical activity.

The presentation will conclude by summarising how this approach to 'whole system analysis' has informed a recent review of the UN trauma system for peacekeeping operations. This will illustrate how lessons in military medicine can be translated across settings. It will also emphasise the importance of international and cross-organisation collaboration to meet our humanitarian duty to maximise clinical outcomes for victims of war and conflict.

Establishing COVID-19 Clinics Nationwide in an Unprecedented and Challenging Environment

Mr Leo Cusack¹

1 Aspen Medical, Deakin, Australia

Abstract

Aspen Medical worked with the Department of Health to roll out up to 154 General Practice Respiratory Clinics (GPRCs) across Australia to provide dedicated services to people with mild to moderate COVID-19 symptoms. These clinics were in addition to services available within public hospitals and general practices.

To ensure the program resulted in a roughly equitable national coverage, the Department engaged with the 31 Primary Health Networks (PHNs) to help identify, prioritise, assess and prepare sites. They asked the PHNs to liaise with local hospital networks and draw on public health evidence of the need to identify optimal locations and practices. On direction from the Department, these potential locations were reviewed by Aspen Medical. On Aspen Medical's advice on-site feasibility, the Department entered a contract with the relevant GP practice, and Aspen Medical organised the site setup and additional requirements including stocks of PPE, validation of infection prevention and control arrangements, training and IT support to the site. Once the site was up and running Aspen Medical provided ongoing support until the company organised for the clinics to be individually decommissioned.

Aspen Medical needed to establish the GPRC sites as quickly as possible. There was no capacity to travel interstate, and the logistics chain was severely compromised. This was also identified as an opportunity to provide innovative solutions by establishing a project management network, and buying locally, using local trades to establish the GPRCs. While there was a need to accept delays on some sites for various reasons, the clinics were set up quickly and within budget in metropolitan,

regional and remote Australia. This included mobile solutions that were developed by Aspen Medical.

The presence of respiratory clinics reduced the risk of further transmission of COVID-19 and helped optimise the use of available stocks of Personal Protective Equipment (PPE) and reduce the pressure on hospital emergency departments. The clinics were established in dedicated premises that met the criteria and were designated into one of the following tiers:

Tier 1: No facility enhancement. Focused on establishment of appropriate flow and provision of equipment and training.

Tier 2: Minor facility enhancement. May be minor construction works within a facility or enhancement such as tents to complement existing facilities.

Tier 3: Major enhancement. Required augmentation by perhaps a series of external structures to allow for appropriate facilities enhancement.

Once these clinics were established, they provided a mechanism to manage infection control safely and complemented the efforts of state and territory clinics. The clinics were staffed by existing general practice doctors and nurses who were funded to assess, test and diagnose respiratory cases, including COVID-19, influenza and pneumonia.

Biography

Leo is an experienced project manager who has worked with Aspen Medical on a diverse range of disaster response and humanitarian projects. These have included managing the company's response to the Ebola crisis in Sierra Leone and Liberia in 2014–2015.

Leo was also responsible for the delivery of trauma and maternity services in Iraq for the WHO and UNFPA during the conflict predominately around Mosul in 2017–2018. In 2018, Leo was the lead at Aspen Medical for their verification as a specialist Emergency Medical Team by the WHO. Aspen Medical remains the only commercial organisation in the world certified as an EMT for infectious disease outbreaks. Most recently, Leo was the COVID-19 Project lead responsible for support to cruise ships internationally, the General Practice Respiratory Clinic Program and also Aspen Medical's response to the crisis in Yemen.

Leo's early career was as an infantry officer in the Australian Army. He maintains a broad range of business interests away from his involvement with Aspen Medical.

A Baptism of Fire – The DFAT Experience of COVID-19

Dr Leonard Brennan¹

1 Department Of Foreign Affairs And Trade, Barton, Australia

Abstract

On 20 January 2020, the author commenced as the Department of Foreign Affairs and Trade's (DFAT) Principal Medical Adviser (PMA), the day before the World Health Organisation (WHO) announced the human to human transmission of a novel coronavirus in the Chinese city of Wuhan.

DFAT has over 110 Posts around the world, on all continents except Antarctica. It supports a diverse international network that includes Australian based staff from both DFAT and a range of other government departments and their dependents, locally engaged staff and contractors.

The presentation will describe the Department's response to the COVID-19 pandemic, including detailing COVID-19 cases within the network, approaches to prevention and containment, the challenges experienced and the lessons learnt.

Biography

Dr Brennan commenced at the Department of Foreign Affairs and Trade, as the Principal Medical Adviser in January 2020 following over 33 years in the Australian Regular Army. While currently a reservist, his full-time career culminated with his appointment as the Director-General Garrison Health, Director-General Army Health Services and Head, Royal Australian Army Medical Corps. Dr Brennan is a specialist general practitioner and medical administrator and has a long-standing interest in communicable diseases of military significance.

Sub-syndromal PTSD: What is its Importance in Military and Veterans?

Dr Duncan Wallace¹, LTCOL Andrew Moss²,
MAJ Samantha Hodges³

¹ ADF Centre for Mental Health, Sydney, Australia

² Joint Health Command, Canberra, Australia

³ Defence Force School of Intelligence, Canungra, Australia

Abstract

Objective

To assist healthcare professionals in their management of military personnel and veterans by providing information on the importance of sub-syndromal PTSD.

Conclusion

Sub-syndromal PTSD occurs when persons experience many of the symptoms of PTSD, with some impairment, but do not meet full diagnostic criteria. Found to be associated with a range of mental health conditions including alcohol abuse, higher rates of suicidal ideas and delayed-onset PTSD, it should be seen as 'symptoms that are predictive of later disorder'. Patients with this condition need accurate assessment, trauma-focused therapy and follow-up to address the symptoms and, potentially, prevent the development of PTSD.

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 has deployed on active service to East Timor, Iraq, Afghanistan and the Persian Gulf. He has also deployed on border protection duties to Christmas Island and Ashmore Reef, as well as humanitarian assistance operations in Banda Aceh and Nias. 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. He has been a visiting medical officer at St John of God Hospital, North Richmond since 2015, and is a conjoint senior lecturer in psychiatry at the University of NSW.

TRE- Training Neurobiological Resilience to Prevent Trauma, Enhance Performance & Optimise Wellbeing

Mr Richmond Heath¹, Dr Jill Beattie²

¹ TRE Australia, Don Valley, Australia

² MiCBT Institute, Hobart, Australia

Abstract

Despite current best practice, traumatic stress, cumulative trauma and 'trained hypervigilance' continue to negatively impact the mental health, physical wellbeing and occupational performance of military personnel, veterans and their families. Australian reports consistently call for self-management strategies that address the underlying neurobiology of stress and trauma, at the same time, having a positive focus on enhancing performance and optimising wellbeing.

TRE (tension/trauma release exercises) Resilience Training is one such performance-enhancing approach, providing a body-based 'calming technique' that concurrently addresses both the multi-systemic and musculoskeletal components of stress and trauma. TRE's key point of difference is the deliberate use of the human body's innate capacity to down-regulate the autonomic and neuromuscular systems through spontaneous shaking and tremors. Commonly inhibited as a sign of weakness, fear, anxiety and shock, and pathologised as a symptom of trauma and Post-traumatic Stress Disorder (PTSD), this natural tremor remains unclassified but is perhaps closest to physiological tremor.

This innate response can be deliberately invoked in a safe and controlled way using TRE, expanding the number and style of self-care strategies available to personnel, and providing them with a significantly different entry point to consciously directed techniques such as mindfulness, visualisation, breath training and general exercise. In Australia, TRE has been introduced to elite athletes with good effect, and there are similar 'tremoring' techniques already being used by AFL footballers and professional surfers. This establishes the credibility of TRE as an elite performance-enhancing tool, in addition to its benefits as a preventative wellbeing technique.

In 2011, the US Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury identified TRE as one of the five most promising techniques to regulate the nervous system, due to its ease of use and immediate benefits of reducing

hyperarousal and muscular tension. Consequently, a controlled trial of the effect of TRE for the treatment of stress and PTSD is underway in the US Department of Veteran's Affairs.

In Australia, physiotherapy research has suggested TRE has a positive effect on reducing restless legs syndrome, a common comorbid presentation of PTSD. While overseas, peer reviewed research suggests TRE is feasible as a potential method for improving quality of life among non-professional caregivers. At the individual level, the benefits of TRE are immediately verifiable using wearable technologies that measure improvements in sleep quality and heart rate variability, both key neurophysiological measures of optimal performance and wellbeing.

Case studies on the benefits of TRE for military personnel and veterans have been published in Australia and Ukraine, and the technique has been shown to be consistently well-liked and accepted by defence personnel in the US, Brazil, Switzerland, Norway, Austria, Canada and Poland. This acceptance appears to be because it is body-based, stigma-free and does not require the need to recall or talk about past events.

Cost-effectively learnt in a group setting or introduced through online training modules, TRE can be used 'at call' for early intervention, or on an ongoing and regular basis as part of standard recovery routines to help reduce stress, build 'neurophysiological resilience' and enhance performance under pressure. As TRE requires little mental focus and minimal physical effort, the technique can also be used in as little as 5–10 minutes lying in bed to assist with sleep. It is, therefore, favourable when personnel are time- and energy-poor and least likely to undertake more demanding self-care practices.

This presentation will provide the trauma-informed theory underlying TRE, videos of TRE being used by military personnel, veterans and first responders and a proposal to allow Australian frontline personnel to evaluate the technique for themselves.

Biography

Richmond Heath is a Physiotherapist, TRE Resilience Trainer and the National Coordinator of TRE in Australia.

He has a diverse background in both physical health and preventative mental health initiatives, including youth suicide prevention.

Since introducing TRE to Australia in 2010, Richmond has provided trauma recovery workshops for survivors of Black Saturday, the Ipswich Floods and the Christchurch Earthquake, and trained more than

2500 people in the use of TRE for their health and wellbeing.

He has been involved in world-first research into the use of TRE for restless legs syndrome, and with a background in high-level sport, is pioneering the use of TRE as a recovery and performance-enhancing tool for elite athletes.

Surge Capacity of Australian ICUs in the COVID-19 Pandemic

CMDR Anthony Holley^{1,2}

1 Royal Australian Navy, Brisbane, Australia

2 Royal Brisbane and Women's Hospital, Brisbane, Australia

Abstract

The burden on healthcare resource utilisation associated with the global coronavirus pandemic of 2019–20 is unparalleled in modern times. Early experience in China, Iran, Italy and Spain demonstrated that between 5 to 16% of laboratory-confirmed COVID-19 patients required admission to an Intensive Care Unit (ICU).

In February of 2020, we urgently undertook an ICU surge analysis designed to inform local, jurisdictional and national critical care capacity. The primary aim of our study was to determine intensive care bed and invasive ventilation capacity in the event of a significant ICU requirement. A secondary aim was to describe variation in these capabilities according to ICU type (tertiary, metropolitan, regional/rural or private) and jurisdiction, as well as other ICU equipment and workforce issues. Data were obtained from several sources. The initial strategy was to interrogate existing data from the Australian and New Zealand Intensive Care Society (ANZICS) Critical Care Resources (CCR) registry. This information was supplemented by a survey of ICU surge capacity distributed to all ICUs in Australia. There are 191 ICUs in Australia with 2378 available intensive care beds during baseline activity, equating to 9.4 ICU beds per 100 000 population. The 175 (92%) ICUs that responded to our surge survey reported an ability to increase intensive care bed capacity by 4258 beds, a 191% increase over baseline capacity of 2228. In considering ventilators, 4815 machines were identified at these sites as capable of delivering invasive mechanical ventilation.

Australian ICUs report potential to nearly triple intensive care bed capacity in response to predicted increased demand associated with the COVID-19 pandemic. Maximal surge could result in an invasive

ventilator shortfall and would require a large increase in workforce. We also demonstrated there exists substantial variation between jurisdictions and greater capacity for expansion in tertiary ICUs.

Biography

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

Anthony is an intensivist and emergency physician working at Royal Brisbane and Women's Hospital. He is a senior lecturer with the University of Queensland Medical School. Anthony is currently the ANZICS President. He is an examiner for the fellowship of the College of Intensive Care Medicine of Australia and New Zealand. Anthony has authored eight book chapters, and 47 peer reviewed publications. He is a supervisor of intensive care training at the Royal Brisbane and Women's Hospital and is an instructor for BASIC and EMST (ATLS). Anthony serves as a representative for the National Blood Authority Critical Care Group in developing the Australian Patient Blood Management Guidelines.

Anthony serves in the Royal Australian Navy and has deployed on multiple occasions. He has deployed to Afghanistan twice, the Persian Gulf, Operation Resolute, Iraq for four tours and most recently to the 2020 bushfires aboard HMAS ADELAIDE.

Strategic Health Implications of Climate Change – Australia and Pacific

CAPT Nathan George¹

1 Australian Defence Force, Adelaide, Australia

Abstract

Anthropogenic climate change represents the most significant threat multiplier faced globally in the modern era, with the capacity to disrupt every instrument of national power. At the heart of this issue is the existential threat posed to human health and wellbeing. Primary, secondary and tertiary health impacts resulting from the direct and indirect effects of a changing climate will result in predominantly detrimental health outcomes on national populations while increasing the risk to those responders working to mitigate these effects.

The current work seeks to assess the potential for climate-related health impacts on food and water

security, disease migration and extreme weather events to undermine our strategic capabilities. Analysis focused on a federal workforce and sought to compare peer reviewed and intergovernmental organisational literature against existing policy guidance from the Australian Government.

Initial results demonstrate the necessity of a comprehensive health assessment process to ensure strategic augmentation of response efforts are targeted, suitable and sustainable. As the nature of national defence evolves to encompass escalating disaster response, proactive integration of national strategic health guidance in military capability development will enable a more responsive Pacific-Step Up and enhanced domestic engagement. The future defence of Australia must incorporate the real risks posed by climate-related health impacts to ensure we can protect both the civilian population and those working in service of the nation.

Biography

CAPT George commenced his academic career prior to employment with the Australian Defence Force with a Bachelor of Psychology (Honours). His research was focused on psychology, statistical analysis, biometric assessment and neurophysiology and thesis work analysed the psycho-physiological tension release mechanisms associated with self-harm. CAPT George transferred to a Master of International Studies to expand beyond clinical research. His Master's thesis work focused heavily on strategic cultures, targeting the use of sociocultural intelligence collection towards expediting post-conflict and post-disaster reconstruction efforts.

CAPT George undertook two years working in development in Cambodia prior to accepting a position at RMC Duntroon. Commissioned in 2014 as a general service officer for the Royal Australian Army Medical Corps CAPT George has been posted to 1st Close Health Battalion Headquarters and 2nd Close Health Company, the Army School of Health and the Australian Army Research Centre.

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

Subthreshold Presentations in the ADF: What we know and where next

Ms Carolina Casetta², Dr Lisa Dell¹

¹ Phoenix Australia – Centre for Posttraumatic Mental Health, Melbourne, Australia

² Joint Health Command, Department of Defence, Canberra, Australia

Abstract

Mental health and wellbeing are critical to an effective and capable workforce. Attention is often directed at improving the outcomes of those with clinical disorders. Evidence shows that subthreshold symptoms are also associated with negative outcomes for the individual. Individuals experiencing subthreshold symptoms risk being unrecognised in the absence of a clinical diagnosis and may remain untreated, allowing symptoms to continue to impact individuals' wellbeing and potentially worsen over time.

Defence have long recognised the importance of identifying personnel with subthreshold symptoms, as evidenced in two of the largest Australian military research projects commissioned in the past decade: the Longitudinal ADF Study Evaluating Resilience (LASER-Resilience) and the Transition and Wellbeing Research Programme (the Programme). Results from these studies suggest that there is a considerable proportion of ADF members who may be experiencing symptoms of mental illness that are not severe enough to meet clinical or diagnostic criteria, but may be at a level to cause the individual distress or concern. The experience of subthreshold symptoms is associated with a high level of impairment, even in the absence of progression to a clinical disorder. Therefore, it is important that ADF members who are experiencing subthreshold symptoms are routinely identified, monitored and supported by health professionals.

In light of these results, Defence have commissioned Early Intervention Investigation. This research program is to inform how defence clinicians identify and manage ADF members presenting with subthreshold symptoms in primary care (including those that may be transitioning out of the ADF). The information gathered will be used to develop a strategy to better manage subthreshold

presentations and associated non-specific health risks in ADF members.

This presentation will provide an overview of the findings from the LASER-Resilience Study and the Programme in relation to subthreshold disorder; what these results mean for ADF personnel; and the next stages in understanding this through the undertaking of the Early Intervention Investigation.

This abstract forms part of the symposium 'Investigating Subsyndromal Mental Disorder and Why it Matters'. This will be the 2nd presentation after Dr Duncan Wallace (prior to Helen Benassi and Emily Jallat's presentation).

Biography

Dr Lisa Dell is a Senior Research Fellow in the Department of Psychiatry at the University of Melbourne. Lisa has a background in psychology and completed her PhD in the area of workplace stress and emotional intelligence. Lisa specialises in working with military and high-risk industries, with over 15 years' experience in leading research projects in this area. Of note, Lisa led the Defence Mental Health Screening review, the Longitudinal ADF Study Evaluating Resilience and is currently leading the Defence Early Intervention Investigation study. She also leads the National Health and Medical Research Council partnership grant study of Intensive Prolonged Exposure therapy, the international consortium developing an outcome scale for moral injury, and an evaluation into a national suicide prevention program.

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

Medic Training: A Proposed Pathway to Professional Mastery

MAJ Aaron Tracey¹

1 1st Close Health Battalion – Australian Army, Townsville, Australia

Abstract

Army medics work in perhaps the most clinically challenging environment of all Army clinicians. With the least amount of formal training, minimal on-site supervision and a wide scope of practice in comparison with similar civilian occupations, medics face significant risks in performing their duties.

The current training and employment paradigm for medics involves front-loading training, with no further formal medical education provided by the organisation. This often leads to either complacency, due to having the mistaken impression that there is nothing more to learn or frustration at Army's lack of investment in professional development of the clinician. There is also a lack of formal recognition of those who invest in their own development, leading to high separation of some of our best performing medics to pursue civilian careers, or nursing and medicine.

Compounding training issues is the lack of formal progression to more clinically challenging roles. In the Close Health environment, junior medics routinely fill evacuation roles (equivalent to a civilian paramedic). This occurs without a firm grounding in primary health care or additional training in medical illnesses (as opposed to trauma), which make up the bulk of presentations. By contrast, other medics complete training in trauma and post to Joint Health Command positions, providing excellent clinical supervised experience and training, but engender a sense of missed opportunities in comparison with Close Health contemporaries.

It is proposed that medics undergo a structured career pathway, similar to the OJT program conducted by other Logistics Corps. Further, the structure of Army Health contribute to the issues outlined above, and serious consideration of removing structural barriers to medic career progression, and more importantly clinical progression, needs to occur. Significant change is not without significant associated risk; however, Army must be clear on the rationale for change, and upfront about the risk mitigation strategies to ensure senior leadership endorsement and support. A Health Brigade may be one option, working within the current structures with more formal career progression and co-operation between Army and JHC is another.

Biography

Major Aaron Tracey commenced his Army career in 1999, initially as an Aeronautical Engineer in RAEME, serving in a variety of aviation and non-Army group units. Following an instructional posting at the Australian Defence Force Academy in 2009, he commenced medical studies, posting to Close Health, where he has remained since 2016.

His operational experience includes serving as a linguist in Iraq, OP RESOLUTE and domestic support to the civilian community during multiple natural disasters in North Queensland. He has supported aviation operations in PNG and during multiple major exercises, and has completed the Aviation and Underwater Medicine courses, in addition to being an AME qualified medical officer

Major Tracey is a Fellow of the Royal Australian College of General Practice, holds a Diploma in Child Health, and is completing a Master's degree in Traumatology. He currently serves as the Senior Medical Officer at 2 Close Health Company in Townsville. His interests include military retrieval, training systems and combat health support.

Are CBRN Masks Appropriate PPE for Civilians Treating SARS-CoV-2 Patients?

LTCOL Steven Adamson¹, BGDR Michael Reade^{1,2,3}

1 Directorate of Army Health, Canberra, Australia

2 University of Queensland, Brisbane, Australia

3 Joint Health Command, Canberra, Australia

Abstract

Introduction

In the context of the SARS-CoV-2 pandemic, negative pressure full-face masks, such as military CBRN masks, might offer superior protection compared to disposable paper P2 masks and non-occlusive glasses. Additionally, disposable masks are in short supply, while military CBRN masks can be disinfected and reused. However, it is unknown whether such masks are acceptable to civilians with minimal training working in public hospitals.

Methods

After appropriate institutional approvals, consenting volunteer civilian ICU staff underwent brief training in the use of the Australian Defence Force in-service CBRN Low Burden Mask (LBM) (AirBoss Defense,

Quebec, Canada) prior to undertaking a simulated cardiac arrest scenario. Previous training with the paper P2 masks had been provided, and most staff had recently cared for ICU patients with SARS-CoV-2 using standard disposable PPE. Evaluation of 10 aspects of each mask type was recorded. Time-to-mask application was also assessed. Effectiveness of protection against airborne viruses could not be tested, but participants reported their confidence in the protection afforded by each system.

Results

Thirty-three participants tested the military CBRN masks, and 28 reported their experience with the paper P2 masks and glasses. Military CBRN masks were donned more quickly: mean time (7.0 [SD 2.1] vs 18.3 [SD 6.7] seconds; $p=0.0076$). The military CBRN masks were rated significantly higher in 8 of the 10 criteria assessed, including ease of donning, comfort (initially and over a prolonged period), fogging, seal, safety while removing, confidence in protection and overall. There was no difference in visibility and communication ability, which were rated highly for both systems. Most (67%) stated they would prefer the LBM if asked to care for a patient with SARS-CoV-2, while 18% had no preference.

Conclusion

This full-face military CBRN mask is acceptable to clinicians undertaking complex tasks in a civilian ICU environment. We could not compare protective effectiveness, but there is no reason to suspect the LBM would be any less safe. Compared to standard disposable masks and glasses, it enhances staff confidence, reduces waste and is likely to be a lower logistic burden during a prolonged pandemic.

Acknowledgements

We thank the officers and soldiers of the 2nd Combat Engineer Regiment of the Australian Army who provided instruction on the use and decontamination of the Low Burden Masks employed in this study. Ms Hannah Carpenter, Mr Bryan Gregory, Dr George Pang and Dr Jason Pincus of the Royal Brisbane and Women's Hospital Intensive Care Unit co-supervised the conduct of the simulated clinical evaluations.

Biography

LTCOL Adamson joined the Australian Army in 2006 after a 17-year career in the Royal Australian Air Force. He completed his medical degree at the University of Queensland and is a Fellow of the Royal Australian College of General Practitioners. He has experience in pre-hospital military medicine after postings to the 1st Close Health Battalion and, more recently, three years with the US Army Medical Department in

San Antonio, Texas. He works currently as the Staff Officer Population Health in the Directorate of Army Health in Canberra.

Disaster and Displacement – A Global Perspective

Dr Paul Byleveld¹

1 NSW Health, St Leonards, Australia

The world is confronted with unprecedented levels of displacement and many protracted humanitarian emergencies, including the Syrian refugee crisis, the Rohingya refugee crisis and devastating droughts, food insecurity and cholera outbreaks. At the end of 2019, 79.5 million people were forcibly displaced worldwide. 85% of the world's refugees are hosted in developing countries (UNHCR 2020a).

In 2019, there were at least 396 natural disasters reported globally, with 11 755 associated deaths and affecting the lives of some 95 million people. Asia remains the most vulnerable region, accounting for 40% of disasters, 45% of deaths and 74% of people affected (CRED 2020). However, the leading international monitoring tools such as EM-DAT do not capture the full burden of disasters in the Pacific (ADB 2018). Many Pacific countries are located on a cyclone belt and/or near tectonic boundaries. These countries are vulnerable to earthquakes or tsunamis, as well as climatic events, including flooding, drought and storm surges.

Conflict, persecution, poverty, climate change and hunger are all contributors to increasingly complex emergencies (UNHCR 2020a). Natural disasters increase the likelihood that people will flee their homes. In the Horn of Africa and Yemen, drought and food insecurity have become major drivers of displacement and are associated with catastrophic cholera outbreaks. Displaced populations are particularly vulnerable to the impacts of natural disaster and disease, as recently evidenced by the COVID-19 pandemic.

Since August 2017, hundreds of thousands of Rohingya people from Myanmar have sought refuge in the Cox's Bazaar region of Bangladesh (Strategic Executive Group UN, IOM 2019). The Kutupalong-Balukhali area has become the largest and most densely populated refugee settlement in the world, with more than 860 000 people. Physical distancing and adequate hygiene are almost impossible to maintain in settlements such as this. The WHO has reported more than 1600 COVID-19 cases in the region (UNHCR 2020b). Deaths have been reported among refugees. Given the limited testing capacity,

the actual numbers are likely to be higher. There is now a massive effort underway to scale up COVID-19 preparedness and response.

The Kutupalong-Balukhali area is hilly and deforested and highly vulnerable to extreme weather and natural disasters. Monsoon rains regularly cause flooding and landslides, which have destroyed thousands of flimsy shelters and killed hundreds. Most recently (May 2020), Cyclone Amphan caused severe damage and destroyed shelters in the settlement.

Disasters can have long-lasting impacts and seriously impair socioeconomic development. Nations and communities vary greatly in their ability to prepare for, and respond to, natural disasters and some remain heavily dependent on international help. In 2016, the World Humanitarian Summit committed to support and empower local organisations to deliver assistance more effectively. Globally the Red Cross/Red Crescent movement works to build resilient communities and support people in disasters.

At a local level, Red Cross/Red Crescent volunteers work with their own communities to strengthen preparedness, mitigate hazards and protect homes and important infrastructure such as health facilities from damage. At the time of disaster or humanitarian emergency, volunteers who already know their communities well are mobilised.

Red Cross/Red Crescent has standardised programs to train volunteers in disease prevention and disaster response (including through the modules Community-Based Health and First Aid, Epidemic Control for Volunteers, Healthy Lifestyle and Psychosocial Support). These programs have been successfully applied by national Red Cross or Red Crescent societies around the world to better prepare communities for disasters and humanitarian emergencies. Effective engagement and empowerment of local communities will help ensure the long-term sustainability of disaster risk reduction and disaster and response and recovery.

(The presentation will draw on the author's experience in natural disasters and humanitarian emergencies with Red Cross and UNHCR).

Self-reliance and Self-management of Mental Health in the ADF

Ms Helen Benassi¹, Professor Phillip Batterham², Professor David Forbes³

1 Joint Health Command, Canberra, Australia

2 Centre for Mental Health Research, Australian National University, Canberra, Australia

3 Phoenix Australia Centre for Posttraumatic Mental Health, Melbourne, Australia

Abstract

Self-reliance is a known barrier to mental health help-seeking in military and civilian populations.^{1, 2} In fact, a desire to handle mental health problems on one's own is the most common barrier to initiating mental health treatment among those who recognise a mental health need, across multiple countries.³ Despite the consistency of findings internationally, the issue has received surprisingly little attention in the literature in comparison to other potential barriers such as stigma and mental health literacy. Self-reliance influences a range of behaviours including, at the extreme, handling problems on one's own all of the time. However, self-reliance may also reflect a preference for maintaining a sense of self-efficacy and enacting self-management practices. Here, self-management is conceptualised as the self-determined activities and strategies used to maintain and improve one's mental health. Much research on self-management is focused on the recovery or maintenance phase of illness, post-treatment, rather than pre-treatment initiation. There is little information on what self-management means to those who perceive a need for care but do not seek treatment.

Objective

The current paper examines self-reliance among a non-treatment seeking sample of current and former Australian Defence Force (ADF) members. The relationship between self-reliance, symptoms and functioning as well as other known barriers to mental health care is explored as well as the techniques used by those who prefer to self-manage to improve or maintain their mental health.

Methods

Data were drawn from a cross-sectional study investigating the mental and physical health of current and recently transitioned ADF members. A total of 11 587 serving and ex-serving ADF members participated in an online survey which examined mental health, help-seeking attitudes and behaviours and reasons for not seeking care. Data were included for analysis if participants reported

that they had 'ever' had a mental health concern and 'never' sought assistance for their mental health (N=1539).

Results

The majority of the sample reported they did not seek help for their mental health because they preferred to manage it themselves (82.0%), and they could still function effectively (85.5%). A smaller proportion indicated they were afraid to seek care (39.0%). Results indicated that while lower symptom severity was associated with self-reliance, the relationship with symptoms was more robust for perceived functioning and fear of help-seeking. To assess the independent effects of the constructs of interest on self-reliance, a regression model was estimated, controlling for demographic factors. In this model, depression symptoms were the only disorder category to be inversely related to self-reliance, while PTSD and anxiety symptoms had no significant association. Disability was less important than perceptions of functioning, self-stigma and resilience in predicting lack of help-seeking due to self-reliance. Self-reliance was associated with the increased use of physical and enjoyable activities, but not informal support-seeking (in-person or online).

Conclusion

Overall, self-reliance was closely associated with perceptions of self as functional and resilient and seeking care either from mental health professionals or informally was likely to be incompatible with this view of self. Self-reliance was less likely to be reported by those with depressive symptoms and was associated with reported active self-management strategies. While self-reliance may be an attempt to maintain a sense of self-efficacy, fear of help-seeking may reflect conservation of resources at extreme risk to this self-efficacy. This heterogeneity within those who do not seek help suggests a need for multi-pronged approaches to the support of these individuals in managing their mental health and facilitating engagement in care when warranted.

(This is the 3rd presentation in the symposium 'Investigating Subsyndromal Mental Disorder and Why it Matters'. Insufficient space to include ref list.)

Biography

Helen is a psychologist and researcher, and Sir Roland Wilson Scholar. During her career, Helen has been responsible for the coordination of strategic mental health research within the Department of Defence. She was an investigator on the Longitudinal ADF Study Evaluating Resilience and the Transition and Wellbeing Research Programme as well as the first-

ever study to examine the prevalence of mental illness in the ADF in 2010. She has worked in roles spanning mental health policy, screening, surveillance, unit climate, epidemiology and personnel selection research.

Helen is currently Acting Director of the newly created Directorate of Health Research within Joint Health Command. She is passionate about the role of research evidence in policy and practice and is focused on building a solid framework to support the translation of health research within Defence.

Taji Multiple Trauma Casualties – Experiences of a MO

CAPT David Johnston¹

1 2 General Health Battalion – Australian Army, Enoggera, Australia

Abstract

Over the period of 11–14 March, two rocket attacks occurred on the coalition forces in the Taji Military Complex, deployed as part of Operation Inherent Resolve and the NATO mission to Iraq. The camp had a Role 1E, deployed as part TGT X OP OKRA, and was the coordinating element for the base multinational health assets.

On the evening of the 11 March, the camp was rocketed by Shia Militia groups with 30 rockets landing in the coalition Camp, with a large percentage of the rockets landing in the accommodation pods resulting in casualties. Subsequently, there was a follow-on attack on the 14 March, which was the first daylight rocket attack since the end of the Iraq war, with a further 26 rockets landing on the camp resulting in further casualties.

This presentation is a case study review of the multi-trauma incidents that occurred after the IDF attacks. The review will look at the following:

- General manning, layout and services available in the Taji Medical Treatment facility
- Timeline review of the multi-trauma incidents on the 11 and 14 March, covering number of casualties, types of injuries, disposition of casualties and outcomes
- Overview of treatment provided
- Use of Allied health during the incident
- Immediate implications post incidents
- Lesson learnt from the multi-trauma incidents.

The presentation will look at the incidents from a medical officer's perspective and their individual

experience as part of a team-based response to a multiple trauma incident. This will include the variation of duties and tasks that were completed by individuals during the two incidents.

Biography

Captain Johnston enlisted in the Australian Army reserve in 1986 to the RAINF. He Corp transferred to the RAMMC in 1992, and then to the Regular Army in 1995 as a medical assistant.

While he was a medical assistant and medical technician, he served with Infantry, Engineer, Artillery, Logistic, Special Forces and Health units as well as an instructor at HMAS CERBERUS Medical School. He deployed to East Timor in 1999 as part of INTERFET, and in 2007 on OPERATION ASTUTE. He also deployed to the Solomon Islands in 2003 on OPERATION ANODE.

He attained the rank of Warrant Officer Class Two before being accepted to study medicine on long-term schooling, graduating from Bond University in 2014. He completed his internship and residency at Caboolture Hospital, and during this period he attained a Certificate in Emergency Medicine.

Captain Johnston was subsequently posted to the 2nd General Health Battalion as a medical officer. There, he has completed his required courses as well as the Medical Officers Underwater Medicine Course. He deployed as the medical officer on the Army Aboriginal Community Assistance Programme in 2018 and then on OPERATION OKRA as part of Task Group Tajit-X in 2019-20.

High Flow Oxygen Hood for COVID-19: Thought Bubble to Capability

Dr Adam Storey¹

¹ Health Services Wing, RAAF Base Amberley, Australia

Abstract

We have described a novel use for the Amron hyperbaric hood, previously used almost exclusively in Australia only for delivery of hyperbaric oxygen therapy. We have demonstrated that use of the Amron hood is viable outside of a hyperbaric chamber in conjunction with a supply of circuit consumables and a source of high flow oxygen-enriched breathing gas, a combination we have termed a high flow oxygen hood (HFOH). We believe the HFOH to be a useful additional option in the hospital response for patients infected with COVID-19 requiring oxygen

supplementation to control respiratory droplet contamination and reduce the burden on critical care resources.

Biography

Adam Storey is currently an MSP member in the RAAF and works at the Royal Brisbane & Women's Hospital as a consultant in both anaesthesia and hyperbaric medicine

Pacific Politics & Disaster Diplomacy

CPL Alasdair Hill¹

¹ Joint Health Command, Campbell Park, Australia

Abstract

Given the prevalence of natural disasters within the South Pacific region (accelerating in frequency and severity due to climate change), Australia finds itself in an increasingly demanding position to meet both domestic and international responsibilities. As the recent OP Bushfire Assist has demonstrated, the capacity of the Australian Defence Force to respond to widespread natural disasters is increasingly challenged, especially given our extant commitments to the Middle East, UN peacekeeping and broader Indo-Pacific engagement.

Australia is limited in its political and economic influence, and so our Defence community must come to terms with the reality that any increased engagement in the Pacific region (as articulated by the federal government earlier in the year), must come at a corresponding cost. We must recognise that our HADR capabilities exist within a wider tension between defence and aid budgeting, and cogency of this tension can better inform our approach to disaster preparedness.

Current literature has outlined the cost-effectiveness of disaster risk reduction (DRR) and climate resiliency efforts when compared to disaster relief efforts. This study argues, citing findings from regional actors such as the Australian Red Cross, Oxfam, UN, coupled with the federal government's internal reports and current academic literature, that HADR operations are costly and ineffective in the long-term (especially considering the increasing threat of climate change to the region). Instead, Australia should ground its regional engagement activities in DRR and localisation of climate resiliency efforts. This would demand long-term partnerships that seek to build local capacity; we should be aiming to make our disaster relief capacities redundant in the face of locally-developed capacity.

The different approach to disaster relief in Vanuatu for Cyclone Pam and Fiji for Cyclone Winston, offer lessons in international versus regional approaches to disaster relief, and the ongoing demands of post-disaster reconstruction. As we find ourselves in the Era of Disasters, we need to embrace the expectations the Australian and regional communities have of the ADF as a well-resourced capability. Health is integral to that capability and indeed should play a leading stakeholder role in future strategy development for Australia in the South Pacific. Our humanitarian principles afford us unique opportunities for driving diplomatic engagement between nations; this too, we must embrace. The long-term stability of the region, and therefore the security of Australia, depends upon a more sustainable approach to disaster preparedness, built upon regional partnerships and a shared sense of responsibility among nations and their respective militaries.

Biography

Corporal Alasdair Hill enlisted into the Australian Army in 2009 and completed his medic training at the Army School of Health in 2012. He has since been posted to 1st Close Health Battalion, 2nd General Health Battalion and is presently posted to National Operations, Joint Health Command, Canberra.

In 2015–16, Corporal Hill deployed to Iraq as an evac medic for Task Group Taji, and in 2017, supported the Army Aboriginal Community Assistance Programme (AACAP) as part of the health team.

He is presently studying a BA, majoring in global politics/policy and international aid/development, with an aspiration towards future medical studies.

Alasdair is passionate about international development, foreign policy, and is particularly interested in the demands climate change presents to the world for a renewed sense of international cooperation.

HeadStrength – ADF's Mental Health App

Emily Jallat¹

1 Joint Health Command, Australia

Abstract

The ADF Centre for Mental Health drives mental health prevention, promotion and early intervention programs and initiatives for the ADF. It has recently added a mental health app to its suite of products that tackle stigma and barriers to care. In line with the Defence Mental Health and Wellbeing Strategy 2018–2023, which emphasises the importance of members' increased control over their wellbeing, HeadStrength delivers the user the ability to anonymously self-check and instantly connect to a range of tools and resources that are relevant and specific to their current level of wellbeing. It is an important addition to the suite of products targeting mental health promotion, prevention and early intervention by delivering person-centred mental health information anywhere, anytime.

HeadStrength features a mood tracker that enables the user to develop insight into their current levels of wellbeing and to observe changes over time. Resources are delivered to the user based on current mood as well as interests. The resources provided in the app have been specifically selected and curated for the ADF audience. They include links to defence specific information as well as links to relevant external sites. Information is delivered via text, audio and or video with users being able to filter on preference relating to the type of information, sources and interests. A range of self-check surveys is included in the app that enables the user to delve further into areas of personal interest or concern.

Biography

Mrs Emily Jallat was appointed as the Director of the Australian Defence Force Centre for Mental Health in August 2018. She is an endorsed clinical psychologist, holds a Master's degree in Clinical Psychology and Neuropsychology from the Universite Aix-Marseille, France and completed her undergraduate psychology degree in England. She started her career as a teacher with a teaching degree from the University of Sydney.

Mrs Jallat has travelled and worked in Australia and Europe in a variety of sectors. Prior to joining the Department of Defence, she was Head of Clinical Governance at Benestar (formally DTC). She is passionate about providing innovative promotion, prevention and early intervention programs to ADF personnel.

Preparing for Capture: The ADF Model

MAJ Samantha Hodges¹

1 Defence Force School Of Intelligence, Australia

Abstract

Being captured by the enemy has been a risk for military personnel since the origins of human conflict. Given this inherent risk of capture, and the significant potential for psychological and physical trauma as a result of captivity, the ADF and many allied nations have developed specialised training programs to equip military personnel to survive these high-risk situations with dignity. In the ADF, members who are deemed a 'high risk' of capture complete Conduct After Capture (CAC) training.

The primary goal of CAC training is to prepare ADF members to endure the rigours of captivity and exploitation, and to survive with dignity. It includes classroom lectures and the application of skills and knowledge in simulated captivity scenarios.

This presentation will outline the ADF's CAC training, including the training model, safety mechanisms, historical participant feedback and the role of ADF psychologists in support of training.

Biography

MAJ Hodges was commissioned as a Psychology Officer in the Australian Army in 2007. Her diverse profile includes Forces Command, Joint Health Command, Intelligence units, training establishments, and broad experience on operations including Operations ASTUTE, SLIPPER, ACCORDION, AUGURY-B, HIGHROAD and VICFIRE ASSIST.

Major Hodges is currently posted to the Defence Force School of Intelligence (DFSI) where her role includes course instruction, staff officer duties and clinical treatment for personnel in a joint environment. She is the senior psychologist for the ADF Conduct After Capture capability, and directly supports the training and certification of human intelligence and information operations personnel.

MAJ Hodges holds a B. Psychology (Hons) and a Masters of Clinical Psychology. She is currently enrolled in a postgraduate course in Global Health Engagement through the United States Uniformed Services University of Health Sciences. MAJ Hodges is the co-author of two peer reviewed articles on the use of telecommunications for therapy, and the importance of sub-clinical trauma in the ADF. A third article on the impact of UAV missions on the mental health of ADF operators is awaiting publication.

NZDF Wellbeing Impacts in the COVID-19 Pandemic Environment

COL Clare Bennett¹, LTCOL Stephen Kearney

1 New Zealand Defence Force, Wellington, New Zealand

Abstract

The impact of the COVID-19 pandemic on the NZDF operation and national response role has been significant. It required new ways of working and presented a range of challenges to our force and our broader Defence community professionally and personally. A range of strategies was put in place to keep connected, foster wellbeing and provide access to support in a lockdown environment. This presentation provides a summary of how we have supported and monitored the health and wellbeing of our people over the last eight months, including levels of wellbeing and areas of current and emerging challenge over time.

Biography

COL Bennett joined the Regular Force in 1987. Since this time, she has held a variety of roles in operational psychology, research, HR policy and strategy and mental health in NZDF and broader government.

International Collaboration is the Future for Global Health

LTCOL Simon Horne¹, Miss Amy Russell, COL USAF Bradley Boetig²

1 Ministry of Defence, N/A, United Kingdom

2 Department of Defense, N/A, United States of America

Abstract

Global Health Engagement (GHE) is an international capability for meeting National Security Objectives, but is also critical in influencing healthcare globally in LMIC. This is not a new premise; however, the way we do it is changing and becoming more focused by design to include strategic partnerships. How we undertake activities is paramount, and an understanding of the requirement for all partners is essential. We should mirror humanitarian and development guidance where applicable; for example, for humanitarian principles in disaster relief, doing no harm and supporting moves towards universal health access. Now that GHE is a core military task, we should ensure that our personnel are trained to plan, deliver, assess, monitor and evaluate programmes that are sustainable and

deliver essential capability and capacity building. Working as part of an alliance to standardise this approach and as individuals to contribute as part of an international response is crucial.

An alliance approach, focusing on our national strengths, allows us to reduce duplication of effort, standardise delivery and streamline messages being disseminated in priority regions, while not over-stretching our armed services. The Uniformed Services University (USA) has joined forces with the UK, Australia, Canada and (soon) New Zealand, to develop an international masters level qualification and international faculty of subject matter experts. Together we are developing an online distance learning package to enable an academic pathway in this field to qualify personnel who can shape, guide and advise on programmes of GHE.

Presentation to include US, UK and Aus representation.

Biography

Lt Col Simon Horne is a British Army Consultant in Emergency Medicine, in Plymouth, UK. He is currently the Consultant Advisor for Emergency Medicine to the Senior Health Advisor (Army).

Simon studied medicine at Oxford, joining the Army in his final year. He has deployed to Northern Ireland, the Gulf, Afghanistan, Sierra Leone and South Sudan in forward surgical teams, the emergency department, prehospital retrieval and medical director roles. In 2014 he undertook the Diploma in Humanitarian Assistance at the Liverpool School of Tropical Medicine. His current academic interests centre around his PhD at King's College London, examining civil-military relationships along the aid, development and peacebuilding spectrum. He also has a keen interest in major incident management and triage, resource-constrained medicine and global health, and military medical ethics. He was director of the Medical Support to Humanitarian Operations course from 2015–2018 and is the lead for the Academic Centre for Defence Healthcare Engagement.

ReVive Ketamine IV Infusion: Integrated ReVive Ketamine IV Infusion: Integrated Treatment for PTSD and TRD

Ms Rachele Dawson¹, Dr Valerie Quah²,
Dr Watson Andrew², Ms Melanie Angkico²,
Dr Joanne Crookes¹, Dr Alexander Lim¹

¹ Zed3 Medical Group, Canberra, Australia

² Calvary Bruce Private Hospital, Canberra, Australia

Abstract

Post-traumatic stress disorder (PTSD) and depression are chronic and debilitating conditions that are sadly common in military personnel. Currently, there is considerable evidence for first-line treatments for PTSD and depression, such as antidepressants and cognitive behavioural therapy; however, these do not yield sustained remission in many individuals. Those who do not respond to conventional treatments are faced with various psychiatric sequelae, including declining quality of life, comorbid chronic conditions, increased risk of suicide and decreased cognitive functioning.

Advances in understanding the pathophysiology of PTSD and depression have highlighted neurobiological mechanisms, including N-methyl-D-aspartate (NMDA) reactivity. High NMDA reactivity is considered to play a role in the formation of intrusive memories and stress reactions. Ketamine is a NMDA antagonist that has been shown to have rapid antidepressant effects and enhance neuroplasticity by preventing the phosphorylation of eEF2 (a protein-coding gene), increasing BDNF levels and elevating shuttling of AMPA receptors. Multiple infusions of ketamine have shown dramatic and rapid results in treatment-resistant sufferers of depression and PTSD. However, questions remain regarding the maintenance of positive outcomes following ketamine infusions and best mode of administration.

We created a multisite, multimodal approach to treating PTSD and depression in veterans using ketamine infusions, with the key aims being rapid treatment and sustained remission of symptoms. The program, which we named ReVive, combines knowledge, assessment and treatment from the disciplines of psychiatry, psychology, general practice and anaesthesiology.

Patients are ex-serving Australian Defence Force members who have failed to respond to trials of conventional medications and/or psychotherapy. Prior to enrolment in the program, patients undergo extensive testing and baseline assessments to assess eligibility (including genomic testing, blood tests (FBC, UEC, LFTs, CRP), urine and psychometric assessment). Patients receive up to six initial doses administered over two weeks on a Monday–Wednesday–Friday basis. Patients then receive monthly follow-up doses over six months to maintain effects. Patients also undergo ongoing monitoring of physical and psychological responses to treatment and concurrent psychotherapy (such as Eye Movement Desensitisation and Reprocessing or Cognitive Processing Therapy).

In our presentation, we aim to (1) provide an overview of the ReVive ketamine protocol, (2) present preliminary results, (3) provide an opportunity for collaboration, and (4) discuss future research directions, specifically our plans for a randomised controlled trial.

Biography

Dr Alex Lim is a Consultant Psychiatrist in private practice in Canberra. He has a special interest in the area of trauma psychiatry, and works extensively with trauma patients and those with PTSD, in particular Veterans and First-Responders. He is passionate about watching his patients improve and getting back to life.

Dr Lim is the founder of the Canberra Trauma Group (CTG) and hosted the RoundTable Conference on Trauma 2018 in Canberra. He has a keen interest in clinical governance and team-based clinical models and encourages clinicians to work collaboratively to provide the best care possible for his patients.

Dr Lim established ZedThree Specialist Centre to welcome clinicians and patients who enjoy working in an interdisciplinary model. He also established the ReVive Ketamine program in 2019. Dr Lim has collaborated with a wide range of professionals to design clinical research into the efficacy and mechanisms of ketamine treatment. He is currently collaborating with research staff from the University of New South Wales, Yale University and the University of Queensland.

Veterans Walking Alongside Veterans: Open Arms Community and Peer Program

Leonie Everett

1 Open Arms – Veterans & Families Counselling, Canberra, Australia

Abstract

The Open Arms – Veterans & Families Counselling (Open Arms) was a service founded by veterans in direct response to the mental health impacts of the Vietnam War. Building on this history, the community and peer program within Open Arms is part of the response to an emerging cohort of veterans from the Middle East, Timor Lest and Peacekeeping missions. The program directly addresses the concerns about suicide among ex-serving ADF personnel. It is part of a broader program to strengthen the support available for the most vulnerable and at-risk individuals.

Compared with Australian men, the age-adjusted rate of suicide between 2001–2017 was 48 per cent lower for ADF serving members, but 18 per cent higher for ex-serving men. Over the same period, the age-adjusted rate of suicide among ex-serving women was 115 per cent higher than that of Australian women. The community and peer program is part of a continuum of support being developed to address these rates.

For veterans and their families, the experience of transitioning from the ADF can be accompanied by complex social, financial, employment, wellbeing and mental health challenges. These challenges are further reinforced by damaging stereotypes of veterans that have emerged in popular discourse. By introducing a lived experience peer advisory workforce, Open Arms is providing veterans and their families with access to alternative stories of identity post service, reflecting the positive recovery journeys undertaken by many in our veteran community.

The Open Arms Community and Peer Program aims to create a bridge to mental health care, strengthen relationships with local service providers and the ex-service community, provide assertive reach-out and integrated support, as well as to provide a platform for connection. The peers also contribute to the cultural competence of the broader Open Arms workforce. Open Arms teams include Australian Defence Personnel and family members with lived experience of mental health recovery. They work both at the national policy and program level and in clinical teams around Australia.

This paper will outline the success of a two year pilot in Townsville, as well as the cultural, policy, training and challenges of the implementation of the program. It will include data from this implementation and highlight the role the program plays in the complex case management, through promoting recovery, hope, reducing stigmatisation and increasing help-seeking behaviours for veterans and their families.

Biography

Dr Stephanie Hodson is the National Manager for Open Arms – Veterans & Families Counselling (Open Arms) and has been with Open Arms since 2016. Stephanie is a veteran herself, serving for 23 years in the Army. Stephanie has led Open Arms in the crucial rebranding from VVCS to Open Arms, collaborating with the RSL to promote and deliver free mental health training for the veteran community, creating a 24/7 national call centre to streamline client intake and provide crisis assistance, and leading the largest national community and peer program, utilising lived experience to promote recovery and engage with veterans and their families.

features of the outbreak. Firstly, in many parts of the world, there has been insufficient effort placed on identifying cases of COVID-19 in populations due to inadequate testing, limited resources and the effects of COVID-19 on health care systems. In many countries, this has led to significant concerns about the accuracy of officially reported case counts. Secondly, COVID-19 has special clinical features requiring new approaches to modelling. A significant number of COVID-19 cases do not exhibit any signs or symptoms (asymptomatic) but are nevertheless infectious. A large number of these cases are found in young persons. Understanding how transmission of COVID-19 operates in the young and asymptomatic, and how this contributes to the spread into the more vulnerable older segments of the population, has emerged as the epidemic has unfolded.

Since late March 2020, detailed COVID-19 mathematical epidemic models have generated regional and global estimates to support medical intelligence outputs that in turn support strategic decision making in the ADF. Led by a team of researchers experienced in the modelling of high consequence emerging diseases of pandemic potential from the Kirby Institute and School of Public Health and Community Medicine at the University of New South Wales, models responding to and incorporating the emerging complexities of COVID-19 as a disease have been developed and implemented into the medical intelligence cycle. In this presentation, the technical approach to the UNSW COVID-19 epidemic modelling will be outlined, as will the modelling cycle and integration of modelling into medical intelligence. Key insights into COVID-19 emerging from the modelling will be provided, as well as some of the pitfalls, cautionary tales, and challenges associated with the valid and proper use of predictive epidemic modelling for decision making in rapidly evolving circumstances.

Regional and Global Modelling of COVID-19 to Support Decision Making

Associate Professor David Heslop¹, Professor Raina MacIntyre¹

¹ University of New South Wales, Randwick, Australia

Abstract

The emergence of COVID-19 in late 2019 in Wuhan, China, resulted in a very large pandemic continuing throughout 2020, and which is likely to persist until adequate public health control is achieved. The pandemic has led to significant impacts in terms of health, mortality but also economic, social, geopolitical and military impacts that are only beginning to be felt. Mathematical epidemic modelling is a tool commonly used to provide decision makers and public health officials information about potential future trajectories that an epidemic might take. This information is critical for understanding the potential magnitude of the crisis, the likely effect of public health or other interventions, and the duration that the crisis is likely to unfold over. Taken together, this can provide information about measures that could 'flatten the curve' or 'delay the peak', thus saving lives.

The mathematical epidemic modelling of COVID-19 has been very challenging due to several unique

Biography

Dr David Heslop is an Associate Professor at the School of Public Health and Community Medicine at UNSW Sydney. He retains military responsibilities as SO1 Public Health and Occupational Medicine at Army Headquarters. Dr Heslop is a clinically active vocationally registered general practitioner, and practising Occupational and Environmental Medicine Physician.

During a military career of over 15 years, he has deployed into a variety of complex and austere combat environments. He has advanced training in Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) Medicine. His research interests lie in health and medical systems innovation and research. He is a

chief investigator on the NHMRC Centre for Research Excellence Integrated Systems for Epidemic Response (ISER). He undertakes collaborative research exploring evaluation of the medical aspects of high risk and high consequence environments through a novel computational modelling and simulation effort with DST Group, and various emergency response and CBRNE related teaching and research activities with Industry and Government organisations. Throughout the COVID-19 crisis, he has been providing specialist Public Health and Occupational and Environmental Medicine advice to a range of government and private organisations.

e-Mental Health in the Wild: Online Help-seeking in the ADF

Ms Helen Benassi^{1,2}

1 Joint Health Command, Australia

2 Centre for Mental Health Research, ANU, Australia

Abstract

Background

It is commonly assumed that the delivery of mental health services online will improve access to care due to the potential to overcome stigma and other barriers to face-to-face help-seeking, such as accessibility and desire for autonomy. Although there is increasing evidence of the efficacy and acceptability of online interventions, studies examining broad utilisation of online mental health resources at a population level are uncommon. Recent reviews in Australia and internationally point to a distinct lack of policy-focused research^{1, 2} and gaps in the translational evidence-base³ for e-mental health. Three key policy-relevant gaps in the evidence base include inadequate definitions of populations for whom e-mental care is most suitable; no benchmark of current e-mental health use compared to other interventions, limiting modelling of future e-service use; and, insufficient information to inform policies that facilitate broad-scale adoption.

Objective

This paper examines the reach of e-mental health resources in the Australian Defence Force (ADF) community, including various modalities (information websites, telephone helplines, social media, internet treatments and smartphone apps), and factors associated with uptake of each modality.

Methods

Data were drawn from a cross-sectional study investigating the mental and physical health of

current and recently transitioned ADF members. A total of 11 587 serving and ex-serving ADF members participated in an online survey, which examined mental health, face-to-face and online help-seeking behaviour, as well as predisposing, need and enabling factors.

Results

Results showed that utilisation of online and mobile health resources varied depending on the type of resource, with websites most commonly used and internet interventions least used. Rates of usage were higher for those with a current disorder; however, overall, it seems that face-to-face services were preferred over both online and telephone options. Those who used online in the absence of face-to-face services were younger, had moderate severity of symptoms and higher self-reported resilience. These users also reported higher self-stigma and greater concerns about the adequacy and relevance of mental health services.

Conclusion

Despite various online and mobile mental health resources available across Australia, there have been low uptake rates in the Australian military, particularly of resources with the strongest evidence base. There is much promise in e-mental health technologies; however, further implementation research is required to engage users and improve the reach of such services.

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3. Batterham P.J. et al. Developing a roadmap for the translation of e-mental health services for depression. *Aust N Z J Psychiatry*, 2015;49(9):776-84.

Biography

Helen is a psychologist and researcher, and Sir Roland Wilson Scholar. During her career, Helen has been responsible for the coordination of strategic mental health research within the Department of Defence. She was an investigator on the Longitudinal ADF Study Evaluating Resilience and the Transition and Wellbeing Research Programme as well as the first-ever study to examine the prevalence of mental illness

in the ADF in 2010. She has worked in roles spanning mental health policy, screening, surveillance, unit climate, epidemiology and personnel selection research.

Helen is currently Acting Director of the newly created Directorate of Health Research within Joint Health Command. She is passionate about the role of research evidence in policy and practice and is focused on building a solid framework to support the translation of health research within Defence.

Army Health Services Modernisation

COL Toni Bushby¹, LTCOL Phil Butt¹, LTCOL Kelly Dunne¹

¹ Director Army Health, Canberra, Australia

Abstract

Army Health Services are currently in the middle of the largest modernisation of the health workforce and establishment structures since the Vietnam era. The catalyst for this modernisation was the release of Army in Motion—Army's Contribution to Defence Strategy and the Employment Category (EC) Modernisation initiative nested within this. For the first time, Army Health would review all Army Health EC as part of two workforce segments—physical and mental health. The key discriminator between these and previous reviews would be the focus on the function delivered to achieve an effect as opposed to the form or structure that currently delivers it. Additionally, the review would be partnered for the first time by the Director Army Health (initially COL Isaac Seidl now COL Toni Bushby) and the Employment Category Sponsor (COL Matt Patching). Given the scale of this undertaking, the workforce segment review (WSR) process was broken into two phases to be undertaken in 2019 (phase 1) and 2020 (phase 2). Major analysis and stakeholder engagement occurred with the commissioning of an environmental scan of the health workforce by KPMG and several COA development working groups and war games held in Brisbane, Albury–Wodonga and Canberra and online using the ADELE platform during the COVID 19 lockdown period. While at the time of writing phase 2 of the Health WSR is currently underway, phase 1 has been completed with the following changes endorsed by the Director-General Army People Capability through the Army EC Review Process:

- Amalgamation of the Medical Technician, Combat Paramedic, Combat Medical Attendant into one EC with SERCAT 5 and 7 ab initio entry pathways and EN and Paramedic entry pathways

and renaming Army Medic (AMED) ECN 368

- Completion of SERCAT 7 AMED IET after achievement of EN qualification and initial Army contextualised training
- Termination of the Operator Theatre Technician (OTT) EC stream
- Absorption of Examiner Psychology Mental Health function delivery into the AMED EC
- Implementation of Nursing Levels to the Nursing Officer EC to enhance capability outcomes and actualise the TWM
- Implement Health Officer Training changes specifically introduce a basic and advanced Health Officer Course.

Detailed implementation plans relating to the above changes will be released by Army Headquarters in the latter half of 2020 and managed by the EC Manager Health within Employment Category and Training Design Group at ALTC.

The second component of the Army Health Modernisation is the establishment review (ER), which in principle, follows a WSR in order to take advantage of any workforce changes. The last time this was undertaken by Army was 10 years ago under the Health Force Modernisation Plan and saw major structural transformation. The terms of reference to undertake the 2020 Army Health Services ER was released in February with the intent to review Army Health Structures to ensure they are ready now and future ready and presents an opportunity to enhance the delivery of health support to Army and the wider Defence community. Again this review will be a partnered approach by the Director Army Health and the EC Sponsor and will involve major analysis and stakeholder engagement through the COA development process to ensure success during the conduct of the ER in September. The implementation plan for the ER will be released in early 2021 with a communication plan, including regional visits to be implemented by DAH during 2021, and the ER finalised by career management cycle 2022.

*Note by the time of presentation updates will be given on phase 2 of the WSR and ER status.

Biography

COL Bushby commenced her appointment as DAH in September 2019. She is the current HOC RAANC and has regimental and clinical experiences in both Joint and Army appointments including Commanding Officer Army School of Health. Colonel Bushby has operational experience in East Timor, Afghanistan and Kosovo. She is an Associate Fellow of the Australasian College of Health Services Management

and a member of the Australian College of Nursing.

LTCOL Dunne commenced her role as the SO1 health workforce and Capability in January 2020. She has served as Commander of the 8th Close Health Company and Adjutant of the Royal Military College, Duntroon and has operational service in the Middle East and South Pacific. She has a Master of Emergency and Disaster Management and is an Associate Fellow of the Australasian College of Health Services Management.

LTCOL Butt has worked as a project officer since October 2018 on the Health WSR and ER. He has a broad regimental background within combat health and has operational experience in East Timor, Banda Aceh and southern Iraq. He is a graduate of the Canadian Force College Joint Command and Staff College and is recognised as a professional member of the Australian Human Resources Institute.

Improving Responses to Veteran Suicide Risk: Embedding SafeSide CARE Framework

Jennifer Veitch¹, Dr Stephanie Hodson CSC¹

¹ Open Arms – Veterans & Families Counselling, 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 Clinical Psychologist and University of Rochester Associate Professor, Dr Anthony Pisani Ph.D., reflects contemporary thinking in suicide prevention. Open Arms has entered into a partnership with SafeSide Prevention, to implement its Risk Prevention Oriented CARE Framework.

This presentation will provide insights into the change journey required to deliver the training and continuous development of a nationwide, multidisciplinary and geographically dispersed workforce inclusive of lived experience peers and an outreach provider cohort of approximately 1400 clinical contractors. The presentation will also speak to the co-designed evaluation process developed specifically for Open Arms to assess the approach taken to the training of the lived experience peer workers and support for their role in suicide risk prevention.

The SafeSide CARE 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).

Open Arms is the cornerstone of the Government's veteran mental health support and suicide prevention response, delivering free and confidential, nationwide counselling and support for over 27 000 current and ex-serving ADF personnel and their families annually. The SafeSide approach reflects the needs of Open Arms clients. It 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

Jennifer Veitch is a psychologist with significant experience in clinical leadership. Jennifer is the Assistant National Manager at Open Arms – Veterans & Families Counselling. She brings a wealth of experience from her work with individuals and families. She is a highly skilled clinician and psychotherapist committed to providing effective interventions and supporting those with complex needs. Jennifer enjoys leading and developing teams and has a particular interest in exploring new and innovative ways of delivering mental health services.

Guiding Principles for Complex Decision Making During the COVID-19 Pandemic

CMDR Anthony Holley¹

¹ Royal Australian Navy, Toowong, Australia

Abstract

The scale of the 2019 coronavirus (COVID-19) pandemic is uncharted territory and was predicted to cause significant strain on finite resources. It is in this context that COVID-19 generated significant challenges regarding potential clinical decision making when the demand for intensive care exceeds local capacity. Intensive care requires significant resources, particularly in relation to highly skilled staff, appropriate physical space and equipment. The ANZICS intensive care surge analysis study demonstrated a potential to triple ICU bed numbers across the nation to a maximum of just over 7000 and

would have constituted the absolute limit. Intensive care specialists, in partnership with other specialist colleagues, are required to make decisions about the ethical allocation of critical resources, especially when demand exceeds capacity. These potentially life-defining/limiting decisions should be made fairly, consistently, transparently and in accordance with policy to the extent that is possible. Any guideline also needs to recognise that comfort and dignity remain essential elements of care, especially when survival seems unlikely, and it is decided that life-sustaining treatments are not initiated or are ultimately withdrawn. In order to promote consistent, transparent, objective and ethical decision making, the Australian and New Zealand Intensive Care Society (ANZICS) formed a working group to urgently develop guidelines outlining key principles that should be utilised during the pandemic. The working group had an ethicist, intensivists and consumer representative.

The key guiding principle for the provision of patient-centred intensive care therapy for adults and children is that treatments are tailored to the specific clinical needs, preferences and values of each individual. The principles developed are intended to support the practice of intensive care specialists during the COVID-19 pandemic and to promote the development of local admission policies that should be endorsed by health care organisations and relevant local authorities. The guideline development, substantial controversy and final document will be presented.

Biography

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

Anthony is an intensivist working at Royal Brisbane and Women's Hospital. He is a senior lecturer with the University of Queensland Medical School. Anthony is currently the ANZICS President. He is an examiner for the fellowship of the College of Intensive Care Medicine of Australia and New Zealand. Anthony has authored eight book chapters and 47 peer reviewed publications. He is a supervisor of intensive care training at the Royal Brisbane and Women's Hospital and is an instructor for BASIC and EMST (ATLS). Anthony serves as a representative for the National Blood Authority Critical Care Group in developing the Australian Patient Blood Management Guidelines.

Anthony serves in the Royal Australian Navy and has deployed on multiple occasions. He has deployed to Afghanistan twice, the Persian Gulf, Operation Resolute, Iraq for four tours and most recently to the 2020 bushfires aboard HMAS ADELAIDE.

Disaster Management Imaging – Facilitating the Future for ADF Radiology

LT Lachlan Roberts¹, LTCOL John Magnussen^{1,2}

1 Australian Defence Force, Enoggera, Australia

2 Macquarie University, Macquarie Park, Australia

Abstract

Providing expedited, high-standard hospital care and assistance worldwide, Australian Defence Force (ADF) Medical Imaging has again proven its preparedness and flexibility to respond to combat and Humanitarian Assistance and Disaster Relief (HADR) tasks wherever and whenever they occur. Medical imaging is a critical component to providing holistic healthcare in this age of modern medicine. It has been proven vital for prompt diagnosis, effective triage and management of complex trauma patients. To be without in these areas is a needless disadvantage to defence members and disaster-stricken communities during their time of crisis. The consistent issue of providing such treatment stems from the fact that radiography equipment and departments are drastically constrained by the infrastructure they reside in or the portability of the often large, complex machines. When disaster strikes and health must respond, solutions to these constraints must be available for all imaging modalities. This has been ADF Medical Imaging's challenge and goal for the past 30+ years—To provide continuous improvements in technology, compact portability and highly deployable imaging solutions for nearly any environment or facility. The ADF has already seen the medical imaging team's assistance in combat deployments in Vietnam, Somalia, Rwanda, East Timor, Afghanistan and Iraq to HADR tasks in Sumatra, Pakistan, Fiji, Papua New Guinea and most recently, in Christmas Island and Howard Springs whole government response to COVID-19. This highly interoperable allied health jigsaw piece is currently utilised in all health spectrums from battlefield trauma to chronic illness diagnosis. With the introduction of JP2060 Ph3&4 in 2023, medical imaging within the ADF will be capable of providing not only deployable medical x-ray, sonography and teleradiology, but will also encompass dedicated portable Computed Tomography (CT), Fluoroscopy and greater teleradiology services in the form of its Picture Archive and Communications System (PACS). As Defence continues to provide higher levels of healthcare and are asked to respond to more and

more HADR tasks within Australian and worldwide, the ability to provide a stand-alone imaging service and quick radiologist reporting through teleradiology is a major milestone in ADF health. From utility in a small Role 1 to an enormous footprint that will be the Role 3 deployable hospital, the ADF is laying the groundwork and will be prepared to tackle all current needs and continue to be future ready.

Biography

Wing Commander John Magnussen is the ADF Radiation Medical Practitioner and is Professor of Radiology at Macquarie University. He is a diagnostic and interventional radiologist with a PhD in Biomedical Engineering and has worked in multiple public and private hospitals. He has published more than 130 articles, abstracts and books chapters on subjects ranging from basic science to clinical research, from medical, biological sciences and archaeology. His work has been supported by more than \$22M in grants. He has a strong interest in the provision of medical imaging in the deployed environment.

Lieutenant Lachlan Roberts is an Australian Army Radiographer posted to the 2nd General Health Battalion. He graduated from Queensland University of Technology with a Bachelor of Medical Imaging Technology in 2016. He has deployed overseas and domestic as a sole Radiographer to Toomelah (NSW) in 2017 for the Army Aboriginal Community Assistance Programme; Iraq in 2018 for Operation Okra – Task Group Taji VII; and most recently, Christmas Island and Howard Springs in 2020 for the whole of government response to COVID-19. He is proud to be a part of the Army radiography team and providing necessary medical support to ADF operations and disaster areas.

Suicide Prevention: Lessons from Research to Inform Our Practice

Dr Stephanie Hodson, Nicole Sadler

1 Phoenix Australia – Centre for Posttraumatic Mental Health, Canberra, Australia

Abstract

Suicide is a global public health concern, and there has been extensive investment on suicide prevention programs, including for serving and ex-serving military populations to date. Suicide prevention programs encompass a wide array of approaches broadly aimed at addressing the balance of risk and protective factors for an individual or a population. The diversity of risk and protective factors for suicidal thoughts and behaviours has led to similarly diverse methods of prevention, ranging from approaches designed to address risk factors before their emergence, to those implemented in the midst of a suicidal crisis.

This paper will outline the current research on suicide prevention programs and strategies, with a focus on those targeting serving and ex-serving military personnel. Findings are guided by the Institute of Medicine's continuum of health services framework, which uses three categories of prevention services, differentiated by increasing levels of risk in the target population: universal, selective and indicated. The implications for translating research findings into programs, including the need for robust evaluation methodologies, will also be explored.

Biography

Nicole Sadler is the Head of Policy and Practice, Phoenix Australia – Centre for Posttraumatic Mental Health, and an Enterprise Fellow in the Department of Psychiatry, University of Melbourne. She is a clinical psychologist who specialises in evidence-based systems and services to support individuals working in high-risk organisations, including military, police and emergency services. Prior to joining Phoenix Australia in 2017, she served in the full-time Army for 23 years and completed her career in the senior Army psychology position at the rank of Colonel.

Nicole continues to serve in the Army Reserves. She is currently undertaking a PhD through the University of Adelaide, investigating suicide ideation and behaviours in serving and ex-serving Australian Defence Force personnel.

Suspending Bioethical Principles During a Pandemic: a Framework Approach

CHAP(SQNLDR) Revd. Dr Nikki Coleman¹

1 Royal Australian Air Force, Canberra, Australia

Abstract

Occasionally in the military, operational situations arise where it is necessary to consider giving to military personnel not-yet-approved medications. A public health emergency, such as a pandemic, is one such situation where the use of not-yet-approved medications may be considered. Operational situations such as these are challenging for the medical personnel on the ground (who may be isolated and not able to consult with an ethicist) and also for the Human Research Ethics Committees/ Research Ethics Committees/ Institutional Review Boards who oversee the approval and use of these medications.

This paper draws upon bioethical principles, the Siracusa principles and the concept of supreme emergency to create a framework to assist medical practitioners and ethics committees in making informed, consistent decisions in order to balance operational needs and risks to military personnel. Two cases are examined to test the framework approach, with a flowchart to assist with ethical decision making during a time of public health emergency, such as a pandemic.

Biography

CHAP(SQNLDR) Revd. Dr Nikki Coleman is the Senior Chaplain Ethicist for the Royal Australian Air Force. Her research interests include military bioethics and space ethics. She is a research fellow at the Case Western Reserve University Inamori Center for Ethics and Excellence, a member of the summer teaching faculty at Yale Interdisciplinary Center for Bioethics, a Research Fellow at UNSW Canberra in the Space department, a visiting research fellow at the RAAF Air Power Development Centre, and a chaplain in the Royal Australian Air Force. She is also a member of the Australian Departments of Defence and Veteran's Affairs Human Research Ethics Committee.

Coping Insights Emerging from Self-reflection on Stressors in Officer Cadets

Ms Samantha Falon¹, Dr Monique Crane¹

1 Macquarie University, Sydney, Australia

Abstract

Evidence suggests that periods of military service may place individuals at an increased risk of compromised mental health (Maguen et al., 2010; Milliken et al., 2007; O'Toole et al., 2009). Of this period, Officer training may represent a particularly stressful and formative period for personnel, entailing a diverse combination of stressors such as extensive academic work, limited opportunities to participate in decision making, time pressure to complete tasks, and separation from friends and family.

In response to these demands, a novel approach to resilience training, known as Self-Reflection Resilience Training (SRT), has been formulated to develop the capacity for resilience in Officer Cadets. In contrast to other interventions that focus on the cultivation of cognitive and behavioural skills in military settings (e.g., Cohn & Pakenham) and other workplaces (e.g., Robertson et al., 2015; Vanhove et al., 2016), SRT enhances the capacity for resilience by using structured self-reflection journals to teach participants to reflect on their initial responses to triggering events, the effectiveness of their existing coping strategies and resources, and how these can be usefully adapted in order to strengthen one's coping approach (Crane, Searle, Kangas, et al., 2019).

Two clustered-randomised controlled trials with Officer Cadets at the Royal Military College found that following exposure to significant training demands, SRT is effective at reducing symptoms of depression and anxiety after a three-month interval (Crane, Boga, Karin, et al., 2019; Falon, Karin, Boga, et al., 2020). However, less is known of the insights into daily stressors and coping approaches (i.e., coping insights) that increase the capacity for resilience in Officer Cadets who complete this intervention. In light of this gap, the objective of the present research was to investigate the types of insights into daily stressors and coping approaches that emerge during the completion of self-reflection journals by Officer Cadets.

To investigate this research question, 68 second-class Officer Cadets from the Royal Military College, Australia, submitted self-reflection journals after the completion of SRT. All written responses were electronically scanned and analysed using a deductive

thematic approach, involving a determination of the extent to which a range of evidence-based exemplar coping insights (Falon, Kangas, & Crane, 2020) were reflected in the available data. Multiple co-authors will corroborate the fit between the emergent themes in the data and the evidence-based coping insights proposed by Falon, Kangas & Crane (2020) in order to reduce the risk of bias.

Initial analyses suggest that the contents of the self-reflection journals reveal a diverse range of coping insights that support the strengthening of resilience, including complex ideas about the self in the context of stressor exposure, an awareness of response patterns to stressors, and principles about the nature of stress and coping with application across time and contexts. Coping insights of this nature may mediate the relationship between self-reflective activity and the emergence of resilient capacities (Falon, Kangas, & Crane, 2020). These qualitative analyses also uncovered domains of coping insight that were underrepresented in the self-reflection journals, potentially reflecting opportunities to adjust or extend the SRT intervention during future trials.

The current study represents the first attempt to analyse the contents of participant journals in order to determine the coping insights, emerging from self-reflective activity, that may culminate in increased capacities for resilience in Officer Cadets. Based on these results, several recommendations have been made about how the SRT program can be modified or supplemented in order to more effectively facilitate the emergence of coping insight and embed this capability into organisational culture.

Biography

Samantha Falon is a registered psychologist who is currently undertaking a PhD and Master of Organisational Psychology at Macquarie University under the supervision of Dr Monique Crane. She holds student membership with the Australian Psychological Society and the College of Organisational Psychologists. Her research interests include the link between occupational resilience and performance, preventative approaches to workplace mental health, and evidence-based training and development programs.

Samantha's doctoral research investigates the critical roles of self-reflection on daily stressors and coping during the development and consolidation of resilience in military personnel. As part of this research program, Samantha has collaborated with the Royal Military College to investigate this research question and establish a high quality, evidence-based resilience training framework in the military context.

The Broadly Incompetent Medical Officer: Outdated Models Denuding Army Capability

MAJ Aaron Tracey¹

1 1st Close Health Battalion - Australian Army, Townsville, Australia

Abstract

The year 2020 marks a decade since the Army Medical Services underwent two significant changes. The first of these was the Combat Health Restructure, which aimed to rebalance Army's combat health to optimise its deployable effect and address issues with employment structures. The second was the establishment of the National Medical Board and Australian Health Practitioner Regulation Agency under the Health Practitioner National Law Act 2009.

There have also been significant developments in Army's concept of operations following the release of Army in Motion. The current paradigm of Army doctor training fails to adequately prepare doctors for the role they are expected to fill. This results in poor utilisation of doctors over their ROSO, low job satisfaction, and increased medico-legal risk to both the individual and the wider ADF. Army in Motion exhorts us to be Ready Now and Future Ready, but we are wedded to last Century's model of a Military Medical Officer.

This paper seeks to provide a way forward, outlining a logical career progression and system of oversight of doctors that addresses some of the critical shortfalls in the current system, whilst maintaining the gains in training, competence, and supervision made during previous reforms.

Biography

Major Aaron Tracey commenced his Army career in 1999, initially as an Aeronautical Engineer in RAEME, serving in a variety of aviation and non-Army group units. Following an instructional posting at the Australian Defence Force Academy in 2009, he commenced medical studies, posting to Close Health, where he has remained since 2016.

His operational experience includes serving as a linguist in Iraq, OP RESOLUTE, and domestic support to the civilian community during multiple natural disasters in North Queensland. He has supported aviation operations in PNG and during multiple major exercises, and has completed the Aviation and Underwater Medicine courses, in addition to being a AME qualified medical officer

Major Tracey is a Fellow of the Royal Australian College of General Practice, holds a Diploma in Child Health, and is completing a Masters degree in Traumatology. He currently serves as the Senior Medical Officer at 2 Close Health Company in Townsville. His interests include military retrieval, training systems, and combat health support.

Imagining Robotics and Autonomous Systems in the Deployed Health Environment

MAJ Nick Alexander¹, Mr Paul Grant^{1,2}

¹ Joint Health Command, Canberra, Australia

² KPMG Australia, Canberra, Australia

Abstract

Robotics and autonomous systems (RAS) have arrived and will continue to be a key aspect of warfighting capability in the years to come. Further in the civilian health sector, RAS has burst onto the scene in the last decade, improving both the quality and access to care for many. The melding of these two streams of innovation; however, is in its infancy. As deployed health services are required to deal with the challenges of the future operating environment, there is great opportunity to leverage RAS to perform a range of the dirty, dumb and dangerous tasks that health practitioners currently provide. There is also value in pushing the boundaries of service delivery to leverage technology to enhance the provision of necessary care as quickly and safely as possible and provide high fidelity understanding of the health of the force.

With great opportunity; however, comes great risk. As more human combatants are removed from the battlespace, does risk to non-combatants increase, and therefore does the primary stakeholder of deployed health services change? How might technology such as nano-bots, which hold such promise as a technology for care, be weaponised and used for nefarious means? Furthermore, how far is too far when it comes to human-machine integration to improve combatant performance?

Posing more questions than answers, this presentation will explore both near and stretch goals for RAS to enhance the delivery of deployed health services. Additionally, it will explore a number of the ethical challenges that we may have to address as military health practitioners as the battlespace of the future becomes more autonomous.

Biography

Paul Grant is a management consultant with KPMG, contracted to provide an interim Chief Health Information Officer capability for Joint Health Command. Paul previously worked with the Australian Digital Health Agency on the national electronic health record project 'My Health Record'. He also spent a decade living and working in London. During this time he lectured for the European Center of Pharmaceutical Medicine, University of Basel, Switzerland. Paul has been an invited health insights subject matter expert at more than 60 conferences around the world. He is a Fellow of The Royal Society for the Encouragement of Arts, Manufactures and Commerce and a member of the Society for Artificial Intelligence in Medicine, Surgery and Healthcare.

Major Nick Alexander is a current serving member of the Royal Australian Army Medical Corps, posted as Staff Officer to Director-General Health Business and Plans, Joint Health Command. He holds a Bachelor of Physiotherapy and a Graduate Certificate in Pain Management. He has completed previous postings spanning the Army's deployable health capabilities. Passionate about future combat health effects, he has published a number of both fiction and non-fiction papers on the topic. He is the Communications Director of the Profession of Arms blog Grounded Curiosity.

Understanding Healthcare Needs of Older Community-based Veterans and Dependants

Georgina Johnstone¹, Dr Marissa Dickins^{1,2}, Dr Angela Joe¹, Dr Judy Lowthian^{1,3,4,5}

¹ Bolton Clarke Research Institute, Bentleigh, Australia

² Southern Synergy, Department of Psychiatry at Monash Health, Southern Clinical School, Monash University, Australia

³ School of Public Health and Preventive Medicine, Monash University, Australia

⁴ Faculty of Health and Behavioural Sciences, University of Queensland, Brisbane, Australia

⁵ Institute of Future Environments, Queensland University of Technology, Brisbane, Australia

Abstract

Background

Individuals supported by the Department of Veterans' Affairs (DVA) are predominately an older cohort, with over two-thirds aged 65 and older. Therefore, it is imperative to understand the health and wellbeing needs of older veterans and dependants. Little is

known about how the impacts of military service manifest in veterans and their informal carers in older age, particularly in relation to those living in the community, and their use of home nursing and care needs.

Method

A secondary analysis of routinely collected electronic care data over 10 years (2007–2016) was conducted. Episodes of care for veterans and dependants were compared to an age- and gender-matched sample of home-nursing clients from a large, not-for-profit community and aged care provider. Descriptive statistics established a demographic and clinical profile; multivariable multilevel generalised linear mixed-effects modelling was used to identify any associations between being a veteran or dependant and care provision.

Results

A total of 26 093 episodes of care were provided to 12 525 DVA-supported clients aged ≥ 65 years during the 10 years; 45.3% of episodes involved veterans (91.7% male, median age 88 (IQR=6)) and 54.7% involved dependants (99.6% female, median age 87 (IQR=6)). Episodes of care for veterans ($n=11\ 817$), or dependants ($n=14\ 276$) were associated with at least 16% and 14% more hours of care respectively than non-DVA-supported individuals, after controlling for confounding factors. Episodes of care for veterans and dependants comprised a greater duration and frequency of care, particularly more support for personal care, than non-DVA-supported individuals. A greater prevalence of cancers, respiratory, skin and musculoskeletal system disorders were present in veteran's episodes of care than the non-veterans matched sample; with episodes more likely to result in a decline in the individual's condition, and discharge to hospital.

Conclusion

Veterans and dependants supported by home nursing, have greater service needs and require greater support than their non-DVA-supported compatriots. Supporting veterans and dependants in the growing oldest age category (90 years and over) is vitally important. It is also essential to consider how to support the growing number of veterans entering the aged care system from post-World War II conflicts. Additionally, we must prepare to support the spouses and children of this group as they consequently enter the system as dependants. These results can inform the appropriate nature and level of current health care and welfare services required by veterans and dependants, as well as what will be needed over the coming decades.

This project was funded by a Defence Health Foundation Medical Research Grant.

Biography

Georgina Johnstone is a Research Officer at the Bolton Clarke Research Institute (formerly RSL Care + RDNS). Bolton Clarke is one of the largest Australian owned and operated not-for-profit healthcare and independent living service providers, with a long tradition of supporting our ex-services community. Georgina was recently awarded a grant from the Defence Health Foundation to analyse community nursing data for veterans and dependants, on which she will be presenting here.

Georgina was previously involved in a project to explore the experience of veterans and their families and identify gaps in health and social care for current and ex-serving members and their families, which resulted in the development of the Bolton Clarke's Veteran Family Mental Wellbeing Series. She has presented this work nationally and internationally. Georgina graduated with an Honours research degree in Psychology (first-class) in 2015.

Fast COVID-19 Testing Kits with Iqarus to Minimise Quarantine Requirements

[Dr Richard Wieser](#)¹

1 International SOS, Sydney, Australia.

Abstract

Introduction

During the COVID-19 pandemic, many countries put regulations in place that international travellers must have a certificate to state they are PCR negative for COVID-19 prior to entry. (The PCR test looks for the presence of the COVID-19 virus on swabs taken from the nose and throat.)

Failure to produce this could be met with a refusal of entry or 14-day quarantine. We have clients who mobilise crews globally for offshore and onshore rotations—quarantining for 14 days would mean that they effectively miss part of their trip or part of their time off.

Discussion

In order to assist our clients with this predicament, we initially put in place a process where our trained clinicians could travel to any departure airport with PCR swabs, which were then sent to a validated and accredited lab. While this has worked out well,

turnaround times can be an issue, as some countries require the test to have been within the last 48 hours, and lab processing times can vary depending on volumes.

Point of care PCR machines have recently become available, and we are now able to utilise a machine that can process 32 samples in one hour. This means that members can have 'real-time' certification of a negative test result, cutting down travel time and further reducing risk. In addition, there is no need for a complex laboratory, and it is relatively portable. The device has been validated by Public Health England.

Performing and analysing the assay

Real-time PCR was performed upon an Applied Biosystems™ 7500 Fast Real-Time PCR System following the cycling and fluorescence acquisition parameter detailed in the genesig® COVID-19 instructions for use. Nucleic acids extracted from clinical samples were aliquoted and 8 µL used in each real-time PCR reaction, with a final volume for 8 µL as per the genesig® COVID-19 instructions for use. Samples were processed in batches of 90 with appropriate negative, internal and positive controls.

Results of real-time PCR testing were verified as acceptable if the designated control wells achieved the defined criteria in genesig® COVID-19 instructions for use. Samples and controls were assigned a quantitation cycle (Cq) value following the data analysis methodology detailed in the genesig® COVID-19 instructions for use. The samples were then interpreted as either 'COVID-19 Detected', 'COVID-19 Not detected' or 'Result invalid' dependent upon the presence of Cq in either/or the FAM or HEX channels.

Conclusion

The ability to perform real-time analyses on several people at once is an extremely critical development for our clients globally. It not only allows for individual country entry requirements but also reduces risk by identifying those who may be PCR positive for COVID-19 but not yet displaying symptoms.

Biography

Dr Louise Slaney is the Medical Director at Iqarus. Iqarus is the International SOS Group's dedicated and specialised lead for delivery of high-quality medical support to governments and their selected implementation partners, supranationals, NOCs, IOCs, non-government organisations and militaries operating in remote and challenging environments around the world. In partnership with International SOS, Iqarus is also the dedicated lead for Safety,

Occupational Hygiene and Environmental Risk (SOHER) solutions and services, as well as the specialised lead for Training and Development. Both offerings are delivered internationally.

International SOS provides international evacuation through its integrated air ambulance solutions, hospital admission-ground ambulance services, as well as arranging all logistics, including visas. International SOS also enables Iqarus' operational teams to provide out-of-country care, thus ensuring seamless, end-to-end oversight. It has proactive relationships with global insurers and integrates GOP and ongoing case management processes

Fresh Whole Blood from Walking Blood Banks for Traumatic Haemorrhage

MAJ David Naumann¹, Dr Adam Boulton², CAPT Amrit Sandhu¹, MAJ Kieran Campbell¹, MAJ William Charlton¹, COL Jennifer Gurney³, Dr Matthew Martine³, MAJ Tom Scorer⁴, Dr Heidi Doughty⁵

1 UK Defence Medical Services, Birmingham, United Kingdom

2 Academic Department of Anaesthesia, Critical Care, Pain and Resuscitation, Heartlands Hospital, University Hospital Birmingham NHS Foundation Trust, Birmingham, United Kingdom

3 Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda, United States of America

4 Centre of Defence Pathology, Royal Centre for Defence Medicine, Birmingham, United Kingdom

5 Academic Department of Military Anaesthesia and Critical Care, Royal Centre for Defence Medicine, Birmingham, United Kingdom

Abstract

Background

Whole blood (WB) is optimal for resuscitation of traumatic haemorrhage. Walking blood banks (WBB) may provide fresh whole blood (FWB) where conventional blood components or stored, tested WB are not readily available. Delivery of FWB has been undertaken in far forward, austere and remote locations by deployed military personnel for combat casualties. More recently, there has been an increasing interest in this as an emergency resilience measure for isolated communities and during crises including the COVID-19 pandemic. We conducted the first systematic review and meta-analysis of the available evidence concerning WBBs for delivery of FWB, in order to better inform practice.

Methods

Standard systematic review methodology was used to obtain studies that reported the delivery of FWB (PROSPERO registry CRD42019153849). Studies that only reported WB from conventional blood banking were excluded. Survival outcomes were compared between patients receiving FWB and those receiving component therapy alone. Odds ratios (OR) and 95% confidence interval (CI) were calculated using random-effects modelling due to high risk of heterogeneity. In addition, adverse events such as transfusion reactions, transmission of blood-borne infections and respiratory complications were recorded. Quality of evidence was assessed using the GRADE system.

Results

There were 27 studies published from 2006–2020 reported >10,000 units of FWB for >3000 patients (precise values not available for all studies). The majority (26/27) were military studies from recent conflicts. Evidence for studies was 'low' or 'very low' except for one study, which was 'moderate' in quality. FWB patients were more severely injured than non-FWB patients, with worse physiological parameters. Survival was equivalent between FWB and non-FWB groups for 8 studies that compared these (OR 1.00 (95% CI 0.65, 1.55); $p=0.61$). However, the highest quality study (matched groups for physiological and injury characteristics) reported an adjusted OR of 0.27 (95% CI 0.13–0.58) for mortality for the FWB group; $p<0.01$. Transfusion reactions and transmission of blood-borne infections were rarely reported. Pulmonary complications were more likely in the FWB group for 4 studies that reported these (OR 2.43 (95% CI 1.70, 3.47); $p<0.0001$).

Conclusions

Thousands of units of FWB from WBBs have been transfused in patients following life-threatening haemorrhage. Survival is equivalent for FWB resuscitation when compared to non-FWB resuscitation, even when patients were more severely injured and more physiologically compromised. Evidence is scarce and of relatively low quality and may underestimate potential adverse events. Whereas WBB may be an attractive resilience measure, caution is still advised and the risks must be understood. WBBs should be subject to prospective evaluation to optimise care and inform policy.

Biography

Major David Naumann is a surgical registrar in the UK Defence Medical Services (Army), and a research fellow in the Academic Department of Military

Surgery and Trauma at the Royal Centre for Defence Medicine. He is an honorary lecturer at the University of Birmingham, where he is a faculty member of the Trauma Sciences MSc. For his PhD, Major Naumann investigated early microcirculatory dysfunction following traumatic haemorrhage.

Mounted Missions: Pushing Boundaries in Veterans Mental Health Programs

Mr Mark Mathieson^{1,2}, Mr Dusty Miller²

1 Self-employed, Taminick, Australia

2 Mounted Missions Limited, Taminick, Australia

Abstract

Mounted Missions Limited is a start-up ACNC registered Health Promotion Charity working with Veterans mental health. We aim to inspire renewed purpose for contemporary veterans. This presentation aims to outline some of the theory and knowledge behind an experiential, challenge-based group program that is residential and incorporates a range of evidence-informed techniques that have yet to gain mainstream clinical acceptance. We outline how we have formed our epistemological structures and how they pertain to program design, and we challenge some of the dogma and limitations within current evidence-based approaches. We will draw links to current models and practices of ecopsychology, adventure therapy, equine and animal-assisted therapy, horticultural therapy and others. We discuss the use of metaphor, narrative and the heroes journey as important parts of working with veterans. Finally, we highlight the potential importance of the concepts of moral injury and ecological self when working with contemporary veterans. Expect some controversial, thought-provoking and radical ideas that will hopefully be both entertaining and stimulating, while challenging 'unconventional thinking'.

Biography

Mark's story begins with a young man's passion for discovering what it takes to be at the pinnacle of performance. Completing a Master's in Sport Psychology led to a range of epiphanies and experiences with elite athletes as well as a career diversion in Military Psychology with the Australian Army Psychology Corps. After 21 years and attaining the rank of LtCol, Mark moved into working primarily with contemporary veterans of unconventional operations. As a result of his own experiences and those of his clients, he has spent the last 10 years

pushing the boundaries of knowledge in approaches to trauma and moral injury.

Supply Chain: Learnings from Delivering Medical Supplies During COVID19

Mr Emmanuel Petrequin¹, Cheryl Plumridge¹

¹ International SOS, Sydney, Australia

Abstract

Introduction

The COVID-19 pandemic has been applying pressure on global manufacturer production capacities and global supply chains. The struggle to move limited supplies as fast as possible to meet rampant demand for test kits, personal protection equipment (PPE) and drugs has been exacerbated by rising demand, panic buying, hoarding and misuse.

Since the start of the outbreak, MedSupply Government Services (MSGs), an International SOS owned fulfilment centre, has been supporting governments and humanitarian actors with medical and pharmaceutical solutions.

This presentation will focus on the challenges, opportunities and learnings from sourcing and delivering medical supplies to governments during the COVID-19 pandemic. A case study of the establishment of testing facilities in Afghanistan requiring a diverse variety of medical supplies within a 30-day timeline will be used as a vantage point. A tight deadline, limited availability of essential medical equipment, stringent export requirements, challenging flight schedules and political unrest highlights the challenges within a pandemic setting and attempts to propose solutions for future preparedness.

Discussion

The challenges posed on the global supply chain during COVID-19 have been immense and universal. By early March, WHO called on manufacturers and governments to increase production of PPE by 40% as a significant shortage left frontline healthcare workers dangerously ill-equipped to care for COVID-19 patients.

Availability of lifesaving commodities quickly became scarce. Manufacturers' already limited stock of medical equipment such as vital ventilators was immediately obtained by opportunistic traders fuelled by speculation and hoarding. Due to the rapid increase in demand for PPE and medical equipment,

manufacturing lines quickly filled up, and by early April most factory sites would quote readiness into 2021.

An increase in demand prices quickly went through the roof. Simple nitrile gloves with a pre-COVID market price of US\$2 for a 100 pack increased to US\$9.50. Inflated pricing and lack of availability mean a higher risk of substandard drugs and equipment entering the market space. There are many examples of counterfeit and quality non-compliant products finding their way into the hands of governments around the globe. This makes compliance and quality assurance key factors.

A solid infrastructure for the global supply chain is critical to ensure availability of medications to meet the needs of patients around the world. With thousands of flights grounded and airports closed, transportation became its own challenge. Limitations on flight routes meant increased risk of delay and changes in export and import regulations made predictions impossible.

MSGs has worked tirelessly with governmental institutions and partners on sourcing high-quality certified PPE and medical supplies delivered on time during challenging conditions. Timely, accurate and credible assessment of suppliers and products along with a highly coordinated approach between client, manufacturers, transporters and customs have been essential for a successful and effective response to minimise impacts on health and operations.

Conclusion

Looking ahead, we must create a more agile supply chain for ventilators and other critical medical devices. To do so, governments and partners like MSGs need to understand their global sourcing and distribution arrangements, access to raw materials, feasibility of deploying new technologies, data usage, government procurement rules, and evolving sanctions and trade-related measures.

A key lesson learned during the pandemic was that speed of action played a considerable role in the success of delivering required products. Delayed decision making by even a day can result in lost opportunity as the supply landscape shifted so rapidly.

Diversification of supply chain is key to preparedness. There is a need for creating a supply chain mapping and contingency strategy to proactively identify potential risks, opportunities and alternative sourcing options for readiness.

Biography

Having 20 years' experience in global supply chain within retail and pharmaceutical distribution, Emmanuel Petrequin is qualified in the field of chemistry and biology (Bachelor of Science). He is well-versed with the skills of supply chain management (Master's) and strategy and leadership management.

Emmanuel started his career as Supply Chain Consultant within Gemini Consulting before becoming the Supply Chain Head of Celesio's French and Benelux subsidiaries. After that, he joined the Bolloré Group and expanded his experience and network within the healthcare and humanitarian sectors, both in warehousing and international freight forwarding.

He is now the General Manager, MedSupply Government Services at International SOS based in Dubai, United Arab Emirates. MedSupply is a leading provider of medical supplies. With over 30 years' experience and worldwide delivery capabilities, they are uniquely positioned to provide customers with high standards of medical supplies. Their services are aimed at providing total medical and pharmaceutical supply chain solutions to a global client base benefiting from our unique combination of logistical skill and personal attention. Crucial to their service is the ability to source and supply high-quality products from manufacturers worldwide and dispatch using the most economical and reliable methods available.

The Broadly Incompetent Medical Officer: Outdated Models Denuding Army Capability

MAJ Aaron Tracey¹

1 1st Close Health Battalion - Australian Army, Townsville, Australia

Abstract

The year 2020 marks a decade since the Army Medical Services underwent two significant changes. The first of these was the Combat Health Restructure, which aimed to rebalance Army's combat health to optimise its deployable effect and address issues with employment structures. The second was the establishment of the National Medical Board and Australian Health Practitioner Regulation Agency under the Health Practitioner National Law Act 2009.

There have also been significant developments in Army's concept of operations following the release of Army in Motion. The current paradigm of Army doctor training fails to adequately prepare doctors for the role they are expected to fill. This results in poor utilisation of doctors over their ROSO, low job

satisfaction, and increased medico-legal risk to both the individual and the wider ADF. Army in Motion exhorts us to be 'ready now' and 'future ready', but we are wedded to last Century's model of a Military Medical Officer.

This paper seeks to provide a way forward, outlining a logical career progression and system of oversight of doctors that addresses some of the critical shortfalls in the current system, while maintaining the gains in training, competence and supervision made during previous reforms.

Biography

Major Aaron Tracey commenced his Army career in 1999, initially as an Aeronautical Engineer in RAEME, serving in a variety of aviation and non-Army group units. Following an instructional posting at the Australian Defence Force Academy in 2009, he commenced medical studies, posting to Close Health, where he has remained since 2016.

His operational experience includes serving as a linguist in Iraq, OP RESOLUTE, and domestic support to the civilian community during multiple natural disasters in North Queensland. He has supported aviation operations in PNG and during multiple major exercises, and has completed the Aviation and Underwater Medicine courses, in addition to being a AME qualified medical officer

Major Tracey is a Fellow of the Royal Australian College of General Practice, holds a Diploma in Child Health, and is completing a Master's degree in Traumatology. He currently serves as the Senior Medical Officer at 2 Close Health Company in Townsville. His interests include military retrieval, training systems and combat health support.

Providing Specialist Support to a Deployed Force using Augmented Reality

Associate Professor Cliff Pollard¹, Michael Reade, Mark Midwinter, Jamie Phillips, Michael Redmond, Michael Rudd, David Walker, Julian Williams

1 Jamieson Trauma Institute, RBWH, Herston, Australia

Abstract

In some time-critical clinical situations, the deployed clinical team may not include the specialist skills that are required. The situation might, for example, be an expanding intracranial haematoma requiring immediate surgical decompression; a peripheral

vascular injury needing proximal vascular control; a circumferential limb burn requiring an adequate escharotomy. In addition, it might not necessarily be a clinical scenario: technical advice might be needed for maintenance of vital medical equipment.

Augmented reality allows specialists at a higher level facility to annotate video images streaming to them from a remote site. Such annotations are transmitted back to the remote clinicians to provide visual directions on how to proceed with the required interventions. In effect, the telepresence of the specialist at the remote site. The annotation on the fixed images coming back to the point of care clinicians could show the site and length of an incision; a line of dissection; and identify structures to avoid!

'Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory.' Where the data transmission occurs across a combination of wi-fi, fibre-optic cable and satellite, delays will occur at each nodal connection. However, this would not be as critical for AR as it would be for remote robotic surgery, where excessive latency could prove disastrous, such as the occurrence of an unexpected complication, perhaps major haemorrhage.

Several software programs, such as Microsoft 365 Remote Access and Vuforia Chalk, are commercially available, and examples of their use will be demonstrated in this presentation. Wearable technology has become increasingly sophisticated, with products such as Vuzix, Real Wear, Fountx and Google Glass. The advantages and disadvantages of wearable technology as compared to iPad use will be discussed.

Where transfer times are short and rapid evacuation possible, the need for immediate surgical intervention may not be necessary. With long transfer times and a deteriorating patient, the need for immediate surgery may be paramount. This technology could provide that critical level of support and confidence to the on-site team. An exploratory trial of the technology with simulation models could perhaps be considered for a future ADF exercise.

Biography

Associate Professor Cliff Pollard is a retired general surgeon; Director of Trauma Services RBWH 2008–2012; Director of Queensland Trauma Registry 2006–2012; Major (Rtd) RAAMC. His deployments include

Bougainville and East Timor 2000 and 2001. He was a MNHHS board member from 2012–2019. His current position is Research Ambassador, Jamieson Trauma Institute, RBWH since 2019.

Evaluating Novel Protective Devices in the Midst of a Pandemic

MAJ Jonathan Begley¹

1 2nd General Health Battalion, Australia

Abstract

The COVID-19 pandemic has induced a well-founded fear for health care worker safety, with large numbers of clinician deaths globally and a worldwide shortage of personal protective equipment (PPE). Aerosol-generating procedures, including intubation, seem to place clinicians at particular risk.

Attempts to protect clinician safety have seen the rapid manufacturing of novel protective devices including the 'aerosol box': a ridged plastic barrier placed over a patient's head during intubation. Despite a lack of any objective research, the aerosol box received praise in the mainstream media, medical education websites and major medical journals. It was quickly adopted by clinicians worldwide, with manufactures distributing hundreds of devices within weeks. For many, the intuitive belief that the device provided the clinician some protection from nosocomial infection went unquestioned. Despite a number of small simulation-based experiments published on social media questioning the safety of the device, the potential negative impact on patient safety was largely ignored in most publications.

We sought to investigate the aerosol box's impact intubating a patient with severe COVID-19 in a simulation-based crossover study. Two such devices were studied (an early-generation box and a latest-generation box). Simulates were designed to be as realistic as possible. The primary outcome was intubation time. Secondary outcomes included first-pass success, breaks in preoxygenation, laryngoscopy grade and breaches of PPE. Freeform commentary was sought from participants after each intubation.

Thirty-six intubations were performed by 12 specialist anaesthetists. Intubation times with no aerosol box (median 42.9 seconds; IQR 32.9–46.9) were significantly shorter than with the early-generation box (median 82.1 seconds; IQR 45.1–98.3) ($p=0.002$) and the latest-generation box (median 52.4 seconds; IQR 43.1–70.3) ($p=0.008$). Without an aerosol box, all anaesthetists obtained first-pass success; with

the early-generation and latest-generation boxes, 9 (75%) and 10 (83%) participants obtained first-pass success respectively. Participants reported reduced ability to manipulate devices within the box, reduced arm movement and increased cognitive load when using the aerosol boxes. PPE was breached or damaged eight times (33%) while using the aerosol box.

In a patient with severe COVID-19, the observed time differences would be clinically significant. Further, the breaches and damage to PPE imply that these devices may paradoxically increase the risk of nosocomial clinician infection. This study received significant attention including in the mainstream media, with at least one major medical education website reversing their position on the device.

Subsequently, other researchers used simulation to examine the impact of aerosol boxes on protecting clinicians from exhaled aerosol. Surprisingly, the level of aerosol the clinician was exposed to increased when the box was used (possibly due to particles escaping from the arm access holes as a result of the Bernoulli principle). This study also received significant attention.

Simulation studies were able to demonstrate the hazards posed to clinicians and patients by these novel devices; however, not before they were in widespread use. There are broader implications beyond the device itself in considering how clinicians respond to personal risk during a pandemic. Drivers of rapid uptake may also include 'Gizmo Idolatry' (the implicit conviction that a more technological approach is intrinsically better than one that is less technological), and 'MacGyver bias' (the inherent attraction of our own personal improvised devices). Before a novel device is considered for clinical use, it must be assessed both for efficacy and safety. The motivation for the use of these devices in times of heightened anxiety is understandable; however, the requirements to critically evaluate new devices prevail even during a pandemic. The rise and fall of the aerosol box should be a cautionary tale for clinicians responding to future hazards.

The principal study has been published in *Anaesthesia* (doi.org/10.1111/anae.15115).

Biography

Jonathan is a medical officer in the 2nd General Health Battalion. He graduated from Monash University in 2008 with Honours degrees in Medicine/Surgery and Medical Science. He completed a Graduate Diploma in Education in 2010 and is currently completing a Master of Public Health. Jonathan is a specialist anaesthetist and advanced trainee in intensive care medicine in

the Medical Specialist Program. His interests include retrieval medicine and adult education. He is lucky to have a wonderfully supportive wife and two small children.

Surgical Workload of Taji ADF Role 2E

Ms Emily Smartt¹, Dr Kyle Bender², Dr Andrew Pearson²

¹ Sydney University Graduate Medical Program, Sydney, Australia

² Australian Defence Force Medical Specialist Program, Australia

Abstract

Introduction

In support of Operation Okra, the Australian Defence Force (ADF) deployed a NATO Role 2E facility to Taji, Iraq. A surgical capability was in location from April 2015 until July 2017. The medical procedural specialists in Taji comprised a general surgeon, orthopaedic surgeon, anaesthetist, intensivist and emergency physician. In order to quantify the surgical workload, caseload data was collated from the contemporaneous operating theatre logbook.

Results

A total of 50 surgical procedures were undertaken during the 27-month period, two-thirds of which required general anaesthesia. Of these, general surgical cases consisted of: open appendectomy (6), abscess drainage (12), skin and subcutaneous lesion excision (5), wound debridement and repair (4), vascular repair (2), varicocoele repair (1), and umbilical hernia repair (1). Orthopaedic surgery cases included external fixation (2), tendon repair (1), and carpal tunnel release (1).

Major trauma cases consisted of one incident of blunt lower-limb trauma, and two incidents of negligent discharge gunshot wounds. The gunshot wounds comprised a severe leg injury requiring vascular repair and a catastrophic chest injury resulting in death before surgical intervention was possible.

Discussion

ADF Forward Surgical Teams (FSTs) are deployed in support of troops with the sole purpose of mitigating risk when the operationally most dangerous course of action could result in the need for urgent surgical intervention. FSTs therefore must be appropriately skilled to manage high volume and complex trauma as well as an extended scope of emergency general surgery.

This FST principally managed low volume, low acuity surgery, typical of published contemporary military hospital case burden. Operational deployments do not necessarily expose clinicians to significant trauma or provide war surgery experience. There is a risk of skill degradation in surgeons deployed to low-tempo environments if technical skills are not regularly performed with throughput of clinical cases. This becomes a serious issue when skill degradation becomes clinically apparent, thus effecting capability. Skill degradation should be considered in the way surgeons prepare for and are managed during deployments.

This review of the caseload from Taji highlights the need for flexible and innovative workforce solutions to ensure optimal allocation of ADF specialist resources to taskings, while using complementary training strategies to maintain a high calibre of competence and versatility. Health care specialists are not deployed to conflict zones for their own personal development; however, we need to ensure as much as possible that they are suitably capable for the duration of that deployment. Recognising the risks of skill degradation over the course of deployment allows mitigation strategies to be implemented.

Mitigation strategies may include the following:

1. Optimised baseline skill level of individual clinicians at the commencement of a deployment through robust training, preparation and selection processes
2. Decreasing the time of skill degradation through shorter, higher turnover deployments
3. In theatre skill maintenance through rotations to higher volume centres (e.g. short exchanges with a local Role 3)
4. Engagement in individually tailored, remote professional development training.

The aim of such mitigation is not to improve an individual's deployment experience but to maintain the surgical team's capability.

Conclusion

The Role 2E facility at Taji managed low-tempo and low-acuity cases with occasional major trauma. This highlights that ADF surgical teams need to maintain a degree of readiness to perform combat resuscitation in an environment that is challenging for skill preservation. Ongoing analysis of caseload data from ADF facilities will help guide policy development regarding recruitment, training, and sustainment of deployed surgical teams. The audit process may also aid command in determining health support required for future operations. Ultimately, this will optimise the care provided to deployed ADF personnel.

Biography

Emily is a final year medical student of the Sydney University Graduate Medical Program with an undergraduate Bachelor of Science, majoring in neuroscience. She aspires to commence surgical training within the next few years. Emily's passions include Upper GIT and general surgery, trauma and military surgery with an interest in research and quality improvement projects.

Transition to Civilian Life as 'The next mission' in the Life of a Service Member: Factors Influencing Mission Success

Dr/Prof Kylie Carra

1 La Trobe Rural Health School, La Trobe University, Bendigo, Australia

Abstract

Introduction

Transitions necessitate significant changes in an individual's usual activities, roles and routines. While many successfully transition from military service, international research indicates that up to 45% of service members experience a difficult or very difficult transition. Physical or mental health conditions such as traumatic brain injury, depression and posttraumatic stress disorder are known to increase adjustment difficulty.

Participation in meaningful activities such as employment, voluntary work and social interactions is critical to transition success, enabling former service members to establish a new 'civilian' identity and sense of purpose and meaning in life.

This study aimed to determine which activities were associated with an easier adjustment among former Australian Defence Force (ADF) members. A secondary aim was to determine whether participation in activities varies by service and demographic characteristics, including age and discharge type.

Methods

One hundred and ninety-eight former ADF members discharged on or after 1 January 2004, responded to a survey. Information was collected about the participant's demographic status and service history. Adjustment was measured using a single item question, 'In general, how has the adjustment to civilian life been since you completed full-time service with the Australian Defence Force?' The

survey also asked participants to identify up to five activities engaged in to improve their health and wellbeing. Activities were coded using the Time Use Classification system developed by the Australian Bureau of Statistics.

Results

An easier adjustment was reported by former service members who participated in employment-related activities (MD = 0.52; 95% CI = 0.149 to 0.900, $d = 0.43$), domestic activities (0.45; 0.104 to 0.80, $d = 0.37$), voluntary and care activities (0.63; 0.21 to 1.06, $d = 0.52$), and social and community interaction (0.57; 0.20 to 0.95, $d = 0.47$).

Former service members aged 20–59 years who reported an easy adjustment were almost twice as likely to be participating in employment-related activities (40%) and domestic activities (40%) than former service members aged 20–59 years who reported a difficult adjustment (23% and 23% respectively). Former service members aged 60 years and over who reported an easy adjustment were more likely to be participating in employment-related activities (26%), voluntary and care activities (40%) and social and community interaction (50%) than former service members aged 60 years and over who reported a difficult adjustment (5%, 21% and 16% respectively).

Former service members who were discharged for medical reasons and reported an easy adjustment were more likely to be participating in domestic activities (43%), voluntary and care activities (29%), and social and community interaction (29%) than former service members who were discharged for medical reasons and reported a difficult adjustment (29%, 2% and 20% respectively). However, participation in employment-related activities was less frequently reported by former service members who were discharged for medical reasons and reported an easy adjustment (0% compared to 18%).

Conclusion

The findings indicate that participation in employment-related activities, voluntary and care activities, domestic activities, and social and community interaction may influence adjustment following completion of military service. Activity-based interventions need to be targeted depending on age, discharge type and perception of adjustment. Further research is required to confirm the findings and better understand the specific benefits of these activities in the context of military transitions.

Biography

Kylie Carra is a lecturer in occupational therapy and PhD. candidate at the La Trobe Rural Health School in Bendigo, Australia. She has over 10 years of experience as an occupational therapy clinician. Her research interests include trauma recovery, community participation, military research, and rural health and wellbeing. Kylie is a reviewer for local and international journals, including the Australian Occupational Therapy Journal, British Journal of Occupational Therapy, American Journal of Occupational Therapy, Rural Sociology, and Environment and Behavior. She was a member of the La Trobe University College of Science Health and Engineering Human Research Ethics Committee from 2015–2020. Her doctoral research explores the influence of meaningful activity on health and psychosocial adjustment during the transition from military service to civilian life.

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

Rachel Groenhout¹, Doctor Andrew Ebringer, Patrick Lobdell

1 International SOS, Sydney, 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 2019, we successfully completed 12 000 medical evacuation and repatriation activities and delivered 2 700 medical evacuation response plans. We deliver, on average, one security evacuation activity every other day.

During the first four months of the coronavirus (COVID-19) outbreak, International SOS performed over 250 air ambulance movements for COVID-19 patients and other patients from over 100 countries around the world.

Discussion

Meeting the regulations set out by origin and destination countries require a high degree of capability and coordination. 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 factors such as safe transportation and contingency plans based on risk tolerance.

Using 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-19 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 skill set, including the ability to integrate with governments 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

Rachel Groenhout is the General Manager for the Sydney Assistance Centre. There are 26 International SOS Assistance Centres globally that take over 4 million assistance calls per year. They deliver, on average, one security evacuation activity every other day.

International SOS (internationalsos.com) is the world's leading medical and travel security risk services company. They care for clients across the globe, from more than 1000 locations in 90 countries. Their expertise is unique: more than 10 000 employees are led by 1400 doctors and 200 security specialists. Teams work night and day to protect members.

International SOS pioneer a range of preventive programmes strengthened by their in-country expertise. They deliver unrivalled emergency assistance during critical illness, accident or civil unrest.

The Military Physio's Role in Human Performance Optimisation: A Public Health Approach

CAPT Lisa Wolski¹

1 Australian Army, Australia

Abstract

Modern warfare for the Australian Defence Force (ADF) is characterised by soldiers operating within a highly complex, 'near-peer' austere environment. This environment is typically isolated from friendly forces, characterised by elevated danger, stress and hardship. The traditional 'golden hour' approach to medical care is inevitably unrealistic in this non-traditional theatre devoid of airspace superiority. Prolonged field care and self-management of health are crucial in order to neutralise threats and outpace the enemy.

Human Performance Optimisation (HPO) units aim to systematically optimise the performance of its people through a comprehensive program of mutually supporting initiatives, addressing three key pillars; physical, social and psychological. The physiotherapist plays a key role in the HPO team. Their primary objective is injury prevention in order to maintain operation advantage. Like the sporting population, injury risk is inherent. With the addition of combat training and warfare, military service is colloquially referred to as the 'ultimate contact sport'.

The HPO physiotherapist's focus typically resides with non-combat injuries. They are more prevalent than combat injuries, resulting in greater military health care burden and medical evacuations. Musculoskeletal injury predominates non-combat injury. Similar to athletic populations, musculoskeletal injuries have detrimental effects on performance, negatively affecting availability and preparedness. Numerous injuries of this type are considered preventable, thus the opportunity for the physiotherapist's injury prevention work to improve physical capability.

The public health model approach is used to inform injury prevention programs. It traditionally involves data collection and analyses, problem identification and prioritisation, development and implementation of preventative strategies, and evaluation. This process is informed by a working group consisting of subject matter experts and unit representatives. It is important to note that the work of HPO is complementary to that of Commander Joint Health Command (CJHLTH), who is responsible for health care provision for ADF members. Delegates of

CJHLTH are likely to be involved in the injury prevention process, particularly with data extraction and working group tasks.

Injury prevention programs may be classified into three phases. Primary prevention programs emphasise health promotion activities in the absence of health problems. Secondary interventions specifically address early marker/s for injury leading to early intervention. Tertiary measures focus on removing complications associated with previous history.

It is integral that the correct data is collected in order to facilitate and evaluate the musculoskeletal injury prevention process. Three key areas should be considered; surveillance, profile and exposure.

1. Surveillance: Musculoskeletal complaint surveillance provides key data and information to determine, quantify and prioritise problem areas. Musculoskeletal complaints are often early warning signs for injury development. The ultimate aim is to intervene before injury onset, to prevent 'diagnoses' or the need for clinical treatment.
2. Profile: Screening conducted is determined based on-the-job task profile/s (e.g. physical demands) of that HPO unit's dependency. Understanding normative data variances is key to identifying aberrancies.
3. Exposure: Exposure quantification involves accurate documentation of mechanical day to day load. Intensity and duration of activities should be reported. Data collection methods vary from simplistic retrospective self-report to elaborate real-time methods utilising wearables.

Surveillance, profile and exposure data are pooled and analysed for trends. Based on the results, the working group determines priority problem areas and identifies potential risk factors. Facilitated by the HPO physiotherapist, injury prevention strategies are subsequently developed, implemented and evaluated. This framework, based on the public health model, is continuous, ensuring an evidence-based, innovative approach to HPO physiotherapy.

Biography

CAPT Lisa Wolski, an APA musculoskeletal physiotherapist, has served in several roles within Defence since 2012. She has worked as a Defence contractor, Australian public servant and Specialist Service Officer across multiple locations. CAPT Wolski has extensive experience in the field of sports physiotherapy, including widespread travel with Australian Defence Force and civilian sporting teams. CAPT Wolski is currently employed full-time as the

lead physiotherapist at the Human Performance Optimisation Centre of Excellence at Holsworthy Barracks in NSW. CAPT Wolski is also a part-time PhD candidate at the University of Sydney studying in the area of biomechanics.

Prevention and Management of Pelvic Floor Dysfunction in Military Women

Miss Catrin Garrington¹, Dr Simone O'Shea¹, Professor Rod Pope^{1,2}

1 School of Community Health, Charles Sturt University, Albury, Australia

2 Tactical Research Unit, Bond University, Robina, Australia

Abstract

Background

Pelvic floor dysfunction (PFD) encompasses a variety of conditions affecting bladder, bowel and sexual function, such as urinary incontinence (UI). PFD is common; approximately 46% of Australian women report symptoms. PFD may negatively impact the health, wellbeing and occupational performance of women. Women involved in physically demanding activities and roles, such as athletes and servicewomen, may have an increased risk of PFD due to the high loads regularly applied to the pelvic floor. Therefore, identifying safe and effective prevention and management strategies is essential.

Aim

The aim of this systematic review was to identify the prevention and management interventions used for PFD in female military personnel and elite athletes and determine their safety and effectiveness.

Method

A systematic search using the keywords 'female', 'military', 'athlete' and 'pelvis' identified studies relating to prevention and management strategies for PFD. Two independent reviewers identified, appraised and extracted data from the included studies and undertook a critical narrative synthesis of the results.

Results

Of 581 studies identified, nine were eligible for inclusion in the review (six military, three athlete). Only one included study, a systematic review in athletes, was published within the past five years, and there were only two controlled clinical trials. The

quality of the included studies was determined to be low to moderate.

Eight studies specifically focused on UI, with the other being a military case study on the success of surgery for a female soldier with faecal incontinence. Pelvic floor muscle training (PFMT) was a common intervention for both prevention and management of PFD in the UI studies and were associated with improved symptoms. The addition of education to PFMT was also shown to be beneficial in elite female volleyballers. Athletes and military women were found to engage in a range of self-management strategies for their PFD symptoms, including fluid restriction and pad use. No adverse outcomes were reported from the intervention strategies reported.

Discussion

Few studies have investigated the safety and effectiveness of prevention and management strategies for PFD in female military personnel and athletes. Women used a range of strategies to manage symptoms of PFD. Of concern is that strategies such as fluid restriction may compromise health through dehydration.

From the evidence available, PFMT and education demonstrated promising findings. Although there were no high-quality clinical trials, this finding is consistent with general recommendations for PFMT to be a first-line intervention for PFD. However, further research is required to determine how these strategies are best implemented to optimise prevention and management of PFD in military women.

Other management approaches for PFD that have not been specifically examined in this population include use of mechanical devices such as pessaries and surgery. Pessaries are reported to be effective in 60% of female PFD cases. Low- to moderate-quality evidence exists supporting surgery for UI and pelvic organ prolapse. There have been no studies comparing the outcomes of surgery with lower cost-conservative management strategies in this population. Further research in the military context is required to determine the safety, feasibility, cost-effectiveness and impacts of a wider range of interventions for the prevention and management of PFD.

A range of limitations were identified within the included studies. There were few controlled clinical trials, limited interventions investigated and a predominant focus on UI, meaning that other types of PFD were not represented. Seven of the studies were conducted in the US, and most were not recently published.

Conclusion

PFMT and education were the most common interventions used for the prevention and management of PFD in military and athlete populations and were found to be safe and improve symptoms.

Biography

Catrin is a final year student completing her Bachelor of Physiotherapy (Honours) at Charles Sturt University in Albury. She is interested in women's health physiotherapy, specifically in the military context. For her Honours dissertation, she explored the pelvic health of military women as well as key strategies in the prevention and management of pelvic floor dysfunction. On completion of her degree, she hopes to gain experience in a physiotherapy grade 1 rotational position at a hospital in Melbourne.

Applying COVID-19 Dental Service Restrictions in the Warlike Operational Setting.

FTLT Max Moody¹

1 Royal Australian Air Force, Australia

Abstract

Although there is currently no data available to objectively assess the risk of SARS-CoV-2 virus transmission during dental practice, the inherent use of aerosol-generating procedures (AGPs) provides a potential virus transmission medium. Despite the uncertain, complex and dynamic nature in which the COVID-19 pandemic unfolds, warlike operational missions must go on. For the two deployed dental teams (one dentist and one dental assistant) within the NATO-led Resolute Support mission in Afghanistan, this means providing ongoing emergency dental services to a dependency of around 17 000 people. The challenge of identifying and appropriately managing the risks associated with dental service delivery in the operational environment is complicated by the lack of access to healthcare infrastructure (such as negative pressure rooms), PPE shortages, asymptomatic COVID-19 carriers and inconsistent compliance with transmission prevention protocols.

This situation required the implementation of an operationally-tailored dental service restriction model that aligned with various COVID-19 transmission threat pictures on bases. To facilitate this, the Australian Dental Association (ADA) COVID-19 Dental Practice Guidelines were reviewed.

Subsequently, the parameters outlined in the ADA dental service restriction levels 1–5 were replicated within the operational model. These restriction levels helped minimise conducting non-clinically urgent AGPs as the COVID-19 transmission threat level increased, and vice versa. This was supplemented by COVID-19 guidelines published by the Communicable Diseases Network Australia (CDNA), Centers for Disease Control and Prevention (CDC) and the World Health Organisation (WHO). Technical guidance was sought from Australian national support base subject matter experts (SMEs), while local COVID-19 transmission prevention protocol was obtained from local health SMEs based at the HKIA-N Role 2 medical treatment facility (MTF).

The operational dental service restriction model consisted of pre-, peri- and post-procedural protocols. Pre-procedural protocol involved obtaining on-base COVID-19 health intelligence weekly through Role 2 MTF command in order to determine a COVID-19 transmission threat picture. Each of the five possible transmission threat picture descriptions corresponded with a respective dental service restriction level (1–5). Additionally, extant Role 2 MTF patient COVID-19 screening protocol helped prevent moderate-high risk COVID-19 patients being seen by dental.

Peri-procedural protocol involved conducting AGPs under rubber dam where possible and undertaking standard, contact and airborne precautions when achievable and indicated by professional guidelines. PPE conservation strategies ensured adequate stocks of required PPE were available to support dental staff in this effort. Telehealth protocols were conducted for quarantine/isolation dental patients, and medications/antiseptic mouthwashes could be provided as needed. For COVID-19 positive patients requiring urgent dental treatment that could not be deferred (i.e. drainage of potentially life-threatening, spreading odontogenic infection), non-AGPs were favoured if possible.

Post-procedural protocol included environmental disinfection procedures outlined in ADA guidelines. Where AGPs were unavoidable (i.e. surgical tooth extraction), dental staff undertook standard, contact and airborne precautions where possible, and factored in settling times for aerosolised particle prior to commencing environmental disinfection. If patient transfer to advanced care facilities became necessary, this was facilitated by dedicated rotary-wing assets with patient isolation modifications. If a dental patient became symptomatic and/or tested positive to COVID-19 within 14 days of being treated, close-contact tracing protocols were implemented to identify testing and quarantine requirements for dental teams.

Due to the implemented model, operational dental support has been sustained throughout various COVID19 threat levels. Dental teams have experienced nil COVID-19 virus transmission and PPE stocks were effectively sustained. Future research opportunities include long-term studies to establish objective risk levels of SARS-CoV-2 transmission during dental AGPs and deployable negative pressure rooms

Biography

Flight Lieutenant Max Moody was born in Adelaide and spent his formative years there and abroad in Japan and Singapore. In 2011, he commenced dental school at Griffith University on the Gold Coast and joined the Royal Australian Air Force (RAAF) as an Undergraduate Dental Officer in 2014. Following graduation, he posted to Joint Health Unit, south Queensland (Amberley Health Centre) at RAAF Base Amberley in 2016.

In 2018, Max posted to No. 1 Expeditionary Health Squadron (1EHS) Amberley where he deployed multiple times with the Role 2 Medical Treatment Facility (MTF) on Exercises Regimen White, Pitch Black and Joint Warfighter Series. He also deployed to Timor Leste alongside American forces to provide dental services to local communities.

Upon posting to 1EHS Townsville Detachment in 2020, Max deployed on Operation Highroad to Kabul (Afghanistan) as part of the NATO Resolute Support mission. Here, he provided dental treatment to coalition forces in a Role 2 MTF amidst the unfolding COVID-19 pandemic.

Outside of work, Max plays soccer, skis regularly and supports the Adelaide Crows AFL team. He reads widely on self-development, leadership and human behavioural psychology and enjoys exploring new places and cultures throughout his world travels.

1PMC Disaster Response During Operation Bushfire Assist 2020

CPL Carly O'Callaghan¹

1 17th Brigade, Australian Army, Enoggera, Australia

Abstract

The ADF provided bushfire emergency support to both state and local government agencies by deploying approximately 200 ARA ADF personnel on Operation Bushfire Assist. During the peak of OP Bushfire Assist, teams from the 1st Preventive Medicine Company (1 PMC) were deployed to three Joint Task Group across three separate AOs. Our

response encompassed 17 Environmental Health Technicians and 1 Environmental Health Officer, which represents 45% of personnel within the company. These members were involved in civilian assistance and force preservation tasks which included testing and certifying 3.88 million litres of purified water for the community on Kangaroo Island and 6.1 million litres of purified water at Bega. No single team or organisation could address every aspect of such a wide-ranging and complex approach to managing the response to this natural disaster. A partnership approach encompassing relevant stakeholders was integral to minimising the negative impacts of this disaster.

The assistance provided by 1 PMC to civilian populations included water supply disinfection, testing and certification, advising and assisting other government agencies and civilian companies, particularly concerning water quality, transport and storage vessels. Assistance with displaced persons camps, shelters and the Kangaroo Island Wildlife Sanctuary was also provided. Our force health protection roles primarily revolved around education, ensuring PPE adherence for carcass removal, monitoring food and water safety as well as camp health and safety inspections.

The deployment of Reverse Osmosis Water Purification Units (ROWPU) to multiple rural locations was a key element of the Army's response to the disaster. The damage caused to essential water infrastructure on Kangaroo Island and considerable ash contamination resulted in concerning levels of iron and manganese in the source water. The extent of the water contamination on Kangaroo Island dealt with by the ROWPU was unprecedented for the machine, resulted in a series of problems requiring the exploration of pre-treatment options and alternate clean in place procedures.

In addition, our team in the area became heavily involved with the testing of local water supplies for South Australia Water, after they re-established the damaged permanent Middle River water treatment plant. It was found that their normal treatment procedure was inadequate for the removal of the high levels of manganese in the source water. Our on-the-spot chemical testing significantly contributed to the recovery of the plant and maintaining a potable drinking water supply for the civilian population. Our testing also allowed us to identify that water with more than twice the health concentration of manganese allowed by the Australian Water Drinking Guidelines (2011) was already reaching the township of Parndana, stirring the need for rapid responses and liaison with SA Health.

The quick response provided by Army and 1 PMC to Operation Bushfire Assist, speaks volumes about our level of readiness and our ability to act on short notice. It highlights our capability and demonstrates our preparedness for conflict and disaster through our ability to provide equipment, personnel and resources to effectively manage and help other stakeholders during emergency and disaster situations.

Biography

Corporal Carly O'Callaghan was born on 4 Sep 1993 in Tamworth, New South Wales. She enlisted as part of the gap-year scheme into the Australian Regular Army in April 2012 as a preventive medicine technician in the Royal Australian Army Medical Corps. She was posted to 2GHB on the completion of initial employment training, where she has remained for the duration of her career

CPL O'Callaghan has been deployed on Operation Augury and Operation Bushfire Assist. She has received the Australian Defence Medal, Philippines Military Merit Medal and Philippines Military Medal First Bronze Anahaw Leaf.

Pelvic Health and Military Occupations: A Study of Australian Servicewomen

Dr Simone O'Shea¹, Professor Rod Pope^{1,2}, Associate Professor Robin Orr², Dr Katharine Freire³

¹ Charles Sturt University, Albury, Australia

² Tactical Research Unit, Bond University, Gold Coast, Australia

³ Three Rivers University Department of Rural Health, Albury, Australia

Abstract

Background

Pelvic health issues, such as urinary incontinence (UI) and urinary tract infections (UTI), are significantly more common in female than male military personnel. Of concern is that some of the identified strategies used by servicewomen to manage their pelvic health, particularly in the field and when deployed, may be associated with negative health consequences. In addition, a range of environmental, equipment and cultural factors have been reported to challenge the ability of servicewomen to manage their pelvic health at work.

Aim

The aims of this investigation were to explore the relationships between female pelvic health and military occupations, and ascertain how women maintain and manage their pelvic health in military occupational settings.

Method

A mixed methods study, including an anonymous online survey followed by a series of individual interviews, was conducted in adult biological females who had actively served in the Australian Defence Force (ADF) for at least six months.

Results

A total of 575 active servicewomen (60%) and veterans (40%) participated in the survey (50% Army, 26% Air Force, and 24% Navy), and seven women consented to an interview. Pelvic health was reported to have a mild to moderate impact on work performance. Key areas where pelvic health influenced work performance to a small degree or more were physical training, maintaining work focus, working without needing breaks, adhering to routines and carrying loads/equipment. Slightly more women reported a negative impact of military tasks and roles on their pelvic health. However, it is notable that some women did report a positive impact. Physical training, lifting/carrying, field activities and managing personal equipment were work tasks most often linked to pelvic health symptoms.

Strategies to maintain and manage pelvic health at work commonly included manipulating menstrual cycles, regular medical check-ups, maintaining hydration and hygiene, diet and weight management and pelvic floor exercises. Fluid restriction and pad use were common strategies used to manage symptoms of UI. Fluid restriction was also used to minimise the need to void, particularly when toilet access or ability to take work breaks was limited. Surgery, pelvic floor exercises and pelvic floor physiotherapy were the most common management interventions for pelvic organ prolapse; whereas antibiotics, increased hydration and urinary alkalinisers featured in the management of UTI.

While a proportion of women reported their ADF career had no perceived impact on their fertility, some expressed concerns about chemical and radiation exposures, prolonged contraceptive use and high levels of physical and emotional stress. Delays in starting a family were common due to long periods away from partners, lack of long-term relationship opportunities, the logistics of timing pregnancy around work, and perceptions that starting a family would negatively impact career prospects and promotion.

Discussion

Preliminary analysis suggests a bi-directional relationship between pelvic health and military occupations. Physical training, lifting and load-carrying tasks were commonly reported to influence, or be affected by, pelvic health. A range of strategies are utilised by female military personnel to maintain and manage their pelvic health at work, and these strategies vary depending on the work context and nature of issues.

Conclusion

This is the first study to explore the relationships between female pelvic health and military occupations in the ADF. Further analysis of survey and interview data is required to gain greater understanding of the factors influencing these relationships, and identify the types of prevention and management supports that would benefit women serving in the ADF.

Biography

Simone is an experienced physiotherapy clinician, researcher and educator. She has a wide range of clinical and research interests including chronic health condition management, women's health, therapeutic exercise, collaborative and culturally responsive health care practice, as well as the design and implementation of health care curriculum. Simone has worked in a wide range of clinical services, but her passion for women's health has developed and grown throughout her career, most recently in both public and private maternity service roles. However, Simone's biggest passion is her family and her four children.

In 2018 Simone was awarded a Defence Health Foundation grant to explore the pelvic health of female military personnel. She feels incredibly privileged to be able to share the experiences of active servicewomen and veterans through this research.

Lessons Learnt from the 'Princesses'

Dr Geetha Isaac-toua¹

1 Aspen Medical, Deakin, Australia

Abstract

Aspen Medical was contracted by Princess Cruise Lines (PCL) to support the set-up and management of quarantine facilities for a number of cruise liners. This presentation goes through the set-up and running of the quarantine facilities for the Diamond and Ruby Princesses, the challenges faced and the lessons learnt.

Although the facilities were set up in different settings, one international (Diamond Princess, Japan) and the other in-country (Port Kembla, Australia), the challenges faced and lessons learnt for future management of facilities were similar.

The main challenge was the need for several different agencies, countries and sectors to work together to achieve a common goal which would affect global health security.

The lessons learnt were the following:

1. The need to have coordination mechanisms in place for all parties involved as these crossed international borders, state and territory borders, cut across private and public sectors and different agencies.
2. The need for consistent and ongoing communication for people in quarantine as well as all parties involved.
3. The need for provision of basic amenities and basic support to keep people in isolation.
4. The need for appropriate training for all involved.

Although the above seem quite obvious, they were very hard to achieve and put in place during this emergency response. The willingness to be flexible and adapt to address these challenges became the key to achieving the outcomes needed.

Biography

Dr Geetha is Aspen Medicals' Group Medical Director and an experienced physician with general medical and public health experience, including humanitarian aid and disaster management. She has been involved in communicable disease control and health protection (including surveillance, infection control, immunisation, tropical health, environmental health and food safety). She has demonstrated experience and knowledge in remote and rural health, occupational health and rehabilitation medicine, including travel medicine. She has developed, implemented and managed health programmes within the Australian health system as well as within general practice. She has supported Defence Force Health in coordination and prevention services as a public health physician. She has vast knowledge in chronic disease screening and management, substance use prevention and management, pharmacovigilance and adverse drug reaction management.

Her diverse range of experience includes setting up specialist training programs, writing policy papers and government and ministerial briefings. Furthermore, she has in-depth familiarity in setting up databases for information management, surveillance, disease control, rapid evaluation and health systems planning.

Musculoskeletal Injury Epidemiology in Special Operations Forces: a systematic review

LT Joanne Stannard^{1,2}, Dr Lauren Fortington¹

1 3rd Health Support Battalion, Australian Army

2 Edith Cowan University, Perth, Australia

Abstract

Background

The military is an occupation associated with unique patterns and high rates of musculoskeletal injury. The consequences of injuries in the military do not just directly impact the individual soldier but also create an extensive ripple effect impacting the wider organisation. Injuries directly impact an individual soldier's availability to work and their quality of life. Cumulatively, injuries impose a burden on a military health system, being the most common reason to seek medical attention during both peacetimes and in combatant operations. At a strategic and operational level, injuries impact a military's readiness and capability to deploy. It is, therefore, important to understand the epidemiology of injuries in order to identify force preservation priorities and opportunities. Injury is a well-researched topic in regular military services, especially in recruit populations. Much less is known about the epidemiology of musculoskeletal injuries in military Special Operations Forces. Special Forces soldiers are trained to execute strategic high-risk missions using specialised tactical skills that are different from regular military services.

Consequently, Special Forces soldiers are exposed to unique risks of injury that are likely to differ from regular military services. The purpose of this research is to establish a high level of evidence informing what is currently known about musculoskeletal injury epidemiology in Special Operations Forces using research from original published studies. Secondary aims of this study are to identify gaps in knowledge for future research and to generate recommendations on priorities for injury prevention.

Methods

Three online databases were searched to identify original, peer reviewed studies, published before December 2019. Studies reporting musculoskeletal injury epidemiology (non-battle trauma) in Special Operations Forces were included. A critical appraisal tool was applied to all included studies and descriptive data was extracted for demographics (e.g. military service, age, rank), study details (e.g. study design, data collection, definitions used) and

injuries (e.g. number of injuries/injured personnel, injury type, body part injured, mechanism, activity, severity). The study is reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement.

Results

From over 800 articles screened, 21 full-text publications were included. Most studies originated in the USA. Included sample sizes ranged from 87 to 1880. A range of injury case definitions and methods to record injury were used, with medical attention case definitions from electronic health systems, the most common form of data collection. Trainees completing qualification training had the highest injury rates reported. The ankle, knee and lumbar spine were the most common body parts injured. Injury causation information was often not assessed or was limited by insufficient information. Of the information available, static-line parachuting caused the most severe injuries, and physical training was the most common activity causing injury. The available evidence indicates that running or lifting are common injury mechanisms in physical training; however, injury mechanism was frequently unreported.

Conclusions

Injuries are prevalent across all Special Operation Forces. Overall, the epidemiological evidence suggests trainees are a priority subgroup in Special Forces populations for injury prevention and that further knowledge needs to be obtained as to why physical training and parachute related injuries occur. Future research should prioritise prospective data collection and investigate injury causation to identify why injuries occurred. This is important in order to ensure that epidemiological evidence and not subjective opinion, are used to direct injury prevention strategies. Future research should also focus on improving the recording and reporting of injury information to improve the accuracy of results and to allow comparisons across cohorts.

Biography

Joanne is a Sport and Exercise Physiotherapist with experience working with the Australian Defence Force as a contract health provider and as a serving Australian Army Reservist with 3HSB.

Joanne is a research student at Edith Cowan University, completing a thesis in the epidemiology of musculoskeletal injuries in military Special Operation Forces. Joanne's research is working towards improving the recording and reporting of epidemiological injury information to inform injury prevention priorities accurately.

Prevalence of Pelvic Health Conditions in Australian Servicewomen and Veterans

Dr Simone O'Shea¹, Professor Rod Pope^{1,2}, Associate Professor Robin Orr², Dr Katharine Freire³

¹ School of Community Health, Charles Sturt University, Albury, Australia

² Tactical Research Unit, Bond University, Gold Coast, Australia

³ Three Rivers University Department of Rural Health, Albury, Australia

Abstract

Background

Pelvic health and support needs vary between sexes given differences in pelvic anatomy and function. Genitourinary infections and urinary incontinence have each been reported to affect up to one-third of United States servicewomen. However, other pelvic health conditions, such as pelvic organ prolapse (POP) or the coexistence of pelvic health conditions, have received minimal attention. No pelvic health data exists for Australian Defence Force (ADF) servicewomen.

Aim

This investigation aimed to determine the types, prevalence, severity and onset of pelvic health issues experienced by ADF servicewomen and veterans.

Method

An online, anonymous cross-sectional survey was developed for biologically female adults who had actively served in the ADF for at least six months. Data were collected from October–December 2019 and February–June 2020.

Results

In total, 575 active servicewomen (60%) and veterans (40%) participated in the survey (50% Army, 26% Air Force, and 24% Navy). The majority (88%) served in a full-time capacity during their ADF service (length of service range: 6 months to >25 years). Over two-thirds reported concerns about their pelvic health, and of those, 85% reported that their concerns began during service. Frequent episodes of urinary urgency were reported by 29% of women, and almost two-thirds experienced urinary incontinence. However, of those experiencing leakage, most (70%) reported it occurred once per week or less. Almost half the respondents had experienced a urinary tract infection, with the majority of these occurring for the

first time during ADF service. Frequent episodes of flatal (9.7%) and faecal (2.2%) incontinence were less commonly experienced by servicewomen. Symptoms of POP were reported by 40% of women, but only 15% had an actual diagnosis. Regular episodes of pelvic pain during service were reported by one-quarter of women, and over 20% of all respondents had a diagnosis of endometriosis. Injuries to the pelvis occurred in 15% of women, and of those over 80% had been during and related to their work in the ADF. Pain associated with menstrual cycles occurred about half the time and was rated as moderate. Over 70% of women participating in the survey had been pregnant, and approximately 40% reported that pregnancy, birth or complications associated with it did impact on their return to work. Over one-third of women had undergone gynaecological surgery while serving in the ADF, and 20% had experienced delays in returning to work due to the surgery or its complications. A range of other pelvic symptoms, such as vulvovaginal irritation, sexual issues, nocturia and incomplete bladder emptying were also reported.

Discussion

A range of pelvic health issues were reported by female military personnel, most commonly mild to moderate urinary incontinence and urinary tract infections. Prevalence rates for urinary incontinence were higher than for the general population but similar to female athletes. Despite the majority of women reporting their symptoms developed during their time in the ADF, these findings need to be interpreted with caution as risk factors unrelated to service, such as pregnancy and ageing, may be contributing factors. Further analysis of the data is required in order to explore risk factors and variations that may exist between services as well as between active servicewomen and veterans.

Conclusion

This is the first study to examine the pelvic health of Australian female military personnel and veterans. Similar to the general female population, pelvic floor dysfunction is common. Further understanding of the pelvic health needs of servicewomen, risk factors and impacts on occupational performance are required to optimise prevention and management interventions.

Biography

Simone is an experienced physiotherapy clinician, researcher and educator. She has a wide range of clinical and research interests including chronic health condition management, women's health, therapeutic exercise, collaborative and culturally

responsive health care practice, as well as the design and implementation of health care curriculum. Simone has worked in a wide range of clinical services, but her passion for women's health has developed and grown throughout her career, most recently in both public and private maternity service roles. However, Simone's biggest passion is her family and her four children.

In 2018 Simone was awarded a Defence Health Foundation grant to explore the pelvic health of female military personnel. She feels incredibly privileged to be able to share the experiences of active servicewomen and veterans through this research.

Interoperability in a Time of COVID-19

CAPT Dale Pitcher¹, SGT John Hickey¹, Ms Bronte Martin²

1 2 GHB, ENOGERA, Australia

2 National Critical Care and Trauma Response Centre, Darwin, Australia

Abstract

During the early stages of the COVID-19 pandemic in February, a Primary Health Care Team (PHCT) from the 2nd General Health Battalion (2 GHB) in Brisbane deployed to Christmas Island to assist in the quarantine of the initial 277 Australian citizens and permanent residents evacuated from Wuhan, China. The PHCT was embedded into the Australian Medical Assistance Team (AUSMAT) who were responsible for the medical conduct of the quarantine lasting 17 days.

Following this quarantine, the PHCT was then redeployed to Howard Springs in Darwin to conduct the 14-day quarantine for the 164 Australian passengers from the Diamond Princess cruise ship docked in Japan. They were again embedded into AUSMAT who led the quarantine mission.

During both these missions, key tasks included establishing and maintaining an effective quarantine of all the cohorts, daily health screening for COVID-19 infection, and providing emergency and primary health care to all evacuees. The 2 GHB team was embedded with AUSMAT for six weeks and demonstrated the potential for future interoperability between the ADF and AUSMAT in both training and operational capacities.

AUSMAT are civilian multidisciplinary health teams comprising doctors, nurses, paramedics, firefighters (as logisticians) and allied health staff, including

environmental health officers, radiographers and pharmacists. They are formed under the auspices of the National Critical Care and Trauma Response Centre (NCCTRC), which was established by the federal government in response to the Bali bombings in 2002. The NCCTRC is focused on enhancing Australia's capacity to provide clinical and academic leadership in disaster and trauma care, as well as providing a local response capability, and internationally unique education, training and exercising capability.

AUSMAT are designed to be self-sufficient, experienced teams able to respond rapidly to a disaster zone to provide lifesaving treatment to casualties in support of the local health response. They are formed ad hoc from a pool of volunteers, who are selected based on having appropriate skills and experience for the deployment and their availability to deploy for two weeks. Often many of the team members have not previously worked together before, which can create some synergistic challenges. Their past deployments include the Samoa measles outbreak 2019; Tropical Cyclone Winston, Fiji 2016; Nepal earthquake 2015; Tropical Cyclone Pam, Vanuatu 2015; the Solomon Islands flooding 2014; Typhoon Haiyan, Philippines 2013; and the Solomon Islands dengue fever outbreak 2013.

This joint quarantine highlighted the potential for future interoperability between ADF Health elements and AUSMAT. Indeed, ADF and AUSMAT have already supported the same HADR missions including Philippines 2013, Vanuatu 2015 and Op Bushfire Assist 2019/20, although they were working independently of one another.

Concepts for future health interoperability include conducting bilateral training integration with each other. Already, personnel from ADF and AUSMAT have similar clinical training backgrounds and are trained on similar equipment, making an integrated training pathway highly achievable. They are also experienced in working in austere, high-stress environments.

In addition to training, the opportunity for joint deployment on future HADR tasks is highly enviable. The benefits of these deployments from an ADF-perspective include learning from the extensive clinical expertise of AUSMAT medical personnel and gaining exposure to trauma and disease management not otherwise encountered. From an AUSMAT-perspective, they would gain additional clinical and support personnel and, importantly, intrinsic strategic ADF logistics support. Currently, AUSMAT rely on standalone specialist technical, logistic procurement, historically with a requirement

to source heavy-lift transport into the host nation, often via ADF as a whole-of-government tasking.

Future joint training and deployments between the ADF and AUSMAT provide many advantages to both organisations and would ultimately enable a prepared and optimised medical response from the Australian Government to the 'next mission'.

Biography

Captain Dale Pitcher enlisted in the Australian Regular Army in January 2000 and completed a Bachelor of Engineering (Civil) at the Australian Defence Force Academy. He graduated from the Royal Military College Duntroon in December 2003 and served as a General Service Officer in the Royal Australian Engineers until 2012, fulfilling various positions and deployments both within Australia and overseas.

In 2013 he transferred to the Royal Australian Army Medical Corps and commenced his Bachelor of Medicine/Bachelor of Surgery degree at the University of Notre Dame Sydney, which he completed in 2016. After finishing his medical residency at Wollongong Hospital in 2018, he was posted to the 2nd General Health Battalion in Brisbane as a Medical Officer and is currently completing his fellowship training with the Royal Australian College of General Practitioners.

Surgical Workload of Taji ADF Role 2E

Ms Emily Smartt¹, Dr Kyle Bender², Dr Andrew Pearson²

1 Sydney University Graduate Medical Program, Sydney, Australia

2 Australian Defence Force Medical Specialist Program, Australia

Abstract

Introduction

In support of Operation Okra, the Australian Defence Force (ADF) deployed a NATO Role 2E facility to Taji, Iraq. A surgical capability was in location from April 2015 until July 2017. The medical procedural specialists in Taji comprised a general surgeon, orthopaedic surgeon, anaesthetist, intensivist and emergency physician. In order to quantify the surgical workload, case load data was collated from the contemporaneous operating theatre logbook.

Results

A total of 50 surgical procedures were undertaken during the 27-month period, two-thirds of which required general anaesthesia. Of these, general

surgical cases consisted of open appendectomy (6), abscess drainage (12), skin and subcutaneous lesion excision (5), wound debridement and repair (4), vascular repair (2), varicocele repair (1), and umbilical hernia repair (1). Orthopaedic surgery cases included external fixation (2), tendon repair (1) and carpal tunnel release (1).

Major trauma cases consisted of one incident of blunt lower-limb trauma, and two incidents of negligent discharge gunshot wounds. The gunshot wounds comprised a severe leg injury requiring vascular repair and a catastrophic chest injury resulting in death before surgical intervention was possible.

Discussion

ADF Forward Surgical Teams (FSTs) are deployed in support of troops with the sole purpose of mitigating risk when the operationally most dangerous course of action could result in the need for urgent surgical intervention. FST's, therefore, must be appropriately skilled to manage high volume and complex trauma as well as extended scope of emergency general surgery.

This FST principally managed low volume, low-acuity surgery, typical of published contemporary military hospital case burden. Operational deployments do not necessarily expose clinicians to significant trauma or provide war surgery experience. There is a risk of skill degradation in surgeons deployed to low-tempo environments if technical skills are not regularly performed with throughput of clinical cases. This becomes a serious issue when skill degradation becomes clinically apparent, thus effecting capability. Skill degradation should be considered in the way surgeons prepare for and are managed during deployments.

This review of the case load from Taji highlights the need for flexible and innovative workforce solutions to ensure optimal allocation of ADF specialist resources to taskings while using complementary training strategies to maintain a high calibre of competence and versatility. Health care specialists are not deployed to conflict zones for their own personal development; however, we need to ensure as much as possible that they are suitably capable for the duration of that deployment. Recognising the risks of skill degradation over the course of deployment allows mitigation strategies to be implemented.

Mitigation strategies may include the following:

1. Optimised baseline skill level of individual clinicians at the commencement of deployment through robust training, preparation and selection processes.

2. Decreasing the time of skill degradation through shorter, higher turnover deployments.
3. In theatre skill maintenance through rotations to higher volume centres (e.g. short exchanges with a local Role 3).
4. Engagement in individually tailored, remote professional development training.

The aim of such mitigation is not to improve an individual's deployment experience but to maintain the surgical team's capability.

Conclusion

The Role 2E facility at Taji managed low-tempo and low-acuity cases with occasional major trauma. This highlights that ADF surgical teams need to maintain a degree of readiness to perform combat resuscitation in an environment that is challenging for skill preservation. Ongoing analysis of case load data from ADF facilities will help guide policy development regarding recruitment, training and sustainment of deployed surgical teams. The audit process may also aid command in determining health support required for future operations. Ultimately, this will optimise the care provided to deployed ADF personnel

Biography

Emily is a final year medical student of the Sydney University Graduate Medical Program with an undergraduate Bachelor of Science, majoring in neuroscience. She aspires to commence surgical training within the next few years. Emily's passions include upper GIT and general surgery, trauma and military surgery with an interest in research and quality improvement projects.

Health and Wellbeing in the NZDF

COL Clare Bennett¹, LTCOL Stephen Kearney¹

1 New Zealand Defence Force, New Zealand

Abstract

In 2016 the NZDF launched the first Health and Wellbeing Survey. What our people told us helped to shape our priorities for action and build our health strategy and action plan over the next three years. In 2019 we checked in again with how our people were tracking, the progress made and areas for continued focus. This presentation shares this journey and insights from our latest survey.

Biography

Col Clare is the Director of Integrated Wellness for the NZDF. She joined the Regular Force in 1987 and has held a range of roles in NZDF (operational psychology, research, HR policy and strategy, and mental health) and in broader government sector.

Micro-RNA levels and cognitive performance after mild traumatic brain injury

Prof Biswadev Mitra^{1,2}, Dr Jonathan Reyes², Mr William O'Brien², Dr Nanda Surendran^{1,2}, Ms Annie Carter¹, Ms Laura McEntaggart¹, Mr Edmond Sorich³, A/Prof Sandy Shultz², Prof Terence O'Brien², A/Prof Catherine Willmott², Prof Jeffrey Rosenfeld^{1,2}, Dr Stuart McDonald²

¹ Alfred Health, Melbourne, Australia

² Monash University, Melbourne, 3004

³ Glia Doagnostics, Melbourne, 3000

Abstract

Introduction

A single physical blow to the head can result in concussion and has been associated with profound loss of key transporters throughout the brain. Such transporters are crucial elements in generating antioxidants to protect neurons from reactive oxygen species. Micro ribonucleic acids (miRNAs) suppress such transporters after brain injury and are detectable in plasma immediately after injury.

AIMS: The primary aim was to assess the discriminative ability of blood miRNA levels specific for brain injury to differentiate between head injured individuals and healthy controls. The secondary aim was to assess the change in miRNA levels over time and correlate the change to performance on commonly used cognitive tests at time points of 0, 7 days and 28 days after injury.

Methods

This was a proof-of-concept pilot prospective cohort study. We recruited a population of young, healthy subjects with mild head trauma deemed to be at risk of concussion and a control population of healthy young volunteers without history of head trauma. Head injured subjects had to be aged 18-50 years, observed or reported to have a head-strike, have moderate or severe brain injury excluded and considered by the treating clinician to be at risk of concussion.

Venous blood was sampled at day 0, day 7 and day 28 (+/- 5 days). Nucleic acid purification and reverse transcription-polymerase chain reaction and were conducted to obtain normalised expression ratios (NER) of miRNA levels at each time point. The Rivermead Post-Concussive Symptom Questionnaire (RPQ) was the primary outcome measure and subjects underwent cognitive testing (Cogstate/Axon) at each timepoint.

Mean NER of miRNAs at day 0 between injured and healthy controls were compared and contrasted to differences between mean symptom severity of head injured subjects and healthy controls. For longitudinal analysis of repeated measures over time for each individual, an analysis of response profiles comparing the response over time of miRNA species with that of RPQ symptom severity was undertaken. The model included the measure of each miRNA compared to RMPCSQ symptom severity, an effect of time and an interaction between the miRNA and time. Wald test of parallelism was used to assess the significance of difference in response of miRNA levels compared to RPQ.

Results

We recruited 60 subjects, of which 30 were head injured and 30 were healthy controls. Overall age was 31 (SD 8.1) years and 32 (53%) were of female gender, with no differences between head injured and control subjects. We excluded 2 head injured subjects who did not report any symptoms on the RPQ.

Symptom severity was significantly higher on day of injury among head injured subjects (Mean 14.1 (SD 9.0) compared to control subjects (Mean 1.2 (SD 3.2); $p < 0.001$). A statistically significant difference was observed in miRNA 32-5p levels with significantly higher levels among head injured subjects compared to healthy volunteers ($p = 0.009$).

Analysis of response profiles of miRNA levels were similar to RPQ change for all species at Day 7, but significantly different at Day 28. Overall response profiles of miRNA levels were significantly different to symptom severity for all species of miRNA.

Conclusions

Among patients with mild TBI, initial miRNA levels were different to healthy controls with significant difference demonstrated for miR 32-5p. Symptom severity was higher on Day 7 compared to Day 0 suggesting the need for medical review before return to play or work. Compared to patient reported symptom severity, response profile of miRNA levels was similar on Day 7, but significantly different by

day 28, suggesting that the two measures reflect different aspects of brain injury and healing.

Biography

Professor Mitra has been appointed as a full-time clinician since 2001 and employed as a staff specialist in Emergency Medicine at Alfred Health since 2008. Currently, he holds leadership positions at Alfred Health as Director of Emergency Medicine Research and Head of Clinical Research, National Trauma Research Institute.

His primary research interests are in trauma resuscitation with focus on haemorrhagic shock and traumatic brain injury. He leads a program of studies into early identification patients with mild traumatic brain injury, focused on development of biomarkers for early diagnosis and management.



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