JMVH

Volume 30 Number 1 January 2022 Journal of Military and Veterans' Health



- Treating Combat-Related Posttraumatic Stress Disorder
- Chemical Veterans' use of Complementary and Alternative Medicines and Quality of Life
- Military Aspects of Cholera in POW / Refugee Camps

The Journal of the Australasian Military Medicine Association



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AMMA ADVANCING MILITARY MEDICINE FOR 30 YEARS 7-10 April 2022 Melbourne



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Front Cover: "Cholera tent", Hintok

Hintok - Railway, Far East; prisoners of war camp. Jack Chalker was serving in the Royal Artillery when he was captured at the fall of Singapore. In October 1942 he was in a party sent to Thailand to construct the Burma-Thailand Railway. Chalker secretly made drawings of the various camps and conditions endured by the prisoners. He drew and painted on whatever materials he could find or steal from the Japanese, hiding his work in sections of bamboo buried in the ground, the attap roofs of huts, or the artificial legs worn by amputees in the hospital camps. His work provides a candid and moving record of the prisoners' suffering. Re: date - While the drawing is titled with a date of 1943, many of Jack Chalker's sketches were reproduced in 1945 at the Australian Medical Headquarters in Bangkok. At the end of the war Chalker travelled to Bangkok at the request of Weary Dunlop. Chalker was required to reproduce three sets each of many of the sketches he had made while in captivity.

Watercolour on paper by Jack Chalker, now deceased, used with the permission of his descendants.

Obtained from the Australian War Memorial - Accession Number ART90844

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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

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ISSN No. 1835-1271

Editorial

The Four Horsemen

In the Editorial that I wrote in January 2021, I was speculating what the imminent roll-out of the COVID vaccines would mean for Australia and the world. Over the last 12 months, we have seen the successful roll-out of 4 vaccines and vaccination rates reaching unprecedented levels, with rates of over 95% two dose vaccinated, which we have rarely seen in adults in recent times. We have also have seen the rise (and fall) of the Delta variant and the rise of the Omicron variant. Vaccine mandates, public health and social measures, masks, contact tracing, lockdowns and border controls have all had a role to play. As we move into 2022, we look forward towards some sort of normality – the 'End Game' of my previous Editorial.

As I write in early March 2022, I am reminded of the Four Horsemen of the Apocalypse, which represent plague, war, starvation and death, in the Christian religion. Perhaps I was in a particularly morbid state of mind, but the invasion of the Ukraine by Russia on 24 February 2022, with its many casualties, attacks on health facilities and mass evacuations in freezing conditions with little food, on top of a pandemic that has already killed over 6 million people, was an inauspicious start to 2022. Combined with the major floods on the East Coast of Australia, where the Australian Defence Force played a crucial support role, 2022 is shaping up to be a challenging year, where all Australians will need to navigate the uncertainties ahead. While I often speculate in my first Editorial of the year, I am loath to do it this time. As military health professionals, we can all expect a challenging year, from the realities of the current



contagion to the possibilities of a worsening global geopolitical situation. 2019 seems a long time ago.

Our first issue of 2022 contains a diverse range of articles from treatment in the field, health and fitness training, and tropical medicine through to women's health and medical specialist training. We continue to attract a good range of articles, including from overseas, but other military and veterans' health articles are always very welcome, and we would encourage all our readers to consider writing on their areas of military or veterans' health interest. We would particularly welcome papers based on presentations given at our 2022 conference, but welcome any articles across the broader spectrum of military health.

Dr Andy Robertson, CSC, PSM Commodore, RAN Editor-in-Chief Australian Defence Force Academy Lecture Theatre Six First session: the Fifth Annual ADF Medical Officer Orientation Course 0910, Monday 7 July 2031

N Westphalen

Author's Note

This article is the last of a series regarding the role of occupational and environmental medicine in the ADF.^{1,2,3,4,5,6,7,8,9'10}

These articles and a recent Productivity Commission inquiry¹¹ describe why high workplace illness and injury rates confirm the need to improve the management of hazards associated with ADF workplaces, with better emphasis on prevention. To this end, a submission by the Royal Australasian College of Physicians to the aforementioned inquiry advocated that this would best be achieved by premising the ADF's health services on a systemsbased occupational health strategic model.¹²

Doing so would require reassessing the fundamental inputs to capability¹³ for both Joint Health Command (JHC) and Defence's Work Health and Safety Branch. Previous papers have explained why the current state of the ADF's occupational and environmental health services, and the small number of civilian specialist practitioners within the Australasian Faculty of Occupational and Environmental Medicine (AFOEM), indicate that a fully mature holistic and sustainable model would take 10–15 years sustained effort.

This article summarises some of the issues raised in these papers and how they can be addressed using an occupational health model. Although the figures quoted in [parentheses] are clearly notional, they are consistent with the author's previous estimates.

Wing Commander Rasheeda Indra stood at the podium, having just completed the usual course housekeeping blather. Before her, sixty-odd people were spread around the auditorium, of whom perhaps half comprised Army members, with the remainder were more or less evenly split between Navy and Air Force. Just over half the group were women, and the older age of around a third of the group implied they were reservists.

There was a brief pause while Rasheeda gathered her thoughts. *OK. Here we go.*

'Right, let's get started. As you know, while you're here enjoying the Canberra weather over the next three weeks, my team and I will be orienting you all regarding Defence's health services and what we need from you to get to where we need to be in the next five to ten years. To do that, I'm going to kick off today by describing how and why things have changed over the last five or so years. To do *that*, we need to go back to the mid-90s.'

There was a stifled yet audible moan from the audience. Rasheeda ignored it and moved on.

During that time, Defence was going through the latest of a series of reviews, re-organisations, rereviews and re-re-organisations—you get the idea that had gone on... and on... and on... since the mid-70s.¹⁴ By then, more or less everyone within Defence—including some health officers—had come to believe that the only thing military doctors did was treat patients, and the only reason to have any in uniform was that civvies couldn't deploy.¹⁵ The health services were therefore seen as ripe for unification, civilianisation and/or contracting out... even though there's no evidence that any of these assumptions had undergone much if any actual validation, amid all the non-medical big-picture stuff.

That's *not* to say there wasn't a need for change—I remember old-and-bold MOs describing how the services back in the 90s each had their own

separate health stovepipes, right down to the clinical paperwork. Quite apart from the cost, all that duplication must've been a real pain for places like Duntroon, which still deals with people from all three services every day.

So, among all the other changes within Defence at that time—most of which had less to do with doing things better than simply saving money¹⁶—the three key ones that led to where we were ten years ago, were:

- 1. the MO pay system was redesigned to more or less align with civilian GP training
- 2. the base health services were taken from the single services and given to a single Defence Health Service (DHS)—later Joint Health Command (JHC), and now the Joint Health Service (JHS)—which was then tasked with contracting them all out
- 3. the responsibility for ADF occupational health was moved from DHS to a separate health and safety directorate, whose remit covered Defence civilians as well as the uniforms.

Now, it could be said that these changes all made sense if all we *did* do is treat patients, and it kinda-sorta worked as long as there were enough experienced MOs around to keep everything else going that wasn't specified in the contracts. We supported deployments to the Middle East, Timor, the Southwest Pacific and elsewhere, while patients back home were getting their clinical treatment.

Yet by the mid-teens, there was a perception within the Defence senior leadership that 'JHC needs fixing'. The warriors were complaining that they weren't getting what they needed: among other things, health staff were only looking at what their patients wanted, without considering what their commanders needed to do, in particular their duty of care obligations per the 2011 Work Health and Safety Act. At the same time, we had lost our patients' trust because we were 'wrecking their careers by telling their commanders everything'.17 Add to that wait times up to three months at places that couldn't recruit civilian GPs, too many members were getting their healthcare outside Defence, which-among other things-meant we were losing track as to who was truly medically employable and deployable, and who wasn't.

So, what had happened?

To answer that, we need to briefly go back even further. In 1940, Colonel Arthur Graham Butler—a civilian general practitioner and gynaecologist, and distinguished Gallipoli and Western Front veteran explained in his official medical history of World War I that all military health services have *three* separate but inextricably linked 'allegiances'—what we would now call 'missions'—with one always assuming priority depending on the situation:

- 1. To patients, to alleviate their suffering—in short, providing clinical care.
- 2. To commanders, to conserve workforce—which extends more broadly nowadays, to refer to facilitating operational capability in general.
- To society, to facilitate the return of ill and injured members to the civilian community something that has since been extended to all ADF members when they leave.¹⁸

Ninety years on, there are two things about what Butler wrote that the assumptions made in the late 90s clearly didn't consider. The first is that civilian health systems and practitioners only have to perform the *first* of these missions—they have *no* remit regarding the other two. The second pertains to how *all* Defence MOs have to juggle *all three* missions with *every* patient they see, *throughout* the latter's military career. In short, the broader ADF's lack of trust in its health services referred to by its commanders and patient subordinates stemmed from a model that simply wasn't intended to deliver the other two missions.'

The audience stirred slightly.

'So, what did that mean in practice? Let's start with the MO pay structure and its relationship to GP training: by the late teens, the RACGP's Chapter of Military Medicine [CMM] had recognised that:

"Military medicine is a complex mix of primary care, population health, occupational medicine, aviation and underwater medicine, emergency medicine and mental health. It is also characterised by exposure to unique challenges of location, resources and personnel management that can sometimes make simple clinical decisions very complicated. For serving medical officers, command, leadership, management, clinical governance, health support, aeromedical evacuation and disaster response planning also fall into our remit as GPs."¹⁹

This statement begs two questions: the first relates to how on earth can general practice—or any other specialty—be reasonably expected to have *all* the skills *to the level of depth required*, to provide *all* the treatment services the ADF needs. The second question pertains to the noteworthy absence of *any* reference to the *other* two missions. Even so, the CMM statement was pretty moot because, although we could always recruit prospective GPs, we couldn't retain anything like the numbers required to maintain the *military* medical expertise required for the other two missions. Fixing the pay in the early oughties so it came somewhere near civilian GP rates helped, but it still didn't stop us losing MOs immediately their ROSO²⁰ was up not just because of the money, but also because too many of the MOs we were recruiting were *always* going into civilian general practice as soon as they could, whatever we did.'

The audience stirred again, as people started looking up.

'To understand the MO retention issue a bit further, it would've been a good start in the late 90s to have clearly understood the demographics of the population we expect them to provide care for. Thirty years later, it turns out that, compared to the civilian workforce population, the ADF population might be more highly medically selected, but it's also younger, is currently about [72] per cent male,²¹ is widely dispersed across Australia, has very high turnover rates, and has a posting cycle whereby about a third routinely have less than 12 months experience of their current job at any one time.²² Hence, it's not only a workforce population, but a workforce population whose combined attributes constitute a 'perfect storm' regarding their risk of workplace illness and injury. We then could've used that information, to ascertain the types of workplace illnesses and injuries to be expected from this population and tailored the health services the ADF needs accordingly.

However, it wasn't until [2024] that we found [36] per cent of Defence primary care presentations were for preventable musculoskeletal injuries, of which [53] per cent were for work-related slips, trips and falls, while the rest were sports injuries. In addition, [35] per cent of presentations were for preventable mental health issues, of which [54] per cent were by people who were struggling because joining Defence wasn't a good career choice-fair enough, it doesn't suit everyone-while the rest were perfectly fine working in Defence, but for various reasons weren't coping with their jobs at that time of their careers. That meant up to two-thirds of Defence primary care presentations were work-related, compared to only 2.4 per cent of those to civilian GPs.²³ It was only then that we also realised this meant Defence simply doesn't have the clinical variety necessary to retain the type of MO it had decided to recruit and base their pay system on 20 years previously.'

The audience stirred again.

'Recognising the sheer volume of preventable workplace conditions took some doing because the data collection was awful, essentially because the workplace injury reporting process was entirely separate from the clinical case reporting process. That meant the work health and safety reporting systems in use in the mid to late teens *wasn't* documenting 80 to 90 per cent of Army's work-related injuries and illnesses—and by extension, probably Air Force and Navy's as well.²⁴

Meanwhile, Defence had spent the previous 100 years cost-shifting its longer-term rehabilitation and compensation expenses to DVA. Although applesand-oranges data collection between the Defence and civilian workforces likewise made meaningful comparisons difficult, evidence in the late teens suggested the DVA compo claim incidence rate may have been up to 12 times the average civilian serious claim incidence rate, and five times the worst civilian serious claim incidence rate. Furthermore, the per capita cost of compensation for current and ex-ADF members might've been *twice* the civilian rate.²⁵ That meant Defence had eminently preventable workplace injury rates-even among its people who weren't deploying or undertaking actual combat operationsthat were far higher and more expensive than the highest-risk civilian workplaces.

These figures also laid bare one of the key fallacies in the 90s: Defence per capita healthcare costs *weren't* up to three times the civilian Medicare rate because its health services provided gold-plated over-treatment services.²⁶ It was because they were playing 'ambulances in the valley', picking up the pieces from excessive yet eminently preventable workplace illness and injuries, while *also* performing the *other* two missions referred to by Butler, which Medicare doesn't cover.

So, by the late teens, we had more-or-less run out of uniformed MOs with more than four or five years military medical experience, typically only including a year or so of deployments, while-however, good clinicians they may have been-the contract MOs and other GPs simply didn't have the remit, capacity or expertise to prevent the two-thirds of cases they were seeing from getting hurt in the first place. Furthermore, although their decision-making was pretty consistent regarding patients who weren't fit for work, these MOs had the same limitations getting them back to normal duties. This impeded not only operational capability: too often it also unnecessarily delayed people's courses, promotions, deployments and other career progression issues-hence why they didn't trust us.

One reason this was happening was that what Defence MOs needed to know was buried within a mere 2866 pages of health policy direction,²⁷ most of which only described the various admin management rather than *clinical assessment* processes.²⁸ It wasn't until the early-mid 20s that it was accepted that bringing in civilian GPs and expecting them to understand and apply the sheer volume of the guidance they need without any actual training was doing a disservice to them, their patients and the latter's commanders. This not only explains why you're here for the next three weeks, it also brings us back to the validity of the assumptions made in the 90s-if Defence MOs need decent training to do everything else their job entails besides treating patients, perhaps the ADF should have rethought its dependence on contract civilian GPs a lot sooner, not to mention how to retain enough uniformed MOs long enough to develop the military medical expertise necessary to provide this training?

This brings me to the relationships between the three services. In 1993, the then WGCDR (later AVM) Tony Austin wrote:

"By integrating the medical branches of the ADF (whilst maintaining a single service identity) the potential employment pool is greatly expanded. This would then allow an individual medical officer to experience, by rotational postings, attachments etc., a much broader range of military medical specialties and thus remain professionally stimulated for a longer period of time. A larger medical pool would also permit specialisation across traditional singleservice lines and thus increase the opportunity for postgraduate training and external accreditation. Hopefully, this would lead to a more natural matching of inherent/interest and service needs thus creating a happier, more fulfilled medical officer population. The obvious flow-on from this would be greater retention of medical officers with enhanced corporate expertise and reduced training costs.

What then are the costs? The first casualty would have to be the traditional interservice antediluvian jingoism that has been the mainstay of military medical practice for generations. The second casualty would be selection by seniority rather than by ability. Are these costs too high? If the concept of a centralised Surgeon General is to be at all credible then the medical officers employed there need to have a realistic understanding of the needs of all three services."²⁹ On the other hand, CMDR (later CAPT) Russ Schedlich RAN wrote:

"Within a 20 or even 30-year career, is it reasonable to expect any health professional to become expert in all the particular fields of medicine that are relevant to military activities? Can one individual become an aviation medicine specialist, an underwater medicine specialist, a combat surgeon, an intensivist and so on, and be up to world standard in any of these? Can he or she achieve professional credibility in all these fields? Clearly not.

Military credibility is also important. Would an army unit commander feel intuitively confident that the advice given him by an air force or navy health professional is based on a full understanding of the issues involved in the problem? Probably not, because he would be, with some justification, sceptical of that persons' knowledge of the army, its environment and operational constraints. In a headquarters environment this is less of a problem, provided the commander is confident that the adviser has ready access to appropriately skilled professionals from the other services.

There is no doubt that Defence, and also its health services, have gained considerably from integrating some of its functions. However, in planning for the future, sight must not be lost of the unique nature of each of the Services, and the importance of a dual outlook—Single Service and Joint—in developing the credibility that will sustain the health services in the future.^{"30}

CMDR Schedlich added:

"Military health services exist for a variety of reasons. They aim to provide a force that is fit to fight-screening out those with conditions incompatible with operational service. providing preventive medicine advice and services, and curing those who fall ill in nonoperational areas so that they are fit to relieve others. Perhaps most importantly, they act as an effective force multiplier by providing timely and effective care to those who are injured or fall ill in combat. Their presence assists in the maintenance of morale, they return the ill and injured to their Units, and they minimise the numbers of personnel evacuated from the theatre of operations.

These are functions of which military health services must not lose sight. They must always be prepared to provide health care in the field promptly and effectively. If they cease to be able to do this, they may as well not exist."³¹

It wasn't until the early-mid 20s that it was realised the underlying premises behind *both* writers' assumptions had, in effect, undergone 20-odd years of unrecognised ad hoc testing, which confirmed the *actual* level of military understanding MOs need to perform the missions described by Butler. In short, although neither exactly hit the mark, it's turned out Schedlich was a bit closer than Austin.

So, by then having recruited MOs throughout that period who weren't particularly satisfied with the generally bland clinical material within Defence, who also lacked a comprehensive understanding as to *why* they were providing healthcare for ADF members and were *never* going to find the *where* and the *how* they did it enticing... we needed to be far better at recruiting MOs who did.³²

The first step to that end was to accept that if only a third or so of Defence primary care presentations were for conditions typically seen in the civilian GP setting, one did *not* have to be a GP Fellow to see ADF patients. That *didn't* mean we didn't need GPs at all, it simply opened the door for public health (PHP) and occupational physician (OEP) trainees to provide primary care to this population under GP supervision, on similar terms to what they were doing anyway for GP registrars.

The corollary relates to the additional primary healthcare ADF patients do need that civilians don't. That meant recruiting, training and retaining enough PHPs and OEPs to support GP trainees regarding the workplace medicine they do within Defence. Although OEPs might not be au fait with pill scripts, skin checks or lipid disorders-without downplaying how important these are-they're specifically trained to treat work-related illnesses and injuries and getting people back to work in a way that GP's aren't. It's also worth noting that-unlike GPs-it's also part of the normal civilian OEP and PHP career progression to make the eventual transition into policy and management roles, thereby sustaining the full range of Defence health functions necessary to conduct Butler's missions.

We also needed more uniformed MOs to fill the post-ROSO gap, not only to undertake the additional workload preventing work-related illness and injuries at the bases and on deployment but also to fill the workplace population health and other staff roles required to conduct all three of Butler's missions. If we need to retain X number of MOs per annum, and the retention rate is only Y per cent per annum, we need to recruit X/Y MOs, which—if Y has never exceeded about 10 per cent in living memory—won't ever be compatible with a contractor-based model. That *doesn't* mean we don't need APS or contract MOs: it simply means they'll fill in the gaps left over once we have the critical mass of uniformed MOs we need to conduct all three of Butler's missions. Progress to this end has been slow; it'll take another five to 10 years to recruit and train the MOs we need... which is where you come in.

Clearly, none of this would have been possible without significant organisational changes. First off, Defence signed up to the RACP *Health Benefits of Good Work*, which provided a framework for better *workforce* personnel management in a way that recognises the importance of *maintaining* employee health as a capability enabler, rather than merely fixing them after they've been broken.³³ Defence also moved the health section of the Defence Work Health and Safety Directorate back to JHS, resulting in a *single* organisation responsible for its occupational health services—including rehab and compensation—that we can now provide as an *intrinsic* component to our primary healthcare services, as per Butler's missions.

Defence also revamped the injury reporting system so that *all* work-related illness and injuries were reported *and* initiated the compensation process at the *first* medical point of contact. Although it took too long to be accepted, this eventually facilitated a 2019 Productivity Commission recommendation, such that JHS is now funded via a premium paid by the service chiefs: this rather altered their motivation to reduce preventable workplace illness and injuries, as well as JHS's motivation to record them.^{34,35} This didn't just reduce healthcare and compensation costs; it also enhanced operational capability because people weren't getting injured as badly or as often.

By the early 20s, it had also become apparent that the old MEC System was being abused as a patient management tool rather than the personnel advisory system it was intended for. Another problem was and still is—that it was not well appreciated why the medical standard for an Army infantry soldier to deploy, doesn't have to be the same as an Air Force avionics maintainer or a Navy steward. Neither was it understood that these assessments are easy, simple and quick if the member either has *no* medical problems at all or if their problem *clearly* stops them from deploying; it's the *continuum between* that's hard to manage. To that end, it seems reasonable to assume that MOs *with* deployment experience are better able to assess the people within this continuum than those without—in particular, *not* just so patients who *shouldn't* deploy *don't*, but also that the ones who *can* deploy, *can*. That meant deploying more MOs for longer and more often: not just to provide healthcare as an end unto itself, *or* to provide deployed workplace health advice, *or* to facilitate operational capability by allowing more personnel with medical conditions to deploy who otherwise can't, but *to gain experience of the deployed environment, as a means of understanding their role in facilitating operational capability on their return to the base setting.*

Besides improving the odds of getting it right on the first place, better medical employability and deployability decision-making is enabling far better fact-based patient advocacy and expectation management, by helping MOs to actively *own* their decisions, rather than providing false hope to patients while abrogating bad news to the ubiquitous "someone else". Furthermore—and far more importantly—it's providing far better face validity for ADF members, regarding the MOs who are making career-altering medical decisions about them.

Defence also moved the central MECRB confirming authorities from JHC to the single-service health directorates. This facilitated better liaison with the personnel management agencies and improved accountability from the treating MOs regarding their employability and deployability decision-making and the service chiefs that reflects their raise/train/ sustain function. In addition, the ADF MEC System was replaced by the current Medical Suitability Personnel Advisory System (MSPAS), which is pretty similar *except* the current Medical Suitability Categories are explicitly focused on each member's medical suitability to *do their job*, rather than the *treatment services* they need while deployed.

Finally, it was eventually recognised that—taking Air Force for example—because the majority of its personnel are generally posted to mostly Air Force bases, it was far more important to ensure consistency of their health services between Williamtown, Amberley and Tindal, than between Richmond (mostly Air Force), Holsworthy (mostly Army) and *Kuttabul* (mostly Navy) in Sydney. The regionallyorganised base (previously 'garrison') health services introduced in the late 90s were therefore reorganised to reflect the clientele's operational environment while remaining under a revamped JHS. So, having focused more or less exclusively on treatment services in the 20 years since the late 90s, the ADF's health services have spent the last decade learning how to be *truly* joint regarding their *other* two missions—to commanders and the Australian community—that were first described as "allegiances" by Butler nearly a century ago. A decade later we still have some way to go—but as the then CDF said in 2017 [underlining added]:

"I look at where we've come to now from back then [1999] and we are well ahead, with a far better understanding that joint isn't doing everything the same. Joint is about bringing the best of the three services and the public service together to get the best combination you can for that particular operation."³⁶

Hopefully, by the end of this course, you'll have the background factual knowledge necessary to advocate on behalf of JHS and your single service, to your patients, commanders and anyone else. For those of you who end up making a long-term career, I hope it'll also give you a start on how you and your successors can avoid—or at least mitigate—some of the 'unintended consequences' made in days of yore. OK, any questions?'

A hand came up from the audience.

'Ma'am?' It was a young Navy officer. 'Lieutenant Ethan Lynch. Didn't returning the MSPAS stuff to the single-service directorates take everything back to where things were back in the 90s—you mentioned places like Duntroon?'

'That's a good question,' said Rasheeda. 'And I can see why it might look that way. The answer is "no". For a start, JHS sets the standards that Duntroon has to comply with, whereas 30 years ago it had to comply with three separate directorates. We now recognise that MSPAS advice has to reflect how each of the personnel directorates operate-even though their processes are often similar, the environments in which each Air Force, Army or Navy member lives and works means they can't be exactly the same. So, for example, if you're a Navy member on a ship and become medically unfit, you'll be posted ashore so the ship can get a replacement: that means there'll be a lot more urgency compared to Air Force or Army members, whose postings don't change unless their unit actually deploys. Hence, all Navy MSPAS go to DNH and all Air Force MSPAS go to DAFS. Army do theirs differently, again because of how they're organised: their MSPAS still go to a local regional confirming authority, with only the Central Army MSPAS going from there to DAH.

Another point to remember, is that these arrangements aren't too dissimilar to how aircrew, divers and submariners from all three services have been managed throughout the whole period we've been talking about. Yes, at the back?'

'Hi ma'am, Major Sophia Collins—I'm a reserve GP from Burnie. Could you expand on WGCDR Austin's references to 'antediluvian interservice jingoism?'

'Sure,' said Rasheeda. 'The point to make is that such statements would only be appropriate if all we did is treat patients. When someone presents with a limb fracture, we'd all agree their clinical treatment doesn't depend on the treating MO's uniform colour. However, the issue these statements miss pertains to the other two missions: clearly, the operational impact for the patient's commander will differ if it's during a deployment somewhere as opposed to the base setting, while the operational impact in the deployed setting won't be the same for a ship at sea compared to somewhere ashore. Likewise, properly documenting the work-relatedness of longterm mental health conditions, in particular, will be problematic-both in terms of developing rapport and knowing what to ask-if the treating MO has no idea what the patient's work actually entails.

While it's taken far too long, I'd like to think the way the ADF's health service personnel have had to work with each other over the last 30 years since has led to better understanding, acceptance and respect as to what, when, why and how each of the services has a bona fide need to do some of the same things a bit differently, because of how it works better for everyone overall.'

'Next question? Yes, over there'

Disclaimer

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

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[Disclaimer: the author was requested to draft this submission, as a member of the AFOEM Policy and Advocacy Committee (PAC). It was cleared by both the Faculty and College PACs prior to submission]

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Assessment of musculoskeletal Pain Associated with Combat-Related lower limb injuries leading to foot and ankle disorders

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Abstract

Background: Injury distributions showed that extremity injuries accounted for a higher percentage of all combat injuries. Extremity injuries were responsible for the greatest consumption of resources during the treatment period. Combat-related extremity injuries disabled 64% of those injured.

Purpose: The study aimed to assess musculoskeletal pain associated with combat-related lower limb injuries leading to foot and ankle disorders.

Material and methods: In this cross-sectional study, as a part of a larger health needs assessment study between 2014 and 2016, participants were interviewed face-to-face by trained assessors who then completed a questionnaire designed by experts based on their experiences with veterans' neuromusculoskeletal examinations during the first two decades after Iran–Iraq War. The relationship between pain and other characteristics was examined by chi-square test. Mann–Whitney test was used to compare different groups in this study (P < 0.05).

Results: 809 veterans were assessed, 95.1% (N=776) of them stated pain at least in one anatomical location. Lower limb pain was 91.6% (N=741) including knee pain 71.1% (N=575), hip pain 42% (N=340) and ankle pain 72.9% (N=590). 66.6% of the participants reported low back pain, while 37.2% complained of upper limb pain.

Conclusion: The results of this study showed the development of significant pain in this group.

Keywords: Musculoskeletal Pain, Foot and Ankle Disorders, Combat-Related Lower Limb Injuries

Conflict of interest: The authors have no conflicts of interest to disclose.

Introduction

The war imposed on Iran by Iraq in 1980 resulted in the deaths and injuries of many military and nonmilitary people. It is estimated that about five hundred and sixty-four thousand Iranians were injured in the eight-year-long war, corresponding to a rate of 70% of the Iranian population.¹ Injury distributions showed that extremity injuries accounted for a higher percentage of all combat injuries.^{2, 3} Extremity injuries were responsible for the most significant resource consumption during the treatment period. Combat-related extremity injuries disabled 64% of those injured.⁴ Nearly one hundred thousand veterans suffer lower-extremity injuries, more than ten thousand of whom have ankle-foot injuries.¹ In the past 30 years, these thousands of Iranian veterans have lived with chronic disability and faced

medical, social and psychological challenges in their day-to-day living.

Helping the injured people is one of the leading health challenges in a country, and in people with a disability population, pain is a prevalent problem.⁵ Musculoskeletal pain caused by battlefield injuries to bones and soft tissues is common among veterans.⁶ A systematic review showed veterans of the Persian Gulf War of 1991 reported a higher proportion of pain symptoms than other military groups.⁷ Chronic pain is associated with veterans' decreased quality of life, impairment in daily functioning and increased mortality, especially when those affected cannot be active.⁸ The causes of pain among veterans with polytrauma include heterotypic ossification, complex regional pain syndrome, myofascial damage, peripheral nerve or plexus injury (neuropathic pain) and emotional stress.⁹ Each cause might require a somewhat different and multidisciplinary approach to treatment such as cognitive-behavioural and physical activation interventions.^{10, 11} Results of one study illustrate that the quality of life of veterans with ankle-foot injuries was significantly lower than that of the average Iranian population, and of veterans with bilateral lower limb amputation all the investigated dimensions (lowest score was observed in the bodily pain scale).¹²

Dealing with war-related foot and ankle injuries is challenging, and many individuals have a long life ahead of them and need to maintain an active lifestyle. Many of these veterans sustained additional injuries to other body regions and sequential polytrauma related injuries and complications. It is essential to understand musculoskeletal pain after years of war-related lower limb orthopaedic injuries that necessarily did not result from direct exposure to combat. In the years following the end of the war, many rehabilitation services, including orthotics and prosthetics devices, physical therapies and drug therapies, have been employed to alleviate pain and unwanted secondary effects and promote quality of life. Identification of pain may affect these services. The present study sought to describe the pain of combat-related musculoskeletal lower limb injures.

Method

In this cross-sectional study, as a part of a larger health needs assessment study between 2014 and 2016, musculoskeletal pain was assessed in veterans who suffered lower limb injures with consequences of foot and ankle disorders, such as lower length discrepancy, drop foot, malunion fracture, toe deformity or amputation. The Human Ethics Committee of Janbazan Medical and Engineering Research Center (JMERC) approved that the present study was designed according to Helsinki. The Declaration of Helsinki is a document issued by the World Medical Association that provides ethical guidelines for research involving human beings.13 The data related to veterans with lower limb injuries were provided by the Veterans and Martyr Affair Foundation (VMAF). Demographic information included age, gender, education level, employment and other injuries other than ankle-foot trauma. Participants were selected based on three main criteria: at least six months had passed since the veteran's lower limb injury; the veteran was aged between 40 to 80 and suffered from war-related lower limb injures with foot and ankle disorders. Veterans with a transtibial or a more proximal level of amputation were excluded from the study.

This health needs assessment study was undertaken by JMERC, with a scientific team that included general practitioners, internists, orthopaedists, prosthetic and orthotic specialists, physical therapists and psychologists. Trained experts were responsible for collecting demographic data. To assess pain, participants were interviewed faceto-face by trained assessors who then completed a questionnaire designed by experts based on their experiences with veterans' neuromusculoskeletal examinations during the first two decades after Iran-Iraq War. Pain was first classified by its location (the part of the body where the pain was felt). Since pain sometimes motivates veterans to seek care, the participants were then asked to respond to the question, 'Have you experienced consultation with a doctor, hospitalisation and surgery?' using one of two options of 'No' or 'Yes'. The participants then were asked about the intensity of pain in the past four weeks and the consequent interference of their daily activities. Pain intensity was determined by asking the participants to answer the question, 'How much body pain have you had during the past four weeks?' choosing one of six options of 'very severe', 'severe', 'moderate', 'mild', 'very mild' or 'none'. They also answered the question, 'During the past four weeks, to what extent did pain interfere with your daily activities (including both work outside the home and housework)?' using one of six options of 'very severe', 'severe', 'moderate', 'mild', 'very mild' or 'none'. The reliability of the questionnaire was at a good level since Cronbach's alpha was 0.8 in this study.

Statistical analysis was performed using SPSS 22 (The Statistical Package for the Social Sciences 22.0). Quantitative variables were reported as the mean \pm standard error, and qualitative variables were presented as frequency and percentage. The relationship between some characteristics and pain was examined by chi-square test. Mann–Whitney test was used to compare different groups in this study. *P* values <0.05 were considered significant.

Results

The majority of 809 veterans evaluated in this study were male (97.4%, N=787) and married (98.4%, N=885). 43.7% of them belonged to the age group of 40 to 50 years (N=353). Mean age of the veterans was 52.4 years \pm 6.7 years. In the current investigation mean age at the time of injury was 22.6 \pm 6.7 years, and mean age after the combat-related injury was 27.7 \pm 4years. Table 1 gives more details about demographic characteristics.

Demographic characteristics		Frequency	Percent	
Age Group	40-50 years	353	43.7%	
	51-60 years	347	42.9%	
	61-70 years	87	10.7%	
	71 years and more	22	2.7%	
Education level	Illiterate	73	9%	
	Under high school diploma	380	46.9%	
	High school diploma	210	26%	
	University education	146	18.1%	
Job status	Employed	219	27.1%	
	Unemployed	590	72.9%	

Table 1. Demographic characteristics of combat- related lower limb injured veterans (N=809)

The causes of lower limb injury were 48.1% (N=389) shrapnel shell, 14.8% (N=119) landmine and 26.4% (N=213) bullet. Most of the participants had more than one cause for their injuries. Two hundred and seventy-four (33.9%) of the veterans were injured in the right leg, 37.9% (N=307) in the left leg, and 28.2% (N=228) in both lower limbs. Other physical injuries (associated combat-related injuries) were head (17.6%, N=142), face (10.5%, N=85), chest (9.3%, N=75), abdominal (14.5% N=117), spine (18.8%, N=152) and upper limb (26.8%, N=216).

Seven hundred and seventy-six (95.1%) of the veterans stated pain at least in one musculoskeletal locale. Lower limb pain was 91.6% (N=741) and included 71.1% (N=575) knee pain, 42% (N=340) hip pain and 72.9% (N=590) ankle pain. Low back pain was one of the most common complaints, with a prevalence of 66.6%. The prevalence of upper limb pain was 37.2%. Pain distribution on lower limb, spine and upper limb was expressed based on consultation with a doctor, hospitalisation and surgeries (see Table 2).

 Table 2. Anatomic Location of pain sensation in lower limb

	Pain leading to consultation with a doctor		Pain leading to Hospitalization		Pain leading to surgery	
	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Right hip	212	26.2	51	6.3	44	5.4
Right knee	415	51.3	89	11	79	9.8
Right ankle	362	44.7	126	15.6	110	13.6
Left hip	221	27.3	60	7.4	52	6.4
Left knee	422	52.2	108	13.3	97	12
Left ankle	376	46.5	124	15.3	113	14
Cervical spine	312	38.6	22	2.7	16	2
Thoracic spine	99	12.2	15	1.9	11	1.4
Low back	539	66.6	68	8.4	51	6.3
Right shoulder	172	21.3	10	1.2	7	0.9
Right elbow	86	10.6	14	1.7	13	1.6
Right wrist and Hand	120	14.8	21	2.6	18	2.2
left shoulder	150	18.5	12	1.5	8	1
Left elbow	91	11.2	11	1.4	7	0.9
Left wrist and Hand	130	16.1	22	2.7	17	2.1

One hundred and fourteen (41.6%, N=114) of right leg injured veterans stated pain in the left leg, 68% (N=209) left ankle pain, 64.4% (N=198) left knee. One hundred and thirty-five (43.9%) of left leg injured veterans had pain in the right leg, 69.3% (N=190) right ankle pain and 58.4% (N=160) right knee (ipsilateral leg injuries). The results of a chisquare test showed that contralateral knee pain was 33.5% (N=103) in the group with left leg injuries and 36.1% (N=99) in the group with right leg injuries. The highest knee pain in veterans with bilateral limb injures was 63.5% (N=145). Contralateral ankle pain was 14.3% (N=44) and 14.2% (N=39) in the group with left and right injuries, respectively. Ankle pain in bilateral limb injures group was 56.1% (N=128).

To report their physical pain intensity, 14.7% (N=119) of the participants selected very severe, 40% (N=324) severe, 26.7% (N= 216) moderate, 13.8% (N=112) mild, 2.5% (N=20) very mild and 2.2% (N=18) none. For the extent of the interference of their physical pain with their daily activities 11.1% (N=90) stated very severe, 35% (N=284) severe, 30% (N=243) moderate, 14.8% (N=120) mild, 5.6% (N=46) very mild and 3.4% (N=26) none. There was not a significant association between the age and lower limb pain (2 (37) = 40.4, p =.32). Also, there was similar result for time after injures (2 (1) = 25.6, p = 0.64).

Discussion

There are many reasons for war injures. An assessment stated that 77% of those injured in war sustained at least one orthopaedic combat injury.¹⁴ Extremity injuries also lead to frequent hospitalisations and a significant burden.³ A study indicated 2313 persons were injured by landmines and unexploded ordnance between 1988 and 2003 in Iran.¹⁵ Explosive devices, landmines, shrapnel and other blast phenomena are also responsible for 65% of Iraq and Afghanistan combat injury cases.¹⁶ In this study, most of the participants had more than one cause for their injuries. Nearly half of the injuries to lower limbs were caused by shrapnel shell.

Pain is a major health problem among people with combat-related injuries.¹⁷ Most veterans with traumatic lower limb injuries successfully survive but are exposed to long-term defects in their lower extremities.^{17, 18} Most of the existing articles focus on lower-extremity amputations.^{19, 20} A study in Veterans Health Administration showed that painful musculoskeletal conditions increase annually.²¹ The present study observed that the prevalence of pain was high for lower limb and spine. These results are consistent with an article that stated musculoskeletal injuries related to military service might contribute to the long-term risk of chronic pain conditions such as osteoarthritis. 22

According to our results, the highest prevalence of pain knee is 64.4% ipsilateral and 36.1% contralateral. Although observed pain in the knee of the intact limb was common, ipsilateral knee pain was higher based on the findings of this research. It seems stresses on the contralateral limb may contribute to secondary pain and disability. Studies of lowerextremity amputation showed that the experience of chronic pain after amputation is complex and multidimensional and is not limited to the amputated limb.23, 24 In fact, 63% of transfemoral and 41% of transtibial amputees exhibited degenerative changes of the knee of the intact limb.²⁵ The prevalence of knee pain was 28% in veterans with high-level lowerextremity amputations.²⁶ Veterans with amputation of the foot and ankle indicated 33.3% contralateral knee pain and 14.8% ipsilateral knee pain.27 The prevalence of knee pain in veterans with unilateral below-knee amputation was 54.7%.²⁸ Compensatory mechanisms may be responsible for reduced pain in the amputated knee compared with the pain in the healthy knee.²⁹ Also, it was confirmed by a study that paying attention to physical comorbidities could be necessary to pain incidence.³⁰

Low back pain comprises the highest percentage among other pains. 66.6% of the participants reported back pain in the present study. This is considerably higher than the prevalence of back pain observed in the general population, which was shown in the studies to be in the range of 1.5% to 36%.³¹ In addition, the participants' low back pain was higher than foot and ankle amputees, with 44.4% low back pain.²⁷ The prevalence of low back pain in veterans with unilateral below-knee amputation was 78.1%.28 There was low back pain in 80% of veterans with highlevel lower-extremity amputations.²⁶ Some physical and functional measures related to low back pain, such as catastrophising, depression, anxiety, workrelated and biomechanical factors such as movement and muscle asymmetries.^{32, 33} may affect our study and lower-extremity injuries are probably not the only causes of back pain. According to a study, low back pain and knee pain were ranked second and fourth in musculoskeletal injury, respectively.¹⁷ In this study, ankle pain (72.9%) and knee pain (71.1%) were the top pains in the ranking. Given that all veterans were associated with combat-related lower limb injuries leading to foot and ankle disorders, these results are acceptable. In addition to injures, gait abnormalities and joint loading over time may lead to joint pain and degeneration.34,35

A percentage of the participants (81.4%) reported that their physical pain intensity was moderate or higher, and in 76%, pain had interfered with their daily activities. Therefore, paying attention to the cause of pain and its treatment is essential. Several population-based studies have also shown that pain is associated with clinically significant decrements in performance-based measures of physical capacity such as gait speed, overall lower-extremity function and greater symptoms of depression, fatigue and insomnia.³⁶⁻³⁹ In addition, pain is a condition that includes a series of beliefs, behaviours and functional disabilities, all of which interplay to create personal meanings of pain.³⁹⁻⁴¹ Chronic pain is a widespread cause of disability in people with musculoskeletal disorders.^{42, 43} However, the aetiology of chronic pain is not acknowledged absolutely,⁴⁴ and investigations have shown that psychological factors may have an important role.45

This study showed that these veterans suffer from chronic pain despite medical advances. Therefore, more profound studies with a comprehensive approach to treatment and rehabilitation of chronic pain are necessary.

Conclusion

Pain is a common problem among persons with war-related foot and ankle injuries. Pain can limit and deteriorate different aspects of life, including functionality, physical activity, professional performance and psychological status. We believe that

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future research is needed to assess musculoskeletal pain associated with combat-related lower limb injuries leading to foot and ankle disorders more comprehensively, more accurately.

Ethics

The ethics committee of Janbazan Medical and Engineering Research Center (JMERC), Tehran, I.R. Iran, approved this study. The informed consent forms were also filled and signed by all subjects participating in the study.

Funding

JMERC supported this study financially by an interdisciplinary research grant.

Acknowledgements

We would like to kindly thank all the veterans with upper and lower-extremity musculoskeletal disorders who took part in separate health needs assessment studies.

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Treating combat-related Posttraumatic Stress Disorder using Therapeutic Fly-Fishing with EMDR (TF-EMDR)

A Parmenter

Abstract

Therapeutic fly-fishing is a nature-based intervention that is experiencing increased use to adjunct mental health treatment with current and former uniformed service professionals. While promising, literature suggesting the use of therapeutic fly-fishing with evidenced-based psychotherapy for posttraumatic stress disorder (PTSD), or any other mode of psychotherapy, does not appear to exist. This raises several questions regarding the ethics and fidelity of current uses of fly-fishing during a person's mental health care. Because of these concerns, the author explores literature surrounding the use of therapeutic fly-fishing for combat-related PTSD and offers a way to integrate fly-fishing directly within a well-researched and widely used PTSD treatment modality: Eye Movement Desensitization and Reprocessing (EMDR) therapy. The distinct phases of EMDR are demonstrated through a treatment protocol, followed by implementation suggestions for interested mental health professionals, organisations and other treatment providers worldwide. The author hopes that clinicians and treatment—with the model presented as one way to integrate the worlds of nature-based treatment and evidence-based practice easily. Finally, this paper serves as a call for research into the concept of Therapeutic Fly-Fishing with EMDR (TF-EMDR) and other such integrations of nature- and evidence-based PTSD treatment approaches.

Keywords: EMDR; Nature-Based Therapy; Military Veterans; PTSD; Fly-Fishing

Introduction

Nature-based approaches are promoted as costeffective wellness and confidence-building activities to adjunct traditional mental health treatment. Nature-based interventions (NBI) and therapies are designed for specific populations within carefully chosen natural settings, providing an experiential vehicle to increase wellbeing-linking mind and body health through a person's connection to the environment.1 A recent systemic literature review regarding the use of NBI for comorbid mental health disorders² concluded that nature is an essential component of healing for health professionals to consider. Although few studies have been produced to evaluate the efficacy of NBI and mental disorders, a 2018 study of incarcerated persons provides evidence that emotional health can be improved simply by engaging with nature.³

Stigma related to psychotherapy and confusing messages about confidentiality prevent many

military and uniformed personnel from accessing traditional mental health services.⁴ This results in less prevention and addressing mental health after deterioration, resulting in longer periods away from work, higher direct care costs and the potential need for retraining. Moreover, psychotherapy can be expensive.5 Therefore, non-traditional approaches facilitated by qualified civilian practitioners may appeal to military members and taxpayers alike. Several nature-based mental health programs appear to offer support for uniformed populations even though research is sparse. Although just a handful of randomised controlled trials in this area exist, they appear to show positive results when used to assist the treatment of combat-related posttraumatic stress disorder (PTSD).⁶

This is still a new frontier with many possibilities yet limited methods for management and cultivation in the area of nature-based treatment of PTSD. Therefore, the reader must recognise the potential good that can result from integrating nature into the treatment for active military and veterans, done within evidence-based frameworks; scientifically proven approaches to achieve results that can be evaluated empirically and delivered with fidelity.

While suggested as useful, it is difficult to identify the types of NBI that are used specifically for treating PTSD and where consistency lies. One form of NBItherapeutic fly-fishing-appears to show promise. It has experienced increased usage among programs serving active military and veteran individuals in recent years. A small number of published articles highlight fly-fishing as a form of recreation therapy that appears to aid in alleviating symptoms, assist with stress management and instil a positive future focus among combat veterans diagnosed with PTSD.^{7,8,9} Despite being discussed as a therapy for PTSD, a complex mental disorder, no researched form of therapeutic fly-fishing appears to be facilitated by licensed mental health professionals. Likewise, there seems to be no research that integrates evidencebased treatment for PTSD with therapeutic flyfishing. In their paper about fly-fishing with combat veterans, Bennet and associates recommended using the activity alongside other methods for treating PTSD⁷ without again suggesting integration with an evidence-based treatment or specifying which models to explore. These issues are concerning, as treating any mental disorder by an unqualified person interferes with a person's trauma recovery⁴ and is widely understood as unethical.¹⁰

Fortunately, various studies have been conducted on the use of evidence-based psychotherapies for the treatment of PTSD. Eye Movement Desensitization and Reprocessing (EMDR) therapy is a psychotherapy that was initially developed as a way to lessen distress related to traumatic memories.¹¹ It is a cost-effective and significantly researched PTSD treatment method,¹² accepted as safe and effective for treating even the most serious comorbid cases.¹³ EMDR is identified by the World Health Organization as a primary treatment for mental disorders resulting from traumatic stress.

In the United States, the Department of Veterans Affairs (VA) partnered with Project Healing Waters one of the country's largest organised therapeutic fly-fishing programs with affiliations in Australia, Europe and Canada. While veterans' agencies from various nations consider EMDR as a recommended evidenced-based therapy for PTSD, neither therapeutic fly-fishing nor any other form of naturebased activity are mentioned in a comprehensive review of randomised controlled trials studying the use of EMDR with combat veterans.¹⁴ This article introduces the concept of Therapeutic FlyFishing with EMDR (TF-EMDR) as a nature-based EBP framework, and *Seiyu-zuri* as the first method for delivering the EMDR Standard Protocol in this way. It serves as an encouragement for treatment providers, especially those engaged with militaryand veteran-focused PTSD treatment, to consider the direct integration of therapeutic fly-fishing and EMDR when appropriate. Empirical research for integrating fishing with EMDR is encouraged, as are other possible integrations of evidence-based PTSD treatments with other NBIs.

Eye Movement Desensitization and Reprocessing (EMDR) Therapy

EMDR follows an eight-phased Standard Protocol and is currently one of the most researched psychotherapies showing efficacy in PTSD treatment.¹⁵ Guided by a trained EMDR Therapist, a client processes imagery, physical sensations, feelings and other associations that arise as a traumatic memory is accessed. Repetitive saccadic eye movements, or other forms of alternating physical stimulation known in EMDR as bilateral stimulation (BLS), aid adaptive information processing in a way that is believed to be similar to what happens during REM sleep.¹⁶ Both EMDR theory and research acknowledge that this decreases the physiological and psychological intensity of a memory as it is reprocessed in a new adaptive form within a person's permanent working memory.^{11,17,18,19} While effective across many populations, a recent meta-analysis by Peter Coventry and colleagues suggests specific efficacy of EMDR with active and veteran military members over other treatment methods.²⁰

As an advanced form of psychotherapy, EMDR may only be conducted by qualified mental health professionals who have completed or are in consultation as they complete a rigorous training program. Many training programs are accredited by a regional EMDR association, such as EMDR Association of Australia (EMDRAA), EMDR Europe and EMDR International Association (EMDRIA) in the United States. Thus, readers cannot use the following information to treat clients unless they have participated in an approved EMDR Basic Training, and trained EMDR therapists are encouraged to seek training in TF-EMDR before actively utilising this in therapy. A trained mental health professional interested in practising EMDR can become an EMDR Therapist through approved trainers. EMDR associations can serve as accrediting bodies, and as clearinghouses for consumer-focused information on EMDR. For example, the eight phases of EMDR therapy (Evaluation/History taking; Preparation; Assessment; Desensitisation; Installation; Body scan; Closure; Reevaluation) are introduced at EMDRIA.org. Finally, many associations manage online directories of trained EMDR therapists.

Five-senses experiencing

New research finds evidence that increased awareness of the five senses and a person's subjective experience will influence wellbeing and resilience even during intense emotional experiences.²¹ It is important to understand that cognitive networks contain much more than thoughts and words. Learning takes place as emotions are held in the body. The integration and processing of information from external and internal stimuli is a key function that has enabled humanity to survive and thrive across ages of traumatic and disturbing experiences. From an epigenetic perspective, frequent experiences of any consistent emotional experience can significantly impact a community when felt at large.²²

Emotions are physiological in nature, meaning that a link between chronic experiences of negative emotions and physical illness exists.²³ Despite this, recent studies on PTSD diagnosed in combat veterans reveal the dangers associated with learning to numb emotional discomfort. Worsened mental health and quality of life, relationship struggles and increased regularity of behavioural traits such as aggression, avoidance of or noncompliance in psychological or medical care, and harm to self and others appear more likely and exacerbated when emotional numbing is a trait.²⁴ As a result, it is possible to assume that engaging with natural urges to avoid psychological threats influences the development of behaviours and associated physiological experiences that can maintain and worsen a person's daily experiences of psychological trauma. Undoing this avoidance, and moving a person towards healing from trauma, involves connecting both a person's mind and body to positive experiences associated in some way with the traumatic wound. Decreasing psychological fusion with negative emotions, while increasing mental flexibility and the ability to have a full range of experiences can allow a person to move towards an adaptive resolution that allows them to live life more fully.^{25,26,27}

Bilateral stimulation and five-senses experiencing

In a review of *Levine and Shefner's Fundamentals* of Sensation and Perception,²⁸ the author remarked that an integrated sensory experience is 'worth ten-thousand words'.²⁹ This statement is an accurate description of the complete picture that takes shape as an adaptive resolution in EMDR—when the linkage

of information from flexible memory networks into maladaptive ones causes a shift in a person's trauma narrative toward letting go.^{17,27}

Since its inception by Francine Shapiro in 1987, EMDR has involved the direct integration of a person's cognitive and physiological experiences. This integration is a hallmark of the model that is present throughout the eight phases of EMDR. The explicit necessity of a whole-person approach and a person's physical and environmental awareness has been amplified throughout the development of EMDR over the past 3 decades. As such, a felt link between mental experiences and physical sensations is widely understood as key for anyone to prepare for adequately and experience posttraumatic growth.^{25,27,30}

Rapid eye movements influence memory consolidation information processing.^{28,27,31} Techniques and like BLS, such as therapist-controlled saccadic eye movements via a handheld wand or fingers moving left to right, and other forms of alternating physical stimulation, are key components of EMDR. Alternating physical movement or stimulation allows a person to remain dually attentive to their internal experience while maintaining a grounded, mindful connection to the here and now.25,27 Initially discovered as eye movements alone, BLS techniques are used throughout EMDR to help activate information sharing between a person's cerebral hemispheres to relieve distressful emotional and physical sensations associated with trauma.²⁷ Thus, strengthening the corpus callosum and creating space for flexibility and mobilisation when experiencing both threatening and non-threatening stimuli.32,33

Over 30 years of research and professional experimentation with BLS have found that various types of cross-lateral physical movement have similar positive effects as using eye movements during EMDR. While some research promotes therapistcontrolled eye movements as more effective for information processing and memory reconsolidation, other forms of alternating physical stimulation are frequently used in EMDR.34 Examples of alternative forms of BLS include the use of alternating stereo sounds and handheld electrical tactile stimulation, as well as rhythmic alternating physical movements such as feet tapping, tapping on the knees, movement of the arms and using recorded visual light streams to regulate one's own eye movements manually. An action known as the 'butterfly hug' is a specific selfadministered BLS technique that involves crossed arms over a person's chest, with rhythmic alternating hand tapping on their shoulders or chest area.²⁷

The effects of BLS appear to be no different whether therapist-controlled or self-administered.^{31,35,25,27} BLS influences the integration of a complete fivesenses experience in EMDR. Although specific uses of self-administered alternating physical stimulation will be discussed later in this paper, the form of BLS used during an EMDR session and its mode of administration can vary based on clients' needs.^{27,36}

TF-EMDR: Landing the method

Various forms of fly-fishing are used throughout the world, each with its own cultural and historical roots. Forms that are more commonly practised in Western societies find roots in historical European culture. This form, known to many as 'rod and reel' fly-fishing, is a technological advancement on simpler fishing methods that used only rod, line and bait.37 Reelfree fly-fishing has experienced a boost in popularity over recent years. Tenkara fishing (tenkara-zuri in Japanese), a form of fly-fishing traditionally used in Japanese mountain streams, has developed an enthusiastic North American audience since the first regional brand took root there in 2009. Tenkara is similarly popular in other areas such as Europe, Australia and New Zealand. With a fixed line tied to a flexible rod, it is understood as an efficient way for anglers to cast across a diversity of ecosystems. As most rods retract to a size small enough to fit into a backpack, it is known as a portable, simplistic and barrier-free method of fly-fishing.37,38

While most therapeutic fly-fishing programs reviewed do not explicitly specify the type of flyfishing used, most appear to apply the rod and reel method common in European-settled areas. To directly integrate fly-fishing with an EBP, the author has chosen tenkara as a method due to the issues of simplicity and cost. Without a reel, the client is able to focus more on the motion of the cast. While writing this article, the author engaged in a personal review of North American branded ready-to-fish outfits for both rod and reel fly-fishing and tenkara. Tenkara outfits appear to be sold for as little as \$U\$25 with an average cost of \$U\$100-\$U\$300 depending on quality, while rod and reel outfits show averages of around \$U\$100-\$U\$900. Thus, simply choosing tenkara as a fly-fishing method appears to greatly reduce cost as a barrier to incorporating it with any therapeutic approach.

Seiyu-zuri: The TF-EMDR Protocol

Integrity is a core value and key personal trait that is held in common by modern military agencies. It is defined by Merriam-Webster and Cambridge Dictionaries as adherence to a code/protocol and describes integration. A synonym of this word, sincerity, is described in these same sources as a characteristic regarding genuineness or authenticity. EMDR and the practice of fly-fishing each promote growth in this area. Seiyu (pronounced as 'say-you'), a word in the Japanese language, can translate to 'having sincerity'. Due to the purpose of promoting genuine self-growth and integrating an established EBP protocol with therapeutic fly-fishing via tenkara-zuri, the author has chosen to also refer to the method of delivering TF-EMDR as Seiyu-zuri.

The following section provides a glimpse into the guiding philosophy of Seiyu-zuri and a description of how the EMDR Standard Protocol functions when used in this way. Additional techniques and aspects of the TF-EMDR protocol that are not mentioned here are available through consultation with the author.

Key characteristics

There are a few important traits of this model which are unique from the sport of fly-fishing. First, it is currently designed as a one-on-one activity. The objective is not to catch fish but to expect it as a possibility while attention is placed on casting and focusing. Second, when a fish is caught or landed, it is a welcome engagement that can be a powerful experience during trauma processing. The therapist will assist the client in accepting the fish carefully and with compassion, releasing it back to the wild. Self-administered forms of BLS (such as the butterfly hug technique or another form of alternating physical movement) is then used to incorporate the experience into processing before going back to the water. Once back to the water, the therapist leads the client's focus to their original target to reassess distress and continue processing using the form of BLS, which is described in the next section. As a final key point, celebratory pictures of caught fish are prohibited in this method. Doing this supports the idea that it's not about the fish-maintaining a therapeutic frame on the activity, focused on resolution of the traumatic material, without diverting attention away from the activated memory network.

Bilateral stimulation

As with any application of EMDR, BLS techniques are essential core functions for integrating adaptive memory networks with wounded ones. In this model, self-administered stimulation is executed by the physical movement of the rod while the client visually focuses on the presentation of the fly on the water. As this is done, a connection to their own five senses is influenced by the experience of being in nature. In the 2017 publication, *Tenkara - the book*:

The complete guide to tenkara, Daniel Galhardo describes two specific presentations used in this form as BLS techniques.38 The 'pause-and-drift' presentation causes the fly to appear alive as it drifts with the current. Keeping their eye on the location of the fly, the client rotates their wrist slightly, so that tip of the tenkara rod moves in a saccadic stop-start motion. Thus, pulling it through the water in short, controlled rhythmic bursts. The second presentation, referred to as 'pulling', moves the fly against the current. Pulling involves longer movements of the rod upstream, allowing for the client to experience slower and longer eye movements if those are more comfortable. Clients may also allow the fly to drift naturally downstream, moving their rod in the opposite direction as they prepare to cast again. When engaging in these methods of BLS, the client casts with their dominant arm while the therapist is positioned opposite to their casting direction, slightly out of view. This is a modification of an EMDR stance known as 'Ships Passing in the Night'.³⁹ Out of sight, the therapist risks less interference with the client's processing while being able to monitor body language and check in between sets of casting as necessary.

Phases 1-2: Evaluation & Preparation

This method is a creative utilisation of the Standard Protocol for EMDR, rather than a modification of it. Evaluation should take place in a private environment, such as an office, and the Preparation Phase should begin there. Preparation allows the therapist to ensure that EMDR is appropriate for the client's presenting issue and ascertain the person's willingness and ability to use BLS to maintain a dual focus of awareness of internal and external experiences. Self-administration using a 'wand' will allow a person essentially the same method of 'casting and following', which they will experience on the water. The therapist will guide the client to simultaneously move their eyes along with the wand's motion, preparing them for an easy transition to the act of moving the rod while watching the fly. Eventually, the wand becomes the rod, and alternative forms of alternating physical stimulation can be suggested at the therapist's discretion.

When it is determined that a person can focus on alternating eye movements while physically engaged in another activity, and if there are no safety concerns regarding conducting psychotherapy in an outdoor setting, the Preparation Phase can be continued in an accessible barrier-free outdoor environment, such as a field. They are introduced to their tenkara fishing gear, provided a brief lesson on casting, and shown how to softly follow the fly's to-and-fro movements with their eyes. This experience is meant to be a brief encounter that allows the client to practice casting and gain familiarity with the equipment prior to visiting a river or any other body of water. Phase 2, Preparation, begins away from a body of water, yet it is to be completed nearby prior to entering Phase 3 of EMDR. By doing so, the client can establish a direct felt connection to the environment where adaptive processing will happen. Additional preparation may be useful during this time, with the use of natural markers as grounding, or meaningful metaphors for desired personal qualities.^{36,40}

Phases 3-4: Assessment & Desensitisation

Once a client shows comfort with casting and performing self-administered BLS on the water, the therapist guides them through an assessment of the most charged areas in need of desensitisation or calming. The therapist prompts the client to notice the emotions, physical sensations, beliefs and ratings of distress and validity related to the image that best describes the worst aspect of their target. Phases 3 and 4 of EMDR transition as the therapist moves into the Ships Passing in the Night position. The therapist directs their client to feel the emotions and sensations elicited, connecting to their surrounding environment, and without filtering or passing judgement for what arises to 'cast with that'. Thus, initiating processing of the traumatic memory.

As they cast, the client can choose either the 'pause-and-drift' or 'pulling' movements, or let the fly naturally drift downstream-whichever is most comfortable. If focusing on the cast is difficult, the therapist can prompt the client to use an alternative form of BLS (either administered by the therapist or self-administered by the client), such as therapistcontrolled eye movements, leg tapping or the butterfly hug technique, until they express comfort in casting again. The therapist may also recommend any alternating movement at their discretion based on assumed effects of the speed or mode of BLS on the client. As the fly moves up or downstream, one complete set of casting concludes one set of BLS. The therapist checks with the client, once finishing the first set, for any new information or signs that the disturbance is changing and again directs them to 'cast with that'. If two sets have been completed, with the client expressing progressive insight or signs of relief, the therapist may allow them to cast until they feel the need to pause.

If the client appears to be experiencing distress, no change in insight, or if they have wandered into other thoughts, the therapist can intervene using a 'cognitive interweave' or redirect their mental focus back to the target image for any new information. A cognitive interweave is an EMDR technique in which a therapist provides a person-centred, open-ended question when a client's thought process appears to be looping, their subjective distress appears to be increasing, or if they are stuck in any other way. Interweaves can also be somatic. They are used strategically if the therapist perceives that it may help the mental processing move towards a natural, adaptive resolution.^{26,41,42} Using these techniques, the trained therapist will find ease in conducting EMDR therapy as usual. If a session ends and distress still exists, incomplete processing can be held with a 'container exercise' using metaphors unrelated to present surroundings so that nature is just associated with healing. The container exercise is another specific EMDR technique,²⁶ used to help close sessions when processing has not finished. This exercise provides clients with a way to mentally detach from traumatic material between therapy sessions if thinking about it causes pain, urges for experiential avoidance or does not serve them in another way.

Phases 5–8: Installation, Body scan, Completion and Reevaluation

When distress around the client's chosen target is alleviated, a positive cognition or self-belief is installed using appropriate BLS. Standing comfortably in or near the river, the client then pays attention to any sensations arising in their body as signs for potential processing. If there are no distressing physical sensations to revisit, the session is closed with a round of slow, deep breathing followed by psycho-education around wellness planning and the potential for continued processing. The final phase of EMDR takes place during the next treatment day, and a return to the river takes place if continued processing or resourcing appears necessary.

Discussion

Due to the potential low cost associated with facilitating TF-EMDR, ease of integration can also be assumed. However, as EMDR practice requires graduate-level mental health professionals to undergo specific rigorous training by an approved training institute, mental health treatment programs will experience costs related to hiring or training an EMDR Therapist if there is no trained person on staff. If program leadership determines that it is more affordable to hire a trained EMDR Therapist, EMDR associations maintain searchable databases of professionals who have completed the minimum of an approved basic training in EMDR. Program leadership should weigh the costs related to training versus hiring to determine which option is most cost-effective.

Literature is limited regarding the general integration of nature in the treatment of combatrelated PTSD. Current research into therapeutic fly-fishing avoids exploring full integration with an EBP and only explores programs facilitated by recreation therapists or others who are not qualified as mental health professionals. As it is becoming a widely practised adjunctive modality in treatment among individuals with combat-related PTSD, flyfishing invites the natural integration of evidencebased psychotherapies into an ecological frame. It offers opportunities for increased consistency, order and desirable outcomes in the practice of caring for military and veterans' mental health. Due to the established research on both EMDR and preliminary explorations of basic therapeutic fly-fishing with combat veterans, it is assumed that TF-EMDR can be easily utilised across the spectrum of outpatient mental health treatment settings and provide an efficacious way to reach military-affiliated individuals who are culturally more inclined to avoid treatment as usual.4

Adjustments should be considered when working with clients with physical limitations or mobility issues impacting engagement. The nonprofit organisation Project Healing Waters serves as one example of an organisation that has found ways to accommodate fly-fishing for combat veterans with such needs.9 The broader culture can also be considered to accommodate family members impacted by combatrelated PTSD or other forms of trauma. Because current TF-EMDR utilises the Standard Protocol of EMDR, it can be offered to address single incident trauma and historical trauma. As a result, research and therapeutic implementation of TF-EMDR should be considered for non-combat wounds, as mental injuries from military service can be exacerbated by previous traumatic experiences in a person's history.43

Qualitative research into this model is highly recommended, and examinations of other means to meld together NBI with evidence-based treatment are also encouraged. Although the practice of EMDR while fly-fishing offers a way to utilise fivesenses experiencing and the somatic element of EMDR therapy, practitioners and researchers should consider additional practices as well. Future directions for nature-based EMDR could include other activities, such as hiking or climbing, which involve bilateral movement and can be done safely while following the EMDR Standard Protocol. The author hopes that readers will consider additional ways to adapt existing evidence-based treatments for use in nature. The needs and treatment interests of any population are as diverse as the environment within and surrounding the water. Therefore, we should also assume that EMDR is not the only way to deliver evidence-based psychotherapy from an ecological perspective. EMDR is one of several methods useful for treating combat-related PTSD.^{12,13,44} For example, in addition to EMDR, the World Health Organization lists cognitive behavioural therapy (CBT) as another valid and recommended EBP for traumatic stress. Research into the effectiveness of TF-EMDR, or any other nature-based integration of EMDR, should be conducted against a nature-based integration of CBT and treatment as usual. Research and program development can also explore implementation outside of the context presented in this article. With the assumption that posttraumatic growth is not limited to those who experience war, adaptations are possible across all age groups and with civilians suffering from other types of psychological trauma.

Finally, how should TF-EMDR and other nature-based EBPs be implemented? Is personal willingness a key factor for treatment success, or does the evidence behind EMDR mean that we can rely on the Standard Protocol across implementations? Existing evidence sets the direction. Though, personal willingness and military culture may determine more regarding overall engagement and treatment outcomes. Military health agencies, veteran administrations, and other such organisations can address this with a top-down approach that deviates from messaging as usual and helps to distance mental health care from beliefs related to negative consequences.4,5 Future research should incorporate perceptions of stigma within these treatments, as doing so can help target ongoing implementation and service delivery while avoiding pitfalls wherever they may be. It can also explore when a referral to TF-EMDR is most useful and investigate its usefulness as employed through intensive group treatment programs versus individual psychotherapy. Finally, the study of TF-EMDR utilisation should be considered within law enforcement, fire service, emergency response, corrections and other unique, high stress uniformed cultures.

Conclusion

The author believes that incorporating fly-fishing with EMDR offers an appealing, engaging and tolerable approach to trauma recovery that is refreshing and relevant to the needs of active and veteran military members. Engaging with psychotherapy and fivesenses experiencing differently may also increase psychological flexibility, alleviate distress, increasing a person's creativity and capacity to handle new stressors as they arise. As there seem to be a number of nature-based veteran- and active military-focused PTSD treatment offerings in existence, combined NBI and EBP approaches can add value to the healthcare system while making certain that the work is happening in the safest, most ethical and efficacious ways possible. TF-EMDR is just one proposed method of doing so. By following the Standard EMDR Protocol, the author believes that trained EMDR therapists will have little difficulty learning Seiyu-zuri in its full form and incorporating it into their practices.

The author plans to engage in research exploring the benefits of Therapeutic Fly-Fishing with EMDR compared to other evidence-based psychotherapies for PTSD. Qualitative research can also focus on the type of combat trauma experienced. It can be used as a means to explore the use of TF-EMDR as described by the author, in addition to commonly used modified EMDR protocols for addressing complex/relational trauma, urge reduction, critical incident stress, acute stress and in group settings.

Conflict Of Interest Statement

Anthony Parmenter has a Master of Arts in Clinical Mental Health Counseling from Antioch University New England, is a licensed mental health professional in the United States and is acknowledged by the EMDR International Association (EMDRIA) as an EMDR Certified Therapist and Consultant-intraining. As an OEF veteran of the United States Air Force, the author works in various capacities supporting military veterans and first responders. When this article was submitted, he was employed full-time by Invest EAP - Centers for Wellbeing, the Vermont state government's Employee Assistance Program. He holds consultation roles with state governments in the United States, trauma recovery tech startups, and provides professional consultation in trauma therapy and EMDR in his associations with EMDRIA and the Parnell Institute for EMDR. The author holds an academic appointment with Bellevue University and operates a private EMDR psychotherapy, coaching and consultation practice that facilitated the development of the ideas presented in this paper. He actively offers TF-EMDR as therapy and offers advanced training to psychotherapists. No other form of financial compensation or support was involved. The terms 'Therapeutic Fly-Fishing with EMDR (TF-EMDR)' and 'The Seiyu-zuri Method' are pending trademarks with USPTO and cannot be used commercially without explicit permission from the author.

Acknowledgements

The author expresses appreciation to the EMDR International Association (EMDRIA) and the Parnell Institute for EMDR, as well as consultants Kit Dowling, Patty Monteleone, Aaron Koba, Kambria Evans and colleague Renee Seff for their guidance and professional support during the development of TF-EMDR. Invest EAP – Centers for Wellbeing encouraged the author's development as an EMDR Therapist, Bellevue University offered library resources which aided research, and Daniel Galhardo provided expert insight into tenkara fishing methods. Finally, the author expresses appreciation to fly-fishing guide Ryan Heck for the introduction of therapeutic fly-fishing while employed together at the Brattleboro Retreat's Uniformed Services Program in Vermont, USA.

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Chemical Veterans' use of Complementary and Alternative Medicines and Quality of Life: a Survey in Southeast Iran

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Abstract

Background: Chemical veterans are commonly faced with physical, psychological, occupational and social problems. These veterans use relatively high levels of complementary and alternative medicine.

Purpose: The current study aimed to investigate the relationship between complementary and alternative medicines (CAM) usage and quality of life of chemical warfare veterans.

Material and methods: Three hundred and sixty chemical veterans were assessed using a cross-sectional correlational study design. The study was conducted in infirmaries affiliated to the Kerman Foundation of Martyrs and Veterans Affairs, in southeast Iran, from 20 April to 20 July 2019. A questionnaire developed by researchers on the use of CAM, and SF-36 to assess the quality of life were used for data collection.

Results: At least one type of CAM was used by 90% of the samples in the past year. The most common were prayer and herbal medicines. The mean quality of life in chemical veterans was 47.17 ± 18.36 . The quality of life score was not significantly different between CAM and non-CAM users (P > 0.05).

Conclusion: Chemical veterans have a poor quality of life. Although they use a variety of CAM methods along with other treatments, they do not have a significant effect on their quality of life.

Keywords: complementary and alternative medicines (CAM); quality of life; veteran; chemical substance

Introduction

Approximately 50 000 Iranian soldiers and civilians were exposed to sulfur mustard during the Iraq-Iran war (1980–1988).¹ A study on chemical warfare veterans during the Iran-Iraq War shows that most veterans have additional problems to pulmonary disease, the most common of which are ocular, dermal and neurological in nature.² Many veterans have symptoms such as fatigue, pain, cognitive and memory problems, itchy skin, gastroenteritis and respiratory problems, the most common of which is fatigue. Furthermore, posttraumatic stress disorders (PTSD) and other psychiatric conditions are also the general results of warfare in veterans'.³⁻⁶ In addition, exposure to sulfur mustard in combat may have long-lasting fertility effects on soldiers and their spouses.1

In addition to the use of chemical drugs, veterans use complementary and alternative medicine (CAM) to reduce their symptoms and improve their quality of life.7,8 According to the definition of the World Health Organization in 2016, complementary and alternative medicine is a set of knowledge, skills and practices based on theories, beliefs and experiences of different cultures used to maintain health and prevent, diagnose, improve, and treat physical and mental illnesses.9-11 Study results have shown that more than half of veterans reported having used CAM practice. Many also reported interest in trying at least one practice or learning more about at least one practice either on their own or with an instructor.9 In another study, most participants were receptive to trying at least one CAM technique if suggested by their counsellor.¹¹ According to the 2012 reports on Iraqi and Afghan troops in the US, about 30% had PTSD, which was reduced after using one of the CAM methods.12

Concerning extensive and varied studies on the effects of CAM on disease control and recovery, there are many people in the world who use a variety of CAM practices to cure disease and control physical and mental symptoms. Since the effects of war and the resulting damage have led to disruption in the current lives of veterans, this study aimed to investigate the relationship between the use of CAM and the quality of life of chemical warfare veterans in southeast Iran.

Materials and methods

Study design and setting

The present study had a cross-sectional and correlational design. Subjects in this study were male chemical veterans with mean ages of 46–78 years in infirmaries affiliated to the Kerman Foundation of Martyrs and Veterans Affairs in southeast Iran.

Sampling and sample size

Inclusion criteria were male veterans exposed to 5–75% of the chemical warfare agents (according to their medical records), with a good physical condition, the ability to speak and hear, and complete consciousness. The exclusion criterion was incomplete questionnaires. The convenience method was used for sampling.

Morgan's table was used to select the sample size due to the limited population. The number of Kermani veterans was 19 000, of whom 4200 were chemical warfare veterans. According to Morgan's table, 351 samples were needed; however, 400 subjects were selected because of the dropout probability. Forty questionnaires were excluded from the study due to very large amounts of missing data. The effective response rate was 90%.

Measures

Data were collected using a three-part questionnaire. The first part included items about sociodemographic information, such as age, marital status, living place, education level, occupation, insurance, income, opium addiction, smoking and alcohol addiction, months serving in war and mean months passed from exposure to chemical agents.

The second part was a questionnaire on chemical veterans' use of CAM during the recent year. The questionnaire was a minor modified version of the previous questionnaire used in similar studies.^{13–17} The questionnaire included nine items on the use of some types of CAM. It was scored using a yes/no answer. Further, if their answer had been yes, they would have answered the frequency of using CAM according to a six-point Likert scale (some times a year = 1, to daily = 6). The reasons for using each kind of CAM were measured using three items of

reducing physical symptoms, reducing stress and anxiety, and others. There was also a yes/no question about consulting a physician for the use of CAM. Ten faculty members of the Razi School of Nursing and Midwifery assessed the content validity index of the questionnaire, which was 0.96. The internal consistency of the questionnaire was checked in a sample of 20 chemical veterans. The Cronbach's alpha coefficient was 0.70. It is noteworthy that this pilot sample was included in the final analysis.

The third part of the questionnaire included different aspects of health related to quality of life. A 36-Item Short Form Survey (SF-36) was used to assess the quality of life of chemical veterans. The 36-Item Short Form Survey (SF-36) designed by Ware & Sherbourne assesses the quality of life and has 36 items and eight subscales. The eight subscales of this questionnaire are physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional wellbeing, social functioning, pain and general health. In addition, by merging the subscales, two subscales of physical and mental health are created. In this questionnaire, a low score indicates poor quality of life, and a high score indicates high quality of life (scores on each subscale are between 0 and 100). The validity and reliability of this questionnaire have been confirmed in the Iranian population.¹⁸ The questionnaire has also been used in other veteran populations.¹⁹

Data collection and analysis

The researchers started the sampling after obtaining the code of ethics from the ethics committee. After obtaining written consent from the participants, the self-administered questionnaire was completed when the clients were in good physical condition. In the case of illiteracy, questionnaires were completed by interview during participants attendance to infirmaries. The data were collected over three months (from 20 April to 20 July 2019).

SPSS 25 was used for data analysis. Frequency, mean, percentage and standard deviation were used to describe the sample characteristics, the use of CAM and the quality of life. A chi-squared test was used to check the association between CAM use (yes/ no) and the qualitative variables. Independent t-test and Mann-Whitney U test was used to compare the quality of life between CAM users and non-users. The significance level was considered to be 0.05.

Ethics approval and consent to participate

The ethics committee of Kerman University of Medical Sciences approved the study protocol (IR. KMU.REC.1397.408). The authorities of the study

setting and all study participants were provided with a detailed explanation of the research method. After obtaining written informed consent, the participants were assured about voluntary participation in the research, their withdrawal and the confidentiality of the information and anonymity in the questionnaire.

Results

The mean age of the study participants was 57.50 \pm 5.49 years. The mean months of serving in war were 20.14 \pm 13.93 and the mean months passed from exposure to chemical substances were 402.90 \pm 19.83. The majority of the participants were married (90%) and residents of Kerman (73.3%). Only 10.6% of the samples were uneducated. Only 16.1% of the samples were unemployed. The majority of the samples had insurance. The income level of nearly half of the samples was <2 million tomans a month. Among the participants, 15.3% were addicted to opium, 40% were smokers, and 4.2% were addicted to alcohol (Table 1).

Overall, 90% of the samples (n = 324) used at least one type of CAM in the past year. As the study population live in a religious country, without considering prayer, 81.9% of the samples (n = 295) used at least one type of CAM in the past year. In addition, without considering the prayer, 58.9% of the samples (n = 212) used only one type of CAM, 17.8% (n = 64) used two types of CAM, 3.1% (n = 11) used three, and 2.3% used four to seven types of CAM during the last year. The samples primarily used medicinal herbs (78.6%), and the least used CAM method was homeopathy (1.1%) (Table 2). In addition, 54% (n = 194) of the samples used medicinal herbs at least once a week, 45.3% of the samples (n = 163) used prayer at least once a week.

Table 2 shows participants' reasons for using each type of CAM and if they have consulted with a physician to use CAM.

There were no differences between CAM and non-CAM users in qualitative demographic characteristics except for job (Table 1). In addition, CAM users were significantly older than non-CAM users (t = -2.17, P = 0.03).

The mean quality of life of the chemical veterans was 47.17. Among the QOL dimensions, the highest mean was allocated to physical functioning and the lowest mean to role limitations due to physical health (Table 3).

The results showed no significant difference between CAM and non-CAM users in the quality of life score and its dimensions (P > 0.05) (Table 4).

Discussion

The present study results showed that, in general, 90% of the samples used at least one type of CAM in the past year. Regardless of the prayer, 81.9% of the samples used at least one type of CAM in the past year. In addition to pharmaceutical drugs, veterans use CAM to reduce their symptoms and improve their quality of life. CAM is considered an alternative method among veterans because of their increasing healthcare problems, and using CAM as an additional therapy can be helpful.^{8, 20, 21} The reason and motivation for using CAM among military personnel may be even greater; for example, it can be used as part of a fitness regimen,²² for stress reduction, or relief of the symptoms of a particular psychological problem.^{11, 23} Since no study addressed CAM in chemical warfare veterans, similar studies on other veterans were mentioned. The result of a study on veterans in the USA showed that among the 278 participants diagnosed with depression, generalised anxiety disorders, and/or PTSD, 239 reported willingness to participate in at least one CAM technique. Veterans were willing to engage in yoga, acupuncture, and/or massage and have thought about exploring therapies such as acupressure, and/or aromatherapy to ease physical discomfort.¹¹ The mentioned study investigated the willingness to participate in at least one CAM technique, while we assessed the use of at least one CAM technique among chemical warfare veterans. A review study showed that among active duty and reserve military, CAM use ranged between 37% and 46%.24 However, CAM use prevalence in Davis et al. is less than in our study.²⁴ Different study populations, questionnaires and participants' medical conditions may be the reasons for the differences.

In the present study, the most commonly used CAM method was medicinal herbs (78.6%), and homeopathy was rarely used (1.1%). People most frequently use medicinal herbs compared with other CAM methods because they are readily available, and they are more familiar, especially native ones.²⁵

So far, few studies have examined the quality of life of survivors of the Iraq–Iran War, especially chemical warfare veterans.²⁶ In the present study, the mean quality of life of the chemical warfare veterans was 47.17 ± 18.36 , showing their poor quality of life in Kerman province. Jafari et al. studied the quality of life of chemical warfare veterans with pulmonary diseases and showed that in all aspects, the mean score of quality of life of veterans with severe pulmonary diseases was lower than that of the general population of Iran.²⁶ Gholipour et al. studied the type of injury and quality of life of veterans in

Variable		Frequency (%)	CAM user (without considering prayer)		Chi-squared test	P- value
			Yes (n/%)	No (n/%)		
Marital status	Single	8 (2.2)	6 (2.0)	2 (3.1)	2.64	0.27
	Married	324 (90.0)	263 (89.2)	61 (93.8)		
	Other	28 (7.8)	26 (8.8)	2 (3.1)		
Living place	Kerman	264 (73.3)	213 (72.2)	51 (78.5)	1.16	0.56
	Villages around Kerman	51 (14.2)	43 (14.6)	8 (12.3)		
	Other cities of Kerman	45 (12.5)	39 (13.2)	6 (9.2)		
Education level	Illiterate	38 (10.6)	34 (11.5)	4 (6.3)	8.28	0.22
	Primary school	25 (7)	22 (7.5)	3 (4.7)		
	Middle school	50 (13.9)	42 (14.2)	8 (12.5)		
	High school	40 (11.1)	32 (10.8)	8 (12.5)		
	Diploma	128 (35.7)	104 (35.3)	24 (37.5)		
	Bachelor	64 (17.8)	53 (18.0)	11 (17.2)		
	Above Bachelor	14 (3.9)	8 (2.7)	6 (9.4)		
Occupation	Employed	67 (15.8)	40 (13.6)	17 (26.2)	11.54	0.009
	Self-employed	108 (30.0)	98 (33.2)	10 (15.4)		
	Retired	137 (38.1)	109 (36.9)	28 (43.0)		
	Unemployed	58 (16.1)	48 (16.3)	10 (15.4)		
Insurance	Yes	319 (88.9)	260 (88.4)	59 (90.8)	0.29	0.67
	No	40 (11.1)	34 (11.6)	6 (9.2)		
Income	<1 million	49 (13.6)	39 (13.2)	10 (15.4)	1.42	0.49
(in tomans)	1–2 million	134 (37.2)	114 (38.6)	20 (30.8)		
	>2 million	177 (49.2)	142 (48.2)	35 (53.8)		
Opium addiction	Yes	55 (15.3)	46 (15.6)	9 (13.8)	0.13	0.85
	No	305 (84.7)	249 (84.4)	56 (86.2)		
Smoking	Yes	144 (40.0)	123 (41.7)	21 (32.3)	1.96	0.21
	No	216 (60.0)	172 (58.3)	44 (67.7)		
Alcohol addiction	Yes	15 (4.2)	13 (4.4)	2 (3.1)	0.24	0.75
	No	344 (95.8)	281 (95.6)	63 (96.9)		

Table 1. Demographic characteristics of the participants and their differences between CAM and non-CAM users
Variable	Frequency of	Confidence	Reason				Consulted
	the users (%)	Reducing Reducing physical stress and symptoms anxiety (n (n/%)		Reducing stress and anxiety (n/%)	Both* (n/%)	Others (n/%)	(n/%)
Medicinal herbs	283 (78.6)	74.3-82.6	71 (27.3)	110 (42.3)	75 (28.8)	4 (1.6)	82 (31.5)
Prayer	238 (66.1)	61.1-70.8	6 (3.3)	171 (93.4)	4 (2.2)	2 (1.1)	2 (1.1)
Massage	48 (13.3)	10.0-16.9	25 (58.1)	11 (25.6)	5 (11.6)	2 (4.7)	27 (62.8)
Wet cupping	31 (9.2)	6.4-12.2	23 (74.2)	6 (19.4)	-	2 (6.5)	19 (61.3)
Dry cupping	18 (5.0)	2.8-7.5	13 (72.2)	3 (16.7)	2 (11.1)	-	9 (50.0)
Acupuncture	12 (3.3)	1.7-5.3	9 (75)	3 (25)	-	-	8 (66.7)
Acupressure	9 (2.5)	0.8-4.2	3 (33.3)	4 (44.4)	-	2 (22.2)	5 (55.6)
Meditation	6 (1.7)	0.6-3.1	1 (16.7)	2 (33.3)	3 (50)	-	2 (33.3)
Homeopathy	4 (1.1)	0.3-2.5	1 (25)	2 (50)	-	1 (25)	4 (100)

Table 2. Chemical veterans' use of CAM and their reasons

* Reducing physical symptoms and stress and anxiety

Table 3. Th	e quality o	of life and i	its dimensions	in haemodia	lysis patients
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Quality of life	Mean	SD
Physical functioning	52.70	24.30
Role limitations due to physical health	38.89	37.07
Role limitations due to emotional problems	47.79	39.11
Energy/fatigue	45.47	18.76
Emotional well being	50.30	18.44
Social functioning	49.83	20.62
Pain	47.92	22.73
General health	40.94	20.35
Total	47.17	18.36

Kermanshah province and concluded that 53% had a poor quality of life.²⁷ In addition, the quality of life of chemical warfare veterans was lower than that of other war veterans (with amputated, special, combined, neurological and psychiatric conditions).27 Ghanei et al. (2017) examined the quality of life of the Iranian veterans in a systematic review and analysed 19 selected articles with a sample size of 2575 people. They showed that the lowest mean score of quality of life was related to chemical warfare veterans, and the highest mean quality of life was related to the veterans with amputated hands/legs.28 The above studies are consistent with the results of the present study. Concerning the chronic pulmonary complications and diseases that occur following chemical damage, poor quality of life is expected, especially in the subscale of physical health.²⁶ In the present study, the role limitations due to physical health had the lowest score among the measured variables. In other words, it has the highest share in the low score of the overall quality of life of chemical warfare veterans. Khoshnevis also reported the negative effects of physical function and role limitations due to physical health on the quality of life of chemical warfare veterans,²⁹ supporting the present study.

The results of the present study showed no significant difference between CAM and non-CAM users in quality of life. In addition, the scores of the dimensions of quality of life were not significantly different between CAM and non-CAM users.

Table 4.	Relationship	between	chemical	veterans'	use of	CAM	and	quality	of life	e
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Variable		Quality of life		Statistical test	P value
		Mean	SD		
Medicinal herbs	Yes	46.90	17.76	t = 0.28	0.78
	No	47.57	20.75		
Prayer	Yes	46.65	17.90	t = 0.58	0.56
	No	47.83	19.42		
Massage	Yes	46.66	16.53	t = 0.16	0.87
	No	47.11	18.71		
Wet cupping	Yes	46.91	16.92	t = 0.04	0.96
	No	47.06	18.58		
Dry cupping	Yes	41.93	13.94	Z = -1.16	0.24
	No	47.32	18.59		
Acupuncture	Yes	46.11	14.92	t = 0.18	0.86
	No	47.08	18.54		
Acupressure	Yes	46.10	13.01	t = 0.16	0.88
	No	47.07	18.54		
Meditation	Yes	47.13	18.35	0.65	0.52
	No	42.20	23.32		
Homeopathy	Yes	47.99	6.57	t = -1.02	0.92
	No	47.04	18.51		
CAM users	Yes	46.72	17.99	t = 1.01	0.31
	No	49.99	21.92		
CAM users (without considering prayer)	Yes	47.11	17.69	Z = -0.33	0.75
	No	46.76	21.55		

t = Independent sample t-test, Z = Mann-Whitney test

Mahmoudian et al. showed that although adding homeopathy to the treatment of veterans with chronic depression improved their quality of life, no statistically significant difference was found between those who received homeopathy and those who did not receive homeopathy.30 However, a 2012 report on Iraqi and Afghan troops in the USA found that approximately 30% had PTSD, which decreased after using one of the CAM methods. In general, the results suggest that CAM intervention may benefit family members as well as veterans with PTSD symptoms.¹². Another study by Hull et al. showed veterans who participated in complementary and integrative health services, reported significant improvements in their most salient symptoms of concern (primarily pain or mental health symptoms), physical quality of

life, wellbeing and the ability to participate in valued activities at follow-up assessments.⁷ The reasons for different results can be due to a long time since exposure to chemicals and disease, and this duration of the disease can impair quality of life. According to a review study, little is known about the reasons for using CAM and the conditions for which it is used.²⁴ Therefore, future surveys of CAM should include military status variables.

Concerning the high number of veterans in Iran, one of the limitations of this project is the low number of samples that might have affected the generalisation of results. Due to the involvement of the veteran's families, it is suggested that the quality of life of veteran's families be examined in future studies.

Conclusion

The results of this study showed that the quality of life of the chemical veterans was lower than the average. Although the veterans used a variety of CAM methods along with other treatments, they did not have a significant effect on their quality of life. According to these results, further studies and efforts are required to improve the quality of life of chemical warfare veterans.

Abbreviations

CAM: Complementary and Alternative Medicines

PTSD: Posttraumatic stress disorders

QOL: Quality of Life

SF-36: Short Form Survey-36

Availability of data and material

The datasets used for the current study are available from the corresponding author upon request.

Competing interests

None to be declared.

Authors' contributions

MD: Conceptualization, Supervision, Methodology, Data analysis, Writing- Reviewing and Editing.

HRR, FM, SMHM, AK, and FRSN: Conceptualization, Data curation, Software, Writing- Original draft preparation.

Acknowledgements

We would thank all participants for their cooperation. The approved research project code was 97000526.

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Treatment at Point of Injury – Forward movement of surgical assets to address noncompressible truncal haemorrhage

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Abstract

Contemporary battlefield trauma surgery in the Middle East Region has been characterised by aeromedical evacuation by rotatory wing (RWAME) with relative impunity. Therefore, future health planning needs to consider an environment whereby RWAME movement may be degraded or denied by a near-peer, peer or superior threat. To that end, an exploration of alternative approaches to surgical management of injured personnel is pertinent.

Life-saving surgical intervention may be delivered by deploying mobile surgical assets forward rather than relying on evacuation of casualty rearward. Shortly after the arrival of surgical resources to the point of injury, temporising damage control procedures may begin, removing the delay associated with casualty preparation, package and transfer. Essentially, the concept is to significantly augment Role 1 activities for a time-limited period to increase the evacuation window allowing patients to survive that would otherwise die on the battlefield if rapid evacuation capability was degraded or denied.

An exploration of the surgical procedures, anaesthetic considerations and transport logistics associated with these interventions is presented in this paper.

Limitations on the concept include tactical training requirement of forward deployed medical staff, definition and description of surgical intervention offered and prerequisite civilian skillset, attendant load list, and considerations of anaesthetic delivery and casualty hold elements.

Background

Contemporary treatment of traumatic military injuries in the Middle East Region (MER) has been facilitated with rapid evacuation of injured personnel to progressively higher levels of care. This has principally been achieved using dedicated rotary wing aeromedical evacuation (RWAME) platforms. Coalition air superiority has been assured throughout these most recent conflicts, and so RWAME has operated in a largely permissive air environment.

Future health planning needs to consider an environment whereby RWAME movement may be degraded or denied by a near-peer, peer or superior threat. To that end, an exploration of alternative approaches to the surgical management of injured personnel is pertinent. The clinical outcomes that became a defining feature of recent operations in the MER were reliant on a mature medical system with a large and firm infrastructure footprint. A fully established medical system linked point of injury with higher echelons of care through to repatriation. These are not likely to be present in any of the following scenarios: the early phases of a heavily contested future military conflict; a conflict involving special warfare troops operating largely unsupported with a partner force; the early phases of a non-contested regional disaster mission; or in the initial phase of a peacekeeping operation.

In any operational scenario where movement is restricted, or in an environment with underdeveloped medical infrastructure, timely and optimal treatment of the injured soldier on the ground at or near the point of injury becomes an essential precondition for success.

An initial approach is to ensure on-scene integral medical technicians are capable (both in skillset and equipment) of performing life-saving procedural interventions to extend survivability on the battlefield prior to transfer to higher levels of care. Ultimately, evacuation is still required for the patient to reach surgical care quickly. However, this necessitates either outbound and inbound personnel and platforms—whether dedicated or opportunistic.

Alternatively, life-saving surgical treatment may be delivered with greater effect by deploying mobile surgical assets further forward. Shortly after the arrival of surgical resources to the point of injury, temporising damage control, life-saving surgical intervention may begin. This removes the inevitable delay associated with casualty preparation, package and transfer of an injured patient at both ends of the evacuation continuum.

Following temporising on-scene surgical intervention, evacuation to higher level echelons of care providing definitive interventional management remains essential, but death from exsanguination secondary to otherwise non-compressible truncal haemorrhage, in particular, may be avoided and more timely control of gross intraabdominal contamination may be achieved. This is relevant given that approximately 90% of combat-related deaths occur prior to the casualty reaching a medical treatment facility.¹

In this discussion paper, we consider the spectrum of forward surgical and anaesthesia intervention necessary for improved survivability of the battle casualty, and associated transport and logistics.

The obvious liability of this paradigm is risk-both to highly specialised (and difficult to replace) medical assets and to the combat medical system more broadly if these assets are taken from larger facilities. Tactical training of forward surgical personnel is time consuming to teach, degradable and mastery is not easily achieved. However, a minimum standard of tactical proficiency is necessary and must be maintained by all far-forward staff. Some level of integrated force protection will still be required as medical assets will always remain non-combatants. This is relevant given the increasing proportion of injuries sustained during special warfare operations with coalition or host nation partners. Inserted or integral surgical assets cannot be allowed to represent a significant tactical liability to the receiving unit, nor can they necessarily consume excessive tactical assets for security from the unit they are supporting.

Considerations of the makeup and readiness requirements of forward surgical teams align with the current Army Capability Establishment Review (CER) terms of reference relating specifically to producing a versatile workforce that offers agile response options. The adaptability of a lightweight, highly specialised team allows use in many contexts (both permissive and non-permissive). Additionally, refining the selection of members into these teams will provide training efficiency and generate capability by leveraging existing civilian expertise in advanced trauma care applied to the austere, highthreat environment-rather than expecting a pool of generalist clinicians to apply clinical skills they have not mastered in an unforgiving and low-resource setting.

A Role 2 Light Manoeuvre element currently exists in the Order of Battle (ORBAT) of the 2nd General Health Battalion (2GHB), and this cell is replicated as a Role 2 (Forward) (R2[F]) in the forthcoming proposed Health CER 2nd Health Battalion (2HB) ORBAT due for implementation in 2022. The organisational and structural makeup of this is not yet confirmed. However, the utility in far-forward intervention is not the intention of this element, but rather the R2(F) is expected to fulfil a role of interim surgical capability while a more formal Role 2 (+/-Enhanced) structure is established. Therefore, in the future health capability of Army, a provision for farforward surgical care is still lacking.

Historical considerations

Forward austere surgical teams have been used on the battlefield to provide surgery close to the point of injury since World War I. During the past two decades, there has been a resurgence in the use of forward surgical teams to provide resuscitative surgical care to soldiers who would otherwise have died prior to reaching a static Role 2 (or 3) health facility.

Initially, during the early stages of Operation ENDURING FREEDOM, surgical support to ground troops was provided by US Army Forward Surgical Teams (FST). Very early into the operation, these teams were split into two, ten-man surgical teams capable of performing initial resuscitation, emergency trauma surgery, limited critical care and low dependency holding.

These ten-man teams ultimately became known as Split Forward Resuscitative Surgical Teams (Split FRST). As forces pushed further away from Forward Operating Bases (FOBs), the demand for lighter and more mobile surgical teams developed. These teams needed to stay within a tactical leap of their supported forces but still be able to provide the same level of initial care of the ten-man Split FRST's.

Various acronyms emerged for these teams, including Special Operations Surgical Teams (SOST), Expeditionary Resuscitative Surgical Teams (ERST) and Golden Hour Offset Surgical Teams (GHOST). These teams consisted of between five to eight personnel and were designed to perform between one and three Damage Control Surgical (DCS) cases on casualties who were deemed too unstable to reach a fixed Role 2 facility collocated with a FST. Their equipment was light and scalable, able to be deployed in anything from large man packable kits with a total weight of 150 kg up to 4000 kg of medical stores for a more static operation.

Australia has utilised mobile tactical surgical teams in the past, notably with the Parachute Surgical Team (PST) that was raised in the 1990s to provide Role 2 resuscitation, surgery and holding for a Parachute Battalion Group (PBG) consisting of 1500 troops. The PST was on the same notice to move as the troops it supported and was staffed by a mixture of regular and reserve medical forces capable of parachuting themselves and their equipment to support a point of entry seizure.

The team exercised with the troops they would support on operations and hence developed Medical Standard Operating Procedures (MSOPs) designed to work within the constraints of a PBG. Given its high readiness, the PST was used for a number of short notice surgical deployments, including the military assistance mission to the Vanamo Tsunami in 1998, and in 1999 to Operation WARDEN where they provided the initial surgical support to peacemaking operations in East Timor.

Since that time, the forward surgical capability of the ADF has significantly degraded. There are now no integral, capable, forward deployable surgical teams with contemporary trauma or tactical expertise. ADF surgical teams deployed on operations since the early 2000s have been made up of medical personnel drawn from multiple different units (and in the case of reservists, with vastly different civilian practices) who may or may not have worked, trained or previously deployed together prior to the deployment. The actual civilian trauma experience of a significant proportion of reserve surgical specialists is unlikely to be equivalent to permanent work in a level 1 civilian trauma centre.

Surgical procedures on scene

Tactical combat casualty care (TCCC) elements of care under fire, tactical field care and casualty evacuation care have addressed the three main causes of preventable death on the battlefield (exsanguination from extremity haemorrhage primarily alleviated by the combat application tourniquet [CAT], tension pneumothorax and airway obstruction) and may be attended to by integral medics on scene, being within their current skillset (actually performed by all soldiers with initial training beginning at Kapooka). On the other hand, non-compressible truncal haemorrhage, which, by definition, is impossible to control with direct pressure, continues to account for almost half of otherwise potentially survivable deaths in recent MER conflicts.2 It is estimated from data held in the Joint Theatre Trauma System that as many as 25% of those who died in Iraq and Afghanistan 2001-2011 died of injuries that were potentially survivable if earlier access to surgical care had been achieved.3 The critical determinant of this potentiality is early access to surgical management. Rapid access of the injured to medical services remains a central tenet in trauma management.⁴

Thoraco-abdominal trauma

In terms of specific organ injury leading to noncompressible truncal haemorrhage, liver, spleen and small bowel mesentery account for most intraabdominal traumatic bleeding given their relative size, vascularity or predisposition to injury.⁵ Haemorrhage control for each of these organs in the first instance need not be overly complex nor time consuming. It has long been well established that complex resectional or restorative surgery is contraindicated in damage control surgery,⁶ and the life-saving manoeuvres associated with haemorrhage control and minimisation of gross intraabdominal contamination may be afforded with minimal equipment and time.

immediately Abdominal packing contains haemorrhage from many organs and is sufficient in the context of subsequent normalisation of physiology in a critical care environment to control up to twothirds of otherwise exsanguinating haemorrhage from liver trauma, for example, at least in the blunt context seen in civilian trauma surgery.⁷ Adjunctive procedures may be necessary for those suffering penetrating injury. Nevertheless, temporisation can buy time for extraction and allow survival in patients who would otherwise bleed to death on the battlefield. Similarly, extraperitoneal packing following pelvic fractures may increase the likelihood of survival to higher-level care where external fixation or advanced procedures may be required.

Splenectomy for blunt or penetrating injury in trauma is usually expediently carried out within minutes with a single firing of a surgical stapler and may be performed with minimal lighting and exposure by surgeons experienced in the technique. Suture ligation is a cheaper but technically more challenging endeavour requiring better exposure and visibility. It would not be the preferred option in a genuinely austere and forward environment with potential close hostile activity. This intervention was only required once in the 15 years of after-action reports analysed by DuBose et al. (2020), among 87 procedures performed by a US Surgical Resuscitation Team (SRT).⁸

Suture ligation of mesenteric small bowel bleeding may be more easily afforded when necessary given its more accessible location in the abdominal cavity, but similar to liver trauma simple packing may be sufficient to allow extraction to higher-level care and more definitive haemorrhage control. Control of enteric contamination with stapled closure of small bowel defects is equally expedient requiring only one surgical instrument with the added advantage of being lightweight, disposable, prepackaged sterile and relatively cheap—that again being the ubiquitous surgical stapler (Figure 1). In the same series referred to in the previous paragraph, intestinal resection was undertaken in 8% of cases, representing a midrange common emergency procedure performed by an SRT. If surgical staplers run low, enteric contamination can be controlled at the most basic level using umbilical tape to ligate injured bowel.



Figure 1: Disposable surgical stapler

In fact, abdominal packing, intestinal resection and splenectomy were the only abdominal procedures undertaken by a highly trained specialist SRT in the recent MER conflict validating the concept of abbreviated and simple-manoeuvre surgery that is possible far-forward.⁸

Life-saving intervention can therefore be afforded

to many patients with non-compressible abdominal haemorrhage with only two surgical techniques packing requiring only in the order of 10–30 disposable, lightweight, prepackaged sterile and extremely cheap surgical packs (Figure 2) and a surgical stapler with a variable number of staple reloads (recommended 10 as a minimum).



Figure 2: Abdominal packs

Temporary abdominal closure is the standard of care for damage control surgery even in fully equipped level 1 civilian trauma hospitals and is achieved using proprietary products such as the VAC system (KCI TM) but can be fashioned from surgical packs and drain tubes attached to suction canisters (Figure 3). Equipment required for formal VAC application includes a sheet of plastic, VAC foam, adhesive occlusive dressing and a VAC canister (Figure 4). This will allow transfer to higher-level care and ends the abbreviated laparotomy on scene.



Figure 3: Make-shift 'VAC equivalent' for temporary abdominal closure (using iobanTM sandwiching a 'huck' towel)



Figure 4: Formal VAC system for temporary abdominal closure (Abthera TM)

Other surgical equipment to allow these abdominal procedures on the field under the most hostile and constrained conditions include scalpel, disposable wound retractor (for example, the Alexis system that is disposable, lightweight, robust and effective— Figure 5), scissors, needle holder and suture material.



Figure 5: Alexis TM wound retractor system

It would generally not be recommended that any thoracic procedures be attempted in the field. The only thoracic procedure that could be entertained is resuscitative thoracotomy (RT) with a pericardial window to relieve cardiac tamponade. However, cardiac repair in an austere environment would be considered extremely unlikely to be efficacious, although would no doubt be attempted in extremis. Thoracic aortic cross clamping is associated with minimal survival even in civilian trauma centres highly skilled in the application and utility with reported survival 9.7%.9 These procedures have been rarely reported in a military setting, and pericardial window at RT was only undertaken once in 15 years. Only seven RT were attempted (with overall mortality of 43%), reflecting the rarity with which this procedure would be considered.⁸ Theoretically, stapled lobectomy of bleeding lung is possible at thoracotomy and should not be contraindicated (especially as it requires no additional equipment other than the Finochetto retractor necessary for thoracic access).

Cross clamping the abdominal aorta at laparotomy is equally likely futile in the extreme forward environment. The procedure is not overly simple but ultimately only requires a single piece of equipment that can be carried prepackaged sterile as an aortic clamp (Figure 6). As a last-ditch attempt to save life, this would not be completely unreasonable, but it is foreseeable that most of these patients requiring this extreme level of intervention to save a life would likely succumb to injuries before arriving at a level of care capable of attending to that injury. An isolated major vascular injury to one of the great arterial vessels below the diaphragm (zone 2 or 3 aorta, common iliac, external/internal iliac or proximal femoral) by a single round may be the exceptional case that may survive, and so the inclusion of an aortic clamp with the carried set could be considered.



Figure 6: Aortic cross clamp

Wound infection is likely to be the least of these patients concerns, however, an attempt at sterility with some form of surgical prep (non-alcoholic to avoid flammability) and single window drape (with preformed central square cut-out, Figure 7) would at least minimise gross environmental soiling and trauma shears to rapidly cut through combat fatigues should also form part of the basic deployed kit. Lastly, individual surgeon headlights (with consideration of tactical green light filter) would be on the list of desirable equipment.



Figure 7: Disposable surgical square drape

Extremity trauma

Thankfully, given the widespread adoption of the CAT tourniquet, extremity trauma is rarely lifethreatening in the field from the perspective of exsanguination. Damage control orthopaedics includes wound debridement and external fixation. However, it is unlikely this will ever need to be taken forward beyond its currently established function in the Role 2E facility, although debridement of gross contamination of limbs should be provided following blast injuries if evacuation time is prolonged (beyond 24 hours). Fasciotomy may equally be necessary if extraction is likely to be delayed. This can be performed by appropriately trained general surgeons with a knife and scissors and should be included in the prerequisite skillset of a forward trained surgeon. Equally, limb-saving is the ability to perform arterial shunting; however, the surgical complexity, exposure and training required to acceptably perform this type of procedure in the far-forward environment limits its applicability. Nevertheless, arterial shunting accounted for almost 14% of surgical interventions performed in the 2004-2019 cohort, although it is unclear under exactly how much austerity these procedures were undertaken.8 Attention to pelvic fracture with pelvic binder application supplemented with pelvic extraperitoneal packing on scene is preferred over external fixation that requires additional equipment and expertise.

Neurotrauma

While theoretically life-saving, craniotomy for military neurotrauma required in the field is rare

and reported only once in the series by DuBose.⁸ This should not be seen as a priority skill given its rarity and unfamiliarity to most general trauma surgeons. The additional load required to effect this intervention coupled with its rarity also argue against including it as a key skill.

Capacity and load list

A small footprint surgical element capable of movement is essential to insertion and extraction inside the battlefield, which must intrinsically be able to move within very short time frames to deliver a meaningful health effect. Additionally, limiting surgical equipment to a load list that can allow transportation carried in backpacks is essential.

Dangelo et al. report their experience of an Expeditionary Resuscitation Surgical Team (ERST) comprising eight personnel (general surgeon, orthopaedic surgeon, critical care physician, emergency department [ED] physician, ED nurse, ICU nurse, surgical technologist, nurse anaesthetist). This team generally works more proximal than a far-forward team and carries supplies to perform 10 major surgical cases (thoracic, abdominal or neurological) with commensurate surgical sets including retractors, drills, vascular clamps, etc. to achieve those effects. The equipment is transported in hard cases; however, it is packageable to be carried forward with three soft bags per team member as necessary (two shoulder packs and a personal 36hour bag).¹⁰

The far-forward surgical team proposed in this discussion paper would be envisaged to compromise half the number of personnel as the described fullscale ERST, being general surgeon, orthopaedic surgeon, anaesthetist, ED physician and nurse, and be equipped to provide a single major procedure to maximise efficiency, mobility and insertion capability. Prioritising only the highest value surgical procedures outlined above while minimising ancillary equipment should allow this small team to carry the required load while maintaining tactical manoeuvrability. The practicality afforded by two surgeons on either side of the operating table in terms of access and expert assistance and a depth of experience in the event of practitioner injury warrants this setup. Equally, two critical care specialists are of benefit in attending to the resuscitation effort concurrently.

In order for such a small team to perform the functions normally performed by a team of 20 to 30 requires individual and team skills and training. Each individual should be selected for predetermined attributes that allow them to function in a small group, and then the team should be trained in SOPs.

In fact, the surgical element of the ERST has a similar constitution comprising five members (general and orthopaedic surgeon, ED physician, nurse anaesthetist and either a second nurse or surgical assistant) and, when deployed forward, was shown to be able to reduce time to surgery by 6 hours. The ERST in this constitution could deliver one major surgical intervention and one minor surgical intervention with their deployed load.¹⁰ The four-member SRT described by DuBose, whose primary role was to provide damage control resuscitation (DCR) and surgery as close to the point of injury as tactically feasible and facilitate transfer to definitive care, comprised surgeon, ED physician, nurse anaesthetist and physician assistant and was equally streamlined.8

It appears between four and six staff achieves the optimal balance between capability and manoeuvrability. A structure of this nature aligns with the central elements of the JP2060 future health clinical care component of the next generation Deployable Health Capability for the Joint Force as it is modular, scalable and flexible and will strengthen the ADF trauma health response. Additionally, with sufficient all corps 'good solider' training in basic military manoeuvre, a surgical element of this nature could be constituted from the three services enhancing interoperability.

Anaesthetic considerations

The principal concerns of the anaesthesia provider in the forward, austere, remote or non-permissive environment are the safe conduct of limited DCR; the administration and maintenance of anaesthesia using minimal equipment and drugs; the preparation for early rearward evacuation, while simultaneously anticipating the need to perform extended field care when necessary. In many ways, the forward military anaesthetist has much more in common with colleagues in relief organisations such as Médecins Sans Frontieres (MSF) and the International Committee of the Red Cross (ICRC), than from military peers in a Role 3 or 4 facility.

The timely delivery of DCR in the austere environment relies on the expert adaptation of advanced skills obtained from regular, contemporary management of the severely injured in permissive, wellresourced trauma centres. The forward and austere environments are clinically unforgiving. To give the severely wounded or injured casualty the best chance of meaningful survival, initial resuscitation and administration of anaesthesia must set in place the preconditions for future success. No relative denial of upstream care can be mitigated downstream.

This requires advanced airway and major vascular access skills, experience in massive transfusion practices and contemporary experience in trauma anaesthesia. The key to success in the unsupported environment being discussed in this paper is the ability and comfort of the anaesthesia provider to adapt their expertise to the limited resources that are inevitable (indeed essential) to maintain a light footprint and forward mobility.

The reality is that the essentials of high-quality resuscitative anaesthesia can be performed using the basic equipment supplied with a resuscitation team. This includes a transport monitor, transport ventilator, transfusion equipment, fluid warmers and syringe drivers. The most common anaesthetic technique used by such teams over the past decade has been Total Intravenous Anaesthesia (TIVA) with ketamine as the dominant hypnotic agent, and usually in some combination with a benzodiazepine and opiate. Muscle relaxation and mechanical ventilation are, of course, ideal for surgery in major cavities and bring with them some reliance on supplemental oxygenation (or oxygen concentration). This has logistical as well as physiological benefits. Physiologically, of the TIVA techniques, ketamine based TIVA is the most haemodynamically stablealthough ketamine remains a myocardial depressant in the shocked patient. Logistically TIVA equipment is lightweight (compared to anaesthesia machines) and ubiquitous in the military supply chain (as well as low-middle income countries where unconventional forces may operate). Unlike volatile anaesthesia, ketamine can be delivered in a closed space such as an aircraft or small unventilated room without the issues of off-gassing of anaesthetic agents.

While much can be achieved with simple equipment, some consideration must be given to the robustness and field utility of selected items. Ideally, all powered equipment should have a simple battery backup (that is, a readily available commercial battery, rather than a proprietary lithium rechargeable). Monitors and syringe drivers should be capable of functioning across a wide range of temperatures, and ventilators should ideally be turbine driven (so that they do not rely on pressurised gas supply to operate). Consideration may also need to be given to operating in low-light environments, or on the other hand, choosing equipment that is not clearly identifiable as military-spec if there is a requirement to support low-signature operations.

Ideally, the DCR team should be made up of a

specialist anaesthetist, an emergency physician and up to two nursing or technical assistants with a background in emergency, critical care or prehospital practice. Such a team could comfortably and rapidly perform techniques to secure a casualty's airway while simultaneously securing major intravenous access (such as via the subclavian vein to facilitate rapid flow rates) and then maintain anaesthesia, all while progressing ongoing haemostatic resuscitation.

Such a combination would allow the team to split into two to manage multiple casualties or perform forward or rearward extraction of casualties. Following successful haemorrhage control by surgical means, the anaesthetic focus would shift to critical care resuscitation until the casualty could be evacuated to a higher level of surgical care.

In addition to the usual litter horses used by a standard ADF resuscitation team, most small, austere surgical teams employ a surgical table that consists of a modular frame that a NATO litter can be strapped onto. The frame is designed so that it is structurally airworthy, with attachments for surgical lights, drip stands and shelves that a monitor can be strapped to. The frame has arm boards that allow the casualty to be positioned in the 'crucifix position' (the preferred position to resuscitate a severely injured person). This setup allows effective access to intravenous lines during damage control surgery and hard points that the team can strop themselves to continue to operate during flight. There are a number of companies that produce such a litter stand: The McVickers, the DOAK Mk 4 and the Charlie's Horse SR901RT are all excellent off-the-shelf examples. All are ruggedised, lightweight, portable solutions that can be used either in an operating room as a surgical table or as the centrepiece of a resuscitation bay.

Post-operative patient evacuation

Given the introduction above regarding air superiority, ideally, any surgical team would be able to operate independently of any particular means of transport or platform (i.e. remain platform agnostic). With requisite training, having a broad range of options available would facilitate flexibility and interoperability. Utilising the 'ruck, truck, house, plane' approach to different modalities in prolonged field care, integration of surgical assets within this framework would allow planning for moving both the team forward and casualty rearward.

Depending on other assets already in the field and the tactical situation, there is an obvious benefit in basing the surgical team forward, even temporarily. Their augmentation in the provision of any tactical field care and preparation for evacuation care affords a greater level of support, especially if evacuation care were to be delayed as it often is.

However, if the surgical team were deployed on an on-call basis, arrangements could enable surgical treatment en route. It is worth noting that the British Medical Emergency Response Team (MERT) that operated in Afghanistan from a CH47 did not perform DCS, rather a highly advanced form of DCR in an air-superior environment with relatively short transportation timeframes.

If airframes are available within the risk profile of the mission, useful Australian Service helicopter options would include CH47 repurposed as a surgical platform (and which, once inserted, may stay on scene or move with medical intervention under way on board in flight). The use of the MI-8 or MI-17 or even the MRH 90 is also technically possible. Useful fixed-wing options include C27 or larger, fitted for surgical intervention.

Following surgery, the team would need to be able to hold a patient in place or evacuate rearward depending on tactical tempo. The usual expectation would be that any patient requiring DCS would not be woken from anaesthesia. Indeed they would require evacuation by critically care trained personnel to a more advanced level of care. En route, they would remain sedated, intubated and ventilated, provided ongoing resuscitation with blood products and attention to temperature control along with the usual aspects of critical care nursing and transport. Depending on the situation, this could be provided from within the team or handed off to another (e.g. RAAF CCATT).

Limitations

The major factor limiting the movement of surgical assets forward remains integral security, followed closely by recruiting, selecting, training and maintaining personnel with the genuine clinical expertise required for this type of work. If surgical teams are pushed forward, they are expected to act more like line units, requiring resources and tactical training. In addition, if the surgical team is busy performing surgical resuscitation, the members concentration and bandwidth will be consumed with the patient they are looking after, meaning that their situational awareness of what is occurring outside of the resuscitation will be compromised. This will require a tactical protection team of 4 personnel to provide close overwatch of the surgical team.

Inserting a surgical element cannot become a liability to the receiving unit. Although once an actual surgical

procedure is commenced, there is no capacity for operating surgeons or anaesthetists to engage in tactical manoeuvres, up to and after that point, far-forward surgical teams must at least be able to engage in defensive movement for self-protection effectively. While remaining non-combatants, to afford a level of self-defence, the ability to fire and move safely in accordance with the current Combat Marksmanship Continuum would be considered essential. Limiting surgical intervention to rapid, easy to execute techniques facilitates this process. Casualty movement following operative intervention also needs to be taken into account, especially from an ongoing anaesthetic perspective. Surgical team members will require training in tactically moving, shooting and communicating in order to improve their survivability within a tactical environment.

Previous reports of deployed ERST members active in the MER confirm that while proficient with individual weapons, members could not provide their own security.¹⁰ Whereas Patel et al. notes there were numerous times the FST was responsible for its own protection without added security and recommended medical personnel attached to FST be further trained in combat skills, including management of prisoners of war.¹¹

The requirement of basic Rifle Fire training completion is insufficient as a minimum to deploy as a farforward surgical team. This is especially pertinent in the Australian context, where virtually the entire specialist medical capability provide reserve service, rather than regular Army employment. In the US context, the days when medical personnel were located in the rear are over,¹¹ and to integrate with our coalition partners, it is recommended the ADF consider the readiness to again deploy a far-forward surgical team.

Instituting change

To institute meaningful change in healthcare delivery in the context of trauma, command interest from non-medical units is required. The introduction of TCCC is exemplary in this regard. Medical training was a highlighted area of command interest by the then commander of the 75th Ranger Regiment, Stanley McChrystal.¹ Ultimately, this has resulted in the widespread adoption of the paradigm among armed forces and improvements in casualty care overall across militaries and nations. Engagement of senior commanders and tactical leaders is necessary to entrench medical outcomes as mission critical objectives. The delivery of effective forward surgical care mitigates not only adverse outcomes for the patient but also the mission more broadly. When a casualty occurs on a mission, the event is a tactical problem to be solved and not just an isolated medical issue. $^{\scriptscriptstyle 1}$

Summary

Once a patient arrives at a Role 2E facility in the MER, trauma care has been of exceptional quality. However, there will be only incremental gains if attention is focused on outcomes at this level. As approximately 90% of battlefield deaths occur prior to a casualty reaching a medical treatment facility, attention needs to switch to enhancing prehospital care to improve survival from combat injury.¹ One method to achieve this is to take the surgical team to the patient, and this has been shown to reduce time to surgery by 6 hours.¹⁰

Damage control surgery is the gold standard civilian and military standard of care for severely injured victims of trauma. The central tenets of abbreviated laparotomy with temporary abdominal closure can be provided in an extreme abbreviated form, temporising injured soldiers at the scene with minimal surgical equipment and highly targeted manoeuvres aimed at stemming or controlling noncompressible truncal haemorrhage. In this ultraabbreviated form, evacuation is still required, but it does buy time to allow casualties who would otherwise have died on the battlefield to reach higher-level care. In many ways, this represents the thoracoabdominal equivalent of the CAT tourniquet, which has revolutionised military medicine and fundamentally altered the causes of battlefield death. Surgical augmentation of Role 1 activities may again alter the distribution of battlefield deaths by minimising deaths from otherwise non-compressible truncal haemorrhage.

This requires an anaesthesia team capable and postured to provide rapid DCR within the resource constraints of the forward environment. These skills require the adaptation of expertise obtained through regular training and clinical experience in the management of the severely injured patient when not deployed. The forward trauma anaesthetist must be temperamentally suited to the austere environment. This is not a clinical environment flush with monitoring or specialised equipment, rather the survival of patients relies on the perfect application of paired-back clinical expertise and procedural skills.

Anticipating the movement of the equipped surgical team along with post-operative critical care patients will require careful consideration to be conducted safely and expeditiously. Ongoing development with trialling and exercising these elements will be essential in integrating this into mainstream practice. A unique selection and training program must be developed to facilitate this process and equip existing trauma specialists with the necessary tactical skill set to provide effective care far forward in this austere environment. Leveraging existing civilian traumaskilled medical staff should minimise the military trauma clinical upskill requirements.

Trauma care can be viewed as a niche capability in the broader context of health, but just as longrange reconnaissance or expeditionary offensive operations are only a fraction of Defence manoeuvre. Maintaining a highly specialised and well-trained group of a relatively small number of trauma specialists remains critical to support Army, Joint, combined or interagency operations more broadly. Noting the similarities in this regard with other special operations truths, it equally applies in health as it does in the special forces that quality is better than quantity; an effect cannot be mass produced, nor can it be created after an emergency has occurred; and finally, humans are more important than hardware. Investment in training highly skilled and agile operators postures Defence to rapidly adapt and evolve to future threats.

Development of a specific trauma-focused health capability to effect far-forward surgical care in this manner will be future-ready and independently deployable at short notice by leveraging the current extensive civilian trauma expertise present in various locations throughout the reserve forces. The training required to raise such an element requires tactical and operational upskilling more than clinical training if appropriate civilian trauma clinicians are identified and engaged. Defence must understand, appreciate and enhance the civilian skill set of its commissioned specialists in order to realise the full potential of those willing and able to serve and deliver a tailored combat health effect in the expert surgical management of trauma.

Disclaimer: The views presented here are those of the authors and do not represent the views of the Directorate of Army Health nor the Australian Army

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Understanding the Victimization of US Army Iraq and Afghanistan Veterans in US Public

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Abstract

Previous research suggests that public estimates of mental health problems in US veterans who returned from the deployments in Iraq and Afghanistan exceed actual concerns. The present project examines how sociodemographic factors may contribute to victimising perceptions of US Army Iraq and Afghanistan Veterans by conducting a free word-association task. A total of 245 US participants provided three open-ended word associations to 'US Army Iraq Veterans' and 'US Army Afghanistan Veteran' and completed a sociodemographic questionnaire. Multiple linear regressions outline that higher social distance towards US Army Iraq and Afghanistan Veterans predicts elevated victimisation scores. A semi-structured, qualitative interview study examined the underlying rationalities of victimising sentiments in 10 participants with no contact and 10 participants with close contact with US Army Iraq and Afghanistan Veterans. The thematic analysis suggests that social distance towards US Army Iraq and Afghanistan Veterans mitigates the victimisation and stigmatisation of veterans. This was the case as those with close contact to US Army Iraq and Afghanistan Veterans had explicit knowledge about which jobs veterans accomplished. In contrast, those who did not know US Army Iraq and Afghanistan Veterans equated deployments with killing, front-line fighting and witnessing atrocities. Implications and conclusions are discussed.

Keywords: Victimisation; Veterans; Civil-Military Relations; Mental Health;

Introduction

An important though understudied aspect of the experience of United States (US) Military veterans' is the process of their transition into civilian life.^{1, 2} While the majority of US Military veterans reintegrate successfully, demographic research outlines that high rates of veterans are unsatisfied with their transition experience,³ and are more likely to suffer from suicidal ideation, unemployment, alcohol or substance abuse and homelessness than members of the civilian population.⁴⁻¹¹ To date, research mainly examines difficulties in the US veterans' transition in relation to mental health difficulties that some veterans experience.¹² Yet, how societally prevalent, negative perceptions of US veterans may impact the reintegration into civilian life remains unaddressed.

Particularly since 9/11, military service has become publicly associated with mental health problems such as posttraumatic stress disorder (PTSD) or depression.¹³ Specifically, studies suggest that veterans in the media are commonly represented in the context of suffering and injury.¹⁴ For example, between 2003 and 2011, a total of 73% of articles in the New York Times and the Washington Post focused on mental and physical health problems when representing US veterans who returned from Iraq or Afghanistan.¹⁴ These negative representations of veterans who returned from Iraq and Afghanistan are mirrored in polls and surveys with representative sample sizes of the US population.^{3, 15, 16} Polls and surveys suggest that public estimations of mental health problems of veterans who returned from the deployments in Iraq and Afghanistan exceed actual concerns.^{3, 15}

Negative and victimising attitudes towards veterans may have problematic consequences and impede a successful transition to post-military life. Specifically, the attribution of veterans suffering from mental disabilities may increase levels of stigma. As mental disability labels include numerous negative stereotypes such as being dangerous, unpredictable, dirty, worthless, weak and ignorant,¹⁷ veterans may face implicit discrimination that diminishes a person's competence.¹⁵ In addition, research suggests that veterans who perceived a lack of respect and pride for homecoming were more likely to have problems adapting to civilian life and experiencing PTSD and suicidal thoughts.¹⁸⁻²² In fact, homecoming support was a stronger predictor of PTSD and suicidal thoughts than theatre or combat exposure itself.^{18, 22} In conclusion, negative perceptions of veterans and stereotypes relating to anticipated or explicit mental health problems of veterans may lead to societal rejection, referring to deliberate actions to avoid those with mental health problems or excluding them from social interactions.^{24, 25}

These problems may be particularly pre-eminent for Army veterans who have returned from the most recent deployments in Iraq and Afghanistan. With this younger veteran population, negative perceptions and victimising sentiments may affect the veteran's economic situation. Moreover, as research finds people relate mental disability particularly to combat experience,¹⁶ and combat experience to the Army,²⁶⁻²⁸ veterans who were part of the Army may be particularly prone to stigmatisation and discrimination.

However, to date, surprisingly little is known about why members of the US public may hold victimising sentiments about US veterans who returned from Iraq and Afghanistan. If this type of research was done, it examined mainly how victimising perceptions of veterans were exhibited in controlled conditions. For example, using an Implicit Association Test (IAT), Schreger & Kimble² outlined that participants held an implicit bias of mental instability towards veterans. While Schreger & Kimble's innovative approach reiterated findings from representative polls and surveys,³ the question why participants may hold these beliefs remained unaddressed. Similarly, Hipes et al.15 outlined in their laboratory experiment that participants would seek greater social distance towards veterans with PTSD, reiterating evidence from studies examining the stigmatisation and social exclusion of individuals with mental health problems.²⁴ Here, social contact with veterans moderated the deleterious effects of a PTSD label, mitigating the extent to which the participants sought social distance.24 Besides social contact, it is not unreasonable to suspect that long-running lack of public support for the US deployments to Iraq and Afghanistan may influence the victimisation of veterans.²⁹⁻³¹ Public support of military interventions was outlined to play a key role in defence and foreign policy.29 Besides justifying appropriate financial resources for the military, sustaining troop morale and military effectiveness,^{30,} ^{32, 33} public support also affects public perceptions of mission success and military fatalities.³¹ For example, public aversion to military interventions was found to be associated with higher estimates of military casualties and mission failure.³¹ Yet,

it remains unclear whether public perceptions of military interventions may also taint perceptions of veterans who participated in these interventions. Prolonged formal education was also outlined to have a negative effect on the public's willingness to support and participate in war.34 If individuals are unwilling to participate in a war, they may also hold negative attitudes towards those who did. Therefore, prolonged formal education may negatively impact individual perceptions of veterans. Such a possible spillover effect may be particularly evident in public perceptions of US veterans who returned from the unfavourably viewed deployments in Iraq and Afghanistan. However, due to the lack of empirical evidence, the possible effect of sociodemographic characteristics on the victimisation of US veterans remains unclear.

The present explorative study addresses this gap in knowledge by examining which sociodemographic characteristics may contribute to elevated victimisation scores in characterisations of veterans and why they do so. Therefore, Study 1, a quantitative word-association study, investigates which sociodemographic characteristics predict higher victimisation scores. Study 2, a qualitative follow-up interview study, will aim to explain why the sociodemographic characteristics outlined in Study 1 predicted higher victimisation scores. The discussion will synthesise the results and outline the real-world implications of the present findings.

Study 1: Methods

Participants

After receiving ethical approval from the University of Colorado at Colorado Springs (IRB 19-064), a total of 245 participants was recruited by advertising the project on social media and at university premises. The participants completed the survey between March 2018 and March 2020. Due to consideration of practicability and feasibility, a convenience sample was recruited. As outlined in Table 1, the recruited population included a high proportion of females, of whom most were well-educated undergraduates. An overview of the sample's sociodemographic characteristics can be found in Table 1. In comparison, the median age of a US citizen is 38.4 years,35 with 90% of all adults above 25 years of age holding a high school certificate (or equal) and only 35% having at least a Bachelor's degree.36 Therefore, the present convenience sample was not representative for the US population.

Demographic characteristics	Frequency
Gender	Female: 157 (64.1%) Male: 88 (35.9%) Non-binary: 0 (0%)
Age	M = 25.12 (SD = 7.63)
Education	College/University or equivalent: 136 (55.5%) High school diploma or equivalent: 107 (43.7%) Below high school diploma: 2 (0.8%)
Nationality	US Citizen: 231 (94.3%) Other: 14 (5.7%)
Opinion about US Armed Forces deployment to Iraq	It was wrong or rather wrong to send the US Armed Forces to Iraq: 155 (63.3%) It was right or rather right to send the US Armed Forces to Iraq: 90 (36.7%)
Opinion about US Armed Forces deployment to Afghanistan	It was wrong or rather wrong to send the US Armed Forces to Afghanistan: 131 (53.5%) It was right or rather right to send the US Armed Forces to Afghanistan: 113 (46.1%)

Table 1. Demographic information US survey

Materials and procedure

Figure 1 shows the test instrument as presented to the participants. After signing informed consent, the participants provided the following information in an online survey:

- 1. The participants were asked to produce three words that came to their mind when thinking of the stimuli terms 'US Army Iraq Veterans' and three words for the term 'US Army Afghanistan Veteran' (free word-association task).³⁷⁻³⁹
- 2. Then the participants were asked to rank the prototypicality of each of their word associations on a 5-point Likert-type scale (extremely important, very important, moderately important, slightly important, not at all important). This process was not timed, and the participants were encouraged to be reflective in their rankings.^{40, 41}
- 3. The participants were presented with a questionnaire that included basic sociodemographic measures (cf. Table 1).

Data analysis

A theme-based Content Analysis (CA)⁴² of the free word associations was conducted to facilitate further descriptive and parametric analyses. A process of grouping together semantically similar answers assisted with data aggregation to reduce ambiguity.^{37, 43} Semantically similar answers that expressed the same content but differed in grammatical form, expression, spelling, etc. were grouped (i.e., Honor honour, Bravery—brave). The evaluation of saliences, frequencies and characteristics of associations was informed by relevant literature^{37, 44, 45} and guided the subsequent construction of the theme-based categories. With satisfactory interrater reliability scores (92.54% interrater concordance), the data was found to be categorised into autonomous and distinctive categories. The data was transposed to SPSS and analysed with a multiple linear regression to examine which sociodemographic characteristics significantly predict the evocation of victimising word associations. Multiple Linear Regression Analysis (MRA) is a commonly used method in exploratory word-association research.^{39, 4} It is a technique for explaining the variation in a dependent variable by observing the relationship with independent variables.

Study 1: Results

Categories were constructed by relating findings from previous literature to the dataset and observing frequencies and similarities within the data.37, 47, 48 Therefore, inductive and deductive approaches were combined, generating a consistent coding system. In this way, the 1470 associations were categorised into a set of 10 distinct categories. While the number of categories may appear high, it is within the expected range, common in word-association studies.49-51 The word associations were categorised with a predominance of associations falling into the victimisation category (US Army Iraq Veteran = 203 associations [27.61%]; US Army Afghanistan Veteran = 246 associations [33.45%]), the war category (US Army Iraq Veteran = 188 associations [25.58%]; US Army Afghanistan Veteran = 162 associations [22.04%]) and into the heroisation category (US Army Iraq Veteran = 161 associations [21.9%]; US Army Afghanistan Veteran = 175 associations [23.81%]).

Please write down the first 3 words that come to your mind when reading the word presented on the following page. Please try to do this as fast as possible!

Ready? Please press green button

Please write down the first 3 words that come to your mind when thinking of a

US Army Iraq Veteran

1. 2. 3.

> Please write down the first 3 words that come to your mind when reading the word presented on the following page. Please try to do this as fast as possible! Ready? Please press green button

Please write down the first 3 words that come to your mind when thinking of a

US Army Afghanistan Veteran

1. 2. 3.

How important are the following words to describe a US Army Iraq Veteran

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
»[word association1]					
»[word association2]					
»[word association3]					

How important are the following words to describe a <u>US Army Afghanistan Veteran</u>

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
»[word association1]					
»[word association2]					
»[word association3]					



An overview of the categories with inclusion and exclusion criteria and frequency of each category occurrence can be found in Table 2. To understand how sociodemographic characteristics may predict the evocation of the victimising category, the present project focused only on victimisation category evocation in the further analysis. Mean importance ratings of victimisation category occurrence were created. The exclusion of mean importance ratings that equated with zero was considered. However, subsampling the sample population in this way could have led to an overfit model that performs poorly on out of sample data.

In order to gain statistically valid and concise regression models, sociodemographic characteristics of the recruited population were eyeballed. Initial analyses indicated that some sociodemographic characteristics tapped onto the same underlying theoretical construct and needed recoding. High Cronbach's alpha values of .82 were found for the victimisation category evocation of US Army Iraq Veteran (M = 2.03 [SD = 1.34]) and US Army Afghanistan Veteran (M = 2.19 [SD = 1.35]). Also, the independent variables 'Attitudes towards the US deployment to Afghanistan' (M = 1.89 [SD = .36]) and 'Attitudes towards the US deployment to Iraq' (M = 1.93 SD =.32]) had a high Cronbach's alpha value of.91. These variables were recoded by averaging and adding means. A list of the dependent and independent variables that were entered into the multiple linear regression model can be found in Table 3.

A preliminary G* Power Analysis⁵² suggested that a sample size of 79 participants would be adequate for a multiple linear regression with 13 predictors. Therefore, the recruited population of 245 participants was sufficient. A multiple linear regression model was computed after checking the assumptions of linearity, absence of multivariate outliers, absence of multicollinearity and equality of covariance matrices.

With acceptable measures of autocorrelation (Durbin Watson = 2.19), the multiple linear regression model indicates that evocation of the victimisation category is significantly predicted by sociodemographic factors; F (13, 244) = 2.934, p =.001. The variance in the victimisation category evocation explained by the sociodemographic characteristics was medium (14.2%).⁵³ The multiple linear regression model suggests that the independent predictor 'social distance to Veterans' (tolerance =.514; VIF = 1.93) significantly predicted the evocation of the victimising category with those being closer to veterans exhibiting lower levels of victimisation category evocation (cf.

Category name	Definition	Examples	Frequency for US Army Iraq Veteran	Frequency for US Army Afghanistan Veteran
Victimisation	Associations that refer to suffering from illnesses	PTSD Crippled Maimed	203 (27.61%)	246 (33.45%)
War	Associations, conceptualising the term 'war'37	War Destruction Death	188 (25.58%)	162 (22.04%)
Heroisation	Associations relating to superiority and heroism; Descriptions describing looking up to veterans	Heroic Bravery Saviour	161 (21.9%)	175 (23.81%)
Branch of Service	Reference to a group within the military; or membership within this group	Army Soldier Military	53 (7.22%)	38 (5.17%)
Reference to US nationality	Associations that refer to US in-group belonging, national inclusion	One of us Ours US	30 (4.09%)	28 (3.81%)
Political motives for deployments	Naming politicians and political reasons for the deployments	Bush, Oil wars Kill Saddam	29 (3.94%)	25 (3.4%)
Age	Associations to age and levels of experience	Young Rookie Old	29 (3.94%)	25 (3.4%)
Physical description	Physical description of a person	Tall Beard Short hair	21 (2.86%)	19 (2.58%)
Other	Associations that did not fit any category	? Mountains Don't Know	15 (2.04%)	9 (1.21%)
Job/occupation	Associations which refer to jobs. being employed and descriptive synonyms of these aspects	<u>Job</u> Professional Employed	<u>6 (.82%)</u>	<u>8 (1.07%)</u>

Table 4). All other independent variables had no significant effect on the evocation of the victimising category.

In conclusion, the results suggest that victimising sentiments may be generally prevalent in characterisations of US Army Iraq and Afghanistan Veterans, though particularly prevalent if those with little social contact veterans characterise US Army Iraq and Afghanistan Veterans.

Study 2: Methods

To examine rationalities and individual reasoning processes that may underlie the victimisation of US Army Iraq and Afghanistan Veterans and to understand how social contact to veterans may impact the victimisation of US Army Iraq and Afghanistan Veterans, an interview study was conducted.

Participants

A sample of 20 civilian participants who self-identified with having none or close social contact with US Army Iraq or Afghanistan veterans were recruited via snowball sampling. Specifically, study one's 'endsurvey page' provided the researcher team's email address, asking the participants to express their interest if they wanted to partake in the interview study (Study 2). Of those who expressed interest, 10 participants who stated to have no contact with US Army Iraq and Afghanistan Veterans on the demographic survey page, and 10 participants who stated to have close social ties to US Army Iraq and Afghanistan Veterans (i.e. father, spouse, close friend) were invited. The total sample of 20 participants was collected in accordance with the sample size guidelines for thematic analysis, suggesting a range between 20 and 30 interviews.54 Following the completion of 20 interviews, the researchers found thematic saturation was achieved,^{55, 56} meaning that after 20 interviews, a point was reached where no new concepts emerged from the interviews. An overview of the participants' sociodemographic characteristics can be found in Table 5.

Table 3. List of dependent and independent variables

Variable name	Classification
US Army Iraq and Afghanistan Veteran Victimising Category Evocation	Continuous Dependent Variable (low to high category mean category importance and evocation)
Gender	Binary Independent Variable (male/female)
Age	Continuous Independent Variable (low to high age)
Education	Continuous Independent Variable (low to high levels of formal education)
Nationality	Binary Independent Variable (US vs other)
Ethnicity	Binary Independent Variable (Caucasian vs other)
Religion	Binary Independent Variable (Christianity vs other)
Opinion about the US Armed Forces	Continuous Independent Variable (low to high levels of appreciation)
Opinions about the US deployments to Iraq and Afghanistan	Binary Independent Variable (support vs opposition)
Social distance to US Army Iraq or Afghanistan Veterans	Continuous Independent Variable (little to greater levels of social distance)
Social Distance to the US Military	Continuous Independent Variable (little to greater levels of social distance)
Time since residing in the US	Continuous Independent Variable (short to long time spent in the US)
National Pride	Continuous Independent Variable (low to high levels of national
	pride)
Political Opinion	Continuous Independent Variable (left [i.e. Democrats/Liberals] to right wing [Conservatives, Republicans])

Table 4. Coefficient scores of significant predictors

Significant predictor	Unstandardised coefficients B [SD]	Standardised coefficients b	t	Sig.
Social distance to veterans	29	31	-3.66	<.001
	[.78]			

Social distance	Age range	Education	Gender	Ethnicity	Identification
No contact	55+	Below A Levels/ High school diploma	Male	Caucasian	US-P1-NC
No contact	55+	Below A Levels/ High school diploma	Male	Caucasian	US-P2-NC
No contact	55+	Above A Levels/ High school diploma	Female	Caucasian	US-P3-NC
No contact	18–34	Above A Levels/ High school diploma	Male	Caucasian	US-P4-NC
No contact	18–34	Below A Levels/ High school diploma	Female	South-East Asian	US-P5-NC
No contact	18–34	Above A Levels/ High school diploma	Male	South-East Asian	US-P6-NC
No contact	18–34	Below A Levels/ High school diploma	Female	South-East Asian	US-P7-NC
No contact	18–34	Above A Levels/ High school diploma	Female	Asian	US-P8-NC
No contact	18–34	Above A levels/ High school diploma	Female	Caucasian	US-P9-NC
No contact	18–34	Below A Levels/ High school diploma	Male	Caucasian	US-10-NC
Close contact	55+	Below A Levels/ High school diploma	Male	Caucasian	US-P11-CC
Close contact	55+	Below A Levels/ High school diploma	Male	Caucasian	US-P12-CC
Close contact	55+	Above A Levels/ High school diploma	Female	Caucasian	US-P13-CC
Close contact	35–54	Above A Levels/ High school diploma	Female	Turkic	US-P14-CC
Close contact	18–34	Below A Levels/ High school diploma	Female	Caucasian	US-P15-CC
Close contact	18-34	Above A Levels/ High school diploma	Male	Caucasian	US-P16-CC
Close contact	18-34	Above A Levels/ High school diploma	Female	Black	<u>US-P17-CC</u>
Close contact	18-34	Above A Levels/ High school diploma	Female	Caucasian	US-P18-CC
Close contact	<u>18–34</u>	Above A Levels/ High school diploma	Male	Caucasian	<u>US-P19-CC</u>
Close contact	18-4	Above A Levels/ High school diploma	Female	Caucasian	<u>US-P20-CC</u>

Table 5. Overview of participants' sociodemographic characteristics

Materials and procedure

To understand how social contact with US Army Iraq and Afghanistan Veterans may relate to holding victimising characterisations, the researchers decided to employ a semi-structured interview schedule. The interview schedule was structured in three subsections: free narratives, clarification prompts and theory-guided questions. In this sense, Study 2 was conducted to corroborate the findings of Study 1 in a qualitative setting and so to examine underlying rationalities of victimising perceptions. After the participants declared informed consent, they were encouraged to speak freely about their perceptions of Iraq and/or Afghanistan Army veterans in section one of the interview ('When you think of US Army veterans who were deployed to Iraq or Afghanistan, which thoughts come to your mind?'). The second section of the interview consisted of follow-up probes that encouraged the participant to elaborate on the information that was previously given (i.e., 'You mentioned "courageous". What do you mean by that?'). In the third section, specific questions attempted to probe into how participants developed their opinions about veterans (i.e., 'What do you think about how US Army veterans returning from Iraq and Afghanistan are represented in newspapers?'). The interview questions were piloted and trialled before the 20 participants were interviewed. The interviews were audio-taped and anonymised during transcription. After the transcripts were sent to participants for checking, a inductive thematic analysis^{5, 57} was conducted.

Data analysis

Following the transcription of the qualitative data, the transcripts were repeatedly read to become as intimate as possible with the accounts. Initial ideas about key topics and potential themes were noted using NVivo 12. The data was then reread and reviewed to identify potential key themes that emerged repeatedly. At this stage, the data was coded by categorising interview extracts. This allowed the identification of connected thematic properties that, drawn together, highlighted how social distance may impact perceptions of US Army Iraq and Afghanistan Veterans.

Study 2: Results

The findings suggest that social distance towards US Army Iraq and Afghanistan Veterans mitigates the victimisation of veterans. Essentially, those who did not know a US Army Iraq and Afghanistan Veterans equated deployments with combat experience. Therefore, veterans who have served in Iraq and Afghanistan as part of the US Army were associated with front-line fighting. This was considered to entail high levels of stress, as front-line fighting was understood to necessarily involve committing and witnessing violent actions and atrocities. In conclusion, participants who did not know US Army Iraq and Afghanistan Veterans characterised a generic veteran population that suffers from inevitable mental health problems.

In contrast, participants who identified a US Army Iraq and Afghanistan Veteran as belonging to their social circle explained the emergence of mental health problems by drawing on individual differences. Here, participants rationalised their characterisation of veterans by drawing on their individual experiences with veterans. Therefore, mental health problems were considered a possible but not necessary consequence of deployment. The following presents these findings by outlining extracts from the narratives.

Participants with close social contact to US Army Iraq or Afghanistan Veterans

All 10 participants with close connections to US Army veterans who returned from Iraq and Afghanistan discussed veterans possibly suffering from service-related mental health problems such as PTSD. However, the development of mental health problems was considered not exclusively related to military experiences but to traumatic experiences more generally. For example:

US-P11-CC: 'It's [mental health problems] not veteran specific [...], if anybody experiences a trauma, they had a head injury, or something has really shook their core, they won't be the same person anymore. No matter if it was war, if it was a car accident. [...] They are all people with different experiences cause they have seen a whole bunch of different stuff, so they just try to deal with their experiences.'

This quote exemplifies how mental health problems were considered a possible but not necessary outcome of deployment. Instead of associating mental health problems exclusively to experiences encountered during the deployment, the trauma that was considered to cause mental health problems could happen in the civilian or the military context. This perception was shared in all 10 participants with close contact to US Army Iraq and Afghanistan Veterans and was based upon educated conceptualisations of the deployments in Iraq and Afghanistan. Specifically, due to their social ties, the participants knew about the soldiers' different roles in Iraq and Afghanistan, not necessarily involving faceto-face fighting and combat experience. Therefore, the participants with social ties to veterans held a more nuanced and realistic conceptualisation of the US deployments to Iraq and Afghanistan:

US-P14-CC: 'In the news, veterans are often pictures as hostile, unpredictable, war-weary, suffering from PTSD just a very stereotypical angry veteran. But in reality, many of those who have been deployed to Iraq or Afghanistan didn't actually see any fighting – like supply chain specialists, counsellors, cooks or Army chaplains. They are normal people, doing normal jobs. But I think they are just seen in these stereotypes. And I think that's bad cause this makes them being pushed out and not perceived as normal people.'

Therefore, while combat experience was characterised as a possible part of a deployment, the participants did not equate deployment with face-toface fighting. In this sense, veterans were considered to have completed occupational requirements. Deductive social labelling and definitions of a 'veteran person' who belong to a different societal category are therefore fundamentally rejected. This type of 'othering' commonly practiced by media, was perceived to communicate victimising sentiments, suggesting that veterans do not fit within the norms of society. For example:

US-P18-CC: 'I think veterans need to be treated like normal people. [...] Cause when you gonna throw that stigma on them, it is hard to find for them what they are when they are not in the military. Cause my dad [US Army Iraq veteran], he has really stressful days at work and, like normal people, he gets anxious. And I've heard his co-workers say: "Oh he's just having an anxiety attack – PTSD, he's a veteran." No, he is having an anxiety attack cause he has a really stressful day! And... maybe it's triggered by a trauma from Iraq, but anybody could have had a trauma. You don't need to be a veteran to have a trauma!'

This quote illustrates how veterans are automatically related to mental health problems and stigmatising attitudes. Even if the veteran responds adequately to contextual requirements, this response is perceived to deviate from a societal 'norm' and ascribed to the veteran's military experience. In this sense, 'othering' the veteran by constructing and labelling veterans as a social category comprises negative and victimising sentiments. However, contact with veterans diminished the extent to which veterans are victimised as those with closer ties to veterans, rejected societal notions about veterans, exhibiting more knowledge about veterans and their deployments.

Participants with no contact to US Army Iraq or Afghanistan Veterans

Essentially, all participants with no social ties to veterans based their conceptualisations of US Army Iraq and Afghanistan Veterans on secondary sources such as media. Here, the predominant representations of US Army Iraq and Afghanistan Veterans witnessing or committing violent actions justified victimising perceptions of veterans. For example:

US-P2-NC: 'I have read a book, I forgot which one it was, it was about a soldier in Iraq. So, they set up something like an outpost. And every few days there were raids and they pretty much saw their friends dying next to them, so I'd guess this is pretty traumatizing – to watch people getting killed next to you. [...]And you just stand there, watching them. It's really a tragedy cause it happens to young persons. I just can't imagine it – it has to be so hard to do that. Definitely traumatizing.'

This quote exemplifies how representations of US Army Iraq, and Afghanistan veterans in media influence individual perceptions and conceptualisations of veterans. Due to the lack of personal experience with US Army Iraq and Afghanistan Veterans, the storyline—even if fictional— ultimately defines what it means to be deployed to Iraq and Afghanistan. Therefore, conceptualisations of the deployments become highly stereotypical with soldiers 'facing death' (US-P1-NC) and 'fighting on the front line every day' (US-P7-NC). This is considered to cause constant stress and trauma from which veterans retrospectively suffer. For example:

NC-P4-NC: 'I don't know anyone or veterans from there. But I know about PTSD and they are probably on edge a lot. If you are in a warzone, you are just constantly on edge. So, I feel if you are under intensive stress over such a long period in time, you cannot let go of it. [...] I guess it is like having every week tests in school. When I graduated I was like – I am done with tests - I had nightmares, waking up screaming, so I was like: Wait, I don't have any tests anymore. If you have been under stress for a while, I think it is just hard to let go.'

Here, the participant anticipated the veterans' necessarily traumatising experience and tried to make sense of it by relating it to own experiences. Specifically, conceptualisations of the horrors of war were considered permanently damaging to the veteran. Worry and distress in the participant's own life served here as a frame of reference to understand the anticipated mental health problems related to stress caused by battlefield exposure. Besides high levels of stress, the veteran's experience with violence and front-line fighting were deemed to cause mental health problems. Here, all veterans were considered to have witnessed atrocities and committed violent actions. For example:

US-P6-NC: 'Every veteran did it [killing]. I can't imagine how it is to go through all that, to kill someone, even if they are terrorists. I can't get my head round it. And I read a lot about PTSD of people who experienced war and tragedy. So, I am sure that there is that aspect and that there is a lot of things that are gonna trigger that memory. And I am sure there are a lot of people who have a physical reaction, breaking down, because of that. And that is probably very hard and probably very hard for their families to deal with as well.'

This quote exemplifies how mental health problems that veterans experience may be justified. Essentially, all veterans were considered to partake in violent actions, such as taking a person's life, during their deployment, with memories associated to these actions haunting the veteran post-service. Therefore, attributions of mental health problems were based on understanding violence and violent actions as inhumane, as exemplified in the following quote:

US-P-1-NC: 'I mean killing is unnatural and unnormal and humans have a lot of empathy - taking a human life is ridiculous. Even if it is in a sense very brave of them cause they were doing it counterterrorism, in some ways it is the only way – to kill them I guess. But someone who is actually doing that – it is still a human life that you are taking, And, even if it is the right thing – ultimately – you're still responsible for cutting off their life stories and I think this is still a very hard thing to watch, to actually do. It's damaging.'

While killing is considered necessary at times and justified in special circumstances, it is conceptualised

as ultimately damaging. This also outlines the sacrificial aspect associated with veterans. Veterans willingly committed what was considered to be permanently damaging in order to protect US society. Therefore, the victimisation and heroization of veterans were highly intertwined.

US-P3-NC: 'I'd think that having to take someone' life will haunt veterans, especially if they had to do it more than once. [...] And I respect that, I am thankful for it. I don't like killing, don't think it's the right thing to do. But it's just necessary... sometimes – unfortunately. And I am thankful that I did not have to do it.'

This quote exemplifies the controversial attitude towards killing that 8/10 participants with no contact to veterans held. While veterans were considered victims of committing lethal actions, they were also appreciated and heroised for this as it saved the participants from taking part in warfare. In this sense, veterans were considered to sacrifice their mental health by committing violent actions for the participant and the US more generally.

In conclusion, attributions of mental health problems were not based on reflections of critically evaluated, objective information. On the contrary, understanding veterans as damaged individuals was rooted in the participants' highly emotional responses to experiencing existential threats and committing violent actions.

Discussion

The present explorative study examined which factors may contribute to elevated victimisation scores in characterisations of US Army Iraq and Afghanistan Veterans and why. The mixed-method approach produced the following key findings, answering the paper's research question:

Which sociodemographic characteristics predict higher victimisation scores?

The multiple linear regression with the victimisation category evocation as a dependent variable and sociodemographic characteristics as independent variables (gender, age, education, nationality, ethnicity, religion, opinion about the US Armed Forces, opinions about the US deployments to Iraq and Afghanistan, social distance to US Army Iraq or Afghanistan Veterans, social distance to the US Military, time since residing in the US, national pride, political opinion) was significant. However, only 'social distance to US Army Iraq or Afghanistan Veterans' predicted victimisation category evocation significantly, with those closer to US Army Iraq or Afghanistan Veterans scoring lower on the victimisation category evocation.

Why do the sociodemographic characteristics outlined in Study 1 predict higher victimisation scores?

The results of the qualitative interview study suggest that both cohorts, those who know and those who do not know US Army Iraq and Afghanistan Veterans had little knowledge about how mental health problems evolve. However, participants who know US Army Iraq and Afghanistan Veterans had a more nuanced understanding of the deployments in Iraq and Afghanistan and of what those who have been deployed did. In contrast, individuals who did not know US Army Iraq and Afghanistan Veterans based their conceptualisations on secondary sources such as media. Here, representations of veterans were internalised that characterised veterans as suffering from their deployment experiences. These representations of veterans as victims remained unquestioned and were justified by individual understandings of deployments that were equated with battlefield exposure and front-line fighting. Additionally, the present findings suggest that victimising and heroising sentiments may be highly intertwined. While violence and war were considered to be occasionally unavoidable but necessarily damaging, veterans were appreciated for their willingness to sacrifice their life, or, at least, their mental health. However, as those who knew US Army Iraq and Afghanistan Veterans had a more explicit understanding of the different roles and jobs entailed in a deployment, veterans were neither arbitrarily considered as heroes or victims. Instead, deployment was perceived as an occupational requirement that may, but not necessarily, cause trauma. Therefore, veterans who returned from deployment were neither heroised nor victimised and thus not stigmatised.

The present findings are aligned with previous research suggesting that members of the US public may hold an implicit bias and stereotyping attitudes towards veterans.^{2, 3, 15} The present research extends previous knowledge by examining which sociodemographic characteristics predict the victimisation of US Army Iraq and Afghanistan Veterans and why they do so. Therefore, the present findings contend with research suggesting that difficulties in veterans' transition may be at least partially accounted for by negative, victimising public perceptions and anticipations of mental health problems.^{2, 15}

Mental health difficulties may not be the only reason why veterans suffer from an increased risk of suicidal ideation, unemployment, alcohol or substance abuse and homelessness ().⁴⁻¹² Instead, negative and victimising portrayals of veterans in the news and media may contribute to implicit stigmatisation and social exclusion of veterans. This, in turn, may impact the reintegration of veterans into civilian society. However, in contrast to previous research, no evidence was found that age, ethnicity, social class, political affiliation and gender influence attitudes towards former Service Personnel.^{29, 31, 32} It may be concluded that these sociodemographic characteristics may therefore only impact on positive perceptions, not victimising perceptions of veterans.

Although the results have provided a thorough examination of the victimisation of US Army Iraq and Afghanistan Veterans, a number of caveats need to be taken into consideration. One limitation addresses the homogeneity of the quantitative study's sample cohort. The cohort comprised a high proportion of white, well-educated females in their mid-twenties. Thus, unlike previous research with representative samples³ the present findings cannot be considered representative for the US public. Many of the individuals were still children when the conflicts in Iraq and Afghanistan began, and so may not have been familiar with the arguments for and against interventions at the start of the conflicts. It may be interesting to compare an older group who were adults at the start of the conflict to see how they may differ from this sample in their beliefs.

The second limitation concerns the selection of associations for analysis. Only an average of 30.53% of the associations to the stimuli terms 'US Army Iraq Veteran' and "US Army Afghanistan Veteran' were utilised for the analysis. However, the limited number of associations that directly relate to the victimisation of veterans can be explained by the highly explorative and open-ended nature of the study. The aim of the study was to examine which associations participants provided without given answering categories; to examine these original associations. Therefore, the benefit of assessing original associations that the participants provided outweighed the limitation of including only a limited number of associations.

Lastly, the qualitative study's method of analysis remains subject to scrutiny. Thematic analysis would have allowed integrating a range of analytic options and multiplexed perspectives. By examining themes that evolved from the participant's answering patterns, it may be possible that other, more implicit themes have been overlooked. This may be particularly the case for the present study, as the focus was placed on examining victimising sentiments in relation to contact with veterans. In conclusion, the discussion and interaction of thematic properties may have been presented in a simplified fashion, balancing the presentation of in-depth explanative and in-breadth explorative information. While the qualitative and quantitative studies could have been elaborated on, the present findings provide the first overview of an under-researched area to date. Future research may want to examine to which extent the present findings may be replicated with veterans from other deployments or non-combat veterans. This would allow to compare and contrast perceptions of veterans, providing a holistic picture of the US public perceptions of their veterans.

Conclusion

The present study suggests it may be necessary to close the civil-military gap to improve the reputation of veterans. Therefore, the present findings suggest that civilians may need to know US Army Iraq and Afghanistan Veterans and see them as individuals successfully accomplished occupational who requirements. This would allow dissociating veterans from heroising and victimising sentiments, which are highly intertwined concepts. Also, the predominantly negative and victimising portraval of veterans in news and media is counterproductive. In addition, it may be helpful to improve the public's understanding of the development of mental health disorders. Members of the general public need to know that traumatic situations can be experienced in the civilian and military context. This may have problematic consequences for veterans as implicit mental health problems can lead to stereotyping and stigmatisation. How to explain and educate the public about veterans and the tasks they have accomplished tasks in a complex and contested moral space is an important area of public discourse that deserves more attention.

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Musculoskeletal surgery in Australian Defence Force trainees: Part 2 - risk factors and impact on deployability

S Faulks, D Duncan

Introduction

The cost of recruiting and training a military trainee is substantial. In 1999, Rudzki and Cunningham estimated the cost of recruiting and training a new Australian Defence Force (ADF) member to be \$A9000, with a net cost of \$A14 245 if they were discharged after 10 weeks.¹ This cost will be significantly higher in 2020 with inflation.

Should a military trainee fail to complete their initial training, there are significant financial and capability losses to the military. Studies in Australian and United States (US) Defence Forces have reported a 5% attrition rate from basic training.^{2, 3} Even if basic training was completed, Hoglin (2012) reported that 31% of ADF recruits did not complete their first term of service.⁴ A US study estimated that a 4% trainee attrition rate translated to a \$US33–57 million lost return on investment (depending on time of discharge).³ Given the significant investment in the recruitment and training of military trainees, it is of benefit to the ADF and the trainee to minimise any causes of this attrition where possible.

One of the primary purposes of being in the military is to deploy on operations. A military member must be recruited, complete initial training and then maintain physical and medical fitness to be deployable. The fitness of ADF members is represented by their Military Employment Classification (MEC), which communicates the ability of ADF personnel to fulfil their regular duties and deploy on operations.5 An ADF member's MEC may classify them as Fully Employable and Deployable, Employable and Deployable with Restrictions, Undergoing Rehabilitation, Undergoing Employment Transition, or Medically Unfit for Further Service.⁵ Deployability, as communicated by MEC, can be used as an indicator of whether a military recruit has completed initial training.

There is limited evidence regarding the impact of injury on the completion of training in ADF trainees. Pope et al. (1999) found that injured ADF trainees were 10 times less likely to complete training than those who had not sustained an injury.6 This is consistent with studies in foreign defence forces.6, ^{7, 8, 9} Injury during basic military training was three times more likely than during other physical activity.7 Overall, Leggat and Smith (2007) estimate that up to 50% of military recruits suffer injury during basic military training.⁸ In the ADF, Allison et al. (2015) found a 34.3% rate of injury during the Army's 80day recruit training,² consistent with another study reporting an injury incidence was 37.6%-46.6%.9 Over time, this appeared to improve with a 13.9% injury prevalence on the Army Recruit course in a 2015 study.¹⁰ A study in Australian Navy recruits reported a lower limb injury rate of 21.9%.¹¹ Ross and Woodward (1993) reported a much lower injury incidence of 2.7% in Australian Air Force trainees.¹²

While musculoskeletal injury rates likely influence the rate of musculoskeletal surgery, there are no contemporaneous studies on the impact of musculoskeletal surgery on the completion of training by ADF trainees. There may also be demographic characteristics that predispose to the requirement for musculoskeletal surgery.

This is the second report from a retrospective cohort study examining musculoskeletal surgery in ADF trainees. This paper assesses the employment outcome of ADF trainees undergoing musculoskeletal surgery, which may influence policy regarding suitability for military service and the appropriate military management of injured ADF trainees. It also provides a descriptive analysis of ADF trainees undergoing musculoskeletal surgery, which may allow targeted injury prevention and guide recruitment policy.

NATO code	Army	Air Force	Navy
O-2	Lieutenant	Flying Officer	Sub Lieutenant
O-1	Second Lieutenant	Pilot Officer	Acting Sub Lieutenant
	Officer cadet	Officer cadet	Midshipman
E-04	Lance Corporal		
E-O3	Private (Proficient)	Leading Aircraftman/woman	Able Seaman
E-O2	Private	Aircraftman/woman	Seaman

Table 1. Rank classifications included in analysis

The purpose of this study was to determine whether ADF trainees who undergo musculoskeletal surgery are less likely to be deployable, according to their MEC, compared to ADF trainees who do not undergo musculoskeletal surgery. A secondary outcome was the investigation of demographic factors of those who underwent musculoskeletal surgery.

Methods

Sample participants

All new patient registrations in the Defence e-Health System (DeHS) from 01 January 2015 to 31 December 2018 were identified. This period was chosen to ensure the required information was available and the consequence of any surgery was likely to be clear.

A proxy of rank was used to identify trainees from the new DeHS user registrations (see Table 1). The uppermost rank of E-O4 or O-2 was determined as those most likely to have been trainees in the period the data covered. This determination excluded specialist officers who enter the ADF at an O-3 level (e.g. medical officers, legal officers, chaplains) and any trainees who were promoted unusually quickly. In Army, specialist officers undergo a truncated initial training course, so this study assumes that the rate of injury is likely lower in this group.

Details of any invoices paid for health services to the trainees were obtained from the Defence Health Services Contracting Team. Services for musculoskeletal surgery as defined by the Medicare Benefits Schedule (MBS) item number recorded on the invoice were identified.¹³ The case sample was further refined to exclude surgery that occurred greater than two years after the date of DeHS registration, as it is unlikely that these members were still trainees at the time of surgery (see Figure 1). This exclusion may not capture some Australian Defence Force Academy cadets, who are trainees for up to four years. Surgery for anterior cruciate ligament reconstruction was excluded as it is being examined in a contemporaneous study (DDVA HREC Protocol Number 186-19).



Figure 1. Methodology for obtaining study sample

Ethics

The Departments of Defence and Veterans Affairs Human Research Ethics Committee approved the conduct of this project (approval number 224-20).

Data analysis

Initial data analysis and coding were performed using Microsoft Excel®, and a de-identified sample using allocated study identification numbers was exported to Stata/IC v16 from StataCorp for statistical analysis.

For analysis of the association of surgery with deployability, participants were grouped according

to their MEC at 12 June 2020 as Deployable or Not Deployable. Participants were further grouped into Deployability groups: 'Fully Deployable', 'Deployable with Restrictions', 'Undergoing Rehabilitation', 'Undergoing Employment Transition', and 'Medically Unfit for Further Service'. The association between surgery and deployability was analysed using Pearson's Chi-Squared test. Two sample proportion tests compared the proportion of each Deployability group in the 'Surgery' and 'No Surgery' groups.

Baseline characteristics of the 'Surgery' and 'No Surgery' groups were compared using a two-sample t-test for age, and two sample proportion tests for gender and service. Two sample proportion tests also compared the ages of 'Surgery' and 'No Surgery' groups.

Statistical analysis was conducted using 95% confidence intervals and *p*<0.05 indicating statistical significance.

Results

Baseline characteristics

The analysis of baseline characteristics is reported in Table 2. The mean age of the Surgery group was significantly higher than that of the No Surgery group (26.4 compared to 25.5, p=0.0041). This difference was due to a higher proportion of trainees aged between 15–24 years in the No Surgery group (55.4% compared to 45.1%, p=0.0001) and a relatively higher representation of trainees in the 25-34 age group in the Surgery group (45.9% compared to 37.7%, p=0.0017). For the ADF trainees who had surgery, 91% fell within the 15–24 or 25–34 age groups (160 and 163 trainees, respectively).

There was no significant difference in the genders of ADF trainees who underwent musculoskeletal surgery compared to those who did not. Army represented 65.9% of the Surgery group but only 57% of the No Surgery group (p=0.0008), and there were proportionally fewer Navy trainees in the Surgery group than the No Surgery group (17.2% and 23.2% respectively, p=0.0071).

Association between surgery and employment outcome

There was a statistically significant association between musculoskeletal surgery and deployability, with the Surgery group more likely to have a Non-Deployable MEC (p=0.0001). Proportionally, there

Table 2. Baseline characteristics of ADF trainees between 2015–2018, comparing those who did not undergo musculoskeletal surgery with those who underwent musculoskeletal surgery.

No Surgery			Surgery		p value		
Mean age (years)	25.5 (95% CI 25.4 to 25.6)			26.4 (95%)	26.4 (95% CI 25.8 to 26.9)		
	Number	%	95% CI	Number	%	95% CI	
Age group 15–24							
25-34	7306	55.4	54.6 to 56.3	160	45.1	39.9 to 50.2	0.0001*
35-44	4970	37.7	36.9 to 38.5	163	45.9	40.7 to 51.1	0.0017*
45-54	728	5.5	5.1 to 5.9	27	7.6	4.9 to 10.4	0.0919
55+	159	1.2	1.0 to 1.4	4	1.1	0.03 to 2.2	0.8918
	14	0.1	0.05 to 0.2	1	0.3	-0.3 to 0.8	0.3267
Gender							
Female	3257	24.7	24.0 to 25.5	100	28.2	23.5 to 32.9	0.1375
Male	9920	75.3	74.5 to 76.0	255	71.8	67.2 to 76.5	
Service							
Army	7507	57.0	56.1 to 57.8	234	65.9	61.0 to 70.9	0.0008*
Air Force	2602	19.8	19.1 to 20.4	59	16.9	13.0 to 20.8	0.1826
Navy	3,68	23.2	22.5 to 24.0	62	17.2	13.3 to 21.1	0.0071*

* statistically significant, p<0.05

	No Surgery (%)	Surgery (%)	p value
Fully Deployable	84.6	72.1	<0.0001*
Deployable with Restrictions	1.4	2.3	0.1578
Undergoing Rehabilitation	12.7	22.5	<0.0001*
Undergoing Employment Transition	0.4	1.7	0.0002*
Medically Unfit for Further Service	0.9	1.4	0.3284

Table 3. Proportion of ADF trainees between 2015–2018 with each employment outcome, comparing those who did not undergo musculoskeletal surgery with those who underwent musculoskeletal surgery

were significantly fewer trainees who were Fully Deployable in the Surgery group (p<0.0001), and significantlymorewhowereUndergoingRehabilitation (p<0.0001) and Undergoing Employment Transition (p=0.0002) (Table 3).

Discussion

Musculoskeletal surgery and employment outcome

This retrospective study examined the association between musculoskeletal surgery in ADF trainees and their deployability. The results of this study demonstrated a statistically significant negative association between musculoskeletal surgery as a trainee and deployability. It is expected that those undergoing surgery require a period of rehabilitation, so the higher proportion of trainees classified as Undergoing Rehabilitation in the Surgery group is not unexpected. As this study used a snapshot of deployability at a single point in time, it is unknown whether those Undergoing Rehabilitation returned to deployability at the end of their rehabilitation, or were found Medically Unfit for Further Service. A longer duration of follow-up in future studies may provide clarification on this.

Considering that 3.1% of ADF trainees who underwent musculoskeletal surgery were classified as either Undergoing Employment Transition or found Medically Unfit for Further Service, this represents a significant loss on investment in recruitment and training for the ADF. It may be that trainees that undergo musculoskeletal surgery should be assessed earlier to determine whether they are likely to be non-deployable long term and managed more appropriately outside of the ADF to prevent further injury. More research is required to develop robust criteria to identify such trainees.

Risk factors for musculoskeletal surgery

Age appeared to be a risk factor for musculoskeletal surgery, with a statistically significant increased mean

age in the Surgery group, with overrepresentation of the 25–34 years age group. However, there was no significant difference in trainees aged over 35 years. This is broadly consistent with studies in the US and Norwegian military trainee populations, which found an association between injury rate and older age.¹⁴⁻ ¹⁶ Interestingly, the Defence Census reports 37% of the permanent ADF population is aged between 25– 34 years, which is close to the proportion in the No Surgery group of trainees.¹⁷ This suggests that age should be considered when implementing training to prevent injury and subsequent surgery in older age groups.

Previous studies have found female gender to be a risk factor for injury in Australian and international military trainees.^{12, 15, 16, 18-23} This study found that females were represented in broadly equal proportions in the Surgery and No Surgery groups. There was a higher proportion of females in both trainee groups compared with the ADF overall (15.1% female). This may reflect a drive towards increasing the number of female military recruits. It is unclear whether the injuries females experienced were less likely to require surgery or whether there were different injury management practices compared to males; further research is required to investigate this inconsistency.

Army trainees represented a higher proportion of the Surgery group than Air Force and Navy. This may reflect the nature of basic training in each service, with a higher physicality in Army basic training exposing those trainees to injury requiring musculoskeletal surgery. Further analysis into the relative impact on different genders within each service would provide useful insight into injury types and training regimens.

Limitations

This study had a number of limitations. First, the selection process made assumptions about a trainee's rank and time in training, which may have excluded some trainees from analysis. The exclusion of anterior cruciate ligament repair impacted the strength of the findings. The identification of particular surgeries was reliant on the coding of MBS item numbers, which may not have been completely accurate. Finally, the time frame for the study meant a definitive outcome from the surgery had not been reached for some trainees. Hence, it is still not completely clear whether there is an association between musculoskeletal surgery and deployability.

Conclusion

These preliminary findings suggest an association between musculoskeletal surgery and deployability

in military trainees, with a higher risk of surgery with increased age and with Army service. Future studies with longer follow-up may clarify this association in more depth and determine causal factors to inform recruitment and retention policies.

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Prevention and management of urinary incontinence, anal incontinence and pelvic organ prolapse in military women and female elite athletes

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Abstract

Background: Pelvic floor dysfunction (PFD), encompassing urinary incontinence (UI), anal incontinence (AI), pelvic organ prolapse (POP) and various other conditions associated with pelvic floor muscles, is prevalent in military women and female elite athletes. Thus, it is important to consider specific prevention and management strategies that these women are currently using, and their safety and effectiveness.

Purpose: To determine specific prevention and management interventions for UI, AI and POP used by female military personnel and elite athletes, and their safety and effectiveness.

Materials and methods: Eight databases were searched for studies on prevention and management of UI, AI and POP using keywords such as 'female', 'military', 'athlete' and 'pelvic floor dysfunction'. Studies were selected and appraised by two independent reviewers. Data were extracted, and a critical narrative synthesis approach was implemented.

Results: The systematic search identified 581 studies; eight were eligible for inclusion in the review. Seven studies focused on UI and one on AI. Pelvic floor muscle training (PFMT) was common and effective in studies of military women and female athletes experiencing UI symptoms. Education was beneficial in female athletes. Concerningly, fluid restriction and pad use were key self-management strategies.

Conclusion: PFMT was the most widely used intervention for prevention and management of UI in female military and athlete populations and was found to be safe and effective.

Introduction

Pelvic floor dysfunction (PFD) in women encompasses a variety of conditions affecting the bladder, bowel and sexual function, such as incontinence and pelvic organ prolapse (POP).¹ Urinary incontinence (UI) is the most prevalent type of PFD and involves involuntary urine leakage.² Anal incontinence (AI) is the involuntary leakage of gas, liquid or solid stool.² POP refers to the descent of the bladder, uterus and/ or rectum within the pelvis.³ UI, AI and POP together affect approximately 46% of Australian women and so, collectively, are common.⁴ Further to this, there is an 80% chance that women involved in running and jumping activities will experience one or more of these conditions.⁵ Together, UI, AI and POP may be considered a significant risk for women in this context.³ Additionally, women who experience these conditions may have to alter their involvement in occupational tasks due to the impacts of the condition on their health and physical performance.⁶

Female elite athletes with high levels of training, as opposed to generally active women, may be at an increased risk of UI, AI and POP; however, prevalence rates vary across studies. One systematic review reported that 19–76% of female elite athletes experience UI symptoms,⁷ whereas a primary study reported a specific prevalence of 47%.⁸ Remarkably, female athletes are nearly three times more likely to experience UI symptoms than women who live a sedentary lifestyle.⁷ One proposed reason for the higher prevalence of UI in female athletes is that

repetitive increases in intraabdominal pressure experienced during exertion lead to downward stress on the structures of the pelvic floor.⁹ As UI, AI and POP together have a relatively high prevalence in the female athlete context, it is important to determine prevention and management strategies to reduce their impacts. From an extensive search of the literature, only one systematic review explored prevention and management strategies for these conditions in female elite athletes, focusing specifically on UI.10 While moderate evidence for pelvic floor muscle training (PFMT) was found, the systematic review was published several years ago and based its findings on studies published earlier still. In addition, it did not consider AI or POP. As a result, an updated synthesis of studies examining how female elite athletes can prevent and manage UI, AI and POP is required.

As part of their daily occupational tasks, military women may be required to participate in intense physical training and lifting or carrying items such as equipment or heavy backpacks.^{11,12} This may also place them at risk of developing incontinence or POP,^{12,13} potentially impacting their occupational performance.³ Approximately one-third of military women are reported to experience symptoms of these conditions.^{14,15,16,17} Therefore, it is valuable to determine specific interventions used by female military personnel and understand how effective and safe these have been shown to prevent or reduce the effects of UI, AI and POP.

Aside from the systematic review focused on female athletes previously discussed, a preliminary search of eight databases identified no other published systematic reviews focused on prevention and management strategies for female athletes or military personnel. Therefore, this systematic review aimed to determine the current extent to which specific prevention and management interventions for UI, AI and POP have been studied in female military and athlete populations and how effective and safe these have been found to be.

The specific research questions to be investigated in this review are:

- 1. What interventions are currently used to *prevent* UI, AI and POP in female military personnel and elite athletes?
- 2. What interventions are currently used to *manage existing* UI, AI and POP in female military personnel and elite athletes?
- 3. How *effective and safe* are these interventions in preventing and managing UI, AI and POP in military women and female elite athletes?

Methods

This systematic review was conducted in accordance with a protocol preregistered with PROSPERO¹⁸ (www.crd.york.ac.uk/prospero/display_record. php?RecordID=161062). The Joanna Briggs Institute (JBI) SUMARI platform was used in its development.¹⁹ This platform supported sequential progress through each step of the systematic review, particularly data management.

Information sources

A systematic search of literature databases was conducted on the 6 December 2019, including CINAHL, the Cochrane database, the Defence Technical Information Centre, the Nursing and Allied Health Database, ProQuest Dissertations & Theses Global, PubMed, SportsDiscus and WorldCat. In order to ensure a comprehensive search, the reference lists of studies selected for inclusion were reviewed to identify any further potentially eligible articles.

Search strategy

The key terms for which searches were conducted in the title, abstract and keyword fields of indexed articles in each database were: woman, women, female, pelvic floor dysfunction, incontinence, prolapse, military, soldier and athlete. Variations of the search strategy, adapted to the respective database, were employed. For example, the search strategies used in CINAHL to identify studies involving military women and female athletes, respectively, were (female OR wom*n) AND (pelvic floor dysfunction OR incontinence OR prolapse) AND (militar* OR soldier*) as well as (female OR wom*n) AND (pelvic floor dysfunction OR incontinence OR prolapse) AND (athlet*). Search strategies employed in the different clinical literature databases are provided in Appendix C.

Study screening and selection

Two independent reviewers assessed articles to determine their eligibility for inclusion in the review. First, the titles and abstracts of articles were screened to remove duplicates. Second, the titles and abstracts of retained articles were screened to exclude clearly ineligible articles. Lastly, the full texts of the remaining articles were obtained and examined to determine eligibility. If disparities or differences in opinion arose between the reviewers, they were resolved by discussion and consensus. A third reviewer was available to moderate but was not required during this stage.
Studies were considered for inclusion in the review if they:

- included women over the age of 18 years currently serving in the military; and/or
- included female veterans over the age of 18 years who were previously in the military; and/ or
- included female elite athletes over the age of 18 years; and
- investigated interventions for prevention or management of UI, AI and/or POP; and
- were published in English; and
- were published between 1994 and 2019.

Studies were excluded from the review if they:

- involved male participants only or data for women could not be readily extracted in studies involving participants of both sexes
- involved only participants under the age of 18 years or data for participants over 18 years of age could not be readily extracted in studies of mixed age groups
- involved participants who were not in the military, not veterans and not elite athletes
- did not document ethics approval to conduct the study
- constituted literature reviews or other secondary research
- were not published in English
- were published prior to 1994.

Reports of primary research with any type of design were included to ensure that any relevant evidence was considered. The ethics approval criterion listed above assumed that documented ethics approval meant the respective study had taken steps approved by a properly constituted ethics committee to manage any significant risk of potential harm to participants.² The decision to extend inclusion to all studies published between 1994 and 2019 rather than a shorter period was made to increase the volume of studies eligible to be included, as it was apparent that a relatively small number of studies had been published in this topic area. Furthermore, including studies from a longer period allowed for a longitudinal aspect of the review, as PFD prevention and management interventions may have changed over time and differ now to 25 years ago.

The search, screening and selection processes results were documented in a Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) diagram.²¹ This type of flow chart depicts the number of research articles found, how many were excluded and for what reasons at each stage of the screening and selection process, and numbers ultimately included in the review.²²

Assessment of methodological quality

The Mixed Methods Appraisal Tool (MMAT) was primarily used to appraise the methodological quality of most of the included studies (but not the included case studies).23 This tool was selected because it can be used to appraise qualitative research, randomised controlled trials, non-randomised studies, quantitative descriptive studies and mixed methods studies²³. The advantage of using the MMAT is that it is easy to use while providing a large amount of guidance on how to apply it to different study designs. The MMAT involves using a checklist to screen articles, which varies with the study design.²³ This checklist incorporates questions with 'yes', 'no', 'unclear', or 'can't tell' responses. It also provides indepth notes to guide researchers in how to respond to the questions. The JBI critical appraisal tool was used to assess methodological quality for the three case studies included in the review.¹⁹ Due to the nature of these studies, they did not fit with the categories in the MMAT. Therefore, it was determined that the use of the JBI tool would be beneficial to ensure objectivity and limit bias in appraisal.

Data extraction

The initial data extracted from each of the included articles included the title, authors, year the study was published and study design. Next, types of prevention and management strategies used by military women or elite athletes to address UI, AI and POP, as well as any findings regarding the effectiveness of these strategies, were extracted. Further data extracted from the studies included age of participants, what branch of the military participants served in, and, if participants were athletes, their levels of participation. Outcome measures and a description of any other relevant results of the studies were also recorded, along with details of participant attrition, adherence to experimental protocols and adverse outcomes, as well as treatment effects.

Data synthesis

The findings of the included studies were synthesised using a critical narrative approach. Narrative synthesis involves the use of text, tables and figures to condense and validate the results of a research process.²⁴ In the analysis of the results, greater weight was given to findings from studies of higher methodological quality and limitations of the included studies, together with possible biases, were considered, thus providing a critical perspective in the review. A statistical synthesis or meta-analysis approach was not suitable for this study as there was a limited number of relevant studies. A variety of interventions, research designs and outcome measures were also used, creating considerable heterogeneity across the included studies.

Results

A total of 581 articles were identified via database searching, from which 161 full-text articles were assessed for eligibility following initial screening and removal of duplicates. A total of 153 full-text articles were excluded leaving eight studies in the review, six involving military personnel and two involving athletes. Results of the search, screening and selection processes are documented in the PRISMA diagram in Figure 1.

Figure 1. PRISMA flow diagram depicting outcomes of the literature search, screening and selection processes



The methodological quality of the included studies was deemed to be moderate to good overall and findings in this regard for each study are detailed in Tables 1 and 2. However, the majority (six of the eight included studies) were not published within the last 10 years and so did not constitute recent evidence.^{8,14,25,26,27,28}

Tables 3, 4 and 5 present an overview of data from the eight studies in the review, along with their key findings. Table 3 encapsulates the key information from the three military studies included in the systematic review that used survey or quasiexperimental designs. All of these studies involved US Army women experiencing UI. Table 4 summarises the key information from the three military case studies included in the systematic review. Each of these reported a case study of one female from the US Army and, of these, two focused on UI and one on AI. Table 5 presents key information from the two athlete studies included in the systematic review. Both studies were focused on UI.

Table 1. Quantitative studies:	quality	' appraisal	results	based	on the	MMAT ²²
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Quantitative randomised controlled trials	Ferreira et al. $(2014)^{28}$	
Screening questions (for all types) S1. Are there clear research questions?	Yes	-
S2. Do the collected data allow to address the research questions?	Yes	_
2.1. Is randomization appropriately performed?	Yes	_
2.2. Are the groups comparable at baseline?	Yes	_
2.3. Are there complete outcome data?	Yes	_
2.4. Are outcome assessors blinded to the intervention provided?	No	_
2.5 Did the participants adhere to the assigned intervention?	Can't tell	_
Quantitative nonrandomized	Davis et al. $(1998)^{13}$	Sherman et al. (1997) ²⁵
Screening questions (for all types) S1. Are there clear research questions?	No	Yes
S2. Do the collected data allow to address the research questions?	Yes	Yes
3.1. Are the participants representative of the target population?	Yes	Yes
3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	Yes	Unclear
3.3. Are there complete outcome data?	Yes	Yes
3.4. Are the confounders accounted for in the design and analysis?	Yes	No
3.5. During the study period, is the intervention administered (or exposure occurred) as intended?	Yes	Unclear
Quantitative descriptive	Criner (2008) ²⁴	Dockter et al. (2005) ⁸
Screening questions (for all types) S1. Are there clear research questions?	Yes	Yes
S2. Do the collected data allow to address the research questions?	Yes	Yes
4.1. Is the sampling strategy relevant to address the research question?	Yes	Can't tell
4.2. Is the sample representative of the target population?	Yes	Can't tell
4.3. Are the measurements appropriate?	Yes	Yes
4.4. Is the risk of nonresponse bias low?	Yes	N/A
4.5. Is the statistical analysis appropriate to answer the research question?	Yes	Yes

Questions	O'Boyle et al. (2004) ²⁶	Painter et al. (2007) ²⁷	Seward (2013) ²⁹
Were patient's demographic characteristics clearly described?	Unclear	Yes	Unclear
Was the patient's history clearly described and presented as a timeline?	Yes	Yes	Yes
Was the current clinical condition of the patient on presentation clearly described?	Yes	Yes	Yes
Were diagnostic tests or assessment methods and the results clearly described?	Yes	Yes	Unclear
Was the intervention(s) or treatment procedure(s) clearly described?	Unclear	Yes	Yes
Was the post-intervention clinical condition clearly described?	Unclear	Yes	Yes
Were adverse events (harms) or unanticipated events identified and described?	Unclear	N/A	N/A
Does the case report provide takeaway lessons?	Yes	Yes	Yes

Table 2. Case reports: quality appraisal results based on the JBI critical appraisal tool¹⁸

Synthesis

The included studies provided evidence regarding a narrow range of PFD prevention and management strategies for UI and AI used by military women and female elite athletes. Seven studies focused strategies for prevention or specifically on management of UI,^{8,14,25,26,28,29,30} with the other being a military case study on surgery as a treatment option for AI.²⁷ None of the studies investigated prevention and management strategies for POP. All six military studies were limited to Army women, with women from other Services (for example, Air Force or Navy) not included in any published studies. The two athlete studies both investigated UI in college8 and volleyball²⁹ athletes. Seven of the included studies were conducted in the USA, while the remaining study was conducted in Portugal. Of note, none of the included studies were conducted on Australian military women or athletes.

One study, by Ferreira and colleagues²⁹ was a randomised controlled trial of pelvic floor muscle (PFM) education, with and without the addition of PFMT, to manage stress UI in female volleyballers. It was deemed to be of satisfactory methodological quality and on that basis provided level II evidence that education in conjunction with PFMT was more effective than education alone.31 The remainder of included studies were determined to provide evidence designated level III and lower.³¹ Risk of bias in most of the included studies was significant due to lack of control groups, assessors not being blinded to the interventions investigated, and attrition. Further study limitations determined during the critical appraisal stage of the review are presented in Tables 1 and 2. Nevertheless, the evidence provided by the included studies on PFMT as a key intervention for

incontinence symptoms exhibited good consistency and potential for good clinical impact, particularly as the populations investigated in the studies were of high relevance for the review questions.³¹ The study settings were similar to military, athlete and healthcare contexts within Australia; however, the results may not be entirely generalisable to contemporary military women, particularly those in the Navy or Air Force.³¹

PFMT was investigated in all seven of the UI studies as both a prevention and management option for UI and was reported to improve UI symptoms. However, PFMT was interpreted, implemented and assessed differently across the included studies. PFMT was the most frequently reported self-management strategy for UI utilised by deployed Army women in a survey reported by Criner (78%).²⁵ Despite this, no information regarding the definition of PFMT, exercise dosage, technique, frequency of training or level of instruction was reported in that study.²⁵ In four other studies included in this review, women were instructed on the importance of PFMT and were guided on incorporating exercises into home exercise programs.^{14,26,28,30} The findings of this review suggest that to be effective, PFMT should be performed by Army women and female athletes at least three times per day for 10-15 repetitions,^{28,30} and should include sustained contraction and relaxation for 10 seconds.^{14,26,29} Two single case studies, each involving a female Army soldier reported no UI symptoms at 6 and 12 months following 6- and 12-week PFMT programs, respectively.28,30 It is important to note that these PFMT programs did not occur in isolation and reported outcomes are due to the combination of PFMT with clinic therapy sessions involving upper and lower limb strength training and conditioning.^{28,30}

Author/ Year/ Country	Study design	Participant Characteristics	Prevention/ management interventions	Outcomes measures	Description of main results
Criner JA. (2008). USA ²⁴	Quantitative descriptive (cross-sectional survey)	N = 69 female army personnel with SUI ^a Mean age: 40.12 years Mean BMI ^b : 25.4 Mean height: 162.6cm Mean weight: 66.7kg Ethnicity: 71% Caucasian, 13% African American, 16% Other Rank: 68.1% officers, 31.9% enlisted Job: 53.6% registered nurses, 27.5% licenced practical nurses, 14.5% other Health history: 70% pregnant at least once Median parity: 2 SUI for >1year: 78% Mild-moderate symptoms: 94.2%	N/A	Demographic data form UDI-6° MFBC ^d MFCC° WOCQ ^f IIQ ^g	Low response rate (18%) ^h weight = <i>SUI</i> symptoms <i>time with SUI = ¹ QOL</i> <i>symptom distress = ¹ QOL</i> <i>field barriers = ¹ coping styles/</i> problem-solving strategies <i>field barriers = ¹ QOL</i> <i>Self-management strategies</i> <i>reported:</i> 78.3% PFM ^k exercises 78.3% panty liners 71% limit fluid intake 66.7% change underclothes frequently 62.3% use the restroom more often 17% avoid exercises 8.7% avoided strenuous exercise
Davis et al. (1998). USA ¹³	Quasi- experimental (observational)	N = 50 active duty female soldiers with UI ¹ (EG ^m), 10 asymptomatic soldiers (CG ⁿ) Mean age: EG: 31.9 years, CG: 36.4 years Mean weight: EG: 63.5kg, CG: 64.9kg Mean height: EG: 164.1cm, CG: 161cm Parity: EG:1.4, CG: 1.5	CG and EG: PFM exercises (2 month program, 10s contraction/ 10s relaxation, 20mins, 2xday)	Urodynamics 6-month follow-up questionnaire	CG and EG: Improved subjective ratings of UI severity post-training: ↓ severity of UI symptoms, pre- training 81%, post-training 12% Daily episodes of UI: 3.83 UI episodes per day to 1.83 UI episodes per day Urgency symptoms: 85% to 70% post-treatment Participants who continued PFM exercises for 6 months = minimal/ no urinary loss Attrition: 12 participants with UI not included due to being transferred
Sherman et al. (1997). USA ²⁵	Quasi- experimental (controlled trial)	N = 39 active duty female soldiers with UI Mean age: 28.5 years Mean parity: 1.28 Ethnicity: 55.9% Caucasian, 32.7% African American, 8.3% Hispanic, 3.1% other 21.7% had used PFM exercises before, 2% regularly	PFM exercises with/without biofeedback (2 month program, 10s contraction/10s relaxation, 5 times with 30s rest between each trial)	Urodynamics Pelvic examination	PFM exercises with/without biofeedback reduced UI symptoms, no differences between groups. CG: Mean number of leaks: 7.27 episodes to 2.9 episodes Mean number of voids per night: 0.65 to 0.26 Mean fluid intake per day: 1.5L to 1.7L Self-management strategies reported: 13.3% restrict fluids Attrition: 4 dropped from PFM exercise only group due to receiving electromyographic feedback, 2 dropped out from pre- existing injury to PFM and opted for surgery, 1 dropped out due to diagnosis changing

Table 3. Military survey and quasi-experimental studies: key data and findings

a: stress urinary incontinence; b: body mass index; c: urogenital distress inventory short form; d: military field barrier checklist; e: military field coping checklist; f: ways of coping questionnaire; g: incontinence impact questionnaire; h: increased; i: decreased; j: quality of life; k: pelvic floor muscle; l: urinary incontinence; m: experimental group; n: control group

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Author/ Year/ Country	Participant Characteristics	Prevention/management interventions	Outcomes measures	Description of main results
O'Boyle et al. (2004). USA ²⁶	36-year-old active duty female soldier 12-year history of anal incontinence	Daily pad use (self- management) Anal sphincteroplasty and perineorrhaphy (surgery)	Symptoms Rectal examination	12 months post: Good anal tone Continent
Painter et al. (2007). USA ²⁷	35-year-old female soldier with SUI ^a United States of America Army basic combat training SIJ ^b pain: 5-6/10 at rest, 7/10 running Parity: 4 (3 vaginal delivery, 1 emergency caesarean) Past History: Left proximal diaphyseal femur fracture (ORIF ^c), Left greater trochanteric bursitis, leg length difference Posture/gait: 'normal', Lumbar extension & right lateral flexion reduced by 25%	Fluid restriction and pads (self-management) Therapy sessions: Twice per week for 3 weeks: Stationary bike warm-up Weightbearing left hip strengthening exercises PFM ^d exercises Ice General aquatic program SIJ belt HEP ^e : 10-12 reps of PFM exercises, 3-5x a day	Lumbar active ROM ^f Self-report of amount of urinary leakage Pain ASLR ^g test	After 6 weeks of treatment: Normal, pain-free lumbar ROM & hip strength Negative ASLR test Good lumbopelvic control SIJ belt while running and jumping Denied urinary leakage 2 month follow-up: Basic combat training, SIJ pain resolved, no leakage 6 month follow-up: Return to full activity, full duties, no issues, no fear of leakage Yoga 2-3x a week
Seward S. (2013). USA ²⁹	31-year-old female soldier 5-year history of SUI (during deployment) SIJ pain Gait: "normal" lumbar & hip ROM: "normal" hip MMT ^h : "normal bilaterally"	PFM exercises and pads (self-management) Therapy sessions: 10 clinic assessments and PFM exercises for 45 mins over 12 weeks HEP: 10-15 reps of sequenced PFM and TA' exercises at least 3 times per day	Patient report ICIQ-UI SF ¹	After 6 weeks of treatment: No reports of urinary leakage when coughing/ sneezing 12 week follow-up: Stopped absorbent pad use Lifting heavy boxes was only aggravating factor 12 month follow-up: Nil issues

Table 4. Military case studies: key data and findings

a: stress urinary incontinence; b: sacroiliac joint; c: open reduction internal fixation; d: pelvic floor muscle; e: home exercise program; f: range of motion; g: active straight leg raise test; h: manual muscle testing; i: transversus abdominis; j: International Consultation on Incontinence Questionnaire for Urinary Incontinence Short Form

Author/ Year/ Country	Study design	Participant Characteristics	Prevention/ management interventions	Outcomes measures	Description of main results
Dockter et al. (2005). USA ⁸	Quantitative descriptive	N = 109 female collegiate athletes (EG ^a), 68 non- athletes (CG ^b) Mean age: EG: 19.17 years, CG: 18.82 years Height: EG:168.07cm, CG:167.79cm Weight: EG: 64.64kg, CG: 65.28kg	N/A	N/A	Education in EG and CG: 80.8% = no education on PFM ^c 19.2% = education on PFM (from media, written instructions) Self-management strategies reported in EG and CG: 41.4% urinated before activity 30% did not do anything
Ferreira et al. (2014). Portugal ²⁸	Quantitative (randomised controlled trial)	N = 32 volleyball athletes with UI ^d (16 EG, 16 CG) Mean age: EG: 19.4 years, CG: 19.1 years BMI ^e : EG: 22.8, CG: 21.5 Duration of UI: EG: 2.4, CG: 1.6 Years of sport practice: EG: 6.9, CG: 4.9 Number of weekly trainings: EG: 3.6, CG: 4.8	PFM education and PFM exercises vs CG (education pamphlet-only) CG: Education pamphlet included information on PFM anatomy, UI, aetiology of SUI, prevention strategies for UI and PFM exercises. EG: Education pamphlet as above PFM exercises included 30 PFM sustained contractions (no duration noted), 4 PFM quick contractions after each sustained contraction, once per day for three months Weekly club visit to ensure adherence to PFM training program Urinary diary to track urine leakage	Bladder diary Questionnaire Pad test	End of training intervention: Reduced urinary leakage by 45.5% (EG), 4.9% (CG) Reduced frequency of urinary leakage episodes to 1.8 episodes per 7 days (EG), 1.9 episodes per 7 days (CG)

Table 5. Athlete studies: key data and findings

a: control group; b: experimental group; c: pelvic floor muscle; d: urinary incontinence; e: body mass index

Of relevance clinically, it was identified that PFMT is not necessarily made more effective by coupling it with biofeedback.²⁶

Dockter and associates⁸ found that 80.8% of their study's participants were not aware of the role of PFMs. Furthermore, Ferreira and colleages²⁹ determined that education in conjunction with PFMT was more beneficial in preventing and managing incontinence in female athletes than education alone. Education was provided to both the control and experimental groups via information pamphlets on pelvic floor muscle anatomy and physiology, UI aetiology, strategies to prevent urinary leakage, as well as instructions on how to contract the pelvic floor muscles.²⁹ Urinary diaries were implemented in the experimental group to track fluid intake, and amount and frequency of urination were also employed as outcome measures in the study.²⁹ Further, the combination of education with PFMT improved outcomes, resulting in reduced urinary leakage and frequency of urinary leakage episodes when compared to education as a standalone intervention.29 Conversely, education as an incontinence prevention strategy was not included in any of the military studies.

Apart from PFMT, fluid restriction or daily pad use were identified by several included studies as key selfmanagement strategies for both UI and AI symptoms used by female military personnel.^{25,26,27,28,30} In addition, Criner²⁵ noted that military women frequently changed their underclothes (67%), visited bathroom facilities more often (62%), avoided exercise (17%) and avoided strenuous exercise (9%) if they suffered from UI. In comparison, self-management strategies for UI in female elite athletes identified in the survey by Dockter⁸ involved urination prior to participation in activity, not laughing and no intervention.

Surgical intervention (anal sphincteroplasty and perineorrhaphy) was found to resolve impacts of AI in one female soldier, 12 months post-procedure.²⁷ This case study provided level IV evidence,³¹ as it was only focused on one individual, and it was also the only article focused on AI included in this systematic review. Therefore, it is difficult to determine how replicable the study's results would be for other military women, or female elite athletes, experiencing similar AI symptoms. Furthermore, the effectiveness, safety and role of surgery for UI and POP were not determined by the findings of this review.

There was limited information regarding the safety of reported intervention strategies, but no adverse outcomes were reported by any of the included studies. Two of the included studies reported attrition data.^{14,26} One of these studies lost 12 participants to follow-up as they were transferred,¹⁴ while the other lost a total of seven participants due to PFM injury, mistaken diagnosis and a change to groups.²⁶ None of the studies provided information on adherence to the prevention and management interventions investigated.

Limitations of included studies

An array of limitations were identified within the included studies. Firstly, there was only one randomised controlled trial. Therefore, prevention and management strategies for UI, AI and POP have not been widely investigated rigorously for this population, resulting in less certainty in the findings due to the potential for confounding and risk of bias in the remaining studies. Furthermore, seven of the included studies focused on UI and only one on AI, meaning that POP was not considered, and very limited evidence exists in relation to AI. Seven of the studies were conducted in the USA, suggesting that international and cultural differences in prevention and management of UI, AI and POP have not been considered in any depth. All six military studies were also focused on Army women, resulting in no available information about interventions used in other military services. Lastly, none of the studies were published recently, causing the data presented to be less relevant to contemporary military women and athletes. The lack of recent studies also limited capacity within the review to examine longitudinal trends, which might, for example, indicate changes in PFD prevention or management practices over time. Furthermore, long-term follow-up beyond 12 months was not investigated in any of the included studies. As a result, it is difficult to determine whether these interventions have ongoing or lifelong benefits in preventing and managing UI, AI and POP.

Discussion

It is clear from this review that very few studies have explored the safety and effectiveness of prevention and management strategies for UI or AI in military women and female elite athletes, and none have explored strategies for POP in these populations. Nevertheless, from the included studies, it is clear that PFMT is an effective strategy in the prevention and management of UI. However, there is limited evidence to indicate it is safe. Despite few high-quality clinical trials of interventions for UI in the female military population, this finding is consistent with current recommendations for the general population that PFMT is safe and should be the first treatment option for women experiencing UI symptoms.³² Although the studies included in the review presented specific PFMT programs, optimal dosage and practice of PFMT are unclear, with variability in the application between studies and individuals.³³ Further research is warranted to ascertain how these strategies can be optimally implemented in the broader female military and elite athlete populations. Additionally, the combination of PFMT with an education program gave positive results in reducing UI symptoms in the female athlete population, so investigation into how military women may also benefit from the addition of such an education program is necessary. Yet, it is unclear from this systematic review whether PFMT and education as a combined intervention were more effective than PFMT alone.

From the included studies, it is evident that women from these populations use various selfmanagement strategies to manage UI symptomsthese include PFMT and, concerningly, fluid restriction and daily pad use. Strategies such as these may aid in reducing the number of accidents and avoid the negative consequences associated with accidents such as needing to change underclothes and embarrassment.³⁴ However, strategies such as fluid restriction and daily pad use do not address the underlying contributing factors to UI and may compromise the women's health in the long term. Fluid restriction as a UI management strategy during military fieldwork is potentially dangerous to the health of female military personnel due to the risk of dehydration and heat stress.¹³ Further to this, daily pad use may be effective in the short term but may be unsafe long term. As pads can be in limited supply during deployment, duration of use may be longer, and alternative items such as toilet paper or paper towels are sometimes used.³⁵ Using these as alternatives may not be as effective as the use of pads in managing UI and may increase the risk of skin irritation.³⁴ Further to this, decreased access to handwashing, showering and laundry facilities and resources in deployed military environments, and decreased sanitation may increase the risk of infections.35

A range of alternative prevention and management interventions for UI, AI and POP, commonly used clinically, have been investigated in the general female population. These include mechanical devices such as pessaries and various surgical procedures. Pessaries are effective in 60% of POP cases in the general female population.³⁶ However, women affected by POP over the age of 55 in the general population were found to experience more adverse effects such as discomfort with pessary use than PFMT, despite pessaries being more cost-effective.³⁷ Female military personnel rarely use pessaries,¹⁵ as being an internal device, barriers may arise relating to decreased hygiene and sanitation in deployed environments. $^{\rm 35}$

Various surgical procedures are also used to treat UI, AI and POP. The type of surgery selected often depends on the severity of the patient's symptoms, the patient's choice and general health, as well as the preference and skills of surgeons.38 Surgical effectiveness for POP in the general female population varies between studies (19.2-57.6%), with treatment success usually based on anatomic support noted.³⁹ Encouragingly, from a patient perspective, 71% consider their surgery to have been 'very successful'.39 Despite there being multiple approaches and types of surgery for these conditions, women in the general population report higher satisfaction levels with surgical intervention than non-surgical options such as PFMT and pessaries.⁴⁰ Furthermore, surgery repeat rates vary between 6-28% for women in the general population.41,42 Adverse outcomes of these surgical procedures include urinary retention, dyspareunia and, if used, mesh exposure.42 In female military and female athlete populations, there have been no studies comparing surgical outcomes with conservative management strategies such as PFMT. Further research is essential to determine the safety, viability, cost-effectiveness and occupational impacts of a broader range of interventions for the prevention and management of UI, AI and POP in female military and athlete populations.

The findings of this systematic review provide valuable knowledge for health professionals, military women and female athletes experiencing UI and AI symptoms as well as for researchers investigating UI, AI or POP. Additionally, this review provides insight into how military women and female athletes prevent and manage UI symptoms. The results of this review may also provide useful guidance for military health services seeking to develop recommendations and clinical guidelines that would inform healthcare facilities regarding UI and AI prevention and management. Ultimately, military women and female elite athletes experiencing UI may benefit from implementing evidence-based treatment options discussed in this review, which may facilitate improved health outcomes.

Suggestions for future research

As discussed, further research into the prescription of PFMT and the role of PFM education is needed in the female military population for UI, AI and POP prevention and management. In addition, it would be beneficial for research to compare strategies regarding their outcomes and safety. Furthermore, research is warranted into how female military personnel can be better supported with their pelvic floor health in deployed environments. This may involve how the additional provision of sanitary items may improve PFD symptoms or how implementing predeployment education programs regarding PFD, pelvic floor anatomy and PFMT benefits these women. This review largely focused on UI, as studies focused on AI and POP were limited or unavailable. On this basis, additional quantitative research into military women and female elite athletes experiencing other types of PFD, such as AI and POP, as well as interventions to prevent and manage these conditions, is also required. As a result, military women and female elite athletes would benefit due to additional evidence and advice on how to reduce the impacts of UI, AI and POP. Research investigating alterations in occupational or training loads post-surgery for military women and female elite athletes may also be warranted to determine surgery repeat rates and factors affecting optimal recovery. Resultingly, the pelvic floor health of military women and female athletes would benefit.

Review strengths and limitations

This was the first systematic review investigating prevention and management strategies for UI, AI and POP in both military women and elite athletes. Strengths of this systematic review included clear inclusion and exclusion criteria with clearly stated aims. It used a broad-based, systematic approach in deciding study eligibility. An array of databases was searched, ultimately increasing the likelihood of identifying relevant articles. The methodological quality of the included articles was systematically appraised, and the review implemented a systematic approach to data extraction and synthesis. These standardised and systematic approaches reduce the risk of bias in the review. Overall, the systematic review provides a clinically-relevant summary of the findings of published studies on the prevention and management of UI in military women and athletes, while identifying existing research gaps on this topic and AI and POP.

However, it should also be noted that this systematic review is limited by the small number of available studies for inclusion. Despite the breadth of the search strategy, it remains possible that some studies may have been missed. In particular, studies published in languages other than English were excluded, and this may have also resulted in missing relevant articles. Similarly, studies published prior to 1994 were excluded. Finally, studies indexed in databases other than those searched or published in less-indexed journals may not have been located by this review.

Conclusion

This systematic review has demonstrated that few published studies have investigated strategies used to prevent or manage UI, AI and POP in military women and female athletes. PFMT was found to be the most common intervention implemented for UI prevention and management in military women and female elite athletes. Education regarding PFMT and relevant pelvic anatomy was also found to be beneficial in female elite athletes. Both of these interventions were found to be safe and improve symptoms. In comparison, other self-management strategies concerningly used by military women, such as fluid restriction and daily pad use, may reduce UI symptoms in the short term but may place the health of female military personnel at risk due to dehydration, heat stress and skin irritation. Further research is required in this area but currently, PFMT and likely also education programs will aid in the prevention and management of UI in military women and female elite athletes. Military women should apply caution in relation to the daily use of pads and fluid restriction as self-management strategies for UI due to potential for adverse health consequences.

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Military Aspects of Cholera in POW / Refugee Camps

G D Shanks

Abstract

Although historically greatly feared due to its ability to kill quickly from dehydration, cholera has not featured in recent ADF military operations except in 2010 when United Nations Peacekeepers from Nepal were linked to the introduction of cholera into postearthquake Haiti. The collapse of field sanitation during the building of the Thai-Burma railway by Allied Prisoners of War (POW) led to multiple lethal cholera epidemics in 1943. Despite half of affected POW dying of cholera, the case rates were only about 10% of those exposed; the disease appeared to spare officers, Dutch soldiers and those recently immunised with killed, whole-cell vaccines. Factors that may also have played a role in the POW camps include malnutrition-induced hypochlorhydria, ABO blood type and lack of oral rehydration therapy knowledge. Oral cholera vaccine might be considered for use in the ADF during tropical operations, including disaster relief efforts in populations with active cholera epidemics.

And my memory of the cholera epidemic was not just the cholera, was the incessant Last Post... they used to burn the corpses and then there were the burials of the non-cholera.

CAPT Hugh de Wardener RAMC, 198 Field Ambulance¹

Cholera is a toxigenic disease caused by gastrointestinal infection with Vibro cholerae that can rapidly kill adults from massive dehydration and electrolyte loss. It currently occurs mainly in Africa or tropical Asia, although cholera has invaded Europe and the Americas during pandemics over the last two centuries. Cholera is rare in societies with functional water and sewage systems, such that it is usually seen in the context of refugee camps (Goma in Democratic Republic of Congo, 1994) or conflict with great population displacement (Bangladesh War of Independence, 1971; Yemen 2016-2020). During the colonial period in India, cholera could destroy British Army units, as occurred in 1846 when a quarter of the 86th Regiment died at Kurrachee.² Injected whole-cell, killed cholera vaccines were developed early in the twentieth century for use during mass religious pilgrimages in India and were credited with high levels of protective effectiveness despite predating the era of randomised clinical trials.³ Such vaccines became standard for troops deploying into the tropics although the protection period was thought to be measured in weeks/ months, not years.

The Australian Army largely avoided cholera during World War I, although its first specialised infectious disease unit was formed in 1916 in the Sinai desert to address a cholera epidemic in Egyptian drivers of the camel train.⁴ Cholera was a major threat to military formations only when field sanitation systems completely broke down during a war. This occurred during the terrible experience of the 8th Division Australian Imperial Force (AIF) and other Allied units during their experience as Prisoners of War (POW) of the Imperial Japanese Army, especially in 1942–44 during the building of the Thai–Burma railway.¹

Successive groups of POW were forced to march up the railway track from Kanchanaburi, Thailand, often overnighting in temporary camps that had been massively faecally contaminated by previous groups of POW or Asian labourers. Although the medical officers were very aware of the cholera threat, they had neither the time nor means to institute preventive measures. Inevitably given the terrible conditions and Japanese disregard for anything other than railroad construction, cholera epidemics broke out within the POW. These appeared as scattered outbreaks in POW camps along the railway, each of a few thousand men. Four separate outbreaks were documented and reported after the war in medical publications.⁵⁻⁸ Cholera cases (n=150-220) were about 10% of each camp's population resulting in about a 50% case mortality rate (deaths n=53-101), often in the form of biphasic epidemics (see Figure 1). Treatment had to be instituted under harrowing conditions during the middle of the monsoon season, often in forced isolation from the main camp. Some intravenous rehydration was possible with improvised means (bamboo cannulas) and crude solutions (rock salt in filtered river water), but the worst-affected POW were dead within hours of



Figure 1: Two cholera epidemics in 1943 Allied Prisoner of War camps along the Thai–Burma railway were described after the war by Marcowitz (Chungkai)⁷ and de Wardener (Linson Camp)⁵ where the weekly morbidity data were extracted for this graph.

symptom onset.⁹⁻¹¹ It was noticed that despite what must have been nearly universal exposure, Dutch soldiers, officers and medical personnel only rarely developed symptomatic cholera.

Explaining why some groups among the POW escaped cholera during an epidemic is not entirely obvious. Military medical officers on the railway credited injected cholera vaccine, which was locally prepared by the Japanese Imperial Army with high levels of protection sometimes within days of use.^{5,7,8} Based on our current understanding of cholera toxin and subsequent post-war vaccine studies, the cholera vaccines used in the Japanese POW camps seem unlikely to have been highly effective.¹² The Dutch soldiers relative freedom from cholera compared to Australian or British POW could have been opportunistic by being in less contaminated camps or due to cumulative immunity from annual cholera vaccination after longer tropical service in the Netherlands East Indies. Officers were less nutritionally debilitated than enlisted soldiers due to not being forced to work on the railway and may explain why officers did not often succumb to cholera. Medical personnel understood infectious diseases better than other POW, but their intense exposure to sick POW would suggest that acquired immunity explained their relative freedom from cholera rather than their ability to better apply field sanitation measures.

Other aspects of cholera that were not appreciated during World War II might have partially explained the devastating but variable effect of cholera on the POW along the Thai–Burma railway. Hypochlorhydria is a known problem of starvation, particularly in pellagra and likely was very common in the vitamindeficient POW. Hypochloridria reduces the infectious dose of Vibrio cholerae by orders of magnitude as the bacteria survive stomach acid to then infect the small bowel.13 All POW were malnourished, and those with hypochloridria would have been very vulnerable to cholera infection. Helicobacter pylori infection was not appreciated as a cause of peptic disease until decades after World War II. Large numbers of surviving POW with peptic ulcer disease make it likely that many were infected with H pylori which may have contributed to hypochloridria.14 Those with group O blood type are known to be more vulnerable to cholera toxin due to ABO blood group polymorphisms.¹⁵ Although blood grouping was done from 1944 in the POW camps in support of an extensive blood transfusion service, most cholera deaths occurred in 1943 and data allowing correlation of cholera mortality to blood groups does not apparently still exist.

Although the record is decidedly mixed, the military has constructively contributed to the post-World War II response to cholera. When located in Taiwan, the US Naval Medical Research Unit 2 discovered that cholera toxin reversed the gut's normal salt sugar exchange mechanism to produce massive water and electrolyte loss.¹⁶ This breakthrough physiological understanding enabled the use of oral rehydration salts as the primary treatment modality for cholera and most dehydrating paediatric diarrheal diseases rather than intravenous fluids. As a result, cholera treatment today is more effective and accessible than what the POW experienced in 1943 because of oral



Figure 2: Australian War Memorial ART90844 Cholera tent, Hintok, Thailand along the railway built by Prisoners of War. 1943. Watercolour on paper by Jack Chalker, now deceased, used with the permission of his descendants.

rehydration salt solutions that directly resulted from military-sponsored medical research.

A US Army water purification team in Europe was on call for airborne deployment during the mass displacement of Rwandan refugees into the Democratic Republic of the Congo in 1994. Specialist equipment (Reverse Osmosis Purification Unit) originally designed to remove nerve gas from contaminated surface water was not what was needed in the Goma refugee camps where the basic problem was a huge number of people (nearly 1 million) forced into an area of impervious ground with few water sources.¹⁷ The field sanitation problem was solved by stationing individuals at each water point to place a measured amount of bleach into all water containers, but this did not occur before the epidemic peaked at 6000 cholera cases per day and a gross mortality of 25–35/10 000 per day.

On another continent, a massive cholera epidemic in Haiti was directly traced to an introduction by United Nations (UN) Peacekeeping soldiers from Nepal coupled with a breakdown of field sanitation.¹⁸ Although military medical officers in the early twentieth century knew that oligo-symptomatic soldiers could be the source of cholera epidemics, this fact had been largely forgotten by 2010. Adequate sanitation, particularly appropriate disposal of collected sewage, could have prevented the cholera epidemic that killed thousands in Haiti. However, the newly introduced pathogen from Nepalese soldiers found fertile ground in the post-disaster Caribbean island. It is estimated that >500 000 cases and in excess of 7000 deaths resulted from this point source introduction of cholera by UN Peacekeeping forces which represents a spectacular failure of field sanitation where ordinary latrine procedures should have stopped contamination of the local river.¹⁸

Yemen has experienced the largest cholera outbreaks in recorded history. From January 2017 to December 2020, there were 2.48 million suspected cases of cholera and 3841 associated deaths (unpublished information). Ongoing multistate conflict and prolonged humanitarian crises in Yemen present serious challenges to the control of cholera. As of September 2020, some 3.34 million people were internally displaced, and 17.9 million people were in need of health assistance. In addition, military attacks have damaged water supply, sanitation, hygiene and health services.19 An integrated community-based approach that includes safe drinking water supply, improved sanitation, personal hygiene and early oral rehydration and treatment is essential to prevention and control of cholera.20

Future ADF missions will likely involve deployments into regional areas for humanitarian assistance/ disaster relief (HADR), where cholera is a potential disease risk. Epidemics have occurred in Papua New Guinea as recently as 2009 and involved more than

15500 cases and 500 deaths over two years.²¹ As long as the ADF can function as a military organisation with its own field sanitation facilities, the likelihood of cholera in ADF soldiers is very low but not zero. Oral cholera vaccine (Dukoral®) is available in Australia given as two oral doses separated by one week. However, it would likely only be recommended for those having direct contact with cholera-infected persons, such as medical personnel in hospitals or engineers working in refugee camps. Recognition by medical personnel of the possibility of cholera in tropical operations/HADR missions is important as readily available oral rehydration salt solutions can lower the previously terrible mortality of cholera to less than one per cent when competently used.¹⁹² Given this situation, the ADF should never have to re-live its extraordinary and heroic history of the cholera epidemics in the POW camps of the Thai-Burma railway.1

Conflicts of interest statement

The author does not claim any conflict of interest.

Funding

The author is an employee of the Australian Defence Organisation and a retired US Army medical officer but did not receive any specific funding for this study.

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Acknowledgements

COL Paul Byleveld RAAMC is thanked for his comments and suggested changes to a draft of this manuscript. The author also thanks the many unnamed historians, medical librarians and archivists who have unselfishly provided references, data and ideas for this and earlier publications. One figure is from the Australian War Memorial's collection and is used with their permission.

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The opinions expressed are those of the author and do not necessarily reflect those of the Australian Defence Force or the US Department of Defense.

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The Australian Defence Force Medical Specialist Program: Past, Present and Future

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Abstract

The Australian Defence Force (ADF) aspires to provide high-quality medical care to personnel deployed on operations. Medical procedural specialists are key enablers of this capability. In the late 20th Century, the ADF relied upon Reserve clinicians to staff deployed health facilities. Though generally successful, this approach is limited in the extent to which it can guarantee the availability of specialists at short notice or for prolonged durations. Consequently, from the early 2000s, the ADF has worked to create a more robust, high-readiness specialist staffing model. As a result, several schemes were established, culminating in the extant Medical Specialist Program (MSP). This paper examines the evolution of the MSP and the contemporary employment of its members. Consideration is also given to challenges encountered during the MSPs early years and how these challenges may be overcome. Particular issues include the imbalance of MSP specialists. If these challenges are met, the MSP will continue to grow as a repository of corporate knowledge and generate value beyond the contribution of its individual members.

Introduction

Health support is a key enabler of combat power. Through effective management of injuries and disease, health support preserves the deployed force, enhances morale and contributes to the willingness of personnel to perform their duties in dangerous operational environments. Indeed, Australian deployed personnel serving overseas expect that, if they are wounded, they will receive the highest possible standard of care.

In order to meet this expectation, the Australian Defence Force (ADF) must possess an expeditionary health service capable of the assessment, stabilisation and evacuation of battle casualties. To support such a capability, the ADF must maintain a pool of highreadiness medical specialists able to apply their subject matter expertise to the planning, conduct and evaluation of operational health support. For most of the ADF's history, such specialists have been drawn from the Reserve forces. However, in recent years, greater attention has been given to the development of a Permanent Force specialist cadre.

This paper will examine the past, present and future of medical specialist capability within the ADF. We begin by outlining considerations for providing specialist medical capability on operations before exploring historical models of health specialist employment within the ADF. We then discuss the extant Medical Specialist Program (MSP) in detail, focusing on its inception, structure and relationship to supporting capabilities. Comparisons are made with specialist employment models in the armed forces of other closely aligned nations. Finally, the MSP's strengths and growth opportunities are outlined, canvassing several potential directions for its future development.

Considerations for the provision of specialist medical support to operations

Military forces from developed nations aspire to provide a standard of care on operations that mirrors, as closely as possible, the standard of care in their domestic health systems. Achievement of this goal relies upon several key capability enablers, including the provision of appropriate health matériel and personnel, resources for individual and collective training, suitable command and organisational arrangements, and the operation of an effective system of clinical governance.

Any system designed to guarantee the supply of specialist clinicians for operational employment must balance several factors, including recruitment, retention, clinician availability and operational readiness. Addressing each of these factors comes at a cost; therefore, further key considerations are the financial resources required to sustain a given medical specialist workforce model and the opportunity cost of not allocating these resources elsewhere.

In recent decades, the ADF has experimented with several models for the employment of medical procedural specialists. All models have had the same goal: to create a responsive and agile specialist health support capability, while minimising the costs of keeping highly trained clinicians 'on the shelf' between deployments and other tasks. The evolution of one program into another has been driven by all of the factors noted above as well as by the nature and tempo of the ADF's operations within our region and further afield.

Specialist medical support in the late 20th Century Australian Defence Force

While the Australian Army Medical Corps provided surgical forward and general hospitals in various locations throughout the World Wars I and II, the emphasis shifted to primary care from the Korean War onwards. Medical staffing is recorded as a chronic problem, as documented in the history of the Royal Australian Army Medical Corps¹ when generating support for the 1st Commonwealth Division in Korea, 'The RAAMC was in a desperate situation. ... When a young Doctor Trousdale and four colleagues offered their services to the Corps in 1953, the then ADGMS warmly welcomed them "as we almost doubled the number of Army MOs". No Australian military surgeons were deployed to either Korea or the Malayan Emergency. The 100-bed 1st Australian Military Hospital in Vung Tau during the Vietnam War provided a surgical service that was staffed by Citizens Military Force physicians, psychiatrists, surgeons and anaesthetists on threemonth deployments with the official Corps history recording considerable administrative difficulties in deploying Reserve officers.1 At times, positions were impossible to fill, necessitating drawing upon personnel from visiting Australian civilian aid teams, until from 1970 onwards, Reserve specialists from the RAN and RAAF were also deployed. In 1973, there were no medical specialists in the Permanent Forces. This remained almost exclusively the case until February 2008, when the first official training scheme detailed below graduated its first consultant.

Medical Officer Specialist Training Scheme

The Medical Officer Specialist Training Scheme $(MOSTS)^2$ was approved in 2001 by Chief of the Defence Force, Admiral Chris Barrie, AC, RAN.

MOSTS focused on maintaining a small group of 'key medical specialists in the full-time element of the ADF and retention in the Specialist Reserve [aiming to] guarantee that essential members of deployable specialist teams are available at short notice to move'. MOSTS was sponsored by the Director-General Defence Health Services (DGDHS) and developed by a working group of medical officers (MOs) over two to three years. It was acknowledged that medical specialists were a critical component of deployed health capability and that there was a need to ensure availability at short notice to move. Accordingly, the policy aimed to 'encourage a select number of military medicine trained MO, who would ordinarily leave the ADF, to retain Permanent Force status whilst being sponsored for specialist training'. It was the first official medical specialist training scheme of its kind in the ADF. However, some MOs were trained to become specialists in the Permanent Force prior to this scheme under local ad hoc arrangements.

The range of specialties identified for sponsorship under MOSTS were general surgery, orthopaedic surgery, anaesthetics, intensive care and emergency medicine. Eligible for selection were MO, who had acquitted all outstanding Return of Service Obligation (ROSO) or those who had completed at least four years of ROSO. These MO must have completed at least two years of effective service as a military clinician, have completed all Service-specific training courses for MO and remained fully fit to deploy.

The clear advantage of MOSTS was the retention of experienced military MO into deployable medical specialist roles. It utilised the existing personnel policy to achieve this by allowing the MO to undertake clinical refresher training in civilian health facilities over 12 months to become eligible and competitive for selection into an approved specialty training pathway. During both refresher and specialty training, the officers selected would work full-time in training hospitals and retain all ADF conditions of service.

Disadvantages of the scheme were a lack of dedicated funding, pay issues, a lack of clear employment models following training and no defined career pathway. Reimbursement of associated training and examination fees were capped at A\$2000 through the continuing professional development arrangement at that time. The length of ROSO was determined on an individual basis and was to be acquitted in a part-time leave without pay (PTLWOP) arrangement in jointly funded positions in civilian hospitals over several years. The specialist salary at that stage was not equivalent to the pay received by staff specialists in a public hospital.

The first entrant into MOSTS in February 2004 was a naval medical officer who was successfully selected for advanced training in orthopaedic surgery with the Royal Australasian College of Surgeons (RACS). Also, a naval medical officer, the second and final candidate, entered the MOSTS as an orthopaedic surgery registrar in February 2005. At the fiveyear review in 2006, it was determined that MOSTS would be cancelled at the end of that year while both officers were still under training. The reasons cited for discontinuing the program were lack of interested candidates and insufficient Service-level support; Navy sponsored only two participants, and Army or Air Force supported no applicants. Despite MOSTS being cancelled, the agreement with the two active participants was honoured.

The first MOSTS candidate attained fellowship in February 2008 and was posted to the Primary Casualty Reception Facility (PCRF) Cell of the Amphibious and Afloat Support Group (AASG) as the inaugural orthopaedic surgeon and Senior Medical Officer. He was soon followed by the second candidate, who completed orthopaedic training in February 2009 and was posted to Balmoral Naval Hospital in HMAS *Penguin*. Both officers completed their ROSO under individualised PTLWOP arrangements. Of the two MOSTS members, one transferred to the Navy Health Reserve in December 2012, and the other has remained in permanent full-time service, assisting in the development of the Swift Incision Program that evolved into the current Medical Specialist Program.

Military Surgical Team

The Military Surgical Team (MST) was established in 2012 at the Royal Brisbane and Women's Hospital (RBWH) as a result of Joint Health Command Project Swift Incision, initiated by MAJGEN Paul Alexander as a component of the comprehensive reform of the ADF's health services. Staff specialist positions in intensive care, anaesthetics, emergency medicine, general surgery (trauma/burns) and orthopaedics were advertised to the Defence Force Reserve members in September 2011. Four consultant MST members were appointed (in emergency medicine, general surgery, anaesthetics and intensive care medicine) in addition to the appointment of the Defence Professor of Military Medicine and Surgery at the University of Queensland and RBWH. The orthopaedics position in the MST was left vacant as there were no applicants, and there were already two Permanent Force orthopaedic surgeons from MOSTS. The MST consultants remained in the Reserve component of their service, and their primary employment remained with either the hospital or university. Defence reimbursed these institutions for the cost of employing each MST member in return for an agreement that these clinicians would be released at short notice for up to four months' Defence Service per year. This was a period of high operational tempo, and all MST clinicians deployed overseas at least once. At the completion of their five-year contracts, two MST officers chose to return to Queensland Health, whereas the other two MST consultants had transferred to the Permanent Force MSP prior to the completion of their five-year contracts. Only the Defence Professor remains on the original contract. Alongside the MST, in 2012, the first four Permanent Force registrars were appointed to positions at RBWH, some of whom went on to become accredited registrars in the MSP.

Swift Incision Program

The Swift Incision Program (SIP) commenced in 2012 concurrent with establishing MST. Unaccredited registrar positions were created at the RBWH as a posting for full-time MOs hoping to enter into accredited specialist training positions. In addition, one unaccredited position in each of the five MST procedural specialties was created with the hope that sufficient experience would be gained to be competitive for selection into accredited training positions. This was the direct precursor of the current MSP by a name change in 2014.

Present

The Medical Specialist Program

The Medical Specialist Program (MSP) is the extant framework for the employment and training of fulltime specialists within the ADF.

The MSP was commissioned in 2014, subsuming the Permanent Force registrars who had commenced in unaccredited positions under the predecessor SIP but who had become established in training positions around Australia. This included the two MST consultants who chose to transfer to the Permanent Force, plus accredited registrars who transferred to Permanent Force from Reserves. Five procedural specialties were represented: general surgery, orthopaedic surgery, anaesthesia, intensive care and emergency medicine. Additionally, a staff position was allocated within Joint Health Command to administer the MSP and maintain the supporting network of clinical placement deeds.

Beyond its core role, the supply of procedural specialists to operations, the MSP was seen as having a second important function: recruiting and retention of general duties MOs. It was intended that the MSP would provide an incentive for those

MOs approaching the end of their ROSO to remain within the Permanent Force rather than separating in order to pursue civilian opportunities for career advancement. Accordingly, the initial target population for the MSP was MOs within 12 months of completing their ROSO. However, it was soon recognised that MOs who had been working outside the civilian hospital system, often for many years, did not always have recent exposure to the clinical rotations and referees needed to gain selection into an accredited training program. Therefore, in recent years expressions of interest for the program have been disseminated more widely within the Reserve and Permanent Force chains of command. Additionally, qualified candidates have been accepted as 'pre-MSP' members and, at the discretion of their single Services, have been afforded the opportunity to undertake prolonged civilian placements to enhance their chances of selection into specialty training programs.

By design, MSP positions were allocated between Services in proportion to their strength. However, growth of the MSP cohort was uneven, both in the distribution of members across Services and the specialties represented. In particular, anaesthesia and critical care positions were quickly filled by the RAAF and RAN, while all three Services were unable to recruit a general surgeon prior to 2015. Surgical positions still have high vacancy rates.

Awareness of the MSP grew among ADF health service leaders following the inaugural MSP Forum in 2015. This forum was particularly significant in enhancing understanding of the MSP among ADF personnel agencies. It was instrumental in the appointment of Army candidates to the program later that year. The annual MSP Forum continues to be an important vehicle for disseminating information about the program to technical and command stakeholders.

Employment of the MSP within civilian hospitals

MSP registrars compete for entry into specialist training programs and complete their training in accredited hospitals in the same manner as their civilian counterparts. MSP registrars are relatively 'quarantined' from military activities and are not expected to undertake duties that would interfere with or prolong their specialty training. However, registrars are different to ADF students on sponsored long-term schooling. They must remain compliant with the individual readiness conditions of their Service and are encouraged to maintain a relationship with their unit, their career manager and the broader MSP cohort. MSP consultants serve as staff specialists within approved civilian health services under a clinical placement deed detailed in the Military Personnel Manual (MILPERSMAN). In order to sustain a meaningful clinical practice with an acuity and case mix suitable for a military trauma specialist, MSP consultants must be allocated to shifts or sessions where such cases might reasonably be seen. Civilian hospital departments generally roster several months in advance; thus, while MSP consultants are present in addition to the minimum staff required to run a particular hospital service, they remain highly integrated within their civilian departments. Accordingly, clinical placements must develop mechanisms to reallocate patients in the event of short-notice deployment of the MSP member. This issue is more pronounced for surgeons than critical care specialists because surgeons often manage their own waiting list of patients for major non-emergent procedures. In contrast, critical care specialists have limited long-term individual responsibility for patient care.

MSP members often form longstanding professional relationships of mutual benefit with a single health service. Civilian health services gain a highly-skilled clinician, often with broad leadership, management and instructional skills, at commonwealth expense. On the other hand, MSP consultants can gain access to necessary learning opportunities by fostering an understanding of their role among their civilian colleagues. As mentioned above, MSP members still rely upon their civilian colleagues to backfill regular and on-call clinical responsibilities when tasked with military duties at short notice. To this extent, the MSP relies upon collegiality and goodwill. While the financial benefits of retaining an MSP member are largely realised by hospital and departmental leadership, the consequences of short-notice absence are borne by fellow clinicians. For these reasons, MSP members are often afforded greater locational stability than other military doctors. This both enhances the development of supportive professional networks and allows MSP consultants to cultivate a clinical practice tailored to their needs as military clinicians.

Employment of the MSP on exercises and operations

The ADF has a need to provide specialist medical capability on exercises and operations. This capability may be delivered by Permanent or Reserve clinicians from all three Services. The MSP offers the ADF a high-readiness, rapidly deployable specialist capability for a prolonged duration, while the Reserves afford depth and the capacity for sustained support to operations.

These roles overlap, and historically, many Reserve specialists have deployed at short notice and for long periods. However, in developing a permanent specialist capability, the ADF has achieved certainty of immediate availability for contingency operations that was not possible previously. Recent examples where this capability has been called upon include Op OKRA, Op FIJI ASSIST, Op BUSHFIRE ASSIST and Op COVID ASSIST. Additionally, in late 2020 when an Australian surgical team embedded with the US Role 3 Hospital in Iraq, three of the four doctors in the first rotation were MSP members and the MSP is represented on all planned future rotations.

Employment of MSP in non-specialist roles

Generally, it is expected that MSP members will be given duties that best utilise their specialist qualifications both on exercises and on operations. Similarly, MSP members have previously served in clinical leadership roles in addition to their specialty when appointed as the Director of Clinical Services of a deployed hospital or as health staff officers. According to extant policy, MSP consultants expect to be absent from civilian clinical placements for around three and up to six months per year. To date, military commitments have varied substantially according to MSP consultant specialty, Service branch and prespecialisation medical qualifications. Emergency Physicians, for example, have been afforded a varied array of opportunities to contribute, owing to the broad nature of their speciality. Nevertheless, as previously noted by US colleagues, a careful balance must be struck with the employment of MSP members in non-specialist roles because time away from hands-on clinical care is a real threat to clinical currency and competency.^{3, 4}

Command and control of the MSP

The MSP is a joint asset *coordinated* by the Director-General Operational Health (DGOH) on behalf of Commander Joint Health (CJHLTH). DGOH has a role in managing MSP members, overseeing their selection, training and clinical placement deeds to develop and maintain a ready specialist workforce. However, MSP members are *commanded* and *administered* by single Services, monitoring individual readiness and performing career management functions.

The management of MSP members differs slightly between the Services. Specialists in the RAAF are held at formation level, within Headquarters Health Services Wing (HQHSW). In contrast, RAN and Army specialists are held at unit level within the Maritime Operational Health Unit (MOHU) and 2nd General Health Battalion (2 GHB), respectively. Both MOHU and 2 GHB are responsible for staffing a deployed Role 2 Enhanced (R2E) facility, while HQHSW does not fulfil this purpose directly; rather, this role within the RAAF falls to the expeditionary health squadrons.

In the nascent phase of the MSP, unit level command of MSP members introduced elements of complexity. Commanding officers were not always sure of the extent to which they directly commanded, versus administered, specialists within their unit. In addition, where full-time and part-time specialists have been segregated within different units, it has not always clear whether the MSP were to be 'first out the door', ahead of Army Reserve clinicians 'kept on the shelf' for contingency operations, with Reserve clinicians carrying responsibility for the majority of tasks, or some pragmatic middle ground. 'Horizontal' direct liaison of full-time and part-time specialists, which can support a more integrated specialist workforce, has historically been viewed with unease by some commanders who felt that such dialogue subverts established command and control structures with deleterious consequences. Notwithstanding these observations, maturation of command and coordination frameworks, and unit and formation leaders' increasing awareness of the role of the MSP, have led to a progressively closer collaboration of Permanent and Reserve specialists from all three Services on both exercises and operations.

International models of health specialist employment

Currently, ADF medical specialists are employed in two contexts: exercises and deployments. Garrison health arrangements are such that ADF members are directed to the civilian public or private health systems for secondary and tertiary care. Thus, notwithstanding the limited need for surgical support to exercises, ADF medical specialists do not provide care for military personnel domestically. For both Permanent Force and Reserve specialists, acquisition of clinical experience and maintenance of procedural skills occurs in civilian hospitals.

Perhaps the closest parallel to the ADF MSP is the specialist training model of the Canadian Armed Forces. Canada has a similar sized military to Australia, with geographically dispersed defence facilities limiting the potential for designated military hospitals. Canadian military specialists are embedded in tertiary civilian hospitals, but like MSP, they also provide consultative support to military primary care doctors and may be involved in research and educational activities. In the UK, like in Australia and Canada, all serving personnel receive hospital-level care from the civilian National Health Service. Military specialists are mainly concentrated within five individual NHS facilities and can care for military members in a domestic environment alongside civilian colleagues. Despite the broad clinical exposure afforded by the UK system, our UK colleagues have noted that, as in Australia, civilian practice can be an imperfect vehicle for learning the skills required in combat surgery.

In contrast, the US military relies predominantly on a full-time, 'active duty' medical specialist workforce almost exclusively employed in Department of Defense (DoD) facilities when not deployed. This system has at least two potential advantages. Firstly, it affords health commanders superior knowledge of the exact case load and case mix of specialist clinicians, a surrogate marker of clinical readiness to deploy. Secondly, it provides a workforce that is available for garrison healthcare yet remains more rapidly deployable than a Reserve-dominated force. Specialist garrison capabilities are necessary because of the scale of the US military and because the DoD provides healthcare to both serving members and their families. However, DoD facilities are rarely trauma centres and afford relatively limited clinical exposure compared to their civilian counterparts. Thus, although the ADF is too small to justify the US full-time specialist model, even if this approach was viable in Australia, there would be a need to overcome limitations in learning opportunities available to military specialists in garrison roles.

Analysis of international military medical specialist workforce models demonstrates that the precise arrangement of clinical placements may be less important than a clear understanding of what is required of Permanent Force specialists. Even an extensive and comprehensive military healthcare system, as seen in the US, cannot consistently provide clinical exposure that guarantees specialists will be ready for operational practice. Recognising that deployed medicine incompletely overlaps with civilian practice, we must consider what other features the MSP must have in order to maximise the quality of deployed specialist care.

Future

The contemporary MSP, building upon the legacy of previous programs, represents a significant step towards a robust deployable medical specialist capability. As part of a Total Workforce Model, it can guarantee a reliable supply of experienced, highreadiness clinicians for operational health support. Nonetheless, the program continues to evolve. In the final section of this paper, we pose several questions to help inform the debate about the MSP's future.

How might the ADF address the imbalance between MSP specialties?

Presently, the MSP trainee and consultant workforce are heavily skewed towards anaesthesia and emergency medicine specialists. This is a problem because availability, particularly short-notice availability, of Reserve surgical specialists is an acknowledged issue for health planners. In an ideal world, applying the Total Workforce Model, fulltime MSP surgical consultants should be available for short-notice deployments, allowing part-time clinicians to prepare their civilian practices for their absence and deploy when ready. Likewise, full-time clinicians should be available to bridge gaps in Reserve capability. A close approximation of this ideal is observed in current task allocation practices for MSP and Reserve critical care specialists. However, there is a risk that over commitment of the relatively small permanent surgical workforce, particularly to tasks where there is a low clinical tempo, will negatively affect retention and clinical capability.

Several MSP registrars are training in intensive care, but there is a dearth of both consultants and registrars for general surgery and orthopaedics. Successive rounds of recruitment to the MSP have not redressed this imbalance. There are several potential reasons why surgical specialists may be harder to recruit into the MSP. Firstly, in its initial years, the MSP explicitly targeted serving MOs within one year of completion of ROSO. These candidates would have spent years working in primary care and may not have secured accredited civilian training positions. Even those MOs who have been offered 'pre-MSP' positions to enhance their competitiveness have often required several years in civilian hospitals prior to selection. Secondly, there may be a greater perceived disparity between military and civilian remuneration for surgeons than for the critical care disciplines. Thirdly, there may be a perceived lack of flexibility regarding options for surgical fellowship training for those in the MSP; in particular, full-time members may not be able to avail themselves of opportunities to pursue subspecialty training overseas, which is a common civilian development pathway.

The competitiveness of ADF MOs for selection into specialist training is particularly an issue for surgery, but potential solutions to the problem apply equally to all MSP disciplines. To an extent, the problem can be bypassed by expanding the pool of candidates eligible for selection into the MSP. Following refinement of the expression of interest process, applications from Reservist specialists and specialists-in-training are now welcomed, and entry is also open to suitable civilian specialist candidates.

Remuneration is a more complex issue. ADF medical procedural specialist pay remains competitive with public sector work in many regions of Australia. However, it is undeniable that some specialties will incur an opportunity cost by choosing military over civilian practice. Therefore, to attract high-quality candidates to the MSP, it is desirable to demonstrate that full-time service can be rewarding in other ways. One means for the ADF to achieve this would be to facilitate streamlined access to high yield learning opportunities such as overseas courses, foreign military exchanges and trauma-oriented sabbaticals, thus affording full-time clinicians professional development opportunities beyond those that would typically be accessible to civilians or Reservists. This approach addresses some weaknesses noted in allied militaries' medical specialist workforce models. It has the potential to enhance both retention and clinical readiness, with effects that are likely to persist following the transition of full-time members to the Reserves.

How might the ADF balance retention with the need to maintain an experienced deployable force?

A significant goal of the MSP was the retention of military MOs beyond their initial ROSO. This goal implies that MSP members must transfer to a different Service category to vacate positions for the next generation of specialists. Unfortunately, this approach has the potential to result in a continually renewing pool of junior consultants; this would be a missed opportunity to use the MSP as a collective repository of corporate knowledge.

Without abandoning the worthy goal of medical officer retention, several options for specialist career progression and promotion are available to allow the ADF to retain some senior consultants within the MSP. Firstly, there is a long-recognised need for inter-Service and inter-SERCAT coordination of specialist capability; this role could readily be performed by delegating elements of technical control to one or more senior Permanent Force specialists. Secondly, there is a need to mentor specialist registrars within each Service. Therefore, MSP supervisor positions could be created within each relevant health unit or within a separate organisational structure. Thirdly, senior MSP consultants could be considered for health leadership positions within each Service and at Joint Health Command. However, in taking on

these positions, it would be necessary to ensure a working model that preserves individual clinical readiness.

How might the MSP be best employed within the Total Workforce Model?

The MSP must be a force-multiplier for Reserve clinicians, not a barrier to their service. Reserve clinicians have a proud history of health support to operations, and the advent of the MSP does not detract from this contribution. Rather, the existence of Permanent Force specialists acknowledges that when there is a need for short-notice deployment, a proportion of Reservists will not be immediately available. Likewise, when deployment windows 'slide left', 'slide right' or broaden, some clinicians who would gladly have served are no longer able to do so.

The MSP was not the only model suggested for providing certainty of supply of medical procedural specialists. One alternative option was a rotation of Reserve specialists through different readiness states, with an on-line member of each of the five specialties guaranteeing their availability at any one time.⁵ Acknowledging this, it behoves all MSP members to consider how the existence of a Permanent Force specialist cadre can offer value to Defence beyond that which might be accrued through a rotation of 'ready Reserves'.

One potential advantage of Permanent Force specialists is fostering long-term professional relationships between individual practitioners and the deployable health units: 2 GHB, the EHSs and MOHU. MSP consultants are often among the longest-serving members of Permanent Force health units and thus are well positioned to manage longterm quality improvement projects and help train new unit members. It has previously been suggested that the MSP could be restructured so that members are directly administered at Joint level, perhaps from within Joint Health Command, to facilitate a more streamlined specialist contribution to health planning and health care provision. However, such a change could produce an MSP workforce less highly integrated with the units with which they will most commonly deploy. So a balance must be struck between Joint capability coordination and strong working relationships at the coalface.

To maximise the scheme's potential, MSP members should be champions of the Total Workforce Model. MSP members who serve with the same unit for extended periods and have contact with a wide pool of Reservist colleagues are ideally positioned to assist their chain of command in finding candidates for a given task. Similarly, MSP members can draw upon the experience of working with a variety of experienced Reservist colleagues when contributing to health units' clinical protocols and guidelines. In the future, it is hoped that there will be further opportunities for specialists to use SERCAT 6 and SERVOP D work patterns to facilitate project work and professional development. This may serve as a model for transition from the MSP to the Reserve Force and vice versa.

It must be acknowledged that, despite the theoretical benefits of Permanent Force specialists, there are some health commanders and Reserve clinicians who have misgivings about the program. It is imperative that opportunities for employment and deployment are allocated equitably and that the MSP is not perceived as acting as a barrier to rewarding Reserve service. Collectively, the authors have observed the benefits of selecting clinical teams to achieve a mixture of service categories, and we highly commend this practice. In the future, it is hoped that clinicians leaving the MSP will transition to the part-time forces, and in doing so, they will promote awareness and acceptance of the program.

What developments are occurring in this area?

The DGOH has commissioned a comprehensive review of specialist capabilities with broad terms of reference that will address many of the areas of discussion mooted in this paper. From this review will emerge considered recommendations, formed through consultation with experienced health commanders, medical specialists and other key stakeholders. This review will set the conditions for the ongoing maturation of the MSP, its alignment with the evolving operational health requirements of the ADF and its integration with supporting capabilities.

Conclusion

The ADF will always require experienced, highreadiness medical specialists to ensure best practice care for our deployed personnel. Currently, the MSP contributes to this need as part of the Total Workforce Model for health. The MSP has matured significantly since its inception, and MSP members regularly contribute to operational health support. In the future, the MSP would benefit from rebalancing specialist disciplines and formalising career development pathways for specialist consultants. Capability can also be enhanced closer links between Permanent and Reserve clinicians. Joint Health Command has initiated a process that promises to consider many of these challenges, giving confidence that the MSP will continue to grow as a repository of corporate knowledge and will generate value beyond the contribution of its individual members.

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