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- 'Military Health Support' in the Australian Defence Force
- Investigating the Prevalence of Non-Communicable Diseases in Veterans with Musculoskeletal Disorders
- Travelling Towards Transition - Considerations for the Military Family

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2021 AMMA CONFERENCE PEARLS OF WISDOM

AMMA ADVANCING MILITARY
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Table of Contents

Editorial

.....	5
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Original Articles

'Military Health Support' in the Australian Defence Force	7
Socioeconomic Factors Affecting the Demand for Dental Services: A Military Population-Based Study, Iran	16
Psychosocial Risk Factors and their Impact on the Performance of Everyday Activities in Canadian Veterans.....	28
Investigating the Prevalence of Non-Communicable Diseases in Veterans with Musculoskeletal Disorders	44

Review Articles

Moral Injury Reconciliation: A Practitioner's Guide for Treating Moral Injury, PTSD, Grief, and Military Sexual Trauma, by Dr Lewis Jeffery Lee.....	52
---	----

Short Communication

General and Specific Benefits from the ADF ARRTS Program	54
An Operational Clinical Skill Set for the ADF General Surgeon: a Proposal and Proof of Concept	59
Malaria Determined Military Outcomes in Burma (Myanmar) Across Three Centuries	62

Case Studies

Acceleration-Induced Atelectasis; a Case with Deceptive Clinical Manifestations for COVID-19 Pneumonia	67
---	----

View From the Front

Operational Clinical Readiness Pathways – An individualised training model to prepare ADF general surgeons for deployment	71
--	----

Commentary

Travelling Towards Transition - Considerations for the Military Family	76
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Special Article

Presentation of the United States Air Medal	79
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The Australasian Military Medicine Association is an independent, professional scientific organisation of health professionals with the objectives of:

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

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

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Editorial

Congratulations to the Journal of Military and Veteran Health reaching its 30 year milestone. In this auspicious year, the Royal Australian Air Force celebrates its 100th birthday and it is my pleasure to pen a short editorial for your next edition.

In the year of the centenary of the Royal Australian Air Force we celebrate a rich history of the many different occupations that have come together over this time in service to deliver air and space power to our nation. The contribution of health personnel is a case in point. As recounted in Air Commodore (Retd) Storey's guest editorial in this journal in July, the association of medicine and military aviation is a long one.

As an aviator, I have been a recipient of Air Force health care over the course of my forty year career, on many bases, exercises and operations. Today's Air Force health service is not the same as the one I first encountered all those years ago. It continues to evolve to meet the needs of our Service, the Joint Force and our nation.

While our health service evolves, our people continue to provide high-quality health care to those in need. They have done so for 100 years and will be needed as we face the next century of Air Force. The Air Force health service is relatively small yet the expectations are high for what it can deliver on our bases, in the air and in times of disaster, both in Australia and abroad. To achieve these expectations, the health workforce is a mix of permanent and part time personnel across many professions from medical technicians and nurses to pharmacists and surgeons. The bulk of the workforce belongs in the permanent force with part time personnel providing different levels of service to meet operational requirements with some of these part time positions at the same readiness notice as our contingent workforce. Through this partnership, highly skilled clinicians can serve their nation in a capacity that is best suited to them while meeting the capability requirements of Air Force.

Direct support of aviation occurs on our bases every day. Aviation Medical Officer's support to operational squadrons and Aerodrome Emergency Health Response are but part of the effort. The Institute of Aviation Medicine is a world class, respected specialist unit that has recently evolved to

provide Senior Aviation Medical Officers on our main bases for direct clinical support, aircrew training and education and mentoring of junior medical officers. Aviation medicine is integral to the human performance and safety aspects of military aviation and the Institute leads that effort.

The reputation of our health services remains strong with our partners in the region. The Indo-Pacific has seen the ADF support peace-keeping, humanitarian assistance and disaster response emergencies as well as enduring and opportunistic training exercises and joint activities. Our health services have contributed equally, relative to our size, to many activities and events in the Indo-Pacific, from Timor Leste and Banda Aceh (Boxing Day Tsunami) to the Solomon Islands, Fiji, Bali and Bougainville. With compassion, skill and courage our Air Force health services, in partnership with other Air Force capabilities face adversity, delivering what is needed in environments that can challenge our steadfastness. Facing that adversity as part of the Joint Force, collaborating within our region and our coalition partners, we know that to be truly effective, we must work together to maximise our effects.

Our health services contribution to operations in Iraq and Afghanistan is the longest example of working with our coalition partners. Our goal to achieve the best possible health outcomes for all coalition forces and, at times, civilians, in the area of operations was challenging. While the recent events in Afghanistan may cause us to reflect, we can be proud of our achievements and the difference we made to the lives of many Afghans.

We continue to demonstrate considerable agility. From December 2019 through 2020 to now domestic support to Operation Bushfire Assist and COVID Assist 19 has been a constant with many tasks in support of the Australian community. These include the short notice assistance to Victorian nursing homes and to the Burnie Base Hospital. Concurrently the aeromedical evacuation support to White Island volcano evacuations, the recent Afghanistan evacuation operation, the maintenance of a constant aeromedical evacuation pathway between the Middle East and Australia and Aviation Medical Officer support to deployed squadrons has kept the health services busy.

The health, including mental health of our people is most important. As we begin to think about life after service, we need to be assured that support services are available and in place as we transition. I continue to work closely with the Chief of Defence Force and other Service Chiefs to ensure our people are well supported and given the opportunity to succeed during their transition to civilian life. We have an obligation. We must not fail.

Mel Hupfeld, AO, DSC
Air Marshal
Chief of Air Force

Cover Photo: Courtesy of Department of Defence, LS Paul Berry

Caption: Critical Care Transport Team Medical Officer, Wing Commander Michael Corkeron, checks on his patient during the flight from Germany to Australia. Mid Caption: RAAF Aeromedical Evacuation (AME) and Critical Care Teams have combined to fly home seven Australian soldiers who were wounded in Afghanistan. After receiving specialist care at the US Landstuhl Regional Medical Centre in Germany, the soldiers were embarked upon an Australian C-17 fitted out with medical equipment for the journey. The four AME Teams and Critical Care Officers deployed at short notice for the mission. The seven soldiers were wounded when an Afghan National Army soldier turned upon them and opened fire immediately following a parade at a patrol base in Kandahar Province. Three Australian soldiers, Captain Bryce Duffy, Corporal Ashley Birt and Lance Corporal Luke Gavin were tragically killed in the incident on October 29, 2011.

'Military Health Support' in the Australian Defence Force

N Westphalen

Introduction

This article follows previous papers by the author, regarding occupational and environmental medicine in the ADF.^{1,2,3,4,5,6,7,8,9,10}

These papers, as well as a 2019 Productivity Commission inquiry,¹¹ indicate that 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 basing the ADF's health services on a systems-based occupational health strategic model.¹²

Doing so would require reassessing the fundamental inputs to capability (FiC)¹³ for both Joint Health Command (JHC) and Defence's Work Health and Safety Branch. The current state of the ADF's occupational and environmental health services, and the small number of civilian specialist practitioners within the Australasian Faculty of Occupational and Environmental Medicine (AFOEM), suggest that a mature holistic and sustainable model would take 10–15 years' sustained effort.

This article expands on these papers regarding health support for ADF operations. As such, it can also be considered a summary thereof.

Definitional clarification

The term 'operational health support' typically refers to the health services that enable *deployed* ADF missions. However, this article demonstrates the need for a term that *also* refers to the health services that enable *non-deployed* ADF operations and the personnel, training, engineering, logistics and other elements *currently* deemed 'non-operational' that facilitate them. Pending an alternative that better describes the necessary health services to support *all* these activities, this paper uses the term 'military health support' (in quotation marks) to recognise the fact that, irrespective of whether they deploy or not, *all* ADF commanders have a mission to perform that requires some form of *targeted* health support.

Factors driving 'military health support'

The health services FiC required to provide 'military health support' should be driven by (but not limited to) the following factors.

Population size. This typically refers to the total number of ADF members assigned to each of the units being supported, but may also include allied or coalition military personnel (permanent and reserve) and entitled non-combatants, such as Defence civilians, contractors, family members without access to civilian health services, and those receiving humanitarian aid/disaster relief health services.¹⁴ The nationwide dispersal of the ADF population, and their high level of geographic mobility even within Australia, pose specific challenges for the ADF's health services.

Population demographics. A previous article describes how this factor's importance pertains to how it contributes to disease and non-battle injuries.¹⁵ The demographic features of most importance to providing health support for ADF members compared to civilians include (but are not limited to) the following:

- Younger working age (31% aged less than 25 in 2015, compared to 12.6% of the Australian population aged 15–25 in 2018).¹⁶ The relevance of this factor pertains to the prevention and treatment of (as examples) their sports injuries, mental health disorders and alcohol/other drug abuse¹⁷
- Relatively short periods of service within typical 40- to 50-year working lifetimes (37.6% serve five years or less, much of which is devoted to training),¹⁸ to which can be added posting cycles resulting in up to a third of all ADF members having less than 12-months experience in their current job at any one time. The ensuing lack of workplace experience further increases their risk of workplace-related illness or injury¹⁹
- A predominantly male population (83.5% as of 2017, to be reduced to 80.1% by 2023)²⁰ has important implications regarding the nature and extent of ADF sports injuries and mental health disorders, to which can be added horseplay and

other risk-taking behaviours. Consideration also has to be given to workplace hazards effects on ADF women of childbearing age (88% aged under 50 in 2015),²¹ noting that the ADF Medical Employment Classification system indicates that 634 ADF members were known to be pregnant as of 1 March 2020

It is important to note that combining these population attributes constitute a 'perfect storm' regarding workplace-related illness and injury risks among ADF personnel.

Non-operational workplace hazards. A previous article describes how these include (but are not limited to):

- biological hazards, such as vector-, food- and waterborne infectious diseases
- physical hazards, such as climate extremes (both heat and cold), noise and vibration, and ionising and non-ionising radiation
- chemical hazards, such as heavy metals, asbestos, fuel and diesel exhaust, in the form of dust, mist, fumes and/or vapours
- ergonomic hazards, such as manual handling and uneven or moving working surfaces
- psychosocial hazards, such as excessive, insufficient or purposeless workloads, shift work, fatigue, social/family isolation (especially noting the aforementioned high levels of geographic mobility even without deploying), and various forms of unacceptable behaviour such as bullying and harassment²²

Although many of these hazards can and should be managed by the relevant civilian public health agencies (particularly in the base setting), the ADF also needs to deal with them where and when these agencies cannot or will not do so.

To these can be added environmental hazards associated with the ADF's aviation, diving and submarine capabilities,²³ and the unique combination of these hazards in the maritime environment even in peacetime, such as:

- accidents ranging from slips, trips and falls, to injuries resulting from fire, flooding, electrical hazards, and chemical and non-ionising radiation exposures. Examples of these injuries include noise-induced hearing loss, poisonings and penetrating and blunt trauma
- biological hazards, typically reflecting crowded living conditions that necessitate a high standard of personal and population hygiene to prevent the transmission of gastrointestinal, respiratory and other infectious diseases

- psychosocial hazards secondary to isolation from family and other domestic social supports for extended periods, living in close proximity with other people, long working hours (including shift work and poor sleep) interspersed with periods of boredom resulting in fatigue, and acute and post-traumatic stress in the event of being involved in or witnessing an incident resulting in death, serious injury or near miss²⁴

Current work health and safety legislation imposes a duty of care on commanders to minimise exposures to workplace hazards.²⁵ However, the disproportionate compensation costs of preventable workplace illness and injury that are shifted to the Department of Veteran's Affairs (DVA) by the ADF—compared to civilian employer insurers (even for ADF members who have never deployed)—confirm the need to improve how the ADF reports and manages them.^{26,27,28,29} This paper not only asserts this can best be achieved with an occupational health-based systems model—given how the ADF's workplace hazards are not limited to the deployed setting—but the application of this model should not unduly differentiate between ADF units that deploy and those that do not, as at present.

Operational workplace hazards. In addition to these non-operational workplace hazards, ADF members may also confront hazards posed by weapons such as knives, clubs, small arms, grenades, mortar and artillery rounds, sea and land mines, and sea-, land- and air-launched missiles and torpedoes, to which can be added atypical weapons such as lasers. These can cause death or injury secondary to penetrating wounds, blunt trauma, drowning or near-drowning, blast injuries and/or burns. Nuclear and other radiological weapons pose additional physical hazards, as do biological hazards from weaponised bacteria, viruses and toxins, and chemical hazards from weaponised blistering, choking and nerve agents.^{30,31}

Even without the current work health and safety legislation, ADF combat commanders have always had an obligation to achieve their mission while minimising battle casualties. This obligation extends to the personnel they lead and the superiors whose orders they obey, as well as to the government, family members and the nation in general, in the interests of:

- maintaining unit and national morale and willingness to fight
- maintaining operational capability (including but by no means limited to simply conserving personnel)

- reducing—as far as possible—the costs of postwar compensation and rehabilitation^{32,33}

These objectives are achieved by a range of measures, such as:

- non-medical mission-specific training and exercise preparations, supported by the relevant health-related recruiting, individual readiness, assessment and promotion (i.e. not just treatment) services.³⁴ It should be noted that, in order to maintain operational capability, the non-medical preparations, in particular, should not create their own preventable illnesses and injuries³⁵
- *where* (see above), *what* and *how* the mission (see below) is conducted, likewise supported by the relevant health promotion, treatment, and casualty evacuation services^{36,37,38}
- non-medical post-mission welfare and other services, supported by the relevant treatment, health promotion and surveillance, rehabilitation and compensation services^{39,40,41,42}

These considerations further reinforce the assertion of this and previous papers that to maintain personnel and national morale, facilitate operational capability and contain compensation costs, the plethora of health services required before, during and after ADF operations (deployed or not) are best managed by incorporating them all into a broader occupational-health-based systems model.

Commander's missions. As previously indicated, this article uses the term 'military health support' to acknowledge that, irrespective of whether or not their units deploy, *all* ADF commanders have a mission of some kind to perform.

The range of such missions—and the associated hazards—should not be underestimated. They begin for most ADF personnel with recruit training at *Cerberus*, Kapooka and RAAF Base Wagga, or initial officer training at the Australian Defence Force Academy, *Creswell*, Duntroon and RAAF Base East Sale. They include all those associated with living among strangers in a new and isolated environment, heretofore unfamiliar forms of physical training and other activities, such as weapons handling.

ADF members then undergo further job-specific training before proceeding to their first non-training unit. The hazards associated with some job-specific training can drive the need for dedicated health support. For example, clearance and ship's diver training at the RAN Diving School at HMAS *Penguin* is supported by the co-located Submarine

and Underwater Medicine Unit.⁴³ This paper contends that this general principle should extend to less-esoteric training environments, such as chefs learning to handle hot food and cooking implements, mechanics learning to operate and maintain rotating machinery, and electricians learning to deal with uncontrolled electrocution hazards. Even 'box-packer' logistics personnel need to become familiar with warehouse hazards such as side lifters, scissor lifts, forklifts and other stores-handling equipment.

Furthermore, many of these hazards remain extant in their post-training workplaces. Many commanders who lead these workplaces conduct a wide range of non-deployed training activities to prepare them for their operational role, not only at places such as RAAF Base Williamstown near Newcastle (76 and 77 Squadrons) but also remote locations such as RAAF Base Tindal (75 Squadron, all currently transitioning to F-35 Lightnings at the time of writing).⁴⁴ However, even when not deployed—or even preparing to deploy—many other commanders have an operational mission to perform. For example, 92 Wing routinely conducts maritime patrol and surveillance of the oceans around Australia (an area totalling up to 26 million square kilometres) from RAAF Base Edinburgh.⁴⁵

Other commanders have as their mission the direct support of units that conduct operations from their base as a matter of course: besides Edinburgh itself, other examples include the Fleet bases at *Kuttatbul*, *Cairns*, *Coonawarra* and *Stirling*, and RAAF bases such as Amberley regarding 36 Squadron (C-17 Globemasters), and Richmond regarding 37 Squadron (C-130 Hercules). Still other base commanders perform this role on an occasional basis, additional to their primary mission. For example, besides supporting 2 Flying Training School (PC-21 trainers) and 79 Squadron (Hawk 127 fighter-trainers), RAAF Base Pearce also supports 92 Wing's Indian Ocean operations when required.

Therefore, this paper asserts that the health services provided for ADF commanders should not only reflect those who deploy but *all* the missions of *all* commanders. This assertion is premised on the extent to which the health services required for (as examples) headquarters such as Russell Offices, Joint Operations Command or Anglesea Barracks are not the same as that required for training establishments such as *Watson*, Kapooka or East Sale, or support bases such as *Stirling*, Laverack or Williamstown. This premise simply acknowledges the extent to which each of these locations has its own unique combination of workplace hazards, for which commanders require occupational *health* (not just *safety*) support.

However, such support is not provided at present by either JHC or the Defence Work Health and Safety branch. This was referred to by the previous SGADF, who, among other issues, referred to commanders complaining that ADF health staff were not considering their duty of care obligations per the 2011 *Work Health and Safety Act*.⁴⁶ This further reinforces the assertion of this and previous papers that the plethora of health services required to support ADF commanders and their missions in the non-deployed and deployed setting is best accomplished with an occupational-health-based systems model.



Bayonet assault course, Kapooka, 2006⁴⁷
The purpose of this image is to demonstrate the injury potential associated with non-operational infantry training, even with a simulated weapon. The scope of 'military health support' for activities such as these includes the prevention—or at least limiting—of the more egregious forms of eminently avoidable injuries, as well as their timely assessment (not only clinical, but also employability/deployability), treatment, rehabilitation and compensation.



Touch rugby game, Japan, 2019⁴⁸
While acknowledging some of the physical and morale benefits of sport, there is also a need to better recognise the cost to operational capability associated with the ensuing injuries, especially those that are eminently avoidable.



Aircraft loading ramp, RAAF Base Amberley, 2020⁴⁹
This image demonstrates the extent to which, although clearly non-deployable, bases such as Amberley directly support ADF operations. In this instance, besides those associated with aircraft flight lines in general, readers may also like to consider the workplace hazards associated with preparing and loading these pallets onto the scissor lifts used to load the aircraft. The scope of 'military health support' extends beyond treating injuries from such tasks and facilitating their prevention, as well as rehabilitation and compensation.



Ship's galley, HMAS Adelaide, 2020⁵⁰
This image illustrates how the scope of cookery training (in this instance) is not limited to food preparation but also the safe use of the associated equipment. Hence, the scope of 'military health support' is not limited to treating injuries when trainees get it wrong, but also supporting their prevention, as well as rehabilitation and compensation.

Access to civilian health services. The ADF's size precludes its ability, or indeed the need, to provide health services in total isolation from those provided for the civilian community, especially for ADF units based in or near the nation's major

population centres. On the other hand, the ADF routinely deploys operational units with organic health services, and even dedicated health units, to locations within Australia and overseas, where civilian health services either do not exist, or do not provide a level of care deemed acceptable to the ADF or the Australian civilian community.

Even so, it is also essential to appreciate the extent to which the treatment services provided for Australian civilian communities—even in the major centres—only constitute a baseline level of health support for ADF personnel and their commanders. In particular, they have no remit to:

- support ADF workplace operational capability by preventing workplace injuries or enabling their early return to work after such injuries by timely treatment and rehabilitation
 - facilitate the eventual return of all ADF members to the civilian community at the end of their permanent and/or reserve service.⁵¹
- As previously indicated, the 2019 Productivity Commission inquiry has identified a range of shortfalls to this end within both Defence and DVA⁵²

Besides the aforementioned workplaces that require bespoke health services to support the ADF's aviation, diving and submarine capabilities,⁵³ previous articles have explained why all ADF workplaces require additional health services that are not readily available in the civilian community.^{54,55,56,57,58,59} Furthermore, the nationwide distribution of ADF workplaces explains why its casualty evacuation requirements are not limited to its deployed personnel, but include ADF workplaces in remote locations within Australia, and ADF members such as reservists on course, who became ill or injured away from home.⁶⁰ This paper asserts that these additional health services can best be provided as part of an occupational health-based systems model.

Conclusion

With ADF personnel arguably exposed to the most diverse range of occupational and environmental hazards of any Australian workforce, high rates of

preventable workplace illness and injury indicate the need to improve the management of occupational and environmental health hazards, with better emphasis on prevention than treatment.

Since the late 1970s, the ADF has undergone substantial changes in how it is organised to deploy and how its deployed elements are supported.⁶¹ With these changes has come an assumption that the scope of the ADF's health services can be limited to supporting its deployed elements while contracting out the rest, rather than enabling *all* the relevant missions of *all* ADF commanders. This paper explains why the scope of providing health support for non-deployed ADF commanders and their personnel extends beyond simply providing treatment services. In fact, although the depth of the health services they require varies according to the mission(s) being supported, their overall scope is exactly the same as for their deployed counterparts. In addition, this paper describes why the plethora of missions conducted by ADF commanders from a multiplicity of locations within Australia precludes a 'one-size-fits-all' solution to providing efficient as well as effective targeted health support.

These considerations support the contention that the ADF's health services should be premised on an occupational health-based systems model, with revised FiC leading to a range of genuinely holistic, sustainable and fit-for-purpose health services over the next 10–15 years.

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.

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- 12 RACP submission to the draft Productivity Commission report, A Better Way to Support Veterans. Royal Australasian College of Physicians 2019 Feb. Available from: https://www.pc.gov.au/_data/assets/pdf_file/0003/236811/subdr234-veterans.pdf. 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.
- 13 See Department of Defence, Defence Capability Development Handbook, 2012. Available from: <http://www.defence.gov.au/publications/DefenceCapabilityDevelopmentHandbook2012.pdf>. This reference describes the following Fundamental inputs to (in this case health) Capability (FiC).
 - Personnel;
 - Organisation;
 - Collective training;
 - Facilities;
 - Supplies;
 - Major systems;
 - Support, and
 - Command and management.
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Socioeconomic factors affecting the demand for dental services: A military population-based study, Iran

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Abstract

Purpose: A better understanding of demand behaviours regarding dental services can help oral health planning for military personnel and their families. The objective of this study was to investigate the socio-economic factors affecting the demand for dental services among the military-sector-affiliated families (MSAFs).

Methods: The present study was cross-sectional descriptive-analytical research conducted in Tehran metropolis in 2019. The sample size was 385 heads of MSAFs selected using the multiple-stage method (stratified-clustering). The study questionnaire was designed according to the conceptual research model. Ten experts assessed its face and content validity using CVI and CVR indices. Reliability was measured by Cronbach's alpha coefficient, which was 0.82. Four hundred participants took part in filling on the questionnaire. All analyses performed using SPSS 16 and the logistic regression model.

Results: Findings of the present study showed that more than 21% of people required dental services but did not actually demand these services. Although people living in the south of Tehran metropolis felt more in need of dental services (OR: 3.63, $P = 0.063$), the potential of demand for dental services among them was significantly lower than people living in the centre (OR: 0.25, $P = 0.049$).

Conclusion: There were statistically significant geographical inequalities in the need and demand for dental services among the MSAFs. Measures should be taken to provide active dental screening according to the socio-economic status of military families in Tehran.

Keywords: Socio-economic status, Dental health, Military personnel, Iran.

Introduction

Determining socio-economic factors affecting disease has an important role in promoting the health of individuals and society as a whole, and is considered a basic human right today.¹ Socio-economic status can be deemed one of the main causes of major health issues; therefore, factors influencing social health might account for the emerging features of inequalities in any national health system.² Therefore, the World Health Organization pays special attention to addressing health inequalities and identifying the underlying socio-economic causes, especially in low and middle-income countries (LMICs). However, there is a lack of research on health topics in these countries, so it is of great concern to investigate household health conditions, determine and analyse their related socio-economic determinants for better comprehensive understanding.^{3,4}

One of these major health problems is oral and dental health, which affect individual and social activities, labour force engagement and mental health.⁵ According to the literature, dental problems have a profound effect on the quality of life.^{5,6} It is also associated with other chronic medical diseases,⁷ in addition to functional, social and psychological constraints.⁸ Drawing on the results of the Harford and Chrisopoulos study in Australia, the average estimated financial loss in labour productivity as a result of oral health problems was 453 million USD per year, and the average working hours lost per worker was 1.56.⁹ In addition, dental health reports from the United States revealed that there is a correlation between oral and dental diseases and cardiovascular consequences, respiratory infections and pregnancy problems including premature and low weight births.¹⁰

Oral and dental diseases are asymptomatic in the early stages and characterised by slow progression; thereby, they can be diagnosed and easily treated through regular and periodic check-ups in the early stages.¹⁰ Given the treatment costs, a significant reduction in future costs can be achieved by timely referral and prompt demand for such care.¹¹ However, the shortage in health insurance coverage for dental services, the economic inflation and financial hardship, and increased dental services costs have a greater impact on the access to these services, especially for poor and low-income groups in developing countries. The most important barriers to access oral and dental health services in such countries include scarcity of financial resources, increased medical expenses and long distances to medical centres.¹²⁻¹⁴ Consequently, the accessibility of individuals and households to oral and dental health services should be constantly monitored. In addition, the underlying factors affecting the utilisation of these services have to be identified and evaluated.

As one of the LMICs, the social and economic inequalities arising in the use of dental services in Iran have not received the necessary interest in terms of research; therefore, few studies are available in this regard.¹⁵ Reasons such as cultural, moral and religious differences, and the range of diseases have made patient referrals and demand on dental services complex and extensive.¹⁶ Hence, there is a pressing need to further examine the socio-economic context influencing the demand for dental services.

Depending on research in the fields of epidemiology and health economics, socio-economic factors have been conventionally defined in accordance with three main criteria; income, education and employment.¹⁷ Previous studies on dental services showed that other factors could be added to the three criteria due to direct and indirect effects. These factors encompass anxiety, fear, medical records, waiting time, availability, insurance coverage and out-of-pocket payment can be listed as prerequisites for the need and demand for dental services.¹⁸

As one of the largest cities in the world, Tehran, the capital of Iran, has a large population. This has led to profound variations between household living standards in terms of social, economic and cultural conditions.¹⁹ The diversity among Tehrani inhabitants represents a good opportunity for researchers to assess and identify socio-economic factors affecting oral and dental health. To the best of our knowledge, no study has been conducted on the behaviour towards dental services among the military-sector-affiliated families (MSAFs). In

Iran, the Armed Forces Medical Service Insurance Organization (AFMIO) presents a health insurance program for military members, their dependents, veterans, retirees and some survivors. The AFMIO also provides compulsory dental insurance to MSAFs. All MSAFs are covered under this dental insurance. MSAFs are free to use military dental centres or under-contract private centres; part of the charges will be financed by the AFMIO. This study aimed to investigate the socio-economic factors affecting the demand for dental services among MSAFs. It could help better understand customers' behaviour in the dental services sector and provide guidelines for essential oral and dental health planning for the MSAFs.

Oral health is an important issue for military personnel and their families. However, there is still little knowledge about the behaviour of MSAFs for dental services from the perspective of health economics. A correct explanation of dental demand function can make it possible to analyse the demand elasticity of dental health services, leading to more adaptation of services provided to the expectations of military personnel and their families. The specific characteristics of dental services, such as the effectiveness of preventive measures, non-emergency and individual-based decision making for visiting and receiving services, justify economic studies of these services, especially of consumption behaviour of MSAFs in both dimensions of need and demand based on the population-based approach. In this study, in addition to the three main socio-economic variables affecting the consumption behaviour of dental services, the variables of anxiety and fear were studied for the first time in the demand function estimation approach.

Methods

The present study is cross-sectional descriptive-analytical research that was conducted in 2019. The study population consists of all the heads in the MSAFs who had at least one year of permanent residence in one of the 22 urban districts of Tehran city. MSAFs have been defined as the immediate family members related by blood, marriage or adoption to a person of the armed forces (employing or retired), including the spouse/partner, children and father/mother living with them. Three hundred eighty-five participants were recruited to take part in this study. The sample size was calculated based on the formula shown below at $P=50\%$, 95% confidence level ($\alpha = 0.05$) and error ($d = 0.05$).

$$n = \frac{z^2_{1-\frac{\alpha}{2}} p(1-P)}{d^2} = \frac{(1.9596)^2 \times 0.5 \times 0.5}{(0.05)^2} \approx 385$$

Due to the lack of access to information of MSAFs in Tehran, sampling was performed using a multiple-stage method (stratified-clustering). For this purpose, the 22 districts in Tehran were divided into five general districts; north, south, centre, east and west (as strata). Afterwards, the Etkā stores (affiliated with the Iranian Armed Forces) in Tehran were identified according to the five districts, and one store was randomly selected in each area to form the sample (as a cluster). Finally, 80 heads of family referring to each of these stores were voluntarily and randomly selected to participate in filling in the questionnaire.

The present research was performed in three phases. In the first phase, the main variables affecting the utilisation of dental services were identified by reviewing the relevant literature. These variables include demographic factors (age, sex, household size, marital status and race/ethnicity), traditional socio-economic factors (occupation status, income and education level) and complementary factors (anxiety, fear, waiting time, access (place of residence), insurance coverage and the service price).¹⁸ Some factors were excluded, which are less common and also those similar among the population, including insurance type, service price and race. In the second stage, a preliminary questionnaire was prepared and psychometrically evaluated according to the variables presented in the conceptual research model. For this aim, face and content validity of the questionnaire were assessed using CVI (Content Validity Index) and CVR (Content Validity Rate) indices by 10 experts. The CVI index ranged from 1 to 0.08, and the CVR index ranged from 1 to 0.6, which were accepted as the minimum scores for each group. Then, the questionnaire reliability was measured using Cronbach's alpha coefficient, which was achieved at 0.82 based on the data collected in the pilot study included 40 heads of family in one of the Etkā stores. The customised questionnaire consisted of 4 parts, and a total of 44 items. The first part (3 items) was related to the demand for dental services, and the second part (4 items on a Likert scale) was on anxiety, while the third part included (19 10-point items) on fear. The fourth part was related to the sociodemographic and economic information about the head of the family (18 questions). The 3 items of the first part of the questionnaire are details as follows. The first item was considered in the form of a table and items A, B and C, which include: A) The need of family head and each member to dental services during the past year (closed question with yes and no answer); B) Referring and receiving dental services by family head and each member during the past year (closed question with yes and no answer); and C) Type of dental services received (closed question), co-payment (open question), place of service (closed question),

basic and supplementary insurance coverage (closed question) and the number of referrals for receiving dental services (open question). The second item considered the cost of paying for travel to the medical centre (open question). The third item considered the average waiting time to receive the service in the medical centre (open question). Waiting time was defined as the time spent by subjects in the waiting room at their last dental visit.

In the final stage, after confirming the questionnaire in terms of psychometrics and reliability, the necessary permissions were obtained to refer to Etkā stores to collect data by coordinating with the relevant centres. In addition, informed consent was obtained from the participants provided with guidance and explanations illustrating the aim and purpose of the study. The questionnaire was completed by the head of the MSAFs. Sampling was carried out during weekdays and mostly in the evening due to peak store visitors. This continued up to meeting the sufficient samples size. To get the required number of valid questionnaires, 400 were distributed and completed by the heads of families.

Using SPSS version 16, data were analysed descriptively and by applying logistic regression models were used to estimate the factors affecting the demand for dental services. Moreover, the ethical approval for the study had been obtained from the Research Ethics Committee of Baqiyatallah University of Medical Sciences.

Results

Table 1 shows the sociodemographic data of the participants in the study. According to the findings, 70% of the participants (281) in the last year required dental services; however, 21% (61 participants) of them did not visit a medical centre to receive these services. The highest non-referral rates were related to males (22%), married (23%), diploma and degree holders (35%), employed (22%), residents in southern Tehran (53%), their average age was 40.9 ± 8 years, the average income of 816.93 US\$ per month and the average family size was 3.5 individual in the household.

Table 2 illustrates the complementary variables in the study. Based on the results, the highest non-referral rate was related to participants who experienced mild anxiety ($\approx 24\%$), followed by moderate anxiety ($\approx 21\%$), then severe anxiety (12.5%). Regarding the degree of fear, the highest rate of non-referral belonged to the group that experienced moderate fear (25.2%). Moreover, the participants who visited the dental clinic and received their services have waited for about 76.34 ± 53.43 minutes, while those who did not receive have waited for 107 ± 71.9 minutes in their last refer.

Table 1. Demographic and classical variables studied in the research

Variables			Need-based dental services (Need for treatment)			Demand-based dental services (Attendance for treatment)		
			Yes	No	Total	Yes	No	Total
Sex	Female	N(%)	24(68.60)	11(31.40)	35(100)	21(87.50)	3(12.5)	24(100)
	Male	N(%)	257(70.40)	108(29.60)	365(100)	199(77.40)	58(22.60)	257(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Marital status	Single	N(%)	20(52.60)	18(47.40)	38(100)	19(95)	1(5)	20(100)
	Married	N(%)	247(71.80)	97(28.20)	344(100)	188(76.10)	59(23.90)	247(100)
	Death of a spouse	N(%)	8(66.70)	4(33.30)	12(100)	7(87.50)	1(12.50)	8(100)
	Divorced	N(%)	6(100)	0(0)	6(100)	6(100)	0(0)	6(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
	High school	N(%)	12(44.40)	15(55.60)	27(100)	10(83.30)	2(16.70)	12(100)
	Diploma	N(%)	45(72.60)	17(27.40)	62(100)	29(64.40)	16(35.60)	45(100)
Education level	Above diploma	N(%)	50(64.10)	28(35.90)	78(100)	34(68)	16(32)	50(100)
	BSc	N(%)	94(66.70)	47(33.30)	141(100)	79(84)	15(16)	94(100)
	MSc	N(%)	60(85.70)	10(14.30)	70(100)	48(80)	12(20)	60(100)
	PhD	N(%)	20(90.90)	2(9.10)	22(100)	20(100)	0(0)	20(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Employment status	Employed	N(%)	246(72.80)	92(27.20)	338(100)	192(78)	54(22)	246(100)
	Retired	N(%)	35(56.50)	27(43.50)	62(100)	28(80)	7(20)	35(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Place of residence	North	N(%)	40(87)	6(13)	46(100)	34(85)	6(15)	40(100)
	South	N(%)	13(81.30)	3(18.80)	16(100)	6(46.20)	7(53.80)	13(100)
	West	N(%)	37(54.40)	31(45.60)	68(100)	32(86.50)	5(13.50)	37(100)
	East	N(%)	160(75.10)	53(24.90)	213(100)	124(77.50)	36(22.50)	160(100)
	Centre	N(%)	31(54.40)	26(45.60)	57(100)	24(77.40)	7(22.60)	31(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Age	N	person	281	119	400	220	61	281
	Mean	Year	40.54	41.37	-	40.42	40.95	-
	SD	Year	±9.36	±13.26	-	±9.60	±8.50	-
Household size	N	person	281	119	400	220	61	281
	Mean	person	3.46	3.06	-	3.44	3.56	-
	SD	person	±1.21	±1.25	-	±1.24	±1.10	-
Income	N	person	281	119	400	220	61	281
	Mean	US\$1	897.94\$	791.11\$	-	920.40\$	816.93\$	-
	SD	US\$	±34.8	±28.5	-	±37.03	±23.8	-

1. One US dollar considered as 42000 I.R.Rials

Table 2. Complementary variables in the study

Variables			Need-based dental services (Need for treatment)			Demand-based dental services (Attendance for treatment)		
			Yes	No	Total	Yes	No	Total
Anxiety	Mild	N(%)	163(67.10)	80(32.90)	243(100)	124(76.10)	39(23.90)	163(100)
	Moderate	N(%)	86(73.50)	31(26.50)	117(100)	68(79.10)	18(20.90)	86(100)
	Severe	N(%)	32(80)	8(20)	40(100)	28(87.50)	4(12.50)	32(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Fear	Low	N(%)	127(64.80)	69(35.20)	196(100)	103(81.10)	24(18.90)	127(100)
	Moderate	N(%)	123(74.10)	43(25.90)	166(100)	92(74.80)	31(25.20)	123(100)
	High	N(%)	31(81.60)	7(18.40)	38(100)	25(80.60)	6(19.40)	31(100)
	Total	N(%)	281(70.30)	119(29.80)	400(100)	220(78.30)	61(21.70)	281(100)
Waiting time	N	person	281	119	400	220	61	281
	Mean	Minute	83.02	72.35	-	76.34	107.13	-
	SD	Minute	±59.19	±54.04	-	±53.43	±71.92	-

Table 3 shows the logistic regression model results of the factors affecting the need for dental services. Based on the findings, there were some statistically significant differences in terms of the need for dental services between different socio-economic groups. The need for dental services of PhD holders was higher than others regarding their educational level. This difference was statistically significant when compared with high school, above diploma and BSc degree holders. Employed participants reported a decrease in their need for dental services than retired ones, and this difference was also statistically significant (OR: 2.06, $P = 0.011$). Also, the need for dental services among the residents of the north (OR:5.59, $P = 0.001$), south (OR:3.63, $P = 0.063$) and east (OR:2.53, $P = 0.003$) of the city were significantly higher than those residents in the city centre, respectively. Furthermore, those people who have experienced high fear demonstrated a need for dental services more than those in the group of low fear. (OR:2.41, $P = 0.048$). Increased waiting time and household size increased the likelihood of the need for dental services (OR: 1.00, 1.32, $P < 0.1$).

Table 4 illustrates the logistic regression model results of the factors affecting the demand for dental services. According to the obtained results, the place of residence was the only socio-economic factor that had a considered effect. The residents in southern Tehran reported less demand for dental services than those in the centre; this difference was statistically significant (OR: 0.25, $P = 0.049$). In addition, the

odds of the residents in the north, west and east of Tehran demanding dental services was 1.6, 1.8 and 1.01 times higher than that of the residents in Tehran centre; however, this difference was not statistically significant.

Discussion

This study was conducted to estimate the demand for dental services among the MSAFs in Tehran city. Based on the sampling method, the number of selected subjects in each Etkra store (north, south, east, west and centre) was equally selected to achieve a residence in all regions of Tehran city. However, the final distribution of the selected samples was asymmetrical in the residential area (north 12%, south 4%, east 53%, west 17% and centre 14%) because the MSAFs were completely free to refer to any Etkra stores (it is not compulsory for them to refer to their living area shopping centres). Another noteworthy point is that Tehran's military settlements and medical centres are mainly located in its eastern region, so the ratio of relevant samples in the eastern category has been more than other categories, demonstrating MSAFs geographical density.

The present study's findings show that more than 21% of people required dental services but did not refer to receive these services. The highest non-referral rates were related to men (22%), married people (23%), diploma group (35%), employed group (22%) and residents of the south of Tehran (53%).

Table 3. Logistic regression results of factors affecting the need for dental services

Variable / response variable: need		Coef.	Std. Error	Sig.	OR	95% CI	
						Lower	Upper
Sex (Ref: Female)	Male	-0.087	0.38	0.820	0.92	0.43	1.94
	Married	-21.097	16407.93	0.999	0.0000000007	-	-
Marital status (Ref: Single)	Death of a spouse	-20.268	16407.93	0.999	0.0000000016	-	-
	Divorced	-20.510	16407.93	0.999	0.0000000012	-	-
Education level (Ref: PhD)	High school	-2.526	0.84	0.003	0.08	0.02	0.41
	Diploma	-1.329	0.79	0.094	0.27	0.06	1.26
	Above diploma	-1.723	0.78	0.027	0.18	0.04	0.82
	BSc	-1.609	0.76	0.035	0.20	0.05	0.89
	MSc	-0.511	0.86	0.532	0.60	0.12	2.97
Employment status (Ref: Retired)	Employed	0.724	0.28	0.011	2.06	1.18	3.60
Place of residence (Ref: Centre)	North	1.721	0.51	0.001	5.59	2.05	15.26
	South	1.290	0.69	0.063	3.63	0.93	14.15
	West	0.001	0.36	0.998	1.00	0.49	2.03
	East	0.929	0.31	0.003	2.53	1.38	4.65
Anxiety (Ref: Mild)	Moderate	0.309	0.25	0.217	1.36	0.83	2.22
	Severe	0.675	0.42	0.107	1.96	0.87	4.46
Fear (Ref: Low)	Moderate	0.441	0.23	0.057	1.55	0.99	2.45
	High	0.878	0.44	0.048	2.41	1.01	5.75
Waiting time		0.003	0.00	0.093	1.00	1.00	1.01
Age		-0.007	0.01	0.475	0.99	0.97	1.01
Household size		0.275	0.09	0.003	1.32	1.10	1.58
Income		0.000000273	0.00000009	0.999	1.00	1.00	1.00

According to the results of previous studies, the delay in timely demand on dental services in Iran has led to the rise of tooth extraction as a treatment strategy, followed by dental prostheses during the 40 and 50 age groups.^{20, 21} Although almost all teeth are kept healthy between the ages between 35 and 40 years in developed countries, unfortunately, the average age of those with healthy teeth among Iranians is around 21 to 21.7 years old based on the statistics of the Oral Health Department in the Ministry of Health.²²

The findings demonstrate the need for dental

services in the PhD group was significantly higher than the high school (OR: 0.08, $P = 0.003$), diploma (OR: 0.27, $P = 0.094$), above diploma (OR: 0.18, $P = 0.027$) and BSc degrees (OR: 0.20, $P = 0.035$). These findings were consistent with preceding studies in the literature that revealed lower education levels and consequent lack of enough health information account for 60% of the differences in social groups in the volume and severity of disorders and diseases.²³ Studies by Lee and Brown showed that higher levels of education are associated with better utilisation of dental services.^{24,25} Additionally, Thumboo et al.

Table 4. Logistic regression results of factors affecting the demand for dental services

Variable / response variable: demand		Coef.	Std. Error	Sig.	OR	95% CI	
						Lower	Upper
Sex (Ref: Female)	Male	0.71	0.64	0.261	2.04	0.59	7.08
	Married	-18.258	5.81	0.999	0.000000012	-	-
Marital status (Ref: Single)	Death of a spouse	-20.044	6.07	0.999	0.000000002	-	-
	Divorced	-19.257	4.00	0.999	0.000000004	-	-
	High school	-19.593	0.84	0.998	0.000000003	-	-
Education level (Ref: PhD)	Diploma	-20.608	0.87	0.998	0.000000001	-	-
	Above diploma	-20.449	0.89	0.998	0.000000001	-	-
	BSc	-19.542	0.61	0.998	0.000000003	-	-
	MSc	-19.817	0.37	0.998	0.000000002	-	-
Employment status (Ref: Retired)	Employed	-0.12	0.45	0.793	0.89	0.37	2.15
	North	0.50	0.62	0.415	1.65	0.49	5.54
Place of residence (Ref: Centre)	South	-1.39	0.70	0.049	0.25	0.06	0.99
	West	0.62	0.65	0.333	1.87	0.53	6.61
	East	0.01	0.47	0.992	1.01	0.40	2.52
Anxiety (Ref: Mild)	Moderate	0.17	0.32	0.593	1.19	0.63	2.24
	Severe	0.79	0.57	0.163	2.20	0.73	6.67
Fear (Ref: Low)	Moderate	0.03	0.51	0.954	1.03	0.38	2.79
	High	-0.34	0.50	0.497	0.71	0.27	1.90
Waiting time		-.008	0.01	0.490	0.99	0.98	1.01
Age		-0.006	0.02	0.696	0.99	0.97	1.02
Household size		-0.082	0.12	0.490	0.92	0.73	1.16
Income		0.00000025	0.00000012	0.998	1.00	1.00	1.00

found that the score of physical and mental health submeasures increased by 0.6 to 0.5 points per each additional academic year.²⁶ Howlader, Kiuila and Mieszkowski reported a strong relationship between education and health status, and there was a remarkable influence of education on health status mentioned in Pedrick study.²⁷⁻²⁹ In a study conducted in China, Ma and McGhee reported a positive and significant relationship between the level of education and increasing the quality of life score in terms of physical and mental health.³⁰ Furthermore, a local study on the Iran provinces

carried out by Vahdaninia showed that less-educated people had a poor health status when compared with well-educated ones.³¹

The results of the present study showed that the need for dental services in employees was significantly higher than retired (OR: 2.06, P = 0.011). This means that employed people feel their need for dental services 2.06 times more than retired people. This significant difference can be attributed to their higher sensitivity to their needs for oral and dental care, importance of their good appearance among

colleagues in the workplace, and the more elasticity to dental services costs they enjoy. According to Bonakdarchian et al., the rootlessness level is reported much lower in employees than retirees, which could be the reason for the sense of need, consequently, more referral and receiving dental services.³² In the same vein, housewives and the unemployed pay less attention to their health compared to employees, according to Vahdaninia's study.³¹ Asfar et al. and McFaden conducted two studies in Syria and the United Kingdom, respectively and demonstrated that unemployment was a predictive factor in assessing individuals lower level of health.^{33,34} Ma and McGhee's research also displayed that employment in specialised occupations has a positive and significant relationship with an individual's assessment of better physical and mental health status compared to simple occupations and unemployment.³⁰ Investigating the social factors affecting health indicates that education, income and employment, are the three main variables in determining the socio-economic conditions of individuals.¹⁷ Meanwhile, employment, the most important factor in determining the level of income, can significantly impact the health status of the individual as well as society. On the other hand, employment is usually positively associated with health insurance coverage of some health services, periodic health care check-ups, preventive services and the provision of health facilities, etc., of both individuals and society.¹⁷ It is noteworthy that employment is deemed as a communication channel between education and income, which directly and indirectly affects the health status by encountering risky working conditions and influencing health behaviours.^{35, 36} Occupation or employment status is evaluated as a socio-economic indicator reflecting the position of the individual in the social texture and thus determines the accessibility to resources, facing psychological risks and physical hazards, and ultimately the effect on lifestyle.³⁷

In our study, people living in 3 general districts in Tehran; the north (OR: 5.59, $P = 0.001$), south (OR: 3.63, $P = 0.063$) and east (OR: 2.53, $P = 0.003$), have been feeling the need for dental services more than those residents in the centre. The odds ratio indicates that southern inhabitants in the capital exhibited the need 3.6 times more than those living in the central region. However, the southern residents who demanded dental services were only one-quarter (25%) the number of those living in the centre who sought to receive these services for the same period. This difference was statistically significant (OR: 0.25, $P = 0.049$). Accordingly, it can be said that many of the existing needs for dental services in the south of Tehran remain latent and

do not convert to actual demand for these services because of the wide variation in the economic, social and cultural situation of residents, which can lead to inequality in the level of oral and dental health in Tehran. Compared to other regions, especially the south, residents in the northern areas of Tehran have mostly higher income levels, more facilities and financial access. This can lead to more need and demand for families living in these areas for dental services. On the other hand, residents in the southern areas of Tehran are mainly with lower incomes, facilities and access. These harmful conditions can increase the need for dental services and, in contrast, restrict the demand for dental services. Generally, multi-variable interaction with the residential area affects the need and demand for dental services. Another noteworthy point is that Tehran's military settlements and medical centres are mainly located in its eastern region, affecting the need and demand for dental services in MSAFs in these areas by providing physical access.

As one of the largest capitals worldwide, Tehran is composed of 22 districts inhabited by millions of people, leading to broad and deep diversity among the families in terms of social, economic and cultural conditions.¹⁹ Concluded from the prior studies, the level of access and quality of health services will vary according to socio-economic status.³⁸ In his study, Wen found a clear correlation between urbanisation levels and the extent of benefiting from dental services. Generally, the chance of receiving preventive and curative dental services increased with high levels of urbanisation.³⁹ Also, Lee et al. reported that marital status and access based on living area, urban or rural, were associated with the utilisation of dental care. They stated that the lower the ruralisation rate and number of dentists, individuals have a greater likelihood of using dental care.²⁴ In their study, Bourne and McGrowder in Jamaica showed a significant association between health status and area of residence.⁴⁰ Nevertheless, Howlader demonstrated a positive but non-significant relationship between health status and residential area in Bangladesh.⁴⁰

The study results also showed that the increase in both waiting time and household size increased the likelihood of sense to the need for dental services (OR: 1.00, 1.32, $P < 0.1$). Although the odds ratio related to waiting time was approximately one that related to household size variable was greater than 1. This indicated that increasing households by one person will increase need for dental services by 0.32. This result was consistent with Stoyanova's study in which there was a positive relationship between the number of households (household size) and the

likelihood of demand for dental services.⁴¹ The main indicators of income; housing status, wealth and property, are calculated as a proportion of the number of people living in the household.⁴² Therefore, with the increase in the number of households, the ratio of total income/wealth to the household decreases and can therefore increase the negative effects of health costs and reduce financial access to services. Based on a study conducted in Iran, increasing household size has increased the potential of solidarity between family members against high health costs.⁴³ Amery et al.'s research undertaken in Yazd province displayed a significant relationship between increasing the family size and the capability of more households to encounter the burden of health expenses.⁴⁴ It also seems that existing health insurance coverage and access to dental services provides the basis for facilitating the use of these services as much as possible for households with a smaller number of family members.

Inequality in socio-economic status can lead to health inequality. Despite its being an important global issue, health inequality and its socio-economic determinants for health policy have notably increased recently.⁴⁵ Meanwhile, studies published on dental services are rare. It should be considered that the study of socio-economic factors affecting the demand for dental services is effective in predicted dental demand and dental services labour training and planning.⁴⁶ In addition, consumers' perception of quality of healthcare services is one of the factors influencing the formation of dental service demand behaviour,⁴⁷ it's worthy to for sufficient attention in future studies.

Limitations and strengths

The study was conducted only in Tehran, but for better understanding and comparing the demand for dental services and existing inequalities geographically, this study can be done in other cities. In this study, the number of samples was not balanced according to the geographic location but was balance according to the MSAFs geographical density. Although the increase of samples in each geographic location can increase the precision of coefficients of geographical inequality, the sample was sufficient to run the regression without the multi-collinearity issue of sampling. However, the unequal numbers of samples in each of the five locations cannot affect the validity of results because the minimum number of samples in each geographical area was sufficient to run the logistic regression without any error. Moreover, the

estimated parameters of the regression model based on geographical area in both perspectives of need and demand for dental services was completely consistent with theoretical expectations.

This study had some strength. First, it may be the first study on the behaviour of consumers of dental services among MSAFs with the demand function estimation approach in Iran. Second, with a systematic approach, in addition to the main socio-economic variables, the variables of fear and anxiety were studied simultaneously by multivariate analysis. Finally, the demand function of dental services was estimated by two approaches, need-based and demand-based.

Conclusion

In the current study, there are statistically significant inequalities based on the different socio-economic levels in terms of the need for dental services. Sense of need for dental services has varied significantly according to educational, occupational and geographic groups. There is also considerable geographical inequality between the regions of Tehran in terms of demand. The demand for dental services in people living in the south of Tehran was a quarter of that of residents in the central regions, while the sense of need for these services was three times more than that of the central regions. Accordingly, the present study suggests that measures of active dental screening should be taken according to the socio-economic status governing the different areas of Tehran.

List of abbreviations

LMICs: low and middle-income countries

MSAFs: military-sector-affiliated families

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Psychosocial Risk Factors and their Impact on the Performance of Everyday Activities in Canadian Veterans

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Abstract

Background: Psychosocial risk factors have been identified as factors for prolonged occupational disability in individuals with debilitating musculoskeletal injuries, chronic pain and mental health conditions.

Purpose: This study has the complementary aims of identifying the correlations of psychosocial risk factors with (1) symptom profile factors and (2) the perceived impact of health conditions on the performance of daily activities based on the behavioural indicators of veterans referred for interdisciplinary rehabilitation in a sample of veterans of the Canadian Armed Forces (VCAF).

Materials and methods: We used a retrospective and cross-sectional non-experimental correlational analysis study design. The correlational analyses were performed using the following variables: psychosocial risk factors and symptom profile factors, and the perceived impact of health conditions on the performance of daily activities based on behavioural indicators.

Results: A statistically significant correlation was found between the overall Sickness Impact Profile (SIP) score and perceived disability, catastrophic thoughts, perceived injustice, fear of movement, and between fatigue and the physical dimension SIP score.

Conclusion: Veterans who have an alarmist view of their symptoms, who are fearful of exacerbating their symptoms through movement, and who harbour feelings of unfairness or injustice experienced a greater perceived impact of their health conditions on their performance of daily activities.

Keywords: Psychosocial support systems, Veterans, Outcome assessment, Healthcare, Multiple chronic conditions

Conflict of interest: The author, Antonio Miguel Cruz, received a research grant from the Occupational Performance Assessment Unit (OPAU) located at the Department of Occupational Therapy, Faculty of Rehabilitation Medicine, University of Alberta, to conduct this study.

Introduction

The total estimated Canadian veteran population is 649 300.¹ The Life After Service Survey (LASS) 2016 showed that veterans suffer more chronic conditions than Canadians of the same age and sex, e.g. arthritis (LASS: 29%, general population: 9.7%), anxiety (LASS: 15%, general population: 12.5%), and post-traumatic stress disorder (PTSD) (LASS: 14%, general population: 2%).^{2,3} A recent systematic literature review of studies investigating the effectiveness of interventions addressing the disabilities of active members of the military and/or

veterans found that the most commonly addressed impairment was PTSD.⁴ Miguel Cruz and colleagues found that numerous studies have implemented interventions that aim to change lifestyles for post-traumatic headaches, and interventions that address alcohol abuse, suicide ideation and behaviour, and stigma reduction (e.g., self-stigma was observed in relation to one's negative perceptions of self when seeking help or having mental health issues). Only a handful of studies have explored the role of the correlations/associations of psychosocial variables as risk factors for prolonged occupational disabilities in individuals with debilitating musculoskeletal

injuries, chronic pain, PTSD and other mental health conditions.⁴ Perceived disability, catastrophising, perceived injustice and fear of exacerbating symptoms have been identified as the most common psychosocial variables as risk factors for prolonged occupational disability in individuals with debilitating musculoskeletal injuries, chronic pain, PTSD and other mental health conditions.⁵ Symptom profile factors of pain, severity of depressive symptoms and fatigue have also been identified as contributing risk factors to prolonged disability.⁶ In veteran populations, in particular, studies have shown that pain-related catastrophic thinking is related to a higher risk of suicide attempts⁷, long-term chronic pain and increased pain perception,⁸ poor performance in cognitive functions (such as learning and memory)⁷ and other substance use disorders.⁹

Chronic pain leads to pain-related disabilities. From a biopsychosocial perspective, chronic pain is the result of a complex amalgamation of biological, psychological and social factors. Pain-related disability encompasses a variety of domains, including physical, occupational, recreational and social functioning.^{10,11} The Fear-Avoidance Model of Pain and Disability is a useful framework for explaining the relations between the aforementioned factors.¹⁰ Simply put, the Fear-Avoidance Model of Pain and Disability posits that pain-related fear activates escape mechanisms that lead to the avoidance of movement and activity. In other words, the long-term avoidance of physical activity may impair functioning, increase negative mood and lead to greater levels of disability.¹¹ There is still some disagreement among researchers regarding the sequential relationships between the psychosocial risk factors in the Fear-Avoidance Model of Pain and Disability. For example, one key point in this debate is whether changes in catastrophising precede changes in pain-related fear. Veterans of the Canadian Armed Forces who were referred to our clinic for interdisciplinary rehabilitation (physical and occupational therapy) presented with a complex clinical picture of chronic pain with poor sleep and undue fatigue, chronic musculoskeletal injuries, mental health conditions and medical conditions, i.e. an amalgamation of psychosocial and symptom profile variables that represent a higher risk of prolonged disability. Thus, we believe that the Fear-Avoidance Model of Pain and Disability of chronic pain is a useful framework for studying this pain-related disability in our sample of veterans.

This study has the complementary aims of identifying the correlations of psychosocial risk factors with (1) symptom profile factors and (2) the perceived impact of health conditions on the performance of daily

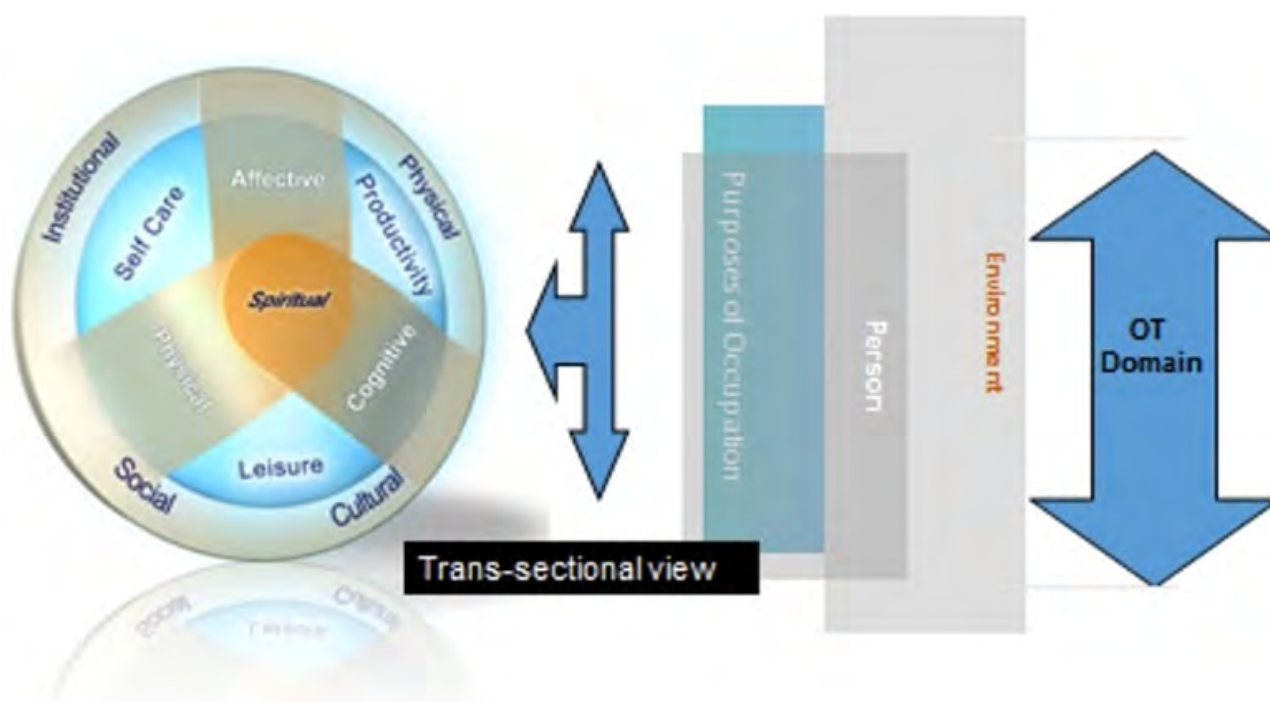
activities based on the behavioural indicators of veterans referred for interdisciplinary rehabilitation. Table 1 shows the variables and measures used in our study. The identification of the correlations between these variables is expected to provide insights for occupational therapists and other healthcare providers working with veterans into possible 'red flags' for prolonged disability. The associations may assist with treatment planning that is focused on factors that are likely to improve the quality of life and wellbeing of veterans as expressed through perceived occupational performance in the psychosocial and physical domains, as well as in their daily activities.

The Canadian Model of Occupational Performance and Engagement (CMOP-E): a brief overview

Specifically conceptualised to consider the entire person-in-environment and make sense of this complexity, the Canadian Model of Occupational Performance and Engagement (CMOP-E) provides a conceptual framework that is holistic in its approach, ecologically interactive and puts the person as a whole at the centre. One of the CMOP-E's main goals is that clients achieve satisfying levels of occupational performance.¹² According to the World Federation of Occupational Therapy: '...occupations refer to the everyday activities that people do as individuals, in families and with communities to occupy time and bring meaning and purpose to life. Occupations include things people need to, want to and are expected to do...'¹³ Occupational performance in the CMOP-E is understood to be a dynamic interaction between a person, his/her occupation, and the environment. A person has three performance components: cognitive, affective and physical, with spirituality at the core, acknowledging that people derive their sense of identity, meaning and purpose 'from everyday life activities'.¹⁴

A person's performance components are also known as his/her internal resources.¹² The CMOP-E indicates that a person lives in a unique environment, showing that he/she is embedded within the cultural, institutional, physical and social dimensions of this environment. A person's occupation is the means by which he/she acts within this environment; in other words, ability demonstration is recognised as occurring within a context, which can have both a positive and negative influence on his/her perception of performance (see Figure 1 for more details). The CMOP-E identifies three occupational purposes: self-care, productivity and leisure.

Figure 1– The Canadian Model of Occupational Performance and Engagement (CMOP-E)¹⁰



Note: The Engagement construct is not shown in the model, but is implicit and a descriptor of the inherent process

The Occupational Performance Assessment Unit's individualised intervention

In 2007, the Occupational Performance Analysis Unit (OPAU) began receiving referrals from case managers at Veterans Affairs Canada (VAC) to provide multidisciplinary rehabilitation for veterans enrolled on the VAC Rehabilitation Program under the newly proclaimed New Veterans Charter. We sought and became registered with VAC as a Multidisciplinary Clinic (MDC) and implemented a standard assessment and treatment protocol for veterans, many with complex presentations, based on the CMOP-E. Our high-skill, low-volume service model in a not-for-profit environment enables client-centred service delivery through physical and occupational therapy. This service aims to decrease the disabilities associated with a veteran's service-related health conditions and to restore the level of functioning and wellbeing that could reasonably be expected within a three to six-month period (i.e. a period of active, focused rehabilitation versus maintenance intervention). Attendance at our program is typically twice per week for 24 physical therapy sessions, and for occupational therapy, sessions total 10–30 hours, depending on their identified needs. The scheduling was modified to accommodate the veterans' other

medical appointments, family commitments, environmental triggers (such as traffic) and activity tolerance. Progress was monitored weekly, and the treatment approach was modified as necessary. Our initial three-hour assessment consisted of a physical therapy examination, an occupational therapy clinical interview, and the administration of the self-report instruments, among them the Progressive Goal Attainment Program (PGAP),¹⁵ which screens questionnaires for the psychosocial risk of pain-related disability and the Sickness Impact Profile (SIP) (see Variables and measures for more details). The findings were documented in a detailed assessment report and recommended treatment plan.

Methods

Study design

Retrospective and cross-sectional correlational analysis.

Data source

The data source used in this study is a primary source of information from the clients' paper-based files located at the OPAU service. (n=250, i.e. the full population of clients in the OPAU). This is a

paper-based database with files from over 10 years, from 2009 to 2019. The data were extracted from a subsample of 64 veteran client files (see the Sample size calculation section). We gathered one-time assessment data over the 10 years.

Sample size calculation

A subsample of the veteran client files contained in the clinical paper-based database was selected for this study ($n=64$, effect size 0.5, power 0.8, alpha 0.05).¹⁶ The effect size of 0.5 was selected according to the values obtained in similar correlational studies.^{17,18} This study's subsample was randomly selected using a proportional stratified sampling method (by sex, i.e. female (total females 51, i.e. 20.3%, 51/250) or male (total males 199, i.e. 79.7%, 199/250)). The total number of males and females selected in our sample was as follows: Total males 51.008 (64X0.797) » 51, total females 12.992 (64X0.203) » 13 (see Table 1 for more details)

Participants

Our sample comprised non-catastrophically injured veterans who had decreased engagement in meaningful, purposeful activities and life roles, who were not gainfully employed, who were enrolled onto the Veterans Affairs Canada (VAC) Rehabilitation Program and who had been referred by their VAC Case Manager to our clinic for the comprehensive interdisciplinary rehabilitation services. VAC offers veterans a wide range of health programs and services, family support, financial programs and services, and training and employment services.

Variables and measures

Table 1 shows the dimension or component, the construct/measure, the CMOP-E dimension, the questionnaire or assessment tool, and the acronyms of the variables and measures used in our study.

Psychosocial variables as risk factors for pain-related disability

In this study, we used the PGAP screening questionnaires for the psychosocial variables as the risk factors of pain-related disability. These questionnaires comprise the following measures:

General Pain Disability Index Questionnaire. The General Pain Disability Index Questionnaire (GPDI) was used to assess perceived disability (a belief that one has a high level of disability).¹¹ The GPDI has six items and uses an 11-point Likert-type scale with responses ranging from 0 = 'no disability' to 10 = 'total disability' for the clients to indicate to what degree

they feel disabled in the five areas of family/home responsibilities, recreation, social activity, occupation and self-care. Prior research has demonstrated that the GPDI has good psychometric properties, i.e. high internal consistency (Cronbach's alpha = 0.81) and moderate test-retest reliability (correlation coefficient = 0.42).¹⁸ The value of the Cronbach's alpha = 0.81 is comparable to that reported for the original version of the scale (Cronbach's alpha = 0.86).¹⁹

Modified Injustice Experiences Questionnaire. The Modified Injustice Experiences Questionnaire (CIEQ-Chr) was used to measure catastrophising (an excessively negative view of one's symptoms) and perceived injustice (an appraisal of cognition comprising elements of severity of loss due to injury, blame and a sense of unfairness and irreparable loss).¹⁵ The CIEQ-Chr uses a three-point Likert-type scale with responses ranging from 0 = 'never' to 2 = 'often'. The first five items assess perceived injustice (CIEQ-I) (based on the 12-item Injustice Experience Questionnaire (IEQ)),¹⁵ and the last seven items assess catastrophising (CIEQ-C) (based on the 13-item Pain Catastrophizing Scale²¹). Prior research has demonstrated that the CIEQ-Chr Questionnaire has excellent psychometric properties, i.e. high internal consistency (Cronbach's alpha = 0.88).²²

Modified Fear and Fatigue Questionnaire. The modified Fear and Fatigue Questionnaire (FFQ-Chr) was used to assess the fear of exacerbating symptoms and fatigue.¹⁵ The FFQ-Chr uses a four-point Likert-type scale with responses ranging from 0 = 'do not agree' to 3 = 'completely agree'. The first five items of the FFQ-Chr assess fear of exacerbating symptoms (FFQ-K) (based on the Tampa Scale for Kinesiophobia²³), and the last five items assess fatigue (FFQ-F) (Multidimensional Fatigue Scale²⁴). Both subscales have shown excellent psychometric properties, i.e. high Cronbach's alpha coefficients ranging between 0.74 and 0.87, and strong test-retest reliability (correlation coefficient = 0.75).

Symptom profile variables as factors that impact daily functioning and behaviour

Pain symptoms. The short-form McGill Pain Questionnaire (MPQ-SF) was used to assess the sensory and affective dimensions of pain.²⁵ The MPQ-SF comprises 15 words that describe the various sensory and affective qualities of pain, and asks the client to use a four-point Likert-type intensity scale with responses ranging from 0 = 'none', 1 = 'mild', 2 = 'moderate', to 3 = 'severe' to rate their experience of these qualities. The individual responses are added up to yield a total score, with higher scores indicating a more severe pain experience. The reliability and

Table 1 – Variables and measures

Dimension or component	Construct/measure	CMOP-E dimension	Questionnaire or assessment tool	Acronym
Psychosocial risk for pain-related disability	Perceived disability	Occupation	General Pain Disability Index Questionnaire	GPDI
	Perceived injustice	Person-affective	Modified Injustice Experiences Questionnaire (CIEQ-Chr) The first five items of the CIEQ-Chr assess perceived injustice	CIEQ-I
	Catastrophic thoughts	Person-affective	Modified Injustice Experiences Questionnaire (CIEQ-Chr) The last seven items of the CIEQ-Chr assess catastrophizing thinking	CIEQ-C
	Exacerbating symptoms (or fear of movement/ kinesiophobia)	Person-affective	Fear and Fatigue Questionnaire (FFQ-Chr) The first five items of the FFQ-Chr assess fear of exacerbating symptoms	FFQ-K
	Fatigue	Person-physical	Fear and Fatigue Questionnaire (FFQ-Chr) The last five items of the CIEQ-Chr assess fatigue	FFQ-F
Symptom profile factors that impact daily functioning and behaviour	Pain symptoms	Person-physical	Short-form McGill Pain Questionnaire	MPQ-SF
	Severity of depressive symptoms	Person-affective	Patient Health Questionnaire-9 Nine-item depression module from the Patient Health Questionnaire (PHQ)	PHQ-9
Perceived impact of health condition on daily functioning (activities) and behaviour	Quality of life (QoL) and perceived health status (PHS)	Person-occupation	Sickness Impact Profile (Overall Score)	SIP-O
		Person-physical	Sickness Impact Profile (Physical Dimension Score)	SIP-PD
		Person-physical	Physical domain-Ambulation	SIP-A
		Person-physical	Physical domain-Mobility	SIP-M
		Occupation-self care	Physical domain-Body Care and Movement	SIP- BCM
		Person-affective	Sickness Impact Profile (Psychosocial Dimension Score)	SIP-PSD
		Person-affective	Psychosocial domain-Social Interaction	SIP-SI
		Person-cognitive	Psychosocial domain-Alertness Behaviour	SIP-AB
		Person-affective	Psychosocial domain-Emotional Behaviour	SIP-EB
		Person-physical	Psychosocial domain-Communication	SIP-C
		Occupation-self care	Independent category - Sleep and Rest	SIP-SR
		Occupation-self care	Independent category - Eating	SIP-E
		Occupation-productivity	Independent category - Work	SIP-W
		Occupation-productivity	Independent category - Home Management	SIP-HM
		Occupation-leisure	Independent category -Recreation/ Pastimes	SIP-RP

Psychosocial risk factors and their impact on the performance of everyday activities in Canadian veterans

validity of the MPQ-SF have been demonstrated in several clinical and experimental studies, i.e. high internal consistency (Cronbach's $\alpha = 0.926$) and a strong test-retest reliability metric (correlation coefficient = 0.85).²⁶

Severity of depressive symptoms. The Patient Health Questionnaire-9 (PHQ-9) is a nine-item depression module from the Patient Health Questionnaire (PHQ).²⁷ The PHQ-9 uses a four-point Likert-type scale with responses ranging from 0 = 'not at all' to 3 = 'nearly every day'. The responses are added up to yield a total score, with higher scores indicating more severe symptoms of depression. The reliability and validity of this measure have been established in several different clinical samples, i.e. high internal consistency reliability (Cronbach's $\alpha = 0.89$) and strong test-retest reliability (correlation coefficient = 0.94).²⁸

Perceived impact of health conditions on daily functioning (activities) and behaviour

The SIP is a quality of life measurement that quantifies a person's perception of the impact of their health conditions on their performance of daily activities based on behavioural indicators. The SIP is a reliable instrument that we use as an analogue for perceived occupational performance.²⁷ The SIP contains 136 statements to which the respondent is instructed 'to check only those statements that you are sure describe you today and are related to your state of health'. The statements are divided into 12 areas of activity which are categorised into three domains: the physical domain (SIP-PD); the psychosocial domain (SIP-PSD); and an 'independent' category. Included in the physical domain are ambulation (SIP-A), mobility (SIP-M), and body care and movement (SIP-BCM). In the psychosocial domain are Social Interaction (SIP-SI), Alertness Behaviour (SIP-AB), Emotional Behaviour (SIP-EB) and Communication (SIP-C). In the independent category are Sleep and Rest (SIP-SR), Eating (SIP-E), Work (SIP-W), Home Management (SIP-HM) and Recreation/Pastimes (SIP-RP). Percentage dysfunction scores are calculated for each of the 12 areas, as well as for the physical domain and psychosocial domain, and an overall score. A score of 20% or more indicates a perceived severe impact on the person's health condition in that area.³⁰ The reliability and validity of the SIP are high, i.e. internal consistency reliability (Cronbach's $\alpha = 0.94$) and strong test-retest reliability (correlation coefficient = 0.92).²⁹ The SIP has shown good divergent validity with the Canadian Occupational Performance Measure (COPM).²⁹ It should be noted that the psychometric properties of the SIP are for the entire instrument and not for each

of the 12 areas.

Demographics

The demographic data include age, gender (female or male), Body Mass Index (BMI) (normal, overweight or obese), marital status (married/common law, widowed/separated/divorced or single/never married), and the highest level of education completed (pre-high school, high school, post-secondary graduation or university degree).

Procedures

We received approval from the University of Alberta Ethics Board before starting to compile the data from the clinic files. The data from the client files were entered into an SPSS® file. Finally, two independent reviewers assessed the validity and integrity of 100% of the data entered into the SPSS® file.

Statistical analyses

The demographic characteristics were analysed using means, standard deviations, and frequencies/proportions. A correlational analysis was performed to explore the correlations between the measures of our study. We used nonparametric Spearman's rho (or parametric Pearson for the SIP dimensions) correlations due to the type of data in our study.¹⁴ We used the following cut-offs to interpret the strength of the relationships between our variables: 0.00–0.29 indicated a weak or negligible correlation; 0.30–0.49 indicated a moderate correlation; higher than 0.50 indicated a strong correlation^{31,32} ($p < 0.05$, two-sided).

We used IBM SPSS® (Version 26.0; IBM Corporation, Armonk, NY) to perform our statistical analyses.

Results

Participants

Table 2 shows the characteristics of the sample of 64 veterans who were referred for the interdisciplinary rehabilitation services at our clinic. They were characterised as adults (mean age of 42.62 years old, SD (8.99)), mainly male (79.7%) and non-officers when released (98.4%). Most were overweight (32.8%) or obese (51.6%) (total 84.4%) with a mean BMI (in kg/m^2) for the entire population of 30.39 SD (5.024), more than half were married (56.3%), and the highest level of completed education for most was high school (62.5%). Overall, the participants had served an average of 15.83 SD (8.25) years, mostly in the Army (84.4%). Table A.1 in the supplemental material also shows that OPAU clients have multiple chronic

Table 2 – Sample characteristics (descriptive statistic)

Mean (years) (SD)		42.62 SD (8.99)	
Body Mass Index (SD)		30.39 SD (5.024)	
	Category	n	%
Age (in years)	<30	8	12.5
	30–39	13	20.3
	40–49	24	37.5
	50–59	18	28.1
	60–69	1	1.6
Gender	Female	13	20.3
	Male	51	79.7
Body Mass Index^a	Normal	10	15.6
	Overweight	21	32.8
	Obese	33	51.6
Marital status	Married/Common law	36	56.3
	Widowed/Separated/Divorced	15	23.4
	Single, never married	13	20.3
Education (Highest level of education completed)	Pre-high school graduation	6	9.4
	High school graduation	40	62.5
	Post-secondary graduation	13	20.3
	University degree	5	7.8
Rank	Officers	1	1.6
	Non-Officer	63	98.4
Service environment	Air Force	4	6.3
	Army	54	84.4
	Navy	5	7.7
	RCMP	1	1.6
Length of service	< 10 years	20	31.7
	10 to 19 years	16	25.4
	≥ 20 years	27	42.9

Notes: a. The BMI categories were defined as follows: Normal weight – BMI greater than or equal to 18.5 to 24.9 kg/m²; Overweight – BMI greater than or equal to 25 to 29.9 kg/m²; Obese – BMI greater than or equal to 30 kg/m²

medical conditions, i.e. those mainly associated with chronic pain (90.6%), back problems (84.4%), mood disorders (82.8%), anxiety disorders (76.6%), PTSD (53.1%), and musculoskeletal disorders (95.3%).

Descriptive statistics of the questionnaire scores

Tables 3a), b) and c) show the descriptive statistics of the questionnaire scores used to measure the psychosocial variables that contribute to pain-related disabilities, symptom profile factors that impact daily functioning and behaviour, and the perceived impact of health conditions on daily functioning (activities) and behaviour, respectively.

Psychosocial variables that contribute to pain-related disabilities. The veterans who receive services at the OPAU see themselves as individuals with high levels of perceived disability. They have reported that these disabilities affect their lives on a day-to-day basis (median of the General Pain Disability Index Questionnaire, GPDI = 7). They reacted with a moderate level of catastrophising thoughts (median CIEQ-C = 5.5) and perceived injustice levels (the median of the first five items of the Modified Injustice Experiences Questionnaire, CIEQ-I = 6) regarding their chronic medical conditions. They had moderate concerns or worries that they might injure themselves again if they were to do certain activities (the median of the first five items of the Fear and Fatigue Questionnaire, FFQ-K = 5) and moderate levels of fatigue when they do physical activities (the median of the last five items of the Fear and Fatigue Questionnaire, FFQ-F = 5).

Symptom profile variables that impact daily functioning and behaviour. The veterans who receive services at the OPAU reported experiencing mild pain symptoms (the median of the short-form McGill Pain Questionnaire, MPQ-SF = 12), and mild symptoms of depression (median PHQ-9 = 14).

Perceived impact of health conditions on daily functioning (activities) and behaviour. Veterans who receive services at the OPAU have high levels of dysfunction in their everyday behaviour related to their diseases (chronic conditions), as 60.0% of the SIP indicators (9/15) showed a threshold with a higher than 20.0% impact (a negative impact on their daily life activities).

Correlations

Table 4 shows the correlations between the variables of our study. With respect to the aims of this study, an inspection of the table shows that the measures of the psychosocial variables that contribute to pain-

Table 3 – Descriptive statistics of the measure score

a) Psychosocial risk for pain-related disability.

Construct/measure	Questionnaire or assessment tool (Acronym)	Median	Mean	SD	95% CI	VD
Perceived disability	GPDI	7	6.28	2.09	(5.76, 6.80)	High
Perceived injustice	CIEQ-I	6	5.80	2.45	(5.18, 6.41)	Moderate
Catastrophic thoughts	CIEQ-C	5.5	5.52	2.18	(4.97, 6.06)	Moderate
Exacerbating symptoms (or fear of movement/ kinesiophobia)	FFQ-K	5	5.11	2.17	(4.57, 5.65)	Moderate
Fatigue	FFQ-F	5	5.66	2.53	(4.57, 5.65)	Moderate

Notes: N=64; SD: Standard Deviation; 95% CI: Confidence Interval; VD: Verbal Descriptor. VD-Scale: 0-1: Very Low (VL); 2-3: Low (L); 4-6: Moderate (M); 7-8: High (H); 9-10: Very High (VH)

b) Symptom profile factors that impact daily functioning and behaviour.

Construct/measure	Questionnaire or assessment tool (Acronym)	Median	Mean	SD	95% CI	VD
Pain symptoms	MPQ-SF	12	13.73	7.64	(11.76, 15.71)	Mild
Severity of depressive symptoms	PHQ-9	14	14.20	6.04	(12.64, 15.76)	Mild

Notes: N=64; SD: Standard Deviation; VD: Verbal Descriptor. VD-scale MPQ-SF: 0: None; 1-15: Mild; 16-30: Moderate; 31-45: Severe; VD-scale PHQ-9: 0-9: Subclinical; 10-14: Mild; 15-19: Moderate; + 20: Severe

c) Perceived impact of health conditions on daily functioning (activities) and behaviour.

Construct/measure	Questionnaire or assessment tool (Acronym)	Median	Mean	SD	95% CI
Quality of life (QoL) and perceived health status (PHS)	SIP-O	25	27.25	10.30	(24.66, 29.85)
	SIP-PD	15	15.68	9.89	(13.19, 18.17)
	SIP-A	17	18.16	14.08	(14.61, 21.70)
	SIP-M	15	16.22	13.95	(12.71, 19.73)
	SIP- BCM	12	14.13	9.61	(11.71, 16.55)
	SIP-PSD	33	34.70	17.05	(30.40, 38.99)
	SIP-SI	33	36.95	20.91	(31.69, 42.22)
	SIP-AB	40	45.24	28.98	(37.94, 52.54)
	SIP-EB	36	41.38	20.94	(36.11, 46.65)
	SIP-C	9	12.56	15.81	(8.57, 16.54)
	SIP-SR	34	32.27	16.90	(28.01, 36.52)
	SIP-E	3	3.36	6.03	(1.85, 4.90)
	SIP-W	70	61.87	19.57	(56.94, 66.80)
	SIP-HM	30	29.97	15.52	(26.06, 33.88)
	SIP-RP	45	43.52	18.87	(38.77, 48.28)

Notes: N=64; SD: Standard Deviation; SIP-PD: SIP-Physical Dimension; SIP-A: Ambulation; SIP-M: Mobility; SIP- BCM: SIP-Body Care and Movement; SIP-PSD: SIP-Psychosocial Dimension; SIP-SI: SIP-Social Interaction; SIP-AB: SIP-Alertness Behaviour; SIP-EB: SIP-Emotional Behaviour; SIP-C: SIP-Communication; SIP-SR: SIP-Sleep and Rest; SIP-E: SIP-Eating; SIP-W: SIP-Work; SIP-HM: SIP-Home Management; SIP-RP: SIP-Recreation/Pastimes; and SIP-O: SIP-Overall; A score of 20% or more indicates that person's health condition has a perceived severe impact in that area.

related disabilities have significant correlations with both the measures of symptom profile factors and the perceived impact of health conditions on daily functioning (activities) and behaviour. Specifically, the psychosocial risk measures of perceived disability (GPDI), perceived injustice (CIEQ-I), catastrophic thoughts (CIEQ-C), fear of movement (FFQ-K) and fatigue (FFQ-F) all had significant positive correlations with the severity of depressive symptoms (PHQ-9). These correlations ranged from $r_{xy}(62) = 0.585$ down to $r_{xy}(62) = 0.377$. At the same time, all the psychosocial risk measures correlated significantly with the overall SIP-O measure of the perceived impact of health conditions on daily functioning (activities) and behaviour. These correlations ranged from $r_{xy}(62) = 0.602$ down to $r_{xy}(62) = 0.396$. Specific corrections will be highlighted in the following paragraphs.

More specifically, a statistically significant correlation was found between the overall SIP-O score (measured by the SIP questionnaire) and perceived disability (GPDI, General Pain Disability Index Questionnaire) ($r_{xy}(62) = 0.602$, $p < 0.001$); catastrophic thoughts (CIEQ-C, measured by the last seven items of the Modified Injustice Experiences Questionnaire (CIEQ-Chr) ($r_{xy}(62) = 0.439$, $p < 0.001$); perceived injustice (CIEQ-I, measured by the first five items of the Modified Injustice Experiences Questionnaire (CIEQ-Chr) ($r_{xy}(62) = 0.525$, $p < 0.001$); fear of movement (FFQ-K, measured by the first five items of the Fear and Fatigue Questionnaire (FFQ-Chr) ($r_{xy}(62) = 0.396$, $p < 0.001$); and fatigue (FFQ-F, measured by last five items of the Fear and Fatigue Questionnaire (FFQ-Chr)) and the physical dimension SIP score (SIP-PD, ambulation, mobility, and body care and movement) ($r_{xy}(62) = 0.290$, $p < 0.001$). Also, a statistically significant correlation was found between the overall SIP score and the severity of depressive symptoms (PHQ-9, Patient Health Questionnaire-9) ($r_{xy}(62) = 0.669$, $p < 0.001$). We found that with increased severity of depressive symptoms (PHQ-9, measured by the Patient Health Questionnaire-9), their health conditions had a greater perceived impact on home management (measured by SIP-HM, an independent category of the SIP) and on recreation/pastimes (measured by the SIP-RP, an independent category of the SIP), i.e. ($r_{xy}(62) = 0.405$, $p < 0.001$; $r_{xy}(62) = 0.372$, $p < 0.001$), respectively.

Discussion

Our study sought to identify correlations between the psychosocial risk factors of pain-related disability and symptom profile factors and the perceived impact of their health conditions on the performance of daily activities based on the behavioural indicators

(perceived occupational performance) of veterans referred for interdisciplinary rehabilitation. We found that among the sample of 64 veterans (client files) included in this study, higher scores for perceived disability, catastrophising, injustice/unfairness, and fear of movement were associated with a more severe perceived impact of their health conditions on their occupational performance in meaningful daily life activities such as home management and recreation/pastimes. We also found a strong correlation between home management and recreation/pastimes associated with more symptoms of fatigue and pain, and more severe symptoms of depression in these veterans.

Our results can be explained according to the Fear-Avoidance Model of Pain and Disability.^{10,11} According to this model, fear of movement often correlates with avoidance of any activities associated with pain. Our results support the findings from previous scholars, i.e. pain-related fear has consistently been associated with more severe disability¹¹. Compounding this, avoidance of situational and environmental triggers is common among veterans affected by PTSD, further potentiating depression and decreased engagement in everyday activities and roles. In addition, the Veterans' Identities Research Theme Working group³¹ states that, although only a small number of veterans encounter difficulties transitioning to civilian life, 'identities can be injured or nurtured during military-civilian transition'. Veterans who have been medically (involuntarily) discharged and those who have chronic health problems face additional challenges. In addition, avoidance of situational and environmental triggers is common among veterans affected by PTSD.

Avoidance behaviours due to pain and PTSD cause further depression and disabilities. Activity participation and reduced fear of pain are considered key elements in effectively managing individuals with chronic health and mental health conditions who experience high levels of catastrophic thinking and fear of movement.¹⁵ For example, Plagge and colleagues explored the clinical effectiveness and feasibility of an intervention utilising collaborative care components and behavioural activation to treat chronic pain and PTSD.³⁴ The participants showed significant improvements in measures of PTSD, pain severity and pain interference, as well as in measures of mental health conditions and quality of life.

The results of our study expand and further illuminate the work of earlier researchers. Psychosocial factors are strongly correlated with disability in a wide range of medical and mental health conditions, specifically pain-related disability. Our study's findings clarify

Table 4: Intercorrelations between the variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	Age (in years)	1.000	0.204	0.070	-0.122	0.132	0.662**	-0.112	-0.189	-0.186	-0.079	0.064	0.097	-0.157	0.156	-0.146	-0.224	-0.100	-0.022	-0.114	-0.001	-0.077
2	Gender		1.000	0.000	-0.092	0.173	0.112	0.003	-0.204	-0.114	-0.144	0.132	-0.195	-0.254*	-0.046	-0.221	-0.211	-0.090	-0.170	-0.161	0.009	-0.221
3	Body Mass Index-BMI			1.000	-0.050	0.004	0.034	0.136	-0.024	-0.164	-0.055	0.138	-0.189	0.085	0.211	0.276*	0.193	-0.240	0.143	0.271*	0.254*	0.328**
4	Marital status				1.000	-0.137	-0.165	-0.056	0.158	-0.032	0.196	-0.057	0.073	-0.058	0.099	-0.025	0.089	0.091	-0.098	-0.075	-0.055	-0.007
5	Highest level of education completed					1.000	-0.039	-0.036	0.022	0.033	0.230	-0.005	-0.164	0.016	-0.126	-0.041	-0.039	-0.037	0.012	0.005	0.182	-0.031
6	Length of service (in years)						1.000	-0.098	-0.313*	-0.199	-0.152	-0.151	-0.031	-0.226	0.140	-0.214	-0.257*	-0.024	-0.062	-0.199	-0.035	-0.151
7	Disability Index (Perceived disability, GPD)							1.000	0.213	0.357**	0.262*	0.380**	0.287*	0.585**	0.653**	0.428**	0.350**	0.117	0.171	0.506**	0.360**	0.602**
8	Perception of Injustice (Perceived injustice, CIEQ-I)								1.000	0.707**	0.582**	0.410**	0.165	0.473*	0.364**	0.473**	0.455**	0.206	0.165	0.242	0.197	0.525**
9	Perception of Catastrophizing (Catastrophic thoughts, CIEQ-C)									1.000	0.559**	0.465**	0.234	0.530*	0.233	0.461**	0.257*	0.239	0.002	0.158	0.242	0.439**
10	Fear of movement (Exacerbating symptoms (or Fear of movement), FFQ-K)										1.000	0.290*	0.089	0.377**	0.423**	0.311*	0.169	0.138	0.041	0.064	0.264*	0.396**
11	Fatigue (FFQ-F)											1.000	0.352**	0.570**	0.290**	0.515**	0.370**	0.101	0.116	0.318*	0.380**	0.515**
12	Pain symptoms (McGill Pain Questionnaire (short form), MPQ-SF)												1.000	0.257*	0.238	0.144	0.247	0.098	0.017	0.083	-0.153	0.179
13	Severity of depressive symptoms (Patient Health Questionnaire-9, PHQ-9)													1.000	0.452**	0.629**	0.369**	0.269*	0.115	0.405**	0.372**	0.669**
14	Sickness Impact Profile (Physical dimension score, SIP-PD)														1.000	0.358**	0.342**	0.165	0.162	0.470**	0.300*	0.656**
15	Sickness Impact Profile (Psychosocial dimension score, SIP-PSD)															1.000	0.500**	.203	.203	0.323**	0.500**	0.900**
16	Sleep/rest-SIP (Independent Category SIP-SR)																1.000	.038	.165	0.401**	0.309*	0.590**
17	Eating-SIP (Independent Category SIP-E)																	1.000	.011	0.216	0.133	0.252*
18	Work-SIP (Independent Category SIP-W)																		1.000	0.164	0.173	0.341**
19	Home management-SIP (Independent Category SIP-HM)																			1.000	0.345**	0.527**
20	Recreation/pastimes-SIP (Independent Category SIP-RP)																				1.000	0.596**
21	Sickness Impact Profile (Overall Score, SIP-O)																					1.000

* $p < 0.05$, ** $p < 0.01$, $n = 64$

the intricate make-up of the psychosocial phenomena that correlate to veterans' singular statements of inability and shine a spotlight on the affected performance of domestic and recreational activities.

Thus, using the CMOP-E, we not only affirm that it produces the expected correlations, but it guides clinicians in a multidisciplinary practice to tailor services within the context of veterans' distinct institutional and cultural environments, not a consideration when using a symptom-oriented treatment approach.

With the dissolution of the prior identity as a serving member of the military (one aspect of 'spirituality' at the centre of the CMOP-E) and the associated job loss ('productivity' in the CMOP-E), roles such as home management and recreation/pastimes take on greater salience, becoming sources of meaningful engagement for veterans who have not found a new vocational identity. Rehabilitation goals focused on increasing veterans' confidence and satisfaction in these roles may be a starting point for reframing their life's purpose, finding a new reason to get up every day and experience 'doing'. For the small proportion of veterans who do not make a seamless transition to a civilian job or permanent disability status, finding new sources of meaning and purpose in life through their daily activities is an important step in their rehabilitation.

As a secondary analysis, this study has some limitations. First, we analysed a sample of $n = 64$ out of 250 clinical files at this particular unique clinic, thus effectively limiting the generalisability of the study to other clinical settings. The second important limitation was that we conducted simple bivariate correlations that do not control for other variables. As result, spurious correlations cannot be ruled out, since no demographic or other medical variables were considered in the analysis. The sample size was insufficient for conducting more complex regression analyses; therefore, future research with larger sample sizes should be conducted in order to avoid this insufficiency.

Future studies will examine the effectiveness of our individualised rehabilitation service model with Canadian veterans, and will explore the cultural, institutional and environmental factors that are salient when working with a Canadian veteran population.

Our findings have the following implications for care management and rehabilitation for Canadian

veterans: The data strongly confirm and add substance to what contributes to the intricate presentation by this sample of veterans, thus providing a possible explanation of why progress in this population is elusive in multiple single-discipline symptomatic treatments. Furthermore, the highly personalised approach of the OPAU's clinicians put the veterans' perspective in focus through considering the context of their needs and the demands of their roles.

Conclusion

The findings from this sample of Canadian veterans at high risk of pain-related disability with severe pain and depressive phenomena serve to enlighten clinicians' understanding of the interplay and relationship of psychosocial and symptom profile variables as risk factors for prolonged disability. The latter contribute to the perception of a greater understanding of their overall health status, their impairments, and their performance of daily life activities (occupations), particularly household tasks and recreation and leisure pastimes. The CMOP-E's constructs guide the collaborative multidisciplinary assessment process and the exploration of veterans' occupational performance within the broader context of their personal environment. By revealing the full range of their daily life activities, some strengths (the performance of activities they do not avoid) emerge. These strengths can become 'doing' facilitators in gradually broadening veterans' engagement in activities and lessening their more intense preoccupations on pain limiting symptoms and, most importantly, in perceiving achieving new goals related to home and leisure pursuits as their new 'mission'.

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Supplemental material. Appendix A

Table A.1: General health indicators, by Rank Group

Indicator	Category	N	Officer (1.6%)	Non-Officer (98.4%)	Regular Force (100%)
Suicidal ideation	Suicidal ideation (Yes)	4	0%	6.3%	6.2%
	Suicidal ideation (No)	60	100%	93.7%	93.8%
Hearing problem	Hearing problem (Yes)	32	0%	50.8%	50%
	Hearing problem (No)	32	100%	49.2%	50%
Chronic pain	Chronic pain (Yes)	58	0%	92.1%	90.6%
	Chronic pain (No)	6	100%	7.9%	9.4%
Back problems	Back problems (Yes)	54	100%	84.1%	84.4%
	Back problems (No)	10	0%	15.9%	15.6%
Arthritis	Arthritis (Yes)	20	100%	30.2%	31.3%
	Arthritis (No)	44	0%	69.8%	68.8%
High blood pressure	High blood pressure (Yes)	10	0%	15.9%	15.6%
	High blood pressure (No)	54	100%	84.1%	84.4%
Mood disorder	Mood disorder (Yes)	53	0%	84.1%	82.8%
	Mood disorder (No)	11	100%	15.9%	17.2%
Anxiety disorder	Anxiety disorder (Yes)	49	0%	77.8%	76.6%
	Anxiety disorder (No)	15	100%	22.2%	23.4%
PTSD	PTSD (Yes)	34	0%	54%	53.1%
	PTSD (No)	30	100%	46%	46.9%
Migraine headaches	Migraine headaches (Yes)	23	100%	34.9%	35.9%
	Migraine headaches (No)	41	0%	65.1%	64.1%
Diabetes	Diabetes (Yes)	8	0%	12.7%	12.5%
	Diabetes (No)	56	100%	87.3%	87.5%
Bowel disorder	Bowel disorder (Yes)	10	0%	15.9%	15.6%
	Bowel disorder (No)	54	100%	84.1%	84.4%
Asthma	Asthma (Yes)	8	0%	12.7%	12.5%
	Asthma (No)	56	100%	87.3%	87.5%
Heart disease	Heart disease (Yes)	4	0%	6.3%	6.2%
	Heart disease (No)	60	100%	93.7%	93.8%
Intestinal or stomach ulcers	Intestinal or stomach ulcers (Yes)	5	100%	6.3%	7.8%
	Intestinal or stomach ulcers (No)	59	0%	93.7%	92.2%
Urinary incontinence	Urinary incontinence (Yes)	5	100%	6.3%	7.8%
	Urinary incontinence (No)	59	0%	93.7%	92.2%
Traumatic Brain Injury-TBI	Traumatic Brain Injury-TBI (Yes)	1	0%	1.6%	1.6%
	Traumatic Brain Injury-TBI (No)	63	100%	98.4%	98.4%
Concussions	Concussions (Yes)	16	0%	25.4%	25%
	Concussions (No)	48	100%	74.6%	75%
Cancer (current)	Cancer (current) (Yes)	0	0%	0%	0%
	Cancer (current) (No)	64	100%	100%	100%
Cancer (prior)	Cancer (prior) (Yes)	0	0%	0%	0%
	Cancer (prior) (No)	64	100%	100%	100%
Chronic bronchitis, or chronic obstructive pulmonary disease (COPD) and Sleep apnoea	Chronic bronchitis, or chronic obstructive pulmonary disease (COPD) and Sleep apnoea (Yes)	10	0%	15.9%	15.6%
	Chronic bronchitis, or chronic obstructive pulmonary disease (COPD) and Sleep apnoea (No)	54	100%	84.1%	84.4%
Stroke	Stroke (Yes)	0	0%	0%	0%
	Stroke (No)	64	100%	100%	100%
Dementia	Dementia (Yes)	0	0%	0%	0%
	Dementia (No)	64	100%	100%	100%
Repetitive strain injuries	Repetitive strain injuries (Yes)	8	0%	12.7%	12.5%
	Repetitive strain injuries (No)	56	100%	87.3%	87.5%
Rheumatic/Autoimmune disease	Rheumatic/Autoimmune disease (Yes)	4	0%	6.3%	6.2%
	Rheumatic/Autoimmune disease (No)	60	100%	93.7%	93.8%
Musculoskeletal	Musculoskeletal (Yes)	61	0%	96.8%	95.3%
	Musculoskeletal (No)	3	100%	3.2%	4.7%
Jaw/Facial/Dental	Jaw/Facial/Dental (Yes)	13	0%	20.6%	20.3%
	Jaw/Facial/Dental (No)	51	100%	79.4%	79.7%
Other health condition	Other health condition (Yes)	4	0%	6.3%	6.2%
	Other health condition (No)	60	100%	93.7%	93.8%

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Investigating the Prevalence of Non-Communicable Diseases in Veterans with Musculoskeletal Disorders

J Minooeefar, M Allami, A Dabiri, E Farajji

Abstract

Background: Non-communicable diseases (NCDs) are responsible for over 53% of the disease burden worldwide. The present study was conducted to examine the prevalence of NCDs among disabled veterans to define treatment approaches for them.

Methods: The study population included all individuals participating in cross-sectional studies from provinces across the country between 2014 and 2017. Veterans with ankle-foot disorders (AFD), below-knee amputations (BKA), short trans-femoral/hip disarticulations (STFA/HD) and hemipelvectomies (HP) were assessed for physical health.

Results: 1785 veterans with lower-limb musculoskeletal disorder were included in the study. Their medical history reported general physical problems including urinary diseases 39.9%, digestive diseases 54.7%, cardiovascular diseases 29.9%, neuropsychiatric disorders 45.4%, respiratory diseases 36.7%, inflectional diseases 13.2%, dermatology 27.9%, endocrine diseases 18.4%, hearing problems 52.8% and sexual disorders 39.9%.

Conclusions: The prevalence of NCDs in these veterans was more than the previously reported prevalence of these diseases in general populations.

Keywords: Non-communicable diseases, Musculoskeletal disorders, Veterans

Background

Non-communicable diseases (NCDs) were responsible for over 53% of the disease burden worldwide and were the cause of 73% of all deaths by 2020.^{1,2} In Iran, NCDs account for more than 76% of the total disease burden.¹⁻⁴ Among them, cardiovascular diseases, cancer, diabetes and chronic respiratory diseases are severe threats to the health of people around the world and require large state and private budgets. Thus, these four diseases have been part of the World Health Organization's (WHO) action plan for years.¹⁻⁴

Strokes and ischaemic heart disease were among the diseases with the greatest burden in 2010, followed by disabilities (including deafness and blindness), as well as renal, endocrine, neurological, haematological, gastroenterological, hepatic, musculoskeletal and skin diseases.¹ According to a study, an analysis of Years of Potential Life Lost (YPLL) revealed acute myocardial infarction as one of the top 10 causes of

YPLL, and acute cerebrovascular disease as one of the top 5 causes of YPLL in all Americans⁵

The prevalence of NCDs in communities can lead to negative consequences. Approximately one-third of patients with severe physical disease experience symptoms of depression.⁶ Pain resulting from physical disease affects welfare, lifestyle, independent living and social relations.^{7, 8} There are significant relationships between mental stress, health status and disease-related limitations on the one hand and the level of pain reported by patients on the other.⁹ The National Health Survey (NHS) in Iran was conducted for a second time in 1999. It combines home interviews and health examinations, which are performed by trained personnel. Sixty-one thousand one hundred and forty persons were studied. NHS data has indicated that four major diseases (cardiovascular diseases, cancers, chronic obstructive pulmonary disease and diabetes) are directly associated with three preventable risk factors: smoking, malnutrition and lack of physical

activity. Health-related studies have revealed that 11.1% of men have high blood pressure. Moreover, the prevalence of obesity and smoking among men is reported to be 5.6% and about 9.23%, respectively.¹⁰ Based on the first study on disease burden in Iran, high blood pressure, with 14.9% of the total burden attributed to risk factors for health, is the second risk factor after obesity and overweight.¹¹

The health status of disabled veterans needs to be considered differently from that of people without disabilities due to underlying war-related physical and social factors. Their medical health status is poorer, and they have to visit doctors more frequently during the year. They also use more medical resources and experience more prolonged periods of hospital stays.¹² Thus, it is wrong to plan their healthcare and allocate resources to them based on the evaluations of people without combat-related disabilities.¹² In order to prevent disease development, it is essential to scientifically identify the prevalence of diseases and risk factors in the target population and decrease them with intervention programs, thereby taking effective measures to promote health in this population. To this end, the present study was conducted to examine the prevalence of NCDs among disabled veterans to define treatment approaches for them. Moreover, the results can be used to develop NCD prevention policies and offer interventions for those at risk of these diseases.

Methods

The study population included all individuals participating in cross-sectional studies between 2014 and 2017. Over three years, health needs assessment studies were performed among Iranian veterans with musculoskeletal disorders across the country. The Human Ethics Committee of Janbazan Medical Engineer Research Center (JMERC) approved the health needs assessment studies (No: IR.ISAAR.REC.1397.002).

In this study, JMERC's database was used to create a new data file for veterans with lower-extremity musculoskeletal disorders. The causes included shrapnel shell, landmine and bullet damage. Most of the participants had more than one cause for their injuries). The veteran populations targeted in the study consisted of veterans with short trans-femoral/hip disarticulation and hemipelvectomy (STFA/HD/HP), below-knee amputation (BKA), ankle-foot disorders (AFD).

Data from the medical history questionnaires were used for the whole study population. In addition, different groups of participants were visited and interviewed face-to-face by internal medicine

physicians, answering a questionnaire based on their opinions in the form of a checklist for clinical information considerations. The content validity of the checklist was reviewed and verified by the physicians.

The inclusion criteria were a war survivor with lower-limb injuries and willingness to participate. The informed consent forms were also filled and signed by all the subjects participating in the health needs assessment studies.

The obtained demographic data included age, gender, education, previous year occupational status and marital status. In the current study, we used recommendations to define health risk factors, as outlined below.

1. Obesity with a body mass index (BMI) of over 30 and overweight, which refers to a BMI between 25 and 29.9.¹³ BMI was calculated using the following equation:¹⁴

$$\text{Estimated body weight below-knee amputee} = \text{Body weight} + (\text{Body weight} \times 0.059)$$

$$\text{Estimated body weight HD/HP} = \text{Body weight} + (\text{Body weight} \times 0.16)$$

2. Hypertension (systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or history of hypertension).¹⁵

3. History of diabetes.

4. Current cigarette use.

Statistical analysis was performed using SPSS 16 (The Statistical Package for the Social Sciences 16.0). Prevalence of problems /diseases or disorders was presented as frequency, percentage and confidence interval. The difference between the prevalence of NCDs in different levels of lower-limb disabilities was examined by chi-square test. Multivariate logistic regression with enter-selection method was employed to find the relation between age and lower level limb disabilities and the type of NCDs. The method used for the evaluation of the appropriateness of the models is Hosmer and Lemeshow Test and classification table. The statistical significance selected was $P < 0.05$. The results of common NCDs were considered as the dependent variable and age and lower level limb disability factors were included in the analysis as independent variables.

Results

One thousand seven hundred and eighty-five veterans with lower-limb musculoskeletal disorder were included in the study. There were 1748 men

(97.9%) and 37 women (2.1%) (see Table 1). Lower-limb disabilities were 79.7 % ankle-foot disorders (AFD), 14.6% below-knee amputation (BKA) and 5.6 % short trans-femoral/hip disarticulation and hemipelvectomy (STFA/HD/HP). Their medical history reported general physical problems including urinary diseases 39.9%, digestive diseases 54.7%, cardiovascular diseases 29.9%, neuropsychiatric disorders 45.4%, respiratory diseases 36.7%, inflectional diseases 13.2%, dermatology 27.9%, endocrine diseases 18.4%, hearing problems 52.8% and sexual disorders 39.9% (see Table 2). According to the chi-square test results, the prevalence of all problems except the eyes, endocrine system and sexual function differed in three lower-limb disabilities. The problems reported by participants were chronic joint pain (39 %), hypolibido (37%), reflux disorder (32%) and headache (30.7%). More details are presented in Table 3.

The prevalence of obesity and overweight were 45.3% (42.9-47.5%) and 24.4% (22.5-26.5%), respectively.

Table 1: Demographic information of veterans

Variable	NO	(%)
Sex		
Male	1748	97.9
Female	37	2.1
Education		
Primary/secondary/high school	843	47.2
Diploma	529	29.6
Academic education	413	23.2
Occupational status in one past year		
Yes	557	31.2
No	1228	68.8
Marital status		
Married	1743	97.6
Widowed/divorced/single	42	2.4

Table 2: The participants' history of physical health problems

Variable	Foot and ankle disorder (n=1424)		Below knee amputee (n=261)		Short trans-femoral, hip disarticulation and hemipelvectomy (n=100)		P-value
	N%	CI (95%)	N%	CI (95%)	N%	CI (95%)	
Urinary diseases (N= 1785)	597 (41.9%)	39.544.5	78 (29.9%)	24.535.6	36 (37.1%)	27.847.4	<0.001
Digestive diseases (N= 1785)	806 (56.6%)	54.059.2	120 (46%)	39.852.1	49 (50.5%)	40.260.8	0.004
Cardiovascular diseases (N= 1785)	391 (27.5%)	25.129.8	99 (37.9%)	32.243.3	42 (43.3%)	34.053.6	<0.001
Hearing problems (N= 1785)	755 (53%)	50.555.7	121 (46.4%)	40.252.5	64 (66%)	56.775.3	0.003
Eyes problems (N=884)	75 (14.3%)	11.517.6	32 (12.3%)	8.416.1	9 (9.3%)	4.115.5	0.431
Neuropsychiatric disorders (N= 1641)	643 (50.2%)	47.652.9	66 (25.3%)	19.930.7	36 (37.1%)	27.847.4	<0.001
Respiratory and lung diseases (N= 884)	228 (43.6%)	39.448.0	78 (29.9%)	24.136.0	18 (18.6%)	11.326.8	<0.001
Infectious diseases (N= 668)	71 (23.1%)	18.927.7	19 (7.3%)	4.210.7	11 (11.3%)	6.218.6	<0.001
Dermatological problems (N=522)	168 (32.2%)	28.236.6	66 (25.3%)	20.331.0	12 (12.4%)	6.219.6	<0.001
Endocrine diseases (N= 884)	90 (17.2%)	14.120.5	56 (21.5%)	16.526.8	17 (17.5%)	10.325.8	0.326
Sexual disorders (N= 1758)	571 (40.1%)	37.342.6	96 (36.8%)	30.742.9	46 (47.4%)	37.157.7	0.268
Orthopaedic problems (N= 1568)	1062 (87.9%)	85.989.8	188 (72%)	66.777.4	84 (86.6%)	79.492.8	<0.001

Regardless of the position of the injuries, about one-third (32%) of all veterans (29.9-34.4%) had a history of hypertension (systolic tension ≥ 140 mmHg or diastolic tension ≥ 90 mmHg). Diabetic persons were 15.9 % (14.3-17.7%) of all veterans. The prevalence of cigarette smoking was 22.9% (19.7-25.8%).

The results from multiple logistic regressions, shown in Table 4, indicated that relevant neuropsychiatric disorders and digestive diseases were less common among younger participants. It was noted that the chance of having orthopaedic problems is lower in veterans with STFA/HD/HP and BKA compared with FAD. The value of the appropriateness of the model for all models was up to 0.91.

Discussion

The findings of this study showed three common physical problems, including digestive diseases (54.7%), hearing problems (52.8%) and neuropsychiatric disorders (45.4%). In 2009, Nejati and Khodabakhsh evaluated the prevalence of chronic diseases in psychiatric veterans. The most common problems were respiratory diseases (18.2%), cardiovascular diseases (14.7%), urinary system diseases (8.9%) and diabetes (7.5%).¹⁶ It seems that the difference in mean age and the type of war-related disorders are the main factors behind these differences.

Our results showed 30.7 % of veterans suffered from headaches and 4.9% migraines. A study indicated the prevalence of headache disorders as 8% (6-11%) and migraine as 14% (12-17%) in Iran.¹⁷ Also, annual stroke incidence was reported from 23 to 103 cases per a population of 100 000 people.¹⁸ Of the veterans with lower-limb injuries, 27.3% suffered from tinnitus. According to available studies, the prevalence of tinnitus in the adult population is 10.1 to 14.5 per thousand, which is estimated to be 22 to 32 per thousand in terms of temporal tinnitus due to noise or cold.¹⁹ Assessment of the pulmonary system showed that 4.8% of the participants had a history of asthma and 18% had chronic bronchitis. In 2007, Heidari et al. stated that the prevalence of asthma symptoms in Iran was 13.4 %.²⁰ Another study indicated an overall prevalence of 4.56% among men and 4.17% among women, and pooled prevalence of asthma was 7.95% for men and 5.83% for women. The pooled prevalence of chronic bronchitis was 5.57%.²¹ Gastroesophageal reflux was a common disease of the digestive system. (20)In Iran, the prevalence of gastroesophageal reflux was estimated at 21.2%.²² Twenty-five per cent of the veterans had a history of kidney stone disease in the present study. In the general population, chronic kidney disease

Table 3: The type of physical health problems in veterans with musculoskeletal disorders

Problem/ disease	Total N	Frequency	(%)
Head trauma	1651	182	11.0
Stroke	1651	23	1.4
Migraine	1651	81	4.9
Headache	1703	523	30.7
Hearing trauma	1651	114	6.9
Tinnitus	1785	487	27.3
Hearing loss	1785	804	45
Chemistry pulmonary injury	750	136	18.1
Asthma	884	42	4.8
Bronchitis	750	46	6.1
Dyspnoea	702	197	28.1
Myocardial infarction (MI)	1785	120	6.7
Coronary artery bypass grafting (CABG)	1569	84	5.4
Congestive heart failure	1569	64	4.1
Stent	455	72	15.8
Orchitis	1651	12	.7
Pyelonephritis	1569	16	1.0
Kidney stone disease	1651	415	25.1
Recurrent urinary tract infection	1651	178	10.8
Reflux	1785	571	32
Gastritis	1785	343	19.2
Dyspepsia	1703	429	25.2
Abdominal surgery	1651	412	25
Low back pain	1162	611	34.2
Spine surgery	1162	37	3.2
Chronic joint pain	1162	461	39.7
Osteoporosis	1162	10	.9
Fracture	1162	5	.4
Hypolibido	1702	632	37.1
Orgasm disorder	1785	535	30

Table 4: Relation between demographic factor and general physical health using logistic regression

Problems/disease	Variable	OR	CI	P
Hearing problems	Age (years)			
	<39	.35	.19.62	<.001
	4049	.69	.50.94	.02
	5059	.81	.601.09	.17
	60< Reference			
	Level of disability			
	STFA/HD/HP*	1.74	.1.132.68	.01
	Below knee amputation	.77	.591.01	.06
Neuropsychiatric problems	Food and ankle disorders Reference			
	Age (years)			
	<39	1.05	.59.1.85	.85
	4049	.96	.69 1.33	.80
	5059	1.04	.761.42	.77
	60< Reference			
	Level of disability			
	STFA/HD/HP	.56	.36.85	.008
Orthopaedic problems	Below knee amputation	.33	.24.45	<.001
	Food and ankle disorders Reference			
	Age(years)			
	<39	1.18	.502.77	.70
	4049	.97	.601.58	.92
	5059	.90	.571.42	.66
	60< Reference			
	Level of disability			
Digestive diseases	STFA/HD/HP	.90	.491.66	.75
	Below knee amputation	.35	.25.49	<.001
	Food and ankle disorders Reference			
	Age(years)			
	<39	.45	.25.79	.006
	4049	1.01	.741.38	.92
	5059	.81	.611.09	.18
	60< Reference			
	Level of disability			
	STFA/HD/HP	.76	.501.14	.19
	Below knee amputation	.66	.50.86	.003
	Food and ankle disorders Reference			

*Short trans-femoral/hip disarticulation and hemipelvectomy (STFA/HD/HP)

was reported as 23.7% for both men and women, 26.6% in women and 20.6% in men.²³ Another study indicated the overall prevalence of chronic kidney disease was 18.9%;²⁴ however, according to our findings, the prevalence of urinary diseases was 39.8%.

In the current study, 15.9 % of veterans were diabetic. Esteghamati et al. found that 7.7% of adults had diabetes and 16.8% of Iranian adults had impaired fasting glucose.²⁵ In addition, Haghdoost et al. reported the prevalence of type 2 diabetes was 24% in people older than 40 years.²⁶ The prevalence of diabetes mellitus was reported at 5.5 %, and the health effects were most prevalent in people older than 60 (10.9 %).²⁷ In our study, the prevalence of the history of hypertension was 26.9%. The overall pooled prevalence of hypertension was 22% (23.6% in men and 23.5% in women).²⁸ The prevalence of hypertension in Ahvaz was 17.58%.²⁹ In a cohort study, the incidence of hypertension was 42.7%.³⁰

Of the veterans, 34.7 % had a history of cigarette smoking; however, 22.9% smoked cigarettes at the time of the study. Smoking prevalence in all subjects was estimated 13.9%, 21.7% and 19.8% in men and 3.6% and 0.94% in women in the meta-analysis of non-communicable disease studies.³¹ Another study showed that the prevalence was 22.9-26.5%, in men and 0.3-0.8% in women.³² In the present study, the ranges of overweight and obesity were 42.8-47.6% and 22.3-26.5%, respectively. The range of overweight prevalence was reported as 27.0-38.5%.³³ One study reported an overall prevalence of overweight was 34.1% (39.5% in men and 36.9% in women).³⁴ In another study, the range of overweight was 4.4%-42.3%,³⁵ the range of obesity prevalence was 12.6-25.9%³³ and the overall prevalence of obesity was 15.4%. The overall prevalence of obesity was 11.7% in men 20.6% in women.³⁴ The rate of obesity was in the range of 1-16.1% in a separate study.³⁵ Obesity was estimated 21.7% in populations above the age of 18.³⁶ The combined prevalence of both overweight and obesity was 51.2% in males and 57.5% in females.³⁴ Godousi and colleagues also found that 48.2% of chemical warfare victims with chronic bronchitis were overweight and 17.5% of them had obesity.³⁷

The results of this study showed that the odds of incidence of hearing problems in veterans with HD/HP were higher than participants with AFD. This indicates that the magnitude of the cause of the war-related injuries can have an influential role in hearing problems such as tinnitus. Nevertheless, the incidence of hearing problems in people with AFD are more than BKA. The odds of having central

nervous system problems in veterans with AFDs are more with amputation. This shows that although the level of war injuries is lower, problems such as headaches and migraines are more prevalent in this group. This requires more examination considering other factors such as psychological dimensions. While it is expected that orthopaedic problems increase with age and higher levels of injury, the results of the present study showed that orthopaedic problems are not related to age. There are fewer problems with orthopaedic problems in participants with BKA than veterans with AFDs. Assessments of biomechanical aspects are needed in this group. The odds of getting digestive diseases are lower in people under 40 and BKA. This suggests the high likelihood of having physical illnesses in veterans with AFDs compared to those with BKAs. This group demand more attention, and it is necessary to evaluate their physical activities and mental dimensions.

Key messages

The health status of disabled veterans needs to be considered differently from that of people without disabilities due to underlying war-related physical and social factors.

The findings of this study showed three common physical problems, including digestive diseases, hearing problems and neuropsychiatric disorders.

In the present study, the ranges of overweight and obesity were 42.8-47.6% and 22.3-26.5%, respectively.

This study suggests that veterans with ankle and foot disorders demand more attention, and it is necessary to evaluate their physical activities and mental dimensions.

Conclusion

The prevalence of NCDs in the studied population of veterans with lower-limb disability was more than the previously reported prevalence of these diseases in general populations. It was also shown that different levels of lower-limb disability and different age groups had different chances of having common health problems.

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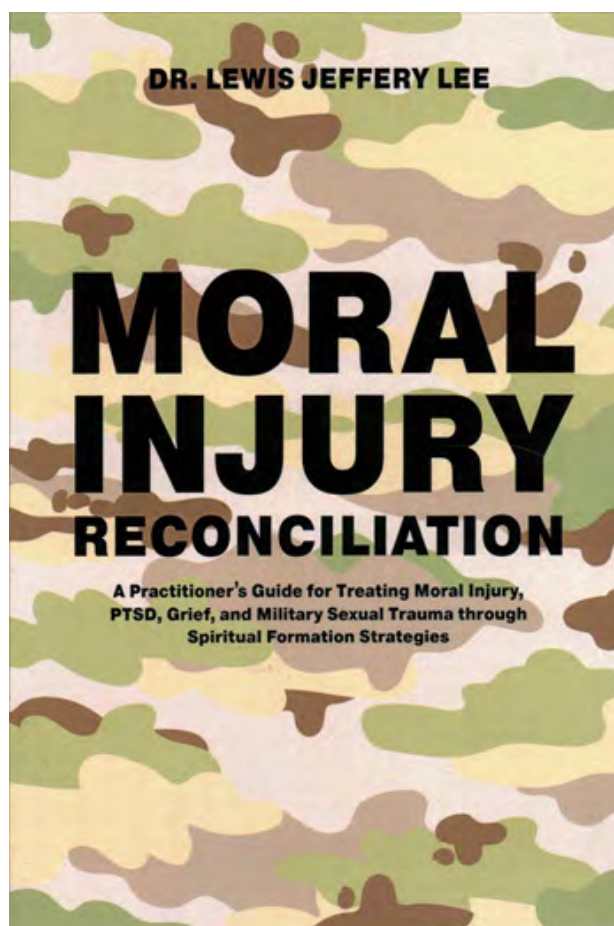
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Moral Injury Reconciliation: A Practitioner's Guide for Treating Moral Injury, PTSD, Grief, and Military Sexual Trauma, by Dr Lewis Jeffery Lee

D Cronshaw



Review by Chaplain Darren Cronshaw

*Dr Lewis Jeffery Lee, *Moral Injury Reconciliation: A Practitioner's Guide for Treating Moral Injury, PTSD, Grief, and Military Sexual Trauma through Spiritual Formation Strategies*. London: Jessica Kingsley, 2018. ISBN. 9781785927577. Paperback. 223pp. AUD\$47.73

Wars are a health hazard for those who fight in them—at physical but also psychological and unseen spiritual distress levels. Research since the 1990s has assisted health practitioners and others understand that things done or undone during military service can lead to a syndrome of symptoms including depression, aggressive behaviour, isolation, guilt, anger, shame, self-harm, a loss of trust in religion or spirituality and declining ethical attitudes. What has become labelled as 'moral injury' can come from different causes and contexts for different soldiers but includes betrayal, incidents with civilians, disproportionate levels of violence, including within-rank violence (sexual trauma or friendly fire).

Dr Lewis Jeffery Lee is a retired US Navy Seal, licensed therapist and Mental Health Chaplain. He identifies moral injury as 'a wound received when one's belief system or expectations about right or wrong have been violated' (p.80) or an 'invisible psychic wound caused by a violation to one's moral code' (p.104). Lee offers helpful background on existing frameworks for understanding and treating moral injury. He explains that soldiers can recover from war's horrors and griefs as long as 'what's right' is not violated, as seminal writer Jonathan Shay and others have suggested. However, when soldiers perform, witness or experience things they didn't expect, especially when 'what's right' is violated, they often need extra support or treatment.

Health professionals have developed and used therapies such as cognitive behaviour and cognitive processing therapy (CBT/CPT) with stoic philosophy, and acceptance and commitment therapy with mindfulness practices. However, researchers and therapists are still only beginning to understand the depths of moral injury and its relationship to other conditions such as PTSD and how treatments might overlap with sexual trauma and grief therapies. There

is also much to learn from recent work on emotional intelligence and family systems. Lee explains how his approach to therapy, especially therapeutic support groups, draws on all these insights.

Moreover, what is distinctive about Lee's *Moral Injury Reconciliation* treatment process or model is how it addresses and draws on religion and spirituality. He suggests that killing, even when justified, has a spiritual toll. The complex and various other causes of moral injury are similarly spiritual in nature and therefore require spiritual interventions. For some soldiers, moral injury can include a dissonance between their religious values and their actions. Traditional religious practices such as lament, confession and forgiveness can thus help them heal and re-orientate to their value system. But even for the majority of soldiers who are not religious, Lee has found his approach helps soldiers not just to alleviate their symptoms but catalyse second-order change and healing. We may live in a predominantly 'secular' society, but there is a spiritual domain of personhood that Lee argues needs attention.

Lee describes his approach as similar to spiritually integrated psychotherapy. Distinctive elements that I appreciated include:

- Starting with the story of a person, with more of a 'salutogenic' model and less of a pathogenic or disease-first perspective.
- Overcoming any divide between psychological and theological disciplines and resources, and seeking to integrate both with a transdiagnostic approach.
- Framing the healing journey around the theological themes of reconciliation and spiritual transformation.
- Utilising a wide range of accessible spiritual practices as healing resources such as spiritual awareness, humility, lament to identify past trauma, confession, forgiveness as a path to freedom, community, resilience know-how and altruism for hope-generation for the future.
- Recognising the potential role of sacred literature in meaning-making.
- Reminding participants of psychological and physical remedies, including the basics of sleep, nutrition and recreation.

The book is a practitioner's guide, explaining the program of treatment Lee has developed over nine weeks. It includes stories, sample therapist dialogues with group members, exercises and homework. The program is structured around three phases that address past, present and future:

- Movement I starts with self and practices spiritual awareness and processes the specific trauma.
- Movement II teaches communication skills for rejoining family and community, including keeping qualities such as selflessness and courage but letting go of the hypervigilance and exaggerated mistrust of others.
- Movement III encourages altruism and benevolent service to others to restore self-good.

The program integrates psychological and theological disciplines and resources, not to offer or pretend a miraculous cure is available, but to suggest that proven ancient practices can help the journey to wholeness with a sense of hope:

While there is much work left, no one need fear moving forward. Cherishing loved ones, enjoying simple pleasures, or putting committed faith in our meaning-making system empowers one's life for real and lasting transformation. Such new thinking may bring joy, though the past we cannot erase. Finding meaning and purpose in our lives will forever remain an enterprise that brings about a sense of coherence. (pp. 204-205)

Moral Injury Reconciliation is a specialist book that would be useful for mental health professionals convening similar programs or for commanders, chaplains and other spiritual care providers supporting veterans and soldiers on a path to wholeness. Its central tenet is that spiritual practices are potential healing resources that complement other therapies in order to help move soldiers and veterans up and out of moral injury.

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The views expressed in this article are those of the author and do not necessarily reflect the position of the Australian Army, the Department of Defence or the Australian Government.

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General and Specific Benefits from the ADF ARRTS Program

T Watt, E J Kehoe

Abstract

The present study was part of an evaluation of the Arts for Recovery, Resilience, Teamwork and Skills (ARRTS) program conducted by the Australian Defence Force (ADF) for wounded, injured and ill veterans as an adjunct to their established treatments. Two previous evaluations, one using categorical judgments and one using standardised rating scales, yielded evidence of overall benefit plus specific benefits in terms of behavioural activation (e.g., sense of purpose and achievement), belonging (sense of social contact and inclusion), sense of flow (concentrated engagement) and good relationships with instructors/mentors. The previous evaluations diverged in their evidence regarding the duration of the benefits of the ARRTS program. The first indicated that high levels of benefit lasted over 24 months, but the second study revealed that the ratings returned to baseline within six months. The current evaluation used primarily categorical judgments of benefits, focusing on the three- and six-month intervals following the program. In agreement with the first evaluation, benefits remained at high levels through the three- and six-month periods. In addition to the categorical judgments, most respondents reported continuing with art-based activities following the program, plus a desire for follow-up contact with fellow participants and arts groups. The results of this and previous evaluations are discussed with respect to emotional memory processes that encode the overall reaction but not its detailed aspects over time.

Introduction

Art-based activities have been beneficial adjuncts in the remediation of disorders including anxiety, depression and PTSD.¹⁻³ Art-based activities have also been associated with improved socialisation, resilience, sense of belonging and quality of life.⁴⁻⁶ To test the value of arts-based activities (visual, written and musical) for wounded, injured and ill veterans, the Australian Defence Force (ADF) conducts Arts for Recovery, Resilience, Teamwork and Skills (ARRTS) program for one month on a biennial basis. The present study was the third in a series of evaluations aimed to identify any beneficial effects of the program as experienced by the participants.

The first evaluation in this series was a retrospective study, comprising 31 of 119 participants contacted 18 to 42 months after completing the ARRTS program through 2015 to mid-2017.⁷ The respondents replied to 16 statements concerning their experiences, e.g. 'I had a sense of achievement from the activities I undertook.' Four statements applied to each of four categories, namely, experience of behavioural activation (sense of purpose and achievement), belonging (sense of social contact and inclusion), sense of flow (concentrated engagement in activity) and instructor relationship (relationship with instructors/mentors.) For each statement, the respondents were asked to tick a box as to whether

the statement applied to themselves before, during and/or after the program. Across all four categories, 23% of the respondents recalled having the experience before the program, rising to 87% during the program and declining to 61% after the program. In response to a further question about the duration of the benefits, 15% recalled the benefits only occurred during the program, while 61% recalled that the benefits were enduring, lasting up to 24 months or longer.

The second, previous evaluation provided a detailed examination asking whether or not there were ongoing benefits at three- and six-month follow-up periods. The respondents (N = 92) represented 86% of participants from programs between late 2017 and late 2019. Rather than broad categorical questions, the second evaluation used standardised rating scales corresponding to the four categories of mechanism examined in the first evaluation. For behavioural activation, belonging, sense of flow, and instructor relationship, a detailed description of each measure may be found in Watt and Kehoe.⁸ Unlike the enduring recall of past benefits observed in the first evaluation, the ongoing benefits largely disappeared within six months.

In both evaluations, respondents reported a positive effect of the ARRTS program. However, the two evaluations yielded different estimates of the

Table 1. Respondent demographics

Gender	
Male	23
Female	14
Age	
<30	10
30-39	12
40-49	9
>50	6
Rank	
Officer	10
Senior Non-Commissioned Officer	5
Other Rank	18
Civilian	4
Service	
Navy	12
Army	15
Air Force	6
Civilian	4
Creative Stream	
Visual Arts	19
Creative Writing	7
Music and Rhythm	11

ongoing benefit, specifically 24 months or more in the first evaluation versus six months or less in the second evaluation. This difference in outcome may be attributable to differences in the measurement instruments, specifically, categorical measures of presence/absence versus multi-point ratings on standardised scales. To help resolve this apparent divergence, the present evaluation included presence/absence measures that were aligned with the content of the rating scales used in the second evaluation. Moreover, questions were added to obtain a behavioural indication of whether the activities in the ARRTS program endured after its conclusion and whether the respondents wished to have further engagement with the program.

Method

Respondents. The respondents (N=37) for the current research participated in the two cohorts of the 2019 ARRTS program and represented 85% of participants. Respondent demographics are shown in Table 1.

Table 2. Benefit, activity and situational questions

- 1 Upon reflection, was the program beneficial? (Yes/No)
- 2 If beneficial, how did the art activity provide benefit? (Tick all that apply to you:)
 - o Flow (being in the moment, losing track of time)
 - o Purpose*
 - o Meaning*
 - o Achievement*
 - o Enjoyment*
- 3 Did the program provide a: (Tick all that apply to you:)
 - o Sense of Belonging
 - o Positive interaction with staff
- 4 Have you continued with an artistic endeavour? (Tick all that apply to you:)
 - o Writing
 - o Music
 - o Theatre
 - o Visual Art
 - o Other
- 5 Have you found another activity since completing the program this is providing benefit?

e.g., sport, yoga, other: _____
- 6 As a result of the program, is the positive effect your participation ongoing?

(Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
- 7 If follow up was provided would you have liked: (Tick all that apply to you:)
 - o A phone call
 - o A catch up with the participants of my program
 - o A catch up with the participants of all programs
 - o Another activity that encouraged belonging
 - o Another activity that encouraged purpose
 - o Another activity that encouraged achievement
 - o Another activity that encouraged flow (being in the moment or the "zone")
 - o Finding a similar art group in my local region

* Features of behavioural activation

Procedure and materials. For the participants who consented, a link to the Qualtrics online platform was sent at three months and six months following the program. There were 34 and 29 completed replies, respectively. The questions asked of the respondents are contained in Table 2. The current evaluation was approved by the Departments of Defence and Veterans Affairs Human Research Ethics Committee, Protocol 853-17.

Results

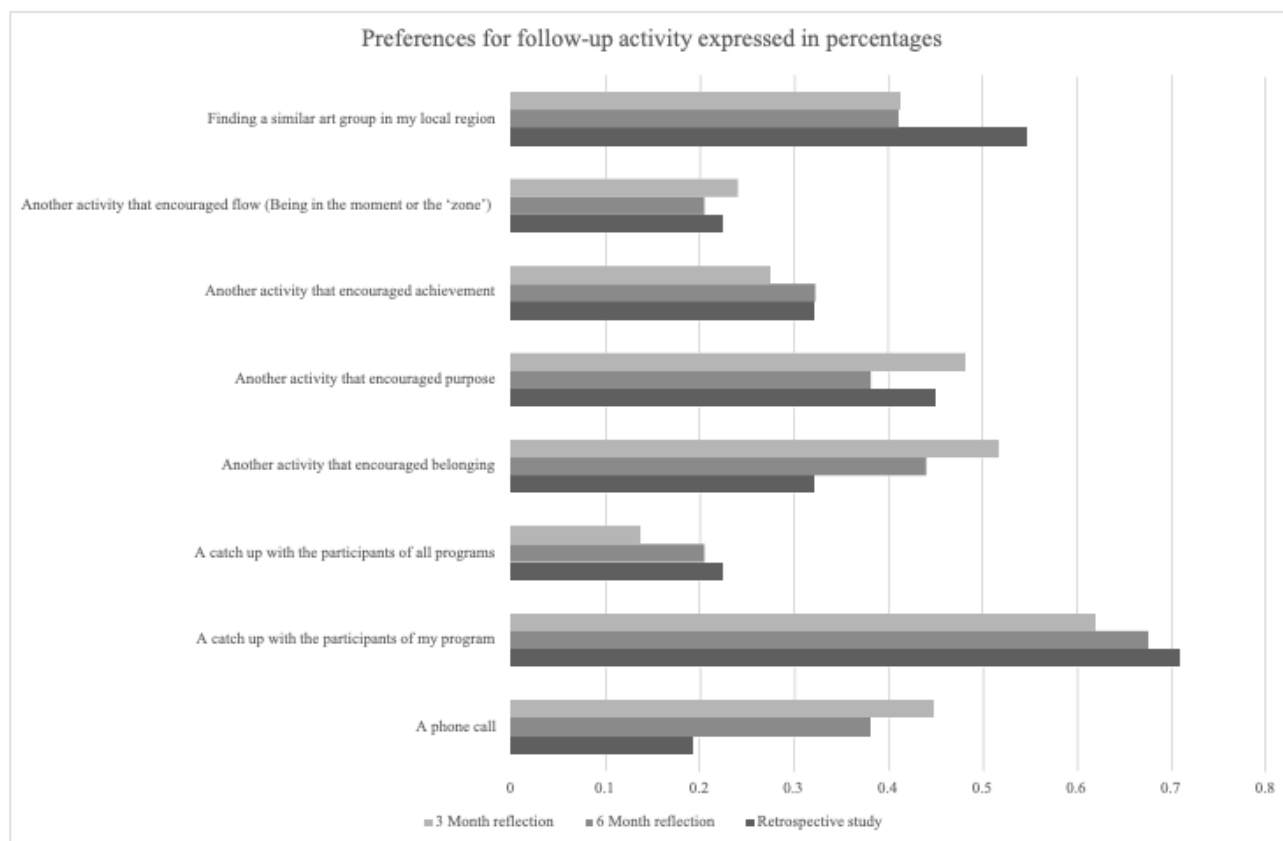
Benefit of the program. At three months, 94% of respondents considered participation to have been beneficial, as did 86% of respondents at the six-month period (Question 1). The apparent decline was not statistically significant; the 95% confidence interval for the difference between the two percentages crossed the zero-difference point. While some respondents did not answer the question, no respondent indicated that the program was a negative experience. With regard to the possible contributing mechanisms (Questions 2 and 3), the majority of respondents at both the three- and six-month periods (with one exception) indicated the benefits of the program included flow (62%, 66%), purpose (56%,

52%), meaning (56%, 55%), achievement (71%, 48%), enjoyment (79%, 76%), sense of belonging (88%, 93%) and positive interaction with staff (82%, 76%). Any apparent differences in specific benefits and/or changes over time were not statistically significant based on zero crossings of confidence intervals.

Sustained benefit of the program. When asked whether the positive effect of participation was ongoing (Question 6), 85% of the respondents strongly agreed or agreed that the benefits continued over the three-month and six-month periods. In addition to the ongoing benefit, the preponderance of respondents had continued with art-based activities over both time periods (94%, 97%) (Question 4). Beyond the art-based activities the program provided, 59% of the respondents indicated taking up other art-based and/or physical activities in the three months following the program, which decreased, although not significantly, to 48% after six months (Question 5). The selected activities at both time points were variable, including, among others, swimming, mountain biking, yoga, astronomy, woodworking and knitting.

Sustained engagement. Figure 1 shows the percentage of respondents who reported what kinds

Figure 1



of sustained engagement they would desire after the program's conclusion at both the measurement points (Question 7). In addition, the corresponding percentages obtained from the previously described first evaluation are also depicted.⁷ Among the options, 'A catch up with the participants of my program' was selected most frequently in both this and the first evaluation (62% or greater). In contrast, 'A catch up with the participants of all programs' was selected least often (23% or less). The difference in confidence interval did not cross the zero point. Less than half the respondents typically selected the other listed activities in either the present or first evaluation.

Discussion

Benefit of program

When asked to reflect on their participation in the ARRTS program, the vast majority of respondents recalled a benefit from the program up to six months later. In particular, a majority typically recalled a benefit related to their flow states, purpose, meaning, achievement, enjoyment, sense of belonging and positive interaction with staff during the program. When asked whether the positive effects of the program were ongoing, 85% of respondents reported that positive effects were sustained across six months.

The present results largely confirm previous findings that respondents experienced benefits from the ARRTS program. In the present study, the respondents experienced both an overall benefit plus specific benefits based on their reflections on the four mechanisms, all of which continued over the six-month follow-up period. Similarly, the first evaluation found overall benefit and specific benefits related to the four mechanisms. In contrast, in the second evaluation, the standardised, multi-item questionnaires used more precisely defined measures of experienced benefits. In that case, the particularised benefits diminished substantially within six months.

The difference in the duration of the experienced benefits may be attributed to memory encoding mechanisms for emotional events. Recall of even highly salient events such as physical injury can change substantially over the time intervening between initial treatment and recovery.⁹ More generally, over retention intervals, the central aspects of an event, including major emotional reactions,

can be readily retrieved while details are lost.¹⁰ In terms of the three evaluations, retrieval of the overall and specific mechanism-related benefits appeared to remain retrievable over several months and years, while precisely defined measures are less retrievable.

Behavioural change and engagement

Beyond subjective benefits, respondents in the present study also reported objective behaviour change. The respondents indicated that nearly all (97%) continued with art-based activities offered during the program at the end of the six-month follow-up. In addition, at the end of the follow-up, nearly half (48%) of respondents had undertaken a wide variety of behaviour-based activities. In addition to self-initiated activities, many respondents (96%) indicated a desire to both sustain connections with their cohort in the ARRTS program and developed connections with other relevant groups.

Limitations and future directions

The present study indicated that the substantial perceived benefits of the ARRTS program persisted for at least six months. However, both this study and the similar persistence seen in the first evaluation⁷ were based modest sample sizes ($N_s < 38$). Thus, they had limited power to detect any downward trend as was seen in the second evaluation, which had a larger sample size ($N=92$). Thus, future research with greater numbers would provide the power to detect trends over time in both categorical measures of benefit versus standardised scale ratings.

Conclusion

The current study extended the existing knowledge on how to engage military personnel with art-based activities as an adjunct to their previous and ongoing clinical treatment. Based on the respondents' recall, the ARRTS program provided both overall and specific benefits. Additionally, the results indicated that participants continued with arts-based activities, and they desired follow-up activities.

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

K W Bender, E Smartt, A Mahoney, A Pearson

Background

Hippocrates recognised that civilian practice alone does not prepare military surgeons for the trauma they may treat while deployed. Similarly, many medical professionals acknowledge that the technical and non-technical skills required of military General Surgeons are unique to the combat environment. Civilian general surgery practice is increasingly characterised by subspecialisation and minimally invasive operative techniques. In contrast, combat surgery continues to rely upon a breadth of experience and traditional approaches that may be less familiar to contemporary surgeons.¹

In order to evaluate and mitigate any consequences of this discrepancy, it is necessary to define the skills requirements of deployed military General Surgeons. Subsequently, a comparison may be made with the skill set surgeons derive from their usual practice, typically in a civilian non-combat setting. Coalition partners have defined these skill sets; however, they are yet to be formalised by the Australian Defence Force (ADF).

Purpose

The authors propose to develop an 'Operational Clinical Skill Set' (OCSS) for ADF General Surgeons. The OCSS will comprise a list of skills that could be meaningfully expected of deployed ADF General Surgeons, supported by analysis of historical caseload and extant trauma surgery curricula.

This paper aims to produce a draft OCSS, to scaffold a formal consultation process involving the wider ADF general surgery community. This draft represents a proof of concept, and in defining an OCSS in the Australian context, it will facilitate other deployable craft groups in establishing equivalent OCSSs.

The General Surgery OCSS aims to enhance ADF healthcare provision in three ways:

1. To guide the development of 'Operational Clinical Readiness Pathways' aimed at defining

and rectifying any skill deficiencies of General Surgeons prior to operational deployment.

2. To serve as an aid to reflective practice by General Surgeons, outlining the expectations of their role and guiding them as they define their own learning needs following recruitment or prior to deployment.
3. To inform the chain-of-command of individual clinicians' skill profiles, measured against a standard and the potential risks and benefits of their nomination for specific tasks.

Method

A scoping review of the literature was undertaken to establish the characteristic case-mix of deployed general surgery services. Relevant studies were identified through a broad Medline search combined with a citations review. Inclusion criteria were: military or civilian Role 2E facility; warlike environment; case study, case series or review; numerical or fractional reporting of caseload and case-mix; English language; and published in the last two decades. Quantitative data were collated and analysed through descriptive statistics.

Having established the expected range of presentations that confront deployed General Surgeons, the authors then aimed to identify a list of core surgical skills that would permit successful management in a Role 2E setting. In the absence of a mature trauma general surgery subspecialty qualification in Australia, the skills outlined in the Definitive Surgical Trauma Care (DSTC) course manual² were used as a guide for what might be meaningfully expected of ADF General Surgeons at present. Skill sets developed and published by coalition partners were also reviewed for comparison. Finally, in order to generate a working list of skills, the published data were collated by body system/region in keeping with the skill training model for civilian General Surgeons in the DSTC.

Results

The initial Medline search and citation review identified 17 articles to consider. Full-text articles were reviewed against the inclusion criteria, and 10 studies were selected for analysis, representing data from a variety of organisations and regions. The content of these papers was categorised by body system, with an additional category of 'Trauma Management Principles' encompassing non-technical skills.

Collated data from recent deployed Role 2E hospitals shows that these facilities must manage a wide range of surgical presentations using damage control principles. Accordingly, the skills required of the deployed Role 2E General Surgeon are broad. The evidence identified for skills in each domain of the General Surgery OCSS is summarised below:

Trauma management principles

- Conflict zones generate complex surgical workloads, with approximately 22% of surgery being for violent injuries.³
- Damage control principles are often utilised.⁴⁻⁶
- The environment is austere with limited resources,⁷ surgery different from civilian practice,¹ and with variable opportunities to learn on the job.⁸
- Workloads fluctuate, including multi/mass-casualty incidents.^{6,8}

Head:

- Head injuries are present in between 10% and 16% of trauma patients.^{1,6}
- About 1–2% of surgeries are performed for head injuries^{1,7}.

Neck/face:

- Facial injuries are common.^{7,8}
- Non-traumatic facial pathology is also described, e.g. peritonsillar abscess.⁶

Chest:

- Chest injuries can be more common than abdominal injuries, and thoracotomies are as common as laparotomies or craniotomies.^{1,7}

Abdomen/pelvis:

- Abdominal trauma generates around 8.9% of surgeries and often requires damage control.^{5,9}
- Non-traumatic abdominal surgery comprises around 7.7% of the total surgical workload.¹⁰

Limbs/vascular:

- Amputations comprise 5% of operations for major trauma and can occur at a variety of anatomic levels.^{7,8}
- Most orthopaedic surgeries are closed reductions with less frequent open reduction internal fixation (ORIF).⁷
- Vascular shunts are used regularly as damage control devices.⁵

Burns/soft tissue:

- Burns are common in modern conflict.⁵
- Fasciotomies are common, comprising 5.7% of surgeries.⁹

Discussion

Considering the evidence regarding case-mix from Role 2E hospitals, we have compiled a draft OCSS for ADF General Surgeons, shown in Table 1. A deployed surgeon *competent* and *confident* in performing all of these skills would be able to manage the breadth of presentations they may expect to see on operations. This skill set shares many similarities with the 'Resuscitative Surgeon' as defined by the Royal College of Surgeons Major Trauma Workgroup position paper.¹¹ Future research should consider the potential utility of the General Surgery OCSS by evaluating its face validity among ADF surgeons, its acceptability as an aid to health planning by ADF commanders, and its impact upon the self-efficacy of deploying surgeons. Demonstrating changes in patient-centred outcomes, such as preventable mortality, will be difficult in the short term due to the low clinical tempo observed in contemporary ADF deployments; however, there is merit in a prospective analysis of the extent to which major trauma presentations to ADF facilities fall within the OCSS as it is presently defined.

OCSSs can ultimately be used to guide recruitment, shape individuals' professional development, select personnel for deployments and generate systematic training programs for capability optimisation. The authors do not consider that surgeons must necessarily possess all skills on the OCSS in order to be deployed. The OCSS may be adjusted over time and may vary for General Surgeons deployed to a facility with subspecialty surgeons. Moreover, some operations may not require certain elements of the OCSS; however, its existence will support command in adopting a risk management approach to the selection of a given clinician for deployment and aid individuals in preparing themselves in a more robust manner for military work.

Conclusion

Review of contemporary military surgical literature, combined with analysis of existing surgical trauma curricula, has resulted in the development of the first draft ADF OCSS for general surgery. The draft OCSS may now be formalised through a structured process seeking expert opinion from a wider group of clinicians to achieve consensus support from the ADF health community.

The present study has demonstrated the feasibility of developing an OCSS to fit ADF requirements for one surgical specialty. This process may be repeated for each of the ADF medical procedural specialist categories. Collectively, such OCSSs could provide a foundation for developing an Operational Clinical Readiness Pathway that links appraisal of skills against the OCSS with targeted learning experiences for individual specialists. This body of work will enhance the ADF's approach to the continuous professional development of its specialist workforce and will ensure that clinicians are confident and competent to undertake the duties the ADF requires of them on operations.

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Conflicts of interest

MAJ Bender, MAJ Mahoney and WGCdr Pearson are all currently employed as medical specialists in the full-time ADF under the Medical Specialist Program (MSP).

None of the authors have any financial or other conflicts of interest to disclose.

The views expressed herein are those of the authors and do not represent the views of the ADF or any of the authors' affiliated organisations.

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Malaria Determined Military Outcomes in Burma (Myanmar) Across Three Centuries

D Shanks

Abstract

Disease has often determined the outcome of tropical military campaigns. This is especially true in Burma (Myanmar), where entire armies have been incapacitated by fever thought to be due to malaria during the Sino-Burmese Wars (1765–1769), the Anglo-Burmese Wars (especially the first in 1824–1826) and World War II (1942–1945) when the British 14th Army fought against the Imperial Japanese Army. The monsoon limits military activity logistically, but malaria following the rains still can incapacitate armies, particularly in forested areas favoured by the *Anopheles* vector. Strict discipline applied to imperfect chemoprophylaxis was successful in World War II and will be required in any future conflicts. Political instability in parts of Southeast Asia continues to make malaria a disease of abiding military medical interest and necessitates better forms of chemoprophylaxis.

Malaria determined military outcomes in Burma (Myanmar) across three centuries

Tropical Southeast Asia has repeatedly resisted invasions from Eurasian empires by wars of attrition fought over difficult terrain and complicated by infectious diseases that decimated foreign armies. Historically, it is difficult to know exactly what stopped the Mongol invasion of Vietnam's Red River Valley in the 13th century; attributed to evil spirits, it seems likely that malaria was involved. The modern southern boundaries of China were determined both by geographic and disease limitations on invading armies. Three historical examples over the past three centuries stand out in terms of Burma (currently known as Myanmar) with Chinese invasions in the 18th century, British/Indian invasions of the 19th century and the Imperial Japanese Army's invasion during World War II in the 20th century. In all three instances, febrile diseases known certainly to be malaria only in the last instance determined the ability of commanders to maintain deployed forces and thus largely determined military outcomes. As political instability continues to cloud the future of Burmese politics, it is worth reviewing the historical record to understand why military operations in Southeast Asia were constrained by malaria and why this threat remains for any complex public health emergency in tropical Asia.

Sino-Burmese Wars

He also decided to ignore the pleadings of his officers and began the campaign at the height of the rainy season... hoping that the 'miasma would not be everywhere'.¹

A series of unsuccessful Chinese invasions of Burmese territory occurred in 1765–1769 as the Qing dynasty pushed its influence southwards against the Burmese who were otherwise occupied against their traditional Siamese enemy. When Chinese forces (green standard or reserve army) were drawn into northern Burma (Bhamo), disease destroyed thousands of soldiers due to enteric and malarial causes. Reports were received that 800 of 1000 soldiers in a single garrison had died of disease.¹ After two preliminary seasonal invasions using local forces from Yunnan failed to make an impression in the Shan Hills, Imperial prestige became involved, and a larger effort using Manchu bannermen (regular army) forces was planned (see Figure 1). Invasion of the central Irrawaddy Valley initially succeeded but pressure on the extended supply lines and increasing disease deaths stopped the offensive short of the capital of Ava.¹ Only a few dozen survivors of the 10 000 strong force were stated to have made it back to China. The fourth and final attempt of this series in 1769 began during the rainy season in contravention to the Burmese military knowledge that this was not

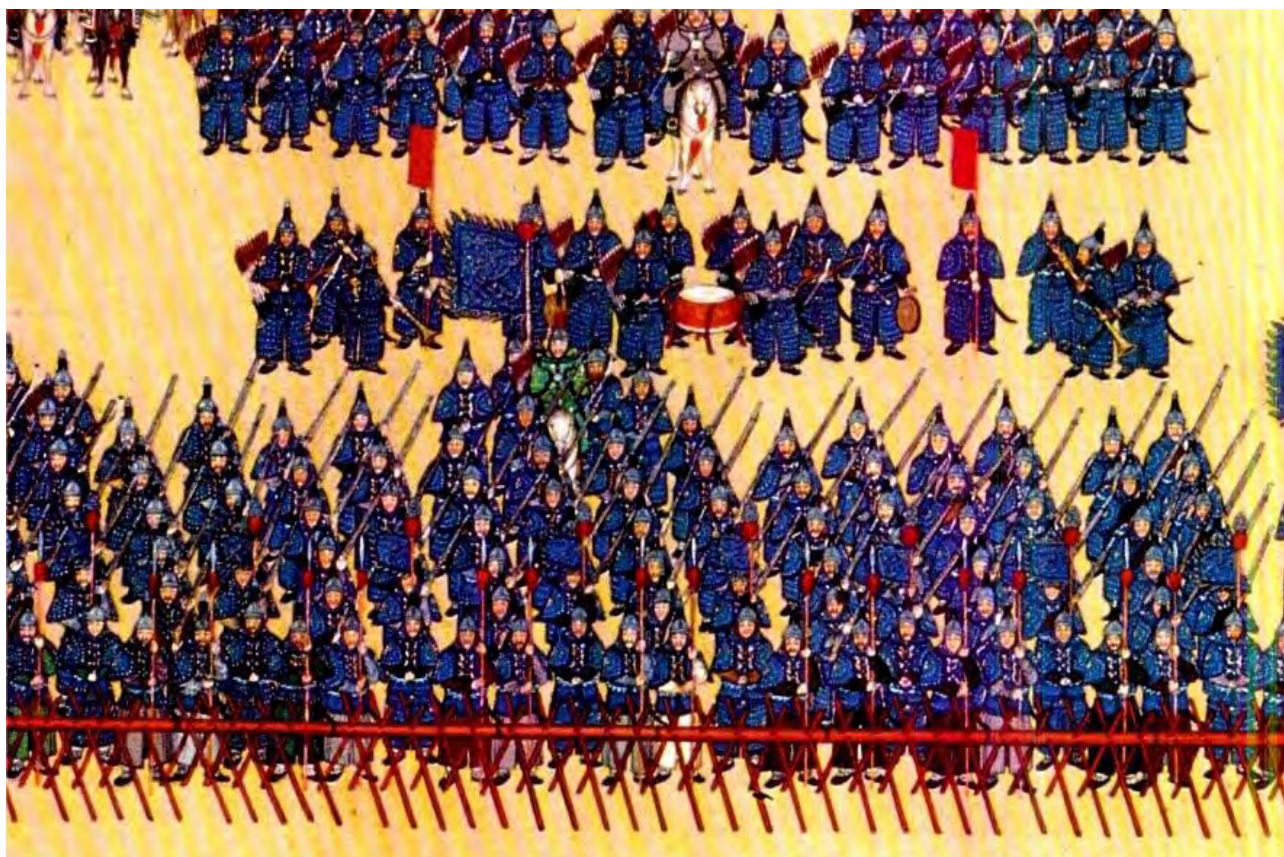


Figure 1: Mongol (Qing dynasty) troops of the Blue Banner in the Chinese Army during the 17th century, similar to those who participated in the Sino-Burmese Wars of 1765–1769. Painting dating to Emperor Qianlong's reign. Considered in public domain as a historical object >200y old.

(Source: <http://chinese-armor.freewebspace.com/photo2.html>)

the time to launch military operations.¹ A Burmese border fortress was remarkably stubborn, slowing the Chinese advance until both the soldiers and its commander were ill from fever. By the end of 1769, a peace treaty was negotiated in order to stabilise the border and permit the invaders to retreat back into China. The Sino-Burmese Wars are widely regarded as the greatest military frontier failures of the Qing, ultimately costing the lives of the four senior military commanders and 70 000 soldiers largely killed by disease.¹

Anglo-Burmese Wars

The detachment was immediately attacked with a malignant jungle fever peculiar to the country, which in a few days reduced it to about twenty men capable of doing duty.²

Conflict between the adjacent empires of the London-based East India Company that had displaced the Mogul rulers of India and the Burmese occurred over

the border provinces of Manipur and Arakan in the early 19th century. By 1824, the British felt compelled to push the Burmese back along the frontier, and initial reverses eventually held to a sea-borne invasion of Rangoon by the Indian Army strengthened by a few British regiments. The Burmese forces retreated up the Irrawaddy river fortifications while the British/Indian soldiers progressively became ill from enteric and malarial fevers. Eventually, superior British artillery (including rockets) killed many soldiers, including the Burmese commander, and a truce involving large financial repartitions was settled on the condition that the invaders leave Burma.¹

Casualties largely due to disease were very high but variably calculated (see Figure 2). It was estimated that of the 40 000 British and Indian soldiers engaged, 15 000 (38%) died. Of the 3586 European soldiers who originally occupied Rangoon, 3115 died (86%), but only 150 of those deaths occurred in battle.³ The War Office in London stated that



Figure 2: Memorial plaque in St George's Cathedral Madras (Chennai) to six Indian Army (16th Native Infantry) officers who died (one in combat, five from disease, including a medical officer) during the First Anglo-Burmese War of 1824–1826.

(Source: Photographer WestCoastMusketeer under Creative Commons in Wikipedia 2016)



Figure 3: Bronze statue in Whitehall, London of Field Marshall William Slim (later Viscount) commander of the British 14th Army in Burma during World War II 1942–1945.

(Source: Photographer Hydeblake in public domain from Wikipedia 2007)

5.25% of British soldiers commanded by General Campbell died in battle, but 67.5% (>1:12 ratio) died of disease during the two-year war.^{4, 5} The Arakan invasion force (which never reached Rangoon) is thought to have experienced 44% casualties largely due to diseases among its European soldiers, while its Indian contingent had 57% casualties; their commander General Morrison died of disease while being evacuated to England.²

World War II

Good doctors are no use without good discipline. More than half the battle against disease is fought not by doctors, but by regimental officers. It is they who see that the daily dose of mepacrine ... is taken...If mepacrine was not taken, I sacked the commander.

I only had to sack three; by then the rest had got my meaning. Field Marshall Sir William Slim^{6, 7}

After the fall of Singapore in 1942, the Imperial Japanese Army invaded Burma with four infantry divisions and rapidly sent two understrength Indian Army Divisions retreating into India through the highly malarious Assamese jungle. A sick, beaten army of stragglers eventually made it back into India just ahead of the monsoon rains of 1942.⁶ Malaria was a major factor in developing sufficient manpower to construct the British/Indian 14th Army into the eventual fighting force it became after its formation in 1943. After a failed Allied offensive in the Arakan in 1943, the entire Indian 6th Infantry Brigade was infected with malaria, and in the last three months of the offensive 18 000 soldiers with malaria were

evacuated back to India.⁷ The Imperial Japanese Army then conducted an ill-advised and poorly-supplied offensive in 1944 to capture Imphal in India but was stopped by the stubborn defence of Kohima. The 14th Army counter-attacked and reached the Irrawaddy Valley after capturing Mandalay. In the reverse of 1942, the Allies chased the Japanese Army back down towards Rangoon, destroying isolated units as they tried to flee into Thailand during the monsoon. Burma was the greatest land-based defeat of the Imperial Japanese Army during all of World War II.

Malaria contributed greatly to the defeat of the Imperial Japanese Army in Burma just as its control gave the British/Indian 14th Army an important medical advantage against its enemy. LTGEN William Slim, whose quote begins this section, was convinced that malaria was largely a matter of military discipline once it was known that the imperfect, yellow-dye mepacrine (atabrine) would stop malaria if taken daily (see Figure 3). Disease casualties on both sides were high but can be estimated because by the 20th century malaria was known to be a parasitic disease spread by mosquitos that could be diagnosed by microscopic examination of the blood. In 1943 the 14th Army's illness rate was an enormous 1200/1000 men with >5000 malaria cases per day at peak with malaria rates between 100–250/1000 men.⁸ Most hospitalisations were due to illness, of which malaria was clearly the chief cause especially given the propensity of Asian malaria to relapse. By 1945 the overall Allied hospitalisation rates of malaria were one-sixth (10/100 men) of peak levels with only six deaths from 14 000 cases.⁷ Japanese malaria casualties can only be estimated. However, essentially, all infantry soldiers in Burma developed malaria at some point in the campaign, which, even if it did not kill them, greatly reduced their combat effectiveness.

Discussion

Malaria retains its particular significance to military operations in Southeast Asia, even today, because it can rapidly increase from a very low baseline to infect and subsequently incapacitate most of a deployed force. For example, East Timor had a very small malaria problem in 1999 until it was massively disrupted by the Indonesian withdrawal that resulted

in a malaria epidemic, infecting the Australian peacekeepers.⁹ Malaria is not restricted to military members but contributes to complex public health emergencies with massive refugee movements, such as the Vietnamese invasion of Cambodia in 1979.¹⁰ Although Southeast Asia has made great progress in some areas of malaria control, the disease is far from eliminated and its potential to disrupt military operations remains. Moreover, current political instability in Burma and uncertain Chinese intentions throughout the region only increase the potential of future emergencies in the area to have a malaria component. Chemoprophylaxis options have advanced considerably since World War II; however, LTGEN Slim's emphasis on discipline enforced by unit officers as the key to making drugs an effective military malaria control measure remains true today.

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Acceleration-Induced atelectasis; a case with deceptive clinical manifestations for COVID-19 pneumonia

H Shahali, M Darvishi

Abstract

These days, the world's healthcare systems are facing the SARS-CoV-2 pandemic and its associated disease, named coronavirus or COVID-19. This virus is a new human pathogen, and although there are many innovative vaccines, there are currently no specific treatment options.

In this study, we report a case with ambiguous clinical manifestation for COVID-19 pneumonia. The patient is a 32-year-old male F-14 pilot who went to the emergency ward with a dry cough, substernal pain and dyspnoea. His vital signs included the following: oral temperature of 38°C, blood pressure of 110/60 mmHg, heart rate of 105 beats/min, respiratory rate of 23 breath/min, and pulse oximetry of 88% on room air. He was admitted, and routine RT-PCR and CBC test were obtained. CXR and chest CT scan demonstrated bilateral lower lobe subsegmental atelectasis. COVID-19 pneumonia was ruled out, and due to a history of exposure to sustained high levels of acceleration with breathing high oxygen concentrations, acceleration-induced atelectasis was considered. Finally, the patient satisfactorily recovered by respiratory rehabilitation and N-acetylcysteine administration. COVID-19 presentations are very similar to different diseases and disorders, which may be confusing and delay treatment. The authors believe that their colleagues will be more careful in identifying and treating patients.

Keywords: SARS-CoV-2, COVID-19 pneumonia, Acceleration-induced atelectasis, Military pilot

Conflict of interest: None

Background

Today, the world is experiencing the coronavirus 2019 (COVID-19) outbreak with rapid transmission, possible complications and a high level of morbidity and mortality. COVID-19 needs early accurate diagnosis, systematised quarantine and closed follow up to reduce the transmission chain and recovery.¹ Military aviators' health is essential because they are the future of military aviation. Preparation for them to enter pilot's training courses and deliver desired services in the form of expert military aviators requires extreme monetary and spiritual costs.²

History

The patient is a previously healthy, 32-year-old male military F-14 pilot who performed a 35-minute air combat manoeuvring training (ACM) flight. A few hours after landing, he went to the emergency ward with a dry cough, substernal pain

(exacerbated by deep inspiration) and dyspnoea. He denied other symptoms, tobacco or medication use, significant past medical history and has not experienced acceleration atelectasis so far. His vital signs included the following: oral temperature of 38°C, blood pressure of 110/60 mmHg, heart rate of 105 beats/min, respiratory rate of 23 breath/min, and pulse oximetry of 88% on room air. Due to the coronavirus pandemic and clinical suspicion of COVID-19 pneumonia, he was admitted, and necessary laboratory and radiographic assessments were ordered.

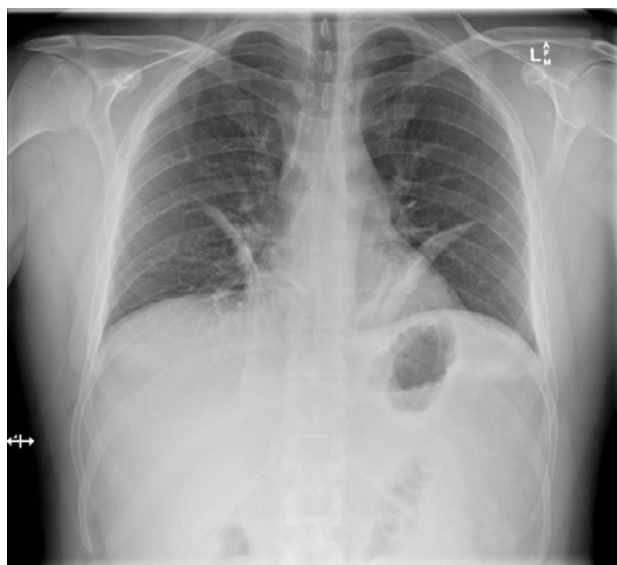
Examination findings

Necessary laboratory assessments (related to COVID-19 infection) were requested, and their results are described in Table 1.

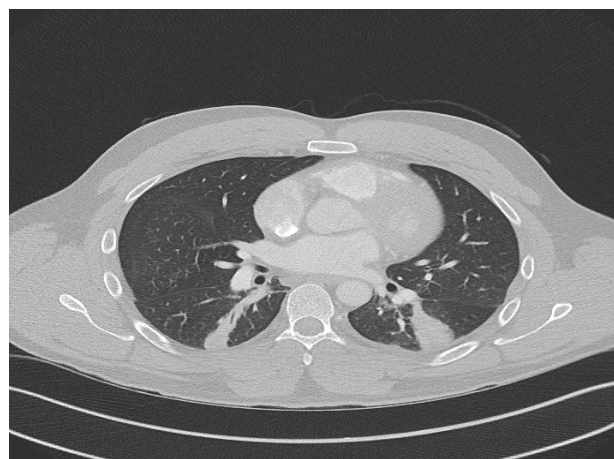
CXR and chest CT scan were ordered due to the pulmonary symptoms, which demonstrated bilateral lower lobe subsegmental atelectasis (Figure 1).

Table.1: Laboratory Findings

Laboratory tests	Results	Reference range
RT-PCR test (nasopharyngeal specimen)	Negative for SARS-CoV-2 (COVID-19)	–
Haematology	WBC = 7800/Cumm	3500–10000
	Lymphocyte = 35%	–
	RBC = 4.6 Mil/Cumm	3.9–5.5
	Hb = 13.8 gr/dl	12–16
	HCT = 41.9 %	34.7–46.7
	MCV = 91 fl	81–100
	MCH = 30.8 pg	27–34
	MCHC = 33.6 gr/dl	31.5–35.7
	RDW = 12.8 %	11.6–14.4
	Band = 3 %	–
	Platelet = 351000/Cumm	150000–450000
	TIBC = 428 g/dl	230–440
	Ferritin = 178 ng/ml	20–250
	Iron (Fe) = 95 g/dl	40–120
Serology	CRP = 4.5 mg/L	Up to 8
	ESR = 13 mm	2–20
	FBS = 75 mg/dl	70–99
Biochemistry	Alk. Phosphatase = 55 U/L	35–104
	LDH = 246 U/L	135–214
	D-dimer = 100 ng/ml	< 250



A



B

Figure.1: A) CXR represented symmetrical curvilinear opacities extending superolateral from the lower mediastinum bilaterally. They are separate to the oblique fissure on the lateral projection, most likely to be atelectasis. B) Axial chest CT scan shows bilateral lower lobe subsegmental atelectasis.

Special investigations

Laboratory and radiographic findings ruled out the clinical suspicion of COVID-19 pneumonia. However, due to his pulmonary symptoms, clinical and paraclinical findings and current history of exposure to sustained high levels of acceleration with breathing high concentrations of oxygen, acceleration (or G)-induced atelectasis was considered. The patient was encouraged to remain upright (to increase functional residual capacity [FRC]) and take as many deep breaths as possible. Administration of incentive spirometry, chest physiotherapy and N-acetylcysteine (600 mg orally every 6 hours for 3 rounds) greatly impacted recovery. Finally, after 48 hours of respiratory rehabilitation, the patient was discharged from hospital with a satisfactory clinical condition, but his return to flight education will be subject to further assessment by an air medical examiner (AME).

Discussion and conclusion

'G-induced atelectasis' is a resorptive and non-obstructive form of atelectasis produces during exposure to sustained acceleration (above about +3 Gz) when exposed to a high concentration of oxygen (for about 15 minutes) before using an anti-G suit. The condition can arise with an anti-G suit, but the severity of lung collapse is considerably less. As discussed above, the terminal airways of the basal alveoli close on exposure to +Gz acceleration so that ventilation of their alveoli ceases, although they continue to be well perfused. The closed airways will open again as soon as the exposure to acceleration ends and ventilation resumes. Since these non-ventilated alveoli are well perfused, gaseous exchange continues between the gas trapped in them and the mixed venous blood flowing through their septa. This blood absorbs the trapped gas from the alveoli at a rate limited by the rate at which the least soluble gas, usually nitrogen, is removed.^{4,5}

There is a wide individual variation in susceptibility, both in the level and duration of acceleration required to produce atelectasis and the magnitude of the effect. The symptoms, which are usually not apparent until after exposure or even after the flight in which the exposure occurred, consist of a dry cough, with or without substernal discomfort or pain, exacerbated by deep inspiration. Chest radiographs reveal atelectatic bands at both lung bases (radiographic signs of collapse can occur in the absence of symptoms, but X-rays are not usually needed to

manage the condition). Chest CT scan has a higher diagnostic sensitivity and often reveals dependent lung densities and loss of volume in the affected side of the chest. Atelectasis may also be directly visible with fiberoptic bronchoscopy and can be both diagnostic and therapeutic. The symptoms and radiographic signs are usually completely clear after changing position from supine to upright (increases FRC and decreases atelectasis), encouraging patients to take several deep breaths (which often provoke bouts of coughing), incentive spirometry, use of chest physiotherapy and a mucolytic agents (e.g. N-acetylcysteine). The mechanism behind all of these measures is a transient increase in transmural pressure that allows for the re-expansion of collapsed lung segments. In the absence of these interventions, however, basal collapse may persist for 24 hours or more.^{3,4}

Based on the Federal Aviation Administration (FAA) guideline, civil pilots with a history of successful atelectasis treatment can return to flight with no signs or symptoms, normal pulmonary examination, and normal spirometry and radiography. However, according to the Royal Air Force (RAF) guideline, in addition to the above conditions, if the atelectasis and its underlying cause had been successfully treated without any recurrence, military pilots can also return to flight duties.⁴⁻⁶

COVID-19 presentations are very similar to different diseases and disorders (such as new-onset pulmonary sarcoidosis, acceleration atelectasis, etc.), which are themselves rare and worrying for military aviators. Subsequently, COVID-19 diagnosis can be confusing, leading to a delay in treatment.⁷ The authors believe that by studying this interesting rare case, their colleagues will be more careful in identifying and treating patients with COVID-19 presentations.

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Ethical approval

The ethical approval of this study was issued by the Ethics Committee of the Aerospace and Sub-aquatic Medical Faculty in Aja University of Medical Sciences, with registration N# 10167121.

Abbreviations

Complete Blood Count —CBC

Reverse Transcription Polymerase Chain Reaction—
RT-PCR

Functional Residual Capacity—FRC

Air medical examiner—AME

Gravitational force from head to foot—+Gz

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Operational Clinical Readiness Pathways – An individualised training model to prepare ADF general surgeons for deployment

A Pearson, A Mahoney, K W Bender

Abstract

Background: Modern developments in civilian surgical practice have driven a shift in general surgeons' experience towards subspecialised and minimally invasive approaches, while military surgery continues to rely on a breadth of skills and traditional open techniques. The authors have previously described an Operational Clinical Skill Set (OCSS) for deployable ADF General Surgeons. It is suggested that the ADF develop an Operational Clinical Readiness Pathway (OCRP) in order to provide optimal training for general surgeons prior to deployment.

Purpose: This paper drafts an OCRP that may be formalised through consultation with the wider ADF General Surgery Community. The OCRP aims to enhance ADF healthcare provision by:

- improving the competence and confidence of ADF General Surgeons in all aspects of austere trauma surgery
- improving recruitment and retention of suitable surgical clinicians
- strengthening coalition ties and interoperability with partner nations.

Conclusion: An OCRP has been drafted, proving the feasibility of this process for the ADF. It is envisaged that a General Surgery OCRP will enhance ADF surgical care and guide other health specialties through OCRP development.

Conflicts of interest: MAJ Bender, MAJ Mahoney and WGCdr Pearson are all currently employed as medical specialists in the full-time ADF under the Medical Specialist Program (MSP).

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The views expressed herein are those of the authors and do not represent the views of the ADF or any of the authors' affiliated organisations.

Background

The Australian Defence Force's (ADF) deployed surgical capability is built upon well-rounded and broadly skilled general and orthopaedic trauma surgeons. Modern surgical care in developed nations has progressed toward subspecialisation, minimally invasive surgery and a reliance on advanced diagnostic imaging. This has resulted in contemporary general surgical graduates possessing a skill set that only partially encompasses that required for the management of combat trauma in austere military environments. Consequently, our surgeons may not be clinically prepared for the task at hand,¹ a risk which has already seen mitigation strategies

proposed by several of our allies.^{2,3} The ADF must also look to develop a system that assists Australian General Surgeons in acquiring and maintaining the skills needed in the deployed environment. Any solution to this problem will need to consider the diversity and complexity of the environments in which our surgeons work. We propose one approach that we have termed 'Operational Clinical Readiness Pathways' (OCRP).

Intended end-state

ADF General Surgeons currently maintain their clinical skills exclusively in the civilian healthcare sector. Their exposure to trauma and surgical

techniques analogous to those required on deployment is not monitored and is likely to be highly variable. Any ADF approach to enhancing surgeons' suitability to deploy on operations must identify and remediate gaps between the skills required for a mission and the existing competencies of a given surgeon. Through this process, surgeons should become confident and competent in trauma resuscitation decision making and performing a wide range of damage control procedures and austere acute General Surgery, which they may not routinely perform in their civilian practice. In our previous work, we conducted a literature review and analysis of the general surgical case mix from recent conflicts to derive a skill set for deployable ADF General Surgeons that we have termed the Operational Clinical Skill Set (OCSS).

Determining a surgeon's suitability to deploy on operations is complex. Common factors considered important in previous studies include a surgeon's subspecialty, any formal trauma surgery training and the surgeon's usual case mix. A 2016 report commissioned by the Royal College of Surgeons into Major Trauma Workforce Sustainability, described and defined a 'resuscitative surgeon'.⁴ This surgeon has clinical grounding in gastrointestinal or vascular surgery with sufficient exposure to operative trauma management to become a competent trauma surgery provider. Similarly, Edwards and colleagues of the United States Army proposed the term 'trauma ready' to distinguish surgeons possessing the full range of requisite skills from surgeons with a narrower range of competencies, whom they designate as 'trauma assist'.⁵ Edwards' approach acknowledges that less experienced surgeons may still make valuable contributions in supporting more experienced surgeons on operations. Common to both the above works is the notion that civilian General Surgery or subspecialty practice alone is insufficient preparation for the demands of combat surgery. Indeed, some have condemned this belief as an unethical illusion.⁶ Consistent with international expert consensus, we argue that the ADF should augment surgeons' existing capabilities through targeted exposure to high-value learning opportunities to achieve competence and confidence in all domains of the OCSS. We have termed this approach 'Operational Clinical Readiness Pathways'.

What is it?

A surgeon's OCRP is an individualised plan for development arising from a process of facilitated reflection on their current skillset ('readiness review')

and supported by a compendium of recognised learning experiences. Every surgeon recruited to the ADF has valuable existing skills and knowledge, which overlap to a greater or lesser extent with the capabilities required in deployed environments. To produce an OCRP, individual surgeons and their mentors can use the General Surgery OCSS to highlight capability gaps. These gaps may then be remediated through predesignated or bespoke learning experiences, which may take the form of (1) coursework, (2) clinical placement or (3) military activities.

Experienced surgeons' OCRPs may be simple, reflecting only the requirement to enhance clinical currency of rarely used skills. In contrast, *ab initio* military surgeons may require extensive support to achieve peak operational readiness. Having an established OCRP framework reassures ADF health leaders that for those surgeons who have more ground to cover, a system exists that allows clinicians to reach the required standard.

1. Coursework

A number of militarily relevant surgical courses are conducted in Australia and overseas. At present, only the Emergency Management of Severe Trauma (EMST) course is a deployment requirement for ADF General Surgeons. Under the proposed model, the ADF would facilitate further training opportunities by endorsing and recognising participation in suitable civilian or military courses through logistic, administrative and financial support. When developing their OCRP, surgeons would be free to match these coursework opportunities against known skills shortfalls. The authors suggest that the following courses (both international and domestic) be included:

- EMST (Early Management of Severe Trauma)
- DSTC (Definitive Surgical Trauma Care)
- EMSB (Emergency Management of Severe Burns)
- ASSET (Advanced Surgical Skills for Exposure in Trauma [USA]) / ABSET (Anatomically Based Skills for Exposure in Trauma [Australia])
- EWSC (Emergency War Surgery Course-US Military)ⁱ
- STaRC (Strategic Trauma Readiness Course-US Military)ⁱⁱ
- STAE (Surgical Training for Austere Environments-UK Civilian)⁷

Additionally, relevant coursework would include:

- participation in Knowledge, Skills and Abilities testing and associated learning modules (US Military)ⁱⁱⁱ
- familiarisation with relevant Joint Trauma Service Clinical Practice Guidelines (US Military)⁸
- the development of an ADF approved and suggested reading list including, but not limited to:
 - Top Knife
 - Front line surgery
 - Emergency War Surgery Manual
 - First to Cut.

We propose that the OCRP should shape how permanent force specialists allocate their clinical time and that reservists would be afforded the opportunity to claim reserve days while attending courses that comprise a part of their authorised OCRP.

2. Clinical placements

Within the OCRP, high-yield clinical placements would be utilised to augment skills and provide exposure to procedures rarely encountered in Australian civilian practice. Even highly motivated clinicians regularly participating in on-call general and trauma rosters are unlikely to achieve significant exposure to cardiothoracic, neurosurgical and open vascular cases. Short-term placements under the supervision of clinicians who understand the requirements of deployed ADF surgeons are likely to be of most benefit. Primarily, these experiences would be in the elective setting, although, depending on timing and case availability, opportunities may emerge for exposure to acute trauma cases. Further, valuable opportunities to learn trauma surgery exposures and techniques may exist in organ retrieval teams, a model that has been proposed in the United Kingdom.⁹

The ADF has not historically provided technical training of medical specialists and relies on civilian training and certification. As such, it is suggested that the ADF collaborate with the Australian and New Zealand Association for Surgery in Trauma (ANZAST) to develop an ADF-specific training

continuum. Similarly, collaboration with the rural surgery section of the Royal Australasian College of Surgeons would seem prudent given the synergies and shared goals between the two organisations.

The work of Hall and colleagues suggests one approach to the identification of high-yield clinical placements. This US group recently defined the 'Combat Casualty Care Relevant Case (CCC-RC)' in their paper to quantify the 'real-world' as distinct from the simulated experience of US military general/trauma surgeons. Defining a CCC-RC as an open, urgent trauma case requiring a blood transfusion, this paper assessed health facilities based on CCC-RCs seen each year.¹⁰ Replication of this study at trauma centres in Australia would quantify their training value for military surgeons on short-term placements. Though data are not yet available to answer this question, discussion within the ADF surgical community suggests that Australian trauma centres are likely to lack the case load required to prepare ADF surgeons for deployment. Therefore, the ADF must look to international centres to fulfil this requirement.

Placements at high-volume trauma centres of excellence are valuable, resulting in improved competence and confidence for key trauma management skills.¹¹ To effectively bridge the gap from civilian gastrointestinal surgeon to deployable resuscitative/trauma surgeon, such a rotation at a high-volume international institution is immensely valuable, if not essential. Opportunities could be explored in our region through the Pacific Step-Up policy,¹² or further afield in institutions with mature international trauma rotations as utilised by NATO allies.¹³ These programs may achieve additional strategic goals when structured to mutual benefit;¹⁴ however, this is beyond the scope of this article.

3. Military activities

Participation in military activities, be they exercises or low-tempo deployments, remains an important aspect of any surgeon's involvement with the ADF. Although these activities afford limited opportunities to develop technical skills and skill degradation is likely with prolonged low-tempo deployments, surgeons benefit from familiarisation with the field environment and basic military skill training.

- i The Emergency War Surgery Course is mandated by US CENTCOM prior to surgeons deploying
- ii This course combines individual and team training culminating in the surgical team taking trauma on call at SAAMC prior to deployment
- iii KSA's are a speciality specific metric designed to assess competency & identify and address gaps in knowledge and ability prior to deployment

Interaction with coalition partners allows for appreciation of other nations' systems and an understanding of the joint deployed environment, particularly the role of the US Joint Trauma System. It also provides opportunities to discuss common problems and share solutions to improve our training systems and capability development. Ongoing relationships with coalition forces may allow the ADF to participate in future high-volume deployed clinical rosters if required.

Conclusion

OCRPs offer a method of bridging the gap between civilian general surgeon and deployable resuscitative/trauma surgeon. OCRPs offer the most practicable and effective method of upskilling well-trained surgeons in the requisite skills required for deployment. Many benefits of such a system exist. Such training would improve the cadre of ADF surgeons' trauma skills and undoubtedly improve the group's confidence in managing severe trauma in austere conditions. This system may also act as a recruitment and retention tool by attracting appropriate clinicians to the ADF to experience opportunities not readily available to

their civilian counterparts. The authors believe this is an important factor given the current period of low-tempo deployments.

Given that the ADF relies on civilian training and accreditation for surgical specialists, such a program would be best managed through a collaboration between ANZAST and the ADF. The ADF would be required to absorb some cost for this proposal to succeed; however, such a collaboration would likely maximise efficiency and minimise these costs. Given the cessation of high tempo operations and growing divergence between civilian and military surgical care, it is an opportune moment to develop the aforementioned training pathway. This will ensure the ADF health community continues to deliver optimal specialist surgical care in deployed health facilities.

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Travelling Towards Transition - Considerations for the Military Family

H Cramm, D Norris, R Dekel, N T Fear

Military-to-civilian transition is a complex and active process. Although researchers have concentrated on the experience of the serving member, there has been growing international recognition that transition involves and affects everyone in a military family.¹⁻¹⁰ Everyone leaves the military at some point, so the journey out should be an expected one.

Drawing on family science, we take an ecological systems approach to conceptualising the journey undertaken by family members experiencing military-to-civilian transition. Understanding that families are a set of individuals interacting within broader, interdependent systems,^{11, 12} we use the analogy of a family preparing to take a trip to conceptualise family factors that need to be considered through the military-to-civilian transition process. The family will be travelling towards a destination—in this case, life outside of the military. For any trip, one needs to have a plan that includes, among others, mode of travel and travel style; these converge with the travel style to create a military-to-civilian transition experience for families. Those planning for this journey need to think beyond how the ‘driver’ will cope with the demands of the trip and extend that lens to consider the accompanying ‘passengers’.

Mode: How will they get there?

As transition approaches, the family will select the most appropriate mode of travel for their journey. The family may choose to travel by bike, car, train, plane, bus or boat, depending on the size, composition and family dynamics, along with the health and ages of the family members. Is everyone travelling together, joining for part of the trip, or meeting the family at the final destination? Key features related to cost, comfort and reliability of the selected travel mode will affect the journey. Is the mode of travel newer or in need of maintenance? Is it reliable or prone to breakdown or delays? How far can the selected mode of travel go before a stop is required? Depending upon a given family profile, say a family with younger children who have a lot of safety equipment and who

need diaper changes, driving may be a preferred option to flying.

Plan: What’s their plan?

Now, think of the different kinds of trips the veteran and his/her family could take. This might be a scenic drive along the old roads of the coast, with sightseeing and getting back to nature in mind. Or, it might involve a direct flight to get to an urban centre with amusement parks and shopping outlets. Alternatively, a cruise might provide something for everyone because some family members don’t ride roller coasters, others don’t enjoy shopping and one has a leg injury that limits the kinds of activities the family might engage in. Perhaps the family is heading back to connect with their larger, extended family in their hometown or going ‘off the grid’, removed from society. If the trip was unexpected, as it might be if a friend or family took ill; the family may be planning the trip as they are taking it.

Style: What’s their style?

In addition to the mode of travel and plan for the trip, organisational style and comfort have to be considered. Some families will have every stop mapped out, with a clear plan, right down to a daily schedule. These families will be stocked up with snacks, drinks, hand wipes and emergency kits. Other families might have a looser plan of what they want to do on a given day, determined the morning of, with decisions informed by factors such as weather and the collective energy of the group. Some families may be able to adapt to unexpected challenges like delayed flights and change their route, while others may feel the need to adhere precisely to the original plan.

What about a guided tour? Trip reviews? Or travel insurance?

All of these variations presume the family is planning their own trip; however, they may be more comfortable

on a guided coach tour where the navigation of new and unfamiliar territory is done for them. Under those conditions, they are able to enjoy the process and make it through; if they had to do it on their own, it could be distressing for the whole family. For some families, this might mean doing a lot of research and exploring trip reviews to better understand potential pitfalls and reputable providers. For other families, they may consider if some kind of travel 'insurance' might offer them the supports they need should the trip run into issues.

Implications

This analogy demonstrates how the transition journey can be experienced in various ways for families, considering factors such as mode, plan and style of travel. The mode of travel is informed by family composition, structure, age of members, family dynamics, resources and resiliency that they are bringing into the trip. If the trip doesn't align with the family's sense of what kind of trip they were planning to take, this is likely to increase strains within the family system. Trips can be *laissez faire* or involve a full itinerary with precise scheduling. For different families under various circumstances, these factors combine in multiple permutations, with the likelihood that different members of the family could have diverse expectations and approaches regarding

travel. A variety of potentially conflicting perspectives within the family, along with family members' responses to unanticipated events and opportunities that appear along the way, can also put pressure on the family system during the journey. Recognising proactively that the transition journey will unfold and that there should be some form of plan in place would be precursors to a successful transition and allow for a more responsive modification to the journey should the need for transition be accelerated. Many travelling towards transition can find the trip harder than they thought it would be to get to their destination but eventually find their way. No one transition journey will work for every family. As policymakers, researchers, clinicians and service providers, we need to ensure that this diversity is adequately reflected in our practices and interactions with families. We offer suggestions for families travelling towards transition in Table 1.

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Table 1. Suggestions for families travelling towards transition.

To ensure the trip goes to plan:	To ensure transition goes to plan:
Start planning as early as possible.	Families must engage in the transition process early in their loved one's military career. The military and other providers could engage with the family early in the process.
It is advisable to do some research.	Families should invest time into exploring what they might need during transition.
Shop around, as different trip providers will provide opportunities.	The military and other providers need to raise the profile of their resources.
Talk to those who have taken similar trips and draw on their experiences.	The military and other providers should draw on the experiences of those who have already left the military. Families should talk to those who have left the military and draw on their experiences.
Keep looking at the options and don't rule anything out.	Further research into these experiences is needed.
Use accessible and easy to understand resources.	The language and terminology of materials provided to family's needs to clear and accessible.
Only use reputable trip 'providers and advisers'.	Services provided should be evaluated to ensure families receive the best support available.
Trip 'providers and advisers' need to cater for a variety of audiences.	The military and other providers need to recognise all forms of family.

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Presentation of the United States Air Medal

Mrs Margaret Sutherland (nee Curgenvén)
Section Officer - RAAF Nursing Service

G Robinson

Mrs Margaret Sutherland (nee Curgenvén), Section Officer N222846, served as a Nursing Officer in the RAAF Nursing Service from 1965–1968. During her short service career, and following initial training to equip her for her RAAF nursing duties and performing Aeromedical Evacuations (AME), she was posted to 4 RAAF Hospital, Butterworth, Malaysia, in 1966. The Vietnam War was in its early stages and Australia had only increased its commitment to a Battalion Group late in 1965. The US military had considerably larger numbers and were already sustaining many battle casualties requiring evacuation to larger health facilities outside Vietnam.

4 RAAF Hospital was the designated transit medical facility for Australian battle and non-battle casualties being evacuated from Vietnam to Australia, and Margaret recalls being part of the AME team that repatriated those soldiers injured during the Battle of Long Tan (18 August 1966). While posted to 4 RAAF Hospital, Margaret was also assigned to the USAF 902nd AME SQN, part of the US Pacific Air Forces (PACAF) for the period 12 January to 12 March 1967. Nurses selected for secondment would go on to perform AME duties on board the USAF DC6 that flew up and down the length of Vietnam collecting US casualties (mostly combat) for repatriation to Clark Air Base in the Philippines, where she was stationed during her secondment. On other occasions, casualties would also be flown to Thailand, Korea, Formosa and the Ryuka Islands. According to her AME log, Margaret flew 146.3 hours during her short 60-day secondment.

The Air Medal was established on 11 May 1942 by an Executive Order of the then US President, Franklin D. Roosevelt. It was to be awarded to anyone who distinguished themselves by meritorious achievement while serving with the US Armed Forces in aerial flight. USAF nurses performing AME duties in Vietnam were awarded the medal following 20 combat missions. However, the RAAF nurses seconded to the 902nd were unable to receive the



medal as Margaret recalls in the following text, a transcription of an article that appeared in the TPI News Winter 2021.

‘Section Officer (S/O) Margaret Curgenvén joined the RAAF in May 1965. She was posted to No 4 RAAF Hospital, Butterworth, Malaysia from RAAF Richmond New South Wales during the later phase of ‘Konfrontasi’ in 1966 and had experience within the RAAF AME system – Vietnam/Australia.

In January 1967, S/O Curgenvén was the 4th RAAF nurse to be selected from Butterworth to fly AME missions with the USAF 902nd AME SQN. This was part of the PACAF (Pacific Air Command Air Force) into Vietnam and throughout the American Bases in South-East Asia.

The USAF Bases at Clark Field, Philippines was enormous, operating 24/7 and Margaret was now 1st Lt Curgenvén. After being orientated into the 902nd AME SQN and system, she was required to complete weapons training with the M16 Armalite rifle and the 38 S&W revolver. (These weapons were not used by the Australian Defence Forces at the time).

Due to the short nature of the RAAF secondment, the experiences were quite harrowing and intense.

From the adrenaline rush of the excitement of the unknown to other times overwhelming to surreal moments with the wounded and seeing mortar fire and contact with the C118. Yet at times there were light-light moments – always experiencing support and friendship within the crew members of the 902nd.

All flights were a challenge; from the nursing challenges in-flight without the support of Medical Officers and the flying conditions in the DC6 (C118). The aircraft were constantly breaking down or malfunctioning, especially the pressurisation system, and at times coming under fire from the Viet Cong. The young Marines at Da Nang seemed to suffer the heaviest casualties; their diagnosis had to be blacked out from the flight manifest before leaving Vietnam. Everything seemed to be non-stop battle casualties.

In 1967 S/O Curgenven witnessed her USAF AME colleagues receiving their US Air Medal after completing the required 20 Combat Support Missions in Vietnam. As the Chief Nurse, Major Jean Corrigan (USAF) pinned the Air Medal onto the USAF Flight Nurse uniforms, she turned to Margaret, who was taking photos of the small ceremony, and told her she would like to have awarded Margaret the US Air Medal for her then 20 combat missions in Vietnam but was sorry she could not as the Australian Government would not allow it.

Margaret went on to complete 40 combat support missions during her 60 day secondment with the 902nd during the USAF 'Rolling Thunder' bombing period in Vietnam. S/O Curgenven official flight missions were recorded on the American Defense Force documents, Dept of the Air Force, 902nd Aeromedical Evacuation Squadron PACAF, OPA San Francisco 96274.

Margaret Curgenven served her country, the RAAF, USAF (PACAF) with honour and integrity. Now she finally has acknowledgment from the USAF (PACAF) upon receipt of the US Air Medal.' (Tilley, p. 7)

For her service with the USAF 902nd AME SQN, the Commander US PACAF approved and awarded Margaret the US Air Medal on 25 March 2020. The medal was to be presented by Lieutenant Colonel A. Cunnar USAF, Air Attaché; however, due to COVID-19 restrictions, he and other dignitaries were unable to attend the small ceremony finally arranged for 12 July 2021. GPCAPT G. Robinson, NSC represented the Chief of Air Force and was supported by GPCAPT G. Carroll, CSC from the Albury Wodonga Air Force Association.



During the period of the Vietnam War, 106 RAAFNS Nurses flew on AME operations and between 1966–1971, 30 were seconded to the USAF 902nd and 903rd AME SQNs to perform AME duties similar to Margaret. Two other nurses known to the author are Section Officer Patricia Furbank and Flight Officer Patricia Dudley. These AME missions were flown under hazardous combat circumstances and Margaret recalled receiving fire from the Viet Cong on a number of occasions. The most harrowing was a mortar attack on Saigon airfield while waiting for repairs to the aircraft along with 58 patients and other nurses. Nevertheless, she recalled fondly the comradery established with her fellow USAF nurses and the appreciation of the very young and frightened US servicemen, many who had received horrendous battle injuries. Sentiments many current and ex-serving RAAF nurses would appreciate.

Written by GPCAPT G. Robinson, NSC

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