JMVH

Volume 32 Number 3 July 2024
Journal of Military and Veterans' Health

- Georgian Ships, Warfare and Medicine 1714 – 1815
- Should the Australian Defence Force Conduct a Drug Trial of Wakefulness-Promoting Medications?
- Antimalarial Drug Supply Issues During the Second World War

The Journal of the Australasian Military Medicine Association

Australian Government
Department of Veterans' Affairs

Veteran Health Check

Ask your patients: **Have you served in the ADF?**

Ex-serving ADF personnel are different from your other patients. Understanding the veteran experience will make it easier for you to connect.

> Veterans and their families face unique experiences during a military career, and in transitioning to civilian life.

Military life can involve significant challenges, not least the exposure to life and death situations. For many veterans, military service and operational deployment can also lead to a strong sense of identity and belonging.

For clinicians working with veterans, demonstrating an understanding of the military experience can enhance the therapeutic alliance and the delivery of effective treatment. Veterans are more likely to engage with health care practitioners they feel understand, or seek to understand, their mental health problems within the context of their military service. Veterans are most at risk of mental and physical health conditions in the early years after they transition out of the ADF. **The Veteran Health Check** program is to encourage early intervention to promote better health outcomes for veterans during their transition to civilian life.

The Veteran Health Check

The Veteran Health Check is an opportunity for GPs to build an understanding of their veteran patient's health and wellbeing. It also assists in early identification of health issues common in the years following separation from the ADF. The program is also an opportunity for veterans to establish a relationship with a civilian GP.

It is recommended that a 45 minute consultation be undertaken for the Veteran Health Check and an assessment tool is available to help you check for health conditions that are common to veterans.

The assessment tool can help you check for health conditions that are common to veterans and recognises the unique physicality and psychological impacts of a military career. It includes screening processes for:

- alcohol and substance use
- post-traumatic stress disorder
- psychological distress

There are two ways to access the Veterans' Health Check Assessment Tool:

- Search '**ADF post-discharge GP Health Assessment**' in Best Practice or MedicalDirector
- Download the tool from **www.dva.gov.au/veteranshealthcheckproviders**.

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STATEMENT OF OBJECTIVES

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

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

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

JMVH is published by the
Australasian Military Medicine Association

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ISSN No. 1835-1271

Editorial

Editorial – Somalia – 30 years on

On 9 December 1992, United States (US) Marines, under the command of Lieutenant General Robert Johnston, landed on the coast of Somalia as part of Operation Restore Hope.[1] General Charles Krulak, in his description of the 'three block war', captured some of the complexity of operations in Somalia, including the need to adjust rapidly from humanitarian assistance to either peacekeeping or traditional warfighting, with tactical decisions taken at the lowest unit levels.[2] The initial decision to send troops to Somalia followed a request from the UN Secretary General, Boutros Boutros-Ghali, for the US to lead a United Task Force (UNITAF) to provide humanitarian relief.[3] Twenty-six nations formed part of UNITAF, including a 1,000 person contingent from Australia's 1RAR. From an operational viewpoint, the initial humanitarian operations were successful, with the UN and other relief organisations able to deliver sufficient food supplies across southern Somalia, and major reductions in starvation and disease deaths. Dr Darrell Duncan provides an excellent summary of the challenges faced by Australian military health personnel at the time.[5] Unfortunately, the follow-on UN Operations in Somalia (UNOSOM II) mission was less successful and was withdrawn in March 1995. Looking back after 30 years, the ADF and its medical personnel successfully conducted its humanitarian role despite the challenges of operating in, what today would be called, a 'hybrid warfare' situation.

Our third issue of 2024 contains a range of articles on diverse topics spanning physical training, mental health, health monitoring, military operational preparations, and military health history. We continue to attract a good range of articles, including from overseas. Other military and veterans' health articles, however, are always very welcome, and we would encourage all our readers to consider writing on their areas of military or veterans' health interest. We would particularly welcome papers based on presentations for the 2024 ICMM conference in Brisbane, but welcome any articles across the broader spectrum of military health.

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

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Georgian Naval Warfare, Ships and Medicine 1714–1815

N Westphalen

Introduction

Previous articles in this series describe the development of a cycle from prehistory to the end of the Elizabethan period, whereby increasing trade necessitated larger and more efficient ships to transport merchandise and better weapons to defend or attack them, thereby facilitating further trading opportunities.[1,2,3,4,5,6] However, it was not until the 18th century that Western medicine had developed sufficiently for its role as an enabler of this cycle to be recognised, thereby making possible—among other things—the European settlement of Australia.[6]

While the technical developments in ships, weapons and medicine often developed independently in multiple regions worldwide, they remained closely linked throughout Western history. This article continues this series by describing the developments in naval warfare, ships and medicine during the British Georgian period from 1714 to 1815. An article filling the gap in this series regarding the Stuart period (1603-1714) has been submitted for publishing in due course.

Georgian naval warfare

By 1714, England (Great Britain following its union with Scotland in 1707) had been at war with France more-or-less continuously for 25 years. These and the long and costly conflicts that followed were largely funded by Britain's transoceanic maritime trade, which had begun with the establishment of the East India Company in 1600, followed by the acquisition of colonies in North America from 1607 and the Caribbean from 1655. English victories at sea during the 1690s limited French access to its own colonies from the Atlantic, while the capture of Gibraltar in 1704 did likewise from the Mediterranean. This meant Britain could further expand its trade, thereby funding its wartime armies and those of its European allies while simultaneously bankrupting their opponents. Despite losing its American colonies in 1783, Britain used this strategy to maintain its economic and maritime supremacy from 1815 until the early 1900s.[7] However, this would not have been possible without finally controlling the occasionally universal rates of what would now be referred to as Disease and Non-Battle Injuries (DNBI) that had been experienced by the English and their Portuguese, Spanish, Dutch and French competitors since the mid-to-late 15th century.

Georgian naval warfare, therefore, usually entailed defending one's own or attacking enemy merchant shipping, typically in single-ship actions that usually produced few wounded (what would now be termed Battle Casualties or BCas) among their crews. Meanwhile, the excessive formalisation of 'line-of-battle' tactics for major fleet actions after 1714 produced plenty of BCas but otherwise proved indecisive: it was not until the 1780s that it was realised that the key to victory lay in breaking their opponent's battle line, which produced truly overwhelming BCas. This culminated at the Battle of Trafalgar in 1805, when the French and Spanish sustained over 5000 dead, 2700 wounded and at least 7000 taken prisoner from 26 000 men (56 per cent), while the British lost 458 killed and 1208 wounded from 17 000 men (10 per cent).[8]

Meanwhile, the peacetime demand to expand British trade while making it safer and more efficient led to various ostensibly *non*-medical scientific advances. The most important of these pertained to developing a means of ascertaining longitude, which began after a navigation error wrecked four out of five British warships on the Scilly Isles in 1707 (killing up to 2000 men), but did not achieve fruition until the first chronometers began to prove their worth during the 1770s.[9]

These demands also begat Britain's scientific expeditions to the Pacific and elsewhere, beginning with HMS *Dolphin*'s circumnavigation in 1764–66. Her captain, John Byron, had narrowly survived the wreck of HMS *Wager* during Commodore George Anson's 1740–44 circumnavigation, while his crew included master's mate John Gore, who sailed with Captain Samuel Wallis on *Dolphin*'s next circumnavigation in 1766–68, and Captain James Cook on his first and third voyages in 1768-71 and 1776-80. In so doing, Byron and Gore provided continuity between the navigational shortfalls that had contributed to Anson's medical disasters (see below), and Cook becoming the father of British hydrography: the

latter's subordinates William Bligh and George Vancouver were followed by their protégés and successors into the 1850s, including (among others) Matthew Flinders, John Franklin, Robert Fitzroy, Philip Parker King and Owen Stanley.[10] Noting that their charts often remained in use beyond World War II, their achievements were only made possible once their surgeons could facilitate keeping some very small ships at sea in typically very remote areas, in addition to simply providing treatment services when people became ill or were injured. At the same time, the links between superiors and their protégés into the second and subsequent generations demonstrate the extent to which the 18th century Navy depended on the patronage system.[11]

Georgian Ships

The previous article in this series on the Tudor period described how the development of 'line-of-battle' tactics in the mid-17th century led to warships differentiating into those with two or more gun decks that could take their place therein (hence 'ships-of-the-line'), and those with one gun deck known as 'frigates', which were fast enough to act as fleet scouts, and large enough to attack enemy and defend their own merchant shipping independently.[12,13] In 1677, The Secretary of the Admiralty, Samuel Pepys, had further classified the RN's warships into six 'rates' based on the number of guns they carried. Although the smallest deemed suitable for the 'line-of-battle' at that time were 40- to 50-gun 'fourth rates', by 1714 this had increased to 50 to 60 guns, thence to 60 to 70-gun 'third rates' by the 1750s, and then 70 to 80 guns during the Napoleonic Wars.[14] During the same period, gun sizes likewise increased: for example, frigates typically carried nine-pounder guns in 1714, but 18- or even 24-pounders a century later. These increases in gun numbers and size necessitated larger crews, from around 300 men for 50-gun ships in the 1710s, to 550 men for 74-gun ships from the 1780s.[15] Furthermore, as the Navy's ships became larger, their wartime numbers also increased, from around 250 in 1714 to over 900 in 1815.[16] These factors posed progressively greater challenges for the navy – including its medical services – in sustaining enough men to keep all these ships at sea during wartime (Figure 1).

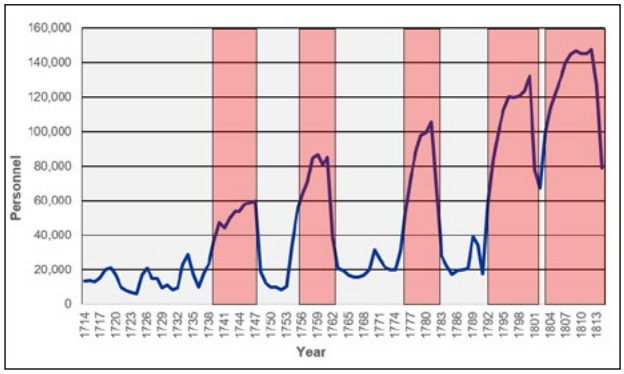

Figure 1: Royal Navy personnel, 1714-1815.[17] The red bars indicate active wartime periods (but also note the peaks between, indicating minor conflicts and/or war scares).

It should also be noted that each 'rate' increased in size while maintaining their gun numbers, to improve overall seakeeping and better facilitate fighting their lower deck guns in bad weather.[18] This also allowed them to remain at sea longer, which for the first time made it possible to blockade the French Atlantic ports more-or-less all year round from the 1750s. These advances increased the DNBI threat to their crews, in particular dysentery from the limitations inherent to their food and water preservation, typhus from their clothing and bedding, and scurvy from a lack of dietary Vitamin C. Furthermore, ships on foreign stations faced additional threats from vector-borne disease, in particular those in the East and West Indies.

Meanwhile, merchantmen likewise increased in size while keeping their crew sizes small to minimise expenses, with most still carrying small-calibre guns on their weather decks for self-defence. The only exceptions were the East India Company's 'Indiamen' – big ships with warship-like gunports and large crews, but lightly-built and only armed with small-calibre guns.[19,20] Although they were not naval vessels, these ships remained crucial to British maritime power into the 19th century. Their size and armament allowed them defend themselves while extending their trade with India and China, if necessary by force. Furthermore, like the highly profitable triangular transatlantic trade to Africa and the West Indies (including the notorious 'middle passage' slave component until its abolition in 1807), the taxes on their cargoes paid for the navy that protected them from commerce raiders. In addition, their large crew sizes increased the pool of trained seamen during peacetime, who could be employed interchangeably – if not voluntarily – with the Navy in wartime. Even so, these crews and their passengers still faced the same DNBI threats as the Navy from their food and water, and from vector-borne disease during their port visits en route to and from India.

Georgian naval medicine

Naval medical administration

The future article in this series on the Stuart period will describe how the *Laws* (also *Rules* or *Rolls*) *of Oléron*, introduced in 1190, became overwhelmed by the number of naval BCas and DNBI during the First Dutch War (1652–54). This led to the first of five Commissions for Sick and Hurt from 1653, which were responsible for wartime medical services ashore and prisoners of war over the next 50 years. In 1714, the last Commission became a permanent Sick and Hurt Board, 80 years before its British Army counterpart was established in 1793.[21] Even so, its primary role pertained less to advancing the naval medical art than managing the Navy's medical finances: for example, although naval surgeons were first required to submit medical journals (including the details of each case) from 1704, this was only done to facilitate their per capita remuneration component rather than to collate and disseminate any lessons learned.[22,23] Having proved ineffective even to this end, the Sick and Hurt Board's prisoner-of-war functions were transferred to the Transport Board in 1796, followed by its remaining responsibilities 10 years later.[24] This left the Navy without a dedicated medical department until the Admiralty underwent major reform in 1832.[25]

Hosier and Anson

Before explaining the 18th-century advances in naval medicine, it is necessary to describe the seminal events that instigated them, the first being Admiral Francis Hosier's West Indies operations during a limited war with the Spanish in 1726–29.

Hosier's mission entailed using 20 ships to blockade Spanish treasure ships in Portobello in modern Panama. In response, the Spanish landed their treasure and waited six months for the scurvy acquired by Hosier's force while crossing the Atlantic, and the local vector-borne diseases on his arrival, to force his withdrawal. This having eventuated, Hosier replaced his losses in Jamaica, after which he continued to lose men in large numbers over the next six months while blockading Vera Cruz and Havana. By the time he and both his successors had died of yellow fever, up to 4000 men had succumbed without a shot fired, from a force that never exceeded 4600 at any one time.[24,26] This disaster was immortalised by a ballad celebrating Admiral Edward Vernon's victory at Portobello in 1739, with only six ships and 2300 men, at a cost of only three killed and seven wounded.[27,28]

Mention has already been made of Anson's circumnavigation (Figure 2). Having received his orders in November 1739, manning shortfalls before his departure 10 months later were acute, accompanied by 20 or 30 sick at a time being crammed into private houses in Portsmouth 'two or three in a Bed of different diseases, without proper Nurses or people to look after them'. Even so, Anson's situation was not unusual until he received 500 'invalids' to serve as marines. As they were usually only deemed suitable for garrison or reserve duties ashore, these men averaged 55 years of age, and had disabilities ranging from limb and back injuries to blindness, deafness and epilepsy. Only 259 joined their ships (none surviving the voyage) after those fit enough to desert did so.[29] Anson then received 300 men to replace the deserters, whose lack of training led to their mortality being almost as high as the invalids. [30 31]

Figure 2. Admiral George Anson, c.1747.[32]

Having departed Portsmouth in September 1740 with eight ships and 1967 men, Anson's passage to Cape Horn set the medical scene, with plagues of flies from rotting provisions resulting in dysentery outbreaks. In South America, the setting up of hospital tents for these cases in a mosquito-infested area led to malaria, while storms off Cape Horn led to dozens of injuries and exhaustion (Figure 3). The inability to wash left men swarming in lice, resulting in typhus, while freezing conditions led to frostbite. Even so, these proved mere harbingers to one of the worst scurvy outbreaks ever recorded, with 751 deaths in three months.[33] As the weather had scattered his squadron, Anson proceeded to Juan Fernandez

Island, whose misplacement on the chart in this pre-chronometer era cost 70 lives in nine days while he searched the wrong area (Figures 4 and 5).[30]

Figure 3. Anson's track chart around Cape Horn, 7 March to 10 April 1741.[34] Note the two tracks resulting from his inability to calculate longitude: one of his estimated route and the other of his actual route, with the former ultimately 300 nautical miles west of the latter. This chart demonstrates how the otherwise avoidable prolongation of sea time exacerbated the scurvy threat to Anson's personnel.

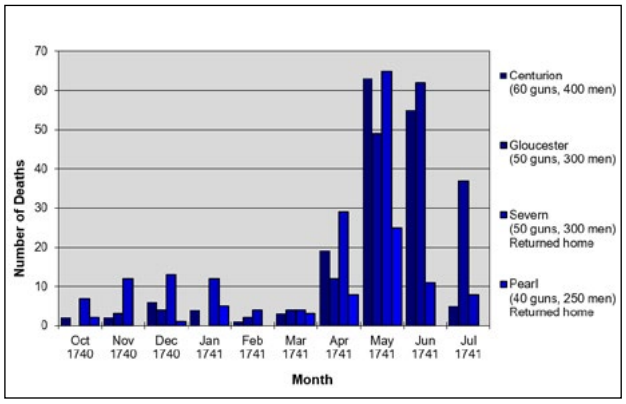

Figure 4. Total crew mortality, Anson circumnavigation, October 1740 to July 1741.[35] This timeframe covers the period between the squadron leaving Britain and Gloucester's arrival (six weeks after Centurion) at Juan Fernandez. Mortality figures for the other four ships during this time (Wager, Tryal and the storeships Anna and Industry) are unavailable.

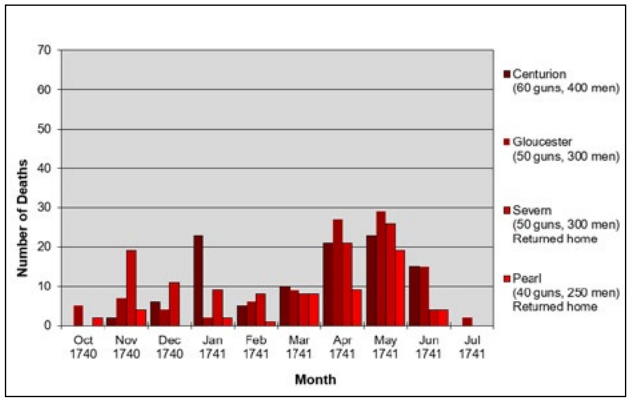

Figure 5. Invalid and marine mortality, Anson circumnavigation, October 1740 to July 1741.[36] This timeframe covers the period between the squadron leaving Britain and Gloucester's arrival (six weeks after Centurion) at Juan Fernandez. Mortality figures for the other four ships during this time (Wager, Tryal and the storeships Anna and Industry) are unavailable.

By September 1741, Anson was only left with *Centurion*, *Gloucester* and 335 men, the rest having either been shipwrecked, returned home or died. Having recovered with fresh vegetables, fish and sea lion meat, Anson successfully raided the South American west coast until May 1742, when he proceeded across the Pacific to intercept the Manila treasure galleon off the Philippines. Although this typically took two months at the right time of year, doing so two months late meant it took four. This resulted in more scurvy that forced *Gloucester*'s scuttling for lack of crew, and by the time *Centurion* reached Tinian in the modern Marianas, another 99 men had died 'like rotten sheep'.[37] Although fresh greens worked their usual cure, her crew took three months to recover enough to sail for modern Macau, China, to refit. Having made her capture in June 1743 off Samar in the Philippines, *Centurion* arrived home a year later, up to £400 000 richer but with only 188 survivors. Overall, Anson had lost 1240 men (63 per cent), of whom only four were killed in action.[30]

Despite the cost in lives, Anson's mission success led to his becoming Admiralty First Lord from 1751 to 1756. Nevertheless, his tenure oversaw substantive reforms, including improved victualling quality; clean clothing for new entrants (although uniforms for the sailors were not provided for another century), and the modern divisional system, which, among other benefits, made individual officers *specifically* responsible for their division's hygiene (rather like antimalarial chemoprophylaxis 150 years later).[38,39,40] Perhaps more importantly, Anson's patronage as First Lord led to many of his surviving officers

achieving high rank, such as George Saunders, who became First Lord (albeit briefly) in 1766 and was followed by Augustus Keppel (1766 and 1782–83), Peircy Brett (1766–70) and Richard Howe (1783–88), the latter also winning the Battle of the Glorious First of June in 1794. Although the hard lessons they had learned first-hand were passed on to their protégés such as William Cornwallis, John Jervis, Cuthbert Collingwood and Horatio Nelson, it was only when these achieved high rank themselves from the mid-1790s that they were applied Navy-wide.

Anson's circumnavigation, therefore, had profound effects on the Navy well beyond his death in 1762. As such, although far less well-known, its effects on the RN medical services can be considered analogous to how the better-known medical disasters during the Crimean War (1853–56) likewise affected the British Army medical services a century later—especially considering how in both cases, the ensuing reforms took around 50 years to be fully implemented.[41]

Subsequent medical advances

Notwithstanding the more egregious failures that followed Hosier and Anson into the 1790s (such as the Second and Third Fleets to Australia), most seamen had accepted the need for better shipboard hygiene by 1714. Some improvements were being made in the victualling to reduce food poisoning; therapeutics had somewhat improved, and—despite the ongoing split in the British medical profession between university-educated physicians and apprentice-trained surgeons—it was generally accepted that naval surgeons needed the skills to treat non-surgical conditions. However, acquiring these skills continued to be hampered by the humoral theory of disease, which remained extant in the face of mounting evidence otherwise into the 1840s.

In this regard, William Cockburn (1669–1739, Figure 6) became the last Navy physician whose medical advice was solely based on convincing yet fallacious theories that had not yet been discounted. To this end, he wrote several books, many in multiple editions; examples include *The Nature and Cure of Distempers of Seafaring People, with Observations on the Diet of Seamen in H.M.'s Navy* (1696) and *Symptoms, Nature, and Cure of a Gonorrhoea* (1713). Despite spending just two years at sea only in home waters, he provided the simplistic, inexpensive and therefore welcome advice that lazy sailors were more susceptible to scurvy and other maladies while advocating his own patient remedy for dysentery that the Navy used into the 1730s. Although 'Jesuit's bark' (containing quinine and quinidine) was in general use for intermittent fevers, Cockburn continued to apply his own humoral theories by bleeding not only all his fever cases, but also those with respiratory, intestinal and cerebral conditions.[42] Hence, notwithstanding his conscientious attention to the sick, Cockburn's advice generally proved detrimental to Hosier's, Anson's and other's crews into the 1750s.

Figure 6. Dr William Cockburn, 1697.[43]

Following Anson's return, Surgeon James Lind (1716–94, Figure 7) performed the first known therapeutic controlled trial, in May 1747 aboard HMS *Salisbury* in the Bay of Biscay.[44] He gave 12 scurvy cases the same diet, with two of each also receiving daily either a quart of cider, 25 drops of elixir of vitriol (dilute sulphuric acid), two spoonfuls of vinegar, 280 ml of salt water, a mixture of garlic, mustard and herbs or two oranges and a lemon. Of these, one of the last two returned to duty after six days while the other was almost ready to do when the fruit ran out.[24] Even so, Lind's 1753 *Treatise of the Scurvy* (dedicated to Anson) referred to citrus fruit as only one among other therapies and erred in recommending the juice be boiled into a concentrate or 'rob', which destroyed the vitamin C.[45] In 1757 he wrote *An Essay on the Most Effectual Means of Preserving the Health of Seaman in the Royal Navy*, which referred to watercress (another useful if impracticable vitamin C source) as an antiscorbutic.[46] On becoming physician to the Haslar Royal Naval Hospital the following year, Lind invented a still to produce fresh water from seawater, and demonstrated that typhus

could be prevented by bathing patients and giving them clean clothing on arrival.[24] In so doing, Lind founded his own naval medical dynasty, beginning with Gilbert Blane (1749–1834, Figure 8), Thomas Trotter (1760–1832) and William Burnett (1779–1861), the latter becoming the first Physician of the Navy in 1832 (Director-General of the Navy Medical Department from 1843).

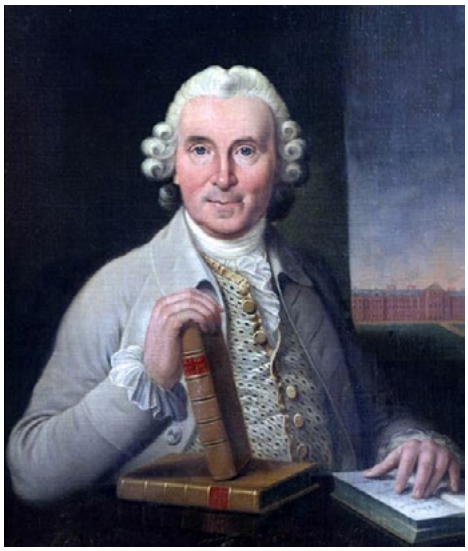

Figure 7. Dr James Lind, c.1783.[47]

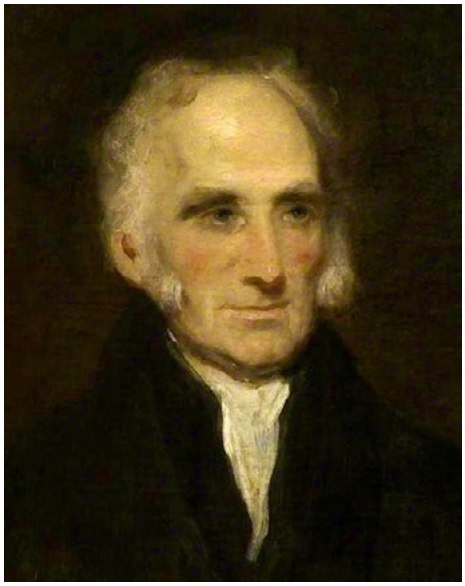

Figure 8. Sir Gilbert Blane, 1833.[48]

Much of the delay in implementing Lind's findings was caused by his being only one of many voices to the Admiralty in its search for an effective, practical—and in particular, cheap—solution. Hence, when Cook sailed on his first voyage in 1768, he took several experimental antiscorbutics with him, including malt, mustard, vinegar, pickled cabbage (sauerkraut) and 'portable soup' (a dissolvable cake made from boiled-down beef offal—see Figure 9), but only a small amount of lemon juice. Rather than Lind's advice, these items reflected that by Dr David McBride in his own treatise on scurvy in 1764, supported by Army physician Sir John Pringle, the anatomist John Hunter, Henry Tom from the Sick and Hurt Board, and Samuel Wallis's surgeon John Hutchinson. Although none of the items they espoused have much vitamin C, their efficacy was not adequately tested because Cook never stayed at sea for more than 15 weeks at a time.[24] On the other hand, his close attention to hygiene meant that Cook sustained very few non-scurvy DNBI fatalities, except for 31 deaths from dysentery during his first voyage on his way home from modern Djakarta.

Figure 9. Original 'portable soup' slab, made between 1756 and 1779.[49] *The broad arrow or 'crow's foot' indicates government ownership.*

In the event, the final proof came when Blane's appointment to the Sick and Hurt Board in 1795 coincided with his friendship with Rear Admiral Alan Gardner (a Howe protégé—see Figure 10), who was appointed to command the East Indies Station. Blane advised him to order a large quantity of lemon juice for his flagship *Suffolk*, which remained on board despite being Gardner's replacement by Rear Admiral Peter Rainier (a Brett protégé—see Figure 11). Nevertheless, Rainer approved issuing 20 ml of juice to each man daily, mixed with 70 g sugar, 570 ml water and 280 ml rum, with the result that *Suffolk* remained at sea for 19 weeks without a single scurvy case. This news quickly spread such that by 1804, the Navy was consuming 230 000 litres of juice per annum, despite costing four shillings and five pence per litre.[24]

Figure 10. Vice Admiral Lord Alan Gardner (1742-1809), 1780-1809.[50]

Figure 11. Admiral Peter Rainier, (1741-1808) 1805.[51] *His glasses have tortoiseshell or horn rims or 'Martin's margins' to reduce the amount of light reaching the eyes.*

Meanwhile, Blane also persuaded the Commander of the Mediterranean Fleet, Vice Admiral John Jervis, to order the issue of soap from 1796, which likewise became Navy-wide shortly thereafter.[24] Although the quantities proved inadequate until at least 1815, the ability to wash clothes at sea, combined with the issue of free clothing on entry and improved shipboard cleanliness, mostly eliminated typhus—unless it was introduced on board by non-naval embarkees.

Patient care afloat

Cockburn's writings confirm that during his time, DNBI cases were not collected into a dedicated sickbay and that, as the surgeon and his mates had no attendants of their own (except in hospital ships from 1703—see Figure 12), each patient received their nursing care from their messmates.[52] The ensuing lack of isolation would have precluded controlling infectious disease cases, especially given the limited berthing space (Figure 13).

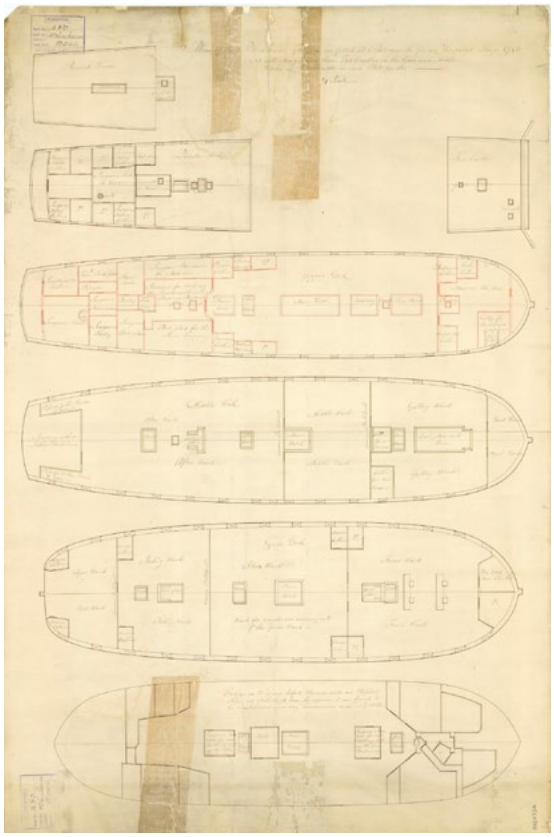

Figure 12. Hospital ship HMS Blenheim, 1743.[53] *Built in 1679 as the 96-gun three-deck second-rate HMS Duchess, she was rebuilt and renamed in 1709 and served as a hospital ship from 1740 until 1760.*[54] *From top to bottom, note the quarterdeck cabins now used by surgeon's mates that were previously for the ship's officers. The upper deck has undergone considerable modifications (in red) to accommodate the senior surgeon, medical stores, the ship's company and marines. The middle and lower decks form the hospital proper, while the orlop deck has been deemed unsuitable for patients. The middle deck is split into three wards and a mortuary forward; the lower deck forward to aft into 'ague' (malaria), 'itchy' (scabies) and 'flux' (dysentery) to port and convalescent fever cases to starboard, and 'fever' wards, with a store room for 'dead men's cloathes' forward. Having previously had a ship's company of about 570 officers and men, both decks now had cots for 255 patients.*[24]

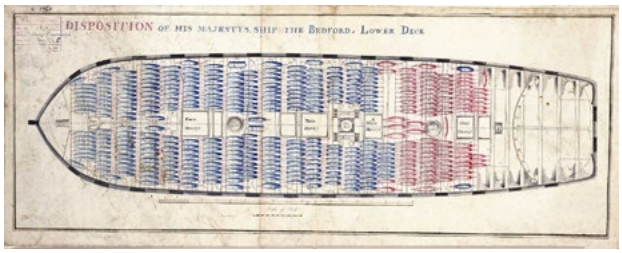

Figure 13. Berthing plan, lower deck HMS Bedford (74 guns), 1775.[55] The blue hammocks are thought to represent seamen (321 men), and the red hammocks marines (96 men). The rest of her crew (totalling about 550 officers and men) either slept on the orlop deck below or had their own messes or cabins on the upper and quarter decks. Note the challenges for the whole ship if infectious DNBI cases (such as tuberculosis, dysentery, typhus and scabies) were not isolated, as had occurred during Anson's circumnavigation 35 years previously.

However, by mid-century, most ship's captains were allocating a dedicated space for accommodating DNBI cases, and by 1800, this became a standardised location on the upper gun deck forward, adjacent to the ship's heads for dysentery cases, and the galley to facilitate special diets (Figures 14–16). Even so, the Admiralty did not mandate dedicated sick berth attendants until 1833, and these had no formal training or a career structure until 1883.[24]

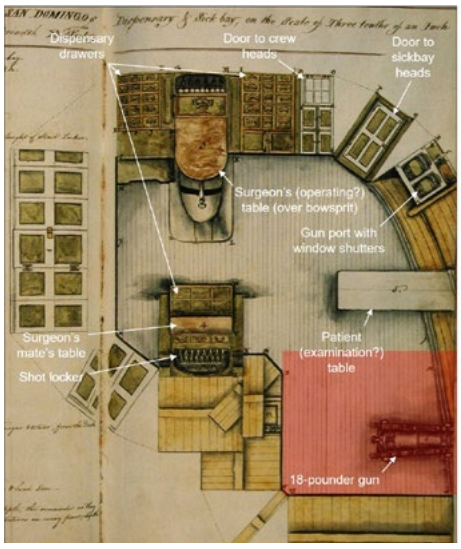

Figure 14. Sickbay plan, HMS San Domingo (74 guns), 1812.[56] Sleeping arrangements for patients and staff (noting the latter were accommodated in the same space) are not shown, but at 15 inches (38 cm) per man, the shaded rectangular area aft around the gun would have been sufficient to sling nine cots, making a ward of sorts that left the rest of the sick bay clear for seeing patients. Otherwise, there was space for another seven or eight cots further forward over the patient table and another seven or eight (i.e., a total of 23–25) inboard above the bowsprit.

Figure 15. Sickbay HMS Victory, 2013. Note the cots used for patient bedding, the gun underneath, the poor lighting despite its upper deck location, and the overall lack of space. (Author)

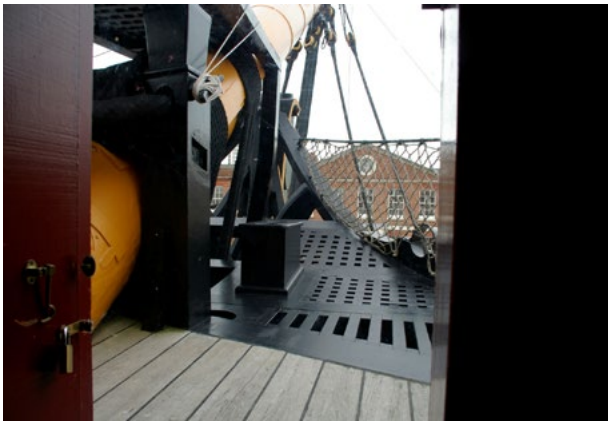

Figure 16. View through the sickbay door to the crew heads, HMS Victory, 2013. The square box in the centre foreground has two of the ship's six 'seats of ease' for over 600 junior sailors and marines. A separate 'roundhouse' was provided for about 100 senior sailors and marine non-commissioned officers, another for the sick, while officers had their own heads aft. (Author)

Meanwhile, BCas continued to be treated in the cockpit, on the orlop deck below the waterline, on a 'first come–first served' basis, without any first aid or triage. Their wounds comprised blunt and penetrating injuries from club and edged weapons and small arms during boarding actions, and contusions, fractures and amputations from crew-served guns or the splinters they produced (Figures 17-20). To these can be added 'flash' burns from ammunition accidents: these comprised up to 25 per cent of BCas in the 1780s until powder spillage was reduced by the introduction of wet rather than dry wads for loading guns, and goose-quill firing tubes and flintlock firing mechanisms.[24] Besides the suffering induced by the absence of anaesthetics or analgesia, can be added the threats posed by post-operative infection,

tetanus and delayed healing caused by scurvy, the latter leading to Blane recommending early rather than delayed amputation.

Figure 17. Traumatic amputation, Battle of Waterloo 1815.[57] Although naval casualties with the same injuries received broadly similar initial treatment, the often-extended delays before they received definitive care ashore—assuming they survived that long—meant their surgeons had to be far more self-reliant.

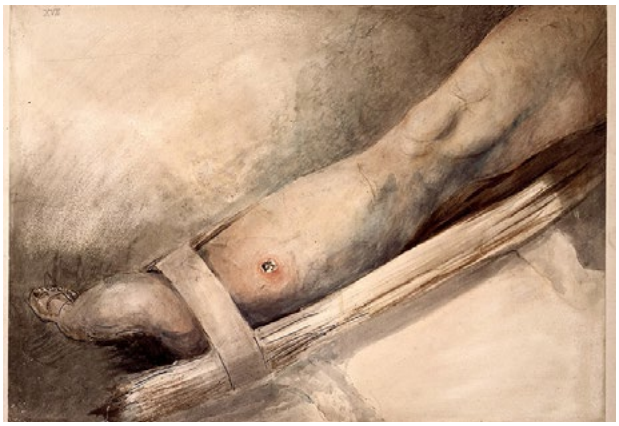

Figure 18. Bullet wound, Battle of Waterloo 1815.[57] Wood splinters from naval actions could produce similar penetrating injuries. Neurovascular compromise (whether from trauma or the swelling seen here) and/or the presence of foreign bodies would have necessitated below-knee amputation. Note the relative lack of devitalised tissue produced by a heavy but low-velocity projectile and the extemporised splint.

Figure 19. Penetrating abdominal sabre wound, Battle of Waterloo 1815.[57] These and penetrating chest injuries were generally deemed fatal.

Figure 20. Sabre wounds, Battle of Waterloo 1815.[57] Similar injuries could be inflicted on naval personnel during boarding actions. Penetrating skull injuries were likewise generally fatal.

Patient care ashore

The future article in this series on the Stuart period will explain how the first two Commissions for Sick, Wounded and Prisoners relied on hired lodgings, and that this was fraught with problems regarding treatment, supervision, and regulation: the only thing in its favour was that it was cheaper than the initial outlay on naval hospitals. Even so, these difficulties were such that the subsequent two Commissions came to prefer using civilian hospitals. However, they faced increasing resistance to this solution for two

reasons; the first was that Navy patients detracted the hospitals from providing medical services for the poor, anticipating similar concerns from the British (and Australian) public hospital systems 300 years later. Secondly, although cheaper for the Navy than private lodgings, naval patients cost the hospitals more than civilians because their treatment tended to be more complex and they more likely to be long-term or permanently disabled. Hence, in 1691, Queen Mary II donated Greenwich Palace to accommodate elderly and long-term disabled seamen, making more beds available for shorter-term cases elsewhere. Meanwhile, the Chatham Chest continued to provide for other disabled seamen until its merger with the Greenwich scheme in 1814.[58,59,60] Although it ceased providing on-site accommodation in 1869, the Greenwich Hospital charity continues to support ex-RN personnel and their dependents to this day.[61]

Otherwise, insufficient hospital beds meant the last two Commissions and the Sick and Hurt Board that followed continued to rely on private lodgings. This entailed employing contract surgeons/agents to find and pay for suitable accommodation, victualling, and medical and nursing providers. Apart from ample opportunities for peculation, the lack of willing landlords led to overcrowding and poor-quality care (as experienced by Anson's men), even by the standards of the time. Even so, the most significant problems came from the patients themselves, in particular drunkenness, fighting and desertion among the convalescents. By 1740, increasing sickness rates as the Navy expanded for its next war (Figure 1) meant the contract system could no longer cope.[25]

The future article in this series on the Stuart period will explain how the first steps had been taken towards naval hospitals for acute DNBI and BCas, with one at Plymouth from 1672 to 1713 (which did not prevent the rest of the town still being overwhelmed by naval patients) and wartime extemporisations at Lisbon and elsewhere. Although lack of lodger accommodation for the Mediterranean Fleet at its Minorca base resulted in the RN's first purpose-built hospital from 1711 (albeit without Admiralty or Sick and Hurt Board approval), it was only in 1744 that the decision was made to build dedicated naval hospitals at Portsmouth, Plymouth and Chatham.[24,62] Although the last would not be built until 1905, construction began at Haslar in 1746 (Figures 21-23), which began receiving patients in 1754 and had 1800 beds on its completion in 1762. The Royal Naval Hospital at Plymouth was finished the same year with 960 beds, having begun construction in 1758 while receiving its first patients in 1760 (Figures 24-26). Some measure of their importance may be found in the fact that on completion, Haslar was the largest brick-built building in Britain. Although the contract system never died out completely, its subsequent use was strongly discouraged: cases were retained on board whenever possible until their ship returned to Portsmouth or Plymouth. Meanwhile, those landed elsewhere were either returned to their ship or sent to Haslar or Plymouth at the first opportunity.[24]

Figure 21. Plan of Portsmouth, 1750, showing Haslar Hospital under construction (circled).[63] Note its location on the Gosport peninsula opposite the dockyard: this permitted direct boat access for the ships, limited the infectious disease risk to the local population, and made it harder for convalescents to desert.

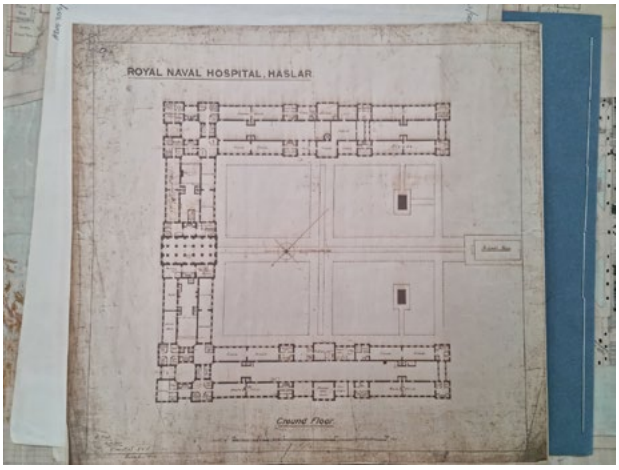

Figure 22. Ground floor plan, Royal Naval Hospital Haslar.[64] Note the open-sided quadrangle: this required a 3.7 m high iron fence to prevent desertion.

Figure 23. Façade, ex-RNH Haslar, 2009.[65] Having been closed at that time, the site has since been redeveloped for retirement housing. The blue doorway of the main entrance seen here had a rail trolley-way to Haslar Creek (to the right) for receiving patients.

Figure 24. Plan of Plymouth, 1820, showing the naval hospital (circled).[66] Note its location on Mill Lake (since been reclaimed), which permitted direct boat access for the ships. A surrounding high wall reduced the infectious disease risk for the local population and made it harder for convalescents to desert.

Figure 25. Plan, Royal Naval Hospital Plymouth, 1796.[67] The buildings forming the quadrangle constituted the hospital proper; its multi-block design was one of the first in England. The area to the left of the quadrangle is staff accommodation; the large circle shows the boat landing stage and the small circle the water tower per Figure 26.

Figure 26. Water tower inside the wall surrounding ex-RNH Plymouth, 2022. The hospital was closed in 1995 to become the Millfields housing development, which is closed to the public. Note the daunting height of the wall for deserting convalescents. (Author)

Consistent with civilian practice, both hospitals were initially managed by their senior physician, who came to abuse their private practice rights and did not always demonstrate the greater administrative skills required to manage naval rather than civilian patients. Following a Board of Inquiry instigated by Trotter through Howe in 1794 (Figures 27 and

28), executive branch (i.e., non-medical) Captains were appointed Governor (later Superintendent) to command the Haslar and Plymouth hospitals from the following year. Naval hospital command was not returned to the medical branch until 1870.[24,25]

Figure 27. Dr Thomas Trotter, 1796.[68]

Figure 28. Admiral of the Fleet Earl Richard Howe (1726–1799), 1794[69]

Besides improving discipline and administration, this decision immediately affected patients deemed medically unsuitable for naval service. Before 1795, these were 'surveyed' by a local board, which provided reports on those deemed to require invaliding to the Sick and Hurt Board. Each survey board comprised three Captains, the hospital physician and surgeon, and the surgeon of the patient's ship. However, from 1795, their reports were forwarded to the Sick and Hurt Board via the hospital Governor, who acted as the survey board president. This change was most likely made in response to personnel shortfalls, combined with the view that too many men were being invalided unnecessarily. Hence, the Plymouth Hospital Governor, Captain Richard Creyke, chaired 26 survey boards between October 1795 and May 1798, at which—in contrast to previous invalidity acceptance rates of 100 per cent—deemed 776 of the 2896 cases (27 per cent) fit for retention, with many fit enough to rejoin their ships.[24] In so doing, Creyke demonstrated that although subject to medical *advice*, medical suitability determinations are ultimately a *command* responsibility based on service requirements.

Conclusion

By 1805, Nelson could tell Trotter, his Physician of the Fleet, 'You taught us to keep the seaman healthy without going into port, and to stay at sea without a refit'.[24] Statistical evidence to his words came from Blane, who estimated that 135 480 sailors' lives had been saved between 1793 and 1814, a number equivalent to *all* RN personnel serving in 1814.[70]

These advances also made the European settlement of Australia possible without horrendous mortality rates. In a major contrast to Anson 48 years previously, the First Fleet had only 48 deaths from 1403 people (3.4 per cent) between departing Portsmouth in May 1787 and arriving at Botany Bay eight months later.[71,72] Despite some egregious failures (notably the Second Fleet in 1790 and the Third the following year), 755 ships transported more than 160 000 convicts over the next 80 years, with an overall average mortality rate of less than two per cent.[72]

Even so, most solutions to the Navy's high DNBI rates were not new. Indeed, the need for high-quality hygiene and victualling had been recognised since Tudor times, while lemon juice was first used to treat scurvy by James Lancaster when the East India Company was founded in 1600. Rather, the Navy's medical successes had been driven by four factors, the first being recognition that the DNBI rates experienced by Hosier and Anson were non-sustainable, given the finite number of trained seamen for the Navy to defend Britain's expanding maritime trade, and for the maritime trade that funded the Navy. Next came the realisation that most Navy DNBI was, in fact, preventable: Lind by experimentation and observation, and Cook by 10 years' practical seagoing experience. These two factors contributed to the third: Anson, Lind and Cook each founded their own naval dynasties, whose first-, second- and subsequent generation protégés,

at a time when the Navy was heavily dependent on the patronage system, eventually implemented the necessary measures to maintain seagoing health. Finally, none of these advances would have been possible without the necessary funding, which came from the expansion of Britain's maritime trade that supported—and was supported by—the Navy. In combination, these factors explain why the Navy's medical reforms began a century before the Army's medical disasters during the Crimean War begat likewise.

However, it is essential to note that although Lind and his successors provided the 'what', Anson and his protégés facilitated the 'how'. This mainly refers to the first sickbays that made it possible to isolate infectious disease cases at sea, and the divisional system to ensure better personnel hygiene. Furthermore, combatant officers such as Creyke ensured that medical suitability determinations remained a *command* responsibility based on service requirements, subject to medical advice.

Amid these reforms, the Sick and Hurt Board had a surprisingly limited role. Although the wartime Commissions had introduced the first rudimentary naval medical administrative systems for managing patients ashore from 1653, neither they nor the Board that followed did much more than manage contractors. Escalating costs, poor quality care and failing to manage convalescent cases effectively led to the Navy's purpose-built hospitals at Haslar, Plymouth and eventually elsewhere. Following the Sick and Hurt Board's demise in 1806, it was not until 1832 that the Navy had a bespoke medical department that truly centralised naval medical administration ashore *and* afloat for the first time. This provided the means to advance the naval medical art that supported its worldwide operations over the next century and beyond.

Disclaimer

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

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Behaviour Change Techniques, Barriers and Facilitators for Promoting Self-managed Physical Activity in Australian Defence Force Veterans: A Mixed-methods Study

Z Papinczak

Abstract

Objectives: Australian Defence Force veterans find self-management of health challenging, and little is known about best-practice approaches for promoting self-managed physical activity in this population. This study assessed the strategies used by health professionals to support veteran patients to self-manage their physical activity regimes and their perceptions concerning the barriers and facilitators that impact veterans' transition from supervised to self-managed physical activity.

Methods: Australian physiotherapists (*n*=37) and exercise physiologists (*n*=27) completed an online survey about the behaviour change techniques they use to promote self-managed physical activity, and the barriers and facilitators to self-management for veteran patients. Five practitioners participated in a follow-up interview exploring implementation and practice issues.

Results: Education and goal setting were the behaviour change techniques used most frequently by health professionals to promote self-managed physical activity (>90% 'always' or 'most of the time'). The most critical facilitators of patient engagement in self-managed physical activity were social support and patient confidence to self-manage. At the same time, chronic health conditions and a lack of interest in self-managing were the most significant barriers. Interview data identified the need for more education for health professionals concerning the use of behaviour change techniques to support veteran patients' transition to self-managed physical activity.

Conclusion: This research identified key factors that can be targeted and strategies health professionals can use to promote self-managed physical activity with veteran patients. Findings offer practical recommendations for improving veterans' transition from supervised to self-managed physical activity.

Keywords: physical activity, behaviour change, veterans' health, self-management, primary health services

Introduction

Regular participation in physical activity (PA) is associated with a range of positive health outcomes, including reduced risk of illness from chronic disease (e.g., heart disease, type 2 diabetes), improved physical and cognitive function, and reduced symptoms of anxiety and depression.[1] Despite the importance of PA, most adults do not meet the minimum recommended levels of activity required for positive health outcomes.[2]

Physiotherapists and exercise physiologists (EPs) are recognised allied health professionals who are essential in promoting PA. EPs are trained to deliver individualised exercise programs that can prevent and treat chronic disease and injury, and use behaviour change techniques (BCTs) that motivate and support patients to self-manage their PA regimes outside of treatment.[3] Physiotherapists also play a critical role in injury prevention and management, and have more recently been recognised as having

the skills to promote self-managed PA with patients. However, this is not a focal point of their clinical practice.[4,5]

In Australia, medical practitioners can refer patients to physiotherapists and EPs for treatments that involve PA through government-funded healthcare schemes.[6] One limitation of this model is that many patients fail to maintain their PA regimens once discharged from treatment.[7,8] This is problematic, given that the health benefits attained during treatment may be lost when an individual is no longer active. Studies have found that patients commonly experience challenges transitioning from supervised to self-managed PA and report difficulties in maintaining motivation and finding the confidence to be active without expert guidance.[9,10] Successful self-management requires patients to acquire the knowledge, confidence and skills to take responsibility for their health and wellbeing. These factors are critical for the effective, long-term management of chronic disease.[11]

Military service veterans are an at-risk population for whom PA self-management is critical. Australian Defence Force (ADF) veterans have significantly higher rates of chronic and mental health conditions, such as depression[12] and cardiovascular disease,[13] when compared to the general population and may have more difficulty in self-managing their health. As PA is a crucial component of managing many chronic and mental health conditions, the Australian Government Department of Veterans' Affairs (DVA) has identified self-management as a key priority in supporting the health and wellbeing of ADF veterans and has taken active steps to invest in the development of a self-management support program to assist veterans in transitioning from allied health treatment involving PA (such as from an EP or physiotherapist) to self-managed PA.[14]

Given their role in chronic disease management, physiotherapists and EPs must use BCTs to encourage patients' participation in self-managed PA. There is, however, currently little knowledge about which specific BCTs are used or the barriers and facilitators that help or hinder patients' transition to self-managed PA. As far as we know, few studies with physiotherapists[4,5,15,16] and none with EPs have examined which BCTs are used in their clinical practice to promote self-managed PA. Furthermore, no studies have examined PA behaviour change issues in veterans, who are likely to have unique treatment considerations. Further research in this area is needed to guide the development of effective self-management programs for veterans and inform best-practice approaches for allied health professionals and organisations seeking to support veteran patients as they transition from treatment to self-managed PA.

This study undertook stakeholder consultations to address limitations in the current knowledge base with Australian physiotherapists and EPs who deliver DVA-funded allied health treatment to ADF veterans. The study aimed to identify (i) the type and frequency of BCTs used by these health professionals to assist PA self-management in veterans, and (ii) the barriers, facilitators and issues that patients and health professionals encounter in engaging with and promoting unsupervised PA in veterans as they transition from supervised to self-managed PA.

Methods

Design

The study utilised a mixed-methods design involving an online survey followed by interviews with a subsample of volunteers who completed the survey. This study was part of a larger DVA-funded research project to develop and evaluate a PA self-management support program for ADF veterans.[14] Ethics approval was obtained by the University of Queensland (2020000034/163-19) and Department of Defence and Veterans' Affairs (DDVAHREC/OUT/2019/BN11979933) Human Research Ethics Committees prior to study commencement, in compliance with the Australian Research Council's National Statement on Ethical Conduct in Human Research.

Recruitment

We sought to recruit a sample of Australian physiotherapists and EPs involved in the delivery of DVA-funded treatment to ADF veterans. The online survey was advertised nationally through Exercise & Sports Science Australia (ESSA) and Australian Physiotherapy Association (APA) communication channels, including social media posts (Facebook and LinkedIn) and e-newsletters distributed to members and advocacy groups. Recruitment took place from July until September 2020, with study advertisements shared monthly. All participants provided informed consent before participating in the research.

Survey and interview procedures

Survey items were developed in consultation with content experts, including ESSA, APA and DVA representatives, and informed by a systematic review of self-managed PA programs for veterans.[17] This review found that seven BCTs were commonly used in effective self-management support programs:

education, goal setting, goal review, barrier identification, action planning, self-monitoring and social support. Survey respondents were asked to consider each of these BCTs, as well as a list of barriers and facilitators. The survey was pilot tested with an EP and physiotherapist before publication online, who confirmed language and format suitability.

The final online survey (28 items) was conducted using Qualtrics (Qualtrics^{XM}, Provo, UT) from July to September 2020 and comprised three sections. The first section focused on allied health professionals' frequency of use of the seven identified BCTs to help veterans with PA self-management. Definitions of the BCTs were provided, and participants responded to each item using a 5-point Likert scale (1 = never; 5 = always). The second section asked participants to rank the importance of seven identified barriers and seven identified facilitators to PA self-management in veterans (1 = most important; 7 = least important). An open-ended item was also included in the first and second sections of the survey to capture additional BCTs, barriers and facilitators that may not have been identified through the review and expert consultation. In the third section, participants responded to demographic questions (primary profession, years working in the profession, work setting and work location). All survey items were optional, with items within sections randomised to mitigate response bias. Responses were anonymous, and the survey took about 10 minutes to complete.

The interviews were conducted in November 2020 with the aim of informing recommendations for clinical practice. We were guided by responses to and issues raised in the survey from which three thematic questions were developed and posed: 1) How do health professionals support their veteran patients to self-manage their PA regimes? 2) When should health professionals begin to implement self-management processes with veteran patients? And 3) What supports do health professionals need to better engage veteran patients in self-management processes? These interviews were completed using Zoom teleconferencing software and ran for one hour. One facilitator (NG) and a note-taker (ZP) were present. The interviews were recorded and later transcribed in full.

Analyses

Descriptive statistics (frequencies, means [M], standard deviations [SD] and rank orders) were used to summarise participant demographics, BCTs, and barriers and facilitators (STATA, version 16.1). Independent samples t-tests were used to identify differences in survey responses between EPs and physiotherapists, with the criterion for statistical significance set at $p<.05$. Conventional content analysis[18] was used to analyse responses to the free-text survey items. Reflexive thematic analysis[19] was used to analyse the interview data.

Results

Survey participants

Table 1 shows the demographic characteristics of survey respondents (n=65). The majority were physiotherapists (58%), and over half the physiotherapists and EPs worked in a private practice facility (66%) located in a capital city or large metropolitan area (68%). The average time working as a health professional was 16.0 years (SD = 13.0; range = 1–44 years), with physiotherapists (M = 21.4 years; SD = 13.5) working significantly longer than EPs (M = 8.5 years; SD = 7.9), $p<.001$. No other significant differences between professions were observed.

Table 1. Characteristics of physiotherapists and EPs who completed the online survey (n=65)

Characteristic	*N*	%
Primary profession [a]		
Physiotherapist	37	57.8
Exercise physiologist	27	42.2
Workplace setting		
Private practice facility	43	66.2
Fitness centre/gym	5	7.7
Community healthcare service	4	6.2
Other	13	19.9
Workplace location		
Capital city/large metropolitan area	44	67.7
Rural/remote area	14	21.5
Large regional town	7	10.8

Note. [a]Data missing from one participant.

Survey data

Table 2 shows health professionals' frequency of use of the seven identified BCTs to support veteran patients with PA self-management. Most survey respondents reported using each BCT 'always' or 'most of the time'. Education (95%) and goal setting (91%) strategies were the most frequently used, while social support (61%) and action planning (70%) were used the least. In the open-response item, six respondents reported using additional BCTs with veteran patients. These were motivational interviewing (n=2), rewarding achievements (n=2), relapse prevention (n=1) and behavioural reminders (n=1).

Table 2. Frequency of use of behaviour change techniques by physiotherapists and EPs

Strategy	Always (5)	Most of the time (4)	Sometimes (3)	Rarely (2)	Never (1)	Survey score M (SD)
Education	45 (70.3%)	16 (25.0%)	3 (4.7%)	-	-	4.7 (0.6)
Goal setting	27 (42.2%)	28 (43.8%)	8 (12.5%)	1 (1.6%)	-	4.3 (0.7)
Self-monitoring	27 (42.2%)	23 (35.9%)	11 (17.2%)	3 (4.7%)	-	4.2 (0.9)
Barrier identification	25 (39.1%)	29 (45.3%)	8 (12.5%)	2 (3.1%)	-	4.2 (0.8)
Goal review	19 (29.7%)	29 (45.3%)	13 (20.3%)	3 (4.7%)	-	4.0 (0.8)
Action planning [a]	15 (23.8%)	29 (46.0%)	17 (27.0%)	2 (3.2%)	-	3.9 (0.8)
Social support [a]	14 (21.9%)	25 (39.1%)	20 (31.3%)	5 (7.8%)	-	3.8 (0.9)

Note. [a]Data missing from one participant.

Table 3 shows the rank ordering of barriers and facilitators to self-managed PA in veterans. The most important barrier was the presence of a chronic health problem that makes self-management difficult, followed by patient lack of interest in self-managing PA. More than 30% of survey respondents rated these two barriers as most important, and fewer than 10% ranked them as least important. Concern that patients may injure themselves during self-managed PA emerged as the barrier of least importance, with 45% of survey respondents ranking this barrier last. The remaining barriers were ranked as moderately important. In the open-response item, additional reported barriers were patients' low motivation (*n*=5), anxiety relating to injury during self-managed PA (*n*=3) and lack of time (*n*=2).

Patient confidence to self-manage PA and the presence of social support were ranked as the most important facilitators, with very few survey respondents considering these to be of low importance (1.6% and 0%, respectively). The remaining facilitators were ranked as moderately important. The exception was 'tapering treatment services', ranked as the least important facilitator by over a third of survey respondents. No additional facilitators were reported in the open-response item.

Table 3. Rankings of barriers and facilitators to self-managed physical activity.

	Rank score *M (SD)*	% ranked 'most important'	% ranked 'least important'
Barriers			
Patient has chronic health condition that makes self-management difficult	2.8 (1.8)	31.3	3.1
Patient isn't interested in self-managing their physical activity	3.0 (2.1)	34.4	7.8
Patient lacks social support to be physically active	3.8 (1.7)	6.3	4.7
Health system pays for treatment but not self-managed physical activity options	4.2 (2.1)	15.6	14.1
Patient doesn't have access to suitable facilities to be active outside of treatment	4.2 (1.6)	6.3	10.9
There are insufficient programs to help patients self-manage their physical activity	4.5 (1.8)	3.1	14.1
Clinician is worried the patient may injure themselves through physical activity performed outside of treatment sessions	5.5 (1.8)	3.1	45.3
Facilitators			
Patient is confident they can self-manage physical activity	2.6 (1.8)	37.5	1.6
Patient has social support	3.4 (1.6)	14.1	0.0
Patient has access to ongoing physical activity support services	3.8 (1.9)	6.3	14.1
Patient exercises with others	4.0 (2.0)	15.6	10.9
Patient receives consistent messaging from all stakeholders	4.2 (2.2)	17.2	21.9
Patient is held accountable for physical activity	4.2 (1.8)	9.4	12.5
Patient's treatment services are tapered	5.7 (1.4)	3.1	39.1

Interview data

Three physiotherapists and two EPs volunteered to participate in an interview. Three worked in a capital city or large metropolitan area, and two in regional or rural Australia. Time spent working as a health professional ranged from five to 35 years.

Theme 1: Strategies to support self-managed physical activity

In line with survey data, participants strongly agreed that social support and self-confidence are key facilitators of self-managed PA in veterans. Interviewees explained that the reason why social support is so critical for veterans is that many lack social support because they are socially isolated: '*The people I see who aren't interested in self-managing, the reason for that is that they're socially isolated*' (EP, Interviewee 1).

Encouraging patients to engage in group-based PA was highlighted as a mechanism for facilitating both social support and motivation to engage in self-managed PA: '*Social support is our hidden agenda. That is one of the things we want to achieve in a group setting, and that is the reason we encourage our clients to be in a group setting*' (Physiotherapist, Interviewee 5). Other strategies to promote social connectedness were pairing low with highly motivated patients as exercise partners and linking patients with community-based social groups outside of PA contexts.

In terms of developing self-confidence, interview discussions centred on identifying activities patients considered challenging and then building physical capability to improve self-efficacy for those specific activities: '*We love to find out what they think they can't do and then prove to them they actually can do it*' (Physiotherapist, Interviewee 4). It was interesting to note that EPs and physiotherapists commented that higher self-confidence matched physical capability in a supervised setting, then acted as the catalyst for the transition into self-managed PA.

Participants identified the value of using graded exercise programs during treatment, which gradually increased in difficulty as physical capability and self-confidence progressed: '*It's essentially an exposure hierarchy for anxiety, but with physical activity*' (EP, Interviewee 2). Linked to this, participants highlighted the importance of assessing improvements in functional fitness and how tangible outcomes through treatment provide a strong platform for PA self-management: '*There's all sorts of ways to affirm that there has been improvement and building confidence—all those physical outcome measures, patients love them. I think they are extremely valid and powerful to use*' (Physiotherapist, Interviewee 4).

Theme 2: When to start self-management processes

All participants agreed that it was important to start using BCTs from the beginning of treatment. They felt that this was critical in establishing expectations with veteran patients that they must take responsibility for self-managing their health: '*It starts at the very first visit when you're doing the patient interview. You're really establishing early on what your expectations are*' (Physiotherapist, Interviewee 4).

Participants also discussed how they transitioned patients to self-managed PA over time and felt it was important to provide ongoing support through the process of building self-management skills: '*It's not like a thing where you say "OK they're ready for self-management now, see you later.". It's a matter of them gradually improving their self-management skills over time*' (EP, Interviewee 1). One EP highlighted the value of offering group exercise classes as part of the transition process to unsupervised PA.

Theme 3: Training to deliver self-management processes

Participants consistently felt that EPs and physiotherapists needed more education on using BCTs to promote self-managed PA during treatment, with one physiotherapist noting that the provision of more BCT resources and materials was important to help encourage uptake and use by health professionals: '*Having some resources available for allied health professionals and perhaps some of the more relevant outcome measures and recommendations. Things that are readily accessible for a less experienced physio*' (Physiotherapist, Interviewee 4).

Participants also questioned whether it was beyond their remit as allied health professionals to utilise BCTs in which they had no training. Social support was identified as a strategy with limited instruction on use and implementation: '*I question if it's something we are fully responsible for or equipped to do. I remember when I was at university, I received no training on how to facilitate social networking. I wonder if it may be a bit too much of an ask*' (EP, Interviewee 2).

Lastly, participants identified that promoting PA self-management during treatment is a concern for EPs who were worried about the loss of clientele. The group thought this was particularly true for health

professionals in private practice who treat 'health as business': '*When you work in private practice, the barrier to self-management is that this is going to steal my patients*' (EP, Interviewee 1).

Discussion

In this mixed-methods study, we surveyed Australian physiotherapists and EPs to assess which BCTs they use during their clinical practice to promote self-managed PA with veterans and the barriers and facilitators for transitioning these patients from supervised to self-managed PA. In addition, we used interviews to explore key issues that these health professionals encounter in promoting self-managed PA with this patient group.

We found that education and goal setting were the BCTs most frequently used by physiotherapists and EPs to promote self-managed PA with veterans. In addition, most of these health professionals used each of the seven assessed BCTs (education, goal setting, self-monitoring, barrier identification, goal review, action planning and social support) 'always' or 'most of the time' to support veterans with PA self-management. Given that these BCTs were identified in our systematic review[17] as most commonly implemented in effective self-management programs for veterans, the latter finding suggests that our participants adopted good-practice approaches for promoting self-managed PA in this population.

A novel finding was that physiotherapists and EPs ranked a lack of interest in self-managing PA as a critical barrier to transitioning veterans to self-management. Within the DVA healthcare system, ADF veterans can receive DVA-funded treatment as long as deemed clinically necessary by their referring doctor.[6] Some patients may not be interested in self-managing their PA because they do not feel it is needed when they can continue seeing their health professional for supervised exercise sessions. There is also evidence that veterans have a preference for supervised treatment modalities over self-management[20] and prefer to exercise in a structured, supervised environment.[21] Based on these findings and the themes emerging from our study, it is recommended that EPs and physiotherapists educate patients about the importance of PA self-management for maintaining health and establishing with their patients from the beginning of treatment that the end goal is to move to self-managed PA. Furthermore, referring patients to group exercise sessions may be a useful strategy, given that these groups offer supervised and structured exercise as part of a self-managed regime.

Another unique finding was that patient confidence to self-manage PA was considered by physiotherapists and EPs as the most important facilitator of self-management in veterans. Patient confidence, similar to self-efficacy, is an individual's belief in their ability to succeed in a particular situation, and the importance that self-efficacy plays in PA is well-established in the wider literature.[22] This finding suggests that health professionals should routinely use BCTs to promote patients' self-confidence to engage in self-managed PA. Previous research highlights the need to select BCTs suitable for the population they are working with, as meta-analyses have found that different BCTs effectively improve both PA and PA self-efficacy in different populations.[23,24] Our findings suggest that using graded exercise programs and performance outcome measures are suitable for building self-confidence with veterans, in line with Bandura's[25] self-efficacy theory.

The finding that social support is a key facilitator of self-managed PA in veterans is consistent with past studies.[26] Nevertheless, despite survey respondents ranking social support as a top facilitator of self-managed PA, it was the BCT that health professionals used the least. In addition, Kunstler and colleagues[4] found that physiotherapists infrequently used social support strategies to promote self-managed PA with patients. These findings suggest that although these health professionals know the importance of social support in self-management, this awareness does not translate into consistent efforts to foster patient social support. Issues relating to social isolation underlie the importance of using social support strategies with these patients to promote engagement in self-managed PA. It is recommended that these health professionals use the PA setting to facilitate social support, which can be achieved through referring patients to group-based PA in their local community to increase opportunities for such support,[27] or implementing 'buddy systems' that pair veterans together as exercise partners.[28]

Two key issues emerged concerning the implementation of BCTs that promote PA self-management by physiotherapists and EPs, namely the concern that some EPs have around the potential loss of patients as they transition to self-managed PA, and the need for EPs and physiotherapists to have more formal training in the use of BCTs. Concerning the first issue, it is crucial that EPs view self-management as an adjunct rather than a replacement for clinical treatment, and understand that self-management can be used in conjunction with in-clinic care to drive better patient outcomes.[29] Regarding the second issue, behaviour change

theory is a clinical competency taught in EP degrees in Australia,[3] but not in physiotherapy degrees.[30] In terms of training for future cohorts of graduates in these health professions, it may be worthwhile for professional organisations and tertiary institutions to consider how undergraduate programs might better emphasise the important role BCTs play in supporting self-management in different treatment scenarios. Professional development opportunities for current practitioners should also be considered, with self-management 'champions' who can mentor other EPs and physiotherapists using BCTs.

The study limitations included the relatively small sample size, and the fact that health professionals who chose to participate likely represent those engaged in self-management support practices. Therefore, the practices reported by these participants may not necessarily be used by physiotherapists and EPs more broadly. Nonetheless, the insights obtained from this group have elicited important recommendations for promoting self-managed PA with veterans. Due to the self-report nature of the survey, participants may have over- or under-estimated their use of BCTs, and a future observational study could investigate this. Using a ranking system for determining the most important barriers and facilitators from a list of predetermined options may have excluded some key factors. However, only a small proportion of respondents reported additional barriers and facilitators in the open-text option, suggesting this is unlikely.

This mixed-methods study is the first to explore the BCTs physiotherapists and EPs use to support their veteran patients in self-managing PA, and the barriers and facilitators to effectively transitioning these patients from supervised treatment into self-management. Our findings provide important insights into the factors that can be targeted, and the strategies that can be used by these health professionals to better promote self-managed PA with veteran patients. Future research that engages with professional organisations and tertiary institutions is recommended to explore solutions for improving the delivery of self-management support practices by physiotherapists and EPs.

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Should the Australian Defence Force Conduct a Drug Trial of Wakefulness-Promoting Medications?

R W Jessup

Abstract

Fatigue jeopardises soldiers' lives, and despite caffeine being the approved wakefulness aid in the Australian Defence Force (ADF), its efficacy equals a placebo with unwanted side effects. The US Military uses modafinil as an alternative, but no ADF studies on modafinil exist. This article argues for exploring alternatives, ensuring consent and conducting willingness-to-participate studies before conducting ADF modafinil trials.

Introduction

Wakefulness-promoting medications combat fatigue during prolonged missions, crucial for pilots and soldiers. Modafinil, a non-stimulant used by the US Military since 2003, may enhance soldiers' alertness during sleep-deprived operations, potentially saving lives. However, Australia lacks modafinil trials for military use. This paper discusses modafinil, its military research status and its broader health implications. It urges the Australian Defence Force (ADF) to address three key aspects before trials, emphasising exploration of wakefulness strategies, informed consent and willingness-to-participate studies.

What is modafinil?

Modafinil acts on brain pathways like dopamine transporters (DAT) unlike addictive amphetamine-like stimulants which acts as monoamine releasers.[1] Common side effects include headaches, diarrhoea, stuffy nose, increased blood pressure and heart rate.[1]

State of modafinil military research

Modafinil studies with small sample sizes pose validity concerns. A larger Singapore Air Force study using historical medical data raises issues of bias.[2] These concerns are exacerbated by military secrecy. To address these issues, independent public institutions running drug trials can bolster accountability, transparency and data-sharing, fostering broader studies and potential civilian applications.

Implications of modafinil military research

Modafinil improves reaction times but its misuse by civilians raises safety concerns.[3] Successful military trials on modafinil could enhance its safety for mainstream civilian use under medical supervision. However, the ADF should explore non-pharmacological wakefulness management before considering modafinil.

Alternative wakefulness-promoting strategies

As shown in Table 1, non-pharmaceutical alternatives to modafinil, such as sleep, exercise, transcranial stimulation, training, hydration and nutrition, show potential benefits.[4] Adequate sleep duration significantly improves reaction times, and physical activity enhances concentration. Transcranial stimulation consistently improves attention, while adequate hydration and nutrient intake positively impact cognitive function. Despite their potential, practical limitations in conflict situations exist. Training proves effective but may be challenging during wartime demands. Caffeine, the ADF's sole approved wakefulness aid, has drawbacks. A 2009 military study on caffeine revealed inefficacy and side effects, emphasising the need for more reliable fatigue countermeasures.[5]

Do soldiers even want to participate in drug trials?

Cook et al.'s 2017 cross-sectional study highlighted recruitment challenges in military research, emphasising the struggle to enrol

Table 1. Non-pharmaceutical alternative strategies to modafinil.

Non-pharmacological strategies	Disadvantages
Sleep	Operational demands prevent sleep
Exercise	Can't exercise in cramped conditions (e.g. foxhole or cockpit)
Transcranial Magnetic stimulation	Need specialised equipment
Training	Time constraints could lead to insufficient training
Cold, citrus-flavoured drinks	Supply-chain limitations (e.g. refrigeration)
Nutrition	Supply-chain limitations (e.g. limited or intermittent supply)

sufficient participants.[6] Altruism for country and comrades emerged as a strong motivator for study participation. Understanding these motivations is crucial for recruitment and overcoming enrolment hurdles, steering clear of undue influence. Wakefulness-promoting agents benefit soldiers, addressing battlefield casualties caused by fatigue. To understand military members' motivations, willingness-to-participate studies prove insightful, despite potential non-response bias.

Australian Defence Force research on wakefulness-promoting strategies

The Defence Science and Technology Group aims to use science and technology for Australia's defence, with recent studies on caffeine-infused gum demonstrating improved cognitive performance.[7] Another study utilised an infrared oculography-based system, reducing drowsiness in ADF Army Reservists.[8] Other strategies employed by the ADF include rest and sleep management, sleep hygiene training programs, rotational policies to ensure equitable workload and rest cycles, physical fitness programs to enhance overall health and combat fatigue, nutritional support to enhance physical and mental wellbeing, the use of caffeine, efficient task management, the use of technology to improve efficiency, psychological support to provide access to mental health resources to help personnel cope with the challenges of their roles, and regular health assessments to identify issues related to fatigue and intervene as necessary. The ADF has specific, detailed policies and procedures in place tailored to the unique operational requirements of the Army, Navy or Air Force to mitigate fatigue among its members. Modafinil can prove to be a useful addition to these fatigue countermeasures after careful study.

Dual-use and wakefulness-promoting medications

Dual-use ethics addresses the potential misuse of military technology in civilian applications.[9] Concerns over wakefulness-promoting medications, like modafinil, focus on potential permanent effects, raising fairness and safety issues. Studies show short-lived, dose-dependent effects, limiting its applicability beyond defined military mission parameters.[3]

Conclusion

The ADF hasn't investigated wakefulness-promoting agents like modafinil in a drug trial, which, if successful, could save soldiers' lives and benefit civilians like shift workers. While alternative strategies like hydration, nutrition and exercise have limitations, caffeine remains the only approved fatigue countermeasure, but has its own efficacy concerns. Willingness-to-participate studies and a well-designed consent process ensure participant autonomy. Addressing these considerations is crucial before conducting modafinil drug trials for military use. Given the promise that modafinil holds in improving safety for soldiers and civilians alike, it is imperative that the ADF conduct a drug trial to explore its safety and effectiveness.

Acknowledgements

The author would like to thank Dr Rebekah McWhirter for her expert assistance in all aspects of writing this paper as the author's Research Scholar Program Advisor at Deakin University. I would also like to extend my gratitude to Dr Cynthia Forlini for her valuable input. This paper did not receive funding from any source and does not represent the views of the Australian Defence Force or Deakin University. These views are my own.

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Antimalarial Drug Supply Issues During the Second World War

G D Shanks

Abstract

Malaria was a major cause of casualties during World War II in the Southwest Pacific, and drug supply issues were acute strategic concerns. The capture of the cinchona plantations of Indonesia by the Japanese Imperial Army and the lack of manufacturing capacity for synthetic substitutes were significant logistical constraints that limited Allied combat operations in the Indo-Pacific Region. Tens of thousands of soldiers were infected with malaria due to inadequate treatment and chemoprophylaxis. In Milne Bay, Papua New Guinea, military operations halted for several months at the end of 1942 due to poor malaria discipline compounded by inadequate medications. Sufficient drug supplies only became available in 1943 when daily quinacrine suppression was enforced. Drug supply disruptions during the COVID-19 pandemic are a reminder that specialist anti-infective medications could have an outsized, modern impact on military operations.

Keywords: malaria, chemotherapy, logistics, Indo-Pacific, World War II

Medical officers and others kept on their feet by taking increased suppressive doses of quinine. Had this alarming increase in rate continued, bounding upwards in geometrical progression as the parasite reservoir grew, the whole force (Milne Bay) *would have been lost in less than two months.*[1]

During the COVID-19 pandemic, supply chain interruptions massively disrupted the world's medical logistical systems. Interestingly, one of the drugs most in demand in 2020 was the antimalarial chloroquine because it was mistakenly thought to work against coronavirus infections.[2] This anomaly reflects the historical reality of 1942 during World War II in the Southwest Pacific when antimalarial drugs were a critical strategic shortage that caused limitations to combat operations, particularly in Papua New Guinea and the Solomon Islands. The global supply of cinchona bark centred in the Dutch East Indies (now Indonesia) had been captured by the Japanese Empire, and the bark processing industry yielding quinine in the Netherlands had fallen to the Nazis. Most of the production capacity of synthetic antimalarials (pamaquine, quinacrine) was in Germany. The Allies had never planned to fight a major war on highly malarious islands and were faced with the prospect of unsustainable disease casualties due to malaria. 'Just-in-time' logistics do not work for events like global pandemics and unexpected tropical campaigns. The Allies rose to the challenge and eventually used superiority in malaria control as a crucial war-winning advantage against the Japanese Imperial Army, but not without great loss and delay. Malaria is one of the few infectious diseases with a well-established capacity to disrupt military campaigns across centuries.[3] Given the Australian Defence Force's (ADF) regional focus and faltering malaria control programs in Melanesia, it is worth re-examining the historical record for future medical logistics lessons, particularly regarding antimalarial drug supplies (e.g., drugs, insecticides).

The Japanese centrifugal offensive after Pearl Harbor captured most of the Australian, British, French, Dutch and USA colonial outposts in the Pacific and Southeast Asia in the first half of 1942.[4,5] One of the worst Australian debacles was the capture of Rabaul, Papua New Guinea in January 1942 with elements of the 2/22 Battalion Australian Imperial Force (AIF) retreating across the mountains of New Britain. Approximately 400 men of Lark Force fled across the southern coast, pursued by both the Japanese and malaria. Approximately 250 men escaped the Tol Plantation massacre and became progressively degraded by malaria as their limited quinine stocks ran out.[4] It is estimated that one-fifth of these survivors died of malaria before being evacuated by boat to Australia; a grim reminder of the lethal character of falciparum malaria.[6] Their pursuers from the 1st Battalion/144 Regiment of the Japanese Imperial Army only fared a little better against malaria as they had come from Guam with no preparation against the parasite. It is estimated that nearly the entire battalion became infected with malaria and 5% died.[7] This battalion was subsequently committed to the Kokoda Campaign and was nearly exhausted by malaria even before arriving in Papua. Disease and starvation accounted

for most of the soldiers on either side in New Guinea once they were cut off from logistical support.[3,8]

The US situation in the Philippines was a larger-scale disaster that occurred in April/May 1942, leading to the greatest surrender in the history of the US Army at Bataan/Corregidor.[5] Malaria played a prominent role in this defeat, with nearly a battalion's worth of men being hospitalised for malaria each day in Bataan.[9] There was insufficient quinine to suppress infections and keep men well enough to fight. Tragically, there were 100 000 kg of cinchona bark in Mindanao from Philippine plantations that could not be turned into useful medication for the troops in Luzon.[9] The lethal aftermath of the surrender was the 'Bataan Death March' to Camp O'Donnell, where 29 589 US and Filipino soldiers died in 1942; one-fifth were estimated to have died directly from malaria.[10] The huge mortality dropped acutely in August of 1942 when their Japanese captors made some quinine available for malaria treatment.[11] The last US Army medical officer (COL Arthur Fischer) leaving the Philippines from Del Monte field in a B-17 carried cinchona seedlings on his lap to re-establish quinine production in Brazil (Figure 1). Unfortunately, this great effort was superseded by better synthetic antimalarial drugs and timed out by the five years required for a tree to yield useful alkaloids.[12]

Figure 1: Cinchona seedlings growing in Washington DC, USA, in November 1943 taken from Mindanao in the Philippines to re-establish quinine production in the Americas.

US Army Photograph, now in the public domain.[12]

The Australian Army had also been making vigorous efforts to secure the last cinchona stocks of Java. COL N. Hamilton Fairley RAAMC paid in advance for the last 100 tons of cinchona bark loaded into a tramp freighter on the Surabaya docks in February 1942.[6] The civil/military collapse of Dutch control of the East Indies resulted in these last precious stocks never arriving in Australia leaving the AIF with less than a year's supply of quinine as a major conflict continued in the highly malarious New Guinea. Synthesising quinacrine (atabrine) was felt to be infeasible not because of a lack of chemical expertise in Australia but because 20 times the amount of precursors would have to be imported to yield a single unit of drug product.[1] COL (later BRIG) Fairley left for Washington on the eve of the Battle for Milne Bay to plead with US and UK Allies for priority access to antimalarial drugs for the Australians because there was no other alternative. Allied medicine stocks fell into an even more critical deficit when the troopship *USS Coolidge* ran upon a mine sinking in the harbour at Espiritu Santo in the New Hebrides (now Vanuatu). The 591 pounds of quinine that went down with the ship represented nearly the entire Allied stock in the Southwest Pacific at the time. In retrospect, it can be stated that it is a very good thing that the Japanese Naval Landing Force landed in Milne Bay in August 1942 to be defeated by the AIF.[13] Had the Japanese waited until December of the same year when the Australian Army was nearly completely combat ineffective from malaria the outcome might have been very different.[14] At one point, 10% of the Allied force in Milne Bay was developing malaria each week.[1]

In truth, the war against malaria could not be won using quinine as it was too short-acting, and the much-reviled but longer-acting quinacrine was essential to eventually asserting malaria control in the combat zones of the Southwest Pacific. Thirty percent of all US Army hospitalisations in the Southwest Pacific in 1943 were from malaria (estimated 50 000). More than 80% of US Marines who initially landed on Guadalcanal were hospitalised for malaria within nine months and 67% of the 32nd US Army Division from Papua developed malaria in ten months. As an example of the continuing casualties from malaria, one needs to consider the four US military Divisions that operated in Melanesia in 1942 (1st and 2nd US Marines, 24th and 32nd US Army Divisions). All required four to six months rehabilitation in non-malarious areas (NSW, VIC, New Caledonia, Fiji) on medication to at least minimise the nearly constant relapses of malaria the soldiers were experiencing before being redeployed for further service.[15] Daily quinacrine use sufficient to turn most soldiers' skin yellow was required, and sufficient medication for this only became available when the American pharmaceutical production capacity caught up with Allied demand in mid-1943 when quinine was largely discontinued except for acute treatment. Due to the unpopular nature of the quinacrine from rumours

Figure 2: Daily quinacrine (atabrine) ingestion enforced by officers (LT J.J. Garrick) in an AIF Commando Unit (2/6th Cavalry) near Wewak, Papua New Guinea, in July 1945.

Australian War Memorial AWM photo 094177, now in the public domain.

and enemy propaganda, enforced drug compliance by subunit officers was necessary[16] (Figure 2).

After 1943, the worst malaria burden was carried by soldiers who were either prisoners of war (POWs) or bypassed Japanese units in New Guinea that expired in the jungle from disease and starvation.[8] Quinine continued to be the only drug available to the Japanese or their prisoners. However, it was strictly rationed in its distribution, causing it to become a medium of exchange (like tobacco) in the Thai-Burma railway camps[10,17] (Figure 3). Quinine's very intermittent use due to supply issues likely caused many to relapse/recrudesce from inadequate treatment or develop the feared complication of blackwater fever (massive haemolysis with hemoglobinuria). Blood for transfusion to treat acute anaemia and antimalarial drugs were key supplies taken by all the medical teams sent to recover POWs in the Southwest Pacific and Southeast Asia.[10,13]

Today, the ADF has three main antimalarial drugs (doxycycline, atovaquone/proguanil, tafenoquine) available in adequate stocks for prevention, but what might happen if there are sudden and unusually high demands for a single product? Examples of epidemic malaria due to inadequate drug stocks have occurred in the 21st century in modern military forces deploying into West Africa with little advanced notice.[18] Although the ADF could manage a battalion's worth of soldiers on antimalarial drugs, a brigade-sized deployment similar to East Timor might once again force a painful re-learning

Figure 3: Lieutenant Ronald Hall of the 9th Division Salvage Unit holding bottles of captured Japanese quinine tablets from a box of abandoned medical stores on the Huon Peninsula in Papua New Guinea in January 1944.

Australian War Memorial AWM photo 070075, now in the public domain.

experience involving preventable casualties and stock-outs of medication.[19] Supply disruptions from concentration of synthesis and formulation of specialised pharmaceuticals in China and India occurred during the COVID-19 pandemic. Let us learn from the historical experience of World War II to avoid such problems in the future.

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Funding: No specific funding was given for this work.

Acknowledgements: The author acknowledges all the soldiers of World War II who fought against the enemy of malaria and thanks the many unnamed military officers, scientists, historians and medical librarians who have unselfishly provided data and ideas for this manuscript, especially the librarians at the Australian Defence Force Library at Gallipoli Barracks, Queensland.

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

Conflicts of interest: The author does not claim any conflicts of interest.

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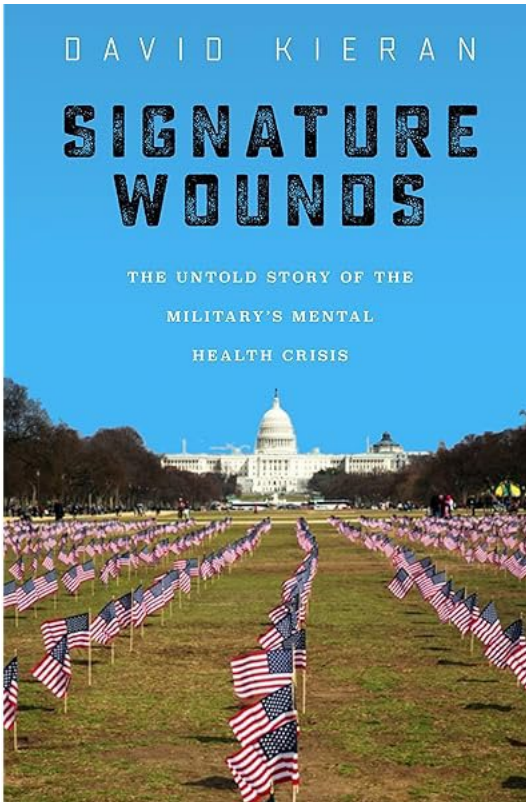
Book Review of *Signature Wounds: The Untold Story of the Military's Mental Health Crisis*

D Cronshaw



Signature Wounds: The untold story of the military's mental health crisis

By David Kieran. New York: New York University Press 2019. ISBN 978-1479892365. AU$32.98.

Reviewed by Darren Cronshaw

Warning: This review includes information on mental illness, trauma and suicide that may be disturbing to some readers. Support is available through your Chain of Command, Chaplaincy or Health Centre, Lifeline 131144 or Open Arms 1800 011 046.

Wars in Iraq (2003–11) and Afghanistan (2001–21) meant Coalition forces were deploying continuously over two decades as part of the Global War on Terror. This led to a considerable cost in veteran mental illness, especially post-traumatic stress disorder (PTSD), traumatic brain injury (TBI) and suicide. These came to be known as signature wounds of the conflicts. What can we learn in Australia from the experience of the US Army and veterans' support?

David Kieran is an Assistant Professor of History and Director of American Studies at Washington & Jefferson College. He interviewed nearly 50 high-ranking Army leaders and gleaned insights from thousands of pages of Freedom of Information requests to investigate the story of US Army's and Veterans' Affairs (VA) response to the mental health crises that Iraq and Afghanistan deployments produced. He also analysed how politicians, activists and society gave attention to mental health problems as part of debates about militarism and foreign policy.

I learned about the challenges of these 21st Century wars to mental health. The US Army had been preparing for a short, intense war in Europe but instead dealt with unforeseen long, protracted counterinsurgencies and more frequent and prolonged deployments. There was limited time away from the front line and no areas were safe from Improvised Explosive Devices (IEDs). IEDs were causing PTSD and TBI, which medical staff were only beginning to understand and diagnose, often misdiagnosing as personality disorder to facilitate discharges. Part of the challenge is that medical care treatments were not keeping pace with military developments: 'It is the story of how the advancement of medical knowledge moves at a different pace than the needs of an army at war.' (p.4) Other challenges included mental illness being missed in screenings, lack of resources, the marked insufficiency of stress debriefings, dilemmas of the role conflict of Medical Officers, lack of communication between caregivers and supporting organisations, contention over whether soldiers should deploy on medications, and unawareness of veteran benefits. Descriptions of VA's efforts are variable, but all too often under-resourced, understaffed and, unfortunately, sometimes callous and bureaucratic. Kieran concludes a tragic reflection of 'when the nation fails to prepare for the aftermath of the wars that it chooses to wage.' (p.280)

The ultimate tragedy is when war service and mental illness lead to suicide. US Army used to be able to say, like Australia, that their suicide rate is less than the national average, but this changed in 2007. Alarmingly, three-quarters of those who took their lives gave no indication of ideation prior, fewer than half had a clear reason, and obvious causal links are not easy to delineate. The American experience reminds me that suicide is a complex and wicked problem, and calls for medical, chaplaincy, Command, team and individual collaborative strategies, ideally from the grassroots and not just top-down.

I also appreciated learning about the responses of the US Army and VA. Kieran suggests their response was aggressive and progressive with cultural change, albeit with lots of debate and some failures. I had three takeaway lessons from the US experience. Firstly, there have been efforts to reduce stigma—essential given that 90% of soldiers would not seek behavioural healthcare out of concerns it would affect their career or at least they would be ridiculed by peers.

Secondly, it has been valuable to make mental health care more accessible to soldiers in units. Mental health professionals embedded in units are an extension of the practice of treating soldiers as close to the front as possible. Their experience is then similar to what Chaplains describe, as one mental health carer reflected: 'Being there, wearing the same uniform as they are, sleeping in the same kind of locations as they are, sharing some of the hardships, speaking their language a little bit—quite a few of the guys came in.' (p.128) The other aspect of accessible mental health care comes from Commanders and colleagues who have the insight and confidence to reach out in support. I was inspired by one officer who often said to troops, 'If you feel like harming yourself, here's my number—call me anytime'. A challenge Kieran identifies is that less qualified junior officers often lack the developed skills to ensure wellbeing. The book did not describe much about grassroots peer support programs that may be one of the most effective ways of reducing stigma and ensuring support.

Thirdly, there have been significant developments in resilience training. For example, the BATTLEMIND training program has focused on strengths and helping soldiers be aware of war's moral challenges: 'The Soldier's inner strength to face fear and adversity in combat with courage [from] existing skills and inner mental strengths.' (p.61) I assume the Australian Army's Battlesmart program has learned lessons from BATTLEMIND. US Army's Comprehensive Soldier Fitness (CSF) program also seeks to elevate and develop resiliency by utilising positive psychology. This was fast-tracked through by Command despite psychologists arguing for more research. Resilience training is also a response to supporting families. However, it aims to develop self-sufficiency rather than offering meaningful support and does not necessarily alleviate the sources of stress in the first instance. Prevention is helpful, but once families or members feel strained, treatment and support are also needed.

Two other areas of concern are mentioned but not explored deeply—military sexual trauma and moral injury. The book includes stories of both, but both are significant traumas in themselves, and both increase the risk of mental illness and suicide. Given the ethical dilemmas of counterinsurgency, moral injury is arguably also a signature wound of recent conflicts that will need more attention.

As new military threats emerge and the nature of conflict continues to change exponentially, it is critical to properly plan mental health programs to prepare and support defence personnel to protect against the physical, mental, ethical and spiritual traumas and dilemmas they may face. As Kieran argues, it is also important to weigh carefully and consider under what circumstances we as a country will engage in conflict at such significant costs. We cannot sidestep this complex mental illness IED staring at us in the room.

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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Untangling the Forward Blood Transfusion Conversation

J L Begley, A G Cahill

Forward blood transfusion has, for good reason, gained significant attention from Defence leadership and within the Australian military health profession. However, we've observed that conversations regarding the forward fresh whole blood (FWB) transfusion capability often confuse or entangle with discussions about autologous FWB transfusion training.

This poses two distinct risks. First, there is the potential for people to erroneously believe that autologous transfusion training carries the same clinical risks as therapeutic blood transfusion, leading to misdirected apprehension about the training itself. Second, reluctance or trepidation about the specifics of autologous transfusion training could hinder or delay the implementation of forward FWB transfusion as a Ready Now capability.

Chan and colleagues' recent publication on autologous FWB transfusion training contributes valuable insights to this conversation and illustrates the potential for such confusion.[1] For instance, while relevant in a clinical context, their discussions of blood-borne viral transmission and transfusion reactions do not apply to autologous transfusion training. Likewise, the referenced reductions in haemoglobin and ferritin levels were observed in a trial analysing serial donations for operational resourcing, not transfusion training.[2] In each instance, readers might erroneously perceive that these risks also apply to autologous transfusion training. Our workplace discussions affirm the prevalence of these misunderstandings.

Similarly, the assertion that 'autologous FWB training is essential to achieve and maintain proficiency in FWB transfusion' explicitly links capability to training.[1] The 'scepticism and reluctance' many have regarding autologous transfusion training will be unnecessarily transferred onto the forward FWB transfusion capability.[1] Decision-makers' apprehension about autologous transfusion training may prevent them from supporting the implementation of the transfusion capability, as they have been told that they cannot have one without the other.

Before we move on, it is important to briefly clarify some definitions: autologous procedures (in this case, transfusion) are where a person receives cell or tissue from their own body. Importantly, autologous transfusions have several medical applications; most are not conducted for training. In contrast, receiving another person's blood is an allogenic transfusion.

A forward FWB capability (the what) should be delinked from the conduct of autologous transfusion training (a proposed how). To further disarticulate the two conversations, we would like to make a few points:

- There is no risk of blood-borne viral transmission from one's own blood in autologous transfusion training. Viral testing is unnecessary for training.
- Similarly, in autologous transfusion training, there is no risk of haemolytic or other antibody-mediated transfusion reactions from one's own blood. Antibody titre level measurements are unnecessary for training.
- The exception to the statements above is in the case of human error leading to a volunteer receiving another person's blood (i.e. an allogenic transfusion). This potentially catastrophic complication has occurred at least once in autologous transfusion training—a medic was transfused with half a bag of another's incompatible blood accidentally.[3] Luckily, no reaction occurred, but the outcome may have differed greatly. Strict adherence to the clinical governance and safety architecture overseeing transfusion training is unwaveringly critical.
- The haemoglobin and ferritin drop referred to in Chan's paper were not in the context of autologous transfusion skills training. These observations occurred in blood donors who repeatedly donated to a simulated blood bank. The whole blood was refrigerated for 22–24 hours before being reinfused; this occurred up to five times in each volunteer over five weeks.[2] This study was intended to test the feasibility of a temporary surge FWB blood bank during a high-risk operational period with a limited donor pool. A statistically significant (but arguably clinically insignificant) reduction in haemoglobin and ferritin were observed. The study involved

autologous transfusion, but not autologous training transfusions—several critical elements differentiate the studied process from autologous training transfusions.

- Several authors have asserted or implied that autologous transfusion is required for the forward FWB transfusion capability, but none have articulated a robust argument to support this assumption.[1,4,5] While the prevailing consensus is that autologous FWB training offers the preferred means of affirming accurate quantitative venesection and subsequent transfusion practice, it seems unlikely to be the only means to achieve this—several other clinical proficiencies are maintained without training on volunteers. It may be true that this is the best method for training forward FWB transfusion, or even the only suitable method, or it may not be. This warrants further investigation, but prolonged deliberation over the training modality should not delay the end state.

Finally, readers may also be interested to know that autologous FWB transfusion training is no longer limited to the military. Since 2019, Norwegian medical students have regularly undertaken autologous transfusion training.[6] This is a much smaller program with substantially more theoretical training.

We believe that discussing FWB capability and training distinctly is crucial. Clinicians, authors, advocates and decision-makers should explicitly clarify which aspect they are addressing. Entwining or confusing these two conversations threatens the future development of both.

(Views are the authors' own)

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RE. Autologous Fresh Whole Blood Transfusion Training – a Narrative Review and Report of U.S. Military Experience

D L Chan, M C Reade

We write in response to the letter to the editor "Untangling the Forward Blood Transfusion Conversation" and thank the authors for their interest in our article on "Autologous Fresh Whole Blood Transfusion Training – a Narrative Review and Report of U.S. Military Experience"[1]. We acknowledge the concerns raised over possible intertwining autologous Fresh Whole Blood (FWB) transfusion training and therapeutic blood transfusion but view comparison of these topics as complimentary and informative rather than problematic.

The discussion of blood-borne viral transmission and transfusion reactions, whilst acknowledged in our manuscript as "virtually absent", nevertheless is applicable. We acknowledge that whilst a volunteer as both the donor and recipient of autologous blood is naturally incapable of acquiring an infection from themselves, and we agree that routine viral testing is unnecessary for training. However, certain risks of blood transfusion training are still applicable. First, there is a risk of needle-stick injury to the person taking and administering the blood. Second, as the authors note there is the small but not zero chance of inadvertent transfusion of blood to someone other than the original donor. This risk is heightened when multiple volunteers participate simultaneously in training sessions that occur in the live clinical environment. Although there are no documented cases of adverse outcomes due to administrative transfusion errors in the training environment, the rare but potentially serious risk observed in therapeutic transfusions remains[2].

We acknowledge the link made between transfusion training and capability in our manuscript. The rationale for this is the observation that activation of the emergency donor panel is substantially slower without training. Our experience of 32 autologous transfusions over 8 training sessions demonstrated an improvement in the time period from activation of the process to commencement of blood transfusion from a mean of 75 minutes in the initial session to 41 minutes in the final 3 sessions (1). Further, it appears illogical if training is implemented as part of a low-titre O program not to concurrently assess antibody titres in O donors. To do so obviates the requirement to obtain a separate blood sample for the regular anti-A / anti-B testing necessary in such a program.

We agree that "prolonged deliberation over the training modality should not delay the end state". Consequently, we advocate adoption of a training modality that is safe and effective, and replacement of this only when another option, such as simulation, can be shown to be superior.

Regards,
Dr Daniel L. Chan
Professor Michael C. Reade

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Notes

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