UNDERSTANDING THE WHOLE OF MILITARY HEALTH SYSTEMS - THE DEFENCE HEALTHCARE CYCLE –ACCEPTED AUTHOR MANUSCRIPT

Authors:

1 - Lt Gen (Rtd) Professor Martin CM Bricknell CB PhD DM MBA MA MedSci (corresponding author)
2 - Major General Paul Cain QHP MBChB MMedSci MSc DAvnMed FFOM

Affiliations

[1] Professor of Conflict, Health and Military Medicine
Conflict and Health Research Group
School of Security Studies
King's College London
K4L.10 Kings Building
London
WC2R 2LS
E: martin.bricknell@kcl.ac.uk

[2] Director Healthcare,
Joint Medical Group
Coltman House,
DMS Whittington,
LICHFIELD, Staffs, WS14 9PY
E: paul.cain105@mod.gov.uk

Key Words: health systems, armed forces personnel, Veterans,

Declarations
Ethics approval and consent to participate – this paper has no requirement for ethical approval
Consent for publication – both authors confirm consent for publication
Competing interests – none declared
Funding – Professor Bricknell's salary is partially funded by the UK Research and Innovation GCRF Research for Health in Conflict developing capability, partnerships and research in the Middle and Near East programme (R4HC-MENA) ES/P010962/1.
Authors' contributions – MB was the primary author. PC provided comprehensive review and significant additional material.
Acknowledgements - none
Authors' information (optional)
Lt Gen (Rtd) Professor Martin CM Bricknell retired from the post of Surgeon General of the UK Defence Medical Services in April 2019. He is trained in Public Health, Occupational Medicine and General Practice with extensive operational experience.
Maj Gen Paul Cain is currently the Director Healthcare in the UK Joint Medical Group responsible for the delivery of Firm Base health services to the UK armed forces.

Title: UNDERSTANDING THE WHOLE OF MILITARY HEALTH SYSTEMS - THE DEFENCE HEALTHCARE CYCLE

ABSTRACT

The provision of healthcare for military personnel and Veterans is an important component of the covenant between the state and its armed forces. Whilst most emphasis is placed on the field medical system, the majority of clinical activity and healthcare costs arise from healthcare in garrisons and for Veterans. This paper proposes a high level concept for the whole of a military healthcare system that encompasses both operational and non-operational health services – the Defence Healthcare Cycle. This illustrates the care pathway for Defence patients from joining the Armed Forces as a recruit; though garrison-based community health services and care on military operations; to hospital and specialist clinical services; and finally transition to being a retiree or Veteran. The paper examines the unique opportunities for integrating clinical services, clinical and managerial information, and health, welfare and support services for Defence patients compared to citizens' services. It also examines two structural tensions: the first between the numbers and skill-mix required to deliver garrison health services versus the requirements to support military operations, the second between supporting the current force and the duties to provide long-term care for those injured or sick from previous conflict. We hope that the Defence Healthcare Cycle will generate debate about the development of concepts and medical doctrine that encompass the whole of military health systems. This will be important as countries re-evaluate their defence expenditure as a result of the Covid-19 crisis and consider the costs and capabilities of each element of their armed forces.

Key Words: health systems, armed forces personnel, Veterans,

Abstract word count: 248

Main document word count: 4442

References: 45

Figures: 1

INTRODUCTION

The provision of healthcare for military personnel and Veterans is an important component of the covenant between the state and its armed forces. The military medical system may also be a significant part of the government-controlled health economy and may have a significant role in a nation's response to national crises. In most nations the military medical system for the armed forces is publicly funded and organised by the Ministry of Defence (MOD).[1] This is normally separate from the public health system for the state's citizens. This military medical system has two strategic roles; to provide health services for armed forces personnel and other entitled beneficiaries from a fixed network of medical treatment facilities, and to support the armed forces on military operations both inside and external to the state.[2] The beneficiaries of this medical system will include armed forces personnel (Active Duty and Reserves) and may also include their families, Veterans, retirees, civilians working for the MOD, and non-military civilians.[3] This may be a very substantial non-salary benefit of

military service. The definition of entitlement that determines access to the military medical system will vary by nation; for the purpose of this paper this whole group is called the 'Defence patient'. This paper will use 'defence' to cover the whole system, 'armed forces' to cover the uniformed military services, and 'joint' to cover integration of the medical services for the navy, army and air force. The term 'Veteran' is used for an ex-military patient with a long-term medical condition directly attributable to military services and the term 'retiree' is used for an ex-military patient who left military service at the end of their contract with no attributable health condition. This distinction may be an important policy decision in the allocation of financial responsibilities for the provision of long-term health care for ex-military patients between the military health system and the wider public health system.

In many countries the cost of health services is rising due to improvements in technology and the range of treatments. This is forecast to be unsustainable for current health systems because of the increased longevity of their populations and the lack of sufficient healthcare workers.[4] These challenges equally apply to military medical services with the additional complication of competing against investment in wider military capabilities from the budget of the MOD. Many nations' armed forces are re-organising their medical services to reduce costs by deepening the symbiosis with the public health system and by shifting from healthcare orientated to navies, armies and air forces to an integrated, joint system. As examples, armed forces personnel receive hospital care from the public health system in UK , Australia and Canada .[5,6,7] In these countries, the military primary care system is organised on a joint basis with a mixed civilian/military workforce. The USA is undertaking a major reorganisation to place all military hospitals under the Defence Health Agency and to reduce the number of military medical personnel.[8] It is likely that the organisation and costs of military health services will come under further scrutiny as countries rebalance their defence budgets to adjust to the economic costs of the Covid-19 crisis. However, this paper does not consider how military health services have contributed to the civil-military response to this crisis.

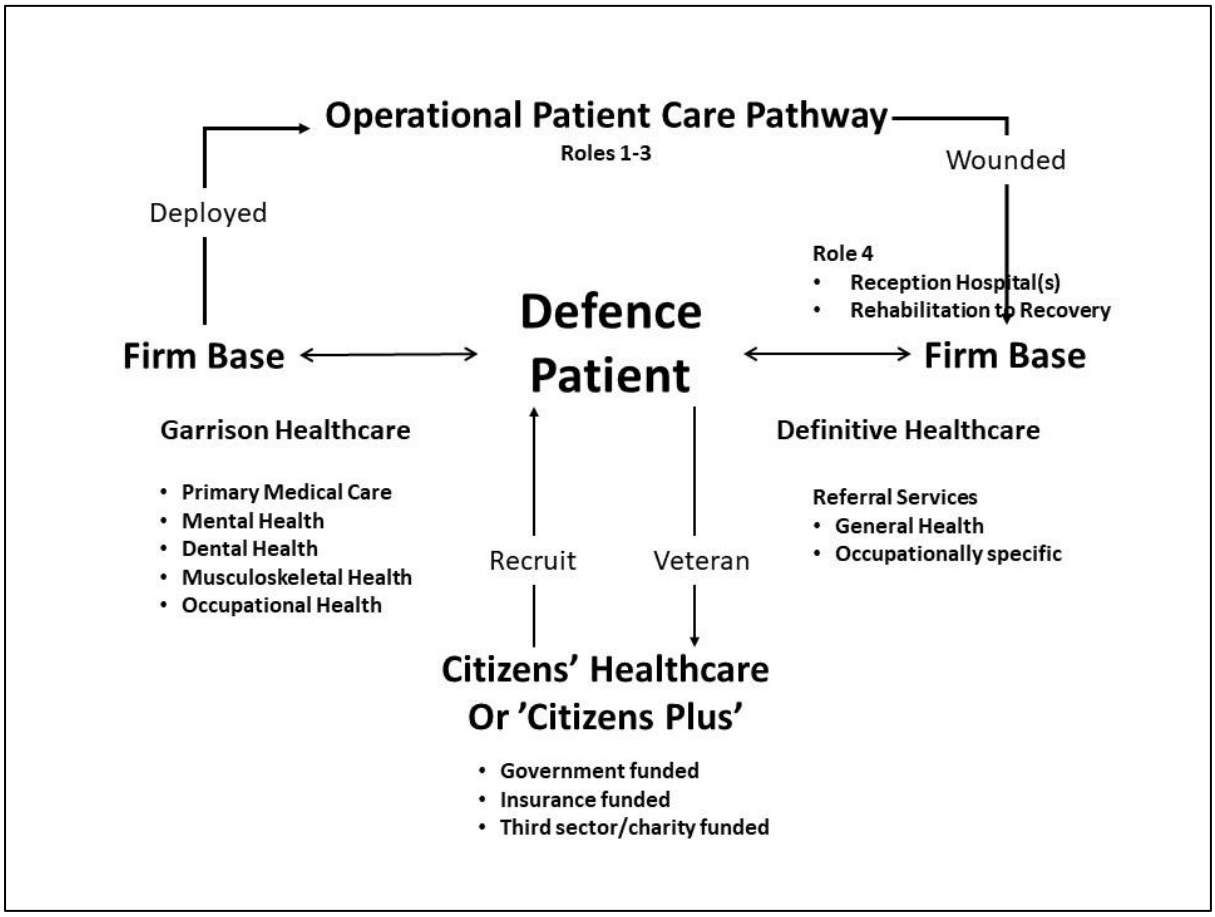
Military doctrine considers military capabilities as an integration of multiple dimensions. For the UK this is summarised as the Defence Lines of Development (DLODs) under the mnemonic TEPIDOIL (training, equipment, personnel, information, doctrine, organisation, infrastructure, logistics; and for medical subjects – clinical).[9] Many military medical services have mature doctrine for operational medical support but there is very little published work on doctrine and concepts for non-operational medical support.[10,12] This paper proposes a high-level concept for the design of a complete military healthcare system that encompasses both operational and non-operational health services – the Defence Healthcare Cycle – in order to highlight the inter-relationships between the two systems.

THE DEFENCE HEALTHCARE CYCLE

The Defence Healthcare Cycle reflects an evolution of thinking as the boundaries between military medical systems and wider public health systems have become more blurred. For the UK, the military health system needed to fundamentally deepen its relationship with the National Health Service (NHS) when independent military hospitals were abolished as part of military reform in the 1990s. This led to the creation of Ministry of Defence Hospital Units that provided military clinical personnel inside NHS hospitals to maintain their clinical competencies and to assist with caring for military patients.[12] Re-formulation of concepts for operational health services for the UK Armed Forces in the past decade have explicitly recognised the role of the NHS in the care of military personnel.[13] The merging of the

primary care services of the Royal Navy, Army and Royal Air Force into the Defence Primary Healthcare created new mechanisms for the commissioning of health services from the NHS for Armed Forces personnel alongside the unification of the defence primary healthcare workforce across the armed services and civilians.[14] This created the opportunity to further develop the conceptual model for the military health system - the Defence Healthcare Cycle as shown in Figure 1. Although this will be explained by reference to the UK context, many of these principles are generic and can be extrapolated into any military health system. Indeed, the non-operational elements of many military medical systems are already organised on a Joint basis (for example, Germany, India, Pakistan, Taiwan, Australia). Furthermore, this model explicitly recognises the need to consider how the government meets its obligations towards military personnel who develop long-term health problems as a result of their military service that extend into their post-military life as a Veteran or retiree.

Figure 1 Defence Healthcare Cycle



The Defence Healthcare Cycle explicitly captures the potential for integration of military and civilian healthcare services to meet the needs of the Defence patient and may also highlight opportunities for civilian patients to access the military pathway. Whilst it has components that arise from the individual armed services (navy, army, air force), it is likely that some healthcare services are organised to be delivered to all beneficiaries independent of the originating service. Furthermore, a proportion of the MOD healthcare workforce will be

civilian so the system is ‘defence’ rather than just ‘joint’ (integration of navy, army, air force).

The design of health systems is increasingly centred on the patient in order to emphasise the need for integration between clinical services; especially to improve care across the boundary of community health services and hospitals as exemplified by the UK NHS long-term plan.[15] The Defence Healthcare Cycle places the beneficiaries of the system at the centre. It uses the term ‘Defence patient’ to cover all personnel entitled to receive healthcare from any component of the healthcare system. This highlights the importance of defining the list of beneficiaries for the military health system, the Defence Population at Risk, as an explicit policy decision because it will drive the attribution of costs for Firm Base healthcare. It is likely that this will involve discussion at government level between the Ministries of Finance, Defence and Health. Subjects for consideration will include: attribution of costs for military personnel who require referral into the civilian health system for clinical services not present in the military health system, attribution of costs for long-term health needs resulting from conditions attributable to military service, attribution of costs for health needs arising after military service (retirees) especially predictable, age-related conditions, and attribution of costs for non-Defence civilians treated within the military health system for the purpose of maintaining skill-mix for military healthcare professionals for their operational role.

The Defence Healthcare Cycle shows the whole system of care for the Defence patient across their life course. All Defence patients are also citizens of their parent nation and so the public health system will be part of their health system (even if only in childhood). The Figure is divided into 4 components; Citizen’s Healthcare, Garrison Healthcare, Operational Patient Care Pathway, and Definitive Healthcare. A uniformed member of the Armed Forces starts as a civilian in receipt of Citizen’s Healthcare from the state health system as an entitlement of being a citizen of their state. Once recruited to the armed forces, the service person has access to Garrison Healthcare based on their place of work. If deployed they receive healthcare organised as the Operational Patient Care Pathway in Role 1, 2 and 3 medical treatment facilities as defined by NATO. The Operational Patient Care Pathway (OPCP) provides a unifying model for medical operational capability. It is already well described within UK medical doctrine and the principles are contained within other national and international military medical doctrines. The concepts that underpin the OPCP will not be considered further in this paper. However, the skills required of military healthcare practitioners to meet their role within the OPCP is heavily skewed towards emergency medicine, trauma care and infectious disease. These conditions are not routinely part of Firm Base healthcare for military patients. Furthermore, the potential volume of patients during high intensity military operations will be substantially more than the routine demand of the Firm Base military health system. Therefore, the overall demand for healthcare providers with skills to support large scale military operations is likely to be greater than the baseline uniformed workforce.

If wounded or sick, Defence patients who require medical evacuation from military operations are received into the Role 4 Definitive Healthcare system (primarily hospitals). A small number of patients may return direct from operations to Garrison Healthcare – so called ‘discharge at airhead’. Armed Forces personnel, on discharge from Regular service, may return to having access to Citizen’s Healthcare as a Veteran or retiree (if access to military healthcare services is not part of their retirement benefits). This is the core, clockwise cycle. It is also possible for a Regular service person to be referred direct from Garrison Healthcare to Definitive Healthcare and to recover; and to be discharged from the OPCP or Definitive Healthcare back to Garrison Healthcare. These pathways are shown as two way arrows. The

overall process may be the same for Reserve members of the Armed Forces, either as a benefit of Reserve service or for the period of their mobilisation into Regular service. There may be similar or further restrictions on entitlement for families of Armed Forces personnel, entitled MOD civilian employees or civilians.

FIRM BASE HEALTHCARE

Firm Base Healthcare covers the two components of Garrison Healthcare and Definitive Healthcare. This term is used to encompass the network of fixed medical treatment facilities that provide healthcare services to the Defence patient on a geographic basis. 'Firm Base' separates these arrangements from the mobile and deployable component of the Defence Healthcare system that supports the OPCP. Firm Base Healthcare is almost invariably a combination of military delivered, military provided (might be contracted) and citizens' entitlement services. The balance will vary between nations. It is important that there is oversight of this whole system in order to ensure that Defence patients have access to safe, effective and efficient healthcare in the Firm Base (both inside the nation and possibly overseas) to meet their clinical needs and the requirements of their employer.

Garrison Healthcare. Garrison Healthcare covers the health services delivered within military garrisons (a geographically defined group of military units and supporting organisations). It encompasses the community-based clinical services of primary medical care, dental care, mental healthcare, rehabilitation, and occupational health. Whilst separated by professional groups, the effect for the Defence patient must be integrated to meet their physical and mental health needs. The military health system is primarily an occupational health service and so these clinical services are orientated to the promotion of well-being, prevention of ill-health, and recovery to fitness for role. Furthermore, the uniformed population are primarily young adults who have already been selected as medically fit for military service and so the majority of medical conditions are short-term musculoskeletal or mental health disorders with a very low incidence of serious, long-term health conditions. This required a community health service with a very different skill-mix and outcomes compared to civilian health systems. Whilst the benefits from integration of community clinical services apply to all populations, the military healthcare system may have a unique opportunity to exploit this integration through co-location of services, a common medical information system, and clarity over clinical leadership and responsibility across professional boundaries. The wider military system may also have influence over the wider, social determinants of health. Social health needs may be met by garrison services such as adjustments to employment by the chain of command, welfare services, religious support, military housing, etc. These services may be provided directly by the MOD using MOD employees or may be commissioned by other providers, especially for Defence patients employed away from military garrisons or overseas. The US TriCare System is an example of large-scale commissioned healthcare services with a global footprint for Defence patients.[16]

Definitive Healthcare. Definitive Healthcare is primarily provided by hospital services. These may be military hospitals, contracted clinical services, or accessed solely on the basis of a citizen's entitlement for Defence patients. Many nations' MODs maintain military hospitals in order to ensure access to healthcare for Defence patients that meets the requirements for the MOD as an employer (including immediate access to hospital beds for Defence patients repatriated from overseas) and also to ensure hospital-based military medical personnel maintain clinical skills suitable for the operational role. There is also a

requirement for referral services for specialist occupational assessment and investigation of Armed Forces personnel covering aviation medicine, underwater medicine, environmental medicine and other aspects of employment within the Armed Forces that may not be covered by the civilian public health system. Some nations have specialist military medical institutes that combine research and clinical assessment in these fields.[17,18,19,20]

However, it is expensive to operate military hospitals and many are only viable if the clinical throughput includes the wider civilian population.[21] In some countries, there is a perception that the overhead costs can be transferred to the public or commercial sector with a resultant saving to the MOD.22 Furthermore it may prove difficult to balance the skills needed for military clinicians (high acuity medical and surgical practice associated with major urban centres) and the breadth of family and community medicine needed for the whole Defence patient population (children, mothers, old people) in rural military garrisons.[23] Thus, the choice between the MOD operating hospitals for Defence patients and contracting hospital services from the public or private system will vary between nations and availability of local services. This choice will be informed by comparisons of clinical services, clinical performance, timeliness of access and the needs of the MOD as an employer (especially to manage active recovery and recuperation back to work) between options.

The reception of military casualties from military operations into the Firm Base is a discrete component of the OPCP. This is covered by the definition of Role 4: 'a definitive hospital response capability (Role 4 Medical Treatment Facility) that offers the full spectrum of definitive medical care that cannot be deployed to theatre or will be too time consuming to be conducted in theatre'. This requires a hospital that has 24 hour availability of the range of the specialist clinical services that can meet the health needs of a severely sick or injured military casualty. There is an additional requirement to meet the military administration and social needs of the patient's family who may not be normally resident in the vicinity of the receiving hospital. Some militaries provide specialist social and welfare services, including hotel accommodation, as part of this package of care; this may substantially exceed the public provision for civilians in the same circumstances.[24]

Residential rehabilitation and recovery services are the final component of the Role 4 care pathway for severely injured or sick Defence patients. The MOD as an employer has highly demanding medical standards for fitness for military roles which may exceed the expected outcome from civilian rehabilitation and recovery services. This may require these services to be delivered within a military setting that provides an additional benefit of re-introducing the military culture and structure for work as part of the recovery process from injury or illness.[25] This residential clinical service will need to cover the Defence patient's breadth of physical, mental and social needs including seamless transition back to these community-based clinical services in Garrison Healthcare once their need for residential services has stopped. Whilst described as a Role 4 clinical service to emphasise the link to the OPCP, residential rehabilitation and recovery is also a key component of rehabilitation referral services from Garrison Healthcare.

CITIZEN'S HEALTHCARE

The final component is Citizens' Healthcare. In some nations the healthcare benefits to Defence patients continue after military service to the end of their life and so these individuals never return to the public health system. However, even the notion of an endpoint

for military service is blurred. Reservists in the UK serve in the Armed Forces but their entitlement to healthcare varies by employment type and readiness for operational deployment. The status 'retiree' occurs at the end of military service and, in some countries, this removes entitlement for MOD provided services from themselves and family members. In principle a retiree has reverted to becoming a citizen and therefore is entitled to 'Citizen's Healthcare' as part of the usual provision of healthcare services by the state. It also includes access to state support for the wider social determinants of health to which a citizen is entitled such as housing, employment support, welfare provision etc.

Some nations make additional provisions from public services for retirees , especially for Veterans with ill-health conditions that are attributable to military service. As an example, in the UK, the Armed Forces Covenant was introduced to mandate 'no disadvantage' for members of the Armed Forces Family who receive services from government departments other than the MOD and the term Veteran is applied to anyone who has received one day's pay for military service.[26] This includes ensuring that a patient's relative position on waiting lists is maintained if they move between NHS commissioners. Healthcare for Veterans is extended by specialist services commissioned to meet the specific needs of Veterans such as the mental health Transition Intervention and Liaison Service (TILS), Veterans (mental health) Complex Treatment Services, and prosthetic services.[27] This is complemented by voluntary 'chartermark' schemes such as 'Veteran Friendly' general practices[28] and the Veterans Covenant Healthcare Alliance.[29] Other nations provide separate, government funded health services that differentiates between retirees and Veterans. As an example, in the US, the Department for Veterans Affairs has a specific mission '*to care for him who shall have borne the battle, and for his widow, and his orphan by serving and honoring the men and women who are America's veterans*'.[30] This provision beyond normal citizens' entitlement might be considered as 'Citizen Plus' government support and lies at the interface between the provision of health services for current Active Duty military personnel and the wider, long-term obligation of government to meet the health needs of military personnel after productive uniformed service as part of the overall package of military benefits.

In many countries there is an established role for private insurance schemes of third sector/charities to provide additional, non-government support to military retirees or Veterans. These may directly provide or commission interventions to improve physical, mental and social wellbeing. In the UK, military charities complement the services provided by the government and represents an additional source of support beyond that available to citizens. Some charities may provide financial assistance for all members of the Armed Forces and their families[31], or to members of each individual service[32,33,34] others might provide welfare services[35], yet others might provide care for specific disabilities such as blindness[36], limb loss[37] or mental health problems[38]. There are similar, non-government charities and health maintenance organisations in many other countries such as the USA[39], Nigeria[40], Pakistan[41]. Some of these Veterans' organisations are members of the Royal Commonwealth Ex-Services League[42].

IMPLICATIONS OF THE DEFENCE HEALTHCARE CYCLE

The Defence Healthcare Cycle provides a conceptual explanation of a whole military health system and allows the deconstruction of the individual components for the Defence patient. It facilitates an examination of choices around each of these components and is especially useful for comparisons between countries and internal choices within a country about different models for delivery. The term 'Defence patient' also enables the deconstruction of

the beneficiaries of the Defence Healthcare Cycle and especially emphasises the notion that the Defence patient remain a citizen of a nation, even if they have additional or different benefits arising from military service. It highlights the importance of the definition of the Defence Population at Risk as a cross-government policy decision that drives the attribution of healthcare costs for Defence patients between government ministries.

This Defence Healthcare Cycle describes the inter-relationship between the 4 components of this healthcare system. It recognises the benefits of integration across clinical services within each component, especially the Garrison Healthcare component of the Firm Base. It illustrates the importance of a view of the whole system for both organisational governance and also from the perspective of a patient through their journey across the interfaces between different providers. This is particularly relevant in the design of clinical and management information systems that support the delivery of health services across the whole of the Defence Healthcare Cycle. In principle this should be simple as the Defence Healthcare Cycle is under unified oversight of the MOD, but it is complicated by global dispersal of patients and medical facilities, integration with civilian clinical systems, and different information needs of clinical and administrative users.

There is scope for further analysis of the components to the level of precision that has been applied to medical doctrine for the OPCP. Garrison healthcare is the core to the Defence Healthcare Cycle through an individual's military career. This relationship between the uniformed patient, their commander, and community health services unified to the common purpose of maximising military performance is at the heart of military medicine. In the UK, the military medical services have had a significant influence on the evolution of general practice, occupational medicine and public health medicine on the basis that the healthcare for military garrisons was already structured as a population-centred clinical service[43]. Internationally, some military medical services are trying to ensure that the status of these community-health practitioners is balanced against the status of hospital-based clinicians. An example is the establishment of a Faculty of Military Medicine by the Irish College of General Practitioners[44]. This paper has not fully explored the potential synergies that could be achieved from further integration of primary care, dental health, mental health, musculoskeletal health and occupational health services on a community basis. This could include new models of care that distribute the use of healthcare professionals across a patient's care in a way that improves care pathways, fully uses the distinct skills of staff groupings and is more sustainable.

It is likely that there will continue to be pressure across military medical services to demonstrate 'value' and reduce their proportion of costs within the Defence budget. Manpower is the largest operating cost for MODs and healthcare manpower (especially doctors) is considered expensive. The Defence Healthcare Cycle shows the potential overlap (or double accounting) for military medical personnel assigned to the Firm Base and also the Operational Patient Care Pathway. It also highlights the potential difference in volume and type of clinical workload between these two settings. Designing the best balance between active duty, Reserve, mobilised civilian volunteers and civilian personnel to meet the numbers and skill-mix required by the whole Defence Health Cycles is a discrete subject for further analysis. However, it is a further example where the needs of Defence have to be placed within the context of a country's overall health economy.

In many nations the number, size and scope of military hospitals has been reduced where is there is an opportunity for public or commercial providers to take on clinical work that does not require uniformed healthcare practitioners. As an example, in Turkey all military hospitals were transferred to the Ministry of Health in 2016[45]. However, it will continue to be important to define the occupationally-orientated referral services that the Defence patient needs. This will be more than specialist knowledge in the environments of altitude, depth, heat and cold. It also includes occupational aspects of all body systems such eyes, ears, skin, circulation, digestion, and mental function. Rehabilitation and recovery for occupation is also likely to remain an essential output of the Defence Healthcare Cycle. Thus, the input costs of the military medical system need to be balanced against the output value of a maximally fit (physical, mental and social) armed force and the contribution of an assured and capable military operational health system to the moral component of fighting power.

CONCLUSIONS

As identified in the introduction, many military health systems are undergoing substantial review and change. In many militaries there is a well-established analytical process for the management of military operational capabilities. This has been applied to medical support on military operations; the Operational Patient Care Pathway. However, there is scope for the same approach to non-operational medical support to the Defence patient. The Defence Healthcare Cycle is a potential model to describe this complete system and allow exploration of choices in organisational and clinical design to meet the organisational and clinical needs of the armed forces.

The paper has identified the critical policy decisions around the definition of the Defence patient as beneficiaries of the military health system. It uses the Defence Healthcare Cycle to illustrate the interdependence of the public health system, Garrison Healthcare, the Operational Patient Care Pathway and the, hospital orientated, Definitive Healthcare system.

It is likely that the purposes, costs and value of military medical services will come under further scrutiny as defence budgets are reviewed to balance the wider the economic costs of the Covid-19 crisis. Whilst the contribution of military medical services to the civil-military government response to this crisis is beyond the scope of this paper, we hope that this model will generate further debates about the development of concepts and medical doctrine for the entirety of military health systems. This can inform strategic choices such as: the balance of costs and obligations between Ministries of Defence, Health, wider social insurance and charities; the healthcare workforce plan to meet the needs of the armed forces within the whole country's health economy; the procurement and integration of medical information systems for the benefit of the Defence patient across the plurality of healthcare providers; and decisions regarding core military medical capabilities that must be retained under military control versus those that can be commissioned/contracted from external providers.

NOTES

1. Almanac Military Medical Corps Worldwide. https://www.military-medicine.com/, accessed 06 Dec 2019.
2. Jonathan Woodson. 'Roles and Responsibilities of the Military Medical Officer' in Francis O'Connor, Eric Shoomaker, Dale Smith (eds), *Fundamentals of Military Medicine*. (Borden Institute: USA, 2019).

https://www.cs.amedd.army.mil/borden/FileDownloadpublic.aspx?docid=142da1dc-4d74-47ae-9f20-bc26ba272ce0, accessed 06 Dec 2019
3. Martin Bricknell, 'Entitlement to military healthcare - limitations of the NHS model', *Journal of Public Health*. (Vol. 21, No. 3, 1999) p. 325–330. DOI:10.1093/pubmed/21.3.325
4. Mark Britnell. 2019. Human: Solving the global workforce crisis in health care. Nuffield Trust guest comment. https://www.nuffieldtrust.org.uk/news-item/human-solving-the-global-workforce-crisis-in-health-care, accessed 05 Dec 2019
5. Armed Forces Healthcare: How it works. NHS England. https://www.nhs.uk/using-the-nhs/military-healthcare/ accessed 05 Dec 2019.
6. Australia, Commonwealth of. Almanac Military Medical Corps Worldwide. https://www.military-medicine.com/almanac/16-australia-commonwealth-of.html, accessed 05 Dec 2019
7. Canada. Almanac Military Medical Corps Worldwide. https://www.military-medicine.com/almanac/30-canada.html, accessed 05 Dec 2019
8. Terri Tanielian, Carrie Farmer, 'The US Military Health System: Promoting Readiness And Providing Health Care', *Health Affairs* (Vol. 38, No 8, 2019) p.1259-1267 DOI: 10.1377/hlthaff.2019.00239
9. How Defence Works. Version 4.2. Ministry of Defence, London 2015. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/484941/20151208HowDefenceWorksV4_2.pdf, accessed 05 Dec 2019.
10. Allied Joint Medical Support. AJP 4.10(C). NATO Standardisation Office, 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/841686/doctrine_nato_med_spt_ajp_4_10.pdf, accessed 05 Dec 2019.
11. Joint Health Services. Joint Publication 4.2. US Joint Chiefs of Staff, Washington 2018. https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp4_02ch1.pdf, accessed 05 Dec 2019.
12. Alastair MacMillan, 'Defence Costs Study 15', *Journal of the Royal Army Med Corps* (Vol. 142, 1996), p.3-8. DOI: 10.1136/jramc-142-01-01
13. Martin Bricknell, 'The Operational Patient Care Pathway', *Journal of the Royal Army Med Corps* (Vol. 160, 2014) p. 64-69. DOI: 10.1136/jramc-2013-000228 PMID: 24478385
14. John Burgess, Mike Gall, Simon Orr, et al. 'Formation of Defence Primary Healthcare: a new way of delivering firm base primary healthcare', *Journal of the Royal Army Med Corps*(Vol. 163, 2017) p. 163:89-93.
15. NHS Long Term Plan. Version 1.2 dated Aug 2019. https://www.longtermplan.nhs.uk/online-version/, accessed 05 Dec 2019.
16. David Smith, Raquel Bono, Brice Slinger, 'Transforming the Military Health System', *Journal of the American Medical Association* (Vol. 318, No. 24, 2017) p. 2427–2428. doi:10.1001/jama.2017.16718
17. MR Dean, 'An overview of the Institute of Naval Medicine' *Journal of the Royal Naval Medical Service*, (Vol. 91, 2005) p.164-6.
18. Malcom Braithwaite, Graham Nicholson, Robert Thornton, David Jones, Robin Simpson, David McLoughin, David Jenkins, 'Armed Forces occupational health—a review', *Occupational Medicine* (Vol. 59, No. 8, 2009) p.528-38 doi: 10.1093/occmed/kqp140
19. Wee Hoe Gan, Rayden Low, Jarnail Singh, @Aviation Medicine: global historical perspectives and the development of Aviation Medicine alongside the growth of Singapore's aviation landscape', *Singapore Medical Journal* (Vol. 52, 2011) p. 324-9.
20. US Naval Medical Research and Development. https://www.med.navy.mil/sites/nmrc/Pages/About.aspx, accessed 05 Dec 2019.

21. Ehsan Teymourzadeh, Mohammadkarim Bahadori Mohammad Meskarpour-Amiri, Javad Khoshmanzar, Sayyed-Mortez Hosseini-Shokouh. 'Economic Performance Analysis of Selected Military Hospitals Using Hospital Indicators and Inpatient Bed-Day Cost' *Hospital Practices and Research* (Vol. 4, No. 1, 2019) p.31-38. doi: 10.15171/hpr.2019.05
22 Rethinking The United States' Military Health System. Health Affairs Blog, April 27, 2017. DOI: 10.1377/hblog20170427.059833
23. Mary Edwards, Kurt Edwards, Christopher White, Craig Shepps, Stacy Shackelford, 'Saving the Military Surgeon: Maintaining Critical Clinical Skills in a Changing Military and Medical Environment' Journal of the American College of Surgeons (Vol. 222, No. 6, 2016) p.1258 – 1264 doi: 10.1016/j.jamcollsurg.2016.03.031
24. Sarah Cage-Brimelow. 'The Operational Patient Care Pathway in the Firm Base: the UK solution', *International Review of the Armed Forces Medical Services* (Vol. 91, No. 3, 2018) p. 50-59.
25. Peter Ladlow,Rhodri Phillip, John Etherington, Russel Coppack, James Bilzon, M Polly McGuigan, Alexander Bennet, 'Functional and mental health status of United Kingdom military amputees post-rehabilitation', Archives of Physical Medicine and Rehabilitation (Vol. 96, No. 11, 2015) p. 2048-2054. doi:10.1016/j.apmr.2015.07.016
26 Armed Forces Covenant. Proudly supporting those who serve. https://www.armedforcescovenant.gov.uk/, accessed 05 Dec 2019.
27 Ex-forces and struggling with your health? NHS leaflet. https://assets.nhs.uk/prod/documents/Mil_Vet_leaflet_FINAL_ONLINE.pdf, accessed 05 Dec 2019
28. Veterans Friendly GP Practices. Royal College of General Practitioners. https://www.rcgp.org.uk/clinical-and-research/resources/a-to-z-clinical-resources/veteran-friendly-gp-practices.aspx, accessed 05 Dec 2019.
29. Veteran Aware NHS Trusts. NHS Improvement. https://improvement.nhs.uk/resources/veteran-aware-hospitals/, accessed 05 Dec 2019.
30. Veterans Administration. https://www.va.gov/, accessed 05 Dec 2019.
31. Royal British Legion. https://www.britishlegion.org.uk/, accessed 05 Dec 2019.
32 Royal Naval Benevolent Trust. http://www.rnbt.org.uk/, accessed 05 Dec 2019.
33 Army Benevolent Fund. https://soldierscharity.org/, accessed 05 Dec 2019.
34 Royal Air Force Benevolent Fund. https://www.rafbf.org/, accessed 05 Dec 2019.
35 Soldiers, Sailors, Air Force Families' Association. https://www.ssafa.org.uk/, accessed 05 Dec 2019.
36 Blind Veterans UK. https://www.blindveterans.org.uk/, accessed 05 Dec 2019.
37 BLESMA, The Limbless Veterans. https://blesma.org/, accessed 05 Dec 2019.
38 Combat Stress for Veterans' Mental Health. https://www.combatstress.org.uk/, accessed 05 Dec 2019.
39 Hope for the Warriors. https://www.hopeforthewarriors.org/, accessed 05 Dec 2019.
40 Defence Health Maintenance Limited. https://www.dhmlnigeria.com/, accessed 05 Dec 2019.
41 Army Welfare Trust. http://www.awt.com.pk/, accessed 05 Dec 2019.
42 Royal Commonwealth Ex-Services League. http://www.commonwealthveterans.org.uk/member-organisations.php, accessed 05 Dec 2019.
43 Kieran Mears, David Morgan-Jones, John Richardson, Robin Simpson, 'General Practice in the Armed Forces: A Definition and Model', *Journal of the Royal Army Medical Corps* (Vol. 158, 2012) p. 156-161. DOI: 10.1136/jramc-158-03-03
44 Faculty of Military Medicine of the Irish College of General Practitioners. https://www.icgp.ie/go/become_a_gp/faculty_of_military_medicine, accessed 05 Dec 2019.

45 Vatandaş, S. The Patterns of Civil-Military Relations: The Western Standards and Turkey's Experience. INSAMER, Oct 2018. https://insamer.com/en/the-patterns-of-civil-military-relations-the-western-standards-and-turkeys-experience_1745.html, accessed 05 Dec 2019.