The Independent Medical Expert Group (IMEG) 7th Report

Report and recommendations on medical and scientific aspects of the Armed Forces Compensation Scheme

July 2024

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Chair's letter to Minister for Veterans and People

Ministry of Defence

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A Non-Departmental Public Body
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Alistair Carns OBE, MC, MP
Minister for Veterans and People
Ministry of Defence
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Whitehall
London SW1A 2HB

Dear Minister,

I have pleasure in presenting the Seventh Report of the Independent Medical Expert Group (IMEG).

Set up following recommendation by the Armed Forces Compensation Scheme (AFCS) Quinquennial Review (QQR) in 2010 (Boyce Review), IMEG is a non-departmental public body providing Minister for Veterans and People (MinVP) with independent evidence-based expert scientific and medical advice on AFCS. Topics for investigation are suggested by claimants, their supporters, members of the public and MOD, and endorsed by you, with IMEG reports published about every two years.

Topics reviewed in this report include Civilian and Military Employability; Military Mental Health (MH); Lower limb Musculoskeletal Injuries (MSKI) and Disorders and the development of Osteoarthritis (OA); an update on the 2013 review of Noise-induced Hearing Loss (NIHL); Interim Awards; and Sea King Helicopter Exhaust Emissions and their possible role in the causation of certain rare cancers. These topic reviews aim to be both scientifically authoritative and relevant to contemporary Defence People priorities. Currently, these priorities are:

1. The need to optimise and maintain operational deployability, with maximal numbers of service personnel fit to fight.

2. Effective recruitment and retention, at a time when the culture gap between military and civilian life, particularly amongst young people, is wide.

3. Given the increased understanding of the importance of paid work in an individual's life, sense of well-being, self-esteem and contribution to family and community, for all service leavers including those medically discharged, an important aim is successful transition to fulfilling civilian life, including where possible, appropriate paid work. For those with long-term severe impairment and functional disability, it is important that appropriate through-life support is provided.

4. Increased workforce inclusivity and diversity, with a higher proportion of women and people of different ethnicities. At present about 10-12% service personnel are women; by 2030 the government aim is 30% of Defence whole force being female.

Defence Statistics for AFCS claims and value of awards are referenced in the report. The Covid pandemic led to a reduction in AFCS claims, working from home delayed case processing, and the planned digitisation of AFCS data has been delayed. In 2022 and 2023, AFCS claims made and decided are returning to 2018/19 levels, but the MOD Defence Statistics data to 31 March 2023, although accredited by the Office for National Statistics (ONS), should be regarded as provisional. The reason for this that here remain significant numbers of undetermined or pending claims, amongst which a proportion are likely to be withdrawn by the claimants, or, on examination by Defence Business Services (DBS) decision-makers, claims may be found ineligible.

Over the period 1 April 2018 to 31 March 2023, about 1,500 service personnel were medically discharged annually, with the most common causes across the single services being musculoskeletal injuries and disorders, and mental health and behavioural disorders. Of total medical discharges from the Royal Navy (RN) and Royal Marines (RM), 46% were due to musculoskeletal disorders; for the Army, 37%; and Royal Air Force (RAF) 26%. Discharge with mental health and behavioural disorders accounted for 29% of the total for RN and RM; for the Army 39%; and for the RAF 49%.

Employability

Reflecting Defence People priorities, for the first time, this IMEG report includes Employability as a standalone topic, which has cross-cutting generic importance to AFCS. The topic chapter emphasises the importance of physical and mental fitness and well-being for military employability, and, reflecting wider societal youth culture in some cases, the need for recruit conditioning prior to basic training. In-service, it also emphasises the ethos of individual responsibility, and a focus on injury and illness protection and prevention. The Equality Act 2010 principles, including on disability, have been followed across Defence for many years. Where service personnel are ill or injured, the first aim of treatment and rehabilitation is restoration of function and retention in service, or if that is not possible, support in successful transition to civilian life, including paid work.

IMEG independent expert members had useful discussion with Defence Medical Services (DMS) colleagues at Defence Medical Rehabilitation Centre (DMRC) Stanford Hall, which is leading in the world-class UK medical rehabilitation care pathways. We also note the recent and planned initiatives in Defence Recovery Capability and the involvement of diverse organisations, other government departments, local authorities, service, and other charities, in striving to provide a multi-faceted and coordinated approach to delivery, which IMEG fully supports.

A similar approach is also applicable to inclusivity and diversity and the force target of Defence whole force of 30% being women by 2030. This requires special consideration, with new gender-free and fair approaches to physical training, treatment, rehabilitation, and occupational assessment.

Mental Health

Since 2010 it has often been contended that AFCS mental health claims are treated unfairly compared with physical conditions, with higher threshold for causal link to service to be accepted, and inequitable award outcomes. Raised in the 2016/17 AFCS QQR, the issues were formally referred for IMEG scrutiny and comment. The 2017 Fourth IMEG report confirmed support for the medical basis of interim awards, the role of consultants in the diagnosis of mental health disorders, finding that AFCS delivered parity of esteem between physical and mental disorders.

Several mental health issues raised in the 2022/23 AFCS QQR were also separately brought to the attention of IMEG. These included parity of esteem; the requirement for consultant level diagnosis of claimed mental health disorders; and interim awards. We have revisited these issues here.

Parity of Esteem

Within current data constraints, we remain content that there is parity of esteem between mental and physical conditions. From the start of the scheme in 2005 to 31 March 2019, physical disorder “lump sum only” awards accounted for 94% of awards, with 6% having an additional Guaranteed Income Payment (GIP); while for mental health disorders there were 81% “lump sum only” awards, and 19% with an additional GIP. By 31 March 2021, mental health awards with a GIP had risen to 21%, while on 31 March 2023, the figure was 26%. To 31 March 2023, 76% of mental health claims have been accepted to date, contrasting with 45% overall AFCS claims acceptance.

Diagnosis

Increasingly, the UK approach to mental health disorders clinical management, in DMS and the NHS, is by multidisciplinary teams, with regular case review conferences overseen by a named consultant psychiatrist or psychologist. Where that is the case, IMEG recommends the consultant-only post-traumatic stress disorder (PTSD) diagnosis requirement should no longer apply.

Interim Awards

An aim of AFCS is that awards paid should, as in the civil courts, be made full and final as early as possible. Despite this, as in the civil courts, final award notification may be delayed.

Sometimes, this is owing to case complexity, or where claims are made soon after the index event, before treatment has begun or is in the early stages, with prognosis being uncertain. A third reason is the now the common increasing waiting time to access best practice treatment. This is a matter of national and international concern, attributed to inadequate awareness campaigns, increased patient demand, and shortage of culturally sensitive, trained, and experienced trauma therapists. Finally, as identified in this Seventh report, there is now clear evidence that about a third of PTSD patients are resistant to treatment.

To support claimants ahead of finalisation, the Boyce 2010 AFCS QQR recommended payment on account of an interim award. If the final steady state award is higher than the initial award, an additional sum is paid; while if there is improvement and a lower final award is now determined, no amount of the initial award is recovered from the claimant. IMEG is also unaware of any case where a final GIP award was paid at a lower rate than any previous GIP band in payment up to award finalisation.

Interim awards are most commonly made in respect of claims for mental health, but apply across AFCS, and are relevant to all conditions in which, at claim application, there is uncertainty about prognosis of the condition (as, for example, in some neurological injuries) and the effects of an adequate course of treatment.

Concerns about interim awards were first raised in the 2016 AFCS QQR, and the issue was referred to IMEG, at which time interim awards were supported from a medical perspective. Following recent further concerns, and current IMEG consideration, we still conclude from a medical standpoint that the concept and award duration timelines remain valid. In addition:

- IMEG recommends that as early as possible, data on AFCS interim awards of all categories, extended at the initial two-year award review to four years, should be routinely collected.
- IMEG also recommends that brief accessible claimant information on interim awards and data collection, and its meaning, should form part of any Information Note for mental health claimants.
- Given the high proportion of mental health claimants receiving interim awards, and the confirmation of treatment resistance in PTSD, IMEG will maintain close contact with emerging evidence on advances in PTSD treatment and the potential impact on AFCS decision-making practice.

Musculoskeletal Disorders and Development of Osteoarthritis

Musculoskeletal injury and other Musculoskeletal disorders, particularly of the lower limb, are the most frequent claims made under AFCS, and a common reason for medical discharge, notably among women. We review the evidence for development of osteoarthritis following injury and in overuse, and the predisposing factors. We also consider aspects of prevention, as well as implications for employability, and compensation aspects. Risk factors for the development of osteoarthritis include unhealthy weight, smoking, alcohol consumption, sporting activities, military training, and under-reporting of injury. We emphasise the need to consider gender aspects of military prevention of injury, enlistment conditioning, and in-service training.

Current best practice treatment for Musculoskeletal injury in the military is described. The great majority of patients are treated in primary care units, with a small minority being referred on to specialist regional rehabilitation units, and finally to the Defence Military Rehabilitation Centre Stanford Hall. Defence Recovery Capability Holistic Transition and Resettlement is considered in relation to Musculoskeletal injury.

Issues of particular concern, raised by claimants, medical staff, and DBS decision-makers, with IMEG expert response comment, are discussed. Topics include:

1. The relationship of osteoarthritis to aseptic bone necrosis.

2. How AFCS should address interval joint replacement, when Musculoskeletal injury or other Musculoskeletal disorder has been accepted as due to service.

3. How AFCS should deal with pain and osteoarthritis developing in the back and lower limbs following a lower limb amputation.

4. Whether any type and duration of military service is associated with inevitable lower limb osteoarthritis.

Noise Induced Hearing Loss

Eleven years after the first IMEG review of noise induced hearing loss and tinnitus, these remain the most common military, civil, and no-fault compensation claims world-wide. The focus of the 2013 IMEG hearing loss review was acute acoustic trauma/blast injury. Eleven years on, with most claims now being made for chronic noise induced injury, this review updates the 2013 topics and comments on recent research advances, and issues raised by claimants and operational staff.

The AFCS compensation threshold for chronic bilateral symmetrical noise induced hearing loss, presently 50dB (decibels) averaged over 1,2 and 3kHz (kilohertz), reviewed in the 2013 report, has been re-examined. In 2013 (and to date), literature scrutiny and discussion with experts has failed to identify new evidence to support revision. The 2013 report recommended a longitudinal follow-up study of in-service personnel with hearing threshold of 35-50dB averaged over 1, 2 and 3kHz. In response, the then Defence consultant adviser in otolaryngology reviewed 3,964 service personnel, finding only two with pure tone hearing thresholds of at least 50dB averaged over 1, 2 and 3kHz bilaterally. Thirty-one personnel had average thresholds of 35dB or more, but not 50dB in at least one ear, and only three had a threshold of 35dB or more, but less than 50dB bilaterally. In 18 of the 31, and two of the three with threshold of 35dB or more but less than 50dB bilaterally, noise injury was thought unlikely to be the cause of the hearing deficit. It was concluded by the Defence consultant adviser that the proposed study would not be feasible, and to date no such study has been carried out.

It has long been observed that normal pure tone audiometry may be associated with complaint of hearing difficulty for speech in noise, tinnitus, and hyperacusis. These symptoms have generally been assumed to be due, not to cochlear damage, but to central auditory injury at the level of the brain stem or the cerebral cortex. More recently, cochlear synaptopathy (described in this report) has been proposed as the underlying deficit and is the subject of a proposed new military noise induced hearing loss assessment method. Despite recent published research, mainly in small rodents, findings are inconsistent, and experts in the field consider that evidence of noise induced cochlear synaptic damage in humans is not established. Given its prominence in recent medico-legal proceedings, IMEG will continue to monitor further emerging evidence.

This report also covers the evidence on the non-auditory effects of hearing loss, including cardiovascular disease, balance effects, accidents at work, sleep and cognitive performance in children and young people; and with hearing loss in the middle-aged, increasingly recognised as a risk factor for dementia in older age.

Clinical management of established noise induced hearing loss is currently symptomatic, with digital hearing aids now widely available. Other new suggested approaches to treatment (stem cell therapy, gene therapy and pharmacotherapy) remain in the research domain. It has been suggested that supply of digital hearing aids suitable for young people should be a responsibility of AFCS. We have carefully considered and discussed this, but reject it as an AFCS responsibility, with reasons.

While serving, healthcare for service personnel is the responsibility of DMS, but from service termination, Defence has no further clinical role in delivering or planning healthcare for individual veterans. At NHS introduction in 1948, the principle was established that veterans should access all medical care required via the NHS. From 1951 this provision has included, for disorders due to service, priority access to secondary care, with decisions made by the treating clinicians (not MOD). With the end of National Service in 1963 and since, there has been a widening culture gap between those who serve and the wider general community, including health professionals. One measure to address this has been the establishment of the Armed Forces Covenant, providing culturally aware NHS healthcare and related support for veterans. IMEG firmly recommends this model, as best able to deliver safe, coherent evidence based best practice care.

Finally, IMEG emphasises and endorses the critical role of hearing loss prevention and oto-protection in the Armed Forces; the need for awareness-raising and education; and individual responsibility and compliance.

Sea King Helicopter Exhaust Emissions and Rare Cancers

Following reports of a possible causal association between Sea King helicopter exhaust emissions and the development of rare cancers, IMEG has undertaken a review of published evidence, and has been given access to a report from the Institute of Naval Medicine (INM) dated September 2022, but not yet published in the public domain. Our current review builds on the findings of the Institute of Naval Medicine report. The cancers in question are multiple myeloma and the very rare leiomyosarcoma. In relation to multiple myeloma published evidence is sparse and relates mainly to benzene exposure as a component of gas turbine exhaust emissions, and is based on civilian industrial occupational benzene exposure, rather than to exposure in military personnel. We have considered the evidence by applying the Bradford Hill considerations for causality, adopted by the

World Health Organisation International Agency for research on Cancer (WHO IARC). For multiple myeloma, there are methodological inconsistencies in the published research, including exposure dose, changing definitions of multiple myeloma, incidence and mortality data. Taken together with the fact that diesel and exhaust fumes are ubiquitous in the environment, we conclude that existing data do not meet the Bradford Hill considerations or WHO IARC criteria for causation. In relation to leiomyosarcoma, we are not aware of any published evidence linking this very rare tumour to benzene or other chemical exposure.

This report should have included updates, since the 2022 IMEG Sixth report, on claims and awards made for Covid-19 related disorders, level 4 mental health disorders, and an audit of spanning cases. Regretfully, this has not been possible. Reference has been made to recent progress on Defence Statistical data quality, but there remain some ongoing limitations. Since AFCS approach to claims and award categories is generic, not diagnosis based, the Covid-19 exercise is not routine but requires specific tasking. In relation to Covid-19, preliminary, but incomplete data, indicate that of some 50 awards made between 1 January 2020 and 31 March 2023, the great majority were made on the likelihood of substantial recovery within 26 weeks. However, these data do not include claims made since 31 March 2023, and so are not as contemporaneous as we would like. I propose that Covid-19 should be considered for prioritisation as part of IMEG's forward work programme. The data limitations also emphasise the importance of digitisation of all data relating to AFCS, which IMEG fully supports.

All IMEG members took part in the discussions and agreed the findings and recommendations of this Seventh Report, which I firmly believe fairly reflect the contemporary evidence and scheme intentions.

Since publication of the last IMEG report in July 2022, there have been several changes to the membership of IMEG. Those leaving, with date of leaving, include:

Professor Peter White, Emeritus Professor of Psychiatry, Queen Mary University of London and St Bartholomew's Hospital (expert member; August 2022).

Professor Paul Cullinan, Professor of Occupational and Environmental Lung disease, Imperial College London, and Royal Brompton and Harefield NHS Trust (expert member; September 2022).

Dr Anne Braidwood, Chief of Defence People Medical Adviser (expert member; June 2024).

Mr JJ Chalmers (injured person who has claimed under AFCS; January 2024).

Brigadier Duncan Wilson, Medical Director to the Surgeon General (observer; April 2024).

Those joining, with date of appointment, include:

Mr Tim Wilton, Emeritus Consultant Orthopaedic Surgeon, University Hospitals of Derby and Burton NHS Foundation Trust (December 2022).

Dr Clare Leris, Defence People Medical Adviser (June 2024).

Surgeon Commodore Jason Smith, Medical Director to the Surgeon General (June 2024).

It is with sadness that I record the death of Professor Linda Luxon, Emeritus Professor of Audiovestibular Medicine at University College London and the National Hospital for Neurology and Neurosurgery. Linda was a founder member of IMEG in 2012, and her contributions to the work of IMEG until demitting office in mid-2022 were authoritative, wise and greatly valued.

This letter would be incomplete without special mention of Dr Anne Braidwood, Chief of Defence People Medical Adviser and expert member of IMEG, who retired in June this year, and who has contributed very substantially to the content of this Seventh IMEG report. Anne's role in the conception and creation of AFCS and its transition from the War Pensions Scheme, in 2005, creating a fairer no-fault scheme, with more timely resolution of claims, laid the foundations of AFCS. Her wisdom, guidance and contributions to IMEG since its creation in 2012 are immeasurable. She has the gratitude of all past and present members of IMEG, and I am personally greatly indebted to her.

As always, I am grateful for the work of the Secretariat, who continue to provide essential expertise, guidance and support.

Yours sincerely,

Dr John W Scadding
Chair, IMEG

Independent Medical Expert Group (IMEG) – List of Members

Chair

Dr John Scadding OBE, MD, FRCP, Emeritus Consultant Neurologist, National Hospital for Neurology and Neurosurgery, London.

Expert Members

Dr Louisa Murdin, MSc, PhD, FRCP, Consultant in Audiovestibular Medicine within the Ear, Nose and Throat Service at Guy's and St Thomas' NHS Foundation Trust, London.

Dr Norman Poole, MD, FRCPsych, Consultant Neuropsychiatrist and Honorary Senior Lecturer, Department of Neuropsychiatry, St George's Hospital, London.

Dr Ali Hashtroudi, Msc, FFOM, LLM, Clinical director of Occupational Health and Safety at Guy's and St Thomas' NHS Foundation Trust, and Head of the National School of Occupational Health Education England; and latterly, Consultant Occupational Physician, Optima Health.

Mr Tim Wilton, MA, FRCS, Emeritus Consultant Orthopaedic Surgeon, University Hospitals of Derby and Burton NHS Foundation Trust (from December 2022).

Professor Paul Cullinan, MD, FRCP, FFOM, Professor of Occupational and Environmental Lung Disease, Imperial College, London, and Honorary Consultant Respiratory Physician, Royal Brompton and Harefield NHS Trust, London (until September 2022).

Professor Neil Pearce, PhD, DSc, FFPH, FMedSci, FRSNZ, Professor of Epidemiology and Biostatistics, London School of Hygiene and Tropical Medicine, London (from April 2024).

Dr Anne Braidwood, CBE, MRCP, MRCGP, FFOM, Chief of Defence People Medical Adviser (until June 2024).

Dr Clare Leris, MBBS, FRCS, Defence People Medical Adviser (from June 2024).

Lay Members

Mr Nick Bunting, OBE, Secretary General of RAFA, as the Ex-Services Charities Organisation member.

Mr John-James Chalmers, an injured person who has claimed under AFCS (until December 2023).

A service representative who sits on the CAC (Central Advisory Committee for Compensation).

Secretariat

Armed Forces People Support Policy Team.

Observer

Brigadier Duncan Wilson, KHP, MD, FRCP, Medical Director to the Surgeon General (until June 2024).

Surgeon Commodore Jason Smith, KHP, MD, FRCP, FRCEM, Medical Director to the Surgeon General (from June 2024).

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Topic 1 - Military and Civilian Employability and the Armed Forces Compensation Scheme

Summary and Key Points

1. This topic report emphasises the importance of maximising military and civilian employability, and the role of occupational health in achieving this. In the UK, military service is voluntary. Enlistment in the Armed Forces goes beyond trade and professional training as in civilian work and should be regarded as a lifestyle. The Equality Act 2010 does not apply strictly to the Armed Forces but its equality and anti-discrimination principles, including on disability, have been followed across Defence and by the three services for many years. Informed by medical advice, where service personnel are ill or injured, a key aim of treatment and rehabilitation, where possible, is restoration of function and retention in service in his or her own job, or another suitable posting or service.

2. We discuss the changing operational roles in the Armed Forces, the increasing numbers of female serving personnel, and the target of 30% by 2030. This requires special consideration, new approaches to physical training, treatment, rehabilitation and occupational assessment, both military and post-service.

3. The importance of physical and mental fitness and, as necessary, conditioning at service entry, awareness and education, an organisational ethos of protection and prevention and, where problems arise, early detection and timely access to assessment, treatment and rehabilitation, is recognised and endorsed.

4. IMEG agrees the importance of full medical assessment at service entry, and periodically during service, according to Defence Joint Service Publication (JSP) 950 – PULHHEEMS, and the Medical Employability Standard.

5. Attention is drawn to the changing nature of the Defence Healthcare caseload, and the implications for rehabilitation and assessment of employability. The most common conditions presenting in service include traumatic physical injury, often training or sports-related, as well as overuse musculoskeletal injury, hearing loss, mental health symptoms and disorders and non-specific low back pain. Psychotic disorders are very rare in service, and prevalence of common mental symptoms and disorders, anxiety and depressive disorders are broadly as in the matched civilian community. The recent hyperkinetic conflicts and increasingly survivable severe conflict-related physical injuries, carry high risk of secondary mental health symptoms and discrete diagnoses. Increasing rates of in-service presentation of psychological symptoms and mental health disorders and AFCS claims and awards have also followed the many recent general community and military specific stress awareness and anti-stigma campaigns.

6. The establishment of recent initiatives in Defence Recovery Capability and the involvement of Services charities in providing a multi-faceted approach is fully supported.

7. Concerns raised by claimants are examined, with review of AFCS descriptors and tariff award values.

Introduction

8. The role of IMEG is to provide evidence-based advice to MinVP on the medical and scientific aspects of the AFCS and related topics. AFCS is an important element of the nation's commitment to those who serve, and part of service personnel terms and conditions. Its perspective and provisions should be coherent with Defence priorities which presently include:

a. the need to optimise and maintain operational deployability, with maximal numbers of service personnel fit to fight;

b. effective recruitment and retention at a time when the culture gap between military and civilian life, particularly amongst young people, is wide;

c. for **all** service leavers including those medically discharged, successful transition to fulfilling civilian life including where possible appropriate paid work. For those with long-term severe impairment and functional disability, appropriate through-life support;

d. the goal of increased workforce inclusivity and diversity, with a higher proportion of women and people of different ethnicities. By 2030 the government aim is 30% of Defence whole force (uniformed and civilian) being female.

9. In the UK since 1963 and the end of National service, military service is voluntary. There are innate differences between military service and most civilian employments. Enlistment in the Armed Forces goes beyond trade and professional training as in civilian work and can be regarded as a lifestyle. The Equality Act 2010 does not apply strictly to the Armed Forces, but its equality and anti-discrimination principles, including application to people with disabling and chronic disorders, have been followed across Defence and by the three services for many years. Informed by medical advice, decisions on medical discharge from service include discussion with the service person and are made by the chain of command. The aim, where possible, is retention in service in his or her own job, or another suitable posting or different single service.

10. The context of IMEG's advice to ministers is AFCS, and the focus of this review is the relevance of occupational health to the scheme. The impact on military and civilian employability of service-related injury and disorder has not previously been considered by IMEG in detail. It is a central concept and principle of AFCS, given the young, selected population and increasing understanding of the role of paid work in an individual's life, sense of well-being, self-esteem and contribution to family and community. While many regular military personnel serve for more than 30 years, the average service duration to normal discharge for other ranks is presently about 10 years and for officers, 15 years, with most of those who serve going on to successful post-service civilian careers. Because of the higher physical and mental standards required for military service, many personnel who are medically discharged are not functionally compromised for suitable civilian work, and since the start of AFCS only 7-10% of final awards have included a reduced earnings allowance, termed in the scheme the GIP.

11. AFCS awards are made where the claimed condition can be accepted on balance of probabilities as predominantly due to service on, or after scheme introduction, 6 April 2005. Awards do not depend on diagnosis but on the functional limitation and restriction caused by the accepted condition, treated to optimal functional state. Awards comprise a lump sum with, for more serious disorders, an additional GIP or reduced earnings allowance, which is paid from service termination for life or, for claims made after service, from date of claim. As a no- fault scheme, with an aim of consistent and equitable awards within claim categories (Tariff tables) and across the range of claimed conditions, award levels are assessed by comparison of the injured person with a normal healthy person of the same age and sex without injury or illness. The lump sum reflects the nature of the accepted condition, its treatment, duration and expected pain and suffering; and the GIP, the expected functional compromise, for suitable paid post service civilian work, taking into account physical, psychological, social and occupational function.

12. The global increasing proportion of older people and lowered birth rates are leading to shortage of civilian workers, a position likely to become the norm. To address this, advances in robotics, cyber and artificial Intelligence, are now well under way. Sustainable quality civilian work is

likely to become less about trade skills than cognitive capabilities, the softer innate capacities, curiosity, emotional and social intelligence, problem solving, resilience, teamwork, management and leadership, adaptive and critical thinking. These lie at the heart of service in the Armed Forces, applicable to all services, ranks, trades and professions and contexts. When developed, effective multidisciplinary teams become a reality, with different team sizes, members, and roles, to fit task objectives. Service personnel are well-placed to continue their contribution to society through civilian work, at the same time supporting team effort and enhancing personal wellbeing and self-will.

Defence Statistics Data: AFCS Awards 6 April 2005 to 31 March 2023

13. Digitisation is proceeding, but to date, AFCS statistical data remain paper based. While 2022/23 claims rate and clearance times are returning to Covid pre-pandemic levels, the data presented in the Seventh Report must be considered provisional and a minimum. Since introduction of AFCS in 2005 a total of 117,145 claims have been registered, including 8,306 in 2022/23, with more than 113,000 cleared. Fifty-three per cent of claims have been accepted and lump sum paid, less than 10% with an additional GIP; 12% have been accepted but deemed below compensation threshold and no award paid; and 30% have been rejected. Total cost in 2022/23 to date is £1,261 million with £763.6 million paid in lump sums, £383.3 million as GIP, and the remainder for survivor.

14. Over the period April 2005-31 March 2023, the most common category of AFCS claims has been Musculoskeletal disorders, accounting for 46% of total claims, with the related traumatic physical injuries, Table 8, Fractures and Dislocations, 24%, and Table 2, Injury, Wounds and Scarring, 15%. mental health disorders now make up 7% of total claims. It is often asserted, as discussed in the sixth IMEG report, 2022, (1), that mental health claims are treated unfairly compared with physical conditions, with higher threshold for causal link to service to be accepted and inequitable award outcomes. Musculoskeletal disorders make up 13% of AFCS GIP, Fractures and Dislocations 17%, and Injury Wounds and Scarring 15%. mental health disorders make up 26% of total GIP awards. Of 6,130 mental health awards, 1,660 were paid a lump sum and additional GIP; of these 210 were for PTSD, while 4,470 mental health awards were lump sum only, of which 2,750 were for PTSD. As the scheme approached steady state in 2011/12 and since then, there have been typically 130-140 final lump sum awards annually, with 20-25 final awards including a GIP (2).

Defence Statistics: Tri-service Medical Discharges

15. Again, medical discharge data are provisional and do not necessarily completely accurately reflect prevalence of disorders. They are affected by changes due to the Covid-19 pandemic and lockdown in-service activities, including medical services, differences in single service retention policy, and medical boarding procedures. Over the period 2018-23, about 1,500 personnel were medically discharged annually, with the most common causes across the single services being musculoskeletal disorders, including chronic overuse and sporting injuries, and mental health and behavioural disorders. Of total medical discharges from the RN and Royal Marines (RM), 46% were due to musculoskeletal disorders, for the Army, 37%, and RAF, 26%. It is also of note that in recent years about half of those medically discharged have more than one functionally limiting condition.

16. In 2022/23 those discharged medically were more likely to be women, other ranks, RM rather than RN personnel, and over the single services of different average age. For RN and RM, this was 30-39 years, for the Army 20-24 years, and for the RAF over 50 years. Compared with many civilian occupations, the nature of military service and access to weapons leads to a lower threshold for medical discharge due to mental health and behavioural disorders. Discharge with mental health and behavioural disorders accounted for 29% of the total for RN and RM, for the Army 39%, and for the RAF 49%, with the most common diagnoses for all three services being mood disorder, neurotic stress-related and somatoform disorder, adjustment disorder and PTSD (3).

Military Employability

17. Armed Forces across the world are presently involved in high conventional military activity at home and overseas. The future is likely to be less reliant on boots on the ground and physical prowess, with increasing emphasis on advances in technology, non-manual technical skills, remote operation cyber and artificial intelligence, and in personnel terms, a focus on diversity and inclusivity, particularly more women in service. These developments and associated in-service revised protection and injury prevention priorities have the potential to significantly impact required functional capacity for enlistment and retention in service, fitness training and employability standards, as well as reducing risk of service-related physical injury and disorder.

Defence Health and Well-Being Strategy 2022 -2027

18. Defence Health and Well-Being is a shared leadership and individual service person responsibility, where all service personnel are supported to lead healthy lives in healthy environments. In turn, these promote good, and prevent and detect, poor health and wellbeing, allowing early detection and treatment, with optimal recovery (4).

Promote Good Health

Effective communication is key for a culture which promotes a healthy lifestyle and a safe, respectful work environment where people make healthy lifestyle choices and live healthier more productive lives.

Prevent

Not all injury and illness can be prevented, but contributory lifestyle and environmental risk factors can be minimised by people and leaders utilising and understanding health and injury data and working together. Awareness raising and training are critical providing the tools and knowledge to manage risk and take mitigating action.

Detect

Detection of the early signs and symptoms of poor health and well-being allows early intervention. Education, training, and screening equips people to recognise in themselves or others when health and wellbeing, physical and increasingly mental, may be compromised.

Treat

In some cases, this includes timely medical diagnosis and intervention but in a predominantly young, selected population, first-line effective self-help measures, colleague and welfare support are also important.

Recovery

Recovery support is non-clinical mandatory activity complementing effective medical treatments and return to employability and productivity. It involves partnerships between the individual service person, the chain of command and the occupational health services available. The first goal is successful return to own work. If that is not possible, the goal becomes alternative suitable service employment options. If medical discharge is necessary, support will be for suitable civilian work and maintained contribution to wider society and self-esteem.

Defence Healthcare

19. The nature of fitness, adventure training and combat puts service personnel at risk of traumatic and overuse physical injury and traumatic psychological injury. In terms of mental health, psychotic disorders are very rare in service, and prevalence of common mental symptoms and disorders, anxiety and depressive disorders parallel those in the broader matched civilian community. Men, in general, and service personnel may be reluctant and delay seeking help especially for mental health problems. For some military personnel, additional factors leading to delayed presentation include mistrust of medical confidentiality and a perception that seeking help could have a negative impact on career prospects. The recent hyperkinetic conflicts and increasingly, survivable severe physical injuries, long recognised as carrying high risk of secondary mental health diagnosis, as well as the community-wide and military specific stress awareness and anti-stigma campaigns, have been accompanied by increasing rates of in-service presentation of mental health disorders and AFCS claims and appeals.

20. The most common injuries and disorders presenting in service include accidental traumatic physical injury, at this date often training or sports-related; overuse musculoskeletal injury; hearing loss; mental health symptoms and disorders; and non-specific low back pain. The core role of DMS is delivery of healthcare through Defence Primary Health Care, and as in wider UK NHS practice, using a holistic multi-professional team approach. Practices in the UK Firm Base are mainly for regular service personnel, with some family practices. Other than when mobilised, healthcare for reservists is by the NHS.

21. Defence Primary Health Care management of injured and ill personnel aims first to preserve life, relieve pain and suffering, maximise operational capability and retain people in service. In addition to a team of specialist occupational physicians led by a Defence consultant adviser, all

military general practitioners undertake training in occupational medicine with application of its principles central to maximising operational capability.

22. From the 1950s and the first phase of closure of military hospitals and absorption into the NHS, secondary medical care for serving personnel has increasingly been and is now mainly through the NHS. An exception is mental health, where cultural affinity and shared experience are often important in encouraging service personnel to engage and commit to assessment and treatment. Out-patient services, team-based and led by military consultant psychiatrists and clinical psychologists, are provided by Defence Community Mental Health Centres across the UK. For other specialties, DMS continues to include uniformed medical consultants in relevant clinical specialties, including trauma, orthopaedics, neurology, sports and exercise medicine, otolaryngology, and rehabilitation, with many based in NHS hospitals, working closely with civilian colleague health professionals. This model works well and is helpful in maintaining cultural affinity in today's civilian world, where, since the end of National Service in the 1960s, many NHS doctors have no personal or family connection with military life, its culture, ethos, and challenges (5).

23. For the most common minor or moderate musculoskeletal and traumatic injuries, the approach is multidisciplinary active case management based in primary care, with early assessment, diagnosis and specialist referral as required. Following any appropriate acute treatment interventions, the mainstay is functional exercise-based rehabilitation aiming at return to full fitness and military role as early as possible. To expedite early return to duty for minor or recurrent conditions, primary care, complex or protracted, treatment is followed by vocational rehabilitation with specialist advice and normally a graduated Return to Work programme. Specialist Multidisciplinary Injury Assessment Clinics are located in Regional Rehabilitation Units and at the consultant-led DMRC, Stanford Hall. Primary care rehabilitation is out-patient based while Regional Rehabilitation Units and the DMRC offer in-patient courses. As well as multidisciplinary specialists in musculoskeletal and orthopaedic injuries, lower limb, spine and upper body quadrant, the DMRC has expert rehabilitation groups for mild traumatic brain injury, pain and biopsychosocial problems, Defence rheumatology, and musculoskeletal imaging. Over the last ten to twenty years prevalence of often very disabling chronic non-specific pain, other medically unexplained symptoms, and so-called functional disorders, where the course and outcome of the health problem has a personal or psychological dimension, expressed in a social or occupational context, have, as in the wider general community, much increased (6)(7)(8)(9).

Military Medical Downgrading and Medical Discharge

24. Advice to the executive on the medical fitness of an individual is provided through the Joint Medical Employment Standard. This informs the executive (chain of command) decision on retention of the service person where functional capacity allows, or where their treated medical fitness leads to medical employability standard downgrading and precludes future military employment, medical discharge. Each case is considered on its merits. Medical and Employment Boards are held as early as possible to determine an individual's likely recovery outcome. This informs a time frame to plan an Individualised Recovery Plan covering overall welfare needs and discharge date.

Defence Recovery Capability Holistic Transition and Resettlement

25**.** Complementary to medical rehabilitation, the Defence Recovery Capability, led by the chain of command, provides a military environment and culture where participation in activities is mandatory, not optional, and has duty status. The Defence Recovery Capability addresses non-medical issues supporting return to duty, or preparation for life in the civilian community after medical discharge. Support may be from the parent unit but for more complex cases, Recovery Pathways and the Royal British Legion Battle Back Centre, where multi-activity courses provide a learning environment supporting success at the personal, interpersonal, and organisational levels, increasing self-confidence, motivation, dealing with stress and having a positive mental attitude focused on what the person **can** do, not on what he or she, **cannot** do.

26. A Personal Recovery Officer and Individual Recovery Plans take an interdisciplinary approach and include medical, welfare, housing, education, re-skilling, Return to Work Programmes, work placements and employment opportunities, and including for service leavers, career transition workshops. MOD and other government departments work together to support Defence Recovery, including DBS and the Veterans Welfare Service. These bodies work closely with the ex-Service charities, statutory and non-statutory bodies, and local community service providers to promote independence, but as required, will provide through-life support (10).

27. The mnemonic **HARDFACTS** lists factors addressed in the process covering all areas of an individual's life.

Health. The patient care pathway is managed by the unit medical staff. In complex cases, the Regional Occupational Health Team may take the lead. Patients undertake recovery duty, which may include work in a military environment overseen by clinical and occupational health staff to inform medical rehabilitation and functional capacity for work.

Accommodation and Relocation. This aims to provide a safe and appropriate environment, taking account of health, training, education, employment, and family needs. The Joint Service Housing Advice Office is the first point of contact and the Haig Housing Trust, the Confederation of Service Charities (COBSEO) designated lead service housing charity.

Drugs and Alcohol. Problems in these areas may cause concerns about employability, status, financial and family stability, adversely impacting the Recovery plans. Early engagement with subject matter experts is essential.

Finance and Benefits. Financially independent, aware, and able to support self and dependants. All service personnel receive an automatic forecast of any ill-health pension benefits they are entitled to, normally no later that 6 weeks prior to their date of discharge.

Attitude, Thinking and Behaviour (Welfare). Personnel on the Recovery path should be self-reliant, with a positive mental attitude and engagement with appropriate welfare connections.

Children and Family. The needs of the family and any children should be fully considered and appropriately supported.

Training, Education and Employment. In employment, or full-time education.

Supporting Agencies. These include statutory, non-statutory and third sector organisations.

Resettlement

28. For those unable to meet the exacting standards for retention in the Armed Forces, Resettlement, lasting from two years prior to service termination date to two years after that date, prepares service leavers to gain paid civilian employment post-discharge. Available to **all** service leavers, with provision dependent on length of service, resettlement courses are provided for all medical dischargees regardless of service duration. Resettlement services are delivered by the Career Transition Partnership, MOD, plus the contracted-out service partner, and include advice, guidance on available support, CV writing, job finding and training courses. Where civilian employment is not appropriate for medically discharged personnel, Resettlement training may be transferred to spouse, civil or eligible partner (11).

Fitness for Military Work

Conditions Precluding Military Service Entry

29. There are few disorders considered, as a matter of course, incompatible with service entry. More commonly, assessment and medical advice will be case-specific, considering the patient's function in the context of job requirements, with recommendations made by consultants in the relevant specialty, and occupational medicine. Disorders likely to be approached this way include presence or childhood history of asthma, inhaler use, mental health disorder or self-harming behaviour, migraine, skin conditions (atopic eczema, contact dermatitis, psoriasis) and traumatic physical injury or overuse musculoskeletal disorder, and non-specific lower limb or low back pain. Entry assessment also includes enquiry on allergies, alcohol, tobacco and substance use and family history.

30. Tables 3 and 4 of the AFCS Tariff cover Mental and Physical Disorders including illnesses and infectious diseases, with descriptors based on generic terms, underlining the key consideration for AFCS compensation and employability. Both in the Armed Forces and civilian work this is less the specific diagnosis as its functional effects and their likely duration in the individual claimant, relative to the job requirements and work environment. Fitness for work implies fit to undertake its duties and tasks effectively and without risk of harm to own or others' health and safety. Fitness assessments take place at enlistment, on transfer to a new post, and on return to work after illness or injury. There are also periodic reviews at certain age points or for surveillance of high-risk disorders such as noise induced hearing loss (12).

Key Points from Joint Service Publication 950 (JSP 950), Joint Service Manual of Military Fitness Standards

31. The PULHHEEMS profile is a tool for standardising medical functional assessment and the Medical Employability Standards used by to ensure that service personnel are employed appropriately. The profile is based on a series of qualities:

P Physical Capacity

U Upper Limbs

L Locomotion

HH Hearing Acuity (right and left)

EE Visual Acuity (right and left, uncorrected and corrected)

M Mental Capacity

S Stability (Emotional)

The factors considered when assessing these qualities:

P – Physical capacity. A service person's overall physical and mental development, functional capacity, potential for physical training and suitability for employment worldwide. The P value reflects the 'U', 'L', 'HH', 'EE' 'M' and 'S' gradings, taking account of deployability and the duties of the relevant employment group.

U – Upper limbs. The functionality of the hands, arms, shoulder girdle and cervical and thoracic spine.

L – Locomotion. The functional efficiency of the locomotor system, lumbar spine, pelvis, hips, legs, knees, ankles and feet, gait and mobility.

HH – Hearing. Based on auditory acuity only.

EE – Visual acuity. Visual acuity only.

M – Mental capacity. Mental capacity is not formally assessed at recruitment but based on interview at recruit selection and the person's academic record. Changes to M value only due to in-service neurological disease or head injury.

S – Stability (emotional). Emotional stability, ability to withstand the psychological stress of military life (especially operations). Amendments most usually in psychiatric illness.

Each quality is graded numerically 0-8 although the full range does not apply to all qualities. eg HH options are 1,2,3,4 and 8: and M and S options are 2,3,7 and 8.

0 Medically unfit for duty and under medical care (P quality only)

2 Medically fit for unrestricted service worldwide

3 Medically fit for duty with minor employment limitations

4 Medically fit for duty within the limitations of pregnancy

7 Medically fit for duty with major employment limitations

8 Medically unfit for service

32. On entry, individuals are awarded a permanent PULHHEEMS profile. Subsequent regrading can occur after a medical board. Where a condition is expected to resolve, the letter R (signifying remediable) may be inserted after the P or other quality, for example P3R L3 or P3R L3R.Gradings may be temporary for a maximum period of 18 months. If not resolved at that point the grade is revised to Permanent. Pregnant serving women who are fit for duty are graded P4. PULHHEEMS assessment takes place at entry and discharge, and at intervals during service, five-yearly from age 30 and every two years if over 50, on return from illness or injury, at change of post or job and at service discharge.

Military Medical Employability Standards

33. The Joint Medical Employability Standard is assigned by medical staff and informs commander decisions on the deployability and employability of service personnel. The Joint Medical Employability Standard is an alphanumeric code reflecting an individual's fitness to be employed in the Air(A), Land (L) and Maritime (M) environments along with any additional specific Environment and Medical Support (E) considerations eg A4 L3 M4 E3. Medical Limitations (MedLims) are applied as relevant, eg Unfit to work in confined spaces.

Military Medical Deployment Standards

34. There are three categories:

1. MFD: Medically Fully Deployable. Fit to deploy to all parts of the world without any limitations or requirements for routine medical support beyond deployed Primary Healthcare.

2. MLD: Medically Limited Deployability. Deployment limited due to:

a. A medical condition.

b. Medical treatment /support needs.

c. Risk due to exposure to specific climates eg heat or cold.

d. The need to avoid specific exposures eg noise or chemicals.

A grade of Medically Limited Deployability requires a medical risk assessment before any deployment, with the outcome dependent on the medical support required, the proposed employment, its length, location, and medical support available. Medically Limited Deployability personnel may vary from those with minimal limitations in terms of role or situations to others whose position is much more limited.

3. MND: Medically Not Deployable. Not deployable outside the United Kingdom. Personnel in this category may be under the care of a medical facility or awaiting medical discharge.

Civilian Occupational Health

35. The role of occupational health in the civilian world is very similar to that in the military context. Medical fitness to undertake most civilian job roles (including vocational training) is assessed based on several general factors discussed below. Such assessment also informs temporary or permanent job modifications to facilitate acquiring a new job or retention / return to own work for an existing employee, if the individual has a medical problem causing functional impairment. The role risk profile in some occupational sectors, such as emergency services and safety critical occupations, is close in nature to the requirements for military roles, with less flexibility in medical fitness standards and opportunity for reasonable adjustments. The fitness assessment for these roles takes account of factors pertinent to the majority of jobs, with outcome based on rules or national guidance to ensure safe working with consistency and fairness.

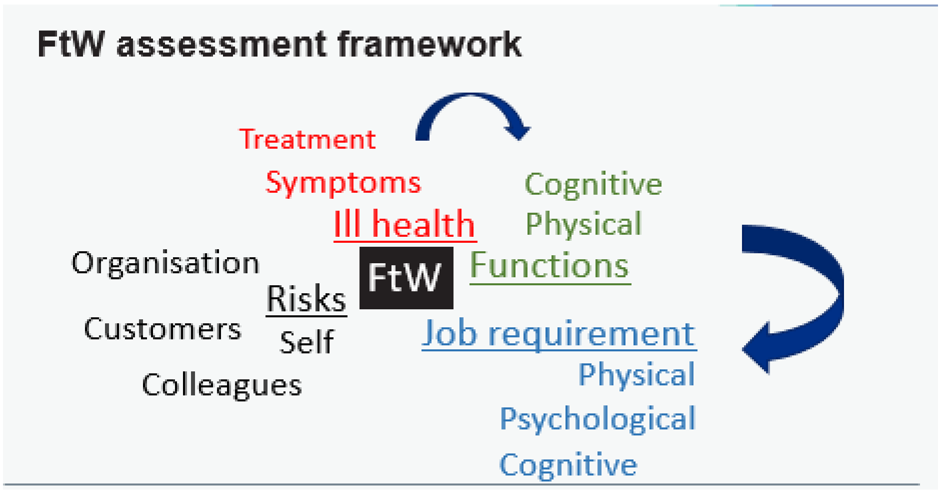
36. For the majority of jobs that are not classed as safety critical, the medical fitness and subsequently the adjustments are assessed individually and based on the following factors:

a. Health related factors including symptoms, diagnosis(es), prognosis(es) both in terms of likelihood of response to treatment and longevity, and availability, effectiveness and side effects of treatment(s).

b. Functional capability / capacity including physical, psychological and cognitive ability and the impact of health factors and non-health related factors, personal, psychological and social.

c. Job requirements including what physical, psychological and cognitive functional abilities are required for the specific role.

37. These three factors are brought together in a risk assessment model to ascertain whether the individual is medically fit to safely, effectively and regularly discharge the duties of the job with or without adjustments (Fit for Work – FtW). It is important to reiterate that the risk is a wide concept encompassing the risk to the individual, the service users / clients, the employer (including but not exclusively, reputation, legal, commercial risks), and to the general public.



The Equality Act 2010

38. The Equality Act 2010 applies ubiquitously to all non-military occupations, including the blue-light emergency services and safety critical roles. Therefore, it is unlawful to discriminate against a disabled person or to fail to implement reasonable adjustments. The Act puts the onus on the employer to identify reasonable adjustment(s) or demonstrate that actions such as not offering an interview, rescinding a job offer or dismissal are a proportionate measure to achieve a legitimate aim, and that there were no potential reasonable adjustments.

AFCS Employability Related Questions from Claimants, DBS Decision-Makers and Medical Advisers

39. What factors should be taken into account in assessment of functional capacity of physical disorders, i.e. illnesses and infectious diseases and mental health disorders leading to medical discharge?

The following matters should be considered:

a. Assessment of functional capability. The PULHHEEMS profile provides a tool that is reasonably successful for the assessment of physical capacity, but not necessarily for psychological and cognitive assessment. It is worth noting that this is not unique to PULHHEEMS, and psychological and cognitive assessment in the context of occupational health is challenging. The typical neuropsychological tools are not designed for this purpose, or are expensive and resource-intensive to utilise, and are not widely available. As in AFCS compensation decisions, fairness, equity and consistency are important in medical employability grading and potential discharge from service, and supported by standard protocols such as PULHHEEMS, even where there are, as here, limitations in utility.

b. DBS decision-makers and medical advisers' skills. Diagnosis of medical disorders is principally based on description and causation, but a key role of DBS medical advisers in relation to AFCS is to make a functional assessment, in order to inform a robust decision about fitness to work. A holistic approach is required, rather than one based on diagnostic labels.

c. The difference between military requirement and availability of adjustments for civilian employment. Whilst a person may not be medically fit for military service or certain safety critical civilian roles, a thorough functional assessment should be able to identify suitable civilian employments, with or without adjustments.

d. Availability and impact of treatment. Several treatment-related factors can influence the decision:

i. The time to access or administer treatment or realise the benefit may be very long (e.g. psychotherapy) or there may be adverse effects. These may be incompatible with retention in military service. However, it might result in improvement of the symptoms and functional capability sufficient to make a civilian job feasible in the short or long term.

ii. If the military environment is a significant perpetuating factor (e.g. for PTSD), removal from the environment can have a significant positive impact on symptoms and functional capability, enabling the person to obtain a civilian job in the short or long term.

iii. Prognosis can sometimes be difficult to predict owing to variable inconsistent outcomes and lack of robust medical evidence on predictors, for example in symptomatic disabling disorders such as non-specific low back pain, chronic fatigue syndrome, and Fibromyalgia, where no objectively verifiable underlying pathology can be identified.

Diversity and Inclusivity

40. IMEG regards issues of equality and diversity as core values and aims to avoid discrimination on equality grounds, whether age, disability, gender, gender reassignment, marriage and civil partnership, pregnancy, maternity, race, religion or belief and sexual orientation. While not a core topic for this report a current Defence priority is increased workforce inclusivity and diversity, including a government aim of 30% Defence whole force being female by 2030. During this review IMEG has noted the significant and proportionate actions being taken to deliver this aim safely, with preserved or enhanced physical and mental health and well-being.

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Topic 2 - UK Military Mental Health and AFCS no-fault compensation: an update

Summary and Key Points

1. We report on improved awareness of mental health disorders in Armed Forces personnel, insights from research, and changing approaches to treatment and rehabilitation.

2. PTSD, the most frequent mental health disorder claimed under AFCS, is reviewed, including numbers of claims, diagnosis, and treatment. From introduction of the diagnosis more than forty years ago, PTSD has been considered a treatable disorder. First line best practice interventions are psychological therapies with, in most guidelines, drug medication as a second line when there are

co-morbidities, typically depression or substance misuse/dependence. It is now clear that about a third of PTSD cases are treatment resistant to best practice interventions. Some new approaches to treatment are being trialled, but published study quality and current results are too inconclusive to provide the basis of revised guidelines. The AFCS approach to mental health disorders is reviewed.

3. Defence Statistics for AFCS claims and value of awards are presented and discussed. It should be noted that the Covid pandemic led to a reduction in claims and working from home delayed case processing. Claims made and decided are returning to 2018/19 levels, but data up to 31 March 2023, presented throughout this Seventh Report (2024) should be regarded as provisional. It is often asserted that mental health claims are treated unfairly compared with physical conditions, with higher threshold for causal link to service to be accepted and inequitable award outcomes. From April 2005 until 31 March 2023, musculoskeletal disorders, the most frequent claims and awards under AFCS, make up 13% of AFCS GIP, Fractures and dislocations 17%, and Injury, wounds and scarring 15%, while mental health disorders attract 26% GIP awards. Of the total 6,130 mental health awards, made from 2005 - 31 March 2023, 1,660 were paid a lump sum and additional GIP. Of these 210 were for PTSD; while of the overall 4,470 mental health awards, 2,750 were for PTSD and lump sum only.

4. Attention is drawn to the high rates of medical discharge due to mental health disorders. Over the period 2018-23 about 1,500 personnel were medically discharged annually, with the most common causes across the single services being Musculoskeletal disorders and mental health and behavioural disorders. Compared with many civilian occupations, the nature of military service, required deployments and need to access weapons, leads to a lower threshold for Armed Forces medical discharge for mental health and behavioural disorders. Of total medical discharges from the RN and RM, 46% were due to Musculoskeletal disorders, for the Army, 37% and RAF 26%; discharge with mental health and behavioural disorders accounted for 29% total for RN and RM, Army 39% and RAF 49%.

5. In response to the 2016/17 AFCS QQR, IMEG reviewed medical aspects of the scheme legislation, including parity of esteem between physical and mental disorders, interim awards and the role of consultants in the diagnosis of disorders, concluding in the Fourth IMEG Report (Dec 2017) (41), that “the logic and utility of consultant level diagnosis” was sound. An audit of AFCS decisions for mental health claims in the Sixth IMEG Report (July 2022) (42) found no evidence that mental health claims were assessed inappropriately, or without parity of esteem.

6. During preparation of this Seventh IMEG Report, the 2022/23 AFCS QQR was published and in March 2024, the government response. A number of the issues raised had also separately been brought to the attention of IMEG since the Sixth report, including again, interim awards, the requirement for consultant level diagnosis of claimed mental health disorders, and parity of esteem issues including scheme definitions, Tariff table descriptors, footnotes and award levels. We have revisited the issues. Increasingly, the UK approach to mental health disorder clinical management is by multidisciplinary teams with regular case review conferences overseen by a named consultant psychiatrist or psychologist. Where that is the case, IMEG recommends the consultant-only diagnosis requirement should no longer apply.

7. We report on the role of doctors in AFCS claim and appeal determination, including treating clinicians, DBS medical advisers and medico-legal clinical experts in mental health claims. These Issues were also raised in the 2022/23 QQR report.

Introduction - Context of This Update

8. AFCS is an important element of the Nation's commitment to those who serve and is part of service personnel terms and conditions. Its perspective and provisions should be coherent with UK Defence priorities, and shared with other allied nations, and presently include:

a. The need to optimise and maintain operational deployability, with maximal numbers of service personnel fit to fight.

b. Effective recruitment and retention at a time when the culture gap between military and civilian life, particularly amongst young people is wide.

c. For all service leavers at discharge, successful transition to fulfilling civilian life, including where possible appropriate paid work. For those medically discharged at a young age with severe long-term functional disability, appropriate through-life support including best practice accessible health care in the civilian community.

d. The goal of increased workforce inclusivity and diversity, with a higher proportion of women and people of different ethnicities. By 2030, government aim is 30% of Defence whole force being female.

Military Mental Health

9. Since the Great War, unusually in international civilian occupational, and military compensation schemes, awards for disablement and death due to service-attributable mental health disorders have been made under the UK no-fault military schemes. Claims rates were not high for most of the last century and many claims were rejected as not attributable to service, but rather deemed to be constitutional.

10. In 1980 and the aftermath of the Vietnam conflict, PTSD was introduced as a diagnosis into the American Psychiatric Association, Diagnostic and Statistical Manual, DSM III, and since then UK research, media, and parliamentary interest in mental health problems, civilian and military, has much increased. In the military context, good mental health supports and enhances physical health and operational effectiveness and led by the chain of command and DMS, is everyone's business and responsibility. UK mental health research, in the Armed Forces and veterans' context, including longitudinal studies is now firmly established, exploring functional and economic effects and impact on patients, family, friends, and colleagues. Regular in-service education campaigns raise awareness, encourage early recognition and acknowledgement of symptoms, and reduce the stigma of mental symptoms and illness and their management. While there is no evidence of a marked increase in service-related disabling mental symptoms and illness, in still-serving regulars with deployed service in a combat role, work at Kings Centre for Military Health Research (KCMHR) found PTSD prevalence increased from 6% in 2004-6 to 7% in 2009-10, remaining stable at that rate in 2014-16. This compares with a general population rate of PTSD, 4% in 2014-2016. As in the wider UK population harmful alcohol use has decreased over the years, but remains higher, at 15% than the comparator general community rate of 10%.

11. Understanding of mental health disorders, their mechanism and pathogenesis and best practice effective treatment interventions remain limited, no matter the context. This century's global challenges, growth of social media, and increasing incidence of mental health problems in young people world-wide, maintain the research and anti-stigma and awareness raising focus. Patient presentation for expert help and mental health compensation claims rates are similarly rising, including in the AFCS. UK medical services, both NHS and DMS, are increasingly predominantly community based, inter-disciplinary, and delivered by teams. There is pressure on mental health services and shortage of trauma trained culturally aware and experienced clinicians. Patient delay in accessing assessment and treatment occurs in the UK civilian context as well as for serving personnel and veterans.

12. As a selected volunteer population with pre-enlistment health screening, severe and enduring mental health disorders, such as schizophrenia, are rare in UK serving personnel. Common mental health symptom prevalence is more common than in the age and sex-matched general working community (1). PTSD is not the most common mental health diagnosis in surveys of service personnel and veterans, although it is the commonest in military no-fault AFCS compensation claims and awards (2)(3). Historically, alcohol has been used to encourage bonding and social cohesion in the Armed Forces internationally but, as in the wider UK community, recent years have seen military alcohol awareness campaigns and NICE recommended opportunistic screening for alcohol misuse. The WHO questionnaire, the alcohol harm assessment tool, Alcohol Use Disorders Identification Test for Consumption (AUDIT-C), was introduced across Defence as part of routine

dental inspections in June 2016, with the screening questions delivered to 110,000 regular personnel by trained dental centre staff with, where appropriate, brief advice (Alcohol Brief Intervention) and signposting to support services (4). Hazardous and heavy drinking levels have declined in regulars in recent years, although they remain higher in both male and female regular serving personnel than in reservists and the equivalent civilian population, with alcohol misuse often comorbid with other mental health diagnoses (5)(6). AFCS legislation precludes awards for substance misuse, including harmful use of alcohol and alcohol dependence.

13. Good physical and mental health and resilience are key in operational effectiveness. The Defence Health and Well-Being Strategy, 2022-2027, owned by the Chief of Defence People, supported by the Director General DMS, aims to promote good, and prevent, detect and treat poor health and wellbeing early, enabling optimal recovery. The Strategy covers physical and mental health including sections on operational and workplace stress, suicide prevention, addictions and healthy lifestyle using a holistic, multidisciplinary approach and setting out the complementary roles of the chain of command at all levels and clinical staff (7).

14. The Armed Forces, and men in general, have often been reluctant to seek expert help with mental health disorders taking the view that they can “deal” with the issue and that such action will prejudice their career progression. This almost certainly contributed to the common experience last century of veterans presenting to doctors, and war pension claims made, often years after symptoms became functionally disabling. Another factor was the common belief that with National Service ending in 1963, increasingly, civilian NHS clinicians had limited experience or understanding of the Armed Forces and its ethos, and so would be unable to help veterans with service-related illness (8)(9). Work with the King’s Fund, UK health departments and NHS, service charities, veterans and their representatives resulted in a new regionally based model of mental healthcare and social support for veterans, together with efforts across the UK to increase civilian clinical staffs’ cultural awareness of the Armed Forces, established regular dialogue and joint working between DMS and NHS, particularly for those medically discharged, at transition from the service to civilian community. The veterans’ services are team-based across GB, working collaboratively with local authorities, service charities, and other third sector organisations, and are members of joint NHS/Defence Boards, implementing best practice support and interventions for psychiatric disorders in Armed Forces personnel and veterans and their families, including where these have led to medical discharge at transition from the military to civilian life. Since in the UK, health is a devolved matter the models differ across the country, but retain shared principles, as for example, seen in the NHS England Integrated Veterans’ Service, Operation Courage (10).

15. Modern clinical management of all disorders and injuries, physical and mental, increasingly uses a holistic, team-based model. The patient's problems and history are first addressed, followed by investigation, a formal diagnosis and care plan delivering best practice assessment, treatment and rehabilitation. For most disorders and cases, an optimal steady state can be achieved in about two or three years. The aim is for the patient, with appropriate support as required, to be able to self-manage in the longer term. Possible exceptions to success with this model include polytrauma, complex chronic physical disorders, and some mental health disorders.

PTSD

16. From introduction of the diagnosis, over forty years ago, PTSD has been widely considered by experts to be a treatable disorder, if not to complete remission, then at least to improved function and reduced or manageable symptoms. Best practice treatment guidance from US, Australia, the International Society for Traumatic Stress Studies (ISTSS), and the UK National Institute for Health and Care Excellence (NICE) has been published for civilian and military communities (11)(12)(13)(14)(15). Most commonly, first line are psychological therapies such as trauma focused cognitive behavioural therapy (tf-CBT) or Eye Movement Desensitisation and Reprocessing (EMDR) therapy, with in some guidelines, but not all, drug medication as a second line/adjunct particularly when there are co-morbidities, typically depression or substance misuse/dependence (15). Previously, there was debate as to the order in which co-morbid disorders, usually in the UK military population, alcohol misuse or depression, should best be addressed. On the assumption that the PTSD came first with alcohol use disorder often developing following use of alcohol to self-medicate the trauma symptoms, alcohol use was often tackled first in the Armed Forces context (16). More recent work increasingly favours concurrent intervention (17)(18). There is also debate as to whether civilian and military PTSD are innately different one from the other, or whether differences such as delayed presentation, relate more to military stressor numbers and chronicity, for example, associated with multiple deployments at short intervals over a career, or fear that seeking help will adversely impact career progression.

17. Current recommended PTSD treatments were introduced thirty years ago. As common in all contexts, civilian and military, the quality of evidence in psychological disorder primary treatment evaluation studies is generally low. This may relate to challenges with study design (such as difficulty blinding participants to the intervention they receive), lack of, or unsuitable controls, often small number of study participants, and the cross-sectional nature of most studies, with short follow-up duration. The recommended average treatment course for PTSD to steady state in the various international guidelines varies, with, for example, NICE 2018 guidance referencing 12 sessions of psychotherapy as best practice (15). Because of the likely multiple stressors and chronicity, experienced military specialists suggest that, for steady state, up to 24 sessions or more might be required. These suggested durations assume a single therapist-patient relationship across the treatment course. More likely in current military and civilian practice is the involvement of multiple therapists, with the need for the patient to revisit the case history, with each change in therapist, sometimes having adverse impact on clinical progress and delay in treatment completion. Other guidelines base treatment course duration from the outset on individual patient needs and response to treatment (10).

PTSD Treatment Resistance

18. It is now clear that about a third of PTSD cases, both civilian and military, are treatment resistant to best practice interventions (19)(20). Some new pharmacotherapy-based treatments are being trialled, but study quality, size, and follow-up duration are variable and results inconclusive, and as yet too provisional to be the basis of guidelines or IMEG recommendations (21)(22)(23)(24).

Experts working in the field consider that while some approaches may be promising, they are unsuitable or even harmful for some patients, and that much more research is required. The most recent NICE PTSD guidance is dated 2018, with no date for a planned review, while more recent ISTSS and Australian guidance continues to recommend the established standard psychological therapies and medication approaches. Based more on sparse evidence of effectiveness rather than evidence of harm, current NICE guidelines expressly do not recommend EMDR for military PTSD. In practice, while not suitable /effective and acceptable in all military cases, in a significant proportion of individual UK cases EMDR has good effect (25).

19. Study and identification of factors pre-disposing to PTSD treatment resistance, particularly distinctive early warning signs, has been limited, with more work required on the impact of adverse childhood experiences, the presence of earlier mental health diagnoses including PTSD, female sex, stressor chronicity, and hazardous and addictive behaviours (26).These insights also underline the need always to consider predisposing , precipitating and perpetuating factors in PTSD and not just the apparent index event. In every case a detailed through-life and family history should be elicited. Potential new military factors for further study include, amongst others, the increasing proportion of women in the front line, cyber warfare, remotely piloted aircraft systems, as well as more traditional workplace exposures and risks, workload, bullying and harassment, including gender differences, the effect of traumatic, and especially repetitive physical injury, or illness (27)(28).

20. Although not a recognised medical diagnosis, account of potential and actual moral injury likely to impact motivation, commitment, and engagement with treatment, is important (29). Affecting first line responders, emergency services, and journalists, as well as Armed Forces personnel, moral injury is the psychological, social, and sometimes spiritual suffering caused by challenge to moral beliefs about the person's own conduct or other people's actions. Effective rules of engagement, training, strong leadership, and the shared sense of purpose found in established units generally help personnel to manage these, but the experience of recent conflicts with no clearly demarcated battle lines and increasing use of artificial intelligence (AI), remotely piloted aircraft weapons systems, with harm to civilians while the operator is not at risk, may transgress deeply held beliefs.

21. Published studies on moral injury, how and why it may develop, and its relation to co-existing mental health diagnoses remain limited (30). PTSD diagnostic criteria have changed over time and in both recent DSM and ICD classifications, guilt, shame, and anger are included. This suggests there is no need for moral injury to be added as a separate psychiatric disorder (31). To do so risks medicalising a predictable human dilemma, depriving the individual of opportunity to come to terms with their action, and leaving the moral injury unresolved, potentially creating another victim with limited hope of recovery.

22. Expert advice and IMEG recommendation are, that for the moment, treatment for military related PTSD should continue according to current NICE or other international guidelines. Effective overall management should be based first on attention to preventive action, stressor awareness and education, good leadership, teamwork, resilience building, zero tolerance of harassment and discrimination, as well as best practice operational deployment frequency and duration.

23. The success of both UK general community and military mental health and awareness raising and anti-stigma campaigns have contributed to raised mental health disorder presentation rates for expert support, with resulting delays in assessment and treatment. While group and remotely

delivered psychological therapies show promise for some diagnoses and patients, they can be onerous and time consuming to arrange and deliver, and clinician shortages cannot be addressed quickly (32).

AFCS and Mental Health Disorders

24. Since 2003 UK Armed Forces have experienced high levels of intense conflict, while at the same time, advances in evacuation from the front line, anaesthetics, and critical care medicine have led to better survival rates from the most severe physical polytrauma than in previous wars, and increased rates of mental health disorder compensation claims. All AFCS descriptor awards across the tariffs include an element for psychological symptoms short of a discrete diagnosable disorder.

25. AFCS claims can be made while the person is still serving, with awards made when on balance of probabilities i.e. more likely than not, service is the predominant cause of the claimed injury or illness. The aim is payment of early full and final awards when the claimant has been treated to optimal steady state or firm prognosis established. AFCS legislation includes nine Tariff tables of injury and disorder categories, with Table 3 headed mental health Disorders, listed generically rather than by specific diagnosis. AFCS assessment is based on functional limitation or restriction (social, interpersonal and occupational) and its duration. Each tariff table lists a series of descriptors and corresponding lump sum award values ranging from £1,236 to £650,000.

26. AFCS has a normal claims time limit of seven years but includes provision for late onset and presentation disorders. Article 3 of the AFCS Order 2011 refers:

“A late onset illness is— (a) a malignancy, or other physical disorder which is capable of being caused by an occupational exposure occurring 7 or more years before the onset of the illness or the date of death, as the case may be; (b) a mental disorder which is capable of being caused by an incident occurring 7 or more years before the onset of the illness; or (c) a mental disorder capable of being caused by an incident occurring less than 7 years before the date of onset of the illness, which disorder is capable of causing the person suffering from it to be unable to seek medical help for the disorder within 7 years of the date of onset of the illness.”

27. The AFCS legislation also includes a definition of "permanent" in relation to the accepted injury or disorder’s function at Article 5 (7): “Functional limitation or restriction is "permanent" where following appropriate clinical management of adequate duration, an injury has reached steady or stable state at maximum medical improvement; and no further improvement is expected.” The aim of early payment of awards and GIP (with no reduction/award recovery if the disorder resolves), is to encourage early engagement and commitment to best practice treatment and rehabilitation, with return to a military role or, where that is not possible, medical discharge and a suitable civilian role.

28. AFCS does not include a prescribed list of disorders eligible for awards but accepts claims for **any** injury or disorder, with the aim of consistent and equitable awards being paid. Vertical equity means that in any one category table, the most disabling and longest lasting disorders attract the highest award, while horizontal equity provides that injury and disorder given the same tariff level, from across the different category tables, have similar impact on function. Where there is no suitable

Tariff descriptor for a claimed disorder or injury, legislation provides for a temporary award and interval inclusion of a Tariff descriptor and appeal right then given (Article 26, AFCS Order 2011).

29. Award lump sums are paid for pain and suffering and, where the disorder is deemed likely to compromise civilian employability, an additional tax-free income stream or reduced earnings allowance, the GIP, is paid from service termination for life, or, if the claim is made post-service, from date of claim. GIP is paid where functional capacity is significantly reduced. Occupational function is the most objectively verifiable functional domain, particularly for a young, selected client group, so civilian employability is the surrogate for GIP level. This is paid at four levels, based on 25%, 50%, 75% and 100% of final military salary, rank, service duration, age at service termination and adjusted for standard expectable military promotion.

Defence Statistics Data - AFCS Awards for Mental Health Diagnoses 31 March 2023

30. 2022/23 claims rate and clearance times began returning to 2018/19 levels while it is hoped that delayed Defence data digitisation will also soon proceed. Meantime AFCS statistical data to 31 March 2023, remains paper based and provisional. In early years after AFCS introduction many claims related to events pre-2005 and appropriately claimed under the War Pensions Scheme. Since April 2005 a total of 117,145 AFCS claims have been registered, including 8,306 in 2022/23, and more than 113,000 cleared. About 50% claims have been accepted and lump sum paid, around 7% with, in addition, a GIP; 12% have been accepted but deemed below compensation threshold and no award paid; and 30% have been rejected. Total cost in 2022/23 to date is £1,261 million, with £763.6m paid in lump sums, £383.3m as GIP and the remainder for survivor GIP.

31. Over the period 5 April 2005 to 31 March 2023, the most common category of AFCS claims has been Table 9, Musculoskeletal disorders, accounting for 46% of total claims (with the related traumatic physical injuries; Table 8, Fractures and dislocations, 24%; and Table 2, Injury, wounds and scarring, 15% of the total), so that overall physical or traumatic overuse injuries make up 85% of claims, and mental health disorders represent 7% of total claims. It is often asserted that mental health claims are treated unfairly compared with physical conditions, with higher threshold for causal link to service to be accepted and inequitable award outcomes. Musculoskeletal disorders make up 13% of AFCS GIP payments, Fractures and Dislocations, 17%, and Injury, Wounds and Scarring, 15%. mental health disorders attract 26% GIP awards. Of the total 6,130 mental health awards, made from 2005-31 March 2023, 1,660 were paid a lump sum and additional GIP. Of these, 210 were for PTSD, while 4,470 mental health awards and, of these, 2,750 for PTSD, were lump sum only. As the scheme approached steady state in 2011/12 and since then, lump sum awards have been made at a steady 130-140 per year with on average 20-25 GIP new annual awards over the same period (3).

Defence Statistics - Medical Discharges to 31 March 2023

32. Again, these data are provisional and do not necessarily reflect prevalence of disorders. They have been affected by the Covid pandemic lockdown and changes in single service boarding procedures, employability standards and retention policy. Over the period 2018-23, about 1,500 personnel were medically discharged annually with the most common causes across the single services being Musculoskeletal disorders, including chronic overuse and sporting injuries, and mental health and behavioural disorders. Of total medical discharges from the RN and RM, 46% were due to Musculoskeletal disorders, for the Army, 37% and RAF 26%; discharge with mental health and behavioural disorders accounted for 29% of the total for RN and RM, Army 39% and RAF 49%. It is also of note that in recent years about half of those medically discharged have more than one functionally limiting condition. In 2022/23 those discharged medically were more likely to be women, other ranks, RM rather than RN personnel; and over the single services of different average age: for RN and RM, 30-39 years, Army 20-24 years and RAF over 50 years. The most common mental health and behavioural disorder diagnoses for all three services were mood disorder, neurotic stress-related and somatoform disorder, adjustment disorder, and PTSD (33).

No Fault AFCS Health Claims - Role of IMEG

33. The subjective nature, limited understanding of aetiology (cause) and pathogenesis of mental health disorders, and the challenge of medically sound, equitable awards, led the 2010 AFCS Boyce Review to recommend that a medical expert group should be set up to provide independent evidenced scientific and medical advice to (the now) Minister Defence Veterans and People (Min DVP) on the AFCS and related matters (34). However, IMEG has no role in individual case determination.

Military Fitness Standards and Employability and Mental Health Disorders (35)

Conditions Precluding Military Service Entry.

34. Tables 3 and 4 of the AFCS Tariff cover Mental and Physical Disorders described in generic terms, not specific diagnoses. While some severe and enduring disorders may preclude enlistment, fitness for military work depends not simply on diagnosis, but rather on compromise of functional capacity, prognosis and likely duration. This should meet the requirements of the particular service, and not be detrimental to the health and safety of others or the individual. Fitness is considered for general service and specific branch or trade duties, including specialist groups, submariners, divers, commandoes, Special Forces, and parachutists. Assessment and medical advice is case-specific, given by consultants in the relevant clinical specialty and occupational medicine. Disorders carefully considered at enlistment include presence or childhood history of asthma, migraine, skin conditions such as atopic eczema or contact dermatitis and psoriasis, traumatic physical injury or overuse musculoskeletal disorder, non-specific lower limb or low back pain and mental health disorder. Entry enquiry also covers allergies, alcohol, tobacco and substance use, and family history, for example, sudden early adult death. A particular limiting factor on enlistment is the challenge of access to appropriate treatment on deployed service in many locations.

35. In-service assessments of work fitness also take place at transfer to a new post, return to work after illness or injury, with periodic reviews every five years from age 30, and two-yearly after age 50, and for surveillance of common high-risk disorders such as noise induced hearing loss.

PULHHEEMS

36. A more general discussion of military fitness for enlistment and retention in service is included in this Seventh report, in the Employability topic chapter. The PULHHEEMS profile tool standardises medical functional assessment, while the Medical Employability Standards are used by career managers and the chain of command to ensure appropriate duties are allocated. The profile is based on a series of qualities:

P - Physical Capacity

U - Upper Limbs

L - Locomotion

HH - Hearing Acuity (right and left)

EE - Visual Acuity (right and left, uncorrected and corrected)

M - Mental Capacity

S - Stability (Emotional)

Where P -Physical capacity. A service person's overall physical and mental development, functional capacity, potential for physical training and suitability for employment worldwide.

The P value reflects the 'U', 'L', 'HH', 'EE', 'M' and 'S' gradings, taking account of deployability and the duties of the relevant employment group.

U – Upper limbs. The functionality of the hands, arms, shoulder girdle and cervical and thoracic spine.

L – Locomotion. The functional efficiency of the locomotor system, lumbar spine, pelvis, hips, legs, knees, ankles and feet, gait and mobility.

HH – Hearing. Based on auditory acuity only. (right ear assessed first then left).

EE – Visual acuity. Visual acuity only. (right eye assessed first then left).

Mental health is considered in terms of:

M – Mental capacity. Mental capacity is not formally assessed at recruitment but based on interview at recruit selection and the person's academic record.

S – Stability (emotional). Emotional stability, ability to withstand the psychological stress of military life (especially operations).

Each quality is graded numerically 0-8, although the full range does not apply to all qualities, e.g. HH options are 1, 2, 3, 4 and 8: and M and S options are 2, 3, 7 and 8.

0 - Medically unfit for duty and under medical care (P quality only).

2 - Medically fit for unrestricted service worldwide.

3 - Medically fit for duty with minor employment limitations.

4 - Medically fit for duty within the limitations of pregnancy.

7 - Medically fit for duty with major employment limitations.

8 - Medically unfit for service.

At entry, a permanent PULHHEEMS profile is awarded. Subsequent re-gradings can occur in service following a medical board.

Military Medical Employability Standards (MES)

37. The Joint Medical Employability Standard (JMES) is assigned by medical staff and informs Executive (chain of command) decisions on the deployability and employability of service personnel. JMES is an alphanumeric code reflecting fitness for Air (A), Land (L) and Maritime (M) environments, and any required specific Environment and Medical Support (E).

Military Medical Deployment Standards

38. The three categories are:

a. MFD Medically Fully Deployable - Fit to deploy to all parts of the world without any limitations or requirements for routine medical support beyond deployed Primary Healthcare.

b. MLD Medically Limited Deployability - Deployment limited due to:

A medical condition, medical treatment/support need, Risk of specific climates e.g., heat or cold, need to avoid specific exposures e.g., noise or chemicals.

MLD grading requires a medical risk assessment (MRA) before any deployment. For complex cases, consultant level occupational physician expertise is required.

c. MND Medically Not Deployable - Not deployable outside the United Kingdom.

Conditions Affecting the M Grading at Service Enlistment

39. The M grading looks for mental capacity sufficient to undertake normal training and posting. Assessment is based on history, head injury, learning difficulties, school career, literacy, jobs since leaving school, hobbies and interests.

Conditions Affecting the S Grading at Service Enlistment

40. Psychiatric conditions representing understandable responses to life events such as divorce, and bereavement may settle with no psychiatric input, while hereditary or complex disorders are more likely to adversely impact function and have greater risk of relapse. Individuals in the first group are not necessarily declared UNFIT if they are symptom free with effective coping strategies. Those with current psychiatric disease or dysfunctional behaviour are always UNFIT.

Psychoactive Substances

41. Illicit Drugs - At enlistment drug related health problems, drug dependence in the 3 years before application or, in harmful use but not dependence in the previous 2 years are normally UNFIT. Broadly similar approach applies to alcohol misuse disorders.

Potentially Psychotic Disorders

42. Schizophrenic and Delusional Disorders (excepting acute and transient psychotic disorders), which may have a relapse rate of about a third are, broadly speaking, incompatible with military service.

43. Mood Disorders range from very disabling psychotic disorders to mild, transient lowering of mood triggered by a minor life stressor or life event. Entry or retention in service depends on case specific facts and response to best practice treatment.

44. For serving personnel, successful treatment, medical employability upgrading and return to duty is central to Defence optimal operational deployability, maximising numbers of personnel fit to fight and retention of trained personnel in their own job, other suitable role, or service.

Defence Recovery Capability Holistic Transition and Resettlement

45. Complementary to medical rehabilitation, the Defence Recovery Capability (DRC), led by the chain of command, addresses non-medical issues to support the service person return to duty,

or prepare for medical discharge. The Recovery strategy provides a military environment and mandatory activities, not options for individual service personnel (SP), and is more fully described in the Seventh Report Employability topic. Recovery support may be from the parent unit or for more complex cases, through single service Recovery Pathways and multi-activity courses run by the Royal British Legion. The latter create a learning environment promoting success at the personal, interpersonal, and organisational levels, increasing self-confidence, motivation, ability to deal with stress and develop a positive mental attitude with focus on what the person can do, not on what he or she, cannot. A Personal Recovery Officer (PRO) guides the individual through the Individual Recovery Plan (IRP) using an interdisciplinary approach which includes medical, welfare, housing, education, re-skilling, Return to Work (RtW) Programmes, work placements and employment opportunities.

46. MOD (including DBS, Veterans UK and the Veterans Welfare Service) and other Government Departments, notably the UK health departments, work collaboratively to support Defence Recovery with welfare social support from the ex-Service charities, statutory and non-statutory bodies, and local community service providers (36)(37).

47. The mnemonic **HARDFACTS** considers the following factors:

Health care - **A**ccommodation and **R**elocation - **D**rugs and Alcohol - **F**inance and Benefits - **A**ttitude, Thinking and Behaviour (Welfare) - **C**hildren and Family - **T**raining, Education and Employment - **S**upporting Agencies.

Resettlement

48. For those unable to meet the exacting standards for retention in the Armed Forces, Resettlement lasting from two years prior to service termination date to two years after that date, prepares service leavers to gain paid civilian employment post discharge. Available to all service leavers with provision, dependent on length of service, resettlement courses are provided for all medical dischargees regardless of service duration. Resettlement services are delivered by the Career Transition Partnership, MOD, plus the contracted-out service partner, and include advice, guidance on available support, CV writing and job finding and training courses. Where civilian employment is not appropriate for medically discharged personnel, Resettlement training may be transferred to spouse, civil or eligible partner (38).

Civilian Employability and Mental Health Disorders

49. Mental health disorders are common in the UK general population. They are also leading causes of loss of productivity and sickness absence in civilian employment. In certain safety critical roles, the decision about fitness to work may directly link to the diagnosis, however in the great

majority of employments, it depends on the individual's functional capability and stability due to the condition, including any treatment impact. Assessment of the functional capacity in mental health disorders can be relatively more complicated compared to physical disorders. The main factor is cognitive function, but energy, motivation and sleep pattern are also relevant. In most cases the functional capability can be assessed through a detailed history and observation, though in certain situations a more detailed cognitive assessment may be required.

50. Whilst the prevalence of mental health disorders has increased, there is better understanding in the wider population and employers, in terms of removing the stigma and instituting short- and long-term support for people with mental health symptoms. This, *inter alia*, includes flexible working, risk assessment and a risk management approach, peer support, work related support and treatment (e.g. provision of Employee Assistance Programmes).

Mental Health Issues Raised by Claimants and Stakeholders Since the Sixth IMEG Report

51. Since IMEG was set up in 2012, AFCS-related mental health issues have been the subject of many comments and complaints by claimants and other stakeholders, with Minister DPF tasking IMEG to investigate. Comment and recommendations on mental health issues have appeared in four IMEG reports, including on interim awards, diagnosis of claimed disorders and the legislative requirement for consultant level diagnosis, and parity of esteem between physical and mental health disorders (39)(40)(41)(42).

52. Since the 2022 Sixth IMEG report there has been further claimant comment, and mental health issues were also raised in the 2022/23 AFCS QQR of the scheme. IMEG has considered some of these, listed below:

Issue 1. Perceived unfairness in the numbers of descriptor disorders and definitions of duration and severity of functional compromise between Table 3 Mental Health Disorder, and Table 4, Physical Disorders. Why are these not the same for both Tables?

Issue 1b. Tables 3 and 4 use similar terminology e.g. very severe /severe/moderate for disorder severity but with different meaning and award levels.

Issue 2. 2011 AFCS Order Article 5 definition of "permanent".

Issue 3. Lack of clarity as to how claim service attribution and assessment are decided.

Issue 4. The role of doctors/clinicians in AFCS, including DBS medical advisers: treating clinicians and medico-legal experts commissioned by solicitors.

Issue 5. Ongoing criticism of the legislative requirement for consultant level psychiatrist or clinical psychologist diagnosis of mental health disorders.

Issue 6. Interim awards continue to be criticised, and as any category of injury or disorder may be involved, this Seventh report includes a stand-alone general update on Interim awards as well as in this topic chapter, brief comment on mental health interim award practice.

Issue 1. Perceived unfairness in numbers of descriptor disorders and definitions of duration and severity of functional compromise between Table 3 Mental Health Disorder and Table 4, Physical Disorders. Why are these not the same for both Tables?

53. There are 6 tariff descriptors and award levels describing different levels of severity and duration in Table 3 for Mental Health disorders in contrast to 11 levels in Table 4. Table 4 Tariff Table, heading Physical disorders, includes illnesses and infectious diseases. AFCS order 2011 Article 12 sets out a list of circumstances where no award for infectious diseases is payable, going on to exclusions where an award may be made. These are:

> a. an exogenous infection acquired in a non-temperate region and the person infected has been exposed to it in the course of service; or
>
> b. in a temperate region, (where) there has been an outbreak of an exogenous infection in service accommodation or in a workplace.

AFCS legislation accepts exogenous infectious diseases encountered on deployed service or through outbreaks in military bases and accommodation. The additional descriptors in Table 4 compared with Table 3, Mental Health disorders, aim to address these infections. There is no equivalent in mental health.

Tables 3 and 4 use similar terminology e.g. very severe/severe/moderate for disorder severity but with different meaning and award levels.

54. IMEG agrees that clarification would be helpful. During AFCS development, from a medical perspective, tariff awards across the nine disorder categories were discussed, with agreement to set each table out in descending order of injury/disorder severity and award level. It was also agreed that medically, to achieve award equity within and across injury category, it was not appropriate, for each Table category, to award the most functionally disabling disorder or injury at the same high award level across the Tables, because by nature some disorders and injuries are potentially more or less disabling than others. For example, compare the functional deficit for descriptors listed in Tables 6 Neurological disorders and 9 Musculoskeletal disorders.

55. AFCS claims and awards for Table 4 Physical disorders are quite rare because of the predominantly male, young, fit selected population, the military focus on protection and prevention, and the standard of proof. Cancers and auto-immune disorders do sadly sometimes arise in fit young people, but numbers of claims are small, with few awards made. Balance of probabilities means that a service causal link for any claimed disorder can be accepted only when the evidence shows the link to be “more likely than not”. Despite progress in research on cancer and auto-immune pathology and mechanisms, contemporary medical understanding on causation in the individual case almost always concludes that the claimed cancer or medical condition is a condition of unknown cause, and a service causal link cannot be tested or accepted.

56. By contrast, mental health awards, notably for PTSD, anxiety and depressive disorders and episodes, are the second most common cause of AFCS awards. Although always multifactorial in origin, with predisposing, precipitating and perpetuating factors, service stressor(s) events are often documented /identifiable and can be accepted as the predominant cause. Award rate is high, 76% compared with the overall around 50% claims of all types and from all Tariff Tables, accepted as service attributable.

57. Another difference between physical and mental disorders is Article 5 AFCS Order 2011, which provides that functional assessment takes account of the primary injury and its effects, making a comparison between the limitation and restriction of the claimant and the capacity of a healthy person of the same age and sex who is not injured or suffering a health condition. While objective assessment of physical functional decline with age is possible, no such approach to psychological health, attitudes and behaviours is available (43)(44).

58. The main factor in assessment of the functional capability in mental health disorders is cognitive and emotional function, but other factors, energy, motivation, sleep pattern, stability in the longer term, and treatment side-effects, are also relevant. In the general community in the UK, the evidence on common anxiety and depressive disorders is that civilian work, with adjustments as required by the Equality Act 2010, may be possible and beneficial for many patients. Less available is work modification for severe and enduring or treatment resistant mental health disorders and, overall, a higher percentage of people with physical disability are in paid work compared with those with mental health problems. The ONS report on the Employment of Disabled people 2022, records that compared with non-disabled adults aged 16-64, of whom 80% were in paid work, the rate for people with disabilities was 50%. Within that group, 58% of those with a musculoskeletal injury or disorder were in work, compared with 50.5% of those with mental symptoms and illness (44).

Conclusion and Recommendation

59. IMEG concludes that medically, simple use of shared common descriptors, definitions, and award levels in Tables 3 and 4, would neither reflect contemporary medical understanding nor deliver the AFCS aim of equity and parity of esteem for claimants across the range of disorders and injuries.

60. IMEG recommends that resolution of these issues requires detailed review and, as necessary, revision of descriptors and legislative amendment, an exercise requiring wider discussion, policy, and legal input. IMEG members would be happy to contribute to medical and scientific aspects as considered appropriate.

Issue 2. 2011 AFCS Order Article 5 Definition of “Permanent”

61. The aim of early payment of awards and GIP (with no reduction/award recovery if the disorder resolves), is to encourage early engagement and commitment to best practice treatment and rehabilitation, with return to a military role or, where that is not possible, a suitable civilian role. Given the difficulty providing accurate and dependable prognoses for mental health disorders early in the course of treatment, a period of time and response to best practice treatment is required before clinicians can conclude a mental disorder is permanent. While there is some circularity, in that chronicity predicts chronicity, this is the state of the science of prognosis.

62. The AFCS legislation includes a definition of "permanent" which reflects this requirement. Article 5 states that “Functional limitation or restriction is "permanent" where following appropriate clinical management of adequate duration, an injury has reached steady or stable state at maximum medical improvement; and no further improvement is expected.”

Conclusion

63. IMEG has again reviewed the legislative definition of “permanent” and its context from a medical perspective and remains content medically that no amendment is required.

Issue 3. Lack of clarity as to how claim service attribution and assessment are decided on Mental Health claims.

64. Reflecting on the issues, including some raised with IMEG, by scheme members, claimants, and their supporters since 2012, IMEG agrees that the development of a standard accessible and succinct information sheet, perhaps sent at claim acknowledgement, to mental health disorder claimants, would be useful.

65. This work might be led by a time limited task force with membership, Terms of Reference, and duration, for discussion. To be effective, the note should be accurate, accessible and succinct, covering priority topics raised by claimants and their supporters, mental health charities, and military and civilian treating health professionals. The note should be produced by DBS, with Defence People policy and legal input.

66. Given some of the issues raised frequently by claimants, IMEG suggests that if a decision to progress an information note is made, it might also include some medical issues, the role of DBS medical advisers and other doctors in the Scheme. Comment on Issue 4 below may be relevant.

Conclusion

67. If a decision to progress an information note is made, IMEG would be pleased to contribute on medical and scientific aspects as appropriate.

Issue 4. As well as an issue raised in the recent QQR report, the role of doctors in AFCS mental health claim and appeal determination is a frequent topic of correspondence, and IMEG takes the view that some clarification would be helpful. Although this might form part of the introductory information note or an Annex, brevity and accessibility are key, and wider discussion as to how best to make this information available is recommended. It should cover the roles of DBS medical advisers, treating clinicians and medico-legal clinical experts. Possible topics might include the following:

68. DBS medical advisers could provide evidence-based medical advice to the lay decision-makers, in line with the case facts and contemporary generally accepted medical understanding on causation. They could also advise on assessment, the appropriate descriptor, and award. Following recommendation by the 2010 AFCS Boyce Review, it is Scheme policy to routinely include DBS medical advice in the claim or appeal determination for some claim categories or types. These include claims for serious traumatic physical injury, mental health disorder, claims where supplementary awards are likely to apply, at reconsideration and appeal, reviews, interim awards, and cases where spanning and worsening, as defined in AFCS, are involved (45).

69. On joining, DBS medical advisers undertake general medico-legal training and specific training on the compensation scheme, rules, and policies. In line with the diverse nature of claimed injuries and disorders, DBS doctors provide medical advice for **any c**laimed condition and are not restricted to advice within their specialty. A similar model applies for the independent AFCS Appeals service. DBS doctors are appointed following a successful period or career in another branch of medicine. This may be general practice, orthopaedics, ophthalmology, psychiatry, and other specialties relevant to military service. They are all registered, licensed and undertake annual appraisal to inform and obtain GMC revalidation every five years. They participate in medical Continuing Professional Development (CPD), which may include attendance at postgraduate courses, regular scrutiny of the peer-reviewed published medical literature, monthly medical meetings at Norcross with tutorial sessions, discussions on case work and relevant medical topics, as well as group discussion on the peer-reviewed quality assurance audit of their advice. This audit, done by the DBS medical advisers on a rolling basis and validated by People Medical Adviser, focuses on the need for medical comment that is accessible to colleagues and claimants, reflects contemporary understanding of causation of the claimed disorder, and assessment advice in line with the scheme rules.

70. **Treating medical (and other) clinicians.** Factual reports from the claimant's treating clinician, with reasons for findings and conclusions, can be invaluable in mental health claims, but there may be a risk of conflict of interest or patient alienation if the clinician is unable to fully support the patient's perspective or does not provide reasons for the opinion. In addition, the treating clinician may not have medico-legal training or be familiar with AFCS rules and policy, and the critical aim of equitable outcomes across the range of claimed disorder categories, not just the treated disorder category.

71. **Expert clinical expert witness reports submitted by claimants or lawyers on behalf of claimants.** The tradition of no-fault compensation, begun with the War Pensions Scheme, notably

with no requirement for claimant legal representations or claimant commissioned medical reports, and evidence gathering largely carried out by scheme administrators on behalf of claimants, is maintained for AFCS. However, claimants may choose to have legal representation and submit a medico-legal expert report. Such factual reports, as from treating clinicians, are welcome and useful. However, these are frequently reliant on claimant self-reported history, with limited contemporaneous documentary evidence, and they may also omit a through-life history and possible insights into predisposing or perpetuating events or circumstances relevant to the cause of the claimed mental health disorder. In addition, experts may not be experienced or specialist in trauma-related problems and their management in the military context. Equity in awards across the range of claimed disorders, not just for mental health disorders, may also be unfamiliar to some clinicians. In practice, reports are often opinions focused on selecting a tariff descriptor and award value, as the response to a direct question from the referring solicitor. Such reports may also lack reasons for the opinion, or evidence that internal consistency of the history has been tested, as well as clarification of symptoms claimed with triangulation between claimant self-reports, clinical evidence, and review of medical notes and investigations.

Issue 5. Ongoing criticism of the legislative requirement for consultant psychiatrist/clinical psychologist diagnosis of mental health disorders.

72. **Diagnosis**. Diagnosis of psychiatric disorders in most cases is dependent on self-report of symptoms and history, together with a mental state examination. There is potential for different diagnoses to be made over time in a single patient by the same or different clinicians or based on different diagnostic classifications or editions. For rigour and consistency, AFCS uses generic descriptors in Table 3 rather than a list of specific disorders.

Disorder Classification

73. Since 1980 there has been revision of PTSD diagnostic criteria in the DSM every few years, most recently in 2013, when the fifth edition of the classification, DSM 5 was published. PTSD is listed in the WHO International Classification of Disease 11th Edition (ICD11) published in 2022 with the inclusion of both PTSD and complex PTSD; the latter is not listed in DSM 5. DSM 5 reclassified PTSD as a “trauma and stressor related disorder” rather than an anxiety disorder. The approach of DSM 5 has been to lower the level of threat inherent in traumatic incidents and expand the symptom criteria to include symptoms of co-morbid disorders. The ICD 11 criteria continue to focus on catastrophic traumatic events and the central role of re-experiencing symptoms, and behavioural avoidance. PTSD is therefore an increasingly heterogeneous condition. Against this background it is perhaps unsurprising that some clinicians do not use either classification. In the UK, WHO ICD criteria are most commonly used for diagnosis, still predominantly ICD 10 (1992), which remains the classification embedded within NHS electronic patient records (46).

Diagnosis by Consultant Clinical Psychiatrists and Psychologists

74. Following IMEG recommendation in the 2013 and 2017 Reports and accepted by Minister, to ensure the robustness of PTSD diagnoses, AFCS current legislation provides that psychiatric claims are to be diagnosed by a clinical psychologist or psychiatrist of consultant grade, and in line with the International Classification of Diseases (ICD) or American Psychiatric Association (APA) Diagnostic and Statistical Manual (DSM) criteria. This requirement remains controversial, was raised again in the 2022/23 AFCS QQR. IMEG has now reconsidered this.

75. The legislation and rule apply to diagnosis, not necessarily to clinical management. It is generally agreed that especially in a military context, there is risk of PTSD over-diagnosis. The approach aims to ensure robust diagnosis of claimed AFCS conditions and so equity and consistency in claims determination across the broad range of claims. In practice, timely, affordable access to consultant diagnosis has sometimes proved difficult for claimants. The NHS and DMS approach to mental health care and clinical management is holistic, team-based and inter-disciplinary, beginning in Defence Primary Health Care. For more complex cases, further treatment, in both military and NHS civilian settings, involves referral to specialist teams of psychiatrists and clinical psychologists, mental health nurses, occupational therapists and social workers, working closely with other government departments (OGD) and local authority staff, military and general charities. There is regular multi-disciplinary team review of patient progress and, led by senior team members, including consultant level psychiatrists and psychologists, agreement on diagnoses, clinical management, and prognosis.

76. **Conclusion and recommendation**: In the light of this, and following careful consideration, IMEG recommends acceptance of diagnoses made in a multi-disciplinary team-based clinical and care path setting, with a named consultant psychiatrist or clinical psychologist lead.

Issue 6. Interim awards continue to be criticised, and as any category of injury or disorder may be involved, this Seventh report includes a standalone general update on Interim awards. Here, we make specific comment on mental health interim award practice.

Interim Mental Health Awards

77. The acceptance rate of AFCS mental health claims overall from scheme introduction is 76%, compared with about 45% for all other claims.

78. From the outset, an aim of AFCS, in contrast to the War Pensions Scheme, was that assessment and awards paid should, as in the civil courts, be made full and final as early as possible. This reflects the approach of modern clinical investigation and treatment practice for most physical and mental health disorders, as well as, given the average young age of claimants, allowing early financial planning and certainty. Despite this, as in the civil courts, final award notification may be delayed.

79. Sometimes this is owing to case complexity or where claims are made soon after the index event, before treatment has begun or is in the early stages, with prognosis uncertain. A third reason is the now common increasing waiting times to access best practice treatment because of patient demand and shortage of culturally sensitive trauma therapists. As well as cost of staff recruitment there is the need for their appropriate training and experience, especially in the military context, and likely to take months or years. Lastly, in this Seventh report we identify the additional category of treatment resistant cases.

80. To address final award payment delay, as suggested by the 2010 AFCS Boyce Review, a payment on account or "interim award "may be paid across the range of tariff categories (Article 52 AFCS Order 2011). The interim award concept remains controversial, despite previous IMEG and other expert comment on the validity of its intention and the medical aspects. Because of their very nature, interim awards are not appealable. Interim awards are designed as a payment on account, not to disadvantage claimants. If the final steady state award is higher than the initial award, an additional sum is paid; while if there is improvement and a lower final award is now found to have been appropriate, no amount of the initial award is recovered from the claimant.

81. Where an initial two-year interim award is appropriate, current claims practice makes it likely that this will be an in-service claim. In that circumstance and where, uncommonly, assessment is possible and supports underlying entitlement to GIP, because the person retains military salary while serving, no GIP will be in payment. Beyond service termination mental health final awards have high rates of GIP, as outlined here already. IMEG is, however, unaware of any case where a final GIP award was paid at a lower rate than any previous GIP band in payment up to award finalisation.

82. Literature searches, reported in previous IMEG Reports, failed to find published evidence on generally applicable best treatment duration for a range of mental health disorders. Treatment is dependent on case specific facts and treatment arrangements. Treatment of mental health disorders by a single therapist will generally progress and be completed to shorter time frame than one delivered by several clinicians, requiring development of new therapeutic relationships, and the patient to reiterate the clinical history.

83. Across all descriptor categories a total of 6,355 initial two-year interim awards have been made since scheme introduction in 2005, with 3,070 total for mental health disorders, and of these 2,735 for PTSD. To date, AFCS claims and awards data remain paper-based, beyond initial two-year interim awards, presented in Defence Statistics AFCS award supplementary tables at table 22. Data are not currently routinely collected and published on initial interim awards extended to the four-year point.

Conclusion and Recommendations

84. The matter of interim awards was first raised in the 2016/17 AFCS QQR and again in the 2022/23 Review. IMEG appreciates the concerns but still concludes there is a sound medical and scientific basis for the concept and present award duration timelines.

85. It is recommended that as early as possible, data on AFCS interim awards of all categories, extended at the initial two-year award review to four years should be routinely collected.

86. IMEG also recommends that brief accessible claimant information on interim awards and data collection and its meaning should form part of any Information note for mental health claimants.

87. Similarly, some guidance on the principles of interim awards, and their use in medical advice and decision-making, should be developed and provided for operational administrative decision-makers and medical advisers.

88. Given the proportion of mental health cases in overall interim awards and the confirmation of significant treatment resistance in PTSD, IMEG should maintain close scrutiny of the emerging published literature, and liaison with clinical experts on advances in PTSD treatment, and any potential impact this may have on decision-making practice on interim awards.

Diversity and Inclusivity

89. IMEG regards issues of equality and diversity as core values and aims to avoid discrimination on equality grounds, whether age, disability, gender, gender reassignment, marriage and civil partnership, pregnancy, maternity, race, religion or belief and sexual orientation. While not a core topic for this report, it is long established that mental health presentation for expert health support and discrete diagnosed disorders is more common in women than men. A current Defence priority is increased workforce inclusivity and diversity, including a government aim of 30% Defence whole force being female by 2030. During this review, IMEG has noted the significant and proportionate actions being taken to deliver this aim safely, with preserved or enhanced physical and mental health and well-being for all service personnel.

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Topic 3 - Lower limb injuries, overuse disorders and the development of osteoarthritis

Summary and Key Points

1. Musculoskeletal injury is the most frequent reason for claims made under AFCS. Here, we review the evidence relating to injury and the development of osteoarthritis, particularly as this relates to lower limb injury, together with consideration of predisposing factors, prevention, employability, and compensation aspects.

2. Risk factors for Musculoskeletal injury include unhealthy weight, smoking, alcohol consumption, sporting activities, military training and under-reporting of injury.

3. We review of epidemiological evidence relating to the development of osteoarthritis from Musculoskeletal injury, deriving from large civilian population studies relevant to the military context. A key issue is the relationship of the physical activity required by military service to the development

of degenerative joint disease osteoarthritis. We discuss this, citing evidence mainly available from civilian research.

4. Best practice military prevention of injury, including enlistment conditioning and in-service training is reviewed.

5. Review of the Defence Statistics of Tri-Service medical discharges 2018-2023 shows the magnitude of the problem and a higher incidence proportionally in women.

6. Civilian epidemiological studies of the development of osteoarthritis related to occupation are reviewed. The limitations of these studies include non-uniform diagnostic criteria, mainly retrospective case selection, and lack of suitable control subjects. The limited published studies of the development of osteoarthritis in military personnel are reviewed.

7. Best practice treatment for Musculoskeletal injury in the military is described. The great majority of patients are treated in primary care units, with a small minority being referred on to specialist regional rehabilitation units, and finally to the Defence Military Rehabilitation Centre (DMRC), Stanford Hall.

8. Defence Recovery Capability Holistic Transition and Resettlement is considered in relation to Musculoskeletal injury.

9. Compensation aspects of lower limb Musculoskeletal injury, with particular reference to osteoarthritis and longer-serving older personnel, are considered.

10. At the final section of this review are issues of particular concern raised by claimants, medical staff and DBS decision-makers with comment in response from IMEG. Topics include: (i) the relationship of osteoarthritis to aseptic necrosis; (ii) how AFCS should address joint replacement when a Musculoskeletal injury has been accepted as due to service, and whether that depends on the time interval between injury and clinical need for joint replacement; (iii) how AFCS should deal with pain and osteoarthritis developing in the back and lower limbs following a service-related lower limb amputation; and finally, (iv) whether **any** type and duration of military service is associated with inevitable lower limb osteoarthritis .

11. AFCS awards for Musculoskeletal injury and osteoarthritis are reviewed.

Introduction

12. The AFCS is an important element of the Nation’s commitment to those who serve, and part of service personnel terms and conditions. Its perspective and provisions should be coherent with UK Defence priorities and shared with other allied nations. They presently include:

a. the need to optimise and maintain operational deployability, with maximal numbers of service personnel fit to fight.

b. effective recruitment and retention at a time when the culture gap between military and civilian life, particularly amongst young people is wide.

c. for all service leavers at discharge, successful transition to fulfilling civilian life, including where possible, appropriate paid work. For those medically discharged at a young age with severe long term functional disability, appropriate through-life support, including best practice, and accessible health care in the civilian community.

d. the goal of increased workforce inclusivity and diversity, with a higher proportion of women and people of different ethnicities. By 2030, the government aim is 30% of Defence whole force being female.

13. The Armed Forces comprise a young, selected, increasingly diverse population, fitter than average age and sex-matched members of the general population. The nature of military service means many core activities are physically demanding and so advances in prevention, protection, training and best practice management of traumatic physical injury and overuse disorders, are highly relevant to Defence priorities and to IMEG.

14. IMEG responsibilities recommended in the 2010 Boyce review of AFCS include topic investigation as tasked by Min (VP)(1). Previous IMEG reports have considered traumatic physical injury and musculoskeletal overuse disorders, including combat-related complex lower limb injuries and outcome after traumatic amputation of an extremity (Third IMEG report 2015), and overviews of Musculoskeletal disorders in the Fourth (2017) and Fifth (2020) reports (2)(3)(4). The present review will focus on contemporary medical understanding of prevention and clinical management of the most common Musculoskeletal injury, lower limb (including sporting) injuries and overuse disorders, predisposing factors, prevention, the development of osteoarthritis, civilian occupational studies, training, employability, and diversity and inclusivity issues. There is also a section on questions from operational medical advisers and scheme decision-makers on contentious and problem Musculoskeletal injury compensation areas.

Background

15. Lower limb injury and overuse disorders are common in-Service personnel (SP), with a quarter of UK 2022/2023 Musculoskeletal medical discharges from all three single Services involving the knee. From the introduction of the AFCS in 2005 until the end of the Afghanistan conflict, claims for combat related traumatic injury, including complex previously unsurvivable blast related polytrauma injuries, were common, while more recently, single sport and training-related trauma and overuse injury claims are predominant. There is often interval development of osteoarthritis and all awards for descriptors in AFCS Tariff tables 8 (Fractures and dislocations) and 9 (Musculoskeletal disorders) include compensation for anticipated consequential osteoarthritis. As in wider society over the last twenty years, the proportion of patients with ongoing seriously disabling chronic pain and biopsychosocial issues leading to medical discharge has much increased.

16. Musculoskeletal injury is the largest cause of medical employability downgrading across Defence, adversely impacting the availability of personnel to work effectively in the home environment and to deploy on operations. In 2022, almost half UK Armed Forces service personnel (over 71,000) had reference to a Musculoskeletal injury in their medical records with about a third

requiring specialist rehabilitation input for their injuries. There are similarities across the single Services, and female SP had higher injury rates compared with males. The most commonly injured body areas were knee, low back, shoulder, ankle and foot, with some variation dependent on service. Ankle injuries are more common than upper limb shoulder injuries in the Army, while the opposite holds true for the RAF. Physical training was the largest cause of injury for all services (40-50%), reflecting different single Service physical fitness /standards. Other important causes were routine military activity and sport.

Risk Factors for Musculoskeletal Injury and Osteoarthritis; Reduction and Prevention

17. The published literature on Musculoskeletal injury risk factors is extensive and heterogeneous, with a wide range of study quality and size and resulting inconsistent findings in primary studies (5). While for some factors there is evidence of both protection against, and increased, risk of Musculoskeletal injury, in most cases lifestyle factors co-exist, increasing risk of injury. For military enlistment and retention, a few principles apply. Individuals are considered on personal case facts, with consultant orthopaedic and occupational health advice. The focus is healthy general lifestyle and identification of intrinsic and extrinsic risk factors for Musculoskeletal injury. Intrinsic, unmodifiable, risk factors include biological sex, pre-enlistment physical activity and fitness, previous injury, anatomical and biomechanical variants (including knee valgus and varus pattern), congenital foot anomaly such as pes cavus (high foot arch), and ethnicity. Potentially modifiable extrinsic factors include service branch, trade and job activities (such as carriage load), injury risk, incidence and type in home and deployed service. For entry there are few automatic barriers to joining up, a possible exception being proven rheumatological disorders. For both entry and retention, functional capacity, scope for mitigation and likely longer-term prognosis for both the service person (SP) and Defence, are key.

18. Musculoskeletal injury risk factor reduction action is led by the chain of command with medical and other specialist advice and individual SP responsibility. Low physical fitness is initially addressed by attention to healthy behaviours. Diet, physical exercise, smoking, alcohol, sleep and substance abuse are identified in the Defence Health and Wellbeing Strategy, with shared responsibility for action by the SP, the chain of command and the organisation (6). There is an expectation that Defence and the single Services will provide the environment for individuals to be successful in reducing their health risks, including high standard work and living conditions, education and training, accommodation, dietary options, healthy food choices and recreational facilities. Mitigation for non-modifiable intrinsic risk factors such as being female with, on average, smaller body size, limb length and shorter stride length are more difficult (7). Usually addressed by pragmatic solutions, such as women marching at the front of the platoon, this is generally a satisfactory approach except where 'marching' represents a significant portion of the fitness regime. In that situation the larger, stronger people at the back will receive proportionately less 'fitness training', being constrained to march at the speed dictated by those at the front. Other risk factors include:

a. Unhealthy weight. There are positive associations between body mass index (BMI), increasing waist circumference and Musculoskeletal injury risk (8), and the odds of sustaining an Musculoskeletal injury and early medical discharge increase in those who are overweight at service entry (9).

b. Tobacco and Smoking. Smoking rates in the UK Armed Forces, while reducing, remain higher than in the general population. Because of heterogeneity and generally poor quality, the published evidence is conflicting, with some studies suggesting a protective effect on Musculoskeletal injury trauma. Because of the wider proven adverse effects, cigarette smoking is actively discouraged in the three Services (10).

c. Alcohol. Alcohol studies are again heterogeneous, generally of low quality and with mixed results. Consumption has been associated with both protection and increased accidental injury risk and pain intensity in Musculoskeletal injury. There is a clear association between high alcohol intake and the subsequent development of osteonecrosis, which may require joint replacement (especially Hip replacement) (11).

d. Sleep. Sleep deficiency, including lack of sleep, sleeping at inappropriate times or poor sleep quality, has been linked to increased risk of Musculoskeletal injury with, in one study, soldiers who slept less than 4 hours per 24-hour period having a 2.35 times higher likelihood of Musculoskeletal injury compared to those sleeping 8 hours or more (12).

e. Leadership and Culture. Military culture is a significant factor in Musculoskeletal injury, as fear of impact on career and negative peer perceptions can lead to under-reporting and record documentation in close time relation to index injury events or symptom onset. Any under-reporting and so apparent reduced prevalence of Musculoskeletal injury, is likely to be short-term, outweighed by subsequent chronic, repeated or more significant injury, increased time lost to Musculoskeletal injury, medical employability downgrading and risk of discharge. The example of today's professional athletes, particularly footballers, in response to injury is helpful, while good military leadership is essential in destigmatising early specialist help-seeking and promoting an open and supportive military culture with healthy attitudes and behaviours, and a positive physical training ethos.

Musculoskeletal Injury Prevention Training

19. For the last twenty years, overuse injuries have been recognised as an issue at recruitment and early in service, with medical downgrading and discharge in all three Services most prevalent in untrained personnel and more recently, women. This, at a time when Defence priorities include the need for effective recruitment and retention and to optimise and maintain operational deployability, with maximal numbers of service personnel fit to fight. A major influence on Musculoskeletal injury at enlistment or early in service is health and fitness trends in the wider community. Reduction in entry standards might increase numbers enlisted, but sustained capability is another matter.

20. Reflecting these issues, changes in the UK in-service physical training programmes and assessments have been made, tailored to functional requirements of roles. Army Health and Physical Performance Research leads on this with Tri-Service overlap and sharing of best practice.

Training programmes are run by Physical Training Instructors (PTI). Preliminary entry conditioning training is focused on aerobic and anaerobic capacity/endurance, and muscle strength/endurance, flexibility and technical skills, lifestyle factors (such as weight management and smoking bans), assessment of risk (such as functional movement analysis and screening), and physical outcome assessments aligned to job role (13).

21. SP, regular and reservist, are required to meet certain low-level standards before increasingly arduous training is commenced. Digitally based, using videos to demonstrate technique, individuals complete a mandatory number of sessions during Phase One training package. Trained strength training aims at maintenance of fitness level, and for the Army, the Service Conditioning Review (SCR) introduced in 2019 is a gender and age-free strength and conditioning diagnostic tool, assessing the multiple components of fitness. This is completed every six months, with focus on upper and lower limb muscle strength, endurance and flexibility, and anaerobic and aerobic fitness (14).

22. Current health and well-being issues amongst young people in the wider community are not unique to the UK. SP recruitment and retention, maximum operational deployability and the significant lifetime human and financial costs of Musculoskeletal injury, have led to mitigation and prevention programmes (MSK-IMPPs) being developed worldwide. These include in the US and Nordic countries, with similar military Musculoskeletal injury patterns, downgrade, medical discharge and compensation claims as the UK. Emergence of best practice unified evidenced approaches are however presently hampered by a lack of common definitions and data collected.

23. To explore some of these limitations and possible remedies, MSK-IMPPs are the subject of a growing international literature (15)(16). Overall, primary studies are of low quality. A recent review involving UK and US experts assessed the international literature to April 2022 to identify (1) barriers and facilitators to implementing and scaling MSK-IMPPs; (2) gaps in MSK-IMPP research; and (3) future research priorities (17). Of 132 articles reviewed, most were primary research studies (90; 68.2%) and the remainder, review papers (42; 31.8%). Among primary studies, 3 (3.3%) investigated only women, 62 (69%) only men and 25 (27.8%) both sexes.

24. The review identified lack of consensus on definitions, surveillance measures and programme reporting outcomes and standards. Barriers to programme implementation were: (i) lack of stakeholder engagement, including sponsorship by senior officers, and lack of enthusiasm and motivation in SP and instructors; (ii) limited resources, particularly, time in busy training schedules so that, for example, opportunity for extended build-up prior to formal traditional training was difficult; (iii) competing military priorities and relative ease with which preventive programmes may be deprioritised; and (iv) equipment-related factors. Facilitators included: (i) strong stakeholder engagement; (ii) targeted programme design; (iii) involvement of Musculoskeletal injury experts; (iv) education about the importance and utility of mitigation and prevention particularly for end-users and instructors; and (v) end-user low burden and acceptability. The review concluded that future MSK-IMPP research should systematically evaluate and formally report details about implementation strategies, barriers and facilitators as well as efficacy and effective outcomes.

Recruit Training

25. UK Armed Forces recruits train in two phases. Phase One is initial recruit training to bring all recruits to a similar standard of basic military ability. Upon completion of Phase 1 training, recruits (except for Army infantry roles, and the Royal Marine Commandos) progress to their trade-specific Phase Two training, made up of courses of varying duration to prepare recruits for their assigned role.

26. The length of Phase 1 recruit training varies according to service and trade. The British Army Phase 1 training, for all units other than infantry, lasts 14 weeks. Infantry units of the British Army undergo a combined 28 weeks of basic training, with for the Parachute and Guards Regiments (30 weeks) and the Royal Gurkha Rifles (36 weeks). The Royal Air Force and the Royal Navy provide 10 weeks of basic training for all enlisted recruits, regardless of trade, while the Royal Marines, excluding the Royal Marines band, undertake 32 weeks of basic training. Officer recruits undertake basic training for the Army, 44 weeks, at Royal Military Academy (RMA) Sandhurst; Royal Air Force, 24 weeks, at RAF College Cranwell (MIOTC); Royal Navy, 30 weeks at Britannia Royal Naval College (BRNC) in Dartmouth; Royal Marines, 15 months, at Commando Training Centre Royal Marines, with 3 weeks towards the end of the course in the United States. Once recruit training is completed, cadets progress to their trade-specific training of varying lengths.

Sporting Injury

27. To combat the global increase in overweight, obesity, and pre-diabetes in the young, recent years have seen national and international general community campaigns to increase physical and mental fitness through sport, with girls and women increasingly involved in football, basketball, netball, rugby, and non-contact team sports. Sport, including team sports, both organised and recreational, is similarly important in the Armed Forces, as are the increasing number of sport-related vocational training and research studies involving young people, including women.

28. General population studies of sport-related injuries and their sequelae are providing useful insights on specific types of injury, and annual incidence in different age and sex groups. Peak age for knee injury in both sexes is 15-24 years, with the most common specific injury being anterior cruciate ligament (ACL) tear. Women have two to eight times higher risk of ACL rupture than men (18). Management of these injuries often involves physical and surgical interventions and prolonged rehabilitation. In many cases there is interval development of osteoarthritis, with one study of young female football players showing radiographic knee osteoarthritis among 42% of players following ACL reconstruction by 12 years after the injury (19).

29. A recent Australian epidemiological study described an analysis of longitudinal data on 228,344 knee injuries from the National Hospital Morbidity Database over the period 1998-2018 (20). The main outcomes were population-related knee injury incidence per 100,000 and sex and age-related annual increasing injury rate over the period. During follow-up there were significant increases in total knee injuries, ACL injury and knee contusion in males and females. Posterior Cruciate Ligament (PCL) injury and dislocations increased in females but not in males. Males had

greater overall incidence of knee injuries but the gap between incidence in the sexes narrowed over the 20-year follow-up period. ACL injuries had the highest annual growth rate of all injuries, particularly in young females aged 5-14 years.

30. These findings reflect wider international research. A 2020 study from Finland over an 18-year period also confirmed growth in ACL injury incidence in females aged 13-15 years (21) and two studies from Sweden and the US, recorded similar trends in knee injury rates with sex and age (22) (23). Knee injury incidence, most commonly ACL, increased during childhood, peaked at ages 15-24 years then gradually reduced with many injuries associated with subsequent osteoarthritis (24).

31. Covid-related lockdown, with resulting reduced and now delayed face-to-face clinical consultations, investigation, and treatment interventions, have underlined the size of human and healthcare challenges of Musculoskeletal disorders. These demand urgent attention to protection and prevention measures for military injury and osteoarthritis, with consideration given to the effectiveness of longer duration enlistment training programmes providing more gradual conditioning to full fitness. This should include evaluation of effectiveness and in addition, education and compliance.

Defence Statistics AFCS Data to 31 March 2023

32. Digitisation on Defence claims and awards is proceeding but to date AFCS statistical data remains paper based. While 2022/23 claims rate and clearance times are returning to 2018/19 levels, the data presented in this Seventh IMEG report are provisional and limited. Since introduction of the AFCS, a total of 117,145 claims have been registered, including 8,306 in 2022/23, and more than 113,000 cleared. Overall, 53% of claims have been accepted and a lump sum paid, less than 10 % with an additional GIP; 12% have been accepted but deemed below compensation threshold and no award paid; and 30% have been rejected.

33. Over the period 6 April 2005 to 31 March 2023, the most common category of AFCS claims has been musculoskeletal disorders, accounting for 46% of total claims (with the related traumatic physical injuries, Table 8, Fractures and dislocations, responsible for 24%, Table 2, Injury, wounds and scarring, 15 % and Table 5, Amputations 7% of total claims). In terms of awards including GIP, Musculoskeletal disorders make up 13%, Fractures and dislocations, 17%, and Injury wounds and scarring, 15% (25).

Defence Statistics Tri-service Medical Discharges 2018-2023

34. These data are also provisional and do not necessarily reflect prevalence of disorders, but are affected by changed practice, mainly related to the pandemic, in-service activities, boarding procedures, employability standards and retention policy. In the years 2018-23 about 1,500 personnel were medically discharged annually, with the most common causes across the single services being Musculoskeletal injury, and Musculoskeletal disorders. Of total medical discharges from the RN and RM, 46% were due to musculoskeletal disorders, for the army, 37% and RAF, 26%.

In 2022/23, those discharged medically were more likely to be women, other ranks, RM rather than RN personnel and over the single services of different average age. For RN and RM, 30-39 years, army 20-24 years and RAF, over 50 years (26).

Contemporary Medical Understanding of Osteoarthritis

35. Osteoarthritis is a major global cause of joint stiffness, pain and tenderness, increasing disability over time, low mood, poor quality of life and substantial healthcare costs. Often affecting weight bearing joints, osteoarthritis prevalence is increasing, with osteoarthritis knee responsible for about 85% of the world osteoarthritis burden (27). The precise reason for increasing osteoarthritis prevalence is unknown but thought to relate to increasing longevity, obesity and sedentary lifestyles (28).

36. Diagnosis is by clinical history, examination and imaging. There is no universally agreed definition of osteoarthritis, with rheumatologists preferring diagnosis by clinical examination and orthopaedic surgeons by imaging. This limits interpretation/comparison of the many diagnoses based on epidemiological studies, but the American College of Rheumatology (ACOR) considers diagnosis secure when three of the following are present: age over 50; morning stiffness of more than 30 minutes; crepitus in the joint; bony tenderness and enlargement; and no heat emanating from the joint. The WHO definition requires abnormalities on imaging, including joint space narrowing, presence of osteophytes, bony sclerosis, and cysts. Radiological changes are usually graded according to the Kellgren-Lawrence scale with a score of 2 or over confirming osteoarthritis, met when joint space is narrowed by 50-75%, without osteophytes or bony sclerosis (29). There is poor correlation between radiological change and symptoms. In one study, only 40% of those with moderate radiological change were symptomatic and only 60% with severe change (30).

37. While cartilage degeneration is central in osteoarthritis, there is failure of the whole joint, with thickening of the subchondral bone and osteophyte formation, synovial inflammation, ligament degeneration, joint capsule hypertrophy and changes in peri-articular muscles, nerves, bursa and fat pads (31). MRI of the affected joint is much more sensitive and specific than is standard radiography with x-rays (32). This means that there is greater accuracy with an MRI, that a normal MRI does effectively exclude some conditions such as osteoarthritis, but also that the presence of positive signs of osteoarthritis in an MRI may occur well before any symptoms are present. Occasionally, the early signs such as subchondral oedema may also imply the development of osteoarthritis when in fact it can be a transient/self-limiting phenomenon due to trauma, or spontaneous but potentially resolving conditions such as transient osteoporosis. Once established, osteoarthritis natural history is variable. Risk factors for progression include increasing age, co-existent other types of joint disease (e.g. gout), generalised osteoarthritis affecting multiple joints, peripheral neuropathy and, particularly for the knees, obesity (33). Osteoarthritis was originally considered an inevitable age-related wear and tear condition, the wide variation in disorder presentation and progression, and the presence in many cases of predisposing factors, suggesting that its development may better be described as a final common pathway, following different primary events and circumstances.

Pathogenesis of Osteoarthritis

38. The pathogenesis of osteoarthritis remains elusive despite major research effort, with some progress over the last hundred years. For cartilage and joint preservation, there must be a balance between cartilage cell (chondrocyte) catabolic (degenerative) and anabolic (regenerative) processes. This cartilage homeostasis is thought to be mediated by suppression of pro-inflammatory cytokines and other inflammatory mediators, with increased anti-inflammatory signalling and reduction of enzymes that degrade the cartilage matrix (34). Joint overload leads to enhanced catabolic activity, cartilage defects and development of osteoarthritis.

39. Osteoarthritis pathogenesis was originally studied in small rodent models which do not precisely replicate all the features of human osteoarthritis. More recently, research has turned to in vitro cartilage cell monolayer cultures. Although at an early stage, there is now much interest in micro-physiological systems which use living human cells, multiple tissue components, and microenvironment to provide a 3D culture model, allowing study of the cellular and molecular interactions and mechanisms in osteoarthritis (35).

40. Several studies have estimated the time for development of osteoarthritis after traumatic injury, but results are heterogeneous, with different study designs, follow-up times, criteria for injury and osteoarthritis diagnosis, initial injury mechanism, severity, treatment (physical or surgical) and rehabilitation, as well as personal characteristics of study subjects such as Body Mass Index (BMI), physical activity and pre-injury training. One study looked at development of osteoarthritis after non-combat knee military injury, finding 10% developed osteoarthritis after knee injury over 20 years with, on average, 4 years from injury to osteoarthritis diagnosis (36). While in another series of osteoarthritis occurring after serious combat-related injuries, osteoarthritis diagnosis was made at a mean period of 19 months after injury (37).

41. A principal problem with this lack of understanding of osteoarthritis mechanisms is the inability to develop personalized treatments or disease-modifying pharmacological treatments for osteoarthritis prevention after trauma, or to slow progress of early osteoarthritis. Best practice treatment remains limited to life-style changes, physical therapy, non-steroidal anti-inflammatory drugs, and end-stage joint replacement and revision.

Predisposing Factors for Osteoarthritis

42. When present together, predisposing factors may further increase the risk of osteoarthritis development. They include:

Ageing, the single largest factor, with the long-term prognosis civilian population Framingham study finding prevalence of radiological osteoarthritis of 12.9% in those aged 30-40 years, compared with 43.7% in those aged over 80 (38).

Trauma, where there is intra-articular damage/fracture, subsequent joint instability or abnormal loading, cartilage damage, especially of the knee, estimated to account for 12% of all osteoarthritis (39). While individual studies cite different figures, there is clear risk of knee osteoarthritis following ACL rupture, further raised by additional meniscal injury. One study estimated a 21% risk following ACL rupture, rising to 48% with additional meniscus injury (40).

BMI over 25 is another risk factor with the mechanical force on the knee in walking, 3-6 times body weight. A 2015 systematic review and meta-analysis found a doubling of risk of knee osteoarthritis in older overweight and obese adults (41), while the Framingham study of osteoarthritis knee in women suggested weight loss of about 5 kg, i.e. 2 BMI units over the ten years before the study examination, reduced the risk of developing symptomatic osteoarthritis by about 50% (42). High body weight is associated with an increased risk of developing systemic metabolic inflammation and Metabolic Syndrome. Various studies in Africa and the Far East have suggested that the features of Metabolic Syndrome, comprising hypertension, hyperlipidaemia and impaired glucose tolerance, are all strongly associated with advanced radiographic changes, and painful and disabling knee osteoarthritis, but more recent reviews found no significant association, noting the cross-sectional design of studies and lack of adjustment for BMI or body weight (43)(44). The authors went on to conclude that longitudinal (prospective) studies were needed, but at present an association between osteoarthritis knee and metabolic syndrome or its component parts has not been proven.

Genetics and heredity. Osteoarthritis is increasingly viewed as a polygenic multifactorial process, damaging the cartilage extracellular matrix, and causing cartilage fibrillation (degeneration) and erosion of the joint surface. Family and twin studies suggest that 40-80% cases have a family history and are genetic (45)(46). Genetics is also thought to influence the age of osteoarthritis onset, joints affected, severity and progression. The same gene sequences overlap with height, bone shape and articular area which may further predispose individuals to, osteoarthritis e.g. hip dysplasia.

Sex differences. Women over the age of 50 in the general population have greater osteoarthritis prevalence, pain severity, and disability at the same levels of radiographic osteoarthritis changes as men (47). Currently, the underlying mechanism is not known, with inconsistent findings in different studies. However, biologically determined sex differences including anatomical knee shape, bone mineral density, hormones and immune function are thought to play a part (48). There are also studies on osteoarthritis of the knee where sex differences such as perception of pain, different levels and types of physical activity, and effects of BMI on osteoarthritis progression have been identified (49). While the increased prevalence of osteoarthritis knee in older women compared with men has often been linked to body weight, osteoarthritis in the finger and thumb is also more common in women (26% compared with 16% in men) (50). Defence prioritises diversity and inclusivity, and since 2018 women have been able to take up any principal service occupation in the three Services, including front line service. Currently, across all three services and roles, there are about 17,000 women, representing 10-12% of Armed Forces total, with a government target of 30% women in Defence whole force (uniformed and civilian personnel) by 2030. To date, there are no robust large studies of UK or international military Musculoskeletal injury and osteoarthritis in women, and similarly in the extensive international civilian occupational published research, reflecting the workforce at due dates. Research has been almost all restricted to male populations.

Cigarette smoking. There have been reports of a possible protective effect of cigarette smoking on osteoarthritis over the last thirty years. However, study findings have been inconsistent, and on balance no such effect is proven. The studies themselves are heterogeneous and with limitations, including small study size, cross sectional and case control design, different and limited joints studied, smoking habit self-reported, and rarely through-life (51)(52).

Civilian Occupational Studies of Osteoarthritis

43. It is generally agreed that there is moderate to good evidence that heavy civilian occupational lifting (chronic joint overload,) especially if combined with kneeling or bending the knees, is associated with the development of knee osteoarthritis (53). Most international occupational studies are based on a working week of 35-40 hours, five days a week, 40-45 weeks a year for typically 10, 20 or more years of load exposure. Individual study results show broad trends, but results are inconsistent. Demonstrable doubling of risk on balance of probabilities is rare, and studies may be further complicated by co-existing undeclared traumatic injury, not necessarily occupation related. Study limitations derive from:

a. Different diagnostic criteria for osteoarthritis, clinical or radiographic or both.

b. Study design and sample size. Most studies are retrospective, case-controlled, with few prospective studies, and in terms of exposure, are often reliant on self-reporting, with high risk of recall bias. In many systematic or umbrella reviews and meta-analyses, individual study quality is judged overall to be low.

c. Populations sampled are often innately biased convenience samples, e.g. orthopaedic clinic attendees or people on waiting lists for joint surgery.

d. Research confounders are often not controlled for, with no information on traumatic injuries while in occupation, or pre-employment in childhood and adolescence, nor on sports played, intensity level and frequency. Similarly, no lifestyle factors such as BMI or smoking are recorded.

e. Occupations and their associated tasks are not defined, and can have quite different meanings in different industries, generations, and locations. Few studies include information on exposure dose and some even omit duration of occupation. Exposures may be described as categorical rather than the more accurate continuous variable.

f. Publication bias, especially with earlier published studies.

g. A major limitation in the AFCS context is the lack of either general or gender based military epidemiological studies.

44. The fact that service personnel undertake heavy lifting and carrying, crawling, running and walking, often loaded, over rough terrain, kneeling, squatting, and climbing ladders is not in dispute. However, the nature of military activities and life-style, rather than the regular civilian job pattern, content and hours worked make it inappropriate to simply extrapolate outcomes of civilian occupational load studies to the Armed Forces context.

Osteoarthritis in the Military Context

45. In the Iraq and Afghanistan conflicts, multi-ligamentous knee injuries were common. A 2017 US study of combat related multi-ligament injury, defined as rupture of two or more knee ligaments, found that only 41% of personnel returned to duty. Predictors of poor outcome included high energy injury mechanism, compartment syndrome, neurovascular injury, traumatic knee arthrotomy (surgical exploration of the knee joint) and associated same side open wound limb injuries. The number of ligaments injured did not predict outcome (54).

46. A US data linkage study of battlefield injuries based on US Army Physical Health Evaluation Board results, reviewed data from 1,566 wounded personnel, identifying permanently disabling conditions preventing return to duty and whether these were pre-existing or caused by combat injury (38). The most common "unfitting condition" leading to medical discharge was osteoarthritis, which was diagnosed in 126 cases. 94.4% of the osteoarthritis cases followed combat injury and the remainder were present before deployment or documented as occurring from a non-combat cause. The most common combat injuries in the series were intra-articular fractures due to blast, fragmentation damage, or gunshot wounds. Osteoarthritis development was recognised in 60% of the combat related injuries. This contrasts with the estimated 12% of osteoarthritis cases related to civilian traumatic injuries, in one study estimating the proportion of patients undergoing total joint replacement (hip, knee or ankle) (55). In the Rivera combat related study (38), rates of osteoarthritis development differed with the joint affected by the primary traumatic injury, occurring in 100% of knee injuries, 90% of elbow or ankle injuries but of only 21% of hip injuries.

Treatment of Musculoskeletal Injury and Osteoarthritis

47. Following clinical diagnosis and investigation by imaging, with or without arthroscopy, best practice management of Musculoskeletal injury and osteoarthritis increasingly relies on pain relief and intensive physical therapy for the initial injury. Where surgery is required, e.g. with ligament rupture, timing of surgery following the injury event is important, with risk of worsening of damage if undertaken either too early or too late. Adequate rehabilitative physical therapy, with good patient compliance, is also key.

48. The military care pathway for most single minor or moderate lower limb Musculoskeletal injury and overuse disorders is based first in primary care units (PRUs), led by GPs and physiotherapists. Where clinical improvement is slow, referral is made to a Regional Rehabilitation Unit (RRU), there being 16 across the UK. Here physical rehabilitation and education courses, typically for non-specific low back pain and exercise-induced lower limb pain but not complex trauma, last for two to three weeks. For more severe complex and multiple injury cases, or if there is poor response to management of the underlying injury, and chronic pain develops, onward referral from the RRU to DMRC, Stanford Hall, near Loughborough, may take place. Treatment here is residential, multidisciplinary, holistic and team based, led by Defence secondary care consultants in medical

rehabilitation, rheumatology, and sports and exercise medicine, with access to occupational physicians, who advise on downgrading and medical employability, pain specialists and team members including physiotherapists, occupational therapists, exercise rehabilitation instructors, and social workers. Defence service consultant orthopaedic surgeons are embedded in NHS Trusts where they run dedicated military clinics. Because of the need for deployability readiness as quickly as possible, procedures such as arthroscopy may be Defence funded with private contractors. For formal specialist mental health interventions, patients are referred to Defence Department Community Mental Health (DCMH) clinics (56).

49. DMRC has no direct role in delivery of injury protection and prevention but advises on strategy on education and single service protocols for recruitment, untrained, trained and in-service fitness training**.**

Military Medical Downgrading and Medical Discharge Policy

50. Advice to the executive i.e., chain of command, on the medical fitness of an individual, is provided by DMS doctors through the award of a Joint Medical Employment Standard (JMES). The JMES is then used to inform the decision by the employer on whether that individual should be retained, if functional capacity permits, or whether retention is precluded, and termination of service is appropriate. Each case is considered on its merits. Medical and Employment Boards determine an individual's likely recovery outcome, an Individual Recovery Plan (IRP) and discharge date.

51. Successful treatment and medical employability upgrading and return to duty is central to Defence priorities of optimal operational deployability, with maximal numbers of SP fit to fight, and wherever possible, retention of trained personnel in their own job or another suitable role or service.

Defence Recovery Capability Holistic Transition and Resettlement

52. A key aim of military treatment and rehabilitation for all disorders and injuries is a level of functional capacity that allows the SP to remain in service, in own role or other suitable post or service. Complementary to medical rehabilitation, where medical fitness for service retention is an issue, the command-led Defence Recovery Capability (DRC) addresses non-medical issues and support to return to duty, or to prepare for medical discharge and civilian employment. Support may be from the parent unit but for more complex cases, reflecting the different employment requirements of the three services, there are single service Recovery Pathways and the Battle Back Centre (BBC). Battle Back is tri-service, with multi-activity courses run by the Royal British Legion, promoting self-confidence, motivation, ability to deal with stress and develop a positive mental attitude and focus on what the service person **can** do rather than on limitations and restrictions.

53. IRP include medical, welfare, housing, education, re-skilling, Return to Work (RtW) Programmes, work placements and employment opportunities. As is relevant to the individual service person, MOD, including DBS, Veterans UK and the Veterans Welfare Service, and the UK

health departments and NHS, work with the ex-Service charities, statutory and non-statutory bodies, local community service providers, delivering a service empowering and promoting independence, and able to give through-life support (57).

54. The mnemonic **HARDFACTS** covers factors addressing all the areas of an individual’s life.

HARDFACTS Outcomes relate to:

Health. The patient care pathway is managed by the unit medical staff with the Regional Occupational Health Team (ROHT) in the lead. As appropriate, patients undertake recovery duty, with work in a military environment where clinical and occupational health staff advise on medical rehabilitation and functional capacity for work.

Accommodation and Relocation. This covers health, training, education, employment, and family requirements. The Joint Service Housing Advice Office (JSHAO) is the point of contact for housing matters, and the Haig Housing Trust is the Confederation of Service Charities (COBSEO) designated lead service housing charity.

Drugs and Alcohol. Problems in these areas may adversely impact optimal Recovery plans and so early engagement with experts, including in the third sector, is essential.

Finance and Benefits. The aim is financial awareness and independence and ability to support self and dependants. This includes early forecast, of any ill-health pension benefits.

Attitude, Thinking and Behaviour. Those being discharged need to be self-reliant, have a positive mental attitude, able to engage with appropriate welfare support. Several stakeholders, statutory and third sector, provide assistance and direction to other facilities.

Children and Family. Ensuring the needs of the family and any children is a high priority. Vulnerable individuals are identified and referred to the appropriate support organisations. Again, this may include connection with the third sector.

Training, Education and Employment. This relates both to courses while employed, or full-time education.

Resettlement

55. For those being medically discharged, Resettlement, lasting from two years prior to service termination date to two years after that date, prepares service leavers to gain paid civilian employment post discharge. Available to all service leavers, with provision dependent on length of service, resettlement courses are provided for all medical dischargees regardless of service duration. Resettlement services are delivered by the Career Transition Partnership, MOD, plus the contracted-out service partner, and include advice, guidance on available support, CV writing and job finding and training courses. Where civilian employment is not appropriate for medically discharged personnel, Resettlement training may be transferred to spouse, civil or eligible partner (58).

Compensation - AFCS Claims and Awards for Musculoskeletal Injuries and Disorders

56. The Covid pandemic and lockdown changed both Armed Forces activities and the arrangements for AFCS claims administration. While recent statistical data are therefore provisional, they are considered indicative. From AFCS introduction in 2005, about half AFCS claims have been for Musculoskeletal injuries and disorders.

57. AFCS differs from the War Pensions Scheme in that claims may be made in service. Over the period 2005 to the end of 2014 and withdrawal from the Afghanistan conflict, the majority of lower limb Musculoskeletal claims were for Improvised Explosive Device (IED), fragmentation and gunshot wound-related traumatic injury. Many of these were complex polytrauma, unsurvivable in earlier conflicts, involving large areas of lower limbs and many structures, amputation and concomitant serious direct injury to other body systems, e.g. traumatic brain injury, acoustic trauma, abdominal or chest injury.

58. Ten years on, the most frequent Musculoskeletal claims remain lower limb injuries, now single minor or moderate sporting or training injuries in young service personnel, and on average less complex and disabling than many of the combat related injuries. A similar pattern is seen in the US Armed Forces, with the knee most commonly involved, and in one series, osteoarthritis being one of the top two most common causes of medical discharge in each of the last ten years (59).

59. Another significant group of UK Musculoskeletal claims are from older personnel, aged 45-55 years, coming to the end of long (typically over 22 years) service. Senior NCOs, they often claim for osteoarthritis, most commonly of the knee, or low back pain, which they relate to chronic overuse, the cumulative physical demands of long-term military training, fitness tests, and deployments including training and combat. While sustained physically demanding routine heavy lifting and carrying loads over rough terrain, regular fitness tests, squatting, crawling, climbing ladders and often combinations of lifting and knee bending or running, applies to many service principal employments, as personnel age and are promoted, they often pursue managerial, predominantly desk-based employments. In many claims, contemporaneous documented reference to an event or injury, medical help seeking, or employability downgrading is rare, with claimants stating reluctance to report minor or bearable injuries, fearing adverse impact on their career. Instead, they continue service duties and physical activities, potentially exacerbating the underlying pathology and functional effects. Quality equitable claim determination requires thorough scrutiny of the case facts.

60. Service duration on average for Other Ranks (OR) is around ten years, and about fifteen years for officers. Whether normally or medically discharged, most service personnel at termination have many years of active and fulfilling life remaining. The Boyce review of 2010 acknowledged that medical discharge is often for protection from worsening, rather than required for the direct disabling effects of the invaliding condition (1). The review also commented that ageing itself is likely in most cases to limit the duration of the required physical fitness level for much ground based service, concluding that while the scheme aims for and should guarantee a fair deal for all those entitled to compensation, with due recognition to the needs of those most seriously disabled, awards should

not act as a disincentive to engage with prevention and, in the event of injury, treatment and rehabilitation. Reflecting the evidence that paid work is generally good for health, "Encouraging Employability "is another principle of AFCS. The contribution to UK society of those who serve extends into post-service life, where the innate military attributes of trade training, resilience, initiative, collaborative ethos, and team working may be particularly valuable.

Civilian Employability Traumatic Physical Injury and Musculoskeletal Disorder Assessment

61. Musculoskeletal disorders are one of the leading causes of loss of civilian productivity including sickness absence. Despite vast improvement in health and safety, physical injuries remain a notable cause of absence. An ageing population and increasing retirement age mean a higher proportion of working age population with chronic Musculoskeletal disorders such as osteoarthritis. On the other hand, society's move from heavy manual roles to less physically demanding jobs, as well as technological advances that reduce the physical demands even in historically demanding jobs, enable people with Musculoskeletal conditions to be economically active despite their symptoms. The risk assessment and management approach is another factor in preventing injuries and enabling those with Musculoskeletal symptoms to continue working. Flexible working, engineering solutions, assistive technology, additional support from peers and management are all important measures.

Clinical Expert Response to Questions from DBS Decision-Makers, Medical Staff, Claimants and their Representatives

1. What is the relation between aseptic bone necrosis and osteoarthritis?

Response:

62. Aseptic necrosis of bone is a condition which is largely a separate entity from OA, although they may coincide in the same joint or patient in one or two specific circumstances. Aseptic necrosis is a condition in which a portion of a bone (often the femoral head or a part of the knee femoral condyle) loses its blood supply. This may recover spontaneously and if there has not been too much damage to the affected bone in the interim there could be full clinical recovery (this may take several years). Where the damage to the bone, while without a blood supply, has been too great, in part also due to expected wear and tear, the structural integrity of that bone may deteriorate suddenly once the blood supply recovers and this leads to rapidly progressive secondary osteoarthritis. Normal repair processes would be prevented by the lack of a normal blood supply. This condition has various causes, amongst which are excessive alcohol intake, corticosteroid treatment, sickle cell disease, Caisson disease (decompression sickness) and various metabolic disorders. The condition can arise (in the hip) as a result of dislocation, fracture of the femoral neck and rarely as a result of severe trauma to the hip without fracture or dislocation. If caused by these forms of acute trauma

the subsequent aseptic necrosis would be expected to develop within the subsequent year or two, although signs may be present on MRI scan much earlier than that.

63. The second way in which osteoarthritis and aseptic necrosis could coincide would be in the older age group where osteoarthritis has already become established. In some such patients, rather than gradual progression of osteoarthritis, the patient may occasionally develop extremely rapid (within weeks) progression of both disability and radiological signs of structural bone collapse particularly affecting the hip. The patient will then usually come rapidly to hip replacement, and at operation the femoral head shows signs of gross disintegration.

64. Both these associated conditions are quite uncommon. Aseptic necrosis developing in another joint after a patient suffers injury (e.g. right hip osteoarthritis in someone who had a long past injury to the left leg) is unlikely to be related to the earlier injury and more likely to relate to one of the other causes of aseptic necrosis such as excessive alcohol consumption (11).

2(a) How should AFCS approach Osteoarthritis development and joint replacement in lower limb Musculoskeletal injury attributable injuries and disorders?

2(b) Specifically, what should be the approach where symptoms and Osteoarthritis development and joint replacement manifest only many years after the index event?

Background:

65. For accepted traumatic physical injury, subsequent development of osteoarthritis at a time interval from claim and award for the primary injury is an issue, and at the outset of AFCS, which coincided with high combat activity and frequent blast-related polytrauma, the decision was made to take the development of osteoarthritis into account in the primary award where injury was clearcut, severe, and there was evidence that it involved the joint.

66. For situations where osteoarthritis has developed many years later and often without identification of a significant index injury documented in Service Medical Records at or around the event, it is for the decision-maker, with medical advice, as required, to make a decision dependent on case specific military facts, for example 20 years' service, RM commando or parachutist, versus someone working in stores or office based for six years undertaking only obligatory fitness tests and related training.

Response:

67. There are essentially two broad categories of acute traumatic physical injury in this respect:

(2a) There is a group of individuals in whom a fracture or dislocation occurs in relation to a joint, and what appears to have been a normal joint deteriorates rapidly over the next 2 years (or perhaps a much shorter period). These should be easily identified by examination and x-ray, with follow-up within the next 2-4 years, provided initial and follow-up x-rays are available.

(2b) The second group show later changes, and these can sometimes develop many years later. Diagnosis should still be straight forward if initial and follow-up x-rays are available, but causation can be more difficult to attribute. The difficulty in this instance is separating out those cases where the patient has had a specific injury affecting the joint from those who might simply be developing osteoarthritis. Unequivocal and documented injury to a joint is unarguably a risk factor for subsequent osteoarthritis. There are two civilian studies that show this (53)(60).

The approach is reasonable for category (2a), where the injury was clearcut, severe, and there was evidence that it involved the joint. This contrasts with (2b) where there might be a possibility of the injury causing arthritis later, but the initial injury was not particularly severe, and the initial evidence of joint damage was either absent or uncertain. The automatic early post-injury inclusion of osteoarthritis risk is then much more debatable.

68. If the person is suffering from few or no symptoms related to the joint in question during the first few years following injury, but then develops osteoarthritis before their AFCS award is finalised, then it would be reasonable to accept that causation of the arthritis is attributable to the injury to the joint concerned. If there are symptoms in a joint that has not been clearly injured, but no arthritis has been detected by the time the AFCS award is finalised, then the possible future need for a joint replacement should be taken into consideration, depending upon the precise nature and duration of the military service of that individual. If there is no clear evidence of a specific injury to a joint, and the service activity has been of a relatively low intensity and/or of limited duration, then the evidence that subsequent joint replacement would be attributable to the person's military service is poor. In this situation the award should not include an element for future joint replacement. The existing review provisions can be used to rectify matters if it subsequently appears that an incorrect decision may have been made.

3. A common contention is that lower limb degenerative joint disease is an inevitable consequence of military service.

Response:

69. This is certainly a strongly held belief in many groups, including some of those involved in AFCS work and amongst some claimant groups. The amount of hard physical work and activity involved in some areas of the services is much greater than in others.

70. Clear evidence of a relationship between such activity levels and development of osteoarthritis in the absence of documented joint injury is difficult to obtain. This problem is exacerbated by the fact that activity is now widely accepted as being beneficial not only for the wellbeing of healthy joints, but also for symptomatic relief in the arthritic joint.

71. There is clear evidence of an increased risk of osteoarthritis in (a) those who are documented as being involved in certain specific types of activity with cumulative joint loading (61); (b) those who engaged in certain jobs in the civilian arena (62); and (c) those who have been engaged in military service (63)(64). However, although there are many such studies they need to be interpreted with caution. They usually include that group of service personnel who have been diagnosed with a

definite injury to a joint prior to osteoarthritis being diagnosed, and this group is not contentious. This group needs to be separated from those with no known joint injury, if we are to answer the question of whether osteoarthritis is produced simply by the level of activity involved in service life.

72. In general, such studies, where they show an increased occupational risk of osteoarthritis, show this risk to be around 1.4-1.6 times the rate expected in a similar control population. It is impossible to draw an accurate conclusion about the risk if those with documented joint injuries were to be excluded, but it is reasonable to suppose that the risk might be nearer to 1.25 times the expected level. Certainly, it is not likely that it would be higher than 1.6 times. This clearly casts doubt on the widely held belief that development of osteoarthritis is an inevitable consequence of service life because of the level of physical activity involved. In the absence of an injury to a joint, there is little evidence to suggest that activity alone leads to osteoarthritis, on the balance of probability. There may be some exceptions to this rule:

a. There are some studies suggesting that ultra-marathon runners who train by running hundreds of miles a week for long periods may be more prone to osteoarthritis in the hip and the knee. This does not appear to apply to those running moderate to high mileages (65)(66)(67).

b. Ballet dancers do seem to have a high rate of osteoarthritis. It may be that this relates more to the extreme positions into which they routinely force their joints rather than simply the amount of exercise they do. Certainly, most dancers are forced to stop performing at the highest level relatively early in life (68)(69).

For AFCS, an individual jurisdiction, with claims considered on their case facts, the matter should be informed by consideration of the claimant’s service role, activities involved and service duration.

4. Amputation and development of Osteoarthritis in other lower limb joints and the vertebral column.

73. Currently, we are beginning to see claims for osteoarthritis or pain in limb joints on the same or opposite sides as the amputation or in both limbs, and also low back pain. How should this be addressed?

Response:

74. As a general statement, orthopaedic surgeons and rheumatologists do accept that back pain and pain in other joints, both ipsilateral (but the same limb i.e. leg rather than arm) and contralateral are probably caused by and follow amputation in the leg. This is less clear in the arm. However, the evidence for this also leading to osteoarthritis is not currently very strong. As regards back pain, the inevitable limping and altered biomechanics when someone walks or runs with a prosthetic leg would predispose to back pain. This is more likely to affect those with above-knee than below-knee amputation.

Diversity and Inclusivity

75. IMEG regards issues of equality and diversity as core values and aims to avoid unjustified discrimination on equality grounds whether they be age, disability, gender, gender reassignment, marriage and civil partnership, pregnancy, maternity, race, religion or belief and sexual orientation. During the writing of this review, gender was identified as an issue, with Defence aim of 30% SP female by 2030. IMEG explored this in the context of Musculoskeletal training and fitness and has addressed it.

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Topic 4 - Noise Induced Hearing Loss

Summary and Key Points

1. Since the introduction of AFCS in 2005, hearing loss and tinnitus have remained the most common military civil and no-fault compensation claims world-wide. Reflecting the then current conflicts and AFCS claims, the focus of the 2013 IMEG hearing loss review was acute acoustic trauma/blast injury. Ten years on, with most claims now for chronic noise injury, this review will update progress on the 2013 topics and comment on recent research advances and issues raised by claimants and operational staff.

2. The causes of noise-induced hearing loss in Armed Forces personnel are discussed. Before the recent conflicts, military claims for acute acoustic trauma were rare, with most claims throughout the 20th century being for chronic broad band noise exposure. Recent (post 2015) claims are mainly for cumulative career noise from workplace, mechanized equipment, land, sea and air transport and episodic acute training and combat related impulse noise exposure from firearms and artillery. The

nature, diagnosis and assessment of acute acoustic trauma and chronic noise induced hearing loss are reviewed here, eleven years following IMEG's previous review in 2013.

3. Military acute acoustic trauma is most often an Army issue, less common in RN and RAF personnel. Diagnosis requires a clinical history of sudden hearing loss temporally related to a plausible environmental event. Typically, the audiogram shows hearing threshold lowering over a wide range of frequencies, particularly at 6-8kHz. The 3 or 4kHz maximal noise notch pattern seen with chronic noise exposure is less well established. In acute acoustic trauma at the lower frequencies, the threshold level may recover, while loss at the higher frequencies may persist, with short-lived tinnitus common immediately after the trauma. When removed from noise, any hearing loss, at one year after initial exposure, can be regarded as permanent. The audiometric pattern of civilian chronic noise induced hearing loss is usually bilateral and symmetrical (defined as less than 15dB audiometric difference between right and left ear air conduction), developing gradually and becoming symptomatic over time.

4. The AFCS compensation threshold for noise induced hearing loss, presently 50dB averaged over 1,2 and 3kHz, previously reviewed by IMEG in 2013, has been re-examined. In 2013 (and subsequently to date), literature scrutiny and discussion with experts has failed to identify new evidence to support revision. The 2013 report recommended a longitudinal follow-up study of in-service personnel with hearing threshold of 35-50dB averaged over 1, 2 and 3kHz. In response, the then Defence consultant adviser in otolaryngology reviewed 3,964 service personnel, finding only two with pure tone hearing thresholds of at least 50dB averaged over 1, 2 and 3kHz bilaterally. 31 personnel had average thresholds of 35dB or more, but not 50dB in at least one ear and only three had threshold of 35dB or more, but less than 50dB bilaterally. In 18 of the 31, and two of the three with threshold of 35dB or more but less than 50dB bilaterally, noise injury was thought unlikely to be the cause of the hearing deficit, suggesting the proposed study would not be feasible.

5. It has long been observed that normal pure tone audiometry may be associated with complaint of hearing difficulty for speech in noise, tinnitus and hyperacusis. These symptoms have generally been assumed to be due, not to cochlear damage, but to central auditory injury at the level of the brain stem or the cerebral cortex. More recently, cochlear synaptopathy has been proposed as the underlying deficit, and is the subject of a proposed new military noise related hearing loss assessment method. Despite recent published research, mainly in small rodents, findings are inconsistent, and evidence of noise induced cochlear synaptic damage in humans cannot be considered to have been established. However, given its prominence in recent medico-legal proceedings, IMEG recognises the importance of continued monitoring of further emerging evidence.

6. IMEG has reviewed the available evidence on the non-auditory effects of hearing loss, covering cardiovascular disease, vestibular effects, accidents at work, sleep and cognitive performance in young people and older age adults.

7. IMEG emphasises and endorses the need for hearing loss prevention and ear (oto)-protection in the Armed Forces. Early diagnosis of hearing problems and regular in-service surveillance informs decisions at enlistment, provides baseline readings for in service surveillance, medical grading and allocation of in-service role, as well as education on ear protection and noise.

8. Clinical management of established noise induced hearing loss is currently symptomatic, with digital hearing aids now being widely available. Other new suggested approaches to treatment, (stem cell, gene therapy and pharmacotherapy) remain in the research domain but offer some hope for the future. Hyperbaric oxygen therapy and local intratympanic administration of corticosteroids, administered alone or with systemic steroids soon after an acute acoustic event, can reduce inflammation in the inner ear and improve hearing thresholds with better outcomes than systemic steroids alone.

9. IMEG has reviewed the impact of noise induced hearing loss on military and civilian employability and medical discharges. From 2018 to 2023 of 1,970 personnel medically discharged from the RN and RM, 63 (3%) had ear and hearing disorders. For the Army, over the five-year period there were 4609 medical discharges, of which 128 (3%) had ear or hearing disorders. RAF medical discharges, 2018-2023 totalled 832, of which 8 (<1%) were for ear and hearing problems.

Background

10. Since the introduction of the AFCS in 2005, hearing loss and stand-alone tinnitus have been the most common military compensation claims world-wide. The last IMEG Review of hearing loss was in the 2013 Second report (1). Reflecting then current conflicts and in-service AFCS claims, the focus was acute acoustic trauma/blast injury. Subsequent IMEG reports covered the audio-vestibular aspects of traumatic brain injury (Sixth report) and tinnitus as a stand-alone disabling symptom (Fifth report) (2)(3).

11. For the 2013 Review, IMEG made findings and recommendations, informed by the published, peer-reviewed scientific and medical literature, discussion amongst group members and with other experts, military and civilian. Ten years on, this Seventh report will update progress on the 2013 recommendations, and comment on recent advances in understanding of hearing loss; causes of military sensorineural hearing loss; non-auditory adverse health effects of noise exposure; current best practice in investigation; and advances in prevention, oto-protection and treatment. The review will also cover issues raised by claimants:

a. The provision of hearing aids suitable for young people as a responsibility of the AFCS not the NHS.

b. Given the policy in other countries, awards for tinnitus and hyperacusis in the absence of audiometrically measurable hearing loss attributable to military service.

Civil and No-Fault Compensation Armed Forces Hearing Loss Claims Post the 2013 Review

12. From 2015 there has been a reduction in UK military acute acoustic trauma no fault and civil claims, but a marked increase, particularly in civil claims, for bilateral noise induced sensorineural

hearing loss Noise-induced Hearing Loss. In most cases this is due to cumulative noise damage over career, often a combination of acute impulse acoustic trauma, from combat and weapons training and chronic workshop, transport, aircraft, and ship noise exposure. The Control of Noise Regulations 2005 (4) specify a Permissible Exposure Limit (PEL) of 140dB for live firing training in the UK. As with many of our allies, the UK has several weapons that breach that limit, even with hearing protection worn correctly. Sound attenuation by the devices is also reduced in real-life situations compared with laboratory testing conditions, and although Defence policy is that protection is worn at all times, this may not be enforced or soldiers ordered not to use it, to maintain situational awareness. There is also a finite failure rate of protective devices, which can become unintentionally dislodged from correct positions especially in combat situations. As a result, civil claims have a high success rate.

13. Awards in civil damages, where negligence must be proved, include loss of amenity and reflect claimant individual circumstances and response to the accepted injury. By contrast, AFCS no-fault awards do not include loss of amenity, and for assessment of award, address deemed average functionally disabling effects by comparison of the injured person with an age and sex matched control person, without the claimed disorder. AFCS awards provide for pain and suffering via the lump sum, while for the most serious accepted injuries and disorders, the additional GIP, paid from service termination for life, is for deemed functional restriction or limitation and likely reduced earnings in future civilian employment.

14. AFCS can accept claims for **any** disorder or injury. Where a causal link to service is established, awards focus not on the diagnosis but on the associated functionally disabling effects, assessed as set out in the legislation, by comparison of the functional limitation and restriction of the claimant and the capacity of a healthy person of the same age and sex who is not injured or ill or suffering the claimed condition. Awards aim to be consistent and equitable within Tariff injury categories, with the most serious conditions attracting the highest awards, and across the range of disorders, so that there is parity of esteem. In this typically young population, for the most serious injuries and disorders, functionally disabling effects are considered particularly in terms of consequent limitation /restriction for suitable civilian employment.

15. Chronic noise damage is compensated under AFCS using descriptors beginning, “bilateral permanent hearing loss…” where there is:

a. Evidence of exposure to hazardous noise due to service on or after 6 April 2005.

b. Bilateral permanent sensorineural hearing loss with an audiometric pattern consistent with noise damage and a compensation threshold of 50dB averaged over 1, 2, 3kHz audiometric frequencies. This threshold does not mark the beginning of functional loss but equates to the long established 20% assessment in the War Pensions and Industrial Injuries Disablement Benefit Schemes. By its nature, and in contrast to acute acoustic trauma, chronic noise damage, like age-related loss, develops gradually, giving time for the person to adjust to its effects.

16. The 2010 Boyce Review revalorised AFCS awards for hearing loss, maintaining the awards for total deafness of one and two ears and increasing awards for all other descriptors by one tariff level (5). The first IMEG report (2011) increased the awards for total deafness (90dB average over

1,2 and 3Khz) in one and two ears, bringing them into line with awards for the loss of sight (6). IMEG (2013) recommended that tinnitus should be taken into account in all AFCS awards for Tariff Table 7 hearing descriptors (1). Reflecting the sudden onset of symptoms with acoustic trauma, IMEG's 2013 report recommendation, accepted by ministers, was that descriptors should merit a lump sum award one tariff level higher than the equivalent award for the audiometric chronic noise injury, but with the same GIP band. This is to take account of the sudden onset of a potentially functionally disabling hearing problem without time for adjustment, as found with a gradual cumulative chronic loss.

Award Statistics

17. In the UK, award of no-fault military compensation under the War Pension Scheme (WPS) or AFCS, does not prevent the service person also making a civil claim, with damages paid where lapse of duty of care is shown. Overall award is, however, adjusted in line with the government principle that double payment for the same injury or disorder is not appropriate. Following the pandemic and disrupted claims processing, Defence Statistics AFCS data in this Report should be viewed as provisional and minimum numbers. Between 1 April 2018 and 31 March 2023, 13,106 civil claims for noise induced hearing loss Noise-induced Hearing Loss were lodged against MOD, with annual claim numbers rising over the period from 1,557 in 2018-19 to 4,235 in 2022-2023 (7).

18. From 2005 and the introduction of AFCS, up to 31 March 2023, a total of 5,055 no-fault awards were made from Table 7 of the AFCS Tariff, headed "Senses" and covering both hearing and ophthalmological disorders. Awards are not made for stand-alone tinnitus, but all hearing disorder payments include an element for accompanying tinnitus. Of the total number of Table 7 awards, 1,300 included a GIP, of which 360 were for hearing disablement; while the 3,695 lump sum-only awards included 3,290 for hearing loss, most commonly for noise induced hearing loss and acute acoustic trauma (8). This pattern of claims and awards reflects that seen in military schemes in allied nations with, in the US Dept of Veterans Affairs (DVA), hearing loss and, separately, stand-alone tinnitus, overall being the most commonly compensated primary disabilities (9).

Tri-Service Medical Discharges for Hearing Loss

19. Regular service personnel with medical conditions or fitness issues which affect functional capacity to perform their duties, are referred to a medical board for examination and review of medical grading. In many cases, the person will first be downgraded for treatment, recovery, and rehabilitation. Where the individual's fitness then still fails to meet service retention standards for their role, the board may first consider and recommend retention, in another more suitable role, permanent downgrading with amended duties, or transfer to another service or branch. For others, medical discharge may be recommended in line with medical policy and single service retention standards. The recommendation is then forwarded to personnel administration units for the chain of command decision regarding discharge and action.

20. Practice and protocols for medical discharge differ across the three services, particularly for untrained personnel. Reflecting the physical demands and the need to access weapons with the associated risks in retaining personnel with mental health disorders, the most common principal causes of medical discharge for each service for the period 2018-2013 were musculoskeletal disorders, Tariff Table 9, mental and behavioural disorders, Tariff Table 3 and Injuries, wounds and scarring, Tariff Table 2. Other countries report a similar profile. The majority of those medically discharged for any reason are not, however, functionally precluded from suitable civilian work.

21. In the year 2022 -23, medical discharge rates for the Royal Navy (RN) and Royal Marines (RM) were 12/1000 service strength, for the Army 11/1000 and Royal Air Force (RAF), 7 per 1000. From 2018 to 2023 a total of 1,970 personnel were medically discharged from the RN and RM. Of these 63 (3%) had ear and hearing disorders. For 2022-23 with a total of 396 discharges, 9 (2%) had ear or hearing problems. For the Army, over the five-year period there were 4,609 medical discharges, of which 128 (3%) had ear or hearing disorders, while for 2022-2023 and a total of 953 discharges, 43(5%) were for ear or hearing problems. RAF medical discharges for the period 2018-2023 totalled 832, of which 8 (<1%) were for ear and hearing problems, and in 2022-23, the total of 216 RAF medical discharges included none for ear and hearing disorders (10).

Causes of Hearing Loss in the Armed Forces

22. Hearing loss is classified as either conductive (related to the outer and middle ear) or sensorineural (related to the inner ear or auditory nerve). The overall leading cause of adult-onset progressive Sensorineural Hearing Loss across the community is age-related hearing loss (Age Related Hearing Loss, or presbycusis). Usually bilateral and symmetrical, Age-Related Hearing Loss is multifactorial in causation with often a familial or other genetic link. Over 100 genes have mutations identified as resulting in hearing loss, without disorders of other organs or syndromes (Non syndromic hearing loss). Mutations in about a third of these genes are seen in adult-onset autosomal dominant hearing loss (11).

23. That noise exposure can damage hearing, has been known since the 18th century, with the World Health Organization estimating that globally one third of all cases of hearing loss can be attributed to chronic occupational noise (12). In the United States, among workers not exposed to noise, 7% have hearing loss, 5% have tinnitus, and 2% are afflicted with both hearing loss and tinnitus. However, among noise-exposed civilian workers the prevalence is significantly higher at 23%, 15% and 9%, respectively (13). Most of the recent AFCS hearing loss claims are for cumulative career noise and for acute acoustic trauma, from workplace, mechanized equipment, land, sea and air transport and training and combat-related impulse noise exposure from firearms and artillery.

24. The audiometric pattern of civilian noise induced hearing loss is usually bilateral and symmetrical (defined as less than 15dB pure tone threshold difference between right and left ear), developing gradually and becoming symptomatic over time, with a similar pattern in career-long military noise induced hearing loss. Noise induced hearing loss can be temporary or permanent, depending on the intensity and duration of noise exposure. Temporary Threshold Shift (TTS) reverts to pre-exposure levels of hearing over a few days up to 2 weeks. Hearing tests should be planned and timed in relation to noise exposure, taking account of Temporary Threshold Shift. Prolonged,

intense or repeated noise exposure can cause Permanent Threshold Shift (PTS). Civilians, even employed in the same industry, if not work-place, for many years, experience clear separation between work and home with opportunity for a regular noise “rest”. This is unlikely for military personnel where, although average service duration is, for many, only around ten years, work pattern is different and during conflict, or other contexts e.g. sea-going service, training deployment, home and work take place in the same space twenty-four hours a day.

25. Military acute acoustic trauma is most frequently weapons-related in combat or training, and less common in RN and RAF personnel compared with Army. For Army personnel, there is different incidence in soldiers, dependent on role and regiment, with infantry troops and high exposure to weapons more common than for personnel in the Adjutant General’s Corps (AGC). Overall, since the Great War and throughout the 20th century, military no-fault claims solely for acute acoustic trauma were rare. That changed with Iraq and Afghanistan and the use of Improvised Explosive Devices (IED). Diagnosis of acute acoustic trauma is by a clinical history of sudden hearing loss and typically an audiogram showing threshold lowering over a wide range of frequencies. At lower frequencies, the threshold level may recover well with time, especially if due to gunfire, while loss at the higher frequencies may persist, with short-lived tinnitus common immediately after the trauma. When people suffer acute acoustic trauma and are then removed from noise, any associated hearing loss, at one year after initial exposure, can be regarded as permanent (14).

26. Blast ear trauma may occur in an open or an enclosed space when pressure may be amplified. For the first five or ten minutes, there may be severe deafness with all audiometric frequencies affected, more common in the higher frequencies. Tinnitus, almost always present, usually resolves as does hearing deficit. While tympanic membrane perforation and middle ear damage may occur, perforation heals spontaneously in most cases, for example, in a Belfast restaurant blast study, in more than 80% of cases (15).

27. As discussed in the 2022 Sixth IMEG report, blast-related Traumatic Brain Injury of any severity was common in the recent conflicts, particularly mild Traumatic Brain Injury in US personnel (2). In one US study, 33% of personnel with Traumatic Brain Injury reported acute, 43% sub-acute and 9% chronic hearing loss damage. In another study over 90% reported tinnitus immediately after the blast event, with 70% having ongoing tinnitus at seven days and a third 10 days to several months post blast (16). In another study, over 90% reported tinnitus immediately after the blast event, with 70% having ongoing tinnitus at seven days and a third from 10 days to several months post blast (17). Research is ongoing into Traumatic Brain Injury, tinnitus, sensorineural hearing loss and PTSD, mechanisms, their interactions, investigation, and effective treatment. IMEG will maintain a watching brief.

28. Relevant to the Armed Forces are other causes of Sensorineural Hearing Loss, some of which inevitably co-exist with the Service-attributable noise effects. As personnel are exposed to service noise they are also ageing and at risk of non-occupational harmful noise exposure (so-called sociocusis). Some of this exposure is a matter of choice, associated with attendance at rock music concerts, use of power tools in DIY or gardening, listening to music at hazardous volume on personal devices, motor sports, and recreational shooting. Some is inevitable excessive environmental noise, for example, traffic noise. Other contributing causes of deafness, rare in the serving military population, include therapeutic drugs, such as aminoglycoside antibiotics and some cytotoxic cancer drugs. Unprotected occupational exposure to established industrial ototoxins such as styrene,

xylene, lead and mercury is rare in the 21st century in the military, but solvent exposure is more common and, as relevant, appropriate protection and surveillance measures apply.

29. Sensorineural Hearing Loss in military personnel can also be caused by viruses such as mumps infection, or as a complication of middle ear infections. In some cases, Sensorineural Hearing Loss can occur acutely without an apparent cause; sudden sensorineural hearing loss is typically unilateral, with bilateral cases possible but rarely observed (18). In Meniere's disease, predominantly low frequency fluctuating Sensorineural Hearing Loss is associated with episodic vertigo and ear pain in most cases. Although usually unilateral to start with, the hearing loss in Meniere's disease can become bilateral and progress over time (19).

30. Epidemiological research from cross-sectional studies shows strong association between Sensorineural Hearing Loss in mid and later adult life and cigarette smoking, alcohol, high Body Mass Index (BMI), and poorly controlled diabetes mellitus, suggesting a possible vascular link (20)(21). Lastly, autoimmune forms of Sensorineural Hearing Loss, again rare in military populations, may be seen in rheumatoid arthritis and systemic lupus erythematosus or in an idiopathic (cryptogenic) form. These are typically progressive, fluctuating and with a variable time course.

31. Many global studies of noise induced hearing loss are based on civilian occupation dating from the mid-20th century and may have led to the popular assumption that the prevalence of noise induced hearing loss is higher in general in men. The literature on women is more limited. In a recent review, sex differences are seen consistently in auditory function, with pre-menopausal women often showing better function than age-matched men; premenopausal women show fluctuations in hearing function across the menstrual cycle with better function during the oestradiol peak or when the oestradiol/progesterone ratio is high. The menopause generally marks the onset of symptomatic age-related hearing loss in women, characterized by a rapid decline in hearing sensitivity and more pronounced loss than in age-matched men (22)(23). Given the government aim of 30% women in the Armed Forces by 2030, we are confident that UK Defence is aware. IMEG will continue to monitor the literature on gender aspects of hearing loss.

Diagnosis of Hearing Loss

32. Early diagnosis of hearing problems and regular surveillance during service is important in military personnel, to inform decisions on enlistment, for baseline readings ahead of in-service surveillance, medical grading and allocation of in-service role/duties. Although hearing is multifaceted, ability to discriminate speech in noise is regarded as most functionally critical. Compensation for hearing damage in the UK Armed Forces is informed by pure tone audiometry, with diagnosis of noise induced hearing loss or acoustic trauma based on clinical history and audiometric pattern. There is no universal agreement on audiometric descriptors for noise induced hearing loss assessment, but in the UK, for civil claims and government military and civilian occupation no-fault compensation schemes, it is based on the average hearing deficit over 1,2 and 3kHz. Factors informing the choice of these frequencies include reliability and repeatability of readings, which is better in this range compared with at the extremes of the audiogram i.e. 500Hz and below or 6kHz and above, difficulty in measuring bone conduction thresholds above 3kHz, while the audiometric notches (hearing deficits), found in the typical audiometric pattern of noise induced

hearing loss, especially if narrow but deep, can inflate the threshold average in the region of the notch (24). Because age-related hearing loss frequently also affects the mid frequencies as well as higher frequencies, audiometric diagnosis of noise-related hearing deficit can be difficult as the person ages, and not every notch or bulge at 4kHz is a sign of noise damage (25)(26).

33. Pure tone audiometry is the current gold standard method of hearing assessment in the civil damages chronic noise exposure context. Sensitivity of sound perception is detected by the hearing threshold measured over frequencies 0.5-8kHz; the range 1-4kHz being generally considered most relevant for speech discrimination (27)(28). Pure Tone Audiometry is of limited value in predicting functional capacity in the individual tested, or situational awareness, sound identification or localisation, all relevant for military populations and weapons-related acute acoustic trauma.

34. Other methods being explored for future clinically routine detection of early hearing damage include transiently evoked or distortion product otoacoustic emissions (TEOAE or DPOAE) (29)(30). The sensitivity of young ears extends above 8kHz to 20kHz, and assessment of extended high frequency deficit may also have a role where ototoxicity is an issue (31).

Assessment of Hearing Loss

35. The importance of high-quality audiometry is increasingly recognised for audiogram comparison over a career lifetime, including for UK military noise induced hearing loss with frequent postings to different locations. Both at home and overseas bases, audiometers should be regularly calibrated, earphones and booths meet appropriate technical standards, with testing staff appropriately trained in audiometry technique. Pure tone audiometry is a subjective psycho-physical assessment dependent on subject co-operation. Test-retest reliability in an individual, even tested in good hands can vary e.g. in one study between 9 and 14.2dB for single frequencies, and confirmation of hearing threshold levels may require objective tests such as cortical evoked response audiometry (cERA) (32). A study of a military population claiming noise induced hearing loss found that about a quarter of all claimants had overestimated hearing thresholds, defined as average hearing thresholds determined by cortical evoked response evoked audiometry (cERA). These were 10dB, or more, better than by pure tone audiometry at 500Hz 1, 2 and 4kHz. The researchers concluded that the presence of a flat audiogram, and a hearing threshold of 25dB or more at 500Hz, are useful predictors of non-organic (functional) hearing loss and, when these signs were present, cERA, and steady state evoked potential responses now increasingly available in clinical practice, are recommended (1)(33)(34).

36. There is wide variability in measured hearing threshold levels amongst individual members of the general population of the same age and sex, and people differ in their concept of hearing functional normality (35). In 1992, the Inter Society Working Group on Hearing Disability (ISWGHD), set up in 1987 by the governing bodies of the UK hearing professional associations, published evidence-based recommendations for medico-legal assessment of hearing disability, particularly occupation attributable Noise-induced Hearing Loss. The report authors also explored the audiometric threshold marking the onset of disability, finding no clear point at which disability begins, but rather a continuum (24). Current international approaches to medico-legal assessment vary.

While sharing many principles with the ISWGHD report, the final recommendations were not universally accepted, and no definitive assessment protocol has been published and agreed.

The Compensation Threshold – 2013 IMEG Report Review and Recommended Study

37. An important recurring issue in civilian medico-legal cases is how to take account of confounding age-related loss as a person is noise-exposed and continues to age following removal from the noise. It has been previously generally accepted that the effects of exposure to noise in humans cease when the exposure ceases (36)(37)(38). As a result, noise and age-associated hearing loss are additive. Compensable noise induced hearing loss should be estimated at or near termination of occupational nose exposure, as is the practice for military noise induced hearing loss no-fault compensation in the WPS and AFCS. This view was confirmed by a 1997 UK expert committee chaired by the government Chief Medical Adviser (CMA) in the context of war pensions, and also later addressed by a US Department of Veterans Affairs (DVA) 2005 report, where the experts concluded that there was a lack of evidence to support delayed onset noise related hearing deficit or tinnitus for military noise hearing loss. (39)(9).

38. The assumption of additivity is also the basis of the International Organisation for Standardisation ISO 1999, which provides that overall hearing loss, H'= H+N /(H X N)/120, where H is constitutional loss, and N, noise related loss. It follows that where H+N is small, overall H' is effectively simply additive, but as ageing progresses and with that, age-related loss increases, the relationship between noise and age-related loss becomes less than additive (40)(41). These questions were explored in the 2013 IMEG report, when scrutiny of the evidence and expert discussion found that, at that date, the available evidence did not support anything other than that the effects of noise and age on hearing are generally additive except in the very old, when they become less than additive. The number of individual functioning cochlear hair cells, upon which hearing is dependent, is finite, and total loss of function can only occur once, whether due to noise or ageing with no increase in rate of decline after cessation of exposure. It was however noted that most of the relevant evidence in humans was based on studies of older people (aged 60 plus years) in whom even in those not occupationally noise exposed, baseline hearing thresholds were high (42)(43)(44). The WHO defines hearing threshold as slight at 20-40dB, moderate at 41-60dB, severe at 61-80dB and profound at 81 or more dB, averaged over 0.5, 1, 2 and 4kHz (45). Most experts would agree that above 30 - 40dB bilateral sensorineural hearing loss averaged over 1, 2 and 3kHz, a young person is likely to report difficulty with speech discrimination while anyone with a bilateral deficit of over 40dB would generally benefit from hearing aids (46)(47). Hearing aids may also be offered in some cases at lower levels of loss.

39. The 2013 IMEG review carefully also sought evidence to inform review and possible reduction of the AFCS compensation threshold, currently 50dB bilateral average over 1,2 and 3kHz. Literature scrutiny and discussion with experts failed to identify pertinent published peer-reviewed evidence to support revision. The report recommended a longitudinal follow-up study of in-service individuals with hearing threshold of 35-50dB averaged over 1, 2 and 3kHz, based on quality-assured audiometry testing and identification of overall causes. The study would investigate the relationship between measured hearing threshold and self-reported hearing disability, and the impact of noise injury on hearing function for a young adult over the remaining lifetime, after the noise injury ceases.

40. In response to the proposal, the then Defence consultant adviser in otolaryngology reviewed 3,964 service personnel, finding only two with pure tone hearing thresholds of at least 50dB over 1,2 and 3kHz bilaterally. Thirty-one personnel had average thresholds of 35dB or more, but not 50dB in at least one ear, and only three had thresholds of 35dB or more, but less than 50dB bilaterally. In 18 of the 31, and 2 of the 3 with threshold of 35dB or more but less than 50dB bilaterally, the Defence consultant was of the opinion that noise injury was unlikely to be the cause of the hearing deficit. He concluded that these data suggested that the IMEG recommended study would not be feasible. No such study has been carried out to date.

2023/24 Seventh Report Update on Lowering the Noise Induced Hearing Loss Compensation Threshold

41. It is acknowledged that the noise induced hearing loss compensation threshold in the military no fault compensation schemes is high, representing not the onset of disabling hearing loss, but in war pensions and industrial injury terms, 20% disablement. For this review IMEG re-visited the 2013 Report evidence and findings and the updated international peer-reviewed scientific and medical literature, concluding that the 2013 conclusion has not been overtaken by a robust body of more recent quality evidence sufficient to now recommend downward threshold revision.

42. We note that in current clinical practice a young person reporting hearing disability might be offered hearing devices at thresholds lower than the no-fault compensation threshold. However, there are problems. Hearing loss, both sensorineural and conductive, is common in the general community due to a variety of causes which may be difficult to distinguish from occupational noise exposure, meaning the diagnosis is difficult. Sensorineural hearing loss may relate to occupational noise but at the same time include other causes, including sociocusis, part of modern life, and ageing, with, in one survey, the prevalence of self-reported ‘severe’ hearing difficulty ranging from 0.2% in 17–30-year-olds, to 4.1% in those aged 61-70 years (48).

43. For hearing loss compensation assessment, pure tone audiometry, a subjective psycho-physical test, is used as a surrogate for disability. This, despite the fact that hearing is multifaceted, with individuals hearing well in one circumstance but not in others, and there being no direct relation between the audiometric deficit and perceived disability (35). People show marked biological variability in hearing, unrelated to noise, age or ear pathology and individual susceptibility to noise. A classic 1965 study of a homogeneous sample of female jute weavers with measured noise exposures, found a 60dB variation at 3kHz (49), while in a more recent unscreened group aged 18-30 years there was variation of -3dB at the 5th centile and 32 dB at the 95th centile; and in a similar screened sample, variation was -3dB at the 5th centile and at the 95th, was 20.5dB (50). With these levels of variability, biological difference is very great compared with noise susceptibility, noted in one study to be a reduction of 12dB at 4kHz following 50 years industrial occupational exposure at 90-100dB (51).

44. For assessment of military compensation, in the individual case, career noise dose and similarly age-related audiometric changes over time are simply unknown. Other relevant issues include pure tone audiometry individual frequency test-retest variation, estimated as at least 5dB in

optimal conditions with experienced audiometricians; the challenges of providing consistent quality audiometry over a career with soundproofed booths; calibrated equipment and trained technicians at all locations in a global platform; and taking account of Temporary Threshold Shift, potentially able to raise measured thresholds by 5-7dB for up to 48 hours after noise exposure (52).

45. The recent work since 2013 on cochlear synaptopathy and proposed new approaches to military noise induced hearing loss assessment, discussed below, are relevant, but findings in humans are not yet definitive, and far less are there agreed approaches to quantitative assessment of impact on function. In conclusion, from a scientific and medical perspective, present evidence does not support downward revision of the noise induced hearing loss compensation threshold.

Recommendation

46. IMEG will maintain literature scrutiny on the issues, including developments in oto-protection, and mindful of the typically much older population affected by civilian occupational noise injury, hearing aids suitable for young people, and their availability.

47. We would urge continued attention to provision and maintenance of high-quality audiometry and access to objective testing at all Defence locations, and its routine use for confirmation of pure tone audiometry (PTA) findings where medical discharge is being considered.

48. Finally, applicable to all service personnel, the focus must be on education and mandatory implementation of good hearing hygiene, oto-protection and hearing loss prevention throughout personal and professional life.

Cochlear Synaptopathy

49. For many years noise exposed people with normal pure tone audiometry have reported difficulty understanding speech in noise, hyperacusis and tinnitus (53)(54)(55)(56)(57). These symptoms have generally been assumed to be due, not to cochlear damage, but to central auditory injury at level of the brain stem or cerebral cortex. A major challenge in researching these issues in humans is that cochlear and vestibular structures are deep in the temporal bone, so that human pathogenesis study is necessarily post-mortem. Most hearing loss research is in rodent models, with rodents being more noise sensitive than humans. Even within rodents there is varied susceptibility with, in ascending order, guinea pigs, mice, gerbils, and most sensitive, chinchillas. Studies in animals depend heavily on electron microscopy, which is only available in humans as a post-mortem investigation.

50. Histopathology (electron microscopic examination) in noise-exposed mice with significant temporary threshold shift 24 hours after the exposure, shows loss of the synaptic connections between inner hair cells (IHCs) and the afferent auditory nerve neurones to the brain, with a resultant reduced cochlear signal to the midbrain and cerebral cortex. Cochlear outer hair cells (OHCs) remain intact and pure tone threshold levels are normal (58). Cochlear synaptic loss, rather than inner hair

cell or outer hair cell death seems to be the earliest sign of damage in both rodent noise- and age-related hearing impairment (59)(60)(61)(62).

51. A study in two groups of adult mice looked at ageing after noise exposure ceases. The mice were exposed (8 –16kHz, to 100- or 91-dB Sound Pressure Level (SPL) for 2 hours), and histology of cochlear hair cells, neurones and the connecting synapses was carried out between 1 hour to 20 months after exposure. The 100dB noise caused 35–50dB threshold shifts at 24 hours. By 2 weeks, thresholds had recovered, but the synapses were reduced by up to 45%. As the mice aged, synapse damage and loss to spiral ganglion cells continued, and threshold shift spread to lower frequencies, and was greater than in the non-noise exposed control animals. Audiometric threshold shifts were present by 1 year after exposure and, at 20 months after noise exposure, whilst variable, were up to 18dB greater in the 100dB noise exposed group. Similarly, at 1 year post exposure, outer hair cells at 32kHz frequency were reduced by up to 10 %. The 91dB noise exposure produced transient threshold shift, with no acceleration of synaptic loss or cochlear dysfunction with ageing, when studied up to 1 year post exposure (63).

52. Based on the substantial international published peer-reviewed small animal research including the work on cochlear synaptopathy, new guidelines on medico-legal diagnosis and assessment of occupational noise induced hearing loss, particularly for military noise induced sensorineural hearing loss, have recently been proposed by Professor Moore (64)(65). The guidelines discuss diagnosis and separation of the different causal types of hearing loss in the claimant's overall loss, and recommend compensation assessment of the occupational element based on comparison of the measured hearing threshold levels at 1, 2 and 4kHz, with an International Organisation for Standardisation, ISO 7029(2017) control population, normally using the 50th percentile of age-associated hearing levels (AAHLs)(66). More controversially the proposed new method also recommends that when audiograms are available both soon after the end of military service and at an interval (undefined) afterwards, the most recent audiograms should be used for diagnosis and quantification, reflecting, as discussed above, any effect of the noise exposure on ageing after removal from the noise.

53. Professor Moore postulates that for military noise damage assessment, for frequencies where the noise induced hearing loss hearing threshold at cessation of noise exposure is mildly elevated, subsequent hearing loss progression is accelerated. In contrast, for frequencies where the noise induced hearing loss is moderate or severe at the end of the noise exposure, the subsequent progression of hearing loss is unaffected or is slowed. Prof Moore proposes that rodent hearing loss up to 55dB following a period of noise exposure could be due primarily to loss of outer hair cell (OHC) function. In this situation he would not expect acceleration of the subsequent progression of hearing loss due to further Outer Hair Cell damage. If loss at the end of noise exposure is much less than 55dB at some frequencies, then further damage to Outer Hair Cells could produce acceleration of the subsequent progression of hearing loss at those frequencies.

54. This hypothesis was tested in 29 former male military personnel (64). Rates of change of hearing threshold level (HTL) in dB/year at or around service termination and five years later were compared with those expected from the average ISO 7029 (2017) 50th percentile rates. The findings were that the level of hearing loss following the end of military service was accelerated for frequencies where the hearing loss was absent or mild at the end of military service, by about

1.7dB/year on average for frequencies 3 to 8kHz, but the progression was as ISO 7029 (2017) or slower for frequencies where loss at the end of military service exceeded about 50dB.

55. In humans, post-mortem temporal bone studies have confirmed age-related cochlear synaptic loss and auditory nerve fibre degeneration (67)(68). In both studies the results suggest that these changes can predate cochlear hair cell loss. For noise induced loss the significant body of research based on non-invasive neurophysiological tests has produced inconsistent results and, as yet evidence of noise induced cochlear synaptic damage in humans cannot be considered established (69)(70).

56. There remain important unresolved questions on the existence of human age and noise induced cochlear synaptopathy, including the noise levels and other relevant variables needed to induce it in humans. This is particularly in respect of military populations with mild or moderate hearing loss due to mixed chronic noise and acute acoustic damage at service termination. Other issues include potential difference between chronic wide-band noise and acoustic trauma, and difficulty separating noise and ageing effects, in terms of noise susceptibility over the person's lifetime, and how to assess noise exposure dose more accurately than by the present usual self-report. Other factors include genetics and individual noise susceptibility, how to relate any threshold level (impairment) changes to functional disability, and the possibility, raised by the phenomenon of temporary threshold shift, that there may be recovery and repair of human damaged synapses. Finally, even if all the known unknowns could be resolved and a potential permanent effect on human hearing threshold established, a key question is how, in practical terms, the effects could be consistently and equitably assessed.

Recommendation

57. IMEG will continue to monitor the literature.

Non-auditory health effects of noise and hearing loss

58. Annoyance and stress symptoms are the most common civilian community responses to environmental noise. This may be manifest in individuals by anger, displeasure, exhaustion, and stress-related symptoms with substantially reduced reported health and wellbeing (71).

Cardiovascular Disease

59. Acute exposure to noise is associated with effects in the autonomic nervous and endocrine systems, raised systolic and diastolic blood pressure and heart rate, and the release of the stress hormones, catecholamines and glucocorticoids (72). Metabolic changes may include elevated blood lipids, viscosity, and blood glucose concentrations, potentially increasing the risk of hypertension, atherosclerosis, myocardial infarction and stroke (73).

Cognitive Performance in Children and Young People and Older Age

60. WHO estimates that about 45,000 disability-adjusted life-years (DALYS) are lost every year in western European countries for children and young people aged 7–19 years because of environmental noise exposure (74)(75). Postulated mechanisms for noise effects on their cognition include communication difficulties, impaired attention, increased arousal, learned helplessness, frustration, irritability, and sleep disruption. Areas with high levels of environmental noise are, however, often also socially deprived, another factor associated with poor cognition and socioeconomic position.

61. The present approach to dementia management aims to treat the underlying cause, but to date, only symptom modification or delay in clinical progress is possible in the great majority of sufferers. Against that background, prevention may be a better option. A 2018 systematic review and meta-analysis of over 20,000 participants, found hearing loss in this population (diagnosed by pure tone audiometry) to be significantly associated with decline in all main cognitive domains, and increased risk for cognitive impairment (76). For Alzheimer's disease and vascular dementia, trends were non-significant.

Sleep

62. Sleep disturbance is another effect of environmental noise exposure, with undisturbed sleep of a sufficient length increasingly recognised as necessary for daytime alertness and performance, as well as quality of life, and health. Sound pressure levels as low as 33dB can induce physiological reactions during sleep including autonomic, motor, and cortical arousals (e.g., tachycardia, body movements, and awakenings), dependent on sleep stage and individual noise susceptibility (77). Elderly people, children, shift-workers, and those with a pre-existing sleep disorder are considered to be at-risk groups for noise-induced sleep disturbance (78)(79). Epidemiological studies suggest that nocturnal noise exposure might be more relevant for the creation of long-term health outcomes such as cardiovascular disease than is daytime noise exposure (80).

Accidents at Work

63. A Canadian study of 465,550 male workers exposed to 80dB or more occupational noise, with noise induced hearing loss detected by screening conducted between 1987 and 2005, found 1,670 (3.6%) had a work-related injury requiring admission to hospital within five years of the test. Information was available on age, cumulative noise level and duration at the time of the hearing test. For each dB hearing loss there was a small but statistically significant risk of injury, while for those

working in an ambient noise level of 100dB, injury risk was more than doubled at 2.36 (with confidence interval, 2.01-2.77) (81).

Vestibular (balance) Effects

64. Preliminary rodent studies suggested that the vestibular system is susceptible to noise over-exposure, an effect since confirmed in rodents by histological and electrophysiological studies, which demonstrate wide disruption in the saccule and utricle of the ear, and less so in the semi-circular canals, the balance organs in the ear (82). However, there is still a lack of data on noise exposure on the human vestibular system, including on functional effects. Animal studies also suggest a capacity for recovery following noise-induced vestibular damage, similar to hearing temporary threshold shift. Effects of blast or acute acoustic trauma are distinct.

Military Hearing Loss Prevention, Ear Protection and Surveillance

65. Established (permanent) military hearing loss can lead to reduction in military effectiveness and operational deployability, and can adversely impact the individual's quality of life, in and beyond service. In recent years, as well as best practice hearing protection, regular hearing surveillance and review of medical employability grading has been introduced by the chain of command and Headquarters Surgeon General. There is emphasis on early awareness and education on the UK noise regulations and good hearing hygiene, with emphasis on personal responsibility for compliance by all service personnel from service enlistment. Effective surveillance relies on cooperation from the chain of command, to ensure availability of personnel for testing, and engagement by the service person, who may be reluctant to admit to hearing symptoms, because of perceived risk of medical downgrading and restricted military employability and career prospects (83)(84).

Noise Reduction and Hearing Loss Prevention

66. Primary prevention, with a focus on regulations, legislation and education in schools, in combination with proper hearing protection are important first lines of defence (85). The preferred method of preventing occupation-related noise induced hearing loss and tinnitus is through engineering controls. Within the military setting, noise exposure may be controlled through isolation (distance and physical barriers), equipment maintenance, vibration dampening, and insulation.

Personal Protective Devices

67. Other methods, include the use of hearing protection devices (HPD) such as in-the-ear foam ear plugs, inserts and sound attenuating over-the-ear devices as appropriate for the specific service

and role. For example, the fast jet pilot needs to discriminate speech in noise, the infantryman to detect faint signals and localize sound, and naval aircraft carrier deck and engine room crew to hear orders. The effectiveness of HPD in real life is lower than under laboratory conditions, and reliant on the individual's regular use of sound protection devices and their proper fitting. Main reasons for failure to consistently use hearing protection are concerns with interference with detection and localization of auditory warning and perception, notably during combat (86). A 2006 US Naval study on the effectiveness of hearing protection equipment use by the crew on a flight deck found that 79% of personnel received an estimated 0–6dB rather than the laboratory test expected 28–30dB of noise attenuation from either misuse of earplugs or non-compliance to ear plugs (87). These preventive and protection measures need to be accompanied by regular best practice surveillance throughout service career, including at specific dates, as service personnel age and ahead of deployed service.

Clinical Management of Hearing Loss

68. Hearing loss and tinnitus are most frequently clinically managed with hearing aids. Gene or stem cell therapies are promising treatments being investigated currently, but still far from application to noise induced hearing loss, or other acquired causes of hearing loss or age-related hearing loss (88).

69. Acute, brief exposure to noise above 130dB Sound Pressure Level (SPL) causes mechanical destruction of the Organ of Corti in the ear, while with chronic lower-level noise exposure, metabolic impairment may result (89). Understanding of the cellular and molecular mechanism of noise induced hearing loss Temporary Threshold Shift and Permanent Threshold Shift (PTS) in rodents and possible pharmacological treatments has been advanced by recent scientific research. This indicates that the associated metabolic cellular change (including stereocilia disruption, swollen nuclei and mitochondria, cytoplasmic vesiculation and vacuolization) may result from inflammation and oxidative stress with, in Temporary Threshold shift glutamate-induced excitotoxicity, and for Permanent Threshold Shift, oxidative stress, producing release of reactive oxygen species (ROS) and free radicals thought to cause severe cochlear damage (90). These insights, from animal experimental studies, are likely to have relevance to acute acoustic trauma (AAT) in humans.

70. Noise Induced Hearing Loss affects the quality of life of affected individuals, lowers civilian workforce productivity and impairs military performance, with substantial cost to governments, only likely to rise further as the global population ages and healthcare and disability costs rise. There is no currently approved pharmacological treatment for human chronic noise induced hearing loss. There are, however, increasing trials of novel treatments in animals and humans for sudden sensorineural hearing loss and acute acoustic trauma (AAT). Although findings are inconsistent some studies of Acute Acoustic Trauma suggest that hyperbaric oxygen therapy (HBOT) and local intratympanic administration of corticosteroids, administered alone or with systemic corticosteroids soon after the event, can reduce inflammation in the inner ear and improve hearing thresholds, with better outcomes than systemic corticosteroids alone (91). More work is needed for a definitive understanding of a possible role in Acute Acoustic Trauma while, because of the need for early treatment after the acoustic event, few human studies of chronic noise induced hearing loss have

been published. Noise induced hearing loss prevention, and the use of oto-protection remain the cornerstone of reducing the enormous burden of noise induced hearing loss.

Hearing Loss and Military Employability

71. Pure tone audiometry became widely available in the 1970s, and the current UK military system of assessing hearing acuity was introduced in 1981. Reflecting the different operational requirements, hearing assessment principles are shared, but slightly different standards apply to the three services. The present military approach to hearing and medical employability, including retention in service, does not depend on any particular level of hearing threshold, but on the individual case facts and specialist otolaryngological and occupational health examination and opinion. The military approach to hearing involves routine surveillance of overall hearing acuity, early detection of the presence and progress of noise damage and the provision of hearing protection suitable for the individual and their circumstances. Allocation to a PULHHEEMS hearing standard is based only on audiometric hearing acuity. Pure tone audiometry is carried out at defined time intervals dependent on age, and as required, clinically, for example ahead of deployment, where there has been an irregular weapon discharge, or a hearing protection device has been dislodged.

72. Because of the potential significant impact for the person and operational consequences for Defence, in its 2013 report, IMEG recommended routine use of objective testing, wherever downgrading to H3 or lower, or where medical discharge is under consideration, with tests undertaken and interpreted by suitably experienced experts. That continues to be the IMEG position.

73. Hearing acuity, tested by pure tone audiometry at 250Hz to 8kHz, is used to determine the PULHHEEMS category in each ear, using the sum of the thresholds (dB) at low frequencies, i.e. 500Hz, 1 and 2kHz, and high frequencies 3, 4 and 6kHz.

The standards are as follows:

PULHHEEMS SUM (dB)	0.5, 1 and 2kHz	3, 4 and 6kHz
H1	not more than 45	not more than 45
H2	not more than 84	not more than 123
H3	not more than 150	not more than 210
H4	more than 150	more than 210

In addition, the noise exposure history and audiometric pattern is used to establish whether noise induced hearing loss is present. Other causes of any hearing loss must also be considered and excluded.

74. General minimum service entry standard is H2, and for aircrew, H1. Once in service, deterioration in high frequencies is currently taken as indicative of noise damage, and so a need for enhanced protection and increased surveillance. Where a serving member is H3 or H4, temporary downgrading and specialist otolaryngological and occupational health opinions are obtained. H3 in one or both ears may make a person not fully deployable. H4 in one or both ears normally leads to medical discharge. Each case is, however, considered on its facts with account taken of the person's service occupation, employability and skills limitations and possible military job options. Objective auditory data should be reviewed at this time. These issues are complex and, although not convinced that AFCS compensation should necessarily be based on the same criteria as present UK military medical employability standards, in 2013, IMEG found that simplicity and transparency, as well as coherence, would greatly benefit if AFCS and PULHHEEMS criteria were aligned. Literature scrutiny for this Seventh report has failed to reveal any new insights into the matter (92).

Civilian Employability Issues for Service Personnel Medically Discharged with Service Acquired Hearing Impairment

75. The income stream element of AFCS awards aims to recognise the impact of all accepted injuries and diseases on post-service civilian employment. In terms of civilian employability with some degree of hearing loss is common in UK working age adults. Based on the National Study of Hearing, 17% of UK adults had a hearing impairment of 25dB or more, averaged over 0.5, 1, 2 and 4kHz in the better ear (BE) (93). Loss of hearing seldom leads to time off work and there are few civilian jobs where perfect hearing is essential, although many more which depend on hearing speech in noisy environments, with issues of person comfort, stress and strain associated with struggling to hear, and above all safety for self and others. According to general health and safety legislation, including Health and Safety at Work 1974 (94), the Management of Health and Safety at Work Regulation 1999 (95), and more specifically the Control of Noise at Work Regulations 2005 (96), there is employer responsibility to conduct a risk assessment to inform methods to reasonably reduce exposure to noise, and institute a hearing conservation programme including training, protection, and pre-employment screening and surveillance. As people are ageing with time in occupations, special attention needs to be paid to those with pre-existing or developing hearing impairment.

76. Normal hearing is difficult to define, particularly in the context of occupation. It is age-related, and despite the efforts to define population ranges and predicted effects of noise exposure, there is wide individual variation in terms of measured threshold and perceived disability. Defective hearing does not preclude driving, including public service vehicles, unless a person is totally unable to communicate in an emergency. As in the military, quality assured audiometry with access to objective testing by experts is essential for valid decisions on civilian employability. Many service leavers are attracted to work in security-related roles, which have no defined hearing standards in the UK, and to the uniformed services and transport. For occupations such as the police, fire and ambulance, civil aircrew, the railways and merchant navy, there are published national audiometric standards but, as in the military, decisions on recruitment and retention are made not just on pure tone audiometry, but on a range of case-specific factors including the job requirements and whether addressing recruitment or retention , "in employment" surveillance (97)(98).

77. Hearing impairment identified in pure tone audiometry does not necessarily indicate functional impairment. However, if there are functional restrictions due to hearing impairment, work modifications should be considered to enable the individual to continue working as well as ensuring their own safety and that of others in the workplace. If the functional impairment is substantial, the Equality Act 2010 may apply to civilians, which means the employer has a legal duty to firstly not discriminate against the individual on the account of their hearing impairment and secondly, to consider reasonable adjustment (99).

78. A thorough functional assessment and risk assessment which considers the individual's functional capacity needs as well as the requirement of the job, will inform what adjustments might be required. Examples of adjustments pertinent to hearing impairment may include:

a. Assistive technology such as induction loop system, other methods to relay the sound to the hearing aid, specific technologies that enable use of hearing aid simultaneous with hearing protection, radio and other equipment required for the job.

b. Non-verbal methods to communicate, including speech recognition systems, text messaging.

c. Identifying non-sound-based alarm system e.g. vibration, flashing lights.

d. Allocating duties that cannot be adjusted, nor can the individual perform because of hearing impairment to another person.

e. Environmental adjustments that improve signal-to-noise ratio by minimising background sign and also improve ability to make use of visual cues to speech and communication.

Issues Raised by Claimants

1. The provision of hearing aids suitable for young people as a responsibility of the AFCS not the NHS.

79. While serving, healthcare for service personnel is the responsibility of DMS, but from service termination, Defence has no further clinical role in delivering or planning healthcare for individual veterans. At NHS introduction the principle was established that veterans should access all medical care required via the NHS. From 1951 this provision has included, for disorders due to service, priority access to secondary care. with decisions made by the treating clinicians (not MOD). With the end of National Service in 1963 and since, there has been a widening culture gap between those who serve and the wider general community, including health professionals. Particularly for mental health problems, some veterans delay seeking civilian medical help, fearing lack of understanding of military service, its ethos and language. One measure to address this has been the establishment of the Armed Forces Covenant, providing culturally dedicated veterans services including for mental health and polytrauma. Healthcare delivery is by holistic team-based collaborative working, led in service by DMS, and after service termination, the NHS and health departments. Additional stakeholders post-service include other government departments, local authorities, service and

other charities. IMEG firmly recommends this model, including priority access as defined, as best able to deliver safe, coherent evidence-based best practice healthcare for veterans.

2. Given the policy in other countries, awards for tinnitus and hyperacusis in the absence of audiometrically measurable military hearing loss.

80. Tinnitus, the perception of sound in the absence of actual external sound, remains a scientific and clinical enigma. A symptom of an underlying pathological process, rather than a single disease, it may relate to ear pathology or to head and neck trauma, neurological, vascular, endocrine and psychiatric disorders or medication side effects, and co-morbidities, particularly psychological disturbances and psychiatric disorder. It is a recognised accompanying symptom to hearing loss of all causes, including noise induced hearing loss.

81. In the Fifth report 2020, IMEG reviewed UK and international public approaches to compensation for tinnitus and the restraints imposed by the many gaps in understanding, concluding that tinnitus is heterogeneous and may or not be associated with noise exposure or hearing loss. As well as the unknown underlying pathogenesis and mechanism, there is no standard test for its existence, agreed scale or method of severity assessment.

82. IMEG recommends no change to the present AFCS approach, concluding that awards should not be made for tinnitus alone, where tinnitus presents without documented hearing loss that meets the diagnostic criteria described above. IMEG will maintain oversight of the published scientific literature.

Diversity and Inclusivity

83. IMEG regards issues of equality and diversity as core values, and aims to avoid unjustified discrimination on equality grounds, whether age, disability, gender, gender reassignment, marriage and civil partnership, pregnancy, maternity, race, religion or belief and sexual orientation. During this updated review we found no such issues.

Conclusions and Recommendations

Compensation Threshold

84. The noise induced hearing loss compensation threshold in the government military and civilian occupational no-fault compensation schemes is high, representing not the onset of disabling hearing loss, but in war pensions and industrial injury terms, 20% disablement. For this Seventh report, IMEG has re-visited the 2013 Report evidence and findings and the emerging work on cochlear synaptopathy. Informed by this review IMEG concludes that the 2013 recommendation has not been overtaken by a robust body of more recent high-quality published evidence sufficient to now recommend downward compensation threshold revision.

Recommendation

85. IMEG will maintain literature scrutiny on the issues, including developments in oto-protection, and mindful of the typically much older population affected by civilian occupational noise injury, hearing aids suitable for young people and their availability.

Cochlear Synaptopathy

86. It has long been observed that normal pure tone audiometry in humans may be associated with complaint of hearing difficulty for speech in background noise, as well as tinnitus and hyperacusis. These symptoms have generally been assumed to be due not to cochlear damage, but to central auditory injury at the level of the brainstem or cerebral cortex. A major challenge in researching these issues in humans is that cochlear and vestibular structures are in the temporal bone so that human pathogenesis study is necessarily post-mortem, and most research to date is in rodent models. In noise exposed mice with Temporary Threshold Shift 24 hours after the exposure, studies show loss of the synaptic connections between inner hair cells (IHCs) and the afferent auditory nerve neurones, and a reduced cochlear signal to the mid brain and cerebral cortex. Cochlear outer hair cells (OHCs) remain intact and pure tone threshold levels are normal (58). This cochlear synaptopathy seems to be the earliest sign of noise damage in both rodent noise- and age-related hearing impairment. Published findings are inconsistent in rodents and the balance of expert opinion is that noise induced cochlear synaptic damage is not confirmed in humans (70).

Recommendation

87. Given the potential significance, IMEG will monitor further emerging evidence.

Hearing Loss Prevention and Oto-Protection

88. For the UK Armed Forces hearing loss prevention and oto-protection is everyone’s business and responsibility. As well as best practice hearing protection, regular hearing surveillance and review of medical employability grading has been introduced in the UK Armed Forces by the chain of command and Headquarters Surgeon General. Other measures include raising awareness and education on the UK noise regulations, use of quality audiometry by trained staff across military locations, good hearing hygiene, and personal responsibility for compliance by all service personnel. Noise exposure is reduced through distance and physical barriers, equipment maintenance, vibration dampening, and insulation and hearing protection devices (HPD) such as foam ear plugs, inserts and sound attenuating earmuffs as appropriate for the specific service and role, for example fast jet pilots who need to discriminate speech in noise, infantrymen to detect faint signals and

localize sound, and naval aircraft carrier deck and engine room crew to hear orders. The effectiveness of Hearing Protection Devices in real life is lower than under laboratory conditions and reliant on the individual's use of sound protection devices and their proper fitting.

Recommendation

89. From the medical perspective, IMEG confirms the critical role of hearing loss prevention and oto-protection. These measures need to be accompanied by regular best practice surveillance throughout service career including at specific dates as service personnel age, and ahead of deployment.

Clinical Management of Hearing Loss – Digital Hearing Aids

90. Although some interesting research on clinical management of hearing loss is under way including stem cell, gene therapy and pharmacotherapy, this is likely to be relevant only in specific relatively rare circumstances. More generally, digital hearing aids will remain first line for most types of hearing loss including in young /middle-aged occupationally noise exposed patients.

Recommendation

91. For Armed Forces personnel and veterans, as discussed in this report, IMEG recommends that responsibility should not lie with the AFCS but be maintained by the NHS, in line with the broader principles set out by Sir William Beveridge in 1942. IMEG firmly recommends this model, as best fitted to deliver safe, coherent evidence based best practice hearing care for veterans, ensuring optimal long-term care.

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Topic 5 - Interim Awards in AFCS: Overview and Rationale

Introduction

1. The matter of interim awards was first raised with IMEG in the 2017 AFCS QQR, and again in the 2022 QQR report. Stakeholder concern was that interim awards lead to financial uncertainty and particularly, in relation to mental health disorders, additional stress, potentially impeding engagement with treatment. This short note provides an overview of the interim award provision, while the mental health topic chapter in this Seventh IMEG report focuses on interim awards for mental health disorders. As detailed in paragraph 9 of this note, of all awards made under AFCS from April 2005 to 31 March 2023, 9% have been initial 2-year Interim Awards. The relevant

legislative provision Article 52 of AFCS Order 2011, refers and is reproduced below as an annex to this note (1).

2. An historical perspective is helpful here. The shape of the WPS was set during the Great War (1914-18) and was much influenced by then medical treatment limitations. The conflict led to high mortality rates and a low proportion of surviving wounded casualties, with at times a ratio of Killed in Action to Wounded in Action (KIA: WIA) of 20:1. A high proportion of the survivable injuries occurred in young men conscripts, with over time, in many, inevitable worsening and early death. Reflecting this pattern, WPS awards are based on the medically assessed degree of disablement, in line with the scheme statutory scheduled assessments, with assessment made for an interim period unless the disorder is in a steady state and unlikely to change, when assessment and award are made final.

3. WPS Interim assessments and awards are typically made for a few years, while the legislation provides for claimants to request review "on any grounds and at any time". Importantly, assessment is by comparison of the injured person, not at the date of injury, but with a normal person of the same age and sex at date of claim, so, for example at age 65 years, male strength and fitness is on average about 65-75% of that in the early twenties. Dependent on case review findings, assessment (and so awards) might increase, be maintained or, if the factual evidence confirms improvement, be reduced, with an appeal right to the independent first Tier Tribunal where, again the appealed assessment may be increased, decreased or maintained (2).

4. This process continues for war pensions in the 21st century, where requests to review assessment levels make up a substantial proportion of overall WPS business, most often with assessment maintained on review and confirmed at appeal. Such a wide gateway is administratively demanding, with expensive (in cost and time) evidence-gathering and inconvenience to pensioners. In addition, it does not reflect modern medical management and the expected course of disorders, regardless of the age of the person. Experts agree that today's clinical aim is to investigate and diagnose the patient's symptoms and illness with early access to an adequate course of best-practice treatment, reaching a steady state of maximum medical and functional improvement within 18 months to two years on average. For more medically complex situations, time to steady state might be extended to a maximum of three to four years, a principle outlined in the Boyce Review (3). Barring subsequent further stressors, slips, trips or falls, steady optimal state should then be maintained by patient self-management with appropriate expert support as required.

5. Full and final compensation awards, and importantly, an appeal right, are appropriate at optimal medical steady state or when prognosis is clear. Providing financial certainty and allowing the person to move on with life, as with civil awards, the AFCS aims to make a full and final award as early as possible after the claim is made, with subsequent limited opportunity to request outcome review. In contrast to the WPS, AFCS claims can be made in service, with, to date, over 80% of AFCS claims included in this group. Many claims are made very soon after the injury or disorder comes to light.

6. The early years of AFCS, from 2005, coincided with the Iraq and Afghanistan conflicts, generating increased numbers of survivable, previously unseen injuries. In complex or multiple traumatic physical injury cases, assessment and claim determination can take time, especially if claims are made soon after the event, with treatment in the early stages, and prognosis, difficult to predict. To address this, the Interim Award provision was introduced into the Scheme following

recommendation in the first quinquennial 2010 Boyce Review (3). This was supported by the Boyce review independent medical expert members, and subsequently confirmed by IMEG following the issue being raised in the 2016 QQR report and was referred to IMEG for a medical perspective (4). IMEG took the view that Interim Awards were in line with modern thinking on disability and chronic illness, particularly for a pre-injury young, physically and mentally fit population. As far as possible, the aim is to treat and rehabilitate people to re-engage maximally with life and living by making full and final awards as early as possible (5).

7. The Order requires that Interim Awards are reviewed within two years of initial award notification, with award finalised and appeal right, if possible, at or before the two-year point. Alternatively, if steady state has not been reached or prognosis remains unclear, the two-year interim award can be extended to a total of four years, when a final award must be made, with an appeal right. Once Interim Awards are finalised, there is no review or award adjustment even if the person continues to make progress and further functional gains. This contrasts with WPS, where, if the disabling effects reduce, assessments and hence awards may be revised downward.

8. Digitisation of AFCS compensation has been delayed and statistical data remain paper-based, entered manually. Military operational (DBS case determination) delivery has largely returned to normal except in a few areas where general resource shortages remain. Data in this Seventh IMEG report (up to 31 March 2023) must, however, be considered provisional (6).

9. From April 2005 to 31 March 2023, of total 88,315 AFCS awards, 7,480 (9%) initial two-year interim awards have been made, most frequently for mental health disorders, these constituting 3,070, i.e. 50% of the total of 6,130 mental health awards. For Musculoskeletal disorders with a total of 40,710 awards, 5% or 2,480 were initial two-year interim, and for Fractures and Dislocations with a total of 3,060 awards, 2,170 or 60% were interim. Interim awards are a payment on account where claims are made soon after the event or onset of the disorder, with treatment in early stages and prognosis difficult to predict. If the final steady state merits a higher lump sum than the initial payment, an additional sum is paid; while if there is improvement and a final lower award is found to have been appropriate, no amount of the initial award is recovered from the claimant. A high proportion of AFCS claims are made in service but given the circumstances where an interim award is appropriate and that the claimant retains military salary while serving, GIP is only paid after service discharge.

Conclusion and Recommendation

10. The matter of interim awards was first raised with IMEG in the 2017 AFCS QQR and again in the 2022/3 QQR. Stakeholder concern was that interim awards lead to financial uncertainty and particularly, in relation to mental health disorders, additional stress, potentially impeding engagement with treatment.

11. IMEG appreciates the concerns but considers there remains a sound medical and scientific basis for the concept and present timeline. It is recommended that close watch is maintained on the interim award data collection processes, with early routine addition of data on all initial interim awards

extended to the four-year point. The issue is further discussed in the Mental Health topic chapter of this Seventh Report.

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ANNEX. Article 52 of the AFCS Order 2011 Interim Awards

Article 52.— (1) An interim award may be made where the Secretary of State is satisfied that a person is entitled to injury benefit but—

(a) the prognosis for the injury in that particular case is uncertain; and

(b) it is not possible to determine which descriptor is applicable to it.

2) The Secretary of State is to select the descriptor considered to be the most appropriate descriptor at the date of the decision.

(3) The Secretary of State must specify the period which the interim award has effect in accordance with paragraphs (4) and (5).

(4) The period referred to in paragraph (3) is to be a maximum of 2 years starting from the date the award was first made.

(5) Where the period specified is less than 2 years, the Secretary of State may extend and further extend the award but, subject to paragraph (6), a final award must be made within the period of

2 years starting with the date on which an interim award was first made.

(6) Where paragraph (7) applies—

(a) the interim award may be extended and further extended for a period not exceeding 2 years; and

(b) a final award must be made within the period of 4 years starting with the date on which an

interim award was first made.

(7) This paragraph applies where—

(a) the prognosis remains uncertain at the end of the initial 2-year period; and

(b) the Secretary of State considers the extension just and equitable having regard to all the

circumstances of the case.

(8) Where the final decision is to award a descriptor at a tariff level which is—

(a) at the same level or higher than the tariff level awarded in the interim award, account is to be taken of the amount of benefit paid in accordance with the interim award and only the difference between the amount of benefit paid in accordance with the interim award and the amount of the final decision is payable.

(b) lower than the tariff level of the tariff awarded in the interim award, no further amount of benefit will be paid in accordance with the final decision, and no amount of benefit paid in accordance with the interim award is recoverable.

Article 5 AFCS Order 2011

Related to interim awards is the concept of “permanency” in the Scheme introduced into Article 5 of the AFCS Order in May 2011 after the 2010 scheme review. Headed “Descriptor – further interpretative provisions”, Article 5 sets out how a descriptor is to be construed, the meaning of “functional limitation or restriction” and how that should be assessed and at Article 5(7) defines “permanent functional limitation or restriction”:

(7) Functional limitation or restriction is —

(a) “permanent” where following appropriate clinical management of adequate duration—

(i)an injury has reached steady or stable state at maximum medical improvement; and

(ii)no further improvement is expected; and

(b) “significant” where the functional limitation or restriction has an extensive effect.

Topic 6 - Sea king helicopter exhaust emissions, multiple myeloma and soft tissue sarcomas

Introduction

1. Following a reported association between exposure to Sea King helicopter aviation fuel gas turbine exhaust fumes and rare carcinomas, specifically multiple myeloma and the very rare soft tissue sarcoma, leiomyosarcoma, in 2022-23 DMS and the Institute of Naval Medicine (INM) carried out an evidence-based medical and toxicology literature scrutiny of the issues. The aim was to establish whether a causal relationship was met. The MOD report concluded that published data and studies are limited, especially on causation in leiomyosarcoma, but currently there is no evidence of causality between helicopter aviation fuel or benzene exposure and soft tissue sarcomas in general,

or leiomyosarcoma in particular, but potentially a theoretical link with Multiple Myeloma (1: Institute of Naval Medicine report, 2022, available on request).

2. The Institute of Naval Medicine report also commented on the different aviation fuels used in Sea King helicopters during service from 1969-2018. Benzene is present as an impurity in JP-8 aviation fuel. Defence Standard 91-087 lists requirements for aromatics in JP-8 to be between 7.0 & 26.5% v/v, however there is no specific standard for benzene content. Analysis of 14 samples of JP-8 from 7 United States Airforce Bases for benzene found that concentrations were below 0.02% in all samples. The presence of benzene in the exhaust emissions of the Sea King helicopter has not been confirmed within the MOD fleet. However, according to other studies performed on helicopter and gas turbine engines it is likely to be present at low concentrations. Only one study to date has been performed by MOD which included benzene in its target compounds of interest; the results showed that benzene was below the limit of detection (<10 ng/tenax tube) for the method used (1). Four other surveys have been completed by the Royal Air Force Centre for Aviation Medicine, confirming concentrations of total and Jet fuel volatile organic compounds (VOCs), exhaust gasses and elemental carbon to be generally low (1). The United States Department of Health and Human Services and Environmental Health Perspectives have not classified JP-5 and 8, and the most modern Jet fuel A as carcinogenic, while the International Agency of Research on Cancer finds the evidence on JP-5 and 8 as not classifiable as human carcinogens. This is because the overall human and small animal evidence is inadequate. Gas Turbine exhaust fumes are not known to be carcinogenic, but they share some characteristics with diesel fumes classified by International Agency of Research on Cancer as carcinogenic, but without any evidence of a causal link to Multiple Myeloma or leiomyosarcoma.

3. MinVP accepted the INM report findings, but to put the matter beyond doubt, he referred the question to IMEG for an independent expert opinion based upon the scientific and medical evidence. Aviation fuel has multiple constituents, and over the almost fifty years during which Sea Kings were in use by the United Kingdom military, these have changed. MOD scrutiny focused mainly on benzene as a constituent of Sea King fuels, since benzene is long recognised as an established cause of blood cancers, although not including Multiple Myeloma. For completeness, IMEG's review also includes volatile organic compounds, polycyclic aromatic hydrocarbons, nitro and dinitro-triarenes.

Multiple Myeloma

4. In general, international published peer-reviewed scientific and medical carcinogenicity studies have considered Multiple Myeloma as one of a list of several possible disorders, rather than the sole focus of interest. This approach often leads to small case numbers for rare disorders and the possibility of chance findings. For Multiple Myeloma there have been few military-specific or military aviation studies. Aviation or gas turbine fuels are also rarely the subject of civilian occupational studies, which mainly consider road and sea transport, heavy engineering, excluding coal mining. Most studies are cross-sectional and date from the mid-20th century. Subjects are often recruited by job title, which may vary in terms of associated tasks across locations or companies, and often no information is provided on job dates or hazard exposure duration or dose, or time between job termination and disorder diagnosis. Because of the rarity of Multiple Myeloma, study

cases are often collected over many years, and over the period 1969-2018 the international blood cancer disorder classification and diagnostic criteria for Multiple Myeloma were revised. The pattern and nature of civilian work is very different from the military work pattern, with, in civilian employment, regular 7-8 hours daily five days a week over years, sometimes a working lifetime, with regular periods away from work. Finally, service personnel are a highly selected group predominantly young, male and fitter than the matched civilian community, further reason for caution in extrapolating civilian occupational study findings to the military context.

5. Multiple Myeloma is a plasma cell malignancy, which leads to overproduction of light and heavy chain monoclonal immunoglobulins. Monoclonal gammopathy of uncertain state and smouldering myeloma are recognised precursor states. In the UK there are about 5,000 annual incident cases. This number has been stable from the late 20th century, following a period between mid-20th century when cases appeared to be increasing by about a third. This led initially to a significant body of studies on general causation. More recently the apparent rise in incidence is ascribed less to new causal agents than to better case ascertainment. UK treated survival is 30%, and Multiple Myeloma development is age-related, from about 40 years and most common in age group 85 plus. There may sometimes be a family history, and the condition is more common in men, notably African American men. This is of note, being the opposite of other blood cancers such as the acute leukaemia’s, where most cases are in white American men. No consistent evidence links Multiple Myeloma to cigarette smoking, socio-economic group or sex humoral state. There are occupational studies including on rural occupations, insecticides and pesticides, diet, ionising and non-ionising radiation. Findings in these studies are similarly inconsistent, leading to current expert conclusion that while several factors have been implicated, no causal lifestyle, occupational or environmental risk factors are established, and that Multiple Myeloma must currently be considered a condition of unknown aetiology (2) (3) (4).

Leiomyosarcoma

6. Leiomyosarcomas are very rare malignant tumours originating from smooth muscle in any part of the body, in the walls of blood vessels, the uterus, stomach and intestines and in the retroperitoneal region. The cause is unknown. They may develop in children or adults. To the best of our knowledge, through scrutiny of published scientific and clinical literature, no environmental exposure has been identified as a possible cause.

IMEG Scrutiny of the Evidence

7. The seminal 1965 Bradford Hill paper was published in the context of occupational health and observations on the frequency of disorders in particular types of work. It set out several considerations supporting causality, not mere association, while stressing that individually meeting all the listed considerations is not always mandatory (5). The considerations include: the strength of the relation; consistency across different circumstances of sample subjects; specificity of the observed association, with risk applicable to particular work and types of disease, and no association with other diseases or causes of death; temporality, so that exposure must predate disease;

biological gradient i.e. there is a dose-response relationship; plausibility; coherence, i.e. study findings should not challenge generally accepted known facts; experimental / semi-experimental evidence where, based on an observation, some preventive action is taken and there is a reduction in incidence of the disorder; and finally, analogy, e.g. if a drug / biological agent has previously been shown to have adverse effects on the foetus we should be open to accept, in another context, other possible evidence of a similar basis of causation.

8. The WHO IARC was set up in 1965 and has now published almost 150 monographs, critical reviews and evaluations of the evidence on carcinogenicity of a range of exposure sources, chemicals, lifestyle factors, occupational factors, biological organisms and physical agents. Reflecting the overall small numbers of aviation, particularly military, primary studies, there is no International Agency for Research on Cancer Monograph on aviation fuel and carcinogenesis. For this IMEG review, because of its wide scope and completeness of primary studies, International Agency for Research on Cancer monograph 105 Diesel and Gasoline Engine Exhausts and Some Nitroarenes was carefully studied with particular attention to reports on aviation fuel and constituents and military studies, all of which were again rare (6).

9. All International Agency for Research on Cancer monograph studies include a preamble which sets out background and the basic scientific principles used in the scrutiny. Exposures for study are usually prompted by clinical observations of possible human carcinogenicity. The monographs evaluate exposures as potentially carcinogenic hazards, and risk to human health based on human studies, animal studies, any evidence on mechanism, with summary and evaluation to a common format. Epidemiological evidence considered includes primary cohort, case-control, ecological i.e. correlation, and intervention studies. Case reports and series and case control studies cannot be the sole basis of causation because of incomplete ascertainment of cases. Similarly, for both case control and longitudinal study, in the models for the control population there may be selective recall or ignorance of exposures. For rare disorders and small case numbers, study power may be increased by meta-analyses in which summary statistics such as relative risk are combined, or in pooled analyses which focus on the cumulative raw data from primary studies. International Agency for Research for Cancer also considers temporality i.e. age at first exposure, exposure dose, peak level and trough, duration, date of first and last exposure, time to onset of disorder, and finally study quality, based on bias, confounding and chance. Bias occurs when, owing to study design or execution, a stronger or weaker association between exposure and disorder appears to be the case. Confounding is a problem which occurs when the apparent relationship of exposure with the disorder is due to another co-existing factor, the real cause. And finally, chance, which produces a spurious result because of small sample size and biological variation of subjects. Pooled data, meta-analyses and outcome studies also have risk of overlap of subjects from individual studies and so double-counting or omission.

10. IMEG’s literature review is based on the Bradford Hill (5) considerations and the principles adopted by the WHO IARC Monographs when investigating the evidence on cancer. IMEG first revisited the individual studies considered in the Institute of Naval medicine report (1), the most recent of which is dated 2021. Further literature search revealed few additional primary studies potentially of relevance. Because of its wide scope and completeness of primary studies, International Agency for Research on Cancer monograph 105 was carefully studied with particular attention to reports on aviation fuel and constituents and military studies, which were rare (6).

Primary studies reviewed were heterogeneous and generally of low-medium quality and with inconsistent findings (6) (7) (8) (9) (10) (11).

11. The general International Agency for Research on Cancer approach to causation was adopted by IMEG. Informed by the evidence from the different study types and subsequent International Agency for Research on Cancer expert working group discussion, exposures assessed are then assigned by International Agency for Research on Cancer to a Carcinogenicity category with the following rationale:

Category 1. Sufficient evidence of carcinogenicity in humans. Here, there is sufficient evidence from human studies or evidence which is strongly suggestive, and in addition convincing small animal evidence.

Category 2. Limited evidence of carcinogenicity. This is further sub-divided into 2A probable and 2B possible. In both groups the human evidence is credible, but chance bias or confounding cannot be ruled out. There is small animal evidence, and the conclusion is a qualitative judgement of overall evidence by the working group.

Category 3. Inadequate evidence. Available studies (human and small animal) are of inadequate quality, power, and consistency. More work is needed.

Category 4. Evidence is suggestive of lack of carcinogenicity. Several human studies without bias or confounding, with consistent outcomes and Relative Risk near 1.0, with narrow confidence intervals.

The current International Agency for Research on Cancer position on benzene / gas turbine exhaust fumes is that there is some published peer-reviewed human evidence suggestive of an association between benzene and /exhaust fumes and multiple myeloma. There are significant study quality issues, inconsistent findings in the primary studies, with, at present, no specific exhaust fume consistently established as responsible, and in studies purporting to find a significant causal association, often a dose-exposure relationship is not met. International Agency for Research on Cancer concludes that there is a “possible” association between benzene and Multiple Myeloma, not the “probable” or more likely than not relationship necessary for balance of probability jurisdictions. International Agency for Research on Cancer makes no finding on benzene / gas turbine exhaust fumes and leiomyosarcoma.

IMEG Findings

12. Because of the limited evidence, we are unable to provide a robust evidence-based comment on causation for leiomyosarcoma. For leiomyosarcoma and soft tissue sarcomas generally there is no credible evidence of causation by aviation fuel or constituents, but this is against a background of the rarity of the disorder and few published studies.

13. Multiple myeloma is a heterogeneous disorder and the subject of different diagnostic criteria classifications over time. Most research has come from civilian occupational primary studies, with typically small numbers of cases. Meta-analyses sum data from the primary studies, covering

different time periods and with risk of double counting. There are different disease definitions, inconsistent dose exposure data included in studies and findings, and, where included, inconsistency between incidence and mortality data. Another complication is that diesel and exhaust fumes are ubiquitous in the environment, and so apportioning any level to occupation is very challenging if not impossible.

Conclusions and Recommendations

14. IMEG finds that the contemporary evidence on a causal link between Sea King helicopter exhaust fumes or benzene and Multiple Myeloma, leiomyosarcoma, and soft tissue sarcomas in general, do not meet the Bradford Hill considerations of causation.

15. Having outlined these key challenges and obstacles, IMEG recommends that at this date there should be no further formal review. Rather, it would be appropriate to keep a watching brief on the emerging published literature regarding study quality and statistical methods. Similarly, at this date, any routine surveillance of personnel / veterans who might have been occupationally exposed is not merited, based on medical and scientific criteria for screening (13) (14).

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