The Independent Medical Expert Group (IMEG)

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

December 2017

Topic 4 - Musculoskeletal Disorders (MSK disorders) Part 1

Key Points

1. The nature of military life makes it unsurprising that MSK disorders are the main reason for military medical downgrading and discharge and the most common reason for AFCS claims and awards. To date over half the awards under the AFCS have been for MSK disorders.

2. MSK disorders in military practice broadly divide into three groups:

   i) discrete, diagnosable strain, sprain or overuse injury e.g. knee meniscus or ligament damage;

   ii) less common physical disorders with clinical onset in service, e.g. genetic and autoimmune conditions, including rheumatoid arthritis or systemic lupus erythematosis, arthritis associated with inflammatory bowel disease, psoriasis or post infective, ankylosing spondylitis, and;

   iii) the largest group of low back pain, neck pain, anterior knee pain usually without evidence of specific pathology.

3. Of the three categories, establishing a causal link to AFCS service is easiest in category i) discrete diagnosable strain sprain or overuse injury to tendon or ligament linked to an event. Most disorders in category ii) physical disorders with clinical onset in service e.g. rheumatoid arthritis will not be due to Service, on the balance of probabilities, but rather will be of unknown aetiology. The most difficult determinations in terms of causal link to service are category iii) conditions such as low back pain, often without evidence of specific pathology and of spontaneous onset.

4. There is no evidence in the absence of preceding traumatic injury that work in the Armed Forces generally causes increased risk of degenerative change in the vertebral column. Decisions on these conditions will depend critically on individual case facts, including the type and duration of service. Royal Marine, Parachute regiment, Special Military Units or combat service are likely to produce quite different physical loading stressors compared with peace-time storeman duties in the Logistics Corps.

5. We reviewed the Table 9 Back descriptors and Tariff awards in light of current understanding of causation, progress and associated disabling effects and remain of the opinion that the present approach to back disorders is evidenced and maintains horizontal and vertical equity.

6. Nociceptive and neuropathic pain and pain syndromes will be considered more fully in Part 2 of the MSK Disorder Review.

Introduction and Background

1. The nature of military life with its focus on physical and sporting activity in a young, fit, predominantly male population makes it unsurprising that MSK disorders are the main reason for military medical downgrading and discharge, and the most common reason for AFCS claims and awards. To date over half the awards under the AFCS have been for MSK disorders. Since the beginning of the scheme, awards have been made as follows:

All years	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
All 26,313	50	385	899	1,597	2,256	2,271	2,900	3,028	3,279	3,486	3,290	2,322
Inc. GIP 535	5	16	34	57	69	101	88	61	52	37	13	2

These data are based on latest available outcomes and should be considered as minimum numbers of awards. In considering MSK disorders in the AFCS, in addition to literature scrutiny, IMEG has taken advice from senior military and civilian academic experts in the epidemiology and clinical management of these disorders, including physical treatment and rehabilitation and orthopaedic surgery. The term musculoskeletal disorders (MSK) relates to a group of symptoms and conditions ranging from common short-lived aches and pains with no established pathology or identifiable precipitant to objectively verifiable effects of specific accidental injuries. MSK disorders are widespread in the general community, occurring at all ages, including amongst adolescents and young adults as well as those of working age. Because of the size of the issue this paper is Part 1 of the IMEG review of MSK disorders.

2. In the military community, about 20,000 cases per year of MSK symptoms and disorders are dealt with in Defence Primary Health Care or at Defence Rehabilitation Centres. MSK disorders in military practice broadly divide into three groups:

   i) discrete, diagnosable strain, sprain or overuse injury, e.g. knee meniscus or ligament damage;

   ii) less common physical disorders with clinical onset in service, e.g. genetic and autoimmune conditions, including rheumatoid arthritis or systemic lupus erythematosis, arthritis associated with inflammatory bowel disease, psoriasis or post-infective, ankylosing spondylitis; and

   iii) the largest group of low back pain, neck pain or anterior knee pain, usually without evidence of specific pathology.

   Symptom onset may be acute or gradual, apparently spontaneous or with a clear temporal relationship to an incident or event. The context may be sport, adventure or other training, or claimants may cite factors such as heavy lifting in their principal service occupation or trade. Symptoms often settle quickly through natural healing and without medical advice, but they may become recurrent or chronic. Following clinical assessment, diagnosis and exclusion of serious pathologies, first-line treatment for MSK disorders is usually physiotherapy, which is successful in most cases. Surgical interventions are much rarer than previously but may be considered where there is failure to progress using physical therapies alone.

3. A key aim of the Defence Health and Well-Being strategy is to maximise operational capability. Owned jointly by the Chief of Defence Personnel and Surgeon General, the strategy applies through life, from joining to service termination and beyond. It is for all Defence personnel, building resilience, physical and mental fitness, promoting healthy lifestyle choices and prevention of injury and disorder. Despite the high rates of physical

activity and repetitive exposure to mechanical stressors associated with military life, including adventure training and sport, the rates of medical downgrading and discharge for military personnel due to MSK disorders is similar, at about 20% of personnel not fully deployable, to most quality rugby teams' fitness for selection rates. Defence Medical Services provide excellent multidisciplinary physical and rehabilitative treatment and occupational health services. These are focussed on regaining and maintaining function particularly in the work context. A decision to medically discharge may be more for protection than a reflection of the severity or functional limitation of the disorder itself, and does not necessarily imply the person is unfit for suitable civilian work. Military service by its very nature demands higher standards of physical and mental fitness than is required for most civilian jobs.

4. A significant proportion of those who leave service for medical reasons annually are so-called "early service leavers", meaning those discharged compulsorily, or who leave at their own request, having completed less than four years' service. Recruit training is designed to improve aerobic fitness, muscle endurance and strength through running, loaded marches and battle training. In recent times as military training across the world increasingly requires recruits to address much greater physical loads than many have ever done previously, MSK symptoms and disorder incidence in recruit studies have ranged from 20-59%. The highest number of problems occur early in training and a recent prospective follow-up UK study of recruits on the Combat Infantryman's Course at the Infantry Training Centre, Catterick, looked at MSK injuries in 6,608 recruits during a 26-week initial training programme, recording injury and rehabilitation times for specific injuries (1). The overall incidence of injury was 48.6%, similar to other military studies and civilian runners, and (2) the most common complaints were leg pain, low back pain, ankle sprains, upper body, head and neck pain and stress fractures. Similar rates and type of injury are seen in other series internationally.

5. In the British Army, soft tissue injuries to recruits typically get better quickly while ankle sprains, low back pain and stress fractures take on average much longer to settle and in some cases lead to medical discharge. Results of trials of general interventions to prevent MSK injury are unproven and disappointing, but evidence is now emerging in support of a more effective role for injury-specific intervention (3) (4). Possible strategies to counter these effects might be simply to recruit only those who are ready at entry to cope with the physical demands. That seems likely to have poor yield, however, and it might be appropriate to move to another basis for recruit selection as in some dance schools and athletic programmes, e.g. gait analysis or quality of movement. Alternatively, it might be possible to re-design training programmes, building up the physical load gently. At present the highest risk of recruit injury occurs early in the programme when the load is highest, there has been little time to acclimatise and the environment itself is unfamiliar. Early downgrading may be especially dispiriting to young recruits, risking reduced motivation and a desire by the young person to leave. These issues are relevant to women as the New Employment Model and women in front- line deployment move closer. The literature as a whole on MSK issues, particularly occupational studies, is primarily male-based. Much more is becoming known about female physiology from recent studies on women athletes, and HQ Surgeon General and the chain of command are undertaking an extensive research programme including the 2015/16 Women in Ground Close Combat Review. As the Armed Forces more fully reflect the diversity of people in the UK today, we need to consider also MSK risk factors and disorders which may be more common in certain ethnic groups. We will continue to monitor the literature.

Specific Injuries

Knee injury

6. Overall, knee meniscus injury is relatively uncommon in young men and women and when it occurs in a military context is due mainly to acute sporting trauma, especially while playing football, where there is torsion of the knee in partial flexion. Meniscal damage is increasingly common with age and may be asymptomatic (5). Beyond this the epidemiology of meniscal injury, its predisposing factors and why it occurs in some people without significant trauma remains largely unknown, and studies to explore effects such as the roles of pre-existing joint laxity or whether background occupational kneeling, squatting or ladder-climbing increase risk of acute traumatic damage are difficult to design robustly. Meniscal damage is associated with osteoarthritis with risk further increased by surgical treatment, whether open surgery or through arthroscopy. Obesity, joint laxity and repetitive occupational kneeling and squatting are individual risk factors for degenerative meniscus lesions, and obesity enhances the risks of heavy physical work (6). Surgical treatment of meniscal injury is common but there remains controversy about its timing, extent, risks and benefits and whether the whole meniscus should be removed, etc.

7. Other problems affect the knee in military personnel including chondromalacia patellae (literally softening of the cartilage), anterior knee pain and, more recently, patello-femoral pain syndrome. These terms are poorly defined and cover anatomical or developmental abnormalities, e.g. patellar mal-tracking or Hoffer's syndrome affecting the infra-patellar fat pad as well as repetitive traumatic and overuse causes and cases where aetiology is simply unknown. There is disparity in the literature over causation and the best practice in the investigation and controversy concerning management of such disorders. Most MSK disorders presenting in the military context are mild to moderate in severity, assessed clinically to exclude serious pathology and treated conservatively with further investigation, e.g. imaging or arthroscopy and possible surgery only considered where that fails.

8. Knee ligament injury is common as a result of sport, including skiing and especially football. Most injuries settle with physiotherapy but further damage is common on return to sport or other physical activity, and surgery may eventually be indicated. Anterior cruciate ligament rupture predisposes to knee osteoarthritis (7). Numerous studies suggest that operative single anterior cruciate ligament reconstruction produces good surgical and functional results (80-90% normal knee function) but a lower return to any level of sports activity (80%), pre-injury level sports activity (60%) and 44% to competitive sport. Fear of further injury was the most common reason cited for failure to return to pre-injury sports level (8). Further research is needed on indications for, and optimal timing of, surgery and whether this should be open or arthroscopic, as well as on return to sport protocols and injury prevention programmes. Present RN policy is to exclude from enlistment recruits with a past history of anterior cruciate ligament rupture. This is owing to the risks associated with frequent ladder-climbing and the relatively long service of RN personnel compared with the Army and RAF, 12 years on average. Neither the Army nor RAF currently operates the same policy.

9. While damage to a single unilateral knee ligament is common in military practice, the recent conflicts were associated with **high energy multiligamentous knee injuries** often accompanied by additional ipsi-lateral limb injuries, most commonly intrarticular fracture of the knee. Most of these ligament injuries were treated surgically with delayed single-stage operative treatment usually several weeks after the index incident. A recent US series confirms that surgical treatment of these complex injuries produces better outcomes than physiotherapy alone. Especially if accompanied by other limb injury and regardless of management, given the severity of these injuries, return to duty rates are low (9). By contrast a French systematic review looked at outcomes in combined anterior or posterior cruciate ligament and postero-lateral corner injuries in civilians, due to sports or motor vehicle accidents, and suggested good functional

outcomes especially for anterior ligament tear, although less good than for single reconstructed cruciate ligament tears. Data on posterior cruciate ligament outcomes was scarce (10).

10. **Osteoarthritis (OA) Knee** is primarily a disorder which is symptomatic in older age and as the population ages, is an increasing public health problem. Early joint changes are usually only diagnosed on MRI imaging in the military population and, owing to the limited correlation of symptoms with MRI changes, such a finding may not be clinically significant at diagnosis or later. Despite the extensive international literature going back over many decades there remain many gaps in our understanding of the causes and progress of OA knee. Risk factors include obesity, female sex and previous knee joint injury including surgical procedures. Open surgery carries higher risk of subsequent osteoarthritis than arthroscopy where, in experienced hands, microscopic techniques and small instruments result in more limited damage.

11. There is a substantial literature on the relation between sport and occupational loading and osteoarthritis of the knee. Where knee injury, significant enough to be documented, occurs, osteoarthritis is likely to develop. Similarly, elite sports activity or participation in high-impact or loading sports, but not hobby or fitness level running, can cause osteoarthritis of the knee. The evidence on typical military-level sport including moderate level running is not convincing of a causal effect (11). Occupational studies are of varied quality with the strongest evidence of a causal link for squatting and kneeling, lifting and heavy physical workload. Evidence is weaker for stair and ladder climbing and against a significant effect for walking or standing on the development of osteoarthritis of the knee (12). In general occupational studies, assume exposure dose based on carrying out the various activities at similar intensity, on most days for most of the working day and week and over at least five to ten years. Where osteoarthritis is established, continued mechanical stress at a similar or greater intensity may worsen the disorder. Obesity and ligament laxity are established risk factors for OA worsening (13).

12. Most studies on working-age adults are restricted to males. In the light of the changing face of the working civilian and military populations, both in the proportion of female workers, as well as the range and intensity of activities including sporting, more work on female risk of osteoarthritis of knee and MSK disorders in general, including duration of exposures, is required. A recent review of studies on physical tasks and knee osteoarthritis did discuss the issue of home making recognising kneeling and lifting as key homemaking activities which can generate a heavy physical work load (14). A 2012 Danish study (15) following up the whole population and based on occupation and job register data showed that generally, jobs with a heavy physical workload are associated with a risk of knee osteoarthritis, and that risk increases directly with cumulative years in occupation. There is a dose response relationship so that workers with 6-10 or more than 10 years' cumulative work have increasing risks of OA knee. This contrasts with OA knee after severe extremity injury due to blast or gunshot wound. Here radiologically detectable and symptomatic OA is often well established within two to three years post-index incident (16).

13. **Ankle sprains and instability** Ankle sprains account for 20-40% of all sports-related injury in some series (17) and are common in the UK military context. Sprains usually involve tears of the lateral ligaments and while the majority heal uneventfully, about a third will suffer a second sprain. In addition attenuation of affected ligaments may lead to ankle instability. This is of two types: mechanical, where range of joint motion is greater than normal, and functional, where movement is physiological but is not under voluntary control. In some cases the picture is mixed. Management of each type may be different, with mechanical instability more likely to need surgical intervention. A trial of at least three months' physical therapy is indicated as the first-line treatment for ankle sprains. If recovery does not occur then surgery should be considered. Over the last sixty years multiple procedures have been developed, including recent less invasive interventions thought likely to have shorter recovery times. However, there is little robust evidence that surgical intervention is required or that modern techniques are more successful than long-established techniques.

As with other MSK disorders, evaluation of the various techniques including cost-effectiveness, best practice and timing is required (18).

14. **Shoulder dislocations, primary and recurrent, and shoulder instability** are as important in military populations as in athletic populations and the associated chronic or recurrent injury and high rate of OA can be very disabling. As yet our understanding of modifiable risk factors is not well developed, and more research is needed on issues such as whether or not recruits with a history of pre-service shoulder subluxation are at greater risk of further dislocation and instability. Two recent US studies showed that a prior history of gleno-humeral joint instability led to an approximately five-fold higher risk of a further dislocation within a four-year follow-up period (19). The other study (20) looked at the ten-year incidence of shoulder dislocation and the percentage with recurrent instability, and the risk factors. Risk was highest in younger individuals and more in males than in females. There was a 30% recurrence rate more likely at younger ages and where there was axillary nerve injury concurrent with the first dislocation. Although the initial dislocation rate was lower in women, women were at more risk of recurrent or chronic lesions; overall, about a quarter had recurrent or chronic injury.

Hip pain

15. **Femoracetabular impingement (FAI)** and associated labral tears are common in young active populations, e.g. sporting and military, and are thought to have a 10-15% incidence (21). FAI gives rise to hip pain and early osteoarthritis. Diagnosis is made clinically and confirmed on X-ray, where cam and pincer deformities of the femoral head and innominate bone acetabulum will be identified. MRI or MR arthrogram can subsequently identify any consequential labral tears or detachment. In a recent Defence Medical Rehabilitation Centre-based trial (22), once FAI diagnosis was confirmed, patients were first treated conservatively by a multidisciplinary team of health professionals for up to three months. If no improvement occurred patients were referred for arthroscopic surgery. A single experienced surgeon was involved and patients were reviewed by the surgeon six weeks post-operatively and then at two, six and twelve months by the military rehabilitation team. As clinically indicated, at the two months' post-surgery review further residential multidisciplinary rehabilitation was undertaken. Both males and females were eligible. 76% of males showed significant improvement over time in symptoms, functional and occupational measures. In both sexes this maximised at six months post-surgery. Another systematic review reported satisfactory return to sport in symptomatic athletes with FAI, particularly professionals, following either open-hip surgery or arthroscopy (23), both procedures having similar outcomes. Results are influenced by time after operation, level of sport competition, and the presence of even minor osteoarthritic change carries less good prognosis. The concept and best-practice management of FAI remains controversial and a UK randomised control study comparing arthroscopic surgical treatment and a non-operative physiotherapy-led intervention called personalised hip therapy is currently being undertaken (24).

Low back and neck pain

16. The most common reasons for overall AFCS claims and awards to date are back disorders, including simple low back pain, and neck pain. It is also a common reason for consultation in Defence Primary Care. This contrasts with the situation in the general community where, although low back pain is a very common symptom, it is estimated that only about a quarter or a third of those affected see their GP. Less severe pain of short duration usually resolves spontaneously. The decision in the civilian community to seek medical help is not directly related to duration or severity

of pain but influenced by multiple factors including the person's previous experience, work, attitudes and beliefs (25). In non-specific low back pain, frequently with spontaneous onset or onset-related only to minor trauma, symptoms are mainly local to the lower back although they may affect buttocks and thighs. True sciatic pain due to a prolapsed intervertebral disc compressing the lumbo-sacral roots is rare (less than 5%). Neck pain is the second most common site. In both conditions, neurological examination is usually normal. Where pain becomes chronic and disabling, serious spinal pathology or nerve root problems should be excluded or referred for specialist advice.

17. In simple low back pain MRI changes and anomalies are very common, inconsistently reported and with generally poor correlation to pain. Degenerative disc prolapse in both lumbar and cervical areas is common even among young people and not necessarily symptomatic or related to significant trauma. These limitations have made surgical intervention relatively uncommon in UK practice and only undertaken after very careful assessment and selection of cases. There is no universally-agreed treatment for simple low back pain but increasingly it is considered best explained by an interaction of physical, psychological and social influences. As a result, programmes delivered by multidisciplinary health care teams have emerged. This is the approach in the UK military. A recent Cochrane systematic review and meta-analysis of multidisciplinary rehabilitative treatment for low back pain lasting over three months (26) considered 41 trials with over 6,500 participants, with pain on average for more than a year, and previous failed treatments. This provided moderate quality evidence that treatments with physical, psychological, social or work-targeted components were more effective than usual care, taken to mean GP community-based care using analgesic and antiinflammatory medication, and in some cases referral to physiotherapy. The review also found low-quality evidence for the effectiveness of physiotherapy in decreasing pain and disability. For work outcomes, multidisciplinary rehabilitation was more effective than physiotherapy but not more effective than usual care. Two trials compared multidisciplinary treatment with surgery. Although outcomes were similar for the two, risk of adverse events was greater after surgery. The authors concluded that for all types of management, the positive therapeutic effects were of modest size and more intensive intervention made no difference to the effects or their size. The review was unable to explore any impact of symptom intensity at presentation. These results suggest that the positive but limited effects need to be carefully considered against the considerable resources required.

18. For many painful disabling cases of low back or neck pain, no underlying pathology can be demonstrated objectively and any imaging abnormalities may not correlate with pain. There is often no clear relation between the severity of the initial symptom or injury and the disabling effects or their duration. Studies of back disorders focus on reported symptoms or consider objective findings such as X-ray and MRI appearances (27). An extensive literature on causation, or more commonly association, between MSK disorders and symptoms and the physical demands of mainly civilian work or sport over a period and different conditions is of variable quality with inconsistent results. There is generally no evidence, in the absence of significant preceding traumatic injury, that work in the military, police, fire service, healthcare or most other occupations causes increased risk of degenerative change in the vertebral column (28). A 2011 systematic review (29) examined eight systematic reviews including 99 studies looking at evidence of a causal relationship between bending, twisting, awkward postures, lifting, manual handling and low back pain. Overall evidence quality was limited and none of the reviews found strong evidence of a causal relation between any occupational physical activity considered and low back pain. Conflicting evidence of an association between low back pain and bending, twisting, lifting, pushing or pulling was found and there was strong evidence against a causal relationship with manual handling, assisting patients, awkward postures, carrying, sitting, standing or walking. These are of course population findings and in

compensation terms individual cases must be looked at on their merits.

19. Driving is a common element of many jobs and there seems to be a link between professional driving involving more than half working time and low back pain (30). For many vehicles, vibration is mainly at 4-6 kHz, which is the resonating frequency of the spine (31). Although the evidence is inconsistent and studies addressing issues such as the dose/response relationship are rare, it is generally agreed that whole-body vibration exposure should be as low as possible (32). Advances in vehicle design including HGV and plant-moving equipment are reducing vibration problems and there is some evidence that posture is an important interacting factor. For pilots, an association is often contended between G-force, helmets and self-reported neck pain. However, a meta-analysis found no difference in neck pain, cervical or lumbar spondylosis in fighter pilots, helicopter and cargo pilots, despite the very different G-forces experienced (33).

20. The evidence on sporting activity and low back pain is that chronic elite-level sport is associated with imaging changes but not necessarily symptoms, while the evidence on moderate or occasional activity as a cause of symptomatic MSK disorders is not compelling. In athletic and military populations there is evidence, particularly in the past, of people being tempted to play on at the same level, despite injury or symptoms, for fear of loss of promotion or team selection, etc. To do this at high competitive sport activity level risks worsening disorders. However, moderate activity is to be encouraged. For low back pain in the military, an important predictor is held to be cigarette-smoking, especially amongst younger personnel (34). Risk is greater with numbers of cigarettes smoked (35). The precise mechanism is unclear. Smoking may simply reflect lifestyle or fitness while there is some evidence of a direct effect on disc cell metabolism (36) and increased rates of low back pain and intervertebral disc degeneration recorded in people with lumbar atherosclerosis suggests an ischaemic effect (37). There is some evidence in the wider literature that this is relevant in other MSK disorders in the general community, but overall evidence suggest this is quite a weak risk factor (34).

21. Until about the mid-1980s, as with many diseases and disorders, standard management of low back pain included bed rest, often well beyond the acute period. Around this time as the deconditioning, psychological and social effects of bed rest became recognised, studies into duration of bed rest began to suggest that across a range of conditions, including low back pain, short periods of rest were better than longer periods. In the mid-1990s work from Scandinavia went further and showed that maintenance of normal activity actually led to more rapid recovery, fewer recurrent problems and less chronic disability (38)(39). This was confirmed by a 1997 systematic review of randomised control trials of bed rest for acute back pain of up to three months (40). Evidence is more limited where there is nerve root irritation or prolapsed disc or sciatica, but what evidence there is, similarly, questions the role of rest (41). Evidence on remaining in work or returning to work as early as possible is also limited but generally positive (42).

22. MSK disorders including low back pain may make work or certain occupation-related tasks difficult or uncomfortable. Present evidence on prevention of low back pain is disappointing. Manual material handling advice and training do not prevent back pain or back pain-associated disability, and a 2010 systematic review of ergonomic interventions which examined ten RCTs provided little evidence that they were more effective than no intervention for short term or chronic long term back pain (43). Most people with episodes of MSK symptoms remain at work and may not even seek medical help, but a proportion of civilian and military cases of low back pain, neck pain,

knee pain and sometimes people with initial more specific diagnosis, e.g. ankle sprain or prolapsed degenerative lumbar vertebral disc, go on to chronic pain and disability and long-term work incapacity.

23. In the period between the mid-1950s and the mid-1970s, DWP data show that rates of UK civilian sickness absence for low back pain were fairly steady with about 10 million days lost per annum. There was then acceleration, so that by the mid-1990s some 85 million days were being lost annually for back conditions. This was despite a marked reduction in the prevalence of heavy work and occupational lifting. The relation between particular jobs and tasks and specific MSK diagnoses is not strong and modification of work ergonomics, with reduction of exposures, has done little to reduce MSK complaints or sickness absence (44).

24. A link has been found between low back pain and low mood and somatising tendency, in neither case not necessarily serious enough to meet a discrete psychiatric diagnosis. Studies also relate disabling MSK symptoms to factors such as low work control, poor support at work, perceived organisational injustice and low job satisfaction (45). The rates of common MSK problems between those in similar occupations differ in different countries and in the same country over time. Incapacity for work due to MSK disorders in Europe is estimated to have a direct cost of 0.5% - 2% of Gross Domestic Product (GDP) (46). The Cultural and Psychosocial Influences on Disability (CUPID) study, an international multi-centre epidemiological study, was established to look at cultural risk factors in common MSK disorders, notably low back and wrist and hand pain amongst workers carrying out similar physical activities in different cultural environments. A 2013 study in this series compared the prevalence of disabling low back pain and wrist/hand pain among workers in 47 civilian occupational groups in 18 countries. The one-month prevalence of disabling low back pain ranged from 9.6% - 42.6% in nurses, and of disabling wrist/hand pain in office workers from 2.2% - 31.6%. After allowing for known influences including health beliefs, group awareness of people outside work with similar symptoms and availability of compensation and disability benefits, an up to eight-fold difference in prevalence still remained. An adequate explanation for these considerable differences remains to be found (47). It seems likely that local cultural beliefs and expectations play a part.

25. The medical model of ill-health assumes a linear relationship between injury, impairment, disability and handicap/participation. An **injury or disorder** causes **impairment**, i.e. anatomical and functional consequences, and **disability**, i.e. limitations and restrictions which are a **handicap** for social and occupational participation. This model is well suited to clinical management of serious and specific MSK pathologies. Virtually all people with disabling painful but minor or non-specific disorders have a primary strain or sprain or overuse injury and the emergence of chronic symptoms and disability is strongly influenced by superimposed psychosocial issues including attitudes and beliefs. Effective management addresses all of these. The medical model is innately doctor-centred: the patient presents symptoms and it is then for the doctor or other health professional to provide curative treatment. In contrast, a biopsychosocial approach addressing the personal, psychological and social issues requires a patient centred approach, educating and supporting the patient in taking responsibility for managing the symptoms rather than passively awaiting curative medical interventions.

26. Evidence of the effectiveness of physiotherapy (massage, manipulation and mobilisation), chiropractic, exercise therapy and medication is limited (48). There are also markedly differing rates for operative interventions for MSK disorders, especially low back pain, across Europe, and again the evidence base on their indication and evaluation of effectiveness is small. It is important that clinicians take an optimistic approach to low back pain and MSK disorders, stressing from the outset the high likelihood of recovery and, for those of working age, that maintaining activity and remaining in or returning to work in most jobs as early as possible will not worsen or exacerbate the problems. For working age adults and the military population the emphasis should be on simultaneous, not sequential, work-focussed healthcare and rehabilitation. In relation to work, a key aim is early intervention and, wherever possible and safe for the patient and colleagues, return to his/her own work or temporary modification of work activity and environment with a graduated return to work programme. Successful management of MSK disorders requires effective communication and coordination between the individual, clinicians and workplace management.

27. This approach is that of DMS and the military chain of command. From the outset the clinical management is work-focussed. Physical rehabilitation and cognitive behaviour therapy aim to give the patient insight and mastery of his pain rather than permitting it to dictate functional limitation and restriction. At the same time individual specific occupational modifications and return to work programmes are developed. Cases where, following an initial fairly minor injury, intractable chronic pain develops can occur in the military population with risk of a prolonged clinical course and ultimate adoption of a highly disabled state. In their evidence, military clinicians indicated to IMEG that many military personnel are more comfortable with a purely physical basis for their symptoms, e.g. retaining MRI images on their mobile phones.

28. Although rates of return to military service and own role vary, for chronic low back pain without identified major pathology, only about 25-33% are generally able to return to some form of deployable service. The costs of chronic MSK disorders include reduced operational capability, loss of military expertise and, most importantly, adverse impact on the well-being of the person and his family. Against that background, any approaches which reduce risk of that sequence are welcome. The current practice, for MSK disorders, of use of primary care-based general manual conservative therapies first is long established, but the selection of cases, timing of their specialist referral and best-practice assessment and treatment interventions including surgery would benefit from further study. There is increasing suggestion and expert observation that earlier referral for expert opinion may lead to better prognosis.

Compensation aspects

29. Table 9 of the AFCS tariff is headed“Musculoskeletal disorders and descriptors” and aims to address the soft tissue diagnoses and low-energy injuries commonly seen in military practice, often in relation to sport and training: strain, sprain and overuse. Fractures and dislocations are in Table 8 and high-energy traumatic physical injury, e.g. Improvised Explosive Device (IED) injury in combat or Road Traffic Accidents (RTAs) are listed in Table 2, “Injury wounds and scarring”. All awards from Table 9 include an element for psychological symptoms short of a discrete diagnosable disorder, and also include any expected consequential osteoarthritis.

30. AFCS is an individual jurisdiction and decisions are based on the case facts as well as the relevant law and contemporary medical understanding of causation and prognosis. As discussed above, the evidence base on MSK disorders, notably osteoarthritis and low back problems and causal link to occupation, is large but inconsistent. Overall it provides no general clear association with military service, as perhaps expected, given the very different roles and activities, duration and era of service. Decisions regarding AFCS awards need careful individual evaluation on causation, disorder severity and prognosis.

31. Of the three categories of injury at paragraph 2 above, establishing a causal link to service on balance of probabilities is easiest in category i), discrete diagnosable strain, sprain or overuse injury to tendon or ligament linked to an event. Where several structures covered by separate Table 9 descriptors are damaged in a single incident, e.g. sporting injury to joint with several damaged ligaments, the overall amount of lump sum awarded is determined by special rules set out at Articles 21 and 22 of the AFCS Order.

Most disorders in category ii), physical disorders with clinical onset in service, e.g. rheumatoid arthritis, will not be due to service on the balance of probabilities, but rather will be of unknown aetiology. An exception might be some post-infective arthritides and in some cases worsening by AFCS service will be considered.

The most difficult determinations in terms of causal link to service are category iii), conditions such as low back pain, which are usually without evidence of specific pathology and often of spontaneous onset. As discussed above, there is no evidence, in the absence of preceding traumatic injury, that work in the Armed Forces causes increased risk of degenerative change in the vertebral column (28). Decisions on these conditions will depend critically on individual case facts, including the type and duration of service. Royal Marine, Parachute Regiment, Special Military Units or combat service are likely to produce quite different physical loading stressors compared with peace-time storeman duties in the Logistic Corps.

32. The QQR raised the issue of the adequacy of AFCS awards for disorders causing low back pain. Table 9 includes a range of descriptors and awards for back disorders where “back“ is intended to include cervical, thoracic, lumbar and sacral vertebral segments and the coccyx. Pathologies covered include non-specific back pain, often arising spontaneously, as well as pain following sprain, strain or significant injury, the latter likely to be documented contemporaneously. Other differentiating descriptor features include the presence of neurological signs, imaging abnormality and consideration of surgery. Under some circumstances an additional award from Table 4, “Physical disorder for a pain syndrome” may be appropriate. Nociceptive and neuropathic pain and pain syndromes will be considered more fully in Part 2 of the MSK Disorder Review.

Conclusion and recommendation:

33. We have carefully reviewed the back descriptors and awards in light of stakeholder concerns and current understanding of causation, progress and associated disabling effects, and remain of the opinion that the present approach is evidenced and maintains horizontal and vertical equity.

Part 2 of the IMEG Review of MSK disorders in the AFCS context will consider overuse, lower limb injuries including Achilles tendinopathy, shin splints, compartment syndrome, medial tibial stress syndrome and stress fractures, pain syndromes and fibromyalgia syndromes.

References:

(1) Sharma, J. et al (2015) Musculoskeletal injuries in British army recruits: a prospective study of diagnosis-specific incidence and rehabilitation time. BMC MSK disorders 16:106

(2) Taunton, J. et al (2003) A prospective study of running injuries; the Vancouver Sun Run in training clinics. Brit. J. Sports Med. 37: 239-44

(3) Coppack, R.J. et al (2011) The effect of exercise for the prevention of overuse anterior knee pain: a randomized controlled trial. Am. J. Sports Med. 39

(4) Sharma, J. et al (2014) Gait retraining and incidence of medial tibial stress syndrome in army recruits. Med. Sci. Sports Exerc. 456:1684-92

(5) Englund, M. et al (2008) Incidental meniscal findings on knee MRI in middle-aged and elderly persons. New Eng. J. Med. 359(11): 1108-1115

(6) Baker, P. et al (2002) Sports injury, occupational activity, joint laxity and meniscal damage. J. Rheumatol. 29:557-563

(7) Muthuri, S.G. et al (2011) History of knee injuries and knee osteoarthritis: a meta-analysis of observational studies. Osteoarthritis and Cartilage/OARS, Osteoarthritis Research Society 19(11):1286-93

(8) Ardern, C.L. et al (2011) Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. Brit. J. Sports Med. 45: 596-606

(9) Barrow, A.E. (2017) Return to duty following combat-related multiligamentous knee injury. Inj. Int. J. Care Injured 48:861-5

(10) Rochecongar, G. et al (2014) Management of combined anterior or posterior cruciate ligament and posterolateral corner injuries: a systematic review. Orthopaedics and Rheumatology: surgery and Research 100S S 371-8

(11) Cymet, T.C. et al (2006) Does long distance running cause osteoarthritis? J. Am. Osteopath. Assoc. 106(6):342-5

(12) Palmer, K. et al (2012) Occupational activities and Osteoarthritis of knee. Brit. Med. Bull. 102: 147-170

(13) Chapple, C.M. et al (2011) Patient characteristics that predict progression of knee osteoarthritis; a systematic review of prognostic studies. Arthritis Care Res. (Hooken) 63(8):1115-25

(14) Ratzlaff, C.R. et al (2012) Is lifelong knee joint force from work, home and sport related to knee osteoarthritis? Int. J. Rheum. doi:10.1155/2012/584193

(15) Andersen, S. et al (2012) Cumulative years in occupation and the risk of hip or knee osteoarthritis in men and women: a register-based follow-up study. Occup. Env. Med. 69:325-330

(16) Nelson, T.J. et al (2008) Close proximity blast injury patterns from Improvised Explosive Devices in Iraq: a report. J. Trauma 65:215-7

(17) Fernandez, W.G. et al (2007) Epidemiology of lower extremity injuries among US High school athletes. Acad. Emerg. Med. 14(7):641-5

(18) Shakked, R. et al (2017) Operative treatment of lateral ligament instability. Curr. Rev. musculoskelet. Med. 10: 113-121

(19) Cameron, K.L. et al (2013) History of shoulder instability and subsequent injury during four years follow-up. J. Bone Joint. Surg. AM 95:439-45

(20) Kardoumi, J.R. et al (2016) Incidence of shoulder dislocations and the rate of recurrent instability in soldiers. Med. and Science in Sports and Exercise http://wwwm.acsm-msse.org2150-2156

(21) Leung, M. et al (2005) Femoroacetabular impingement – a common cause of hip complaints leading to arthritis. Unfallchirurg. 108:9-10

(22) Bennett, A. et al (2016) Prospective 12-month functional and vocational outcomes of hip arthroscopy for FAI as part of an evidence-based hip pain rehabilitation pathway in an active military population. BMJ Open Sport Exerc. Med. 2:doi.10.1136/bmjsem.2016.00144

(23) Casartelli, N.C. et al (2015) Return to sport after hip surgery for femoroacetabular impingement: a systematic review. Br. J. Sports Med. 49:819-24

(24) Wall, P.D.H. et al (2016) Personalised hip therapy: development of a non-operative protocol to treat femoroacetabular impingement syndrome in the FASHIoN randomised controlled trial. Br. J. Sports Med. 50:1217-23

(25) Waddell, G. (1998) The Back Pain revolution, Churchill, Livingstone. Edinburgh p 1-8

(26) Kamper, S. J. et al (2015) Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic and meta-analysis. BMJ350:h444 doi:10.1136/bmj.h444

(27) Endean, A. et al (2011) Potential of MRI findings to refine case definitions of mechanical low back pain in epidemiological studies: a systematic review. Spine 36(2):160-9

(28) Lotters, F. et al (2003) Model for work-relatedness of low back pain. Scand. J. work Env. Health 29(60):431-440

(29) Kwon, B.K. et al (2011) Systematic review: occupational physical activity and low back pain. Occup. Med. (Lond.) 61(8):541-8

(30) Troup, J.D.G. (1978) Driver's back pain and its prevention. A review of the postural vibratory and muscular factors together with the problem of transmitted road shock. Applied Ergonomics 9:207-214

(31) Pope, M.H. et al (1991) Biomechanics of the lumbar spine. Basic principles in Frymoyer, J.W. (ed). The adult spine: principles and practice. Raven New York p1487-150

(32) Lings, S. et al (2000) Whole body vibration and low back pain: a systematic critical review of the epidemiological literature 1992-1999. Int. Arch. Occup. Environ. Health 73(5):290-7

(33) Shiri, R. et al (2015) Cervical and lumbar pain and radiological degeneration among fighter pilots: a systematic review and meta-analysis. Occup. Environ. Med. 72(2):145-150

(34) Shiri, R. et al (2010) The association between smoking and low back pain: a meta-analysis. The Am. J. of Medicine 123(1):87-e7-35

(35) Deyo, R.A. et al (1989) Life style and low back pain: the influence of smoking and obesity. Spine 14:501-6

(36) Vo, N. et al (2011) Differential effects of nicotine and tobacco smoke condensate on human annulus fibrosus cell metabolism. J. Orthop. Res. 29(10):1585-91

(37) Kaupilla, L.I. et al (2009) Atherosclerosis and disc degeneration/low back pain – a systematic review. Eur. J. Endovasc. Surg. 37(6):661-67

(38) Indahl, A. et al (1995) Good prognosis for low back pain when left untampered – a randomized clinical trial. Spine 20:473-77

(39) Malmivaara, A. et al (1995) The treatment of acute low back pain – bed rest, exercises or ordinary activity? New Eng. J. Med. 332:351-355

(40) Waddell, G. et al (1997) Systematic reviews of bedrest and advice to stay active for low back pain. Brit. J. Gen. Pract. 47:647-52

(41) Postacchini, F. et al (1988) Efficacy of various forms of conservative treatment in low back pain: a comparative study. Neuro-orthopaedics 6:28-35

(42) Catchlove, R. et al (1982) Effects of a directive return to work approach in the treatment of workmen's compensation patients with chronic pain. Pain 14:181-191

(43) Driessen, M.T. et al (2010) The effectiveness of physical and organisational ergonomic interventions on low back pain and neck pain: a systematic review. Occup. Env. Med. 67(4):277-85

(44) Verbeek, J. et al (2012) Manual material handling advice and assistive devices for preventing back pain in workers: a Cochrane Systematic Review. Occup. Env. Med

69:79-80

(45) Macfarlane, G. et al (2009) Evaluation of work-related psychosocial factors and regional musculoskeletal pain: results from a EULAR task force. Ann. Rheum. Dis. 68:885-9

(46) Bevan, S. et al (2009) Musculoskeletal disorders in the European work force. The Work Foundation

(47) Coggon, D. et al (2013) Disabling musculoskeletal pain in working populations: is it the job, the person or the culture? Pain: 154: 856-63

(48) Burton, K. et al (2012) Musculoskeletal Disorders in Snashall, D. et al (eds.) ABC of Occupational and Environmental Disorders 3rd ed., pp 48-51