

# Hands On

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## Sport and exercise medicine

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### Editorial

The wait for the 2012 Olympic and Paralympic Games in London is nearly over. We are all looking forward to exciting and inspiring performances from the world's elite sportspeople. Hopefully the Olympics will encourage people of all abilities to take up exercise which will have significant benefits at a personal and public health level.

Primary care is ideally placed to promote and prescribe exercise to patients. Inevitably some people will develop musculoskeletal problems and will need our help. In general these needs can be managed successfully without need to call on the expertise of secondary care but sometimes this is necessary.

Sport and Exercise Medicine (SEM) was recognised in the United Kingdom as a medical speciality in its own right in 2006 and specialist training and consultant posts continue to develop. Now is a good opportunity to introduce this new speciality and highlight how important it is for it to be commissioned and made widely available across the country.

**Simon Somerville**

### Introduction

Physical activity and musculoskeletal problems are closely intertwined, and both are significant issues affecting healthcare worldwide. Physical inactivity is one of the leading public health problems in the UK, and musculoskeletal problems have historically constituted the group of conditions with the greatest health burden in the UK. The majority of issues relating to these two domains can be appropriately managed within general practice; however, when the requirements of an individual exceed what it is possible to provide within primary care the new speciality of Sport and Exercise Medicine (SEM) is ideally placed to assist.

Patients commonly present to general practice with musculoskeletal problems, and only a small number need investigations or onward referral to secondary care. In addition many patients with musculoskeletal problems will see allied health professionals at some point: these include physiotherapists and podiatrists both within and outside the NHS, as well as osteopaths and chiropractors who have historically worked outside the NHS but whom some services are now choosing to employ on a sessional basis.

**Providing answers today and tomorrow**

Some patients will require investigations, and the access to these varies markedly in different regions. Likewise referral routes vary depending on the local services that are available. Patients with suspected fracture should be directed to the local fracture clinic or A&E services depending on situation; those suspected of having a more serious soft-tissue lesion which could cause longer-term problems such as a knee meniscal tear or anterior cruciate ligament (ACL) injury should be referred onward either for further care or for further investigations to guide treatment. The exact pathway of such will depend on local factors. In regions with an NHS SEM service this is an appropriate place to refer a wide range of musculoskeletal problems that exceed the care possible within primary care. For those patients with proven injuries that require surgical intervention, such as significant osteoarthritis of the knee that has failed conservative management options, then orthopaedic surgeons are appropriate; for those with suspected or proven autoimmune problems rheumatology input could be sought. While there is no 'one size fits all' model, most SEM services are experienced in managing patients with a wide range of musculoskeletal conditions, not just the typical 'sporting injuries' – the service in Leicester for instance employs SEM physicians, an orthopaedic surgeon, extended-scope physiotherapists, a nurse practitioner and a podiatrist directly, with access to a range of other specialists when needed.

## Acute injuries

The management of traumatic (acute) sports injuries can be divided into three stages: management of the acute injury, then rehabilitation, and finally return to play.

### Management of acute injury

The main aim here is to minimise further harm. While most contact with patients is likely to be in the GP surgery, it is possible to be involved at the scene of the injury and this is where management should start. The initial response should be to check for safety – of both casualty and rescuer. Managing a cervical spine injury in a fallen cyclist is little use if you are then ridden over yourself! Once it has been deemed safe the patient is assessed first for life-threatening problems (airway, breathing, circulation) before a survey for injuries is performed.

When dealing with immediate injury management, the acronym 'PRICED' may be helpful in remembering what to do with the injury:

- **PROTECT** (and **P**revent other injury) – Open wounds need to be kept clean and covered with sterile dressings. Suspected fractures can be splinted (checking for pulse and sensation distal to injury before and after splinting).
- **REST** – The purpose of rest is to allow the body's own healing process to occur naturally. This may require time off work, crutches, slings, buddy strapping and splinting.
- **ICE** – Acute injuries have a large blood flow with lots of inflammatory mediators being released in the area. Ice packs will reduce this response, minimise swelling and help with pain. The pack can be secured with a bandage or even cling film.
- **COMPRESSION** – Following icing, a compression (elasticated) bandage may help to minimise swelling.
- **ELEVATION** – Elevating the injured extremity will also minimise swelling.
- **DRUGS** – In the first 24 hrs simple painkillers are ideal. After 24 hrs have passed anti-inflammatory drugs may be helpful – in the initial period they may be counterproductive as they can inhibit clotting. If a leg is going to be immobilised for any length of time it may be worth considering the use of low-dose aspirin to reduce the risk of deep vein thrombosis (DVT).

In a more subacute setting, where an acute injury has occurred and the immediate management is completed, certain key features in the history and examination should be considered as part of the assessment. General features of these are highlighted in Box 1.

### Rehabilitation

After the initial pain and swelling have settled rehabilitation can start. The general principles are to return the limb to its pre-injury condition or better in terms of strength, muscle length, proprioception and functional use. If there are any factors predisposing to injury these should also be corrected/treated. This is where a good physiotherapist may be useful. Patient information leaflets, examples of which can be found through NHS websites or sources such as Arthritis Research UK ([www.arthritisresearchuk.org](http://www.arthritisresearchuk.org)), can help to encourage early appropriate movement.

### BOX 1. Subacute injury: key features of assessment.

#### History

- Was this a single 'injury' or a more insidious onset?
- What was the mechanism of injury?
- What magnitude and direction of forces were involved?
- What management took place initially?
- Is there any deformity or swelling? If swelling was this immediate or delayed?
- What functional loss has occurred?
- Are there other symptoms of concern, such as pins and needles from neurovascular compromise?
- Was this a first or re-injury? If a re-injury, what previous treatments have been tried?

#### Examination

- Expose the area adequately and compare to the other side.
- Look for symmetry, swelling.
- Assess ranges of movement and joint stability.
- Any specific tests needed for the injured part.
- Functional assessment.

## Return to play

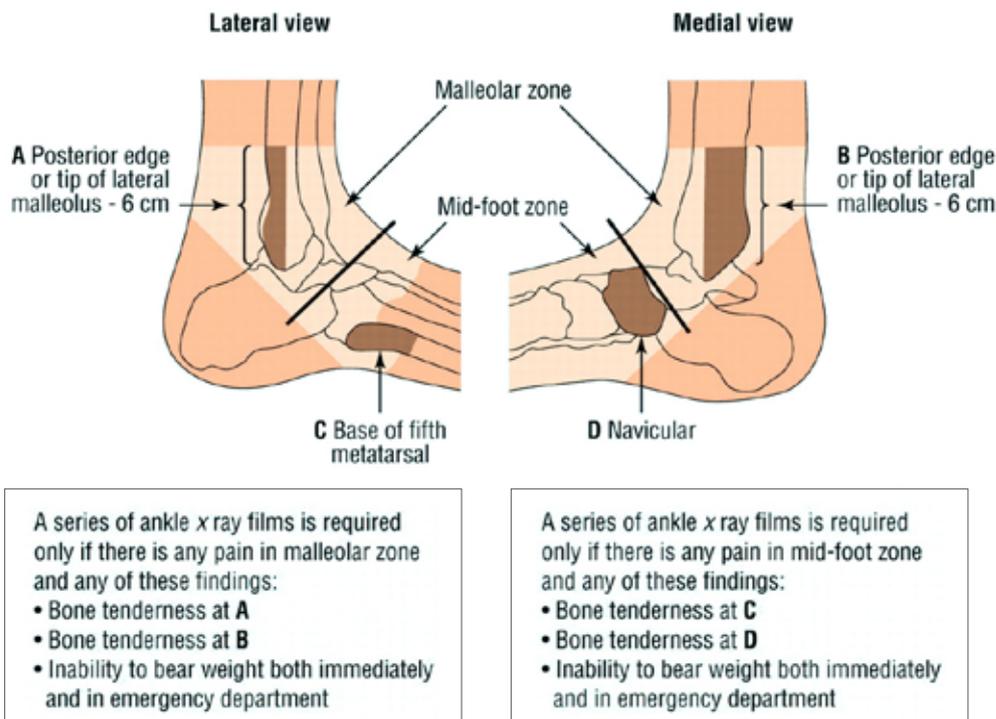
Having returned the injured body part to full strength and function, a graduated return-to-play strategy is the safest way to resume sport. In the case of a football player, for example, returning to a match following injury with no

functional build-up puts them at risk of further injury. If you break down the components of the exercise and test each of these in turn you can minimise risk in the process (see Box 2). The same underlying principles can be applied to other sporting disciplines and other injuries.

### BOX 2. Management of a footballer sustaining an acute inversion ankle sprain.

- **Initial management:** Use Ottawa Rules<sup>1</sup> (Figure 1) to decide if x-ray is indicated. Examination is often difficult due to pain and swelling. Use 'PRICED' as previously described.
- **After 72 hrs review and re-examine:** Look for lateral ligament damage using anterior draw test (Figure 2) to examine for anterior talofibular ligament (ATFL) and talar tilt test (Figure 3) for calcaneofibular ligament (CFL). Onward referral may be needed if the CFL portion of the lateral ligament is damaged; however injuries of the ATFL alone can often be managed conservatively.
- **Look at proprioception** – for example, can they balance on the affected foot? However this may be too painful at this stage.
- **Rehabilitation can commence at this point.** This may take 6–12 weeks depending upon individual responses.
  - **Range of movement:** Initially get the patient to 'write' the alphabet with great toe.
  - **Eversion strength:** Using a piece of elastic fitness band looped around a table leg or the other foot the patient can evert against resistance. Resistance should be low, aiming for high number of repetitions, e.g. 3 sets of 10 twice a day.
  - **Proprioception:** Possibly the most important element as this is significantly compromised with an inversion injury, putting the patient at increased risk of re-injury. Start by balancing on the affected leg and building slowly with increased duration, then introduce unstable surfaces such as a cushion or wobble-board, then add in movements.
- **Return-to-sport planning** can start when pain is settled, range of movement is full, eversion strength is good and proprioception is at least as good as with the other ankle. This can start with flat-surface straight-line jogging, before moving on to sprinting, then progressing to change in direction such as running through cones. Once this can be performed comfortably, the actions can be repeated using a ball for more sport-specific skills. Each stage should initially take place on a hard, flat surface before progressing to more uneven surfaces such as grass if proprioception is adequate. In addition there is a need to be aware of specific requirements for the player, for example a striker will need to be able to shoot. Once the athlete is able to complete these stages successfully they can return to training, initially without contact and building up to full contact training. It would then be sensible to play a partial game (e.g. the second half) before undertaking a full game.

All these stages are fluid and dynamic and will overlap to some extent. Some people will move through the stages more quickly than others; appropriate rehabilitation can however reduce the risk of re-injury. The patient information and exercise leaflet (enclosed) covers some of these areas in more detail.



**FIGURE 1. Ottawa ankle rules.** Using the Ottawa ankle rules can assist decision about radiography following ankle injury.<sup>1</sup> (Reproduced from Bachmann LM et al, BMJ 326(7386):41, ©2003 with permission from BMJ Publishing Group Ltd.)

## Chronic overuse injuries

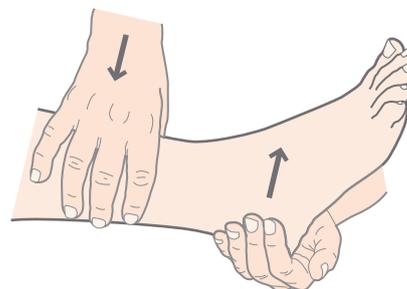
Repetitive motions cause tissue damage that requires time to heal, and overuse injuries occur when the tissue is unable to adapt quickly enough to the demands that are placed upon it. Examples of this include stress fractures, Achilles tendinopathy (see Box 3), rotator cuff tendinopathy, tennis elbow (lateral epicondylitis) and some nerve entrapment syndromes.

### Establish the diagnosis and cause

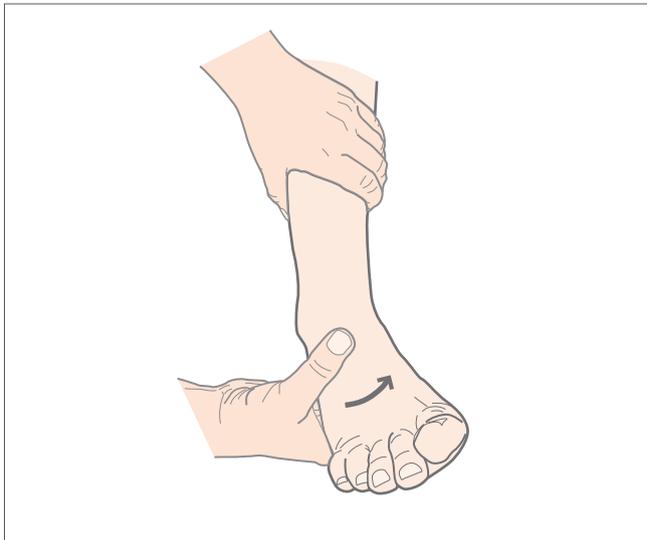
The key to optimum treatment of overuse injuries comprises a diagnosis with a thorough assessment of potential risk factors. Making an accurate diagnosis requires taking a detailed history of onset, timing and frequency of symptoms, as well as alleviating and exacerbating factors. Examination may reveal which structures are affected and it can be helpful to ask the patient to perform the manoeuvre that produces their pain. It is important to consider not just what has occurred, but why, and why now. Therefore a cause should be sought for overuse injuries, which can be divided into extrinsic factors (e.g. training habits, shoes and equipment) and intrinsic (e.g. malalignment, muscle weakness or flexibility).

## Treatment

Relative rest (or activity modification) – particularly avoidance of the exacerbating activity – while using the involved area in non-painful ways is the starting point for the treatment of overuse injuries; this can sometimes take many weeks and so the patient should be informed of the likely timescale to ensure a realistic expectation. Patient education and home exercise can help recovery. Supervised physiotherapy may be needed to help focus and monitor intrinsic factors; in addition advice from



**FIGURE 2. Anterior drawer test (ankle)** to assess the integrity of the anterior talofibular ligament (ATFL) component of the lateral ligament. The lower leg is immobilised with one hand while the other hand cups the heel and applies an anterior force with the foot in slight plantar flexion. A greater range of movement in comparison with the uninjured side, especially if there is no 'end-feel', implies injury to the ATFL.



**FIGURE 3. Talar tilt test (ankle)** to assess the integrity of the calcaneofibular ligament (CFL) component of the lateral ligament. The lower leg is immobilised with one hand while the other hand inverts the hind foot. A greater range of movement in comparison with the uninjured side implies injury to the CFL.

podiatrists and coaches can sometimes be important in correcting any biomechanical or technical faults that contribute to the problem.

Adequate pain relief enables more effective participation in therapy. Injections are not without risk and in most cases should only be performed after less invasive measures fail. Good education gives patients reasonable expectations of the interventions planned and awareness of their own responsibility to follow recommendations of activity modification and exercises at home.

Most overuse injuries improve or resolve after 3–6 months but recurrences are quite common if the predisposing factors are not addressed.

Other specialist treatments for specific tendinopathies include extracorporeal shock-wave therapy (ESWT), autologous blood injections (ABI), high volume injections (HVI) and surgery. The availability of these varies depending on locality.

## Exercise as medicine

While physical activity is invaluable in the prevention and treatment of a range of conditions, in order to provide appropriate advice to patients wanting to start exercising a few key pieces of information need to be gathered:

- Current and previous physical activity levels
- Goals
- Activity preferences
- Medical history, including cardiovascular risk
- Any current symptoms or injuries.

In general, healthy adults with no significant cardiovascular risk factors, medical history or current symptoms should be able to commence an exercise programme of moderate to high intensity. Although the long-term benefits of exercise in individuals with coronary artery disease are well established the risk of cardiac events during vigorous activity is transiently increased, and therefore establishing those at risk of coronary artery disease and performing

### BOX 3. Example of chronic overuse injury: Achilles tendinopathy.

- History is typically insidious, without trauma. Normally sore first thing in the morning and improves somewhat with limited activity but may be sore again after exercise.
- Predisposing factors may include inappropriate footwear, a high arch or an overpronated foot, and change in activity levels or technique.
- Examination typically shows thickened mid-substance Achilles tendon, with pain on local pressure. Rupture of the Achilles tendon can be assessed by squeezing the calf while the patient lies prone with their feet hanging off the end of the couch. If the tendon is intact the ankle will plantar flex; if the tendon is ruptured however this will move far less in comparison to the normal side. In addition the patient will be unlikely to be able to stand on tiptoe on the affected side.
- Management options may include time, pain relief, simple orthotics, a graded flexibility and eccentric strengthening programme<sup>2</sup> which can be shown directly or with the aid of physiotherapists, a tension night splint, or very occasionally surgery, or novel therapies such as high-volume injections under ultrasound guidance.<sup>3,4</sup>
- Investigations are rarely needed initially, but if a patient is not responding then either ultrasound or MRI may be helpful.
- Onward referral may be required when the patient's need exceeds the care possible within primary care, or when specialist advice or reassurance is required, or if there is no improvement with simple measures.

appropriate assessment and further investigation is important.

The Physical Activity Readiness Questionnaire (PAR-Q) is a screening questionnaire used by the fitness industry to identify those with potential risks from exercise participation (see Box 4). Positive answers to questions in patients aged over 40 who have been inactive previously results in the suggestion that the individual consults their GP. Depending on the condition and risk identified this may require further investigation or exercise modification and supervision.

An assessment of an individual's ability to participate in exercise should identify pathologies and medications posing a risk to the exercising individual as well as identifying cardiovascular risk factors and any existing symptoms. It should therefore include a full medical history including medications and relevant family history. Specific symptoms should be enquired about including chest pain, shortness of breath, dizziness/syncope, confusion and symptoms of musculo-skeletal pain. A cardiovascular examination including pulse and blood pressure measurement and auscultation of heart sounds should be performed.

Depending on the findings of the assessment further investigation may be required. For example if there is known or suspected cardiac, pulmonary or metabolic disease a symptom-limited exercise test prior to vigorous activity may be advisable.

Those with significant medical problems can be referred to supervised exercise programmes with appropriately qualified instructors. Obese individuals with no other comorbidities should be

given the same general advice as patients with a sedentary lifestyle; however the types of exercise need to take into account comfort and body weight, and non-weight-bearing exercises such as cycling and swimming may be more appropriate.

### **General advice about starting exercise**

(This should be accompanied by other general health advice regarding e.g. smoking, alcohol.)

- **Exercise type** The different components of fitness and exercise including endurance, intensity, resistance and flexibility benefit health in different ways. In general a combination of exercises is most beneficial. The exercise undertaken should be enjoyable, sustainable and at the appropriate level for that individual.

- **Gradual progression** If starting from a sedentary lifestyle initial activity should be of low intensity and short duration, e.g. 10 minutes in addition to warm-up and cool-down twice weekly. The activity duration can be gradually increased over several weeks up to between 20 mins and an hour. A day or two should be allowed for recovery between exercise sessions. Intensity levels may be assessed using the 'Talk Test', in which if the patient feels their breathing is increased but is still able to talk in sentences during exercise it suggests a moderate level of intensity and is typically a safe level for most people to start with.

- **Rest days/recovery** Allowing the body to recover properly is important, and therefore when starting out allowing 1–2 days between exercise is advised – as the individual progresses the recovery time may be reduced. Strenuous activities and heavy weight-training for the same

**BOX 4. Physical Activity Readiness Questionnaire (PAR-Q).** (<http://www.csep.ca/CMFiles/publications/parq/par-q.pdf> ©2002. Used with permission from the Canadian Society for Exercise Physiology. [www.csep.ca](http://www.csep.ca).)

**Answer yes or no to the following questions:**

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
2. Do you feel pain in your chest when you do physical activity?
3. In the past month, have you had chest pain when you were not doing physical activity?
4. Do you lose your balance because of dizziness or do you ever lose consciousness?
5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
7. Do you know of any other reason why you should not do physical activity?

muscle groups on consecutive days should generally be avoided.

- **Preparation** Appropriate clothing for sport or activity, including footwear, should be worn.
- **Warm-up** In general this should comprise 5 minutes of low-intensity activity to encourage blood flow to muscles and prepare them for exercise in order to reduce risk of injury and acclimatise to exercise. It can take the form of the same activity at a lower intensity.
- **Cool-down** Similar to warm-up, in order to gradually lower the heart rate.
- **Stretching** Stretching after exercise is important for maintaining and developing range of movement and may reduce injury risk.
- **Fuel** It is advisable not to eat a large meal within 4 hrs of starting exercise; however it is important to maintain energy levels and a light snack may be consumed within this period. Carbohydrate replacement immediately post-activity can aid recovery. Patients with diabetes may need to take additional care of their glucose levels during and after activity.
- **Hydration** Maintaining adequate hydration both prior to and during exercise is important. Caution should be advised regarding the use of energy drinks as some contain large amounts of carbohydrates, which should be borne in mind if exercise is being used as a method of weight loss. There are conflicting theories about the volume and type of hydration required during exercise, and there are risks of over- as well as under-hydration.
- **Warning symptoms** Patients should be warned about the development of any significant symptoms and the need to consult a doctor if any of these occur. These symptoms may include chest pain, increasing fatigue, excessive breathlessness, ear, jaw or neck pain, dizziness or palpitations, or severe headache.
- **Pain** A degree of post-exercise soreness and discomfort during exercise can be expected. However if pain develops during exercise then the individual should stop. Pain following exercise should also be taken seriously and the patient advised to seek medical assessment.

It is important to offer a follow-up appointment to the patient once they have begun their sport, activity or exercise to ensure that they are achieving their goals and making progress without any warning symptoms, pain or other adverse effects. A suitable solution for GPs is to encourage the patient to seek support from a qualified fitness adviser. Individual patients' needs for advice or input may exceed that able to be provided from primary care, in which case a specialist can aid in the management. This could be a local SEM specialist or an alternative depending on local availability and individual requirements. Currently there are few such services commissioned in the UK, and there is a need for wider delivery of such services, as discussed in the NHS document 'Sport and exercise medicine: a fresh approach' (see 'Further reading').

### Intensity guide

Many of the current recommendations focus on intensity levels.

- **Moderate-intensity activity** results in a slightly increased rate of breathing. Examples include brisk walking, slow swimming, golf, tennis doubles and cycling at 5–9 mph.
- **Vigorous activity** results in significantly increased heart rate and rate and depth of breathing. Examples include jogging, cycling, squash, rowing and cycling >10 mph or with an incline.

As well as symptoms of exertion the target heart rate is commonly quoted, using a theoretical maximal heart rate (220–patient's age). Moderate-intensity correlates with 40–60% of the patient's maximum heart rate (HR max) and vigorous with >60%. The pulse rate can then either be checked at intervals or a heart rate monitor can be used. While cautions exist with this, it is an easily applied objective method of intensity. An alternative to this is the 'Talk Test' described above.

### 'Fit for exercise' letters

Owing to the many benefits to health, the medical profession should in general encourage and promote exercise; therefore accurate information that will enable safe and appropriate participation should be given when requested. However GPs are often asked to provide a letter to verify that a patient is 'fit' for exercise, e.g. for gym membership or participation in an event, and there are valid concerns about this.

If there are no medical contraindications and the activity or exercise is deemed appropriate for the patient's current fitness level then a statement that they have no known medical contraindications to exercise may be issued. However it is impossible to guarantee that no adverse medical consequence of participation in sport or exercise will ensue and a disclaimer outlining this should therefore be included.

With the patient's express permission details about previous and current medical conditions, injuries and medications may be given which, while not stopping them becoming active, may alter the level of activity they are considering.

## Return to activity post-injury

Return to activity or sport following injury is determined by a number of factors including sport type and demands (i.e. playing position and level), the nature of the injury sustained and the rehabilitation from this. The acute management has been discussed above; return following a more prolonged recovery period can be compromised by significant deterioration in the patient's fitness. This can be minimised by maintaining aerobic activity during an injury period with other modalities, such as cycling or swimming. Return to sport should be a gradual process, and there are many similarities in restarting activity in a deconditioned individual to starting activity for the first time, including setting the intensity, duration and frequency, ensuring an adequate warm-up and cool-down for sessions, and ensuring adequate recovery between sessions.

Recovery from specific injuries such as concussion lies outside the scope of this report and differs between sports. Reference to sport-specific advice is suggested for this topic – see the report of the 3rd International Conference on Concussion in Sport.<sup>5</sup>

## Athletes and medication

One of the challenges when working with athletes who compete under anti-doping rules is being aware of what medication may be permitted or banned in and out of competitions. The rules for permitted sport are set every January by the World Anti-Doping Agency (WADA), changing as evidence changes. One resource for checking the status of a particular medication is Global Drug

Reference Online (Global DRO – <http://www.globaldro.com/>), produced through a partnership between UK Anti-Doping (UKAD), the Canadian Centre for Ethics in Sport (CCES) and the United States Anti-Doping Agency (USADA). This allows an athlete or health practitioner to search online about the status of a particular medical product. This only relates to medication, and there is always some concern about the risk of 'contaminated supplements': the status of particular supplements can be checked at <http://www.informed-sport.com/>.

## Conclusion

The maintenance of physical activity throughout adult life is probably the greatest intervention in terms of all-risk reduction of other disease that can be made for an individual, and appropriate early and on-going management of musculoskeletal problems is key for optimal recovery. Many of these issues are able to be dealt with either wholly or partially within primary care and so GPs play a vital role. Physical activity advice is often omitted from consultations in which it may do some good, and should be seen in the same way as smoking cessation advice and other health promotion interventions. Some situations or injuries do require specialised input in either investigation or onward referral, and the routes for these will be determined by local pathways and availability. This is discussed further in the 'Sport and exercise medicine: a fresh approach' document recently published.

## Further information

Should you have an interest in learning more about Sport and Exercise Medicine then many opportunities exist. These include regular conferences and a course run by the British Association of Sport & Exercise Medicine (BASEM) (<http://www.basem.co.uk/>) as well as university diploma/Master's-level courses (including some distance-learning) such as the following:

**Cardiff Metropolitan University:** <http://www3.uwic.ac.uk/english/studyatuwic/courses/cardiff-school-of-sport/pages/sport-exercise-medicine-msc-pgd-pgc.aspx>

**Queen Mary, University of London:** <http://www.whri.qmul.ac.uk/sportsmed/>

**University College London:** [http://www.ucl.ac.uk/surgicallscience/departments\\_research/iseh/msc\\_sports\\_medicine\\_exercise\\_health](http://www.ucl.ac.uk/surgicallscience/departments_research/iseh/msc_sports_medicine_exercise_health)

**University of Bath:** <http://www.bath.ac.uk/study/pg/programmes/spor-and-exer-medi>

**University of Nottingham:** <http://www.nottingham.ac.uk/scs/study/postgraduate-taught-courses/sports-exercisemedicine.aspx>

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## Further reading

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### Continuing professional development (CPD) task

- Consider ways you can promote physical activity to sedentary patients with chronic disease, and put these into practice. Consider using validated questionnaires such as the International Physical Activity Questionnaire (IPAQ) or General Practice Physical Activity Questionnaire (GPPAQ) to record activity levels.
- Consider performing an audit of the referrals made to secondary care for patients with sporting injuries in the last few months. What was the outcome of the referrals? Could any more have been done within Primary Care before the referral was made?

## **GP Training Bursaries**

### **Would you like to develop your knowledge or skills?**

Arthritis Research UK is pleased to offer a number of training bursaries for GPs wishing to develop a specialist interest in MSK medicine and surgery. The bursaries will provide GPs with an opportunity to gain qualifications that will promote the delivery of high-quality local care to patients.

Arthritis Research UK will fund up to half of the tuition fees for a postgraduate course in the field of arthritis, musculoskeletal medicine or surgery leading to a PGCert, PGDip, Master's degree or similar recognised qualification. The scheme has a rolling deadline so you can apply at any time. For further details please visit our website **[www.arthritisresearchuk.org](http://www.arthritisresearchuk.org)** and search for 'bursaries'.

## **New Centre for Sport and Exercise Injuries**

Arthritis Research UK will be launching a new Centre for Sport and Exercise Injuries later this year, which will be an international centre of excellence in research into the prevention of osteoarthritis following sport and exercise injury. The new Centre will, for the first time, co-ordinate the work of leading experts to undertake and share research into the risks associated with specific sports and specific body types, and how best to reduce these risks and to participate in sport healthily. The Centre will also look at how best to manage injuries when they do occur, reviewing recovery techniques and surgical and pharmacological interventions. Arthritis Research UK plans to make available £3m for supporting the Centre over the next 5 years.

Further information can be found on our website at **[www.arthritisresearchuk.org](http://www.arthritisresearchuk.org)**.

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**Topical Reviews** will change to electronic-only distribution after **this mailing (Summer 2012)** except for those who sign up to receive a hard copy via our special mailing list. To do this please go to **[www.arthritisresearchuk.org/reportsmailinglists](http://www.arthritisresearchuk.org/reportsmailinglists)** and enter your details. Alternatively, you can join the email notification list (see below) via the same link.

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