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Disclaimer

The Cover Shot

This photograph was taken in October, 2010 when Hong Kong host one of the world rugby's fearsome contests between the All Blacks and the Wallabies as they battle for the Bledisloe Cup at the Hong Kong Stadium. I took this shot from the south stand when a lineout was contesting near midway. With the sun fading and 60 meters away from the action, the camera settings were pushed to the limit.

Nikon 300mm f2.8, ISO 2500, 1/640 with D700

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Editorial

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Editor

Dr. Patrick YUNG

Since the Olympic year in 2008, the atmosphere of sports participation in Hong Kong has been growing rapidly, and people are more aware of how sports medicine & sports science can help to prevent injury, improve performance, and most importantly, achieve a better health. The science and knowledge so gathered have grown so broad & deep in the past decade, which are beyond any single professional, to be good enough to provide the best care and advice to our athletes or patients. Very much like participating in a sports team, we need a team effort to collaborate, with experts of different specialties, to achieve the goal of good patient care, and that are the very unique characteristics of sports medicine.

In this issue of the Medical Diary, there are five articles contributed by various experts in the field of sports medicine, delivering the recent advanced knowledge in exercise science. We start with an article on the "**Updated knowledge on exercise prescription**", which is now very often used by our medical practitioners for our patient care, followed by another related article on the "**Myth and Misconception in Exercise & Weight loss**" (This article comes with questions for the purpose of CME). Since endurance sports like long distance running or Marathon running are becoming more and more popular in Hong Kong, to cater for the need of runners, we have an article on the "**Current evidence in respiratory muscle training & exercise performance**". Having said that, participating in demanding endurance sports is not totally without risks, the best way to minimise the risks is prevention, and thus an article on the "**Latest advances on non-invasive cardiac imaging in prevention of exercise related sudden cardiac death**" is prepared for your easy reference. Finally, to echo the Hong Kong Government in the promotion of regular exercises among disabled people, and even to the extent of competitive sports, our last article in this issue is related with the current knowledge and future development of "**Sports medicine for the physically disabled**".

I would like to thank all the council members of Hong Kong Association of Sports Medicine & Sports Science (HKASMSS), in particular all the authors, & our coordinator Ms. Gina Wong, for their great contributions to prepare this issue of Medical Diary. I am sure you will find this article enjoyable to read and informative in your practice.

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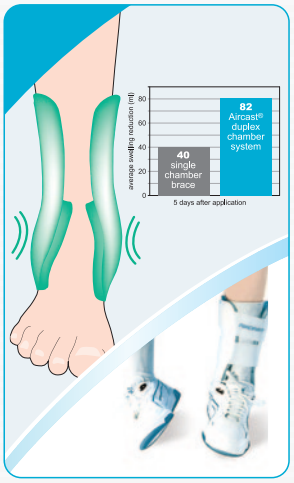

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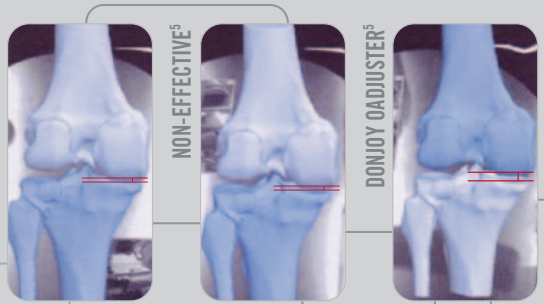

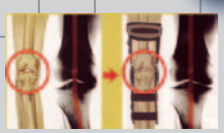

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1. Role of bracing in the management of knee osteoarthritis. *Rannou et al. Curr Opin Rheumatol,* 2010
2. Unloader bracing for medial compartment osteoarthritis: Implications on Mediating Progression. *Ramsey et al. Sports Health, Vol. 1, No. 5,* 2009.
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Myths and Misconceptions in Exercise & Weight Loss

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This article has been selected by the Editorial Board of the Hong Kong Medical Diary for participants in the CME programme of the Medical Council of Hong Kong (MCHK) to complete the following self-assessment questions in order to be awarded 1 CME credit under the programme upon returning the completed answer sheet to the Federation Secretariat on or before 31 December 2011.

Introduction

The prevalence of body mass index BMI-defined obesity has increased since 1972, in adults and children in Hong Kong[1-2], similar to the world-wide situation. The incidence of adult overweight and obesity (BMI ≥ 23.0) in Hong Kong was reported at 39.2% in 2010, including 21.0% as obese[3]. The World Health Organization (WHO) postulated that by 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese[4]. The link between obesity and chronic diseases like diabetes, hypertension, and heart disease is well versed throughout the literatures[5-6]. And even in the absence of any metabolic syndrome, negative effects may happen 20 years down the road[7].

With the advancement of technology and knowledge, there is a rising expectation and acceptance of the experts, especially medical professionals, to "guide us" in solving problems[8]. However, questions on efficacy remain a vital concern[9]. Critics have pointed out that the treatment of obesity, in the absence/presence of pharmacological or surgical intervention, demands a change in life-style, diet or exercise, but the 'optimal diet' or 'optimal physical activity level', has yet to be defined[10-11]. Without a clear solution on how to tackle obesity, the medical professionals often end up recommending more physical activity and self restraint [12].

The medical community and the individuals need to be provided with sufficient information, since decision-making depends on the presence or absence of informed and/or rational choices[13]. The benefits of exercise in weight control are well documented throughout the literature[14-15], and it is not within the scope of this discussion to venture further.

This article attempts to examine the common 'exercise for weight loss' misconceptions and the effectiveness and dose-recommendations of exercise for successful weight loss management.

Misconception #1: The rise in obesity in the developed countries, such as Hong Kong, is due to inactivity of the population as a whole.

A recent international multi-centre study in daily total energy expenditure TEE (measured by doubly labelled water technique and indirect calorimetry) in 149 Nigerian and 172 African-American women (18-59 year age) was completed. Activity energy expenditure AEE was calculated by subtracting the resting energy expenditure from the total energy expenditure, and correlated to body size and adiposity. The Nigerian women exhibited lower BMI, higher AEE (though of insignificant difference in the two groups – with 800 kcal-day-1 for Nigerian women versus 760 kcal-day-1 in African-American women). When adjusted for body size, AEE of Nigerian women was similar to the American counter-part, even with higher TEE and REE in this group[16].

But the scholars have noted significant differences in diet profile of the two groups, with much lower fibre, lower carbohydrates; and higher fat (at 40-45 percent), animal protein and processed foods intake of the African-American diet. The study concluded that AEE was not associated cross-sectionally with adiposity, and that decreased physical activity energy may "have less of a role in the development of obesity than anticipated' [16].

Longitudinal studies reported similar findings. Despite a much higher incidence of obesity in the contemporary African-American women at 50% versus 7% in rural Nigeria women, no differences in mean activity energy expenditure or physical activity level were observed over three years[17]. The role of energy expenditure in the cause of obesity at the population level was thus called into question.

The view was confirmed in the meta-analysis review of 98 doubly labelled water studies (including 183 cohorts and 4972 individuals) on total energy expenditure TEE and physical activity level PAL. Mean BMI was higher in the developed countries for both men (BMI 22.7±1.0 in developing countries compared with 26.0±0.7 in industrialised countries); and women (BMI 24.3 ± 0.7 in developing countries compared with 26.6 ± 0.4 in industrialised countries). However, TEE adjusted for weight and age or physical activity level did not differ significantly between developing and industrialised countries[18].

The conclusion that can be drawn from these studies is that the major causative factor of obesity is a surplus in energy intake, and not due to inactivity of the population as a whole. Thus, modifications of the diet should become the corner stone and an indispensible part of any obesity intervention.

Misconception #2: The best way to lose weight is to exercise.

Although apparently difficult to define, a clinical significant weight loss can be interpreted as an >5% change in body weight; while weight maintenance is defined as <3% change in body weight[19].

Recent literature review completed by the American College of Sports Medicine (ACSM)[20] reported similar evidence-based recommendations from the National Heart, Lung and Blood Institute[21]. Although physical activity PA has the potential for weight loss, unless the overweight/obese subjects can achieve or sustain extreme amount of PA like military training or mountain climbing, few PA studies were able to achieve significant or ≥3%% weight loss by exercise-only interventions in sedentary overweight individuals. ACSM thus classified the statement "PA will promote clinically significant weight loss" as Evidence Category B statement[20].

According to ACSM, the amount of exercise recommended to achieve clinically significant weight loss is at >250 min-wk-1 (for example, 50 min per day for 5 days of a week). While moderate intensity exercise 150-250 min-wk-1 is considered effective for providing modest weight loss or weight maintenance[20].

Critics for the above statement have argued that for the SAME amount of energy deficit, whether as a result of diet-only or exercise-only, one may expect equal degree of weight loss[22]. However, an energy deficit of 500 kcal per day through exercise is apparently difficult a task for most of our sedentary population.

The conclusion that can be drawn from these studies is that in members of a sedentary population, exercise should be an integral part, but not solely, of weight loss therapy.

Misconception #3: Since one pound of fat is estimated to be around 3500 calories, if one can perform a 500 calories exercise bout per day, one can expect to lose one pound in a week.

Theoretically, creating a caloric deficit of 500 calories per day for a week, could result in the loss of 3500 calories of stored energy.

Simple steps used to calculate exercise energy often employed by sports dietitian are:

1. Look-up exercise energy in Metabolic Equivalent of Task (MET) units. A good reference source for exercise energy in MET is the Compendium of Physical Activities, developed by Dr. Bill Haskell from Stanford University[23].

   Metabolic Equivalents of Exercise Energy per kg body weight per hour

Light Intensity Activities	MET < 3
Sleeping	0.9
Watching television	1.0
Desk work, typing	1.8
Walking 1.7 mph (2.7 km/h), level ground, very slow	2.3
Walking 2.5 mph (4 km/h)	2.9
Moderate Intensity Activities	**3 to 6**
Walking 3 mph (4.8 km/h)	3.3
Bicycling, stationary, 100 watts, light effort	5.5
Walking 3.4 mph (5.5 km/h)	
Running 4 mph (13 min/mile)*	6
Vigorous Intensity Activities	**> 6**
Jogging, general	7.0
Running jogging in place	8.0
Rope jumping	10.0

Source: http://en.wikipedia.org/wiki/Metabolic_equivalent
**The compendium of physical activities 2011[23].*

2. Calculate the energy expended from such activity. For example:
   -the estimated energy expenditure for running at 4 mph (13 min/mile) is 6 METs
   -A 65kg man running at above this speed for 45 min.= 6 METs x 65kg x 0.75 hours = 293 kcal

And hence theoretically, if one is more concerned about creating energy deficit for weight loss (rather than how much energy is burnt through exercise), the estimated 'extra energy' spent through exercise may thus have been over-estimated by one MET. Since one MET is defined as 1 kcal/kg/hour, and roughly equivalent to the energy cost of sitting quietly, the ACTUAL energy deficit created by exercise should then be the difference between exercise and sedentary energy expenditure.

The conclusion that can be drawn from the above information is that the caloric deficit created by increasing exercise energy expenditure is less than one may expect.

Discussion & Conclusion

Recently, Hall et al have also postulated that even with a continuum of an energy deficit of 500 kcal per day (through diet or exercise), one may not be able to produce a steady downward trend of weight loss[24]. According to the scholars, as one loses weight, metabolic adaptations occur, resulting in a drop in energy expenditure. A theoretical calculation would lead to an adjusted new energy equation for weight loss. Awaiting for wider applications, this theoretical calculation is now adopted by the National Institute of Diabetes and Digestive and Kidney Diseases NIDDK. as a research tool[25], and is accessible on the web as the "body weight simulator"[25]. For example, a continuum of -500 calories per day over 90 days (totalling a deficit of 45,000 calories), would result in a loss of 12 pounds instead of 12.8 pounds.

The ability to succeed in weight loss intervention is difficult. Evidence is accumulating that dietary intake may be more important than increasing energy expenditure when it comes to solving our obesity crisis. Sustainable weight loss is not likely to happen without dietary reform. This is not to lessen the important role of exercise in health care management, but to serve as a reminder for the importance of comprehensive and coordinated care in the face of the obesity epidemic.

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MCHK CME Programme Self-assessment Questions

Please read the article entitled "Myths and Misconceptions in Exercise & Weight Loss" by Mrs. Mimi SHAM and complete the following self-assessment questions. Participants in the MCHK CME Programme will be awarded CME credit under the Programme for returning completed answer sheets via fax (2865 0345) or by mail to the Federation Secretariat on or before 31 December 2011. Answers to questions will be provided in the next issue of The Hong Kong Medical Diary.

Questions 1-10: Please choose the best answer.

1. The incidence of overweight and obesity in Hong Kong is approximately :
(a) 21% **(b) 30%**
(c) 35% **(d) 39%**

2. The observed difference between women in Nigeria and America in daily activity energy expenditure amounts to approximately :
(a) 40 kcal **(b) 100 kcal**
(c) 200 kcal **(d) 300 kcal**

3. According to the study cited in the above discussion, the likely cause of overweight in African-American women, when compared to Nigerian women, is likely due to:
i. An overconsumption of animal protein foods
ii. An overconsumption of potato/grains
iii. An overconsumption of energy intake
iv. An overconsumption of processed foods
(a) ii, iii, iv **(b) All of the above**
(c) i, ii, iii **(d) i, iii, iv**

4. For the overweight/obese patients, a 'significant' weight loss in clinical practice can be defined as achieving a total weight loss of:
(a) Achieving desirable BMI **(b) 10 kg**
(c) >5% of initial weight **(d) 3% of initial weight**

5. According to the energy calculation formula proposed in the discussion, approximately how much energy will a 70kg man spend in an overnight 8 hours-sleep?
(a) 200 kcal **(b) 300 kcal**
(c) 400 kcal **(d) 500 kcal**

6. According to the discussion, the major causative factor of overweight/obesity in the modern society is:
(a) Lack of exercise **(b) Genetic predisposal**
(c) Overconsumption of energy dense foods **(d) Lack of daily activity**

7. According to the American College of Sports Medicine, In order to achieve significant weight loss, the amount of exercise recommended PER DAY (5 days per week) is:
(a) 30 min-day-1 **(b) 40 min-day-1**
(c) 50 min-day-1 **(d) 60 min-day-1**

8. According to the American College of Sports Medicine, In order to achieve modest weight loss or for weight maintenance, the minimum amount of exercise recommended PER DAY (5 days per week) is:
(a) 30 min-day-1 **(b) 40 min-day-1**
(c) 50 min-day-1 **(d) 60 min-day-1**

9. The actual energy deficit resulted from exercise tends to be over-estimated if one forgets to take into consideration of:
(a) energy expenditure in inactivity **(b) resting energy expenditure**
(c) Weight of the individual **(d) Duration of the exercise**

10. With the same amount of energy deficit through diet/exercise, a steady rate of weight loss may not be achievable due to :
(a) A ceiling effect on further weight loss **(b) Metabolic adaptations to a lesser body size**
(c) Genetic destination to weight status **(d) Deviation from diet/exercise**

ANSWER SHEET FOR DECEMBER 2011

Please return the completed answer sheet to the Federation Secretariat on or before 31 December 2011 for documentation. 1 CME point will be awarded for answering the MCHK CME programme (for non-specialists) self-assessment questions.

Myths and Misconceptions in Exercise & Weight Loss

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Answers to November 2011 Issue

Current Concepts in Mandibular Reconstruction

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4. **DOSAGE: Adults:** Zmax should be taken as a single 2 g dose. Zmax provides a full course of antibacterial therapy in a single oral dose. **Pediatric patients 6 months and older:** Zmax should be taken as a single dose of 60 mg/kg (equivalent to 27 mg/lb) body weight. The Zmax dose in mL is equivalent to the child's weight in lb (1 mL/lb dose), for a body weight of less than 75 lb (34 kg). Pediatric patients weighing 75 lb (34 kg) or more should receive the adult dose (2 g). It is recommended that Zmax be taken on an empty stomach (at least 1 hour before or 2 hours following a meal). Constituted suspension should be consumed within 12 hours.
5. **CONTRAINDICATIONS:** Zmax is contraindicated in patients with known hypersensitivity to azithromycin, erythromycin or any macrolide or ketolide antibiotic.
6. **WARNINGS & PRECAUTIONS:** Serious allergic reactions, including angioedema, anaphylaxis, Stevens Johnson syndrome and toxic epidermal necrolysis reported rarely in patients on azithromycin therapy using other formulations. Despite initially successful symptomatic treatment of the allergic symptoms, when symptomatic therapy was discontinued, the allergic symptoms recurred soon thereafter in some patients without further azithromycin exposure. These patients required prolonged periods of observation and symptomatic treatment. *Clostridium difficile* associated diarrhea (CDAD) must be considered in patients w/ diarrhea following antibiotic use. Exacerbation of symptoms of myasthenia gravis and new onset of myasthenic syndrome in patients receiving azithromycin therapy. If a patient vomits between 5 and 60 minutes following administration, alternative therapy should be considered. Caution should be exercised in patients with GFR <10 mL/min, due to a higher incidence of gastrointestinal adverse events. Prolonged cardiac repolarization and QT interval, imparting a risk of developing cardiac arrhythmia and *torsades de pointes* in treatment with macrolides. Prescribing Zmax in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to the patient and increases the risk of the development of drug-resistant bacteria. Careful monitoring of patients when used digoxin, ergotamine or dihydroergotamine, cyclosporine, hexobarbital and phenytoin concomitantly with azithromycin.
7. **INTERACTIONS:** Prothrombin times should be carefully monitored while patients are receiving azithromycin and oral anticoagulants (e.g. warfarin) concomitantly. Azithromycin had minimal effect on the pharmacokinetics of atorvastatin, carbamazepine, cetirizine, didanosine, efavirenz, fluconazole, indinavir, midazolam, sildenafil, theophylline (intravenous and oral), triazolam, trimethoprim/sulfamethoxazole or zidovudine. Co-administration of nelfinavir increases azithromycin serum concentration.
8. **PREGNANCY AND LACTATION:** Pregnancy Category B. Teratogenic effects: should only be used during pregnancy if clearly needed. It is not known whether azithromycin is excreted in human milk, caution should be exercised when administered to a nursing woman.
9. **SIDE EFFECTS: Adults:** Common side effects included diarrhea/loose stools, nausea, abdominal pain, headache, vomiting. Less common side effects included palpitation and arrhythmias including ventricular tachycardia and hypotension, chest pain, constipation, dyspepsia, flatulence, gastritis, oral moniliasis, vaginitis, dizziness, vertigo, asthenia, rash, pruritus, urticaria, taste perversion. **Pediatric Patients in clinical trials:** Common side effects included vomiting, diarrhea, loose stools, abdominal pain, nausea, rash, dermatitis, anorexia, fever. Less common side effects included chills, flu syndrome, headache, abnormal stools, constipation, dyspepsia, flatulence, gastritis, gastrointestinal disorder, hepatitis, leucopenia, agitation, emotional liability, hostility, hyperkinesia, insomnia, irritability, parasthesia, somnolence, asthma, bronchitis, cough increased, dyspnea, pharyngitis, rhinitis, fungal dermatitis, maculopapular rash, pruritus, urticaria, otitis media, taste perversion, dysuria.

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Updated Knowledge on Exercise Prescription

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Given the benefits of regular physical activity, the promotion of physical activity has become an important public health issue in recent decades. According to the Thematic Household Survey in 2002, an average person would visit a doctor 4.2 times in a year.[1] The consultation time with the patients thus provides an opportunity for general practitioners to give advice and encourage their patients to engage in regular physical activity. The Department of Health is collaborating with the Hong Kong Medical Association, the Hong Kong Doctors Union, Leisure and Cultural Services Department, Home Affairs Department, Physical Fitness Association Hong Kong, China, non-governmental organisations and others to launch the Exercise Prescription Project by two phases, starting from January 2006.[1] Training courses were arranged for general practitioners and useful information on exercise prescription and precaution had been included on the website of the Department of Health's Central Health Education Unit (http://exerciseRx.cheu.gov.hk.).

The effectiveness of exercise prescription by general practitioners on physical activity promotion in patients has been investigated in other countries[2-7] and in Hong Kong.[8] Collectively, the components of exercise prescription in these studies include: 1) a counselling session (on average lasted for 2 to 5 minutes) on physical activity given by the general practitioner,[2-8] 2) pamphlets or booklets containing information on the benefits of physical activity, exercise recommendations, and local physical activity opportunities,[2,3,5,6,8] 3) a brief booster phone call made by the health educator to patients shortly after they have received physician counselling[7] or continued support by telephone and post delivered by exercise specialist or health educator.[4,5] Follow-up periods of these programs ranged from one month to one year. Results from these programmes suggested that exercise prescription in general practice can help to promote physical activity in patients. Lack of time, and difficulty of linking other health care workers to the counselling were common obstacles raised by general practitioners in the exercise prescription practice.[3]

Recommendation for moderate-intensity exercise was the main strategy being adopted by general practitioners from the above exercise prescription studies. The recommendations for adults to accumulate >= 30 minutes of moderate-intensity aerobic physical activity on most days of the week was originated by the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) in 1995.[9] The CDC/ACSM recommendations on aerobic exercise have been updated in 2007, to that all healthy adults aged 18 to 65 yr need moderate-intensity aerobic (endurance) physical activity for a minimum of 30 min on five days each week or vigorous-intensity aerobic physical activity for a minimum of 20 min on three days each week to promote and maintain health.[10] In 2008, the U.S. Department of Health & Human Services (USDHHS) issued the 2008 Physical Activity Guidelines for Americans with greater flexibility on aerobic exercise recommendations, by dividing the total amount of aerobic physical activity an adult gets every week into four categories from "Inactive", "Low activity", "Medium activity", to "High activity", and elaborated how each of these categories is related to health benefits[11] - most health benefits occur with at least 150 minutes a week of moderate intensity physical activity, with additional benefits occurring with more physical activity. Guidelines from the WHO's 2010 Global Recommendations on Physical Activity for Health have also drawn attention to the health benefits of similar amount of weekly moderate intensity aerobic exercise.[12] However, it is also commonly observed in clinical practice that a number of adults have difficulties to meet this exercise recommendation.[11,13] In a recent study, Wen et al. assessed the health benefits of different volumes of physical activity in a large cohort in Taiwan and demonstrated that 15 minutes a day or 90 minutes a week of moderate-intensity exercise provided a reduction in all-cause and all-cancer mortality and extended an individual's lifespan for an average of 3 years - this minimum amount of exercise is applicable to men and women of all ages, even those with cardiovascular diseases or lifestyle risks.[14] General practitioners might consider using this low-volume of physical activity recommendation to encourage patients whose main problem was time constraint and have difficulties to start or to follow the commonly used international guidelines.[10-12]

Apart from the recommendation of aerobic exercise, it has to be noted that muscle-strengthening activities have also been incorporated into the above recently updated exercise recommendations and guidelines.[10-12] Research demonstrated that muscle-strengthening exercise, which is also termed as resistance training or strength training, has profound effects on the musculoskeletal system, contributes to the maintenance of functional abilities, and prevents osteoporosis and other disabilities.[15] More recent research demonstrates that resistance training may positively affect risk factors such as insulin resistance, resting metabolic rate, glucose metabolism, blood pressure, body fat, and gastrointestinal transit time, which are associated with diabetes, heart disease, and cancer.[15] In view of the potential health-related

benefits of resistance training, it should be an important component in an exercise programmes. From the 2008 Physical Activity Guidelines, this recommended that adults should do resistance training that is of moderate or high intensity and involves all major muscle groups on 2 or more days a week, while for children and adolescents, resistance training should be included as a part of their 60 or more minutes of daily physical activity, on at least 3 days of a week.[11]

Exercise recommendations on other components of physical fitness such as flexibility and neuromotor function may also influence some aspects of health and is beneficial to patients with special needs. Research demonstrated that flexibility exercise develops range of motion of joints and may enhance postural stability and balance.[16,17] Although no consistent link has been shown between regular flexibility exercises and a reduction of musculotendinous injuries, flexibility exercise targeting the major muscle-tendon units of the shoulder girdle, chest, neck, trunk, lower back, hips, posterior and anterior legs, and ankles are recommended. This routine can be completed within 10 minutes, included in a general fitness programme, or conducted as a stand-alone one.[16] Neuromotor exercise training, sometimes called functional fitness training - incorporates motor skills such as balance, coordination, and agility, and proprioceptive training - is beneficial to improve balance, agility, muscle strength, and reduces the risk of falls in older persons.[16,18]

General practitioners act an important role in counselling patients on physical activity. In particular, general practitioners identify individuals with potential risks from doing exercise and require further clinical evaluation before starting an exercise programme, give advice on whether a patient with different medical conditions (eg. pregnant women, hypertensive patient) could tolerate exercise training, and identify individual with special needs. Exercise recommendations are different in individuals of different age groups (eg. children, the elderly), and the exercise programme being prescribed to an individual is needed to be adjusted regularly in order to obtain better physical fitness achievement. In current clinical settings, however, it may be very difficult for general practitioners to deliver all components of exercise prescription to patients. For possible cases, the suggestion of getting advice from qualified physical coaches would be very helpful for the long-term successfulness of the exercise programme.

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Current Evidence in Respiratory Muscle Training & Exercise Performance

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Introduction

The respiratory system is a vital organ in mammals, by which oxygen is delivered to the red blood cells and concomitantly carbon dioxide is removed and expelled in the environment. Environmental air, rich in oxygen, is driven via the upper airways into the alveoli within the lungs where gas exchange takes place between alveolar air and the pulmonary circulation. The lungs are passively extensible organs and located within the thoracic cage. Movement of air into and out of the lungs is performed by the respiratory muscles. The inspiratory muscles contract and increase the volume of the thoracic cavity which creates a negative pressure that allows air entering into the lungs, while expiratory muscles remove the air from the lungs.[1] The respiratory muscles consist of inspiratory and expiratory muscles. The muscles of inspiration are the diaphragm and intercostal muscles as well as some muscles in the neck region including scalenes and sternocleidomastoids. The muscles of expiration are those from the muscular corset of the abdominal wall, such as rectus abdominis, transversus abdominis, internal and external oblique muscles. The four abdominal muscles involved in breathing serve as postural muscles, in rotating and flexing the trunk, and when coughing, speaking or singing, and playing wind instruments.[2]

In the past, the highly-resistant characteristics of the breathing pump muscles contributed to an assumption regarding the likelihood that the breathing muscles contributed to exercise limitation. Physiologists often assumed that the breathing pump muscles, particularly the diaphragm, were so well evolved from their continuous work that they were immune to fatigue.[2] However, some reports of respiratory muscle fatigue after high levels of sport competitions came out in the 1980s and nowadays, we have a clearer picture between respiratory muscles and exercise performance.

Breathing Muscle Limitations in Exercise

Breathing is so natural and easy when we are healthy. The average adult takes about 10 to 15 breaths per minute, with a volume of about 0.5 litres, producing a 'minute ventilation' of 7.5 litres per minute. Each breath moves this amount of air into and out of the conducting zone and respiratory zone, which is referred to as the tidal volume. The volume of each breath (tidal volume) depends on the body size and metabolic rate of an individual. People with a bigger body have larger lungs and take larger breaths. They require more energy and oxygen to support their metabolism, so they naturally have a relatively larger minute ventilation.[2]

During heavy exercise, the breathing frequency rises to around 40 to 50 breaths per minutes. In a physically active young male, the tidal volume rises to around 3 to 4 litres. In Olympic-class male endurance athletes, tidal volume can be over 5 litres, resulting in a minute ventilation of 250 to 300 litres per minute. As reported by McConnell, the earliest studies of inspiratory muscle fatigue after competitive sports appeared in three decades ago, where significant reductions in inspiratory muscle strength were measured after marathon running. Subsequent research further confirmed these findings and showed that inspiratory muscle fatigue is present after ultramarathon and triathlon competitions. Breathing muscle fatigue makes a major limitation to sport skills performance as well as postural control. Failure of proper postural control increases the risk of sport injury.[2]

Running is one of the most popular sports but it presents a huge challenge to the breathing muscles. It requires them to function not only as breathing muscles, but also as a central part of the systems that control running posture, protect the spine from injury, and optimise force transmission during the leg drive phase of running. Some may experience stitch pain (localised and focused discomfort in the thoracic region) during running. Although there is no solid proof concerning the cause of this stitch pain, researchers believe that it is possibly due to diaphragm ischaemia or diaphragm spasm while running. In addition to the pain around the rib cage, runners may also have discomfort around the clavicles and lower neck area. These are signs that the inspiratory muscles, such as sternomastoids, scalenes, and intercostals, are overloaded and undertaking too much work of breathing. In rowing, fatigue in breathing muscles are often seen in competitive rowers. Research has shown that the strength of the inspiratory muscles is about 12% to 20% lower after a 2000m race.[3] In competitive cycling, the cyclists have to lean forward in order to minimise the wind effect. This crouched body position puts extra pressure on the inspiratory muscles which increase the diaphragm work.

Swimming appears to be the most challenge for the respiratory muscles. As reported by Lomax and McConnell, competitive swimming induces the most severe inspiratory muscle fatigue of any sport studied

to date.[4] The researchers stated that a 29% fall in inspiratory muscle strength was found after 200m swim race, compared with around 10% to 20% for terrestrial sports. The reasons for breathing muscles fatigue in swimming can be summarised as follows: (a) a great demand for work is placed on the inspiratory muscles because of the hydrostatic pressure and the higher elastic work of breathing; (b) the inspiratory muscles are weaker because of the horizontal position in the water; (c) high inhalation rates and volumes are needed (functional weakening); and (d) very low breathing frequency can accelerate fatigue of the inspiratory muscles.[2]

Studies on Respiratory Muscle Training

Theoretically, making the breathing muscles stronger and more fatigue resistant could delay or abolish the negative influences of breathing on exercise tolerance. Recent studies of breathing muscle training have examined endurance sports utilising two types of exercise tests: fixed-intensity exercise undertaken to the limit of tolerance and time trials.[3, 5-7] It appears that respiratory muscle training is able to improve time trial performance in many competitive athletes. In fact, there are some fundamental concerns about respiratory muscle training, including the optimal breathing technique, setting and optimising the training load, monitoring progress, performing maintenance training, and optimising the recovery.

We take swimming as an example. The objectives of swimming-specific respiratory muscle training are to (a) train the inspiratory muscles to overcome external (hydrostatic) impedance of thoracic expansion; (b) train the breathing muscles to be capable of achieving rapid, deep inhalations in spine positions; and (c) enhance the ability of the breathing muscles to function both as contributors to propulsive force and as thoracic and pelvic stabilisers.[2]

With the recent development of user-friendly respiratory muscle training devices, many studies have been conducted across a variety of sports. A study utilising 27 collegiate soccer players to determine the effect of respiratory muscle training on intermittent exercise performance, respiratory muscle strength, and respiratory muscle fatigue was conducted. Subjects were randomly assigned into either the training group or control condition during off-season conditioning. They performed respiratory muscle training 10 times weekly for 5 weeks using a commercially-available training device. Performance was evaluated utilising the Yo-Yo Intermittent Recovery Test. It was found that respiratory muscle training improved intermittent exercise performance significantly in soccer players.[8]

In swimming, researchers invited 16 competitive club-level swimmers and they were assigned randomly to either the training group or placebo control group. Each swimmer performed a series of physiological and performance tests before and following 6 weeks of respiratory muscle training, including (a) an incremental swimming test to the limit of tolerance to determine lactate, heart rate, and perceived exertion response, (b) standard measures of lung function (forced vital capacity, forced expiratory volume in 1 s, peak expiratory flow) and maximal inspiratory pressure, and (c) 100m, 200m, and 400m swimming time trials. Training utilised a hand-held pressure threshold device and consisted of 30 repetitions, twice per day. In comparison with the control group, the respiratory muscle training group improved the swimming performance: 100m by 1.7%, 200m by 1.5%, and 400m by 0.6%.[9] Respiratory muscle training has also been shown to improve divers swimming endurance. Investigation demonstrated that the respiratory muscles were considerably less fatigued following a four-week respiratory muscle training.[10] In rowing, 17 competitive rowers were given respiratory muscle training for 10 weeks. Data with repeated measure design indicated that significant rowing performance were observed in the inspiratory muscle training group, but not the expiratory muscle training group.[11] Leddy et (2007) indicated that a 4% improvement was found by using a time-trial assessment in endurance running.[12]

For disabled sport, 12 competitive wheelchair racing athletes were assessed before and after respiratory muscle training. They performed 30 sessions of training for 30 min each whereas the control group received no respiratory muscle training. In the training group, the time of the 10-km time-trial decreased significantly from before versus after intervention (27.1 vs 24.1 min).[13] In overweight and obese subjects, respiratory muscle training together with exercise and nutrition counselling programme was found to have significant improvement in the 12-minute time trial and the incremental cycling test.[14] In older adults, respiratory muscle training appears to be an effective preventive way to improve walking ability and functional performance capacity.[15]

Respiratory Muscle Training Device

The commercially available respiratory muscle training device has been used in several studies examining lung function and exercise tolerance. It is both comfortable and practical to use and maintain.[16] As described by McConnell, the device is similar to weightlifting. The 'weight' is applied in the form of a resistance to airflow, via a mouthpiece. The resistance can be generated using two main methods: flow resistance loading or pressure threshold loading. Such load can be limited to breathing phase by using a valve that permits unimpeded airflow during either inhalation or exhalation.[2] The use of an inspiratory flow resistance loading device has been reported to have an increase in inspiratory muscle strength in the range of 20% to 50%. The inspiratory pressure threshold loading device is the most widely used of breathing training which contains a pressure-load in the form of spring-loaded poppet valve, and it can improve the inspiratory muscle strength. Figure 1 shows the foundation of Inspiratory Muscle Training essentials. Common brand names, such as POWERbreathe, Pflex, TrainAir, Threshold, and SpiroTiger are available in the market, but users are advised to consider the various functions of these equipment before training.

Figure 1. Foundation Inspiratory Muscles Training (IMT) Essentials.

- Set the training load to the 30-repetition maximum (30RM) using a process of trial and error
- Inhale against the load with maximum effort (as fast as possible)
- Breath in and out as far as possible during each breath
- Train twice per day – morning and evening
- Remember that repetition failure for the inspiratory muscles is an 'inability to achieve a satisfying breath'
- Progress the training by keeping the load at your new 30RM to account for improvement (increase the load at least once per week)
- Train in a window between 25 and 35 breaths per session
- Keep in mind that whole-body training may affect IMT because of residual fatigue, so evening IMT sessions may be more challenging than morning session – but don't reduce your training load
- If you suspect that there is any residual fatigue of the inspiratory muscles, take a day off from the IMT
- Don't do IMT just before a big training session or competition
- Keep an IMT diary

Source: McConnell A. Breathe strong perform better. Campaign, IL: Human Kinetics, 2011, p. 105.

To conclude, respiratory muscle training opens a research area for sport scientists to investigate its relationship with various competitive sports. Recent studies have demonstrated that respiratory muscles, especially the inspiratory muscle strength can be improved through proper training so as to enhance sport performance.

Figure 2 shows the respiratory muscle training performed by Mr Chan Ka Ho, the current Hong Kong record-holder of 3000m and 15km running events.

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Latest Advances on Non-invasive Cardiac Imaging in Prevention of Exercise-related Sudden Cardiac Deaths

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Heart disease is the number one killer and the annual mortality is close to 170,000, i.e. one cardiac death every 2 minutes worldwide. In Hong Kong, the number of cardiac deaths in the last year was over 6,000 and there were about six sudden cardiac deaths every day. Exercise-related sudden cardiac deaths were also not infrequent with an incidence of one in 100,000.

While Prof. BJ Maron has introduced the concept of 'Paradox of Exercise' in 2000 stating that "vigorous physical exertion increases the short term risk of sudden cardiac death in all people, yet simultaneously offers protection from this risk in those who exercise regularly, while they are both active and sedentary", other Sports Medicine experts interpret the act of long term high intensity sports activity to be "too much of the good thing".

Non-traumatic cardiac arrests that we see in the sports fields are mostly cardiovascular in origin. Sudden Cardiac Arrest (SCA) in athletes is uncommon but catastrophic. They are usually related to congenital or structural abnormalities in younger than 35 and coronary artery disease in those 35 years and above.

Cardiovascular Causes of Sudden Deaths in Young Competitive Athletes

For those younger than 35 years of age, they are typically unrecognised prior to death and rather unpreventable. They are mostly congenital or structural defects including hypertrophic and arrhythmogenic right ventricular cardiomyopathy, coronary anomaly and ion channelopathy such as long QT syndrome and Brugada syndrome.

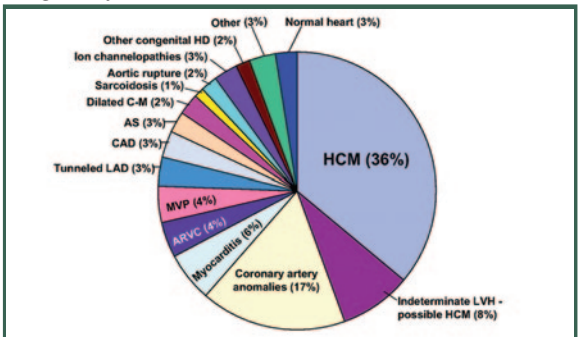


Figure 1. Distribution of cardiovascular causes of sudden death in 1435 young competitive athletes. From the Minneapolis Heart Institute Foundation Registry, 1980 to 2005. ARVC indicates arrhythmogenic right ventricular cardiomyopathy; AS, aortic stenosis; CAD, coronary artery disease; C-M, cardiomyopathy; HD, heart disease; LAD, left anterior descending; LVH, left ventricular hypertrophy; and MVP, mitral valve prolapse.

The 12-Element AHA Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes

In view of the catastrophic nature of sudden cardiac deaths in healthy and physically active athletes, pre-participation screening is recommended. The AHA Recommendations and Considerations Related to Pre-participation Screening for Cardiovascular Abnormalities in Competitive Athletes: 2007 Update published the 12-Element AHA Recommendations for Pre-participation Cardiovascular Screening of Competitive Athletes as in the table.

TABLE. The 12-Element AHA Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes

Medical history*

Personal history

1. Exertional chest pain/discomfort
2. Unexplained syncope/near-syncope†
3. Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
4. Prior recognition of a heart murmur
5. Elevated systemic blood pressure

Family history

6. Premature death (sudden and unexpected, or otherwise) before age 50 years due to heart disease, in ≥1 relative
7. Disability from heart disease in a close relative <50 years of age
8. Specific knowledge of certain cardiac conditions in family members: hypertrophic or dilated cardiomyopathy, long-QT syndrome or other ion channelopathies, Marfan syndrome, or clinically important arrhythmias

Physical examination

9. Heart murmur‡
10. Femoral pulses to exclude aortic coarctation
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure (sitting position)§

*Parental verification is recommended for high school and middle school athletes.

†Judged not to be neurocardiogenic (vasovagal); of particular concern when related to exertion.

‡Auscultation should be performed in both supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction.

§Preferably taken in both arms.

Mandatory Resting ECG for Screening of Channelopathy and Cardiomyopathy

In contrast with the AHA recommendation, both the Italian community and the European Society of cardiology adopt a more aggressive approach for screening with the requirement of mandatory resting ECG as many of the genetic related disorders such as channelopathy and cardiomyopathy can potentially be identified by resting ECG. It has been shown that the annual incidence of sudden death in athletes screened under such protocol has declined dramatically over the past years. The flow chart of the Italian / ESC screening protocol is as below.

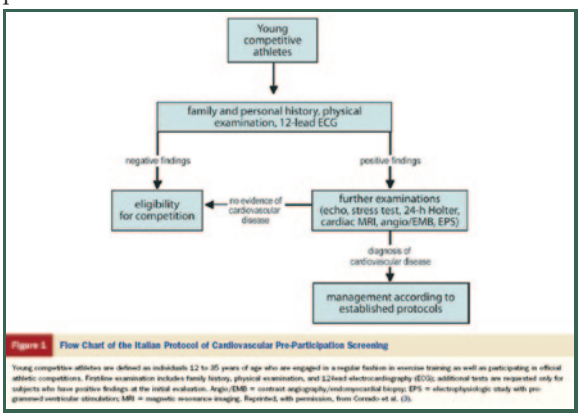


Figure 1 Flow Chart of the Italian Protocol of Cardiovascular Pre-Participation Screening

Young competitive athletes are defined as individuals 12 to 35 years of age who are engaged in a regular fashion in exercise training as well as participating in official athletic competitions. Frontline examination includes family history, physical examination, and 12-lead electrocardiography (ECG); additional tests are requested only for subjects who have positive findings at the initial evaluation. Angio/EMB = contrast angiography/endomyocardial biopsy; EPS = electrophysiologic study with programmed ventricular stimulation; MRI = magnetic resonance imaging. Reprinted, with permission, from Corrado et al. (3).

Echocardiogram for Detection of Cardiomyopathy and Coronary Anomaly

Echocardiogram are easily accessible, totally non-invasive imaging techniques that are very helpful in identifying the two commonest causes on SCD in young athletes such as cardiomyopathy and coronary anomaly. In fact the combination of a carefully conducted history and examination (according to the 12-element AHA recommendations), a 12-lead resting ECG and an echocardiogram would be able to identify the majority of the potential younger athletes at risk of exercise-related SCD.

SCD in Athletes 35 Years and Older

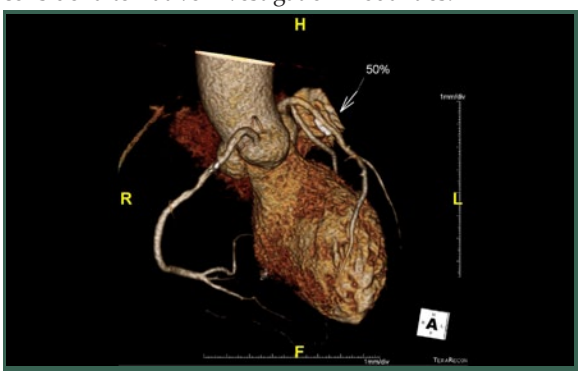
For older athletes 35 years and above, over 90 % are related to coronary atherosclerosis. These patients usually have multiple coronary risk factors. Other common causes include dilated cardiomyopathy and valvular heart disease.

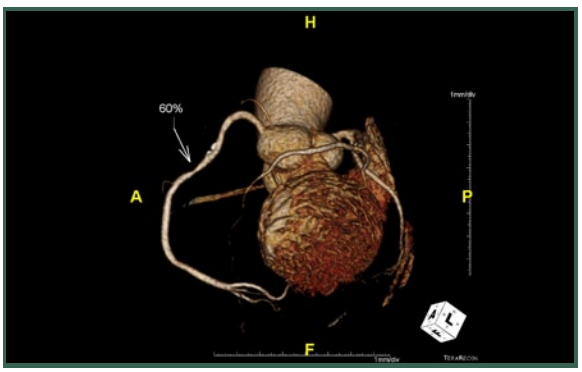
Individuals that have significant underlying coronary artery disease might have exercise-related symptoms such as chest pain, dyspnoea or syncope. However, more than half of these patients remain asymptomatic and subclinical until they have heart attacks.

Since 2005, Coronary Computed Tomography Angiogram (CCTA) has been used as a new technique to visualise the degree of narrowing of coronary arteries and to predict long term prognosis. The older generation 64 slices CT scanner provides useful information on the coronary anatomy with a moderate level of sensitivity and specificity. However, there were significant limitations including the requirement of a slow regular heart rate of below 65 bpm and a good quality breath holding. Patients with tachycardia or Atrial Fibrillation were contra-indicated. With the improvement of temporal resolution, i.e. a faster acquisition speed, the newer generation CT scanners provide images of much better quality and is able to scan patients with fast heart rate and AF. If the CCTA shows a normal coronary artery, i.e. a negative result, one can be almost 100 percent certain that there is no significant CAD. CCTA is probably the most reliable non-invasive imaging technique to rule out coronary anomalies. Since over 90 percent of exercise-related SCD in athletes aged 35 years and older are caused by underlying CAD, a negative CCTA is most reassuring for fitness to continue competitive sports.

Another advantage of new-generation CT scanners is the low radiation involved. The major concern with CT scans in the past was exposure to radiation. The average radiation dose for a 64 slices scanner was high (in the range of 15 mSv). With newer scanners, in particular the Dual Source 256 scanner, the radiation dose can be as low as 1 mSv. This is equivalent to 1/3 of our exposure to natural background radiation (3 mSv per year). With safety becoming less of a concern, cardiac CT scans can now be applied to the large population of athletes for screening purposes.

However, one needs to be aware that individuals with a history of severe allergy or poor kidney function are not suitable for cardiac CT scans. The scan requires injection of a contrast agent to visualise coronary arteries and this may trigger an allergic reaction in susceptible individuals. Anti-allergic coverage is mandatory and one might also consider alternative investigation modalities.





In conclusion, cases of exercise-related Sudden Cardiac Arrest (SCA) are not infrequent and are potentially

preventable. They are usually related to congenital or structural abnormalities in those younger than 35 and coronary artery disease in those 35 years and above. The combination of a carefully conducted history and an examination (according to the 12-element AHA recommendations) and a 12-lead resting ECG are generally effective screening protocols. The additional use of echocardiograms in the younger athletes (<35 years of age) and the low radiation dose Coronary CT Arteriogram in the old athletes (>35 years of age) are highly sensitive and specific in identifying those at risk and can potentially prevent exercise-related sudden cardiac arrest.(SCA).

Rental Fees of Meeting Room and Facilities at The Federation of Medical Societies of Hong Kong

(Effective from October 2009)

Venue or Meeting Facilities	Member Society (Hourly Rate HK$)			Non-Member Society (Hourly Rate HK$)		
	Peak Hour	Non-Peak Hour	All day Sats, Suns & Public Holidays	Peak Hour	Non-Peak Hour	All day Sats, Suns & Public Holidays
Multifunction Room I *(Max 15 persons)*	150.00	105.00	225.00	250.00	175.00	375.00
Council Chamber *(Max 20 persons)*	240.00	168.00	360.00	400.00	280.00	600.00
Lecture Hall *(Max 100 persons)*	300.00	210.00	450.00	500.00	350.00	750.00
Non-Peak Hour: 9:30am - 5:30pm Peak Hour: 5:30pm - 10:30pm						
LCD Projector	500.00 per session					
Microphone System	50.00 per hour, minimum 2 hours					

Radiology Quiz

Dr. Peter HUI

Department of Radiology, Queen Mary Hospital

Dr. Peter HUI

Fig 1

Fig 2

Medical History:

60 year-old female, complained of chronic foot pain.

Imaging Available:

Plain radiograph of the right foot (DP & DP Oblique)

(See P.30 for answers)

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Sports Medicine for the Physically Disabled

Mr. Wai-man CHUNG

Senior Physiotherapist, Physiotherapy Department, Queen Elizabeth Hospital
International Classifier (Wheelchair Fencing), International Wheelchair Fencing Federation

Mr. Ying-Ki FUNG

Member, Classification Committee, International Paralympic Committee

Mr. Wai-man CHUNG Mr. Ying-Ki FUNG

Introduction

The concept of disability sports was first introduced in 1944 by Sir Ludwig Guttmann, a neurosurgeon who organised sports for ex-servicemen with spinal cord injuries. The original aims for disability sports were to enhance patients' physical rehabilitation and social reintegration[1]. With the continuous influx of expertise and resources over the years, disability sports have been evolved from rehabilitation regimes to competitive sports. Nowadays, athletes with disabilities can compete at elite level with excellent supports from different experts (including coaches, exercise scientists, biomechanists and healthcare professionals). In this article, we would like to highlight the contribution, challenges and future development of sports medicine and science in disability sports.

Optimising Performance by Applying Sports Science knowledge

Advanced technology of the mobility aids and equipment

Contemporary adaptive equipment technology allows athletes with disabilities to engage in many elite sport activities. To enhance the performance of the athlete, scientists utilise the biomechanics and ergonomic research to design and manufacture different sports equipment for disabled athletes[2]. For instance, the development of energy-storing prosthetic feet enables sprinters with lower-limb amputation to sprint more efficiently and powerfully[2] (Figure 1). With the carbon fibre transtibial artificial limbs, it is not surprising to see the famous bilateral below-knee amputee runner, Oscar Pistorius, to finish the 400m race in 45.07s. In other disabled sports (such as cycling, equestrian or sailing), the prostheses are designed to seamlessly connect the athletes with the equipment[2] (Figure 2). Further, extensive studies have been conducted for wheelchair sports in past few decades to investigate the propulsion biomechanics in order to enhance sport performance and to minimise injury[3]. For instance, the latest design of a racing wheelchair has significantly optimised the abilities of its user by incorporating features such as three-wheeled design, high-pressure lightweight tubular tyres, lightweight rims and small handrims[3] (Figure 3). Wheelchairs for track and field events, road racing, wheelchair basketball, tennis and rugby are all differently designed to meet the purpose of a particular sport[2,3], Figure 4-6.

Figure 1. Energy storing prosthetic feet

Figure 2. Prosthesis interfaced with racing bicycle

Figure 3. Racing wheelchair

Figure 4. Handcycle for road racing event

Figure 5. Wheels for wheelchair tennis are specially-angulated to allow rapid-change of propulsion direction

Figure 6. Wheelchair for rugby is designed for frequent bumpings and collisions during the games.

Adaptive Training Strategy

Athletes with physical impairments have distinctive changes in the metabolic, cardiorespiratory, neuromuscular or thermoregulatory systems, which reduce their overall physiological capacity in comparison with the able-bodied individuals[4]. Individualised adaptation is therefore required for disabled athletes in order to cope with their training levels. For athletes with spinal cord injury (SCI), the compromised autonomic and somatic nervous system functions disrupt the control of skin blood flow as

well as the sweating below the level of lesion[2,4,5]. Consequently, SCI athletes may be more susceptible to hyperthermia during distance wheelchair racing or other prolonged exercise events. SCI athletes, especially the tetraplegic athletes with high-level lesion, should be therefore recommended to keep adequate hydration and wear proper clothing to minimise the risks of heat stress during competition[4,5].

In cerebral palsy (CP) athletes, increased muscle tone is common. Athletes should be advised to stretch vigorously before and during the training or competition[5]. As muscle fatigue may aggravate the muscle tone, sufficient rests should be scheduled in-between the sets[5]. Active-type recovery in the form of low-intensity aerobic exercises and stretching programmes should also be encouraged to CP athletes[5,6].

Imbalance and unequal body movements in athletes with amputations or limbs deficiency may increase excessive stress and loading to their spinal and peripheral joints. High incidences of cervical spine injuries and low back disorders were found in upper and lower extremity amputees respectively[5,7]. It is important to include biomechanical testing (e.g. motion analysis or gait assessment) and correction in the training. Relevant strengthening programmes and flexibility exercises should also be incorporated in the daily training routine so as to prevent muscle imbalance[7].

Classification in Disability Sports

Classification in disability sports is a unique and critical aspect to provide a fair level of playing field for disabled athletes. In early years, the classification system was medically based. Athletes, irrespective of their extent of impairments, received a "class" based on their medical diagnoses and competed within the same "class" for all sports. As the Paralympic Movement advanced, the classification system drove from the "Medical classification system" to the "Functional classification system". Athletes with different medical diagnoses but similar functional ability are classified into the same class for competition in a particular sport event (for example, an athlete with a complete L2 SCI would compete with an athlete with double above-knee amputee in the same wheelchair racing class). In contrast to the medical classification approach, functional classification systems are sports specific. Each disabled sport has its certified classifiers from a diverse range of backgrounds (medical doctors, physiotherapists and technical delegates) to assess the athletes. Through series of bench tests and field examinations, athletes will be assigned to different "classes" in accordance with the classification rules of a particular sport.

Although the functional classification had improved the fairness of the original classification system, it is subjected to criticism from athletes, medical professionals and sports administrators for being atheoretical and not scientific-proven. Many classification systems rely on the judgement of the experienced classifiers rather than empirical evidence[5]. The determinants of sports-specific performance are poorly understood[5]. The causal relationship between sport-specific determinants and sport outcomes has not been justified. As suggested by the International Paralympic Committee (IPC), a classification code is established as to develop and to support the on-going development of an accurate, reliable, consistent and credible sport focused classification system[8]. Given this background, different researches have been commenced to validate and strengthen the methods used in the existing functional classification system.

Disability Sports Injuries

Since sports participation is associated with the risks of injury, it is conceivable that the increment in the number of participants and intensity of elite training in disabled sports engender an increased number of sports injuries. Unfortunately, research on disabled sports injury surveillance is insufficient. Based on the results of limited published literature, high prevalence of sports injury has been reported in disabled sports. Previous studies by Canadian[9], British[10] and American[11] Paralympic teams had documented 60% to 82% medical attendance rates for their disabled squad athletes during the Paralympic Games. In another study, the injury rate for young wheelchair track athletes during a national game was found to be as high as 97%[12]. Regarding the types of injury, minor soft tissue injuries (such as, abrasion, strains, sprains and contusions) were more common than major trauma (such as, fractures and dislocations)[12]. Ferrara and associates quantified the severity of sports injury in 19 elite wheelchair athletes who participated in a national training camp[13.] They found that 57% of the athletes sustained minor injuries (7 days or less of lost participation), 32% of them sustained moderate injuries (8 to 21 days of missed participation) and 11% of them got major injuries (22 or more days of missed participation)[13]. For the location of injuries, research has shown that the involved body parts in disabled sportsmen appeared to be disabilities and sports dependent. Lower extremity injuries were found to be more common in ambulatory athletes[14] (such as, athletes with visual impairment, upper limb amputation or cerebral palsy) and upper extremity injuries were more frequent among wheelchair athletes[15]. In general, disabled athletes are more vulnerable to high incidence of minor sports injuries that are disability-dependent.

Although limited literature on sports injury of disability sports has been published, the results of the available studies reveal a large discrepancy in the reported incidence rates, which ranged from 25% to 97%. Ferrara and Peterson[16] attributed the disparity in the incidence rates to the discrepancy in the definition of injury adopted in various research studies. The large variety of definitions may exaggerate the risk of injury and make inter-study comparison difficult. The problem is further complicated by the different methodologies used in the disability sports injury studies. With inconsistent definition of injury and methodologies, the injury incidence and pattern in disabled athletes remain unclear. In light of this, the IPC has implemented a long-term prospective injury surveillance project to characterise different risk factors and quantify their effects on disabled athletes[17]. Future studies should also focus on motion analysis of the various disability sports, injury mechanism and prevention strategies for

disabled sports injuries as well as the Pre-participation Examination (PPE) for disabled athletes.

Doping

Similar to the able-bodied athletes, athletes with disabilities must comply with the rules and regulations of the World Anti-Doping Agency. There is, however, an additional doping method that is unique to some disabled athletes, which is termed "boosting". Boosting is an intentional induction of autonomic dysreflexia in SCI athletes with lesion levels above T6[5,18]. It has been reported that some athletes with SCI, particularly those compete in wheelchair racing and wheelchair rugby, deliberately induce autonomic dysreflexia prior to or during the event in order to enhance their performance[18]. Research had demonstrated that boosting could significantly increase the peak VO_2 in tetraplegic athletes[18]. The IPC Medical and Anti-Doping Code clearly states that boosting is illegal as this method may induce medical emergency condition that may endanger the athlete's health[5]. If the autonomic dysreflexia is left untreated, the induced hypertension may result in cerebral haemorrhage, cardiac arrhythmias and death[5,18]. Boosting may give an athlete with an unfair competitive advantage but it may also pose serious health risks to the athlete. For these reasons, boosting is a prohibited technique in disability sports competition and athletes who violate this rule would be subject to disqualification and long-term sanctions[5,19].

In addition, the implementation of anti-doping in disability sports is complicated as athletes often take multiple medications for treating various medical conditions (such as, spasticity and pain control). Although these medicines are essential for the athlete to participate in the sports, some medications may cause significant cognitive effects or other consequences that may significantly alter the athlete's performance. The IPC has an active doping control programme that follows the banned drug list of the World Anti-Doping Agency (www.wada-ama.org)[16]. It is the responsibilities of athletes and physicians to follow the banned medication list. For example, physicians should choose suitable substitutes for the prohibited substances or submit Therapeutic Use Exemptions (TUEs) applications for indicated athletes[5,17,19].

Conclusions

The blossom of disability sports is well evidenced by the rapid development of Paralympics sports. Over a hundred world records have been broken in each Paralympic Games. While rehabilitative specialists endeavour to improve the gait pattern of our amputee patients, a world-class sprinter with a double leg amputation has already broken the 100m world record at 10.91 seconds. The contemporary concept of disability sports emphasises the optimisation of abilities and skills of athletes. Strong collaboration among various professionals is needed to ensure the advanced performance of disabled athletes. While coaches should learn the pathologies and characteristics of disabled athletes, and make appropriate adjustments in the training, healthcare professionals and sport scientists should apply the knowledge in sports medicine and science to hasten the sports injury recovery and to enhance the performance of the rehabilitating disabled athletes.

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	First trimester scan for fetal abnormalities	Dr. T.K. LO Associate Consultant Department of O&G, Kwong Wah Hospital
9 Feb 2012	Diagnosis of fetal anomalies : tips and pitfalls	Dr. Ben CHAN Femina Healthcare 4D Ultrasound Prenatal Diagnosis and Treatment Centre
	How to improve prenatal detection of congenital heart disease	Dr. K.Y. LEUNG Chief of Service Department of O&G, Queen Elizabeth Hospital
16 Feb 2012	Ultrasound of the placenta	Dr. T.Y. FUNG Chief of Service Department of O&G, Hong Kong Baptist Hospital
	Intrapartum ultrasound	Dr. W.L. LAU Consultant Department of O&G, Kwong Wah Hospital
23 Feb 2012	Ultrasound Diagnosis of ectopic pregnancy	Ms. Christina LAM Senior Sonographer Department of Radiology, Queen Mary Hospital
	Non-tubal ectopic pregnancies : diagnosis and management	Dr. Vincent CHEUNG Consultant Department of O&G, Queen Mary Hospital
1 Mar 2012	Imaging of uterine fibroids	Dr. John LEUNG Consultant Medical Imaging Department, Union Hospital
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The Federation President Cup Soccer Five & Basketball Tournament 2011

The Federation President Cup Soccer Five & Basketball Tournament 2011 was held at the Ying Wa College on Nov 19 & 27, 2011. This year we did the first attempt in organising the basketball matches too which proved to make our fraternal activity an even bigger success.

There were 11 participating teams for the Soccer Five Tournament – AstraZeneca, Bayer, Federation Invitation Team, GlaxoSmithKline, HK Association of Sports Medicine & Sports Science, HK Dental Association, HK Medical Association, HK Occupational Therapy Association, Jacobson Medical, Pfizer and SGS and 6 teams for the Basketball Tournament – GlaxoSmithKline, HK Dental Association, HK Medical Supplies, Jacobson Medical, Pfizer and sanofi-aventis.

We were very glad to have the following guests in joining the opening and closing ceremonies:
- Dr. Raymond LO, President of the Federation of Medical Societies of HK
- Dr. S.K. CHAN, 2nd Vice President of the Federation of Medical Societies of HK
- Dr. Kingsley CHAN, Co-chairman of the Soccer Five & Basketball Tournament 2011
- Dr. Wing-hong LIU, Co-chairman of the Soccer Five & Basketball Tournament 2011
- Mr. Nelson LAM, Co-chairman of the Soccer Five & Basketball Tournament 2011
- Dr. Patrick YUNG, President of the HK Association of Sports Medicine & Sports Science
- Dr. Sigmund LEUNG, President of the HK Dental Association
- Mr. Dick LEE, former Commissioner of Police
- Mr. Stephen LEUNG, Country Manager of Pfizer

Congratulations to the winning teams:
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Soccer Five Tournament 1st Runner up – Bayer
Soccer Five Tournament 2nd Runner up – Pfizer
Soccer Five Tournament 3rd Runner up – SGS
Soccer Five Tournament Top Scorer – Mr. CHAN Kai-hong, Jacobson Medical
Basketball Tournament Champion – Pfizer
Basketball Tournament 1st Runner up – GSK
Basketball Tournament 2nd Runner up – HK Medical Supplies
Basketball Tournament 3rd Runner up – sanofi-aventis
Basketball Tournament Top Scorer – Mr. CHAN Chong-keung, Jacobson Medical

Thanks for all your support! We look forward to seeing you all again at the Federation President Cup Soccer Five & Basketball Tournament in 2012!!!

Financial Dinner with Award-winning Investment Strategist Mr. Andrew Look

Kindly invited by SHK Private, the Federation joined the Financial Dinner on Nov 29, 2011 at the Hong Kong Bankers Club with 2 tables of guests from the Federation and its member societies. Much valuable insight of the upcoming 2012 market outlook on Hong Kong, China Mainland, the US and Europe was shared by Mr. Andrew Look during the dinner. The Federation would like to thank SHK Private and the participants for joining the event.

May we wish you a successful 2012 with abundant health and wealth!

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6 Jan 2012	Common Oral Disease and Oral and Maxillofacial Surgery	Dr. Ken Wai-kuen CHIU Specialist, Oral and Maxillofacial Surgery Private Practice
13 Jan 2012	Minor Oral Surgery in Dental Office	Dr. Julianna Cho-hwei LIEW Specialist, Oral and Maxillofacial Surgery Dental Officer, Oral and Maxillofacial and Dental Unit Queen Mary Hospital
20 Jan 2012	Dental Implant Surgery in Dental Office	Dr. Raymond Lop-keung CHOW Specialist, Oral and Maxillofacial Surgery Private Practice
27 Jan 2012	Peri-operative Nursing in Dental Office	Ms. Julie Suk-lin CHOW Ward Manager, Operation Theatre Services Department Queen Mary Hospital Mr. Kai-yuen TSAI Registered Nurse, Operation Theatre Services Department Queen Mary Hospital Mr. Charles Yu-ning LAW Enrolled Nurse, Operation Theatre Services Department Queen Mary Hospital
3 Feb 2012	Sedation in Dental Office	Dr. Gary Lee-ka TAM Specialist, Anaesthesiologist / Associate Consultant, Department of Anaesthesiology Queen Mary Hospital
10 Feb 2012	Medical Emergency in Dental Office	Dr. Alfred Sze-lok LAU Specialist, Oral and Maxillofacial Surgery Private Practice

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Venue : Lecture Hall, 4/F., Duke of Windsor Social Service Building, 15 Hennessy Road, Wanchai, Hong Kong
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				* HKMA Kln City Community Network – Update on Bisphosphonates and Osteoporosis Management 1	* Joint Surgical Symposium - Recent Advances in Thyroid Surgery * HKMA Shatin Doctors Network – Advancing Knowledge - Stroke Prevention in Atrial Fibrillation 2	3
* HKMAPS 4th Seasonal Photo Competition * HKMA Tennis Tournament 4	5	* FMSHK Officers' Meeting * HKMA Council Meeting 6	* HKMA CW&S Community Network – Common Thoracic Diseases 7	* HKMA Kln East Community Network – Current Trends in the Management of Blood Glucose in Type 2 Diabetes * HKMA Structured CME Programme with Hong Kong Sanatorium & Hospital Year 2011 – Recent Advances in Cataract Surgery 8	* HKMA Shatin Doctors Network – Nonalcoholic Fatty Liver Disease: A Review of the Spectrum of Disease, Diagnosis and Therapy 9	* Refresher Course for Health Care Providers 2011/2012 10
* HKMA Tennis Tournament * HKMA Certificate Course on Family Medicine 2011 11	12	* HKMA Kowloon West Community Network - Hepatitis B Management - Latest Update 13	* Hong Kong Neurosurgical Society Monthly Academic Meeting –Seizures in Brain Tumour Patients 14	* HKMA – KLN East Community Network; HA – UCH; HKCFP - CME Course for Health Personnel 2011 * HKMA NTW Community Network - Updates on Glaucoma & ARMD * FMSHK Executive Committee 15	16	17
* HKMA Tennis Tournament 18	19	20	21	22	23	24
25	26	27	28	29	30	* FMSHK Annual Dinner - Casablanca * HKMA 91st Anniversary Ball 31

Date / Time	Function	Enquiry / Remarks
1 THU 1:00 pm	**HKMA Kln City Community Network – Update on Bisphosphonates and Osteoporosis Management** Organiser: HKMA Kln City Community Network, Chairman: Dr. Chu-wah CHIN, Speaker: Dr. Dicky Tak-kee CHOY, Venue: Sportful Garden Restaurant, 2/F, Site 6, Whampoa Garden, Wonderful Worlds of Whampoa, 8 Shung King Street, Hung Hom, Kowloon	Miss Candice TONG Tel: 2527 8285 1 CME Point
2 FRI 8:00 am – 9:00 am 1:00 pm	**Joint Surgical Symposium - Recent Advances in Thyroid Surgery** Organisers: Department of Surgery, The University of Hong Kong & Hong Kong Sanatorium & Hospital, Chairman: Dr. Wing-Tai SIU, Speakers: Dr. Brian LANG & Dr. Kai-Pun WONG, Venue: Hong Kong Sanatorium & Hospital **HKMA Shatin Doctors Network – Advancing Knowledge - Stroke Prevention in Atrial Fibrillation** Organiser: HKMA Shatin Doctors Network, Speaker: Dr. Wilson Wai-man CHAN, Venue: Jasmine Room, Level 2, Royal Park Hotel, Shatin, New Territories	Department of Surgery, Hong Kong Sanatorium & Hospital Tel: 2835 8698 Fax: 2892 7511 1 CME Point (Active) Miss Candice TONG Tel: 2527 8285 1.5 CME Points
4 SUN *(11, 18)* 2:00 pm	**HKMAPS 4th Seasonal Photo Competition** Organiser: The Hong Kong Medical Association, Venue: HKMA Head Office, 5/F, Duke of Windsor Social Service Building, 15 Hennessy Road, Hong Kong **HKMA Tennis Tournament** Organiser: The Hong Kong Medical Association, Venue: Kowloon Tong Club	Miss Alice TANG / Miss Sharon HUNG Tel: 2527 8285 Miss Alice TANG / Miss Sharon HUNG Tel: 2527 8285
6 TUE 8:00 pm – 10:00 pm 8:00 pm	**FMSHK Officers' Meeting** Organiser: The Federation of Medical Societies of Hong Kong, Venue: Gallop, 2/F., Hong Kong Jockey Club Club House, Shan Kwong Road, Happy Valley, Hong Kong **HKMA Council Meeting** Organiser: The Hong Kong Medical Association, Chairman: Dr. Kin CHOI, Venue: HKMA Head Office, 5/F, Duke of Windsor Social Service Building, 15 Hennessy Road, Hong Kong	Ms. Sonia CHEUNG Tel: 2527 8898 Fax: 2865 0345 Ms. Christine WONG Tel: 2527 8285
7 WED 1:00 pm	**HKMA CW&S Community Network – Common Thoracic Diseases** Organiser: HKMA CW&S Community Network, Prof. Anthony Ping-chuen YIM, Venue: The Hong Kong Medical Association Central Premises, Dr. Li Shu Pui Professional Education Centre, 2/F., Chinese Club Building, 21-22 Connaught Road Central, Hong Kong	Mr. Alan LAW Tel: 2527 8285 1 CME Point
8 THU 1:00 pm 2:00 pm	**HKMA Kln East Community Network – Current Trends in the Management of Blood Glucose in Type 2 Diabetes** Organiser: HKMA Kln East Community Network, Speaker: Dr. Mark HORNG, Venue: Lei Garden, Kwun Tong, Kowloon **HKMA Structured CME Programme with Hong Kong Sanatorium & Hospital Year 2011 – Recent Advances in Cataract Surgery** Organiser: The Hong Kong Medical Association, Chairman: Dr. Kin-lun TSANG, Speaker: Dr. Joan T WU, Venue: The Hong Kong Medical Association Central Premises, Dr. Li Shu Pui Professional Education Centre, 2/F., Chinese Club Building, 21-22 Connaught Road Central, Hong Kong	Mr. Alan LAW Tel: 25278285 1 CME Point HKMA CME Department Tel: 2527 8452 1 CME Point
9 FRI 1:00 pm	**HKMA Shatin Doctors Network – Nonalcoholic Fatty Liver Disease: A Review of the Spectrum of Disease, Diagnosis and Therapy** Organiser: HKMA Shatin Doctors Network, Speaker: Dr. Vincent WONG, Venue: Jasmine Room, Level 2, Royal Park Hotel, Shatin, New Territories	Miss Candice TONG Tel: 2527 8285 1.5 CME Points
10 SAT 2:30 pm	**Refresher Course for Health Care Providers 2011/2012** Organiser: The Hong Kong Medical Association, Speaker: Ms. Shuk-ching NG, Venue: OLMH	Ms. Clara TSANG Tel: 2354 2440 2 CME Points
11 SUN 2:00 pm	**HKMA Certificate Course on Family Medicine 2011** Organiser: The Ho ng Kong Medical Association, Speakers: Dr. Chi-man CHENG & Prof. Samual Yeung-shan WONG, Venue: Queen Elizabeth Hospital, Kowloon	HKMA CME Department Tel: 2527 8452 3 CME Points
13 TUE 1:00 pm	**HKMA Kowloon West Community Network - Hepatitis B Management - Latest Update** Organiser: HKMA Kowloon West Community Network, Chairman: Dr. Bernard Siu-man CHAN, Speaker: Dr. Konrad Tang-tat FUNG, Venue: Crystal Room I-III, 30/F., Panda Hotel, Tsuen Wan, N.T.	Miss Candice TONG Tel: 2527 8285 1 CME Point
14 WED 7:30 am	**Hong Kong Neurosurgical Society Monthly Academic Meeting –Seizures in Brain Tumour Patients** Organiser: Hong Kong Neurosurgical Society, Chairman: Dr. Danny CHAN, Speaker: Dr. Peter WOO, Venue: Seminar Room, Ground Floor, Block A, Queen Elizabeth Hospital, Kowloon	Dr. Gilberto LEUNG Tel: 2255 3368 Fax: 2818 4350 1.5 CME points
15 THU 1:00 pm 1:00 pm 8:00 pm – 10:00 pm	**HKMA – KLN East Community Network; HA – UCH; HKCFP - CME Course for Health Personnel 2011** Organiser: HKMA – KLN East Community Network, Chairman: Dr. Man-fuk LEUNG, Speaker: Dr. Kwan-ho SHAM, Venue: East Ocean, TKO **HKMA NTW Community Network - Updates on Glaucoma & ARMD** Organiser: HKMA NTW Community Network, Speaker: Dr. Anita Sing-yee NG, Venue: Plentiful Delight Banquet, Yuen Long **FMSHK Executive Committee** Organiser: The Federation of Medical Societies of Hong Kong, Venue: Council Chambers, 4/F., Duke of Windsor Social Service Building, 15 Hennessy Road, Wanchai, Hong Kong	Mr. Alan LAW Tel: 2527 8285 1 CME Point Mr. Alan LAW Tel: 2527 8285 1 CME Point Ms. Sonia CHEUNG Tel: 2527 8898 Fax: 2865 0345
31 SAT 7:30 pm 7:30 pm	**FMSHK Annual Dinner - Casablanca** Organiser: The Federation of Medical Societies of Hong Kong Venue: Run Run Shaw Hall, The Hong Kong Academy of Medicine Jockey Club **HKMA 91st Anniversary Ball** Organiser: The Hong Kong Medical Association, Venue: Grand Ballroom, Conrad Hong Kong	Ms. Sonia Cheung Tel: 2527 8898 Fax: 2865 0345 Ms. Candy YUEN Tel: 2527 8285

Meeting

14/1/2012	**Hong Kong Surgical Forum – Winter 2012** Organiser: Department of Surgery, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Queen Mary Hospital & Hong Kong Chapter of American College of Surgeons, Venue: Underground Lecture Theatre, New Clinical Building, Queen Mary Hospital, Pokfulam, Hong Kong, Registration & Enquiry: Forum Secretary, Hong Kong Surgical Forum, Tel: (852) 2819 9691 / (852) 2819 9692, Fax: (852) 2818 9249, E-mail: hksf@hku.hk, Web-site: http://www3.hku.hk/surgery/forum.php
19/1/2012	**Clinical Meeting of HK Thoracic Society** Organiser: Hong Kong Thoracic Society, Venue: LG1, Lecture Room, Ruttonjee Hospital, Registration & Enquiry: Dr. Fanny Wai San KO (PWH) & Dr. Arthur Chun Wing LAU (PYNEH), Tel: (852) 2632 2785, Fax: (852) 2637 5396
19/1/2012	**Clinical Meeting of American College of Chest Physicians (HK & Macau Chapter)** Organiser: Hong Kong Thoracic Society, Venue: LG1, Lecture Room, Ruttonjee Hospital, Registration & Enquiry: Dr. Fanny Wai San KO (PWH) & Dr. Arthur Chun Wing LAU (PYNEH), Tel: (852) 2632 2785, Fax: (852) 2637 5396

Answer to Radiology Quiz

Imaging Findings:

Sclerosis and collapse of the right 2nd metatarsal head is noted, indicating presence of avascular necrosis.
Mild hallux valgus deformity is also noted.
No other abnormal bone lesions detected.

Diagnosis:

Frieberg's disease (avascular necrosis of the second metatarsal head)

Discussion:

Frieberg's disease is caused by avascular necrosis (AVN) of the metatarsal head, from repetitive stress with microfractures at the metaphysis which deprives the epiphysis of adequate circulation. Most patients are female. The usual presentation is pain in the forefoot that involves the head of the second metatarsal. The disease is more common in patients whose 1st metatarsal is shorter than the 2nd metatarsal, which increases the weight on the 2nd metatarsal head. Wearing of high-heel shoes will increase the risk of having Frieberg's disease or make the condition worse. Initial management includes proper foot wear with metatarsal bar or pad placed beneath the involved bone, and limiting activity for 4-6 weeks.

Different names are also given to AVN of other bones, such as Kienbock's disease (AVN of lunate); Kohler's disease (AVN of navicular); Panner's disease (AVN of capitellum) or Preiser's disease (AVN of scaphoid), to name a few.

Dr. Peter HUI
Department of Radiology, Queen Mary Hospital

The Federation Annual Dinner 2011

31st December, 2011 (Sat)

Run Run Shaw Hall
The Hong Kong Academy of Medicine Jockey Club Building

Performers of the evening: Ms. Suzan Guterres & Mr. Howard McCrary

Enjoy an Elegant & Chic New Year's Eve Celebration with our Federation's Friends !

Book your tickets now **($1,000 HKD per person)**

- **Free Raffle Tickets for Early Bird before Oct 31**
- **Top Raffle Prizes include Cathay Pacific air tickets & Swire Travel travel coupons**
- **Gaming tables for charity**

Call the Federation Secretariat on 2527-8898 to reserve your tables !

Ms. Suzan Guterres 蘇姍小姐- one of the most glamorous and gorgeous stars of our very own Hong Kong's entertainment industry, and has recently released her fabulous audiophile "Colors of Suzan".

Mr. Howard McCrary - The renowned, award winning singer, songwriter, producer , and also a Grammy Award nominee, who has worked with some of the US 's most prestigious Artistes such as Quincy Jones, Michael Jackson, Chaka Khan, Edwin Hawkins to name a few.

THE FEDERATION OF MEDICAL SOCIETIES OF HONG KONG

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