

## A Delphi developed syllabus for the medical specialty of sport and exercise medicine: Part 2

David Humphries<sup>1,2</sup>, Rod Jaques<sup>3,4</sup>, H Paul Dijkstra<sup>5,6</sup>, Irfan M Asif<sup>7</sup>, Mark Batt<sup>8,4</sup>, Mats Borjesson<sup>9</sup>, Emin Ergen<sup>10</sup>, Celeste Geertsema<sup>11</sup>, Boris Gojanovic<sup>12</sup>, Anca Ionescu<sup>13</sup>, Christa Janse Van Rensburg<sup>14</sup>, Connie Lebrun<sup>15</sup>, Nahar Azmi Mohamed<sup>16</sup>, Margot Mountjoy<sup>17</sup>, Tvisha Parikh<sup>18</sup>, Diana Robinson<sup>19</sup>, Robert Sallis<sup>20</sup>, Martin Schwellnus<sup>21</sup>, Pdraig Sheeran<sup>22</sup>.

<sup>1</sup>School of Medicine, University of Tasmania, Hobart, Tasmania, Australia

<sup>2</sup>ACSEP, Melbourne, Australia, Past President

<sup>3</sup>English Institute of Sport, London, UK

<sup>4</sup>FSEM(UK), Past President

<sup>5</sup>Department of Medical Education, Aspetar Sports Medicine and Orthopedic Hospital, Doha, Qatar

<sup>6</sup>Department for Continuing Education, University of Oxford, Oxford, UK

<sup>7</sup>Department of Family and Community Medicine, University of Alabama, Birmingham (UAB) School of Medicine, USA

<sup>8</sup>Nottingham University Hospitals / Centre for Sport, Exercise & Osteoarthritis Research Versus Arthritis, Nottingham, UK

<sup>9</sup>Center for Health and Performance, Sahlgrenska Academy, Gothenburg University, Gothenburg, Sweden

<sup>10</sup>Department of Sports Medicine, Aspetar Sports Medicine and Orthopedic Hospital, Doha, Qatar

<sup>11</sup>Department of Sports Medicine, Aspetar Sports Medicine and Orthopedic Hospital, Doha, Qatar

<sup>12</sup>Swiss Olympic Medical Center, Hôpital de La Tour, Meyrin, Switzerland

<sup>13</sup>Sports Medicine Department, Carol Davila University of Medicine, Bucharest, Romania

<sup>14</sup>Sport Exercise Medicine and Lifestyle Institute (SEMLI) & Section Sports Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa

<sup>15</sup>Department of Family Medicine, Faculty of Medicine & Dentistry, University of Alberta, Canada

<sup>16</sup>Sports Medicine Department, University Malaya Medical Center, Kuala Lumpur, Malaysia

<sup>17</sup>Department of Family Medicine, McMaster University, Hamilton, Canada

<sup>18</sup>Sir HN Reliance Foundation Hospital, Girgaum, Mumbai, India

<sup>19</sup>ACSEP, Melbourne, Australia. Curriculum Committee Chair

<sup>20</sup>Kaiser Permanente Medical Center, Fontana, California, USA

<sup>21</sup>Faculty of Health Sciences, University of Pretoria, South Africa

<sup>22</sup>Faculty of SEM RCSI RCPI, Dublin, Ireland. Past Dean

Corresponding Author

Dr David Humphries: 36 Collins Street, Hobart 7000, Australia. Telephone +61362319225

Email: [david.humphries@utas.edu.au](mailto:david.humphries@utas.edu.au)

## Abstract

### Background

Training in the medical specialty of sport and exercise medicine (SEM) is available in many, but not all countries. In 2015 an independent Delphi group, the international syllabus in sport and exercise medicine group (ISSEMG), was formed to create a basic syllabus for this medical specialty. The group provided the first part of this syllabus, by identifying 11 domains and a total of 80 general learning areas for the specialty, in December 2017. The next step in this process, and the aim of this paper was to determine the specific learning areas for each of the 80 general learning areas.

### Methods and Findings

A group of 26 physicians with a range of primary medical specialty qualifications including, Sport and Exercise Medicine, Family Medicine, Internal Medicine, Cardiology, Rheumatology, and Anaesthetics were invited to participate in a multiple round online Delphi study to develop specific learning areas for each of the previously published general learning areas. All invitees have extensive clinical experience in the broader sports medicine field, and in one or more components of sports medicine governance at national and/or international level.

### Conclusion

The hierarchical syllabus developed by the ISSEMG provides a useful resource in the planning, development, and delivery of specialist training programs in the medical specialty of sport and exercise medicine.

## Introduction

The purpose of the international syllabus in sport and exercise medicine group (ISSEMG) has been detailed in the initial paper[1]. Briefly it was determined that, while there was a need to increase the numbers of sport and exercise medicine (SEM) physicians internationally, there were potential barriers to the development of SEM training in countries without training programs, one of which was the requirement to develop a syllabus. The creation of a basic international syllabus for the medical specialty of SEM was seen as a solution to that barrier, and the ISSEMG has undertaken the development of this syllabus. Of note the World Health Organisation (WHO) has issued a global action plan on physical activity [2], the recommendations of which can only emphasise the need for more SEM specialists. The aim of this international Delphi consensus was to agree on the specific learning areas for each of the 80 previously agreed general learning areas of the 11 domains in the medical specialty of SEM. There has been no change in the purpose, focus or funding of the project since the first publication.

## Methods

As detailed in the initial paper[1] the ISSEMG decided on a hierarchical syllabus structure, comprising broad domains of learning, for example the domain "Physical activity and human

health". Each domain was broken into general learning areas, for example in the physical activity and human health domain "Applied exercise physiology: types of exercise, effects of exercise and maximising adaptations to exercise" and "Physical activity guidelines and recommendations" are amongst the general learning areas. This publication details the third level of the hierarchy, namely the specific learning areas under each general learning areas. The project has continued to use a modified Delphi process. The members of the Delphi group were invited to be part of process on the basis that they had significant skills in one or more of the following; SEM syllabus and/or curriculum development, SEM training program development and/or implementation, and SEM specialist assessment program development and/or implementation. Four additional members (EE, CG, AI, and CL) were added to the group involved in the original paper to broaden representation, and one member of the original team was replaced by two others late in the process because of a scheduled academic hand over. For each set of specific learning areas an initial questionnaire, a commentary and 1-2 follow up questionnaires have been used to determine which specific learning areas would be included in the syllabus. When required email discussions initiated by group members assisted the process. A total of 24 questionnaires were used in the development of the specific learning areas. The response rates to questionnaires varied between 55% and 100%, with the overall average response rate being 65%. A cut point of 80% agreement amongst the respondents to each questionnaire was used to indicate group agreement for inclusion in all but 4 cases. In these cases, as indicated in the specific learning areas list with an asterisk, 79% was accepted. The lack of 100% response rate was recognised as a potential weakness in the methodology. This was, in part, addressed by the fact that all members of the group were made aware of the results of the initial round scores for each topic as part of the follow up commentary. All members of the group were able to provide additional commentary at that point and were able to respond to follow up questionnaires on the same topic.

## Results

The domain, general and specific learning areas for the SEM specialty syllabus are presented in a numbered tabular form for ease of use and cross referencing.

Each specific learning area represents an area of medical knowledge determined by the ISSEMG to be fundamental to medical specialists in the specialty of SEM. Some are relatively broad areas of knowledge, some quite specific. ISSEMG also added specific learning areas to the previously uncategorised 'Advanced skills' group. These are learning areas which may be regarded as advanced learning in the specialty, pertinent to some but possibly not all national medical organisations seeking to train in the specialty. These are now listed in the 'Extrinsic skills of a SEM physician' domain. Each Domain, General learning area and Specific learning area has been listed in a numerical structure to assist with understanding the overall syllabus and to allow easy referencing. Additional comments, agreed by the ISSEMG, have been added in some sections to enhance the document. In a number of instances there have been minor adjustments to the titles and numbering of the general learning areas in this paper compared to the original paper[1]. These have been made to assist with the clarity and utility of the syllabus. These changes are noted where they have occurred.

Domain	General Learning Areas	Specific Learning Areas
1. Physical activity and human health	1.1 The role of physical activity in the prevention and treatment of disease: population health perspectives	1.1.1 Physical activity levels as a modifiable factor in population health 1.1.2 Determinants of physical activity participation in different populations 1.1.3 The health burden of preventable and modifiable non communicable diseases 1.1.4 Preventable and modifiable non communicable diseases that are influenced by physical activity 1.1.5 Effective physical activity interventions in improving population health 1.1.6 Barriers to implementation of physical activity programs for population health
	1.2 Applied exercise physiology: types of exercise, effects of exercise, and maximising adaptations to exercise	1.2.1 Aerobic exercise: Physiological effects, adaptations and testing methods 1.2.2 Anaerobic exercise: Physiological effects, adaptations and testing methods 1.2.3 Strength training: Physiological effects, adaptations and testing methods 1.2.4 Proprioceptive training: Physiological effects, adaptations and testing methods 1.2.5 Flexibility training: Physiological effects, adaptations and testing methods 1.2.6 Endurance training: Physiological effects, adaptations and testing methods 1.2.7 Energy transfer during physical activity 1.2.8 The physiological basis, effectiveness, and application of recovery strategies both short and long term
	1.3 Physical activity guidelines and recommendations	1.3.1 Relevant national and international physical activity and sedentary behaviour guidelines 1.3.2 Proportion of population that meet physical activity and sedentary behaviour guidelines 1.3.3 Health risks of not achieving minimum physical activity and sedentary behaviour guidelines 1.3.4 Health benefits of achieving minimum physical activity and sedentary behaviour guidelines 1.3.5 Health benefits of achieving physical activity levels beyond minimum physical activity and sedentary behaviour guidelines
	1.4 Barriers to physical activity: environmental, social, physical and psychological	1.4.1 Climatic context including pollution, temperature, and altitude 1.4.2 Social and financial context, including poverty and lack of facilities 1.4.3 Cultural context, including clothing, tradition, and religion 1.4.4 Personal identification context including gender 1.4.5 Physical ability context, including pre-existing illness and injury 1.4.6 Psychological context, including motivational issues, and pre-existing mental health disorders
	1.5 Screening before prescribing exercise	1.5.1 When medical evaluation is appropriate 1.5.2 When medical evaluation is mandatory 1.5.3 General medical evaluation

	<i>(Please note that for clarity the single general learning area 1.5 in the original paper has been split into two general learning areas, 1.5 and 1.6, in this paper. This numerical change flows on for the remainder of this domain)</i>	<ul style="list-style-type: none"> <li>1.5.4 Musculoskeletal evaluation</li> <li>1.5.5 Cardiorespiratory evaluation</li> <li>1.5.6 Neurological evaluation</li> </ul>
	1.6 Contra-indications in exercise prescription	<ul style="list-style-type: none"> <li>1.6.1 Relative and absolute contraindications in cardiovascular disease</li> <li>1.6.1 Relative and absolute contraindications in neurological disease</li> <li>1.6.3 Relative and absolute contraindications in respiratory disease</li> <li>1.6.4 Relative and absolute contraindications in musculoskeletal disease</li> <li>1.6.5 Relative and absolute contraindications in immunological and haematological disease</li> </ul>
	1.7 Exercise prescription in healthy individuals	<ul style="list-style-type: none"> <li>1.7.1 Benefits of exercise prescription in healthy individuals</li> <li>1.7.2 Role of health professionals in exercise prescription in healthy individuals</li> <li>1.7.3 Motivational interviewing and creating behavioural change</li> <li>1.7.4 Structured exercise prescription options</li> <li>1.7.5 Exercise types: modalities, frequency, intensity, duration, adaptation rates and risks</li> <li>1.7.6 The intersection of SEM and the fitness industry</li> </ul>
	1.8 Exercise prescription in individuals with disease	<ul style="list-style-type: none"> <li>1.8.1 Specific benefits of exercise over a range of diseases</li> <li>1.8.2 Problem oriented exercise prescription</li> <li>1.8.3 Systematic exercise prescription protocols</li> <li>1.8.4 Other health professionals and exercise prescription</li> <li>1.8.5 Exercise types: modalities, frequency, intensity, duration, adaptation rates, review schedules and risks</li> <li>1.8.6 Effective interaction between health professionals and fitness industry professionals</li> <li>1.8.7 Integration of exercise prescription with other health interventions including nutritional advice</li> </ul>
	1.9 Exercise prescription in special circumstances	<ul style="list-style-type: none"> <li>1.9.1 Exercise prescription in pregnancy</li> <li>1.9.2 Exercise prescription in those of advanced age</li> <li>1.9.3 Exercise prescription in children</li> <li>1.9.4 Exercise prescription in novice exercisers</li> <li>1.9.5 Exercise prescription for overweight and obese individuals</li> <li>1.9.6 Exercise prescription pre- and post- surgery</li> </ul>
	1.10 Communicating the physical activity message beyond the individual	<ul style="list-style-type: none"> <li>1.10.1 Role of the SEM specialist in promotion of physical activity to the government</li> <li>1.10.2 Role of the SEM specialist in promotion of physical activity to communities</li> <li>1.10.3 Role of the SEM specialist in advocacy for exercise facilities</li> </ul>

		1.10.4 Role of the SEM specialist in promotion of physical activity to other health professionals
2. Medical issues related to exercise	2.1 Neurological issues related to physical activity	<p>2.1.1 Exercise induced headache  2.1.2 Post-concussion syndrome  2.1.3 Epilepsy and physical activity  2.1.4 Peripheral neuropathy  2.1.5 Nerve entrapments</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to neurological symptoms presenting in a SEM setting, including but not limited to muscle cramping, weakness, extremity pain, sensory alteration, and loss of neuromuscular co-ordination</p>
	2.2 Respiratory issues related to physical activity	<p>2.2.1 Exercise induced bronchospasm  2.2.2 Asthma and exercise  2.2.3 Other environment related triggers for bronchospasm and asthma when exercising, including pollutants  2.2.4 Asthma medications and the WADA list  2.2.5 Pulmonary embolus  2.2.6 Lung restriction due to musculoskeletal disease including but not limited to ankylosing spondylitis  2.2.7 Upper and lower respiratory tract infections</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to respiratory symptoms presenting in a SEM setting including but not limited to cough, wheeze, environmental respiratory triggers, pre-syncope, and shortness of breath</p>
	2.3 Cardiovascular issues related to physical activity	<p>2.3.1 Athlete's heart, adaptive cardiac changes related to exercise  2.3.2 Sudden cardiac death in athletes  2.3.3 Exercise and cardiac ischaemic events  2.3.4 Ventricular pre-excitation syndrome  2.3.5 Anomalous coronary arteries  2.3.6 Channelopathies  2.3.7 Marfan syndrome  2.3.8 Cardiomyopathies  2.3.9 Hypertension  2.3.10 Endocarditis, myocarditis, and pericarditis  2.3.11 Cardiac valvular disease  2.3.12 Atherosclerotic coronary artery disease  2.3.13 Extreme endurance events as a cardiac stressor  2.3.14 Exercise related peripheral vascular occlusive conditions  2.3.15 Deep vein thrombosis</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to cardiovascular symptoms presenting in a SEM setting, including but not limited</p>

		to chest pain, shortness of breath, unexpected fatigue, dizziness, palpitations, syncope, and collapse
	2.4 Gastrointestinal issues related to physical activity	<p>2.4.1 Runner's diarrhoea  2.4.2 Exercise related gastro-oesophageal reflux  2.4.3 Anti-inflammatory drugs and gastrointestinal pathology  2.4.4 Irritable bowel syndrome  2.4.5 Inflammatory bowel disease  2.4.6 Exercise induced abdominal pain, acute and chronic  2.4.7 Gastrointestinal bleeding and ischaemia in endurance athletes  2.4.8 Impaired nutritional absorption and its consequences</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to gastrointestinal symptoms presenting in a SEM setting including but not limited to nausea, a changing bowel habit, abdominal pain, and bloating</p>
	2.5 Renal and urogenital issues related to physical activity	<p>2.5.1 Contact sport and the single kidney  2.5.2 Electrolyte disturbance related to physical activity  2.5.3 Renal disease, hydration, and physical activity  2.5.4 Haemoglobinuria, proteinuria and myoglobinuria in athletes  2.5.6 Renal and urogenital infections  2.5.7 Urogenital microtrauma and its consequences including but not limited to infection, skin lesions, testicular and neurological pathologies</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to renal and urogenital symptoms presenting in a SEM setting including but not limited to haematuria, proteinuria, and sexual dysfunction</p>
	2.6 Metabolic issues related to physical activity	<p>2.6.1 Diabetes  2.6.2 Metabolic syndrome  2.6.3 Thyroid and parathyroid disease  2.6.4 Bone density issues in athletes  2.6.5 Vitamin D deficiency  2.6.6 The athlete with fatigue (including over-reaching and over-training)</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to metabolic symptoms presenting in a SEM setting including but not limited to excessive fatigue, unexplained weight gain or loss, amenorrhoea, thermal intolerance, palpitations, hypoglycaemia, and hyperglycaemia</p>
	2.7 Ear, nose and throat issues related to physical activity	<p>2.7.1 Vocal cord dysfunction  2.7.2 Otic barotrauma and infection in sport  2.7.3 Allergic rhinitis</p>

		2.7.4 Sinusitis, pharyngitis, and tonsillitis
	2.8 Immunological and haematological issues related to physical activity	<p>2.8.1 The effects of physical activity on immune function (both positive and negative)</p> <p>2.8.2 Anaphylaxis</p> <p>2.8.3 Exercise induced urticaria</p> <p>2.8.4 Exercise induced angioedema and anaphylaxis</p> <p>2.8.5 Haemodilution in athletes</p> <p>2.8.6 Iron status and physical activity</p> <p>2.8.7 Anaemias</p> <p>2.8.8 Clotting disorders</p> <p>2.8.9 Sickle cell trait and other haemoglobinopathies</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to immunological and haematological symptoms presenting in a SEM setting including but not limited to fatigue, excessive bruising, recurrent infection, skin rashes and recurrent allergic problems</p>
	2.9 Dermatological issues related to physical activity	<p>2.9.1 Blisters and other skin trauma related to physical activity</p> <p>2.9.2 Skin and subcutaneous infection in athletes</p> <p>2.9.3 Eczema and dermatitis</p> <p>2.9.4 Skin cancer</p> <p>2.9.5 Herpes gladiatorum</p> <p>2.9.6 Sunburn</p> <p>2.9.7 Stump/Prosthesis interfaces in athletes with artificial limbs</p> <p>Comment: A SEM physician should recognise that exercise may reveal underlying disease and have a robust clinical approach to dermatological symptoms presenting in a SEM setting including but not limited to urticarial and infectious rashes, changes in pigmentation and purpura</p>
	2.10 Psychological and mental health issues related to physical activity	<p>2.10.1 Competition related anxiety</p> <p>2.10.2 Athletic life demands and stress related illness</p> <p>2.10.3 Masking and self-management of mental health issues with exercise</p> <p>2.10.4 Anorexia nervosa, bulimia, disordered eating, and exercise addiction</p> <p>2.10.5 Transition to retirement mental health issues</p> <p>2.10.6 Anxiety, depression, psychosis, and bipolar disease</p> <p>2.10.7 Sleep hygiene, in and out of competition</p> <p>2.10.8 Basic sports psychology including, but not limited to, performance and psychological responses to injury</p>
3. Injuries related to sport and exercise	3.1 Principles of tissue injury and repair in the musculoskeletal system	<p>3.1.1 Overuse and traumatic mechanisms of tissue injury</p> <p>3.1.2 Acute and chronic inflammation in connective tissues</p> <p>3.1.3 Connective tissue repair: regeneration, healing, fibrosis, and pathological repair</p> <p>3.1.4 Adaptive properties of connective tissues to training stress</p>



	3.2 Principles of injury prevention	3.2.1 Intrinsic and extrinsic risk factor identification 3.2.2 Gender, and age variation and injury risk in sport 3.2.3 Psychological variation and injury risk in sport 3.2.4 The influence of prior injury on future injury risk 3.2.5 Sport specific preparation 3.2.6 Biomechanical assessment of gait, and sport specific activity e.g. throwing 3.2.7 Injury prevention equipment including, but not limited to, footwear, helmets, eye protection and braces 3.2.8 Proven injury risk reduction programs 3.2.9 Implementation of injury risk reduction programs 3.2.10 Current injury prediction and prevention models, and their limitations
	3.3 General pathology of the musculoskeletal system	3.3.1 Rheumatological disease presenting in a SEM setting 3.3.2 Inheritable connective tissue variants and disorders, e.g. hypermobility syndrome, and their contribution to injury risk in a SEM setting
	3.4 Management of head and neck injuries in SEM  <i>(Please note title change compared to the initial paper)</i>	3.4.1 Management of head and neck skeletal injury 3.4.2 Management of head and neck neurological injury 3.4.3 Management of cervical spine disc, ligament, and joint injury 3.4.4 Management of injury to the eyes, ears, nose, and oral structures 3.4.5 Appropriate collaboration with other specialists in the management of these injuries
	3.5 Management of upper limb injuries in SEM  <i>(Please note title change compared to the initial paper)</i>	3.5.1 Management of upper limb skeletal injury 3.5.2 Management of upper limb joint injury 3.5.3 Management of upper limb tendon pathology 3.5.4 Management of upper limb muscular injury 3.5.5 Management of upper limb neurological injury * 3.5.6 Appropriate collaboration with other specialists in the management of these injuries
	3.6 Management of chest wall, abdominal wall, and thoracic spine injuries in SEM  <i>(Please note title change compared to the initial paper)</i>	3.6.1 Management of chest wall and thoracic spine skeletal injury * 3.6.2 Management of chest wall and thoracic spine disc, ligament, and joint injury * 3.6.3 Management of chest and abdominal wall muscular injury 3.6.4 Commotio cordis 3.6.5 Appropriate collaboration with other specialists in the management of these injuries
	3.7 Management of lumbar spine and pelvic injuries in SEM  <i>(Please note title change compared to the initial paper)</i>	3.7.1 Management of lumbar spine and pelvis skeletal injury 3.7.2 Management of lumbar spine and pelvis disc, ligament, and joint injury 3.7.3 Management of lumbar spine and pelvis muscular injury 3.7.4 Appropriate collaboration with other specialists in the management of these injuries

	<p>3.8 Management of lower limb injuries in SEM</p> <p><i>(Please note title change compared to the initial paper)</i></p>	<p>3.8.1 Management of lower limb skeletal injury</p> <p>3.8.2 Management of lower limb tendon pathology</p> <p>3.8.3 Management of lower limb muscular injury</p> <p>3.8.4 Management of lower limb neurological injury *</p> <p>3.8.5 Appropriate collaboration with other specialists in the management of these injuries</p>
	<p>3.9 Interpretation of radiological and other investigations</p>	<p>3.9.1 Appropriate use, and recognition of strengths and weaknesses, of X-rays, CT scans, ultrasound scans, isotope scans and MRI scans in a SEM setting</p> <p>3.9.2 Principles of interpretation of radiological examinations</p> <p>3.9.3 Appropriate use, and recognition of strengths and weaknesses, of laboratory testing in a SEM setting</p> <p>3.9.4 Appropriate use, and recognition of strengths and weaknesses, of dynamometry and other forms of strength testing in a SEM setting</p> <p>Comment: Interpretation of point of care ultrasound scans relevant to SEM may be included as an advanced specific learning area</p>
	<p>3.10 Principles of injury rehabilitation</p>	<p>3.10.1 Early rehabilitation including protection, optimal loading, compression, and elevation</p> <p>3.10.2 Management of pain and the inflammatory response</p> <p>3.10.3 Restoration of joint range of motion and stability</p> <p>3.10.4 Restoration of muscular flexibility, strength, and endurance</p> <p>3.10.5 Restoration of proprioception and balance</p> <p>3.10.6 Sport specific functional activities</p> <p>3.10.7 Mitigation of underlying risk factors</p> <p>3.10.8 The physiology and mitigation of deconditioning</p> <p>3.10.9 Psychological aspects of injury</p> <p>3.10.10 Scientific basis of treatment modalities</p> <p>3.10.11 Interdisciplinary care</p>
	<p>3.11 Return to sport decision making</p>	<p>3.11.1 The return to sport continuum</p> <p>3.11.2 Athlete autonomy</p> <p>3.11.3 Strengths and weaknesses of physical testing in return to play decision making</p> <p>3.11.4 Psychological influences in return to play decision making</p> <p>3.11.5 Third party influences in return to play decision making</p> <p>3.11.6 Current models in return to play decision making</p>
<p>4. Nutrition</p>	<p>4.1 Sports nutrition for health and performance</p>	<p>4.1.1 The influence of nutrition on the health of athletes</p> <p>4.1.2 The influence of nutrition on athletic performance</p> <p>4.1.3 Recognition and utilisation of the skills of qualified sports dieticians</p> <p>4.1.4 Problems that may arise as a consequence of dietary restrictions</p>

		<p>4.1.5 Interdisciplinary management of athletes with significant nutritional problems</p> <p>4.1.6 Current controversies in athlete nutrition and assisting athletes to evaluate various sources of information concerning these issues</p> <p>4.1.7 The influence of nutrition on the health of young and developing athletes, especially during the growth spurt</p>
	4.2 Hydration	<p>4.2.1 Recommendations for fluid intake in the general and athletic populations</p> <p>4.2.2 Evaluation of the hydration status of athletes</p> <p>4.2.3 Hydration protocols according to type and duration of activities</p> <p>4.2.4 The effects of hydration choices in the potential development of pathological states</p> <p>4.2.5 The impact of variables such as temperature and electrolyte concentration on fluid absorption from the gut</p>
	4.3 Carbohydrates	<p>4.3.1 Recommendations for dietary carbohydrate intake in the general and athletic populations</p> <p>4.3.2 Types and quality of dietary carbohydrates</p> <p>4.3.3 The differing roles of carbohydrates in athletes at different phases of the training and competition cycle</p>
	4.4 Fats	<p>4.4.1 Recommendations for dietary fat intake in the general and athletic populations</p> <p>4.4.2 The various types of dietary fats and their effects on human health and athletic performance</p>
	4.5 Protein	<p>4.4.1 Recommendations for dietary protein intake in the general and athletic populations</p> <p>4.5.2 The difference between high- and low-quality protein</p> <p>4.5.3 The role of protein intake at different phases of the training and competition cycle</p>
	4.6 Micronutrients and vitamins	<p>4.6.1 Recommendations for micronutrient and vitamin intake in the general and athletic populations</p> <p>4.6.2 Dietary choices and disease states that may compromise the micronutrient and vitamin status of an athlete</p> <p>4.6.3 Clinical presentations, methods of evaluating and methods of correcting micronutrient and vitamin disturbance in an athlete</p>
	4.7 Energy requirements and relative energy deficiency	<p>4.7.1 Energy requirements of athletes of various types</p> <p>4.7.2 Athletes at risk of problems with energy balance</p> <p>4.7.3 Short- and long-term pathological consequences and clinical presentations of athletes with relative energy deficiency</p> <p>4.7.4 Management of athletes with relative energy deficiency</p> <p>4.7.5 Identification, evaluation, and treatment of relative energy deficiency in an interdisciplinary setting</p> <p>4.7.6 Specific biomarkers such as ferritin, haemoglobin and thyroid stimulating hormone levels</p>

		that may act as general biomarkers for overall nutritional status in athletes
	4.8 Nutritional supplements	4.8.1 The scientific rationale behind the use of various nutritional supplements 4.8.2 The health risks of nutritional supplements 4.8.3 The risks of committing an 'Anti-doping Rule Violation' via supplement usage, and appropriate sources of information to minimise this risk
5. Pharmacology	5.1 Medication abuse in elite athletes	5.1.1 The risks of excessive use, abuse, and addiction to a variety of permitted medications commonly prescribed to athletes including but not limited to analgesics, non-steroidal anti-inflammatories, corticosteroid injections, inhaled bronchodilators, sleeping tablets and anxiolytic agents 5.1.2 Appropriate prescription of medications required for management of injuries and medical conditions, after a formal consultation with the athlete 5.1.3 The risk of providing excessive quantities of medications to athletes 5.1.4 The role of the SEM physician in avoiding the prescription of medication via third parties such as training and allied health staff without the specific direction of the physician 5.1.5 Strategies to minimise the potential long-term health risks of medication in athletes
	5.2 The influence of medications used in the treatment of disease on exercise capacity	5.2.1 Identification of population groups in which medication negatively influencing exercise capacity is most likely to occur 5.2.2 Cardiac medications which may influence exercise capacity and the mechanisms responsible, including but not limited to beta blockers, diuretics, ACE inhibitors and nitrates 5.2.3 Risks posed by some lipid lowering agents to skeletal muscle 5.2.4 Potential risks posed by fluoroquinolones and renin angiotensin II receptor antagonists in the development of tendon pathology
	5.3 Medication and exercise interactions which may cause or worsen disease	5.3.1 Exercise induced hypoglycaemia in patients using medications designed to reduce blood glucose levels including insulin, pramlintide, exenatide and long acting sulfonylureas 5.3.2 The risk of the combination of exercise and NSAIDS causing or worsening renal disease 5.3.3 The risk of the combination of prolonged exercise and NSAIDS precipitating hyponatremia 5.3.4 Drugs which impair thermoregulation including anticholinergics, alcohol, opiates, neuroleptic drugs, antidepressants, and the mechanism/s by which this impairment occurs 5.3.5 The risk of exercise induced dehydration altering the blood concentrations of various drugs including novel anticoagulants 5.3.6 The potential for prolongation of the QT interval in susceptible individuals when taking various

		drugs and drug combinations including but not limited to macrolide antibiotics
6. Anti-Doping	6.1 The World Anti-Doping Agency (WADA) list  <i>(Please note title change compared to the initial paper)</i>	6.1.1 The roles of the World Anti-Doping Agency (WADA) 6.1.2 The 4 main categories of prohibited substances in the WADA list 6.1.3 The 3 criteria for a drug or method to be entered in the WADA list, and recognise that a drug or method must meet at least 2 of the 3 criteria to be prohibited 6.1.4 The differences between the WADA categories of 'prohibited at all times', 'prohibited in competition' and 'prohibited in certain sports' 6.1.5 The 10 categories of Anti-Doping Rule Violation that apply to athletes and support staff 6.1.6 Sources of additional information regarding whether a drug or method is prohibited by the WADA list, including but not limited to " <a href="http://www.globaldro.org">http://www.globaldro.org</a> " 6.1.7 The doping risks posed by supplements and information provision to athletes encompassing consideration of i) actual need/benefit ii) possible risk to health and iii) risk of inadvertent doping 6.1.8 The date on which the WADA list is updated annually 6.1.9 The roles and responsibilities of the athlete under the WADA code
	6.2 The WADA therapeutic use exemption process	6.2.1 The role of the therapeutic use exemption process in the management of legitimate medical conditions in athletes 6.2.2 The therapeutic use exemption process should generally not be used when an appropriate non-prohibited option exists 6.2.3 Circumstances where a therapeutic use exemption is required prior to an athlete commencing treatment with a prohibited substance or method 6.2.4 Circumstances where a retroactive therapeutic use exemption may be sought for an athlete using a prohibited substance or method 6.2.5 The bodies that grant therapeutic use exemptions and which body to apply to in each circumstance 6.2.6 The non-ethical use of the therapeutic use exemption process 6.2.7 Application for a therapeutic use exemption, forms and procedures 6.2.8 The appeals process for a disallowed therapeutic use exemption request
	6.3 Other prohibited medications in specific sports	6.3.1 Recognition that some professional athletes, including jockeys, are subject to a set of anti-doping rules unrelated to the WADA rules and the specialised knowledge required when dealing with such athletes 6.3.2 Recognition that some sports do not allow the use of specific substances/medications/methods in

		addition to the standard WADA prohibitions and research any such additional restrictions whenever taking on a role with an unfamiliar sport
	6.4 The consequences of doping: Health risks, sanctions, and responsibilities	<p>6.4.1 The key roles a specialist sport and exercise medicine physician has in the anti-doping arena and the methods that may be used to subvert those roles</p> <p>6.4.2 Effective communication of the complexities of the anti-doping rules, sanctions, and responsibilities to athletes and sports officials</p> <p>6.4.3 The principle that the athlete always has absolute responsibility for any substance they ingest or administer</p> <p>6.4.4 The health risks, both short and long term, of the various doping methods and medications. In particular, the risks of anabolics, stimulants, and the manipulation of hormones, hormone agonists and haemoglobin levels.</p> <p>6.4.5 Effective communication of doping health risk information to athletes and officials</p> <p>6.4.6 Ways in which anti-doping rule violations can be committed</p> <p>6.4.7 Anti-doping rules which apply to different sports leagues/disciplines</p> <p>6.4.8 The potential legal and criminal consequences of doping violations</p> <p>6.4.9 Co-ordinated anti-doping information for sporting federations, team staff and athletes</p>
7. Sports team care and sports event medical management	7.1 Roles of the SEM physician in the team environment	<p>7.1.1 Appropriate roles a SEM physician may be required to fulfil in the team environment in addition to clinical skills</p> <p>7.1.2 Inappropriate roles that a SEM physician may be asked to fulfil in a team environment</p>
	7.2 The Olympic movement medical code on the ethical treatment of athletes	<p>7.2.1 The Olympic movement medical code as an appropriate ethical framework when providing medical care for athletes</p> <p>7.2.2 The role of a SEM physician in leading education on key aspects of the Olympic movement medical code</p>
	7.3 Medical evaluation of athletes and event participants  <i>(Please note title change compared to the initial paper)</i>	<p>7.3.1 Assessment of the need for, and required level of, pre-season/pre-event medical evaluation of athletes, as well as the strengths and limitations of such evaluations</p> <p>7.3.2 Implementation of pre-season and pre-event athlete health evaluation programs</p>
	7.4 Pre-season/pre-event medical organisation	<p>7.4.1 Planning and execution of a comprehensive medical support plan (including but not limited to manpower, equipment, consumables, communication etc) for sporting events - both when travelling with teams and as part of Local Organising Committee (LOC) medical team</p> <p>7.4.2 Planning and execution of a comprehensive pre-season / pre-event athlete information program and be involved in implementing such a program</p>

	7.5 Equipment, medical supplies and facilities for team and event care	7.5.1 Design and execution of a comprehensive medical equipment, supplies and facilities plan according to the specific needs of teams and events
	7.6 Match/event day medical care	7.6.1 Development of written medical action plans for sporting events 7.6.2 Specific training requirements in the management of pre-hospital emergency care for those undertaking sporting event coverage 7.6.3 Creation of a medical and allied health team for community-based events e.g. fun runs 7.6.4 Integration of medical teams with other resource groups including communications teams, spotters, transport teams and ambulance services
	7.7 Emergency sports medicine: on-field assessment and management of sports injuries and medical conditions	7.7.1 A structured approach to the assessment of acute medical situations in a pre-hospital setting including but not limited to: cardiac events, acute allergic events, respiratory compromise, hypoglycaemia, hyponatremia, hyperthermia, hypothermia, drowning and collapse 7.7.2 A structured approach (such as the DRSABCDE) to on field/in event acute medical and injury situations in a pre-hospital setting 7.7.3 Potential risks to players, officials and medical teams when delivering event medical care (on-field and elsewhere) and mitigation of these risks 7.7.4 A structured approach to the management of potential spinal injuries in a pre-hospital setting 7.7.5 A structured approach to the management of airway compromise in a pre-hospital setting 7.7.6 A structured approach to the management of traumatic respiratory compromise, e.g. laryngeal fracture, tension pneumothorax, in a pre-hospital setting 7.7.7 A structured approach to the management of traumatic circulatory compromise e.g. haemorrhage from a laceration, fracture, or organ injury in a pre-hospital setting 7.7.8 A structured approach to the management of neurological injury e.g. serious head injury or spinal injury in a pre-hospital setting 7.7.9 A structured approach to the management of fractures and dislocations, including reduction of these where appropriate, in a pre-hospital setting 7.7.10 A structured approach to the management of facial, dental, ENT and eye injuries in a pre-hospital setting 7.7.11 A structured approach to the management of traumatic dermal and subdermal injuries including grazes, lacerations, and contusions  Comment: The ISSEMG strongly recommends that the specific learning areas for this general learning area are learnt as a component of a structured practical course and revised frequently

	7.8 Post season and post event review of medical care	7.8.1 The value of in-season/in-event data collection in the evaluation of medical care of teams and events 7.8.2 The conduct of a post season/post event medical review 7.8.3 Drawing inferences and making recommendations from such reviews, in collaboration with other members of the athlete health team
	7.9 Team travel	7.9.1 Structure and delivery of pre-travel medical advice for athletes and team officials appropriate to the destination, including but not limited to vaccinations, environmental adaptation, and infectious disease risks 7.9.2 Implementation of medical strategies for dealing with time zone change 7.9.3 Development of strategies, with allied health team members, for nutrition, recovery, and injury management during and after team travel episodes 7.9.4 Appropriate medical kits for team travel 7.9.5 The necessary permissions required as a doctor when travelling internationally with teams and how those permissions may vary from country to country 7.9.6 Liaison with local medical systems when travelling with teams internationally
	7.10 Common general practice problems encountered when travelling with teams	7.10.1 Diagnosis and treatment of common infections 7.10.2 Diagnosis and treatment of common dermatological issues 7.10.3 Diagnosis and treatment of common allergic reactions 7.10.4 Diagnosis and treatment of common psychological issues in athletes 7.10.5 Diagnosis and treatment of moderate exacerbations of common medical problems such as asthma, dysmenorrhoea, and migraine
8. Physical activity in challenging environments	8.1 SEM as it relates to physical activity at altitude	8.1.1 Physiological adaptations triggered by exposure to increasing altitude, including respiratory, cardiovascular, haematological, renal, and sleep adaptations 8.1.2 The use of altitude adaptations as part of a training regimen 8.1.3 The risks of developing altitude related medical conditions in various scenarios including skiing, trekking and mountain climbing 8.1.4 The symptoms and management of altitude related medical conditions including altitude headache, acute mountain sickness, high altitude pulmonary oedema, high altitude cerebral oedema, high altitude cough, high altitude retinopathy and other related problems 8.1.5 Altitude related illness as a mimic of other medical conditions including but not limited to food poisoning, concussion, hypertensive crisis, transient ischaemic attack, and respiratory disease 8.1.6 Recognise that age, pre-existing medical conditions, and medications increase a variety of risks when exercising at altitude



		8.1.7 Risk reduction strategies, for both individuals and organisations, in the prevention of altitude related medical conditions, including the optimal acclimatisation period and appropriate medications
	8.2 SEM as it relates to physical activity in cold environments	8.2.1 Principles of heat exchange between the body and the surrounding environment 8.2.2 Physiological adaptations triggered by exposure to cold 8.2.3 Recognition and initial management of peripheral tissue injury caused by cold 8.2.4 Recognition and initial management of loss of core temperature, including knowing the classifications of severity of hypothermia and how this alters management 8.2.5 Additional risk factors for cold injury including but not limited to water immersion, wind chill, alcohol, age, clothing, and prescription medications 8.2.6 The effects of cold on other medical conditions such as asthma 8.2.7 Recognition and initial management of cold mediated immune disorders 8.2.8 Risk reduction strategies, for both individuals and organisations, in the prevention of cold related illnesses
	8.3 SEM as it relates to physical activity in hot environments	8.3.1 Principles of heat exchange between the body and the surrounding environment 8.3.2 Physiological adaptations triggered by exposure to heat 8.3.3 Recognition and initial management of peripheral tissue injury caused by heat 8.3.4 Recognition and initial management of increased core temperature, including an understanding of the classifications of heat related illness and how this alters management 8.3.5 Additional risk factors for heat related illness including but not limited to lack of acclimatisation, limited access to suitable fluids, prescription medication, previous heat related illness, clothing, age and intercurrent illness 8.3.6 Risk reduction strategies for both individuals and organisations in the prevention of heat related illnesses
9. Specific groups undertaking sport and exercise	9.1 SEM as it relates to paediatric athletes  <i>(Please note title change compared to the initial paper)</i>	9.1.1 Consider long term outcomes as paramount when managing sports injuries in children and adolescents 9.1.2 The influence of growth and maturation on cardiovascular fitness and muscular strength 9.1.3 Age appropriate training principles 9.1.4 Training load management during childhood and adolescence including signs of overtraining 9.1.5 The problems of early sports specialisation versus the benefits of non-specialisation 9.1.6 Osteochondroses, including traction apophysitis. Differentiate those with a benign course from those that require specific intervention to prevent long term disability

		<p>9.1.7 Anterior cruciate ligament injury, prevention, and treatment</p> <p>9.1.8 Pars interarticularis injury, prevention, and treatment</p> <p>9.1.9 Recognition and management of concussion in children and adolescents</p> <p>9.1.10 Recognition and initial management of diseases masquerading as sports injury including but not limited to juvenile inflammatory arthropathy and bone tumours</p> <p>9.1.11 Sport and exercise for children with chronic disease</p>
	<p>9.2 SEM as it relates to female athletes</p> <p><i>(Please note title change compared to the initial paper)</i></p>	<p>9.2.1 Physiological and biomechanical differences and injury risk</p> <p>9.2.2 Menstruation, menstrual dysfunction, and exercise</p> <p>9.2.3 Pregnancy and exercise</p> <p>9.2.4 Polycystic ovary syndrome, including the 'lean' form</p> <p>9.2.5 Sacroiliac joint dysfunction</p> <p>9.2.6 Breast issues relating to exercise</p> <p>9.2.7 Recognition and initial management of gynaecological issues presenting in a SEM context</p>
	<p>9.3 SEM as it relates to ageing athletes</p> <p><i>(Please note title change compared to the initial paper)</i></p>	<p>9.3.1 Benefits of exercise during the ageing process</p> <p>9.3.2 Sarcopenia and osteoporosis</p> <p>9.3.3 Increased risk of cardiovascular events</p> <p>9.3.4 Influence of medication on exercise capacity</p> <p>9.3.5 Limitations on exercise capacity caused by intercurrent disease</p> <p>9.3.6 Sport and exercise in older athletes with chronic disease</p>
	<p>9.4 SEM as it relates to athletes with a disability</p> <p><i>(Please note title change compared to the initial paper)</i></p>	<p>9.4.1 Current concepts in classification of athletes with disabilities</p> <p>9.4.2 Critical role of interdisciplinary health care</p> <p>9.4.3 Spinal cord injured athletes, urinary tract issues including infection</p> <p>9.4.4 Spinal cord injured athletes, the influence of injury level on heat tolerance and cardiac output</p> <p>9.4.5 Spinal cord injured athletes, skin, and wound care</p> <p>9.4.6 Spinal cord injured athletes, autonomic dysreflexia, spontaneous and intentional</p>
	<p>9.5 SEM as it relates to extreme and adventure sport athletes</p> <p><i>(Please note title change compared to the initial paper)</i></p>	<p>9.5.1 Injury prevention and first aid kits for these athlete groups</p> <p>9.5.2 Specific screening protocols for these athlete groups, where available</p> <p>9.5.3 The increased risk of injuries and environment related medical problems in these athlete groups</p> <p>9.5.4 The possible link between extreme cardiac loads and the potential for longer term cardiac issues such as conduction problems</p> <p>9.5.5 The value of learning first aid and the use of safety devices, such as personal locator beacons, in these athlete groups</p>

		Comment: Wilderness medicine may be included as an advanced specific learning area
10. Intrinsic skills of a SEM physician	10.1 Communication	10.1.1 Methods of conveying SEM messages to individuals, teams, and sporting organisations 10.1.2 Methods for effective communication with medical and allied health professionals on clinical cases in both non-emergency and emergency situations 10.1.3 Methods of facilitating shared medical decision making, including athletes, coaches, and where appropriate other stakeholders
	10.2 Collaboration	10.2.1 Work effectively in groups including medical teams, sporting teams and research teams 10.2.2 Recognise and utilise the skill sets of other professionals
	10.3 Leadership and management	10.3.1 The leadership roles a SEM physician 10.3.2 Leadership and management skills 10.3.3 Methods of developing leadership skills, and their use in interdisciplinary situations, including the utilisation of feedback for skill improvement
	10.4 Health advocacy	10.4.1 Skills required when acting as a health advocate for individuals 10.4.2 Skills required when acting as a health advocate with teams and sporting organisations 10.4.3 Skills required when acting as a health advocate for the community, including charities and health promotion organisations, on SEM issues
	10.5 Research, teaching and learning	10.5.1 Skills required for the interpretation of research publications 10.5.2 Skills required for teaching at both community and professional level 10.5.3 The need for, and active participation in, lifelong professional learning 10.5.4 Skills required to acquire, appraise, and apply evidence to individual patient care 10.5.5 Mentoring skills for others involved in SEM
	10.6 Professionalism	10.6.1 Recognition of the limits of a personal skill set 10.6.2 Appropriate professional boundaries when dealing with patients (including athletes not under direct care), sporting administrators and members of medical teams 10.6.3 National professional reporting requirements 10.6.4 Participation in maintenance of professional standards programs
	10.7 Ethics	10.7.1 Always act in the best interests of the patient, both short and long term 10.7.2 Potential conflicts of interest when dealing with sporting organisations 10.7.3 Potential conflicts of interest when dealing with commercial organisations, including, but not limited to, pharmaceutical companies 10.7.4 Reporting requirements around issues of athlete welfare, safety, and inappropriate behaviour of staff, colleagues, or parents to the appropriate authorities

		Comment: ISSEMG recognises that in some circumstances, notably pre-contract medical screening examinations, a SEM physician will be acting primarily for an organisation rather than for the athlete. This is acceptable provided national regulatory frameworks on medical information sharing are adhered to and the process is transparent
	10.8 Cultural, religious and LGBTQI awareness and safety  <i>(Please note title change compared to the initial paper)</i>	10.8.1 Advocacy for safe inclusive sport and exercise programs 10.8.2 Recognition and reporting of inappropriate behaviours, such as bullying, in the SEM context 10.8.3 Recognition of and respect for diversity in the SEM context
11. Extrinsic skills of a SEM physician	11.1 Perform a comprehensive examination of the musculoskeletal and neurological systems and interpret the findings at an advanced level	11.1.1 Assessment of each anatomical region in terms of musculoskeletal integrity, function, and variation 11.1.2 Assessment of each anatomical region and globally in terms of neurological integrity, function, and variation 11.1.3 The examination features that help differentiate musculoskeletal injury from musculoskeletal disease 11.1.4 Sensitivity and specificity of common musculoskeletal examination special tests 11.1.5 Positive and negative predictive values of commonly used musculoskeletal examination special tests 11.1.6 The biomechanical consequences of an injury or insufficiency of one musculoskeletal anatomical area on connected musculoskeletal anatomical areas
	11.2 Perform a sport-specific medical and musculoskeletal screening examination	11.2.1 Generic sports medicine evaluation examinations of an athlete 11.2.2 Sport specific evaluation programs and the development of such programs 11.2.3 Additional testing appropriate for sporting organisations and athletes based on needs 11.2.4 Vaccinations appropriate for sporting organisations and athletes appropriate for their needs, where necessary enlisting the assistance of infectious disease specialists 11.2.5 The purposes and potential harms of sport specific medical and musculoskeletal evaluations including communication of this information
	11.3 Perform advanced life support in non-hospital environments	11.3.1 Basic CPR, the use of an automated external defibrillator and advanced life support 11.3.2 Appropriate review cycles for these skills  Comments: The ISSEMG believes these skills should be mandatory in training
	11.4 Provide effective immediate medical care for on-field injuries and medical events	11.4.1 Have and maintain specialist skills in providing care as listed in the general learning area 'Emergency sports medicine: On field assessment and management of sports injuries and medical conditions' 11.4.2 Ongoing cycles of training in on-field care

	<p>11.5 Perform concussion screening examinations, baseline, and post-injury, and interpret the results</p>	<p>11.5.1 Current and emerging tests available for concussion screening, including their validity and weaknesses  11.5.2 Administration of appropriate concussion screening tests including, but not limited to, the current SCAT test  11.5.3 Clinically significant variations between baseline and post head injury concussion screening tests  11.5.4 Assessment of concussion using a combination of clinical acumen and concussion screening tests  11.5.5 Resources and processes for the assessment of concussion in children</p>
	<p>11.6 Interpret radiological and other investigations relating to SEM at an advanced level</p>	<p>11.6.1 Advanced skills in interpreting musculoskeletal images in the following radiological modalities: X-Ray, CT scanning, MRI scanning and musculoskeletal ultrasound  11.6.2 Advanced skills in interpreting laboratory tests pertinent to the care of athletes  11.6.3 The role, utility, and general interpretation of isotope bone scans  11.6.4 The role, utility, and general interpretation of DXA scans and other modalities of determining bone health  11.6.5 The role, utility, and timing of electrophysiological tests in diagnosing peripheral neurological and neuromuscular issues</p> <p>Comment: In this circumstance advanced skill means a skill level slightly below a specialist clinician in that field e.g. a radiologist, but sufficient to confidently interpret an investigation without recourse to another specialist in all but complex cases</p>
	<p>11.7 Interpret ECG findings in an athlete with reference to current guidelines</p>	<p>11.7.1 The performance of a standard 12 lead ECG  11.7.2 ECG findings consistent with 'athlete heart'  11.7.3 ECG findings of concern in an athlete  11.7.4 The further investigation of ECG findings of concern in an athlete  11.7.5 Recognition of the need for a sports cardiologist opinion in many cases  11.7.6 The indications for, and principles of performing and interpreting, a stress ECG</p>
	<p>11.8 Inject a variety of joints and soft tissues without radiological guidance</p>	<p>11.8.1 Safe injection practices including informed consent  11.8.2 The purpose and safety of the various injectable substances pertinent to SEM  11.8.3 Have the knowledge required to determine whether a guided or unguided injection is more appropriate  11.8.4 Safe injection of ankle, knee, elbow and shoulder joints and associated peri-articular tissues  11.8.5 Safe injection of soft tissues including tendon, peri-tendon, muscle, and bursae where it is appropriate to inject without radiological guidance</p>

	11.9 Prescribe advanced protective braces	11.9.1 Appropriate braces to assist in injury prevention, acute injury management and long-term protection of the musculoskeletal system
	11.10 Advanced skills	11.10.1 Methods of taping joints, tendons and muscles for injury prevention and treatment 11.10.2 Interpretation of simple video analysis of a variety of sporting skills including running gait 11.10.3 Performance and interpretation of a targeted ultrasound examination for a peripheral musculoskeletal problem 11.10.4 Injection techniques for a variety of joints and soft tissues using ultrasound guidance 11.10.5 Performance and interpretation of the findings of a resting and exercise lung function test 11.10.6 Performance and interpretation of a stress ECG

## Discussion

Specialty training in SEM is evolving, and various training models exist. The ISSEMG syllabus can be adapted to a variety of contexts, including training systems where SEM specialisation is gained as an additional component of a primary specialty. In such circumstances components of the syllabus may have already been covered during training in the primary specialty. The breadth and depth of the syllabus presented is substantial and it should be evident that the training of specialist SEM physicians requires significant resources and time. The ISSEMG recognises that some of the specific learning areas listed cover areas that are still in flux in terms of our level of knowledge. As such the ISSEMG syllabus should be treated as a living document by national medical organisations that guide training in the medical specialty of SEM. They will need to refine and adapt the syllabus to their needs and consider evolving knowledge.

Developing a medical specialty curriculum from a syllabus is a significant undertaking. Curriculum developers must have a deep understanding of the relevant national (or local) medical system and available resources, the health priorities of the given system, the medical pre and post graduate education processes available in that system, and the proposed scope of practice of the new specialty. For the actual development of a curriculum several other fundamentals are required. These include: 1. a curriculum document, based on a syllabus, that clearly details the relevant learning outcomes required to cover the learning areas of the syllabus, 2. teaching and learning methods designed specifically to satisfy the requirements of each learning area, mapped to the curriculum 3. validated formative and summative assessment processes blueprinted to the curriculum document, 4. a comprehensive outline of the training process, which in SEM typically includes items such as the usual training duration required, necessary clinical exposure, sports team and event coverage, research and the reporting requirements of trainees and supervisors, 5. access to suitable training instructors and training positions, 6. the ability to develop doctors who are not just medical experts but also have competence in other fundamentals including, but not limited to communication, collaboration, scholarship, leadership and health advocacy and 7. a cycle of review and renewal of the curriculum.

## Conclusion

The ISSEMG has developed a syllabus for the medical specialty of SEM. This syllabus will be of value to national medical organisations developing SEM specialty or subspecialty training programs and may inform benchmarking of current training programs. This syllabus will contribute to the future international development of the medical specialty of SEM internationally. No further publications are planned by the ISSEMG.

## Statements:

*Competing interests* None

*Contributorship* All listed authors have made substantial contributions to the conception or design of the work, or the acquisition, analysis, or interpretation of data. Additionally, they have been involved in the drafting or critical review and have approved the final version

*Acknowledgements* The following people were additional collaborators in this project, F.J.G. Backx, Bert Fields, Maarten Koornneef, Els Stolk

*Funding information* There are no funders to report for this submission

*Ethics approval* Not applicable

*Data sharing* Not applicable

## References

1. Humphries, D., R. Jaques, and H.P. Dijkstra, *A Delphi developed syllabus for the medical specialty of sport and exercise medicine*. *British Journal of Sports Medicine*, 2018. 52(8): p. 490-492.
2. WHO, *Global action plan on physical activity 2018–2030: more active people for a healthier world*. 2018, Geneva.