The Anatomical Society Core Regional Anatomy Syllabus for Undergraduate Medicine.

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Abstract

The Anatomical Society's core syllabus for anatomy (2003 and later refined in 2007) set out a series of learning outcomes that an individual medical student should achieve on graduation. The core syllabus, with 182 learning outcomes grouped in body regions, referenced in the *General Medical Council's Teaching Tomorrow's Doctors*, was open to criticism on the grounds that the learning outcomes were generated by a relatively small group of anatomists, albeit some of whom were clinically qualified. We have therefore used a modified Delphi technique to seek a wider consensus. A Delphi panel was constructed involving 'experts' (n=39). The revised core syllabus of 156 learning outcomes presented here is applicable to all medical programmes and may be used by curriculum planners, teachers and students alike in addressing the perennial 'What do I need to know ?' question.

Introduction

Applying an appropriate level of anatomical knowledge is the foundation of safe and effective clinical practice. Defining what students need to learn and also when in a programme that learning should best take place, are two of the many decisions faced by curriculum planners. A particular challenge is posed by our ever-expanding knowledge about health and disease together with the need to accommodate changes of emphasis in medical treatment, such as the increased focus on prevention and care delivered in primary settings, and the emergence of newer disciplines and an increased understanding of how students learn (Smith and Mathias 2011 and Smith et al., 2014). Detailed guidelines on course content are not usually prescribed by regulatory bodies. In Tomorrow's Doctors (2009), the UK General Medical Council (GMC) sets out *'what medical schools are expected to deliver and what employers of new graduates can expect to receive'*, but does not prescribe the detailed content of any course (McHanwell et al., 2007, Moxham et al., 2014, Smith et al., 2015). We recognise that determining appropriate course content is not unique either to anatomy or to undergraduate medicine and that defined syllabi exist for some regions of the body, e.g. the head and neck (Tubbs et al., 2014). We anticipate that the outcomes of the present study will be of value to anatomists specifically and to course planners more generally, and hope that our experiences as described in this paper will guide others faced with similar problems. A Delphi method (a form of consensus survey, Keeney et al. 2011) was used to produce a rigorous and research-based consensus on the learning outcomes in anatomy that a newly qualified medical graduate needed to have achieved during his/her initial training. The accompanying paper (Smith et al., 2015) discusses the Delphi methodology in detail. Our results showed that some

learning outcomes in the 2007 syllabus remain unaltered 47/163 (29%) (Smith et al., 2015). The reasons that the other outcomes needed to be modified were varied, including correction of syntactical errors and alteration of the content or the clinical application. The learning outcomes presented below are the product of this rigorous validation procedure. We emphasise that this syllabus is not a definitive list of the anatomy needed over a professional career and recognise that the acquisition of post graduation knowledge is speciality-dependent. In addition, this core syllabus should not be considered in isolation from other aspects of a curriculum. Every learning point in the syllabus needs to be applied to clinical practice using a range of appropriate skills and behaviours.

We acknowledge that any curriculum needs to balance the demands of many different disciplines as well as delivering realistic learning opportunities for students so that they may develop their understanding of anatomy. We recognise that further work needs to be undertaken to define anatomy syllabi for other professions and for sub disciplines of anatomy, for example histology and embryology. The Anatomical Society anatomy syllabus is presented according to body region to allow to easy mapping (blueprinting) to any curriculum, irrespective of format, i.e., whether system-based, problem-based or hybrid. We strongly recommend that the syllabus is read in conjunction with the accompanying methodological paper (Smith et al., 2015).

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The term ‘anatomy’ used in the learning outcomes below encompasses the form, functions, position and relations as well as the neurovascular connections of a given structure or group of structures.

Anatomical Terms

Overview: Medical graduates should be able to communicate effectively with colleagues and be able to understand and use anatomical language appropriately. Knowledge of accepted general anatomical terminology is a prequisite for learning anatomy.

1. Define and demonstrate the following basic terms relative to the anatomical position: medial, median, lateral, proximal, distal, superior, inferior, deep, superficial, palmar, plantar, anterior / ventral, posterior / dorsal, cephalic / cranial, rostral, caudal.
2. Describe the following basic anatomical planes: axial / transverse / horizontal, sagittal and coronal.
3. Define and demonstrate the basic terms used to describe movement: flexion, extension, lateral flexion, pronation, supination, abduction, adduction (radial /

ulnar / deviation), medial / internal and lateral / external rotation, inversion, eversion, plantar flexion, dorsiflexion, protraction, retraction and circumduction.

4. Define the basic terms somatic and visceral/autonomic when used to describe parts of the body and nervous systems of the body.
5. Describe the key anatomical differences between a neonate, child and adult.

Head and Neck

Overview: Medical graduates should be able to demonstrate the position of the palpable and imaging landmarks of the major bones of the skull, including the frontal, parietal, temporal, occipital, maxilla, mandible, nasal, sphenoid, zygoma and ethmoid bones. Demonstrate the palpable position of the hyoid bone, thyroid and cricoid cartilages, lateral mass of the atlas and the spine of C7. Demonstrate the major sutural joints of the skull and describe the fontanelles of the neonatal skull.

6. Describe the boundaries, walls and floors of the cranial fossae.
7. Describe the relationships between the structures of the brain and the anterior, middle and posterior cranial fossae.
8. Identify the major foramina of the skull, both internally and externally, and list the structure(s) that each transmits.
9. Describe the arrangement of the pia, arachnoid and dura mater within the cranial cavity and in relation to the brain. Describe the reflections of the dura mater and the formation of the venous sinuses.
10. Describe the anatomy of the dural venous sinuses. Explain the entrance of cerebral veins into the superior sagittal sinus in relation to subdural haemorrhage.

Explain how connections between sinuses and extracranial veins may permit intracranial infection.

11. Describe the anatomy of the individual layers of the scalp. Describe the significance of its blood supply, particularly in relation to laceration injuries.
12. Describe the main muscles of the face and summarise their nerve supply and the consequences of injury to their nerve supply.
13. Describe the anatomy of the eyelid, conjunctiva and lacrimal gland. Explain their importance for the maintenance of corneal integrity.
14. Describe the boundaries of the orbit, the globe of the eye and the location, actions and nerve supply of the intrinsic and extraocular muscles. Explain the consequences of injury to their nerve supply.
15. Describe the bones of the nasal cavity, in particular the major features of the lateral wall of the nasal cavity. Describe the arteries that supply the lateral wall and nasal septum in relation to epistaxis.
16. Name the paranasal sinuses. Describe their relationship to the nasal cavity and their sites of drainage through its lateral wall. Explain their innervation in relation to referred pain.
17. Describe the intracranial and intrapetrous course of the facial nerve and the relationships of its major branches to the middle ear in relation to damage of the nerve within the facial canal.
18. Describe the anatomy of the temporomandibular joint. Explain the movements that occur during mastication and describe the muscles involved and their innervation.

19. Describe the course and major branches of the maxillary artery, including the course and intracranial relations of the middle meningeal artery and its significance in extradural haemorrhage.
20. Describe the anatomy of the sensory and motor components of the trigeminal nerve, including how their integrity is tested clinically.
21. Describe the functional anatomy of the auricle, external auditory meatus, tympanic membrane, auditory ossicles and pharyngotympanic tube.
22. Describe the anatomy of the parotid, submandibular and sublingual salivary glands, the course of their ducts into the oral cavity and their autonomic secretomotor innervation.
23. Describe the boundaries and major features of the oral cavity and summarise its sensory innervation.
24. Describe the anatomy of the tongue, including its motor and sensory innervation and the role of its extrinsic and intrinsic muscles. Explain the deviation of the tongue on protrusion following hypoglossal nerve injury.
25. Describe the anatomical arrangement of the lymphoid tissue in the pharyngeal and posterior nasal walls.
26. Describe the anatomy, function and innervation of the muscles of the pharynx and soft palate. Describe the components of the gag reflex and how they are tested.
27. Describe the stages of swallowing and the functions of the muscles of the jaw, cheek, lips, tongue, soft palate, pharynx, larynx and oesophagus, during swallowing.

28. Demonstrate the boundaries of the anterior and posterior triangles of the neck defined by the sternum, clavicle, mandible, mastoid process, trapezius, sternocleidomastoid and the midline.
29. In the posterior triangle, demonstrate the position of the spinal accessory nerve, the roots and trunks of the brachial plexus, the phrenic nerve, the external jugular vein and subclavian vessels in relation to penetrating neck trauma.
30. In the anterior triangle, demonstrate the position of the common, internal and external carotid arteries, the internal jugular vein and vagus nerve, the trachea, thyroid cartilage, larynx, thyroid and parathyroid glands. Explain their clinical significance in relation to carotid insufficiency, central venous line insertion and emergency airway management.
31. Describe the hyoid bone and cartilages of the larynx. Explain how these are linked together by the intrinsic and extrinsic laryngeal membranes.
32. Describe the intrinsic and extrinsic laryngeal muscles responsible for closing the laryngeal inlet and controlling vocal cord position and tension. Explain how these muscles function during phonation, laryngeal closure, cough / sneeze reflexes and regulation of intrathoracic pressure.
33. Describe the origin, course and functions of the motor and sensory nerve supply of the larynx and the functional consequences of their injury.
34. Describe the position and anatomy of the thyroid and parathyroid glands, their blood supply and the significance of the courses of the laryngeal nerves.
35. Demonstrate the origin, course and major branches of the common, internal and external carotid arteries and locate the carotid pulse.
36. Describe the courses of the accessory, vagus and phrenic nerves in the neck.

37. Describe the anatomy of the major structures passing between the neck, and the thorax and the upper limb. Describe the courses and important relationships of the subclavian arteries and veins.
38. Describe the anatomy of the motor and sensory nerves to the head and neck and apply this knowledge to a neurological assessment of the cranial and upper cervical spinal nerves.
39. Describe the sympathetic innervation of the head and neck including the features and main causes of Horner's syndrome.
40. Demonstrate the positions of the external and internal jugular veins and the surface landmarks that are used when inserting a central venous line.
41. Describe the anatomy of the major groups of lymph nodes in the head and neck and the potential routes for the spread of infection and malignant disease.
42. Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the head and neck and be able to recognise common abnormalities.

Vertebral column

Overview: Medical graduates should be able to recognise the characteristic features of the vertebral column, including the curvatures of the spine, its osteology, musculature and innervation. They should have sufficient knowledge to be able to perform an examination of the back, understand pathologies, e.g. back pain and whiplash injuries, and to be able to perform procedures such as lumbar puncture.

43. Describe the main anatomical features of typical and atypical vertebrae. Identify the atlas, axis, other cervical, thoracic, lumbar, sacral, and coccygeal vertebrae and recognise their characteristic features.

44. Describe the anatomy of intervertebral joints. Explain the role of intervertebral discs in weight-bearing, give examples of common disc lesions and how they may compress adjacent neurological structures.

45. Describe the regions and functions of the vertebral column. Describe the range of movement of the entire vertebral column and its individual regions. Explain the anatomical bases of common spinal injuries.

46. Identify the principal muscles, ligaments and surface features of the vertebral column in order to be able to perform an examination of the back. Discuss their functional roles in stability and movement of the vertebral column.

47. Describe the anatomical relationships of the meninges to the spinal cord and dorsal and ventral nerve roots, particularly in relation to root compression and the placement of epidural and spinal injections. Describe the anatomy relevant to performing a lumbar puncture.

48. Describe the anatomy of a typical spinal nerve, including its origin from dorsal and ventral spinal roots, its main motor and cutaneous branches and any autonomic component.

49. Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the vertebral column.

Thorax

Overview: Medical graduates should be able to appreciate the bony arrangement of the thoracic cavity, the clavicle, sternum and ribs. They should be able to describe and demonstrate the divisions and contents of the mediastinum. They should be familiar with the anatomy of the respiratory and cardiovascular system in the thorax

(heart, lungs and great vessels) and the structure of the diaphragm. They should be able to describe the anatomy of the breasts, and the arterial supply, venous and lymphatic drainage and innervation of the thoracic organs and walls of the thoracic cavity. They should be able to interpret relevant standard diagnostic images using a range of modalities.

50. Demonstrate the main anatomical features and surface landmarks of the thoracic vertebrae, ribs and sternum.
51. Describe the anatomy of the joints between the ribs, vertebrae, costal cartilages and sternum. Explain their contribution to the movements of ventilation.
52. Describe the anatomy of the intercostal muscles. Describe a neurovascular bundle in a typical intercostal space and outline the structures its components supply.
53. Describe the attachments and relations of the diaphragm and the structures that pass through and behind it. Explain the movements of the diaphragm, its motor and sensory innervation and pleural and peritoneal coverings.
54. Explain the movements involved in normal, vigorous and forced ventilation and describe the muscles responsible for these movements.
55. Describe the boundaries of the thoracic inlet and outlet and the structures that pass through them and their relations.
56. Describe the arrangement and contents of the superior, anterior, middle and posterior parts of the mediastinum.
57. Summarise the anatomy of the bronchial tree and bronchopulmonary segments and explain their functional and clinical significance.

58. Describe the blood supply, innervation and venous and lymphatic drainage of the lungs. Describe the structures in the hilum of the lung and their relationships to each other and to the mediastinum.
59. Demonstrate the surface markings of the heart and great vessels, the margins of the pleura and the lobes and fissures of the lungs and explain their clinical relevance.
60. Demonstrate the arrangement of the fibrous and serous layers of the pericardium and relate it to conditions such as cardiac tamponade and pericarditis.
61. Describe the origin, course and main branches of the left and right coronary arteries and discuss the functional consequences of their obstruction in conditions such as ischaemic heart disease.
62. Identify the major anatomical features of each chamber of the heart and explain their functional significance.
63. Describe the structure and position of the atrio-ventricular, pulmonary and aortic valves and describe their function in the prevention of reflux of blood during the cardiac cycle.
64. Describe the anatomical course of the spread of electrical excitation through the chambers of the heart.
65. Demonstrate the surface markings of the heart and the position and site of auscultation of its four major valves.
66. Describe the course of the ascending aorta, the arch of the aorta and the descending thoracic aorta. Name their major branches and the structures they supply.

67. Describe the origins, courses and relationships of the brachiocephalic veins, inferior and superior venae cavae and the azygos venous system.
68. Describe the origin, course and distribution of the vagus and phrenic nerves.
69. Describe the distribution and function of the sympathetic chains and thoracic splanchnic nerves. Explain the mechanism of referred pain from T1-5 sympathetic afferents to the chest wall and relate it to the thoracic viscera.
70. Describe the course, major relations and neurovascular supply of the oesophagus within the thorax.
71. Describe the course and major relations of the thoracic duct. Explain the lymph drainage within the thorax and its clinical significance.
72. Describe the anatomy of the breast including its neurovascular supply. Explain the lymphatic drainage of the breast and its clinical relevance to metastatic spread.
73. Identify major thoracic structures on standard diagnostic images e.g. CT, MRI, X-ray and ultrasound.

Upper Limb

Overview: Medical graduates should be able to describe the innervation, arterial supply, venous and lymphatic drainage of the structures of the upper limb. They should be able to interpret relevant standard diagnostic images using a range of modalities, with particular reference to common sites of fractures. They should be able to explain the factors that influence the stability of the joints of the upper limb. They should have a working knowledge of surface anatomy (including the site of major pulse points, e.g. radial), dermatomes and peripheral nerve distribution. They

should be aware of the organisation of the deep fascia of the upper limb and its clinical relevance to compartment syndromes.

74. Describe and demonstrate the main anatomical landmarks of the clavicle, scapula, humerus, radius and ulna. Identify the bones of the wrist and hand and their relative positions, identify those bones that are commonly injured, e.g. scaphoid.
75. Describe the neurovascular structures lying in close relation to the bones and joints of the upper limb which are at risk of injury following fracture or dislocation. Predict what the functional effects of such injury might be.
76. Describe the origin, course and distribution of the major arteries and their branches that supply the shoulder, arm, forearm and hand in relation to common sites of injury. Explain the importance of anastomoses between the branches. Identify those sites where neurovascular structures are at particular risk of damage from musculoskeletal injuries.
77. Demonstrate the sites at which pulses of the brachial, radial and ulnar arteries may be located.
78. Describe the course of the main veins of the upper limb and contrast the functions of the deep and superficial veins. Identify the common sites of venous access and describe their key anatomical relations.
79. Describe the anatomy of the brachial plexus from its origin in the neck to its terminal branches. Recognise brachial plexus injuries and explain their clinical presentation.
80. Describe the origin, course and function of the axillary, radial, musculocutaneous, median and ulnar nerves in the upper limb.

81. Name the major muscles and muscle groups that the axillary, radial, musculocutaneous, median and ulnar nerves supply, together with their sensory distribution. Predict the consequences of injury to these nerves and describe how to test their functional integrity.
82. Describe the anatomy of the pectoral girdle, explain the movements of the pectoral girdle; identify the muscles and joints responsible for these movements. Name the main attachments and nerve supply of these muscles.
83. Describe the factors that contribute to the movement and stability of the gleno-humeral joint and explain the functional and clinical consequences of its dislocation.
84. Describe the boundaries and contents of the axilla, including the major vessels and relevant parts of the brachial plexus.
85. Describe the anatomy of the axillary lymph nodes and explain their importance in the lymphatic drainage of the breast and skin of the trunk and upper limb and in the spread of tumours.
86. Describe the anatomy of the elbow joint. Demonstrate the movements of flexion and extension. Identify the muscles responsible for these movements. Name the main attachments and nerve supply of these muscles.
87. Describe the anatomy of the radio-ulnar joints. Explain the movements of supination and pronation; identify the muscles responsible for these movements, name the main attachments and describe the nerve supply of these muscles.
88. Describe the anatomy of the wrist. Describe and demonstrate movements at the wrist joints and name and identify the muscle groups responsible for the movements. Describe the relative positions of the tendons, vessels and nerves in the region of the wrist in relation to injuries.

89. Name and demonstrate the movements of the fingers and thumb. Describe the position, function and nerve supply of the muscles and tendons involved in these movements, differentiating between those in the forearm and those intrinsic to the hand.
90. Describe the main types of grip (power, precision and hook) and the role of the muscles and nerves involved in executing them.
91. Describe the position and function of the retinacula of the wrist and the tendon sheaths of the wrist and hand in order to explain carpal tunnel syndrome and the spread of infection in tendon sheaths.
92. Describe the anatomical basis of assessment of: cutaneous sensation in the dermatomes of the upper limb, motor function, tendon reflexes, and muscle power in the upper limb.
93. Describe the fascial compartments enclosing the major muscle groups of the upper limb; explain the functional and clinical importance of those compartments and their contents.
94. Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the upper limb and recognise common abnormalities.

Abdomen

Overview: Medical graduates should understand the musculature of the abdominal walls and the structure of the inguinal canal. They should be able to explain the three dimensional arrangement of the viscera within the abdominal and the pelvic cavities. They should be able to understand the arrangement of the peritoneum, the greater

and lesser sacs and the mesenteries. They should be familiar with the anatomy of the gastrointestinal tract in the abdomen (stomach, duodenum, jejunum, ileum, caecum and colon) and the hepatobiliary system (liver, gallbladder), endocrine system (suprarenal glands and the endocrine components of the pancreas) and the urinary system (kidneys and ureters) and hematopoietic organs (spleen). They should be able to describe the arterial supply, venous and lymphatic drainage and innervation of the abdominal viscera and the abdominal wall. They should be able to interpret relevant standard diagnostic images using a range of modalities.

95. Demonstrate the bony and cartilaginous landmarks visible or palpable on abdominal examination and explain their clinical significance.
96. Demonstrate the surface projections of the abdominal organs onto the four quadrants and nine descriptive regions of the abdomen.
97. Describe the anatomy, innervation and functions of the muscles of the anterior, lateral and posterior abdominal walls. Discuss their functional relationship with the thoracic and pelvic diaphragms and their roles in posture, ventilation and voiding of abdominal/ pelvic/ thoracic contents.
98. Describe the anatomy of the inguinal ligament and inguinal canal in the male and female. Explain the contents of the canal and how inguinal hernias develop, including the anatomy and clinical presentation of such hernias.
99. Describe the relationship between the femoral canal and the inguinal ligament and the anatomy of femoral hernias.
100. Demonstrate the surface projections of the liver, gallbladder, pancreas, spleen, kidneys, stomach, duodenum, jejunum, ileum. Describe the caecum, appendix, ascending, transverse, descending and sigmoid parts of the colon.

101. Describe the organisation and clinical significance of the parietal and visceral peritoneum, the greater and lesser sacs, mesenteries and peritoneal ‘ligaments’. Explain the significance of the attachments of the ascending and descending colon to the posterior abdominal wall.
102. Describe the functional anatomy of the small and large bowel mesenteries; their structure, location and their vascular, lymphatic and neural contents.
103. Explain the nerve supply of the parietal and visceral peritoneum and the role of the visceral peritoneum in referred pain.
104. Describe the position and functional anatomy of the stomach, its position, parts, sphincters, vascular, lymphatic and nerve supply and key relations to other abdominal organs.
105. Describe the duodenum, its parts, position, secondary retroperitoneal attachment; vascular, lymphatic and nerve supply and key relations to other abdominal organs.
106. Describe the regions and positions of the small and large intestine and their vascular, lymphatic and nerve supply. Describe the anatomical variations in the position of the appendix and explain their significance in relation to appendicitis.
107. Describe the position and functional anatomy of the liver, its lobes, segments and their key anatomical relations. Explain the peritoneal reflections of the liver and its movement during ventilation. Summarise the functional anatomy of the portal vein, the portal venous system, porto-systemic anastomoses and their significance in portal hypertension.
108. Describe the position, functional anatomy and vasculature of the gall bladder and biliary tree; explain their relations in the abdomen and the clinical significance of inflammation of the biliary system and biliary (gall) stones.

109. Describe the position and form of the pancreas and its relations to other abdominal organs. Discuss the significance of these relations to pancreatitis and biliary stone disease.
110. Describe the position and functional anatomy of the kidneys and ureters. Demonstrate their relations to other abdominal and pelvic structures. Discuss the clinical significance of renal and ureteric anatomy in relation to urinary stones.
111. Describe the position and relations of the suprarenal (adrenal) glands and their functional anatomy.
112. Describe the anatomy of the spleen, including its position, blood supply, surface markings, relations and peritoneal attachments. Explain the significance of these relations in trauma, chronic infection and haematopoietic disorders.
113. Describe the origins, courses and major branches of the abdominal aorta, coeliac axis, superior and inferior mesenteric, renal and gonadal arteries. Describe the clinical significance of the blood supply to the abdomen for example in relation to abdominal aneurysm repair. Describe the origin and course of the inferior vena cava and its major tributaries.
114. Describe the anatomy of the lymph nodes draining the abdominal viscera and their significance in relation to metastatic spread.
115. Interpret standard diagnostic images e.g. CT, MRI, X-ray and ultrasound of the abdomen and recognise common abnormalities.

Pelvis and Perineum

Overview: Medical graduates should be able to appreciate the arrangement of the bony pelvis and describe its sexual dimorphism. They should understand the three dimensional arrangement of the pelvic cavity, its continuity with the abdominal cavity

and its peritoneal relationships. They should be able to understand the structures that support the pelvic viscera, including the muscles of the pelvic diaphragm. They should be familiar with the anatomy of the urinary and gastrointestinal system in the pelvis (ureters, bladder, urethra, rectum and anal canal) and the reproductive system in males (scrotum, testis, vas deferens, seminal vesicles, ejaculatory ducts, prostate, and penis) and females (ovaries, uterine tubes, uterus, cervix, vagina, labia, and clitoris). They should be able to describe the arterial supply, venous and lymphatic drainage and innervation of the pelvic organs and perineum. They should be able to interpret relevant standard diagnostic images using a range of modalities.

116. Describe the skeletal and ligamentous components of the pelvis, the anatomy of the pelvic inlet and outlet and recognise their normal orientation. Explain sexual differences in pelvic skeletal anatomy.
117. Demonstrate the palpable anatomical landmarks of the ilium, ischium and pubis.
118. Describe the anatomy and functional importance of the pelvic diaphragm, its midline raphe, perineal body, attachment points and the structures passing through it in males and females. Describe the clinical significance of the pelvic diaphragm, e.g. in relation to continence, prolapse and episiotomy.
119. Describe the anatomy of the bladder, its base and ureteric openings and its relationship to the overlying peritoneum. Explain how the position of the bladder changes with filling and during pregnancy.
120. Describe the anatomy of the urethra; explain the anatomy of its different parts in males and females in relation to continence and catheterisation.

121. Describe the innervation of the bladder, its sphincters and the mechanism of micturition.
122. Describe the anatomy of the scrotum, testis and epididymis and their normal features on clinical examination. Explain the significance of the vascular supply of the testis in relation to torsion and varicocele and the lymphatic drainage in relation to tumour spread.
123. Describe the structure and course of the spermatic cord and ductus (vas) deferens.
124. Describe the anatomy and relations of the prostate gland and seminal vesicles. Describe the normal form of the prostate when examined per rectum and how this changes in relation to hypertrophy and malignancy.
125. Describe the anatomy and relations of the ovary, uterine tubes, uterus, cervix and vagina, including their peritoneal coverings. Describe the changes that occur in the uterus and cervix with pregnancy.
126. Describe the origin, course and relations of the ovarian, uterine, vaginal and testicular arteries.
127. Describe the anatomy and neurovascular supply of the penis, scrotum, the clitoris, vulva and vagina. Explain the anatomy of the urogenital diaphragm and perineal ‘pouches’.
128. Describe the origin, course and distribution of the pudendal nerves and the sites of pudendal nerve block.
129. Describe the innervation of and mechanisms involved in the erection of cavernous tissue in males and females and in emission and ejaculation in the male.

130. Describe the anatomy, relations and peritoneal coverings of the sigmoid colon, rectum and anal canal. Explain the functional anatomy of puborectalis, the anal sphincters and their role in faecal continence.
131. Describe the blood supply and venous drainage of the distal bowel; the supply from superior rectal (from inferior mesenteric), middle rectal (from internal iliac) and inferior rectal arteries (from internal pudendal to anal canal only), and porto-systemic venous anastomoses. Explain the clinical significance of the blood supply and venous drainage of the distal bowel, e.g. in continence, haemorrhoids and anal fissures.
132. Describe the anatomy of the ischio-anal fossa and explain its clinical significance, e.g. in relation to abscesses and fissures.
133. Describe the lymphatic drainage of the pelvic and perineal organs.
134. Interpret standard diagnostic images of the pelvis and perineum e.g. CT, MRI, X-ray and ultrasound and be able to recognise common abnormalities.

Lower Limb

Overview: Medical graduates should be able to describe the innervation, arterial supply, venous and lymphatic drainage of the structures of the lower limb. They should be able to interpret relevant standard diagnostic images using a range of modalities, with particular reference to common sites of fractures (neck and shaft of femur, tibia and fibula). They should be able to explain the factors that influence the stability of the joints of the lower limb. They should have a working knowledge of surface anatomy (including major pulse points e.g. femoral), dermatomes and peripheral nerve distribution, and the functions of major muscle groups and their innervation in order to perform clinical procedures such as a basic neurological

examination of the lower limb and intramuscular injections. They should be aware of the organisation of the deep fascia of the lower limb and its clinical relevance to compartment syndromes.

135. Describe the osteology and surface landmarks of the pelvis, femur, tibia, fibula and foot. Demonstrate their palpable and imaging landmarks. Explain how the bones, joints and related structures are vulnerable to damage and what the consequences of such damage could be.
136. Demonstrate the origin, course and branches of the major arteries that supply the gluteal region, hip, thigh, leg, ankle and foot. Explain the functional significance of anastomoses between branches of these arteries at the hip and knee.
137. Demonstrate the locations at which the femoral, popliteal, posterior tibial and dorsalis pedis arterial pulses can be palpated.
138. Demonstrate the course of the principal veins of the lower limb. Explain the role of the perforator veins between the superficial and deep veins and the function of the 'muscle pump' for venous return to the heart. Describe the surface landmarks for sites of venous access that can be used for 'cut-down' procedures in emergencies.
139. Outline the origin of the lumbosacral plexus and the formation of its major branches.
140. Describe the origin, course and function of the femoral, obturator, sciatic, tibial, common fibular (peroneal), sural and saphenous nerves and summarise the muscles and muscle groups that each supplies, as well as their sensory distribution.

141. Describe the anatomy of the gluteal region and the course of the sciatic nerve through it. Explain how to avoid damage to the sciatic nerve when giving intramuscular injections.
142. Describe the anatomy and movements of the hip joint. Summarise the muscles responsible for these movements, their innervation and attachments.
143. Describe the structures responsible for stability of the hip joint.
144. Describe the structures at risk from a fracture of the femoral neck or dislocation of the hip and explain the functional consequences of these injuries.
145. Describe the boundaries and contents of the femoral triangle with particular regard to arterial blood sampling and catheter placement.
146. Describe the anatomy and movements of the knee joint. Summarise the muscles responsible for these movements, their innervation and main attachments.
147. Identify the factors responsible for maintaining the stability of the knee joint. Describe the locking mechanism that occurs in full extension. Explain the anatomical basis of tests that assess the integrity of the cruciate ligaments.
148. Describe the boundaries and contents of the popliteal fossa.
149. Describe the close relations of the knee joint, including major bursae and explain which of these structures may be injured by trauma.
150. Describe the anatomy of the ankle and subtalar joints. Explain the movements of plantar flexion, dorsiflexion, inversion and eversion. Summarise the muscles responsible for these movements, their innervation and their attachments.
151. Describe the factors responsible for stability of the ankle joint, especially the lateral ligaments, and explain the anatomical basis of ‘sprain’ injuries.

152. Describe the arches of the foot and the bony, ligamentous and muscular factors that maintain them.
153. Describe the fascial compartments enclosing the major muscle groups and explain the functional importance of these compartments and their contents in relation to compartment syndrome.
154. Describe the anatomical bases (nerve root or peripheral nerve) for loss of movements and reflexes at the knee and ankle resulting from spinal injuries, disc lesions and common peripheral nerve injuries. Describe the dermatomes of the lower limb and perineum that can be used to assess spinal injuries.
155. Describe the lymphatic drainage of the lower limb and its relationship to infection and tumour spread.
156. Interpret standard diagnostic images e.g. CT, MRI, X-ray and ultrasound of the lower limb and be able to recognise common abnormalities.

Acknowledgements

This project was undertaken and funded by the Anatomical Society. The authors express their gratitude to everyone involved, especially the Delphi Panel and Council members. The authors acknowledge the work of Agnese Sile and Ellen Thomas for their support and work with Survey Monkey and communication to the Delphi Panel.

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