ESPE European Society for Paediatric Endocrinology

E.A.P.

European Training Requirements

for Competency in

Paediatric Endocrinology and Diabetes

Syllabus completed April 2021

Approved by EAP Tertiary Care Council 21 January 2021

Approved by EBP 24 January 2021

Approved by UEMS 24 April 2021

Preamble

The Union Européenne des Medecins Specialistes / Union of European Medical Specialists (UEMS) is a non-governmental organisation representing national associations of medical specialists at the European Level. With a current membership of 40 national associations and operating through 43 Specialist Sections and European Boards, the UEMS is committed to promote the free movement of medical specialists across Europe while ensuring the highest level of training, which will pave the way to the improvement of quality of care for the benefit of all European citizens.

The UEMS areas of expertise notably encompass Continuing Medical Education, Post Graduate Training and Quality Assurance. It is the UEMS' conviction that the quality of medical care and expertise is directly linked to the quality of training provided to the medical professionals. Therefore the UEMS committed itself to contribute to the improvement of medical training at the European level through the development of European Standards in the different medical disciplines. No matter where doctors are trained, they should have at least the same core competencies.

In 1994, the UEMS adopted its Charter on Post Graduate Training aiming at providing the recommendations at the European level for good medical training. Made up of six chapters, this Charter set the basis for the European approach in the field of Post Graduate Training. With five chapters being common to all specialties, this Charter provided a sixth chapter, known as “Chapter 6” that each Specialist Section was to complete according to the specific needs of their discipline. More than a decade after the introduction of this Charter, the UEMS Specialist Sections and European Boards have continued working on developing these European Standards in Medical training that reflects modern medical practice and current scientific findings. In doing so, the UEMS Specialist Sections and European Boards did not aimed to supersede the National Authorities' competence in defining the content of postgraduate training in their own State but rather to complement these and ensure that high quality training is provided across Europe.

At the European level, the legal mechanism ensuring the free movement of doctors through the recognition of their qualifications was established back in the 1970s by the European Union. Sectorial Directives were adopted and one Directive addressed specifically the issue of medical Training at the European level. However, in 2005, the European Commission proposed to the European Parliament and Council to have a unique legal framework for the recognition of the Professional Qualifications to facilitate and improve the mobility of all workers throughout Europe. This Directive 2005/36/EC established the mechanism of automatic mutual recognition of qualifications for medical doctors according to training requirements within all Member States; this is based on the length of training in the Specialty and the title of qualification.

Given the long-standing experience of UEMS Specialist Sections and European Boards on the one hand and the European legal framework enabling Medical Specialists and Trainees to move from one country to another on the other hand, the UEMS is uniquely in position to provide specialty-based recommendations. The UEMS values professional competence as “the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served”. While professional activity is regulated by national law in EU Member States, it is the UEMS understanding that it has to comply with International treaties and UN declarations on Human Rights as well as the World Medical Association (WMA)

International Code of Medical Ethics (https://www.wma.net/policies-post/wma-international-code-of-medical-ethics).

This document derives from the previous Chapter 6 of the Training Charter and provides definitions of specialist competencies and procedures as well as how to document and assess them. For the sake of transparency and coherence, it has been renamed as “Training Requirements for the Specialty”. This document aims to provide the basic Training Requirements for each specialty and should be regularly updated by UEMS Specialist Sections and European Boards to reflect scientific and medical progress. The three-part structure of this document reflects the UEMS approach to have a coherent pragmatic document not only for medical specialists but also for decision-makers at the National and European level interested in knowing more about medical specialist training.

Paediatrics

Paediatrics is an independent medical specialty based on the knowledge and skills required for the prevention, diagnosis and management of all aspects of illness and injury affecting children of all age groups from birth to the end of adolescence, up to the age of 18 years. It is not just about the recognition and treatment of illness in babies and children. It also encompasses child health, which covers all aspects of growth and development and the prevention of disease. The influence of the family and other environmental factors also play a large role in the development of the child, and many conditions require life-long management and follow-up before a smooth transition of care to adult services.

For these reasons we believe that all doctors practising **Paediatric Endocrinology and Diabetes** require a solid basic training in General Paediatrics, as set out by many National Training Authorities (NTAs), and in the recommended European Common Trunk Syllabus, approved by the European Academy of Paediatrics (EAP)-UEMS. This training, which should be of **3 years minimum duration**, should act as a prelude to specialist training, and will underpin many of the principles set out in this specialist syllabus.

This document sets out the minimum requirements for training in Tertiary Care Paediatric Endocrinology and Diabetes. Tertiary Care Paediatric Endocrinology and Diabetes was recognised in 1996 as a Paediatric subspecialty (competency) by the General Assembly of the European Board of Paediatrics, itself a section of the UEMS.

Subspecialty description

Paediatric Endocrinology and Diabetes is a non-surgical subspecialty concerned with the care of children and adolescents who have structural and functional disorders of the endocrine glands, of hormone synthesis, secretion and action, and the consequences there of on health, growth, puberty, homeostasis and metabolism.

Composition of the ESPE Syllabus subcommittee /Short-term Task Force

Leena Patel, ESPE Accreditation and Syllabus Convener 2019-2022.
Emeritus Professor of Medical Education, The Division of Medical Education, University of Manchester; and Consultant Paediatric Endocrinologist, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

Kanetee Busiah, Consultant Paediatric Endocrinologist, Endocrinology, Diabetology and Obesity unit, Lausanne University Hospital; and Senior Lecturer, Faculty of Biology and Medicine, Lausanne University, Switzerland

Aleksandr Peet, Consultant Paediatric Endocrinologist, Children's Clinic of Tartu University Hospital; Institute of Clinical Medicine, Faculty of Medicine, Tartu University, Tartu, Estonia

Gianluca Tornese, Consultant Paediatric Endocrine and Diabetes Unit, Institute for Maternal and Child Health IRCCS "Burlo Garofolo", Trieste, Italy

Naomi Weintrob, Previous Associate Clinical Professor of Pediatrics, Department of Pediatrics, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv; Former Head of Pediatric Endocrinology and Diabetes Unit, Dana-Dwek Children's Hospital, Tel-Aviv Medical Center, Tel-Aviv; Consultant in Endocrinology, Department of Pediatrics, Meir Medical Center, Kfar Saba, Israel; Previous Elected President of the Israel Society of Pediatric Endocrinology

Methodology for generating the syllabus

The Chair of the ESPE Education and Training (ETC) Committee Rasa Verkauskiene initiated this revision to the ESPE ETR/Training Programme Syllabus in 2019. The Syllabus subcommittee /Short-term Task Force was established in October 2019. They reviewed the 2013 syllabus content and updated it in keeping with EAP and UEMS requirements.

Comments and contributions were obtained from trainees and specialists in paediatric as well as adult endocrinology and diabetes from countries in Europe and around the world. Thereafter it was peer reviewed by the Chair of the ETC Rasha Hamza, members of the ETC and members of the ESPE Council in 2020. The reviewers comprised representatives of national societies.

With ESPE approval, the Syllabus subcommittee submitted this ETR to the EAP in August 2020. The document was revised further to receiving comments from UEMS reviewers and submitted to UEMS for ratification in April 2021. The methodology used has contributed to ensuring the validity of the updated syllabus and its utility throughout Europe as well as worldwide.

Acknowledgments

We are grateful to all listed below who have provided constructive comments and contributed to this ETR.

TRAINEES

Amish Chinoy, Paediatric Endocrine Research Fellow, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

Chris Worth, Paediatric Endocrine Research Fellow, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

Maria-Cristina Antoniou, Paediatric Endocrine Trainee, Endocrinology, Diabetology and Obesity unit, Lausanne University Hospital, Lausanne University, Switzerland

María de los Ángeles Gómez Cano, Paediatric Endocrine Trainee, Department of Paediatric Endocrinology, Hospital 12 de Octubre, Madrid, Spain

Patricia Pérez Mohand, Paediatric Endocrine Trainee, Department of Paediatric Endocrinology, Hospital 12 de Octubre, Madrid, Spain

SPECIALISTS IN PAEDIATRIC, ADOLESCENT AND ADULT ENDOCRINOLOGY

Claire Higham, Consultant Endocrinologist, The Christie Hospital, Manchester, UK

Daphne Yau, Consultant Pediatric Endocrinologist, University of Saskatchewan, Canada

Indraneel Banerjee, Consultant Paediatric Endocrinologist, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

John Schulga, Consultant Paediatrician and Lead for Paediatric Diabetes & Endocrinology, NHS Forth Valley; Honorary lecturer, Glasgow University, Scotland

Meghna Chawla, Consultant Paediatric Endocrinologist, Grant Medical Foundation, Ruby Hall Clinic Group of Hospitals, Pune, India

Mya Sandar Thein, Consultant Paediatric Endocrinologist, Yangon Children's Hospital, Myanmar

Philip Murray, Consultant Paediatric Endocrinologist, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

Raja Padidela, Consultant Paediatric Endocrinologist, Department of Paediatric Endocrinology, Royal Manchester Children's Hospital, United Kingdom

CHAIRS and MEMBERS OF THE ESPE Education and Training Committee (ETC)

Rasha Tarif, Chair of ESPE ETC. Paediatric Endocrinologist, Cairo, Egypt

Rasa Verkauskiene, Chair of ESPE ETC 2016-2019. Professor and Head of Department, Department and Institute of Endocrinology, Lithuanian University of Health Sciences, Kaunas, Lithuania

Abdelhadi Habeb, Consultant Pediatric Endocrinologist, Chairman of Pediatrics, PMBAH, National Guard Ministry, Madinah, Kingdom of Saudi Arabia

Andrea Luczay, ESPE Accreditation and Syllabus Convener 2016-2019. Head of Endocrinology, Department of Paediatrics, Semmelweis University, Budapest, Hungary

Annemieke Boot, Pediatric Endocrinologist, University Medical Center Groningen; Beatrix Children's Hospital, Groningen, the Netherlands

Francesco Chiarelli, Professor of Paediatrics and Paediatric Endocrinology, Department of Paediatrics, University of Chieti, Chieti, Italy

Ieuan Hughes, Emeritus Professor of Paediatrics, University of Cambridge, United Kingdom

Jan Lebl, Professor and Head, Department of Pediatrics, Charles University in Prague, 2nd Faculty of Medicine, Prague, Czech Republic

Justin Davies, Consultant Paediatric Endocrinologist, Southampton Children's Hospital, Southampton, United Kingdom

Violeta Iotova, Paediatric Endocrinologist, Professor and Head, Clinic of Paediatric Endocrinology, UMHAT "St Marina", Varna, Bulgaria

MEMBERS OF ESPE COUNCIL

Agnès Linglart, Professor of Paediatrics, Bicêtre Paris Sud Paris Saclay University and Hospital, Paris, France

Evangelia Charmandari, Professor of Pediatric and Adolescent Endocrinology, Division of Endocrinology, Metabolism and Diabetes, First Department of Pediatrics, National and Kapodistrian University of Athens Medical School, "Aghia Sophia" Children's Hospital, Athens, Greece

Syed Faisal Ahmed, Samson Gemmell Chair of Child Health, University of Glasgow, UK

MEMBERS OF EAP

Rob Ross Russell, EAP Chair of European Board of Paediatrics. Consultant in Paediatric Intensive Care and Respiratory Paediatrics, Addenbrooke's Hospital, Cambridge, United Kingdom

Berthold Koletzko, EAP Chair of Tertiary Care. Professor of Paediatrics, Ludwig-Maximilians-Universität, and Head, Division of Metabolic & Nutritional Medicine, Hauner Children's Hospital, University of Munich, Germany

MEMBERS OF UEMS

Arthur Felice, UEMS Executive Section of Surgery & European Board of Surgery, President European Board of Surgery. Professor, Department of Surgery, University of Malta, Imsida, Malta

Nada Cikes, UEMS Vice President, Enlarged Executive Committee, Rheumatology Section and Board. Professor, Division of Clinical Immunology and Rheumatology, Department of Medicine, University Hospital Centre Zagreb, Croatia

Tibor Ertl, UEMS ETR Review Committee. Emeritus Professor of Pediatrics and Neonatology, University of Pécs, Association of Hungarian Medical Societies

CONTENTS

1. INTRODUCTION 10
2 AIM OF TERTIARY CARE TRAINING 10
2.1 Aim of tertiary care training 10
2.2 End Result of Training, Training outcomes and Competencies 11
3 TRAINING PERIOD - Clinical training 14
4 RESEARCH TRAINING 15
4.1 Participation in Research 15
4.2 Participation in Audit project 15
5 REQUIREMENTS FOR TRAINING INSTITUTIONS 16
5.1 Requirements for centres 16
5.2 Accreditation of centres 16
5.3 Full training centre 17
5.4 Training unit 17
6 REQUIREMENTS FOR TRAINERS 18
7 REQUIREMENTS FOR TRAINEES 19
7.1 Prerequisite for Clinical training 19
7.2 Additional requirements of trainees 19
7.3 Record of Progress and Assessments 19
7.3.1 Portfolio and Log-book 19
7.3.2 Formative competency assessments 19
7.3.3 Summative assessments 20
8 CONTENT TABLES 21
8a CROSS CUTTING AND NON-TECHNICAL SKILLS 21
A. PROFESSIONALISM (ATTITUDES) 21
B. COMMUNICATION 22
C. SITUATION AWARENESS 22
D. DECISION MAKING 23
E. SAFEGUARDING 23
F. LEADERSHIP 24
G. TEAM WORKING 24
H. TIME AND TASK MANAGEMENT 24
I. HEALTH ECONOMICS AND SERVICE PROVISION 25
J. SCIENCE AND BIOSTATISTICS 25
K. SELF-DIRECTED LEARNING 25
L. GENERIC TEACHING AND EDUCATION SKILLS 26
8b SPECIALTY SPECIFIC CONTENT FOR TERTIARY CARE PAEDIATRIC ENDOCRINOLOGY AND DIABETES 27
8b.1 Knowledge and skills 27
8b.2 Content for tertiary care paediatric endocrinology and diabetes 30
A. BIOMEDICAL KNOWLEDGE 30
B. PROCEDURAL SKILLS IN PAEDIATRIC ENDOCRINOLOGY AND DIABETES 31
C. PAEDIATRIC ENDOCRINE AND DIABETES EMERGENCIES 31
D. GROWTH - SHORT STATURE 32
E. GROWTH - TALL STATURE AND OVERGROWTH 34
F. PUBERTY 35
G. WEIGHT DISORDERS 36
H. PITUITARY GLAND, HYPOTHALAMUS, CENTRAL NERVOUS SYSTEM 36

I. THYROID GLAND 38
J. PARATHYROID GLANDS, METABOLIC BONE AND MINERAL DISORDERS 39
K. ADRENAL GLANDS 41
L. SEX DEVELOPMENT AND GENDER 43
M. DISORDERS OF TESTES AND MALE REPRODUCTIVE TRACT 44
N. DISORDERS OF OVARIES AND FEMALE REPRODUCTIVE TRACT 45
O. GLUCOSE AND LIPID METABOLISM - DIABETES MELLITUS 46
P. GLUCOSE AND LIPID METABOLISM - HYPOGLYCAEMIA 48
Q. SALT AND WATER REGULATION 49
R. CONDITIONS WITH ENDOCRINE FEATURES 49
RESOURCES 51
APPENDIX 52

1. INTRODUCTION

Curriculum is a Latin term which refers to the recommendations about an entire educational programme and the processes for delivering it. It includes the theoretical (syllabus), practical (process and practice for instructional methods and assessments) and productive (outcomes) aspects which are planned, purposeful, systematic and progressive.

Syllabus derives from a Greek term and is used for the description about the content and learning objectives of a curriculum or course. Thus it refers to the material to be learnt and taught in an educational programme.

This ETR intends to:

- Harmonise and improve training programmes in **Paediatric Endocrinology and Diabetes** between different European countries.
- Establish clearly defined standards of knowledge and skill required to deliver care in **Paediatric Endocrinology and Diabetes** at tertiary care specialist (consultant) level.
- Improve the quality of care for children and adolescents requiring **Paediatric Endocrinology and Diabetes** services.
- Foster the development of a European network of competent tertiary care centres for **Paediatric Endocrinology and Diabetes**.
- Promote European contributions, commitment and collaborations with professionals worldwide to achieve implementation and quality assurance of this syllabus.

2 AIM OF TERTIARY CARE TRAINING

2.1 Aim of tertiary care training

The aim of tertiary care training in **Paediatric Endocrinology and Diabetes** is to equip clinicians with the competencies required to provide safe high quality and effective care for children and adolescents who present with common as well as rare problems to a tertiary service in **Paediatric Endocrinology and Diabetes**.

2.2 End Result of Training, Training outcomes and Competencies

The end result of training is defined as being able to practice independently as a Tertiary Care specialist in **Paediatric Endocrinology and Diabetes.**

Many countries have reformed their postgraduate medical education to improve quality and effectiveness. New pedagogic initiatives include defining the competency based outcomes of education and training, for example using the CanMEDS framework.

CanMEDS framework

The CanMEDS framework describes the 7 roles of a doctor, presents competencies for each of these roles and sets high educational standards which aim to enhance patient care. An additional role is that of a mentor.

By the end of tertiary training, the specialist doctor will be able to display the following characteristics and competencies for each of these 8 roles in paediatric endocrinology and diabetes:

1. **Medical expert**

- Integrate all CanMEDS roles and fulfil the obligations of a tertiary specialist to recognise and safely manage individual patient's and the population problems
- Practise medicine within their defined scope of practice and experience
- Apply biomedical, psychosocial as well as specialised knowledge, clinical skills and professional attitudes to inform their daily practice
- Perform patient-centred clinical assessment and establish shared management plans
- Apply skills of critical thinking and reasoning to gather, interpret and analyse findings from a variety of sources, including clinical data and research evidence
- Plan and arrange diagnostic tests, procedures and treatments
- Establish plans for ongoing care and, when appropriate, timely consultation
- Provide comprehensive and high quality clinical care within the framework of a specialised Tertiary service in the emergency/inpatient/outpatient/community settings using up-to-date specialised diagnostic and therapeutic modalities. Care includes health promotion, disease prevention, emergency management and therapeutic practice.

2. **Communicator:**

- Establish professional therapeutic relationships with patients and their families/carers before, during and after medical encounter
- Elicit and synthesise accurate and relevant information, incorporating the perspectives of patients and their families/carers
- Communicate with all concerned, effectively and in a timely manner using face-to-face interactions, written documentation and other modalities
- Apply a humane, compassionate and person-centred approach in all interactions
- Engage patients and their families/carers in developing plans that reflect the patient's health care needs and goals

- Document and share written and electronic information about the medical encounter to optimise clinical decision-making, patient safety, confidentiality and privacy
- Share health care information and plans with patients and their families/carers

3. **Collaborator:**

- Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety
- Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care
- Liaise with and work effectively with relevant professionals to achieve optimal patient health. Professionals include:
    - primary care physicians
    - general paediatricians in secondary care
    - tertiary paediatric specialists in cardiology, child and adolescent psychiatry, clinical genetics, dentistry, gastroenterology, adolescent gynaecology, immunology, intensive care, metabolic medicine, neonatology, nephrology, neurology, neurosurgery, nuclear medicine, oncology, ophthalmology, orthopaedics, paediatric surgery and urology, pathology, radiology, respiratory medicine and rheumatology
    - health care professionals such as Specialist Nurses, Dietitians, Speech and language therapists, Clinical psychologists, Pharmacists, Physiotherapists, Occupational therapists and Social workers.
    - scientists and technicians in investigation facilities in biochemistry, genetics/molecular biology, radiology and histopathology
- Develop an integrated pattern of care with colleagues in Adult Endocrinology and Diabetes

4. **Leader**:

- Contribute to improving health care delivery in teams, networks (regional, national and international) organisations and systems
- Engage in the stewardship of health care resources
- Demonstrate leadership in professional practice
- Manage career planning, finances and health human resources in a health service

5. **Health advocate:**

- Identify and respond to the health needs of individual patients and the local people by supporting them, speaking up for them and influencing improvements in health and health care delivery in a socially accountable manner
- Use expertise responsibly and influence to advance the health of individual patients, communities and population

6. **Scholar and Researcher:**

- Integrate best available evidence into practice
- Demonstrate continuous enhancement of their professional activities through ongoing reflection and learning

- Expand beyond their clinical role to take on educational and scholarly roles
- Be trained in clinical research and capable of conducting/establishing meaningful research
- Create, translate and disseminate medical knowledge and practices

7. **Professional:**

Demonstrate

- professional behaviours and values including probity, ethical standards, and respect for patients, society and the profession
- commitment to the health and wellbeing of self, individuals and society through ethical practice, professional led regulation and high personal standards of behaviour.
- professional competence, which is "*the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the individual and community being served.*"[1]
- clinical competence as well as all key qualities that enable trust: integrity (truthfulness and benevolence), reliability (conscientiousness and predictable behaviour) and humility (recognition of own limitations and willingness to ask for help if needed)

8. **Mentor:**

- Develop mentorship skills during the period of training
- Recognise strong attributes and aspects that need improvement among younger colleagues, provide constructive feedback, and guide and support them to enhance their professional development

[1] Epstein RM, Hundert EM. Defining and assessing professional competence. *JAMA*. 2002; 287(2): 226–235. doi:10.1001/jama.287.2.226

3 TRAINING PERIOD - Clinical training

A clinical training period of **at least 24 months full-time, or the equivalent part-time employment** in **Paediatric Endocrinology and Diabetes**, preferably uninterrupted, is essential. This period of training may be fully or partly dedicated to Paediatric Endocrinology and Diabetes. Where it is partly dedicated (e.g. to support on-call general paediatric service delivery or a hybrid post), a minimum of 70% of the time should be devoted to Paediatric Endocrinology and Diabetes training.

When feasible, experience (e.g. 1-2 months or equivalent part-time) in the following should be sought:

- adult endocrinology and adolescent gynaecology - the experience should include attending and participating in transition clinics, multi-disciplinary meetings and joint educational sessions
- hormone or biochemistry laboratory
- clinical genetics and genetics laboratory
- paediatric radiology

Clinical training should be designed:

- to enable the trainee to acquire the required competencies from active participation and experiences in the clinical setting
- to provide opportunities for the trainee to participate at increasing levels of responsibility for patient care
- with appropriate clinical and educational supervision to promote the trainee's professional development while also ensuring patient safety. As the trainee progresses in their professional development, the intensity of supervision is expected to reduce from full supervision initially, to on-demand and distant supervision, and finally unsupervised practice.

The ESPE e-learning web portal can be used for interactive learning, self-assessment and classroom teaching. The portal is a free-of-charge interactive learning environment for up to date topics in pediatric endocrinology and diabetes consisting of chapters and problem solving cases.

The clinical training programme will need to be adapted according to local circumstances and when there is overlap in paediatric subspeciality training (e.g. paediatric endocrinology and metabolic diseases).

4 RESEARCH TRAINING

4.1 Participation in Research

There are no guidelines at present for undertaking a research programme within the European Syllabus of tertiary training.

While research is important and dedicated research training (clinical or laboratory based) over 1 to 2 years is desirable in Paediatric Endocrinology and Diabetes, opportunities to undertake research will depend on local circumstances. Irrespective of whether such dedicated research training is available, a trainee is expected to achieve the following during core clinical training in Paediatric Endocrinology and Diabetes:

- critique research papers and understand the process of peer review of scientific work
- understand the basics of how to conduct research, write the research protocol, collect and analyse data, and write the research report
- conduct at least one case series or an index case study and present to colleagues
- present scholarly work at least once at a national or international conference, and
- have at least one peer-reviewed publication under supervision, ideally as first author or authorship demonstrating a significant contribution to the design, execution and analysis of the study as well as drafting or revising the paper.

4.2 Participation in Audit project

The trainee should

- conduct at least one systematic style review of a topic
- conduct at least one audit or quality improvement project
- prepare a detailed evidence-based appraisal of a diagnostic test or a therapeutic intervention

5 REQUIREMENTS FOR TRAINING INSTITUTIONS

5.1 Requirements for centres

A training centre can be a single institution or a group of related establishments accredited for training purposes.

The centre must provide adequate experience in all fields of paediatric endocrinology including emergency care. There should be at least two consultant paediatric endocrinologists located at a full training centre, serving a population of 1 million and with a 1:2 trainee to trainer ratio.

The number of outpatient, day-case and inpatient activities, and range of pathology managed must be sufficient to provide suitable exposure and training for common and serious paediatric endocrine and diabetes problems. The minimum annual number of new outpatient, follow-up outpatient and day-case activities for a centre with two consultants is 180, 600 and 140 respectively [Hormone Research in Paediatrics *accepted February 2021*; UK Standards for Paediatric Endocrinology, January 2019. Endorsed by Royal College of Paediatrics and Child Health.https://www.rcpch.ac.uk/sites/default/files/2019-01/uk_paediatric_endocrine_standards_-_january_2019_-_final_0.pdf]

In addition to experiential learning and training, the centre must provide a rolling programme of education in paediatric endocrinology consisting of formal and informal teaching, supplemented and reinforced by electronic/web-based modules linking directly to the content in this ETR. There should be access to a comprehensive reference library for journals, textbooks and courses. Facilities that enable e-learning and promote self-directed learning should be available.

5.2 Accreditation of centres

The recognition of training institutions will ultimately be part of a joint process involving NTAs, EAP-UEMS and ESPE. It is anticipated that ESPE will act as the agent for EAP-UEMS and Confederation of European Specialists in Paediatrics (CESP) in executing this task. A list of the names and characteristics of existing national training centres will be created and held by ESPE and EAP-UEMS. EAP will oversee quality assurance of the recognised centres at periodic intervals every 5 years using the guidelines suggested by the UEMS and its bodies such as CESMA (The Council for European Specialists Medical Assessment), NASCE (The Network of Accredited Clinical Skills Centres of Europe) and EACCME (The European Accreditation Council for CME). The processes will incorporate clinical governance, manpower planning and external auditing.

Accreditation will initially be given by the NTA and ultimately approved by EAP-UEMS. The approval process will follow the EU Guidelines (currently in preparation).

5.3 Full training centre

The centre must provide adequate experience in all fields of Paediatric Endocrinology and Diabetes including emergency, neonatal and intensive care, and paediatric neurosurgery. It is expected to provide all Training modules. The number of activities must be sufficient to provide at least a minimum experience for a trainee to achieve the competencies detailed in section 3.

A group of related establishments can be considered a centre and each component considered as a unit contributing one or more modules.

The centre must have easy access and close relationships with other relevant specialities such as adolescent gynaecology, cardiology, child and adolescent psychiatry, clinical biochemistry, clinical and molecular genetics, dentistry, gastroenterology, histopathology, immunology, intensive care, metabolic medicine, neonatology, nephrology, neurology, neurosurgery, nuclear medicine, oncology, ophthalmology, orthopaedics, paediatric surgery and urology, radiology, respiratory medicine and rheumatology.

Demonstration of involvement of other health care professionals who may contribute to the quality of care of patients with endocrine problems is essential for recognition. These will include specialist nurses, clinical psychologist, dietitian/nutritionists, occupational therapist, physiotherapist and social worker.

The centre must provide evidence of on-going clinical research. In countries that have approved centres for Paediatric Endocrinology and Diabetes care then the Full Training Centre must be one of these.

The centre will be responsible for regular teaching, such as weekly clinical staff/seminars, and other meetings in radiology, clinical genetics, pathology and the regional/nation.

5.4 Training unit

Training Units are institutions that provide training in one or more aspects (Modules). They must provide adequate exposure in the defined area and a teacher who is deemed competent in these areas.

When an aspect of training cannot be provided in one centre it will be necessary for the trainee to be taught at another suitable centre by a Paediatric Endocrinology and Diabetes trainer approved for that purpose.

6 REQUIREMENTS FOR TRAINERS

The training staff at a Centre should include at least two trainers.

Each trainee should have a dedicated Lead Educational supervisor or trainer for the duration of their training.

The Lead Educational supervisor or trainer must have been practising Paediatric Endocrinology and Diabetes **for at least 5 years** and have specialist accreditation in those countries where the subspecialty is recognised.

There should be additional Clinical supervisors/trainers who should provide training across all aspects of the speciality and be research active in Paediatric Endocrinology and Diabetes. At least one additional trainer should also have specialist accreditation in those countries where the subspecialty is recognized.

A Trainer is a person who holds acknowledged expertise in one or several aspects of Paediatric Endocrinology and Diabetes. This person's contribution may be restricted to these areas of expertise. Both educational supervisors and trainers must have practised Paediatric Endocrinology and Diabetes for a **minimum of 2 years** after completion of specialist training.

Trainers should work out a training programme for the trainee in accordance with the trainee's own qualities and the available facilities of the institution. Regular review will be required to allow for flexibility and for early identification of problems/deficiencies.

The trainer should work with the Trainee to create a Personal Development Plan (PDP). Trainers are expected to provide appraisal and assessment of progress. Appraisal consists of determining what is needed and what evidence is required to show that this has been achieved. Assessment evaluates progress against objectives. Trainee assessment should be provided in terms of:

- Training and career ambitions
- Training experience related to syllabus
- Achievements related to personal development plan

In order to provide close personal monitoring of the trainee during his/her training, the number of trainees should not exceed the number of trainers in the centre.

Trainers will meet the trainee at the beginning of the programme to define the educational contract for that trainee. Reviews of progress should take place at 3 monthly intervals during the first year of training to appraise the individual.

An annual assessment should be undertaken, ideally at a National level, to review competencies achieved and to allow progress within the teaching programme. Assessments should be detailed and contain statements of theoretical and practical experience accumulated by the trainee. It is expected that the trainee will also provide an account of the training received and problems encountered **(portfolio)**. Reports will be submitted to the Trainer/Coordinator or national body.

7 REQUIREMENTS FOR TRAINEES

7.1 Prerequisite for Clinical training

A medical doctor who has successfully completed training of **at least 3 years in general paediatrics** will be eligible for access to further specialist training in **Paediatric Endocrinology and Diabetes**. This prerequisite is to ensure that the specialist trainee is competent to deliver safe general paediatric and neonatal care.

7.2 Additional requirements of trainees

In order to gain the necessary depth of experience, each trainee should be actively involved in the care of children and adolescents with a range of paediatric endocrine and diabetes problems during the whole period of their speciality training. This should include the care of outpatients, inpatients, endocrine emergencies and community care where appropriate.

7.3 Record of Progress and Assessments

7.3.1 Portfolio and Log-book

The trainee will be required to keep a personal portfolio according to National guidelines and European Union directives. The portfolio will comprise an ongoing and up-to-date evidence of their development. This includes a written or electronic log-book. The logbook should document patients they have seen in a range of settings, diagnosis and therapeutic interventions instigated and followed-up. The Logbook grading must be certified and signed individually by the applicants' clinical tutor, Director or Head of Training Centre.

The trainee should attend and provide evidence of **attendance at local, regional and national meetings**. Attendance at International Meetings, such as ESPE, Endocrine Society, European Endocrine Society and International Society for Pediatric and Adolescent Diabetes (ISPAD) **is considered essential for Tertiary Care training**. It is **recommended to give at least one**, and preferably 2 to 3, presentations (poster and/or oral) at these meetings. **Attendance at dedicated short educational programmes, such as Summer school or Winter school, is strongly encouraged**.

7.3.2 Formative competency assessments

Formative assessments focus on the trainee's development and are used to identify how they are learning, their strengths and weaknesses, and tailor training/learning activities to meet the needs of the trainee. Formative assessments are therefore 'assessments for learning'. A shift in the balance from summative to formative assessments has the greatest potential to improve learning. This is especially of benefit when ongoing and dialogic feedback is embedded in day-to-day activities during the training period.

Competencies should be evaluated throughout the training period. There are a number of different tools for this, describing different aspects of training. Some of these are set out below in Table 1. Formal and informal reflection on these assessments and the feedback received is an important aspect of their success.

Table 1. Examples of Formative Work-place based assessments

Assessment	Purpose	Method
MiniCeX (Mini clinical examination)	Provides feedback on skills needed in clinical care	Trainer observes a trainee examining a patient, sharing information and explaining the management plan to the parents
CbD (Case based discussion)	Assesses clinical reasoning or decision making	Trainee presents a more complex case to the trainer and has a discussion about the evidence or basis for diagnosis or treatment.
LEADER	Focuses on leadership skills	A trainee is observed within a team and in a leadership capacity (e.g. leading the management of a patient with diabetic ketoacidosis; leading a multi-disciplinary team meeting)
HAT (Handover assessment tool)	Evaluates handover skills	Handover episodes are supervised and discussed
DOC (Discussion of correspondence)	Assesses letter writing skills	Clinic letters or discharges are reviewed and discussed
MSF (Multi-source feedback)	Provides wider feedback on performance	Confidential comments from a wide range of colleagues, patients and the trainee are sought

A guide to workplace-based assessment can be found at:
www.rcpch.ac.uk/resources/assessment-guide

7.3.3 Summative assessments

Summative assessments have important purposes in selection, certification and institutional accountability. Currently satisfactory completion of the training programme in **Paediatric Endocrinology and Diabetes** is undertaken according to national legislation in each country. A Pan-European Exit Summative Examination is recommended by UEMS. Accordingly, ESPE will develop an assessment strategy for an exit examination.

8 CONTENT TABLES

8a CROSS CUTTING AND NON-TECHNICAL SKILLS

Non-technical skills involve the cognitive and social skills that are necessary for safe and effective health care.

A. PROFESSIONALISM (ATTITUDES)	
1	Towards patients and parents/carers • Respect their autonomy • Elicit and acknowledge their concerns • Share information and support them • Treat all fairly and irrespective of age, gender, race, disability, religion, social or financial status • Deliver best quality care in a compassionate and caring way
2	Towards colleagues and junior staff • Respect and treat all individuals fairly and without prejudice • Communicate and collaborate in a productive manner • Acknowledge the multidisciplinary character of the specialism and expertise of all health care professionals • Behave in a responsible, reliable and dependable way
3	Towards society • Appropriate communication to society about paediatric endocrine and diabetes diseases • Improve care by evaluating processes and outcomes • Make effective use of resources
4	Towards themselves • Abide by the values of honesty, confidentiality and altruism • Acknowledge personal health, capacities, emotional reactions, and limitations in knowledge, skills, and attitude and take appropriate measures to correct these • Participate in educational programmes • Maintain competence and dedicated approach throughout professional career

B. COMMUNICATION	
1	Create and sustain a relationship that is therapeutic for patients and supportive of their families/carers • Communicate with family honestly and supportively • Determine extent to which patient and parents/carers want to participate • Be present, pay attention to patient • Care and work collaboratively • Accept and explore patients feelings • Provide a sustainable relationship that allows for repair when mistakes are made • Be authentic, honest, admit and apologise for mistakes
2	Use effective listening, language and communication skills to facilitate the relationship • Recognise and select preferred and most effective mode of communication • Elicit, verify and provide information using effective nonverbal, verbal (questioning, explanatory) and writing skills • Use nonverbal cues, e.g eye contact, nodding, pausing • Use verbal skills, e.g. sign-posting, back tracking, reflecting, mirroring • Tailor information for patient's/family's needs and check understanding • Understand their perspective
3	Create an atmosphere of mutuality and respect through patient and parents'/carers' participation and involvement in decision making • Collaboratively set agenda for encounter • Include them in choices and decisions to the extent they desire • Explain the role of different healthcare professionals to the patients and parents/carers • Negotiate mutually acceptable plans in partnership with patients/carers and professionals
4	Work effectively with others as a member or leader of the health care team • Demonstrate respect, collaboration and cooperation • Ensure communication is adequate and clearly understood • Resolve conflict

C. SITUATION AWARENESS	
1	Understand situations, anticipate and identify problems, and recognise need for action
2	Integrate information from multiple sources
3	Prioritise actions, ensure patient safety and prevent errors

D. DECISION MAKING	
1	Synthesise information, evaluate options and propose best solutions for • individual case plans, long-term scheduling plans • under normal conditions and time pressure crisis situations
2	Deal with uncertainty, and information which may be incomplete and conflicting
3	Manage risk and re-evaluate

E. SAFEGUARDING	
1	Understand children's rights and statutory context within which we work and legislation including the UN Convention on the Rights of the Child and Human Rights Act.
2	Recognise potential indicators of child maltreatment and make an appropriate referral. Document appropriately when a child is not brought to an appointment, identify patterns of nonattendance and act appropriately to ensure the child's health needs are met.
3	Recognise that particular groups of children are more vulnerable. Have an understanding of the impact of adverse childhood experiences (ACEs). Proactively engage vulnerable young people to identify and address additional health needs.
4	Understand the impact of parents'/carers' mental/physical health on the wellbeing of children.
5	Understanding what to do about concerns about children including how and when to share information according to Caldicott principles and how to escalate concerns when the response is not appropriate. Identify and act appropriately and proactively on safeguarding concerns including: • keep appropriate records, and differentiating fact from opinion • communicate safeguarding/child protection concerns both verbally and in a written report to a variety of multi-disciplinary for and within court proceedings. This will be supervised by the consultant in charge of the child's care. • intervene early and proactively to reduce risk, including contributing to risk assessments. • share information (in person, by phone and in writing) • seek further advice and help when necessary • make appropriate referrals • contribute to multi-disciplinary assessments and effective management plans • escalate concerns if concerns are not taken seriously
6	Be aware of professional abuse and how to raise concerns. Act on concerns or suspicions about colleagues in relation to their actions or behaviours with children.

7	Reflects on own safeguarding practice as appropriate to experience through audit, case discussion, peer review and supervision. This can be documented on ePortfolio.
8	Able to apply lessons learnt from serious case reviews, and other reviews.
9	Understand and contribute to the child death process with guidance from consultant in charge of child's care.

F. LEADERSHIP	
1	Lead with integrity, responsibility and accountability
2	Have a vision and clear sense of purpose, provide direction and be proactive to achieve this
3	Create climate of trust, inspire, show concern and advocate for followers
4	Harness collective creativity and followers' contributions to problem solve
5	Demonstrate courage by making unpopular decisions and confronting poor performance
6	Persevere and overcome challenges to achieve results

G. TEAM WORKING	
1	Value the roles, expertise and limitations of all team members
2	Contribute actively to team efforts. Share information and responsibility.
3	Resolve misunderstandings and conflicts with and between members of the team

H. TIME AND TASK MANAGEMENT	
1	Prioritise and plan according to urgency and importance
2	Prepare, review and update 'To do' lists
3	Organise work productively, complete in a timely manner and be punctual
4	Identifying and utilise available resources to provide and maintain standards. Delegate appropriately

I. HEALTH ECONOMICS AND SERVICE PROVISION	
1	Function effectively in a hospital organisation, in particular the paediatric endocrinology and diabetes service
2	Contribute to the population-based approach for healthcare
3	Understand, use and develop health care guidelines and policies
4	Apply principles of health economics
5	Contribute to health screening and surveillance programmes

J. SCIENCE AND BIOSTATISTICS	
1	Formulate a clinical or scientific question Know strengths and limitations of different study designs, and propose most appropriate method to answer the question
2	Prepare protocol and carry out a project, e.g. • Perform a literature search and critically appraise papers • Conduct the project • Look for and collaborate with the right experts • Apply General Data Protection Regulation (GDPR) to collect data, electronic data maintenance, information governance and patient confidentiality • Know basics of statistical methods, e.g. parametric and nonparametric statistics, modelling such as correlation and regression • Analyse and interpret data, present results and publish findings/reports • Formulate new questions based on results

K. SELF-DIRECTED LEARNING	
1	Take responsibility for active learning throughout training period
2	Use patients and experiences encountered during training as triggers to explore new concepts, and continuously apply these to new situations
3	Use the contents of this ETR, reflection from formative assessments/constructive feedback and self-evaluation to • identify gaps in own knowledge and abilities • make plans to address these and • monitor progress
4	Find and use credible and varied sources for learning, including health care experts for tacit knowledge, standard textbooks, peer reviewed journals and evidence-based guidelines

L. GENERIC TEACHING AND EDUCATION SKILLS	
1	Communicate clearly in the role of a teacher • Assess the educational needs of learners • Define aims of learning activity to meet these needs
2	Apply principles of adult learning and facilitate learning from work-based experiences and formal educational sessions
3	Prepare teaching materials and learning resources
4	Use range of teaching and learning methods including online and blended learning
5	Offer, seek and accept honest, constructive and timely feedback. Use this and reflection to enhance educational practice

8b SPECIALTY SPECIFIC CONTENT FOR TERTIARY CARE PAEDIATRIC ENDOCRINOLOGY AND DIABETES

8b.1 Knowledge and skills

The core content for tertiary care paediatric endocrinology and diabetes comprises:

- Knowledge: basic and speciality specific clinical knowledge
- Clinical skills: consultation and reasoning (cognitive) skills
- Procedural skills required for assessing, investigating and managing patients

Achieving competence to provide holistic care in Paediatric endocrinology and diabetes requires integrating and assimilating all three. The levels of competence for these and as defined by UEMS are shown in Table 2.

A sound **basic knowledge base** is a prerequisite and provides the foundations for clinical practice. The content items for this are labelled 'B' in section 8b.2. It includes the physiology, biochemistry and pathology concepts that underpin the deeper understanding of conditions encountered in Paediatric Endocrinology and Diabetes. Although trainees will have acquired these during undergraduate studies and common trunk paediatric training, they will need to revisit and expand through teaching and personal study (e.g. specialty e-learning, digital media and textbooks).

Additionally, **speciality specific clinical knowledge, skills and reasoning** are required to provide care and multi-disciplinary management for children and young persons with paediatric endocrine and diabetes problems. The problems encountered include those that are:

- common
- emergency, life threatening, serious
- easily missed.

Clinical knowledge includes understanding about disease frequency, aetiology, clinical features (symptoms and signs), natural history, complications, diagnostic evaluation, medicines and interventions.

Clinical skills includes gathering information, taking a history, sharing information and physical examination.

Clinical reasoning comprises the thinking strategies for diagnostic, clinical judgement and decision making skills. These are used to:

- gather and assess patients' problems from history, clinical examination and appropriate investigations (including biochemical, radiological, genetic tests)
- interpret correctly, analyse and evaluate the meaning of the information
- integrate information to formulate and evaluate plausible differential diagnoses/problem lists, and make definitive diagnosis
- decide actions to improve outcomes
- review and revise decisions

Management and followup includes

- monitoring, preventing and treating
- working with relevant professionals
- sharing information, supporting and educating patients and carers

Speciality specific clinical knowledge, skills and reasoning are distinguished as **essential and core** (labelled as 'C') or **desirable** (labelled as 'D') for two broad groups of problems:

- 'C' representing essential/core for problems that are routinely encountered vs
- 'D' representing desirable for problems that are rare and therefore may not be encountered during training.

The competencies that are **essential ('C')** will be acquired during training from active hands-on clinical experience and work-based learning, and consolidated through teaching, personal study and continuing professional development.

The competencies that are **desirable ('D')** are required for knowing how to recognise and approach the assessment, diagnosis and management of rare disorders. These are to be acquired through real or virtual clinical experience, case discussions, reports in journals, conferences and continuing professional development.

Table 2. Levels of competence for clinical knowledge, skills and reasoning

Adapted from those defined by UEMS.

Note: throughout 'carers' applies to parents, family members and other carers

Level	1	2	3	4	5
Trainee	Has observed	Can do with assistance	Can do but may need assistance	Competent to do without assistance	Can be 'trusted' to do independently without assistance or need for advice
Extent of supervision required **Details for competence**	Enhanced direct supervision	Direct supervision	Indirect supervision, when required	Occasional ad hoc advice from supervisor	Independent and no supervision required. Can supervise others
1. Knowledge base	Adequate for common problems. But limited ability to apply knowledge.	Adequate for common and serious problems.	Good for common and serious problems.	Good for majority problems and complications.	Excellent and can apply to deal with complexity, uncertainty and difficult problems at the level of a consultant.
2. Clinical assessment	Rigid formulaic approach to gathering information, not focused and misses important points.	Focused consultation but misses some relevant details. Recognises presentation of common problems.	Focused hypotheses-driven consultation and gathers pertinent information.	Flexible, fluid and efficient consultation.	Proficient, targeted and incremental approach to gathering all relevant information.
3. Management and followup	Requires guidance from supervisor. Lacks	Reasonable management plans but without	Appropriate management plans for common and	Management plan is responsive to patient &	Incorporates patient's, carers' and other professionals' perspective when

	awareness of standards and guidelines.	significant patient & carer involvement.	serious problems, and mutually acceptable for patient & carers. Needs input from supervisor for atypical situations. Ensures continuity of care.	carers' preferences. Considers reassurance, expectant measures and simple treatment where appropriate. Occasionally needs advice from supervisor, e.g. for complex situations.	negotiating management plans. Monitors progress. Anticipates, avoids and/or deals with unexpected deviations or uncertainty. Generates justifiable approaches to management when guidelines are not available.
4. Clinical reasoning: diagnostic, clinical judgement, decision making skills	Limited ability to interpret, to distinguish normal from abnormal and to integrate information.	Interprets and makes decisions from familiar patterns and illness scripts.	Decisions made using experience-based intuition and logical thinking.	Decisions made using critical, logical thinking and debiasing strategies.	Calculative analytical approach and lateral thinking for novel situations.
5. Clinical communication and team working	Develops working relationship with patient & carers.	Focuses on the problem rather than patient & carers. Some awareness of how other team members might assist.	Recognises impact of the problem on the patient & carers. Appropriately involves other team members.	Adapts and communicates effectively in a range of situations. Coordinates team approach.	Empowers patients, carers and team. Advanced skills such as confrontation, catharsis (e.g. enable patient & carers to release emotional tension) or catalysis (e.g. encourage them to problem-solve through reflection and self-discovery) to achieve better outcomes.
6. Medical record keeping and written communication	May miss important information or lack clarity and accuracy.	Pertinent details included. Presentation may be confusing or not appropriate.	Content and presentation are appropriate.	Content and presentation are good.	Content and presentation are excellent.
7. Reflective practice	Limited reflection, self-awareness and evidence of learning.	Some self-awareness and some evidence of learning.	Good ability to self-assess, identify gaps and prioritise learning. Knows when to seek help.	Shows insight and critical self-assessment. Uses these to undertake further development.	Shows insight and critical self-assessment for self & others. Uses these to guide further development.

8b.2 Content for tertiary care paediatric endocrinology and diabetes

The content in this section is categorised by logical domains. Where appropriate, some content is included in more than one domain. Consensus guidelines and statements produced and those endorsed by ESPE, and seminal references relevant for practicing clinicians are included in the Appendix. These are up to date at the time of publication of this ETR.

A. BIOMEDICAL KNOWLEDGE		
1	Embryology of the endocrine system	B
2	Molecular and genetic basis of endocrine disorders	B
3	Hormones • Normal and abnormal regulation, secretion, endocrine and paracrine signalling • Transport in blood • Target cells and receptors • Physiological functions and actions in target tissue	B
4	Biochemistry of endocrine tests • Basal hormone levels, serial measurement profiles, stimulation tests, suppression tests • Types of specimens • Assay methods, reference ranges and interpretation	B
5	Tests used in endocrinology • Genetic tests, utility, value and limitations • Copy number variant analysis (including chromosome analysis and array comparative genomic hybridisation) • Single-gene, next-generation/multi-gene (targeted gene panels), whole-exome sequencing • Imaging techniques	B
6	Stages and regulation of normal growth antenatally and from birth to adulthood	B
7	Physiology and physical changes of normal puberty	B
8	Embryology and molecular genetic basis for determination, differentiation and development of gonads, internal structures and external genitalia	B
9	Steroid biosynthetic pathway	B
10	Aetiology, epidemiology and prevention of paediatric endocrine and diabetes problems	B
11	Endocrine disrupting chemicals and their adverse effects	B
12	Basic immunology and application to autoimmune endocrine disorders	B

13	Psychosocial impact of endocrine and diabetes problems	B
14	Implications of fetal and early life endocrine programming for diseases in adulthood	B
15	Pharmaco-kinetics and -dynamics of medicines used for managing paediatric endocrine and diabetes problems	B

B. PROCEDURAL SKILLS IN PAEDIATRIC ENDOCRINOLOGY AND DIABETES		
1	Use anthropometry and puberty monitoring equipment (e.g. wall mounted stadiometer for standing height, table mounted stadiometer for sitting height, orchidometer), population and disease-specific growth charts or standards for clinical assessment	C
2	Assess skeletal maturation from hand and knee radiographs	C
3	Prediction of adult height	C
4	Assess appearance of the external genitalia using validated methods, such as external genital score (EGS) [1]	C
5	Perform dynamic function tests (e.g. growth hormone stimulation tests)	D
6	Use blood glucose monitoring technologies (e.g. glucometers, ambulatory continuous glucose monitoring (CGM) devices)	C
7	Use available injectable hormone administration technologies (e.g. insulin pen devices, insulin pump, growth hormone pen devices)	C
8	Perform ultrasound examination of thyroid and testes (not essential and will be country-specific depending on the resources available and local needs)	D

C. PAEDIATRIC ENDOCRINE AND DIABETES EMERGENCIES		
1	Adrenal crisis	C
2	Diabetic ketoacidosis [2]	C
3	Diabetes Hyperglycaemic Hyperosmolar State [2]	C
4	Diabetes Insipidus	C
5	Hyperkalaemia	C
6	Hyponatraemia	C
7	Hypernatraemia	C
8	Hypocalcaemia	C

9	Hypercalcaemia	C,D
10	Hypoglycaemia (diabetes and non-diabetes related)	C
11	Syndrome of inappropriate ADH and Cerebral salt wasting	C
12	Thyroid storm/crisis	D
13	Newborn baby with atypical genitalia	C

D. GROWTH - SHORT STATURE		

1	Evaluation of growth
	• Anthropometric measurements
	• Growth charts and normal standards:
	  ○ height, sitting height and subischial leg length, weight, body mass index, head circumference
	  ○ national and ethnic variations
	  ○ WHO growth charts
	  ○ disease specific charts
		C

2	LMS method (smooth (L) curve, trends in the mean (M) and coefficient of variation (S)) for creating growth charts, population and measurement selection criteria	B
3	Definitions of short stature, growth retardation, growth failure, faltering growth, failure to thrive; variations across European countries	B
4	Role of growth hormone, thyroid and estrogens on growth and skeletal maturation at different ages	B
5	Short stature: • Classification, normal variant vs pathological	C
6	Growth hormone deficiency: • Isolated vs associated with other pituitary hormone deficiencies • Transient vs permanent • Role of priming for GH stimulation tests • End of growth re-assessment	C
7	Growth hormone replacement therapy: • Mechanism of action on growth and metabolism • Approved indications, doses during childhood and young adulthood [3] (national and international), modification of dose with other hormone replacement, short and long term adverse effects • Rationale for stopping treatment • Price, types of devices	C
8	Growth hormone resistance • Genetic disorders of the GH-IGF axis • Acquired: chronic inflammation	C

9	Turner Syndrome: [4] • Range of chromosomal abnormalities, growth and puberty • Other problems: fertility, metabolic syndrome, bone health, auto-immunity, cardiac, psychosocial health • Growth hormone and sex steroid replacement treatments • Transition to adult care	C
10	Disproportionate short stature • Skeletal dysplasias • SHOX haploinsufficiency • Post spinal irradiation • Spinal abnormalities, kypho-scoliosis • Mucopolysaccharidosis	C
11	Noonan syndrome • Genetics, growth and puberty • Other problems: metabolic syndrome, bone health, malignancy, potential adverse effects of growth hormone • Other RASopathies	C D
12	Prader Willi syndrome • Genetics, growth, body composition, puberty, type 2 diabetes, developmental delay, respiratory surveillance • Potential adverse effects of growth hormone • Transition to adult care	C
13	Other short stature syndromes • Aarskog syndrome • CHARGE association • Down's syndrome • Kabuki syndrome • Robinow syndrome • Rubinstein-Taybi syndrome • Seckel syndrome	D
14	Small for gestational age (SGA) with failure of catch-up growth [5]	C
15	Silver Russell syndrome: [6] • Genetics, growth and puberty • Other problems: hypoglycemia, nutrition	C

16	Other SGA syndromes with short stature; associated with micro-, normo- and macrocephaly; with or without increased risk of malignancy • 3-M syndrome • Bloom syndrome • Fanconi anaemia • Floating Harbour syndrome • Mulibrey Nanism • Nijmegen breakage syndrome • Microcephalic osteodysplastic primordial dwarfism type 2 (MOPD2) • Meier Gorlin syndrome • SHORT (Short stature,Hyperextensibility/Hernia, Ocular depression, Rieger anomaly, Teething delay) syndrome	C,D
16	Undernutrition and poor weight gain • Underlying chronic conditions or treatments • Impact on linear growth and puberty • Anorexia nervosa • Diencephalic syndrome	C,D

E. GROWTH - TALL STATURE AND OVERGROWTH		
1	Definition of tall stature	B
2	Tall stature • Classification, normal variant, pathological • Management: supportive, surgical (epiphysiodesis)	C
3	Marfan syndrome • Growth • Other problems: eye and cardiac	C
4	Klinefelter syndrome [7] • Growth and puberty • Other problems: fertility, metabolic syndrome, bone health, psycho-social and mental health, autoimmunity, transition to adult care	C
5	Beckwith Wiedemann syndrome [8] • Genetics, growth, hypoglycemia, tumor risk	C
6	Syndromic overgrowth due to altered epigenetic regulation and activation of the PI3K/mTor pathway • Sotos syndrome (mutation in NSD1 gene) • Weaver syndrome (mutation in EZH2 gene) • Tatton-Brown-Rahman syndrome (mutation in DNMT3A gene)	C

7	Other syndromes with tall stature • Ehlers Danlos type IV • 47,XYY • Aromatase deficiency, oestrogen receptor mutation	D

F. PUBERTY		
1	Tests for diagnosis and management of puberty disorders • Biochemical, radiological and genetic • Utility, interpretation	C
2	Minipuberty	C
3	Pathological vs non-pathological developmental variations • Premature adrenarche • Premature thelarche and thelarche variant • Isolated premature or delayed menarche • Gynaecomastia • Hirsutism	C
4	Psychosexual aspects of pubertal maturation	C
5	Precocious puberty [9] • Definition • Classification • Central: idiopathic vs pathological and isolated vs familial causes • Peripheral including McCune Albright syndrome • Clinical implications and management	C
6	Delayed puberty [10] • Definition • Constitutional vs functional vs pathological • Hypogonadism: hypogonadotrophic vs hypergonadotrophic • Clinical implications and management	C
7	Isolated hypogonadotrophic hypogonadism including Kallmann syndrome • Genetics, growth, puberty, body composition and comorbidities • Transition to adult care	C
8	Pubertal issues in patients with • post-oncological problems [11,12,13] • syndromes	C D
9	Medically assisted reproduction: current status and counselling	D
10	Hormonal treatment for gender dysphoria [14]	D

G. WEIGHT DISORDERS		
1	Regulation of adipose tissue and nutritional status in health and illness • Leptin-melanocortin pathway	B
2	Excessive weight gain and obesity [15] • Polygenic, multifactorial: excessive calorie intake, sedentary lifestyle, adverse emotional environment • Monogenic • Endocrine • Hypothalamic • Infant born small for gestational age • Syndromic: o Prader Willi syndrome o Bardet-Biedl syndrome o Other: Alstrom, Börjeson-Forssman-Lehman, Carpenter, Cohen, MOMO syndrome • Iatrogenic: corticosteroids, antipsychotic drugs, antiepileptic drugs	C
3	Complications of obesity • Metabolic • Nonmetabolic • Related to diseases in adulthood	C
4	Management of obesity • Lifestyle modifications, Pharmacotherapy, Surgery • Prevention	C
5	Weight loss and/or poor weight gain • Endocrine vs nonendocrine differential diagnoses • Eating disorders	C
6	Lipodystrophy syndromes	D

H. PITUITARY GLAND, HYPOTHALAMUS, CENTRAL NERVOUS SYSTEM		
1	Hypothalamic-pituitary unit: embryology, genetics, anatomy, physiology	B
2	Hypothalamic dysfunction: • Pathophysiology and clinical implications • Hypothalamic syndrome and other endocrine problems	B

3	Congenital central nervous system malformations: pathophysiology, clinical implications • Septo-optic dysplasia spectrum • Holoprosencephaly • Hypoplastic anterior pituitary, missing stalk and ectopic posterior pituitary • Empty sella syndrome • Rathke cleft cyst • Hamartoma	C
4	Anterior and posterior pituitary hormones: physiology	B
5	Pituitary hormone deficiencies • Isolated or multiple hormone deficiencies • Genetic, congenital, acquired (trauma, infiltration, inflammation, tumours, surgery, radiotherapy, vascular)	C
6	Pituitary masses[16] • Craniopharyngioma, other benign and malignant lesions • Red flags for investigating	C
7	Growth hormone deficiency: congenital, secondary/acquired	C
8	GH excess/ pituitary gigantism	D
9	Prolactin deficiency: acquired, genetic defects (*POU1F1, PROP1, other*)	D

10	Prolactin adenomas including: [17]
	• Prolactin excess
	  o Isolated prolactinoma, MEN1
	  o Other causes: pituitary stalk compression, medications
	• Non-functioning adenomas/ incidentalomas
		C

11	Gonadotrophin deficiency/ hypogonadotrophic hypogonadism: [10] • Genetic (isolated or with other pituitary hormone deficiency), acquired • Gonadotrophin releasing hormone (GnRH) deficiency	C
12	Adrenocorticotrophin deficiency/ secondary glucocorticoid deficiency: • Genetic (isolated or with other pituitary hormone deficiency), acquired	C
13	Adrenocorticotrophin excess/ Cushing disease [18, 19]	D
14	Thyrotropin deficiency: • Genetic (isolated or with other pituitary hormone deficiency), acquired • Thyrotrophin releasing hormone (TRH) deficiency	C
15	Vasopressin/antidiuretic hormone (ADH) deficiency/ central diabetes insipidus: genetic, congenital intracranial anatomic defects, acquired	C
16	Syndrome of inappropriate ADH secretion (SIADH) vs cerebral salt wasting[20]	C

I. THYROID GLAND		
1	Congenital hypothyroidism [21] • Primary, secondary and tertiary subtypes • Primary: thyroid agenesis/hypoplasia, ectopia, dyshormonogenesis • Newborn screening • Initial clinical assessment, thyroid function and imaging • Thyroid hormone replacement	C
2	Primary acquired hypothyroidism • Autoimmune, chronic lymphocytic thyroiditis	C
3	Infant of a mother with hypo- or hyperthyroidism [22] Neonatal hyperthyroidism	C D
4	Sick euthyroid syndrome	C
5	Interpretation and management of abnormal thyroid function tests in specific contexts • Prematurity • Neonatal period • Hyperthyroxinaemia, euthyroid hyperthyroxinaemia e.g. Familial dysalbuminaemia • Trisomy 21	C,D
6	Primary acquired hyperthyroidism [23] • Grave's disease, thyroiditis • Toxic adenoma, multinodular goitre • Medication induced: amiodarone	C
7	Thyroid swelling and nodules [24] • Benign, malignant • Sporadic, familial, MEN syndromes	C
8	Rare genetic defects of thyroid hormone function, pathophysiology, phenotype • Transport disorders: Thyroid-binding globulin (TBG) defects • Reduced sensitivity, resistance syndromes: thyroid hormone receptor defects • Allan-Herndon Dudley syndrome, Brain-lung-thyroid disease	D

J. PARATHYROID GLANDS, METABOLIC BONE AND MINERAL DISORDERS		
1	Physiology of Calcium, Phosphate, Vitamin D, Parathyroid hormone (PTH) and FGF23	B
2	Bone biology • Skeletal development, osteoblast, osteoclast and osteocyte function • Bone modelling and remodelling • Histology of bone in the context of mineral, cartilage & collagen formation & function	B
3	Radiology: findings, interpretation, differential diagnosis for specific disorders • Rickets • Osteogenesis imperfecta • Basics of skeletal dysplasia	C
4	Bone densitometry measurement techniques, size correction in paediatrics, interpretation, use in management of altered bone mass conditions	D
5	Metabolic bone disease of prematurity: pathophysiology, investigations, management and ongoing monitoring	C
6	Hypocalcaemia • Approach to management and including management of specific conditions • Transient neonatal hypocalcemia • Genetic disorders of calcium-sensing receptor (CaSR) and parathyroid gland development • Hypoparathyroidism due to metabolic & syndromic causes ○ DiGeorge or 22q11.2 deletion syndrome ○ As part of APS1 • Pseudohypoparathyroidism and its different forms [25] • Acquired hypoparathyroidism • Magnesium deficiency	C C D D C D C
7	Hypercalcaemia • Approach to management and including management of specific conditions • Abnormal vitamin D metabolism • Disorders with suppressed PTH secretion, e.g. Williams syndrome, subcutaneous fat necrosis, hypercalcaemia of infancy • Disorders of calcium-sensing receptor associated with hypercalcaemia • Disorders of parathyroid glands/PTH oversecretion	C D C C D

8	Rickets, rickets-like conditions and soft tissue calcification
	• Approach to management and including management of specific conditions
	• Disorders of vitamin D and its metabolism
	  ○ Acquired [26]
	  ○ Genetic
	  ▪ Vitamin D hydroxylation-deficient rickets
	  ▪ Hereditary 1,25(OH)2 D-resistant rickets
	• Disorders of phosphate metabolism
	  ○ X-linked hypophosphatemic rickets [27]
	  ○ Other familial hypophosphatemic rickets
	  ○ Renal tubular disorders associated with rickets
	  ○ Tumour induced hypophosphatemia, part of McCune-Albright syndrome [28]
	• Conditions associated with soft tissue calcification: Generalised Arterial Calcification of Infancy[29]
	• Rickets & mineralisation defect: Hypophosphatasia [30]
		C
		
		C
		D
		
		C
		D
		C
		C
		C
		
		D
		D

9	Disorders of altered bone mass: differential diagnosis, investigation & management
	• Conditions associated with low bone mass:
	  ○ Primary osteoporosis
	  ▪ Osteogenesis imperfecta [31, 32]
	  ▪ Other forms of primary osteoporosis [33]
	  ○ Secondary osteoporosis
	  ▪ Steroid induced (Duchenne Muscular Dystrophy, management of malignancies)
	  ▪ Rheumatoid disorders and other inflammatory condition of bone
	• Conditions associated with high bone mass:
	  ○ Osteopetrosis [34]
	  ▪ Osteoclast-rich
	  ▪ Osteoclast-poor
		C

10	Skeletal Dysplasia • Achondroplasia • Basic principles of investigation and management of rare dysplasias	D
11	Bisphosphonate treatment • Preparations, mode of admininstration, doses, side effects and indications	C
12	Novel therapies • e.g. X-linked hypophosphatemic rickets, Hypophosphatasia	D

K. ADRENAL GLANDS		
1	Adrenal anatomy and embryology • Functional zones of the cortex • Feto-placental unit • Fetal adrenal steroidogenesis	B
2	Adrenal steroid hormone physiology and biochemistry • Mineralocorticoids, glucocorticoids, androgens and their precursors • Classical and alternative/ backdoor pathways of steroid biosynthesis • Regulation, hypothalamic-pituitary-adrenal axis, negative and positive feedback loops o Secretion, transport, metabolism, diurnal variations and actions • Renin-angiotensin-aldosterone system	B
3	Laboratory evaluation of adrenal function: basal levels, stimulation and suppression tests	B
4	Cortisol deficiency: primary, secondary and iatrogenic	C
5	Primary adrenal insufficiency [35,36] • Acute vs chronic • Acquired: Addison's disease, autoimmune polyglandular syndromes • Inherited metabolic o Adrenoleukodystrophy/Zellweger spectrum disorder o Mitochondrial	C D
6	Genetic and biochemical defects in steroidogenesis, phenotype, biochemical profile in blood and urine, evaluation and basic management • Steroidogenic acute regulatory protein (StAR) • Cholesterol P450 side-chain cleavage (scc) • 3β-hydroxysteroid dehydrogenase (3β-HSD) • 21α-hydroxylase (P450c21) • 11 beta-hydroxylase deficiency (P450c11β) • 17α-hydroxylase/ 17,21 lyase (P450c17) • P450 oxidoreductase (POR)	C D
7	Congenital adrenal hyperplasia due to 21α-hydroxylase defect [37] • Classical, simple virilising, nonclassical forms • Spectrum of genetic and biochemical defects, genetic counselling • Transition to adult care	C
8	Congenital adrenal hypoplasia: genetic defects, phenotype	D

9	ACTH resistance/ familial glucocorticoid deficiency, (FGD) • Types, genetics, clinical presentation • Triple A / Achalasia-Adrenal insufficiency-Alacrima syndrome	D
10	Adrenal crisis • Stress doses of glucocorticoids • Forward plan, sick-day rules, discharge advice and safety netting	C
11	Management of children and adolescents with glucocorticoid deficiency requiring surgery	
12	Hypercortisolism • Central, adrenal, ectopic [19] • Iatrogenic	D C
13	Aldosterone deficiency • Pseudohypoaldosteronism types 1 and 2 • Aldosterone synthase deficiency (P450c11AS, Corticosterone methyl oxidase)	C D
14	Mineralocorticoid excess • Primary hyperaldosteronism, adenoma, hyperplasia, Apparent Mineralocorticoids Excess, Glucocorticoid-suppressible Hyperaldosteronism	D
15	Premature adrenarche vs pathological hyperandrogenism Glucocorticoid resistance, 11β-hydroxysteroid dehydrogenase 1 (11β HSD1) defect (apparent cortisone reductase deficiency)	C D
16	Adrenal cortex tumours: • Functioning, nonfunctioning • Isolated, associated with other disorders (Li-Fraumeni, Carney, McCune Albright)	C
17	Adrenal medulla tumours: pheochromocytoma [38] • Isolated or associated with other disorders (Multiple Endocrine Neoplasia 2, von Hippel-Lindau, Neurofibromatosis type 1)	D
18	Glucocorticoid treatment • Preparations used, relative potency, routes of administration, actions and side effect profile • Physiological replacement, stress doses, pharmacological treatment, and withdrawal	C

L. SEX DEVELOPMENT AND GENDER		
1	Chromosomal, gonadal and phenotypic sex Psychosexual development: gender identity, gender role, and sexual orientation	C
2	Embryology, molecular genetic basis and role of hormones for determination, differentiation and development of gonads, internal structures and external genitalia	C
3	Difference in sex differentiation/ development (DSD) [39] • Different terms • Definition and differentiation from Gender dysphoria • Molecular and biochemical basis	C
4	DSD Clinical manifestations and multidisciplinary approach (local, regional and international) to the evaluation, sex assignment, diagnosis and management (medical, psychological and surgical) • By age at presentation: newborn, childhood, adolescence[40] • Pathophysiological classification: o XX DSD, Ovotesticular DSD o XY DSD, XY gonadal dysgenesis; LH/HCG receptor defects; defects in testosterone biosynthesis or action o Chromosomal DSD, mixed gonadal dysgenesis; XO/XY, XX/XY and other sex chromosome variations	C, D
5	Priorities in evaluation of newborn with atypical genitalia • Differentiating from normal variations • Use of external genital score • Monitoring for salt wasting CAH	C
6	Evaluating outcome of DSD • germ cell tumours • hormone function and need for sex hormone replacement • psychosexual function and activity • prospects of fertility • psych-social-cultural health	C
7	Long term course of DSD, counselling patient and family, ethical issues, socio-cultural and religious issues, considerations for sex assignment/reassignment, timing of surgery, advocacy groups opinion [41]	C
8	Gender non-conformity / gender dysphoria / gender variance: definition, principles of care, national legislation	D

M. DISORDERS OF TESTES AND MALE REPRODUCTIVE TRACT		
1	Testes structure and function • Leydig cell and Sertoli cell function • Across fetal life, infancy, childhood and puberty • Regulation by LH and FSH, role of receptors	B
2	Embryology and physiology of testicular descent	C
3	Nonpalpable testes • Maldescent/cryptorchidism vs testicular regression vs anorchia • Unilateral vs bilateral cryptorchidism vs retractile • Timing of surgical intervention • Associated with Persistent Mullerian Duct syndrome	C
4	Testicular failure/dysfunction • Approach to management and including management of specific conditions • Hypergonadotrophic vs hypogonadotrophic hypogonadism • Aetiology: congenital, acquired • Fertility and psychosexual outcome • Klinefelter syndrome	C
5	Testicular swellings and tumours • Benign, malignant, leukemia • Germ cell (seminoma), non-germ cell (Leydig cell, Sertoli cell, primitive gonadal structures), mixed gonadal elements (gonadoblastoma, dysgerminoma) • Adrenal rest tumour associated with congenital adrenal hyperplasia • Fragile X syndrome	D C D
6	Micropenis: normal vs abnormal and associated with DSD	C
7	Enlarged penis: normal vs abnormal and feature of precocious puberty	C
8	Hypospadias with/without bifid scrotum: isolated vs associated with DSD	C

9	Testosterone treatment
	• Preparations and routes of administration
	• Indications, doses and duration of treatment
	  ○ Infancy
	  ○ Constitutional delay in puberty
	  ○ Pubertal hormone replacement
		C

10	recombinant FSH and hCG treatment in hypogonadotrophic hypogonadism	D

N. DISORDERS OF OVARIES AND FEMALE REPRODUCTIVE TRACT		
1	Ovarian structure and function • Granulosa and theca cells, follicular development, corpus luteum, germ cells reserve through life • Hormones secreted and changes across fetal life, infancy, childhood and puberty • Regulation by LH and FSH, role of receptors, negative and positive feedback in the hypothalamic-pituitary-ovarian axis	B
2	Ovarian failure: [42] • Approach to management and including management of specific conditions • Primary vs secondary, hypogonadotrophic vs hypergonadotrophic • Aetiology: congenital and acquired, sporadic or familial, isolated or syndromic • Fertility and psychosexual outcome • Turner syndrome [4]	C
3	Ovarian hyperandrogenism: • primary vs secondary • Polycystic Ovary Syndrome (PCOS)[43] • Androgen secreting ovarian tumour	C D
4	Ovarian cysts: follicular, other cysts	C
5	Ovarian tumours • Germ cell (germinoma/dysgerminoma, teratoma) • Mesenchymal (granulosa cell) • Adrenal rest tumour associated with congenital adrenal hyperplasia	D C
6	Menstrual problems: • Amenorrhoea: primary and secondary • Disorders of menstrual frequency, duration and flow • Dysmenorrhoea • Premenstrual syndrome	C
7	Non-menstrual vaginal bleeding: • Pathological vs sexual abuse vs factitious • Approach to investigating	C

8	Oestrogen and oestrogen-progesterone hormone replacement [44]
	• Preparations and routes of administration
	• Indications, doses and duration of treatment
	  ○ constitutional delay in puberty
	  ○ pubertal hormone replacement
		C

O. GLUCOSE AND LIPID METABOLISM - DIABETES MELLITUS		
1	Glucose homeostasis and role of hormones in physiological regulation	B
2	Diabetes in children and adolescents [45] • Definition • Aetiological classification • Epidemiology • Diagnosis	B
3	Stages of type 1 diabetes [46] • Preclinical vs clinical • Non-emergency vs emergency presentations • Phases - partial remission/honeymoon, chronic	B
4	Monogenic diabetes (MODY) • genetic defects of beta cell function or development [47] • general approach	 D C
5	Neonatal diabetes [48]	D
6	Type 2 diabetes mellitus [49]	C,D
7	Genetic defects in insulin action: insulin resistance, Donohue syndrome	D
8	Chronic systemic diseases and treatments which affect the pancreas • Cystic fibrosis-related diabetes (CFRD) [50] • Thalassaemia major • Pancreatitis • Pancreatectomy	C
9	Drug induced diabetes: corticosteroids	C
10	Diabetes education [51] • Primary at diagnosis • Secondary and continuing	C
11	Ambulatory diabetes care: clinic organisation structures, processes and outcomes [52]	C
12	Glycemic control assessment, monitoring, interpreting results and targets[53,54] • Glucose self-monitoring methods with blood (or urine) • Continuous glucose monitoring • Ketone testing with urine or blood • HbA1c	C

13	Insulin treatment: [55] • Insulin preparations • Insulin requirement, doses, regimens • Administration techniques • Pump therapy	C
14	Nutritional management, rationale, recommendations, dietetic evaluation and growth monitoring [56]	C
15	Diabetic ketoacidosis and hyperglycemic hypersmolar state [57]	C
16	Hypoglycemia [58]	C
17	Sick day management: rationale, recommendations [59]	C
18	Management of children and adolescents requiring surgery: rationale, recommendations [60]	C
19	Physical exercise: rationale, recommendations [61]	C
20	Psychological impact and management [62]	D
21	Diabetes challenges and management for specific age groups • Preschool child [63] • School-age [64] • Adolescence [65]	D
22	Microvascular and macrovascular complications [66] • Risk factors, pathophysiology • Screening, prevention and management	D
23	Other complications and conditions associated with type 1 diabetes [67] • Growth and pubertal development • Other autoimmune problems: thyroid, coeliac disease, pernicious anaemia, adrenal • Skin and joint changes	C
24	Diabetes technologies [68]	C
25	Diabetes management & challenges in limited resource settings [69]	D
26	Diabetes management in specific situations: fasting during Ramadan [70]	D

P. GLUCOSE AND LIPID METABOLISM - HYPOGLYCAEMIA		
1	Non-diabetic hypoglycaemia • Approach to investigations and critical test samples during hypoglycaemia • Approach to management and including management of specific conditions • Differential diagnoses with and without ketosis • Ketotic vs hormone deficiencies vs metabolic • Complex and indeterminate forms of hypoglycaemia • Perplexing presentations and factitious induced hypoglycaemia	C D
2	Transient neonatal hypoglycaemia • Transient congenital hyperinsulinism • Infant of mother with diabetes • Intrauterine growth restriction • Perinatal asphyxia • Neonatal sepsis	C
3	Congenital hyperinsulinism • Focal vs diffuse • Diagnostic genetic and imaging investigations • Medical and surgical management	C,D
4	Hypoglycaemia associated with hormone deficiency: GH deficiency or resistance, cortisol deficiency	C
5	Drug induced: insulin, oral antidiabetes drugs, beta-blockers	C
6	Islet cell tumours: association with genetic syndromes and appropriate screening	D

Q. SALT AND WATER REGULATION		
1	Polydipsia and polyuria • Primary polydipsia • Central vs nephrogenic diabetes insipidus (DI) • Desmopressin treatment for central DI	C
2	Hypernatremia other than diabetes insipidus • Adipsic hypernatremia, inadequate water intake, excessive free water loss, excessive sodium intake • Fluid management	D
3	Hyponatraemia • Sodium deficiency or loss: adrenal insufficiency, cerebral salt wasting • Excessive free water gain: water intoxication, SIADH • Fluid management and rate of correction of plasma sodium	C
4	Water deprivation test: procedure and interpretation	C
5	Fluid management in neurosurgical patients	C

R. CONDITIONS WITH ENDOCRINE FEATURES		
1	Multiple endocrine neoplasia: spectrum of manifestations, genetic testing, screening • MEN1, MEN2A, MEN2B	C
2	Syndromes with endocrine neoplasia • Neurofibromatosis type 1 • Carney complex • von Hippel-Lindau syndrome • DICER1 syndrome • Li Fraumeni syndrome • Peutz-Jegher syndrome • PTEN Hamartoma Tumour Syndrome (PHTS)	C D
3	Autoimmune Polyglandular Syndromes (APS) • APS1, APS2, APS4	D
4	Endocrine consequences of chronic and systemic diseases including • Anorexia nervosa • Thalassaemia major • Sickle cell disease • Cystic fibrosis	C

5	Endocrine consequences of • surgery • chemotherapy • radiotherapy • bone marrow/stem cell/organ transplant • trauma, including pituitary function following severe traumatic brain injury	C

RESOURCES

Dattani MT, Brook CGD, editors. Brook's Clinical Paediatric Endocrinology. 7th Edition, 2019. John Wiley and Sons

> This textbook has been compiled by an experienced editorial team and internationally renowned contributors. It presents basic science and clinical management of endocrine disorders for all involved in the care of children and adolescents.

ESPE Consenus Statements and Guidelines: https://www.eurospe.org/clinical-practice/consensus-statements-and-guidelines/

ESPE e-learning web portal: https://espe-elearning.org/ Go to Login (right upper corner), Register first for a new account.

Frank JR, Snell L, Sherbino J, editors. CanMEDS 2015. Physician Competency Framework. Royal College of Physicians and Surgeons of Canada, Ottawa 2015.

Journals:

> Clinical Endocrinology
>
> European Journal of Endocrinology
>
> Hormone research in paediatrics
>
> Journal of Clinical Endocrinology and Metabolism
>
> Pediatric Diabetes

ICPED Consortium. International Classification of Pediatric Endocrine Diagnoses (ICPED). 2013-2016. http://www.icped.org

International Society for Pediatric and Adolescent Diabetes (ISPAD). ISPAD Clinical Practice Consensus Guidelines 2018. https://www.ispad.org/page/ISPADGuidelines2018

Melmed S, Koenig R, Rosen C, Auchus R, Goldfine A. Williams Textbook of Endocrinology, 14th Edition, 2019. Elsevier

Sperling M, editor. Pediatric Endocrinology, 4th Edition, 2014. Saunders

Year Book of Paediatric Endocrinology. https://www.espeyearbook.org

> This summarises and comments on the major advances in paediatric endocrinology during the previous year.

APPENDIX

---

[1] van der Straaten S, Springer A, Zecic A, et al. The External Genitalia Score (EGS): A European Multicenter Validation Study. *J Clin Endocrinol Metab* 2020; 105(3):dgz142. doi:10.1210/clinem/dgz142

[2] Wolfsdorf JI, Glaser N, Agus M, et al. ISPAD Clinical Practice Consensus Guidelines 2018: Diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *Pediatr Diabetes* 2018; 19 Suppl 27: 155–177. doi:10.1111/pedi.12701

[3] Ho KK; 2007 GH Deficiency Consensus Workshop Participants. Consensus guidelines for the diagnosis and treatment of adults with GH deficiency II: a statement of the GH Research Society in association with the European Society for Pediatric Endocrinology, Lawson Wilkins Society, European Society of Endocrinology, Japan Endocrine Society, and Endocrine Society of Australia. *Eur J Endocrinol* 2007; 157(6): 695–700. doi:10.1530/EJE-07-0631

[4] Gravholt CH, Andersen NH, Conway GS, et al. Clinical practice guidelines for the care of girls and women with Turner syndrome: proceedings from the 2016 Cincinnati International Turner Syndrome Meeting. *Eur J Endocrinol* 2017; 177(3): G1–G70. doi:10.1530/EJE-17-0430

[5] Clayton PE, Cianfarani S, Czernichow P, Johannsson G, Rapaport R, Rogol A. Management of the child born small for gestational age through to adulthood: a consensus statement of the International Societies of Pediatric Endocrinology and the Growth Hormone Research Society. *J Clin Endocrinol Metab* 2007; 92(3): 804-10. doi: 10.1210/jc.2006-2017.

[6] Wakeling EL, Brioude F, Lokulo-Sodipe O, et al. Diagnosis and management of Silver-Russell syndrome: first international consensus statement. *Nat Rev Endocrinol* 2017; 13(2): 105–124. doi:10.1038/nrendo.2016.138

[7] Radicioni AF, Ferlin A, Balercia G, et al. Consensus statement on diagnosis and clinical management of Klinefelter syndrome. *J Endocrinol Invest* 2010; 33(11): 839–850. doi:10.1007/BF03350351

[8] Brioude F, Kalish JM, Mussa A, et al. Expert consensus document: Clinical and molecular diagnosis, screening and management of Beckwith-Wiedemann syndrome: an international consensus statement. *Nat Rev Endocrinol* 2018; 14(4): 229–249. doi:10.1038/nrendo.2017.166

[9] Bangalore KK, Fuqua JS, Rogol AD, et al. Use of Gonadotropin-Releasing Hormone Analogs in Children: Update by an International Consortium. *Horm Res Paediatr* 2019; 91: 357-372. doi: 10.1159/000501336

[10] Boehm U, Bouloux PM, Dattani MT, et al. Expert consensus document: European Consensus Statement on congenital hypogonadotropic hypogonadism - pathogenesis, diagnosis and treatment. *Nat Rev Endocrinol* 2015; 11(9): 547–564. doi:10.1038/nrendo.2015.112

[11] Sklar CA, Antal Z, Chemaitilly W, et al. Hypothalamic-Pituitary and Growth Disorders in Survivors of Childhood Cancer: An Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab* 2018; 103(8): 2761–2784. doi:10.1210/jc.2018-01175

[12] van Dorp W, Mulder RL, Kremer LC, et al. Recommendations for Premature Ovarian Insufficiency Surveillance for Female Survivors of Childhood, Adolescent, and Young Adult Cancer: A Report From the International Late Effects of Childhood Cancer Guideline Harmonization Group in Collaboration With the PanCareSurFup Consortium. *J Clin Oncol* 2016; 34(28): 3440–3450. doi:10.1200/JCO.2015.64.3288

[13] Skinner R, Mulder RL, Kremer LC, et al. Recommendations for gonadotoxicity surveillance in male childhood, adolescent, and young adult cancer survivors: a report from the International Late Effects of Childhood Cancer Guideline Harmonization Group in collaboration with the PanCareSurFup Consortium [published correction appears in *Lancet Oncol* 2017; 18(4): e196]. *Lancet Oncol* 2017; 18(2): e75–e90. doi:10.1016/S1470-2045(17)30026-8

[14] Hembree WC, Cohen-Kettenis PT, Gooren L, et al. Endocrine Treatment of Gender-Dysphoric/Gender-Incongruent Persons: An Endocrine Society Clinical Practice Guideline [published correction appears in *J Clin Endocrinol Metab* 2018 Feb 1; 103(2):699] [published correction appears in *J Clin Endocrinol Metab* 2018; 103(7): 2758-2759]. *J Clin Endocrinol Metab* 2017; 102(11): 3869–3903. doi:10.1210/jc.2017-01658

[15] Styne DM, Arslanian SA, Connor EL, Farooqi IS, Murad MH, Silverstein JH et al. Pediatric obesity-assessment, treatment, and prevention: An endocrine society clinical practice guideline. *J Clin Endocrinol Metab* 2017; 102(3): 709-757. doi.org/10.1210/jc.2016-2573

[16] Spoudeas HA, Harrison B. Paediatric Endocrine Tumours. A Multi-Disciplinary Consensus Statement of Best Practice from a Working Group convened under the auspices of the BSPED and UKCCSG (rare tumour working groups). 2005. https://www.bsped.org.uk/media/1373/rareendocrinetumour_final.pdf *accessed 6 March 2020*

[17] Melmed S, Casanueva FF, Hoffman AR, et al. Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab* 2011; 96(2): 273–288. doi:10.1210/jc.2010-1692

[18] Nieman LK, Biller BM, Findling JW, et al. The diagnosis of Cushing's syndrome: an Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab* 2008; 93(5): 1526–1540. doi:10.1210/jc.2008-0125

[19] Nieman LK, Biller BM, Findling JW, et al. Treatment of Cushing's Syndrome: an Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab* 2015; 100(8): 2807–2831. doi:10.1210/jc.2015-1818

[20] Tuli G, Matarazzo P, de Sanctis L. Clinical approach to sodium homeostasis disorders in children with pituitary-suprasellar Tumors. *Neuroendocrinology* 2020; 110(3-4): 161–171. doi:10.1159/000502609

[21] Léger J, Olivieri A, Donaldson M, et al. European Society for Paediatric Endocrinology consensus guidelines on screening, diagnosis, and management of congenital hypothyroidism. *J Clin Endocrinol Metab* 2014; 99(2): 363–384. doi:10.1210/jc.2013-1891

[22] Léger J. Management of fetal and neonatal Graves' disease. *Horm Res Paediatr* 2017; 87(1): 1–6. doi:10.1159/000453065

[23] Ross DS, Burch HB, Cooper DS, et al. 2016 American Thyroid Association Guidelines for Diagnosis and management of hyperthyroidism and other causes of thyrotoxicosis [published correction appears in *Thyroid* 2017; 27(11): 1462]. *Thyroid* 2016; 26(10): 1343–1421. doi:10.1089/thy.2016.0229

[24] Francis GL, Waguespack SG, Bauer AJ, et al. Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid* 2015; *25*(7): 716-759. doi:10.1089/thy.2014.0460

[25] Mantovani G, Bastepe M, Monk D, et al. Diagnosis and management of pseudohypoparathyroidism and related disorders: first international Consensus Statement. *Nat Rev Endocrinol*. 2018; 14(8): 476–500. doi:10.1038/s41574-018-0042-0

[26] Munns CF, Shaw N, Kiely M, et al. Global Consensus Recommendations on Prevention and Management of Nutritional Rickets. *J Clin Endocrinol Metab* 2016; 101(2): 394–415. doi:10.1210/jc.2015-2175

[27] Haffner D, Emma F, Eastwood DM, et al. Clinical practice recommendations for the diagnosis and management of X-linked hypophosphataemia. *Nat Rev Nephrol* 2019; 15(7): 435–455. doi:10.1038/s41581-019-0152-5

[28] Javaid MK, Boyce A, Appelman-Dijkstra N, et al. Best practice management guidelines for fibrous dysplasia/McCune-Albright syndrome: a consensus statement from the FD/MAS international consortium [published correction appears in *Orphanet J Rare Dis* 2019 Nov 21;14(1):267]. *Orphanet J Rare Dis* 2019; 14(1): 139. Published 2019 Jun 13. doi:10.1186/s13023-019-1102-9

[29] Ferreira C, Ziegler S, Gahl WA. Generalized arterial aalcification of infancy. 2014 Nov 13. In: Adam MP, Ardinger HH, Pagon RA, et al., editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2020. Available from: https://www.ncbi.nlm.nih.gov/books/NBK253403/

[30] Michigami T, Ohata Y, Fujiwara M, et al. Clinical Practice Guidelines for Hypophosphatasia. *Clin Pediatr Endocrinol* 2020; 29(1): 9–24. doi:10.1297/cpe.29.9

[31] Mueller B, Engelbert R, Baratta-Ziska F, et al. Consensus statement on physical rehabilitation in children and adolescents with osteogenesis imperfecta. *Orphanet J Rare Dis* 2018; 13(1): 158. Published 2018 Sep 10. doi:10.1186/s13023-018-0905-4

[32] Tauer JT, Robinson ME, Rauch F. Osteogenesis Imperfecta: New Perspectives From Clinical and Translational Research. *JBMR Plus* 2019; 3(8): e10174. Published 2019 Feb 20. doi:10.1002/jbm4.10174

[33] Ward LM, Konji VN, Ma J. The management of osteoporosis in children. *Osteoporos Int* 2016; 27(7): 2147–2179. doi:10.1007/s00198-016-3515-9

[34] Wu CC, Econs MJ, DiMeglio LA, et al. Diagnosis and Management of Osteopetrosis: Consensus Guidelines From the Osteopetrosis Working Group. *J Clin Endocrinol Metab* 2017; 102(9): 3111–3123. doi:10.1210/jc.2017-01127

[35] Bornstein SR, Allolio B, Arlt W, et al. Diagnosis and Treatment of Primary Adrenal Insufficiency: An Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab* 2016; 101(2): 364-389. DOI: 10.1210/jc.2015-1710.

[36] Reznik Y, Barat P, Bertherat J, et al. SFE/SFEDP adrenal insufficiency French consensus: Introduction and handbook. *Ann Endocrinol (Paris)* 2018; 79(1):1–22. doi:10.1016/j.ando.2017.12.001

[37] Speiser PW, Arlt W, Auchus RJ, et al. Congenital Adrenal Hyperplasia Due to Steroid 21-Hydroxylase Deficiency: An Endocrine Society Clinical Practice Guideline [published correction appears in *J Clin Endocrinol Metab* 2019; 104(1): 39-40]. *J Clin Endocrinol Metab* 2018; 103(11): 4043–4088. doi:10.1210/jc.2018-01865

[38] Chen H, Sippel RS, O'Dorisio MS, et al. The North American Neuroendocrine Tumor Society consensus guideline for the diagnosis and management of neuroendocrine tumors: pheochromocytoma, paraganglioma, and medullary thyroid cancer. *Pancreas* 2010; 39(6): 775–783. doi:10.1097/MPA.0b013e3181ebb4f0

[39] Hughes IA, Houk C, Ahmed SF, Lee PA; LWPES Consensus Group; ESPE Consensus Group. Consensus statement on management of intersex disorders. *Arch Dis Child* 2006; 91(7): 554–563. doi:10.1136/adc.2006.098319

[40] Ahmed SF, Achermann JC, Arlt W, et al. Society for Endocrinology UK guidance on the initial evaluation of an infant or an adolescent with a suspected disorder of sex development (Revised 2015). *Clin Endocrinol (Oxf)* 2016; 84(5): 771–788. doi:10.1111/cen.12857

[41] Cools M, Nordenström A, Robeva R, et al. Caring for individuals with a difference of sex development (DSD): a Consensus Statement. *Nat Rev Endocrinol* 2018; 14(7): 415–429. doi:10.1038/s41574-018-0010-8

[42] Committee on Adolescent Health, American College of Obstetricians and Gynecologists. Primary ovarian insufficiency in adolescents and young women. Committee Opinion No. 605. *Obstet Gynecol* 2014; 123:193–7. www.acog.org/Clinical-Guidance-and-Publications/Committee-Opinions/Committee-on-Adolescent-Health-Care/Primary-Ovarian-Insufficiency-in-Adolescents-and-Young-Women?IsMobileSet=false

[43] Ibáñez L, Oberfield SE, Witchel S, et al. An International Consortium Update: Pathophysiology, Diagnosis, and Treatment of Polycystic Ovarian Syndrome in Adolescence. *Horm Res Paediatr* 2017; 88(6): 371–395. doi:10.1159/000479371

[44] Matthews D, Bath L, Högler W, et al (BSPED Working Group). Guidance Statement: Hormone Supplementation for Pubertal Induction in Girls. 30 September 2016. https://www.bsped.org.uk/media/1378/hormonesupplementationforpubertalinductioningirls.pdf

[45] Mayer-Davis EJ, Kahkoska AR, Jefferies C, et al. Chapter 1: Definition, epidemiology, diagnosis and classification of diabetes in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 7-19. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/1.definition,_epidemiology,_.pdf

[46] Couper JJ, Haller MJ, Greenbaum CJ, et al. Chapter 2: Stages of type 1 diabetes in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 20-27. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/2.stages_of_type_1_diabetes_.pdf

[47] Hattersley AT, Greeley SAW, Polak M, et al. Chapter 4: The Diagnosis and management of monogenic diabetes in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 47-63. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/4.the_diagnosis_and_manageme.pdf

[48] Beltrand J, Busiah K, Vaivre-Douret L, et al. Neonatal Diabetes Mellitus. *Front Pediatr* 2020; 8: 540718. Published 2020 Sep 30. doi:10.3389/fped.2020.540718

[49] Zeitler P, Arslanian S, Fu J, et al. Chapter 3: Type 2 Diabetes mellitus in youth. *Pediatric Diabetes* 2018; 19 (Suppl 27): 28-46. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/3.type_2_diabetes_mellitus_i.pdf

[50] Moran A, Pillay K, Becker D, et al. Chapter 5: Management of cystic fibrosis-related diabetes in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 64-74. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/5.management_of_cystic_fibro.pdf

[51] Phelan H, Lange K, Cengiz E, et al. Chapter 6: Diabetes Education in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 75-83. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/6.diabetes_education_in_chil.pdf

[52] Pihoker C, Forsander G, Fantahun B, et al. Chapter 7: The Delivery of ambulatory diabetes care to children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 84-104. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/7.the_delivery_of_ambulatory.pdf

[53] DiMeglio LA, Acerini CL, Codner E, et al. Chapter 8: Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 105-114.

https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/8.glycemic_control_targets_a.pdf

[54] Sherr JL, Tauschmann M, Battelino T, et al. Chapter 21: Diabetes Technologies. *Pediatric Diabetes* 2018; 19 (Suppl 27): 302-325. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/21.diabetes_technologies.pdf

[55] Danne T, Phillip M, Buckingham B, et al. Chapter 9: Insulin treatment in children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 115-135. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/9.insulin_treatment_in_child.pdf

[56] Smart CE, Annan F, Higgins LA, et al. Chapter 10: Nutritional management in children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 136-154. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/10.nutritional_management_in.pdf

[57] Wolfsdorf JI, Glaser N, Agus M, et al. Chapter 11: Diabetic ketoacidosis and hyperglycemic hypersmolar state. *Pediatric Diabetes* 2018; 19 (Suppl 27): 155-177. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/11.diabetic_ketoacidosis_and.pdf

[58] Abraham MB, Jones TW, Naranjo D, et al. Chapter 12: Assessment and management of hypoglycemia in children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 178-192. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/12.assessment_and_management.pdf

[59] Laffel L, Limbert C, Phelan H, et al. Chapter 13: Sick day management in children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 193-204. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/13.sick_day_management_in_ch.pdf

[60] Jefferies C, Rhodes E, Rachmiel M, et al. Chapter 15: Management of children & adolescents with diabetes requiring surgery. *Pediatric Diabetes* 2018; 19 (Suppl 27): 227-236. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/15.management_of_children_&_.pdf

[61] Adolfsson P, Riddell MC, Taplin CE, et al. Chapter 14: Exercise in children and adolescents with diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 205-226. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/14.exercise_in_children_and_.pdf

[62] Delamater AM, de Wit M, McDarby V, et al. Chapter 16: Psychological care of children and adolescents with type 1 diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 236-249. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/16.psychological_care_of_chi.pdf

[63] Sundberg S, Barnard K, Cato A, de Beaufort C, et al. Additional Chapter Managing diabetes in preschool children. *Pediatric Diabetes* 2017; 0: 1-19. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/ispad_guidelines/ISPAD_preschoolers.pdf

[64] Bratina N, Forsander G, Annan F, et al. Chapter 20: Management and support of children and adolescents with type 1 diabetes in school. *Pediatric Diabetes* 2018; 19 (Suppl 27): 287-301. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/20.management_and_support_of.pdf

[65] Cameron FJ, Garvey K, Hood K, et al. Chapter 17: Diabetes in Adolescence. *Pediatric Diabetes* 2018; 19 (Suppl 27): 250-261. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/17.diabetes_in_adolescence.pdf

[66] Donaghue KC, Marcovecchio L, Wadwa RP, et al. Chapter 18: Microvascular and macrovascular complications in children and adolescents. *Pediatric Diabetes* 2018; 19 (Suppl 27): 262-274. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/18.microvascular_and_macrova.pdf

[67] Mahmud FH, Elbarbary NS, Fröhlich-Reiterer E, et al. Chapter 19: Other complications and associated conditions in children and adolescents with type 1 diabetes. *Pediatric Diabetes* 2018; 19 (Suppl 27): 275-286. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/19.other_complications_and_a.pdf

[68] Sherr JL, Tauschmann M, Battelino T, et al. Chapter 21: Diabetes Technologies. *Pediatric Diabetes* 2018; 19 (Suppl 27): 302-325. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/21.diabetes_technologies.pdf

[69] Codner E, Acerini C, Craig ME, et al. Chapter 22: Introduction to the Limited Care Guidance Appendix. *Pediatric Diabetes* 2018; 19 (Suppl 27): 326-327. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/23.limited_care_guidance_app.pdf

[70] Deeb A, Elbarbary N, Smart CE, et al. ISPAD Clinical Practice Consensus Guidelines: Fasting during Ramadan by young people with diabetes. *Pediatr Diabetes* 2019; 1–13. https://cdn.ymaws.com/www.ispad.org/resource/resmgr/consensus_guidelines_2018_/deeb_et_al-2019-pediatric_di.pdf