FELLOWSHIP PROGRAM
IN ENDOCRINOLOGY, DIABETES AND METABOLISM
CURRICULUM

Contents

FACILITIES FOR TRAINING

Sponsoring Institution

Name:	SUNY Upstate Medical University
Address:	750 E. Adams Street, CWB 353 Syracuse, NY 13210

JACHO Approved √
Program director located at this site: √

Number of Endocrinology faculty: 12

Chair, Department of Internal Medicine:

Name:	Michael Iannuzzi, MD, MBA, FACP, FCCP
Title:	Professor of Medicine
Address:	750 E. Adams Street Room 5142 University Hospital Syracuse, NY 13210
Telephone:	315-464-4505
Fax:	315-464-4504
Email:	iannuzzim@upstate.edu

Chief, Division of Endocrinology and Metabolism:

Name:	Ruth S. Weinstock, MD, PhD
Title:	Professor of Medicine and Medical Director, Joslin Diabetes Center
Address:	750 E. Adams Street, CWB 353 Syracuse, NY 13210
Telephone:	315-464-5740
Fax:	315-464-5718
Email:	weinstor@upstate.edu

Additional Participating Hospitals

Name:	Department of Veterans Affairs Medical Center
Address:	800 Irving Ave. Syracuse, NY 13210

Distance from primary hospital: 2 minutes
Are these rotations required: Yes

JACHO Approved √
Program director located at this site: √

Note: Program Director is a part-time VAMC employee. SUNY Upstate Medical University faculty in Endocrinology, Diabetes and Metabolism cover the VAMC for endocrine services

Program Number: 1433521087

Program Director:

Name:	Ruth S. Weinstock, MD, PhD
Title:	Professor of Medicine, and Research Professor of Physiology, Chief, Division of Endocrinology, Diabetes & Metabolism at the SUNY Upstate Medical University and the Department of Veterans Affairs Medical Center, and Medical Director, Joslin Diabetes Center at SUNY Upstate Medical University.
Research :	Her research activities focus on the prevention and treatment of diabetes mellitus and its complications.

Key Faculty:

Name:	Arnold M. Moses, MD
Title:	SUNY Distinguished Professor of Medicine and Director of the Clinical Research Unit and Metabolic Bone Disease Center at University Hospital

Research activities include clinical trials of new therapeutic agents for the treatment of osteoporosis and Paget's disease of bone. Dr. Moses also conducts clinical investigations on the pathophysiology of diabetes insipidus and pseudohypoparathyroidism.

Name:	Marisa Desimone, MD
Title:	Assistant Professor of Medicine

Clinical interests include

Name:	Barbara L. Feuerstein, MD
Title:	Associate Professor of Medicine and Chief, Endocrinology, VA Medical Center

Clinical interests include the prevention and treatment of diabetes mellitus, lipid disorders, obesity, nutrition and general endocrine disorders.

Name:	George G. Holz, PhD
Title:	Professor of Medicine and Pharmacology

Research interests are centered on studies to understand the mechanisms of action of GLP-1 agonists on beta cell function and mass, including determining the signal transduction properties of the GLP-1 receptor.

Name:	Rachel L. Hopkins, MD
Title:	Assistant Professor of Medicine

Clinical interests include the diagnosis and treatment of diabetes and thyroid disorders and general endocrinology.

Name:	Roberto E. Izquierdo, MD

Title: Professor of Medicine and Pediatrics. Chief, Pediatric Endocrinology, Diabetes and Metabolism and Director, Thyroid Center

Clinical interests include treatment of thyroid disease and diabetes mellitus, in children and adults. Research interests include clinical investigations in thyroid diseases and diabetes mellitus.

Name: Jennifer J. Kelly, DO
Title: Assistant Professor of Medicine

Clinical interests include metabolic bone disease, diabetes mellitus, thyroid diseases and general endocrinology. Dr. Kelly directs the bone density unit. Research interests include clinical studies in osteoporosis and other metabolic diseases.

Name: Colin A. Leech, PhD
Title: Research Associate Professor

Research interests are centered on signaling pathways that regulate insulin secretion and the cell cycle of beta cells. Electrophysiology, cellular imaging and molecular biology techniques are used to investigate ion channel function and signal transduction pathways.

Name: Barbara Mols- Kowalczewski, MD
Title: Assistant Professor of Medicine

Interests: Clinical diabetes and endocrinology; educational activities

Name: Michael Wm. Roe, PhD
Title: Associate Professor of Medicine

Research interests are focused on understanding molecular mechanisms involved in the regulation of beta cell biology and the pathophysiology of diabetes mellitus. His research group utilizes genetically-encoded biosensor technology and real-time confocal microscopy to study signal transduction in single cells, islets of Langerhans and transgenic animals.

Additional Faculty/Research Collaborators:

Name: Shawky Z. Badawy, MD
Title: Professor and Chairman of Obstetrics and Gynecology, Director of Reproductive Endocrinology and Infertility, SUNY Upstate Medical University

Supervises Menopause and Infertility Clinics (Reproductive Endocrinology rotation)

Name: John J. Folk, MD
Title: Associate Professor of Obstetrics & Gynecology Perinatal Center, SUNY Upstate Medical University

Supervises management of patients with endocrine disorders during pregnancy.

Name: Lewis Johnson, MD, CDE
Title: Clinical Professor of Endocrinology and Cardiology, SUNY Upstate

	Medical University
Participates in Journal Club and Case Conferences	

Name:	Kamal Khurana, MD
Title:	Professor of Pathology, SUNY Upstate Medical University
Participates in Thyroid Cancer Clinic and Thyroid Case Conference; Research Collaborator	

Name:	Kara Kort, MD
Title:	Assistant Professor of Surgery, SUNY Upstate Medical University
Participates in Thyroid Case Conference and Thyroid Cancer Clinic; Research Collaborator	

Name:	Lauren E. Lipeski, MD
Title:	Assistant Professor of Pediatrics, SUNY Upstate Medical University
Participates in Diabetes Clinical Activities and Conferences and Pediatric Endocrinology Rotation	

Name:	Michele Lisi, MD
Title:	Assistant Professor of Radiology, SUNY Upstate Medical University
Participates in Case Conferences and Thyroid Cancer Program	

Name:	Mary A. McGrath, MD
Title:	Assistant Professor of Radiology, SUNY Upstate Medical University
Participates in Case Conferences and Thyroid Cancer Program	

Name:	Ronald D Saletsky, PhD
Title:	Clinical Associate Professor of Psychiatry and Behavioral Sciences, SUNY Upstate Medical University
Participates in Diabetes Clinical Activities and Conferences; Research Collaborator	

Name:	Irene Sills, MD
Title:	Clinical interests include diabetes in youth and young adults, puberty and adolescent/pediatric gynecology and gender-variant children. Research includes studies on the treatment and prevention of type 1 diabetes in children.
Participates in Diabetes Clinical Activities and Conferences, Supervises Pediatric Endocrinology Rotation; Research Collaborator	

Name:	Robert K. Silverman, MD
Title:	Associate Professor of Obstetrics and Gynecology Perinatal Center, SUNY Upstate Medical University
Supervises management of patients with diabetes during pregnancy (High Risk Pregnancy Clinics)	

Name:	Alexandra C. Spadola, MD

Title:	Assistant Professor of Obstetrics and Gynecology, SUNY Upstate Medical University

Supervises management of patients with diabetes during pregnancy (High Risk Pregnancy Clinics)

Name:	Susan E. Stred, MD
Title:	Clinical Associate Professor of Pediatrics, SUNY Upstate Medical University

Supervises Pediatric Endocrinology Rotation; Participates in Journal Club and Case Conferences

Name:	Paula Trief, PhD
Title:	Professor of Psychiatry and Behavioral Sciences, Clinical Professor of Orthopedic Surgery, SUNY Upstate Medical University

Participates in Diabetes Clinical Activities and Conferences and Journal Club; Research Collaborator

1.5 Introduction

This subspecialty training program in endocrinology, diabetes and metabolism is designed to provide advanced training and experience at a level for the trainee to acquire the knowledge, skills, attitudes and experience required for all of the competencies needed by a consultant in this field. This program is designed to fulfill the needs of those trainees who anticipate their future activities to be solely the clinical practice of this specialty, those who expect to function as clinician-educators and those who intend to pursue careers in clinical and/or basic endocrine research. The program recognizes that some trainees may evolve into specialists whose activities encompass more than one of the above career paths. The teaching environment and educational experiences for trainees, detailed below, will equip them to become strong clinicians, educators, and investigators.

1.6 Goals for trainees and programs:

A. Patient Care

1. Acquire the technical and practical skills that are required by a consultant in endocrinology, diabetes and metabolism. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

2. Acquire clinical skills in a progressive fashion and with increasing responsibility appropriate for a consultant in endocrinology, diabetes and metabolism. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

3. Gain the knowledge and skills necessary for providing cost-effective, ethical and humanistic care of patients with diabetes and disorders of endocrinology and metabolism. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

B. Medical Knowledge

1. Learn basic and advanced endocrine biochemistry, physiology and pathophysiology, which provide the basis for understanding diseases of the endocrine system (year 1).

2. Accumulate a critical mass of fundamental information and practical approaches for the diagnosis, management and prevention of endocrine disorders. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 will have the knowledge base expected for a practicing endocrinologist.

C. Communication and Interpersonal Skills

1. Acquire the skills needed to counsel patients with diabetes and other endocrine disorders, and to communicate effectively with patients with complex diseases, referring physicians and other health

care professionals. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

D. Professionalism

1. Gain the knowledge and skills necessary for providing cost-effective, ethical and humanistic care of patients with diabetes and disorders of endocrinology and metabolism. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

E. Practice-Based Learning

1. Gain the knowledge and skills necessary for critical analysis of the laboratory testing and the endocrine literature. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

2. Acquire skills in design and performance of hypothesis-driven endocrine research, and to participate in such research or equivalent scholarly activity. In year 1, the trainee will start acquiring these skills and begin participation in research. By the end of year 2, the trainee will have gained experience conducting, reporting and presenting research.

3. Provide an environment that fosters "a spirit of inquiry and scholarship" which will thereby instill a commitment to life-long learning (years 1 and 2).

F. Systems-Based Learning

1. Gain the knowledge and skills necessary for providing high quality, cost-effective, ethical and humanistic care of patients with diabetes and disorders of endocrinology and metabolism. The trainee will demonstrate increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice.

1.7 Objectives

A. Patient care.

The program will provide training in:

1. Diagnosis and management of endocrine diseases including:

(a) History and physical examination with emphasis on examination of the fundi, thyroid and feet (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice) and breasts and male and female reproductive organs (year 2).
(b) Selection and interpretation of endocrine biochemical tests (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).
(c) Selection and interpretation of imaging procedures such as sonography, radionuclide scans, computerized axial tomography, magnetic resonance imaging, positron emission tomography, etc (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice) .
(e) Fine needle aspiration of the thyroid and interpretation of cytology and pathology (year 2).
(f) Understanding pharmacotherapy for endocrine disorders and appropriate use of surgery, radiation therapy, treatment with radioisotopes, etc (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).
(g) Selection and management of patients for whole organ or islet cell transplantation (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

B. Medical Knowledge

The program will provide training in:

1. Endocrine biochemistry, genetics, developmental biology, physiology and pathophysiology (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

2. Hormone action including signal transduction pathways as well as the biology of hormone receptors and feedback inter-relationships (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice)

3. Diagnosis and management of disorders in endocrinology, diabetes and metabolism (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

4. Procedural and technical skills required by the endocrine subspecialist (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

C. Professionalism

1. The program will provide training in professionalism, including peer interactions, communication with patients, their families and other health care providers, confidentiality and avoidance of conflict of interest (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

D. Practice-Based Learning

1. The trainee will begin a clinical or basic research project in Endocrinology, Diabetes and Metabolism in year 1, and provide a written report and oral presentation of rationale and results by the end of year 2.

2. The program will provide training in the understanding of existing and emerging endocrine literature (increasing competency in year 1 and throughout year 2, such that by the end of year 2 the trainee will be prepared for independent practice).

3. The trainees will participate in chart audits for diabetes performance measures with review of results and monitoring of improvement (years 1 and 2).

4. Personal scholarship and self-instruction (increasing competency in year 1 and throughout year 2).

Systems-Based Learning

1. The program will provide training in the transition of diabetes care between the outpatient and inpatient settings (year 1).

2. The trainees will identify a quality improvement project (year 1) and complete the project (year 2).

1.8 Patient Care Experience

Trainees will be directly supervised and continually evaluated by attending physicians assigned to the inpatient and ambulatory settings. Inpatients are reviewed on a daily basis with the attending physician. Attending physicians who are physically in the ambulatory setting review the ambulatory care experience of the trainee on a case by case and real time basis. The continuing interaction between trainee and attending physician is the heart of the educational experience. The integration of endocrine disorders with other diseases of the patient is part of the interaction between attending physician and trainee. When relevant, health promotion and identification of risk factors for disease are emphasized. All patient interactions take into account cultural, socioeconomic, ethical occupational, environmental and behavioral issues.

Our program provides a progressive learning experience. Trainees are given increasing responsibility as they progress through the program and demonstrate their expanding knowledge base and expertise in diagnosis and management of endocrine disease. They serve as leaders of the endocrine 'team', which is constituted by trainee, internal medicine residents and medical students, always under the supervision of the attending physician. Our program emphasizes a scholarly approach to diagnosis and management. Self-instruction is expected of the trainee along with critical analysis of the patient's problems and appropriate decision analysis regarding further evaluation and/or management.

Professionalism and ethical behavior are hallmarks of this training program. Our faculty serves both as mentors and role model clinicians for the values of professionalism. These include placing the needs of the patient first, a commitment to scholarship, helping other colleagues, continuous quality improvement and humanistic behavior both in patient interactions and interactions with other health care providers. Issues concerning professional ethics and physician impairment are discussed as they relate to specific interactions with patients. When applicable, these issues will be discussed as part of the evaluation of specific patients. Attributes of professionalism may also be the subject of conferences using examples in *Project Professionalism*, published by the American Board of Internal Medicine (www.ABIM.org). Each trainee will be provided a copy of *Project Professionalism* and will be expected to read and understand its contents and behave according to the highest professional standards.

1.8.1 General

Ambulatory services in Endocrinology, Diabetes and Metabolism are provided at the Joslin Diabetes Center/University Endocrinologists and Osteoporosis Center at SUNY Upstate Medical University. This ambulatory facility (>17,000 square feet) is the home of all adult and pediatric outpatient endocrine services and serves as the major referral center for all endocrine services in central upstate New York. The Joslin Diabetes Center uses a multi-disciplinary approach to the management of diabetes and offers state-of-the-art therapies including insulin pumps and continuous glucose monitoring systems. The diabetes patient education program is American Diabetes Association (ADA) recognized, and the faculty have received NCQA/ADA provider recognition. Comprehensive diabetes services are available. The team approach is emphasized using four diabetes nurse CDEs, three dietitian CDEs, a physical therapist/exercise physiologist CDE, five nurse practitioners, three podiatrists, eight clinical adult endocrinologists (one is board certified in both adult and pediatric endocrinology), three additional pediatric endocrinologists and availability

of pediatric and adult psychologists, ophthalmologists, urologists, nephrologists, cardiologists, neurologists, surgeons and other subspecialties as needed.

This site is also the home of our interdisciplinary Thyroid Center of Excellence (with Nuclear Medicine, Surgery and Pathology) and Metabolic Bone Disease Center (with Nuclear Medicine, Radiology and Orthopedic Surgery). There is a DEXA bone mineral density machine and two thyroid ultrasound machines at the center. The Diabetes and Endocrine clinics at the Department of Veterans Affairs Medical Center are an additional rich training experience for our fellows. The attendings in these clinics are all faculty at SUNY Upstate Medical University. The VA Medical Center clinics offer experience working in a closed healthcare system with an EMR, electronic reminders and a controlled formulary.

Inpatient consultations in Diabetes, Endocrinology and Metabolism are primarily at the University Hospital of SUNY Upstate Medical University and the Department of Veterans Affairs Medical Center (2 minute walk from SUNY Upstate). There are also occasional consultations at Crouse Hospital, which is connected by a bridge to the University Hospital of SUNY Upstate Medical University (typically 0-1 new consult/month).

The Clinical Research Unit (CRU) in the Institute for Human Performance (IHP) at SUNY Upstate Medical University is directed by Dr. Arnold Moses (key faculty member). The Division of Endocrinology, Diabetes and Metabolism is the major user of the CRU. This specialized unit is dedicated to conducting clinical research funded by government, foundations or industry. The CRU staff includes five certified research nurses who are dedicated exclusively to conducting research and an experienced laboratory technician. The CRU contains nine private rooms for studies, a conference room, a laboratory for processing specimens, offices for the Endocrine research nurse and research assistants and office and research areas for investigators. The basic science laboratories for the Divisions (Drs. Holz, Roe and Leech) are located on the upper floors of this IHP building.

1.8.2 Ambulatory Care

Since most endocrine care is delivered in an ambulatory setting, the ambulatory experience is emphasized throughout the entire duration of the program.

Educational Purpose: To learn about a variety of diseases of endocrinology and metabolism, through consultation and provision of continuing care.

Teaching Methods: Ambulatory care is both consultative and continuing. For each interaction, the trainee will spend sufficient time with the patient to carry out an appropriate history and physical examination and then to interact with and be directly supervised by the endocrine faculty assigned to that ambulatory activity. The learning experience surrounding a patient interaction evolves from review of history, physical examination and laboratory results with the faculty, taking direction from the faculty and being provided with references or other learning materials that can be used for self-instruction and subsequent review with the faculty.

Practice Setting: Continuity Clinic

Location of clinic: Joslin Diabetes Center, University Endocrinologists and Osteoporosis Center
Number of fellows/session: 1-3
Number of fellows/faculty: 1-2
Number of exam rooms/fellow: 2

Number of patients/fellow/session:	New patients: 1 hour slots Follow-up patients: 30 minute slots Usually 0-1 new and 4-6 follow-ups

Allied health professionals in clinic

Podiatrists:	5 sessions/week
Nurse Educator (RN, CDEs):	3
Certified Diabetes Educator (PT/exercise):	1
Dietitian CDEs:	3
Medical Office Assistants (including LPNs):	9

Frequency of Clinic

Number of sessions/week:	First year fellows have 2 clinics/week; second year fellows have 4-6 clinics/week
Duration through training:	Continuous

Practice Setting: Other Ambulatory Clinics

Location of Clinic:	Department of Veterans Affairs
Number of fellows/session:	2
Number of fellows/faculty:	1
Number of exam rooms/fellow:	1
Number of patients/fellow/session:	4-6

Allied Health Professionals in Clinic

Nurse (RN or LPN):	2
Nurse Practitioner CDE:	1
Certified Diabetes Nurse Educator:	1
Nutritionist:	1
Podiatrist:	1

Frequency of Clinic

Average number of sessions/week:	Diabetes Clinic 1/week; Endocrine Clinic 1/week
Duration through training:	Year 1

Disease Mix and Patient Characteristics: Patients are 21 years of age or older including adequate representation of geriatric patients. The distribution of ages and sex in our clinics approximates their distribution among the general population with endocrine disease. At least 25% of all patients will be either gender. Trainees care for patients with a wide range of clinical problems in stages of illness appropriate to the ambulatory setting.

A unique feature of our program is that our pediatric endocrinologists work side-by-side with our adult endocrinologists, sharing the same ambulatory care facility (Joslin Diabetes Center/University Endocrinologists and Osteoporosis Center). This facilitates experience in pediatric endocrinology.

In addition to clinics in which the trainee encounters the broad range of endocrine pathology, rotations through disease-specific clinics are an integral part of the training program. These topics are routinely covered in conferences, discussions, journal club and other didactic sessions.

However, additional clinical rotations are also available during the second year of the fellows' training. These clinical opportunities are either required or elective and include:

	Required	Elective
Pediatric endocrine	☒	☐
Reproductive endocrine	☒	☐
Nuclear Medicine	☐	☒
Perinatal Center (High Risk OB)	☒	☐
Ultrasound-guided thyroid FNA clinic	☒	☐
Thyroid cancer clinic	☒	☐

Procedures and Services: Dynamic endocrine studies and fine needle aspiration biopsy of the thyroid will be taught and performed by the trainees in the ambulatory setting. Appropriate laboratory testing, including imaging, will be ordered and results reviewed as part of the doctor/patient/attending interaction. Cytological and pathological material will be reviewed and analyzed when appropriate. Second year fellows attend the weekly ultrasound/FNA clinic, where they perform ultrasound guide FNA's under the direct supervision of our faculty.

Reading Lists and Educational Resources: These are listed below under the disease specific sections of the curriculum. In addition, fellows are encouraged and expected to perform Medline searches and obtain relevant recent literature as appropriate.

Evaluation: Evaluation and feedback is an ongoing process by virtue of the close mentoring relationship between fellows and the faculty in our program. Our division evaluates the six (6) competencies promoted by the ACGME and the ABIM. These include: Patient Care, Medical Knowledge, Practice-Based Learning Improvements, Interpersonal and Communication Skills, Professionalism, and Systems-Based Learning. See section on evaluation, below.

Trainees follow their continuity clinic/ambulatory patients for the duration of the program. By means of the ambulatory experience provided in this program, the trainee has the opportunity to observe and learn the course of endocrine diseases and their treatments.

1.8.3 In-patient Care

Since endocrine specialists are frequently required to consult on and manage endocrine aspects of care in hospitalized patients, the training program also emphasizes training in the inpatient setting.

Educational Purpose: To learn about a variety of diseases of endocrinology and metabolism as they occur in the hospitalized patient.

Teaching Methods: Hospital care is both consultative and continuing. For each interaction, the trainee will spend sufficient time with the patient to carry out an appropriate history and physical examination and then to interact with and be directly supervised by the endocrine faculty assigned to that activity. The learning experience surrounding a patient interaction evolves from review of history, physical examination and laboratory results with the faculty, taking direction from the faculty and being provided with references or other learning materials that can be used for self-instruction and subsequent review with the faculty. Consultation is frequently requested to determine the impact of endocrine disease on coexisting illnesses that necessitated hospitalization. The trainee will also learn, under supervision, how to interact not only with the patient and family, but also with other physicians caring for the patient.

Practice Setting: In-patient consultative service

Number of consults/week	The consult service follows, on average, 6-10 patients/day and receives 10-14 new consults/week
Number of fellows/team	2
Are students/residents included in the team	Yes
Average duration of rounds (hours)	2-4
Duration of rotation (weeks)	Weekdays Year 1 and every 4th weekend

Disease Mix and Patient Characteristics: On request, trainees provide consultation to the Internal Medicine service and other departments such as surgery, vascular surgery, obstetrics and gynecology, psychiatry, ophthalmology, neurosurgery, orthopedic surgery, etc. Patients will have a variety of diseases that impact on the endocrine system, diseases of other systems with coexisting endocrine disease, or manifestations of primary endocrine disease such as diabetes mellitus, thyroid or parathyroid disease that warrant hospitalization. Patients will be adults of all ages, including the geriatric age group and both sexes. Sex and age of patients will parallel their distribution among the variety of endocrine disease that occurs in hospitalized patients. The severity of illness will be much greater than in the ambulatory setting.

Procedures and Services: Trainees will coordinate the evaluation and management of the endocrine aspects of the patient's illness. After interaction with the endocrine-attending physician, the trainee will order appropriate laboratory tests, biopsies, imaging and infusion studies, as dictated by the patient's problem. Data will be reviewed and treatment recommended.

Reading Lists and Educational Resources: These are listed below under the disease specific sections of the curriculum. Fellows are expected to perform Medline searches and review relevant recent literature as indicated.

Evaluation:

Trainees evaluate patients by history, physical examination, and review of available laboratory and other data. The trainee is encouraged to formulate a differential diagnosis, plan for further evaluation and management. These are reviewed with faculty assigned to teaching rounds and faculty assigned in the ambulatory setting. Learning occurs by an iterative process through continuing interaction with faculty, review of pertinent literature and further discussion as new data emerges or changes in the patient's condition occurs as a consequence of recommended treatment.

Experience in the inpatient setting will include preparation of appropriate patients with endocrine disease for surgery as well as postoperative management, radiation therapy and/or treatment with iodine-I-131. Interaction with professionals from other departments is reviewed and evaluated. In-patients who have surgery or biopsy, pathology and cytology are reviewed with appropriate specialists in those departments.

See section 1.11 on evaluation, below.

1.9 Facilities and Resources

The program has full-time secretarial support, which facilitates scheduling, arranging consultations, preparing conference schedules and referrals. Fellows have office space that contains computer facilities that can be used for email and internet services, including literature searches. The faculty regularly receive a number of journals and books, all of which are available to the trainee. Trainees are encouraged to participate in local and national endocrine meetings. In general, each trainee attends one national meeting per year.

1.9.1 Teaching Site(s)

Primary ambulatory site: Joslin Diabetes Center, University Endocrinologists and Osteoporosis Center at SUNY Upstate Medical University

Additional ambulatory site: Department of Veterans Affairs Medical Center, Syracuse

Primary inpatient site: University Hospital at SUNY Upstate Medical University

Additional inpatient site: Department of Veterans Affairs Medical Center, Syracuse
Crouse Hospital, Syracuse

1.9.2 Clinical Rotations

First year fellow have two continuity clinics/week at the Joslin Diabetes Center University Endocrinologists and Osteoporosis Center and work at the Department of Veterans Affairs Diabetes Clinic and Endocrine Clinic (2 sessions/week).

Second year fellows work at the Joslin Diabetes Center University Endocrinologists and Osteoporosis Center (4-6 sessions/week) and do their rotations on pediatric endocrine, reproductive endocrine, high risk obstetrics clinic, thyroid cancer clinic and ultrasound-guided/FNA clinic.

Inpatient consultations are performed by first year fellows during the week. The four fellows share this responsibility on weekends (1 weekend/month/fellow).

1.9.3 Additional Facilities and Resources

Our hospital has modern facilities and services, including in-patient, ambulatory care and laboratory resources and these are readily available to all trainees. In addition, complete biochemistry laboratories and hormone assays are available 24 hours per day. The Joslin Center has its own DEXA machine and our endocrine faculty train fellows on bone mineral density (BMD) interpretations. The Joslin Center also has two ultrasound machines used for ultrasound-guided FNAs. Cytologic interpretation of thyroid aspirations are available on site and fellows review these specimens with the Department of Pathology staff. The hospital has facilities for karyotyping. The Department of Radiology provides MRI, CT, ultrasound, and radiologic imaging services that can conduct studies for all types of endocrine diseases including inferior petrosal sinus and adrenal vein sampling. The hospital supports a dietary/nutritional service, and there are three dietitians at our Joslin Center. There is a fully staffed surgical pathology laboratory

for the interpretation of surgical and cytologic specimens, including immunohistologic studies. Nuclear Medicine provides all routine radionuclide imaging methods including radio-iodine thyroid scanning and ablation, adrenal and parathyroid scanning as well as MIBG and technicium pyrophosphate bone scans. Podiatric Medicine provides care to all patients at the university hospital on an as-needed basis, and Podiatrists are on site at our Joslin Center 5 sessions/week, and are on site at the V.A. Diabetes Clinic.

1.9.4 Core Conferences

Endocrinology, Diabetes and Metabolism Case Conference

Educational Purpose: To discuss a variety of diseases of endocrinology and metabolism in greater depth than at the bedside or the ambulatory care setting. Correlation with endocrine biochemistry, physiology and pathophysiology is expected.

Teaching Method: This weekly case conference reviews the diagnosis, evaluation and management of disorders in Endocrinology, Diabetes and Metabolism over the course of the year. This conference is offered for CME credit, and is attended by our faculty (adult and pediatric endocrinologists), including voluntary faculty, fellows, housestaff and students. Guest speakers are periodically invited. A list of topics, speakers and participants is kept by the Program Director as well as the Office of Continuing Medical Education. The first Thursday of each month is a thyroid conference. Faculty from Pathology/Cytology routinely review thyroid aspiration biopsies and when available, surgical pathological specimens. Faculty and trainees from Nuclear Medicine and Surgery also regularly attend via teleconferencing. The second Thursday of the month is a general endocrinology (adult and pediatric) case conference. The case conference on the third Thursday of the month concentrates on disorders of mineral metabolism and metabolic bone diseases. The fourth Thursday of the month is the Diabetes; Metabolism and Lipid Disorders case conference. Members of the Joslin team, (nurse educators, dietitians, exercise physiologist, etc.) attend. The fifth (quarterly) Thursday of the month is a Pituitary Disease case conference. There is also a Morbidity and Mortality case conference held quarterly. Fellows routinely help plan and conduct these conferences. A fellow usually presents at least one case and reviews one relevant Journal article at each conference.

Procedures and Services: Appropriate use of biochemical testing, imaging and biopsy as well as review of above studies, cytology and pathology are routinely incorporated in the conference.

Reading Lists and Educational Resources: May be prepared for selected conferences. More detailed lists and resources are provided below in the sections on specific groups of endocrine diseases. Fellows are expected to refer to relevant current literature during their presentations.

Evaluation: Trainees who give conferences are evaluated by attending physicians (see Conference Evaluation Form). Their performance in this venue is also part of their overall evaluation by attending physicians and the program director. See section on evaluation, below.

Additional Clinical Conferences:

1) Metabolic Bone Disease Conference: In this conference, disorders of bone and mineral metabolism are reviewed, with pertinent review of the medical literature and discussions by faculty and fellows from Endocrinology (adult and pediatric), Nuclear Medicine, Radiology, Orthopedic Surgery, Pathology, Physical Medicine and General Medicine. Invited speakers from other institutions are periodically invited. This conference meets the first Friday of each month at 8:15 a.m. and is offered for CME credit. A list of topics and participants is kept by the Office of Continuing Medical Education. Fellows routinely help conduct this conference.
2) Teaching Session with Dr. Arnold Moses and Dr. Jennifer Kelly: The attendees are the endocrine fellows, and medical residents and students on the Endocrine elective. At these sessions, which take place 3 times/month, 1 or 2 recent publications on calcium disorders, metabolic bone diseases or water and electrolyte metabolism are reviewed and discussed. These discussions usually relate to patients who are currently in the hospital or being followed as outpatients at the Joslin Center.
3) Reproductive Endocrinology Conference: This weekly conference is organized by Dr. S. Badawy (Professor, OB/GYN and Director, Division of Reproductive Endocrinology and Infertility). Cases seen in the Infertility Clinic are discussed, and there are periodic didactic sessions. Fellows will be expected to attend this conference during their rotation through this clinic during their second year.
4) Endocrinology Core Curriculum and Board Review Teaching Series: Weekly teaching session with the fellows and a faculty member cover all required clinical topics in Endocrinology, Diabetes and Metabolism (listed in the curriculum) over the course of the year and assists in preparation for the Endocrinology Boards. Each session ends with discussion and review of relevant board review questions.
5) Joslin Diabetes Center Team (Staff) Meeting: Fellows are encouraged to attend this monthly meeting in which practice management issues, program, quality improvement, patient satisfaction and staff issues are discussed.
6) Additional: All fellows annually attend at least one national forum/workshop sponsored by the Endocrine Fellows Foundation, the Endocrine Society, the American Diabetes Association or the American Association of Clinical Endocrinologists for further training in all major areas of endocrinology, diabetes and metabolism. All second year fellows attend the American College of Endocrinology (ACE) Endocrine University: Technology for Endocrinology Fellows-in-Training (6 day program) at the Mayo Clinic in Rochester, MN. In addition, fellows attend regional and national meetings in which their research is being presented.

Journal Club

Educational Purpose: To expose trainees, on a continuing basis, to critical reading of the emerging endocrine literature. Participation in Journal Club also provides instruction in clinical epidemiology, in biostatistics and in clinical decision theory.

Teaching Method: Trainees will be expected to present analyses of assigned papers in the current literature or of papers of their own selection. Their presentation will include analysis of experimental groups and design, methodology of measurements, and of statistical analysis. Others, including faculty, will interact with the trainee.

Disease Mix: Literature relating to all endocrine disease will be discussed during the training program.

Procedures and Services: As research concerning endocrine procedures or services is published, those papers may come under discussion in Journal Club.

Evaluation: Trainee's performance in this venue will be part of their evaluation by the faculty. In turn, trainees will evaluate faculty as facilitators of the Journal Club and as participants.

Journal Clubs are scheduled at 3-4 times/month at the primary training site.

Research Conferences

Educational Purpose: To acquaint trainees with the status of current research carried out by the faculty, other trainees, members of other Divisions within the Department of Medicine, or other Departments in the institution. Trainees will participate in the critique of the presentation and be exposed to the interactive discussions of the participants.

Teaching Method: Interactive discussion of presented research among experts on topics of basic and clinical science of endocrinology and metabolism, including experimental design, methodology, statistical analysis and interpretation of data. In addition, those fellows actively participating in either basic or clinical research will present their research project to the division at least annually.

Disease Mix: Research may be presented that relates to any and all endocrine disease.

Procedures and Services: Not applicable.

Research Conferences are scheduled at monthly intervals within the Division of Endocrinology and Metabolism, and occur at least weekly intervals for other Divisions and Departments within the institution. Those schedules are posted and trainees are encouraged to attend, as their time allows. They must attend Research Conferences at least monthly intervals.

Basic Science Conferences

Educational Purpose: To instruct trainees in the basic biochemistry, physiology and pathophysiology of the endocrine system. At a minimum, subject areas will include molecular biology and immunology as they relate to endocrinology and metabolism, signal transduction pathways, biology hormone receptors and principles of hormone action, biology of sexual development, reproductive endocrinology, endocrine aspects of sexual dysfunction, and feedback systems.

Teaching Methods: Monthly teaching sessions are led by Dr. George Holz or Dr. Michael Roe. Trainees are given materials for self-instruction in the subject area of the Basic Science Conference. The conference is usually in a seminar format with as much interaction between trainees and faculty as possible.

Disease Mix: Not relevant.

Procedures and Services: Not relevant.

Evaluation: The faculty will evaluate trainee preparedness and interaction. In turn, trainees will evaluate the effectiveness of the faculty.

Basic Science Conferences are held on a monthly basis. In addition, many other basic science conferences take place within our institution, almost on a daily basis both in

basic science and clinical departments. Their schedules are posted and trainees are encouraged to attend, as their time allows.

1.9.5 Procedures

Trainees will obtain a comprehensive understanding of indications, contraindications, limitations, techniques, complications and interpretations of procedures that are required for diagnosis and management of patients with disorders of endocrinology and metabolism. This understanding includes informing the patient about the above aspects of specific procedures and obtaining informed consent. Procedures will be taught and then supervised by faculty in various patient care settings, described above. Trainees will maintain logbooks that list each procedure and copies will be maintained in the program director's files. Each entry includes name of patients, identifying numbers, clinical problem, procedure, indication of complications, results of test. The program director will determine, on the basis of faculty input and analysis of logbook entrees, when the trainee has achieved proficiency in a specific procedure. For fine needle aspiration biopsy of the thyroid, the supervising faculty will determine when the fellow is proficient or whether they require further training and experience.

All procedures are carried out in accord with universal precautions and protection of health-care workers, as defined by Occupational Safety and Health Administration (OSHA). Trainees, along with all other health care personnel at this institution, must participate in annual training sessions(s) on precautions for health-care workers, as detailed by OSHA.

The specific procedures that will be learned in this training program will be detailed in the disease-specific sections of this curriculum.

1.9.6 Other Competencies

Trainees who do not have appropriate computer skills to enable them to search the literature electronically, participate in computer-assisted instruction and use electronic information networks will be taught those skills.

Issues concerning quality assessment, quality improvement, risk management and cost-effectiveness are discussed in all clinical and laboratory settings throughout this program.

Each fellow is required to complete a quality improvement project which is approved and reviewed with the Program Director. A summary of this project is placed in each fellow's portfolio. Each fellow also completes chart audits quarterly (and has their charts audited quarterly) for diabetes performance measures and compliance with JCAHO requirements. These results are reviewed with each fellow and placed in their portfolio.

Similarly, ethics and professionalism are considered in all patient interactions and may be supplemented by exercises in *Project Professionalism*, published by the American Board of Internal Medicine. As indicated above, each trainee will be given a copy of this publication and expected to carry out their daily activities in accord with the highest professional standards. Ethics issues are also discussed in case conferences.

Additional training experiences are encouraged in clinical pathology. For those trainees who may, in future activities, direct a clinical laboratory, twenty hours of supervised training in the indications, performance, and evaluation of results of endocrine testing are suggested.

Patient education, counseling and end-of-life care will be taught by example when appropriate in specific interactions with patients and their families. Other issues that concern palliative care for terminally ill patients are discussed when appropriate. Two available resources may be used as supplementary teaching materials, if deemed necessary by the program director. These are the publications: (1) Care of the Dying and Promotion of Physician Competency- Educational Resource and Personal Narratives, published by the American Board of Internal Medicine (www.ABIM.org), and (2) EPEC (Education for Physicians on End-of-life Care), published jointly by the Robert Wood Johnson Foundation and the American Medical Association (www.ama-assn.org/ethic/epec). Additional relevant conferences addressing these issues are offered in our institution, and fellows are encouraged to attend.

1.10 Research and Other Scholarly Activities

Trainees in this program are expected to carry out research and participate in other scholarly activity. During the first year, trainees are expected to learn about the research interests of the faculty members, by attending Research Seminars, Journal Clubs, or by direct interaction initiated by the faculty, trainee or program director. In general, trainees should reach an agreement to carry out research with a specific faculty member by the middle of the first year of the program. This allows the trainee to learn the literature concerning the research area and begin, by repeated interaction with the faculty mentor, to formulate an experimental design. Thus, within 6-9 months, the trainee is ready to move into the research arena without delay. In our program, the allotment of time dedicated to research varies over the course of a training year as well as between years of training. In general, the annualized percentage effort for research is:

Year 1	10-20%
Year 2	50-80%

The research experience in our training program is based on a mentor: trainee relationship that is meaningful, interactive at frequent intervals, and that leads to formulation of the research problem, determination of appropriate experimental design, use of appropriate research methodology, analysis of data, interpretation of results and, eventually, publication in peer-reviewed journals. In our program, almost all trainees publish in peer-reviewed journals and present their work at national endocrine meetings. During their first year, fellows are taught clinical research design and methodology, ethical conducts of research, and laboratory techniques of molecular and cellular biology and interpretation of data (basic science and research conferences). They also learn basic statistics, IRB procedures (including informed consent) and the basis of radiation safety. In Journal Club, they learn to analyze scientific literature critically. All fellows are required to pass the CITI course and gain experience with clinical protocols on the Clinical Research Unit and are involved in clinical trials. Lectures on clinical research include study design and statistics are required. Fellows are encouraged to attend (and pass the final examination in) The Introduction to the Principles and Practice of Clinical

Research (NIH) course and become certified. This course is available via teleconference through the College of Medicine.

In addition to basic and clinical research, trainees will present at Clinical Conferences, Journal Club, and, Research Seminars. They are encouraged to write up and publish interesting cases that they encounter during their training. Finally, faculty is encouraged to ask trainees to participate in writing of invited Chapters or Reviews, with appropriate authorship designation.

1.11 Evaluation

Evaluation in this program is an ongoing process and occurs in a 360° manner. During clinical rotations, the attending of the month is the principal evaluator of the trainee. Trainees are evaluated in all aspects of clinical activities and patient care, including attributes of professionalism. Evaluation forms developed by the American Board of Internal Medicine are employed for this evaluation and the attending and trainee are expected to discuss the evaluation before the end of the month, and before the evaluation form is electronically entered into e-value. E-value is available electronically to the Program Director and the trainee. Trainees are required to keep their own record of procedures, indicating who supervised the procedure and copies of the procedure logbook or equivalent documents are provided to the program director for the trainee's file annually. Clinical evaluations are conducted by supervising attendings and research mentors. 360 degree evaluations are also performed by Joslin staff including nurse educators and dietitians and VA nurse educators. Attendings also evaluate conference presentations (forms attached). Dr. Kelly completes the mini CEX with each fellow twice a year. At semiannual intervals, the program director will prepare a written summary of the evaluations for each trainee and those will be discussed in person with the trainee.

At annual intervals, a summary evaluation will be prepared by the program director, documenting the degree to which the trainee has mastered each component of clinical competence. Trainees will be advanced to a position of greater responsibility after they have demonstrated satisfactory scholarship and professional growth. A written policy of to ensure due process has been developed by the Department of Medicine and is used by all Subspecialty Divisions in our institution. A formal, in-service examination (from the Endocrine Society) is administered annually to help determine the trainee's base of factual knowledge and ability to make decisions concerning patient care. Two additional self-learning programs and examinations are available at this time. One is the Endocrine Self Assessment Program (ESAP), published by the Endocrine Society and Up-To-Date, and the other is the American Association of Clinical Endocrinologists Self-Assessment Program (ESAP), published by the American Association of Clinical Endocrinologists.

To complete the circle of evaluation, trainees will evaluate the faculty members who serve as their Attending and enter those evaluations, using forms developed by the American Board of Internal Medicine, into e-value. Trainees, at annual intervals, also evaluate the program as a whole, using American Board of Internal Medicine forms. One faculty meeting each year, during the spring, will be devoted, in part, to a review of these evaluations of the faculty and the program. The focus of this meeting will be to review

the educational effectiveness of the curriculum. Plans to improve those parts of the program that may not be optimal will be developed at these meetings.

Counseling and Remediation: In the unlikely event that a trainee requires remediation in one or more areas that impact on clinical competence, the program director will appoint an ad hoc committee of faculty to develop a plan of remediation, implement the plan and evaluate the trainee's response. If a faculty member receives poor evaluations as an attending physician, those evaluations and plans for improving performance will be discussed in a meeting with the program director.

The research mentor, using forms developed by the American Board of Internal Medicine, will evaluate the research performance of each trainee. Those evaluations will be discussed with the trainee and then forwarded to the program director for review and inclusion in the trainee's portfolio.

Evaluation of the graduates will be done by a mailing at one year after completion of training and every five years, thereafter. The evaluation will employ a survey instrument that asks the graduates' perception of the program's relevance to their current activities, suggestions for improvement and ideas for additions and/or changes to the curriculum.

All fellows maintain a portfolio which contains:

Two Mini-CEX Evaluations (Per Year)
Description of Research Project
Description of Quality Improvement Project
Lists of Presentations
Evaluations of Presentations
Lists of Publications
Two Copies of Inpatient Consults (Per Year)
Two Copies of Outpatient Consults (Per Year)
Two Copies of Inpatient Follow-ups (Per Year)
Two Copies of Outpatient Follow-ups (Per Year)
Chart Audit Results (Quarterly)
Description of Plans/Suggestions for Identified Areas in Systems Based Practice Needing Improvement
Program Director Semi-Annual Evaluation Meetings
Continuity Clinic Evaluations
Research Mentor Evaluation
List of National Meetings Attended
Scholarly Activities (Quarterly)
Self-Assessments

Evaluation Summary

General Competencies	Teaching	Evaluation Tools
Patient Care	Direct supervision of patient care in ambulatory and inpatient settings	Faculty evaluation Mini CEX Portfolio review
Medical Knowledge	Clinical settings (during 1:1 supervision in ambulatory setting and Rounds on inpatient consultation service) Conferences, lectures, Journal Clubs Directed readings	Faculty Evaluation MiniCEX Annual In-Training exams Evaluations of presentations at conferences
Interpersonal and Communication Skills	Didactic teaching sessions Feedback during supervision of clinical encounters Conferences	Review of Portfolio Faculty Evaluations MiniCEX 360 Evaluation
Professionalism	Ethics and CITI Courses Conflict of Interest Instruction Conferences	Faculty Evaluation 360 Evaluation
Practice Based Learning	CITI Course Team Meetings with staff and Program Director Journal Club Chart audits for diabetes patient charts/quarter for adherence to performance measures and JCAHO requirements	Faculty Evaluations Review of Chart Audits by Program Director Portfolio Review
Systems Based Learning	Faculty member mentors fellow in an area that needs improvement and fellow describes plans/suggestions for improvements in these areas (i.e. improved format/algorithms for insulin orders in the hospital). Each fellow provides a description of these activities for their portfolio which is reviewed by the Program Director. Conferences and Lectures	Program Director review of quality improvement project Faculty evaluations Portfolio review

Section 2
Disorders of the Adrenal Cortex and Medulla

1. Introduction

A. Background

A complete understanding of the diseases affecting the adrenal gland is essential for the endocrinologist. Adrenal pathophysiology includes numerous life-threatening conditions ranging from electrolyte disturbances, alterations in blood pressure, and malignancy. Indeed, it is essential that the endocrinologist accurately recognize and promptly manage the patient with adrenal disease.

B. Goals and Objectives

Our major goal is to ensure an appropriate knowledge base for this area, including an understanding of the hormonal and neurolgical regulation of electrolytes and blood pressure, the biosynthesis of steroid hormones and their target tissues/actions, the genetic basis for inherited diseases of the adrenal gland, recognition of adrenal cortical hyper- and hypo-function as well as adrenal medullary hyperfunction, static and dynamic tests of adrenal gland function, adrenal imaging techniques and management of adrenal dysfunction. Many diseases affecting the adrenal gland are common, such as the incidental adrenal mass, primary aldosteronism, and ACTH suppression from exogenous steroid therapy. These will be routinely encountered in most clinical training settings. In contrast, conditions such as a pheochromocytoma are more rare. As noted, however, the latter condition represents an extremely critical medical diagnosis.

C. Training and Evaluation

The training program provides opportunities for the endocrine fellow to develop competence in the clinical evaluation and management of patients with adrenal cortical and adrenal medullary disorders. This clinical experience includes opportunities to diagnose and manage adult outpatients and inpatients of both sexes. The fellow is given opportunities throughout the training period to assume responsibility for and follow patients, with increasing level of responsibility to reflect his or her year of training. In addition, the fellow is given the opportunity to observe the evolution and natural history of these disorders, as well as the efficacy of therapy. Appropriate training in adrenal disease will reflect a combination of both hands-on clinical encounters and an array of additional learning experiences including both formal teaching and self-directed methods. Evaluation will be consistent with those as dictated by the core competencies. Specifically, it will include discussions with faculty on a continuing basis and clinical presentations. In addition, standardized in-training exams are required and self-learning testing, such as ESAP are strongly encouraged.

2 Program Content

A. Physiology

The endocrine trainee must have a basic understanding of the normal physiology of the adrenal cortex and medulla. This knowledge base must include:

(1) adrenal gland embryology, anatomy, and zonation

(2) adrenal steroid pathways of biosynthesis, specific enzymatic steps, and steroid hormone structures

(3) steroid metabolism
(4) hypothalamic-pituitary-adrenal axis and normal patterns of ACTH and cortisol secretion
(5) regulation of adrenal glucocorticoid, androgen, and estrogen secretion
(6) factors affecting measured levels of steroids in plasma and urine
(7) molecular and cellular mechanisms as well as physiologic effects of glucocorticoids, mineralocorticoids, androgens, and estrogens
(8) renin-angiotensin-aldosterone system and regulation of mineralocorticoid secretion
(9) catecholamine biosynthetic pathway, physiological effects of catecholamines, excretion of catecholamines and catecholamine metabolites.

The method of education for adrenal physiology should include formal instruction and reading the chapters covering adrenal cortex and adrenal medulla from one of the major endocrine textbooks [see reading list] and other resources, becoming progressively more complex as the fellow proceeds through each year of training.

B. Evaluation and Management of Adrenal Disorders

The evaluation and management of the adrenal disorders should be mastered in a progressive fashion for each year of training. For each disorder listed, the trainee must have a thorough knowledge of:

(1) clinical presentation
(2) pathophysiology
(3) physical examination findings
(4) differential diagnosis
(5) laboratory findings
(6) typical imaging findings
(7) clinical management

Common adrenal disorders include, Cushings syndrome and disease (adrenal, pituitary, ectopic, and iatrogenic), adrenal insufficiency (pimary, including polyglandular, secondary, adrenal crisis and glucocorticoid theraphy), non-functioning adrenal mass (benign and malignant), hirsutism and virilization.

The primary methods of education for these disorders will be direct clinical experiences and clinical case discussions and teaching conferences. These case discussions would usually take place on hospital rounds or in the outpatient endocrine clinic setting. The training program provides and documents a breadth of adrenal topics in clinical case conferences. The knowledge base should be enhanced with reading appropriate sections of an endocrine textbook, suggested supplemental articles, review of clinical practice guidelines from the Endocrine Society and Medline searches (see reading list).

C. Rare Causes of Adrenal Disorders

The fellow should also be familiar with rare causes of the adrenal disorders including those disorders of mineralocorticoid excess. In addition to primary aldosteronism, the

fellow should be familiar with the spectrum of causes from renin-dependent (eg, renovascular disease, coarctation of the aorta) to renin-independent (eg, 11-β-hydroxysteroid dehydrogenase deficiency, Liddle's syndrome, hypercortisolism, congenital adrenal hyperplasia). The trainee should be knowledgeable of the special features of Cushing's syndrome, adrenal insufficiency, aldosteronism, and pheochromocytoma in the hospitalized patient.

D. Adrenal Hyperplasia; 21-hydroxylase deficiency

The fellow must have a thorough knowledge of the clinical presentation, pathophysiology, differential diagnosis, laboratory findings, and clinical management of 21-hydroxylase deficiency and should be familiar with other forms of congenital adrenal hyperplasia.

E. Hypertension

With regard to hypertension, the fellow should know when to consider secondary (endocrine) causes of hypertension and how to manage essential hypertension in patients with endocrine disease (eg, diabetes mellitus).

F. Glucocorticoid Therapy

A thorough understanding of glucocorticoid therapy must be achieved.. This part of the curriculum must include:

(1) knowledge of the different glucocorticoid preparations (oral and parenteral)
(2) chronic maintenance glucocorticoid dosing
(3) inpatient and outpatient "stress" coverage dosing
(4) management of glucocorticoid withdrawal including evaluation of hypothalamic pituitary-adrenal axis function
(5) recognition of the manifestations of excessive and insufficient glucocorticoidtherapy.

G. Adrenal Studies and Procedures

The endocrine fellow must understand the indications for and the interpretation of all of the tests and procedures listed in the Tables below. In addition, the fellow should be able to personally conduct cosyntropin stimulation tests and dexamethasone suppression tests. The fellow should be proficient in identifying normal and abnormal adrenal glands on computerized imaging. Methods of education should include formal instruction, direct clinical experiences, clinical case discussions, and self-directed learning.

Dynamic Endocrine Tests

Cosyntropin stimulation test – 1 μg and 250 μg
Corticotropin-releasing hormone (oCRH)stimulation test
Dexamethasone suppression tests (DST)
oCRH/DST protocol
Insulin tolerance test
Saline suppression test for aldosterone
Clonidine suppression test for norepinephrine

Imaging and Radiology Procedures
Adrenal venous sampling for aldosterone
Inferior petrosal sinus sampling for ACTH with oCRH stimulation
Computerized adrenal imaging (CT, MRI)
CT-guided adrenal FNA biopsy
^{123}I-metaiodobenzylguanidine (MIBG) scintigraphy, where available
Indium In-111-labeled pentetreotide (OctreoScan®) scintigraphy
[6ß^{131}I]iodomethyl-19-norcholesterol (NP-59) scintigraphy

3. Reading List

Textbooks:

Post T, Narins RG, Rose DB. Clinical Physiology of Acid-Base and Electrolyte Disorders, 5th ed., McGraw-Hill, NY 2000.

DeGroot LJ, Jameson JL, eds. *Endocrinology*. 5th ed. Philadelphia, Pa: W.B. Saunders Co; 2006.

Felig P, Frohman LA, eds. *Endocrinology and Metabolism*, 4th ed. New York, NY: McGraw-Hill Professional, 2001

Becker KL, Bilezikian JP, Bremner WJ, Hung W, Kahn CR, Loriaux DL, Nylen ES, Rebar RW, Robertson GL, Wartofsky L, eds. *Principles and Practice of Endocrinology and Metabolism.* 3rd ed. Philadelphia, Pa: J.B. Lippincott Williams & Wilkins; 2001.

Wilson JD, Foster DW, Kronenberg HM, Reed Larson P, eds. *Williams Textbook of Endocrinology*. 11th ed. Philadelphia,Pa: W.B. Saunders Co; 2007.

Electronic Textbooks:

General endocrinology textbook: www.endotext.org

UpToDate in Endocrinology and Diabetes. Available on the library website www.upstate.edu/library

Clinical Practice Guidelines:

The Endocrine Society: http://www.endo-society.org/guidelines/current-clinical-practice-guidelines.cfm

The American Association of Clinical Endocrinologists: http://www.aace.com/pub/guidelines

Adrenal

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Cushings syndrome						
a) Adrenal	☒	☒	☒	☒	☒	☒
b) Pituitary	☒	☒	☒	☒	☒	☒
c) Ectopic	☒	☐	☒	☒	☒	☒
d) Iatrogenic	☒	☒	☒	☒	☒	☒
2. Adrenal Insufficiency						
a) Primary (including polyglandular)	☒	☒	☒	☒	☒	☒
b) Secondary	☒	☒	☒	☒	☒	☒
c) Adrenal crisis	☒	☒	☐	☒	☒	☒
d) Glucocorticoid therapy	☒	☒	☒	☒	☒	☒
3. Pheochromocytoma	☒	☒	☒	☒	☒	☒
4. Mineralocorticoid Excess						
a) Aldosteronism	☒	☐	☒	☐	☒	☒
5. Nonfunctioning Adrenal Mass (Including Incidentaloma)						
a) Benign	☒	☒	☒	☒	☒	☒
b) malignant	☒	☒	☒	☒	☒	☒
6. Hirsutism and Virilization	☒	☐	☒	☐	☒	☒
7. Congenital adrenal hyperplasia	☒	☐	☒	☐	☒	☒
8. Fluid and electrolytes						
a) Hypernatremia and hyponatremia	☒	☒	☒	☒	☒	☒
b) Hypokalemia and Hyperkalemia	☒	☒	☒	☒	☒	☒
c) Metabolic acidosis and alkalosis	☒	☒	☒	☒	☒	☒
9. Hypertension						
a) Primary (Essential)	☒	☒	☒	☒	☒	☒
b) Secondary (Endocrine)	☒	☒	☒	☒	☒	☒

Section 3
Disorders of Bone and Mineral Metabolism

1. Introduction

A. Background

A clear understanding of disorders of bone and mineral metabolism is a critical component of the fellowship training in Endocrinology, Diabetes, and Metabolism. Osteoporosis is a major public health problem and primary hyperparathyroidism is the third most endocrine disorder in this area of discipline. Given the widespread prevalence of osteoporosis and frequent nature of primary hyperparathyroidism, the endocrinology fellow needs to learn to work with the patient's primary care and other physicians in providing appropriate consultative and management advice in the care of patients with osteoporosis.

In addition to osteoporosis and primary hyperparathyroidism, the two most common bone & mineral disorders, a number of other disorders of bone and mineral metabolism are commonly referred to the practicing endocrinologist for evaluation and management. These include hypercalcemia of malignancy, Paget's disease, renal osteodystrophy and nephrolithiasis. The remainder of the disorders in this area, while less common, clearly require the knowledge and experience of an endocrinologist to accurately diagnose and manage. These include different varieties of hypoparathyroid states, other forms of hyper- and hypocalcemia, osteomalacia and rickets and their various forms, as well as disorders of other minerals (ie, magnesium and phosphorus), and developmental bone disorders such as osteogenesis imperfecta, fibrous dysplasia, various chondrodysplasias etc.

B. Goals & Objectives:

It is our intention that the fellow develops the required knowledge base and skills to manage patients with various disorders of bone and mineral metabolism.

- an understanding of the normal mineral homeostasis of calcium, phosphorus and magnesium and of the calcium regulating hormones: parathyroid hormone, calcitonin, and 1,25-dihydroxyvitamin D

- an understanding of the skeletal homoestasis including anatomy, structure, bone remodeling, and of the local and systemic hormones and factors that regulate skeletal homeostasis

- an understanding of the critical and close interrelationship between mineral and skeletal homeostasis.

The overall competencies that an endocrinology fellow needs to acquire in this area must begin with a solid understanding of the anatomy and biology of bone matrix and

cellular elements. S/he must also be well versed in the physiology of calcium, magnesium, and phosphorus homeostasis, and understand the biochemistry of the calcium-regulating hormones. With this as a background, the fellow must be competent in the clinical evaluation of bone and mineral disorders, including obtaining a relevant, comprehensive history and performing the relevant physical examination, as well as ordering and interpreting the appropriate laboratory tests in a cost-effective manner. The specific disorders and the management skills needed for each are described in the template and discussed further later. Clinical experience also includes opportunities to diagnose and manage patients of both sexes in both the inpatient and outpatient setting. The fellow must also learn to function as a consultant for other physicians in these disorders. To truly understand the evolution and natural history of bone and calcium disorders, as well as the effectiveness of therapeutic interventions, the educational program provides most of the experience in this area in our ambulatory care setting.

The overall training program facilitates the acquisition of these skills through a number of tools. These include, but are by no means limited to, didactic lectures, interactive computer programs, oral case presentation and discussion, and most importantly, direct and close supervision by the faculty of fellow evaluation and management of patients with as wide a spectrum as possible of bone and calcium disorders.

C. Training and Evaluation

Clear mechanisms are in place for the evaluation of the fellows and the provision of positive and negative feedback. Evaluation is in the form of faculty critiques of the fellow's performance, and In-Training examinations. Two self-assessment examinations are also available (ESAP and AACE). Feedback is provided both orally at the end of a specific rotation as well as using written (electronic) evaluations. In addition, fellows have an opportunity and a mechanism for providing feedback to the faculty regarding the quality of teaching and mentoring they receive.

2. Program Content

The following summarizes the key learning areas in disorders of bone and mineral metabolism for the clinical training program in Endocrinology and Metabolism.

1. Biology of Bone

The necessary basic background in this area should include a thorough understanding of the fundamentals of bone biology. Specifically, the fellow must know the macroscopic and microscopic structure of bone, the composition and mineralization of the bone matrix, and the fundamentals of bone remodeling and growth (ie, the processes of intramembranous and endochondral ossification). S/he should also have knowledge of the role and function of the principal cells involved in bone remodeling; osteoblasts, osteoclasts, and osteocytes. Finally, s/he should be familiar with the various systemic and local factors regulating bone development, modeling, and remodeling.

2. Physiology of Calcium, Magnesium, and Phosphorus Homeostasis

A basic understanding of mineral homeostasis should include knowledge of the factors regulating intestinal absorption, renal handling, and flux in and out of bone of these minerals. Included in this is the role of systemic hormones (PTH, calcitonin, 1,25-dihydroxyvitamin D, growth hormone, estrogen, glucocorticoids, and others) as well as dietary factors (intake of these minerals and other factors such as sodium intake). The fellow should also have an understanding of alterations in calcium and phosphorus homeostasis during physiological states such as puberty, pregnancy, lactation, and aging.

3. Molecular Biology, Biochemistry, and Mechanism of Action of Calcitropic Hormones

The fellow should have an understanding of the synthesis and secretion of PTH, its peripheral metabolism, and mechanism of action. S/he should have a knowledge of the role of the calcium-sensing receptor and vitamin D receptor in normal physiology and abnormal pathology. The fellow should understand the role of PTH-rP in malignancy and humoral hyperacalcemia of malignancy. S/he should understand the synthesis, metabolism, and action of vitamin D and its key metabolite, 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D. S/he should be aware of the potential normal skeletal and non-skeletal actions of PTH-rP and 1,25-dihydroxyvitamin D. Finally, s/he should have an understanding of the synthesis and secretion of calcitonin, as well as its action on bone.

4. Clinical Evaluation of Bone and Mineral Disorders

The fellow should learn to obtain a comprehensive but relevant history and perform the appropriate physical examination. This should include a detailed musculoskeletal examination, as well as other parts of a comprehensive examination (eg, breast, gonadal and other relevant examination) when appropriate.

5. Laboratory Methods

The fellow should understand the methods, strengths, and limitations of various measurements s/he will be requesting. S/he should understand issues of assay accuracy, variability (inter and intra assay, individual and biologic) and detection limits. S/he should be able to integrate a number of test results and recognize specific patterns of test abnormalities associated with various disease states.

The fellow should have knowledge of abnormalities in protein binding that might affect serum calcium measurements, as well as possible artifacts/physiological alterations in serum phosphorus and magnesium determinations. S/he should understand issues involved in collection and interpretation of ionized calcium and urinary calcium measurements. S/he should have a full understanding of PTH assays, correct interpretation of the assay result in light of ambient serum calcium concentration including the effects of changes in renal function on the assay. Similarly, s/he should have knowledge of calcitonin assays, as well as the role of stimulated serum calcitonin

measurement in the diagnosis of C-cell hyperplasia and medullary thyroid carcinoma. The fellow should have an understanding of when a PTH-rP level may be useful in the evaluation of the patient. S/he should have a knowledge of assays for 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D, and understand the clinical situations warranting either 25-hydroxyvitamin D measurement (ie, in the evaluation of vitamin D depletion or intoxication) or the 1,25-dihydroxyvitamin D measurement (as in the evaluation of granulomatous hypercalcemia or hypophosphatemic ricets and osteomalacia). The fellow should also understand gonadal steroid and other hormonal measurements as they relate to the evaluation of disorders of bone and mineral metabolism.

The availability of biochemical markers of bone turnover has added another tool for the evaluation of osteoporosis and other metabolic bone diseases. The fellow should have a working knowledge of markers of bone formation and resorption, and their indicated uses.

Finally, the fellow should have knowledge of molecular diagnostics, particularly as they apply to disorders of bone and mineral metabolism. This includes understanding the different techniques of molecular diagnostics (ie, mutation identification using single-strand conformational polymorphism, direct DNA sequencing, restriction endonuclease analysis, etc.). While it is acknowledged that the general applicability of these techniques at present is principally for the diagnosis and management of Multiple Eendocrine Neoplasia syndromes, clearly they will be increasingly used in the future in the evaluation of other bone and mineral disorders.

6 Imaging Techniques/Other Procedures

The training program has a close working relationship with radiologists who can provide expert interpretation of bone radiographs of adults and children. The fellow should develop the fundamental skills to recognize the typical radiographic appearances of at least common metabolic bone disorders (ie, osteoporosis, hyperparathyroidism (both primary and uremic secondary), rickets and osteomalacia, Paget's disease of bone, etc.). Similarly, s/he should have an understanding of bone scintigraphy and its appropriate use.

Understanding various bone mass measurement techniques is a critical component in the evaluation of osteoporosis. The fellow should have knowledge of the technical aspects of Dual Energy X-ray Absorptiometry (DEXA) measurements, and understand issues of quality control, precision, and interpretation of DEXA measurements, both in terms of diagnosing osteopenia and osteoporosis, as well as in interpreting longitudinal changes. S/he should understand the use of DEXA for assessment of body composition. S/he should also be familiar with other available technologies, such as quantitative CT, ultrasound, and digital radiography.

The fellow should, acquire the skills to interpret bone biopsies. Bone histomorphometry is useful in the evaluation of difficult metabolic bone diseases, and still remains instrumental for the definitive diagnosis of osteomalacia and renal osteodystrophy.

The fellow should learn the fundamentals of parathyroid imaging (scan and ultrasound), including the appropriate use of these tests in the evaluation of patients with hyperparathyroidism (primary or uremic secondary). S/he should also learn the appropriate use of CT and MR imaging in the evaluation of patients with persistent or

recurrent hyperparathyroidism. Finally, the fellow should acquire sufficient working knowledge in interpreting various imaging techniques in the evaluation of patients with kidney stones such as plain x-rays with and without tomography, intravenous pyelography, CT and ultrasound.

7 Postmenopausal and Age-Related Osteoporosis

Post menopausal and age-related osteoporosis is by far the most common bone and mineral disorders and likely the most common reason for referral to an endocrinologist or bone and mineral specialist. Therefore, the fellow should have a thorough understanding of the epidemiology and current concepts in the pathogenesis of both postmenopausal and age-related osteoporosis. The fellow should be familiar with the impact of physical activity and nutrition (in particular, calcium and vitamin D) on bone mass and fractures and of factors such as medications, impaired vision, and propensity to fall on fracture risk. S/he should be sufficiently knowledgeable to advise the patient on appropriate prevention measures, and learn to manage the woman going through menopausal transition. S/he should be well versed in the diagnostic evaluation of osteoporosis, including the correct interpretation of bone density data within the clinical context of the particular patient.

S/he should be able to exclude secondary causes for osteoporosis, including primary and secondary hyperparathyroidism, prolonged and severe vitamin D depletion, exogenous and endogenous glucocorticoid excess, hyperthyroidism, transplant bone disease, osteogenesis imperfecta, multiple myeloma, etc. In addition, the fellow should know how to evaluate and manage patients with idiopathic (both in men and women) osteoporosis and various forms of secondary osteoporosis. The fellow should also be familiar with other skeletal complications of glucocorticoid use, including avascular necrosis.

S/he should be comfortable with the use of both non-pharmacologic (ie, lifestyle changes, calcium and vitamin D supplementation, and, appropriate referral to physiotherapy) and pharmacologic interventions (estrogen/hormone replacement therapy, HRT, Selective Estrogen Receptor Modulators, bisphosphonates, calcitonin, and parathyroid hormine) for management and treatment of a patient with osteoporosis. S/he should be able to evaluate the patient who has sustained an osteoporotic fracture and institute measures to reduce the risk of subsequent fractures. The fellow should also be familiar with issues of pain management in patients with vertebral or other fractures. Finally, s/he should be able to work with the specialists (orthopedist or radiologist) in the management of patients with acutr fractures, learn when to seek appropriate referral for a patient with acute fracture for vetebro-, kyphoplasty, as well as in the management of patients with delayed healing of fractures.

8. Hypercalcemic Disorders

The fellow should have a full understanding of the evaluation and management of patients with various types of hypercalcemia. S/he should be able to distinguish the differences and similarities between PTH and non-PTH mediated hypercalcemias and the

appropriate use and interpretation of PTH assay (elevated versus non-suppressed in the context of an elevated serum calcium for instance) to make a diagnosis of primary hyperparathyroidism (PHPT) versus non-PTH mediated hypercalcemias (ie, humoral hypercalcemia of malignancy, hyperabsorptive hypercalcemia due to granulomatous disorders, or other number of miscellaneous causes of hypercalcemia). S/he should also be able and comfortable in differentiating sporadic PHPT from Familial Hypocalcuric Hypercalcemia (sometimes referred to as Familial Benign Hypercalcemia), as well as pursuing, when appropriate, various forms of familial hyperparathyroidism either isolated or as part of MEN syndromes, including an understanding of genetic testing for these syndromes.

If a diagnosis of PHPT is established, the fellow should know the necessary evaluation of these patients leading to a decision regarding surgical versus medical management. If the patient decides to have surgery, the fellow should work with an expert parathyroid surgical team in the peri- and post-operative management of these patients, including post-operative hypocalcemia. Specifically, the fellow should be able to distinguish hungry bone syndrome from post-operative hypoparathyroidism, and manage both appropriately. If a decision is made for medical therapy or conservative observation, the fellow should be familiar with the measures to monitor during follow-up of these patients and the endpoints that would result in recommending surgery. Finally, s/he should be familiar with evolving approaches to the management of patients with PHPT, both surgical (ie, minimal invasive parathyroidectomy, alcohol ablation) and the use of various bisphosphonates, estrogen or raloxifene if the bone density is unacceptably low and the patient refuses surgery and calcimimetic agent, cinacalcet, if the serum calcium is unacceptably high and the patient is unwilling or unable to have parathyroidectomy.

In addition to PHPT, the fellow should know the evaluation and management of patients with parathyroid cancer. S/he should be able to effectively evaluate and manage the patient with hypercalcemia in the setting of a suppressed PTH (ie, hypercalcemia of malignancy and hyperabsorptive hypercalcemia due to granulomatous disorders).

9. Paget's Disease of Bone

The fellow should be familiar with current concepts of pathogenesis, natural history, and treatment of Paget's disease of bone. The evaluation and management of Paget's disease involves an understanding of the appropriate laboratory studies to document the extent and severity of the disease (biochemical markers of bone turnover, scintigraphy, and radiographs), familiarize with the typical radiographic appearance, and learn the characteristic features that distinguish Paget's disease of bone from other similar conditions such as fibrous dysplasia and mosr importantly osteoblastic metastases. The fellow should be able to combine this data with the patient's symptoms, leading to a decision about appropriate type and duration of therapy. The latter may include observation or pharmacologic therapy with calcitonin, oral, or intravenous bisphosphonates.

10. Renal Osteodystrophy

While primarily managed by the nephrologist, the endocrine fellow should have a clear understanding of pathogenesis and clinical manifestations of renal osteodystrophy in its various forms, including secondary and tertiary hyperparathyroidism. The role of the endocrinologist may be most relevant and important during and following parathyroid surgery in such patients. The fellow should be familiar with pre- and post-operative management of these patients, particularly how to prevent and treat hungry bone syndrome. The fellow should learn the appropriate use of bone biopsy and bone histomorphometry in evaluating patients with various forms of renal osteodystrophy (osteitis fibrosa, adynamic bone disease, mixed uremic osteodystrophy, osteomalacia etc) and if possible, the fellow should make a concerted effort to acquire appropriate training in these techniques.

11. Rickets and Osteomalacia

While much less common than osteoporosis, the fellow should learn how to evaluate and treat various types osteomalacic disorders and to distinguish these from osteoporosis. Nutritional vitamin D deficiency is particularly becoming a growing public health problem in the elderly, and increases significantly the risk of hip fracture. In addition, recognition of vitamin D deficiency often uncovers a previously unsuspected diagnosis, such as celiac sprue, in an otherwise minimally symptomatic patient. The fellow should know the appropriate tests to order in this setting (ie, serum bone specific alkaline phosphatase, 25-hydroxyvitamin D and PTH levels, and urine calcium), including possibly a bone biopsy when needed. The fellow should have appropriate exposure to various inherited disorders of vitamin D action, such as vitamin D dependency, or renal handling of phosphate such as sporadic and familial hypophosphatemic (some times referred to as vitamin D resistant) rickets and osteomalcia. The evaluation of patients with tumor-induced osteomalacia is often extremely difficult, as the underlying tumor may sometimes be impossible to identify. Thus the fellow should also be familiar with medical management of such patients.

12.Nephrolithiasis

The fellow should be able to evaluate a patient with nephrolithiasis. Based on the type of stone and the evaluation (ie, identification of hypercalciuria, hyperoxaluria, hyperuricosuria, or low urinary citrate), the fellow should be able to identify any underlying disorders such as primary hyperparathyroidism or enteric hyperoxaluria. S/he should know the medical management of the patient based on this evaluation, and to work with a dietician in the appropriate dietary management of these patients.

13. Hypocalcemic Disorders

The fellow should know how to manage acute hypocalcemia as, for example, in the post-operative setting. This includes the use of intravenous calcium preparations and

when they are indicated. S/he should be able to manage chronic hypocalcemia with oral calcium and vitamin D preparations and, if indicated, a thiazide diuretic. Working with a dietician, s/he should be able to advise the patient with hypoparathyroidism regarding dietary phosphate restriction, and use phosphate binders when indicated. S/he should be able to assess the patient with various forms of hypocalcemia, including that due to acute pancreatitis, acute illnesses, and associated with the use of various medications.
The fellow should know the various types of parathyroid resistance syndromes and the appropriate testing, both biochemical and genetic, necessary to establish a diagnosis of different varieties of pseudohypoparathyroidism. S/he should be familiar with possible resistance to other hormones as well as the non-endocrine disorders that are not uncommon in these patients.

14. Other Mineral Abnormalities

The fellow should be able to identify the possible causes of hypo- and hypermagnesemia in a patient, and to institute appropriate therapy. S/he should be able to identify situations in which hypomagnesemia is the cause or contributing to hypocalcemia. S/he should also be able to identify the etiology of hyper- or hypophosphatemia in a patient, and to treat these conditions.

15.Genetic, Developmental, and Dysplastic Skeletal Disorders

The fellow should be familiar with these disorders, which can present both in children and in adults. These include various sclerosing bone disorders and skeletal dysplasias. The fellow should be able to evaluate the patient referred because of an elevated bone density, in the absence of radiographic sclerosis. An experienced skeletal radiologist is a great asset to the training program in the accurate diagnosis of these conditions based on the radiographic findings. The fellow should have exposure to the evaluation and management of patients with osteogenesis imperfecta as well as appropriate medical management of both the skeletal aspects of fibrous dysplasia and, when present, the management of precocious puberty in these patients.

16. Skeletal Neoplasms/Infiltrative Disorders

The fellow should be able to identify benign and malignant skeletal neoplasms on skeletal radiographs, and institute appropriate referrals to an Orthopedic surgeon or to radiation and/or medical Oncologists. S/he should also be familiar with the various infiltrative disorders of bone, including mast cell disease and histiocytosis X.

17. Extraskeletal Calcification/Ossification

These include relatively uncommon conditions such as tumoral calcinosis, metastatic and dystrophic calcification, dermatomyositis with calcinosis cutis universalis, and various rare ossification disorders. While the fellow may not necessarily have the opportunity to mange these relatively rare conditions, s/he should be familiar with these disorders and their treatment.

D. Suggested Reading

Textbooks, Primers and Treatise

J.D. Wilson, D.W. Foster, H.M. Kronenberg & P.R. Larsen, Eds: Williams Textbook of Endocrinology; 11th Edition, 2007

Rosen CJ, ed. Primer on Metabolic Bone Diseases and Disorders of Mineral Metabolism, 7th Edition, Amer Soc of Bone & Mineral Research, Raven Press, 2008.

Bonnick, S.L. Bone Densitometry in Clinical Practice: Application and Interpretation, Second Edition, Humana Press, 2003.

Marcus R., Feldman D, Nelsen D, Rosen CJ (ed). Osteoporosis 3rd ed., Academic Press, 2007.

Bilezikian JP, Raisz LG, Martin TJ (ed), Principles of Bone Biology, 3rd ed. Academic Press, San Diego, 2008.

Useful websites with educational contents and position papers

www.asbmr.org American Society of Bone & Mineral Research; Review Bone Curriculum
www.nof.org National Osteoporosis Foundation
www.iscd.org International Society for Clinical Densitometry

Disorders of Bone and Mineral

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Biology of Bone						
a) Anatomy/ultrastructure	☒	☐	☐	☐	☒	☒
b) Osteoblasts/osteocytes/osteoclasts	☒	☐	☐	☐	☒	☒
c) Bone matrix/mineralization	☒	☐	☐	☐	☒	☒
d) Regulation of bone remodeling	☒	☐	☐	☐	☒	☒
2. Physiology of calcium, magnesium, and phosphorous homeostasis						
a) Intestinal absorption, Ca, P, Mg	☒	☐	☐	☐	☒	☒
b) Renal handling of Ca, P & P	☒	☐	☐	☐	☒	☒
c) Mineral balance and homeostasis	☒	☐	☐	☐	☒	☒
3. Molecular biology, biochemistry, and mechanism of action of calcitropic hormones						
a) Synthesis & metabolism of PTH	☒	☐	☐	☐	☒	☒
b) PTH/PTHrP–Mechanism of action	☒	☐	☐	☐	☒	☒
c) Vitamin D and its metabolites	☒	☐	☐	☐	☒	☒
d) Calcitonin	☒	☐	☐	☐	☒	☒
4. Clinical Evaluation of Bone and Mineral Disorders						
a) Comprehensive relevant history	☒	☒	☒	☒	☒	☒
b) Physical examination	☒	☒	☒	☒	☒	☒
5.Laboratory Methods: Understanding the measurements for:						
a) Serum Ca, P, & Mg & ionized Ca	☒	☒	☒	☒	☒	☒
b) PTH/PTH-rP	☒	☒	☒	☒	☒	☒
c) Calcitonin	☒	☒	☒	☒	☒	☒
d) Vitamin D & its metabolites	☒	☒	☒	☒	☒	☒
e) Urinary Ca (fasting and 24 hours)	☒	☒	☒	☒	☒	☒
f) Bio-markers for bone turnover	☒	☒	☒	☒	☒	☒
g) Molecular diagnosis of bone and mineral disorders	☒	☒	☒	☒	☒	☒

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
6. Imaging techniques/ other procedures						
a) Bone X-rays in children & adults	☒	☐	☒	☐	☒	☒
b) Bone Density Measurement	☒	☐	☒	☐	☒	☒
c) Bone scintigraphy	☒	☒	☒	☒	☒	☒
d) Parathyroid imaging	☒	☒	☒	☒	☒	☒
e) Bone biopsy & histomorphometry	☒	☐	☐	☐	☒	☒
7. Postmenopausal and Age-related Osteoporosis (OP)						
a) Epidemiology & Pathogenesis	☒	☐	☐	☐	☒	☒
b) Role of Physical activity & Nutrition in OP	☒	☐	☐	☐	☒	☒
c) Prevention of OP	☒	☐	☐	☐	☒	☒
d) Evaluation & treatment of OP	☒	☒	☒	☒	☒	☒
8. Other Forms of Osteoporosis (OP)						
a) Juvenille OP	☒	☐	☒	☐	☒	☒
b) Idiopathic (male & female) OP	☒	☐	☒	☐	☒	☒
c) Glucocorticoid OP (GIOP)	☒	☒	☒	☒	☒	☒
d) Transplant related OP	☒	☒	☒	☒	☒	☒
e) Other forms of secondary OP	☒	☐	☒	☐	☒	☒
9. Rickets and Osteomalacia						
a) Nutritional rickets & osteomalacia	☒	☐	☒	☐	☒	☒
b) Bone disease secondary to GI, hepatic & pancreatic disorders	☒	☒	☒	☒	☒	☒
c) Vitamin D dependent rickets	☒	☐	☒	☐	☒	☒
d) Hypophosphatemic rickets	☒	☐	☒	☐	☒	☒
e) Tumor induced osteomalacia	☒	☐	☒	☐	☒	☒
f) Hypophosphatasia	☒	☐	☒	☐	☒	☒
g) Fanconi syndrome and RTA	☒	☐	☒	☐	☒	☒
h) Drug induced osteomalacia	☒	☐	☒	☐	☒	☒

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
10. Hypocalcemic disorders						
a) Hypoparathyroidism	☒	☒	☒	☒	☒	☒
b) PTH Resistance Syndromes	☒	☐	☒	☒	☒	☒
c) Misc causes of hypocalcemia	☒	☒	☒	☒	☒	☒
11. Renal Osteodystrophy	☒	☒	☒	☒	☒	☒
12. Paget's Disease of Bone	☒	☒	☒	☒	☒	☒
13. Hypercalcemic Disorders						
a) Primary Hyperparathyroidism	☒	☒	☒	☒	☒	☒
b) Familial HPT syndromes/ MEN	☒	☐	☒	☐	☒	☒
c) Familial Hypocalciuric Hypercalcemia (FHH)	☒	☐	☒	☐	☒	☒
d) Hypercalcemia of Malignancy	☒	☒	☒	☒	☒	☒
e) Hypercalcemia of granulomatous disorders	☒	☒	☒	☒	☒	☒
f) Other miscellaneous causes	☒	☒	☒	☒	☒	☒
14. Other Mineral Abnormalities						
a) Hypo & Hypermagnesemia	☒	☒	☒	☒	☒	☒
b) Hypo & Hyperphosphatemia	☒	☒	☒	☒	☒	☒
15. Nephrolithiasis	☒	☐	☒	☐	☒	☒
16. Genetic, developmental, and dysplastic disorders	☒	☐	☒	☐	☒	☒
17. Skeletal neoplasms and infiltrative disorders	☒	☒	☒	☒	☒	☒
18. Extraskeletal calcification and ossification	☒	☐	☒	☐	☒	☒

Section 4
Diabetes Mellitus

I. Introduction

A. Background

Diabetes is an increasingly common, potentially devastating, extraordinarily expensive, treatable, but incurable, chronic disease. It is by far the most common endocrine disorder that seriously impacts health and limits longevity in those affected. The World Health Organization projects the worldwide population of people with diabetes will grow to 300 million by the year 2025. Many more have impaired glucose tolerance or impaired fasting glucose and are at high risk for atherosclerotic disease and diabetes. People with diabetes are at 2- to 4-fold increased risk for a myocardial infarction or a stroke. Diabetes is the leading cause of blindness with its onset in working age adults and of non-traumatic amputations, and the most common single cause of end-stage renal disease requiring dialysis and transplantation. The total annual economic cost of diabetes in 2002 was estimated to be $132 billion, or one out of every 10 health care dollars spent in the United States. Much of this was for the care of long-term microvascular and macrovascular complications of diabetes that are now known to be in large part preventable.

B. Goals and Objectives

1. Treatment and management goals:

It is now well-established that treatment makes a long-term difference for people with diabetes. Currently available treatments are far from ideal, but they are demonstrably effective. These treatments involve an integrated care team (eg, an endocrinologist, a diabetes educator, a nutritionist). Among the specific objectives of our training program is to teach our fellows (residents) in Endocrinology, Diabetes and Metabolism to know and understand the evidence that in people with diabetes:

(1) glycemic control reduces the risk of microvascular (retinopathy, nephropathy and neuropathy) and macrovascular (cardio-, cererbro- and peripheral vascular disease) events;
(2) treatment of dyslipidemia reduces the risk of macrovascular events;
(3) treatment of hypertension and even early nephropathy reduces end-stage renal disease and other microvascular as well as macrovascular events;
(4) aspirin reduces macrovascular events;
(5) treatment of early retinopathy reduces blindness;
(6) foot care reduces amputations; and
(7) implementation of Standards of Care results in better glycemic control and reduces costs.

Additional objectives are to know, understand and pursue the recommended treatment goals (updated by the American Diabetes Association (ADA) in each January issue of *Diabetes Care*) and minimum outcome measures shown in the following tables.

Treatment Goals

	Goal
Hemoglobin A_{1c} (%)	≤7%
Preprandial Glucose (mg/dL)	80-130
Bedtime Glucose (mg/dL)	100-140
LDL Cholesterol (mg/dL)	<100
Triglycerides (mg/dL)	< 150
Blood Pressure (mm Hg)	≤ 130/80
Urine Microalbumin	Normal

In some individual patients it may be appropriate not to individualize treatment goals, but the rationale for that decision should be made explicit. *These goals need to be modified for children with diabetes.*

Minimum Outcome Measures

Hemoglobin A_{1c}	Semiannually*
Dilated Eye Exam	Annually
Foot Exam	Annually
Blood Pressure	Each visit
Urine Microalbumin	Annually
Fasting Lipid Profile	Annually
Self Management Education	Annually
Medical Nutrition Therapy	Annually
Serum TSH	Annually
Self Blood Glucose Monitoring	Yes
Tobacco Counseling	Yes

*ADA Recommendation: Quarterly until glycemic control is achieved, then semiannually.

2. Comprehensive Patient Evaluation

Given this knowledge it is our objective to teach fellows to evaluate patients with diabetes comprehensively including assessments of:

(1) glycemic control (long-term with HbA_{1C}, short-term with the history and the SMBG log including identification of both hyper- and hypoglycemia);
(2) blood pressure control;
(3) lipid control (fasting lipid profile);
(4) the status of microvascular complications (history, dilated eye examination, detailed foot examination including monofilament testing, urine albumin);
(5) macrovascular complications (history, cardiovascular examination, and nuclear testing for coronary artery disease);
(6) the need for additional self management education, medical nutrition therapy, or both; and
(7) smoking status.

These basic principles are emphasized throughout the fellow's training experience in our inpatient and outpatient care settings as well as in our didactic program and our clinical conferences. It is our premise that, while complications of diabetes must be detected and treated in their early stages, the prevention of complications through comprehensive diabetes care is the new paradigm in the management of diabetes.

An additional objective of our program is to provide, through research experience and didactic instruction, insights into the basic and clinical scientific advances that will lead to improvements in the prevention and treatment of diabetes and its complications.

3. Evaluation and Management of Acute and Chronic Complications

It is also our objective to teach the evaluation and management of acute and chronic complications, including:

(a) Diabetic ketoacidosis
(b)Hypersmolar non-ketotic syndromes
(c) Hypoglycemia
(d) Microvascular and macrovascular disease, including
    (i) Diabetic Retinopathy
    (ii) Diabetic nephropathy
    (iii) Diabetic neuropathy
    (iv) Dermatologic aspects of diabetes
    (v) Coronary heart disease
    (vi) Peripheral vascular disease
    (vii) Cerebrovascular disease
(e) Infections in the diabetic patient

4. Evaluation and Management of Diabetes and Pregnancy

Finally, it is also our objective to teach the evaluation and management of all aspects of diabetes and pregnancy, including:

(a) Preconception counseling of non-gestational diabetes
(b) Screening and diagnosis of gestational diabetes
(c) Treatment goals of non-gestational and gestational diabetes
(d) Antepartum screening for women with diabetes during pregnancy
(e) Management of labor and delivery in women with diabetes during pregnancy
(f) Management of the postpartum period on women with diabetes
(g) Screening for complications during pregnancy in women with diabetes

C. Training and Evaluation

The clinical experiences of our fellows include opportunities to diagnose and manage inpatients and outpatients, representing adolescent and adult patients of both sexes and representing variable acuity, with both types 1 and type 2 diabetes as well as the uncommon types of diabetes. It also includes opportunities for the fellow to function in the role of consultant for patients and other physicians and services in both inpatient and outpatient settings.

Training in comprehensive diabetes care occurs repetitively and progressively over the first two years of training in the setting of the fellow's supervised inpatient and outpatient care of people with diabetes and in the context of our didactic diabetes teaching program. The latter includes lectures and conferences (e.g., Standards of Care for People with Diabetes, Management of Type 1 Diabetes, Management of Type 2 Diabetes, Diabetic Ketoacidosis and Nonketotic Hypersmolar Syndrome, Diabetic Macro- and Microvascular Complications, Dyslipidemia, Hypertension, and

Hypoglycemic), as well as self-directed and faculty-directed reading about diabetes, including both specific and generic reading. There is no year-specific aspect to the curriculum; rather, the fellow will become more competent with continued exposure to practical and didactic learning.

In addition, our curriculum emphasizes biochemistry and physiology, including cell and molecular biology as they relate to diabetes and its complications. These are fundamental to the management of diabetes. The appropriate utilization and interpretation of clinical laboratory, radionuclide and radiologic studies for the treatment of diabetes is stressed throughout the clinical and didactic program.

Finally, our fellows have clinical experience in multidisciplinary diabetes education and treatment programs related to preventive care. They work closely with our nurse and dietitian certified diabetes educators. At the beginning of the fellowship program fellows attend the Diabetes Group Education classes taught by our Joslin educators, including the insulin pump classes, carbohydrate counting and continuous glucose monitoring (sensor) classes. Fellows are encouraged to wear a pump (saline infusion) and sensor for a week, to better understand these devices. Interpretation of pimp and sensor downloads are reviewed with faculty. As detailed earlier, our program emphasizes the training of fellows in the preventive aspects of diabetes care (ie, glycemic control, lipid control, blood pressure control, aspirin, use of statins, ACE inhibitors/ARBs, smoking cessation etc. and the identification and treatment of early microvascular and macrovascular complications) in the context of the Standards of Care and Outcome Measures recommended by the American Diabetes Association (updated each January in *Diabetes Care* and available on-line at www.diabetes.org). In addition, fellows conducts chart audits quarterly (on each others patients) for the outcome measures listed above (i.e. A1c, blood pressure, lipid control, annual eye exams, foot exams, smoking cessation, etc.). Patient education – by the physician, the diabetes educator, the nutritionist and other specialists – is a fundamental component of diabetes care. Because diabetes is so common, patients with this disease are seen by fellows in virtually all of their inpatient and outpatient encounters and the team approach is also utilized in all of those settings. In addition, multidisciplinary diabetes education and treatment is the central focus of our Diabetes Center. This also includes the assistance of social work and ethics consultants, if necessary.

In this context fellows become competent and then expert in the comprehensive management of diabetes through supervised, progressive responsibility for the care of people with diabetes in their inpatient and outpatient activities throughout their fellowship training. This allows them to observe the natural history of diabetes and its complications, as well as the effectiveness of therapeutic interventions. Fellows have experience representing variable acuity and the full spectrum of diabetes. To accomplish these goals, the majority of the training in diabetes occurs in ambulatory care settings.

Patient encounters are supervised by a member of the Endocrinology, Diabetes and Metabolism faculty who reviews the historical, physical and other information gathered by the fellow with that fellow at the bed side/examination table and provides immediate confirmatory or corrective feedback. That faculty member then reviews the fellow's diagnostic and therapeutic plans, again providing immediate feedback. Learning is facilitated further by self-directed reading of the literature, reading suggested by the responsible faculty member, or both and by patient follow-up. The latter includes analysis

of subsequent laboratory findings and of the patient's course with refinement of the management plan over time, again in consultation with the responsible faculty member. Thus, learning is evaluated by direct observation of the fellow by the faculty member and discussions with that and other faculty and colleagues including presentations at rounds and case conferences as well as by formal In-training examinations. Written self-assessment program (e.g., ESAP, MKSAP) are also encouraged. Evaluations are made in all areas of the six core competencies as outlined by the ACGME by faculty and 360 evaluations are completed by nurse and dietitian educators.

Fellows learn to initiate and manage pump therapy and use and interpret data from continuous glucose monitoring systems (CGMS) under the supervision of a Joslin attending (key faculty) and the diabetes management team through their outpatient experience at the Joslin Diabetes Center at SUNY Upstate Medical University. Fellows spend time with the insulin pump trainers at Joslin, to learn the technical aspects of pump therapy, including carbohydrate counting and pump programming. They actively participate in insulin pump starts and follow-up care. Insulin pump manuals, the Insulin Pump Therapy Book, instructional videotapes and other insulin pump therapy reference materials are available for the fellows at the Joslin Center. Fellows are evaluated by the supervising faculty member and by the Joslin insulin pump trainers.

II. Program Content

The ACGME Program Requirements for Residency Education in Endocrinology, Diabetes and Metabolism include a heavy emphasis on diabetes. As a Joslin Diabetes Center with a large multidisciplinary team, these requirements as listed below, are fully covered.

- Residents must have clinical experience in a multidisciplinary diabetes and education program.
- Residents must have formal instruction, clinical experience, or opportunities to acquire expertise in the evaluation and management of the following disorders:
    - Type 1 and 2 diabetes mellitus including
        - (1) Patient monitoring and treatment objectives in adolescents and adults
        - (2) Acute and chronic complications, including
            - (a) Diabetic ketoacidosis
            - (b)Hypersmolar non-ketotic syndromes
            - (c) Hypoglycemia
            - (d) Microvascular and macrovascular disease, including
                - (i) Diabetic Retinopathy
                - (ii) Diabetic nephropathy
                - (iii) Diabetic neuropathy
                - (iv) Dermatologic aspects of diabetes
                - (v) Coronary heart disease
                - (vi) Peripheral vascular disease
                - (vii) Cerebrovascular disease
            - (e) Infections in the diabetic patient
        - (3) Gestational diabetes

(4) Diabetes mellitus in the pregnant patient
(5) The surgical patient with diabetes mellitus
(6) Patient education
(7) Psychological issues
(8) Genetics and genetic counseling as it relates to patients with endocrine and metabolism disorders
(9) Dietary principles

- Provision must be made for the residents to acquire experience and skill in the following areas:

Management of adolescent and adult patients of all ages with diabetes mellitus, including but not limited to the following aspects of the disease:

(1) The utilization and interpretation of autoimmune markers of type 1 diabetes in patient management and counseling
(2) Prescription of exercise program
(3) Rationale for and calculation of diabetic diets
(4) Oral antidiabetic therapy
(5) The use of intravenous insulin in acute decompensated diabetes mellitus
(6) Chronic insulin administration, including use of all varieties of insulin delivery systems
(7) Glucose monitoring devices, including continuous glucose sensors
(8) Funduscopic examination, recognition, and appropriate referral of patients with diabetic retinopathy
(9) Foot care
(10) Psychosocial effects of diabetes mellitus on patients and their families
(11) Patient and community education

- The formal curriculum of the program provides instruction in the following:
  (1) Pathogenesis and epidemiology of diabetes mellitus
  (2) Genetics as it relates to endocrine diseases
  (3) Developmental endocrinology, including growth and development and pubertal maturation, as it relates to diabetes.
  (4) Endocrine physiology and its pathophysiology in diabetes and principles of hormone action.
  (5) Biochemistry and physiology, including cell and molecular biology and immunology, as they relate to diabetes.
  (6) Signal transduction pathways and biology of hormone receptors.

Provision is also made for the fellows to acquire experience and skill in the management of adolescent and adult patients of all ages with diabetes mellitus, including the utilization and interpretation of autoimmune markers of type 1 diabetes in patient management and counseling, prescription of exercise programs, the rationale for and calculation of diabetic diets, oral antidiabetic therapy, the use of intravenous insulin administration in acute decompensated diabetes, the use of all varieties of insulin delivery systems, glucose monitoring devices, funduscopic examination and recognition and appropriate referral of patients with diabetic retinopathy, foot care, psychosocial effects of diabetes on patients and their families, and patient and community education. They acquire experience and skill in each of these aspects of diabetes care through conferences

and their inpatient and outpatient activities. Among the latter, the Joslin Diabetes Center focuses specifically on diabetes care including the team concept and approaches to the prevention of complications.

III. Suggested Reading

Books:

Walsh J, Roberts R. Pumping Insulin: Everything You Need for Success on a Smart Insulin Pump. 4th ed. Torey Pines Press, 2006.

LeRoith D, Taylor SI, Olefsky JM (eds). Diabetes Mellitus: A Fundamental and Clinical Text, 3rd Edition; Lippincott Williams & Wilkins, 2003.

Wilson JD, Foster DW, Kronenberg HM, Reed Larsen Peds. Williams Textbook of Endocrinology, 11th ed, Saunders Co, 2007.

Electronic:

Clinical Practice Recommendations American Diabetes Association: www.professional.diabetes.org (updated each January)

American Assn of Clinical Endocrinologists guidelines http://www.aace.com/pub/guidelines

The Endocrine Society guidelines http://www.endo-society.org/guidelines

Section 5
Gonadal Disorders

1. Introduction

A. Background

Endocrinology of the reproductive system encompasses normal pubertal development and adult male and female reproductive function and the effects of excesses or deficiencies of reproductive hormones on other body systems. Issues in reproductive endocrinology are extremely prevalent in the population, highlighting the importance of this area in an endocrine training program. Disorders of this system may arise at a hypothalamic, pituitary or gonadal level as a result of a primary abnormality or secondary to abnormalities in other endocrine or non-endocrine organs. These disorders may present as primary or acquired hypogonadism, infertility, or erectile dysfunction or with evidence of hyperandrogenism or hyperestrogenism. In addition, this area of study includes abnormalities of primary or secondary reproductive organs such as skin, penis, prostate, uterus, ovaries and breast. This is an extremely important area of endocrinology, not only due to the prevalence of primary abnormalities of the reproductive system per se, but also because of the profound impact of gonadal hormone abnormalities on other endocrine and non-endocrine systems including bone, thyroid, adrenal, metabolic, dermatologic, cardiovascular, muscle, neurologic and psychiatric. Disorders of non-reproductive systems may be hormone dependent and conversely non-reproductive disorders often affect the reproductive axis.

B. Goals and Objectives

It is our intention that the fellow develop the following:

1. An understanding of the physiology of: (1) normal male and female adrenarche and puberty; (2) the normal menstrual cycle; (3) normal male reproductive physiology; (4) the physiology of the menopause and the physiology of reproductive aging in men and women; and (5) an understanding of the genetics of disorders of the reproductive system.

2. An understanding of the biochemistry, cell biology, and molecular biology of gonadotropin-releasing hormone, the gonadotropins, gonadal steroids and the inhibin/activin/follistatin family of proteins; an understanding of factors involved in growth and differentiation of the gonads (including germ cell development), internal genitalia and accessory sex organs, and autocrine/paracrine interactions in reproductive function; knowledge of the mechanism of gonadotropin and steroid hormone action.

3. Familiarity with the types of assays available for the measurement of gonadotropins, steroids, inhibins and insulin and the clinical utility of these assays in the diagnosis and management of patients with reproductive disorders; familiarity with the evaluation and interpretation of semen analysis.

4. An understanding of how to perform, evaluate and determine the utility of dynamic provocative endocrine testing as it applies to the reproductive system.

5. An understanding of how to evaluate and determine the utility of pelvic ultrasonography and hypothalamic/pituitary, adrenal, prostate and testicular imaging, and bone densitometry.

6. A comprehensive understanding of how to evaluate and manage disorders of sexual differentiation, disorders arising in the pediatric age group including congenital adrenal hyperplasias, chromosomal disorders such as Turner and Klinefelter syndromes, and precocious or delayed puberty.

7. A comprehensive understanding of how to evaluate and manage female reproductive disorders including: (1) primary amenorrhea; (2) secondary amenorrhea or oligomenorrhea; (3) galactorrhea; (4) hyperandrogenism; (5) dysfunctional uterine bleeding; (6) ovarian lesions; (7) premenstrual symptoms; (8) peri-menopausal and menopausal symptoms; and (9) infertility. The fellow may also receive training in ovulation induction.

8. A comprehensive understanding of how to evaluate and manage male reproductive disorders including: (1) primary and acquired male hypogonadism; (2) gynecomastia; (3) erectile dysfunction; (4) testicular masses; (6) prostatic disorders; and (7) fertility disorders including induction of spermatogenesis.

9. Due to their prevalence the following areas should receive special attention: (1) the diagnosis, pathophysiology, and genetics of polycystic ovarian syndrome and its metabolic consequences; (2) male subfertility, erectile dysfunction and prostate disorders; and (3) perimenopausal and menopausal management, including decreased libido.

10. An understanding of the clinical presentation and prevalence of hormone producing neoplasms of the testis and ovary and of tumors that affect hypothalamic and pituitary function; familiarity with the treatment of hormone responsive tumors and disorders (breast, prostate, endometrium, neurologic).

11. An understanding of the effects of age on the reproductive axis in men and women and the subsequent effects of hypogonadism on other systems.

12. An understanding of the effects of acute and chronic disease on the reproductive system in men and women.

13. An understanding of the interaction of psychosocial disorders with the reproductive system including premenstrual dysphoric disorder, eating disorders, perimenopausal mood disorders, sexual dysfunction, decreased libido and substance abuse and facility in basic counseling and triage in these areas.

14. An understanding of the physiology and importance of the following drugs as they apply to the reproductive system: (1) GnRH, GnRH agonists/ antagonists, gonadotropins; (2) hormonal contraceptives; (3) selective androgen and estrogen receptor modulators (SARMS and SERMS); (4) hormone replacement therapy in men women; (5) non-hormonal strategies for menopause management; and (6) non-prescription and environmental compounds.

15. An understanding of the emerging technologies and treatment and how they impact on the comprehensive management of reproductive endocrine disorders including assisted reproductive technologies and genetic testing and facility in counseling patients regarding these options.

C. Training and Evaluation

1. Specific Procedures:

The training program provides opportunities for the fellow to develop clinical competence in reproductive endocrinology. The opportunity to diagnose and manage male and female adolescent and adult patients with reproductive endocrine disorders will occur primarily in an outpatient setting due to the generally non-acute nature of these problems, but may also include attention to reproductive endocrine issues in inpatients with other endocrine and non-endocrine diagnoses. This training requires interaction with pediatric endocrinology, gynecology, urology, oncology, genetics, surgery, pathology, radiology and/or other subspecialties. Competence in the interpretation of the following procedures/studies is expected:

a. Hormone assays (peptide and steroid)
b. Imaging studies
    i. Pituitary MRI/CT
    ii. Ovarian ultrasound/CT/MRI
    iii. Adrenal CT/MRI and functional adrenal scans (e.g. MIBG, NP 59)
    iv. Hysterosalpingogram
c. Other radiographic studies
    i. DXA
    ii. Mammography
d. Dynamic hormone testing (e.g. GnRH stimulation test)
e. Semen anaylsis
f. Assisted fertility techniques: IUI, IVF

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2. Educational Expectations (per year of training)

It is expected that upon completion of the first year of training, fellows will be well versed in the ability to investigate both primary and secondary hypogonadism in men and women. In addition, they will be able to properly interpret radiographic imaging studies of the pituitary and adrenal glands. Moreover, fellows will be facile with the performance and interpretation of hormone assays. By the completion of the second year of training, the fellow will be able to identify appropriate patients for medical and/or assisted ovulation induction is needed. They will be able to coordinate therapy for men with hypogonadotropic hypogonadism needing gonadotropin therapy for induction of

spermatogenesis. The fellows will recognize the potential advantages and risks of hormone replacement therapy in both women and men and be able to properly prescribe topical, oral or intramuscular hormone treatment as indicated.

3. Evaluation:

Evaluation will be those dictated by the core competencies. Specifically it will include discussions with faculty on a continuing basis and clinical presentations. In addition, annual standardized in-training examinations (Endocrine Society) are required and self-learning such as the ESAP are strongly encouraged.

2. Program Content

See check box forms

3. Suggested Reading

Textbooks:

Sperling M. *Pediatric Endocrinology*. 3rd ed. Elsevier Health Sciences, 2008.

Becker KL, Bilezikian JP, Bremner WJ, Hung W, Kahn CR, Loriaux DL, Nylen ES, Rebar RW, Robertson GL, Wartofsky L, eds. *Principles and Practice of Endocrinology and Metabolism.* 3rd ed. Philadelphia, Pa: J.B. Lippincott Williams & Wilkins; 2001.

Tulchinsky B, Little AB, eds. *Maternal-Fetal Endocrinology*. 2nd ed. Philadelphia, Pa: WB Saunders Co; 1994.

Yee Wm, Rosen G, Cassidenti D. *Transvaginal Sonography in Infertility*. Lippincott-Raven; 1995.

Lebovic DI, Gordon JD, Taylor RN. Reproductive Endocrinology and Infertility, Scrub Hill Press, 2005.

Yen SSC, Jaffe RB, Barbieri RL, eds. *Reproductive Endocrinology*. 4th ed. Philadelphia, Pa: WB Saunders Co; 1999.

Clinical Practice Guidelines:

The Endocrine Society http://www.endo-society.org/guidelines

The American Association of Clinical Endocrinologists
http://www.aace.com/pub/guidelines

Electronic References:

www.endotext.org

Endocrine Up to Date on library website www.upstate.edu/library

National Center for Biotechnology Information. Online Mendelian Inheritance in Man. Available at http://www3.ncbi.nlm.nih.gov/Omin/

Gonadal Disorders

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Female						
a) Normal female reproductive physiology including puberty	☒	☐	☐	☐	☒	☒
b) Primary/ secondary amenorrhea	☒	☐	☒	☐	☒	☒
c) Dysfunctional uterine bleeding	☒	☐	☐	☐	☒	☒
d) Hirsutism/ virilization	☒	☐	☒	☐	☒	☒
e) Polycystic ovarian syndrome	☒	☐	☒	☐	☒	☒
f) Infertility	☒	☐	☒	☐	☒	☒
g) Menopause	☒	☐	☒	☐	☒	☒
2. Male						
a) Normal male reproductive physiology including puberty	☒	☐	☐	☐	☐	☒
b) Hypogonadism	☒	☐	☒	☐	☒	☒
c) Gynecomastia	☒	☐	☒	☐	☒	☒
d) Erectile dysfunction	☒	☐	☒	☐	☒	☒
e) Infertility	☒	☐	☒	☐	☒	☒
f) Prostatic disorders	☒	☐	☒	☐	☒	☒
3. Pediatric						
a) Intersex disorders	☒	☐	☒	☐	☒	☒
b) Precocious puberty	☒	☐	☒	☐	☒	☒
c) Delayed puberty	☒	☐	☒	☐	☒	☒
d) Gonadal dysgenesis	☒	☐	☒	☐	☒	☒
4. Neoplasia						
a) Testicular tumors	☒	☐	☐	☐	☒	☒
b) Ovarian tumors	☒	☐	☐	☐	☒	☒
5. Disease Specific Studies/ Procedures						
a) GnRH/ GnRH analogues	☒	☐	☒	☐	☒	☒
b) Ovarian ultrasound	☒	☐	☒	☐	☒	☒
c) Pelvic examination	☒	☐	☒	☐	☒	☒
d) Semen analysis	☒	☐	☒	☐	☒	☒
e) Induction of spermatogenesis	☒	☐	☒	☐	☒	☒
f) Male/Female hormone replacement	☒	☐	☒	☐	☒	☒
g) Ovulation induction	☒	☐	☒	☐	☒	☒

Section 6
Hypothalamic-Pituitary Disorders

1. Introduction

A. Background

Growth, development and reproduction are regulated by the interactions of the endocrine and nervous systems. The pituitary regulates endocrine organs under the influence of the hypothalamus. Disorders of the pituitary and hypothalamus may therefore cause isolated or multisystem endocrine hypofunction and hyperfunction. Furthermore, expanding lesions of the pituitary/hypothalamic area may cause neurologic dysfunction.

B. Goals and Objectives

Fellows will acquire an understanding of (1) neuroendocrine physiology, specifically hypothalamic/pituitary anatomy and morphology, regulation of hormone secretion, cellular and molecular mechanisms of action (receptors, signal transduction pathways, gene interaction); (2) the pathophysiology, clinical manifestations, diagnostic approaches, and treatment of hypothalamic and pituitary dysfunction. By the end of their training, fellows will be competent in the evaluation and management of patients with hypothalamic-pituitary disorders (see below).

C. Training and Evaluation

1. Specific Procedures

These objectives will be accomplished through a combination of interdisciplinary conferences, formal lectures, case discussions, direct clinical experience, and self-directed learning. Clinical training will include close interactions with other related disciplines, including neurosurgery, neuroradiology, neurology, neuro-ophthalmology, pathology, and nuclear medicine.

Familiarity with the methods of pituitary surgery is required. This experience includes the pre-operative evaluation, operative approach (e.g. transsphenoidal surgery) and post-operative management. Fellows may obtain this experience through rotations at their primary institution or via collaborative training at other centers where pituitary surgery is performed on a more regular basis.

Fellows will also be familiar with radiotherapy techniques, both standard and stereotactic approaches, for the treatment of pituitary tumors.

2. Educational Expectations (per year of training)

It is expected that upon completion of the first year of training, fellows will be well versed in the ability to investigate all forms of hypothalamic and pitutiary disease in men and women. In addition, they will be able to properly interpret radiographic imaging studies and dynamic tests of pituitary function. Moreover, fellows will be facile with the performance and interpretation of hormone assays.

3. Evaluation:

Evaluation will be consistent with those dictated by core competencies. It will include discussion with faculty on a continuing basis and clinical presentations. In addition the Endocrine Society in-training exam will be administered yearly, and self-learning testing such as ESAP are strongly encouraged.

2. Program Content

In relation to the diseases listed below, residents fellows will have experience in the performance of endocrine clinical laboratory and radiographic studies and basic laboratory techniques, including quality control, quality assurance, and proficiency standards. Provision must be made for the fellow fellow to acquire experience and skill in the following areas:

Basal Hormone levels

(1) prolactin (PRL)
(2) insulin-like growth factor-1 (IGF-1)
(3) growth hormone (GH)
(4) Free thyroxine (T4)
(5) thyrotropin (TSH)
(6) Cortisol (plasma and urine, including metabolites)
(7) adrenocorticotropic hormone (ACTH)
(8) luteinizing hormone (LH)
(9) follicle stimulating hormone (FSH)
(10) testosterone/estradiol
(11) serum osmolality
(12) urine osmolality.

Dynamic Hormone Testing

(1) Insulin-hypoglycemia stimulation (insulin tolerance test)
(2) Thyrotropin Releasing Hormone (TRH) stimulation test
(3) Gonadotropin Releasing Hormone (GnRH) stimulation test
(4) Corticotropin Releasing Hormone (CRH) stimulation test
(5) GH stimulation tests (L-dopa, arginine, clonidine, exercise, glucagon, GH Releasing Hormone [GHRH], insulin-hypoglycemia)
(6) ACTH (cosyntropin) stimulation test
(7) Metyrapone test
(8) Dexamethasone suppression test
(9) Oral glucose suppression test
(10) Water deprivation test.

Neuroradiology

(1) Magnetic Resonance Imaging (MRI)
(2) Computed Tomography (CT)
(3) Inferior Petrosal Sinus Sampling

Neuroophthalmology

The fellow will understand the indications for and interpretation of formal visual field examinations

Other Tests

(1) Growth charts
(2) Radiologic bone age)

Pituitary Adenomas

Prolactinomas

(1) Manifestations (galactorrhea, amenorrhea, infertility, erectile dysfunction, osteopenia, neurologic mass effects)
(2) Diagnostic tests (basal PRL, assessment for hypopituitarism when indicated, exclusion of other causes of hyperprolactinemia, MRI)
(3) Management options (dopamine agonists, surgery, irradiation)
(4) Special considerations for pregnancy and MEN1

GH-secreting adenomas

(1) Manifestations (acromegaly, gigantism, neurologic mass effects)
(2) Diagnostic tests (IGF-1, glucose suppression test of GH, assessment for hypopituitarism when indicated, MRI)
(3) Management options (surgery, somatostatin analogs, GH antagonists, dopamine agonists, irradiation)
(4) Special considerations - ectopic GHRH syndrome, assessment for co-secretion of PRL, TSH, ACTH, association with MEN1

ACTH-secreting adenomas

(1) Clinical manifestations – Cushing's syndrome
(2) Diagnostic tests (urinary free cortisol, ACTH, dexamethasone suppression testing, CRH testing, MRI, Inferior Petrosal Sinus Sampling, assessment for hypopituitarism when indicated)
(3) Management options (surgery, irradiation, medical [ketoconazole, mitotane, metyrapone, and other agents])
(4) Special considerations - differential diagnosis from ectopic ACTH and ectopic CRH is critical; Nelson's syndrome

TSH-secreting adenomas

(1) Clinical manifestations - hyperthyroidism
(2) Diagnostic tests (Free T4, TSH, alpha-subunit, consideration for TRH testing, MRI, assessment for hypopituitarism when indicated)
(3) Management options (surgery, irradiation, somatostatin analogs)
(4) Special consideration - differential diagnosis from thyroid hormone resistance is critical

Gonadotropin cell adenomas

(1) Clinical manifestations - mass effects (neurologic dysfunction, hypopituitarism)
(2) Diagnostic tests (LH, FSH, glycoprotein subunits, TRH test, assessment for hypopituitarism, MRI, visual field assessment when indicated)

(3) Management options (surgery, irradiation)

Non-secreting tumors

(1) Clinical manifestations - mass effects (neurologic dysfunction, hypopituitarism)

(2) Diagnostic tests (assessment for hypopituitarism, MRI, visual field assessment when indicated)

(3) Management options (surgery, irradiation)

Space-occupying and Infiltrative Disorders of the Pituitary and Hypothalamic Region

Space occupying lesions (Craniopharyngiomas, Rathke's cleft cysts, meningiomas, arachnoid cysts, chordomas, dysgerminomas, hamartomas, gangliocytomas, abscess, metastases)

Infiltrative/inflammatory disorders (sarcoidosis, tuberculosis, Langerhans cell histiocytosis, lymphoma, lymphocytic hypophysitis, hemochromatosis)

Hypopituitarism

Panhypopituitarism

(1) Clinical manifestations (growth failure, fatigue, decreased strength, body hair loss, fine facial skin wrinkling,infertility, amenorrhea, erectile dysfunction, constipation, cold intolerance, bradycardia, orthostatic hypotension)

(2) Etiology

Congenital (gene, receptor, embryopathic)

Acquired (tumors, infiltrative, trauma, apoplexy and Sheehanís, irradiation, metabolic [weight loss, anorexia nervosa, malnutrition, hemochromatosis, critical illness], drug (corticosteroids, dopamine)

Selective hormone deficiencies

(1) Gonadotropins (Kallmann's syndrome, weight loss, idiopathic)

(2) ACTH (iatrogenic from glucocorticoid suppression, idiopathic very rare)

(3) TSH (rare)

(4) Growth Hormone

Child onset (congenital or acquired)

(i) Manifested as growth failure

(ii) Differential diagnosis (hypothalamic vs pituitary, GH insensitivity syndrome, differentiate from non GH deficiency causes of short stature [systemic disease, dyschondroplasias, Turner's syndrome, psychosocial, etc.])

Adult onset is usually associated with other hormone deficiencies in panhypopituitarism. See above.

Treatment

(1) Growth hormone administration - dose adjusted by IGF-1 levels
Special consideration - IGF-1 treatment for GH insensitivity

(2) Thyroxine -dose adjusted clinically and by Free T4 levels

(3) Glucocorticoids - dose adjusted clinically

(4) Estrogen/Progestin - oral, transdermal
(5) Testosterone - injection, transdermal
(6) GnRH - possible utility with hypogonadotropic hypogonadism of hypothalamic etiology
(7) HCG and HMG/FSH - for fertility in men and women

Posterior Pituitary Disorders

Diabetes Insipidus

(1) Clinical Manifestations - polyuria, polydipsia, thirst, dehydration
(2) Differential diagnosis
Central vs. nephrogenic
Congenital (familial) vs. acquired (see causes of hypopituitarism plus drug induced [cisplatin, carbamazepine, lithium, vincristine,etc.] plus metabolic [hypercalcemia, hypokalemia], sickle cell anemia)
Psychogenic polydipsia
Others causes of polyuria
(3) Diagnostic testing
Overnight water deprivation test
Measurement of vasopressin
Diagnostic trial of desmopressin
MRI
Assessment of anterior pituitary function
(4) Treatment
Desmopressin - nasal, oral, parenteral
Chlorpropamide
Thiazide diuretics (esp. nephrogenic)
(5) Special considerations
Coexistent thirst center damage
Pregnancy - DI may be transient, may be associated with acute fatty liver of pregnancy

Hyponatremia

(1) Clinical manifestations (nausea, vomiting, headache, confusion, seizures, coma, death) - symptoms dependent upon degree and speed of onset
(2) Differential diagnosis
Hypovolemic - appropriate vasopressin (ADH) secretion
Euvolemic - inappropriate ADH secretion (SIADH) {need to exclude hypothyroidism, hypoadrenalism}
Hypervolemic - (intravascular hypovolemia, eg, cirrhosis, CHF)
(3) Diagnostic tests
Urine and serum osmolality and urine sodium
Exclude other causes of hyponatremia (high triglycerides, glucose)

(4) Treatment

Mild - water restriction

Severe - saline, hypertonic saline, furosemide, monitor closely to avoid central pontine myelinolysis

Miscellaneous Hypothalamic Syndromes

(1) Laurence-Moon-Biedl Bardet
(2) Prader-Willi Syndrome
(3) Sotosí Syndrome (cerebral gigantism)
(4) Pineal region tumors
(5) Empty sella syndrome

3. Suggested Reading

Textbooks:

DeGroot LJ, Jameson JL, eds. *Endocrinology*. 5th ed. Philadelphia, Pa: W.B. Saunders Co; 2006.

Felig P, Frohman LA, eds. *Endocrinology and Metabolism*, 4th ed. New York, NY: McGraw-Hill Professional, 2001

Becker KL, Bilezikian JP, Bremner WJ, Hung W, Kahn CR, Loriaux DL, Nylen ES, Rebar RW, Robertson GL, Wartofsky L, eds. *Principles and Practice of Endocrinology and Metabolism.* 3rd ed. Philadelphia, Pa: J.B. Lippincott Williams & Wilkins; 2001.

Wilson JD, Foster DW, Kronenberg HM, Reed Larson P, eds. *Williams Textbook of Endocrinology*. 11th ed. Philadelphia,Pa: W.B. Saunders Co; 2007.

Electronic Texts:

www.endotext.org

Endocrine Up to Date on library website www.upstate.edu/library

Disorders of the Hypothalamus and Pituitary

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Pituitary Tumors						
a) Cushing's Disease	☒	☐	☒	☒	☒	☒
b) Acromegaly	☒	☐	☒	☒	☒	☒
c) Prolactinoma	☒	☒	☒	☒	☒	☒
d) Non-functioning adenomas	☒	☒	☒	☒	☒	☒
2. Space-Occupying/ Infiltrative Disease						
a) Cranipharyngloma	☒	☒	☒	☒	☒	☒
b) Hemochromatosis	☒	☐	☒	☒	☒	☒
c) Histiocytosis X	☒	☒	☒	☒	☒	☒
d) Sacroid	☒	☒	☒	☒	☒	☒
3. Hypopituitarism						
a) Adrenal	☒	☐	☒	☒	☒	☒
b) Thyroid	☒	☐	☒	☒	☒	☒
c) Growth hormone	☒	☐	☒	☒	☒	☒
d) Gonadotropins	☒	☐	☒	☒	☒	☒
4. Water Balance						
a) Diabetes insipidus	☒	☒	☒	☒	☒	☒
b) SIADH	☒	☒	☒	☒	☒	☒
5. Disease Specific Studies/ Procedures						
a) GnRH stimulation	☒	☐	☒	☐	☒	☒
b) Insulin induced hypoglycemia	☒	☐	☐	☐	☒	☒
c) CRH stimulation	☒	☐	☒	☐	☒	☒
d) IPSS	☒	☐	☐	☐	☒	☒
e) Pituitary imaging MRI/CT	☒	☒	☒	☒	☒	☒
f) Dexamethasone suppression	☒	☐	☒	☐	☒	☒

Section 7
Lipid Metabolism Disorders

1. Introduction

A. Background

Hyperlipidemia refers to elevations in plasma cholesterol, triglycerides or both. These are usually due to an increase in the concentration of very low density lipoprotein (VLDL) and/or low density lipoprotein (LDL) in plasma and result from disturbances in lipoprotein metabolism. The term dyslipidemia is generally used to describe abnormalities in plasma lipoproteins that include low levels of high density lipoprotein (HDL), and/or abnormalities of lipoprotein composition or distribution. The lipid section requires an understanding of the physiology and pathophysiology of lipoprotein metabolism, the clinical impact of disorders of lipoprotein metabolism, and their treatment. An understanding of the pathobiology of the dyslipidemias requires a fundamental understanding of lipoprotein physiology, and the various sites at which defects can occur in these metabolic pathways. This includes an appreciation of the pathogenesis and diagnosis of both genetic disorders and secondary forms of dyslipidemia that result from the presence of several endocrine and other diseases, lifestyle variations, and/or the use of a variety of drugs. The area of lipids also requires training in the therapy of these disorders. Therapeutic options include both lifestyle (diet and physical activity) and pharmacological therapy.

Many forms of dyslipidemia are associated with an increased risk of cardiovascular disease (CVD), especially coronary artery disease. These include those that have high levels of LDL, and some forms of hypertriglyceridemia, which can be a marker of other abnormalities associated with increased cardiovascular risk. Low levels of HDL in plasma also can be associated with increased CVD risk. Epidemiological studies have demonstrated that the major importance of dyslipidemia is that they are associated with an increased risk of developing accelerated or premature CVD. Clinical trials have shown that CVD symptoms and cardiovascular events can be markedly attenuated by appropriate therapy of these disorders. However, not all forms of dyslipidemia are associated with increased CVD risk. An understanding of the relationship between various forms of dyslipidemia and other cardiovascular risk factors in determining overall cardiovascular risk is important in the prevention and treatment of accelerated or premature CVD.

Marked elevations of plasma triglycerides also can result in pancreatitis and other features of the chylomicronemia syndrome. An understanding of the multiple factors that may contribute to marked hypertriglyceridemia and the appropriate management, which dramatically reduce the risk of pancreatitis in these patients.

B. Goals and objectives

By the completion of their training, fellows should be competent in the diagnosis of the various common genetic and acquired forms of dyslipidemia. They should have a good understanding of the various laboratory tests that are available to aid in their diagnosis, and should be aware of the strengths and limitations of these diagnostic tests. Fellows also should be competent in the management of these disorders. This includes an understanding of the dietary principles and other life style modifications involved in the treatment of dyslipidemia and in atherosclerosis prevention. The fellow also should be competent to prescribe the major classes of drugs used to treat dyslipidemia, singly and in combination, and be aware of their major side effects.

C. Training and Evaluation

1. Specific Procedures:

None

2. Educational Expectations (per year of training):

These skills will be acquired through a variety of means, including: formal instruction (teaching conferences) and clinical experience. By completion of their first year of training, the fellow should be facile with the following areas of practice:

(1) Familiarity with the latest guidelines for the diagnosis and management of hyperlipidemic patients that are issued by the National Cholesterol Education Program. These are updated periodically

(2) Evaluation and follow-up of outpatients with various genetic and acquired forms of dyslipidemia

(3) Selection of the appropriate pharmacological agent in the management of hyperlipidemic/dyslipidemic patients

By completion of the second year of training, the fellow will have further improved their skills to include interdisciplinary practice with cardiologists, nuclear medicine (e.g. stress tests) and thoracic/cardiovascular surgeons.

3. Evaluation:

Evaluation by faculty, dictated by core competencies and based upon observations of clinical encounters and clinical presentations. In addition, the Endocrine Society annual in-training exam will be administered, and self-learning testing (i.e. ESA) is strongly encouraged.

2. Program Content

Triglyceride

- chylomicrons (risk for pancreatitis)
- LPL deficiency
- Mix of two common disorders: chylomicronemia syndrome
- VLDL (with low HDL)
  - familial hypertriglyceridemia (FHTG)
  - familial combined dyslipidemia (FCHL)
  - diabetic dyslipidemia
- Type III, remnant removal disease

Cholesterol

- With increased triglyceride: FHTG, FCHL, diabetes
- LDL: defective LDL receptor or ligand
- Lp(a)

Other Endocrine Dyslipidemia

- Hypothyroidism
- Cortisol excess
- Acromegaly
- Estrogen, testosterone
- (Other) drugs, alcohol

Management

- Severe hypertriglyceridemia and pancreatitis
- Atherosclerosis risk: LDL level and heterogeneity, Lp(a), low HDL with and without high triglyceride

Special considerations

One area that requires special emphasis is the approach to the diagnosis and management of diabetic dyslipidemia and the dyslipidemia that frequently accompanies insulin resistance. The focus in many clinics is on management of hyperglycemia, which has been convincingly shown to be of benefit to the prevention of microvascular complications of diabetes. However, the major cause of morbidity and mortality in this disease is due to complications of macrovascular disease. Approaches to the prevention and treatment of the macrovascular complications of diabetes, including lipid disorders, are emphasized in the management of the diabetes patient in our Joslin Diabetes Center. With the increasing awareness of the importance of treatment of dyslipidemia and other modifiable risk factors in addition to hyperglycemia, special emphasis on the management of diabetic dyslipidemia, and the dyslipidemia that accompanies the insulin resistant syndrome, is included as part of the lipid curriculum. This includes knowledge of the specific changes in lipids and lipoproteins that occurs in diabetes and the insulin resistance syndrome, how these changes are affected by the management of hyperglycemia, specific approaches to the management of these lipid abnormalities in diabetes, and a global approach to CVD risk factor management in diabetes and the insulin resistance syndrome.

Another area that requires emphasis is the management of the patient with marked hypertriglyceridemia. Elevation of plasma triglycerides to levels that put a patient at risk of pancreatitis usually results from a combination of a common genetic form of hypertriglyceridemia with one or more acquired forms of hypertriglyceridemia, and/or the use of lipid raising drugs. Marked hypertriglyceridemia is one of the most common causes of recurrent pancreatitis, but frequently is not diagnosed and treated appropriately. It is important that fellows understand the interaction of genetic and secondary forms of hypertriglyceridemia in the etiology of marked hypertriglyceridemia. At the completion of their fellowship, fellows should be able to identify the major genetic and acquired conditions that are involved in the causation of marked hypertriglyceridemia. They also should be competent in the management of this condition, with a view to the prevention of recurrent pancreatitis.

A uncommon condition that fellows should be competent with the diagnosis and treatment of is type III Familial Dysbetalipoproteinemia (remnant removal disease). General internists or primary care physicians usually do not correctly diagnose this genetic form of dyslipidemia. The clinical and laboratory features that lead to the diagnosis of this relatively uncommon condition is part of the lipid curriculum for endocrinology fellows. Fellows learn the different therapeutic options in this condition.

With the advent of newer and improved lipid-lowering agents, combinations of drugs that affect lipid metabolism are being used more frequently. Some of these combinations are rational, effective, safe and cost effective. Others are associated with potentially dangerous side effects. It is important that fellows understand the relative risks and benefits of combination therapy for the treatment of dyslipidemia. In rare instances with high LDL that is resistant to therapy, apheresis may be indicated.

There are a number of rare disorders of lipid and lipoprotein metabolism, which have provided considerable insight into our understanding of lipid and lipoprotein metabolism. These include lecithin cholesteryl acyl transferase deficiency, hepatic lipase deficiency, cholesterol ester transport protein deficiency, apolipoprotein CII deficiency, abetalipoproteinemia and Tangier disease. For example, the identification of the molecular defect in Tangier disease has provided important insight into the understanding of reverse cholesterol transport. A less rare condition is hypobetalipoproteinemia. Fellows should be familiar with these conditions.

3. Suggested Reading

Textbooks

Scriver CR, Beaudet AL, Sly WS, Valle D, Childs B, Kinzler KW. *The Metabolic and Molecular Basis of Inherited Disease*. 8th ed. McGraw-Hill NY; 2001.

Kwiterovich PO. *The Johns Hopkins Textbook of Dyslipidemia.* Lippincott Williams & Wilkins; 2010.

Electronic:

Clinical Practice Recommendations American Diabetes Association: www.professional.diabtes.org (updated each January)

American Association of Clinical Endocrinologists guidelines http://www.aace.com/pub/guidelines

The Endocrine Society guidelines http://www.endo-society.org/guidelines

National Lipid Association: www.lipid.org

Disorders of Lipid Metabolism

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Cholesterol						
a) LDL defect	☒	☐	☒	☐	☒	☒
b) LDL receptor defect	☒	☐	☒	☐	☒	☒
c) Management	☒	☐	☒	☐	☒	☒
2. Triglycerides						
a) Chylomicrom	☒	☐	☒	☐	☒	☒
b) Lipoprotein lipase defect	☒	☐	☒	☐	☒	☒
c) Apoprotein CII defeciency	☒	☐	☐	☐	☒	☒
d) VLDL	☒	☐	☒	☐	☒	☒
e) Management	☒	☐	☒	☐	☒	☒
3. Mixed defects						
a) Management	☒	☐	☒	☐	☒	☒
4. Secondary Dyslipidemias						
a) Diabetes mellitus	☒	☐	☒	☐	☒	☒
b) Hypothyroidism	☒	☐	☒	☐	☒	☒
c) Medication	☒	☐	☒	☐	☒	☒
5. Other						
a) Tangier's disease	☒	☐	☐	☐	☒	☒
b) Lpa	☒	☐	☐	☐	☒	☒
c) Apoprotein physiology	☒	☐	☐	☐	☒	☒

Section 8
Nutrition and Obesity

1. Introduction

A. Background

Endocrinology is concerned with the actions of hormones and the organs and tissues in which the hormones are formed. A number of hormones are particularly involved with fuel, vitamin, and mineral metabolism. They are profoundly involved in substrate flux and the utilization of food for energy production and storage. Their importance in nutrition is therefore great. A practicing endocrinologist must have a basic knowledge of nutrition to understand the endocrine interactions that occur. At a minimum, there must be in an endocrinology subspecialty training curriculum a core knowledge in nutrition (including nutrition support), and an understanding of eating disorders (including obesity, anorexia nervosa and bulimia).

B. Goals and Objectives

The goals for the training of Endocrine Fellows in Nutrition are to have a working knowledge of the above conditions, both basic pathophysiology and treatment modalities.

C. Training and Evaluation

1. Specific Procedures:

(1) Dexa for Body Composition
(2) Bioelectrical Impedance Analysis
(3) Total Parenteral Nutrition Formulation/Management

2. Educational Expectations (per year of training):

By completion of their first year of training, the fellow should be facile with the following areas of practice:

(1) Familiarity with the latest guidelines for the diagnosis and management of obese patients.
(2) Medical and surgical approaches to the management of obesity
(3) Sequelae of diet, malabsorption and weight loss
(4) Nutritional management of the hospitalized patient
(5) Manifestations of nutritional deficiencies

By completion of the second year of training, the fellow will have further improved their skills to include interdisciplinary practice with bariatric surgeons, gastroenterologists and physical therapists.

Training will occur through lectures and conferences, clinical experience and self-directed reading.

Evaluation will be dictated by core competencies and base upon observations of clinical encounters and clinical presentations. Formal in-training exams will also be given.

2. Program Content

<u>i. Fuel Metabolism</u>

Role of hormones and peptides in the regulation of fuel metabolism

Central Nervous System Regulation
Micronutrient Requirements

Vitamins: A, D, E, K folate, ascorbate, thiamine, riboflavin, niacin, B12, biotin, pantothenic acid, pyridoxine
Antioxidants
Inositol, choline, carnitine
Minerals: Ca, P, Mg, Mn, Fe, Zn, Cu, Se, iodine

Vitamins and Minerals

(1) Sources in the diet: bioavailability and absorption
(2) Parenteral preparations
(3) Metabolism
(4) Antagonists
(5) Drug/nutrient interactions
(6) Deficiency syndromes
(7) Excess syndrome
(8) DRIs (normal requirements)
(9) Dietary supplements

Macronutrient Utilization: carbohydrates, proteins and fats
Modulation of Disease Processes by nutrients in food and by dietary supplements (carcinogenesis, diabetes mellitus, cardiovascular disease, pregnancy, metabolic bone disease)
Eating Disorders

ii. Obesity

Who Are the Obese?

(1) body composition
(2) prevalence

What Causes Overweight?

(1) gene/environment interactions
(2) energy balance
(3) neuro-endocrine causes: rare hypothalamic obesity syndromes, pituitary, adrenal, thyroid, PCO, insulin resistance, leptin deficiency
(4) drug induced
(5) primary psychiatric

Health Hazards

(1) insulin resistance leading to the metabolic syndrome
(2) mechanical complications

Clinical Classification and Natural History
Clinical Evaluation
Treatment

(1) behavior modification
(2) diet treatments including:
high protein, high fat, low carbohydrates,
protein-supplemented modified fast, liquid diets
low fat, high carbohydrate diets
traditional diet (ADA, AHA)
non-traditional diets
(3) physical activity
(4) pharmacological treatment
(5) surgery

(6) setting up a weight management program
(7) complications of treatment (eg, gallstones, electrolyte abnormalities, arrhythmias, vitamin deficiency)

Obesity Clinical Trials – evaluation and interpretation

iii. Anorexia/Bulemia

The Clinical Syndromes

(1) anorexia: diagnosis, full blown syndrome, pre"syndrome"
(2) bulimia: purging, exercise, laxative, exercise as purging

Neuro-Endocrine Metabolic Abnormalities

(1) gonadotropin abnormalities
(2) hypo metabolic manifestations
(3) HPA axis interrelations
(4) other pituitary abnormalities: GH, prolactin
(5) estrogen abnormalities

Clinical Sequelae

(1) osteoporosis
(2) amenorrhea
(3) dentition
(4) CVD

Psychological Characteristics

Treatment

iv. Nutrition Support

Protein Calories Malnutrition (Marasmus)

head and neck cancer, malabsorption, CNS disease, anorexia and bulimia, GI obstruction, iatrogenic, drug induced, senescence

Protein Malnutrition (Adult Kwashiorkor-Like Syndrome)

critical illness acute vs sustained/chronic, trauma, burn, protein-losing enteropathy, HIV, cancer, nephrotic syndrome

Nutritional Assessment

history, physical exams, including anthropometrics, laboratory assessment, body composition

Treatment

(1) enteral: oral and tube feeding
(2) parenteral
(3) pharmacological (anabolics)
(4) combined modalities
(5) monitoring treatment

Interpretation of Clinical Trials in Nutrition Support

v. Emergencies

Extreme Obesity

(1) decompensated respiratory failure
(2) decompensated cardiovascular failure
(3) cellulitis and other skin disorders
(4) complications of treatment (acute cholecystitis, arrhythmias)

Anorexia/Bulimia

(1) cardiac arrhythmia

(2) sepsis
(3) hypotension
(4) hypoglycemia
(5) psychosis
(6) electrolyte abnormalities

Parenteral Nutrition

(1) catheter related sepsis
(2) thrombus or emboli
(3) bleeding
(4) hypo and hyperglycemia

Re-feeding Syndrome

(1) volume overload and heart failure
(2) electrolyte abnormalities and arrhythmia

3. Suggested Reading

Textbooks:

Finer, Packianathan, Bray. Obesity. Health Press, 2008.

DeGroot LJ, Jameson JL, eds. *Endocrinology*. 5th ed. Philadelphia, Pa: W.B. Saunders Co; 2006.

Felig P, Frohman LA, eds. *Endocrinology and Metabolism*, 4th ed. New York, NY: McGraw-Hill Professional, 2001

Becker KL, Bilezikian JP, Bremner WJ, Hung W, Kahn CR, Loriaux DL, Nylen ES, Rebar RW, Robertson GL, Wartofsky L, eds. *Principles and Practice of Endocrinology and Metabolism.* 3rd ed. Philadelphia, Pa: J.B. Lippincott Williams & Wilkins; 2001.

Wilson JD, Foster DW, Kronenberg HM, Reed Larson P, eds. *Williams Textbook of Endocrinology*. 11th ed. Philadelphia,Pa: W.B. Saunders Co; 2007.

References:

Physicians Desk Reference: For Nutritional Supplements.

A.S.P.E.N. (American Society for Parenteral and Enteral Nutrition) Guidelines for the Use of Parenteral and Enteral Nutrition in Adult and Pediatric Patients: http://www.nutritioncare.org/library.aspx

The Weight-Control Information Network: http://win.niddk.nih.gov

NIH Office of Dietary Supplements: http://dietary-supplements.info.nih.gov

US Food and Drug Administration: http://www.fda.gov

Additional Reading

Shils M, Shike M, Ross AC, Caballero B, Cousins RJ, eds. *Modern Nutrition in Health and Disease*. 10th edition, Lippincott Williams and Wilkins, 2006.

Nutrition and Obesity

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Obesity						
a) Pathophysiology	☒	☒	☒	☒	☒	☒
b) Diagnosis	☒	☒	☒	☒	☒	☒
c) Management	☒	☒	☒	☒	☒	☒
2. Starvation						
a) Anorexia nervosa	☒	☐	☒	☐	☒	☒
b) Bulemia	☒	☐	☒	☐	☒	☒
3. Vitamin Deficiency						
a) Water soluble	☒	☐	☒	☐	☒	☒
b) Fat soluble	☒	☐	☒	☐	☒	☒
4. Total Parenteral Nutrition						
a) Management	☒	☒	☐	☒	☐	☒
5. Disease Specific Studies/ Procedures						
a) Other	☒	☐	☒	☐	☒	☒

Section 9
Thyroid Disorders

1. Introduction

A. Background

Thyroid specific disorders include both anatomical defects of the thyroid gland as well as disorders due to the effects of thyroid hormones on extrathyroidal tissues. Thyroid disorders are among the most common diseases encountered by the endocrine consultant; they occur in the population with a prevalence greater than 10% in some studies. Furthermore, the incidence of thyroid disorders is rising, in part because our diagnostic tools are much more sensitive and sophisticated. Thyroid disorders account for a significant amount of morbidity in our society and the fellow should be competent in their diagnoses and treatment.

Performance of thyroid sonography and fine needle aspirations are an intrinsic part of the evaluation of patients with nodular thyroid disease. Ultrasound is superior to physical examination for delineation of both the number and size of thyroid nodules in patients with palpable thyroid abnormalities. The current recommendations for evaluation of euthyroid patients with palpable thyroid nodules include performance of a diagnostic thyroid ultrasound. Furthermore, sonographic features of thyroid nodules guide in evaluation for risk of malignancy and therefore assist in both decision making about fine-needle aspiration (FNA) of small thyroid nodules and selection of nodules for FNA in multinodular thyroid glands. Sonography may also be necessary to guide placement of the needle for FNA in certain situations where palpation is not sufficient. In addition, ultrasound examination of the cervical lymph nodes is important both in the initial staging evaluation and for surveillance of patients with differentiated thyroid cancer. Ultrasound-guided FNA of abnormal cervical lymph nodes will diagnosis recurrent or residual locoregional papillary or medullary thyroid cancer. Lastly, ultrasound may detect parathyroid adenomas and aid in the pre-operative evaluation of hyperparathyroid patients.

B. Goals and Objectives

It is our intent that the fellow develop the following:

1. The training program will provide opportunities for the fellow to develop clinical competence in the area of thyroid disease. Clinical experience must include opportunities to diagnose and manage (1) adolescent and adult inpatients and outpatients of both sexes with (2) a variety of thyroid diseases of (3) varying acuity. The program also must include opportunities to function in the role of an endocrinology consultant for patients and other physicians and services in both inpatient and outpatient settings.

2. In relation to the diseases listed below, there should be formal instruction in: (1) thyroid physiology and pathophysiology in systemic diseases and principals of hormone action, (2) biochemistry and physiology, including cell and molecular biology and immunology, as they relate to thyroid disease, and (3) signal transduction pathways and biology of thyroid hormone receptors and their interaction with other hormone receptor pathways. The appropriate utilization and interpretation of clinical laboratory, radionuclide, and radiologic studies for the diagnosis and treatment of thyroid diseases should be stressed.

3. Fellows will have formal instruction, clinical experience, or opportunities to acquire expertise in the evaluation and management of the disorders listed below as well as aspects of those disorders that relate to: (1)

psychiatric disease, (2) aging, with particular emphasis on the care of geriatric patients and thyroid related changes associated with aging, and (3) adaptations and maladaptations to systemic diseases with respect to effects on the hypothalamic-pituitary-thyroid axis.

4. Fellows will have formal instruction and clinical experience in performing thyroid ultrasounds and FNAs. At completion of the training program, the fellow will achieve the following competencies:

(1) Knowledge and understanding of the physics of ultrasound and its relation to the performance and interpretation of ultrasound imaging.
(2) The skill to perform and interpret a diagnostic thyroid ultrasound optimizing the technical features of the ultrasound machine.
(3) The skill to perform ultrasound-guided FNA of solid and cystic thyroid nodules. This involves medical knowledge and practice-based learning and improvement from previous aspirations and personal communication with the patient for informed consent foe ach FNA.
(4) An understanding of the indications for and advantages of ultrasound-guided FNA of a thyroid nodule versus palpation-guided FNA.
(5) The ability to identify the different imagines characteristics of thyroid nodules and to understand the features of each of these characteristics that is associated with thyroid cancer. This will involve new medical knowledge and practice based learning and improvement from studies patients.
(6) Medical knowledge and an understanding of the indications for and use of ultrasound imaging for surveillance of cervical lymph nodes in thyroid cancer patients. This will involve new medical knowledge and practice-based learning and improvement form studied patients.
(7) Medical knowledge and understanding of the indications for and use of ultrasound imaging for detection of parathyroid adenomas in patients with hyperparathyroidism. This will involve new medical knowledge and practice-based learning and improvement from studied patients.

C. Training and Evaluation

1. Specific Procedures:

The training program will provide opportunities for the fellow to develop clinical competence in thyroidology. Specific procedures needed include:

(1) The fellow must perform a sufficient number of fine needle aspiration biopsies of a thyroid nodule to be deemed compentant. The fellow is expected to review the cytology with a pathologist who has expertise in interpretation of thyroid cytopathology.

(2) The opportunity to become proficient in the performance of thyroid ultrasound, including ultrasound-guided fine needle aspiration biopsy of the thyroid and lymph node tissue.

(3) The fellow is expected to review imaging studies with individuals who have expertise in interpreting these images. Such studies include thyroid ultrasound and nuclear imaging studies.

2. Training in Ultrasound of the Thyroids, Parathyroid and Lymph Nodes:

These skills are acquired at the Joslin Diabetes Center. Supervision of the fellow is provided by a qualified attending. Training in the knowledge and skills to perform an ultrasound diagnostic exam and ultrasound-guided FNA includes:

(1) Formal training such a didactic lectures and/or self-directed learning through reading material concerning ultrasound physics, and the indications for and interpretation of thyroid, parathyroid, and cervical lymph node ultrasound, including ultrasound-guided FNA.

(2) Knowledge of the current guidelines for the diagnosis and management of thyroid nodules and thyroid cancer, focusing on the recommendations for thyroid ultrasound that are published by the Society of

Radiologists in Ultrasound, the American Thyroid Association, the American Association of Clinical Endocrinologists, and the European consortium.

(3) Familiarity with the American Institute in Ultrasound *Practice Guidelines for the Performance of Thyroid and Parathyroid Ultrasound Examination*

(4) Supervised performance, interpretation, and reporting of diagnostic thyroid ultrasound, including:

a. Ultrasound instrumentation and the skill to perform and interpret a diagnostic thyroid ultrasound optimizing the technical features of the ultrasound machine.

b. The ability to identify the different imaging characteristics of thyroid nodules and to understand the features of each of these characteristics that is associated with thyroid cancer.

(5) Supervised performance and reporting of ultrasound-guided FNA procedures, including:

a. An understanding of the indications for ultrasound-guided FNA of a thyroid nodule versus palpation FNA

b. The skill to perform ultrasound-guided FNA of solid and cystic thyroid nodules.

(6) Supervised performance, interpretation, and reporting of ultrasound imaging for detection of parathyroid adenomas, including:

a. An understanding of the indications for and an exposure to ultrasound imaging for detection of parathyroid adenomas in patients with hyperparathyroidism

(7) Supervised performance, interpretation, and reporting of ultrasound imaging for detection of metastatic thyroid cancer to cervical lymph nodes, including:

a. An understanding of the indications for and an exposure to ultrasound imaging for surveillance of cervical lymph nodes n thyroid cancer patients.

(3) Evaluation:

Evaluation will be dictated by the core competencies and based upon faculty observation and supervision of clinical encounters and clinical presentations. In addition, in-training exams will be used and fellows are encouraged to use self-learning testing e.g. ESAP. The evaluation of the trainees in ultrasonography and FNAs includes direct observation of the trainee during the performance of the delineated procedures by the qualified attending. The fellow will keep a log of all performed diagnostic imaging studies and ultrasound-guided FNA procedures. If possible, all images should be archived and retrievable.

D. Educational Expectations (per year of training)

It is expected that upon completion of the first year of training, fellows will be well versed in the ability to investigate all forms of thyroid disease in men and women. In addition, they will be able to properly interpret radiographic imaging studies and nuclear scans of the thyroid gland. Moreover, fellows will be facile with the performance and interpretation of hormone assays. During the initial year of training, the fellow will gain significant experience in needle biopsy of thyroid nodules. By the completion of the second year of training, the fellow will be able to independently perform a fine needle aspiration of a thyroid nodule.

2. Program Content

In relation to the diseases listed below, fellows gain experience in the performance of endocrine clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance, and proficiency standards. Fellows also acquire experience and skill in the following areas:

(1) the interpretation of laboratory tests; immunoassays; and radionuclide, ultrasound, radiologic, and other imaging studies for the diagnosis and treatment of thyroid diseases;

(2) the effects of a variety of non-endocrine disorders on laboratory and imaging studies and performance and interpretation of stimulation and suppression tests as related to thyroid disease; and

(3) thyroid related emergencies, including:
(a) severe hypo- and hyperthyroidism (thyroid storm and myxedema coma);
(b) severe thyroid dysfunction during and after pregnancy;
(c) tracheal compression from a goiter or from the treatment of thyroid disease;
(d) agranulocytosis secondary to anti-thyroid drug therapy.

1. The fellow will have a comprehensive understanding of all causes of thyrotoxicosis and will be familiar with Graves' Disease, thyroiditis, and toxic nodular goiters.

2. The fellow will have a comprehensive understanding of all causes of hypothyroidism including the conditions of auto-immune and post-ablative hypothyroidism .

3. The fellow will have a comprehensive understanding of thyroid cancer including:
Differentiated epithelial thyroid cancer
Medullary thyroid cancer
Thyroidal lymphoma

4. The fellow will have a comprehensive understanding of the causes of nodules and goiters including the single nodule, multinodular goiter, and a diffuse goiter.

5. The fellow will be familiar with other causes of thyroid dysfunction. These include pregnancy related thyroid dysfunction, polyglandular autoimmune syndrome, and thyroid dysfunction in non-thyroidal disease.

3. Suggested Reading

Textbooks:

Werner and Ingar's The Thyroid, 9th ed., ed. Braverman LE, Utiger JB, Lippincott Company, 2005.

Websites:

American Thyroid Association Professional Guidelines: http://www.thyroid.org/professionals

Thyroid Disease Manager: www.thyroidmanager.org

American Association of Clinical Endocrinologists guidelines http://www.aace.com/pub/guidelines

The Endocrine Society guidelines http://www.endo-society.org/guidelines

Additional Reading for Ultrasonography and FNAs:

American Institute in Ultrasound *Practice Guideline for the Performance of Thyroid and Parathyroid Ultrasound Examination:* http://www.aium.org/publication/clinical/thyroid.pdf

Frates MC, Benson CB, Charboneau JW, Cibas ES, Clark OH, Coleman BG, Cronan JJ, Doubilet PM, Evans DB, Goellner JR, Hay ID, Hertzberg BS, Intenzo CM, Jeffrey RB, Langer JE, Larsen PR, Mandel SJ, Middleton

WD, Reading CR, Sherman SI, Tessler FN. Management of thyroid nodules detected at US: Society for Radiologists in Ultrasound Consensus Conference Statement. Radiology 237:791-800, 2005.

Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, Mandel SJ, Mazzaferri EL, McIver B, Sherman SI, Tuttle RM. Management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 16:1-32, 2006.

AACE/AME Task Force on Thyroid Nodules. Medical guidelines for clinical practice for the diagnosis and management of thyroid nodules. Endocrine Pract 12:63-101, 2006.

Pacini F, Schlumberger M, Dralle H, Rossella E, Smit JWA, Wiersinga W. European consensus for the management of patients with differentiated thyroid carcinoma of the follicular epithelium. Eur J Endocrinol 154:787-803, 2006.

Thyroid Disorders

Method of Education

	Formal Instruction	Direct Clinical Experiences		Clinical Case Discussions		Self-directed learning
		In-patient	Out-patient	Attd. Rds	Conferences	
1. Hyperthroidism						
a) Grave's Disease	☒	☒	☒	☒	☒	☒
b) Thyroiditis	☒	☐	☒	☒	☒	☒
c) Toxic nodule	☒	☐	☒	☒	☒	☒
d) Toxic multinodular goiter	☒	☐	☒	☒	☒	☒
e) Struma Ovaril	☒	☐	☐	☐	☒	☒
f) Thyrotoxicosis factitia	☒	☐	☒	☒	☒	☒
g) Other	☒	☐	☒	☒	☒	☒
2. Hypothroidism						
a) Thyroiditis	☒	☐	☒	☒	☒	☒
b) Post-ablative	☒	☐	☒	☒	☒	☒
c) Other	☒	☒	☒	☒	☒	☒
3. Thyroid Cancer						
a) Papillary thyroid cancer	☒	☒	☒	☒	☒	☒
b) Follicular thyroid cancer	☒	☒	☒	☒	☒	☒
c) Medullary thyroid cancer	☒	☐	☒	☒	☒	☒
d) Anaplastic thyroid cancer	☒	☒	☒	☒	☒	☒
e) Other	☒	☐	☒	☒	☒	☒
4. Nodules						
a) Simple nodule	☒	☐	☒	☒	☒	☒
b) Multinodular goiter	☒	☐	☒	☒	☒	☒
c) Diffuse goiter	☒	☐	☒	☒	☒	☒
d) Other	☒	☐	☒	☒	☒	☒
5. Other						
a) Polyglandular autoimmune syndrome	☒	☐	☒	☒	☒	☒
b) Pregnancy-related thyroid disease	☒	☐	☒	☒	☒	☒
c) Non-thyroidal illness	☒	☒	☒	☒	☒	☒
6. Disease Specific Studies/ Procedures						
a) Fine needle aspiration	☒	☐	☒	☒	☒	☒
b) Thyroid ultrasound	☒	☐	☒	☒	☒	☒
-c) Thyroid scan-iodine	☒	☒	☒	☒	☒	☒
d) Thyroid scan-Tcm	☒	☐	☒	☒	☒	☒

Section 10
Pediatric Endocrinology Rotation

Primary Goals:

GOAL: Counseling. Understand the role of the endocrinologist in counseling to parents and youth with specific endocrine disorders.
Provide preventive counseling to parents and patients with specific endocrine conditions about: 1. The need for influenza vaccination in children with certain endocrine disorders (hypoadrenalism, diabetes mellitus, hypopituitarism, chronic steroid use, and Cushing Syndrome). 2. The association of chronic steroid use and decreased bone density. 3. The importance of metabolic control for prevention of long term complications such as retinopathy, neuropathy, nephropathy, and macrovascular disease. 4. The value of support groups and camps available for children with diabetes mellitus.
GOAL: Normal Versus Abnormal (Endocrine). Differentiate between normal, physiologic deviations from normal, and pathological states related to pediatric endocrinology.
1 : Describe the normal developmental patterns of statural growth and weight gain, along with normal variations. Describe body proportions that can help to differentiate proportionate from disproportionate short stature.
2 : Perform Tanner staging (SMR) and explain the sequential physiologic events associated with puberty.
3 : Identify early puberty and differentiate it from premature thelarche and premature adrenarche.
4 : Describe the hypothalamus-pituitary-peripheral gland axis along with their stimulatory and inhibitory feedback mechanisms.
5: Describe Calcium and Phosphorus homeostasis, vitamin D metabolism, parathyroid hormone functions, and their interrelationships.
6 : Explain the findings on clinical history and examination that suggest a disease of endocrine origin and require further evaluation and treatment. Such diseases include hypo- and hyper-thyroid states, diabetes mellitus, diabetes insipidus, rickets, obesity, delayed or accelerated growth, early or delayed puberty, adrenal insufficiency and hyperactivity, and congenital adrenal hyperplasia.
7 : Interpret clinical and laboratory endocrine tests to identify endocrine disease, including: bone age, vitamin D, calcium, phosphate and alkaline phosphatase, glucose, insulin, and hemoglobin A1C, T4, free T4, TSH, parathyroid hormone, serum and urine electrolytes and osmolality, cortisol and ACTH, FSH, LH, estradiol, testosterone, cortisol, rennin, adrenal androgens and precursor hormone levels, growth hormone, imaging studies (MRI, CT Scan, Ultrasound, and thyroid scans) and bone densitometry.
GOAL: Undifferentiated Signs and Symptoms (Endocrine). Evaluate, treat, and/or refer patients who present with undifferentiated signs and symptoms that may represent an endocrine disease process.
Create a strategy for determining if the following presenting signs and symptoms are caused by an endocrine disease process and determine if the patient needs treatment or referral. 1. Fatigue 2. Vomiting/Weight loss 3. Short and tall stature

4. Obesity
5. Polydipsia
6. Hypoglycemia
7. Hyperglycemia
8. Hypocalcemia
9. Early or delayed puberty
10. Acanthosis nigricans
11. Headaches
12. Dizziness
13. Diplopia and blurred vision
14. Polyuria

GOAL: Common Conditions Not Referred (Pediatric Endocrine). Diagnose and manage endocrine conditions in patients not generally requiring referral.

Diagnose, explain the pathophysiology of, and manage the following endocrine conditions:

1. Premature adrenarche
2. Premature thelarche
3. Delayed puberty due to chronic disease or anorexia nervosa
4. Exogenous obesity
5. Familial short stature, constitutional delay of growth or puberty
6. Short stature variants not meeting criteria for hormone therapy
7. Gynecomastia in a pubertal male
8. Infant of mother with gestational diabetes
9. Transient hypocalcemia of a newborn
10. Transient hypoglycemia of a newborn

GOAL: Conditions Generally Referred (Pediatric Endocrine). Recognize, initiate management of, and refer patients with endocrine conditions that require referral.

Identify, explain the pathophysiology of, provide initial management for, and refer to a pediatric subspecialist the following endocrine conditions:

1. Adrenal insufficiency
2. Ambiguous genitalia, hypogonadism, and micropenis
3. Central and nephrogenic diabetes insipidus and psychogenic polydipsia
4. Congenital adrenal hyperplasia
5. Congenital hypothyroidism
6. Delayed or precocious puberty
7. Diabetes mellitus type I (diabetic ketoacidosis (DKA), long-term management)
8. Endocrine causes of obesity
9. Hirsutism, hyperandrogenism, and polycystic ovaries
10. Hypoglycemia in childhood and adolescence
11. Metabolic bone disease including rickets and skeletal dysplasias
12. Abnormalities of calcium, phosphorus, or magnesium homeostasis
13. Short stature variants meeting criteria for hormonal treatment
14. Tall stature and excessive growth syndromes
15. Thyroid dysfunction and goiters
16. Diabetes mellitus type II

Identify the role and general scope of the practice of endocrinology. Recognize situations where children benefit from the skills of specialists trained in the care of children, and work effectively with endocrine specialists to care for children with endocrinology problems.

GOAL: Diabetes Mellitus (Types 1 and 2). Diagnose and manage diabetes mellitus in children.

1 : List the findings on clinical history and examination that suggest a diagnosis of diabetes mellitus and/or diabetic ketoacidosis in children.
2 : Identify the risk factors for developing type 2 diabetes and provide routine screening for those at elevated risk.
3 : Differentiate Type 1 and Type 2 diabetes on the basis of findings from the clinical history, physical examination, and laboratory tests.
4 : Diagnose diabetes mellitus and diabetic ketoacidosis from presenting symptoms and confirmatory lab tests.
5 : Order appropriate confirmatory diagnostic serum and urine tests for diabetes mellitus and accurately interpret the results.
6 : Compare and contrast the different preparations of insulin and describe the pharmacokinetics of each.
7 : Discuss treatment regimens available for patients with Type 2 diabetes, including the use of oral medications, determination of initial dosages, drug pharmacokinetics, dose adjustments based on serum glucose levels, possible side effects and monitoring for safety.
.8 : Order appropriate initial dosages of insulin based on both clinical and laboratory findings and adjust subsequent dosages based on serum glucose levels.
9 : Order appropriate IV and PO fluids to manage ketoacidosis and initial hyperglycemia with or without ketosis, realizing that insulin therapy may be required in the initial treatment of Type 2 diabetes.
10 : Recognize immediate life threatening complications associated with the diagnosis and treatment of diabetic ketoacidosis and steps for initial treatment and stabilization. Refer for intensive care as indicated.
11 : Develop an educational plan for parents and patients that provides effective education regarding diabetes, availability of support groups and diabetic camps, diet and exercise, home glucose monitoring, adjustment of insulin or oral medications dosages, use of insulin pumps, response to illness, and preventive care.
12 : Develop a cost-effective plan for monitoring patients with diabetes, including use of hemoglobin A1-C levels and daily glucose profiles to assess control, frequency and severity of hypoglycemia and hyperglycemia, treatment compliance, and the development of long term complications such as retinopathy, nephropathy and neuropathy.
13 : Identify the clinical and biochemical indicators that necessitate consultation or referral of a child with diabetes.
GOAL: Thyroid Disorders: Understand the diagnosis and management of thyroid diseases in children.
1 : Explain the findings on clinical history, examination, and laboratory tests that suggest the presence of a thyroid disorder (hypo- or hyper-thyroidism), including abnormal growth patterns, goiter, etc.
5.28.2 : Identify the thyroid function tests, including newborn screening, available for detecting and diagnosing a thyroid disorder, and describe the indications for ordering, limitations and interpretations.
3 : Discuss the identification, treatment, and follow-up in a patient with congenital hypothyroidism. Discussion should include the importance of early detection and limitations of newborn screenings, as well as treatment, monitoring and parental education.
4 : Identify imaging studies available for patients with a thyroid disorder and the indications for obtaining such studies.
5 : Discuss the causes of hyperthyroidism.
6 : Compare and contrast the different treatment options for hyperthyroidism, including oral medications, irradiation, and surgery, and discuss the selection criteria for each treatment modality.
7 : Create an education, treatment and follow-up plan for a patient with a thyroid disorder that includes treatment, monitoring, potential complications, and long-term follow-up.

GOAL: Pediatric Competencies in Brief (Subspecialty Rotation). Demonstrate high standards of professional competence while working with pediatric patients and their families.
Competency 1: Patient Care. Provide family centered patient care that is developmentally and age appropriate, compassionate, and effective for the treatment of health problems and the promotion of health.
1 :Use a logical and appropriate clinical approach to the care of patients presenting for specialty care, applying principles of evidence-based decision-making and problem solving.
.2 :Describe general indications for subspecialty procedures and interpret results for families.
Competency 2: Medical Knowledge. Understand the scope of established and evolving biomedical, clinical, epidemiological and social-behavioral knowledge needed by an endocrinologist; demonstrate the ability to acquire, critically interpret and apply this knowledge in patient care.
1 :Acquire, interpret and apply the knowledge appropriate regarding the core content of this subspecialty area.
2 :Critically evaluate current medical information and scientific evidence related to this subspecialty area and modify your knowledge base accordingly.
Competency 3: Interpersonal and Communication Skills. Demonstrate interpersonal and communication skills that result in information exchange and partnering with patients, their families and professional associates.
1 :Provide effective patient education, including reassurance, for a condition(s) common to this subspecialty area.
2 :Communicate effectively with primary care and other physicians, other health professionals, and health related agencies to create and sustain information exchange and team work for patient care.
3 :Maintain accurate, legible, timely, and legally appropriate medical records, including referral forms and letters, for subspecialty patients in the outpatient and inpatient setting.
Competency 4: Practice-based Learning and Improvement. Demonstrate knowledge, skills and attitudes needed for continuous self-assessment, using scientific methods and evidence to investigate, evaluate, and improve one's patient care practice.
1 :Identify standardized guidelines for diagnosis and treatment of conditions common to this subspecialty area and adapt them to the individual needs of specific patients.
2 :Identify personal learning needs related to this subspecialty; systematically organize relevant information resources for future reference; and plan for continuing acquisition of knowledge and skills.
Competency 5: Professionalism. Demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to diversity.
1 :Demonstrate personal accountability to the well being of patients (e.g., following-up lab results, writing comprehensive notes, and seeking answers to patient care questions).
2 :Demonstrate a commitment to carrying out professional responsibilities.
3 :Adhere to ethical and legal principles, and be sensitive to diversity.
Competency 6: Systems-Based Practice. Understand how to practice high quality health care and advocate for patients within the context of the health care system.
1 :Identify key aspects of health care systems as they apply to specialty care, including the referral process, and differentiate between consultation and referral.
2 :Demonstrate sensitivity to the costs of clinical care in this subspecialty setting, and take steps to minimize costs without compromising quality
3 :Recognize and advocate for families who need assistance to deal with systems complexities, such as the referral process, lack of insurance, multiple medication refills, multiple appointments with long transport times, or inconvenient hours of service.
4 :Recognize one's limits and those of the system; take steps to avoid medical errors.

Procedures

GOAL: Diagnostic and screening procedures. Describe the following tests or procedures, including how they work and when they should be used; competently perform those commonly used

by the pediatrician in practice.
Bone age: interpretation
Bone densitometer
Radiologic interpretation: CT of head
Radiologic interpretation: MRI of head
Radiologic interpretation: skeletal x-ray (incl. abuse)

Evaluation:

Evaluation will be based upon faculty observation of clinical encounters and clinical presentations, as well as the in-training examination.