

**Icahn School of Medicine at Mount Sinai Clinical Curriculum for Clinical  
Fellowship in Endocrine Surgery  
(Current as of January 2021)**

**Goal of the Fellowship**

To immerse the fellow in the study and practice of diseases of the endocrine system such that the fellow will achieve expert level knowledge and skill-based confidence by the end of the experience.

The curriculum of the Mount Sinai Clinical Fellowship in Endocrine Surgery is based on the curriculum specified by the American Association of Endocrine Surgeons.

**PREAMBLE:** The purpose of this document is to define the learning objectives in this Endocrine Surgery fellowship. This curriculum is designed to build on and to follow the current RRC and ABS requirements for General Surgery training. It is an expectation of the American Board of Surgery that a qualified surgeon be knowledgeable in the management of Endocrine Surgery, therefore, this curriculum will not restate those learning objectives required of all general surgeons but rather build upon these concepts.

**PREREQUISITES:** Completion of an RRC approved (or International equivalent) General Surgery Residency. The fellow must be Board-Certified or in the examination process by the American Board of Surgery (i.e., “board eligible”). Exceptions for entry into fellowship for international candidates may be granted by the program director. However, ultimate certification will be dependent upon the fellow’s ability to meet all stipulated requirements.

**AIM:** To obtain the knowledge and technical skills required to achieve mastery in Endocrine and related Surgery.

**GOAL OF THE FELLOWSHIP:** To provide fellows with an immersion in the study and practice of diseases of the endocrine organs (thyroid, parathyroid, adrenal glands and endocrine pancreas) such that the fellow will achieve expert level knowledge and skill-based confidence by the end of the experience. This Curriculum for Endocrine Surgery Fellowship describes the goals and objectives of the core competencies that are common to and required by all Fellowships in Endocrine Surgery including: patient care, medical knowledge,

practice-based learning and improvement, interpersonal and communication skills, professionalism and systems-based practice.

### **Patient Care:**

Fellows will be expected to perform preoperative assessment of patients and demonstrate an understanding of the management options, indications, contraindications, and complications associated with the recommended procedure. Fellows should demonstrate understanding of and ability to order, integrate and interpret perioperative testing and evaluation of all organ systems as related to endocrine surgery.

Fellows will demonstrate intraoperative decision-making that minimizes complications and demonstrates an awareness of the limitations of his/her technical skills.

Fellows will demonstrate knowledge of anatomy of the endocrine organs, both normal and abnormal.

Fellows will demonstrate knowledge of a variety of approaches (both operative and nonoperative) to a given endocrine disease and exhibit reasoning to arrive at the correct procedure and/or plan of action for a given patient.

Fellows will demonstrate expertise in interpreting anatomic and physiologic studies of the endocrine organs and systems.

Fellows will demonstrate fundamental competency relevant to their area of expertise. These include some or all of the following:

1. Basic Skills: a. preoperative preparation (positioning, knowledge of necessary equipment); evaluations of cardiopulmonary system, age, body habitus b. exposure c. retraction d. tissue handling e. camera navigation f. two-handed manipulation g. port-site placement h. alternative access techniques i. use of angled scopes j. FLS completion k. vascular control and algorithm for control of bleeding l. knot-tying ability, both hands, intracorporeal and extracorporeal.

Advanced Skills: a. intraoperative ultrasound b. suturing c. stapling d. knowledge of energy sources.

Fellows will acquire skill in diagnostic ultrasonography relevant to their area of expertise.

### **Medical Knowledge:**

Fellows will be expected to demonstrate understanding of the anatomy, physiology and pathologic conditions of the endocrine organs and systems.

Fellows will demonstrate an understanding of the surgical and nonsurgical options for managing pathologic conditions of the endocrine organs.

Fellows are expected to be able to appropriately order, read, and interpret diagnostic tests and images.

Fellows are expected to have basic FLS certification; to have knowledge of two or more journals delving into Endocrine Surgery.

### **Practice-based Learning and Improvement:**

Fellows will remain diligent in updating their knowledge with regard to advances in allied health disciplines.

Fellows will demonstrate an ability to access multiple resources for obtaining timely evidence to guide patient care decisions and be able to explain their decision-making rationale.

Fellows will demonstrate ability to perform a detailed assessment of their patient care practice and be able to identify best practices and areas for improvement.

Fellows will participate in and lead journal clubs, M&M conferences, and Grand Rounds as indicated.

Fellows will be engaged in the education and training of residents and medical students, where appropriate.

Fellows will seek and accept constructive feedback concerning their practices.

Fellows will use feedback from faculty and their own self-assessments to develop a plan for filling gaps in knowledge or skills.

Fellows will learn the basics of practice management to include billing and coding for operative procedures, where relevant.

Fellows will actively participate in a combination of bench, clinical, and/or basic science research as agreed upon with the program director.

### **Interpersonal and Communication Skills:**

Fellows will provide concise and accurate communication of clinical information both in verbal and written form.

Fellows will demonstrate effective communication with patients and family members in a manner that creates and sustains a professional and therapeutic relationship across a broad range of socioeconomic and cultural backgrounds.

Fellows will demonstrate a caring attitude toward patients and families.

Fellows will effectively explain working diagnoses and management.

Fellows will demonstrate ability to effectively communicate with physicians, other health professionals and health related agencies about patients' problems.

Fellows will maintain comprehensive, timely and legible medical records.

### **Professionalism:**

Fellows will display compassion and respect for all patients even under difficult circumstances.

Fellows will treat all members of the health care team with respect regardless of their level of power or influence.

Fellows will advocate for patients' needs and desires.

Fellows will take personal responsibility for the timely completion of all assigned work and medical records.

Fellows will demonstrate the importance of teamwork by assisting colleagues in need.

Fellows will demonstrate honesty in their interactions with patients and team members by practicing full disclosure of information with their patients, admitting and disclosing patient care errors, and admitting weaknesses as well as knowledge gaps.

Fellows will demonstrate respect of patient confidentiality and the importance of best practices for insuring optimal care in the clinical setting.

### **Systems-based Practice:**

Fellows will demonstrate understanding of new technologies and their role in the care of their patients.

Fellows will demonstrate understanding of the integrative nature of health care and will coordinate the care of their patients utilizing the support of consulting physicians, allied health professionals, and ancillary staff.

Fellows will develop appropriate discharge and disposition plans for patients by assessing the patients' access to out-patient services, resources for paying for medications and tests, and by working cooperatively with the discharge planning service to obtain needed treatments and follow-up for their patients.

Fellows will communicate the discharge plan with the patient's referring physician to insure adequate follow-up care.

Fellows will practice cost-effective medicine. Specifically, they will learn to avoid unnecessary tests and minimize length of stay while providing high quality care.

Fellows will demonstrate understanding of the importance of institutional policy in promoting patient health through strict adherence to infection control policies and specific treatment protocols.

Fellows will demonstrate understanding of documentation criteria for different levels of care.

Fellows will develop an understanding of the nature and importance of regulatory requirements implemented by agencies such as the Joint Commission, CMS, RRC, and Fellowship Council.

## **Core Curriculum for Endocrine Surgery**

### **I. COGNITIVE EXPERIENCE**

In addition to the clinical and technical experience, it is expected that the fellow will also participate in non-clinical educational endeavors. These activities will be documented and validated by the Program Director.

#### **A. Didactic Educational Sessions Required**

It is mandatory that all fellows attend these sessions. The didactic sessions may include specially designated Endocrine Surgery textbook review sessions, journal clubs, peer-review conferences, and resident teaching rounds. The following topics must be covered during the fellowship:

1. Epidemiology of the different endocrine related disease processes
2. History of Endocrine Surgery
3. Physiology and Interactive Mechanisms of the Endocrine Organs
4. Preoperative Evaluation of the Endocrine Surgical Patient
5. Postoperative Management of the Endocrine Patient
6. Laparoscopic versus Open approaches
7. Thyroidectomy
8. Central and Lateral Neck Lymph Node Dissections
9. Parathyroidectomy
10. Parathyroid Autotransplantation
11. Reoperative Thyroid Surgery
12. Reoperative Parathyroid Surgery
13. Adrenalectomy,
14. Enucleations and formal Pancreatic Resections for PNETs
15. Managing Postoperative Complications
16. Endocrine Disease Process in Childhood and Adolescence
17. Outcomes of Endocrine Surgery

#### **B. Management Conference Requirements**

Fellows are encouraged to participate in the biweekly Resident Educational Conferences and morbidity and mortality (M&M) conferences.

#### **C. Research Requirements**

Fellows are expected to conduct research and are expected to complete at least one clinical and/or research project during the fellowship and submitted to a National or Regional Society. The research project should to be accepted for presentation by the conference or for publication in the journal to which it was submitted.

#### **D. Multidisciplinary Conference Requirements**

Fellows are expected to participate in and lead monthly Thyroid and Adrenal multidisciplinary conferences.

### **II. CLINICAL AND TECHNICAL EXPERIENCE**

#### A. Surgical Operation Requirements

In order to meet the designation of comprehensive training, fellows must be exposed to more than 125 Endocrine operations. The fellow should have assumed the role of primary surgeon in at least 51% of cases, defined as having performed the key components of the operation.

There should be a minimum of: 60 thyroidectomies, 30 parathyroidectomies, 10 Central lymphadenectomy, 5 Lateral lymphadenectomy, 10 adrenalectomies, and 10 advanced endocrine operations.

#### B. Evaluation Requirements

The fellow will participate in 50 patient preoperative evaluations, 100 postoperative in-patient management encounters, and 100 postoperative outpatient evaluations.

#### C. Performance Assessment Synopsis

The Program Director will be responsible for conducting at least 2 fellow performance assessment interviews and providing the ASMBS with a brief synopsis of the meeting. to assess progress, provide feedback and enhance the quality of the education of the trainee.

## **AAES COMPREHENSIVE ENDOCRINE SURGERY FELLOWSHIP CURRICULUM**

The American Association of Endocrine Surgeons (AAES) is dedicated to the maintenance of high standards in the practice of endocrine surgery. In 2004 the Executive Council of the AAES mandated the development of a Fellowship Curriculum with specific objectives to provide a more formalized structure to the existing Endocrine Surgical Fellowships. The Education & Research Committee of the AAES put together a list of objectives and guidelines for Fellowship training in Endocrine Surgery. These were circulated to the membership for their input and comments. A final draft was reviewed and ratified by the Council in October 2005. These objectives provided a structure and a framework for Fellows to enhance their postgraduate training. They were first revised in 2010 by the Education & Research Committee. In the past decade there have been many advancements in the management of endocrine surgical disease. Members of the Education and Fellowship Committees updated and revised the objectives to develop the AAES Comprehensive Endocrine Surgery Fellowship Curriculum in July 2020. The Fellow, the program director and the faculty members of a training unit should utilize this Curriculum and strive to meet these objectives. Individual programs will require flexibility in the design of the fellow's rotations and experience. Information regarding Fellowship training in Comprehensive Endocrine Surgery can be obtained from our web site [www.endocrinesurgery.org](http://www.endocrinesurgery.org) Goal: By the end of the fellowship, our trainees will have demonstrated proficiency in the assessment, surgical treatment, and surveillance of benign and malignant thyroid, parathyroid, adrenal, and GEP-NET conditions.

**I. THYROID GLAND** A. Thyroid Knowledge Learning Objectives: 1. Describe the histologic appearance of normal thyroid tissue and the components of a thyroid follicle and discuss its relevance to thyroid surgery 2. Discuss the secretion and homeostasis of thyroid hormones in both the normal and pathological disease states 3. Describe the relationship of critical adjacent structures to the thyroid such as the recurrent and superior laryngeal nerves, as well as the relationship with the superior and inferior parathyroid glands 4. Explain when a non-recurrent laryngeal nerve may occur 5. Compare the pathophysiology, risk factors, and clinical presentation for the following thyroid diseases: a. Solitary thyroid nodule b. Multinodular thyroid gland c. Hyperthyroidism/Thyrotoxicosis including toxic adenoma, Graves' disease, and Hashimoto's disease d. Well-differentiated thyroid cancer (WDTC) e. Rare thyroid malignancies - including medullary thyroid cancer,

lymphoma and anaplastic thyroid cancer f. Familial/syndromic thyroid cancers 6. For each of the thyroid diseases above, formulate a thorough diagnostic plan including: a. History and Physical Exam: i. Differentiate and list relevant findings in the patient's history, family history, and environmental exposures, especially ionizing radiation ii. Perform a complete physical examination of the thyroid and the neck iii. Recognize the typical presentation of benign or malignant thyroid tumors and signs and symptoms that might suggest a more aggressive behavior iv. Discuss indications for assessment of the patient's voice, vocal cords and laryngoscopy b. Diagnostic interventions: i. Lab Tests: 1. Select appropriate lab tests in different thyroid pathologies: 2. Describe indications for TFTs, thyroid antibodies, calcitonin, CEA, and genetic testing ii. Imaging Modalities: 1. Discuss indications for thyroid ultrasound, elastography, axial imaging, and nuclear medicine imaging 2. Describe the TIRADS versus ATA classification system in relation to different types of thyroid nodules 3. Describe appearance of parathyroid incidentalomas and abnormal cervical lymph nodes on ultrasound 4. Explain limitations of ultrasound and recognize when to consider additional work up such as CT, MRI and/or PET CT 5. Analyze radiologic studies to appropriately distinguish between surgically resectable from unresectable thyroid lesions iii. Biopsy: 1. List indications for fine needle aspiration (FNA) biopsy of different thyroid nodules and neck masses 2. Describe the Bethesda classification for the cytologic interpretations of thyroid lesions 3. Recommend molecular testing of thyroid FNA specimens when indicated 4. Discuss findings of molecular testing and their implications 5. Recommend appropriate course of action based on molecular findings iv. Staging: 1. Stage different thyroid malignancies accurately based on AJCC classification system c. Treatments: i. Formulate a treatment plan based on the characteristics of the disease and specific needs of the patient and also includes pre-operative care including antibiotics, steroids, surgical preparation for Grave's/hyperthyroidism, vitamin D/calcium, and VTE prophylaxis. ii. Discuss and select the appropriate treatment options: Curative versus palliative, surgical versus nonsurgical iii. In surgical patients, plan appropriately to consult additional services to assist with management, if necessary iv. Develop a plan for pregnant patients with thyroid diseases that require surgical interventions v. Outline a treatment algorithm for adult and pediatric patients with MEN 2a or 2b without evidence of a thyroid lesion vi. List the indications for prophylactic neck dissection in N0 thyroid malignancies and how this might differ based on primary disease pathology vii. Evaluate and manage patients with possible nodal disease viii. Discuss the risks of primary versus revision surgery for thyroid malignancies ix. Discuss the benefits and limitations of recurrent laryngeal nerve monitoring x. Discuss the different approaches to identify and preserve the recurrent and superior laryngeal nerve during thyroid surgery xi. Recognize (preoperatively or



intraoperatively) when to consider resection of an involved recurrent laryngeal nerve xii. Outline an approach to rehabilitation of a patient needing recurrent nerve resection or suffering from a nerve injury including: 1.Primary repair 2.Cable graft 3.Ansa to distal nerve repair 4.Secondary approaches to vocal fold paresis and paralysis xiii. Describe extended thyroid surgery indications and situations that require tracheal resection, laryngectomy, or other extended operations xiv. Analyze a pathology report and recognize the classic histopathologic findings for papillary thyroid cancer, follicular thyroid cancer, medullary thyroid cancer, anaplastic thyroid cancer, and thyroid lymphoma xv. Explain indications for adjuvant therapy following surgery for thyroid cancer based on staging, pathologic characteristics, operative findings, and post-surgical imaging (radioactive iodine scan) and recommend adjuvant treatments when appropriate, including these options: 1.RAI Treatment 2.External beam radiation therapy 3.Targeted therapy (BRAF inhibitors and TKI) xvi. Discuss and recommend options for recurrent and metastatic disease including: 1. Additional surgery 2.Additional RAI or external beam 3.Systemic treatment xvii. Recognize common complications of thyroid and lateral neck surgery. Formulate a plan to treat post-operative complications including: 1. Postoperative hemorrhage and surgical bed hematoma 2.Hypocalcemia 3. Recurrent nerve injury 4.Chyle leak 5.Surgical site infections d. Surveillance: i. Formulate an evidence based surveillance program for thyroid cancer survivors based on established guidelines (such as NCCN) ii. Appropriately use these tests in surveillance: 1.TSH, Tg, anti-Tg antibodies 2.Neck ultrasound 3.Select other imaging such as chest imaging and/or PET/CT in appropriate cases. iii. Recognize the common signs and symptoms of recurrent disease and plan an appropriate work up plan B. Thyroid Skill Learning Objectives: 1. Global Skills: a. Perform a thorough oncologic physical exam of the thyroid gland including the central and lateral neck, and oral cavity b. Perform or demonstrate ability to conduct a diagnostic thyroid ultrasound i. Use or describe optimal ultrasound machine settings for thyroid evaluation ii. Be able to record accurate measurements including three-dimensional sizing of thyroid nodules and document any findings iii. Evaluate the central and lateral neck lymph nodes for malignancy iv. Understand the use of ultrasound to evaluate vocal cord motion v. Compare ultrasound findings with previous studies to determine interval change vi. Perform or demonstrate understanding on how to obtain informed consent and perform an ultrasound guided fine needle aspiration (FNA) c. Perform or describe a flexible fiberoptic laryngoscopy i. Operation and trouble-shooting of the camera and video equipment ii. Administer appropriate pre-procedure analgesics iii. Interpret laryngoscopy findings d. Coordinate a multi-disciplinary care approach, including endocrinology, pathology, nuclear medicine, and oncology e. Compile appropriate

billing codes for office performed procedures f. Explain post-operative incision care and pain management to a patient requiring thyroid surgery

2. Operating Room Skills: a. Demonstrate appropriate patient positioning for thyroid surgery b. Safely identify and ligate the superior pole vessels c. Demonstrate safe use of an energy device or alternative for hemostatic ligation d. Formulate a plan for high superior poles or inadequate exposure of these vessels e. Recognize relationship of the superior vessels with the superior laryngeal nerve f. Operate or demonstrate use of a nerve monitoring system g. Demonstrate appropriate lead placement and knowledge of equipment h. Trouble-shoot common malfunctions i. Analyze the information obtained from the nerve monitoring apparatus j. Accurately identify and dissect the recurrent laryngeal nerve including: k. Recognize relationship with the parathyroid glands l. Recognize when to consider recurrent laryngeal nerve resection m. Be familiar with approaches to repair nerve injury n. Recognize and preserve parathyroid tissue during thyroidectomy including: a. Recognize parathyroid devascularization b. Perform parathyroid auto-transplantation o. Evaluate for presence of pyramidal lobe to ensure removal of all thyroid tissue p. Obtain and evaluate for adequate hemostasis q. Perform central lymph node dissection including nodes posterior to the recurrent nerve r. Perform or assist in a modified radical neck dissection

C. Thyroid Attitudinal Learning Objectives: 1. Thyroid nodule: a. Explain the natural history of thyroid nodules to patients. Answer questions regarding incidence of cancer in thyroid nodules from patients and referring physicians and alleviate the anxiety of a new growth on imaging b. Educate patients and physicians about the prudence of observation for benign appearing nodules c. Prepare patients for the possibility of indeterminate or non-diagnostic FNA results. The endocrine surgeon should also be able to lead the patient through the decision making process if such a result is obtained and be able to discuss the risks and benefits of surgery vs observation 2. Multinodular goiter: a. Discuss indications for surgery and be able to re-assure patients and referring physicians that goiters can be observed if they do not meet an indication for surgery b. Discuss the probabilities that certain symptoms may or may not improve following surgery 3. Well-differentiated thyroid cancer: a. Reassure patients papillary thyroid cancer generally has an excellent prognosis in younger patients. Also, discuss the real life socioeconomic implications of being diagnosed with a cancer, even if that cancer has a good prognosis b. Discuss in detail the appropriate risks and benefits of observation for small papillary thyroid cancers c. Explain the risks and benefits of thyroid lobectomy and total thyroidectomy. Be able to aid the patient in deciding on the option that is best for the patient d. Discuss the risks of surgery including recurrent laryngeal nerve injury and hypoparathyroidism and what those injuries

would mean of the patients health and lifestyle if they occur e. Present a patient's story in a multi-disciplinary tumor board. Be able to proficiently communicate with other members of the treatment team before and after surgery and clearly delineate the follow up plan f. Prepare the patient for potential adjuvant therapies such as radioactive iodine and TSH suppression g. Discuss the implications of post thyroidectomy hypothyroidism 4. Medullary thyroid cancer: a. Discuss the long-term treatment for medullary thyroid cancer which may include recurrence and additional surgeries b. Explain to a patient the potential implications regarding the potential to be diagnosed with other cancers. Also be able to discuss the implications of a familial syndrome on other members of the family and potentially in young children c. Guide the patient through the follow up period including explaining the significance of doubling times 5. Anaplastic thyroid cancer: a. Conduct frank conversations with the patient and the family about end of life care and decision-making.

#### Further Thyroid Resources:

1. Patel KN, Yip L, Lubitz CC, Grubbs EG, Miller BS, Shen W, Angelos P, Chen H, Doherty GM, Fahey TJ 3rd, Kebebew E, Livolsi VA, Perrier ND, Sipos JA, Sosa JA, Steward D, Tufano RP, McHenry CR, Carty SE. The American Association of Endocrine Surgeons Guidelines for the Definitive Surgical Management of Thyroid Disease in Adults. *Ann Surg.* 2020 Mar;271(3):e21-e93.
2. Fancy, T., et al. (2010). "Surgical Anatomy of the Thyroid and Parathyroid Glands." *Otolaryngologic Clinics of North America* 43(2): 221-227.
3. McMullen, T. P. W. and L. W. Delbridge (2009). *Thyroid Embryology, Anatomy, and Physiology: A Review for the Surgeon. Endocrine Surgery: Principles and Practice.* J. Hubbard, W. B. Inabnet and C.-Y. Lo. London, Springer London: 3-16.
4. Hubbard J, Inabnet WB, Lo CY (Eds). *Endocrine Surgery, Principles and Practice,* Springer, London, UK, 2009.
5. Randolph, G. (2013). *Surgery of the thyroid and parathyroid glands (2nd ed.).* Philadelphia, PA: Saunders/Elsevier.
6. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, Pacini F, Randolph GW, Sawka AM, Schlumberger M, Schuff KG, Sherman SI, Sosa JA, Steward DL, Tuttle RM, Wartofsky L. 2015 American Thyroid

Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer.

7. Alexander EK, Pearce EN, Brent GA, Brown RS, Chen H, Dosiou C, Grobman WA, Laurberg P, Lazarus JH, Mandel SJ, Peeters RP, Sullivan S. 2017 Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease During Pregnancy and the Postpartum. *Thyroid*. 2017 Mar;27(3):315-389.

8. Smallridge RC, Ain KB, Asa SL, et al. American Thyroid Association guidelines for management of patients with anaplastic thyroid cancer. *Thyroid*. 2012;22(11):1104-1139.

9. Wells SA Jr, Asa SL, Dralle H, et al. Revised American Thyroid Association guidelines for the management of medullary thyroid carcinoma. *Thyroid*. 2015;25(6):567-610.

10. Chen AY, Bernet VJ, Carty SE, et al. American Thyroid Association statement on optimal surgical management of goiter. *Thyroid*. 2014;24(2):181-189.

11. Ferris RL, Baloch Z, Bernet V, et al. American Thyroid Association Statement on Surgical Application of Molecular Profiling for Thyroid Nodules: Current Impact on Perioperative Decision Making. *Thyroid*. 2015;25(7):760-768.

12. Francis GL, Waguespack SG, Bauer AJ, et al. Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid*. 2015;25(7):716-759.

13. Tufano RP, Clayman G, Heller KS, et al. Management of recurrent/persistent nodal disease in patients with differentiated thyroid cancer: a critical review of the risks and benefits of surgical intervention versus active surveillance. *Thyroid*. 2015;25(1):15-27.

14. Kiess AP, Agrawal N, Brierley JD, et al. External-beam radiotherapy for differentiated thyroid cancer locoregional control: A statement of the American Head and Neck Society. *Head Neck*. 2016;38(4):493-498.

15. Cancer Genome Atlas Research, N. Integrated genomic characterization of papillary thyroid carcinoma. *Cell*, 2014;159(3), 676-690.

16.Cibas, E. S., & Ali, S. Z. The Bethesda System for Reporting Thyroid Cytopathology. *Thyroid* 2009;19(11), 1159-1165.

17.Nikiforov YE, Seethala RR, Tallini G, et al. Nomenclature Revision for Encapsulated Follicular Variant of Papillary Thyroid Carcinoma: A Paradigm Shift to Reduce Overtreatment of Indolent Tumors. *JAMA Oncol.* 2016;2(8):1023-1029.

18.Powers AE, Marcadis AR, Lee M, Morris LGT, Marti JL. Changes in Trends in Thyroid Cancer Incidence in the United States, 1992 to 2016. *JAMA.* 2019;322(24):2440-2441.

19.Stanford medicine. Thyroid exam. 2020  
<https://stanfordmedicine25.stanford.edu/the25/thyroid.html>

20.Rago T, Vitti P. Role of thyroid ultrasound in the diagnostic evaluation of thyroid nodules. *Best Practice & Research Clinical Endocrinology & Metabolism.* Volume 22, Issue 6, 2008.

21.Patients with Thyroid Cancer Are at Higher Risk of Bankruptcy than Patients with Other Types of Cancer, or Those Without Cancer. *Clin Thyroidol* 2013;25:150–151

II. PARATHYROID GLANDS A. Parathyroid Knowledge Learning Objectives: 1. Describe parathyroid embryology and how this can be applied to both eutopic and ectopic parathyroid localization 2. Describe the anatomic relationship of the parathyroid glands to the recurrent laryngeal nerve 3. Compare the histology of normal parathyroid glands to that of parathyroid adenomas and parathyroid hyperplasia. Explain the histologic criteria for the diagnosis of parathyroid carcinoma 4. Describe calcium, phosphate, and vitamin D homeostasis and how this influences Parathyroid hormone (PTH) secretion 5. Describe the effects of PTH on the skeletal, kidney and intestinal systems and its half-life. 6. Create differential diagnoses for hypercalcemia and describe how to differentiate among possible diagnoses 7. Compare the pathophysiology, clinical presentation, natural history, and indications for surgery in patients with primary, secondary and tertiary hyperparathyroidism as well as patients with parathyroid carcinoma 8. Explain and compare normocalcemic primary hyperparathyroidism and normohormonal primary hyperparathyroidism to classical primary hyperparathyroidism. Describe clinical manifestations and role of surgery for both of these variants 9. Describe the familial syndromes associated with primary hyperparathyroidism. Formulate a plan

for the identification and management of such patients, including indications to perform genetic testing 10. Compare the scope, indications, limitations, and sensitivity, for the following imaging modalities: ultrasound (surgeon vs. radiologist-performed), sestamibi +/- SPECT, MRI, 4D-CT 11. Describe and justify the indications for surgery and surgical options for patients with primary hyperparathyroidism, secondary hyperparathyroidism and tertiary hyperparathyroidism 12. Describe the surgical approach for a patient with suspected parathyroid cancer including en-bloc resection 13. Describe the indications, techniques, and pitfalls of intraoperative adjuncts that are available for parathyroidectomy (Intraoperative PTH, radio-guided surgery, auto-fluorescence) 14. Describe and compare non-surgical management options for patients with primary, secondary, and tertiary hyperparathyroidism including close surveillance, bisphosphonates, calcimimetics, and ethanol ablation 15. Describe and compare the limitations and appropriate utilization of both intra-operative frozen section and PTH aspiration of the parathyroid gland 16. Define long-term cure of parathyroid disease and monitoring for recurrence. B. Parathyroid Skills Learning Objectives: 1. Evaluate a patient with hyperparathyroidism with a complete history and physical exam (specifically eliciting signs/symptoms, family history, medication history, prior neck/cardiac surgery) 2. Explain the diagnostic work up for patients with primary hyperparathyroidism: Pre-operative PTH, calcium, creatinine, vitamin d, 24h urine calcium + creatinine, DEXA, renal ultrasound/KUB 3. Evaluate a patient with persistent/recurrent primary hyperparathyroidism (including review operative reports/pathology, select appropriate imaging modalities, describe and interpret results of invasive techniques for localization and intra-operative adjuncts) 4. Describe/demonstrate the key components of a comprehensive parathyroid ultrasound 5. Describe/demonstrate the key components of direct and indirect laryngoscopy for assessment of voice function 6. Compare and justify the patients who are candidates for a minimally invasive approach vs a four-gland parathyroid exploration 7. Describe the operative management of patients with a familial syndrome causing primary hyperparathyroidism 8. Describe the technique for parathyroid auto-transplantation (preservation and preparation of the explanted parathyroid gland, location for auto-transplantation and technical components of the procedure) 9. Describe the peri-operative management of patients with secondary hyperparathyroidism (laboratory evaluation, dialysis, calcium/vit D supplementation, identification and management of hypocalcemia) 10. Describe the peri-operative management of hypercalcemic crisis, hungry bone syndrome, and vitamin D deficiency 11. Demonstrate use of intra-operative PTH and explain the criteria used to determine a successful drop 12. Use the knowledge of anatomy and embryology to find superior, inferior, and ectopic parathyroid glands 13.

Demonstrate use or knowledge of how to apply ultrasound or technetium 99 to perform guided parathyroidectomy 14. Compare indications and benefits of a lateral versus central approach for a re-operative parathyroidectomy 15. Recognize clinical signs suspicious for a diagnosis of parathyroid carcinoma and formulate an appropriate surgical plan 16. Describe surgical management of parathyroid carcinoma 17. Describe alternate access approaches to parathyroidectomy C.

Parathyroid Attitudinal Learning Objectives: 1. Explain how to counsel patients regarding the possibility of surgical failure or need for reoperation in the future 2. Describe the informed consent discussion for a patient with suspected familial primary hyperparathyroidism as compared to a patient with sporadic primary hyperparathyroidism. 3. Explain how to counsel patients with secondary hyperparathyroidism regarding hungry bone syndrome 4. Describe the multimodal management of parathyroid disease and establish working relationships with primary care providers, endocrinologist, and nephrologists 5. Explain how to counsel patients regarding parathyroid cancer Further Parathyroid Resources:

1. Wilhelm, S. M., Wang, T. S., Ruan, D. T., Lee, J. A., Asa, S. L., Duh, Q. Y., . . . Carty, S. E. (2016). The American Association of Endocrine Surgeons Guidelines for Definitive Management of Primary Hyperparathyroidism. *JAMA Surg*, 2016: 151(10), 959-968. PMID: 27532368

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3. Babwah F, Buch HN. Normocalcaemic primary hyperparathyroidism: a pragmatic approach, *J Clin Pathol*. 2018 Apr;71(4):291-297. doi: 10.1136/jclinpath-2017-204455. PMID: 29437827.

4. Stephen AE, Mannstadt M, Hodin RA. Indications for Surgical Management of Hyperparathyroidism: A Review. *JAMA Surg*. 2017 Sep 1;152(9):878-882. PMID: 28658490.

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6.Liu ME, Qiu NC, Zha SL, Du ZP, Wang YF, Wang Q, Chen Q, Cen XX, Jiang Y, Luo Q, Shan CX, Qiu M. To assess the effects of parathyroidectomy (TPTX versus TPTX+AT) for Secondary Hyperparathyroidism in chronic renal failure: A Systematic Review and Meta-Analysis. *Int J Surg.* 2017 Aug;44:353-362. PMID: 28634117.

7.Evans DB, Rich TA, Cote GJ. Surgical management of familial hyperparathyroidism. *Ann Surg Oncol.* 2007;14(5):1525-1527. PMID: 17285397

8.Greg Randolph (ed) *Surgery of the Thyroid and Parathyroid Glands.* Saunders, Philadelphia PA, 2020

9.Cameron JL (ed). *Endocrine glands. Current Surgical Therapy (13th edition).* St. Louis: Mosby.

10.Clark, Duh. Perrier, Jahan (ed) *American Cancer Society Atlas of Clinical Oncology Endocrine Tumors.* BC Decker Hamilton, Ontario. 2003

11.Michel Gagner & William Inabnet (ed) *Minimally Invasive Endocrine Surgery.* Lippincott Williams & Wilkins, Philadelphia PA, 2002

12.Virginia LiVolsi & Sylvia Asa (ed) *Endocrine Pathology* Churchill Livingstone, Philadelphia PA, 2002

13.Orlo Clark, Quan Duh, Electron Kebebew (ed). *Endocrine Surgery 2nd Edition* Elsevier Saunders, Philadelphia PA, 2005 (Textbook of Endocrine Surgery)

III. ADRENAL GLANDS A. Adrenal Knowledge Learning Objectives: 1. Define normal adrenal anatomy bilaterally, focusing on vascular supply. Describe common anatomic variants. 2. Describe the histology of the adrenal gland, including each of the layers of the cortex as well as the medulla 3. Explain the normal physiology of the adrenal glands, including secretion and feedback loops associated with each layer of the gland (i.e., aldosterone, cortisol, catecholamines, and androgens/estrogen) 4. Compare the scope, indications, limitations, and sensitivity for the following imaging modalities available for the adrenal gland (CT,MRI, PET, MIBG, Octreotide scan, Dotatate) 5. Describe the work up and management of an incidental adrenal mass 6. Describe the clinical presentation, requirements for biochemical diagnosis, perioperative testing, surgical treatment, and perioperative management for the following adrenal diseases: a. Primary



hyperaldosteronism b. Adrenal Cushing's syndrome c. Pheochromocytoma d. Virilizing adrenal tumor

- List the key steps in performing a left and right adrenalectomy, using both open and minimally-invasive approaches
- Describe the surgical approach for a patient with suspected or biopsy-proven adrenocortical cancer, including en-bloc resection of other organs, lymphadenectomy, and justification of operative approach
- Describe the potential complications associated with open and laparoscopic adrenalectomy
- Describe non-surgical management options for patients with an adrenal nodule that does not meet criteria for resection, including repeat hormonal evaluation and surveillance imaging
- Discuss the inherited endocrinopathies that can be associated with adrenal pathology, and formulate a plan for the identification and management of such patients, including indications to perform genetic testing.
- Formulate a plan for post-operative management of functional adrenal tumors and malignancies, including medication regimens, biochemical surveillance, and repeat imaging

**B. Adrenal Skills Learning Objectives:**

- Evaluate a patient with an adrenal nodule, including a complete history and physical exam (specifically eliciting signs/symptoms, family history, surgical history, medication use)
- Interpret diagnostic testing performed as part of an adrenal nodule workup, including plasma aldosterone concentration, aldosterone-renin ratio, urine cortisol, salivary cortisol, low-dose dexamethasone suppression test, ACTH, plasma metanephrines, urine metanephrines, DHEA-S
- Determine when patients should be referred for advanced diagnostic testing for functional adrenal disorders, including salt-loading test, high-dose dexamethasone suppression testing
- Determine which patients should undergo adrenal vein sampling and interpret the results
- Select and justify the optimal operative approach for adrenalectomy for each individual patient, accounting for factors such as patient history, physical characteristics, tumor characteristics, and underlying pathology
- Demonstrate safe surgical technique for removal of the left or right adrenal gland via a minimally-invasive approach: 1) laparoscopic transabdominal, 2) laparoscopic retroperitoneal approach, or 3) robotic approach
- Demonstrate safe surgical technique for removal of the left or right adrenal gland via an open anterior approach
- Determine when advanced techniques in adrenalectomy should be employed, including bilateral adrenalectomy or cortical-sparing approaches

### C. Adrenal Attitudinal Learning

Objectives:

## **Guiding Standards for Successful Completion of an AAES-Accredited Fellowship in Comprehensive Endocrine surgery**

The guiding standards were created in 2018 for AAES-accredited fellowships in Comprehensive Endocrine Surgery. These standards will be used to guide the affirmation by each program director that finishing fellows have met the minimum requirements of the AAES. The below requirements are the minimum standards required for graduating fellows and are not intended to remove local control over the breadth of expectations set by the individual AAES fellowship program directors. These standards will comprise part of the tracked outcomes reportable each year to the fellowship accreditation committee, and will serve as a cornerstone of the triennial reaccreditation process for fellowship programs.

1) Case volumes: Each fellow will track their operative case experience using the CESQUIP database.

The minimum number of operative cases required during an AAES-accredited fellowship is:

Thyroid operations 60,  
Parathyroid operations 30,  
Adrenal operations 10,  
Central neck lymphadenectomy 10,  
Lateral neck lymphadenectomy 5,  
Advanced endocrine operations 10,  
Total case number 125

Central and lateral neck lymphadenectomies can be counted when done concurrent to the index thyroid operation. Advanced cases include (but are not limited to) reoperative thyroid/parathyroid/lateral neck surgery, reoperative adrenal surgery, adrenalectomy performed with concomitant multivisceral resection, cortical-sparing adrenalectomy, enteropancreatic neuroendocrine tumor procedures, and pediatric endocrine surgical procedures. For those fellowship programs that extend to two years, these minimum case volumes would be expected to be met during the first year, or equivalent of clinical time as determined by the program's structure. These minimum numbers have been achieved by our programs and fellows in years past. The categories chosen, especially the reoperative cases in the advanced operations designation, are intended to demonstrate the exposure and experience

with a breadth of complex endocrine surgery, as well as exposure to the inherent multidisciplinary care required especially for revision operations.

2) 15 complete ultrasound examinations (5-characterization of thyroid nodules, 5-parathyroid localization or lymph node mapping; and 5 ultrasound guided FNA). This will be attested to by the program director. Documentation of these examinations necessary for external certification may be completed at the discretion of the fellow. A documentation rubric will be provided that is modified from the American Association of Clinical Endocrinologists-sponsored Endocrine Certification in Neck Ultrasound.

3) 12-Cases presented by the Fellow and reviewed at an institutional multidisciplinary conference; discussion at the bi-annual AAES national videoconference may be included in this number.

4) Scholarly experience: It is the intention of the AAES to train surgeons in the science of endocrine surgery. To do this, a wide variety of scholarly work and its dissemination is to be considered.

This list includes:

- Peer reviewed manuscript
- Book chapter
- Non-peer-reviewed print or electronic publication
- Locoregional, national, or international meeting presentation –poster or oral podium talk (inclusive of clinical science, basic science, interesting case, techniques)
- Instructional video
- Grand rounds (or equivalent) lecture (local or invited)
- Faculty lecture at CME course
- Institutional teaching conference/director of regular journal club
- Resident or Medical student (or other student –e.g., DO, PA, NP) lecture
- Development of novel curriculum (and, ideally disseminated –for example, in MedEd Portal)
- Advisor/mentor for junior learner (student or resident) in research project It will be the responsibility of the individual fellowship program director to attest to the fellow meeting the scholarly requirement. The annual attestation by the program director will include a statement:

▪I hereby attest that \_\_\_\_\_ (fellow name here) has satisfactorily completed an active intellectual and scholarly pursuit during the period of fellowship training.