



CHILDREN'S HOSPITAL HARVARD MEDICAL SCHOOL JOSLIN DIABETES CENTER

TRAINING PROGRAM IN PEDIATRIC ENDOCRINOLOGY

Introduction

The Training Program in Pediatric Endocrinology at Children's Hospital Boston and Joslin Diabetes Center, Harvard Medical School consists of a comprehensive clinical and research experience spanning three years. This program is intended for physicians who desire to pursue a career in academic medicine, which combines both clinical and research activities, and to prepare future academic leaders in endocrinology and diabetes. The clinical management of outpatient and inpatient endocrine disorders, including diabetes, is emphasized in the first year. The second and third years are primarily devoted to an in-depth investigation of an area of basic or clinical research under the supervision of a faculty preceptor. Each year, the program accepts four fellows.

The First Year

In the first year, fellows divide their time between monthly inpatient and outpatient rotations. Each fellow sequentially experiences the inpatient endocrinology service at Children's Hospital, the inpatient diabetes service at Children's Hospital, the outpatient endocrine general and subspecialty services at Children's Hospital, and an outpatient rotation at Children's Hospital focusing on more urgent endocrine disorders and educational activities, each for a total of 3 months. Children's Hospital, being both an active primary care hospital as well as a major tertiary care center for the northeastern United States, has a large and varied patient population with a unique mixture of endocrine diseases and their complications. These range from more common disorders such as diabetic ketoacidosis and disorders of growth, to more uncommon disorders such as congenital adrenal hyperplasia, precocious puberty, glycogen storage diseases, and acquired endocrine dysfunction secondary to systemic diseases such as cystic fibrosis, congenital heart disease, and brain tumors. The two inpatient fellows, in conjunction with the Endocrinology Division faculty, evaluate and manage all endocrine consultations within the hospital and the newborn nurseries at the adjacent Brigham and Women's (BWH) and Beth Israel Deaconess Medical Center (BIDMC) Hospitals. In addition, they supervise the

care of all endocrine patients admitted to the Children's Hospital endocrine service. While on the inpatient rotation fellows maintain four half-day clinic sessions per month, of which one is in the Diabetes Program at Children's Hospital.

On the outpatient service at Children's Hospital, the fellow is exposed to a wide range of endocrine disorders in four to five half-day clinics each week. The clinics include general pediatric endocrinology, type 1 diabetes, type 2 diabetes, obesity, metabolic bone diseases, reproductive endocrinology, thyroid, and brain tumor/neuroendocrine dysfunction. In the diabetes programs at Children's Hospital Boston, the fellow works with multidisciplinary teams that include nurse educators, nutritionists, and social workers, to treat both type 1 and type 2 diabetes. As with the inpatient rotations, fellows on the outpatient rotations closely interact with members of the Endocrinology Division faculty. The end of each clinic session is highlighted by a lively post-clinic conference at which all fellows, house staff, students, and faculty review the differential diagnosis and management of instructive patients seen in clinic that day. In addition, an adult endocrinology clinic is held at BIDMC.

During the 3 months of the urgent care/educational outpatient rotation at Children's Hospital, the fellow sees predominantly new patients for urgent consultations, evaluates outpatient pre-operative consultations, attends approximately one to two endocrine subspecialty clinics per week, and has approximately 5 to 10 hours/week available for scholarly activities. The fellow on this rotation is encouraged to carry out an independent clinical research project.

During the first year, each fellow is responsible for preparing and conducting approximately 15 clinical conferences attended by endocrinologists at Children's Hospital, Joslin Diabetes Center, BWH, BIDMC, and the other Harvard-affiliated teaching hospitals in the Harvard Medical School area. These conferences give the fellow the opportunity to investigate clinical topics in depth and to engage a group of senior endocrinologists in discussion.

First year fellows take diabetes outpatient evening call from outside the hospital from 6 PM to 10 PM one night per week, overnight call from

outside the hospital one night per week and every 10th weekend (Fr-Su). Second and third year fellows take call every 10th weekend, and diabetes outpatient call on a similar schedule.

The Second and Third Years

In the second and third years, the fellow, under the supervision of a faculty preceptor selected during the first year, undertakes a comprehensive investigation of one area of basic or clinical research. In both the second and third years, each fellow also continues longitudinal clinics for one half-day per week in general endocrinology and diabetes (3/month) at Children's Hospital. All first or second year fellows spend one week at a residential summer camp for children with diabetes, where practical issues in diabetes outpatient management are emphasized under the guidance of attending staff.

Research Opportunities

Research opportunities within Children's Hospital Division of Endocrinology and Joslin Diabetes Center include:

Division of Endocrinology, Children's Hospital Boston

A wide variety of projects at the level of patient-oriented research, isolated genes, cells, and intact organisms that include transgenic, knockout, and knockin mouse models of human diseases are available.

Bioinformatics, Medical Informatics

(Preceptors: Isaac Kohane, M.D., Ph.D., Marco Ramoni, Ph.D., Daniel Nigrin, M.D.) Functional genomics: bioinformatics analysis of high throughput RNA and DNA data, microarray analysis of global gene expression in murine models of diabetes; Cross-platform integration and confidentiality in electronic medical records; Web-based search of medical records in clinical research; Web-based communication between patients and caregivers.

Calcium and Mineral Homeostasis

(Preceptors: Catherine Gordon, M.D., M.M.Sc., Ingrid Holm, M.D., M.P.H.) Epidemiology and pathology of vitamin D deficiency; Pathology and therapy of bone loss in anorexia nervosa; Genetics of osteopenia.

Carbohydrate Metabolism and Diabetes Clinical Research (Preceptors: Joseph I. Wolfsdorf, M.B., B.Ch., Amy Fleischman, M.D., M.M.Sc., Erinn Rhodes, M.D., M.P.H., Maryanne Quinn, M.D.) Pathophysiology and therapies of glycogen storage diseases; Etiology of hypoglycemia in acutely ill children; Role of mitochondrial dysfunction in insulin resistance and diabetes; Outcome evaluation of type 1 and 2 diabetes treatment.

Diabetes and Obesity Basic Research

(Preceptors: Morris White, Ph.D., M.D., Sudha Biddinger, M.D., Ph.D., David Olson, M.D., Ph.D.) Role of IRS proteins in insulin signaling, pancreatic beta cell biology, and etiology of type 1 and type 2 diabetes; Role of endoplasmic reticulum stress in insulin action, beta cell function, and energy regulation; Role of insulin resistance in the metabolic syndrome; Regulation of appetite and energy expenditure.

Genomic Research in Endocrinology

(Preceptors: Joel Hirschhorn, M.D., Ph.D., Ingrid Holm, M.D., M.P.H.) Pathology of type 1 and type 2 diabetes, obesity, puberty and growth disorders due to polygenic mutations.

Mammalian Stress Response

(Preceptors: Joseph A. Majzoub, M.D., David Breault, M.D., Ph.D.) Regulation of the hypothalamic-pituitary-adrenal axis by corticotropin-releasing hormone (CRH) and vasopressin *in vitro* and *in vivo*; Role of CRH in fetal development and timing of parturition; Stem cells in endocrine gland development, function, and disease.

Obesity Clinical Research

(Preceptors: David Ludwig, M.D., Ph.D., Cara Ebbeling, Ph.D., Erinn Rhodes, M.D., M.P.H.) Role of dietary composition on appetite and body weight regulation in humans and animal models. Use of low glycemic index diets to prevent and treat obesity, cardiovascular disease and diabetes mellitus.

Neuroendocrinology Research

(Preceptor: Laurie Cohen, M.D.) Causes of hypothalamic obesity in patients with brain tumors. Uses of growth hormone treatment in children.

Thyroid Pathophysiology in Children

(Preceptors: Stephen Huang, M.D., Rosalind Brown, M.D., Jessica Smith, M.D., Jeremi Carswell, M.D.) Biology of thyroid metabolism in normal and disease states, pathology of autoimmune thyroid diseases in children; diagnosis and management of thyroid cancer in children.

Joslin Diabetes Center

Section on Behavioral and Mental Health

Research (Preceptors: Lori Laffel, M.D., MPH, Katie Wenger, R.N., Ph.D.), (Ann Goebel-Fabbri, Ph.D., Korey Hood, Ph.D.) Psychosocial aspects of diabetes; Design and evaluation of interventions to improve medical, psychosocial, and quality of life outcomes. Pediatric- focused assessment, intervention, and outcomes research in type 1 and type 2 diabetes.

Section on Cellular and Molecular

Physiology (Preceptors: Steve Shoelson, M.D., Ph.D., Mary-Elizabeth Patti, M.D. Rohit Kulkarni, M.D., Ph.D., Jongsoo Lee, Ph.D.) Mechanism of action of insulin and related hormones; Investigation of insulin mimetics; Study of signal transduction pathways by IRS-1 and IRS-2 in normal and diseased states; Molecular genetics of type 2 diabetes.

Section on Clinical Research (Preceptors: Ed Horton, M.D., Allison Goldfine, M.D., A. Enrique Caballero, M.D., Om Ganda, M.D., Osama Hamdy, M.D., Ph.D., Antoine Kaldany, M.D., James Rosenzweig, M.D., Mark Williams, M.D., Howard Wolpert, M.D.) Testing of new medical devices, diagnostic tools, and medications; Clinical trials design; Clinical trials to prevent type 1 and type 2 diabetes and to prevent/postpone complications; and Study of health care delivery and outcomes research. Study of obesity and defects in endothelial function.

Section on Stem Cell Biology (Preceptors: T. Keith Blackwell, M.D., Ph.D., Mary Loeken, Ph.D., Amy Wagers, Ph.D.) Stem cell research, oxidative stress, and gene regulation using molecular, cellular, and animal techniques. Transcription regulation leading to congenital malformations, especially neural tube defects, in offspring of diabetic mothers; Regulation of embryonic gene expression by glucose and metabolic pathways; Genetic polymorphism in susceptibility to congenital defects associated with diabetic pregnancy.

Section on Eye Research (Preceptors: Lloyd P. Aiello, M.D., Sven Bursell, Ph.D., Jerry Cavallerano, O.D., Ph.D., Lloyd M. Aiello, M.D.) Prevention and treatment of eye complications of diabetes; Non-invasive methods to detect type 2 diabetes via hyperglycemia causing changes in light absorption within the eye and development of a video-based retinal imaging; Use of vitamin E to improve retinal blood flow and lower the risk of eye complications. Medical informatics in the detection and management of diabetic eye disease.

Section on Genetics and Epidemiology (Preceptors: Andrzej Krolewski, M.D., Ph.D., Lori Laffel, M.D., M.P.H., Alessandro Doria, M.D., Ph.D.) Renal complications of diabetes; Identification of genes that contribute to susceptibility to diabetes and complications, using candidate gene approaches as well as genome scanning; Interaction of genes with environmental factors in promoting disease; Study design, cost-effectiveness approaches, and study of health care delivery and outcomes research. Pediatric-focused assessment, intervention, and outcomes research in type 1 and type 2 diabetes.

Section on Immunology and Immunogenetics (Preceptors: Diane Mathis, Ph.D., Christophe Benoist, M.D., Ph.D., Tihamer Orban, M.D.) Genetic basis and the pathophysiology of autoimmunity; Identification of genes that lead to type 1 diabetes and its complications; Cellular, humoral, and apoptosis pathways that induce beta cell destruction; Transgenic/knockout models to assess the loss of tolerance and immunoregulation that lead to diabetes and to generate pseudo- or super-beta cells; Clinical trials of interventions to prevent or arrest beta cell destruction.

Section on Islet Transplantation and Cell Biology (Preceptors: Gordon Weir, M.D., Susan Bonner-Weir Ph.D., Arun Sharma Ph.D., Myra

Lipes, M.D.) Islet transplantation methods to devise ways to successfully transplant healthy insulin-producing islet cells, from humans or animals, into patients with diabetes; Studies of beta cell function in type 2 diabetes; Growth and differentiation of islet cells.

Section on Metabolism (Preceptor: Laurie Goodyear, Ph.D.) Mechanisms of action of insulin and insulin-like growth factors; Molecular basis for resistance to insulin in diabetes and other disorders; Role of altered insulin and IGF signaling in diabetes complications; Regulation of glucose metabolism by insulin and by exercise; Effects of specific nutrients on the insulin/IGF pathways; Understanding how exercise, insulin, and IGF influence the body's ability to convert glucose to energy.

Section on Obesity (Preceptors: C. Ronald Kahn, M.D.) Molecular mechanisms of weight control; CNS signals that recognize changes in energy balance, appetite regulation, energy expenditure; organs involved in weight regulation; adipocyte biology; insulin signaling in fat cells; DNA chip and proteomic techniques in the study of obesity and diabetes; pathways in type 2 diabetes involving genes of oxidative phosphorylation.

Section on Vascular Cell Biology (Preceptors: George King M.D., Edward Feener Ph.D., Ph.D., Robert Stanton, M.D.) Vascular complications in diabetes; Molecular and functional changes in blood vessels due to hyperglycemia; Role of angiotensin II in blood pressure regulation, fibrinolysis, and insulin resistance; Role of protein kinase C in vascular complications; Physiology and regulation of retinal blood flow and neovascularization. Mechanisms of diabetic kidney complications; Pharmacologic interventions to alter the course of diabetic nephropathy.

Rounds, Clinics, and Conferences

Monday

8:30 a.m. Endocrine Inpatient Rounds
Noon Joslin: Clinical Conference
1:00 p.m. Pediatric Endocrine/Diabetes Clinics
5:00 p.m. Post-clinic Conference

Tuesday

8:30 a.m. Endocrine Inpatient Rounds
Noon Children's: Fellows' Case Conference
Joslin: Research Conference
1:00 p.m. Diabetes Clinic
5:00 p.m. Post-clinic Conference

Wednesday

8:30 a.m. Endocrine Inpatient Rounds
9:00 a.m. Brain Tumor/Neuroendocrine clinic
Noon Medical Grand Rounds
1:15 p.m. Interhospital Endocrine Grand Rounds/
Clinical Rounds
2:30 p.m. Endocrinology Seminars/Journal club

4:00 p.m. Thyroid conference (monthly), alternates with Fellowship Directors' Rounds (with Drs. Majzoub, Wolfsdorf, or Stafford)
5:00 p.m. Endocrine-Surgery conference (rotating among neurosurgery, general surgery, urology)

Thursday

8:00 a.m. Joslin: Pediatric Clinical Case Conference or Journal Club
8:30 a.m. Endocrine Inpatient Rounds
9:00 a.m. Children's Research group lab meeting/journal club
Reproductive Endocrine Clinic
Obesity Clinic
Lipid Clinic
9:30 a.m. Joslin Pediatric Research group lab meeting/journal club

Noon Reproductive Endocrine Conference (monthly)
Noon Joslin: Metabolism Lecture Series
1:00 p.m. Pediatric Endocrine/Diabetes Clinics
5:00 p.m. Post-clinic Conference

Friday

8:00 a.m. Interhospital Fellows' Teaching Conf.
9:00 a.m. BIDMC Endocrine Grand Rounds
Thyroid Clinic
Adult Endocrine Clinic
Type 2 Diabetes Clinic
9:15 a.m. Endocrine Inpatient Rounds
Noon Mini Grand Rounds
1:00 p.m. Metabolic Bone Disease Clinic, or Gender Management Service Clinic

For further information contact:

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