UNIVERSITY OF MINNESOTA
GRADUATE MEDICAL
EDUCATION

2016-2017
FELLOWSHIP
POLICY AND PROCEDURE
ADDENDUM

Department of Medicine

Diabetes, Endocrinology and
Metabolism Fellowship
Program
### Table of Contents

**Introduction and Welcome to New Fellows** ................................................................. 4
**Department of Medicine Mission Statement** .............................................................. 4
**Division of Diabetes, Endocrinology and Metabolism Mission Statement** ................. 4

**SECTION 1 - STUDENT SERVICES** ............................................................................ 5
- Campus Mail and Copy Machine ................................................................................. 5
- Computer Training ........................................................................................................ 5
- E-Mail Addresses ............................................................................................................ 5
- HIPAA Training ............................................................................................................. 5
- Hospital EMR Passwords and Access ........................................................................... 6
- Internet and Intranet Access ........................................................................................ 6
- Pagers ............................................................................................................................ 6
- Research Resources ...................................................................................................... 7
- Tuition and Fees ............................................................................................................ 7
- Useful Websites ............................................................................................................ 7
- Career-Related Websites ............................................................................................. 7
- Debt Management ......................................................................................................... 7

**SECTION 2 - BENEFITS** ............................................................................................ 8
- Holidays ......................................................................................................................... 8
- Insurance - Dental .......................................................................................................... 8
- Insurance - Life .............................................................................................................. 8
- Insurance - Long-Term Disability ................................................................................ 8
- Insurance - Medical ....................................................................................................... 8
- Insurance - Short-Term Disability ............................................................................... 8
- Laundry Service ........................................................................................................... 8
- Leave – Illness and Vacation ......................................................................................... 9
- Leave – Parental and Personal ..................................................................................... 9
- Leave - Professional and Academic (Includes Conferences and CME) ......................... 10
- Leave - Unauthorized Leave ......................................................................................... 10
- Leave - Other ............................................................................................................... 10
- Leave - Policy on Effect of Leave for Satisfying Completion of Program ..................... 10
- Meal Tickets ................................................................................................................ 10
- Meetings ....................................................................................................................... 11
- Parking ......................................................................................................................... 11
- Professional Liability Insurance .................................................................................. 11
- Resident and Fellow Assistance Program (RAP) .......................................................... 11
- Stipends ......................................................................................................................... 12
- U-Card ......................................................................................................................... 12
- White Coats ................................................................................................................ 12

**SECTION 3 - GENERAL POLICIES AND PROCEDURES** ...................................... 13
- ACGME Competencies ............................................................................................... 13
- Duty Hours and Call Schedules .................................................................................... 13
- Evaluation Policy .......................................................................................................... 13
- Graded Responsibility ................................................................................................... 15
- In-Training Examination (ITE) ..................................................................................... 15
- Laboratory/Pathology/Radiology Services ................................................................... 15
- Life Support Certifications (BLS/ACLS/PALS) .............................................................. 16
- Medical Records ......................................................................................................... 16
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of Fellow Well-Being / Adequate Rest</td>
<td>16</td>
</tr>
<tr>
<td>Moonlighting Policy</td>
<td>16</td>
</tr>
<tr>
<td>On Call Activities</td>
<td>17</td>
</tr>
<tr>
<td>Procedure Logs</td>
<td>17</td>
</tr>
<tr>
<td>Professional Dress Code</td>
<td>17</td>
</tr>
<tr>
<td>Residency Management Suite (RMS)</td>
<td>17</td>
</tr>
<tr>
<td>Security/Safety</td>
<td>18</td>
</tr>
<tr>
<td>Supervision</td>
<td>18</td>
</tr>
<tr>
<td>Support Services</td>
<td>18</td>
</tr>
<tr>
<td>Training/Graduation Requirements</td>
<td>18</td>
</tr>
<tr>
<td>Visa Sponsorship</td>
<td>18</td>
</tr>
<tr>
<td>Workers' Compensation</td>
<td>19</td>
</tr>
<tr>
<td><strong>SECTION 4 – INSTITUTION RESPONSIBILITIES</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>SECTION 5 - DISCIPLINARY AND GRIEVANCE PROCEDURES</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>SECTION 6 – ADMINISTRATION</strong></td>
<td>22</td>
</tr>
<tr>
<td>Program Contact Information</td>
<td>22</td>
</tr>
<tr>
<td>Faculty Lists</td>
<td>22</td>
</tr>
<tr>
<td><strong>SECTION 7 – FELLOWSHIP PROGRAM CURRICULUM</strong></td>
<td>23</td>
</tr>
<tr>
<td>Program Requirements</td>
<td>23</td>
</tr>
<tr>
<td>Goals</td>
<td>23</td>
</tr>
<tr>
<td>Objectives</td>
<td>24</td>
</tr>
<tr>
<td>Conferences</td>
<td>25</td>
</tr>
<tr>
<td>Clinical Training</td>
<td>28</td>
</tr>
<tr>
<td>Outpatient Clinical Training</td>
<td>29</td>
</tr>
<tr>
<td>Inpatient Clinical Training</td>
<td>31</td>
</tr>
<tr>
<td>Research Training</td>
<td>32</td>
</tr>
<tr>
<td>Core Curriculum</td>
<td>32</td>
</tr>
</tbody>
</table>
Introduction and Welcome to New Fellows
On behalf of the faculty, staff, and fellows, welcome to the Division of Diabetes, Endocrinology and Metabolism at the University of Minnesota. We hope the time you spend with us will be both educational and enjoyable.

The policies and guidelines that pertain to endocrine fellows are laid out in three separate documents:

(1) The Institution Manual is designed to be an umbrella policy manual. Some programs may have policies that are more rigid than the Institution Manual in which case the program policy would be followed. Should a policy in a Program Manual conflict with the Institution Manual, the Institution Manual would take precedence.

(2) The Program Manual is specific to the Department of Medicine and policies are written in accordance with the American Board of Internal Medicine (ABIM) and the Accreditation Council for Graduate Medical Education (ACGME). Policies apply to all educational experiences within the program and are subject to periodic review and change by the faculty, Program Director, Fellowship Director and Department Chair.

(3) The Fellowship Policy and Procedure Addendum (this document) outlines policies and procedures specific to your training program. Please refer to the Program Manual (above) for further departmental policies and procedures.

Fellows are responsible for knowing and adhering to the policies and guidelines contained in this handbook. If you have any questions about the policies or guidelines, please contact the program director or coordinator for assistance.

Again, welcome to the program!

Department of Medicine Mission Statement
The mission of the Department of Medicine is to enhance the health of the people of Minnesota, the nation and the world, through innovation and research, education and patient care.

It is the mission of the Department of Medicine to provide excellent training in the practice and science of Medicine by immersion in patient care with emphasis upon critical reasoning, scholarship, and professional responsibility, and to promote personal and professional satisfaction.

Division of Diabetes, Endocrinology and Metabolism Mission Statement
To develop academic endocrinologists who will become leaders in education, research, and patient care.
SECTION 1 - STUDENT SERVICES

Campus Mail and Copy Machine
The fax machine (number 612-626-3133), outgoing campus mail, and US mail collection boxes are located in 6-207 PWB. Check your mailbox frequently for various distributions and telephone messages. There are also refill request forms and other documents that may need your immediate attention. For those of you not at the University of Minnesota site, important mail/information will be mailed to your home address or your site location.

The copy machine is also located in 6-207 PWB. You may be given the division account number to use to pay for journal articles or book chapters that you copy in the Biomedical Library. This account number is to be used sparingly. All fellows are encouraged to use discretion in order to minimize copying charges outside of the division’s copy machine.

Computer Training
Computer literacy is essential to functioning effectively as a physician and within our program. All of your medical charting is done through electronic medical record systems. Residency Management Suite (RMS) is used to log duty hours weekly, collect evaluation feedback and log procedures.

Computer training is available at the University of Minnesota Medical Center, Fairview (UMMC-FV). The Biomedical Library staff present an overview of the services and resources offered through the use of computers, and also demonstrate search strategies for medical practice and research. Using online demonstrations of the Library’s online Web forms to request services (e.g., photocopying) and databases to search for health related information (e.g., Medline and electronic journals), fellows can learn how to connect to these resources from within the Library, their clinics, or from home. Information is updated monthly to give fellows access to the most current health topics. The Bio-Medical Library will also assist fellows in any other computer-related issues they might have.

RMS training will be conducted during your orientation in July. Should you feel you need additional training, please speak with your program coordinator.

E-Mail Addresses
Fellows are assigned a University e-mail account at the beginning of their fellowship. If you are coming from another program, you will need to initiate your new U of M account (if you haven’t already). Go to https://www.umn.edu/initiate. You will choose a password. If you have complications, contact UMN Tech Support at (612) 301-4357.

You are required to log-on to your U of M email at least twice a week as we regularly send announcements about the program via e-mail. Additionally, the University exclusively uses email as the official mode of communication.

HIPAA Training
All University of Minnesota Residents, Fellows, Faculty and Staff have to complete HIPAA training sessions through the University of Minnesota, regardless of any other training sessions you may have had elsewhere. HIPAA Training is federally mandated. You access your training through ULearn. These training sessions will be assigned to you and must be
completed soon after your fellowship start date. To log on, sign in using your X500 and password.

All Fellows will need to complete the following training sessions:

- Introduction to HIPAA Privacy and Security Video
- Privacy and Confidentiality in the Clinical Setting
- Privacy and Confidentiality in Clinical Research
- Data Security in Your Job
- Securing Your Computer Workstation
- Using University Data
- Managing Health Data Securely

If you have problems accessing the training sessions call the helpline: 612-301-4357

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<tr>
<th>Hours</th>
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<th>8:00 a.m. – 11:00 p.m.</th>
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<td>Friday:</td>
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<td>Sunday:</td>
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For more information about the University of Minnesota’s Privacy and Security Project and Federal regulations, go to: privacysecurity.umn.edu.

**Hospital EMR Passwords and Access**

EMR passwords and access will be provided at all site locations. Initial login and password information can be obtained through the Education Office at each site. If you are having problems logging into these systems, please call the Information Center at 612-672-6805 (for EPIC, PACS) or the UMPhysicians Help Desk at 612-884-0884 (for Allscripts).

**Internet and Intranet Access**

All residents and fellows have internet access through the University of Minnesota. Your login and password are tied in with your email account at the University. To login, go to the University of Minnesota, Twin Cities website at umn.edu/twincities/index.php. Click on “One Stop”. At this level, you can search for names and check your email. Click on “myU” located in the top, right corner of this page then enter your X500 (Internet ID) and password. MyU is the location for many resources related to academics, human resources, etc. Remember, it is very important to logout of the internet when you are done viewing this site as your personal payroll information is listed here.

**Pagers**

Each fellow will be assigned a universal pager to be carried throughout their training. Fellows will not have to switch beepers when they switch sites as the pagers have an 80-mile radius. Batteries for pagers are available in the division office. If the pager needs repair, please contact the program coordinator. Certain repairs are at no charge to the fellow; however, if the repair is due to water damage or poor handling, the fellow may be responsible for the repair or replacement of the pager. At the end of training, fellows must turn their pagers in to the program coordinator.
**Research Resources**
Fellows have free access to Medline and other electronic library services. Fellows may gain access from home computers via modem, DSL, etc., and from computers in the fellows’ room at some of the hospital sites. Fellows also have access to workstations in the Reference Area of the Bio-Medical Library in Diehl Hall. The University of Minnesota Biomedical Library has a comprehensive collection of journals and textbooks in electronic format which can be readily accessed via the internet.

**Tuition and Fees**
Tuition and fees are being waived at this time. Trainees who are enrolled in Graduate School pay tuition and fees.

**Useful Websites**
Bio-Medical Library Website: [https://hsl.lib.umn.edu/biomed](https://hsl.lib.umn.edu/biomed)
Extensive on-line biomedical information including over 100 medical journals available with full text is available.

The University of Minnesota also has web sites ([twincities.umn.edu/](http://twincities.umn.edu/) on campus involvement and events with ongoing information on campus. Residents/fellows can present their U Card at many of these events for discounted or student rates.

**Career-Related Websites**
There are many web sites dedicated to physician recruitment. A sample of those includes:
- American College of Physicians / American College of Internal Medicine: [acponline.org](http://acponline.org)
- PracticeLink: [practicelink.com](http://practicelink.com)
- Physicians Employment: [physemp.com/](http://physemp.com/) Healthcare
- Association of American Medical Colleges: [aamc.org/](http://aamc.org/)
- Association of Program Directors in Internal Medicine (resources / job bank section has job postings): [im.org](http://im.org)

**Debt Management**
The AAMC has a debt management free list serve for residents/fellows designed to help residents/fellows manage their medical student loans. Residents/fellows can subscribe to it by doing the following:
- Send an e-mail to: majordomo@aamcinfo.aamc.org
- In the subject field, provide information and identify your residency program
- In the text section of the e-mail, simply type: Subscribe-moneymatters-your e-mail address
SECTION 2 - BENEFITS

Holidays
University holidays are posted on the Office of Human Resources website. Holidays may vary by training site. Please check the call schedule at your site for holiday coverage assignments.

Insurance - Dental
Optional dental coverage is available for medical fellows only. Family dental coverage is not available.

Please contact the Office of Student Health Benefits at 612-624-0627 or umshbo@umn.edu if you have dental enrollment questions. Questions regarding this dental policy, such as what is and is not covered should be directed to the Delta Dental Customer Service Center at 651/406-5916 or 1-800/553-9536 Web site: deltalignment.org.

Insurance - Life
Forms to request a change of beneficiary may be obtained by contacting the Office of Student Health Benefits at 612-624-0627 or umshbo@umn.edu.

Insurance - Long-Term Disability
( Please see the Institution Manual for complete long-term disability insurance information .)

Insurance - Medical
All medical fellows must be enrolled in one of two medical insurance plans offered through the residency/fellowship training program unless the fellow provides documentation of other comparable medical insurance coverage. Please refer to the departmental Medical Resident/Medical Fellow Benefits Program Booklet for comparison information of premiums and benefits available under each plan. Please contact the Office of Student Health Benefits at 612-624-0627 or umshbo@umn.edu if you have enrollment questions or need to make changes in your medical insurance coverage. Questions regarding your specific policy, such as coverage should be directed to the insurance carrier (shb.umn.edu/residents-fellows-and-interns/health-benefits).

Insurance - Short-Term Disability
Short-term disability insurance is provided, at no cost, to all fellows in the Department of Medicine through Guardian. Enrollment in the short-term disability plan is automatic with no application form required.

Under this policy, a disability is defined as an injury, sickness or pregnancy for which you are under the ongoing care of a physician or practitioner other than yourself. The plan pays for both total and partial disability. This plan has a 15-day beginning date - you must be disabled for 14 days before benefits begin. The plan pays 70% of your base stipend if disabled and benefits can be paid up to 24 weeks. Maximum weekly benefit is $1,000.00.

Laundry Service
The first time you are having your coat laundered, you must be sure to request that your coat is tagged and chipped for identification so that your coat will be routed back to you. Ask for assistance with this from the division administrative assistant. After the initial identification, lab
coats are laundered on an as needed basis and are sent in on a Tuesday and returned within two weeks.

**Leave – Illness and Vacation**
In accordance with the ABIM policy for board certification, all fellows will be given one month of leave (four weeks), to be used for both vacation and sick leave. Any leave that exceeds one month will be unpaid and must be made up at the end of the training. There is no carryover of vacation or sick time from one year to the next. For details, please refer to the ABIM policy located on the web at [www.abim.org](http://www.abim.org). Fellows are allotted five paid working days (one week) of sick/personal time per fellowship year. Personal days may be used for personal or family illness, personal or family emergency and practice search. When such a situation arises, fellows are responsible for notifying the program coordinator, the coordinator of the site you are rotating at, the appropriate faculty member, and/or your continuity clinic.

Fifteen (15) paid working days (three weeks) are granted for vacation each fellowship year. Vacation days cannot be carried over to the next academic year. Regarding planned vacations, fellows are responsible for notifying the fellowship coordinator at least 60 days in advance.

Fellows who are graduating from the fellowship program are allowed to take vacation during one of the last two weeks of their fellowship. Please plan accordingly and save a week of vacation if you wish to use it at the end of your academic year.

All fellows, regardless of rotation location, must complete a Fellow Time Off Request Form for any absence due to vacation, meeting, or personal time away from work. This form is available via the RMS homepage or from your program coordinator. Once the form is completed, it should be returned to the coordinator for processing which includes notification of rotation sites and continuity clinics.

**Leave – Parental and Personal**
Fellows are provided with six weeks of paid maternity leave and two weeks of paid paternity leave. (Note that any leave that, when added to vacation time and any other personal time away, results in more than one month away from the program in a PGY year will extend training.) Fellows should notify the program director as far in advance as possible of the request for maternity/paternity leave.

Other Personal Leave should be requested at least three months in advance of the planned leave, except in the case of a personal crisis or emergency, for which appropriate notifications should be made as soon as possible to the program director. Fellows are responsible for arranging schedule changes for all other personal leave and should make arrangements as far in advance as possible, in consideration of their colleagues and the program.

When requesting a Leave of Absence, please consider the following:

The ABIM allows any one year of training to be interrupted by only four weeks, including vacation, sick leave, educational leave and Maternity/Paternity Leave. Any time off exceeding four weeks will extend your training.

When taking maternity leave (6 weeks paid) or paternity leaves (2 weeks paid), consider the
following:

This leave time in addition to any vacation time could extend a resident’s training.

Maternity Leave (6 weeks paid):
4 weeks – If no vacation time was used in the year, no time needs to be made up. And it is paid time.
2 weeks – This time will need to be made up, but it is paid time.
**Anything past this will not be paid and all time over four weeks will need to be made up.

Paternity Leave (2 weeks paid):
2 weeks – does not need to be made up, paid time.
**This will then shorten the allowed vacation time from 3 weeks to 1 week.

Leave - Professional and Academic (Includes Conferences and CME)
Time away for academic leave and conferences other than those that are part of the curriculum may be granted in addition to regular vacation time. Requests must be received in writing by the fellowship office and approved by the fellowship director following the same guidelines as for vacation time. No more than 10 days per academic year will be allowed; time beyond this limit must be taken as regular vacation time.

Leave - Unauthorized Leave
Unexcused, unsupported, or unauthorized absences/leaves and/or significant tardiness from any mandatory clinical or educational activity constitutes unprofessional conduct. Under your signed employment contract, unprofessional conduct is behavior which will subject the fellow to discipline for non-academic reasons. Such discipline may be in the form of a written warning, probation, suspension or termination.

Leave - Other
See the Institution Manual for information on the following types of leave: bereavement, medical, Family Medical Leave Act (FMLA), jury/witness duty and military.

Leave - Policy on Effect of Leave for Satisfying Completion of Program
All fellows must meet the twenty-four month training requirements established by the American Board of Internal Medicine. Fellows may miss one month per year or two months per fellowship, including vacations, sick leave, leaves of absence (LOAs), etc. Time in excess of two months whether for vacations, sick leave, maternity or paternity leave must be made up to meet this requirement. This requirement does not include the additional third year for research that many fellows undertake.

A requested LOA must be discussed with the Fellowship Program Director. The Fellowship Program Director must approve your request at least three months prior to the requested LOA date. Exceptions may be made if the request falls under the definition of the Family Medical Leave Act (FMLA). (Please see Part A of the Department of Medicine Policies and Procedure manual for the Medical School policy on FMLA). **Do not assume that a LOA will be granted automatically. Obtain approval before making plans.**

Meal Tickets
There is no allotment for meals to fellows in Diabetes, Endocrinology and Metabolism.
Meetings
The program will reimburse the cost, up to $1,200, for each fellow to attend one national meeting of the Endocrine Society or American Diabetes Association once during the fellowship. The program will also pay the cost, up to $1,200, for a fellow to attend additional annual meetings of the Endocrine Society or American Diabetes Association if the fellow is presenting his or her research work (poster or oral presentation).

Fellows will be responsible for expenses above $1200. Fellows will be expected to consume the meals offered at the meetings and should share rooms whenever possible to defray costs. Fellows will not be reimbursed for car rental or expenses for other individuals.

In addition, during the final year of fellowship, the program will cover the registration fee for Endocrine University for those fellows accepted into the program. Fees associated with submission of abstracts and poster printing will be reimbursed in addition to the allotted $1200. All expense reimbursement requests should be submitted within 30 days following the conference (or within 30 days of when the expense is incurred if not conference related).

Fellows may be given academic or vacation leave (as determined by the fellowship director) to attend other meetings to present their research work. The funding for these meetings will be determined on an individual basis.

Parking
University of Minnesota Medical Center: There are a number of parking lots available on the East Bank campus. Go to: http://www1.umn.edu/pts/ for maps and prices or for information on contract parking.

After hours parking in the East Bank patient visitor ramp begins at 4:30 p.m. Monday through Friday and is available all day/night on weekends and holidays. Residents/fellows must go to the parking office (Mayo Building B-340) to activate their after hours parking. (This also allows fellows to park in the Yellow ramp on the Riverside campus during daytime hours and shuttle to the East Bank.) A $25 refundable deposit is required.

Fellows on their two month UMMC clinical rotation can obtain a parking card from the fellowship coordinator.

VA Medical Center: Free parking is available at the VA Medical Center.

Hennepin County Medical Center: Fellows on the inpatient service pay a $50 deposit for a parking card at the beginning of the month. At the end of the rotation when the card is returned, the $50 is refunded.

Professional Liability Insurance
The Medical Resident and Medical Fellow Professional Liability Insurance policy is administered through the University’s Office of Risk Management and Insurance. Questions regarding this policy should be directed to Krista Cozine at 612-625-9995.

Resident and Fellow Assistance Program (RAP)
Training can be stressful for fellows and their families. While we try to foster a culture of
professionalism, warmth and support within the program, there are times when a fellow or her/his family may wish to have additional counseling. The Resident and Fellow Assistance Program (RAP) is a confidential assistance program designed specifically for residents and fellows, and is available to all residents/fellows and their families free of charge. Residents/fellows and their families are encouraged to take advantage of this benefit.

RAP offers support and assistance to residents/fellows with issues and problems such as getting a handle on debt, dealing with stress, career choices, relationships, and adjusting to training programs. RAP is strictly confidential, and is provided by an outside firm, Sand Creek Group, Ltd. The RAP program will NOT notify the program or program director of a fellow’s use of the program. Contact: Sand Creek Group, Ltd. at 651-430-3383 or 1-800-632-7643. More information can be found on the GME website.

**Stipends**
The base stipend levels are available in the Institution Manual as well as on the GME website. For specific payroll-related questions, contact Human Resources at 612-626-0119.

**U-Card**
Your U Card identifies you as a student, staff or faculty member. Your first U Card is free and can be obtained at the U Card Office located in room G22 in the Coffman Memorial Union building, 300 Washington Avenue SE, Minneapolis / East Bank Campus, phone 612-626-9900. They are open weekdays: 8:30 a.m. to 4:00 p.m. Bring your driver’s license, state ID or passport and be prepared to have your picture taken.

See the U Card website for more information.

**White Coats**
Each fellow is issued two white lab coats to last throughout the fellowship. If needed, please contact the fellowship coordinator to order an additional coat.
SECTION 3 - GENERAL POLICIES AND PROCEDURES

ACGME Competencies
An in-depth description of the General Competencies requirements can be found on the ACGME website. Reference to these competencies is indicated throughout the Fellowship Program Curriculum section of this manual.

Duty Hours and Call Schedules
Generally, duty hours are 8:00 to 5:00 Monday through Friday. Duty hours are defined as all clinical and academic activities related to the training program, i.e., patient care (both inpatient and outpatient), administrative duties related to patient care, the provision for transfer of patient care, time spent in-house during call activities, and scheduled academic activities such as conferences. Duty hours do not include reading and preparation time spent away from the duty site.

Duty hours are limited to 80 hours per week averaged over a four week period inclusive of all in-house call activities.

There is no overnight in-house call for the fellowship program. A fellow and faculty are assigned for phone calls and emergency consults 24 hours a day, 7 days a week. Typically the first year clinical fellow takes calls during daytime hours on weekdays. After hour/night time call and weekend call rotates between the first year clinical fellow and the senior fellows or faculty, depending on the site. The first year clinical fellow will be assigned after hour/night time call and weekend call every other week. Fellows assigned weekend call at UMN will round on weekends with faculty. Typically fellows assigned weekend call at the VAMC or HCMC do not need to come in on weekends to round, but may be called in for new or follow-up consults. Fellows have a minimum of 1 day per week free of all clinical responsibilities averaged over a four week period. The training program provides adequate time for rest and personal activities, which consists of a 10-hour time period provided between all daily duty periods.

Evaluation Policy
All evaluations are completed online using RMS. The following describes the evaluation program and schedule for evaluations:

Clinical Year – Clinical Rotations
The fellow will be evaluated monthly and will evaluate the attending faculty and rotation.

Research Years
The fellow will be evaluated every six months by the faculty research mentor and will evaluate the mentor/research experience every six months.

Continuity Clinic
Supervising faculty will evaluate the fellow every three months and the fellow will evaluate the supervisor every six months.

Year End
The fellow will evaluate the program and faculty yearly.

Other Evaluation Methods
Patient surveys, evaluations by clinic staff, medical students and residents rotating on the endocrine service and fellow performance on the annual in service training exam will also be part of a fellow's ongoing evaluation toward meeting ACGME milestones and meeting core competencies.

Faculty evaluations may be reviewed online at any time and faculty is available to review individual evaluations with fellows.

**ACGME Competencies**
Fellows are provided with multiple opportunities for training in the six core competencies, as outlined by the ACGME, and are evaluated in each of these, as described below.

1. **Learning activity.**

<table>
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<th>Experience</th>
<th>Core Competency</th>
<th>Patient care</th>
<th>Medical knowledge</th>
<th>Interpers. &amp; comm. skills</th>
<th>Professionalism</th>
<th>Practice-based learning</th>
<th>System-based practice</th>
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2. **Evaluation methods.**

<table>
<thead>
<tr>
<th>Context/modality</th>
<th>Core Competency</th>
<th>Patient care</th>
<th>Medical knowledge</th>
<th>Interpers. &amp; comm. skills</th>
<th>Professionalism</th>
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</tbody>
</table>
Graded Responsibility
Fellows are assigned incrementally increasing responsibility and independence during their training appropriate for their demonstrated level of competency and professional development (as assessed by the supervising physicians), according to a three-tiered format as shown below.

<table>
<thead>
<tr>
<th>Function/activity</th>
<th>Level of responsibility/ independence by proficiency level*</th>
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</thead>
<tbody>
<tr>
<td>Clinical data collection</td>
<td>Beginning: independent, with staffsupplementation</td>
</tr>
<tr>
<td></td>
<td>Developing: independent, with staff confirmation</td>
</tr>
<tr>
<td></td>
<td>Proficient: independent, with selective staff confirmation</td>
</tr>
<tr>
<td>Formulation of clinical assessments/plans</td>
<td>Beginning: jointly with staff</td>
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<tr>
<td></td>
<td>Developing: independent, with staff confirmation</td>
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<tr>
<td></td>
<td>Proficient: independent, with selective staff confirmation</td>
</tr>
<tr>
<td>Communication of recommendations to 1st teams/referring MDs</td>
<td>Beginning: after discussion with staff</td>
</tr>
<tr>
<td></td>
<td>Developing: preliminary, independent; final, after discussion with staff</td>
</tr>
<tr>
<td></td>
<td>Proficient: independent, with selective staff confirmation</td>
</tr>
<tr>
<td>Procedures – thyroid fine needle aspiration</td>
<td>Beginning: jointly with staff participation</td>
</tr>
<tr>
<td></td>
<td>Developing: Independent with selective staff participation</td>
</tr>
<tr>
<td></td>
<td>Proficient: Independent with staff supervision</td>
</tr>
<tr>
<td>Case conference preparation</td>
<td>Beginning: jointly with staff</td>
</tr>
<tr>
<td></td>
<td>Developing: independent, with staff confirmation</td>
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<tr>
<td></td>
<td>Proficient: independent, with selective staff confirmation</td>
</tr>
<tr>
<td>Supervision of students/residents</td>
<td>Beginning: jointly with staff</td>
</tr>
<tr>
<td></td>
<td>Developing: independent, with staff review</td>
</tr>
<tr>
<td></td>
<td>Proficient: independent, with selective staff review</td>
</tr>
<tr>
<td>Research</td>
<td>Beginning: directed background reading, tutored skill development</td>
</tr>
<tr>
<td></td>
<td>Developing: execution of existing projects with staff oversight</td>
</tr>
<tr>
<td></td>
<td>Proficient: analysis and presentation of results, new project development, independent conduct of research with selective staff review</td>
</tr>
</tbody>
</table>

*As assessed by supervising faculty based on observation of fellow’s performance. Clinical proficiency levels correspond approximately with the first, second, and third 4-month blocks of clinical experience, but individual fellows move through the levels at different rates depending on their rate of developing the relevant competencies.

In-Training Examination (ITE)
Fellows who have not completed the Endocrine Boards are required to take the In-Training Examination offered by the Endocrine Society. The Division pays for this exam. The results of the test assist fellows as well as the fellowship program directors to identify strengths and weaknesses of both the fellow and the training program. The exam is taken in the winter of each year.

Laboratory/Pathology/Radiology Services
Inpatient clinical support services are available on a 24-hour basis at UMMC, HCMC and the Minneapolis VAMC to meet reasonable and expected demands, including intravenous
services, phlebotomy services, messenger/transporter services, Inpatient Radiology services including laboratory and radiologic information retrieval systems that allow prompt access to results.

**Life Support Certifications (BLS/ACLS/PALS)**
Please refer to the Institution Manual for the Life Support Certification policy.

**Medical Records**
Clinical records that document both inpatient and ambulatory care are readily available at all times. Each site provides electronic and/or paper-based medical records for patient care. Passwords and access to these records are provided at each site’s orientation during the first day of the rotation.

**Monitoring of Fellow Well-Being / Adequate Rest**
*Each inpatient site is responsible for ensuring adequate rest and well-being for its fellows. This may be accomplished by a schedule of uninterrupted sleep and carrying pagers for a team member during agreed-upon hours.*

The program directors and fellowship coordinator will monitor duty hours, days off, and adequacy of rest at all sites by reviewing RMS duty hour reports. The program directors will review duty hour issues with fellows should they arise. The program encourages fellows to recognize their own levels of stress also, and to seek the advice of their program directors, fellowship coordinator or attending physician if stress becomes too great.

**Moonlighting Policy**
In addition to the Moonlighting Policy set forth in Part A of the Department of Medicine Policies and Procedure Manual, fellows must adhere to the following guidelines specific to the Internal Medicine training program. Moonlighting is defined as any work performed as a physician outside of the fellowship program that generates revenue.

In general, the Department of Medicine discourages moonlighting activities by fellows. Moonlighting during the hours of 8:00 am to 5:30 pm on workdays or during any hours while on call is **strictly prohibited**; the Department views moonlighting during these times as a breach of trust and a violation of professionalism. Clinical responsibilities extended beyond these hours have priority over any scheduled moonlighting activities. Moonlighting must not interfere with the fellow’s performance of patient care or educational responsibilities on any rotation during fellowship training. Fellows violating this policy may be subject to probation, suspension without pay and/or disciplinary action including, but not limited to, termination.

Moonlighting is discouraged during any rotation in which the fellow has clinical responsibilities. Any moonlighting that is done during clinical rotations must not interfere with the fellow’s clinical responsibilities, so is best limited to the fellow’s days off or, if done on weekdays, should not begin until the completion of daily rounds (the timing of which must be negotiated in advance with the supervising faculty physician). All fellows who secure moonlighting positions must obtain advance approval from the Fellowship Program Director. In order to be approved, the fellow must provide the organization and site of the moonlighting activity, the nature of work (i.e. urgent care, chart review, etc.), the name and telephone number of the immediate supervisor, and the anticipated hours of work per month. This information should be provided to the Fellowship Director by using a standardized moonlighting form that is available from the
Fellowship Coordinator.

- Moonlighting requires a prospective written statement of permission from the program director that will be made part of the fellow’s file.
- Fellows are not required to engage in moonlighting.
- Moonlighting activities will not be allowed to conflict with the scheduled and unscheduled time demands of the educational program and its faculty.
- The fellow’s performance will be monitored for the effect of these activities upon performance and adverse effects may lead to withdrawal of permission.
- Internal moonlighting must be counted toward the 80-hour weekly limit on duty hours.
- Moonlighting activities must not coincide with scheduled “on call” responsibilities.
- Moonlighting is not permitted with a J1 visa.

Professional liability insurance coverage is the responsibility of the fellow and/or hiring institution. The insurance coverage provided by the University of Minnesota does not cover moonlighting activities, including that which occurs at the VA or Regions Hospitals.

**On Call Activities**
In-house call is defined as those duty hours beyond the normal work day when fellows are required to be immediately available in the assigned institution. Continuous on-site duty, including in-house call, must not exceed 24 consecutive hours. Fellows may remain on duty for up to 6 additional hours to participate in didactic activities, transfer care of patients, conduct outpatient clinics and maintain continuity of medical and surgical care. Endocrinology trainees have no In-hospital call. As a result, information is not provided in this manual regarding in-hospital call and on-call rooms.

**Procedure Logs**
As a requirement for board certification, fellows are required to perform at least six fine needle aspiration biopsies of the thyroid before they can be considered proficient. Trainees will keep track of these procedures online in the Residency Management Suite (RMS).

**Professional Dress Code**
Residents/Fellows are expected to be neat, clean, and orderly at all times during the performance of training program activities. Jewelry, clothes, hairstyle and fragrances should be appropriate for the performance of duties in the hospital or clinic. The fellows’ identification badges are to be worn whenever the fellow is involved in clinical or administrative duties.

Fellows are expected to dress according to generally accepted professional standards appropriate for their training program. Where safety is a factor, fellows should use common sense in choosing clothing and shoes for training activities.

**Residency Management Suite (RMS)**
All fellows will receive RMS training during their first-year orientation, where the “painting”
system will be introduced. Fellows are responsible for painting in their hours worked. It is expected that fellows log in to RMS at least every three days to enter in hours; however, daily entering would be ideal. For questions related to RMS, please contact the program coordinator. The coordinator will be checking compliance and will send reminders with deadlines. Painting in duty hours is a program requirement. Failure to comply fully could result in disciplinary action.

Security/Safety
Security and personal safety measures are provided to fellows at all locations, including but not limited to parking facilities, on-call quarters, hospital and institutional grounds, and related clinical facilities (e.g. medical office buildings).

Contact Information:
UMMC Security Office: 612-273-4544 / East Building / Riverside Campus
University of Minnesota Security Monitor Program: 612-624-WALK
HCMC Security Office: 612-873-3232
ANWH Security Office: 612-863-5416 (internal phone, 3-5416)

Supervision
Fellows are supervised closely in all their activities by designated faculty members, i.e. the assigned endocrinology consult service attending during consult months, the assigned clinic attending during continuity clinic and the designated research mentor for research activities. All patient care decisions and recommendations made by the fellow are discussed with the relevant faculty member, and changes (if any) are communicated to the primary teams or patient, as appropriate. Faculty members confirm relevant aspects of the history and physical examination, as assessed by the fellow, to the extent necessary in order to ensure that clinical decision making is appropriate and documentation is accurate. When fellows supervise residents and students in providing patient care, the fellow is responsible for seeing that the decisions and recommendations made by the trainees are appropriate, which then is verified by the responsible faculty member. The program director has overall responsibility for ensuring that fellows are performing and progressing satisfactorily, as ascertained from the standardized evaluations submitted periodically by the supervising faculty members and from direct discussions with these faculty members as needed to clarify any questions raised by the standardized evaluations.

Support Services
Please see the Resident Inpatient Guides for specific information related to accessing and utilizing these services and systems at all sites affiliated with the Internal Medicine Residency Program. Each of these services must be provided at all sites affiliated with the Internal Medicine Residency Program.

Training/Graduation Requirements
Please review the ABIM website for requirements for certification in subspecialties and added qualifications.

Visa Sponsorship
The J-1 alien physician visa sponsored by ECFMG is the preferred visa status for foreign national trainees in all UMN graduate medical education programs; therefore, the Diabetes,
Endocrinology and Metabolism Fellowship Program sponsors only J-1 visas. We do not sponsor H-1B visas. More information can be found on the UMN-GME webpage.

**Workers’ Compensation**
Please see the Institution Manual for workers’ compensation benefit information as well as the [GME website](#) under “Resident and Fellow Resources” for a detailed description of the procedure for needle sticks.
SECTION 4 – INSTITUTION RESPONSIBILITIES

Please refer to the Institution Manual.
SECTION 5 - DISCIPLINARY AND GRIEVANCE PROCEDURES

Please refer to the Institution Manual for Medical School policies on the following: Discipline/Dismissal/Nonrenewal; Conflict Resolution Process for Student Academic Complaints; Academic Incivility Policy and Procedure; University Senate on Sexual Harassment Policy; Sexual Harassment and Discrimination Reporting; Sexual Assault Victim’s Rights Policy; and Dispute Resolution Policy.
SECTION 6 – ADMINISTRATION

Program Contact Information

J. Bruce Redmon, MD
Director
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Minneapolis, MN 55455

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Fax: 612-626-3133
E-mail: redmo001@umn.edu

Pam Coppa
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Diabetes, Endocrinology and Metabolism Fellowship Program
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Fax: 612-626-3133
E-mail: copp0008@umn.edu

Sommer Wappel
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Minneapolis, MN 55455

Phone: 612-624-5150
Fax: 612-626-3133
E-mail: srduffy@umn.edu

Faculty Lists
See fellowship website for faculty lists.
SECTION 7 – FELLOWSHIP PROGRAM CURRICULUM

Overall Objectives of the Endocrinology and Diabetes Fellowship Program

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 needed by a consultant in this field. Our 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.

Program Requirements
Our training program is an important part of the academic mission of the division. We seek to ensure that our fellows successfully complete their training goals, whether they are preparation for a career as an endocrinologist working as a researcher, teacher or clinician at an academic institution or as a clinical endocrinologist in private practice. Fellows spend at least 12 months in clinical endocrinology training in the inpatient and outpatient settings. These 12 months are usually done as the first year of fellowship. In special circumstances, fellows may have research time during their first year of fellowship, in which case their clinical training time will extend into their second year. This latter arrangement is made for fellows who wish to begin their research activities during the first year of fellowship. The majority of year two of the fellowship is devoted to a research project(s) with some clinical time including one-half day a week of fellow continuity clinic. There is the option for a third fellowship year for additional research training for fellows with a demonstrated interest and commitment to an academic endocrinology career.

Goals
1. To learn basic and advanced endocrine biochemistry, physiology and pathophysiology, which provide the basis for understanding endocrine disease.
2. To accumulate a critical mass of fundamental information and practical approaches for the diagnosis, management and prevention of endocrine disorders.
3. To acquire the technical and practical skills that are required by a consultant in endocrinology, diabetes and metabolism.
4. To acquire clinical skills in a progressive fashion and with increasing responsibility appropriate for a consultant in endocrinology, diabetes and metabolism.
5. To acquire knowledge and skills necessary for providing cost-effective, ethical and humanistic care of patients with diabetes and disorders of endocrinology and metabolism.
6. To acquire knowledge and skills necessary for critical analysis of the endocrine literature.
7. To acquire skills in design and performance of hypothesis-driven endocrine research, and to participate in such research or equivalent scholarly activity. This may include gaining extensive experience in grant writing and scientific presentation.
**Objectives: The program will provide training in:**
1. Endocrine biochemistry, physiology and pathophysiology.
2. Hormone action and inter-relationships.
3. Diagnosis and management of endocrine diseases including:
   - (3.1) History and physical examination with emphasis on examination of the fundi, thyroid, peripheral vascular system, neurologic system, breasts, penis, testes and female reproductive organs.
   - (3.2) Selection and interpretation of endocrine biochemical tests.
   - (3.3) Selection and interpretation of imaging procedures such as sonography, radionuclide scans, computerized axial tomography, magnetic resonance imaging, positron emission tomography and DEXA.
   - (3.4) Fine needle aspiration of the thyroid and interpretation of cytology and pathology.
   - (3.5) Understanding pharmacotherapy for endocrine disorders and appropriate use of surgery, radiation therapy, treatment with radioisotopes, etc.
4. Procedural and technical skills required by the endocrine subspecialist.
5. Professionalism, including peer interactions, communication with patients, their families and other health care providers, confidentiality and avoidance of conflict of interest.
6. Endocrine clinical and basic research.
7. Understanding of existing and emerging endocrine literature.
8. Personal scholarship and self-instruction.

How these specific learning objectives apply to the major learning experiences of this program is indicated below.

### Objectives for the Major Learning Experiences

<table>
<thead>
<tr>
<th>Objectives</th>
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**Educational Program**
Formal fellowship educational activities primarily are held at the UMMC site and include a weekly endocrine core curriculum conference; a weekly clinical case conference; clinical and basic science journal clubs; and a weekly endocrine citywide conference. Additional educational instruction occurs through weekly department of medicine conferences including a weekly departmental research conference (UMMC), grand rounds and morbidity and mortality conference. Individual research groups and laboratories hold additional research meetings and conferences. Individual on line training is available through the Clinical and Translational Research Institute in clinical and translational research including responsible conduct of research, clinical trial design and statistical methods.

**Core Conferences**

<table>
<thead>
<tr>
<th>Conferences (at UMMC site)</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday (All Fellows)</th>
<th>Friday</th>
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<tr>
<td>Medicine Research Conf.</td>
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<td>Medicine Grand Rounds</td>
<td>Morbidity and Mortality conference</td>
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<td>Basic Science Journal Club</td>
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<td>Clinical Journal Club (4th Thursday)</td>
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<td>Core curriculum conference</td>
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<td>Clinical case conference</td>
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<td>Thyroid cytology conference (1st Thursday)</td>
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<td>City-Wide conference</td>
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**Weekly Conferences (at HCMC site)**

<table>
<thead>
<tr>
<th>Monday</th>
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<tr>
<td>Noon Conference</td>
<td>Noon Conference</td>
<td>Noon Conference</td>
<td>Grand Rounds</td>
<td>Noon Conference</td>
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**Weekly Conferences (at VA site)**

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<th>Monday</th>
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<tr>
<td></td>
<td></td>
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<td>Morbidity and Mortality</td>
<td>Medicine Research</td>
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<tr>
<td></td>
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<td>Medicine Research</td>
<td>Medicine Grand Rounds</td>
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<tr>
<td></td>
<td></td>
<td>Clinica Journal Club</td>
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</tbody>
</table>
Core Curriculum Conference

**Educational Purpose:** Formal instruction by faculty in the molecular and biochemical physiology, pathophysiology, diagnosis and management of the range of endocrine diseases that a trained endocrinologist will need to understand and master.

**Teaching Method:** Lectures by endocrine faculty and other faculty or experts in related disciplines.

**Disease Mix:** The spectrum of endocrinology is covered over a two year cycle of lectures.

**Procedures and Services:** Appropriate use of biochemical testing, imaging and biopsy may be the subject of 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.

**Evaluation:** Fellows will evaluate the effectiveness of faculty as teachers and the overall effectiveness of the conference through annual faculty and program evaluation. (See Section 3 – Evaluation Policy).

Clinical 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:** Case presentations by fellows and faculty. The first year fellow assigned to the UMMC site is responsible for preparing and formally presenting a case and reviewing the pertinent literature related to that case. Additional cases are brought for discussion by other fellows and faulty. The conference also provides a forum for instruction and participation in quality improvement as discussion of patient management and possible errors in that management are also discussed. Once a month, the conference is held jointly with our pathology department to review endocrine cases with their corresponding cytology and/or pathology findings.

**Disease Mix:** All endocrine diseases are discussed. Those low frequency disorders that might not be encountered by a trainee during the program are discussed.

**Procedures and Services:** Appropriate use of biochemical testing, imaging and biopsy as well as review of above studies, cytology and pathology may be the subject of 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.
**Evaluation:** Trainees who give conferences will be evaluated by attending physicians. Their performance in this venue is part of their overall evaluation by attending physician and the program director. (See Section 3 – Evaluation Policy).

**Basic Science Journal Club**

**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 of hormone receptors and principles of hormone action, biology of sexual development, reproductive endocrinology, endocrine aspects of sexual dysfunction and feedback systems.

**Teaching Method:** Trainees will be given materials for self-instruction in the subject area of the Basic Science Conference. Faculty will lead the conference, which will usually be 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. (See Section 3 – Evaluation Policy).

Basic Science Conferences are held on a weekly basis. In addition, many other basic science conferences take place within our institutions, 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.

These basic science conferences are held from 1 pm to 2 pm once a week under the supervision of the faculty. One fellow is assigned each week to identify (in consultation with supervising faculty) a relevant article from the basic science literature, prepare a review and critique of the article and present it to the group. All trainees are expected to attend this conference and participate in critical evaluation of the article presented. In addition, fellows rotating at UMMC are expected to attend the Department of Medicine weekly research conference which provides exposure to research in related disciplines.

**Clinical 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. For the monthly division wide clinical journal club, a faculty member will be assigned with the trainee to select and present one or more clinical papers at the conference.
**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:** The 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. (See Section 3 – Evaluation Policy).

The division wide clinical journal club is held once a month on the fourth Thursday from 3 – 4 p.m. at the VAMC. Other training sites have journal club at biweekly or monthly intervals. All trainees and faculty are expected to participate in the monthly divisional clinical journal club.

**Endocrine City Wide Research Conference**

**Educational Purpose:** To educate trainees in 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 and visiting clinicians and researchers. 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.

The endocrine division city wide research conference is held weekly from 4 to 5 PM on Thursdays, October through June.

**Clinical Training**

The University of Minnesota fellowship program provides a rich array of opportunities for clinical training in endocrinology.

The three primary teaching sites are University of Minnesota Medical Center (UMMC), the Minneapolis Veterans Administration Hospital (VAMC) and Hennepin County Medical Center (HCMC). In addition to these sites, one fellow typically maintains a continuity clinic at the Health Partners (HP) Specialty Center Endocrinology Clinic in St. Paul.

The University of Minnesota Medical Center has modern facilities and services, including inpatient, ambulatory care and laboratory resources readily available to all trainees. In addition, complete biochemistry laboratories and hormone assays are available 24 hours per day. The hospital has facilities for karyotyping. The Department of Radiology provides MRI, CT, ultrasound, DEXA 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. There is a fully staffed surgical pathology laboratory for the interpretation of surgical and cytologic specimens, including thyroid aspirations and 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.

The UMMC site also has an ADA certified diabetes education and management program that is staffed by CDE nurse educator and CDE dietician. Other professionals participate in this program including psychologists, psychiatrists, orthopedic surgeons, neurologists, and podiatrists. The trainee works closely with these educators throughout the training program. This activity provides the trainee exposure to the multidisciplinary approach to the management of patients with diabetes.

Similar resources are available at the other training sites for clinical care and fellow training.

Trainees are directly supervised and 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 of highest importance in our training program. Our faculty serve 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.

**Outpatient Clinical Training**

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.

During the first year of fellowship, the ambulatory care experience includes 4 months at each of the three teaching sites, UMMC, HCMC and VAMC (done in 2 month blocks). During this time fellows attend daily outpatient endocrinology clinics according to each site’s schedule. First year fellows also have a weekly half day continuity clinic which they will maintain throughout their fellowship. Continuity clinics are held at each of the three training sites and at the Health Partners (HP) Specialty Center Endocrinology Clinic in St Paul. Typically the fellow will have two new patients and three to five follow-up patients during continuity clinic to evaluate and discuss with the staff. Faculty at the continuity clinic sites precept the continuity clinic on a rotating basis so that fellows have exposure to a number of different faculty during the continuity clinic experience. As the fellow demonstrates his or her competence in endocrine consultation, the supervising faculty member will allow the fellow to take increasing responsibility for the management of the patient. The continuity clinic allows the trainee to experience continuity of care by following the new patients for the duration of their treatment.

In the second year of training (and third year if applicable), the ambulatory care experience is primarily the ongoing continuity clinic. Depending on the training site, senior fellows may also spend an additional half day a week seeing patients in their sites outpatient clinic.

All fellow/patient interactions are under the supervision and ultimate responsibility of designated faculty members. For beginning trainees, faculty will assume a more hands on approach and typically repeat significant and key portions of the history and exam. Beginning fellows will typically discuss the assessment and plan/recommendations with faculty prior to communicating recommendations with referring physicians or hospital staff. As the trainee develops knowledge and proficiency in the evaluation and management of endocrine patients, trainees will be given more independence and allowed to take more initiative in patient evaluation and management.

Trainees may make preliminary management recommendations to referring physicians contingent upon final review and approval by responsible faculty. While trainees take ownership of their continuity clinic patients, ultimately these patients are the responsibility of faculty. Should situations arise requiring faculty involvement outside of the continuity clinic, the faculty member most recently staffing the patient will be the responsible faculty physician.

**Disease Mix and Patient Characteristics**

Patients are 18 years of age or older. The distribution of ages and sex in our clinics approximates their distribution among the general population with endocrine disease. Trainees care for patients with a wide range of clinical problems in stages of illness appropriate to the ambulatory setting.

In addition to clinics in which the trainee encounters the broad range of endocrine pathology, rotations through disease-specific clinics (e.g., weight management clinic, pituitary clinic, renal stone/osteoporosis clinic) are an integral part of the training program. Fellows also have the opportunity to attend pediatric endocrinology clinic during their second year of training.
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. Trainees initially receive instruction in ultrasound imaging of the thyroid and fine needle aspirate of thyroid nodules using a thyroid model. The fellow will then progress to performing this procedure under the direct supervision of faculty. Initially trainees may observe and assist with the procedure. They will progress to performance of the procedure with assistance of faculty until they are sufficiently competent to carry out the procedure without assistance but under the supervision of faculty. 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.

Methods of evaluation
Trainees will be evaluated monthly during their first year clinical rotations. Assessment methods will include direct observation and global assessment by faculty through the RMS system, multisource assessment by medical students, residents and clinic staff. All trainees will be evaluated every three months with regard to their continuity clinic performance. Assessment methods will include direct observation and global assessment by faculty through the RMS system, multisource assessment by clinic staff and patient surveys. (See Section 3 – Evaluation Policy).

In-patient Clinical Training
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.

Our fellowship program provides consultative services to all hospitalized patients at the request of the attending physician, including patients which may be designated as “non-teaching” with respect to other services.

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.

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, and orthopedic surgery. Patients will have a variety of diseases that impact 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.

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. 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. Inpatients who have surgery or biopsy, pathology and cytology are reviewed with appropriate specialists in those departments.

**Methods of evaluation**
Trainees will be evaluated monthly during their first year clinical rotations. Assessment methods will include direct observation and global assessment by faculty through the R M S system and multisource assessment by medical students and residents. (See Section 3 – Evaluation Policy).

During the second fellowship year (and third, if applicable), fellow training in the in-patient setting continues as fellows participate in evening and weekend call rotation which provides additional in-patient clinical experience. This experience consists of coverage of the consultative service at times when the first year fellow is not available for this coverage or for weekend coverage as part of the normal call rotation. This experience averages two to four call days per month.

**Research Training**
Research is a key component of the endocrine fellowship experience. The Division offers exciting research opportunities in basic, translational and clinical research. Facilities for research at the University of Minnesota include the NIH funded Clinical and Translational Sciences Institute which provides facilities and other support for clinical and translational research, the Stem Cell Institute, the Center for Magnetic Resonance Research and the Masonic Cancer Center. Basic science research opportunities are also available through the laboratories of faculty in the basic science departments of the Medical School. Endocrine faculty at the VAMC and HCMC are also actively involved in clinical, translational and basic research.

**Endocrinology Fellowship Core Curriculum**

**Disorders of the Adrenal Cortex and Medulla Introduction**
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.

An appropriate knowledge base for this area includes an understanding of the hormonal and neurological 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 of these diseases affecting the adrenal gland are common, such as the incidental adrenal mass, and will be routinely encountered in most clinical training settings. In contrast, conditions such as a pheochromocytoma are rarer. As noted, however, the latter condition represents an extremely critical medical diagnosis. Thus, appropriate training in adrenal disease will likely reflect a combination of both hands-on clinical encounters and an array of additional learning experiences including both formal teaching and self-directed methods.

Discussion

The training program must provide opportunities for the endocrine trainee to develop competence in the clinical evaluation and management of patients with adrenal cortical and adrenal medullary disorders. This clinical experience must include opportunities to diagnose and manage adult outpatients and inpatients of both sexes. The trainee must be given opportunities throughout the training period to assume responsibility for and follow patients to observe the evolution and natural history of these disorders, as well as the efficacy of therapy.

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 [1-5] and other resources.
Evaluation and Management of Adrenal Disorders

Competency in the evaluation and management of the adrenal disorders required by the Residency Review Committee are listed in the Form at the end of this section (Disorders of the Adrenal). 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

The primary methods of education for these disorders should be direct clinical experiences and clinical case discussions. These case discussions would usually take place on hospital rounds or in the outpatient endocrine clinic setting. It would be optimal for the training program to provide and document a breadth of adrenal topics in clinical case conferences. The knowledge base of all of the adrenal disorders listed in the Form (Disorders of the Adrenal) should be enhanced with reading appropriate sections of an endocrine textbook [1-5], suggested supplemental articles, and Medline searches.

Rare Causes of Adrenal Disorders

The trainee should also be familiar with rare causes of the adrenal disorders listed in the Form. For example, for the category of "Mineralocorticoid Excess," in addition to primary aldosteronism, the trainee should be familiar with the spectrum of causes from renin-independent (e.g., renovascular disease, coarctation of the aorta) to renin-independent (e.g., 11-ß-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.

Adrenal Hyperplasia; 21-hydroxylase deficiency

The trainee 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.

Hypertension

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

Glucocorticoid Therapy

Although not required by the RRC, a thorough understanding of glucocorticoid therapy must
be achieved (see Form). 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 glucocorticoid therapy.

Adrenal Studies and Procedures

The endocrine trainee must understand the indications for and the interpretation of all of the tests and procedures listed in the Tables below. In addition, the trainee should be able to personally conduct cosyntropin stimulation tests and dexamethasone suppression tests. The trainee 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
123I-metaiodobenzylguanidine (MIBG) scintigraphy
Indium In-111-labeled pentetreotide (OctreoScan®) scintigraphy
[6β131I]iodomethyl-19-norcholesterol (NP-59) scintigraphy

Evaluation

Evaluation of competency should include discussions with faculty on a continuing basis and clinical presentations. Written evaluations such as ASAP and ESAP should be encouraged, but not required.

Suggested Reading

One of the following general endocrine textbooks


Chapter 12 – The Adrenal Cortex, WL Miller, JB Tyrrell
Chapter 13 – Diseases of the Sympathochromaffin System, PE Cryer
Chapter 14 – The Endocrinology of Hypertension, JD Baxter, D Perloff, W Hsueh, EG Biglieri
Chapter 15 – Glucocorticoid Therapy, JB Tyrrell


Chapter 12 – The Adrenal Cortex, DN Orth, WJ Kovacs
Chapter 13 – Catecholamines and the Adrenal Medulla, JB Young, L Landsberg
Chapter 14 – Endocrine Hypertension, R.B. Dluhy, GH Williams


Journal Articles

Cushing's Syndrome


Adrenal Insufficiency


Pheochromocytoma and Mineralocorticoid Excess
Dluhy RG, Lifton RP: Glucocorticoid-remediable aldosteronism. J Clin Endocrinol Metab. 1999; 84:4341-4


Nonfunctioning Adrenal Mass


Hirsutism, Virilization, and Congenital Adrenal Hyperplasia


Fluid and Electrolytes


Hypertension


Adrenal Studies and Procedures


Self Assessment Tests

American Association of Clinical Endocrinologists (AACE) Self-Assessment Program (ASAP) for Endocrinology, Diabetes and Metabolism.
<table>
<thead>
<tr>
<th>Adrenal Disorders</th>
<th>Method of Education</th>
<th>Method of Evaluation</th>
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<tbody>
<tr>
<td></td>
<td>Formal Instruction</td>
<td>Direct Clinical Experiences</td>
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<td></td>
<td>In-patient</td>
<td>Out-patient</td>
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<tr>
<td><strong>1. Cushings syndrome</strong></td>
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<td>a) Adrenal</td>
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<td>b) Pituitary</td>
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<td>c) Ectopic</td>
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<td>d) Latrogenic</td>
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<td><strong>2. Adrenal Insufficiency</strong></td>
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<tr>
<td>a) Primary (including polyglandular)</td>
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<td>×</td>
</tr>
<tr>
<td>b) Secondary</td>
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<td>×</td>
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<tr>
<td>c) Adrenal crisis</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>d) Glucocorticoid therapy</td>
<td>×</td>
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<td><strong>3. Pheochromocytoma</strong></td>
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<td><strong>4. Mineralocorticoid Excess</strong></td>
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<tr>
<td>a) Aldosteronism</td>
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<td><strong>5. Nonfunctioning Adrenal Mass (Including Incidental)</strong></td>
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<td>a) Benign</td>
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<td>b) malignant</td>
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<tr>
<td><strong>6. Hirsutism and Virilization</strong></td>
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<td><strong>7. Congenital adrenal hyperplasia</strong></td>
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<td><strong>8. Fluid and electrolytes</strong></td>
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<td>a) Hypernatremia and hyponatremia</td>
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<td>b) Hypokalemia and Hyperkalemia</td>
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<tr>
<td>c) Metabolic acidosis and alkalosis</td>
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<td><strong>9. Hypertension</strong></td>
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<td>a) Primary (Essential)</td>
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<td>b) Secondary (Endocrine)</td>
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Bone and Mineral Disorders Introduction

A clear understanding of disorders of bone and mineral metabolism is a critical component of the fellowship in Endocrinology, Diabetes, and Metabolism. Osteoporosis is the major public health problem in this area. It is responsible for at least 1.3 million fractures and costs $13.8 billion in direct health care costs in the United States each year. The lifetime risk of a fracture of the vertebral, wrist, or hip due to osteoporosis is nearly 40% for white women and increases to about 50% when other age-related fractures are included. Although osteoporosis is more common in women, men also incur substantial bone loss with aging, and elderly men have age-specific hip fracture rates and a prevalence of vertebral fractures that are at least half those in women. Given the widespread prevalence of osteoporosis, the endocrinology trainee 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, a number of other disorders of bone and mineral metabolism are commonly referred to the practicing endocrinologist for evaluation and management. There include primary hyperparathyroidism, hypercalcemia of malignancy, Paget’s disease 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 hypoparathyroidism, other forms of hyper- and hypocalcemia, as well as disorders of other minerals (i.e., magnesium and phosphorus), osteomalacia in its various forms, and developmental bone disorders.

The overall competencies that an endocrinology trainee 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 trainee 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 must include opportunities to diagnose and manage patients of both sexes in both the inpatient and outpatient setting. The trainee 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 must have at least 30% of the experience in this area in ambulatory care settings.

The overall training program must facilitate 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 trainee evaluation and management of patients with as wide a spectrum as possible of bone and calcium disorders.

Evaluation: Clear mechanisms must be in place for the evaluation of the trainees and the provision of positive and negative feedback. Evaluation can be in the form of faculty
critiques of the trainee’s performance, ABIM examinations, or In-Training examinations. Two self-assessment examinations are also available (ESAP and AACE). Feedback should be provided both orally at the end of a specific rotation as well as using written evaluation sheets. In addition, trainees should have an opportunity and a mechanism for providing feedback to the faculty regarding the quality of teaching and mentoring they receive. In the attached Discussion of specific learning areas, the panel recognizes certain essential areas, which each training program must cover. In addition, there are a number of areas which, while desirable and should be covered by the program, are not mandatory, particularly if the relevant patient population is not available or appropriate faculty expertise is not present.

Discussion

The attached template summarizes the key learning areas for the clinical training program. These are discussed below.

Biology of Bone

The necessary basic background in this area must include an understanding of the fundamentals of bone biology. Specifically, the trainee must know the macroscopic and microscopic structure of bone, as well as the fundamentals of bone remodeling and growth (i.e., the processes of intramembranous and endochondral ossification). S/he must also have knowledge of the cells in bone, specifically osteoblasts, osteocytes, and osteoclasts, as well as the composition and mineralization of the bone matrix. Finally, s/he must be familiar with the various systemic and local factors regulating bone development and remodeling.

Physiology of Calcium, Magnesium, and Phosphorus Homeostasis

A basic understanding of mineral homeostasis must include knowledge of the factors regulating intestinal absorption, renal handling, and flux in and out of bone of these compounds. Included in this is the role of systemic hormones (1,25(OH)2D, PTH, growth hormone, estrogen, glucocorticoids, and others) as well as dietary factors (intake of these minerals, other factors such as sodium intake). The trainee must also have an understanding of alterations in calcium and phosphorus homeostasis during physiological states such as puberty, pregnancy, lactation, and aging.

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

The trainee must have an understanding of the synthesis and secretion of PTH, its peripheral metabolism, and mechanism of action. S/he must have knowledge of the role of the calcium-sensing receptor in normal physiology. The trainee must understand the role of PTH-rP in malignancy. S/he must understand the synthesis, metabolism, and action of vitamin D and its key metabolite, 1,25(OH)2D. S/he should be aware of the potential normal skeletal and non-skeletal actions of PTH-rP and 1,25(OH)2D. Finally, s/he must have an understanding of the synthesis and secretion of calcitonin, as well as its action on bone resorption.
Clinical Evaluation of Bone and Mineral Disorders

The trainee must learn to obtain a comprehensive but relevant history and perform the appropriate physical examination. This must include a detailed musculoskeletal examination, as well as other parts of a comprehensive examination (e.g., gonadal exam) when appropriate.

Laboratory Methods

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

The trainee must have knowledge of abnormalities in protein binding that might affect serum calcium measurements, as well as possible artifacts/physiological alterations in the serum phosphorus and magnesium determinations. S/he must understand issues regarding the collection and interpretation of ionized calcium and urinary calcium measurements. S/he must have a full understanding of PTH assays, including the effects on the assay of changes in renal function, and the correct interpretation of the assay in light of the ambient serum calcium concentration. Similarly, s/he must have knowledge of calcitonin assays, as well as the role of stimulated calcitonin testing in the diagnosis of C-cell hyperplasia and medullary thyroid carcinoma. More recently, assays for PTH-rP have become available, and the trainee must have an understanding of when a PTH-rP level may be useful in the evaluation of the patient. S/he must have a knowledge of assays for 25-OHD and 1,25(OH)2D, and understand the situations warranting either the 25-OHD measurement (i.e., in the evaluation of vitamin D deficiency or intoxication) or the 1,25(OH)2D measurement (as, for example, in the evaluation of possible granulomatous hypercalcemia). The trainee must also understand gonadal steroid and other hormonal measurements as they apply to the evaluation of bone and calcium disorders.

The recent availability of biochemical markers of bone turnover has added another tool for the evaluation of osteoporosis and other metabolic bone diseases. The trainee must have a working knowledge of markers of bone formation and resorption, and their indicated uses. Finally, the trainee must have knowledge of molecular diagnostics, particularly as they apply to disorders of bone and calcium metabolism. This includes understanding the different techniques of molecular diagnostics (i.e., mutation identification using single-strand conformational polymorphism, direct DNA sequencing, restriction endonuclease analysis, etc.). While general applicability of these techniques at this point is principally for the MEN syndromes, clearly they will be increasingly used in the future in the laboratory evaluation of bone and mineral disorders.

Imaging Techniques/Other Procedures

The training program should have a close working relationship with a skeletal radiologist
who can provide expert interpretation of bone radiographs of adults and children. The trainee must develop the fundamental skills to recognize the radiographic appearance of at least common metabolic bone diseases (i.e., osteoporosis, hyperparathyroidism, osteomalacia, Pagets, etc.). Similarly, s/he must have an understanding of bone scintigraphy and its appropriate use.

Understanding bone mass measurements is a critical component in the evaluation of osteoporosis. The trainee must have knowledge of the technical aspects of DEXA measurements, and understand issues of quality control, precision, and interpreting 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 trainee should, if possible, acquire the skills to perform and 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 trainee must learn the fundamentals of parathyroid imaging (scan and ultrasound), including the appropriate use of these tests in the cost-effective evaluation of the hyperparathyroid patient. S/he must also learn the appropriate use of CT and MR imaging in the evaluation of patients with persistent or recurrent hyperparathyroidism.

**Postmenopausal and Age-Related Osteoporosis**

As noted in the introduction, osteoporosis is the major public health disorder in this area, and likely the most common referral diagnosis. As such, the trainee must have a thorough understanding of the epidemiology and current concepts of the pathogenesis of postmenopausal and age-related osteoporosis. The trainee must also be familiar with the impact of physical activity and nutritional factors (in particular, calcium and vitamin D nutrition) on bone mass and of factors such as medications, impaired vision, and propensity to fall on fracture risk. S/he must be able to advise the patient on appropriate prevention measures, and learn to manage the woman going through the menopausal transition. S/he must be well versed in the diagnostic evaluation of osteoporosis, including the correct interpretation of BMD data within the context of the clinical setting of the particular patient. S/he must be able to exclude secondary causes of osteoporosis, including multiple myeloma, underlying malignancy, primary hyperparathyroidism, osteomalacia, and osteogenesis imperfecta. S/he must be comfortable with the use of both non-pharmacologic (i.e., lifestyle changes, calcium supplementation, and, working with a physiatrist, prescription of appropriate physiotherapy) and pharmacologic measures (HRT, SERMs, bisphosphonates, calcitonin, and PTH, when available) for the treatment of osteoporosis. S/he must be able to evaluate the patient who has sustained an osteoporotic fracture and institute measures to reduce the risk of subsequent fractures. The trainee must 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 orthopedist in the evaluation of patients with delayed healing of fractures.

**Other Forms of Osteoporosis**
In addition to postmenopausal and age-related osteoporosis, the trainee must be familiar with the evaluation and management of other forms of osteoporosis. Principal among these are glucocorticoid- and increasingly, transplant-associated osteoporosis. S/he should work closely with the primary physicians in the management of these difficult patients, since particularly the post-transplant patient often has multiple endocrine abnormalities (i.e., hyperglycemia, hyperlipidemia) in addition to the metabolic bone disorder. Where appropriate, the trainee should advise on the management of all of the multiple endocrine/metabolic derangements in these patients. The trainee must also be familiar with other skeletal complications of glucocorticoid use, including avascular necrosis. In addition, the trainee must know how to evaluate and manage other forms of osteoporosis, including idiopathic (male and female) osteoporosis and various forms of secondary osteoporosis.

**Rickets and Osteomalacia**

While less common than the various forms of osteoporosis, the trainee must learn to evaluate and treat the osteomalacic disorders and to distinguish these from osteoporosis. Nutritional vitamin D deficiency is particularly a 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 non-tropical sprue, in an otherwise minimally symptomatic patient. The trainee must know the appropriate tests to order in this setting (i.e., 25-hydroxyvitamin D level, PTH, urine calcium), including possibly a bone biopsy when needed. Inherited disorders of vitamin D action or phosphate handling can be difficult to manage, and the trainee should have appropriate exposure to these. The evaluation of patients with tumor-induced osteomalacia is often extremely difficult, as the underlying tumor may be impossible to identify. As such, the trainee must also be familiar with the medical management of these patients.

**Hypocalcemic Disorders**

The trainee must 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 must also 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 must also 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 trainee must also know the various types of parathyroid resistance syndromes and the appropriate testing necessary to establish a diagnosis of pseudohypoparathyroidism. S/he should be familiar with possible resistance to other hormones as well as the non-endocrine disorders in these patients.

**Renal Osteodystrophy**

While primarily managed by the nephrologist, the endocrine trainee must have a clear understanding of renal osteodystrophy in its various forms, including secondary and tertiary
hyperparathyroidism. The role of the endocrinologist may be most important during and following parathyroid surgery in these patients, and the trainee must be familiar with the post-operative management of these patients, particularly hungry bone syndrome. Use of bone biopsy and bone histomorphometry is particularly useful in the evaluation of renal osteodystrophy and if possible, the trainee should have appropriate training in these techniques.

**Paget’s Disease**

The trainee must be familiar with current concepts of the pathogenesis, natural history, and treatment of Paget’s disease. The evaluation and management of Paget’s disease involves an understanding of the appropriate laboratory studies to identify the extent and severity of the disease (bone markers, scintigraphy, and radiographs), as well as combining this data with the patient’s symptoms, leading to a decision about appropriate therapy. The latter may include observation or pharmacologic therapy with calcitonin, oral, or intravenous bisphosphonates.

**Hypercalcemic Disorders**

The trainee must have a full understanding of the evaluation and management of hypercalcemia. S/he must be able to use the PTH assay to make a diagnosis of primary hyperparathyroidism versus non-parathyroid hypercalcemia (i.e., hypercalcemia of malignancy, that due to granulomatous disorders, or other miscellaneous causes of hypercalcemia). S/he must be comfortable differentiating primary hyperparathyroidism from FHH, as well as pursuing, where appropriate, a diagnosis of familial hyperparathyroidism or an MEN syndrome. Included in this is an understanding of genetic testing for these syndromes.

If a diagnosis of primary hyperparathyroidism is established, the trainee must know the necessary evaluation of these patients leading to a decision regarding surgical or medical management. If the patient goes for surgery, the trainee must work with the surgical team in the peri- and post-operative management of these patients, including post-operative hypocalcemia. Specifically, the trainee must be able to distinguish hungry bone syndrome from post-operative hypoparathyroidism, and manage both appropriately. If a decision is made for medical therapy or observation, the trainee must be familiar with the follow-up of these patients and the endpoints that would result in a recommendation for surgery. Finally, s/he must be familiar with evolving approaches to the management of patients with primary hyperparathyroidism, both surgical (i.e., minimal access parathyroidectomy, alcohol ablation) and medical (i.e., bisphosphonates, calcium receptor agonists).

In addition to primary hyperparathyroidism, the trainee must know the evaluation and management of parathyroid cancer. S/he must be able to effectively evaluate and manage the patient with hypercalcemia in the setting of a suppressed PTH (i.e., hypercalcemia of malignancy, that due to granulomatous disorders).

**Other Mineral Abnormalities**

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

**Nephrolithiasis**

The trainee must be able to evaluate the patient with nephrolithiasis. Based on the type of stone and the evaluation (i.e., identification of hypercalciuria, hyperoxaluria, hyperuricosuria, or low urinary citrate), the trainee must be able to identify any underlying disorders such as primary hyperparathyroidism or enteric hyperoxaluria. S/he must 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.

**Genetic, Developmental, and Dysplastic Skeletal Disorders**

The trainee 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 trainee should also 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 trainee 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.

**Skeletal Neoplasms/Infiltrative Disorders**

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

**Extraskeletal Calcification/Ossification**

These include relatively uncommon conditions such as tumoral calcinosis, dermatomyositis, and various ossification disorders. While the trainee may not necessarily have the opportunity to manage these relatively rare conditions, s/he should be familiar with these disorders and their treatment.

Suggested Reading

<table>
<thead>
<tr>
<th>Disorders of Bone and Mineral</th>
<th>Method of Education</th>
<th>Method of Evaluation</th>
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<tbody>
<tr>
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<td>Formal Instruction</td>
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<td>In-patient</td>
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6. Imaging techniques/ other procedures
- a) Bone radiology in children and adults
- b) Bone scintigraphy
- c) Bone density and measurement
- d) Bone biopsy
- e) Bone histomorphometry
- f) Parathyroid imaging

7. Postmenopausal and Age-related Osteoporosis
- a) Epidemiology
- b) Pathogenesis
- c) Role of physical activity
- d) Nutrition and osteoporosis
- e) Prevention of osteoporosis
- f) Evaluation and treatment of osteoporosis

8. Other Forms of Osteoporosis
- a) Juvenile osteoporosis
- b) Idiopathic (male and female) osteoporosis
- c) Glucocorticoid osteoporosis
- d) Transplant related osteoporosis
- e) Other forms of secondary of osteoporosis

9. Rickets and Osteomalacia
- a) Nutritional rickets and osteomalacia
- b) Bone disease secondary to Gl/liver d/o
- c) Vitamin D dependent rickets
- d) Hypophosphatemic rickets
- e) Tumor induced osteomalacia
- f) Hypophosphatasia
- g) Fanconi syndrome and RTA
- h) Drug induced osteomalacia
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</table>

**10. Hypocalcemic disorders**

a) Hypoparathyroidism

b) Parathyroid resistance

c) Misc causes of hypocalcemia

**11. Renal Osteodystrophy**

**12. Paget’s Disease**

**13. Hypercalcemic disorders**

a) Primary hyperparathyroidism

b) Familial hpt syndromes/ MEN

c) Familial hypocalciuric hypercalcemia

d) Hypercalcemia of Malignancy

e) Hypercalcemia due to granulomatous d/o

f) Other, misc causes of hypercalcemia

**14. Other mineral abnormalities**

a) Magnesium depletion and hypermagnesemia

b) Hyper- and hypophosphatemia

**15. Nephrolithiasis**

**16. Genetic, developmental, and dysplastic d/o**

**17. Skeletal neoplasms/ infiltrative d/o**

**18. Extraskeletal calcification/ ossification**
Diabetes Introduction

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. An estimated 16 million Americans, and 135 million people worldwide, have diabetes. The World Health Organization projects the latter 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. Medical care for people with diabetes costs approximately $100,000,000,000 per year in the United States. Much of this is for the care of long-term microvascular and macrovascular complications of diabetes that are now known to be in large part preventable.

Sequelae of Treatment

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 (e.g., an endocrinologist, a diabetes educator, a nutritionist). Among the specific objectives of our training program is to teach our trainees (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 events (retinopathy, nephropathy and neuropathy) and may reduce macrovascular 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.

Treatment Goals and Minimum Outcome Measures

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

<table>
<thead>
<tr>
<th>Treatment Goals</th>
<th>Goal</th>
<th>Action Required*</th>
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<tbody>
<tr>
<td>Hemoglobin A1c (%)</td>
<td>&lt;7</td>
<td>&gt;8</td>
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</tbody>
</table>
Preprandial Glucose  80-120 <80, >140
(mg/dL)
Bedtime Glucose (mg/dL)  100-140 <100, >160
LDL Cholesterol (mg/dL)  <100 >130
Triglycerides (mg/dL)  < 200 > 400
Blood Pressure (mm Hg)  < 130/85 > 135/90
Urine Microalbumin  Normal Elevated

*Actions might include additional self-management education, medical nutrition therapy, or both; increased SMBG, patient contact, or both; adjustment of meal plan, exercise, or pharmacological therapy; or co-management or referral to a diabetes specialist. In some individual patients it may be appropriate not to act, but the rationale for that decision should be made explicit. These goals need to be modified for children with diabetes.

Minimum Outcome Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Hemoglobin A1c</td>
<td>Annually*</td>
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<tr>
<td>Dilated Eye Exam</td>
<td>Annually</td>
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<td>Foot Exam</td>
<td>Annually</td>
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<td>Blood Pressure</td>
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<td>Urine Microalbumin</td>
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<td>Fasting Lipid Profile</td>
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<td>Self-Management Education</td>
<td>Annually</td>
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<tr>
<td>Medical Nutrition Therapy</td>
<td>Annually</td>
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<td>Serum TSH</td>
<td>Annually</td>
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<td>Self Blood Glucose Monitoring</td>
<td>Yes</td>
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<td>Tobacco Counseling</td>
<td>Yes</td>
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*ADA Recommendation: Quarterly until glycemic control is achieved, then semiannually or annually.

Comprehensive Patient Evaluation

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

1. glycemic control (long-term with HbA1C, 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);
6. the need for additional self-management education, medical nutrition therapy, or both; and
7. smoking status.

These basic principles are emphasized throughout the trainee’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.

**Clinical Experience**

Our training program provides opportunities for the trainee in Endocrinology, Diabetes and Metabolism to develop clinical competence and expertise in the management of diabetes. Our educational program – including the mission of the Division of Endocrinology, Diabetes and Metabolism, the educational goals and objectives and the anticipated educational outcomes of our fellowship program, its methodologies for teaching, faculty, methods of evaluation and its educational settings (inpatient consultations, outpatient clinics and conferences including the formal didactic program) – was detailed in Section I. Our facilities and resources were described in Section II. Its clinical experiences as they relate to diabetes are described in the paragraphs that follow.

The clinical experiences of our trainees 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 trainee 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 in the setting of the trainee’s supervised inpatient and outpatient care of people with diabetes in the context of our didactic diabetes teaching program. The latter includes Lectures (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 Syndromes), as well as self-directed and faulty-directed reading about diabetes, including both specific and generic reading.

In this context trainees 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. Trainees have experience representing variable acuity and the full spectrum of diabetes. To accomplish these goals, more than 30% of the training in diabetes occurs in ambulatory care settings.

**Patient Encounters, Trainee Supervision and Evaluation**

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 trainee with that trainee at the bedside/examination table and provides immediate confirmatory or corrective feedback. That faculty member then reviews the trainee’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 trainee 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 written self-assessment (e.g., ESAP, ASAP, or both).

Biochemistry and Physiology

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.

Preventive Care

Trainees have clinical experience in multidisciplinary diabetes education and treatment programs. As detailed earlier, our program emphasizes the training of fellows in the preventive aspects of diabetes care (i.e., glycemic control, lipid control, blood pressure control, aspirin, 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) [or the Medical Guidelines for the Management of Diabetes Mellitus recommended by the American Association of Clinical Endocrinologists (Endocrine Practice 6:43, 2000).] 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 trainees 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 Clinic (specify).

Accreditation Council for Graduate Medical Education Program Requirements

The ACGME Program Requirements for Residency Education in Endocrinology, Diabetes and Metabolism include a heavy emphasis on diabetes. We include these guidelines for your reference.

III.A.4.Residents must have clinical experience in a multidisciplinary diabetes and education program.
III.A.5.Residents must have formal instruction, clinical experience, or opportunities to acquire expertise in the evaluation and management of the following disorders...
c. 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  

III.B.5. (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:  
(a) The utilization and interpretation of autoimmune markers of type 1 diabetes in patient management and counseling  
(b) Prescription of exercise program  
(c) Rationale for and calculation of diabetic diets  
(d) Oral antidiabetic therapy  
(e) The use of intravenous insulin in acute decompensated diabetes mellitus  
(f) Chronic insulin administration, including use of all varieties of insulin delivery systems  
(g) Glucose monitoring devices  
(h) Funduscopic examination, recognition, and appropriate referral of patients with diabetic retinopathy  
(i) Foot care  
(j) Psychosocial effects of diabetes mellitus on patients and their families  
(k) Patient and community education  

III.C.1. The formal curriculum of the program must, at a minimum, provide 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.

Trainees in our program have formal instruction, clinical experience or opportunities to acquire expertise in each of these areas. The methods of education/educational settings and the methods of evaluation are detailed in the table.

**Technical and Other Skills**

Trainees also develop technical and other skills relevant to diabetes. The issues of the performance of endocrine clinical laboratory and radionuclide studies and basic laboratory techniques – including quality control, quality assurance and proficiency standards – are addressed specifically in the trainee’s didactic program. In addition, trainees gain experience in these areas in their clinical and research activities.

Provision is made for the trainees to acquire experience and skill in the interpretation of laboratory tests, including those based on immunoassays, radionuclide, ultrasound, radiologic and other imaging studies and the effects of a variety of non-endocrine disorders on laboratory and imaging studies, and performance and interpretation of stimulation and suppression tests. This occurs in their inpatient and outpatient activities and in their patient-based conferences including the didactic program.

Provision is also made for the trainees 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, funduscopy 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 Diabetes Clinic focuses specifically on diabetes care including the team concept and approaches to the prevention of complications.

**Formal Instruction**

The curriculum of our training program provides formal instruction in the pathogenesis and epidemiology of diabetes and genetics as it relates to diabetes. This occurs in lectures, clinical conferences and research seminars as well as in patient care settings. Indeed, discussions of issues such as the relative roles of insulin deficiency and insulin resistance in the pathogenesis of type 2 diabetes, the possible reasons for the increasing incidence of diabetes in developing as well as developed countries and the most recent insights into the molecular genetics of diabetes are recurring topics in the trainees’ clinical and research activities. Thus, there is considerable informal as well as formal instruction in these areas. Finally, trainees also receive formal instruction in developmental endocrinology – particularly growth, development and pubertal maturation – as it relates to diabetes, in endocrine physiology and pathophysiology in diabetes and systemic diseases and principles of hormone action, in biochemistry and physiology, including cell and molecular
biology and immunology, as they relate to endocrinology and metabolism in general and diabetes in particular, and signal transduction pathways and biology of hormone receptors. These are fundamental to the practice of modern endocrinology, diabetes and metabolism including clinical diabetology.

**Suggested Reading Journal Articles**


Case conferences, journal clubs and research seminars focused on diabetes and related issues
### Diabetes Mellitus

#### Method of Education

<table>
<thead>
<tr>
<th>Formal Instruction</th>
<th>Direct Clinical Experiences</th>
<th>Clinical Case Discussions</th>
<th>Self-directed learning</th>
<th>Direct observations with patient</th>
<th>Discussions with faculty</th>
<th>Clinical Presentation</th>
<th>Written Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-patient</td>
<td>Out-patient</td>
<td>Attd. Rds</td>
<td>Conference</td>
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#### 1. General
- a) Patient monitoring
- b) Treatment objectives in adults
- c) Objectives in adolescents

#### 2. Acute and chronic complications
- a) Ketoacidosis
- b) Hyperosmolar non-ketotic coma
- c) Hypoglycemia
- d) Retinopathy
- e) Nephropathy
- f) Peripheral neuropathy
- g) Autonomic neuropathy
- h) Dermatologic
- i) Coronary heart disease
- j) Peripheral vascular disease
- k) Cerebral vascular disease

#### 3. Gestational diabetes mellitus
- a) Screening
- b) Treatment

#### 4. Surgical management
- a) Pre-operative preparation
- b) Post-operative preparation

#### 5. Patient education
- a) Home glucose monitoring
- b) Psychosocial issues
- c) Genetics and counseling
- d) Nutrition
- e) Hypoglycemia
- f) Exercise
- g) Foot care

#### 6. Therapy
- a) Oral agents
- b) Subcutaneous insulin
- c) Insulin Pump
- d) Intravenous Insulin and DKA
<table>
<thead>
<tr>
<th>Diabetes Mellitus (page 2)</th>
<th>Method of Education</th>
<th>Method of Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formal Instruction</td>
<td>Direct Clinical Experiences</td>
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<td>In-patient</td>
<td>Out-patient</td>
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</tbody>
</table>

7. Other
a) Pathogenesis of diabetes mellitus
b) Genetics as it relates to diabetes

8. Disease specific studies/procedures
a) Fundoscopic examination
b) Photocoagulation therapy

9. Hypoglycemic Syndromes and Islet tumors
Gonadal Disorders Introduction

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 includes abnormalities of primary or secondary reproductive end organs such as skin, penis and accessory sex organs such as prostate, uterus, or 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.

Goals

It is our intention that the trainee 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 trainee 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.

Training

1. The training program must provide opportunities for the trainee 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 must also include attention to reproductive endocrine issues in inpatients with other endocrine and non-endocrine diagnoses. This training is likely to require interaction with pediatric endocrinology, gynecology, urology, oncology, genetics, surgery, pathology, radiology and/or other subspecialties.

2. The trainee must be given the opportunity to assume responsibility for and follow patients with reproductive endocrine disorders throughout the training period. Due to the nature of these disorders, the majority of follow-up will be in outpatient settings. Appropriate experience with the spectrum of reproductive endocrine disorders in adolescents and in male and female patients may require that trainees see patients with a number of different attendings or in several different types of clinics.

3. In addition to mentored inpatient and outpatient diagnosis and management of patients with endocrine abnormalities pertaining to the reproductive system, trainees must be given the opportunity to gain experience with case presentation and critique in informal and formal settings to develop their own skills as teachers and consultants.

4. Due to the rarity of certain conditions and the need to cover a broad spectrum of reproductive endocrine disorders in males, females and adolescents, patient encounters must be supplemented by an ordered series of sessions that may be either didactic or problem-oriented in approach.

5. Formal instruction must be provided in the types of assays used for measurement of gonadotropins, steroids and inhibins and the concepts of standards, sensitivity and specificity as they pertain to these hormone assays. Individualized instruction must also be provided in examination of the pelvis, breast, testis and prostate and in semen analysis. Formal instruction and experience in induction of spermatogenesis must be provided. Other technologies, which have an impact on diagnosis and management of disorders of the reproductive system, may be included such as pelvic ultrasound and induction of ovulation.

6. Self-assessment tools should be available to assist the trainee in acquiring knowledge in reproductive endocrine areas.

Evaluation

Trainees should be evaluated on their clinical skills in patient interactions, physical diagnosis, differential diagnosis and formulation of evaluation and treatment plans throughout the training period. Feedback must be given in an ongoing manner in the clinical setting and formal verbal and written evaluation must be provided at year-end. Procedures must be monitored in an ongoing way throughout the training period and ongoing verbal feedback provided to the trainee. Case presentations in formal and informal settings will provide an important means of evaluating students and advantage should be taken of the available self-evaluation programs.
**Suggested Reading**

**Textbooks**


**CD-ROM**


**Internet sites**


**Journal Articles**


Suggested Self-Evaluation Tools: Endocrine Self-Assessment Program
<table>
<thead>
<tr>
<th>Gonadal Disorders</th>
<th>Method of Education</th>
<th>Method of Evaluation</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Formal Instruction</td>
<td>Direct Clinical Experiences</td>
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<td>In-patient Out-patient Attd. Rds Conference</td>
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<tr>
<td><strong>1. Female</strong></td>
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<tr>
<td>a) Normal female reproductive physiology including puberty</td>
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<td>b) Primary/ secondary amenorrhea</td>
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<td>c) Dysfunctional uterine bleeding</td>
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<td>d) Hirsutism/ virilization</td>
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<td>e) Polycystic ovarian syndrome</td>
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<td>f) Infertility</td>
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<td>g) Menopause</td>
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<td><strong>2. Male</strong></td>
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<td>a) Normal male reproductive physiology including puberty</td>
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<td>b) Hypogonadism</td>
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<td>c) Gynecomastia</td>
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<td>d) Erectile dysfunction</td>
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<td>e) Infertility</td>
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<td>f) Prostatic disorders</td>
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<td><strong>3. Pediatric</strong></td>
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<tr>
<td>a) Intersex disorders</td>
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<td>b) Precocious puberty</td>
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<td>c) Delayed puberty</td>
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<td>d) Gonadal dysgenesis</td>
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<td><strong>4. Neoplasia</strong></td>
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<td>a) Testicular tumors</td>
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<td>b) Ovarian tumors</td>
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<td><strong>5. Disease Specific Studies/ Procedures</strong></td>
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<tr>
<td>a) GnRH/ GnRH analogues</td>
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<td>b) Ovarian ultrasound</td>
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<td>c) Pelvic examination</td>
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<td>d) Semen analysis</td>
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<td>e) Induction of spermatogenesis</td>
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<td>f) Male/Female hormone replacement</td>
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<td>g) Ovulation induction (suggestion)</td>
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Hypothalamic-Pituitary Disorders Introduction

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.

Goals: Trainees 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, trainees will be competent in the evaluation and management of patients with hypothalamic-pituitary disorders (see below).

Training and Evaluation: 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. Trainees will receive regular evaluations through frequent individual assessments from supervising faculty and semiannual evaluations by the Program Director.

Diagnostic Testing

The trainee will be able to understand the indications, performance and interpretation of the following tests.

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**

The trainee will understand the indications for and interpretation of the following procedures.  
Magnetic Resonance Imaging (MRI)  
Computed Tomography (CT)  
Inferior Petrosal Sinus Sampling

**Neuroophthalmology**

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

6.2.4 Other Tests (growth charts, radiologic bone age)

6.2.5 Treatment Modalities

The trainee will understand the indications, advantages and adverse effects of surgical, medical and irradiation (conventional and stereotactic) therapies for hypothalamic-pituitary disorders.

**Specific Disorders**

The trainee will receive formal instruction, and clinical experience in the evaluation and management of the following disorders.  
**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 (sarcoïdosis, 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, e.g., 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

Suggested Reading

DIAGNOSTIC TESTING


Cutler GB Jr. Corticotropin-releasing hormone (CRH): clinical studies and use. The Endocrinologist 1997; 7:10S-16S.


NEURORADIOLOGY


Hall WA, Luciano MG, Doppman JL et al. Pituitary magnetic resonance imaging in normal

NEUROOPHTHALMOLOGY


OTHER TESTS


TREATMENT MODALITIES


Brada M, Ford D, Ashley S, Bliss JM, Crowley S, Mason M, Rajan B, Traish D: Risk of second


SPECIFIC DISORDERS

Pituitary Adenomas


Prolactinomas


GH-secreting adenomas


ACTH-secreting adenomas


Invitti C et al: Diagnosis and management of Cushing’s syndrome: results of an Italian


TSH-secreting adenomas


Gonadotropin-cell adenomas


Non-secreting tumors


Space-occupying and infiltrative disorders
Space-occupying lesions


Infiltrative/Inflammatory disorders


Lam KSL, Sham MMK, Tam SCF, Ng MMT, Ma HTG. Hypopituitarism after tuberculous meningitis in childhood. Ann Intern Med 1993; 118:701-706.

Wolansky LJ, Gallagher JD, Heary RF et al. MRI of pituitary abscess: two cases and review of


Hypopituitarism Panhypopituitarism


Triulzi F, Scotti G, diNatale B, Pellini C, Lukezic M, Scognamiglio M et al: Evidence of a congenital midline brain anomaly in pituitary dwarfs: a magnetic resonance imaging study in


Selective Hormone Deficiencies

Yen SSC. Female hypogonadotropic hypogonadism. Endocrinol Metab Clin N Amer 1993;22;29-58.


Posterior Pituitary Disorders Diabetes Insipidus


Richardson DW, Robinson AG. Desmopressin. Ann Intern Med 1985; 103:228-239


Miscellaneous Hypothalamic Syndromes


Masera N, Grant DB, Stanhope R, Preece MA: Diabetes insipidus with impaired osmotic


<table>
<thead>
<tr>
<th>Disorders of the Hypothalamus and Pituitary</th>
<th>Method of Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formal Instruction</td>
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<td>In-patient</td>
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<td>c) Growth hormone</td>
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<td>f) Dexamethasone suppression</td>
<td>X</td>
</tr>
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<td></td>
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<tr>
<td>Direct observations with patient</td>
<td>X</td>
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<tr>
<td>Discussions with faculty</td>
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</tr>
<tr>
<td>Clinical Presentation</td>
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<tr>
<td>Written Examination</td>
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Lipid Metabolism Disorders Disease Area

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.

Importance of Lipids

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.

Goals

By the completion of their fellowship, trainees 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. Trainees 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 trainee 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.

Training

These skills should be acquired through a variety of means, which may vary between different programs, depending on the size and specific interest of the faculty, and whether or not the program includes a clinic dedicated to the diagnosis and treatment of lipid disorders. Suggested training to acquire these skills might include:

(1) Formal training such a didactic lectures and/or self-directed learning through reading material concerning physiology and pathophysiology
(2) 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
(3) Hands on evaluation and follow-up of outpatients with various genetic and acquired forms of dyslipidemia in either general endocrine continuity clinic or in rotations through specialized lipid disorders clinic
(4) Lectures and/or reading materials regarding the application of diet therapy and lifestyle changes
(5) Formal lectures and/or reading material on the pharmacological management of the hyperlipidemic/dyslipidemic patient

Where no formal lectures are given, a specific list of articles on these topics, common to all programs, should be provided to trainees at the beginning of their fellowship experience.

Specific Disorders of Lipid Metabolism

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 diabetic 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. An approach to the prevention and treatment of the macrovascular complications of diabetes is often inadequately emphasized in the management of the diabetic patient. 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, should be included as part of the lipid curriculum. This includes knowledge of the specific changes in lipids and lipoproteins that occur 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 trainees understand the interaction of genetic and secondary forms of hypertriglyceridemia in the etiology of marked hypertriglyceridemia. At the completion of their fellowship, trainees 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.

An uncommon condition that trainees should be competent with the diagnosis and treatment of is remnant removal disease (type III hyperlipoproteinemia), or 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 should be part of the lipid curriculum for endocrinology trainees. Trainees also should be aware of 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 trainees 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 recent identification of the molecular defect in Tangier disease has provided important insight into the understanding of reverse cholesterol transport. However, most practicing endocrinologists and even lipid specialists are unlikely to see any of these conditions in their lifetime. Therefore, a detailed working knowledge of these conditions should not be a requirement for the lipid curriculum. A less rare condition is hypobetalipoproteinemia. Trainees should be familiar with this condition, its diagnosis and implications.

Evaluation

The attending physicians with whom they work in their continuity and subspecialty clinics should evaluate trainees at least annually. Evaluations must include comments regarding clinical judgment, medical knowledge, clinical skills, humanistic qualities, professionalism, medical care and continuing scholarship (ABIM).

Suggested Reading


Current Opinion in Lipidology: Journal published six times per year with extensive reviews.


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<tr>
<th>Disorders of Lipid Metabolism</th>
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<td>b) LDL receptor defect</td>
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<td>c) Management</td>
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<tr>
<td>a) Chylomicron</td>
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<td>b) Lipoprotein lipase defect</td>
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<td>c) Apoprotein CII deficiency</td>
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<td>d) VLDL</td>
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<td><strong>3. Mixed defects</strong></td>
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<td>b) Hypothyroidism</td>
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<td>c) Medication</td>
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<td><strong>5. Other</strong></td>
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<tr>
<td>a) Tangier’s disease</td>
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<td>b) Lpa</td>
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<td>☐</td>
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<tr>
<td>c) Apoprotein physiology</td>
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Nutrition and Obesity Introduction

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).

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

Core Knowledge in Nutrition

Fuel Metabolism
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

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 practice
(7) complications of treatment (e.g., gallstones, electrolyte abnormalities, arrhythmias, vitamin deficiency)
Obesity Clinical Trials – evaluation and interpretation

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

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: bia dexa, metabolic cart
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

Specific Technical Procedures

Metabolic Cart - Energy Expenditure Dexa for Body Composition Bioelectrical Impedance Analysis
Total Parenteral Nutrition Formulation/Management

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
Suggested Reading

Texts

Biochemical and Physiological Aspects of Human Nutrition. Martha Stipanuk, editor. W.B. Saunders Company. A comprehensive textbook focusing on biochemistry and metabolism. It is appropriate for the human nutrition curriculum in an endocrine training program setting.


Physicians Desk Reference: Dietary Supplements. Aspen Guidelines For Enteral and Parenteral Nutrition

Nutrition in Medicine (NIM) Series
nutritioninmedicine.org/

Additional Reading


For an introduction to alternative medicine products that an endocrinologist will be faced with in practice:


Shultz. Rational Phytotherapy

US Food and Drug Administration website

Dr. Zeisel, SCIENCE, 1998 for understanding safety

US Office of Dietary Supplements website

Tufts website for dietary supplements
<table>
<thead>
<tr>
<th>Nutrition and Obesity</th>
<th>Method of Education</th>
<th>Method of Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Formal Instruction</td>
<td>Direct Clinical</td>
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<td>Experiences</td>
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1. Obesity
a) Pathophysiology
b) Diagnosis
c) Management

2. Starvation
a) Anorexia nervosa
b) Bulimia

3. Vitamin Deficiency
a) Water soluble
b) Fat soluble

4. Total Parenteral Nutrition
a) Management

5. Disease Specific Studies/Procedures
a) Other
Thyroid Disorders Introduction

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 trainee should be competent in their diagnoses and treatment.

Program Requirements

1. The training program must provide opportunities for the trainee 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. The trainees must be given opportunities to assume responsibility for and follow patients throughout the training period in both inpatient and outpatient settings to observe the evolution and natural history of thyroid disorders, as well as the effectiveness of therapeutic interventions. To accomplish these goals, the educational program must have at least 30 percent of the training in endocrine subspecialty related ambulatory care settings. Residents must have experience representing variable acuity and a wide spectrum of thyroid related diseases.

3. The curriculum must emphasize biochemistry and physiology, including cell and molecular biology, as they relate to thyroid disease. The appropriate utilization and interpretation of clinical laboratory, radionuclide, and radiologic studies for the diagnosis and treatment of thyroid diseases must be stressed.

4. Residents must 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.

5. 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.

6. In relation to the diseases listed below, residents should have experience in the performance of endocrine clinical laboratory and radionuclide studies and basic laboratory
techniques, including quality control, quality assurance, and proficiency standards. Provision must be made for the trainee to 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.

Specific Disease Disorders

The methods of education and methods of evaluation for the disorders of the thyroid are provided in the subsequent table and listed in 6 broad areas.

1. The trainee must have a comprehensive understanding of all causes of thyrotoxicosis. The major method of education will be by direct clinical experiences in the out-patient clinic, by clinical case discussions on attending rounds and in conferences, and by self-directed learning for Graves' Disease, thyroiditis, and toxic nodular goiters. For these disorders the trainee will be evaluated by direct observations and discussions with the faculty, as well as by clinical presentations. For other causes of thyrotoxicosis, the trainee may use self-directed learning, clinical case discussions, or obtain formal instruction to assure adequate understanding of the other causes of thyrotoxicosis.

2. The trainee must have a comprehensive understanding of all causes of hypothyroidism. Auto-immune and post-ablative hypothyroidism should be learned by direct clinical experience in the out-patient setting, as well as by clinical case discussions and self-directed learning. Teaching of the other causes of hypothyroidism may also utilize formal instruction, clinical case discussions, or self-directed learning to meet this objective.

3. The trainee must have a comprehensive understanding of thyroid cancer. Differentiated epithelial thyroid cancer should be learned by direct clinical experience in the out-patient setting and supplemented by experience in the inpatient setting. Further teaching by clinical case discussion and self-directed learning is encouraged. Medullary thyroid cancer should also be learned by direct clinical experience in either the out-patient or inpatient setting with supplementation by formal instruction, clinical case discussion, and self-directed learning. Other causes of thyroid cancer may be taught by clinical case discussions or self-directed learning.

4. The trainee must have a comprehensive understanding of the causes of nodules and goiters. The single nodule, multinodular goiter, and a diffuse goiter should be learned by direct clinical experience in the out-patient setting with supplementation by clinical case
discussions and self-directed learning. Other causes of nodules and goiters may be taught by self-directed learning in addition to direct clinical experience and clinical case discussion.

5. The trainee must be familiar with other causes of thyroid dysfunction. These include pregnancy related thyroid dysfunction, polyglandular autoimmune syndrome, and thyroid dysfunction in non-thyroidal disease. These diseases should be learned by direct clinical experience in the in-patient or out-patient setting. They may be supplemented by clinical case discussions and self-directed learning. Other causes of thyroid dysfunction may be taught by self-directed learning in addition to clinical case discussions and direct clinical experience.

6. The trainee must have sufficient experience to become competent in the following procedures. (1) The trainee must perform at least 10 fine needle aspiration biopsies of a thyroid nodule. The trainee is expected to review the cytology with a pathologist who has expertise in interpretation of thyroid cytopathology. (2) The trainee is expected to review imaging studies with individuals who have expertise in interpreting these images. Such studies include thyroid ultrasound and nuclear imaging studies.

The curriculum committee recognizes that proficiency in fine needle aspiration biopsy, which includes indications, interpretation and complication, often requires more than 10 procedures, and encourages the trainee to perform as many as practical during their training.

Additional Training

Experience in the two following areas is encouraged. (1) 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. This opportunity may occur at the trainee’s training site or through a sponsored course. (2) The opportunity to fulfill the Nuclear Regulatory Commission and state requirements for administration of radio-iodine for hyperthyroidism and thyroid cancer. This opportunity may occur at the trainee’s training site or through a sponsored course.

Evaluation

The evaluation of the trainees in all areas should include direct observations with the patient and discussions with the faculty. Additional evaluations can occur following clinical presentations by the trainee.

Suggested Reading

The curriculum committee recognizes there are many appropriate textbooks that can be used for directed self-learning. These include the textbooks on thyroid disease as well as the textbooks in general endocrinology. The curriculum committee encourages the trainee to utilize any of these sources for self-directed learning.
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<th>Disorders of the Thyroid</th>
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<td><strong>1. Hyperthyroidism</strong></td>
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<tr>
<td>a) Grave’s Disease</td>
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<td>x</td>
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<td>b) Thyroiditis</td>
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<td>x</td>
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<tr>
<td>c) Toxic nodule</td>
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<td>d) Toxic multinodular goiter</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>e) Struma Ovaril</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>f) Thyrotoxicosis factitia</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>g) Other</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>2. Hypothyroidism</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Thyroiditis</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>b) Post-ablative</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>c) Other</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>3. Thyroid Cancer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Pappillary thyroid cancer</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>b) Follicular thyroid cancer</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>c) Medullary thyroid cancer</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>d) Anaplastic thyroid cancer</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>e) Other</td>
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<td><strong>4. Nodules</strong></td>
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</tr>
<tr>
<td>a) Simple nodule</td>
<td>x</td>
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<tr>
<td>b) Multinodular goiter</td>
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<tr>
<td>c) Diffuse goiter</td>
<td>x</td>
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</tr>
<tr>
<td>d) Other</td>
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<td><strong>5. Other</strong></td>
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</tr>
<tr>
<td>a) Polyglandular autoimmune syndrome</td>
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<tr>
<td>b) Pregnancy-related thyroid disease</td>
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</tr>
<tr>
<td>c) Non-thyroidal illness</td>
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<tr>
<td><strong>6. Disease Specific Studies/ Procedures</strong></td>
<td></td>
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</tr>
<tr>
<td>a) Fine needle aspiration</td>
<td>x</td>
<td>x</td>
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<tr>
<td>b) Thyroid ultrasound</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>c) Thyroid scan-iodine</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>d) Thyroid scan-Tcm</td>
<td>x</td>
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