

Body Imaging & non-vascular intervention

Introduction

One of the broadest areas in the radiological sciences is imaging of the adult abdomen and pelvis. The diversity of clinical disciplines served by this subspecialty area is a testament to this fact. Disciplines such as gastroenterology, general surgery, urology, gynecology, oncology, nephrology, endocrinology, transplant surgery, and vascular surgery all interact extensively with radiologists who perform imaging examinations in this area.

This diversity underscores the need for highly trained body imaging specialists capable of answering the often complex clinical questions posed during the management of patients being treated within these clinical disciplines. This program aims at taking a major step toward fulfilling this goal.

General Objectives

To afford high level training and ensure subspecialty competency in all aspects of adult body imaging; thereby enabling the graduates to function as local and national references in the diagnosis and radiological evaluation of pathological processes of the adult abdomen and pelvis. The graduates should become resources for advanced subspecialty multidisciplinary medical care and education in this field.

Specific objectives

- Acquire knowledge of relevant embryological, anatomical, pathophysiological, biochemical and clinical aspects of gastrointestinal and genitourinary (GI/GU) diseases.
- Obtain in-depth understanding of the major imaging techniques relevant to GI/GU diseases.
- Grasp in-depth knowledge of the indications, contra-indications, complications and limitations of surgical, medical and radiological interventions and procedures pertaining to the GI/GU systems.
- Master clinical knowledge relevant to medical and surgical GI/GU disease so that the fellow may confidently discuss the appropriate imaging strategy for the clinical problem with the referring clinician.
- Obtain a detailed knowledge of current developments in the specialty.
- Acquire direct practical exposure with appropriate graded supervision in all forms of current GI/GU imaging procedures.
- Acquire appropriate competency and accuracy in the selection, performance, supervision and reporting of GI/GU imaging investigations and minor imaging-guided interventions.
- Understand and practice appropriate Islamic medical ethics and undertake an attitude of accepted professional conduct that shall be applied throughout the fellow's subsequent medical career.

Admission Requirements

To be admitted to the Saudi Body Imaging Subspecialty Program, a candidate must:

- 1) Possess a Saudi Specialty Certificate in Radiology or its equivalent (which is approved by the Saudi Commission) or have at least successfully completed the written component to the Saudi Specialty Certificate in Radiology.
- 2) Be licensed to practice medicine in Saudi Arabia.
- 3) Provide written permission from the sponsoring institution, allowing him/her to participate in full-time training for the entire one-year program.
- 4) Sign an undertaking to abide by the rules and regulations of the Training Program and the Saudi Commission.
- 5) Successfully pass the interview for this particular subspecialty.
- 6) Provide three letters of recommendation from consultants with whom the candidate has recently worked.
- 7) Register as a trainee at the Saudi Commission for Health Specialties.

Training Requirements

1. Training shall be full time. Trainee shall be enrolled for the entire two-year period.
2. Training shall be conducted in institutions accredited for training by the Saudi Board of Radiology and the subspecialty of Body Imaging.
3. Training shall be comprehensive and include all aspects designated in the structure and content of the program.
4. Trainees shall be actively involved in patient care with gradual progression of responsibility.
5. Trainees shall abide by the other training regulations and obligations set by the Saudi Board of Radiology and the Saudi Commission for Health Specialties.

Center Accreditation

Centers will be accredited to participate in the program based on the fulfillment of several criteria which include but are not limited to the following:

1. The imaging department has an established subspecialty body imaging section.
2. The section has a minimum of two subspecialty certified radiologists in body imaging.
3. The volume of patients is sufficient (see Appendix 1).
4. The imaging equipment is of satisfactory standard (see Appendix 2).
5. The department is already accredited for residency training in radiology.

Structure of the Training Program

This is a two-year (104 week) fellowship program that will conform to the following structure:

The fellow will start by performing **eight-week blocks in each** of the following modalities (in his/her base institution):

1. *Ultrasound*: Apart from standard imaging procedures of the adult abdomen and pelvis, this rotation shall also include imaging of small parts such as the thyroid and scrotum. Fellows will be expected to *personally scan* patients, particularly when significant or ambiguous findings are observed by the technologists. Transvaginal female pelvic sonography as well as transrectal sonography of the prostate may also be performed with an appropriate chaperone where necessary. Doppler techniques including those of the carotid, organ transplant and peripheral vasculature should also be covered. In addition, contrast-enhanced sonographic techniques should be learned.
2. *CT scanning*: Routine abdominal and pelvic examinations should be prescribed, supervised, interpreted and reported by the fellow. Emphasis will be placed on learning multidetector CT techniques for a wide variety of applications. Specialized examinations such as CT colonography, CT angiography, and CT urography should all be learned. Since many examinations also include imaging of the chest, there will be significant exposure to chest diseases that may be associated with abdominal pathological processes. Opportunity might also be available to perform CT coronary and pulmonary angiography. The fellow should become comfortable after this period manipulating the imaging data at dedicated 3D workstations for both interpretation and illustration.
3. *MR imaging*: Emphasis must be placed on learning practical physical principles as they relate to abdominopelvic and chest imaging including MR angiography. Fellows should be heavily involved in direct supervision of examinations; working with technologists to make necessary adjustments to parameters and protocols as the studies are being performed. Indications and precautions for the use of a variety of MR contrast agents should also be learned. Proper post-processing of imaging data is a central part of the rotation.

The **remaining 18 months** shall be spent as follows:

- a) *Adult fluoroscopy (four weeks)*: The fellow will consolidate his/her fluoroscopic skills; including being exposed to a variety of less traditional examinations of the GI/GU systems; such as post-operative evaluation of bypass surgery patients. The fellow should also learn recent trends in the appropriateness of various fluoroscopic studies; many of which have been superseded by other cross-sectional techniques. Conventional abdominal radiography reporting should also be included in this rotation. *Leaves will not be permitted during this period.*
- b) *Cross-sectional interventional procedures (continuous eight week block)*: This rotation should be performed during the second year, during which the fellow should learn the necessary skills to safely and effectively perform sonographically and CT guided interventional body procedures such as drainages, biopsies, and aspirations. Appropriate indications, safety measures and follow-up should be emphasized.
- c) *Additional time in each of US (8 wks), CT (20 wks), and MR (24 wks)*: This will be performed in blocks of no less than four weeks at a time and will allow the fellow to apply the skills acquired during the first six months in a more

independent fashion; functioning as a junior consultant with staff supervision available where necessary. These should be performed at various institutions, based on the fellow's clinical needs and the supervising staff's determination of required additional exposure.

- d) Elective rotation (16 wks): Allows flexibility to enhance exposure to certain facets of the program or to work in areas of particular interest to the fellow such as in PET-CT, chest imaging, or high-risk obstetrical sonography for example. At least eight weeks of this period should have some relevance to the field of body imaging.
- e) Research activities: The fellow will be given an average of one half day per week of protected academic time during his/her second year to complete a research project, supervised by a staff member.

The fellow shall perform a minimum of 16 weeks in each of CT and MRI during the first year, as well as a minimum of 12 weeks of US and 4 weeks' elective. Rotations through the enrolled institutions should be in a minimum of three month blocks with a minimum of three months performed at all participating institutions.

During the entire period, fellows will be expected to demonstrate scholarly activity; such as review of specialized texts and recent literature, teaching of residents and junior staff, as well as involvement in relevant clinical-radiological conferences. Conducting an appropriate research project is strongly encouraged.

Program Content

- A. **Modalities**: Fellows must become proficient in the physical principles, indications, setup, logistics and performance of imaging modalities related to body imaging including but not limited to CT scan, MRI, ultrasound, fluoroscopy, and conventional radiography. They must be knowledgeable in advanced protocols, techniques, artifacts, contraindications and precautions related to the performance of these examinations. They should also become proficient at post processing techniques of 3D data sets utilizing dedicated workstations.
- B. **Contrast agents**: The fellow will become familiar with the variety of contrast agents available for use in body imaging examinations including but not limited to: oral contrast agents, intravenous sonographic, iodinated, or Gadolinium-based agents, non-Gadolinium-based MR IV contrast agents, as well as agents used for fluoroscopic intra-cavitary opacification. He/she should be familiar with their preparation, indications, methods of administration, precautions, contraindications, limitations and artifacts.
- C. **Pathology**: The fellow will become familiar with the presentations, imaging findings, differential diagnosis, complications and management of disease processes related to the adult abdomen and pelvis. These processes include but are not restricted to the following:
 - a. Congenital abnormalities of the abdominal and genital organs.
 - b. Infectious diseases (acute and chronic).
 - c. Inflammatory disorders.

- d. Neoplastic diseases (benign or malignant) including detection, staging and followup.
- e. Vascular disorders including those of the chest and peripheral vasculature that are related to abdominal pathology.
- f. Metabolic, endocrine and depositional diseases of the abdominal viscera.
- g. Traumatic & iatrogenic injuries.
- h. Functional & mechanical disorders of body organ systems.
- i. Emergencies: including investigation of the acute abdomen.

Pathology encountered by the following *clinical disciplines* shall be included (though not limited to these areas):

1. General Surgery.
2. Internal Medicine.
3. Gastroenterology.
4. Urology.
5. Hepatobiliary Surgery.
6. Hepatology.
7. Obstetrics and gynecology.
8. Vascular Surgery.
9. Nephrology.
10. Oncology.
11. Endocrinology.
12. Colorectal Surgery.
13. Emergency & Critical Care Medicine.
14. Family Medicine.

- D. **Procedures:** The fellow should become proficient in the performance of various procedures related to body imaging including but not limited to fluoroscopic positioning and maneuvers, sonographic & Doppler techniques, as well as basic sonographic & CT- guided interventional procedures (drainages, biopsies, etc.).
- E. **Teaching & Didactic activities:** The fellow must demonstrate ability to instruct and guide residents by conducting unknown case tutorial sessions at least once a month, providing advice on imaging techniques & patient management, as well as conveying important teaching points during case readouts and reviews. He/she will also exhibit the capability to assimilate information & data and organize it into concise formal educational presentations. Participation in preparing and moderating relevant clinical-pathological meetings will also be required. A regional journal club meeting should be arranged every three months with active participation by the fellow.
- F. **Literature:** Fellows should become familiar with the major radiological journals and should review them critically on a regular basis. They should learn how to conduct research by making every effort to participate in at least one research project during their training. Participation at a conference or scientific meeting is strongly encouraged.
- G. **Radiation & safety:** The fellow will acquaint him/herself with all aspects related to radiation & magnetic field safety and protection, following accepted guidelines of practice to ensure the safety of patients and staff alike.
- H. **Professional attitudes** will be emphasized including adherence to medical and Islamic ethics & practices, as well as maintenance of an attitude of continuing education & learning. Constructive interaction with senior staff,

clinicians and technical staff will be exercised. Attributes such as responsibility, dedication, cooperation, teamwork and a solid work ethic will be reinforced through emphasis upon role models.

- I. **On-call duties:** The fellow will be on-call exclusively for body imaging cases, backing up the on-call residents. The fellow will not be on-call less than three times a month and no more than eight nights per month. This should include one weekend per month.

Methods of Instruction/Training

The program objectives shall be achieved through all of the following:

- Demonstration of proper indications, protocols, techniques and procedures.
- Direct supervision of fellows during performance of their duties with appropriate feedback afforded.
- Provision of opportunity for consultation with senior staff to solve clinical problems.
- Discussion of methods of investigation, diagnosis and management of various clinical problems during readout sessions.
- Conducting unknown case tutorials, both by and for the fellow.
- Review of reports dictated by the fellow prior to verification with the provision of verbal instruction when significant errors are found.
- Provision of guidance and assistance during performance of research projects.

Vacations

Fellows will be permitted four weeks of annual leave during the program in addition to *only one* of the two Eid vacations (7-10 days). Fellows will not be permitted to take leaves during the fluoroscopy rotation. A maximum of two weeks of vacation may be taken during rotation through any specific service modality. Leave requests must be submitted well in advance. One week of *appropriately justified* emergency leave and one week of *properly confirmed* study leave may be allowed during the program.

Evaluation & Certification

Fellows' clinical performance, professional attitude and assimilation of knowledge will be regularly evaluated by mentoring staff members. Periodic (every three months) written evaluations (Appendix 4) will be obtained from concerned staff and summarized by the fellowship director into a single form that will be reviewed and signed by the fellow. These evaluations will be reviewed by the fellowship training committee periodically to identify aspects that may require further emphasis or counseling. Attendance at didactic activities will also be monitored.

Provided that evaluations and attendance are satisfactory, the fellow will be required to undergo an OSCE examination at the end of the first year in order to be promoted to the second year. At the end of the second year, the fellow must pass both a written

and an oral examination. The examination committees will be formed by the subspecialty committee of the Saudi Commission.

Upon satisfactory completion of the above requirements, the Saudi Commission for Health Specialties will confer upon the trainee the official certification of the subspecialty training program.

Reading & subscription recommendations:

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APPENDIX 1

Minimum average workload requirements for recognition of the training center for subspecialty rotational training in body imaging (deficiencies may be complemented by rotations at other institutions):

Examination	Cases per week
Ultrasound	200
Doppler sonography	25
CT scan & CT angiography	75
MRI & MR angiography	25
Fluoroscopy	25
Cross-sectional interventional procedures	35

APPENDIX 2

Minimum equipment requirements for recognition of the training center for subspecialty rotational training in body imaging are:

- ***Ultrasound:*** Probe frequencies ranging between 3.5-12 MHz, color and power Doppler capabilities.
- ***CT scan:*** Multi-detector scanner (16 detector rows or more), radiation dose modulation, and power injector are indispensable. Non-ionic IV contrast media must be available.
- ***MRI:*** 1.5 T or above scanner with phased array body coil. Basic spin-echo, gradient-echo & fat suppression sequences, in addition to 3D angiographic sequences are a must. Diffusion weighted capabilities are highly recommended. A power injector and ECG & respiratory-gating facilities are mandatory.
- ***Fluoroscopy:*** Standard digital fluoroscopic capabilities as well as various barium and water soluble contrast agents are required.
- ***3D postprocessing workstation:*** capable of all basic techniques for reformations and angiographic rendering is essential.