DEPARTMENT OF RADIOLOGY
THE UNIVERSITY OF BRITISH COLUMBIA

Diagnostic Radiology Residency Program
Gordon & Leslie Diamond Health Care Centre
2775 Laurel Street, 11th Floor
Vancouver, BC Canada V5Z 1M9

2022-2023
UBC Diagnostic Radiology
Resident Handbook

Last updated: January 9th, 2023

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General Guidelines

This manual was created as a general guide intended to answer some frequent questions as well as serve as a go-to resource for many components of the program. Nothing in this guide supersedes the policies created by either the University, PGME, or the Department of Radiology. Please feel free to contact the Program Office with any questions you may have about the information provided herein.

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UBC Radiology Administrative Staff Contact and Roles

Program Director	Dr. Cameron Hague	cjhague75@gmail.com
Assistant Program Director	Dr. Tony Sedlic	tonysedlic@gmail.com
Chief Resident	Dr. Omid Ebrahimzadeh	ubcradiologychief@gmail.com
Chief Resident	Dr. Ali Silver	ubcradiologychief@gmail.com

Program Office Mailing Address:
UBC Department of Radiology
Faculty of Medicine
11th floor - 2775 Laurel Street
Vancouver, BC V5Z 1M9

Education:

Marwan Taliani, Education Program Manager focuses on the educational and operational components of the Department's Educational Programs including working with the Diagnostic Radiology Residency Program Director, Dr. Cameron Hague and the Assistant Program Director, Dr. Tony Sedlic.
Email: marwan.taliani@ubc.ca

Alissa Burrows, Senior Residency Program Assistant provides administrative support to the Diagnostic Radiology Residents, Education Manager and the Program Directors.
Email: alissa.burrows@ubc.ca

Mason Leung, Senior Residency Program Assistant provides administrative support to the Nuclear Medicine, Neuroradiology and Pediatric Radiology Residents, Education Manager and the Program Directors.
Email: mason.leung@ubc.ca

Ariel Kwan, Undergraduate and Resident Elective Program Assistant provides administrative support to undergrad and postgrad students taking electives and the Undergraduate Director, Dr. Savvas Nicolaou.
E-Mail: ariel.kwan@ubc.ca

Administration:

Wendy Westman, Administrative Manager (Faculty & Finance Manager) oversees Faculty Recruitment, Appointments, Reappointments and Promotions and manages the Department's finances and research accounts.
E-mail: wendy.westman@ubc.ca

Carmen Kopp, Administrative Coordinator supports the Department Head's academic initiatives, staff recruitment, oversees faculty committee meetings & appointments, information technology administration, and various departmental events/conferences.
E-mail: carmen.kopp@ubc.ca

Nusrat Nipa, Executive Assistant provides general support for the department and the Department Head's schedule, and is the front office contact person for the department.
E-mail: nusrat.nipa@ubc.ca

Angelo Hernandez, Administrative Assistant provides general support for the department, the administrative manager and administrative coordinator.
E-mail: angelo.hernandez@ubc.ca

Soudabeh Zarrinkafsh, Fellowship and Undergraduate Education Manager provides admin support for incoming and current fellows.
E-mail: soudabeh.zarrinkafsh@ubc.ca

Ines Jaksic, Fellowship Program Assistant provides administrative support to the Fellows, the Fellowship and Undergraduate Education Manager, and Division Directors.
Email: ines.jaksic@ubc.ca

Radiology-Specific Hospital Site Directors:

- Dr. Gordon Andrews – UBCH
- Dr. Cameron Hague – SPH
- Dr. Andrew Thompson – LGH
- Dr. Roberta Dionello – MSJ
- Dr. Nicolas Murray – VGH
- Dr. Farahna Sabiq – VGH
- Dr. Eugene Strovsky – SMH
- Dr. Linda Warren – BCW 505
- Dr. Rita Chiu – RCH

For Rotation Supervisors, please see Hospital Site Information in **Appendix A.**

Post Graduate Medical Education Office

Residents are responsible for submitting any changes in their contact information to payroll, employee benefits, the College of Physicians and Surgeons of BC, UBC Registrars and PAR-BC.

The Post Graduate Medical Education Website is rich in resources for current trainees and includes but is not limited to information pertaining to:

- Policies and Procedures – click here for PGME Wide Resident Policies and Procedures.

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- Resident Registration
- UBC Email Address
- Online Training Requirements
- The Resident Management System allows residents to update their personal information online including their address, phone number, email addresses, etc. It is each resident's responsibility to keep their contact information up to date.
- Resident Reimbursements
- Residents as Teachers
- Prescription Privileges
- Medical Education Research Requests

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Committee Members

Residency Program Committee

The Residency Program Committee (RPC) is composed of the Program Director, the Assistant Program Director, a representative from each of the major teaching hospitals, two resident representatives (junior and senior resident) and two chief residents. The Head of the Department is an ex-officio member of the RPC. The Program Director chairs the committee. The committee is responsible for developing policies for residency training and advising the Head of the Department on all matters concerned with residency training.

RPC Membership

Name	Role	E-Mail	Site/Yr
Dr. Cameron Hague	Program Director	cjhague@75@gmail.com	SPH
Dr. Tony Sedlic	Asst. Program Director	tonysedlic@gmail.com	VGH
Dr. Jonathon Leipsic	Department Head	JLeipsic@providencehealth.bc.ca	SPH
Mr. Marwan Taliani	Program Manager	Marwan.taliani@ubc.ca	N/A
Ms. Sneha Dabgar	Project Manager	Sneha.dabgar@ubc.ca	N/A
Ms. Alissa Burrows	Sr. Program Assistant	Alissa.burrows@ubc.ca	N/A
Dr. Edwin Peramaki	Site Leader	ed.peramaki@gmail.com	SPH
Dr. Lydia Bajno	Site Leader	Lydia.Bajno@cw.bc.ca	BCCH
Dr. Farahna Sabiq	Site Leader	Farahna.Sabiq@vch.ca	VGH
Dr. Charlotte Yong-Hing	Site Leader	Charlotte.YongHing@BCCANCER.BC.CA	BCCA
Dr. Tanya Martin	Site Leader	Tetyana.Martin@BCCANCER.BC.CA	BCCA
Dr. Nicolas Murray	Site Leader	nicolas.murray@VCH.CA	VGH
Dr. Pete Tonseth	Site Leader	Pete.Tonseth@BCCANCER.BC.CA	BCCA
Dr. Mark Shewfelt	Chief Resident	ubcradiologychief@gmail.com	R5
Dr. Ali Silver	Chief Resident	ubcradiologychief@gmail.com	R4
Dr. Morgan Young-Spiers	PGY1 Representative	morganys@student.ubc.ca	R1
Dr. James Nugent	Junior Representative	james.nugent@alumni.ubc.ca	R3

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Dr. Rebecca Spouge	Senior Representative	rebecca.spouge@alumni.ubc.ca	R3
Dr. Philip Edgcumbe	Wellness Representative	edgcumbe@alumni.ubc.ca	R3
Dr. Helena Bentley	CBD Resident Representative	bentley@alumni.ubc.ca	R3

The Committee meets a minimum of four times per year, at the call of the Chair.
Specific functions of the Committee include:

- To administer the residency program ensuring the quality of education, maintaining the standards and requirements as established by the Royal College and the Faculty.
- To regularly review all arrangements of the program, including physical resources, didactic lectures, clinical rotations, and CanMeds content.
- To report to the faculty on all aspects of the Residency Program.
- To act as a liaison between residents and faculty, and specifically to adjudicate appeals from residents in cases of dispute.
- To monitor the evaluation of residents and to make recommendations to the Department Head and relevant faculty regarding their promotion, remedial training or dismissal.
- To provide a forum in which residents can present and discuss their concerns related to the educational process.
- To bring to the attention of the Department head any items concerning quality care which could influence residency training.
- Provide career planning and counselling.
- Selection of resident candidates.

Competence Committee

Dr. Philipp Blanke - Competence Committee Chair
Dr. Cameron Hague – Program Director
Dr. Ren Yuan – Standing Member
Dr. Emily Pang – Standing Member
Dr. Brendan Quiney – Academic Advisor
Dr. Jen Ellis – Academic Advisor
Dr. Audrey Spielman – Academic Advisor
Dr. Mark Madden – Academic Advisor
Dr. Amie Padilla-Thornton – Academic Advisor

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Clinical Learning Opportunities

Rotations

The academic year is divided into thirteen four-week rotations. Please be aware of changeover dates, which is always a Monday. The most current rotation schedule is available under schedules on www.one45.med.ubc.ca. Notification of changes to the schedule is provided by email.

General Clinical Duties

Dictation Protocols:

When dictating reports, please remember to;

- Dictate slowly and clearly speak into the microphone at all times to ensure accuracy of reports
- Wait 1-2 seconds before recording
- Avoid extended pauses
- Ensure that there is little or no background noise
- Do not chew food while recording reports
- When finished dictating the report, indicate end of dictation
- State your name and co-signers, if applicable, at the beginning of each new dictation
- Dictate patient's name, MRN # and Accession #, title and date of exam for each report. Use the 24 hour clock when stating exam times.

NB for St. Paul's Hospital: Transcriptionists are typing without requisitions to refer to. Be succinct and avoid repetitiveness

Comparison Exams – When comparing your exam to one that was completed at a different facility, state the name of the facility and the date the exam was performed.

Check that equipment is properly functioning when dictating

Contact Information:
Powerscribe/PACS problems – PACS Pager 604 871-7904
Report & Transcription IDXRad Problems – Transcription Office 63998/63736
Other problems – Help Desk 54334

On-Call Responsibilities

Starting with Block 4, R2 residents at VGH and SPH will take buddy call with a senior resident. This call is designed to orient R2s to the on-call format with graded responsibility. Towards the end of the period, the junior resident will act as first call with senior resident back-up.

R2 residents will start taking call duty at the start of Block 6 with back-up VGH and alone at St Paul's Hospital. This will be preceded by a Pre-Call Curriculum (See under "Non-Clinical Learning" for more info).

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Call Protected Days (Residents are excused from taking call)

R1s are not excluded from clinical or call duties to attend social events hosted by the Department of Radiology – with the exception of the annual Summer BBQ in July. However, you are certainly welcome to attend any of the other events if you are on vacation / personal time.

R2-5s are only excused from call until 10 pm for the following events:

- Summer BBQ
- Holiday (Winter) Event
- R5 Graduation Dinner

If a R2 to R5 resident chooses not to participate in (i.e., attend) one of the below events, they will be assigned on-call duties by the Chief Resident:

- Ski Day (March). Covered by resident not participating in Ski Day.
- Research Day and Graduation Dinner (June). Fellows and staff will cover call from 6pm- 10pm.
- Summer BBQ (July). Fellows or staff will cover call from 6pm-10pm.
- Curling Day (October). Covered by resident not participating in Curling Day.
- Residents' Holiday Event (December). Fellow and staff will cover call from 5pm-10pm.
- Christmas and New Year's Break. Each Resident is entitled to 5 consecutive working days off including statutory holidays and weekend days. A 50/50 split of Residents with half off during Christmas and the other half over New Years. Exact dates depend on the calendar year but can be extended to January 7 of the New Year. Residents will be invited to select their preference and, if necessary, Chief Residents will assign call to ensure coverage by Residents.

Night Float

During night float, residents complete night shifts for a week at a time at VGH. Night floats are considered call shifts but residents do not attend regular daytime duties during that week.

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Non-Clinical Learning Opportunities

Each Friday, a *week at a glance* email is sent to residents, providing an overview of what educational sessions to expect for the following week. For virtual lectures (typically held using Zoom), relevant connection details are included for each session.

Click here to view the academic calendar.
Click here to access the Diagnostic Radiology community on Entrada.

Courses

AIRP

The American Institute of Radiological Pathology (AIRP) rad-path correlation courses will be held virtually with synchronous and asynchronous lectures through August 2022. In-person courses will resume in September 2022. This course is mandatory as it is a remarkable learning experience. No housing is provided, however, AIRP attendees can now get great hotel rates at various hotels in the area (http://www.airp.org/Housings). The course fee at the moment is $2,000 U.S. and is paid by the Department of Radiology.

As a pre-requisite for attendance, residents must submit one radiology case accompanied by pathologic material. An opportunity to attend this course should not be missed as the positions then become available to the more junior residents. Attendance during summer months is not permitted.

Please see the ACR AIRP website for the most up-to-date information: https://www.acr.org/Lifelong-Learning-and-CME/AIRP/Four-Week-Course#Overview

Anatomy Block

R1 residents take part in an anatomy block during the entirety of block 13. The purpose of this block is to support residents' transition into R2. Lectures are currently held virtually, some of which are recorded and made available to access anytime within the Diagnostic Radiology community in Entrada.

Pre-Call Curriculum

Prior to starting call, R2 residents attend pre-call lectures between July and December. These lectures help residents to prepare for the pre-call OSCE taking place in the fall and for call shift duties. In addition, R2 residents participate in buddy calls during November and December, where they are paired with a senior resident (R4-5), to help prepare for independent call shifts.

Pre-Call Lectures
Proto-calling and Call Procedures
Uroradiologic Emergencies

Chest/Mediastinal Assessment in Trauma
Neuroradiologic Emergencies and Imaging
Evaluation of C-Spine Trauma
PRACTICE OSCE (e.g., Spring 2020 OSCE)
Abdominal Trauma
Trauma and RIPIT
CTAs on Call
Emergency Ultrasound
Managing Emergencies for Radiologists Workshop
Hands-On Ultrasound Workshop
OFFICIAL On-Call OSCE

Physics Curriculum

The Physics Curriculum is provided by the UBC Department of Radiology physicists. This is a 1-year curriculum delivered on one half day per month and is required for all R3 residents. The curriculum consists of condensed online lectures that are accessible via Entrada and in-person practical sessions. There are also virtual office hours with the faculty physicist which provides residents the opportunity to ask questions about online content.

Resident as Teachers Series (RaT)

This series, held by the Office of Faculty Development, consists of 6 educational topics that are held throughout the academic year. These sessions are designed to support residents in becoming effective teachers. Residents are required to attend each lecture once and will gain a certificate for completing all topics. Please visit the Resident as Teachers website for the most up-to-date information on the curriculum.

Lectures:

- Introduction to teaching (30 min module completed in July/Aug by all incoming residents)
- Effective presentations (1 hr)
- Effective and efficient clinical teaching (1hr)
- Clinical reasoning/critical thinking skills (2 hr)
- Direct observation and feedback (2 hr)
- Patient education (1 hr)

Didactic Sessions

Academic Half Days (AHD)

Academic half days are every Wednesday afternoon from 1:30-4:30pm and residents are given protected time from their clinical duties. Residents are expected to attend 67% of all AHD. Attendance is recorded by the resident via One45. Most AHD sessions are held at VGH while one session per month is typically

delivered at SPH. Pediatric AHD are usually held at BCCH. Please refer to the full academic calendar for exact locations.

Sessions with Visiting Professors and community radiologists will also be held throughout the year. During weeks when visiting professors are present, their lectures will be scheduled into some of these time slots as necessary and will often include additional lectures on Tuesday afternoon or Thursday morning.

Journal Club

Purpose:

- Develop critical appraisal skills
- Increase familiarity with key radiology journals
- Exposure to current evidence
- CanMEDS Scholar role

Frequency:

- 2 times per academic year
- Meal/beverages are provided

Host:

- Rotating faculty members from pool of volunteers
- Selects two articles from current literature one month prior to date
- Facilitates 15 minute discussion following 15 minute resident presentation for each article

Presenter:

- 2 residents/articles per meeting
- Usually PGY-3 and PGY-4
- PowerPoint presentation and/or handout, depending on venue
- Brief summary of background, purpose, materials/methods, results and discussion
- Followed by main focus on critique of materials/methods, results and clinical implications

Noon Rounds

All residents are expected to attend daily rounds, held from 12:00-1:00 PM, location usually posted on Sunset or communicated by a resident. Please check the message board on Sunset every morning. The staff radiologists are aware that the residents will be at rounds during that time and are expected to cover the work in all subspecialties. From September - December, the noon rounds will be divided into Junior and Senior Rounds on Mondays. The Junior Rounds are run by a fellow and the Senior Rounds by staff. The Junior Rounds schedule is usually circulated by early September of each year.

These daily rounds consist of subspecialty or general radiology rounds. Please see the online schedules for specific information on the Noon Rounds.

Please see descriptions of the rotations at the other teaching hospitals for further discussion of noon rounds at those sites.

Radiology Grand Rounds

These are typically held weekly on Wednesdays (12-1pm) from September to the end of June during the academic year and consist of topics of interest to all residents. The Host site is at VGH Diamond Centre with the exception of one session being delivered at SPH each month. There may be exceptions to when and where these will be delivered so any change will be communicated to residents by the department. The full schedule may be viewed here.

All R2 to R5s are expected to attend majority of these academic sessions each year and are highly recommended to present at least once before the end of their residency. Attendance is recorded by the resident via One45. These lectures will be rotated through the various teaching hospitals and a schedule of the times, locations and speakers will be available on Master Schedule on the UBC Radiology Residency website. The residents are given call protection to attend these rounds.

If any resident is kept from attending rounds, is called away from rounds or feels that any of the rounds are suboptimal, he/she should make this known to the Chief Resident(s), Program Director or assistant Program Director. The Chief Resident(s) will notify the Program Director who will take the appropriate measures.

Peer Learning Rounds

Peer Learning Rounds, formally known as M&M (Morbidity & Mortality) Rounds, occur twice a month in lieu of noon rounds when it takes place. It is typically on a Tuesday.

Professional Advancement Learning Series (PALS)

The Professional Advancement Learning Series (PALS) is a monthly 1-hour interactive presentation providing professional development training to address non-medical subjects. The topics cover one or more themes of the CanMEDS framework and include subjects that provide competence in the areas of professional, communicator, collaborator, leader, health advocate and scholar. Sessions are typically on a Friday and take place in lieu of noon rounds. Sessions that are applicable to radiology residents are communicated to residents in advance via the academic calendar and *week at a glance* emails.

Visiting Professors

Vising professorships have traditionally consisted of one Grand Round, one AHD, and 1-2 supplemental lectures for the residents. Mandatory for residents to attend.

Conferences

Leave of absence with pay will be granted for attendance of various conferences. Prior approval by the Program Director or Department Head is required, preferably at least one month in advance. Eligible events are categorized by the various funding sources as follows:

1. Radiology Residency Program Education Funds will support up to $2,000 during your residency for:
    a. Conferences (transportation, accommodation and other travel expenses)

b. Review Courses (transportation, accommodation and other travel expenses)
c. Text Books

To submit an expense claim, please complete the reimbursement form, which can be found on the UBC Radiology Postgrad website.

2. Academic Divisional Funds: The division, or radiologist associated with the project will now provide support for hypothesis driven oral podium presentations.
3. AIRP: An additional $2,000 CAD per resident (in addition to the course fee) is earmarked for expenses incurred by residents attending AIRP in person.

Projects

Research Projects

Every resident is encouraged to pursue one or more research projects during their residency training. In this context, 'research' is broadly defined as any scientific inquiry including published papers, presentations, or organization of teaching resources. To facilitate this process, a series of didactic lectures will be presented on topics including study design, critical appraisal of scientific articles, statistics, and the basic principles involved in writing a manuscript at the Evidence-Based Medicine Course offered each year by the UBC Faculty of Medicine.

Resident research projects are typically initiated via collaboration between the resident and staff. To help the resident who would most likely be overwhelmed with the number of attendings and projects available, the Residency Research Director is always available for discussion and advice regarding resident research.

To encourage research activities by residents, an annual Radiology Research Day is held each year. All residents are encouraged to present at least one completed paper at these events during their residency.

A Farewell Dinner is held at the end of Radiology Research Day for all final-year radiology residents and their spouses/partners. The Trueman, Poon and Boyd Awards are presented at this dinner.

Clinical Audits

All junior residents (R2-3) are required to complete a clinical audit project. This program is led by Dr. Patrick Vos (Radiologist in charge of Quality at SPH) and Dr. Gerald Legiehn (Vice Chair of Quality, UBC Radiology). Each audit project must be supervised by a staff radiologist. Residents are encouraged to present their audit projects at the UBC Radiology Clinical Audit Evening and to submit their project to the Clinical Audit Session of the Annual Scientific Meeting of the Canadian Association of Radiologists.

Annual Events

Research and Audit Days

Research Days, a department wide event typically held in May each year, provide R2-5 residents with the opportunity to showcase research projects that they have been working on during their residency. Every resident is encouraged to pursue one or more research projects during their residency training. In this

context, 'research' is broadly defined as any scientific inquiry including published papers, presentations, or organization of teaching resources. Residents are highly encouraged to present at Research Day and are able to submit their projects to be considered, by a panel of judges, for an award. Information on awards available to apply for, along with application requirements, are kept on the website.

Audit Days are typically held in November each year and provide R3 residents the opportunity to showcase their audit projects, which are mandatory projects focused on quality assurance and improvement. A panel of judges select winners that are awarded funds to support their attendance and presentation at the Canadian Association of Radiologists annual meeting.

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Leadership Opportunities

Chief Resident and Resident Representatives

Two chief residents are appointed each year, sharing the duties for the entire year. The appointments are staggered; occurring in December and June. The chief residents will assign most schedule duties.

The chief residents are ombudspersons for all residents in the program and will be available to discuss any problems, suggestions or other matters of concern.

In addition, there are two elected resident representatives, usually from third and second years. These residents also represent their colleagues at the Residency Program Committee meetings.

- **Chief Residents**: selected by the program director. A resident lead vote is held to inform the program director of resident preference.
- **Junior and Senior Resident Representatives**: an open call is issued and a new representative is approved by the outgoing representatives and program director.
- **Wellness Representative**: an open call is issued and a new representative is approved by an outgoing representative and program director
- **CBD Resident Representative**: this is a new position and is selected by the program director.
- **RSNA Resident Representative**: an open call is issued and a new representative is selected by the program director.

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Evaluations

Resident Evaluations

All residents are evaluated each month. An in-training evaluation form (ITER) is sent to each Rotation Supervisor – using the One45 web-based system. The Rotation Supervisor is expected to discuss the evaluation with the resident face-to-face and to point out strengths and weaknesses at the end of the rotation. Mid-rotation feedback is not mandatory but weaknesses, if any, should be identified to the resident at midpoint of the rotation. Residents are encouraged to contact the Rotation Supervisor to arrange a face-to-face meeting at the end of the rotation. Evaluations should be completed by 2 weeks after the rotation ends.

If the supervisor does not get a chance to personally discuss the evaluation report with the resident, the form is still filled out, and then electronically sent to the resident for their acceptance, or not. The resident indicates acceptance at the bottom of the electronic form.

In order to remain in the program, the resident must demonstrate:

- High moral and ethical standards
- Good rapport with patients and staff
- Adequate performance in daily duties
- Adequate performance in the in-training written and oral examinations.

The Program Director will meet with all PGY-2 to PGY-5 residents in December. If resident performance is found, to that date, to be unsatisfactory, it will be discussed at the Residency Program Committee meeting and the resident will receive formal written instruction from the Program Director on how to make improvements. If the resident's performance remains inadequate, formal remediation procedures will then follow as dictated by the Postgraduate Dean.

Radiology Staff Evaluations

The Resident Evaluation of Staff Teaching should be electronically filled out by the resident after each rotation. These evaluations are entirely anonymous, and should be completed as soon as possible after the rotation. They are reviewed yearly by the Teaching Evaluation Committee, but in cases in which rotations involve only a small number of residents, the assessment of these evaluations will be postponed until three or more staff evaluations have been received, again to ensure anonymity. Both the numeric scores and comments from these evaluations are collated to produce an individualized Feedback Summary Report for each faculty member. This occurs biannually and the reports are reviewed by the Department Head and the Faculty Teaching Evaluation Committee before distribution to faculty.

ACR In-Training Examinations

The ACR in-training examination is held every January or February for first, second, and third-year residents. Yearly practice orals for all residents are usually given during March and April. Three to four

practice OSCE exams will be organized for the senior residents each year as part of the Wednesday academic half-day. The PGY-5 Mock Oral Exam Committee will hold oral exams in the disciplines of Chest, Neuro, Abdo and MSK in the Fall and in the Winter for the final-year residents.

OSCE

Practice Objective Structured Clinical Examinations (OSCEs) are held online twice a year, typically in the spring and fall. These provide an important basis for assessing resident performance throughout the year and also an opportunity to practice for the Royal College written examination.

Mock Oral Exams

Every spring, R2-4 residents are paired with two examiners to participate in mock oral exams. Similar to OSCEs, these provide an important basis for assessing resident performance throughout the year and also an opportunity to practice for the Royal College applied examination.

R5s are provided with additional practice ahead of the Royal College applied examination in the Spring. There will be two mock oral and OSCE exams in the year, one in the fall and in the spring before the Royal College examination.

Competence Committee - Resident Summary

The Competence Committee will review the resident at a minimum of twice a year. The commmittee will look at all aspects of the resident's progress in the program by reviewing EPAs, ITERs, MSFs, Exams, etc.

If the resident is not progressing as expected, the PD will call an additional meeting to discuss a remediation plan.

At the end of each competence committee review, the committee will provide the resident with a resident assessment summary form that outlines how the resident is progressing in the program. This will be shared with the resident.

Resident STR (Specialty Training Requirements) Tracking Document

The Program Office maintain a training portfolio over the course of the program. This is a brief record of the resident's training experiences which will vary for each individual over the five years.
Documentation is intended to assist in identifying educational strengths and deficits, which may then be addressed in a timely manner.

Purpose:

- To facilitate an active role in the resident's own education, including the CanMEDS competencies
- To allow identification of training deficiencies

Content:

- Required STR Blocks by the Royal College

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- Blocks completed or to be completed by the resident
- Presentations at journal club, grand rounds, research day, and audit day

Usage:

For personal use only, not evaluation
Should be updated at least annually
May be discussed with Program Director (e.g., at the “fireside chat”), or a mentor

Royal College Spring Certification Exam

There can be no assurance that late applications can be processed in time for the relevant examinations. **Meeting these deadlines is the responsibility of the individual resident.** Inquiries should be directed to the Royal College of Physicians and Surgeons of Canada.

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Policies and Procedures

Program-Specific Policies

PGME has created many policies and procedures mentioned above which can be found at their website here. Below are some program specific policies, approved by the Residency Program Committee:

- UBC Diagnostic Radiology – Resident Wellness Policy
- UBC Diagnostic Radiology – Resident Supervision Policy
- UBC Diagnostic Radiology – Resident Safety Policy
- UBC Diagnostic Radiology – Resident Safety Policy Additions

Personal or Medical Leave, and Reduced Activity Days (RAD)

Sick Days

It is your responsibility to notify your Rotation Supervisor, Hospital Site Representative (see below) and the Program Office when you are off sick.

Vacation

The annual entitlement is twenty working days, excluding weekends (four weeks). There is no carryover into the next academic year.

To apply for vacation or conference leave consult with the Chief Resident/Senior Resident (4-6 weeks in advance) who is doing the on-call schedule and the radiologist who is supervising the rotation you will be away from.

Residents are required to give 2 weeks notice regarding vacation time to the appropriate rotation supervisor. Upon being approved for your time off, please inform the Program Office for tracking purposes.

Here's a quick summary of steps to take when you are absent:

- **Illness:** email rotation supervisor & program office to let them know.
- **Vacation / Flex Day:** obtain approval from rotation supervisor and forward to program office (minimum 2 weeks notice required).
- **Conference:** consult with the Program Director, Rotation Supervisor, and the Chief Residents (4-6 weeks in advance as it may impact the call schedule).
- **Maternity / Parental Leave:** consult with Marwan on the process.

Leave of Absence

Please visit the PGME website for full policy details.

Five consecutive days in addition to the above are guaranteed over Christmas or New Year's and will be assigned by the Chief Resident(s) or the senior resident at St Paul's or Children's Hospitals. All residents will be scheduled to work at least part of the alternate five-day period.

All approved holidays and conferences are kept on file and on One45.

Self-Reporting a Leave to the Royal College:

Residents are considered "Registrants" of the CPSBC, in the same way as all licensed physicians and are obliged to report any time away from practice (training) due to Maternity Leave/Parental Leave or health reasons (medical leave).

Residents who take time away from training due to a Parental/Maternity Leave must download and complete the Temporarily Inactive – Parental Leave form and submit the form directly to the Registration department of the CPSBC. The Temporarily Inactive – Parental Leave form can be found here: https://www.cpsbc.ca/files/pdf/TI-Parental-Leave.pdf. The completed form must be emailed to registration@cpsbc.ca.

When you are ready to return to work following a parental leave, please complete and submit the following form: https://www.cpsbc.ca/files/pdf/TI-Parental-Leave-RTW.pdf

Residents who take time away from training due significant Health Reasons must download and complete the Temporarily Inactive – Health Leave form and submit the form directly to the Monitoring department of the CPSBC. The Temporarily Inactive – Health Leave form can be found here: https://www.cpsbc.ca/files/pdf/TI-Health.pdf The completed form must be faxed to 604-694-6135 or emailed to monitoring@cpsbc.ca. Registrants may also contact the health monitoring department to speak with a health monitor.

Further information on the above can be found in the Professional Standards and Guidelines document on the CPSBC website here: https://www.cpsbc.ca/files/pdf/PSG-Changing-Status-to-TI.pdf

Appeals

Appeals of decisions regarding residents, including evaluations and dismissal, are handled in accordance with the UBC Faculty of Medicine Resident Evaluation and Appeals Policy. An ITER may be appealed in writing to the Program Director, for consideration by the Residency Education Committee. A FITER may be appealed in writing to the Resident Staff Appeals Committee. A dismissal may be appealed in writing to the Associate Dean and Resident Staff Appeals Committee.

Remediation

The program follows the directive of the Associate Dean, UBC Postgraduate Medical Education with respect to deficiencies noted in residents' evaluations. Firstly, unless extremely serious, the area of deficiency must be established through clear documentation on multiple ITERs to ensure against an isolated observation. The Program Director then discusses the deficiency with the resident and the RPC (with resident representatives present, if desired by the resident). Should the area of deficiency continue on subsequent ITERs, the resident may then be required to participate in a remediation program reviewed by the Residency Program Committee and overseen by the Associate Dean. The plan would include clear

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definition of the deficiency, remediation objectives, appropriate learning activities, and a suitable mechanism of evaluation. The schedule of events, criteria of successful completion of remediation, and possible outcomes are also defined at the outset. The latter may include probation, but only if completion is unsuccessful.

Resident Doctors of BC Collective Agreement

A copy of the 2019-2022 Collective Agreement may be found here.

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Resources and Access

PGME Resident Wellness Office

The Resident Wellness Office (RWO) provides wellness support to all residents across all programs and locations. The RWO will be the first point of contact for wellness assessments and referrals, individual and group counselling support, and advocating for overall health and wellness of UBC medical residents. The counsellor will also serve as the liaison between external stakeholders and PGME.

Please visit the Resident Wellness Resources Guidebook (PDF) for information on the various resources and services available to support residents.

Please feel free to contact a Resident Wellness Counsellor at resident.wellness@ubc.ca to book an appointment or to learn more about the wide range of services provided by the Resident Wellness Team.

Office Location: Diamond Health Care Centre (VGH): 2775 Laurel Street, 10th Floor, Room 10203 and 10228.

Resident Virtual Library (Online Lecture Series)

Various resources, including recordings of various lectures, are available to the resident in Entrada (entrada.med.ubc.ca/) within the Diagnostic Radiology Community.

Please contact the Program Assistant for access to the community.

Resident Library

The resident library is located next to Cam's desk on the 11th floor of DHCC (11111).

- All items must be signed out by you in person with a member of the office staff.
- The loan period is for 2 weeks with one renewal (in person or by email) for an additional 2 weeks, assuming no one else has placed a hold on the book.
- The book must be returned in person by the borrower.
- Once you have already borrowed the book for 4 weeks, you cannot borrow it again for at least 2 weeks after you returned it.
- You can borrow a maximum of 3 books at any one time.
- For overdue books, $500 will be removed from your next conference/AFIP/Review course for each library item that is not returned by the day it is due back.
- For each additional 2 weeks thereafter, an additional $500 dollars will be removed from the above funding.
- After 3 infractions, all conference funding will be removed.

- If a book is lost or stolen while in your possession, you will be expected to replace the textbook at your expense in a timely manner.
- These textbooks were purchased for radiology and nuclear medicine residents only; therefore please do not lend the textbooks in your possession to others.
- PGY-5's have priority for Case Series Books. They may request the book to be returned within a "reasonable time" from a non-final year resident.
- Exchanging books directly with the resident who wants to borrow it next is not permitted.
- You can request a hold on any item in person or by email.
- Renewal is not possible for books with hold requests placed on them.

Resident Lounge

The Resident Lounge is located in DHCC 2247 (access code is 90210). The lounge is strictly intended for use by Radiology residents use and no other residents, medical students, hospital staff, are to be given access to this room. Please advise the program office if there is a problem with the computers or network printer.

There are bins in the Resident Lounge for garbage and recycling for paper and bottles/cans. Please use them appropriately. There is also a mailbox for each resident; please empty your mailbox regularly by removing your mail or placing any unwanted mail in the paper recycling bin.

Keys/Card Access

The program office ensures that each incoming PGY2 resident has a Health Authority issued card and appropriate access to the various sites. If you encounter any issues or require any additional access please get in touch with the program office.

Dosimeters

Dosimeters are given to Radiology residents and swapped out on a quarterly basis. Please pick up and swap your dosimeter by going to JPPS Room G940. In the event of a lost dosimeter, the resident is expected to pay a replacement fee.

After Hours On-Call and Call-Back Parking

VGH
Please use the orange coloured hanger that is left in one of the residents' lockers. Please clarify with one of the Chiefs at the start of the year on the designated locker.

SPH

1. Please photocopy and complete the form on Appendix H. Alternatively, you may download the form on the UBC Radiology Postgrad website.

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2. Remember to include original copies of your parking receipts, as well as the call schedule. Receipts must match the call schedule so ensure you are attaching the most recent version of the call schedule.
3. Please submit your form and receipts to the UBC Radiology program office where we will make a copy of your submission and mail it for processing.

UBCH

1. Please photocopy and complete the form on Appendix I. Alternatively, you may download the form on the UBC Radiology Postgrad website.
2. Remember to include original copies of your parking receipts, as well as the call schedule. Receipts must match call schedule so make sure you are attaching the most recent version of the call schedule.
3. Please submit your form and receipts to the UBC Radiology program office where we will make a copy of your submission and mail it for approval by the UBCH lead technician and processing by VCH payroll.

BCCH

1. Please photocopy and complete the form on Appendix I. Alternatively, you may download the form on the UBC Radiology Postgrad website.
2. Remember to include original copies of your parking receipts, as well as the call schedule. Receipts must match call schedule so make sure you are attaching the most recent version of the call schedule.
3. Please submit your form and receipts to the UBC Radiology program office where we will make a copy of your submission and mail it for approval by the BCCH medical imaging operations manager and processing by VCH payroll.

Mileage

Mileage for call-backs can be claimed by filling out the “Offsite Callback” tab of the BCIRPA-HEABC Resident Expense Reimbursement Form. Rate reimbursed is $0.50 per kilometer, so a trip to UBCH from the VGH vicinity would be reimbursable for around $5 each way.

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Appendix A: Hospital Site Information

Site Information: BC Cancer Agency

600 West 10th Ave., Vancouver, BC, V5Z 4E6

Breast Imaging Rotation	Dr. Tanya Martin (tetyana.martin@bccancer.bc.ca)
Oncologic Imaging Rotation	Dr. Ren Yuan (ren.yuan@bccancer.bc.ca) Dr. Patrick Martineau (patrick.martineau@bccancer.bc.ca)

Useful CAIS Resource Codes

- CT list: VACT
- MRI list: VAMRI
- US lists (including US-guided procedures): VAUS and VAUS2
- PET/CT lists: VAPET1 and VAPET2

Useful Phone Numbers

- Service Desk (IT): 604-675-4299
- Chris Lam: 604-877-6000 x 672141
- Fellow/Resident room: 604-877-6000 x672760
- DI Secretary (Sandy Teng):604-877-6000 x672261
- Dictation system x676202

Computer Access

Our in-house IT/PACS support person is Chris Lam (ext 672141). Chris can help you with these steps on your first day.

Prior your arrival, DI secretary, Sandy Teng will have sent you instructions regarding your login ids and passwords. You will have the following:

1. Login ID to PHSA domain firstname.lastname. First time login password will be assigned by IT and e-mailed to you from Sandy
   If you already have and ID for access to BC Children's & Women's, Sandy will ask for BCCA application to be added to your profile.
   If you have not used your login ID for many months or have forgotten it, please call Service desk to have it reset : 604-675-4299, 2
   You cannot use your VCHA or other HA login ID.remote web access is allowed if needed

2. PHSA Care Connect access – This is linked to your PHSA login ID and will auto login and authenticate from e-Health viewer icon or within the CAIS imaging application. Please note that each Health Authority is a different login. Sandy will have applied for your access and Chris Lam will show you how to access the imaging.
3. Login ID for Philips IntelliSpace PACS will be assigned on your first day. Chris Lam will help you create filters and display layouts.
4. In case you are not able to login on your first day there is a generic DI login code to PHSA domain.

   login ID : difiles1 password :hockey2 - you can use this to review patient chart until your id is sorted out

Clinical and Imaging Systems Access

1) CAIS (Schedule Inquiry 4). Required for DI and FI departments (for FI also require Action List within Schedule Inquiry 4)
    a) Each workstation at BCCA stores a user profile, so each first time login on a workstation requires a setup of CAIS icons and printer assignment. Chris lam will demonstrate for you.
    b) Instructions: Windows Start, Programs, BCCA applications , CAIS icons. A purple screen will display, enter 1 (VCC site). A batch file will down load the CAIS icons (do not be alarmed at the error messages)
2) Dictation system
    a) For dictation access in DI you will use a generic Resident code for dictation (600207) The FI department will assign you an individual ID. Please note there is a change in dictation systems to modal and requires is an MSP number - FI will sort out a code for you.
    b) Dictation process in DI:
    c) Resident dictates.
    d) Transcription routes reports to Resident action list in CAIS.
    e) Resident will edit reports in CAIS and only select " next". Residents must NEVER select "sign" or "sign + next" or "verify + next".
    f) Resident must write down the BCCA ID numbers for reports they have edited and give the numbers to the transcriptionists. Transcriptionists will then route to appropriate Radiologist for sign-off in CAIS.
    g) Dictation process for FI:
3) Resident dictates
4) Report verified on action list
5) Report routed to FI physician for sign-off
6) Philips intelliSpace Radiology (DI/FI)
7) iSite radiology access assigned by Chris Lam - See her if you have issues with image display and management
8) GE Advantage Workstation (FI)
9) Access from FI
10) Segami (FI)
    a) Access from FI

11) Printer assignment
    Each printer in the department will have a label with print \\servername\Printer to assign printer.
    Select windows start, settings, printers and faxes.
    Add printer and follow onscreen instructions for a networked printer.

Work Stations

In DI there are two reporting stations in the Resident/fellow reporting room in the clerical area. Staff Radiologist office stations depending on availability.

Lockers

Pending availability, lockers may be provided. Inquire with Karen Locken, clerical supervisor.

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Site Information: BC Children's Hospital

4500 Oak St, Vancouver, BC V6H 3N1

Pediatric Radiology Rotation	Dr. Lydia Bajno (lydia.bajno@cw.bc.ca)

The Pediatric Radiologists are listed below. Each has training in general pediatric radiology, with subspecialty interests as follows:

1. Bajno, Lydia - Body Imaging
2. Bray, Heather - Body Imaging
3. Cairns, Robyn - Musculoskeletal Imaging
4. Culham, Gordon - Cardiothoracic Imaging
5. Hegde, Ashwin - Body Imaging
6. Heran, Manraj - Interventional Radiology
7. Jamieson, Douglas - Body Imaging
8. Mawson, John - Cardiothoracic imaging
9. Maroo, Sanjay - Interventional Radiology, Cardiac Imaging
10. Mignone, Cristina - Neuroimaging
11. Nadel, Helen - Nuclear Medicine/Oncology Imaging
12. Sargent, Michael - Neuroimaging
13. Yewchuk, Lila - Body Imaging

Site Information: BC Women's Hospital

4500 Oak Street, Vancouver, BC V6H 3N1

BC Women's Breast Health Program: Suite 505-750 West Broadway, Vancouver, BC, V5Z 1H4

<table>
<tr><td>Breast Imaging and Intervention Rotation</td><td>Dr. Marie-Josée Cloutier (mariejosee.cloutier@cw.bc.ca)</td></tr>
<tr><td colspan="2">The rotation supervisor is Dr. Marie-Josée Cloutier at the Breast Program at BC Women's Hospital, X-ray 505 office in the Fairmont Building, (750 West Broadway), and the Screening Mammography Program. Other instructors include Dr. Linda Warren at these locations, Dr. Nicky Lapinsky and Dr. Miriam Buckley at X-ray 505. The division of time will vary depending on availability of instructors at the different facilities.</td></tr>
<tr><td rowspan="2">Obstetrical Ultrasound Rotation</td><td>Dr. Chantal Mayer (CMayer@cw.bc.ca)</td></tr>
<tr><td>Co-Supervisor: Amanda Easton, RDMS (aeaston@cw.bc.ca)</td></tr>
</table>

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Site Information: St. Paul's Hospital

1081 Burrard, Vancouver BC V6Z 1Y6

Abdominal Rotation	Dr. Patrick Vos (pmvos@hotmail.com)
Angiography Rotation	Dr. Dave Fenton (davfent@gmail.com)
Cardiac Rotation	Dr. Cameron Hague (cameron.hague@vch.ca)
Chest Rotation	Dr. Cameron Hague (cameron.hague@vch.ca)
CT Body and Chest Rotation	Dr. Cameron Hague (cameron.hague@vch.ca)
Body Intervention Rotation	Dr. Dave Fenton (davfent@gmail.com)
MRI Rotation	Dr. Cameron Hague (cameron.hague@vch.ca)
MSK Rotation	Dr. Tim Murray (murraytim0@gmail.com)
Nuclear Medicine Rotation	Dr. George Sexsmith (sexsmith@telus.net)
Neuro Rotation	Dr. Brendan Quiney (bquiney2@gmail.com)
General TTP Rotation	Dr. Cameron Hague (cameron.hague@vch.ca)
Obstetrical Ultrasound Rotation	Dr. Ed Peramaki (ed.peramaki@gmail.com)
Ultrasound Rotation	Dr. Ed Peramaki (ed.peramaki@gmail.com)

St. Paul's Hospital is a 600 bed tertiary care hospital and the only hospital in downtown Vancouver. Major programs in the hospital include neurology, cardiovascular, gastrointestinal, chest services, renal, and infectious disease. St. Paul's Hospital is the major center in Western Canada for the treatment of HIV patients. A busy obstetric unit is also part of the care delivered by SPH, with over 2,000 deliveries annually.

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Site Information: Vancouver General Hospital

899 West 12th Ave, Vancouver BC, V5Z 1M9

Abdominal CT/MR Rotation	Dr. Gavin Sugrue (Gavin.Sugrue@vch.ca)
	Dr. Will Yee (williamcyee@hotmail.com)
Abdominal Radiology Rotation	Dr. Anastasia Hadjivassiliou (drahadjivassiliou@gmail.com)
Angiography Rotation	Dr. Anastasia Hadjivassiliou (drahadjivassiliou@gmail.com)
Chest CT Imaging Rotation	Dr. Ana-Maria Bilawich (anamaria.bilawich@vch.ca)
Chest Radiography Rotation	Dr. Ana-Maria Bilawich (anamaria.bilawich@vch.ca)
Emergency Rotation	Dr. Nicolas Murray (Nicolas.Murray@vch.ca)
Interventional Radiology Rotation	Dr. Anastasia Hadjivassiliou (drahadjivassiliou@gmail.com)
Musculoskeletal Rotation	Dr. Hugue Ouellette (hugue.ouellette@vch.ca)
Neuroradiology CT Rotation	Dr. Jason Shewchuk (jason.shewchuk@vch.ca)
Neuroradiology MRI Rotation	Dr. Jason Shewchuk (jason.shewchuk@vch.ca)
Neuroradiology Spine Rotation	Dr. Jason Shewchuk (jason.shewchuk@vch.ca)
Nuclear Medicine Rotation	Dr. Dan Worsley (dan.worsley@vch.ca)
Ultrasound Rotation	Dr. Emily Pang (Emily.Pang@vch.ca)

Our Team:

(In Alphabetical order)

Dr. Gordon Andrews: *Vancouver Imaging Chief Operating Officer*
- subspecialty interests include sports medicine imaging

Dr. Bruce Forster
- subspecialty interests include sports medicine imaging, QA/QI and appropriateness in MSK imaging.

Dr. Luck Louis: *Director of MSK Ultrasound*
- subspecialty interests include MSK ultrasound and trauma imaging

Dr. Paul Mallinson: *Director of MSK Education*
- subspecialty interests include tumor imaging and advanced MSK intervention

Dr. Peter Munk: *MSK Intervention Pioneer*
- subspecialty interests include tumor imaging and advanced MSK intervention

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Dr. Nicolas Murray: *Director of MSK CT/DECT*
- subspecialty interests include DECT and trauma imaging

Dr. Savvas Nicolaou: *Vancouver Imaging Chief Executive Officer & Radiology Department Head*
- subspecialty interests include DECT and trauma imaging

Dr. Hugue Ouellette: *Head of MSK Division*
- subspecialty interests include tumor and sports medicine imaging

Dr. Adnan Sheikh: *Director of MSK MRI and Research*
- subspecialty interests include AI, 3D printing, tumour and sports medicine imaging and advanced MSK intervention

Sandy St. Cyr: *Ultrasound Technologist*
- special interest in MSK ultrasound

Neuroradiology Resources

Educational Facilities: Neuroradiology Library – Room 885A

Text Library

A collection of up-to-date textbooks is available in the Neuroradiology Library. These books may be taken out overnight but they must be brought back during the day as they are often used as references. Replacing them in the appropriate section (Brain, Spine, Anatomy, etc) is required. Residents wishing to use a book for days/weeks are encouraged to obtain their copy from the Biomedical or Woodward libraries. All textbooks removed from the Neuroradiology Library require sign-out. The sign-out sheet will be with Dr. Jason Shewchuk. Any textbook not returned to the Library will be considered property of the last resident to have signed it out, with appropriate charges paid back to the Division of Neuroradiology by the resident.

Film Library

A large collection of teaching films is available. In addition, a database of interesting cases is maintained on the MIRC server. A teaching file has been started and two neuroradiology lectures for medical students are on the Radiology Web Site. Radiology Grand Rounds are also available via the Web. Videos of 'core' lectures by well-known radiologists are also available on most neuroradiology subjects.

Skull and Spine Models

A collection of models of the skull, petrous bones, and spine is available in the Library. These models are an excellent learning tool, when viewed along with the x-rays in puzzling cases. These models are to not leave the Library except when taken out under the supervision of one of the Neuroradiology Staff.

N.B.: Please remember that no texts, models or teaching file films are to be left lying in the Department (especially in the reporting areas) after hours. All books and models should be returned to the Library at the end of the day.

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Appendix B: Modules (CBD Residents)

EPA MAP

EPAs
- TTD – Transition to Discipline
- F – Foundation
- C – Core
- TTP – Transition to Practice

Transition to Discipline
- Transition to Discipline Module ("TTDM")

General Modules
- Abdo Module ("Abdo")
- Angio Module ("Angio")
- Chest Module ("Chest")
- CT Module ("CT")
- MRI Module ("MRI")
- MSK Module ("MSK")
- US Module ("US")

Sub-Specialty Modules
- Cardiac Imaging Module ("Cardiac")
- Interventional Radiology Module ("IR")
- Nuclear Medicine Module ("NM")
- Neuroradiology Module ("NR")
- Pediatric Radiology Module ("PR")

Transition to Practice
- Transition to Practice Module ("TTPM")

EPA	Name	Rotation	Completion Guidelines
TTD1	Navigating information systems used in Diagnostic Radiology	TTDM	• Case review with staff radiologist, senior resident, or fellow • Collect 2 observations of achievement from at least 2 different assessors
TTD2	Using a dictation system	TTDM	• Review of report by staff radiologist, senior resident, or fellow • Collect 1 observation of achievement
TTD3	Recognizing normal anatomy in radiography and CT imaging	TTDM	• Image review with staff radiologist, senior resident, or fellow • Collect 7 observation of achievement - At least 1 abdomen/pelvis radiograph - At least 1 abdomen/pelvis CT - At least 1 chest radiograph (i.e., cardiothoracic) - At least 1 chest CT - At least 1 head CT - At least 1 MSK radiograph - At least 1 spine radiograph or CT
TTD4	Identifying and assessing unstable patients, providing initial management, and obtaining help	TTDM	• Direct observation and/or case review by supervisor • Collect 5 observations of achievement on any 4 different presentations

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TTD5	Assessing patients with common medical or surgical presentations	TTDM	• Case review with supervisor • Collect 7 observations of achievement - At least 2 of each type of presentation - At least 1 pediatric case
TTD6	Working effectively as a member of the interprofessional team	TTDM	• Direct and indirect observation by supervisor, with input from other members of the interprofessional team • Collect 3 observations of achievement - At least 2 observations that include input from a nurse or other health professionals

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Transition to Discipline Module

Authors: T. Sedlic
Updated: April 6, 2022
RPC Approved: TBD

Introduction:

Transition to Discipline gives residents a period of time to make the transition from Undergraduate to Postgraduate training. It will involve orientation to the University and hospitals as well as clinical and educational training experiences. Each resident will spend their clinical time at one general adult hospital site. For blocks 11-13, residents will return to Vancouver for radiology-specific rotations, including bootcamp.

This module is focused on enabling new residents to:

- Complete orientation including mandated Health Authority and UBC PGME education sessions and modules (health and safety, confidentiality, Residents and Teachers, etc.).
- Gain basic clinical skills in patient assessment and care.
- Gain exposure basic clinical indications and contraindications for outpatient and inpatient imaging.
- Undertake sessions and didactic teaching in introduction to principles of radiology
- Gain experience with Competency-By-Design training and evaluation portfolios

EPAs to be completed in this module:

TTD 1. Navigating information systems used in Diagnostic Radiology

- *Case review with staff radiologist, senior resident, or fellow*
- *Collect 2 observations of achievement*
    - *At least 2 different assessors*

TTD 2. Using the dictation system

- *Review of report by staff radiologist, senior resident, or fellow*
- *Collect 1 observation of achievement*

TTD 3. Recognizing normal anatomy in radiography and CT imaging

- *Image review with staff radiologist, senior resident, or fellow*
- *Collect 7 observations of achievement*
    - *At least 1 abdomen/pelvis radiograph*
    - *At least 1 abdomen/pelvis CT*
    - *At least 1 chest radiograph (i.e., cardiothoracic)*
    - *At least 1 chest CT*
    - *At least 1 head CT*
    - *At least 1 MSK radiograph*
    - *At least 1 spine radiograph or CT*

TTD 4. Identifying and assessing unstable patients, providing initial management, and obtaining help

- *Direct observation and/or case review by supervisor (most responsible physicina (MRP), attending physician, other consulting staff, senior resident)*

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- *Collect 5 observations of achievement*
    - *Any 4 different presentations*

TTD 5. Assessing patients with common medical or surgical presentations

- *Case review with supervisor (most responsible physicina (MRP), attending physician, other consulting staff, senior resident)*
- *Collect 7 observations of achievement*
    - *At least 2 of each type of presentation*
    - *At least 1 pediatric case*

TTD 6. Working effectively as a member of the interprofessional team

- *Direct and indirect observation by supervisor, with input from other members of the interprofessional team*
- *Collect 3 observations of achievement*
    - *At least 2 observations that include input from nurse or other health professionals*

Required Training Experiences:

Adult Radiology Rotation 4-week block (TTD 1, 2, and 3)

1. Introduction to radiography, ultrasound, and computed tomography
2. Understanding imaging indications, limitations, and contraindications
3. Introduction to image interpretation and radiology reporting

TTD Boot Camp and Anatomy Course

1. 4-week rotation of didactic lectures covering an introduction to topics in adult and paediatric radiology
2. Introduction to radiological anatomy
3. Pre-recorded lecture series covering neuroradiology, ultrasound and imaging in pregnancy, emergency and trauma imaging, thoracic imaging and ICU radiographs.

Resident Assessment:

The resident will be assessed by either daily narrative evaluation forms or formal EPA assessments based on the following:

1. Faculty observation of clinical activities in the rotation specific outpatient and inpatient settings.
2. Review of the Logbook entries to ensure adequate volume and variety of clinical experiences.
3. Attendance, participation and preparation for education sessions.

The resident will be given feedback on their performance throughout the learning module including but not limited to:

- Daily following specific work-based assessments
- At the mid-point of the TTD period
- At the completion of the TTD period
- Following the end-of-stage Competency Committee meeting

All Mandatory Training Experiences must include a successful summative end of training experience evaluation.

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Appendix C: Rotation Goals & Objectives (Traditional Residents)

Abdominal Rotation Goals & Objectives - SPH

Updated: August 16, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

During the four-year residency program in diagnostic radiology, residents will receive a total of six months of training in abdominal imaging and are expected to develop graded responsibility as they progress through the training years. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the rotation's end. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

The resident on the abdominal rotation at SPH is responsible for all emergency plain films, ERCP's, CT enterography and CT colonography examinations and fluoroscopic procedures performed during the week including cystograms, small bowel follow throughs, modified barium swallows, hypaque enemas to assess for postoperative leak prior to reanastomosis and UGI studies. The residents also have the opportunity to obtain body MRI experience which is shared with one of our three body imaging fellows. St. Pauls's hospital has very busy gastroenterology and colorectal departments with considerable opportunity to gain experience in the above modalities. We also provide the residents the opportunity to review 30 CT colonography cases with pathology correlation on our GE workstation.

Senior residents also have the opportunity to participate in one of two body intervention rooms during which time they will acquire experience in many types of biopsies including renal, liver and thyroid. Here, they will also have the opportunity to perform chest and abdominal drainages as well as nephrostomies as they arise.

Residents are expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

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Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of GI anatomy
- Understands how and why the protocols used to perform CT enterography and CT colonography differ from others in the abdomen.
- Understand indications and contraindication to various GI and GU fluoro based imaging procedures
- Perform GI and GU exams with supervision appropriate to level of training
- Development of ability to detects findings, summarize cases, offer recommendations, understands treatment and clinical implications
- Interpret findings into an appropriate differential diagnosis
- Develops the ability to integrate plain film findings including those of barium and ERCP with cross-sectional and multiplanar findings in the abdomen and pelvis.
- Develops knowledge of abdominal and pelvic pathologies seen in clinical practice.
- Develops the ability to integrate findings to form a clinically useful differential diagnosis and management plan.
- Understands the implications that imaging findings have on treatment and management decisions.
- Shows competence in manual and procedural skills.

Communicator

- Dictates accurate, concise and useful reports in an expedient manner following discussion of the case with the staff radiologist.
- Communicates all time sensitive important findings to the clinical team/ordering physician.
- Communicates effectively with patients, families, and other health professionals.
- Obtains informed consent from patients and their families in an appropriate fashion.

Collaborator

- Consults effectively with the clinical team including physicians, nurses, technologists and clerical support staff. Fulfills consultant role (for level of training).

Manager

- Performs/interprets an appropriate volume of cases for level of training.
- Manages daily workflow in the department including prioritization, protocoling and triaging cases appropriately. Reports are dictated and signed in a timely manner

Scholar

- Develops and monitors a personal continuing education strategy, including self-directed learning and teaching of other residents and students.
- Shows competence in the evaluation of medical literature.

Professional

- Demonstrates integrity, honesty and compassion in both personal and professional behaviours.
- Demonstrates insight into one’s personal strengths and weaknesses.
- Demonstration of ethical behaviour, satisfactory attendance, punctuality, level of responsibility and reliability expected of a radiology resident.

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Abdominal Rotation Goals & Objectives - VGH

Updated: August 13, 2021
Reviewed by: Drs. E. Pang (CT) and W. Yee (MRI)
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

The abdominal CT/Fluoro and abdominal MR rotations at VGH accommodate R2-5 residents and residents are expected to develop graded responsibility as they rise from first to fourth year level. Guidance will be given to each resident at the commencement of a rotation, an interim evaluation will occur halfway through the rotation if requested, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately 1730 hours. Ongoing teaching and interaction with staff occur throughout the day. If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Pang/Yee in advance, at least two weeks prior to any planned absence from the rotation. There will be a staff specifically scheduled on MRI on Monday and Wednesdays at VGH, and on Fridays at BCW. Any urgent inpatient MRs performed outside those days can be reviewed with the CT staff.

R4, R5 / Core, TTP Residents – Senior residents are expected to function at a senior level with the goal of demonstrating readiness for independent practice. These include reporting inpatient and outpatient CT/MRI and reviewing with staff, help to answer phone and in-person CT/MRi related inquires, and help to protocol CT and MRI requisitions.

For protocolling specifically, junior residents should review all CT protocols with the fellow or staff, while senior residents can review complex or uncertain protocols. All MR protocols should be reviewed with a staff or fellow regardless of seniority. The CT and MR requisitions to be protocolled can be found in the CT and MR booking offices respectively. Inpatients should be prioritized first thing in the morning.

The VGH CT rotation also includes fluoroscopy, and residents are expected to assist with these at a level based on experience. If unfamiliar, please let the staff or fellow know so we can help teach/supervise. Senior residents are also expected to assist the staff or fellow with CT guided procedures.

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Although reporting volumes may understandably vary depending on required teaching session attendance or other unforeseen circumstances, as a general guideline a minimum case number of 2 x PGY level per day should be aimed for (ie. minimum 4 cases per day for PGY2, 6 for PGY3, 8 for PGY4, 10 for PGY5).

The residents are invited to attend abdominal MRI/interesting case rounds held on Mondays at 12-1 pm in the abdominal CT/MR reading room.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- CT
    - Knowledge of CT (multi-detector and dual energy) physics, technical imaging parameters and artifacts
    - Understands imaging protocols, including use of iodinated IV contrast and positive, neutral and negative oral contrast
    - Knowledge of cross sectional CT and multi-planar anatomy
    - Knowledge of clinical radiology and pathology
    - Acquire diagnostic skills in defining pathologic processes as depicted with CT and to correlate these findings with those of other modalities
    - Detects findings and interprets findings into an appropriate differential diagnosis
    - Ability to summarize case, offer recommendations, understands treatment and clinical implications
    - Knowledge of the procedure: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care
    - Basic technical ability: patient positioning, sterile technique, local anaesthetic, simple procedures
    - Advanced technical ability: ability to perform more difficult procedures
    - Fluoroscopy: ability to perform studies such as modified barium swallows, upper GI, cystograms etc.
- MR
    - Knowledge of MR physics including:
    - Understanding and being able to apply basic MR physics principles of spin echo, gradient echo (in and out of phase, 2D and 3D) and DWI sequences
    - Understand factors affecting signal-to-noise ratio, spatial resolution and imaging time
    - recognize common MRI artifacts and be able to reduce (or eliminate) them
    - Understand ancillary techniques such as fat suppression, spoiler gradients, saturation bands, and flow compensation
    - Knowledge of MR safety and risks of contrast administration
    - knowledge of screening/contraindications, foreign implanted bodies
    - Knowledge of cross sectional MR and multi-planar anatomy
    - Knowledge of clinical radiology and pathology
    - Acquire diagnostic skills in defining pathologic processes as depicted with MR and to correlate these findings with those of other modalities
    - Detects findings and interprets findings into an appropriate differential diagnosis
    - Ability to summarize case, offer recommendations, understands treatment and clinical implications

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicates effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians
- Able to obtain appropriate informed consent for CT guided procedures
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Leader

- Manages daily workflow in the department, including prioritization, protocoling and triage of cases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training
- Reports are dictated and signed in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understands benefits and limitations/risks related to CT and MR imaging and their respective contrast agents.
- Understands the appropriate use of CT and MR and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviours
- Practice medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Acceptance of constructive criticism

Reading List

Recommended Textbooks:

CT - Fundamentals of Body CT, 3rd edition, 2005. By Richard Webb, William Brant and Nancy Major.

MR - Abdominal-Pelvic MRI. By Richard Semelka. There is a 2nd edition in the resident library that can be signed out.

Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with Stat DX and the internet can provide many review articles (eg Radiographics).

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Body Intervention Rotation Goals & Objectives – SPH

Updated: September 17, 2021
RPC Approval: TBD

Level/Stage

- R3, R4, R5
- Core, Transition to Practice

Introduction

The SPH radiology department current has a dedicated body intervention room (Room 11) with a C-arm for body interventional procedures, with US available for combined interventions. There is also an additional room for purely ultrasound guided procedures (Room 33). Additionally, a CT scanner is available for all procedures requiring CT guidance.

Core Responsibilities and Expectations

This is a **senior level** rotation dedicated to late R3-5. Expectations are similar between trainee levels given the senior nature of this rotation.

The case mix would include ultrasound guided thyroid, renal and liver biopsies to be done in room 33. Room 11 would include procedures such as pleural drainage, paracentesis, abscess drainage, G and PEG tube placement, percutaneous transhepatic cholangiograms (PTC) and percutaneous nephrostomies. CT guided procedures are performed in Room 21, and include lung and pleural biopsies, solid organ biopsies, CT guided drainages and solid organ RFA.

Residents on this rotation would be expected to work in close conjunction with the Body inte rventional team of fellows, nurses and technical support staff.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of cross sectional and multi-planar anatomy as it pertains to body/thoracic interventional cases. Including pertinent biliary and GI anatomy.
- Develop a knowledge of the various indications and contraindications for thoracic and body interventional procedures.
- Understands the necessity for pre-procedure planning and prepares for cases appropriately
- Performs body interventional procedures with supervision appropriate to level of training
- Understands post-procedure care and potential complications of procedures undertaken

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Communicator

- Communicates effectively with patients, families and other health professionals.
- Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist.
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings. (Depending on the level of training this may wait until after review with the staff physician.)
- Obtains informed consent for patients in an appropriate fashion

Collaborator

- Respects, recognizes the roles of, and effectively interacts with the healthcare team, including nurses and technologists

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safety issues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies. Understands the appropriate use of imaging and procedural resources in the context of a hospital health care setting.

Scholar

- Effectively teaches others skills and information utilized during this rotation.
- Continued self-directed learning: reading around cases and topics.

Professional

- Interaction with support staff, nurses, clinical teams and staff in an professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiology and acceptance of constructive criticism/guidance to help improve areas of weakness
- Attendance, punctuality, work ethic, enthusiasm, reliability and motivation are all appropriate.

Reading List

Kandarpa K. Handbook of Interventional Radiologic Procedures.

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Cardiac Rotation Goals & Objectives - SPH

Updated: September 17, 2021
RPC Approval: TBD

Level/Stage

- R3, R4, R5
- Core, Transition to Practice

Introduction

The SPH radiology department current has 2 1.5 T GE MR scanners both of which are capable of cardiac imaging. Cardiac MRI cases cover a wide range of indications including assessment of adult congenital heart disease, work-up of ischemic heart disease (including stress perfusion exams), evaluation of cardiomyopathies including HCM and ARVC, as well as assessment of cardiac masses.

SPH currently has two 256 slice GE CT scanners (Revolution and Cardiograph), both capable of cardiac exams. CT studies are performed for evaluation of coronary artery disease as well as work-up of patients for percutaneous cardiac valve placement (aortic, mitral and tricuspid).

SPH currently performs 10-30 cardiac MRIs and 100-150 cardiac CTs per week.

Once reviewed by the cardiac resident on service all CT and MR exams would then be reviewed with one of three fellowship trained cardiothoracic radiologists.

Core Responsibilities and Expectations

This is considered a **senior level** rotation. Residents are expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist. CT coronary exams are dictated in a standardized fashion in our department, residents newto this rotation should take time to familiarize themselves with this format.

Residents are expected to attend and participate in the following Rounds:

- Noon rounds daily (except Wednesdays) SPH radiology library
- Monday 7am.: Ortho rounds (SPH library) (optional)
- Tuesday 8am: Chest rounds (8a Providence building)
- Wednesday 5pm: Grand rounds
- Thursday 7:15 am: Cardiac rounds (Hurlburt or new lecture theater)
- Friday 1pm: Resp/Rad/Path Chest rounds (Gourlay conference center)

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For **R5/TTP Residents** who may have an interest in cardiac imaging as a career, further emphasis is placed on evaluation for structural heart disease. Including planning for TAVI, TMVI etc. As well as a deeper understanding of the literature behind CCTA and understanding of the protocols.

For **R5/TTP Residents** who have not done this rotation, general goals are: develop an approach for looking at the heart on CT imaging, and the ability to accurately grade coronary stenosis on CCTA. A basic approach to cardiac MRI is also expected, with a focus on understanding basic cardiac function measurements, how MR is used to assess valve dysfunction, assessment of cardiac masses and an understanding of how delayed enhanced sequences are used to inform a differential diagnosis. A basic understanding of adult congenital heart disease is expected as well.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar cardiac anatomy
- Develop a basic understanding of cardiac physiology, particularly as it pertains to imaging studies.
- Gain an understanding of CT and MRI physics, particularly with regards to applications in cardiacimaging. Residents are encouraged to spend time with the excellent group of MR technologists at SPH to gain practical knowledge of MR.
- Understand cardiac CT and MRI imaging protocols. Be able to help MR and CT technologists withprotocol related questions, appropriate to level of training.
- Develop a level of familiarity with the GE work station to allow interpretation of cardiac CT and assessment of functional values on MRI studies.
- Develop knowledge of cardiac pathologies seen in clinical practice with MR.
- Develop the ability to detect pertinent findings on cardiac CT and MR studies.
- Develop the ability to integrate findings to form a clinically useful differential diagnosis (when relevant) and offer an appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions.

Communicator

- Informing the ordering physician either verbally or otherwise of any time sensitive important findings. (Depending on the level of training this may wait until after review with the staff physician.)
- Obtains informed consent for patients in an appropriate fashion

Collaborator

- Discussion of cases with clinical teams, applying the radiologic findings to help guide patient management
- Coordinate read-out of cases with the cardiac imaging fellow. A close collaboration with the cardiac fellow will help residents on this rotation to maximize their learning experience.

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safety

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issues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate
- Develop an understanding of the risks and benefits of various imaging studies. Application of this knowledge to alter imaging protocols to limit risk when deemed necessary. With cardiac CTthis is especially important as knowledge of the varying protocols (i.e. retrospective vs. prospective ECG-gating) can change radiation dose substantially.

Scholar
- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence-based fashion appropriate to the level of training
- Continued self-directed learning: reading around cases and topics.
- A great deal of cardiac imaging research is ongoing at SPH, residents are encouraged to familiarize themselves with the studies currently underway and to participate, whether it be byconsenting patients or reviewing data, as much as possible.

Professional
- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiology and acceptance of constructive criticism/guidance to help improve areas of weakness

Reading List

Please see the cardiac binder at SPH for pertinent reading material (ask staff or fellows where this binder lives).

A SPH Cardiac Imaging Website has been set up with a number of useful links, resources and a readinglist. Please see Dr. Leipsic, Dr. Ellis or Dr. Hague for the website address.

Textbooks:
- Halpern E. Clinical Cardiac CT: Anatomy and Function 2011.
- Bogaert J Clinical Cardiac MRI 2nd edition
- 2012Websites:
- Scct.org: society of cardiovascular CT. Excellent bank of cases and guidelines pertinent to CT imaging of the heart.
- Scmr.org: society of cardiac MR. Access to case of the day and guideline papers focused on MRimaging of the cardiovascular system.

Binder:

- A binder of cath proven coronary cases is also present, with CCTA datasets available for review.Please utilize this during any down time.

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Chest Radiography Rotation Goals & Objectives - VGH

Updated: November 25, 2021
Reviewed by: Dr. A.M. Bilawich
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

During the course of the four years, residents will receive one month of chest radiography training as a junior resident and one month of chest radiography training as a senior resident. Residents are expected to develop graded responsibility as they rise from junior to senior resident level. Each resident will be given guidance at the beginning of a rotation, an interim evaluation will occur mid rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day. Ongoing teaching and interaction with the staff occurs throughout the day.

If a resident is absent from his/her chest plain radiography rotation for any reason, he/she should give ample warning to the rotation supervisor.

Vacation and conference requests must be booked with the rotation supervisor in advance, at least two weeks prior to any planned absence from the rotation.

Core Responsibilities and Expectations

Resident responsibilities and expectations are outlined alongside the CanMEDS objectives below. Junior-specific and senior-specific responsibilities and expectations are identified at the front of the list item in brackets as "**[Junior]**" or "**[Senior]**".

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

Basic Science

[Junior] At the end of first Chest radiography rotation, the junior resident (R2/3) will demonstratelearning all of the following anatomy on PA and lateral chest radiographs.

[Senior] At the end of the second Chest radiography rotation, the senior resident (R4/5) willdemonstrate learning all of the following anatomy on PA and lateral chest radiographs.

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a. Knowledge of anatomy (PA and lateral chest radiographs)
   - *Identify the following structures on the posteroanterior (PA) chest radiograph:*
     - *Lung – right, left, right upper, middle and lower lobes, left upper (including lingual)and lower lobes*
     - *Fissures – major, minor, azygos, superior and inferior accessory*
     - *Airways – trachea, carina, main bronchi*
     - *Heart – right atrium, left atrial appendage, left ventricle, location of the four cardiac valves*
     - *Pulmonary arteries – main, right, left, interlobar*
     - *Aorta – ascending, arch, descending*
     - *Veins – superior vena cava, azygous, left superior intercostals ('aortic nipple')*
     - *Bones – spine, ribs, clavicles, scapulae, humeri*
     - *Right paratracheal stripe*
     - *Junction lines – anterior, posterior*
     - *Aortopulmonary window*
     - *Azygoesophageal recess*
     - *Paraspinal lines*
   - *Identify the following structures on the lateral chest radiograph:*
     - *Lungs – right, left, right upper, middle and lower lobes, left upper (including lingual)and lower lobes*
     - *Fissures – major, minor, superior accessory*
     - *Airway – trachea, upper lobe bronchi, posterior wall of bronchus intermedius*
     - *Heart – right ventricle, right ventricular outflow tract, left atrium, left ventricle, the location of the four cardiac valves*
     - *Pulmonary arteries – right, left*
     - *Aorta – ascending, arch, descending*
     - *Veins – inferior vena cava, pulmonary vein confluence*
     - *Bones – spine, ribs, scapulae, humeri, sterum*
     - *Retrosternal line*
     - *Posterior tracheal stripe*
     - *Right and left hemidiaphragm*
     - *Raider's triangle*

[Senior] At the end of the second Chest radiography rotation, the senior resident (R4/5) will demonstrate knowledge of X-ray physics, technical parameters of image acquisition, artifacts.

Diagnostic Chest Radiography

[Junior] At the end of first Chest radiography rotation, the junior resident (R2/3) will demonstratelearning the following knowledge-based objectives written in italics.

[Senior] At the end of the second Chest radiography rotation, the senior resident (R4/5) will demonstrate learning all of the following knowledge-based objectives (written in italics and normaltypeface).

b. Knowledge of clinical radiology and pathology
   - *Signs in Thoracic Radiology: Definite, identity and state the significance of the following on a radiograph*

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- *Air bronchogram – indicates a parenchymal process, including nonobstructive atelectasis as distinguished from pleural or mediastinal process*
- *Air crescent sign – indicates a lung cavity, often resulting from fungal infection or saprophytic colonization*
- *Deep sulcus sign on a supine radiograph – indicates pneumothorax*
- *Continuous diaphragm sign – indicates pneumomediastinum*
- *Ring around the artery sign (air around pulmonary artery, particularly on lateral chest radiograph) – indicates pneumomediastinum*
- *Fallen lung sign – indicates a fractured bronchus*
- *Flat waist sign – indicates left lower lobe collapse*
- *Gloved finger sign – indicates bronchial impaction, which can be seen in allergic bronchopulmonary aspergillosis*
- *Golden S sign – indicates lobar collapse caused by a central mass, suggesting an obstructing bronchogenic carcinoma in an adult*
- *Luftsichel sign – indicates upper lobe collapse, suggesting an obstructive bonchogenic carcinoma in an adult*
- *Hampton's hump – pleural based, wedge-shaped opacity indicating a pulmonary infarct*
- *Silhouette sign – loss of contour of the heart, aorta or diaphragm allowing localization of a parechymal process (e.g. A process involving the medial segment of the right middle lobe obscures the right heart border, a lingular process obscures the left heart border, a basal segmental lower lobe process obscures the diaphragm)*
- *Cervicothoracic sign – a mediastinal opacity that projects above the clavicles is retrotrachealand posteriorly situated, whereas an opacity effaced along its superior aspect and projectingat or below the clavicles is situated anteriorly*
- *Tapered margins sign – a lesion in the chest wall, mediastinum or pleura may have smoothtapered borders and obtuse angles with the chest wall or mediastinum while parenchymal lesions usually form acute angles*
- Figure 3 sign – abnormal contour of the descending thoracic aorta, indicating coarctation ofthe aorta
- *Fat pad sign or sandwich sign – indicates pericardial effusion on lateral chest radiograph*
- *Double density sign – opacity projecting over the right side of the heart, indicating enlargement of the left atrium*
- *Hilum overlay sign and hilum convergence sign – used to distinguish a hilar mass from a non-hilar mass*
- Interstitial lung disease
    - List and identify on a chest radiograph four patterns (nodular, reticular, reticulonodular and linear) of interstitial lung disease (ILD).
    - *Identify Kerley A and B lines on a chest radiograph and explain their etiology.*
    - *Recognize the changes of congestive heart failure on a chest radiograph – enlarged cardiac silhouette, pleural effusions, vascular redistribution, interstitial or alveolar edema, Kerley lines, enlarged azygous vein, and increased radio of artery to bronchusdiameter.*
    - *Define the terms 'asbestos-related pleural disease' and 'asbestosis' and identify each on a chest radiograph.*
    - Identify honeycombing on a radiograph, state the significance of this finding (end-stage lung disease), and list the common causes of honeycomb lung.
    - *Describe the radiographic classification of sarcoidosis*.
    - Recognized progressive massive fibrosis/conglomerate masses secondary to silicosis or coal worker's pneumoconiosis on radiography.

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- List causes of lower lobe predominant ILD.
- List causes of upper lobe predominant ILD.

- Alveolar Lung Disease
  - *List four broad categories of acute alveolar lung disease (ALD).*
  - *List five broad categories of chronic ALD.*
  - Recognize a pattern of peripheral ALD on radiography and give an appropriate differential diagnosis, including a single most likely diagnosis when supported by associated radiologic findings or clinical information.
- Atelectasis, Airways and Obstructive Lung Disease
  - *Recognize partial or complete atelectasis of the following on a chest radiograph:right upper lobe, right middle lobe, right lower lobe, right upper and middle lobe,right middle and lower lobe, left upper lobe, left lower lobe.*
  - *Recognize complete collapse of the right or left lung on a chest radiograph list an appropriate differential diagnosis for the etiology of the collapse.*
  - *Distinguish lung collapse from massive pleural effusion on a frontal chest radiograph.*
  - Name the important things to look for on a chest radiograph when the patient history is 'asthma'.
  - Recognize Kartagener syndrome on a chest radiograph and name the three components of the syndrome.
- Mediastinal Masses and Mediastinal/Hilar Lymph Node Enlargement
  - *State the anatomic boundaries of the anterior, middle, posterior and superior mediastinum.*
  - *Name the four most common causes of an anterior mediastinal mass and localize amass to the anterior mediastinum on a chest radiograph.*
  - *Name the three most common causes of a middle mediastinal mass and localize amass in the middle mediastinum on a chest radiograph.*
  - *Name the most common cause of a posterior mediastinal mass and localize a mass inthe posterior mediastinum on a chest radiograph.*
  - Name two causes of a mass that straddles the thoracic inlet and localize a mass tothe thoracic inlet on a chest radiograph.
  - Name five etiologies of bilateral hilar lymph node enlargement.
  - *State the three most common locations (Garland's triad) of thoracic lymph node enlargement in sarcoidosis.*
  - *List the four most common etiologies of 'egg-shell' calcified lymph nodes in the thorax.*
- Solitary and Multiple Pulmonary Nodules
  - *Define the terms pulmonary nodule and pulmonary mass.*
  - *Name the three most common causes of a solitary pulmonary nodule.*
  - *Name six causes of cavitary pulmonary nodules*
  - *Name four causes of multiple pulmonary nodules.*
  - Describe an appropriate imaging algorithm to evaluate a solitary pulmonary nodule.
- Benign and Malignant Neoplasms of the Lung and Esophagus
  - *Name the four major histologic types of bronchogenic carcinoma.*
  - *Name the type of non-small cell lung cancer that most commonly cavitates.*
  - *Name the types of bronchogenic carcinoma that are usually central.*
  - Describe the TNM classification for staging non-small-cell lung cancer.
  - Describe the staging of small-cell lung cancer.

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- Name the most common extrathoracic sites of metastases for non-small-cell and small-cell lung cancer.
- Name the stages of non-small-cell lung cancer that are portentially resectable.
- Recognize abnormal contralateral mediastinal shift on a postpneumonectomy chest radiograph and state etiologies for the abnormal shift.
- Name the most common thoracic locations for adenoid cystic carcinoma and carcinoid tumors to occur.
- Describe the TNM classification for staging esophageal carcinoma, the role of imagingin staging esophageal carcinoma and the stages of esophageal carcinoma that are potentially resectable.
- Describe the classification of lymphoma, the role of imaging in staging of lymphomaand the typical and atypical imaging findings of thoracic lymphoma.
- Define primary pulmonary lymphoma.
- Describe the typical chest radiograph appearances of Kaposi sarcoma.

o Chest Wall, Pleura and Diaphragm

- *Recognize and name causes of a large unilateral pleural effusion on a chest radiograph.*
- *Recognize a pneumothorax on an upright and supine chest radiograph.*
- *Recognize a pleural based mass with bone destruction or infiltration of the chest wallon a chest radiograph and name likely causes.*
- *Recognize pleural calcification on a chest radiograph and suggest the diagnosis of asbestos exposure (bilateral involvement) or old tuberculosis or trauma (unilateral involvement).*
- *Recognize the typical chest radiographic appearances of pleural effusion, given differences in patient positioning, and describe the role of the lateral decubitus viewto evaluate pleural effusion.*
- *Recognize apparent unilateral elevation of the diaphragm on a chest radiograph and suggest a specific etiology with supporting history and associated chest radiographic findings.*
- *Recognize imaging findings suggesting a tension pneumothorax and understand theacute clinical implications.*
- Recognize diffuse pleural thickening, as seen in fibrothorax, malignant mesotheliomaand pleural metastases.

o Infection and Immunity

- *Name the radiographic manifestations of postprimary pulmonary tuberculosis.*
- *Name the most common segmental sites of involvement of postprimary tuberculosisin the lung.*
- *Define a Ghon lesion (calcified pulmonary parenchymal granuloma) and Ranke comples (calcified node and Ghon lesion); recognize both on a chest radiograph anddescribe their significance.*
- Name and describe the types of pulmonary aspergillus disease.
- Identify an intracavitary fungus ball on chest radiography.
- Describe the radiographic appearances of PCP pneumonia.
- Other than bacterial infection, name two important infections and two important neoplasms to consider in patients with AIDS and chest radiograph abnormalities.
- Name most important etiologies of hilar and mediastinal lymphadenopathy in patients with AIDS.
- Describe the time course and chest radiographic appearance of a blood transfusion

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reaction.
- *Describe the chest radiographic appearance of a military pattern and provide a differential diagnosis.*
- Describe the chest radiographic findings of posttransplant lymphoproliferative disorder.

- Unilateral Hyperlucent Hemithorax
  - Recognize a unilateral hyperlucent hemithorax on a chest radiograph.
  - Identify the common causes for unilateral hyperlucent hemithorax on a chest radiograph, and suggest a specific diagnosis when certain associated findings areseen.
- Pulmonary Vasculature
  - *Recognize enlarged pulmonary arteries on a chest radiograph and distinguish themfrom enlarged hilar lymph nodes.*
  - Recognize enlargement of the central pulmonary arteries with diminution of the peripheral pulmonary arteries on a chest radiograph and suggest the diagnosis of pulmonary artery hypertension.
  - Name the common causes of pulmonary arterial hypertension.
- Thoracic Aorta and Great Vessels
  - Describe the classification of aortic dissection (DeBakey and Stanford) and implications for classification on medical vs. surgical management.
  - Recognize a right aortic arch and double aortic arch on a chest radiograph.
  - State the significance of right aortic arch with mirror image branching vs. with an aberrant subclavian artery.
  - Recognize a cervical aortic arch on a chest radiograph.
  - *Define the term aneurysm and pseudoaneurysm.*
- Cardiac Valvular Disease
  - *Identify and describe the findings of each on a chest radiograph: enlarged right atrium, enlarged left atrium, enlarged right ventricle, and enlarged left ventricle.*
  - Describe and recognize the chest radiograph findings associated with each of the following valvular diseases: mitral regurgitation, mitral stenosis, aortic regurgitation,aortic stenosis, tricuspid regurgitation.
  - Recognize an enlarged ascending aorta and aortic valve calcification on a chest radiograph and suggest the diagnosis of aortic stenosis when these findings are present.
  - Recognize an enlarged left atrium, vascular redistribution, and mitral valve calcification on a chest radiograph and suggest the diagnosis of mitral stenosis whenthese findings are present.
  - State the most common etiologies of aortic stenosis, aortic regurgitation, mitral stenosis, mitral regurgitation, tricuspid regurgitation, pulmonary stenosis.
- Pericardial Disease
  - *Recognize pericardial calcification on a chest radiograph and name the most common causes.*
  - *Describe and identify two chest radiograph signs of a pericardial effusion.*
  - *Name common causes of a pericardial effusion.*
  - Describe findings of each of the following on a chest radiograph: pericardial cyst, constrictive pericarditis, absence of the pericardium, pneumopericaridum.
- *Monitoring and support devices ' lines and tubes'*
  - *Describe and identify on a chest radiograph the normal appearance and*

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complications associated with each of the following:

1. *Endotracheal tube*
2. *Central venous catheter*
3. *Peripherally inserted central venous catheter*
4. *Pulmonary artery catheter*
5. *Feeding tube*
6. *Nasogastric tube*
7. *Chest tube*
8. *Intra-aortic ballon pump*
9. *Pacemaker generator and leads*
10. *Automatic implantable cardiac defibrillator*
11. *Left ventricular assist device*
12. *Atrial septal defect closure device*
13. *Pericardial drain*
14. *Extracorporeal life support cannulae*
15. *Intraesophageal manometer, temperature probe and pH probe*
16. *Trachea, bronchial and esophageal stent.*

- *Explain how an intra-aortic balloon pump works.*
- *Describe the venous anatomy and expected course of the veins from the axillary vein to theright atrium relative to anatomic landmarks.*
- *Recognize the difference between skin fold and pneumothorax on a portable chest radiograph.*
- Postoperative thorax
  - Identify the normal postoperative findings and complications of the following procedures on chest radiographs:
    1. Wedge resection, lobectomy, pneumonectomy
    2. Coronary artery bypass graft surgery
    3. Cardiac valve replacement
    4. Aortic graft
    5. Aortic stent
    6. Transhiatal esophagectomy
    7. Lung transplantation
    8. Lung volume reduction surgery

c. Understands imaging techniques
d. Detects findings
e. Interprets findings into an appropriate differential diagnosis
f. Ability to summarize case, offer recommendations, understands treatment and clinical implications

Communicator

- Communicates effectively with patients, families and other health professionals
- Appropriate and timely communication of findings to referring physicians, including whenresults are urgent
- Obtains appropriate informed consent

- Accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and effectively interacts with the health care team, includingnurses and technologists
- Fulfills consultant role (for level of training)

Leader

- Manages daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training

  [Junior] The resident (R2) in the First Chest Radiography rotation will be responsible for reviewing a minimum of 20 chest radiographs per day (ICU, CCU, other inpatient and outpatient chest radiographs) with the staff chest radiologist.

  [Senior] The resident (PGY4/5) in the Second Chest Radiography rotation will be responsible for reviewing a minimum of 30 chest radiographs per day (ICU, CCU, other inpatient and outpatient chest radiographs) with the staff chest radiologist.
- Reports are dictated and signed in a timely manner

  All reports have to be signed by the end of the working day they have been dictated.

Health Advocate

- Understands benefits and risks related to imaging studies
- Understands the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students and patients
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Attends weekly Thoracic Surgery Rounds (7-8 am every Tuesday) and Radiologic-Clinical-Pathologic Rounds (1-2 pm every Friday from September to June)

Professional

- Exhibits professional behaviour, displaying honesty, integrity and respect
- Exhibits ethical behaviour, sensitivity to gender/culture diversity
- Demonstrates punctuality
- Demonstrates good work ethic, enthusiasm and motivation
- Demonstrates reliability, responsibility and conscientiousness
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for helpwhen appropriate
- Accepts constructive criticism

Reading List

Recommended Textbooks:

Chest Radiology The Essentials. By Jannette Collins and Eric J. Stern. 3rd Edition (2014).

Thoracic Imaging Pulmonary and Cardiovascular Radiology. By W. Richard Webb and Charles B. Higgins.3rd Edition (2016)

Muller's Imaging of the Chest (Expert Radiology Series). By CM Walker and JH Chung. 2nd Edition (2018)

Fraser and Pare's Diagnosis Diagnosis of Diseases of the Chest. By NL Muller, R Fraser, N Colman and PD

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Pare (2001) is available as a reference in the reading room.

Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with StatDX and internet can provide many review articles (ie. Radiographics).

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Chest Rotation Goals & Objectives - SPH

Updated: September 17, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

The SPH radiology department currently has 3 CT scanners. Two of the GE scanners have cardiac capability. The resident on the CT chest rotation at SPH can expect to share 5-6 HRCTs and 10-20 routine CT chests, as well as 10-20 CXRs. The case mix reflects the strengths of the hospital with a combination of in and outpatient imaging. A CT body resident and fellow will also be on and the rotating resident will be expected to share cases with their colleagues.

The resident on SPH chest should attempt to review HRCT cases with either Dr. Hague, Dr. Leipsic or Dr. Ellis. Routine CT chests can be reported with the body staff of the day. CXRs can be reviewed with any available staff.

Core Responsibilities and Expectations

Residents are expected to attend and participate in the following Rounds:

- Noon rounds daily (except Wednesdays) SPH radiology library
- Monday 7am.: Ortho rounds (SPH library) (optional)
- Tuesday 8am: **Chest rounds** (8a Providence building)
- Wednesday 5pm: Grand rounds
- Thursday 730am: GI rounds (GI conference center)
- Friday 1pm: **Resp/Rad/Path Chest rounds** (Gourlay conference center)

Residents are expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

The resident on SPH chest should attempt to review HRCT cases with either Dr. Hague, Dr. Leipsic, Dr. Murphy or Dr. Ellis. Routine CT chests can be reported with the body staff of the day. CXRs can be reviewed with any available staff.

Junior Residents (R2-3, Foundation-Core) will be expected to do, 8-10 routine CT chests, and 10 CXRs.

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Emphasis placed on urgent/inpatient work to help with call preparation and comfort. Seeking out urgent cases for immediate review with staff. PGY2s should attempt to see case(s) of chest trauma, acute pulmonary embolism and acute aortic syndromes in preparation for call. PGY3s can enforce their understanding of these pathologies but should expand their focus to include HRCT cases and begin to formulate a template and plan for reviewing these complex cases.

Senior Residents (R4-5, Core-TTP) will do 4-5HRCTs, and 10-15 routine chests, and 20+ CXRs. A deeper understanding of ILD is expected at the end of this block for senior residents. If done as a PGY5 freedom to help with transition to practice resident may help prepare for ILD rounds and rad path rounds, and to taper the rotation to individual learning plan is made.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

*(Junior-specific and senior-specific objectives are identified at the front of the list item in brackets as "**[Junior]**" or "**[Senior]**".)*

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar thoracic anatomy
- Understand CT physics, technical parameters of image acquisition and CT related artifacts andhow these factors contribute to diagnostic imaging with CT.
- Understand thoracic CT protocols with regards to use of IV contrast as well as scan delay timingand CT slice thickness and spacing. Be able to help CT technologists with protocol related questions.
- **[Junior]** Develop knowledge of thoracic pathologies seen in clinical practice, specifically a firm understanding of acute thoracic imaging including pulmonary emboli, chest trauma, infection,acute aortic syndromes.
- **[Senior]** Develop knowledge of thoracic pathologies seen in clinical practice, specifically gain knowledge with regards to interstitial lung disease and the nomenclature utilized in CT chest imaging.
- Develop the ability to accurately and rapidly detect pertinent findings on CXR and CT studies ofthe chest
- Develop the ability to integrate findings to form a clinically useful differential diagnosis and offeran appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions.

Communicator

- Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist.
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings. (Depending on the level of training this may wait until after review with the staff physician.)
- Obtains informed consent for patients in an appropriate fashion
- Communicate effectively with patients, families and other health professionals.

Collaborator

- Discussion of cases with healthcare teams, including nurses and technologists, applying the radiologic findings to help guide patient management. Fulfills a consultant role (for level oftraining)
- Help coordinate preparation and cases for Friday afternoon multidisciplinary case conference.
- Share interesting cases with fellows and other residents at SPH.

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Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safetyissues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies. Application ofthis knowledge to alter imaging protocols to limit risk when deemed necessary.
- Gain an understanding of the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence-based fashion appropriate to the level of training
- Continued self-directed learning: reading around cases and topics, including teaching other residents and students.

Professional

- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiologyand acceptance of constructive criticism/guidance to help improve areas of weakness
- Demonstration of satisfactory attendance, punctuality, work ethic, reliability expected of a radiology resident

Reading List

1. Fundamentals of Diagnostic Radiology. Brant and Helms
2. Anatomy in Diagnostic Imaging. Fleckenstein
3. Fundamentals of Body CT. Brant
4. Primer of Diagnostic Imaging. Weissleder
5. Thoracic Imaging. Webb and Higgins
6. Imaging of the Chest. Muller and Silva
7. www.str.org (society of thoracic radiology has many excellent lectures in the education section)
8. Hansell DM et al. Fleischner Society: Glossary of Terms for Thoracic Imaging. Radiology 2008;246 (3): 697-722
9. Online resources: STATDx and RadPrimer (via individual logins)
10. Online resources: Hague lectures series on Entrada (CWL required)

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Chest CT Imaging Rotation Goals & Objectives - VGH

Updated: November 25, 2021
Reviewed by: Dr. A.M. Bilawich
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

During the course of the four years, residents will receive one month of chest CT training as a junior resident and one month of chest CT training as a senior resident. Residents are expected to develop graded responsibility as they rise from junior to senior resident level. Each resident will be given guidance at the beginning of a rotation, an interim evaluation will occur mid rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day. Ongoing teaching and interaction with the staff occurs throughout the day.

If a resident is absent from his/her Chest CT rotation for any reason, he/she should give ample warningto Dr. Bilawich (Cardiothoracic Section Head and rotation supervisor).

Vacation and conference requests must be booked with Dr. Bilawich in advance, at least two weeks prior to any planned absence from the rotation.

Core Responsibilities and Expectations

Resident responsibilities and expectations are outlined alongside the CanMEDS objectives below. Junior-specific and senior-specific responsibilities and expectations are identified at the front of the list item in brackets as "**[Junior]**" or "**[Senior]**".

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

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Basic Science

[Junior] At the end of first Chest CT rotation, the junior resident (R2/3) will demonstrate learning all ofthe following cross sectional and multi-planar anatomy on CT chest.

[Senior] At the end of the second Chest CT rotation, the senior resident (R4/5) will demonstrate learningall of the following cross sectional and multi-planar anatomy on CT chest.

a. Knowledge of cross sectional and multi-planar anatomy
    - Identify the following structures on chest CT:
        - Lungs: right, left, right upper lobe, right middle lobe, right lower lobe, left upper lobe, lingual and left lower lobe, and corresponding segments
        - Pleura and extrapleural fat
        - Airway: trachea, main bronchi, carina, lobar and segmental bronchi
        - Heart: left ventricle, right ventricle, moderator band, left atrium, left atrial appendage, right atrium, right atrial appendage, mitral valve, aortic valve, tricuspidvalve, pulmonary valve, coronary arteries (left main, left anterior desceding, left circumflex, right, posterior descending), coronary veins, coronary sinus
        - Pericardium: including pericardial recesses
        - Pulmonary arteries: main, right left, interlobar, segmental
        - Aorta: asceding, sinuses of Valsalva, arch, descending
        - Arteries: brachiocephalic (innominate), common carotid, subclavian, axillary, vertebral, internal mammary, intercostal
        - Veins: pulmonary, superior vena cava, inferior vena cava, brachiocephalic, subclavian, axillary, internal jugular, external jugular, azygos, hemiazygos, left superior intercostals, internal mammary
        - Bones: ribs and costochondral cartilages, clavicles, scapulae, sternum, spine
        - Esophagus
        - Thymus
        - Thyroid gland
        - Muscles: sternocleidomastoid, anterior and middle scalene, pectoralis major and minor, deltoid, trapezius, infraspinatus, supraspinatus, subscapullaris, latissimus dorsi, serratus anterior
        - Aortopulmonary window
        - Azygoesophageal recess
        - Gastrohepatic ligament, celiac axis
        - Diaphragm
        - Secondary pulmonary lobule: identify on CT and define.
        - Fissures: major, minor, azygos, accessory (superior and inferior).

[Senior] At the end of the second Chest CT rotation, the senior resident (R4/5) will demonstrateknowledge of CT physics, technical parameters of image acquisition and artifacts.

Diagnostic CT

[Junior] At the end of first Chest CT rotation, the junior resident (R2/3) will demonstrate learning the

following knowledge-based objectives written in italics.
[Senior] At the end of the second Chest CT rotation, the senior resident (R4/5) will demonstrate learningall of the following knowledge-based objectives (written in italics and normal typeface).

b. Knowledge of clinical radiology and pathology
   - *Define an acinus*
   - *Define and state the significance of the following on a chest CT:*
     - *CT angiogram sign: enhancing pulmonary vessels against a background of low attenuation material in the lung*
     - *Halo sign: suggesting invasive pulmonary aspergillosis in a leukemic patient*
     - *Split pleura sign: a sign of empyema and other inflammatory pleural processes.*
   - Interstitial lung disease
     - Make a specific diagnosis of ILD when supportive findings are present in the historyor on radiologic imaging.
     - Define the terms 'asbestos-related pleural disease' and 'asbestosis' and identify each on a chest CT.
     - Identify honeycombing on chest CT, state the significance of this finding (end-stagelung disease), and list the common causes of honeycomb lung.
     - Recognized progressive massive fibrosis/conglomerate masses secondary to silicosis or coal worker's pneumoconiosis on chest CT.
     - List causes of lower lobe predominant ILD.
     - List causes of upper lobe predominant ILD.
     - *Recognize findings of lymphangioleiomyomatosis and Langerhans cell histiocytosis onchest CT.*
     - Identify and give appropriate differential diagnosis when the patterns of septal thickening, perilymphatic nodules, bronchiolar opacities ('tree-in-bud'), air trapping,cysts and ground glass opacities are seen on CT.
   - Alveolar Lung Disease
     - *List four broad categories of acute alveolar lung disease (ALD).*
     - *List five broad categories of chronic ALD.*
     - Recognize a pattern of peripheral ALD on chest CT and give an appropriate differential diagnosis, including a single most likely diagnosis when supported by associated radiologic findings or clinical information.
   - Atelectasis, Airways and Obstructive Lung Disease
     - *Name the four types of bronchiectasis and identify each type on chest CT.*
     - *Name common causes of bronchiectasis.*
     - Recognize the typical appearance of cystic fibrosis on CT.
     - *Define tracheomegaly.*
     - Recognize tracheal and bronchial stenosis on chest CT and name the most common causes.
     - *Name the three types of pulmonary emphysema and identify each type on a chest CT.*
     - Recognize alpha-1-antitrypsin deficiency on chest CT.
     - State the imaging findings used to identify surgical candidates for giant bulectomyand for lung volume reduction surgery.
     - Recognize and describe the significance of a pattern of mosaic lung attenuation onchest CT.

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- Mediastinal Masses and Mediastinal/Hilar Lymph Node Enlargement
  - *State the anatomic boundaries of the anterior, middle, posterior and superior mediastinum.*
  - *Name the four most common causes of an anterior mediastinal mass and localize amass to the anterior mediastinum on a chest CT.*
  - *Name the three most common causes of a middle mediastinal mass and localize amass in the middle mediastinum on a chest CT.*
  - *Name the most common cause of a posterior mediastinal mass and localize a mass inthe posterior mediastinum on a chest CT.*
  - Name two causes of a mass that straddles the thoracic inlet and localize a mass tothe thoracic inlet on a chest CT.
  - Name five etiologies of bilateral hilar lymph node enlargement.
  - *State the three most common locations (Garland's triad) of thoracic lymph node enlargement in sarcoidosis.*
  - *List the four most common etiologies of 'egg-shell' calcified lymph nodes in the thorax.*
  - *Recognize a cystic mass in the mediastinum and suggest the possible diagnosis of a bronchogenic, pericardial, thymic or esophageal duplication cyst.*
  - Recognize the findings of mediastinal fibrosis on chest CT.
- Solitary and Multiple Pulmonary Nodules
  - *Define the terms pulmonary nodule and pulmonary mass.*
  - *Name the three most common causes of a solitary pulmonary nodule.*
  - *Name six causes of cavitary pulmonary nodules*
  - *Name four causes of multiple pulmonary nodules.*
  - Describe an appropriate imaging algorithm to evaluate a solitary pulmonary nodule.
  - Describe the indications for percutaneous biopsy for a solitary or multiple pulmonary nodules.
  - Describe the complications and the frequency with which complications occur because of percutaneous lung biopsy using CT guidance.
- Benign and Malignant Neoplasms of the Lung and Esophagus
  - *Name the four major histologic types of bronchogenic carcinoma.*
  - *Name the type of non-small cell lung cancer that most commonly cavitates.*
  - *Name the types of bronchogenic carcinoma that are usually central.*
  - Describe the TNM classification for staging non-small-cell lung cancer.
  - Describe the staging of small-cell lung cancer.
  - Name the most common extrathoracic sites of metastases for non-small-cell and small-cell lung cancer.
  - Name the stages of non-small-cell lung cancer that are portentially resectable.
  - Name the most common thoracic locations for adenoid cystic carcinoma and carcinoid tumors to occur.
  - Describe the TNM classification for staging esophageal carcinoma, the role of imagingin staging esophageal carcinoma and the stages of esophageal carcinoma that are potentially resectable.
  - Describe the classification of lymphoma, the role of imaging in staging of lymphomaand the typical and atypical imaging findings of thoracic lymphoma.
  - Define primary pulmonary lymphoma.
  - Describe the typical chest CT appearances of Kaposi sarcoma.

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- Chest Wall, Pleura and Diaphragm
  - *Recognize and name causes of a large unilateral pleural effusion on a chest CT*.
  - *Recognize a pleural based mass with bone destruction or infiltration of the chest wallon a chest CT and name likely causes.*
  - *Recognize pleural calcification on a chest CT and suggest the diagnosis of asbestos exposure (bilateral involvement) or old tuberculosis or trauma (unilateral involvement).*
  - *Recognize imaging findings suggesting a tension pneumothorax and understand theacute clinical implications.*
  - Recognize diffuse pleural thickening, as seen in fibrothorax, malignant mesotheliomaand pleural metastases.
  - Describe and recognize the CT findings of malignant mesothelioma.
  - *Describe the difference in appearance of a pulmonary abscess and empyema on chestCT and how the two are differently managed.*
  - *Distinguish pleural from intraperitoneal fluid on chest CT.*
- Infection and Immunity
  - *Name the most common segmental sites of involvement of postprimary tuberculosisin the lung*.
  - *Define a Ghon lesion (calcified pulmonary parenchymal granuloma) and Ranke complex (calcified node and Ghon lesion); recognize both on a chest CT and describetheir significance.*
  - Name and describe the types of pulmonary aspergillus disease.
  - Identify an intracavitary fungus ball on chest CT.
  - Describe the radiographic appearances of PCP and CMV pneumonia.
  - Other than bacterial infection, name two important infections and two important neoplasms to consider in patients with AIDS and chest CT abnormalities.
  - Name most important etiologies of hilar and mediastinal lymphadenopathy in patients with AIDS.
  - *Describe the chest CT appearance of a military pattern and provide a differential diagnosis.*
  - Describe the chest CT findings of posttransplant lymphoproliferative disorder.
- Unilateral Hyperlucent Hemithorax
  - Recognize a unilateral hyperlucent hemithorax on a chest CT.
- Pulmonary Vasculature.
  - Name the common causes of pulmonary arterial hypertension.
  - *Recognize lobar and segmental pulmonary emboli on chest CT.*
  - Recognize variations in pulmonary venous anatomy.
- Thoracic Aorta and Great Vessels
  - *Describe the classification of aortic dissection (DeBakey and Stanford) and implications for classification on medical vs. surgical management.*
  - *Describe and recognized the findings of, and distinguish between each of the following on CT:*
    1. *Aortic aneurysm*
    2. *Aortic dissection*
    3. *Aortic intramural hematoma*
    4. *Penetrating atherosclerotic ulcer*
    5. *Ulcerated plaque*

6. *Ruptured aoric aneurysm*
7. Sinus of Valsalva aneurysm
8. Subclavian or brachiocephalic artery aneurysm
9. Aortic coarctation
10. Aortic pseudocoarctation

- Recognize a right aortic arch and double aortic arch on a chest CT.
- State the significance of right aortic arch with mirror image branching vs. with an aberrant subclavian artery.
- Recognize a cervical aortic arch on a chest CT.
- *Recognize an aberrant subclavian artery on chest CT*
- Recognize normal variants of aortic arch branching.
- Define the term aneurysm and pseudoaneurysm.
- Identify and describe findings of Takayasu arteritis on chest CT.

- Pericardial Disease
  - *Recognize pericardial calcification on a chest CT and name the most common causes.*
  - *Name common causes of a pericardial effusion.*
  - Describe findings of each of the following on a chest CT: pericardial cyst, constrictive pericarditis, absence of the pericardium, pneumopericaridum.
- Postoperative thorax
  - Identify the normal postoperative findings and complications of the following procedures on chest CT:

1. Wedge resection, lobectomy, pneumonectomy
2. Coronary artery bypass graft surgery
3. Cardiac valve replacement
4. Aortic graft
5. Aortic stent
6. Transhiatal esophagectomy
7. Lung transplantation
8. Lung volume reduction surgery.

[Senior] At the end of the second Chest CT rotation, senior residents will be expected to functionin the capacity of a fellow/junior staff. Senior residents are expected to develop a more advancedapproach to interpretation of CT examinations, and be able to integrate clinical, laboratory data and the results of complementary imaging modalities in dealing with more complicated Cases.

c. Understands imaging protocols, including use of intravenous contrast
d. Detects findings
e. Interprets findings into an appropriate differential diagnosis
f. Ability to summarize case, offer recommendations, understands treatment and clinical implications

[Senior] Residents doing two months or more elective time in chest radiology in their final yearwill have the opportunity of doing lung biopsies. The goals and objectives for the optional CT guided intervention component are:

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- Demonstrates knowledge in performing CT guided intervention
- Demonstrates knowledge of the procedure: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care
- Demonstrates technical ability, including knowledge in patient positioning, sterile technique,use of local anesthetic, performing simple or more difficult procedures

Communicator

- Communicates effectively with patients, families and other health professionals
- Appropriate and timely communication of findings to referring physicians, including whenresults are urgent
- Obtains appropriate informed consent
- Accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and effectively interacts with the health care team, includingnurses and technologists
- Fulfills consultant role (for level of training)

Leader

- Manages daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training

[Junior] The resident (R2/3) in the First Chest CT rotation will be responsible for reviewing aminimum of 6 Chest CT's per day.

[Senior] The resident (R4/5) in the Second Chest CT rotation will be responsible for reviewing aminimum of 10 Chest CT's per day.

- Reports are dictated and signed in a timely manner

All reports have to be signed by the end of the working day they have been dictated.

Health Advocate

- Understands benefits and risks related to imaging studies
- Understands the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students and patients
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Attends weekly Thoracic Surgery Rounds (7-8 am every Tuesday), Multidisciplinary InterstitialLung Disease Rounds (8-9 am first and second Friday in the calendar month) and Radiologic- Clinical-Pathologic Rounds (1-2 pm every Friday from September to June)

Professional

- Exhibits professional behaviour, displaying honesty, integrity and respect
- Exhibits ethical behaviour, sensitivity to gender/culture diversity
- Demonstrates punctuality
- Demonstrates good work ethic, enthusiasm and motivation
- Demonstrates reliability, responsibility and conscientiousness
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for helpwhen

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appropriate
- Accepts constructive criticism

Reading List

Recommended Textbooks:

Thoracic Imaging Pulmonary and Cardiovascular Radiology. By W. Richard Webb and Charles B. Higgins.3rd Edition (2016).

Muller's Imaging of the Chest (Expert Radiology Series). By CM Walker and JH Chung. 2nd Edition (2018)

Fraser and Pare's Diagnosis Diagnosis of Diseases of the Chest. By NL Muller, R Fraser, N Colman and PD Pare (2001) and High-Resolution CT of the Lung. By W. Richard Webb, Nestor L. Muller and David P. Naidich are available as a reference in the reading room.

Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with StatDX and internet can provide many review articles (i.e. Radiographics).

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CT Goals & Objectives - SPH

Updated: September 20, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

The SPH radiology department current has 3 CT scanners. All 3 of the GE scanners have cardiac capability. The resident on the CT rotation at SPH can expect to share between 20-40 body and chest cases with the body imaging fellow on a daily basis. The case mix reflects the strengths of the hospital with a combination of in and out patient imaging.

Core Responsibilities and Expectations

Residents would be expected to reviewcases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

Junior Residents (R2-3, Foundation-Core) are expected to do between (R2/F) 10 and (R3/Core) 15 cases per day, and attempt to focus on ER and inpatient work (cases marked as urgent) to help with preparation for and comfort with oncall related pathologies.

R2/Foundation residents' focus should be on such cases with an attempt to see cases of

- Abdomen: acute appendicitis, acute diverticulitis, ischemic bowel, bowel perforation,intraabdominal abscess.
- Chest: aortic dissection, acute pulmonary emboli, and pulmonary infection.

Reading should be largely based on "fundamentals of body CT" (see below).

R3/Core residents would solidify knowledge of the above acute entities but also work on other acute as well as non-acute intraabdominal (solid organ lesion assessment, IBD followup, malignancy workup) and chest (interstitial lung disease, and lung nodule followup) pathologies.

R2/Foundation residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis prior to discussing the case with the staff radiologist.

R3/Core residents should do the same, but also be prepared to provide management plans and next steps based on imaging findings.

As a **Senior Resident (R4-5, Core-TTP)**, volumes should be 20+ scans per day (chest/abdo/pelvis counted as 2 exams). Focus should be to solidify search patterns, and provide concise and directive reports which

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demonstrate and understanding of next steps in the patient's management plan based on imaging findings and DDx.

Reading should focus on subspecialty texts and reading around cases. For senior residents,a learning plan which identifies areas of weakness to focus on prior to starting independent practice should be considered.

As a late R4-5 on this rotation, the expectation is that you would protocol the requisitions in the morning, asking questions of staff or fellows only as needed. You should be able to explain to a more junior colleague the reasoning for the protocol used, including its potential pitfalls.

Residents would be expected to reviewcases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

Tuesday morning chest rounds should be led by the resident on this rotation if a senior.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar abdominal and thoracic anatomy
- Understand CT physics, technical parameters of image acquisition and CT related artifacts andhow these factors contribute to diagnostic imaging with CT
- **[Junior]** Understand thoracic and abdominal CT protocols with regards to use of oral and/or IV contrast as well as scan delay timing and CT slice thickness and spacing. Be able to help CT technologists with protocol related questions.
- **[Senior]** Understand thoracic and abdominal CT protocols with regards to use of oral and/or IV contrast as well as scan delay timing and CT slice thickness and spacing. Be able to help CT technologists with protocol related questions. Be familiar with SPH institutional protocols and when to use them appropriately.
- Develop knowledge of thoracic and abdominal pathologies seen in clinical practice
- Develop the ability to accurately and rapidly detect pertinent findings on CT studies of the chestand abdomen
- Develop the ability to integrate findings to form a clinically useful differential diagnosis and offeran appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions

Communicator

- Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings. (Depending on the level of training this may wait until after review with the staff physician. For **senior** residents this should occur spontaneously.)
- Obtains informed consent for patients in an appropriate fashion
- Communicate effectively with patients, families and other health professionals

Collaborator

- Discussion of cases with healthcare teams, including nurses and technologists, applying the radiologic findings to help guide patient management. Fulfills training level appropriate

consultant role

- **[Senior]** Fulfills a consultant role: answers phone calls, prioritizing scans and coordinating withfront desk staff

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safety issues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies. Application of this knowledge to alter imaging protocols to limit risk when deemed necessary. Gain an understanding of the appropriate use of imaging studies and rationalization of use of imagingresources

Scholar

- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence-based fashion appropriate to the level of training
- Continued self-directed learning: reading around cases and topics, including teaching other residents and students.

Professional

- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiology and acceptance of constructive criticism/guidance to help improve areas of weakness
- Demonstration of satisfactory attendance, punctuality, work ethic, reliability expected of a radiology resident.

Reading List

1. Fundamentals of Diagnostic Radiology. Brant and Helms
2. Anatomy in Diagnostic Imaging. Fleckenstein
3. Fundamentals of Body CT. Brant
4. Primer of Diagnostic Imaging. Weissleder
5. Thoracic Imaging. Webb and Higgins
6. Imaging of the Chest. Muller and Silva
7. Diagnostic Imaging: Abdomen. Federle
8. Genitourinary Radiology: Zagoria
9. Online resources: STATDx and RadPrimer (via individual logins)
10. R2s (and 3s as needed): Dr. Hagues CT How to series and protocolling series on Entrada.

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General CT Rotation Goals & Objectives - UBCH

Updated: April 27, 2022
Reviewed by: Dr. A. Gordon
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Rotation Supervisor

- Dr. Gordon Andrews (gordon.andrews@vch.ca)

Introduction

The general CT rotation at UBCH accommodates R2-5 residents and residents are expected to develop graded responsibility as they rise from first to fourth year level. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Junior Residents (R2-3, Foundation-Core) are expected to do between (R2/F) 10 and (R3/Core) 15 cases per day, attempting to focus on ER and inpatient work (cases marked as urgent) to help with preparation for and comfort with on call related pathologies.

R2/Foundation residents' focus should be on such cases with an attempt to see cases of

- Abdomen: acute appendicitis, acute diverticulitis, ischemic bowel, bowel perforation, intraabdominal abscess.
- Chest: aortic dissection, acute pulmonary emboli, and pulmonary infection.

Reading should be largely based on "fundamentals of body CT" (see below).

R3/Core residents would solidify knowledge of the above acute entities but also work on other acute as well as non-acute intraabdominal (solid organ lesion assessment, IBD follow up, malignancy workup) and chest (interstitial lung disease, and lung nodule follow up) pathologies.

R2/Foundation residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis prior to discussing the case with the staff radiologist.

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R3/Core residents should do the same, but also be prepared to provide management plans and next steps based on imaging findings.

As a Senior Resident (R4-5, Core-TTP), volumes should be 20+ scans per day (chest/abdo/pelvis counted as 2 exams). Focus should be to solidify search patterns, as well as to provide concise and directive reports which demonstrate and understanding of next steps in the patient's management plan based on imaging findings and DDx. Senior residents will have the opportunity to learn about and report CT cardiac and CT colonography.

Reading should focus on subspecialty texts and reading around cases. For senior residents, a learning plan which identifies areas of weakness to focus on prior to starting independent practice should be considered.

As a late R4-5 on this rotation, the expectation is that you would protocol the requisitions in the morning, asking questions of staff or fellows only as needed. You should be able to explain to a more junior colleague the reasoning for the protocol used, including its potential pitfalls.

Residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

The CT resident will work closely with an array of staff and fellows rotating through UBCH, including MSK, Neuro, Abdomen, ER/trauma and IR. There are a myriad of teaching rounds provided to residents and other learners, however complicated in scheduling and often integrated between VGH and UBCH sites with remote access provided as needed. Typically teaching rounds occur at noon and are the responsibility of MSK/Neuro Monday, MSK Tuesday and Friday, Neuro Wednesday, and Abdomen Friday. The resident should speak with staff and fellows at the beginning of the rotation regarding additionally scheduled teaching rounds, thereby allowing the resident to fully experience and participate in all rounds. The resident should be prepared to present as well as to be called upon during all teaching rounds.

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately 1730 hours. Ongoing teaching and interaction with staff occurs throughout the day. If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Andrews in advance, at least two weeks prior to any planned absence from the rotation.

Residents are asked to submit two teaching files by the end of the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- To understand CT physics, technical imaging parameters and artifacts
- To understand imaging protocols, including use of iodinated IV contrast
- To learn cross sectional CT and multi-planar anatomy
- To acquire knowledge in clinical radiology and pathology
- To be able to detect findings and interpret the findings into an appropriate differential diagnosis

- To be able to summarize each case, offer recommendations, understand the treatment and clinical implications of each case

Communicator

- Be able to establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicate effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Manage the daily workflow in the department, including prioritization, protocoling and triage of cases, physician consultation and supervising of day-to-day operation
- Perform/interpret appropriate volume of case for level of training
- Dictate and sign reports in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Learn to allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understand the benefits and limitations/risks related to CT imaging.
- Understands the appropriate use of CT and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Submit two teaching files to the digital library.
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behavior
- Practice medicine ethically consistent with obligations of a physician
- Demonstrate insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Be accepting of constructive criticism

Reading List

Recommended Textbooks:

-Fundamentals of body CT. Webb, Brant, Major. Saunders

-Fundamentals of Diagnostic Radiology. Brant and Helms

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Community Rotation Goals & Objectives – LGH

Updated: September 20, 2021
Reviewed by: Dr. M. Madden
RPC Approval: TBD

Location: Lions Gate Hospital
231 E 15th Street, North Vancouver, B.C. V7L 2L7

Level/Stage

- R4, R5
- Core, Transition to Practice

Rotation Supervisor

- Dr. Mark Madden (mark.madden08@gmail.com)

Introduction

This is an elective rotation available to senior residents.

The overall goal of this rotation is to expose the residents to community-based radiology. Emphasis will be placed on procedures. With the possibility of fluoroscopy, plain film, ultrasound, CT/MRI, and office experience as the resident wishes. Economic factors in private practice can also be discussed.

Core Responsibilities and Expectations

Hospital procedures in particular will be made available to the resident and over the years, this has become most popular with the senior residents. Residents will be expected to arrive with a sense of humour and enthusiasm. Weekend and night call through the residency program will remain a responsibility to pre-existing resident schedules. No call, evening or weekend work is assigned through LGH.

Intervention cases will include but not limited to:

Simple: Breast, Thyroid, Liver biopsy (and Prostate if the resident wishes). Mammo guided FWL. Pleural and Abdominal Drainage. MSK intervention to include joint injections, barbatage, and prolotherapy. All Fluoro guided procedures to include MSK and spine (ie facet/nerve root blocks, epidurals)

Advanced: Angiography including angioplasty, Uterine fibroid embolization, Varicocele embolization,

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RFA renal and liver, CT guided biopsy and Drain, Port insertion, PICC lines, Pleurex insertion,

The residents at the end of the rotation are expected to function in the capacity of a fellow/junior staff.At the initiation of the rotation, the resident should identify areas of specific weakness and/or interest and the training will help address these issues. Senior residents are expected to check cases, to reviewcases with staff, to consult with referring physicians, to initiate appropriate intervention (under supervision), and to report examinations as appropriate.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of US, CT, MRI, plain film physics, artifacts and understanding imaging protocols
- Knowledge of multi-planar anatomy
- Knowledge of clinical radiology and pathology
- Detects findings and interprets findings into an appropriate differential diagnosis
- Ability to summarize case, offer recommendations, understands treatment and clinical implications
- Knowledge of the procedure: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care. This in particular will be emphasized.
- Basic technical ability: patient positioning, sterile technique, local anaesthetic
- Advanced technical ability: ability to perform more difficult procedures

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicates effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians
- Able to obtain appropriate informed consent for US guided procedures
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, includingnurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Manages daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training
- Reports are dictated and signed in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understands benefits and limitations/risks related to intervention
- Understands the appropriate use of intervention and rationalization of use of imaging resources

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Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviours
- Practice medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Acceptance of constructive criticism

Reading List

Recommended Textbooks: Any of the core textbooks and Intervention textbooks.

Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with Stat DX and the internet can provide many review articles (eg. Radiographics).

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Community Rotation Goals & Objectives - RCH

Updated: November 26, 2021
Reviewed by: Dr. R. Chiu
RPC Approval: TBD

Location: Royal Columbian Hospital
330 E. Columbia Street, New Westminster BC, V3L 3W7

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

Royal Columbian Hospital is located in New Westminster and serves as the tertiary care hospital for the Fraser Health Authority, the largest Health Region in the province with a population of over 1.6 million. The hospital is a trauma centre and is fully represented by specialties including emergency medicine, orthopaedics, pediatrics, cardiac services, OB/GYN, vascular surgery, GI/general surgery and neurosciences. The hospital has over 400 acute beds including ICU, CCU, and SCN wards plus has one of the busiest emergency and labour/delivery departments. The Royal Columbian Hospital Radiology Department also supplies imaging services to the Fraser Valley Centre of the BC Cancer Agency.

The Royal Columbian Hospital radiologists provide services to Eagle Ridge Hospital in Port Moody and a private office in Coquitlam. Eagle Ridge Hospital is a community hospital offering primary and secondary services to Port Moody, Coquitlam and Port Coquitlam. It has 90 acute and 75 long term care beds with a busy emergency department and is an orthopaedic and ENT site for the region. The private office, MedRayImaging, is an outpatient imaging facility located centrally in Coquitlam adjacent to Coquitlam Centre.

At RCH, there are two multi-detector CT scanners. A great variety of CT studies are performed daily including CT brain perfusion, coronary CT, CT colonography, and CTA. The two MRI units are 1.5T with the capability of performing a large volume of MRA, breast, cardiac and abdominal studies in addition to neuroradiology and MSK cases. The ultrasound department is active in obstetrical scanning, and neonatal head scanning and ultrasound-guided interventions are also performed. The angio/interventional department has a state-of-the-art Philips angiography machine with 3D rotational capability and Flat Panel technology. A second room has a Philips multipurpose unit. A large range of angiographic and non-vascular diagnostic and interventional procedures are performed daily at RCH. A comprehensive breast diagnostic and interventional imaging department also operates at RCH.

Eagle Ridge Hospital currently offers fluoroscopy, CT, ultrasound and CR. The private office performs digital radiography, ultrasound, bone densitometry, diagnostic and screening mammography as well as private MRI.

Both Royal Columbian and Eagle Ridge Hospitals use GE Centricity PACS, which is linked to all sites in the Fraser Health Authority.

There are 21 full time radiologists with various fellowship training and/or subspecialty experience such as MRI, cardiac/chest imaging, abdominal imaging, breast imaging, vascular/interventional radiology, pediatrics, and neuroradiology.

Core Responsibilities and Expectations

The resident will be based primarily at Royal Columbian Hospital. The resident is not expected to take call and will be excused early should he/she have to take call at the teaching hospitals. The resident willalso be excused on post-call days and for any resident rounds/functions.

At Royal Columbian Hospital, the resident will rotate through the various areas of the department. The resident is encouraged to participate fully during the rotation. The exact structure of the rotation can bevaried to accommodate the resident's wishes. The amount of hands-on experience such as angiography, body/breast/spine interventional procedures, will depend on the comfort level of the resident and supervisor.

While at RCH, there are radiology rounds every Wednesday at noon (interesting/teaching cases, M&M). The resident should also participate at various monthly rounds including ultrasound, breast, G.I./GeneralSurgery, and neurosciences.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Demonstrate diagnostic and therapeutic skills for ethical and effective patient care
- Access and apply relevant information to clinical practice
- Demonstrate effective consultation services with respect to patient care, education and legal opinions

Communicator

- Establish therapeutic relationships with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Discuss appropriate information with patients/families and the health care team
- Relay important findings to clinicians in a timely manner

Collaborator

- Consult effectively with other physicians and health care professionals
- Contribute effectively to other interdisciplinary team activities

Manager

- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Identify the important determinants of health affecting patients
- Contribute effectively to improved health of patients and communities

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- Recognize and respond to those issues where advocacy is appropriate

Scholar

- Develop, implement and monitor a personal continuing education strategy
- Critically appraise sources of medical information
- Facilitate learning of patients, house staff/students and other health professionals
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviours
- Practice medicine ethically consistent with obligations of a physician

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Community Rotation Goals & Objectives - SMH & JPOC

Updated: September, 2021
Reviewed by: E. Strovski
RPC Approval: TBD

Location: Surrey Memorial Hospital and Jim Pattison Outpatient Care and Surgery Center

Level/Stage

- R4, R5 (R5 Preferred)
- Core, Transition to Practice

Rotation Supervisor

- Dr. Jun Wang (junwang.ubc@gmail.com)

Introduction

Surrey Memorial Hospital (SMH) is the largest acute care site in the Fraser Health region with over 650 acute care beds and the busiest Emergency Department in the entire province. Surrey Memorial Hospital currently provides a full range of primary and secondary level hospital services to the community of Surrey and the wider Fraser South area. In addition, the hospital provides selected tertiary-level services to the entire Fraser Health region.

The Surrey Memorial Hospital Radiologists provide services to the adjacent Jim Pattison Outpatient Care and Surgery Center (JPOC) which offers a full range of scheduled outpatient services, including day surgery, diagnostic services and specialized health clinics

The aim of this rotation is to expose residents to community based radiology in both hospital and outpatient settings. The resident will rotate through various rotations at both SMH and JPOC but emphasis will be placed on interventional procedures typically encountered in a community setting.

Core Responsibilities and Expectations

Cases will include but not limited to:

- **Ultrasound guided procedures:** Breast biopsies and FWL, thyroid, liver, renal and prostatebiopsies. Pleural and abdominal drainages.
- **Fluoro guided procedures**: Joint injections, Lumbar punctures
- **CT**: CT guided lung biopsies and drainages
- **Angiography/interventional radiology**: Fistuloplasty, Perm Cath and tunneled catheter insertion, Percutaneous nephrostomy, transhepatic cholangiogram, interventional

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oncology,

peripheral vascular disease, endovascular treatment of venous thromboembolism, vertebroplasty, nerve root blocks, facet blocks, epidural injections.

- Plain films, CT, US and MRI cases will also be made available to the residents

Residents are not expected to take call and will be excused early for resident teaching rounds, functionsor pre-scheduled call at the teaching hospitals

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Demonstrate knowledge of procedures in regards to indications, complications appropriate alternatives, use of conscious sedation and post procedural care
- Basic technical ability such as patient positioning, sterile technique and local anaesthetic
- Ability to perform procedures in a safe, efficient and efficacious manner
- Detects and interprets findings, formulating appropriate differential diagnosis
- Ability to summarize case findings and offer appropriate recommendation and management

Communicator

- Establish therapeutic relationship with patients and families
- Obtain and synthesize relevant history from patients, families or referring physicians
- Listen effectively
- Discuss appropriate information with patients and families and the health care team
- Relay important findings to clinicians in a timely manner

Collaborator

- Working efficiently with other health professionals including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Performs/interpret appropriate volume of cases for level of training
- Prioritizing and triaging of interventional cases
- Utilizing/allocating finite resources effectively
- Utilize information technology to optimize patient care, lifelong learning and other activities

Health Advocate

- Identify the important determinants of health affecting patients
- Contribute effectively to improved health of patients and communities
- Recognize and respond to those issues where advocacy is appropriate

Scholar

- Facilitates learning of patients and other health professionals
- Demonstrates continuous self-directed learning and evidenced based approach medicine withcritical appraisal of radiology literature
- Develop implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion,
- Exhibit appropriate personal and interpersonal professional behaviour
- Practice medicine ethically consistent with obligations of a physician

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Junior Consultant Rotation (Transition to Practice) Goals & Objectives- SPH

Updated: November 1, 2019
Reviewed by: C. Hague
RPC Approval: TBD

Level/Stage: R5 / Transition to Practice

Introduction

St. Paul's Hospital is a 600 bed tertiary care hospital and the only hospital in downtown Vancouver. Major programs in the hospital include cardiovascular, gastrointestinal, chest services, renal and infectious disease. St. Paul's Hospital is the major center in Western Canada for the treatment of HIV patients. A busy obstetric unit is also part of the care delivered by SPH, with over 2,000 deliveries annually.

This is a senior resident rotation. With the overall goal of helping develop the ability to function as a junior staff radiologist. An emphasis is placed on independent practice and more advanced rolls such ashelping prepare for multidisciplinary conferences.

Residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

The general goals of this rotation are to allow senior residents to work in a transition to practice setting outside of overnight call. This rotation will allow senior residents to focus on areas of deficiency in personally defined practice areas, and also allow the ability to work on produce a volume of reports expected of academic and community radiologists. Primarily this rotation is to be utilized to focus on accurate and rapid reporting of plain films.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar abdominal and thoracic anatomy
- Understand CT, US, MR and xray physics, technical parameters of image acquisition.
- Understand head and neck, thoracic, abdominal and MSK imaging protocols for US, CT and MRI.
- Consolidate knowledge of common pathologies seen in clinical practice
- Develop the ability to accurately and rapidly detect pertinent findings on various imaging modalities.
- Develop the ability to integrate findings to form a clinically useful differential diagnosis and offeran appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions.

Communicator

- Residents are responsible for dictation of accurate, concise and useful reports. Most reportswould be dictated independently, but an important part of this rotation is demonstrating ofwhen to ask for help with regards to specific imaging findings, management decisions or protocoling questions.
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings.

- Obtains informed consent for patients in an appropriate fashion
- Communicate effectively with patients, families and other health professionals

Collaborator

- Discussion of cases with healthcare teams, including nurses and technologists, applying the radiologic findings to help guide patient management. Fulfills a consultant role, recommendingappropriate further imaging or other testing in concordance with Canadian and international guidelines.
- Helps prepare and present cases as part of multidisciplinary conferences (neuro, GI, rectal staging, and chest imaging)

Manager

- The volume of cases interpreted per day is in keeping with the level of training.
- Reports are dictated, accurately edited and signed off in an expedient fashion
- Develop ability to manage daily workflow in the department, including prioritization, protocolingand triage of cases, physician consultation and supervising of day-to-day operation

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies.
- Application of this knowledge to alter imaging protocols to limit risk when deemed necessary.
- Gain an understanding of the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence based fashion appropriate to the level of training
- Continued self-directed learning: reading around cases and topics, including teaching other residents and students.

Professional

- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiology and acceptance of constructive criticism/guidance to help improve areas of weakness
- Demonstration of satisfactory attendance, punctuality, work ethic, reliability expected of a radiology resident.

Reading List:

1. Fundamentals of Diagnostic Radiology. Brant and Helms
2. Anatomy in Diagnostic Imaging. Fleckenstein
3. Fundamentals of Body CT. Brant
4. Primer of Diagnostic Imaging. Weissleder
5. Thoracic Imaging. Webb and Higgins
6. Imaging of the Chest. Muller and Silva
7. Diagnostic Imaging: Abdomen. Federle
8. Genitourinary Radiology: Zagoria

DEPARTMENT OF RADIOLOGY
THE UNIVERSITY OF BRITISH COLUMBIA

Diagnostic Radiology Residency Program
Gordon & Leslie Diamond Health Care Centre
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Mammo/Breast Imaging Rotation Goals & Objectives - BCCA

Updated: August 13, 2021
Reviewed by: Dr. T. Martin
RPC Approval: TBD

Level: R2-5

Introduction

The Breast Imaging division at the BC Cancer serves multiple key roles in women's health. It is an active component of a multidisciplinary management and follow-up of current BC Cancer patients. The department also acts as a tertiary referral center for review of outside studies, breast biopsies and fine wire localization (FWL) prior to OR. The group is a member of the BC Cancer Breast Screening Program, as well as a major referral center for screening breast MRI for women at high risk for breast malignancy. This diverse involvement will offer the resident well-rounded exposure to breast imaging, with particularvalue in various procedures and breast MRI.

Residents will receive an orientation organized by the rotation supervisor or department secretary on the first day of the block. He or she should meet with Dr. Tanya Martin for any clarification of rotation objectives or expectations. An informal interim evaluation and the end of rotation ITER will be scheduledat this time. Residents are encouraged to discuss any particular interests or requests pertaining to breastimaging with Dr. Tanya Martin or any of the breast radiologists.

Expectations for exam volume (by week)

1. Mammography: 30-50
2. Ultrasound: 10-20
3. Interventional procedures: 10 – 15
4. MR: 2 – 10 (PGY level dependent)
5. Screening mammography: 1 – 2 sessions UBC Diagnostic Radiology Rotation-Specific Objectives

Reading List:

1. BI-RADS – Breast Imaging Atlas – ACR 4th or 5th edition
2. Breast Imaging – the Core Curriculum Series by Gilda Cardenosa
3. Breast MRI: Diagnosis and Intervention by Elizabeth Morris and Laura Lieberman
4. Current relevant publications

Screening mammography day – discuss with Dr. Tanya Martin at the beginning of the rotation

- At beginning of week, choose a screening day
- Pre-read exams
- Review pre-read cases with the attending radiologist

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Daily Responsibilities

Junior Residents (R2-3):

- Review and dictate all mammograms and US studies
- Perform as many procedures as possible
- In CERNER check BCC VA US and BCC VA MG for patients lists
- Remind mammo and US technologists in morning that you are on and where to find you
- Technologists present all cases to the resident first
- Resident to scan US patients
- If uncertain, review the case with the responsible radiologist prior to letting the patient go
- Review all reported studies with the radiologist
- Observe mammography technique with mammo technologists at the beginning of the rotation

Senior Residents (R4-5):

- Review and dictate breast MRI
- Review and dictate all mammograms and US studies
- Perform as many procedures as possible
- In CERNER check BCC VA US, BCC VA MG and BCC VA MR for patients lists
- Remind mammo and US technologists in morning that you are on and where to find you
- Technologists present all cases to the resident first
- Resident to scan US patients
- If uncertain, review the case with the responsible radiologist prior to letting the patient go
- Review all reported studies with the radiologist

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

To familiarize with the classification of neoplastic disease of the breast

- Including precursor lesions (DIN), in situ and invasive carcinomas
- Recognize and describe their imaging features on mammography, ultrasound and MR
- To participate in tertiary center breast imaging consultation and breast procedures in order to:
    - Develop approach to investigation of microcalcifications, asymmetry, architectural distortionand masses
    - Develop skills in stereotactic, tomosynthesis, US-guided and MR-guided biopsy, as well as fine-wire localization utilizing various modalities
    - To gain familiarity with screening mammography
    - To gain basic understanding of management of breast neoplasia
    - Medical, radiation and surgical oncology role in management of breast cancer
    - Recognize and describe the post-treatment imaging findings

Communicator

- To demonstrate effective interaction with patients, including empathy and clarity

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- To obtain informed consent effectively
- To provide accurate, concise, complete and timely findings through verbal and written reports
- UBC Diagnostic Radiology Rotation-Specific Objectives

Collaborator

- To appreciate the multidisciplinary approach to breast cancer management, and the role of diagnostic imaging within it
- Attendance/participation at weekly Breast Radiology -Pathology conferences (every Wednesday12-1pm) and multidisciplinary Breast Rounds (Friday 12-1pm) is encouraged
- To provide consultation to referring physicians, appropriate to level of training
- To respectfully interact with technologists, administrative and clerical staff, and other physicians

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safetyissues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- To gain understanding of the epidemiology of breast cancer, including genetic risk factors
- To gain understanding of the organization of the BC Cancer Breast Screening Program

Scholar

- To facilitate one's learning through appropriate use of resources, including staff, texts and online sources
- To critically appraise and utilize current literature where appropriate
- Contribute 2 interesting cases to the teaching file (PowerPoint format)

Professional

- To provide ethical care with compassion
- To accept responsibility to self, including one's education
- To accept and utilize constructive criticism
- To demonstrate satisfactory attendance, punctuality, sound work ethic, and initiative
- To recognize and respect own limitations, and seek assistance appropriately

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Mammo/Breast Imaging and Intervention Rotation Goals & Objectives - MSJ

Updated: Sept 20, 2021
Reviewed by: Dr. R. Dionello
RPC Approval: TBD

Location: Mount St. Joseph Hospital
3080 Prince Edward St, Vancouver, BC V5T 3N4

Rotation Supervisor

- Dr. Roberta Dionello (rdionello@gmail.com)
- Other instructors: Drs. Yvette Cheong, Amie Padilla-Thornton, Jessica Farrell and Aileen Rankin.

Level/Stage: R4, R5 / Core, Transition to Practice

Introduction

To provide a broad clinical experience in breast imaging, focusing on diagnostic mammography and breast ultrasound in the context of symptomatic patients and those with screen detected abnormalities, as well as in the performance of procedures such as ultrasound guided biopsies with and without clip placement, fine needle aspirations, and fine wire localizations.

Core Responsibilities and Expectations

The day runs from 8am to 5pm. You will work closely with the radiologist on breast that day, on yourown workstation but in the same office as the staff radiologist.

Procedural responsibilities: the clerks provide us with the patient folders for all patients to have fine wire localisation (FWL) about a week in advance. You should review the file so that on the morning ofthe procedure you know which modality and what lesion(s) you are targeting. There are usually 2-5 FWLs per day, 2-3 days per week. On such days our diagnostic volumes are lower.

Biopsies of breast lesions are pre-booked in morning (on non-FWL days) and afternoon slots. There are usually 3-5 biopsies to be performed per day. You are welcome to review these cases in advance by looking on Cerner (Powerchart > Ambulatory Organizer) to see what is booked for upcoming days.

Sometimes a biopsy or breast abscess aspiration will be added on during the work day.

Diagnostic imaging responsibilities: Serve as the first point person for technologists in working up of breast patients by deciding whether more mammographic images are needed, whether an ultrasound isneeded, and whether a biopsy is required. There are between 12 – 20 diagnostic cases per day. You are responsible for reporting breast cases, and encouraged to use the reporting templates that we all use (ask us which are particularly useful in your first few days). Please remember that all reports must have a "RECOMMENDATION SUMMARY" with at least one of four tags (see "BREAST IMAGING MACROS FOR MI REPORTS" document emailed to you at the start of your rotation). The clerks search each day's reports for the tags requiring imaging/biopsy/referral recommendations.

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Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Demonstrate understanding of what imaging is required for patients with an abnormal screening mammogram
- Demonstrate understanding of what imaging is required for patients with clinical symptoms
- Understand and effectively use BIRADS in interpreting breast imaging studies (mammographyand ultrasound)
- Understand the limitations of mammography, ultrasound, and MR breast imaging
- Make appropriate recommendations for biopsy and aspirations of breast and axillary lesions
- Recognize procedural indications, complications, appropriate alternatives
- Understand post procedural care
- Demonstrate skill in performing ultrasound guided breast biopsies and clip placement and finewire localization: patient positioning, sterile technique, local anesthetic administration, choiceof devices

Communicator

- Obtain and synthesize relevant history from patients
- Be present during interactions with patient
- Discuss recommendations for appropriate follow-up with patients
- Effectively discuss findings, impression, and recommendations
- Generate concise and accurate radiology reports
- Communicate with emergency physicians, family physicians, and surgeons, when necessary, toensure appropriate care

Collaborator

- Interact effectively with technologists in the diagnostic work-up of breast patients
- Attend and contribute to breast multidisciplinary round discussions with breast surgeons and pathologists (on hold at present)

Manager

- Participate in discussions of quality assurance
- Consider ways to optimize patient care while allocating finite healthcare resources appropriately

Health Advocate

- Understand the benefits, limitations, and harms of screening mammography
- Be aware of the provincial guidelines for screening
- Be able to explain screening recommendations to a patient
- Understand the rationale for diagnostic mammography, ultrasound, and MR in the investigationof breast abnormalities, to make best use of public resources.

Scholar

- Effectively teach other medical personnel (technologists, medical students, etc)

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviour
- Practice medicine ethically consistent with obligations of a physician
- Demonstrate insight with regards to own limitations, strength and weaknesses
- Ask for help when appropriate
- Be accepting of constructive criticism

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MRI Rotation Goals & Objectives - SPH

Updated: September 17, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

The SPH radiology department current has 2 1.5 T GE MR scanners. Cases are a mixture of neuro, MSK, body and cardiac. Cardiac and MSK are separate rotations at SPH, thus the majority of the cases reviewed by residents on the MRI rotation are neuro or body.

Body MRI at SPH consists of 7-8 cases per day with varied exams to review. Liver, pelvic, renal as well as MR enterography, rectal cancer staging and perianal fistula cases are all commonly performed at SPH.

Neuro MRI at SPH has a heavier case load of 20-40 cases per day, with varied indications including both spinal and head imaging.

Core Responsibilities and Expectations

Residents are expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

Junior Residents (R2-3, Foundation-Core) are expected to focus on body MRI cases, with expected volumes of 10 cases per day. As a R2 on this rotation it is likely your first introduction to MRI. Focus on understanding basic pulse sequences is important, as is establishment of a search patterns for common abdo/pelvic exams: Liver, Renal, MRCP, Enterography, Female pelvis, rectal cancer staging/restaging, perianal fistula. As a R3 goals will be to reinforce concepts above, and to increase volume of cases reviewed.

Neuro MRI cases can be reviewed as time permits, but focus should remain on body MRI, as other rotations will also cover neuro imaging in more detail.

Senior Residents (R4-5, Core-TTP) are expected to focus on Body MRI. You should be reinforcing concepts learned earlier in residency: establishing functional search patterns and reporting templatesyou can bring with you into practice. Additionally, emphasis is placed on you filling in areas of weakness with body MRI that you have identified.

You should be reporting 10-20 cases per day. Integrating body fellows into your readouts will help to maximize the total case volume you will see.

If volumes are lower, please review neuro MRI cases as a R4. For R5s if volumes are low suggest helping with plain films or reporting in areas that you feeling further training would be most beneficial.

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Specific goals and objectives that relate to the CanMEDS roles are as follows:

*(Senior-specific objectives are identified at the front of the list item in brackets as "**[Senior]**".)*

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar anatomy
- Gain an understanding of MRI physics, technical parameters of image acquisition and MR related artifacts and how these factors contribute to diagnostic imaging with MR. Residents areencouraged to spend time with the excellent group of MR technologists at SPH to gain practicalknowledge of MR.
- Understand neuro and body MR protocols with regards to use of varied gadolinium agents, aswell as varied scan parameters. Be able to help MR technologists with protocol related questions, appropriate to level of training.
- Develop knowledge of neurologic and abdominal pathologies seen in clinical practice with MR.
- Develop the ability to accurately and rapidly detect pertinent findings on MR studies of the CNSand abdomen.
- Develop the ability to integrate findings to form a clinically useful differential diagnosis and offeran appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions.
- **[Senior]** Accurate and complete reporting with limited help from staff for focal liver lesion assessment, perianal fistula cases, ovarian characterization, MRCP, enterography and renal masses
- **[Senior]** Be able to use templated reports for rectal cancer staging/restaging.

Communicator

- Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist.
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings. (Depending on the level of training this may wait until after review with the staff physician.)
- Obtains informed consent for patients in an appropriate fashion
- Communicate effectively with patients, families and other health professionals.

Collaborator

- Discussion of cases with clinical teams, applying the radiologic findings to help guide patient management
- Coordinate read-out of MR body cases with the body fellow in room 11. Body MR is a growingfield, but the number of cases remains comparatively small. We would like to ensure the residents and fellows gain as much exposure as possible.
- Fulfills a consultant role (for level of training)
- Gain respect, and recognition of the roles of, and effectively interacts with the healthcare team, including nurses and technologists
- **[Senior]** Attendance at rectal cancer MDD (Friday at 7am) is recommended.

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safety issues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies. Application ofthis knowledge to alter imaging protocols to limit risk when deemed necessary

Scholar

- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence-based fashion appropriate to the levelof training
- Continued self-directed learning: reading around cases and topics, including teaching fellow residents and other students

Professional

- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiology and acceptance of constructive criticism/guidance to help improve areas of weakness
- Demonstration of ethical behaviour, satisfactory attendance, punctuality, level of responsibilityand reliability expected of a radiology resident

Reading List

1. MRI: The Basics. Hashemi (MRI physics text)
2. Fundamentals of Diagnostic Radiology. Brant and Helms
3. Primer of Diagnostic Imaging. Weissleder
4. Neuroradiology: The Requisites. Grossman and Yousem

5. Diagnostic Imaging Series: Neuro. Osborn
6. DI Series: Head and Neck. Harnsberger
7. Fundamentals of Body MRI. Roth (2016)
8. Abdominal-Pelvic MRI 4th edition. Semelka (2016)
9. Additional online resources: STATDx and RadPrimer (via individual login)
10. Dr. Hague's How to MR lectures on Entrada: Liver, female pelvis, and rectal MR
11. **[Senior]** Society of Abdominal Radiology: Rectal cancer staging templates and review

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General MRI Rotation Goals & Objectives - UBCH

Updated: April 27, 2022
Reviewed by: Dr. A. Gordon
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Rotation Supervisor

- Dr. Gordon Andrews (gordon.andrews@vch.ca)

Introduction

The general MRI rotation at UBCH accommodates R2-5 residents and residents are expected to develop graded responsibility as they rise from first to fourth year level. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Junior Residents (R2-3, Foundation-Core) are expected to do between (R2/F) 10 and (R3/Core) 15 cases per day, attempting to focus on the standard MRI studies performed at UBCH, for example knee/hip/shoulder joint derangement, MS and dementia work-up, spine imaging, as well as uterine fibroid and solid abdominal tumour assessment.

Reading should be largely based on the fundamentals of MRI and the development of elementary MRI diagnostic skills

R3/Core residents would solidify knowledge of the standard MRI studies listed above, as well as start to explore imaging of less typical body parts and non-standard indications.

R2/Foundation residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis prior to discussing the case with the staff radiologist.

R3/Core residents should do the same, but also be prepared to provide management plans and next steps based on imaging findings.

As a Senior Resident (R4-5, Core-TTP), volumes should be 15-20 scans per day. Focus should be to solidify search patterns, as well as to provide concise and directive reports which demonstrate and understanding of next steps in the patient's management plan based on imaging findings and DDx.

Reading should focus on subspecialty texts and reading around cases. For senior residents, a learning plan which identifies areas of weakness to focus on prior to starting independent practice should be considered.

As a late R4-5 on this rotation, the expectation is that you would protocol the requisitions in the morning, asking questions of staff or fellows only as needed. You should be able to explain to a more junior colleague the reasoning for the protocol used, including its potential pitfalls.

Residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis and management plan prior to discussing the case with the staff radiologist.

The MRI residents will work closely with an array of staff and fellows rotating through UBCH, including MSK, Neuro, Abdomen, ER/trauma and IR. There are a myriad of teaching rounds provided to residents and other learners, however complicated in scheduling and often integrated between VGH and UBCH sites with remote access provided as needed. Typically noon teaching rounds occur are the responsibility of MSK/Neuro Monday, MSK Tuesday and Friday, Neuro Wednesday, and Abdomen Friday. The resident should speak with staff and fellows at the beginning of the rotation regarding additionally scheduled teaching rounds that take place early and late in the workday, thereby allowing the resident to fully experience and participate in all rounds. The resident should be prepared to present as well as to be called upon during all teaching rounds.

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately 1730 hours. Ongoing teaching and interaction with staff occurs throughout the day. If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Andrews in advance, at least two weeks prior to any planned absence from the rotation.

Residents are asked to submit two teaching files by the end of the rotation.

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately 1730 hours. Ongoing teaching and interaction with staff occurs throughout the day. If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Andrews in advance, at least two weeks prior to any planned absence from the rotation.

Residents are asked to submit two teaching files by the end of the rotation.

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Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- To acquire knowledge in MR physics including:
  - understanding and being able to apply basic MR physics principles of spin echo, gradient echo (in and out of phase, 2D and 3D) and DWI sequences
  - understand factors affecting signal-to-noise ratio, spatial resolution and imaging time
  - recognize common MRI artifacts and be able to reduce (or eliminate) them
  - understand ancillary techniques such as fat suppression, spoiler gradients, saturation bands, and flow compensation
- To learn about MR safety, including:
  - risks of contrast administration
  - knowledge of screening/contraindications, foreign implanted bodies
- To know the cross sectional MR and multi-planar anatomy
- To acquire knowledge in clinical radiology and pathology
- To be able to detects findings and interpret the findings into an appropriate differential diagnosis
- To be able to summarize cases, offer recommendations, and understand treatment and clinical implications of each case.

Communicator

- Be able to establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicate effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Perform/interpret appropriate volume of case for level of training
- Dictate and sign reports in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Learn to allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understand the benefits and limitations/risks related to MR imaging and respective contrast agents.
- Understands the appropriate use of MR and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Submit two teaching files to the digital library.
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviors
- Practice medicine ethically consistent with obligations of a physician

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- Demonstrate insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Be accepting of constructive criticism

Reading List

Recommended Textbooks:

MRI in Orthopedics and Sports Medicine. Stoller

Diagnostic Neuroradiology. Osborn

The Physics of Clinical MRI Taught Through Images. Runge

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Musculoskeletal Rotation Goals & Objectives – VGH

Updated: November 4, 2021
Reviewed by: Drs. H. Ouellette and P. Mallinson
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

Welcome to the VGH MSK rotation. The bone radiology rotation at VGH is designed to serve two purposes. For junior residents, this rotation serves as an introduction to bone radiology. For third- and fourth-year residents, this rotation provides in-depth experience in bone CT, bone MRI, musculoskeletal interventional procedures, as well as a re-exposure to a wide variety of plain radiographic examinations of the musculoskeletal system. The opportunity to observe complex MSK procedures such as thermoablation and cementoplasty is entirely optional but available on request.

Additional MSK staff and fellow rotations take place at UBC, participation in these will form part of the resident UBC CT and MRI rotations.

Residents are required to submit two teaching files by the end of the rotation

Core Responsibilities and Expectations

Junior-specific and senior-specific responsibilities and expectations are identified alongside the pertaining CanMEDS objectives below. It is tagged in the front as "**[Junior]**" or "**[Senior]**". Junioris R2&3, Senior is R4&5

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

[Junior] For junior residents, this rotation provides an introduction to musculoskeletal plain films and basic fluoroscopic procedures (such as knee aspirations, hip aspirations, shoulder and hip arthrograms, diagnostic blocks, and steroid injections), as well as providing exposure to more advanced topics such as bone CT, bone MRI and tumor biopsy. The option to observe advanced interventional procedures such as radiofrequency ablation

and vertebroplasty is available on request, but this is not core knowledge and priority should begiven to basic diagnostic and procedural skills at this stage.

[Senior] In-depth exposure to bone CT, bone MRI and basic bone interventional procedures in order to achieve RCPSC core competency for independent practice. The option to observeadvanced interventional procedures such as thermal ablation and bone augmentation vertebroplasty is available on request.

[Junior and Senior] Participate in review and dictation of the radiographs from orthopaedicreconstructive, orthopaedic trauma, rheumatology and all other inpatient and outpatient MSK radiographs on a regular basis. Aim to report a variety of body parts and pathologies.

[Senior] Involvement in the CT-guided biopsy procedures, including tumor biopsies, diagnostic blocks, joint aspirations, and drainages. Surgical guidance is key for safe biopsyand all cases should be discussed with the MSK Radiology fellow or MSK staff and be performed via an approach specified by an orthopaedic oncologist (such as Dr. Paul Clarkson).

[Junior and Senior] Observing and performing basic fluoroscopic joint aspirations andinjections (as needed).

[Junior and Senior] Daily check with MSK fellows or the relevant booking desk regardingany arthrograms or other procedures to be performed.

- Demonstrate diagnostic and therapeutic skills for ethical and effective patient care
- Access and apply relevant information to clinical practice (including review of patient charts, records on CareConnect including prior imaging, Labs and online documents suchas clinic letters)
- Demonstrate effective consultation services with respect to patient care, education andlegal opinions

Communicator

[Junior and Senior] Review and dictation of orthopaedic ward, trauma and musculoskeletaloutpatient films.

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Discuss appropriate information with patients/families and the health care team
- In the setting of MSK Radiology training, this can take the form of pre-procedure historytaking, informed patient consent and advice relating to basic procedures. Involvement in consults with Clinical teams and services is encouraged, but always seek help fromfellows or staff when unsure.

Collaborator

[Junior and Senior] Review and dictation of bone CT and bone MRI examination on a dailybasis in conjunction with the MSK fellows. Attend all readouts.

[Senior] Resident may spend one afternoon reviewing bone densitometry with Dr Munk(optional).

- Consult effectively with other physicians and health care professionals
    - Involvement in consultations with clinical colleagues regarding cases is encouraged with appropriate support from Fellows and Staff. If ever in doubt,always ask.
- Contribute effectively to other interdisciplinary team activities
    - This includes rounds, research and teaching.

Manager

- Utilize resources effectively to balance patient care, learning needs, and outsideactivities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and otheractivities

Health Advocate

- Identify the important determinants of health affecting patients
- Contribute effectively to improved health of patients and communities
- Recognize and respond to those issues where advocacy is appropriateScholar

[Junior] Participate in review of bone CT cases and bone MRI cases. For a first rotation,focusing on the most commonly imaged joints such shoulder, hip and knee and ankle isrecommended.

[Junior] Complete review of the musculoskeletal section of the ACR teaching files.

[Junior] Read a basic bone radiology textbook (currently we recommend Helms,Fundamentals of Skeletal Radiology, Second Edition).

[Senior] Self-study regarding bone CT and MRI. This should include review of a relevant textbook and/or online resource (we currently recommend Chan, Lang and Genant 'MRI of

the Musculoskeletal System'. Useful articles can be found online on resources such asRadipaedia , radsource and /Stat dx.

[Senior] Participate in all Noon rounds.

[Junior and Senior] Attend weekly Bone Tumor Rounds (8:00-9:30 AM) every Monday atBCCA.

[Junior and Senior] Attend MIPPR rounds (**this is optional** – for those with interest in advanced MSK procedures) (8:00-9:00 AM) 1st and 3rd Tuesday of the month at BCCA.

[Junior and Senior] Attend weekly MSK Interesting Case Rounds (12:00-13:00) everyThursday at BCCA (unless attending resident noon-rounds).

[Junior and Senior] Attend weekly Rheumatology Rounds (12:00-13:00) every Friday at VGH.

- Develop, implement and monitor a personal continuing education strategy
    - Discuss with your MSK radiology tutors your goals and expectations for the placement, in particular, the skills and topics you would like to focus on in orderto achieve core competency in MSK radiology.
- Critically appraise sources of medical information
    - Attend MSK Journal Club where possible (usually on Tuesdays once per month).
- Facilitate learning of patients, housestaff/students and other health professionals
    - In particular; support visiting medical students during their placements and medical professionals from other specialties to further their understanding ofthe potential, limitations and applications of diagnostic radiology
- Contribute to development of new knowledge
    - Participation in research is encouraged. Those with interest in undertaking anMSK Radiology research project should contact Dr. Adnan Sheik

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviors
- Practice medicine ethically consistent with obligations of a physician

Reading List

Books

- **[Junior]** HELMS C. Fundamentals of Skeletal Radiology. Second Edition, WB Saunders.
- **[Junior]** Excellent *introduction to skeletal radiology.*

American College of Radiology Syllabi: Bone

- **[Junior]** Excellent regarding differential diagnosis and cover most major entities.RESNICK D. Bone and Joint Imaging. Third Edition.
- **[Junior]** Must be read in its entirety during residency.

ROGERS L. Radiology of Skeletal Trauma. Churchill Livingstone, 2002.

- **[Junior]** This is the best general trauma overview.
  WEISSMAN & SLEDGE. Orthopedic Radiology.
- **[Junior]** Best general overview and reference regarding treatment and radiologistassessment of treatment.

FREIBERG AA. The radiology of orthopaedic implants. Mosby 2001.

- **[Senior]** Greenspan - Orthopedic Radiology
- **[Senior]** Resnick - Bone and Joint Imaging
- **[Senior]** Chapman - Aids to Radiological differential diagnosis, Chapters 1,2, and 3
- **[Senior]** Brower - Arthritis in Black and White.
- **[Senior]** McKinnis - Fundamentals of Orthopedic Radiology
- **[Senior]** Chew – Skeletal Radiology: The Bare bones
- **[Senior]** Kaplan, Dussault - Musculoskeletal MRI
- **[Senior]** Stoller, Tirman – Diagnostic Orthopedics
- **[Senior]** Bianchi – Ultrasound of the Musculoskeletal system 2007
- **[Senior]** Jon Jacobson - Musculoskeletal Ultrasound (3rd Ed).
- **[Senior]** Ann Brower - Arthritis in Black and White

Journal Articles

Many excellent articles on particular pathologies and anatomical regions can be found inonline journals via Google Scholar or PubMed search engines and UBC Library Access.
Articles in *Radiographics* and *AJR* tend to be particularly well written. Recommendations include:

A Practical MRI Grading System for Lumbar Foraminal Stenosis. Seunghun Lee, JoonWoo Lee, Jin Sup Yeom, Ki-Jeong Kim, Hyun-Jib Kim, Soo Kyo Chung, and Heung Sik Kang. *American Journal of Roentgenology 2010 194:4, 1095-1098*

Radiology of soft tissue tumors. Mallinson PI, Chou H, Forster BB, Munk PL. *Surg OncolClin N Am. 2014 Oct;23(4):911-36.*

Image-guided musculoskeletal biopsy. Apoorva Gogna, Wilfred C G Peh, Peter L Munk. *Radiol Clin North Am 2008 May;46(3):455-73, v.*

Imaging of limb salvage surgery and pelvic reconstruction following resection of malignant bone tumours. Tan TJ, Aljefri AM, Clarkson PW, Masri BA, Ouellette HA,Munk PL, Mallinson PI. *Eur J Radiol. 2015 Sep;84(9):1782-90.*

Dual-Energy CT for the Musculoskeletal System. Mallinson PI, Coupal TM, McLaughlinPD, Nicolaou S, Munk PL, Ouellette HA. *Radiology. 2016 Dec;281(3):690-707.*

Online Resources

i. *MSK Anatomy* – a subscription to e-Anatomy may be considered. An MRI atlas isavailable on request from Dr. Munk (to be kept in the department).

https://www.imaios.com/en/e-Anatomy

ii. https://intersocietylectures.com (ISS website)
iii. https://www.freitasrad.net (MRI atlas free)
iv. University of Washington, Evaluation of Adult Foot Alignment
v. http://www.gentili.net/foot/introduction.htm
vi. http://www.gentili.net/Hand/intro.htm
vii. http://preview.fluidmedia.com/UnRavellingSpA/toc.html - Great resource forspondyloarthopathy
viii. http://learningradiology.com

For procedures and ultrasound scanning techniques online video resources can be particularly helpful.

ix. Current bone biopsy system at VGH.
https://www.youtube.com/watch?v=Qvy5IO1SSzM

x. MSK Ultrasound

MSK Ultrasound
https://www.youtube.com/watch?v=uGs4O3jGvn0

Tear vs tendinopathy of the rotator cuff https://www.youtube.com/watch?v=7_0epksK8BY

https://www.essr.org/subcommittees/ultrasound/

For info on how to scan, on probe placement and live demos, Steve Bird at birdultrasound.com.au offers a subscription for 12 months, costs approx. $80CAD. There are acouple of videos of that are free, these are the links

Comprehensive elbow pain webinar Steven Bird
https://youtu.be/MliEGHR3eDg

Ankle – this is an excerpt
https://www.youtube.com/watch?v=OZI-AfclegI

For Hip and groin assessment including; inguinal and femoral hernia assessment as well as theso called “sports hernia”, ant hip, snapping hip, how to find the indirect head of RF origin, etc.

Jon Jacobson masterclass 2019 Athletic hip presentation
https://www.youtube.com/watch?v=6fa6YPbhuWU

Jon Jacobson Masterclass 2019 Hip and Groin Demohttps://www.youtube.com/watch?v=SZwA6e283kk

Jon Jacobson talks about ultrasound of the post op shoulder
https://youtu.be/ScqfK2qQUo8

Jon Jacobson hip pathology
https://youtu.be/Uv7ILAlUNIY

The essentials in ultrasound guided interventions Jon Jacobson
https://youtu.be/74Pw26ZTq5k

Epic mic night with Jon Jacobson
https://youtu.be/zcb22kmXS6g

Lower limb peripheral nerve entrapment sites Jon Jacobsonhttps://youtu.be/CBKWs4FCwyk

Jon Jacobson/Robert Laus masterclass 2019 prox hamstrings and lat hiphttps://youtu.be/r48M3fTV8Jo

Hams lat hip Robert Laus https://youtu.be/IJb6Tnh8C2U

Jon Jacobson arthritis, gout, psoriatic, degenerative and seronegative,https://youtu.be/IJb6Tnh8C2U

The sonographic evaluation of greater trochanteric pain syndrome AIUM
https://m.youtube.com/watch?list=PLUTU1H_Edc9W6DLprMxoJSPrhVpotJjFw&v=qnnxgUPHQz U

xi. LOWER EXTREMITY, HAMS, LAT HIP, ant hip, groin

Sonographic evaluation of the posterior thigh AIUM
https://www.youtube.com/watch?v=-aPqbpS8VAE

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Ankle ultrasound medial ligament complex https://www.youtube.com/watch?v=fVV1WJRazNA

Jon Jacobson Gamekeeper's thumb
https://www.youtube.com/watch?v=KFpjIuf9qF4

Jon Jacobson ultrasound of the elbow – trimmed to 3 min long
https://youtu.be/9inaC_Xz7Ns

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Musculoskeletal Rotation Goals & Objectives - SPH

Updated: August 13, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

During the course of the four years, residents will receive minimum six months of dedicated musculoskeletal training which may be performed at St. Paul's Hospital and/or VGH. Residents are expected to develop graded responsibility as they rise from first to fourth year level. Guidance will be given to each resident at the commencement of a rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. The final evaluation will be a consensus evaluation from all staff and fellows that the resident worked with during that specific rotation. The final evaluation with be submitted to the residency training program director.

Core Responsibilities and Expectations

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately 1730 hours. If a resident is absent from his/her MSK rotation for any reason, he/she should give ample warning to Dr. Fenton or Dr. Cresswell. Vacation and conference requests must be booked with Dr. Fenton or Dr. Cresswell in advance, at least two weeks prior to any planned absence from the rotation.

Ongoing teaching and interaction with staff and fellows occurs throughout the day as per the appended schedule.

[R2/3 (first MSK rotation)]: The first 1-2 weeks should focus primarily on gaining basic knowledge of MSK anatomy, pathology and plain radiography. Chapters 1, 15, 10 and 2-8 of Musculoskeletal MRI by Kaplan and Helms should be read (in that order) as soon as possible during the first rotation. The remaining chapters should be read if time permits or early in the second rotation. First-year residents will work closely with the MSK fellows and staff. Residents will be taught and expected to perform straight forward arthrograms, therapeutic injections and aspirations of the shoulder, hip and knee independently but with staff/fellow supervision by the end of the rotation. Residents will participate in all academic rounds and MSK ultrasound sessions (schedule appended below). Residents will observe/participate in all fellow read-outs which are scheduled once or twice per day as per the schedule. Residents will read 10-20 plain radiographs from the "hotseat" list and read them out with the MSK staff. Residents should complete the MSK Radiography Teaching File. Once the relevant chapters in Kaplan and Helms have been read, residents should begin reading cases, beginning with CT of all body parts, and MRI of the Knee. MRI of the Shoulder and Spine can be included if time permits. Residents will present at at-least one Friday MSK rounds. This is a 10 minute presentation of a topic in

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MSK radiology, chosen by the resident, usually related to an interesting case encountered during the rotation.

[R3/4 (second/third MSK rotation)]: Residents should read the remaining chapters in Kaplan and Helms and review Chapters 1, 15, 10 and 2-8 if necessary. Residents will continue to perform straight forward injections under Fluoro +/- U/S guidance independently but with supervision. Residents will participate in all academic rounds and MSK ultrasound sessions (schedule appended below). Residents will observe/participate in all fellow read-outs which are scheduled once or twice per day as per the schedule. Residents will read a wide variety of cases including Plain Radiography, CT of all joints (including SPECT CT), MRI of the Knee, Shoulder, Wrist, Ankle, Hip and Spine. Residents will present at at-least one Friday MSK rounds. This is a 10 minute presentation of a topic in MSK radiology, chosen by the resident.

[R5] Senior residents are expected to function in the capacity of a fellow/junior staff. At the initiation of the rotation, the resident should identify areas of specific weakness and/or interest and the training will help address these issues. Senior residents are expected to check cases, to review cases with staff, to consult with referring physicians, to initiate appropriate intervention (under supervision), and to report examinations as appropriate. Senior residents will participate in all academic rounds, MSK ultrasound sessions and all fellow readouts. Residents will present at at-least one Friday MSK rounds. This is a 10 minute presentation of a topic in MSK radiology, chosen by the resident.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of MR, CT and US physics, artifacts and understanding imaging protocols as related to MSK imaging.
- Knowledge of multi-planar anatomy of the knee, shoulder, wrist, hand, hip, ankle, foot, elbow, spine, pelvis and TMJ.
- Knowledge of clinical radiology and pathology as it pertains to MSK imaging
- Detects findings and interprets findings into an appropriate differential diagnosis
- Ability to summarize case, offer recommendations, understands treatment and clinical implications
- Knowledge of the procedure: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care, appropriate modality (U/S, Fluoro, or CT guidance)
- Basic technical ability: patient positioning, sterile technique, local anaesthetic, simple procedures such as arthrograms, therapeutic injections and joint aspirations of the common joints (shoulder, knee, hip and wrist)
- Advanced technical ability: ability to perform more difficult procedures

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicates effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians

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- Able to obtain appropriate informed consent for MSK procedures
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Manages daily workflow in the department, including prioritization, protocoling and triage of cases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training
- Reports are dictated and signed in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understands benefits and limitations/risks related to the various modalities utilized in MSK imaging and image guided MSK procedures
- Understands the appropriate use of MSK imaging and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviors
- Practice medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Acceptance of constructive criticism

Reading List

Recommended Textbooks:

1. Musculoskeletal MRI by Kaplan, Helms, Major et al. This book is worth owning but there is a copy in the fellows office.
2. Fundamentals of Skeletal Radiology (The “pink book”) by Clyde Helms, 2004
3. MSK Chapters of Brandt and Helms.
4. Bone and Joint Imaging, 2nd edition by Resnick, Kransdorf

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5. Magnetic Resonance Imaging in Orthopaedics and Sports Medicine by David W. Stoller. 3rd Edition

Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with Stat DX and the internet can provide many review articles (eg Radiographics).

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Neuroradiology Rotation Goals & Objectives - SPH

Updated: September 20, 2021
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

The SPH radiology department current has 4 CT scanners. And two MRIs with a 3 T magnet soon to be installed.

Core Responsibilities and Expectations

Junior Residents (R2-3, Foundation-Core) would be expected to do between (R2) 10 and (R3) 15 cases per day, and attempt to focus on ER and inpatient work (cases marked as urgent) to help with preparation for and comfort with oncall related pathologies.

For R2s, focus should be on such cases with an attempt to see cases of

- Head: stroke, bleed, intracranial infection, trauma.
- Neck/spine: trauma, assessment for spinal stenosis, infection.

R3 residents would solidify knowledge of the above acute entities but also work on other acute as well as non-acute pathologies. The expectation is a R3 on this rotation would start to review MRI exams of the brain and spine. Goals being to understand the basic principles of MR physics and pulse sequences and how it applies to neuro imaging, as well as to understand the role MR has in evaluation of both acute and chronic pathologies of the CNS. Focus should be made to MRI brain for evaluation of stroke, infection and mass assessment. For Spine MR focus should be on infection, trauma, and developing a templated approach to evaluation of myelopathic and radicular presentations.

R2 residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis prior to discussing the case with the staff radiologist.

R3 residents should do the same, but also be prepared to provide management plans and next steps based on imaging findings.

Senior Residents (R4-5, Core-TTP) would be expected to do between (R4) 25 and (R5) 30 cases per day. Focus will be on both CT and MR imaging. The R5s doing this rotation would be expected to have a learning plan for the rotation that is self-directed and attempts to fill identified gaps in knowledge.

Focus on sinus imaging, temporal bone assessment, and spine infection are all strengths at SPH.

Residents would be expected to review cases independently, consolidate findings, formulate a differential diagnosis prior to discussing the case with the staff radiologist, and also be prepared to provide management plans and next steps based on imaging findings. Understanding of current

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literature as it pertains to individual pathologies is also expected.

R4/5 residents will be expected to protocol both CT and MRIs and ask question of staff as required.

Neurology rounds take place 8am Tuesday morning. Residents at this stage should inquire with staff about leading the imaging of these rounds. (Cases to be presented provided the day before).

Specific goals and objectives that relate to the CanMEDS roles are as follows:

*(Senior-specific objectives are identified at the front of the list item in brackets as "**[Senior]**".)*

Medical Expert

- Develop a knowledge of cross-sectional and multiplanar abdominal and thoracic anatomy
- Understand CT (R2-3) and MR physics (R3 only), technical parameters of image acquisition and CT related artifacts and how these factors contribute to diagnostic imaging with CT.
- **[Senior]** Understand CT and MR physics, technical parameters of image acquisition and CT related artifacts and how these factors contribute to diagnostic imaging with CT.
- Understand head and spine MR (R3 only)/ CT protocols. Be able to help CT technologists with protocol related questions.
- **[Senior]** Understand head and spine MR/ CT protocols with regards to use of IV contrast as wellas scan delay timing and CT slice thickness and spacing. Be able to help CT technologists with protocol related questions.
- Develop knowledge CNS pathologies seen in clinical practice
- Develop the ability to accurately and rapidly detect pertinent findings on CT studies of the headand spine
- Develop the ability to integrate findings to form a clinically useful differential diagnosis and offeran appropriate plan for the patient in question
- Understand the implications that imaging findings have on treatment and management decisions.

Communicator

- Residents are responsible for dictation of accurate, concise and useful reports following discussion of the case with the staff radiologist.
- Informing the ordering physician either verbally or otherwise of any time sensitive important findings (Depending on the lvl of training this may wait until after review with the staff physician).
- Obtains informed consent for patients in an appropriate fashion
- Communicate effectively with patients, families and other health professionals.

Collaborator

- Discussion of cases with healthcare teams, including nurses and technologists, applying the radiologic findings to help guide patient management. Fulfills a consultant role (for level oftraining)

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safety issues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Develop an understanding of the risks and benefits of various imaging studies. Application of this knowledge to alter imaging protocols to limit risk when deemed necessary. Gain an understanding of the appropriate use of imaging studies and rationalization of use of imagingresources

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Scholar

- Develop the ability to utilize the radiological literature to help guide diagnostic decisions and management recommendations in an evidence-based fashion appropriate to the lvl of training
- Continued self-directed learning: reading around cases and topics, including teaching other residents and students.

Professional

- Interaction with support staff, nurses, clinical teams and staff in a professional fashion
- Development of insight into one's personal strengths and weakness in a given area of radiologyand acceptance of constructive criticism/guidance to help improve areas of weakness
- Demonstration of satisfactory attendance, punctuality, work ethic, reliability expected of a radiology resident.

Reading List

1. Fundamentals of Diagnostic Radiology. Brant and Helms
2. Online resources: STATDx and RadPrimer (via individual logins)
3. R2s (and 3s as needed): Dr. Hagues CT How to series and protocolling series on Entrada
4. **[Senior]** The requisites: Neuroadiology
5. **[Senior]** Osborn: Brain
6. **[Senior]** Harnsberger: Head and Neck

Jon Jacobson ultrasound of the hand and wrist trimmed to only include the wrist joint- 3 minlong
https://youtu.be/WJB5UEZ

Hand and wrist pathology pdf Jon Jacobson
https://static1.squarespace.com/static/58e1bcbe29687f5bed20469b/t/5c6b40b0e4966b1492b28044/1550532790021/Jacobson+US+Wrist+Hand+Pathology+1-28-19.pdf

Trauma

The American Society of Emergency Radiology (ASER)has many excellent video lectures of MSK trauma in including spine and extremities.
https://aser.org/aser-annual-meeting-trauma/

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Neuroradiology CT (Junior) Rotation Goals & Objectives – VGH

Updated: November 15, 2021
Reviewed by: Dr. J. Shewchuk
RPC Approval: TBD

Level/Stage

- R2, R3
- Foundation, Core

Introduction

Residents receive a minimum of three months training in neuroradiology during their residency. Those with an interest in this area, and particularly those who expect to make use of head and spine imaging during their practice, are encouraged to obtain additional training.

Residents will be assigned specific responsibilities on a monthly basis, and are expected to assume graded responsibility as they progress. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Junior residents during the first two years, the emphasis is on basic head and spine CT interpretation.

Residents are also expected to gain experience protocolling requisitions. Workdays are 0800 to 1700 hours, Monday to Friday. All inpatients CT scans until 1700h must be done before the day's work is complete.

Residents are required to submit at least two teaching files by the end of the rotation. These are to be inthe format of a short PowerPoint presentation to be shown during Friday morning Neuroradiology Interesting Case Rounds (0800-0900) in the Neuroradiology Reading Room.

Teaching will take place in the following forms:

- Daily review of all studies reported with a staff radiologist;
- Attendance at weekly Neuroscience Grand Rounds correlative rounds on Wednesday morning;
- Participation in weekly Neuroradiology Resident Noon Rounds at VGH; attendance of and participation in Interesting Neuroradiology Cases Rounds (8am Friday mornings in the NeuroReporting Room)
- Residents are expected to attend all Department of Radiology Visiting Professor seminars and lectures, as well as special courses offered in specific years. Neuroradiology Visiting Professorsalternate with other specialties.

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If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with the rotation supervisorin advance, at least two weeks prior to any planned absence from the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

1. Basic Science
   - To understand cross-sectional and multi-planar anatomy for neuroradiology
   - To understand CT physics, technical parameters of image acquisition, and artifacts
2. Diagnostic CT
   - To understand clinical neuroradiology and pathology
   - To understand imaging protocols, including use of iodinated contrast
   - To detect and interpret findings into an appropriate differential diagnosis
   - To summarize a case, offer recommendations, and understand treatment and clinical implications

Communicator

- To communicate effectively with patients, families and other health professionals
- To demonstrate appropriate and timely communication of findings to referring physicians
- To generate accurate, concise, complete reports

Collaborator

- To respect and recognize the roles of, and effectively interact with, other members of the healthcare team, including nurses and technologists
- To fulfill consultant role (appropriate to level of training)

Leader

- To manage daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation, and supervising of day-to-day operations
- To review/interpret an appropriate volume of cases for level of training
- To dictate and sign reports in a timely manner

Health Advocate

- To understand benefits and risks related to imaging studies
- To understand the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- To effectively teach others, including residents, medical students, and patients
- To demonstrate continuous self-directed learning (read around cases and topics)
- To demonstrate evidence-based medicine approach and critical appraisal with regards to radiology literature

Professional

- To exhibit professional behaviour, displaying honesty, integrity and respect
- To exhibit ethical behaviour, sensitivity to gender/culture diversity
- To demonstrate satisfactory attendance and punctuality
- To have a good work ethic, enthusiasm, and motivation
- To be reliable, responsible and conscientious
- To demonstrate insight with regards to own limitations, strengths and weaknesses, and to askfor help when appropriate
- To accept constructive criticism

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Reading List

A great deal of information is now available on the internet and a number of review articles are suggested on the Neuroradiology Division's website and UBC residents' website. Text books, however, still provide core reading for the radiology residents.

New editions of some of these texts are available in the hospital or UBC libraries. New textbooks are published every year. Many new textbooks are available on CD-ROM as well as in print. New books tend to concentrate on CT and MRI. Consult the preferences of other radiology residents to find the "one" that best meets your needs for the basic text, before investing in a number of textbooks.

For the first neuroradiology rotation, two core texts are recommended:

- The Neuroradiology section in **Brant and Helms Fundamentals of Diagnostic Radiology.**
- **Neuroradiology: The Requisites. Yousem, Zimmerman and Grossman.**

Additional text books below may be useful and are recommended as reading or for reference after the first rotation.

- Castillo, Mauricio, **Neuroradiology Companion**, Lippincott Williams & Wilkins, **3rd Ed 2006**.
- The **Diagnostic Imaging** series, by Drs Anne Osborn, Rick Hansberger and colleagues is a useful reference, with tomes on:
    - Anatomy (2006)
    - Brain (2004)
    - Spine (2005)
    - Head and Neck (2004) and others on other systems as well

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Neuroradiology CT (Senior) Rotation Goals & Objectives – VGH

Updated: November 15, 2021
Reviewed by: Dr. J. Shewchuk
RPC Approval: TBD

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

Residents receive a minimum of three months training in neuroradiology during their residency. Those with an interest in this area, and particularly those who expect to make use of head and spine imaging during their practice, are encouraged to obtain additional training.

Residents will be assigned specific responsibilities on a monthly basis, and are expected to assume graded responsibility as they progress. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Senior residents will interpret CT of the brain, spine, and head and neck, and be involved in CT-guided spine injections and biopsies.

Residents are also expected to gain experience protocolling requisitions. Workdays are 0800 to 1700 hours, Monday to Friday. All inpatients CT scans until 1700h must be done before the day's work is complete.

Residents are required to submit at least two teaching files by the end of the rotation. These are to be inthe format of a short PowerPoint presentation to be shown during Friday morning Neuroradiology Interesting Case Rounds (0800-0900) in the Neuroradiology Reading Room.

Teaching will take place in the following forms:

- Daily review of all studies reported with a staff radiologist;
- Attendance at weekly Neuroscience Grand Rounds on Wednesday morning;
- Participation in weekly Neuroradiology Resident Noon Rounds at VGH; attendance of and participation in Interesting Neuroradiology Cases Rounds (8am Friday mornings in the NeuroReporting Room)
- Residents are expected to attend all Department of Radiology Visiting Professor seminars and lectures, as well as special courses offered in specific years. Neuroradiology Visiting Professorsalternate with other specialties.

If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Shewchuk in advance, at least two weeks prior to any planned absence from the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

1. Basic Science
   - To apply knowledge of cross-sectional and multi-planar anatomy to neuroradiology
   - To apply knowledge of CT physics, technical parameters of image acquisition, and artifacts to neuroradiology
2. Diagnostic CT
   - To understand clinical neuroradiology and pathology
   - To understand imaging protocols, including use of iodinated contrast
   - To detect and interpret findings into an appropriate differential diagnosis
   - To summarize a case, offer recommendations, and understand treatment and clinical implications
3. CT-guided intervention
   - To understand the procedures: indications, complications, appropriate alternatives, use of conscious sedation, post-procedure care
   - To demonstrate basic technical ability: patient positioning, sterile technique, local anaesthetic,simple procedures
   - To demonstrate advanced technical ability: performing more difficult procedures

Communicator

- To communicate effectively with patients, families and other health professionals
- To demonstrate appropriate and timely communication of findings to referring physicians
- To obtain appropriate informed consent when applicable
- To generate accurate, concise, complete reports

Collaborator

- To respect and recognize the roles of, and effectively interact with, other members of the healthcare team, including nurses and technologists
- To fulfill consultant role (appropriate to level of training)

Leader

- To manage daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation, and supervising of day-to-day operations
- To review/interpret an appropriate volume of cases for level of training
- To dictate and sign reports in a timely manner

Health Advocate

- To understand benefits and risks related to imaging studies
- To understand the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- To effectively teach others, including residents, medical students, and patients
- To demonstrate continuous self-directed learning (read around cases and topics)
- To demonstrate evidence-based medicine approach and critical appraisal with regards to radiology literature

Professional

- To exhibit professional behaviour, displaying honesty, integrity and respect

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- To exhibit ethical behaviour, sensitivity to gender/culture diversity
- To demonstrate satisfactory attendance and punctuality
- To have a good work ethic, enthusiasm, and motivation
- To be reliable, responsible and conscientious
- To demonstrate insight with regards to own limitations, strengths and weaknesses, and to askfor help when appropriate
- To accept constructive criticism

Reading List

A great deal of information is now available on the internet and a number of review articles are suggested on the Neuroradiology Division's website and UBC residents' website. Text books, however, still provide core reading for the radiology residents.

New editions of some of these texts are available in the hospital or UBC libraries. New textbooks are published every year. Many new textbooks are available on CD-ROM as well as in print. New books tend to concentrate on CT and MRI. Consult the preferences of other radiology residents to find the "one" that best meets your needs for the basic text, before investing in a number of textbooks.

For the first neuroradiology rotation, two core texts are recommended:

- The Neuroradiology section in **Brant and Helms Fundamentals of Diagnostic Radiology.**
- **Neuroradiology: The Requisites. Yousem, Zimmerman and Grossman.**

Additional text books below may be useful and are recommended as reading or for reference after the first rotation.

- Castillo, Mauricio, **Neuroradiology Companion**, Lippincott Williams & Wilkins, **3rd Ed 2006**.
- The **Diagnostic Imaging** series, by Drs Anne Osborn, Rick Hansberger and colleagues is a useful reference, with tomes on:
    - Anatomy (2006)
    - Brain (2004)
    - Spine (2005)
    - Head and Neck (2004) and others on other systems as well

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Neuroradiology MRI (Junior) Rotation Goals & Objectives – VGH

Updated November 15, 2021
Reviewed by: Dr. J. Shewchuk
RPC Approval: TBD

Level/Stage

- R2, R3
- Foundation, Core

Introduction

Residents receive a minimum of three months training in neuroradiology during their residency. Those with an interest in this area, and particularly those who expect to make use of head and spine imaging during their practice, are encouraged to obtain additional training.

Residents will be assigned specific responsibilities on a monthly basis, and are expected to assume graded responsibility as they progress. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Junior residents during the first two years, the emphasis is on basic head and spine MRI interpretation, lumbar punctures and myelography.

Residents are also expected to gain experience protocolling requisitions. Workdays are 0800 to 1700 hours, Monday to Friday. All inpatients MR scans until 1700h must be done before the day's work is complete. As time permits, residents are expected to help out with CT readout and ensure all inpatient CT studies done by 1700h are read out by the end of the work day.

Residents are required to submit at least two teaching files by the end of the rotation. These are to be inthe format of a short PowerPoint presentation to be shown during Friday morning Neuroradiology Interesting Case Rounds (0800-0900) in the Neuroradiology reading room.

Teaching will take place in the following forms:

- Daily review of all films reported with a staff radiologist, neuroradiologist or fellow;
- Attendance at weekly Neuroscience Grand Rounds on Wednesday morning;
- Preparation and participation in weekly neuroradiology resident noon rounds at VGH; attendance of and participation in Interesting Neuro Cases Rounds (8am Friday mornings in

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theNeuro Reporting Room);

- Residents are expected to attend all Department of Radiology Visiting Professor seminars and lectures, as well as special courses offered in specific years. Neuroradiology Visiting Professorsalternate with other specialties.

If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Shewchuk in advance, at least two weeks prior to any planned absence from the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

1. Basic Science
   - To understand cross sectional and multi-planar anatomy for neuroradiology
   - To understand MRI physics, technical parameters of image acquisition, artifacts
2. Diagnostic MRI
   - To understand clinical radiology and pathology
   - To understand imaging protocols, including use of contrast agents
   - To detect and interpret findings into an appropriate differential diagnosis
   - To summarize a case, offer recommendations, and understand treatment and clinical implications
3. Procedures
   - To understand procedures: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care
   - To demonstrate basic technical ability: patient positioning, sterile technique, local anaesthetic,simple procedures

Communicator

- To communicate effectively with patients, families and other health professionals.
- To demonstrate appropriate and timely communication of findings to referring physicians
- To obtain appropriate informed consent when applicable
- To generate accurate, concise, complete reports

Collaborator

- To respect, recognize the roles of, and effectively interact with the healthcare team, includingnurses and technologists
- To fulfill consultant role (for level of training)

Leader

- To manage daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation, and supervising of day-to-day operations
- To perform/interpret appropriate volume of case for level of training
- To dictate and sign reports in a timely manner

Health Advocate

- To understand benefits and risks related to imaging studies
- To understand the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- To effectively teach others, including residents, medical students and patients
- To demonstrate continuous self-directed learning (read around cases and topics)

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- To demonstrate evidence-based medical approach and critical appraisal with regards to radiology literature

Professional

- To exhibit professional behaviour, displaying honesty, integrity and respect
- To exhibit ethical behaviour, sensitivity to gender/culture diversity
- To demonstrate satisfactory attendance and punctuality
- To have a good work ethic, enthusiasm, motivation
- To be reliable, responsible and conscientious
- To demonstrate insight with regards to own limitations, strength and weaknesses, and to ask forhelp when appropriate
- To accept constructive criticism

Reading List

A great deal of information is now available on the internet and a number of review articles are suggested on the Neuroradiology Division's website and UBC residents' website. Text books, however, still provide core reading for the radiology residents.

New editions of some of these texts are available in the hospital or UBC libraries. New textbooks are published every year. Many new textbooks are available on CD-ROM as well as in print. New books tend to concentrate on CT and MRI. Consult the preferences of other radiology residents to find the "one" that best meets your needs for the basic text, before investing in a number of textbooks.

For the first neuroradiology rotation, two core texts are recommended:

- The Neuroradiology section in **Brant and Helms Fundamentals of Diagnostic Radiology.**
- **Neuroradiology: The Requisites. Yousem, Zimmerman and Grossman.**

Additional text books below may be useful and are recommended as reading or for reference after thefirst rotation.

- Castillo, Mauricio, **Neuroradiology Companion**, Lippincott Williams & Wilkins, **3rd Ed 2006**.
- The **Diagnostic Imaging** series, by Drs Anne Osborn, Rick Hansberger and colleagues is a useful reference, with tomes on:
    - Anatomy (2006)
    - Brain (2004)
    - Spine (2005)
    - Head and Neck (2004) and others on other systems as well

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Neuroradiology MRI (Senior) Rotation Goals & Objectives – VGH

Updated: November 15, 2021
Reviewed by: Dr. J. Shewchuk
RPC Approval: TBD

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

Residents receive a minimum of three months training in neuroradiology during their residency. Those with an interest in this area, and particularly those who expect to make use of head and spine imaging during their practice, are encouraged to obtain additional training.

Residents will be assigned specific responsibilities on a monthly basis, and are expected to assume graded responsibility as they progress. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Senior residents, in addition to interpretation of brain, spine, and head and neck MRI, will be more involved with on-line supervision of more complex MRI studies, as well as having increased responsibility for lumbar punctures and CT myelography.

Residents are also expected to gain experience protocolling requisitions. Workdays are 0800 to 1700 hours, Monday to Friday. All inpatients MR scans until 1700h must be done before the day's work is complete. As time permits, residents are expected to help out with CT readout and ensure all inpatient CT studies done by 1700h are read out by the end of the work day.

Residents are required to submit at least two teaching files by the end of the rotation. These are to be inthe format of a short PowerPoint presentation to be shown during Friday morning Neuroradiology Interesting Case Rounds (0800-0900) in the Neuroradiology reading room.

Teaching will take place in the following forms:

- Daily review of all films reported with a staff radiologist, neuroradiologist or fellow;
- Attendance at weekly Neuroscience Grand Rounds on Wednesday morning;
- Preparation and participation in weekly neuroradiology resident noon rounds at VGH, attendance of and participation in Interesting Neuro Cases Rounds (8am Friday mornings in theNeuro Reporting Room);

- Residents are expected to attend all Department of Radiology Visiting Professor seminars and lectures, as well as special courses offered in specific years. Neuroradiology Visiting Professorsalternate with other specialties.

If a resident is absent from this rotation for any reason, he/she should give ample warning to the Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Shewchuk in advance, at least two weeks prior to any planned absence from the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

1. Basic Science
   - To apply knowledge of cross sectional and multi-planar anatomy to neuroradiology
   - To apply knowledge of MRI physics, technical parameters of image acquisition, and artifacts to neuroradiology
2. Diagnostic MRI
   - To understand clinical radiology and pathology
   - To understand imaging protocols, including use of contrast agents
   - To detect and interpret findings into an appropriate differential diagnosis
   - To summarize a case, offer recommendations, and understand treatment and clinical implications
3. Procedures
   - To understand procedures: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care
   - To demonstrate basic technical ability: patient positioning, sterile technique, local anaesthetic,simple procedures
   - To demonstrate advanced technical ability: performing more difficult procedures

Communicator

- To communicate effectively with patients, families and other health professionals.
- To demonstrate appropriate and timely communication of findings to referring physicians
- To obtain appropriate informed consent when applicable
- To generate accurate, concise, complete reports

Collaborator

- To respect, recognize the roles of, and effectively interact with the healthcare team, includingnurses and technologists
- To fulfill consultant role (for level of training)

Leader

- To manage daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation, and supervising of day-to-day operations
- To perform/interpret appropriate volume of case for level of training
- To dictate and sign reports in a timely manner

Health Advocate

- To understand benefits and risks related to imaging studies
- To understand the appropriate use of imaging studies and rationalization of use of imaging resources

Scholar

- To effectively teach others, including residents, medical students and patients
- To demonstrate continuous self-directed learning (read around cases and topics)

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- To demonstrate evidence-based medical approach and critical appraisal with regards to radiology literature

Professional

- To exhibit professional behaviour, displaying honesty, integrity and respect
- To exhibit ethical behaviour, sensitivity to gender/culture diversity
- To demonstrate satisfactory attendance and punctuality
- To have a good work ethic, enthusiasm, motivation
- To be reliable, responsible and conscientious
- To demonstrate insight with regards to own limitations, strength and weaknesses, and to ask forhelp when appropriate
- To accept constructive criticism

Reading List

A great deal of information is now available on the internet and a number of review articles are suggested on the Neuroradiology Division's website and UBC residents' website. Text books, however, still provide core reading for the radiology residents.

New editions of some of these texts are available in the hospital or UBC libraries. New textbooks are published every year. Many new textbooks are available on CD-ROM as well as in print. New books tend to concentrate on CT and MRI. Consult the preferences of other radiology residents to find the "one" that best meets your needs for the basic text, before investing in a number of textbooks.

For the first neuroradiology rotation, two core texts are recommended:

- The Neuroradiology section in **Brant and Helms Fundamentals of Diagnostic Radiology.**
- **Neuroradiology: The Requisites. Yousem, Zimmerman and Grossman.**

Additional text books below may be useful and are recommended as reading or for reference after the first rotation.

- Castillo, Mauricio, **Neuroradiology Companion**, Lippincott Williams & Wilkins, **3rd Ed 2006**.
- The **Diagnostic Imaging** series, by Drs Anne Osborn, Rick Hansberger and colleagues is a useful reference, with tomes on:
    - Anatomy (2006)
    - Brain (2004)
    - Spine (2005)
    - Head and Neck (2004) and others on other systems as well

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Neuroradiology Spine Rotation Goals & Objectives – VGH

Updated: November 15, 2021
Reviewed by: Dr. J. Shewchuk
RPC Approval: TBD

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

This rotation is specifically designated for **senior residents (R4, R5 / Core-TTP)** in the last 6 months (Jan-Jun) of the academic year. Guidance will be given to each resident at the commencement of the rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

Residents will be involved with fluoroscopic spine injections and procedures. Residents are also expected to gain experience protocolling requisitions for spine procedures and imaging. There will be additional opportunity for spine MRI, CT and CR interpretation. Workdays are 0800 to 1700 hours, Monday to Friday.

Residents are required to submit at least two teaching files by the end of the rotation. These are to be inthe format of a short PowerPoint presentation to be shown during Friday morning Neuroradiology Interesting Case Rounds (0800-0900) in the Neuroradiology Reading Room.

Teaching will take place in the following forms:

- Daily preview and review of all procedures with a staff radiologist and supervision of proceduresas required (more independence will be granted as competence is demonstrated);
- Attendance at weekly Neuroscience Grand Rounds on Wednesday morning;
- Participation in weekly Neuroradiology Resident Noon Rounds at VGH; attendance of and participation in Interesting Neuroradiology Cases Rounds (8am Friday mornings in the NeuroReporting Room)

Residents are expected to attend all Department of Radiology Visiting Professor seminars and lectures, aswell as special courses offered in specific years. Neuroradiology Visiting Professors alternate with other specialties.

If a resident is absent from this rotation for any reason, he/she should give ample warning to the

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Radiologist scheduled for that day. Vacation and conference requests must be booked with Dr. Shewchuk in advance, at least two weeks prior to any planned absence from the rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

1. Basic Science
- To understand cross sectional and multi-planar anatomy of the spine
- To understand the fundamentals of image-guided needle placement
- To understand the action of commonly used pharmaceuticals (local anesthetic, steroids)

2. Fluoroscopic-guided procedures
- To understand the procedures: indications, complications, appropriate alternatives, use of conscious sedation, post-procedure care
- To demonstrate basic technical ability: patient positioning, sterile technique, local anaesthetic,simple procedures
- To demonstrate advanced technical ability: performing more difficult procedures

3. Diagnostic Spine MRI/CT/CR
- To understand spine pathology
- To understand imaging protocols, including use of iodinated contrast
- To detect and interpret findings into an appropriate differential diagnosis
- To summarize a case, offer recommendations, and understand treatment and clinical implications

Communicator
- To communicate effectively with patients, families and other health professionals
- To obtain appropriate informed consent
- To demonstrate appropriate and timely communication of findings to referring physicians
- To generate accurate, concise, complete reports

Collaborator
- To respect and recognize the roles of, and effectively interact with, other members of the healthcare team, including nurses and technologists
- To fulfill consultant role (appropriate to level of training)

Leader
- To manage daily workflow in the department, including prioritization, protocoling and triage ofcases, physician consultation, and supervising of day-to-day operations
- To perform/review/interpret an appropriate volume of cases for level of training
- To dictate and sign reports in a timely manner

Health Advocate
- To understand benefits and risks of spine imaging studies and procedures
- To understand the appropriate use of spine imaging and procedures and rationalization of useof imaging resources

Scholar
- To effectively teach others, including residents, medical students, and patients
- To demonstrate continuous self-directed learning (read around cases and topics)
- To demonstrate evidence-based medicine approach and critical appraisal with regards to radiology literature

Professional
- To exhibit professional behaviour, displaying honesty, integrity and respect
- To exhibit ethical behaviour, sensitivity to gender/culture diversity

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- To demonstrate satisfactory attendance and punctuality
- To have a good work ethic, enthusiasm, and motivation
- To be reliable, responsible and conscientious
- To demonstrate insight with regards to own limitations, strengths and weaknesses, and to askfor help when appropriate
- To accept constructive criticism

Reading List

A great deal of information is now available on the internet and a number of review articles are suggested on the Neuroradiology Division's website and UBC residents' website. Text books, however, still provide core reading for the radiology residents.

New editions of some of these texts are available in the hospital or UBC libraries. New textbooks are published every year. Many new textbooks are available on CD-ROM as well as in print. New books tend to concentrate on CT and MRI. Consult the preferences of other radiology residents to find the "one" that best meets your needs for the basic text, before investing in a number of textbooks.

An excellent book for spine injections is:

- Fenton and Czervionke "**Image-Guided Spine Intervention**"

The following free online article is good for basic needle placement information and should be read before starting the rotation:

- **"Guidelines to Imaging Landmarks for Interventional Spine Procedures: Fluoroscopy and CT Anatomy"** by Cianfoni et al.

  http://asnr.publisher.ingentaconnect.com/search/download?pub=infobike%3a%2f%2fasnr%2fn

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Obstetrical Ultrasound Rotation Goals & Objectives – BCWH

Updated: August 13, 2021
RPC Approval: TBD

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

This is an elective rotation available to **senior residents**. Guidance will be given to each resident at the commencement of a rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

All residents are expected to arrive in the department by 0800 or 0900 hours (depending on the scheduled start time of the reporting physician as posted in the reporting room) and stay until approximately 1600 hours. Ongoing teaching and interaction with staff occurs throughout the day. If a resident is absent from his/her ultrasound rotation for any reason, he/she should give ample warning to the education coordinators or by calling 604-875-2156 to speak with either supervisor.

During the rotation, the resident is integrated into the BC Children's/UBC Hospital call schedule as, *at the present time*, no call is required at BC's Women's Hospital.

By the end of the rotation, the resident should be able to independently perform (1) a normal routine19-20 week screening scan, and (2) a normal third trimester scan.

As per departmental educational policy, the resident will be required to document attendance for eachhalf-day of the rotation by obtaining a signature to confirm participation. A form will be supplied.

<u>Specific goals and objectives that relate to the CanMEDS roles are as follows</u>:

Medical Expert

- understand US physics, artifacts and understanding imaging protocols, including use of different scanning probes and Doppler
- demonstrate knowledge of multi-planar fetal anatomy
- demonstrate knowledge of clinical fetal radiology and pathology
- Detect and interpret findings into an appropriate differential diagnosis

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- be able to summarize case, offer recommendations, understands treatment and clinical implications
- demonstrate knowledge of the prenatal procedures: indications, complications, appropriate alternatives
- Perform, document, and report a complete detailed normal obstetrical ultrasound scan at 18 to19 weeks (see list of standard views below), recognize the presence of pathology and expand the scan appropriately.
- Perform, document, and report a complete normal third trimester scan including assessment offetal growth, amniotic fluid volume, cord Doppler, and fetal well-being.
- Demonstrate diagnostic and therapeutic skills for ethical and effective patient care
- Access and apply relevant information to clinical practice
- Demonstrate effective consultation services with respect to patient care, education and legal opinions
- Demonstrate the following technical skills:
  (Note: The resident is assumed to have already mastered basic ultrasound skills, knowledge of ultrasound physics, and ability to utilize the equipment before starting the rotation, as this is a senior resident rotation. The resident will spend half of each day scanning one-on-one under the supervision of a technologist, who will focus on the technical aspects of obtaining standard views)
  - To determine placenta location, cervical length, amniotic fluid index, fetal lie and presentation; and to detect the presence or absence of normal fetal cardiac activity (to include rate and rhythm).
  - To obtain acceptable quality images of the head, trunk, and femur for standard biometry measurements including BPD, HC, AC and FL. For first trimester scans, thecrown-rump length should be accurately measured.
  - To assess and obtain acceptable quality images of the fetal stomach, bladder, kidneys, umbilical cord, heart (to include four chamber and short axis/outflow views), spine andlong bones, as well as to include major intracranial structures.
  - To assess and obtain acceptable quality images of gestational age-appropriate fetal markers for aneuploidy as are presently used in the department.
  - To recognize the presence of maternal and fetal pathology as it relates to obstetrics andto expand the scan to include appropriate additional assessment and images.
  - To understand the parameters used to assess fetal well-being and to be able to performa scan to assess these components (AFI, Doppler, growth, fetal movement, biophysical profile).
  - To assess and document images to assess normal and abnormal findings in scans donefor maternal indications (maternal abdomen, pelvic, renal, postpartum and venous Doppler scans.
- Demonstrate the following interpretive skills:
  - To use standard departmental criteria for dating a pregnancy using menstrual and ultrasound dates.
  - To understand the scientific basis and provenance of fetal biometry charts, and to use these appropriately.
  - To assess common indications for obstetrical ultrasound and tailor the scan accordingly.
  - To generate appropriate reports for normal 18 week detailed scans.
  - To generate appropriate ultrasound reports for third trimester scans to include assessment of fetal well-being.
  - To understand the significance of maternal screen results and the factors relevant to interpreting scans.
  - To recognize abnormal fetal development, to generate a differential diagnosis, and to

have knowledge of subsequent diagnostic or therapeutic steps
  - To assess the criteria for evaluating markers for aneuploidy and to understand the significance of markers.
  - To understand indications for fetal echocardiography.
  - To interpret normal and abnormal findings in maternal abdomen, renal, pelvic, postpartum and venous Doppler scans.
  - To recognize obstetrical ultrasound findings that may require urgent referral and/or intervention.
  - To understand indications for fetal karyotyping, methods of karyotyping, and inherent risks.

Communicator

- establish therapeutic relationship with patients/families
- obtain and synthesize relevant history from patients/families/communities
- listen effectively and sensitively
- discuss appropriate information with patients/families and the other health professionals in thehealth care team
- Interpret and communicate results of obstetrical ultrasound scans to supervising and referring physician, and request other relevant consultations and investigations
- understand that the role of the radiologist is to primarily provide imaging information and to develop strategies to interact with patients and families without providing counseling and discussion of clinical implications of findings
- Demonstrate appropriate and timely communication of findings to referring physicians
- Give accurate, concise, complete reports

Collaborator

- consult effectively with other physicians and health care professionals
- contribute effectively to other interdisciplinary team activities, including research activities
- Respects, recognizes the roles of, and consult effectively with the healthcare team, includingnurses and technologists
- Contribute effectively to other interdisciplinary team activities
- Work collaboratively with the technologists, learning scanning techniques in first through third trimester obstetrical ultrasounds
- Work collaboratively or at least three half-days per week with the attending perinatologist/ radiologist, interpreting scan results and providing recommendations. A smaller component ofthe rotation involves observing procedures such as chorionic villous sampling andamniocentesis.
- Work effectively with all members of the ultrasound team including technologists, nurses, medical geneticists, and genetic counselors.
- Recognize the team relationship between radiologists and obstetricians in the care of the obstetrical patient and understand the importance of physician-patient communication in thesetting of pregnancy, especially in the presence of complication or loss.

Manager

- understands issues of daily workflow in the department, including prioritization, protocols andtriage of cases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of cases for level of training
- Reports are completed in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization

- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- identifies the important determinants of health affecting patients
- contributes effectively to improved health of patients and communities
- recognizes and responds to those issues where advocacy is appropriate

Scholar

- Attends ultrasound case review rounds (Tuesdays 08:00- 09:00)
- Attends Fetal Diagnostic Service case rounds (Mondays, Tuesdays and Thursdays 12:00 – 13:00)
- Attends FDS multidisciplinary conferences (alternate Fridays 15:00 – 16:00)
- Presents a topic of general interest at departmental rounds (topic and venue to be discussed)
- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develops, implement sand monitors a personal continuing education strategy
- Contributes to development of new knowledge

Professional

- Delivers highest quality care with integrity, honesty and compassion
- Exhibits appropriate personal and interpersonal professional behaviours
- Practices medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for helpwhen appropriate
- Accepts constructive criticism and suggestions for improvement

Reading List

Recommended Textbook:

Diagnostic imaging of fetal anomalies - David A. Nyberg, John P. McGahan, Dolores H. Pretorius (Lippincott, Williams and Wilkins). This is the most comprehensive textbook for fetal diagnosis, written from a radiological point of view. A copy is available in the Hamber Library and can be signed out.

http://www.sonoworld.com/TheFetus/Home.aspx This site is a good resource for examples and discussions of specific fetal anomalies. It is especially good for reading around cases or looking at very rare fetal anomalies that are not commonly seen in day-to-day reporting.

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Obstetrical Ultrasound Rotation Goals & Objectives – SPH

Updated: August 13, 2021
RPC Approval: TBD

Level/Stage

- R4, R5
- Core, Transition to Practice

Introduction

This is a **senior level** rotation. Guidance will be given to each resident at the commencement of a rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

The resident is assumed to have already mastered basic ultrasound skills, knowledge of ultrasound physics, and ability to utilize the equipment before starting the rotation, as this is a senior resident rotation. The resident will spend half of each day scanning one-on-one under the supervision of a technologist, who will focus on the technical aspects of obtaining standard views.

By the end of the rotation, the resident should be able to independently perform (1) a normal routine19-20 week screening scan, and (2) a normal third trimester scan.

Residents are expected to attend and participate in the following rounds:

- Ultrasound case review rounds (Tuesdays 08:00- 09:00)
- Fetal Diagnostic Service case rounds (Mondays, Tuesdays and Thursdays 12:00 – 13:00)
- FDS multidisciplinary conferences (alternate Fridays 15:00 – 16:00)
- Presents a topic of general interest at departmental rounds (topic and venue to be discussed)

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Understand US physics, artifacts and understanding imaging protocols, including use of different scanning probes and Doppler
- Demonstrate knowledge of multi-planar fetal anatomy
- Demonstrate knowledge of clinical fetal radiology and pathology
- Detect and interpret findings into an appropriate differential diagnosis
- Be able to summarize case, offer recommendations, understands treatment and clinical implications

- Demonstrate knowledge of the prenatal procedures: indications, complications, appropriate alternatives
- Perform, document, and report a complete detailed normal obstetrical ultrasound scan at 18 to19 weeks (see list of standard views below), recognize the presence of pathology and expand the scan appropriately.
- Perform, document, and report a complete normal third trimester scan including assessment offetal growth, amniotic fluid volume, cord Doppler, and fetal well-being.
- Demonstrate diagnostic and therapeutic skills for ethical and effective patient care
- Access and apply relevant information to clinical practice
- Demonstrate effective consultation services with respect to patient care, education and legal opinions

I. Technical skills

Specific objectives for this one-month elective include:

- To determine placenta location, cervical length, amniotic fluid index, fetal lie and presentation; and to detect the presence or absence of normal fetal cardiac activity (to include rate and rhythm).
- To obtain acceptable quality images of the head, trunk, and femur for standard biometry measurements including BPD, HC, AC and FL. For first trimester scans, the crown-rump length should be accurately measured.
- To assess and obtain acceptable quality images of the fetal stomach, bladder, kidneys, umbilical cord, heart (to include four chamber and short axis/outflow views), spine and longbones, as well as to include major intracranial structures.
- To assess and obtain acceptable quality images of gestational age-appropriate fetal markersfor aneuploidy as are presently used in the department.
- To recognize the presence of maternal and fetal pathology as it relates to obstetrics and to expand the scan to include appropriate additional assessment and images.
- To understand the parameters used to assess fetal well-being and to be able to perform ascan to assess these components (AFI, Doppler, growth, fetal movement, biophysical profile).
- To assess and document images to assess normal and abnormal findings in scans done for maternal indications (maternal abdomen, pelvic, renal, postpartum and venous Doppler scans.

II. Interpretive skills

- To use standard departmental criteria for dating a pregnancy using menstrual and ultrasound dates.
- To understand the scientific basis and provenance of fetal biometry charts, and to use these appropriately.
- To assess common indications for obstetrical ultrasound and tailor the scan accordingly.
- To generate appropriate reports for normal 18-week detailed scans.
- To generate appropriate ultrasound reports for third trimester scans to include assessmentof fetal well-being.
- To understand the significance of maternal screen results and the factors relevant to interpreting scans.
- To recognize abnormal fetal development, to generate a differential diagnosis, and to have knowledge of subsequent diagnostic or therapeutic steps
- To assess the criteria for evaluating markers for aneuploidy and to understand the significance of markers.
- To understand indications for fetal echocardiography.
- To interpret normal and abnormal findings in maternal abdomen, renal, pelvic, postpartumand venous Doppler scans.
- To recognize obstetrical ultrasound findings that may require urgent referral and/or

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intervention.
    - To understand indications for fetal karyotyping, methods of karyotyping, and inherent risks.

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively and sensitively
- Discuss appropriate information with patients/families and the other health professionals in thehealth care team
- Interpret and communicate results of obstetrical ultrasound scans to supervising and referring physician, and request other relevant consultations and investigations
- Understand that the role of the radiologist is to primarily provide imaging information and to develop strategies to interact with patients and families without providing counseling and discussion of clinical implications of findings
- Demonstrate appropriate and timely communication of findings to referring physicians
- Give accurate, concise, complete reports

Collaborator

- Consult effectively with other physicians and health care professionals
- Contribute effectively to other interdisciplinary team activities, including research activities
- Respects, recognizes the roles of, and consult effectively with the healthcare team, includingnurses and technologists
- Contribute effectively to other interdisciplinary team activities
- Work collaboratively with the technologists, learning scanning techniques in first through third trimester obstetrical ultrasounds
- Work collaboratively or at least three half-days per week with the attending perinatologist/ radiologist, interpreting scan results and providing recommendations. A smaller component ofthe rotation involves observing procedures such as chorionic villous sampling and amniocentesis.
- Work effectively with all members of the ultrasound team including technologists, nurses, medical geneticists, and genetic counselors.
- Recognize the team relationship between radiologists and obstetricians in the care of the obstetrical patient and understand the importance of physician-patient communication in thesetting of pregnancy, especially in the presence of complication or loss.

Leader

- Implement processes to ensure personal practice improvement
- Set priorities and manage time to integrate practice and personal life
- Apply the science of quality improvement (i.e., discussion of potential audit) to contribute to improving systems of patient care
- Contribute to a culture that promotes patient safety, including recognition of patient safetyissues, and utilization of health informatics to improve patient safety
- Demonstrate leadership skills to enhance health care

Health Advocate

- Identifies the important determinants of health affecting patients
- Contributes effectively to improved health of patients and communities
- Recognizes and responds to those issues where advocacy is appropriate

Scholar

- Effectively teaches others, including residents, medical students, patients and other he alth professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)

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- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develops, implement sand monitors a personal continuing education strategy
- Contributes to development of new knowledge

Professional

- Delivers highest quality care with integrity, honesty and compassion
- Exhibits appropriate personal and interpersonal professional behaviours
- Practices medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for helpwhen appropriate
- Accepts constructive criticism and suggestions for improvement

Reading List

Recommended Textbook:

Diagnostic imaging of fetal anomalies - David A. Nyberg, John P. McGahan, Dolores H. Pretorius (Lippincott, Williams and Wilkins). This is the most comprehensive textbook for fetal diagnosis, written from a radiological point of view. A copy is available in the Hamber Library and can be signed out.

http://www.sonoworld.com/TheFetus/Home.aspx This site is a good resource for examples and discussions of specific fetal anomalies. It is especially good for reading around cases or looking at very rare fetal anomalies that are not commonly seen in day-to-day reporting.

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Oncologic Imaging Rotation Goals & Objectives – BCCA

Updated: September 23, 2021
Reviewed by: Dr. R. Yuan
RPC Approval: TBD

Level/Stage:

- R3, R4, R5
- Core, Transition to Practice

Introduction

The Oncologic Body Imaging rotation will be mainly divided between the Diagnostic Imaging (DI) and Functional Imaging (FI) departments at BC Cancer Vancouver.

The DI Department is an active component of a multidisciplinary management and active follow-up of current BC Cancer patients. It also acts as a tertiary referral center for review of outside studies for diagnosis/differential diagnosis, assessment of treatment response and variety of procedures with focuson organ biopsy. Our imaging department has a well-established relationship with the FI division and oncology departments located in the same building. This diverse involvement will offer the resident well-rounded exposure to oncological imaging, with value in systemic imaging assessment and procedures.

Residents will receive an orientation organized by the rotation supervisor Dr. Ren Yuan or designate onthe first day of the block, which will include IT training with Cerner (and CAIS) and iSite/FFI computer systems. The learner is advised to meet with Dr. Yuan for any clarification of rotation objectives or expectations. Residents are encouraged to discuss any interests or requests pertaining to body imagingwith Dr. Yuan.

The rotation objectives are categorized in accordance with the CanMEDS competency framework.

GENERAL OBJECTIVES:

1. Understand the utility of specific medical imaging examinations and their appropriate use inoncology, with focus on CT, MRI, and PET/CT
2. Supervise and perform these imaging studies to the required level of competence for obtainingcertification by the Royal College
3. Obtain a general understanding of oncologic and non-oncologic indications for the use of PET/CT
4. Perform US, CT and Fluoroscopy-guided biopsies and procedures with graduated supervision

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ROTATION SCHEDULES

Week Distribution:

- For a full month (4 weeks) rotation:
  - 2 weeks of MRI (the 1st and last week) except for 1 day during these two weeks (oftenFriday) in Radiation Oncology and Wednesday AHD
  - 1 week of CT except for Wednesday AHD
  - 1 week of PET-CT except for Wednesday AHD
- For a 3-week rotation (with 1 week vacation or night float allowance as per the program)
  - 1 week MRI except for Wednesday AHD
  - 1 week CT except for Wednesday AHD
  - 1 week at PET-CT except for Wednesday AHD and 1 day in Radiation Oncology (oftenFriday)
- For a rotation less than 3 weeks duration, please arrange a discussion with site rotation supervisor beforehand.

Expectations for Exam Volume:

Case volume can vary depending on PGY level, complexity of cases and the other clinical service on the same day (e.g. Biopsy, tumor board conference).

1. CT and MRI: 5-7 per day.
2. Procedure: as many as learner can participate in and/or observe.

Suggested Readings:

1. Silverman. Oncologic imaging
2. Hricak, Husband, Panicek eds. Oncologic imaging: Essentials of reporting common cancers.
3. Gouliamos et al eds. Imaging in clinical oncology
4. Relevant reference papers suggested by the BCCA staff radiologists during the rotation

Daily Reporting Cases and Procedures:

- In CERNER, check BCC VA CT/MRI/US, for patient lists. CT -guided biopsies are always in the 10-11am slot, if any.
- The resident will meet with the assigned staff radiologist in the morning to decide which casesto take; and which procedures to attend /perform.
- Exams can be “reserved” on iSite (by the resident or staff radiologist). Please communicate withthe staff radiologists to ensure cases are finalized (i.e., “mark read” with measurements/annotations saved in key images).
- In iSite, please save the “presentation state” after you have looked at the case. This will save your markups even if you log out. Use this state to review the case with the radiologist

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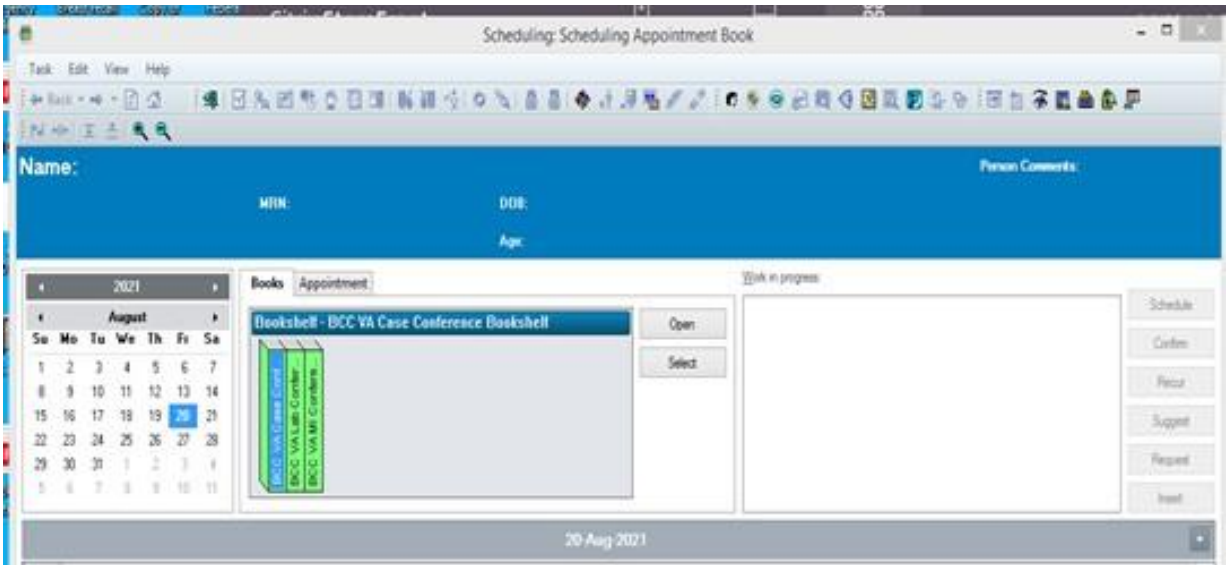
as it allows you to view and modify your markups. When you are finished reviewing, ask the radiologist to re-save the presentation state so you can dictate with the updated markups andsave as read with the final markups. (Residents are welcome to learn the RECIST standard for tumor follow-up but please avoid clinical trial cases that require Tumor Measurement Forms (TMFs).

- The resident is encouraged to review Head Neck cases with Dr. Monty Martin when he has suchcases to report/review for conference.
- The resident is responsible for completing all their reports by the end of the rotation.

Tumor Board Conferences:

- In the 1st week the resident is expected to attend all body conference but not necessarily prepare cases for conference presentation (please approach Dr. Yuan for conference link).
- In subsequent weeks the resident is expected to prepare and present 1 conference per week with the supervision of the assigned Radiologist - Please discuss with the assigned conference radiologist beforehand, review cases with them; they will also attend the conference for supportand potential additional questions.
- The resident should try to join Dr. Monty Martin for preparation the Head Neck Conference (HNC) cases every Monday and please communicate with Dr. Martin beforehand regarding thepreparation time.
- Tumor Board Conference Code in CAIS:
    - *Monday: "HNC" (head and neck)*
    - *Tuesday: "GIC" (GI), "LYC" (lymphoma), "GYC" (gyne)*
    - *Wednesday: "GUC" (GU), "NSRTC" (neuro stereotactic radiation), "LGC" (lung)*
    - *Friday: "CNC" (neuro)*
- Tumor Board Conference Code in CST Cerner bookshelf:



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PET-CT:

The resident will spend 1 week (for a 4-week rotation) at PET/CT with Dr. Patrick Martineau (office 4243C @ BCCA). Residents will have opportunities to understand the physiology behind 18F-FDG PET/CT, learn the appropriate indications and limitations of PET/CT, and gain familiarity with emerging PET radiotracers (e.g., PSMA, DOTA, DOPA). Residents are expected to read/report PETCT during the PETCT rotation (5~7 cases per day). Case volume can vary depending on PGY level, complexity of cases and the other clinical service on the same day.

Radiation Oncology:

The Resident will (optional) spend 1 day in Radiation Oncology to gain some exposure to pertinent topics related to Radiology with Dr. Michael Peacock. This one-day exposure can be one of the following perspectives: a) a clinical appointment between radiation oncologist and patient, or 2) radiation treatment delivery, or 3) radiation treatment planning.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert:

1. Demonstrate knowledge of clinical radiology and pathology with regards to the diagnosis and follow-up of malignancy, including disease – specific search patterns
2. Gain familiarity with tumour staging and its relevance to treatment (including while not limited to the following primaries: HNC/lung/colorectal/cervical/endometrial/prostate cancer/HCC, etc.)
3. Understand basic management of various malignancies, the roles of medical, radiation and surgical oncology in cancer care; and to recognize the relevant imaging changes during those therapies
4. Gain familiarity with Reporting and Data Systems, RECIST, etc.
5. Integrate oncologic findings across multiple modalities
6. Understand indications of different imaging modalities and CT/MRI protocols chosen for oncologic imaging
7. Demonstrate a general understanding of the physiology behind 18F-FDG PET/CT
8. Demonstrate knowledge of appropriate indications and limitations of PET/CT
9. Gain familiarity with emerging PET radiotracers (e.g., PSMA, DOTA, DOPA)

Communicator:

1. Demonstrate effective interaction with patients, including empathy and clarity; and to obtain informed consent effectively
2. Provide an accurate, concise, and timely report that is pertinent to the clinical questions in the cancer care scenario
3. Understand the benefits of standardized medical imaging reports
4. Appreciate need to communicate with referring team clinicians upon detection of findings requiring prompt clinical action
5. When appropriate, dictate a PET/CT report and communicate findings to the referring physician

Collaborator:

1. Function as a member of a multidisciplinary health care team: including providing consultation to referring physicians, appropriate to level of training during routine work and at multidisciplinary tumor board conference; and to Radiation Oncology for radiation planning
2. Discuss selected patients and their PET/CT findings with the clinical team

3. Respectfully interact with technologists, administrative and clerical staff, and other physicians

Leader/Manager:

1. Gain exposure to issues in management, specifically regarding prioritization of studies
2. Understand quality assurance issues including, but not limited to, medical errors, vendor specific hardware limitations, and technical parameter optimization
3. Understand the cost of PET/CT to the institution and society

Health Advocate:

1. Explain the benefits and risks of investigations including population screening
2. Understand major risk factors for specific malignancies
3. Educate and advise on the use and misuse of each imaging modalities
4. Identify a specific scenario where education regarding PET/CT should be delivered to foster appropriate use
5. List 3 groups who could benefit from knowledge of the utility of PET/CT

Scholar:

1. Facilitate one's learning through appropriate use of variety of resources
2. Provide one current article pertinent to general or specific oncology imaging for discussion, and/or contribute 2 interesting cases as teaching file (PowerPoint format).
3. Provide one current article on PET/CT for discussion

Professional:

1. Provide ethical patient care with compassion
2. Demonstrate satisfactory attendance, punctuality, sound work ethic, and initiative
3. Accurately assess one's own performance, strengths, and weaknesses, and accept/utilize constructive advice

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Pediatric Radiology Rotation Goals & Objectives - BCWH

Updated: August 13, 2021
RPC Approval: TBD

Level/Stage:

- R3, R4, R5
- Core, Transition to Practice

Introduction

During the course of the radiology residency, radiology residents receive 16 weeks of Pediatric Radiology training; 8 weeks during R3 year and 8 weeks during R4 or R5 years. Pediatric Radiology training at BC Children's Hospital is designed as "rotations within a rotation". Residents are assigned to Hot Seat, Ultrasound, Satellite, Neuroimaging, and Cardiac / Body Imaging rotations during their Pediatric Radiology training. There is some flexibility in the training rotations with residents able to undertake some Interventional Radiology or otherwise tailor their training to their needs during the final 4-week Pediatric Radiology rotation.

Vacation, conference and call requests must be booked with the rotation supervisor prior to the beginning of the rotation. There are frequently three residents rotating on the same call schedule at one time, and care is given to create monthly call schedules and weekly work rosters well in advance. Residents are required to do one weekend of call in each month, as well as approximately one weekday night of call each week. Residents are not required to stay on site at the hospital while on call; a pager is provided. Residents should contact the rotation supervisor if they will be absent from the rotation due to illness orother urgent matters.

Core Responsibilities and Expectations

The overall goals and objectives of the Pediatric Radiology training are to develop a sound knowledge of general pediatric radiology (plain films, fluoroscopy, ultrasound and CT and MRI) and the principles of radiation protection as applied to the pediatric population. By the completion of the Pediatric Radiology training, the resident should be capable of acting in a consultant role to discuss indications for imaging studies in children and the management implications of findings. The resident should understand appropriate techniques for imaging children and how techniques are modified depending on age and size of the patient. The resident should be capable of performing a satisfactory fluoroscopic or ultrasound study on a pediatric patient; particularly those studies which are unique to the pediatric population.

While on the Hot Seat rotation, residents should arrive at the Hot Seat and begin reviewing plain films

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from the Emergency Room by 0800 hours. The ultrasound rotation begins with NICU conference in the NICU at 0800 hours. Residents should have reviewed relevant imaging prior to the NICU conference. Residents on the Cardiac / Body Imaging Rotation should review relevant PICU imaging prior to PICU conference which begins at 0745 in the PICU conference room. The Neuroimaging rotation and atellite rotations begin at 0800. The workday generally ends by 1700 hours.

Teaching occurs throughout the day at the workstation and at mandatory case review teaching conferences, which are held at 1215 hrs on Monday, Tuesday and Friday of every week. Residents are expected to attend "Academic Rounds" held from 1630 to 1730 hrs most Tuesdays during the academic year and Departmental Quality Assurance rounds held on Tuesdays following noon conference. A number of multidisciplinary case review conferences are held throughout the week. Residents are encouraged toattend these conferences and UBC Pediatric Grand Rounds, which are held on Fridays at 0830 hrs during the academic year. A schedule of Departmental conferences will be distributed to the residents on the first day of the Pediatric Radiology rotation.

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of multi-planar anatomy, clinical pediatrics, and pathology as pertains to pediatric imaging
- Knowledge of modality specific physics and pediatric specific imaging protocols
- Able to detect and interpret findings to develop an appropriate differential diagnosis considering the age of the patient
- Able to summarize case, offer recommendations, understand treatment and clinical implications
- Able to perform satisfactory pediatric fluoroscopy and ultrasound procedures
- Knowledge in the area of the Pediatric Radiology curriculum:
    - Radiation effects and safety during imaging procedures
    - Head and Neck Imaging
        a. Congenital conditions (ie. Inner ear and branchial cleft malformations)
        b. Infection and Inflammation
        c. Neoplastic conditions
    - Neuroimaging
        a. Congenital anomalies
        b. Neonatal Brain Injury
        c. Metabolic and Neurodegenerative Disorders
        d. Infection and inflammation
        e. Neoplastic Conditions
        f. Vascular Disorders
        g. Trauma including Non-Accidental Injury
    - Respiratory / Thoracic Imaging
        a. Congenital anomalies
        b. Infection and Inflammation
        c. Systemic Conditions with Lung Involvement
        d. Neoplastic Conditions
        e. Trauma
    - Cardiovascular Imaging

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    a. Congenital Heart Disease
    b. Infection / Inflammation
    c. Cardiovascular involvement with systemic disease
- Gastrointestinal / Abdominal Imaging
    a. Congenital Anomalies i.e Malrotation, in utero bowel obstruction
    b. Infection / Inflammation
    c. Acquired Bowel Obstruction
    d. Neoplastic Conditions
    e. Trauma
    f. Transplant
- Genitourinary Imaging
    a. Congenital Anomalies
    b. Infection / Inflammation
    c. Metabolic and inherited Conditions
    d. Neoplastic conditions
    e. Torsion
    f. Trauma
    g. Transplant
- Musculoskeletal Imaging
    a. Congenital Anomalies
    b. Skeletal Dysplasias and Metabolic Conditions
    c. Trauma including Non-Accidental injury
    d. Scoliosis
    e. Infection / Inflammation
    f. Neoplastic Conditions

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicate effectively with patients, families and other health professionals
- Demonstrate appropriate and timely communication of findings to referring physicians
- Give accurate, concise, complete reports

Collaborator

- Respect, recognize the roles of, and consult effectively with the healthcare team, including clinicians, surgeons, nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Manager

- Manage daily workflow in the department, including prioritization, physician consultation and supervising of day-to-day operation
- Perform/interpret appropriate volume of case for level of training
- Dictate and sign reports in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activitiesHealth

Advocate

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- Understand benefits and risks/limitations related to imaging studies in the pediatric population
- Understand the appropriate use of imaging studies and rationalization of use of imaging resources in children

Scholar

- Effectively teach others, including residents, medical students, patients and other health professionals
- Demonstrate continuous self-directed learning (reads around cases and topics)
- Demonstrate evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviours
- Practice medicine ethically consistent with obligations of a physician
- Demonstrate insight with regards to own limitations, strength and weaknesses, asks for helpwhen appropriate
- Accept constructive criticism

Reading List

- Fundamentals of Pediatric Radiology by Lane F. Donnelly
- Caffey's Pediatric Diagnostic Imaging (ed. Brian Coley),
- Pediatric Sonography (ed.Marilyn Siegel)
- Pediatric Neuroimaging (ed. A James Barkovich)

These and other relevant textbooks are available in our department. Good review articles on topics in Pediatric Radiology are available in AJR, Pediatric Radiology, and Radiographics.

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Ultrasound Rotation Goals & Objectives - SPH

Updated: March 29, 2021
Reviewed by: Dr. E. Peramaki
RPC Approval: TBD

Level/Stage

- R2, R3, R4, R5
- Foundation, Core, Transition to Practice

Introduction

During the course of the four years, residents will receive a total of six months of ultrasound training and are expected to develop graded responsibility as they increase in seniority. Guidance, which should include review of this document, will be given to each resident at the commencement of a rotation, an interim evaluation will occur halfway through the rotation, and a final evaluation will be given at the end of each rotation. Each final evaluation will be submitted to the residency training program director.

Core Responsibilities and Expectations

All residents are expected to arrive in the department by 0800 hours and stay until the conclusion of the working day, approximately1700-1730 hours. Ongoing teaching and interaction with staff occurs throughout the day. If a resident is absent from his/her ultrasound rotation for any reason, he/she should give ample warning to Dr. Peramaki or Dr. Brown. Vacation and conference requests must be booked with Dr. Peramaki or Dr. Brown in advance, at least two weeks prior to any planned absence from the rotation. A general US textbook (Diagnostic Ultrasound by Carol Rumack, Stephanie Wilson, J. William Charboneau) is available as a reference and must not be taken out of the reading room.

[R2's first month of rotation]: Should focus primarily on scanning with close supervision by a technologist and by the end of the month should be comfortable scanning most abdomen or pelvis cases, and should recognize normal anatomy. Residents in this month are expected to focus on exams that would potential be seen oncall: abdomens, pelvic, early/first trimester OB (including endovaginal scan technique), scrotal ultrasound and DVT assessment. A basic understanding of transplant renal ultrasound is recommended. Residents will join technologists in scanning patients, and follow their scanned cases through to review with staff.

[R2's second month of rotation]: Further exposure to common pathology including gallstones, biliary dilatation, hydronephrosis, intra-uterine and ectopic gestation. Exposed to Doppler screening for DVT and endovaginal scanning, although first years are expected to seek senior advice/supervision when performing these scans. Again this rotation is expected to be largely for exposure to scanning technique.

[R3, R4 / Core]: Time spent scanning will diminish in these years, with further emphasis placed on scan interpretation and dictation. It is expected that residents identify areas of weakness with scanning (i.e. renal transplant) and seek out opportunities to improve skills in their areas of weakness. Residents at this stage should be comfortable with all aspects of normal/abnormal abdominal and pelvic scans including EV scans, DVT studies and assessment of renal transplant. Although there is a dedicated OB ultrasound

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rotation at SPH, and BCWH, exposure to the basics of detail ultrasounds and fetal assessment will begin during this rotations.

[R5 / TTP]: Senior residents are expected to function in the capacity of a fellow/junior staff. At the initiation of the rotation, the resident should identify areas of specific weakness and/or interest and the training will help address these issues. Senior residents are expected to check cases, to review cases with staff, to consult with referring physicians, to initiate appropriate intervention (under supervision), and to report examinations as appropriate.

Seniors will be instructed and encouraged to perform various interventional procedures under ultrasound guidance, will be given further exposure to carotid duplex, and will be instructed on prostate ultrasound and biopsy technique.

Reading List

- Recommended Textbooks:
- Diagnostic Ultrasound. by Carol Rumack, Stephanie Wilson, J. William Charboneau. 3rd edition is in the reading room, note a new 4th edition has just come out (Dec 2010)
- Ultrasound: The Requisites / Edition 2 *by Barbara Hertzberg, Alfred B. Kurtz, Barbara S. Hertzberg.*
- Reading around cases that the resident encounters during his/her rotation is mandatory. This can be done with Stat DX and the internet can provide many review articles (eg Radiographics).

Specific goals and objectives that relate to the CanMEDS roles are as follows:

Medical Expert

- Knowledge of US physics, artifacts and understanding imaging protocols, including use of different scanning probes and Doppler
- Knowledge of multi-planar anatomy
- Knowledge of clinical radiology and pathology
- Detects findings and interprets findings into an appropriate differential diagnosis
- Ability to summarize case, offer recommendations, understands treatment and clinical implications
- Knowledge of the procedure: indications, complications, appropriate alternatives, use of conscious sedation, post procedure care
- Basic technical ability: patient positioning, sterile technique, local anaesthetic, simple procedures (prostate US and thyroid biopsy)
- Advanced technical ability: ability to perform more difficult procedures

Communicator

- Establish therapeutic relationship with patients/families
- Obtain and synthesize relevant history from patients/families/communities
- Listen effectively
- Communicates effectively with patients, families and other health professionals.
- Demonstrate appropriate and timely communication of findings to referring physicians
- Able to obtain appropriate informed consent for US guided procedures
- Give accurate, concise, complete reports

Collaborator

- Respects, recognizes the roles of, and consult effectively with the healthcare team, including nurses and technologists
- Contribute effectively to other interdisciplinary team activities

Leader

- Manages daily workflow in the department, including prioritization, protocoling and triage of cases, physician consultation and supervising of day-to-day operation
- Performs/interprets appropriate volume of case for level of training
- Reports are dictated and signed in a timely manner
- Utilize resources effectively to balance patient care, learning needs, and outside activities
- Allocate finite health care resources wisely
- Work effectively and efficiently in a health care organization
- Utilize information technology to optimize patient care, life-long learning and other activities

Health Advocate

- Understands benefits and limitations/risks related to ultrasound and ultrasound guided procedures
- Understands the appropriate use of ultrasound and rationalization of use of imaging resources

Scholar

- Effectively teaches others, including residents, medical students, patients and other health professionals
- Demonstrates continuous self-directed learning (reads around cases and topics)
- Demonstrates evidence based medical approach and critical appraisal with regards to radiology literature
- Develop, implement and monitor a personal continuing education strategy
- Contribute to development of new knowledge

Professional

- Deliver highest quality care with integrity, honesty and compassion
- Exhibit appropriate personal and interpersonal professional behaviours
- Practice medicine ethically consistent with obligations of a physician
- Demonstrates insight with regards to own limitations, strength and weaknesses, asks for help when appropriate
- Acceptance of constructive criticism