UNIVERSITY OF SASKATCHEWAN

DEPARTMENT OF MEDICAL IMAGING

POSTGRADUATE EDUCATION PROGRAM

RESIDENT'S TRAINING MANUAL

Revised February 2009

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PREFACE

Medical Imaging is an exciting, dynamic, evolving discipline. This in itself contributes to a certain amount of turmoil, as there is a large amount of material "to conquer". However, let us first welcome you to the Program.

The tasks of Medical Imaging with respect to the training of Radiologists can be viewed according to the following functions.

1. To foster participation and goals of the department as follows:

    a. Service;
    b. Research;
    c. Teaching;
    d. Administration;
    e. Influence.

2. Preparation for the Radiology Fellowship Examination.
3. Preparation for a future job as a Radiologist.
4. Preparation for life-long learning.
5. Preparation for evidence-based Medicine.
6. Preparation for re-certification.

From time-to-time there are tensions which arise within the department based on educational philosophy. Please remember that this is a postgraduate program and as such will fall somewhere between the level of an MSc. and Ph.D. While there will be some didactic learning, much of the onus for learning falls on the trainee as well. There are opportunities all around you, and it is up to you to avail yourself of them whenever possible.

Prior to starting your rotation you should review the outline for the rotation. Remember at the end of the rotation it is <u>your</u> responsibility to ensure that you have received your evaluation, that you have completed an evaluation of the faculty, and that you have added cases to the teaching file.

A) <u>GOALS AND OBJECTIVES</u>

The training program in Diagnostic Radiology at the University of Saskatchewan provides an opportunity for Residents to achieve the educational objectives outlined in the Royal College document, "Specialty Training Requirements in Diagnostic Radiology." (see appendix D) and the General and Specific objectives outlined in the Royal College Document, "Objectives of Training and Specialty Training Requirements in Diagnostic Radiology (2000)" (see appendix E). This is a five-year program.

The PGY1 year is structured to provide a diverse clinical experience, hopefully allowing Residents to develop an understanding of the imaging needs of a variety of clinical disciplines. Specific Educational Objectives for the PGY1 clinical year can be found in Part I and Part II of the document "Educational Objectives Postgraduate Year-1 Medical Imaging (revised February 2009)".

PGY1: This year consists of:

Medical Imaging	**4 weeks**
General Elective	**4 weeks**
Obstetrics/Gynecology	**4 weeks**
Internal Medicine	**4 weeks**
Neurology	**4 weeks**
Medicine Elective	**4 weeks**
Pediatrics	**8 weeks**
General Surgery	**4 weeks**
Neurosurgery	**4 weeks**
Anatomy/Surgery Elective	**4 weeks**
Anatomic Pathology	**4 weeks**
Emergency	**4 weeks**

(See PGY1 Manual for further details).

The subsequent four years consist of rotations in the subspecialties of Diagnostic Radiology. Residents will be given graded responsibility for the care of patients, the performance of procedures, and in their interpretation. Faculty and Residents participate in Resident education. There will be a continuing effort by the faculty to provide up-to-date information and techniques in the subspecialty areas they are involved with. This will require the ongoing procurement of new and emerging technology in this highly technology oriented specialty.

B) AFFILIATED HOSPITALS

Saskatoon

a. Royal University Hospital (RUH), Head, Dr. Grant Stoneham
b. St. Paul's Hospital, Head, Dr. Carolyn Flegg
c. Saskatoon City Hospital, Head, Dr. Tom Waslen

Regina

a. Regina General Hospital, Head, Dr. C. Lim
b. Pasqua Hospital, Head, Dr. C. Lim

C) POSTGRADUATE EDUCATION COMMITTEE

Program Director:	Dr. D. Fladeland
St. Paul's Hospital:	Dr. C. Flegg
Saskatoon City Hospital:	Dr. T. Waslen
Chief Resident:	Appointed yearly
Elected Representative	Elected yearly
Regina Coordinator:	Dr. C. Lim

D) ADMINISTRATIVE RESIDENT

One Resident, in third or fourth year, will be elected by their peers with approval of the Postgraduate Education Committee for a duration of three to twelve months. The majority of this time should be spent at the Royal University Hospital to facilitate Resident communication with all involved.

Duties

a) The Administrative Resident will be responsible for scheduling Resident call and holidays. He/she will ascertain that the Residents and faculty assigned are appropriate to provide adequate coverage. Concerns or deficiencies in staffing should be brought to the attention of the Program Director.

b) The Administrative Resident will perform the duties of the Chief Resident in his/her absence.

c) Copies of all documentation related to this should be forwarded to the administrative secretary for filing to facilitate future retrieval and review.

E) CHIEF RESIDENT

The Chief Resident will be a third or fourth year Resident nominated by the Postgraduate Education Committee and approved by the entire Faculty of the Department of Medical Imaging. The appointment will have a six to twelve month mandate.

Duties

a) The Chief Resident will be the liaison between the Resident body, the faculty, technical staff, and support staff in the department. Conflicts and problems should be brought to the attention of the Chief Resident who may decide that a solution exists within their realm of influence. Unresolved problems should then proceed to the Program Director to facilitate a solution.

b) Any incident involving Residents should be recorded by the Chief Resident with a copy given to the Program Director.

c) Scheduling

In the absence of the Administrative Resident, call and holiday schedules will be the responsibility of the Chief Resident.

d) Teaching

The Chief and/or Administrative Resident may be called upon to recruit Residents for teaching inter-departmental rounds, medical students, technology students or technologists, nursing units, etc.

e) Resident Representative

The Chief Resident should meet regularly with the Resident body (Chair of Resident Affairs Committee). The minutes of all meetings should be forwarded to the Program Director. Evaluations of rotations and faculty should be supervised by the Chief Resident and performed on at least a yearly basis, with the results conveyed to the Program Director.

F) DUTIES OF ADMINISTRATIVE/CHIEF RESIDENT AS OUTLINED BY THE COLLEGE OF MEDICINE

Each program, with a minimum of three Residents, will have an Administrative Resident.

The duties assigned to the Administrative Resident/Chief Resident represent a wide range of responsibilities that can be assigned by the Program Director. Since the number of

persons and other factors vary among the departments and hospitals, it is recognized that in some situations the Resident may not encompass each category. It is further recognized that the complexity of individual functions or tasks can vary among departments and/or hospitals but that no attempt will be made to alter the compensation due to these differences. Also, duties may be delegated in such a manner that two or more Residents share the responsibilities.

Duties:

1. Liaison between faculty/staff and Residents, including handling of complaints and concerns originating with the Residents, faculty/staff, or hospital administration.
2. Arrangement and preparation of call schedules, ward schedules and holidays to ensure appropriate coverage in the department at any given time. Scheduling of Resident teaching rounds, Pathology rounds, Grand Rounds, and other teaching sessions is the responsibility of the Administrative Resident in consultation with the Program Director.
3. Orientation of new trainees.
4. Organization of case rounds and audit of ward charts.
5. Residency Teaching Round Scheduling.
6. Subspecialty and Grand Round Scheduling.
7. Undergraduate Seminar Scheduling.
8. Allocation of junior Residents to consultants.
9. Arrange patient cases for undergraduate and postgraduate examinations.
10. Supervision and assessment of JURSIs including the review of exams written by the JURSIs.
11. Supervise and coordinate the investigation and treatment of patients as directed by the attending physician.
12. Membership on the Postgraduate Education Committee
13. Assist in updating resource material in the department library.
14. Assist in selecting articles to be reviewed by Residents at journal club meetings.
15. Additional duties that may be assigned from time to time by the Program Director.

G) EVALUATION OF RESIDENTS

Residents will be evaluated by his/her supervisors at the completion of each rotation by formal online evaluation**,** the evaluation system will typically be done electronically.

Each rotation has an assigned coordinator. By default, an evaluation will be sent to this individual the first week following a completed rotation. The coordinator will determine how he/she wants to obtain input from other preceptors for the evaluation form. In some cases the coordinator may be away or have had limited exposure to the resident. In these

cases, the resident should indicate to the Administrative Secretary the individual to send the evaluation to. This would also apply to elective rotations (in or out of province).

Once the rotations are completed they will be available for electronic review by the resident. Residents should also complete rotation evaluations at that time.

A mid-term evaluation should be obtained at the halfway point of each rotation. This may be written or oral feedback.

The In-Training Evaluation process is detailed in Appendix G. An example of the In-Training Evaluation Report (ITER) incorporating the Can Meds 2000 competencies is included as Appendix H.

A formal written evaluation of each Resident will be made at six month intervals. This evaluation will be completed during a meeting of the department faculty, and the chief and administrative Residents. The results of this evaluation will be presented to the Resident by the Program Director for discussion and signature. The results of any practice oral examination will also be recorded. This is to allow constructive criticism to be given ensuring continuing improvement in Resident performance.

The Residents should also feel free at that time to discuss problems they see with the program or to ask for advice regarding future rotation planning, electives, career counselling or additional training.

H) EVALUATION APPEAL MECHANISM

If the Resident is dissatisfied with the evaluation given then they should indicate this dissatisfaction on the evaluation form. The evaluation form, however, should be signed to indicate that they have seen it.

The evaluation form should then be reviewed with the Program Director. If possible the Program Director will act as a mediator between the rotation supervisor and the Resident.

If the Resident is not satisfied with the content of the evaluation an appeal may be launched.

The appeal action must be initiated by the Resident. The Assistant Dean of Postgraduate Medical Education must receive a written submission documenting the reasons for the appeal. Upon receipt of the appeal the Assistant Dean will have an appeal committee struck. This will consist of three members of the medical faculty, a Resident from Medical Imaging, and a Resident selected by PAIRS. This committee will have the

power to uphold the decision of the Program Director or request that the Program Director modify the evaluation.

If the Program Director refuses to alter the evaluation the matter will be referred to the Assistant Dean of Postgraduate Medical Education, the Dean, and subsequently the Executive of Faculty of the University of Saskatchewan, who will then make a ruling. (See Appendix F) "College of Medicine, University of Saskatchewan, Regulations for dealing with unsatisfactory evaluations and disciplinary action."

I) CALL DUTY

Call shall be not more than ten days in thirty as provided for by the PAIRS contract. Currently, Residents are on call for general radiology, computed tomography (CT), ultrasound, MRI and Angio/Interventional procedures. This coverage only starts after the Resident has received appropriate training in each individual area (usually 2 months). The Faculty are the primary contacts for MRI and Angio/Interventional call.

Staff radiologists are scheduled for backup call for all modalities.

Responsibilities while on call for general radiology include Emergency x-rays, plain x-ray interpretation, GI and GU work. This Resident may also be called back for Angiography procedures. Residents will begin general call in their first year after introductory training.

Residents are required to supervise after hours administration of contrast material in CT. The resident on call for MRI contrast supervision will receive an educational stipend for the hours between 5 – 10 pm.

Residents are currently not required to remain in hospital overnight. Residents are required to be in the hospital for examinations requiring supervision.

J) ROUNDS

Academic Half Day - (1300 - 1700 on Wednesdays, 1200-1700 on Bank Days) Rounds are scheduled, on a body systems and modality approach, presenters consisting of staff radiologists and other medical faculty, present topics within their realm of expertise. A schedule will be arranged by the chief Resident on a 6 monthly basis in consultation with the Program Director. Includes Radiology/Pathology and Grand Rounds as listed below.

Radiology/Pathology Conference - A staff person is assigned to this conference on a rotating basis. Two Residents will be given one unknown case each for discussion of the

findings and differential diagnosis. A member of the Pathology Department may be in attendance to present the pathology findings.

Grand Rounds – A Resident will present an interesting topic or issue for discussion. This will be a formal presentation, usually relating to state-of-the-art imaging or diagnosis, or other topical issues in Medical Imaging.

Research and Methodology Statistics - (1530 - 1630 hours) Wednesdays, over three months, this is mandatory for all PGY2 Residents. Arranged by the College of Medicine.

Physics – Will be organized by the Postgraduate Medical Education Committee.

Biomedical Ethics - A three hour introductory lecture course for first year Residents arranged through the College of Medicine.

Journal Club - Monthly from September to May. Scheduled by the Chief Resident.

Saskatoon Medical Imaging Breast Imaging - These rounds are provided by the faculty at Saskatoon Medical Imaging. They are arranged bi-monthly with presentation of cases accompanied by supper. All residents engaged in a Mammography rotation at SMI are expected to attend, attendance otherwise is voluntary.

Diagnostic Imaging Research Day - Once per year. Dr. Kent Teaching Room – (usually Feb to June).

Recommended Rounds Outside of the Department

Neurological Sciences Rounds

Surgery Grand Rounds

Medical Grand Rounds

K) RESEARCH

1. Royal College Guidelines

   The ability to conduct a radiology research project, which may include quality assurance.

2. Goals of Resident Research

a) Learn to formulate a "research question" and successfully complete the process involved to reach a conclusion.
b) To facilitate an exchange of information and ideas amongst the members of the department.
c) To increase the academic output of the department.
d) Quality Assurance.
e) Obtain data on utilization trends.
f) Obtain data in support of the need for specific imaging modalities in our department.

3. What is a research project?

a) Ask a question.
b) Search and critically evaluate the "literature", and formulate an opinion as to the value this information.
c) Synthesize the information into an organized form suitable for presentation to colleagues.
d) Formulate a "research question", or "hypothesis", if the original inquiry does not satisfy your curiosity.
e) Design an appropriate study protocol to address the "research question".
f) Perform the study.

4. Resident Research Objectives

a) Each Resident is required to present the status of his/her research activities at the Annual Medical Imaging Research Day until two completed projects have been presented.
b) Each Resident must complete two "projects" during their residency.
c) One project may be a "Case Report", "Case Study" and/or "Case Series" with the understanding that it must be externally presented or published in order to be considered completed.
d) These projects should be completed by the end of PGY4, with possible extension to the first four months of PGY5.
e) PGY5 Residents are exempt from presentation if they have fulfilled the above requirements.

5. Funding

Funds are available from the department Research Account.

Requests for funding should be forwarded to the Medical Imaging Research Committee for evaluation and approval.

Research proposals submitted for funding should include:

a) Principal investigator;
b) Co-investigators;
c) Title of project;
d) Introduction;
e) Hypothesis;
f) Study design;
g) Budget proposal;
h) References from scientific literature.

L) PREAMBLE TO ROTATION OUTLINE

1. General Goals

   a) Learn the normal anatomy, variations of normal anatomy, basic sciences, and relevant clinical background pertinent to the specific rotation.
   b) Learn to correlate the radiological findings and clinical information in order to discuss the most probable pathological processes.
   c) Demonstrate sound clinical ability and judgement. Develop responsibility for radiology procedures, team work skills, ability to supervise personnel and handle workloads, and competency in emergency situations.
   d) Demonstrate ability to perform all procedures. Safe use of imaging equipment is of great importance.
   e) Become able to act as a consultant in diagnostic imaging.

2. The workday in all rotations begins at 0800 hours. The workday concludes when all scheduled work pertinent to the Resident's rotation has been completed. This should include dictation of all procedures checked with the supervising radiologist.

3. Residents are expected to be present in the department at the time procedures are scheduled and to remain in the department until scheduled procedures are completed.

4. Staff supervising Residents should be available for consultation particularly when unusual procedures are scheduled or the Resident is inexperienced.

5. All x-rays and procedures are checked with a Staff radiologist prior to being reported by a Resident. During the Resident's PGY5 year the faculty of the department will determine whether a Resident is competent to report plain x-rays without reviewing them with a radiologist. Backup will be available at all times.

6. Residents are expected to be aware of the scheduled procedures that are pertinent to the rotation they are on. They must be aware of their patients previous history, including previous radiologic investigation. Contraindications to procedures should be elicited from the patient or clinician. Procedures are only rejected after consultation with the supervising radiologist.

   Residents are responsible for coverage, either personal or delegated, of their work area for the entire day. Technologists in their area must be instructed by the Resident how to contact them, or their designate, during periods of absence, i.e. noon lunch, rounds, lectures, etc. The designated person covering may be the Attending Radiologist, or another appropriate individual.

   The successful Resident will, prior to checking images with the Supervising Radiologist, review the patient's previous imaging, the clinical history available, and do some appropriate reading around the case.

7. Consultation with members of other departments should be minimal and supervised in early years of training. It is best to rely upon other Residents and faculty until more experience has been acquired.

8. Residents will from time to time be assigned to prepare topics/patients for discussion at rounds in radiology and/or other medical disciplines. This will help the Resident gain confidence in public speaking and presentation skills.

9. Reading material is listed in Appendix B. Refer to this appendix for suggested reading before starting a new rotation.

10. Resident Evaluations of Rotations. (see Appendix "I")

    Evaluation forms can be obtained from the Administrative Resident or the Administrative secretary. Residents should complete evaluation forms and submit them to the Program Director to provide constructive criticism or praise for completed rotations. These forms will be kept in confidence and comments will from time to time be passed on to rotation supervisors. This will aid in improving the structure and content of the program.

A summary evaluation of each rotation should be completed yearly by the resident body, compiled and forwarded to the Program Director by the Chief Resident.

M) ROTATIONS

GOALS & OBJECTIVES
RESPIRATORY SYSTEM ROTATION

GENERAL OBJECTIVES

On completion of the required respiratory system rotations the resident will be competent to function as a consultant radiologist to referring family physicians and specialists in the field of pulmonary and cardiac diseases. The resident will demonstrate the ability to supervise, advise on and perform imaging procedures to the required level of competence for obtaining licensure.

SPECIFIC OBJECTIVES

At the completion of respiratory radiology rotations, the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

Specific Requirements: **Junior residents**

- Demonstrate knowledge of the anatomy of the chest for all ages, both conventional and multiplanar, with emphasis on radiological anatomy.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to respiratory conditions.
- Apply pattern recognition in assessment of diffuse pulmonary disease.
- Develop an approach to the evaluation of ICU chest radiographs. (PICU and NICU may also be covered partly on this rotation).
- Apply the appropriate imaging modalities for investigation of various respiratory conditions, and be able to list the risks and benefits of each.
- Show competence in general intravenous access.
- Explain the importance of informed consent, potential complications of each modality (such as contrast media reactions), and demonstrate knowledge of and ability to manage complications effectively.
- Identify the acceptable and expected results of thoracic interventional therapy as well as unacceptable and unexpected results.
- Describe invasive procedures pertaining to the lungs such as fine needle aspiration, bronchoscopy, transbronchial biopsy, thoracoscopic biopsy, bronchoalveolar lavage, and pulmonary angiography as well as listing the benefits and disadvantages of these procedures for various conditions.

- Basic knowledge of relevant lab studies including pulmonary function tests, microbiology, and biochemistry as related to various pathological processes.
- Apply the fundamentals of quality assurance as it pertains to chest radiography.

Specific Requirements: **Senior residents**

Continued knowledge of all of the above listed requirements plus:

- Demonstrate knowledge of pertinent differential diagnoses that correlate with applied patterns in assessment of diffuse pulmonary disease.
- Show competence in FNA lung and core pleural biopsies, ultrasound guided thoracocentesis, and limited pulmonary angiography.
- Demonstrate ability to manage a patient independently during a thoracic procedure in close association with an attending radiologist.
- Apply the appropriate follow-up care of patients who have received interventional therapy.
- Competence in effective consultation, conduct of clinico-radiological conferences, and the ability to present scholarly material and lead case discussions.
- Explain the physics and technical factors of plain x-ray radiography as it pertains to the various types of chest x-rays, including the double emulsion film specifically developed for imaging of the chest.
- Explain the physics and technical factors of CT scanning, digital and/or computed Radiography, MRI, and Angiography as it pertains to the chest.
- List the theoretical, practical, and legal aspects of radiation protection and the possible harmful effects of modalities pertinent to imaging of the chest.

Communicator

Specific Requirements:

- Apply a sound and systemic style of reporting for all thoracic modalities.
- Have the ability to assemble a report that succinctly describes the chest imaging findings, gives the most likely differential diagnoses, and recommends further testing and/or management when indicated.

Collaborator

Specific Requirements:

- Consult effectively with other physicians and health care professionals (Junior resident).

- Have the ability to function as a member of a multidisciplinary health care team in the optimal practice of thoracic radiology (Senior resident).

Manager

Specific Requirements:

- Be competent in conducting or supervising quality assurance related to chest imaging including an understanding of safety issues and economic considerations.
- Be competent in computer science as it pertains to the practice of Radiology.

Health Advocate

Specific Requirements:

- Describe and explain the benefits and risks of radiological chest investigations and treatment including population screening.
- Educate and advise on the use and misuse of thoracic radiological imaging.

Scholar

Specific Requirements:

- Competence in evaluation of the medical literature pertaining to chest radiography.
- Demonstrate ability to be an effective teacher of chest radiology to medical students, residents, technologists, and clinical colleagues.

Professional

Specific Requirements:

- Be able to accurately assess one's own performance, strengths, and weaknesses.

CHEST ROTATION – DUTIES FOR JUNIOR RESIDENTS

1. **Review of plain chest x-rays.** Plain x-rays should be reviewed from Monday through Friday mornings by the resident. X-rays are to be loaded on the multiviewer until PACS is functional, they the images should be acquired from the PACS. Assessment of the x-rays **MUST** include a review of all previous pertinent studies, if available. A **minimum** of **15 - 20** cases should be reviewed

on per day. Discussion of the x-rays will then take place with the supervising radiologist indicated on the weekly schedule. It is recommended that a mutually agreeable time be arranged for x-ray checking prior to the end of the day. These cases will then be dictated by the Resident.

2. **ICU/CCU.** The resident should accompany the staff assigned to reading ICU and CCU **at least** twice a week. It is recommended that the Resident read these x-rays out with staff in attendance. This particularly important for junior Residents.

3. **Normal CT of the Chest.** It is important on the first chest rotation to familiarize oneself with anatomy of the chest as demonstrated on CT, as well as to develop a basic understanding of standard and high resolution CT. The first year Residents will not be responsible for CT of the chest as exposure to plain x-rays should be maximized at this time.

   These activities should dominate the first chest rotation for residents. Emphasis will be on normal anatomy, physiology, and pattern recognition of disease processes.

CHEST ROTATION - DUTIES FOR INTERMEDIATE AND SENIOR RESIDENTS

1. **Review of plain chest x-rays.** Same as above except a **minimum of 25 – 30 cases** should be reviewed per day.

2. **ICU/CCU.** Same as above.

3. **CT of the Chest.** This assignment is mainly for Residents in PGY2 and higher. The Resident will protocol the scheduled and add-on CT chest cases for the day with the supervising chest radiologist. The Resident will supervise the performance of these cases and administer IV contrast as necessary. The Resident will review the cases as well as any previous or current relevant studies and obtain pertinent clinical information regarding the cases. They will be reviewed with the supervising chest or CT radiologist, and the Resident will then dictate the cases.

4. **NICU/PICU.** In the absence of a resident doing a pediatric rotation the senior chest resident may participate in NICU rounds and review and dictate the cases for NICU and PICU.

5. **Interventional Procedures.** When feasible, the resident should either observe or be involved in any interventional procedures related to the chest, such as lung

biopsies, pulmonary angiography, etc. The degree of involvement will depend upon the experience of the Resident and the presence or absence of a Resident on the Angio/Interventional rotation.

These activities should dominate the remaining chest rotations for residents. Knowledge of normal anatomy on a chest X-ray and pattern recognition of disease processes must be established. Emphasis will be on application of pattern recognition to differential diagnoses, pathophysiology, and formulating a diagnosis and plan of action where applicable.

CHEST ROTATION - GENERAL RESIDENT DUTIES

1. **Respiratory Rounds.** These rounds may be held from time-to-time. The format will vary depending on the supervisor. The chest Resident should collect a list of interesting cases seen during the week to have, if required, for chest rounds or current case rounds. Participation with active presentation of cases is expected where applicable.

2. **Pulmonary Rounds** are also held every Monday afternoon from 1600-1700 hours in the Respiratory Medicine Library, 5th Floor Ellis Hall. Attendance is encouraged but not mandatory.

3. **Teaching File.** The chest Resident is responsible for collecting interesting cases for the department teaching file. This will include an appropriate work-up of the case with pertinent clinical and/or pathological findings. A brief summary of the condition should also be included. The case will then be reviewed by the attending Chest radiologist before finalization by the Resident. One case per rotation must be added to the teaching file.

RESIDENT EVALUATIONS

1. The Resident's day-to-day performance will be evaluated. A mid-rotation informal evaluation should be given, and if it is not, please ask the supervising radiologist about your performance. It is the responsibility of the Resident to ensure that the end of rotation evaluation is both completed by the supervising radiologists and reviewed with you within one to two weeks of completing the rotation. This must be returned to the Administrative Secretary (see Resident Evaluation System – Appendix G).

   Lack of initiative in obtaining a sufficient number of cases will result in an unsatisfactory evaluation. Senior residents should be able to review a number of plain x-ray cases **and** the chest CT cases for the day. Failure to appear for readout of ICU

and CCU x-rays as scheduled with the responsible radiologist will also result in an unsatisfactory evaluation.

2. Performance of chest CT will be evaluated on a day-to-day basis.

CHEST CURRICULUM COURSE

The Chest series is designed as a combination of lectures and x-ray sessions. Typically, the sessions alternate. The series repeats over a two-year cycle. Some sessions are listed here but covered in the Pediatric series.

1. Introduction: Imaging Modalities
2. Malignancy and Staging
3. Interstitial Disease
4. Sarcoidosis
5. TB
6. Fungal and Parasitic Disease
7. Mediastinal Disease
8. Inhalation Disease and Pneumonoconiosis
9. Trauma and ICU
10. Emphysema and Cystic Disease
11. Vascular and PE
12. Malformations (included in Pediatrics)
13. Cardiovascular (included in Pediatrics)

GOALS & OBJECTIVES
CT ROTATION

GENERAL OBJECTIVES:

On completion of the required rotations, the resident will be competent to function as a consultant radiologist to referring family physicians and specialists in the field of disease processes commonly assessed with CT. The resident will demonstrate the ability to supervise, advise on and perform CT imaging procedures to the required level of competence for obtaining certification by the Royal College.

SPECIFIC OBJECTIVES

At the completion of general CT rotations, the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

Specific Requirements: **Junior Residents.**

- Demonstrate knowledge of anatomy, both conventional and multiplanar, with emphasis on transverse radiological anatomy as shown on CT.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to assessment of disease processes imaged with CT.
- Learn and apply appropriate protocols for evaluation of various body systems.
- Develop an approach to the interpretation of CT of the head, neck, body and extremities.
- Describe the risks and benefits of CT procedures.
- Show competency in general intravenous access.
- Explain the importance of informed consent, potential complications such as contrast media reactions, and demonstrate knowledge of and ability to manage complications effectively.
- Identify the acceptable and expected results of CT interventional procedures as well as unacceptable and unexpected results.
- Basic knowledge of relevant lab work related to various pathological processes.
- Apply the fundamentals of quality assurance as it pertains to CT.

Specific Requirements: **Senior residents**

Continued knowledge of all of the above listed requirements plus:

- Demonstrate knowledge of pertinent differential diagnoses that correlate with CT findings.
- Competence in effective consultation, conduct of clinical-radiological conferences, and the ability to present scholarly material and lead case discussions.
- Explain the physics and technical factors of conventional, spiral, and multidetector CT.
- List the theoretical, practical, and legal aspects of radiation protection and the possible harmful effects of CT.
- Show competence in performing CT guided interventional procedures.
- Demonstrate ability to manage a patient independently during a CT interventional procedure in close association with an attending radiologist.

- Apply the appropriate follow-up care of patients who have undergone a CT interventional procedure.

Communicator

Specific Requirements:

- Apply a sound and systematic style of reporting for all CT procedures.
- Have the ability to assemble a report that succinctly describes the CT findings, give the most likely differential diagnoses, and recommend further testing and/or management when indicated.
- Identify the importance of communication with referring clinicians, particularly in a situation when the results of an investigation or procedure should be urgently communicated.

Collaborator

Specific Requirements:

- Consult effectively with other physicians and health care professionals (Junior resident).
- Have the ability to function as a member of a multidisciplinary health care team in the optimal practice of CT as it applies to health care (Senior resident).

Manager

Specific Requirements:

- Be competent in conducting or supervising quality assurance related to CT imaging including an understanding of safety issues and economic considerations.
- Be competent in computer science as it pertains to the practice of CT.

Health Advocate

Specific Requirements:

- Describe and explain the benefits and risk of CT investigations including population screening.
- Educate and advise on the use and misuse of CT imaging.

Scholar

Specific Requirements:

- Competence in evaluation of the medical literature pertaining to CT and its applications in health care.
- Demonstrate ability to be an effective teacher of CT radiology to medical students, residents, technologists, and clinical colleagues.

Professional

Specific Requirements:

- Be able to accurately assess one's own performance, strengths, and weaknesses.

CT ROTATION – DUTIES FOR JUNIOR RESIDENTS

1. The resident will be responsible for choosing protocols for all of the booked cases for the day with guidance from the attending radiologist. The protocols will be applied individually to each case to best address the clinical question.
2. The resident will be available to monitor cases as they are performed to ensure that a completely diagnostic study is obtained.
3. The resident, with supervision, will field telephone calls and written requests for emergent add-on studies and will triage these according to the patients clinical status based upon clinical information provided.
4. When feasible, the Resident should either observe or be involved in all CT guided interventional procedures. The degree of involvement will depend upon the experience of the Resident.
5. The resident will review the cases for the day, including other pertinent studies, and these cases will be checked with the attending radiologist and dictated by the resident.
6. Other residents on neuroradiology, musculoskeletal, and chest rotations, depending on their level of training, may be responsible for studies in their respective areas according to the objectives outlined for those rotations.
7. All ER cases are to be provided an initial interpretation via fax to the ER.

These activities should dominate the first CT rotation for Junior residents. Emphasis will be on normal anatomy, physiology, and identification of findings related to various disease processes as assessed by CT.

CT ROTATION - DUTIES FOR INTERMEDIATE AND SENIOR RESIDENTS

1. The resident will continue to perform the first three duties described above with increasingly less supervision from the attending radiologist as experience is gained.
2. The resident will continue to review the cases for the day, including other pertinent studies, and will develop a list of differential diagnoses for the CT findings. These cases will be checked with the attending radiologist and dictated by the resident.
3. Other residents on neuroradiology, musculoskeletal, and chest rotations, depending on their level of training, may be responsible for studies in their respective areas according to the objectives outlined for those rotations.

These activities will dominate the remaining CT rotations for Senior residents. Emphasis will be on interpretation of findings related to various disease processes as assessed by CT, development of differential diagnoses as they pertain to the imaging findings, and formulating a diagnosis and plan of action where applicable.

RESIDENT EVALUATIONS

1. The Resident's day-to-day performance will be evaluated. The end of rotation evaluation will be done by a committee of radiologists involved with CT over the month. It is the responsibility of the Resident to ensure that the end of rotation evaluation is both completed by the committee and reviewed with the Resident by the CT supervisor within one or two weeks of completing the rotation. The evaluation must be returned to the Administrative Secretary (see Resident Evaluation System - Appendix G).

GOALS & OBJECTIVES FOR THE CVS – VASCULAR/INTERVENTIONAL ROTATION

GENERAL OBJECTIVES:

On completion of the CVS Vascular/Interventional Rotations, the resident will be competent to function as a General Consultant Radiologist to referring physicians in the subject area of Vascular and Interventional Radiology. The resident will demonstrate the ability to supervise and perform some imaging procedures, as well as advise referring physicians as to the appropriate investigation for their patient in this subject area. The skills will be developed to a level appropriate for Royal College Certification.

If the resident undergoes the minimum training of three months, they should demonstrate the ability to perform the following interventional procedures:

(Type A Procedures – By-law for the Operation of Diagnostic Imaging Facilities in the Province of Saskatchewan).

- Central venous access
- Percutaneous drainage fluid collections
- Percutaneous biopsy

The resident would not be expected to independently perform other more complicated interventional procedures until a further three months of dedicated training in Angio/Interventional Radiology had been undertaken. These procedures would include, but would not be limited to, the following procedures:

(Type B procedures – By-law for the operation of Diagnostic Imaging Facilities in the Province of Saskatchewan).

- Angiography
- Biliary interventions
- Fallopian tube catheterization
- IVC filter placement
- Intravascular stents
- Percutaneous arterectomy
- Percutaneous biliary endoprostheses
- Percutaneous GI intervention
- Percutaneous nephrostomy
- Percutaneous transluminal angioplasty
- Regional thrombolysis
- Therapeutic embolization
- Ureteral stents
- Transjugular intrahepatic portosystemic shunts (TIPS)
- Endoluminal stent grafting

SPECIFIC OBJECTIVES

At the completion of the CVS-Vascular/Interventional Rotation the resident will have acquired the following competencies, and will function effectively as:

<u>Medical expert/clinical decision-maker</u>

General Requirements:

To expand the residents knowledge-base to include an understanding of the role of Angiography and Interventional Radiology for the purposes of diagnosis and treatment.
To demonstrate Diagnostic and Therapeutic skills for ethical and effective patient care.
Access and apply relevant information to the clinical practice of Diagnostic Radiology, so as to have competence in the clinical radiological skills associated with Vascular and Interventional Radiology.
Demonstrate effective consultation skills with respect to patient care, education and legal opinions.

Specific Requirements:

This rotation is split into an initial month spent at St. Paul's Hospital (SPH), where the resident is exposed to the bulk of peripheral vascular and genitourinary imaging and intervention performed in the Saskatoon Health Region. The final two months of this rotation is obtained at Royal University Hospital (RUH), where the resident is exposed to the majority of Neurologic, Pediatric, trauma, and surgical/medical specialties operating at the tertiary care center.

There is expected to be graded involvement of the residents in the preparation and performance of the procedures undertaken on the vascular/interventional radiology service. There is graded supervision of the residents through the three months, and the resident is expected to become more proficient, and act more as a consultant, over the three-month period.

- Demonstrate knowledge of the anatomy of the cardiovascular system for all ages, with knowledge of both fluoroscopic/angiographic anatomy, as well as cross-sectional/multiplanar anatomy.
- Demonstrate knowledge of the anatomy relevant for interventional procedures such as biliary drainage and nephrostomy tube placement.
- Demonstrate knowledge of the anatomy relevant to safe placement of drainage tubes, routes for drainage for fluid collections, and routes for access for percutaneous biopsy.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to vascular/interventional procedures.
- Understand the nature of formation of radiologic images from an angiographic and ultrasonographic perspective, including physical and technical aspects, patient positioning, and contrast media, and utilization.

- Knowledge of the theoretical, practical, and legal aspects of radiation protection related to fluoroscopic and angiographic imaging, including other imaging techniques and their possible harmful effects.
- Knowledge of clinical radiology as it relates to vascular/interventional procedures, including understanding of the disease processes, appropriate application of imaging the patients, importance of informed consent, complications that can arise from interventional and angiographic procedures, and factors effecting interpretation and differential diagnosis.
- Understand the fundamentals of quality assurance as they relate to vascular/interventional procedures.
- Understand the fundamentals of epidemiology, biostatistics, and decision analysis.
- Show competence in manual and procedural skills in a graded fashion as it relates to vascular/interventional procedures. In particular, to be able to perform type "A" procedures as detailed in the By-law for the Operation of Diagnostic Imaging Facilities in the Province of Saskatchewan (Central venous access, percutaneous drainage of fluid collections, and percutaneous biopsy).
- Demonstrate appropriate ability to manage a patient independently during procedures, in close association with specialists or other physicians who have referred the patient.
- To understand when it serves the patient's best interest to discontinue a procedure, or refer a patient to another physician.
- Be able to obtain informed consent for vascular/interventional procedures, and explain possible complications to the patient and family members.
- Understand the acceptable and expected results of Diagnostic and Interventional investigations and therapy, as well as unacceptable and unexpected results. This must include knowledge and ability to manage radiologic complications effectively.
- Understand the appropriate follow-up care of patients who have received angiography and interventional procedures.
- Understanding of a sound and systematic style of reporting.
- Competence in effective consultation, conduct of Clinical-Radiological conferences as they relate to angiography and intervention, conduct of morbidity and mortality as it relates to interventional procedures, and the ability to present scholarly material and lead case discussions related to this area.
- The resident would be expected to have attained knowledge appropriate to function as a consultant to referring family physicians and specialists in the following areas.

    - Peripheral vascular disease – atherosclerosis, other.
    - Aortic aneurysms – thoracic and abdominal.
    - Aortic dissection

- Aortic trauma
- Vascular trauma
- Venous thrombosis and pulmonary embolism
- Carotid artery disease
- Cerebral aneurysm
- AVM or other causes of cerebral hemorrhage
- Thoracic outlet syndrome
- Carcinoma of the lung
- Biliary obstruction and jaundice
- Pancreatitis
- Hepatic tumor and metastases
- Pancreatic tumors
- Renal tumors
- Urinary obstruction

Communicator

General Requirements:

Establish appropriate therapeutic relationships with patients and families as it relates to the performance of angiography and interventional procedures.
Listen effectively.
Obtain the appropriate information during consultation with referring physicians in order to be able to make a recommendation regarding a most appropriate angiographic or interventional procedure, and recommendations regarding management of patients.
Discuss appropriate information with patients and families, as well as the health care team and be able to obtain informed consents for angiographic and interventional procedures.

Specific Requirements:

- Apply a sound and systematic style to produce a radiologic report regarding vascular/interventional procedures, which will describe the imaging findings, most likely differential diagnoses, and recommend further testing and/or management if appropriate.
- Understand and identify the importance of communication with referring physicians, including and understanding when the results of investigations or procedures should be urgently communicated.
- Communicate effectively with patients and their families, and have a compassionate interest in them.

- Demonstrate knowledge, skills, and attitudes that incorporate issues related to gender, culture, and ethnicity pertinent to the performance of vascular/interventional procedures.

Collaborator

General Requirements:

Consult effectively with other physicians and health care professionals.
Contribute effectively to the interdisciplinary approach to management and treatment of a patient with regards to diagnostic and therapeutic interventions.

Specific Requirements:

- Demonstrate the ability to function as a member of a multidisciplinary health care team in the practice of angiography and interventional procedures.

Manager

General Requirements:

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

Specific Requirements:

- Demonstrate competence in conducting or supervising quality assurance studies as they relate to vascular/interventional procedures.
- Participate in morbidity and mortality rounds regarding complications and analysis of angiography/interventional radiology.
- Understand safety issues and economic considerations pertaining to the studies performed.
- Demonstrate competence in computer science as it pertains to the practice of angiography/interventional radiology.

Health Advocate

General Requirements:

Identify the important determinants of health affecting patients who will undergo diagnostic and therapeutic procedures.
Contribute effectively to improve the health of patients and communities.
Recognize and respond to issues where advocacy is appropriate.

Specific Requirements:

- Understand and communicate the benefits and risks of radiologic investigations and treatment in particular as this relates to diagnostic and therapeutic procedures performed in angiography and interventional radiology.
- Recognize when radiologic diagnostic or therapeutic procedures will be detrimental to the health of a patient.
- Educate and advise on the use and misuse of radiologic imaging and radiologic interventions.

Scholar

General Requirements:

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

Specific Requirements:

- Demonstrate competence in the evaluation of the medical literature as it pertains to angiography/interventional diagnosis and therapy.
- Demonstrate the ability to be an effective teacher of issues related to interventional and angiographic imaging to medical students, residents, technologists and clinical colleagues.

Professional

General Requirements:

Deliver high quality care with integrity, honesty and compassion.
Exhibit appropriate inter-personal professional behavior.

Practice medicine ethically, consistent with the obligations of a physician respecting the needs of culture, race, and gender.

Specific Requirements:

- Accurately assess one's own performance, strengths, and weaknesses.
- Understand the ethical and medico-legal requirements of a radiologist.

RESIDENT DUTIES:

The first month of the angiography/interventional rotation is undertaken at St. Paul's Hospital, followed by two months at Royal University Hospital. There is ability to undertake an additional elective experience at other sites.

The residents will be expected to progress in a graded supervised fashion in their performance of procedures through the three-month period, and to take an increasing role from junior to senior status in the preparation and management of patients for angiographic and interventional procedures. Rather than having specific duties for junior and senior residents, there is an expectation that the performance of these duties will be on a spectrum, with increasing responsibility and skill demonstrated as the resident progresses to the end of the three-month rotation.

Specific Duties:

- Hours: 8 A.M. to 5 P.M.
- **Consents/pre-procedure assessment preparation**:
  Initially the resident will be accompanied by the supervisor during acquisition of consent and preparation of the patient for the proposed procedure. As the resident progresses through the three-month rotation, the resident will be expected to acquire informed consent for procedures independently. It is a general expectation that the patients will be seen the day prior to the proposed procedure, including Sunday, with appropriate pre-preparation investigation and therapeutic interventions to ensure that the patient can safely undergo the appropriate procedure. Assessment of the indications and contra-indications for the procedure is essential to the appropriate performance of procedures.
- **Arranging Procedures**:
  The resident will be expected to take an active part in screening patients and arranging bookings (in-patients and out-patients) as their knowledge of the subspecialty grows. There will be graded responsibility in this area and the more experienced resident should function independently at the discretion of the supervising radiologist(s).

- **Procedure Attendance**:
  The resident will demonstrate a responsible attitude by his/her diligent attendance to the service ensuring a smooth operation by keeping the staff radiologist informed of all procedures, priorities, complications, and patient problems. During the course of the three-month rotation, the resident is encouraged to become independent in the care of patients, but must remember that the ultimate responsibility lies with the staff radiologist.
- **Dictation of Procedures**:
  The dictation of procedures will initially be the responsibility of the supervising radiologist. As the resident becomes more familiar with the procedures and the dictation format, these dictations will be performed by the resident. All dictations are reviewed by the supervising radiologist to ensure accuracy and appropriateness of communication to others in the medical community.
- Teaching Rounds take a priority if a case is not in progress.
- Two cases are to be added to the Departmental Teaching File during the rotation. Pertinent history and physical findings, imaging and pathology should be provided.

RESIDENT EVALUATION:

- The resident's day-to-day performance will be evaluated. A mid-rotation informal (verbal) evaluation will be given.
- It is the responsibility of the resident to ensure that at the end of the rotation the appropriate evaluation form is completed by the supervising radiologist and reviewed by the resident within one-to-two weeks of the end of the rotation. This evaluation is to be forwarded to the Program Director.
- An oral examination may be given during the final month of the rotation.
- A written examination may be given during the final month of the rotation.

RECOMMENDED READING:

- Diagnostic Angiography – Kadir (must read).
- Abrams Angiography: Vascular and Interventional Radiology – Abrams (Reference text).
- Gastrointestinal Angiography – Reuter and Redman (Reference text).
- Vascular and Interventional Radiology – Valji (Reference text).
- Introduction to Cerebral Angiography - Osborn (Reference text).
- Interventional Radiology – Castaneda-Zuniga (Reference text).
- Essential of Diagnostics and Interventional Angiographic Techniques – Gerlock & Marmirfakhree (Reference text).
- Atlas of Normal and Variant Angiographic Anatomy – Kadir (Reference text).

- Handbook of Interventional Radiology and Angiography – Wojtowycz (Reference text).
- Handbook of Interventional Radiological Procedures – Kandarpa, Aruny (Reference text).

COURSE CURRICULUM:

This Course Curriculum is intended to run over approximately a two-year period, and is therefore intended to be repeated once during the resident's training.

ANGIOGRAPHY BLOCK

Topic

1. **General Introduction to Angio/Interventional Radiology**
   - Principles and Indications
   - Angioplasty and Stenting
   - Embolization
2. **Thoracic Aorta**
3. **Neuroangiography**
   - Cerebral
   - Carotid
4. **Abdominal Aorta and Mesenteric Vessels**
5. **Renal**
6. **Pelvic, Lower Extremity, Upper Extremity**
7. **Pulmonary and Bronchial**
8. **Venous and Lymphatic**
   - IVC filters
9. **Thrombolysis and Thrombectomy**

INTERVENTIONAL BLOCK

10. **Percutaneous Biopsy and Drainage**
11. **Biliary Interventions**
    - PTC, PTBD
    - Cholecystostomy
    - Stenting
12. **Urologic Interventions**
13. **GI Interventions**
14. **Transjugular Intrahepatic Portosystemic Shunts (TIPS).**
15. **Testicular and Ovarian Vein Embolization**

16. Uterine Artery Embolization
17. Fallopian Tube Recanalization
18. Treatment in Emergency Situations

GOALS & OBJECTIVES FOR FLUOROSCOPY ROTATION

GENERAL OBJECTIVES:

On completion of the Fluoroscopy rotation, the resident will demonstrate competence in performance and interpretation of all fluoroscopic procedures. The resident will have attained a knowledge base capable of functioning as a consultant radiologist. The resident will have developed these skills commensurate with a Royal College certification level.

SPECIFIC OBJECTIVES:
Medical expert/clinical decision-maker

Specific Requirements:

Junior Residents

- Demonstrate knowledge of gross anatomy of all body systems imaged with fluoroscopy.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to body systems imaged with fluoroscopy.
- Correlate abnormal findings on imaging studies with surgery and pathology.
- Develop proficiency in the performance of procedures: upper and lower GI, small bowel follow through and small bowel enemas, arthrography, joint aspiration, myelography, cysto-urethrography, intravenous pyelography, retrograde pyelogram interpretation, sinograms/fistulograms, tube checks, drainage tube placement, aspiration of abscesses/cavities, biopsies, and other interventions using fluoroscopic guidance.
- Understand, and be able to intelligently discuss irradiation risks with all fluoroscopic procedures. Be able to tailor exams to achieve the most clinical information, with the lowest dose of irradiation possible.
- Be able to obtain informed consent from a patient, and discuss intelligently all possible complications from fluoroscopic procedures.
- Be able to recognize, and effectively treat intravenous contrast reactions.

Senior Resident:

- Show increased gradation of responsibility. Be able to supervise and advise junior residents.
- Develop more in-depth discussion regarding disease entities and associations, with a broader knowledge base.
- Demonstrate competence in effective consultation and ability to lead case discussions.
- Show competence in performance of interventional procedures.

Communicator

Specific Requirements:

- Demonstrate a logical and concise reporting style.
- Show ability to recognize emergent conditions, and report them promptly to the referring clinical service. Examples include: perforation, aspiration, and adverse reactions to contrast media.

Collaborator

Specific Requirements:

- Consult effectively with other physicians and health care professionals.
- Be able to function and contribute in an effective fashion within a multidisciplinary health care team.

Manager

Specific Requirements:

- Show competence in conducting all fluoroscopic procedures.
- Understand safety and economic issues pertaining to fluoroscopic procedures.

Health Advocate

Specific Requirements:

- Explain the benefits and risks of all fluoroscopic procedures.
- Educate and advise on appropriate use of fluoroscopy.

Scholar

Specific Requirements:

- Evaluate pertinent medical literature in an effective fashion.
- Demonstrate ability and willingness to be a teacher of fluoroscopy.

Professional

Specific Requirements:

- Deliver high quality health care in an effective professional fashion.
- Develop a continuing medical education strategy.
- Develop realistic guidelines regarding one's strengths and weaknesses.

Resident Duties:

Hours 0800 to 1700 hrs. In the AM the resident is to review and protocol all fluoroscopic cases.
All cases are to be performed primarily by the resident depending upon level of experience, and then reviewed with appropriate staff. Procedures unfamiliar to the resident are to be performed/supervised by staff/senior resident.

All cases of an emergent nature or inpatient should be reviewed promptly with staff, and verbal/written report issued as soon as possible. A dictated report is to be issued by day's end on these cases.

Scheduled rounds are to be attended by the resident on service.

Two teaching file cases to be submitted at the end of each 1 - month rotation.

Cases to be fully reviewed, and researched prior to review with staff.

Resident Evaluation:

The resident's day-to-day performance will be evaluated. A formal written evaluation will be issued at the end of the resident's rotation. A committee, comprised of all staff that had supervised the resident during their rotation will contribute to this evaluation.

It is the responsibility of the resident to ensure that the end of rotation evaluation is completed by the supervising staff, and reviewed with the resident.

REFERENCES:

Double Contrast Gastrointestinal Radiology – Lauer, Levine
Practical Alimentary Tract Radiology – Margulis
Gastrointestinal Radiology: A Pattern Approach – Eisenberg
Differential Diagnosis in Conventional Gastrointestinal Radiology - Burgener
Dynamic Radiology of the Abdomen: Normal and Pathologic Anatomy – Meyers
Bone and Joint Imaging – Resnick
Practical Pediatric Imaging – Kirks
Handbook of Interventional Radiology and Angiography - Wojtowycz

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GOALS & OBJECTIVES FOR THE GENERAL RADIOLOGY ROTATION

GENERAL OBJECTIVES:

The General Rotation is to provide the resident with a broad exposure to the various imaging modalities in Radiology. The degree of involvement and autonomy will be based on the resident's level within the diagnostic training program. It is anticipated that the majority of persons undertaking this rotation will be in their final year of Radiology Residency, and will be near to completing all the requirements for Royal College Certification. This rotation is to provide an ability, in a supervised environment, to function more independently as a junior staff person. It is expected that there will always be backup for the residents, but that the residents will be functioning at the higher end of the graded responsibility spectrum. The rotation will provide experience in fluoroscopy including GI procedures, review of plain x-ray studies, Ultrasonography, CT, and Interventional procedures as appropriate.

On completion of the General Rotation, the residents will be expected to be competent to function as a consultant radiologist to referring physicians in Diagnostic Radiology. The residents undertaking this rotation will be very close to formal Royal College Certification, and their skills will be expected to be developed to an appropriate level.

The resident should demonstrate the ability to supervise and perform imaging procedures, as well as to advise referring physicians as to the appropriate investigations for their patients.

SPECIFIC OBJECTIVES

At the completion of this rotation, the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

General Requirements:

Demonstrate diagnostic and therapeutic skills for ethical and effective patient care.
Access and apply relevant information to clinical practice so as to have competence in clinical radiological skills.
Demonstrate effective consultation services with respect to patient care, education and legal opinions.

Specific Requirements:

- Understand the nature of formation of all types of radiological images, including physical and technical aspects, patient positioning, contrast media.
- Knowledge of the theoretical, practical and legal aspects of radiation protection, including other imaging techniques and their possible harmful effects.
- Knowledge of human anatomy at all ages, both conventional and multiplanar, with emphasis on radiological applications.
- Knowledge of all aspects of clinical radiology, including understanding of disease, appropriate application of imaging to patients, importance of informed consent, complications such as contrast media reactions, and factors affecting interpretation and differential diagnosis.
- Understand the fundamentals of quality assurance in radiology.
- Understand the fundamentals of epidemiology, biostatistics and decision analysis.
- Show competence in manual and procedural skills and in diagnostic and interpretive skills.
- Demonstrate the ability to manage the patient independently during a procedure, in close association with a specialist or other physician who has referred the patient. The radiologist should know when the patient's best interests are served by discontinuing a procedure, or referring the patient to another physician.
- Understand the acceptable and expected results of investigations and/or interventional therapy as well as unacceptable and unexpected results. This must include knowledge of and ability to manage radiological complications effectively.
- Understand the appropriate follow-up care of patients who have received investigations and/or interventional therapy.
- Show understanding of a sound and systematic style of reporting.

- Competence in effective consultation, conduct of clinico-radiological conferences, and the ability to present scholarly material and lead case discussions.

Communicator

General Requirements:

Establish appropriate therapeutic relationships with patients/families.
Listen effectively.
Obtain the appropriate information during consultation with referring physicians in order to be able to make recommendations regarding the most appropriate testing and/or management of patients.
Discuss appropriate information with patients/families and the health care team, and be able to obtain informed consent when this is needed.

Specific Requirements:

- Have the ability to produce a radiologic report which will describe the imaging findings, most likely differential diagnoses, and, when indicated, recommend further testing and/or management.
- Understand the importance of communication with referring physicians, including an understanding of when the results of an investigation or procedure should be urgently communicated.
- Communicate effectively with patients and their families and have a compassionate interest in them.
- Recognize the physical and psychological needs of the patient and their families undergoing radiological investigations and/or treatment, including the needs of culture, race and gender.

Collaborator

General Requirements:

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

Specific Requirements:

- Have the ability to function as a member of a multi-disciplinary health care team in the optimal practice of radiology.

Manager

General Requirements:

Utilize resources effectively to balance patient care, learning needs, and other 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.

Specific Requirements:

- Be competent in conducting or supervising quality assurance including an understanding of safety issues and economic considerations.
- Be competent in computer science as it pertains to the practice of radiology.

Health Advocate

General Requirements:

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

Specific Requirements:

- Understand and communicate the benefits and risks of radiological investigation and treatment including population screening.
- Recognize when radiological investigations or treatment would be detrimental to the health of a patient.
- Educate and advise on the use and misuse of radiological imaging.

Scholar

General Requirements:

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.

Specific Requirements:

- Competence in evaluation of the medical literature.
- The ability to be an effective teacher of radiology to medical students, residents, technologists, and
  clinical colleagues.
- The ability to conduct a radiology research project, which may include quality assurance.
- Appreciation of the important role that basic and clinical research plays in the critical analysis of current scientific developments related to radiology.

Professional

General Requirements:

Deliver highest quality care with integrity, honesty and compassion.
Exhibit appropriate personal and interpersonal behaviors.
Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements:

- Be able to accurately assess one's own performance, strengths and weaknesses.
- Understand the ethical and medical-legal requirements of radiologists.

ROTATION RESPONSIBILITIES:

On this rotation the resident will be a senior resident near the certification level. The residents will be expected to be scheduled into various imaging modalities, and function as a junior staff person. There will be appropriate staff backup for any questions or problems. The resident may be scheduled in GI/Fluoroscopy procedures, General Plain X-ray Review, Ultrasound, CT, or General Interventional Procedures as appropriate. At all times there will be appropriate backup by an attending radiologist, but the resident will be expected to demonstrate sufficient proficiency to function as a general radiologist through the graded responsibility spectrum.

The rotation may be undertaken at Saskatoon City Hospital, St. Paul's Hospital or Royal University Hospital.

RECOMMENDED READING:

- Gastrointestinal Radiology – Gohr and Levine (Must Read).

- Dynamic Radiology of the Abdomen: Normal and Pathologic Anatomy – Meyers (Must Read).
- Gastrointestinal Radiology: Pattern Approach – Eisenberg (Additional Text).

GOALS & OBJECTIVES
GENITOURINARY SYSTEM ROTATION - ST. PAUL'S HOSPITAL

GENERAL OBJECTIVES:

On completion of the Genitourinary system rotation the resident will be competent to function as a consultant radiologist to referring physicians in the subject of genitourinary diseases. The resident will demonstrate the ability to supervise and perform imaging procedures as well as advise referring physicians as to the appropriate investigations for their patient. These skills will be developed to a level appropriate for Royal College certification.

SPECIFIC OBJECTIVES:

At the completion of the Genitourinary (GU) rotation the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision maker

Specific Objectives: **Junior Resident**

- Demonstrate knowledge of the anatomy of the GU system for all ages, both conventional and multiplanar with emphasis on radiologic anatomy.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to GU conditions.
- Correlate abnormal findings on imaging studies with surgical pathology by following cases with surgical intervention through the Department of Pathology.
- To develop a working knowledge of the performance of a cystogram, voiding cystogram, retrograde pyelography, antegrade pyelogram, percutaneous nephrostomies, renal angiography, renal/bladder ultrasound, transrectal prostate ultrasound/biopsy, scrotal ultrasound, ultrasound of the uterus and ovaries, hysterosalpingography, renal/bladder/prostate CT.
- To understand the use of the radiography, ultrasound and CT equipment used.
- Basic technique of the standard examinations with appropriate modifications to fit the clinical situation.

- Develop knowledge of the basic contrast media agents, their usage, possible complications, and treatment of contrast reactions.
- Explain the importance of informed consent and the possible complications of interventional GU procedures.
- Basic knowledge of lab values pertaining to the GU system.

Specific Objectives: **Senior Residents**

- In close association with the attending radiologist show proficiency performing interventional GU procedures (TRUS with biopsy and percutaneous nephrostomy).
- Apply appropriate follow-up care following interventional procedures.
- Demonstrate competence in effective consultation and the ability to lead case discussions.
- Explain the physics and the technical factors as they apply to plain radiology, conventional and computed tomography (CT), and angiography used in GU imaging.
- Demonstrate knowledge of radiation protection as it applies to GU examinations.

Communicator

Specific Requirements:

- Apply a sound and systematic style of reporting for all GU modalities.
- Demonstrate the ability to assemble a report that succinctly describes the pertinent imaging findings, gives the most likely differential diagnoses, and recommends further testing or management when indicated.
- Identify the importance of communication with the referring physicians particularly when the results of the procedure should be urgently communicated.

Collaborator

Specific Requirements:

- Consult effectively with other physicians and health care professionals.
- Demonstrate the ability to function as a member of a multidisciplinary health care team in the optimal practice of GU Radiology.

Manager

Specific Requirements:

- Be competent in conducting or supervising quality assurance as it pertains to GU examinations.
- To understand safety issues and economic considerations pertaining to the studies performed.

Health Advocate

Specific Requirements:

- Explain the benefits and risks of GU investigations and treatments.
- Educate and advise on the use and misuse of GU imaging.

Scholar

Specific Requirements:

- Demonstrate competence in the evaluation of the medical literature pertaining to GU imaging.
- Demonstrate the ability to be an effective teacher of GU imaging to medical students, residents, technologists, and clinical colleagues.

Professional

Specific Requirements:

- Be able to accurately assess one's own performance, strengths and weaknesses.
- Understand the ethical and medico-legal requirements of radiologists.

Resident Duties:

Hours - 8:00 a.m. to 5:00 p.m. In the AM the resident is to review the day's caseload related to the GU tract in Ultrasound, CT, General Radiology, and Angiography.

Specific Duties: **Junior Residents**

- The resident is to select those cases in Ultrasound and CT which are related to the GU system and participate in conducting the Ultrasound scans, review the appropriate CT examinations and supervise/inject contrast media for these examinations with the aid of the attending radiologist.

- To review cases with the attending radiologist and to dictate a report related to the examinations.
- To provide consultation to fellow residents and attending physicians relative to examinations in which the resident is involved.
- To follow up pathology of interesting diagnostic cases with the Dept. of Pathology.
- To select two cases of interest to be placed in the teaching file with relevant background material.
- To attend scheduled rounds in diagnostic imaging.
- To do background reading related to GU imaging as well as researching material related to current cases.
- To familiarize oneself with the emergency equipment and the drugs available for contrast reactions.

Specific Duties: **Senior Residents**

- As per junior residents and:
- To research material related to interesting cases and where applicable prepare case reports for publication.

Resident Evaluation

- The resident's day-to-day performance will be evaluated. A mid-rotation informal evaluation will be given.
- It is the responsibility of the resident to ensure that the end of rotation evaluation is completed by the supervising radiologist and reviewed with the resident one-to-two weeks following the end of the rotation.
- Lack of completion of two teaching cases will result in an unsatisfactory evaluation.

REFERENCES:

Text of Uroradiology – Dunnick
Ultrasound of the Prostate – Rifkin
Uroradiology – An Integrated Approach – Freeland, Filly, Goris
Radiology – Diagnostic Imaging – Intervention – Tavaras & Ferrucci – Volume IV
Genitourinary – The Requisites.

GOALS & OBJECTIVES

GASTROINTESTINAL/ABDOMEN
ROYAL UNIVERSITY HOSPITAL

GENERAL OBJECTIVES:

On completion of the GI/Biliary system rotation the resident should be competent in all fluoroscopic procedures related to the GI and biliary systems. There will also be inclusion of cross-sectional imaging modalities such as CT and U/S when at all possible to further correlate imaging findings; however, the focus of this rotation will be based upon fluoroscopic procedures. The resident should show proficiency in performing and supervising fluoroscopic procedures. The resident should develop a skill set appropriate for Royal College certification. The resident will be expected to attain a level of skill and knowledge base so as to be an effective consultant for referring clinicians.

SPECIFIC OBJECTIVES:

Medical expert/clinical decision maker

Specific Requirements**: Junior residents**

- The resident will develop knowledge of the gross anatomy of the GI/Biliary system for all ages. Focus will be on related fluoroscopic anatomy; however, there will be correlation with cross-sectional imaging when at all possible.
- The resident will develop knowledge of pertinent clinical findings, and pathology of the GI/Biliary system. The resident will demonstrate thorough knowledge of normal and pathologic anatomy.
- Correlation with surgery, gastroenterology, and pathology will be key to the resident's understanding of radiographic abnormalities.
- The resident will develop proficiency in the performance of : single and double contrast upper and lower GI exams, Cholangiography (percutaneous and through drainage tubes), placement of drainage tubes, sinograms/fistulograms, abscess drainages, and other interventions.
- While on the rotation, plain radiography of the abdomen will be an integral part of the resident's day-to-day activities. Inpatient, and Emergency x-rays will have priority reading status with the resident and the appropriate supervising staff.
- The resident will become fluent in the utilization of different contrast medias for different clinical scenarios (water soluble vs. barium). The resident will learn to optimize exams utilizing single or double contrast.
- The resident will recognize and act upon emergent findings with appropriate staff supervision such as: pneumoperitoneum, toxic megacolon, obstruction, bowel ischemia, biliary obstruction placing the patient at risk for ascending cholangitis.

Senior Residents:

- The senior resident will show increased proficiency in execution of fluoroscopic exams so as to function effectively in an unsupervised fashion.
- The senior resident will show increased knowledge base and more mature differential list when discussing cases. They will take upon a more developed consultative role.
- The senior resident will be able to effectively discuss irradiation dosages and risk/benefit ratios to all exams. The resident will be able to discuss an imaging algorithm which would most effectively address the patient's clinical condition.

Communicator:

Specific Requirements:

- Develop a logical and concise reporting style for all modalities.
- Be able to describe, and convey pertinent findings to clinicians in a timely fashion, paying particular attention to emergent conditions.
- Develop pertinent and clinically appropriate differential diagnoses, so as to aid in patient management.

Collaborator:

Specific Requirements:

- Describe and communicate pertinent imaging findings to physicians and other allied health professionals.
- Function effectively, and contribute in a meaningful fashion in a multi-disciplinary environment.

Manager

Specific Requirements:

- Show competence in conducting and supervising quality assurance.
- Ensure safety, economic, racial, and ethical considerations are given to all patients and exams.

Health Advocate

Specific Requirements:

- Be able to intelligently discuss the risks/benefits of all exams to patients in an understandable fashion.
- Be able to utilize GI/Biliary imaging in a cost-effective and logical fashion so as to optimize patient care,

Scholar

Specific Requirements:

- Show diligence in evaluation of medical literature pertaining to GI/Biliary imaging.
- Demonstrate effective teaching to physicians and other allied health professionals.

Professional

Specific Requirements:

- Deliver high quality care in a professional and effective fashion.
- Demonstrate the ability to develop a continuing medical education strategy.
- Develop a collegial and professional relationship with all allied health professionals and associated physicians.

Resident duties:

Hours 8 A.M. to 5 P.M.

- The resident will gather the appropriate abdominal x-rays from the Emergency and Inpatient stacks for review with appropriate staff.
- The resident will review all GI/Biliary cases booked for fluoroscopy in the am. Protocoling and possible revision/redirection of procedures will be performed by the resident and reviewed with the appropriate staff.
- The cases will be performed primarily by the resident depending upon level of exposure to procedures on a graded responsibility curve. The cases will then be reviewed by the attending staff and subsequently dictated by the resident. Emergent, and Inpatient cases will be dictated that day, with verbal reports given as soon as possible to clinical house staff.
- Correlation with clinical house staff and pathology on all interesting cases is to be performed by the resident.
- 2 Teaching file cases are to be submitted at the end of each 1 month rotation.

Resident Evaluation:

The resident's day-to-day performance will be evaluated by various staff involved with GI/Biliary work. A group discussion at the end of the 1-month rotation will follow after which, a formal written evaluation will be generated. An informal mid-rotation oral evaluation will also be given.

References:

Gastrointestinal Radiology – Laufer and Levine
Dynamic Radiology of the Abdomen: Normal and Pathologic Anatomy – Meyers
Gastrointestinal Radiology: A Pattern Approach – Eisenberg
Double Contrast Gastrointestinal Radiology – Laufer
Computed Tomography of the Body – Moss, Gamsu, Genant

GOALS & OBJECTIVES FOR MRI ROYAL UNIVERSITY HOSPITAL

GENERAL OBJECTIVES:

On completion of the MRI rotation the resident will be competent to function as a consultant radiologist in MRI. The core requirement rotation is currently three months, although additional training up to six months may be accommodated as necessary. The resident will supervise and evaluate imaging performed in MRI at a consultant level. These skills will be developed to a level appropriate for Royal College Certification.

Medical expert/clinical decision maker

Specific Requirements:

- Understand the theoretical aspects to the formation of an MRI image.
- Knowledge and application of the safety concerns regarding individuals and property with respect to an MRI facility and imaging.
- Understanding of the MRI sequences in terms of the physics involved in their execution and their benefits and detriments.
- Knowledge of the techniques used to answer clinical questions with effective use of time.
- Ability to rank the clinical importance of requests and understanding the utility of MRI to assist in clinical decision-making.

- Knowledge of the normal anatomy of imaged body areas with respect to different sequences, genders and age groups.
- Understanding of different artifacts, their imaging characteristics, causes and remedies.
- Understanding of the changes occurring as a result of pathological processes and their imaging characteristics.
- Ability to formulate an appropriate and concise differential diagnosis in an order of most likely to least likely based upon radiological findings and clinical/laboratory findings.
- Appropriate recommendations for interval of follow-up for a clinical/radiological finding.
- Demonstrate effective consultation with clinical staff with regard to appropriateness, findings and likely diagnoses as a result of an MRI examination.

Communicator

Specific Requirements:

- Effectively communicate with clinical staff as to the appropriate use of MRI examinations and, where appropriate, recommend alternative methods of investigation.
- Produce concise and clear written reports and verbal presentations of the techniques of an examination, the findings and the resulting differential diagnoses.
- Ability to counsel and communicate with patients and their families as to the function of the MRI scanner and the use of contrast agents.
- Ability to answer questions and concerns of patients and their families with empathy and consideration for gender, culture, and religious background.

Collaborator

Specific Requirements:

- Ability to interact effectively with different clinical teams
- Provide information with reference to the particular needs of a specific team.

Manager

Specific Requirements:

- Allocate MRI time in order to provide the most useful information to deal with clinical conditions of the highest severity and urgency.
- Understand the imperatives of other teams and be able to incorporate this information into case protocols and ranking of cases.
- Make the most efficient use of workstations to aid in study interpretation and explanation to clinical teams.

Health Advocate

Specific Requirements:

- Explanation of the potential benefits and risks of a study to clinicians, patients and their families.
- Counsel clinicians as to the effects of inappropriate use of the MRI scanner and diagnostic limitations of studies.
- Educate clinicians about new or underused techniques of MRI investigation providing information that is more useful and/or is obtained in a less invasive/morbid manner that other modalities.

Scholar

Specific Requirements:

- Ability to monitor the medical literature for new techniques of investigation and to critically evaluate the utility of such information.
- Demonstrate ability to teach residents from radiology or other departments as well as technologists, nurses and clinicians about MRI.
- Appreciate and/or participate in research endeavors in MRI.
  To work in concert with other individuals involved in research, either clinical or basic.

Professional

Specific Requirements:

- Be able to assess their own strengths and weaknesses with regard to MRI and devise techniques to improve.
- Exhibit appropriate interpersonal relationships with technologists, nurses and other workers by exhibiting respect, understanding and tolerance.
- Uphold the confidentiality of patients and their right to make informed decisions.

Resident Duties:

Specific Duties:

As a general principle the MRI resident is responsible for all clinical studies done at the RUH facility with the exclusion of on call cases. This includes scheduled patients that may be scanned after hours. It should be noted that residents from other rotations might be participating in MRI at the same time (neuroradiology, pediatrics, MSK). The level of involvement of the other residents will vary, as residents will have different levels of experience and seniority. The expected level of involvement should be discussed with all of the residents involved and the attending staff at the start of the rotation. However, it remains the ultimate responsibility of the MRI resident to be in charge of the cases.

At present the core requirement of MRI is 3 months, although many individuals will choose to do additional training. The amount of responsibility will increase in a graded fashion through the three months.

All residents must be present at or before 0800 in the MRI suite. If an individual cannot do this due to personal reasons, this should be discussed with the MRI staff prior to the event so alternative arrangements can be made.

First Month

The resident must be present for case protocol at 0800 each day. The protocol will be performed by the staff radiologist and/or senior resident on service with the MRI resident observing.

Case monitoring will initially be done by the staff radiologist/senior resident with the MRI resident observing. Patients should not be sent out of the scanner by the MRI resident, unless directed to do so by the staff/senior resident.

The resident is responsible for displaying the study images and previous comparison studies for readout. Initial reporting may be done by the staff/senior resident at the staff radiologist's discretion. However, it is expected that the resident will do the majority of the reporting in the first month.

Less teaching and responsibility is required than other years, allowing for more reading about the physics of MRI and the basic pulse sequences.

Second Month

The resident should be present at case protocol at 0800. The resident will plan the cases under the observation of the staff radiologist or senior resident. All case protocols will be checked.

Case monitoring will be done by the resident under the observation of the staff radiologist/senior resident. Later in the month, monitoring may be left to the resident at the discretion of the staff radiologist. The resident is excused from case monitoring during scheduled rounds.
The resident should hang all study images and previous studies for readout. The cases should be thoroughly reviewed prior to readout with the staff radiologist. The resident will be responsible for all reporting.

The resident will have to prepare one MRI round. The time and format should be discussed with the MRI staff. In most cases, the round will be a case discussion lead by the resident.

Third Month

The resident should independently protocol all cases, with input from the staff when asked. The resident should also assist more junior residents involved in MRI in the daily protocol.

The resident should independently monitor cases and decide on further imaging that needs to be done, with staff consultation as requested. The patient may be sent on the approval of the resident.

All cases should be displayed with previous studies for readout and reporting. All cases need to be checked with attending staff before final reports are issued.

One MRI round will be presented each month with input from the staff radiologists. The time and format will be discussed.

The resident may be asked to participate in multidisciplinary rounds (tumor board) at the discretion of the staff radiologist.

The resident will participate in requisition approval with the staff radiologist.

Reference List:

1) Osborn, AG. Diagnostic Neuroradiology, St. Louis, 1994, Moseby.

2) Westbrook, C. and Kaut, C. MRI in Practice, Oxford, 1998**,** Blackwell Science.
3) Som, P. Head and Neck Imaging, St. Louis, 1996, Moseby.
4) Shellock, Frank G., Pocket Guide to MR Procedures and Metallic Objects: Update 2001, Philadelphia, 2001, Lippincott Williams and Wilkins.
5) Stoller, David W. MRI, Arthroscopy, and Surgical Anatomy of the Joints, Philadelphia, 1999, Lippincott-Raven.
6) El-Khoury, Georges et al. Sectional Anatomy by MRI, New York, 1995, Churchill Livingstone.
7) Stark, David and Bradley, William G. Jr., Magnetic Resonance Imaging, Toronto, 1999, Moseby.
8) Barkovich, A. James, Pediatric Neuroimaging, Philadelphia, 2000, Lippincott Williams and Wilkins.
9) Atlas, Scott W. Magnetic Resonance Imaging of the Head and Spine, Philadelphia, 1996, Lippincott Williams and Wilkins.
10) Magnetic Resonance Imaging Clinics of North America. Toronto, W.B. Saunders and Company, 1998-present.

MRI Lecture Series

The series is planned to address the imaging techniques in MRI as well as the specific considerations of imaging different body areas. Most of the brain and spine pathology areas are covered in the neuroimaging section and are not listed here. The series is planned over a two-year period.

1. Introduction and Safety
2. Physics: Signal Production
3. Physics: Signal Localization
4. Physics: Imaging Parameters and Sequences
5. Artifacts
6. MRA
7. Diffusion/Perfusion (covered in neuroimaging)
8. Spectroscopy (covered in neuroimaging)
9. Abdomen
10. Pelvis
11. Cardiac and Large Vessels
12. Shoulder
13. Elbow
14. Wrist
15. Hip
16. Knee
17. Ankle

GOALS & OBJECTIVES FOR THE MAMMOGRAPHY ROTATION

GENERAL OBJECTIVES:

On completion of the Mammography System Rotation (three 1-month blocks), the resident will be competent to function as a consultant radiologist to referring physicians in the subject of Mammography and Breast Diseases. The resident will demonstrate the ability to supervise and perform imaging procedures, as well as advise referring physicians as to the appropriate investigations for their patient. These skills will be developed to a level appropriate for Royal College Certification.

SPECIFIC OBJECTIVES

At the completion of training, the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

General Requirements:

Demonstrate diagnostic and therapeutic skills for ethical and effective care for patients who present with diseases of the breast.
Assess and apply relevant information to clinical practice so as to have competency in clinical radiologic, mammographic and ultrasonographic skills.
Demonstrate effective consultation services with respect to patient care, education, and legal opinions.

Specific Requirements:

- Be familiar with the technical aspects of film screen Mammography, stereotaxis, and breast Ultrasound. This includes the Physics of image production, dedicated processing, positioning and display of images.
- Understand the quality control procedures and processes that relate to breast imaging. This will included both technical and professional quality control.
- Understand the normal radiographic appearance of normal breast parenchyma and the axilla, normal variants, and changes that relate to treatment.

- Know the sonographic appearance of normal breast parenchyma and the axilla, normal variants and artifacts.
- Understand the indications for imaging with Ultrasound and the importance of correlation of these studies with the mammogram and the clinical history.
- Be familiar with the typical appearance of in-situ and invasive breast carcinoma.
- Be familiar with unusual forms of carcinoma, either as unusual presentations of typical neoplasms, or as unusual malignancies.
- Be familiar with non-malignant breast diseases and conditions, e.g. fibrocystic changes, benign tumors, proliferative changes, etc.
- Be familiar with the sensitivity, specificity, and predictive value of mammographic screening.
- Be familiar with major studies and controversies related to breast screening, the screening process, the operation of the breast screening program, and recommendations for routine screening of women at various ages.
- Develop skills such that the resident may act as a co-coordinator of information for clinical presentations, breast imaging studies, and pathology findings.
- Develop skills in the performance of localization procedures, ultrasound guided localizations and breast cyst drainage.
- Be able to tailor mammographic studies through the use of additional or supplementary imaging e.g. Magnifications, special views, Ultrasound, etc., for problem solving.
- Knowledge of safety concerns with regard to radiation exposure and Ultrasound examinations.
- Understand the appropriate follow-up care of patients who have undergone investigational procedures.
- Demonstrate a sound and systematic reporting style.

Communicator

General Requirements:

Establish appropriate therapeutic relationships with patients/families.
Listen effectively.
Obtain the appropriate information during consultation with referring physicians in order to be able to make recommendations regarding the most appropriate testing and/or management of patients with breast diseases.
Discuss appropriate information with patients/families in the health care team, and be able to obtain informed consent for tests and procedures when this is needed.

Specific Requirements:

- Display good communication skills with peers, professional and support staff, and day-to-day educational clinical activities.
- Demonstrate the ability to produce a radiologic report which will describe the imaging findings, most likely differential diagnoses, and when indicated, recommend further testing and/or management.
- Understand the importance of communication with referring physicians, including and understand when the results of an investigation should be urgently communicated.
- Communicate effectively with patients and their families and have a compassionate interest in them.
- Demonstrate the ability to answer questions and concerns of the patients/families with empathy and consideration for gender, culture, age, and religious background.

Collaborator

General Requirements:

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

Specific Requirements:

- Demonstrate the ability to function as member of multidisciplinary health care team in the optimal practice of mammography and ultrasonography of the breast.
- Demonstrate a collegial professional attitude to the medical and technical staff.
- Demonstrate self-initiative and function with an organized approach in day-to-day activities.

Manager

General Requirements:

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

Specific Requirements:

- Appropriately plan and supervise cases, particularly when interventional procedures are performed.
- Work in a collegial fashion with support staff.
- Be aware of safety considerations and quality assurance, particularly in interventional procedures.
- Demonstrate competence in conducting or supervising quality assurance, including an understanding of safety issues and economic considerations.
- Demonstrate competence in computer sciences that pertains to the practice of mammography and ultrasonography of the breast.

Health Advocate

General Requirements:

Identify the important determinants of health affecting patients with breast disease.
Contribute effectively to improve the health of patients and communities, including being aware of the process and procedures involved in screening mammography.
Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements:

- Demonstrate the ability to understand and communicate the benefits and risks of radiologic investigations and treatment including population screening.
- Recognize when radiologic investigations or treatments would be detrimental to the health of the patient.
- Educate and advise on the use and misuse of mammographic and ultrasonography as they relate to breast disease.

Scholar

General Requirements:

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 care professionals.
Contribute to development of new knowledge.

Specific Requirements:

- Demonstrate intellectual curiosity, enthusiasm, and energy with case material and problem solving.
- Attendance at designated rounds and teaching sessions is expected.
- Additional assignments of an academic nature, e.g. Additions to teaching files, may be given to the resident and are expected to be complete promptly.
- Review surgically proven cases, and contribute 5 - 10 carefully worked-up cases to the teaching file.
- Demonstrate competence in evaluation of medical literature as it relates to breast diseases.
- Demonstrate the ability to be an effective teacher of radiology to medical students, technologists, and clinical colleagues.

Professional

General Requirements:

Deliver the highest quality care with integrity, honesty, and compassion.

Exhibit appropriate personal and interpersonal professional behaviours, including a professional appearance and demeanor.

Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race, and gender.

Specific Requirements:

- Be able to accurately assess one's own performance, strengths, and weaknesses.
- Be punctual and make him/herself available for teaching and review sessions.
- Exhibit appropriate interpersonal relationships with clinicians and support staff by exhibiting respect, understanding and tolerance.
- Have a respectful, helpful, supportive and compassionate manner in all patient relationships.
- Uphold confidentiality of patients and their right to make informed decisions.

RESIDENT DUTIES:

As in most rotations, the resident is expected to take a graded increased responsibility over the three-month period, with skills and abilities developed to the level appropriate for Royal College Certification after three months of training.

The resident is expected to see at least 1000 mammograms during the three-month period, which would include both screening and diagnostic cases. The resident will initially begin as an observer, with ongoing progression to the point of reporting cases after review by the radiologist. There should also be observation of all other diagnostic and interventional procedures utilized, with progression to performance of selective studies under the supervision of the radiologist and at the discretion of the attending radiologist.

Additional duties at the individual rotation site may be assigned at appropriate by the attending radiologist.

ROUNDS:

There are Mammography and Breast Ultrasound Rounds at Saskatoon Medical Imaging approximately 6 – 8 times per year. All residents are invited to attend. Those residents involved in a Mammography rotation are expected to attend.

RECOMMENDED READING:

- Breast Imaging – Kopan's (Must Read)
- Teaching Atlas of Mammography – Tabar & Bean (Must Read)

GOALS & OBJECTIVES
MUSCULOSKELETAL SYSTEM ROTATION

GENERAL OBJECTIVES:

On completion of the Musculoskeletal System Rotations (3 months), the resident will competent to function as a consultant radiologist to referring physicians in the subject of Musculoskeletal Imaging and Disease. The resident will demonstrate the ability to supervise and perform relevant imaging procedures and diagnostic tests, as well as to advise referring physicians as to the appropriate investigations for their patients from a musculoskeletal perspective. These skills will be develop to a level appropriate for Royal College certification.

Graded responsibility:

The musculoskeletal system is taught in a minimum of three one-month rotations. These typically occur in the PGY-2, PGY-3 and PGY-4 years, with a scheduled elective

additional fourth month in the PGY-5 year. The residents are expected to take a graded approach to their abilities in their rotation as they progress from junior to senior residents. At the end of the rotations, the residents should be functioning at a level appropriate for Royal College Certification.

Junior residents in their first month of their rotation will be expected to focus primarily on plain x-ray evaluation at the bone multi-viewer. In second and subsequent rotations, the residents will be expected to have increased involvement in other aspects of musculoskeletal imaging performed in the department such as: CT, MRI, Myelography, Arthrography, and biopsies. Additional expectations may be relayed to the resident by the supervisor at the beginning or during any particular rotation.

SPECIFIC OBJECTIVES:

On completion of training the resident will have acquired the following competencies, and will function effectively as:

Medical expert/clinical decision-maker

General Requirements:

Demonstrate diagnostic and therapeutic skills for ethical and effective patient care for patients who present with musculoskeletal problems.
Assess and apply relevant information to clinical practice so as to have competence in clinical and diagnostic radiologic skills as this applies to musculoskeletal imaging.
Demonstrate effective consultation services with respect to patient care, education, and legal opinion.

Specific Requirements:

- Understand the nature of formation of radiologic imaging utilized in assessment of the musculoskeletal system, including physical and technical aspects, patient positioning and contrast media.
- Understand the application of imaging modalities as they relate to assessment of the musculoskeletal system, including: Plain x-ray imaging, CT, Ultrasound, Magnetic Resonance Imaging, and Nuclear Medicine applications relevant to MSK imaging.
- Knowledge of the theoretical, practical, and legal aspects of radiation protection and including other imaging techniques and their possible harmful effects.
- Knowledge of safety concern with regard to radiation exposure and magnetic field exposure.

- Knowledge of anatomy as it pertains to the musculoskeletal system, including knowledge of soft tissue and skeletal structures.
- Knowledge of human anatomy at all ages, both in a conventional format and multiplanar format, with emphasis on musculoskeletal applications.
- Knowledge of clinical radiology as it relates to musculoskeletal imaging, including understand of the disease processes, appropriate application of imaging to patients, importance of informed consent for interventional procedures, complications such as contrast media reactions and factors affecting interpretation and differential diagnoses.
- Knowledge of the importance of obtaining informed consent for interventional procedures (myelography, arthrography, biopsy), including risks, benefits, and alternatives to procedures/studies.
- Understand the fundamentals of quality assurance in musculoskeletal imaging
- Understand the fundamentals of epidemiology, biostatistics, and decision analysis in musculoskeletal imaging.
- Understand image artifacts, appearance, causes, and remedies.
- Show competence in manual and procedural skills (myelography, arthrography, and biopsy) and in diagnostic and interpretative skills.
- Ability to detect pathologic processes and formulate appropriate and concise differential diagnoses.
- Demonstrate the ability to manage the patient independently during an interventional procedure, in close association with a specialist or other physician who has referred the patient. The resident should know when the patient's best interests are served by discontinuing the procedure, or referring the patient to other physicians.
- Understand the acceptable and expected results of investigations and/or interventional therapy as well as unacceptable and unexpected results. This must include knowledge of an ability to manage radiologic complications from interventional procedures effectively.
- Understand the appropriate follow-up care of patients who have received investigations, and/or interventional therapy.
- Demonstrate a sound and systematic reporting style.
- Act as an effective consultant, conduct clinical-radiological conferences, and ability to present scholarly material and lead discussions.

Communicator

General Requirements:

Establish appropriate therapeutic relationships with patients/families.
Listen effectively.

Obtain appropriate clinical information during consultation with referring physicians in order to be able to recommend appropriate additional testing, and/or management when indicated.
Discuss appropriate information with patients/families and the health care team, and be able to obtain informed consent for tests and procedures if necessary.

Specific Requirements:

- Ability to produce a concise radiologic report which describes the imaging findings, most likely differential diagnoses and recommend further testing and/or management when indicated.
- Understand the importance of communication with referring physicians, including understanding of when the results of investigating procedures should be urgently communicated.
- Communicate effectively with patients and their families and have a compassionate interest in them.
- Recognize the physical and psychological needs of the patients and their families undergoing musculoskeletal investigations and/or treatment, including the needs of culture, race and gender.

Collaborator

General Requirements:

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

Specific Requirements:

- Demonstrate the ability to function as a member of multidisciplinary health care team in order to provide optimal patient care for patients with musculoskeletal problems.

Manager

General Requirements:

Utilize resources effectively to balance patient care, learning needs, and other 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.

Specific Requirements:

- Appropriately plan and supervise imaging of musculoskeletal abnormalities, particularly in CT and MRI.
- Demonstrate competence in conducting or supervising quality assurance, including an understanding of safety issues and economic considerations, particularly in CT and MRI.
- Allocate the limited MRI and CT resources to deal with musculoskeletal conditions in an appropriate fashion based on the severity and urgency of the disease process. This includes appropriate prioritization of patients in consultation with the clinical services.
- Effectively utilize workstations and/or PACS systems to aid in the study, interpretation, and review of cases.

Health Advocate

General Requirements:

Identify the important determinants of health affecting patients with musculoskeletal disorders.
Contribute effectively to improve the health of patients and communities. Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements:

- Demonstrate the ability to explain potential benefits, and risks of the study to: Clinicians, patients, and their families. In addition, provide potential alternatives when appropriate.
- Counsel the health care teams as to the appropriate use of CT, MRI, Ultrasound, and plain x-ray imaging, and the limitations of these studies.
- Recognize when radiologic investigation or treatment will be detrimental to the health of the patient.

Scholar

General Requirements:

Develop, implement, and monitor a personal education strategy.

Critically appraise sources of medical information as they relate to musculoskeletal imaging.
Facilitate learning of patients, house staff/students, and other health professionals.
Contribute to development of new knowledge.

Specific Requirements:

- Demonstrate an ability to monitor the medical literature for new techniques for investigation and analysis of musculoskeletal disorders, and to critically evaluate the utility of such information.
- Demonstrate the ability to teach residents from radiology and other services, as well as technologists, nurses, clinicians, medical students, and other clinical colleagues.
- Contribute to the musculoskeletal teaching file.
- Demonstrate an appreciation of the important role that basic clinical research plays in the critical analysis of current scientific developments related to musculoskeletal imaging.

Professional

General Requirements:

Deliver the highest possible care, with integrity, honesty, and compassion.
Exhibit appropriate personal and inter-personal professional behaviors.
Practice medicine ethically, consistent with the obligations of physicians respecting the needs of culture, race, and gender.

Specific Requirements:

- Demonstrate the ability to accurately assess one's own performance, strengths and weaknesses.
- Demonstrate appropriate interpersonal relationships with clinicians and support staff, by exhibiting respect, understanding and tolerance.
- Uphold confidentiality of patients and their right to make informed decisions.

RESIDENT DUTIES:

- Hours: 8 A.M. to 5 P.M.
- The residents are expected to take an increasing role in the evaluation of musculoskeletal disorders as they progress from their junior to senior rotations. In the first junior rotation, emphasis will be placed on plain x-ray

evaluation but subsequent rotations must include graded responsibility in planning and execution of additional musculoskeletal imaging studies including:

- Myelography
- Arthrography
- CT Imaging
- MRI
- Ultrasound

Junior Resident Responsibilities (Initial Rotation).

1. Organize and review cases. Delineate the pertinent findings and provide a summary and brief list of differential diagnoses.
2. Obtain x-rays, organize and review these cases.
3. Review the cases with the appropriate staff radiologist.
4. Dictate and sign off reports promptly.
5. Appropriately contact clinical services with verbal results of an urgent nature.
6. Reports of all in-patients and emergency patients will be provided on the same day as the study.
7. As time allows, be involved in Myelographic and arthrographic procedures, under the supervision of a staff radiologist.
8. If deemed appropriate by the supervising radiologist, become involved in generating protocols for CT examinations with plain x-ray correlation, and gradually begin planning cases with staff guidance.
9. Submit two teaching file cases.

Senior Resident Responsibilities (Subsequent rotations)

1. As per the junior responsibilities regarding reviewing plain x-rays.
2. Become actively involved in planning protocols for both CT and MRI.
3. Prioritize in-patients/ER-patient requests for musculoskeletal imaging appropriately.
4. Supervise MRI and CT examinations.
5. Alter protocols as necessary if an unexpected finding is observed.
6. Be involved in Myelographic and Arthrographic procedures, under the supervision of a staff radiologist.
7. Organize and review cases. Delineate findings and provide a summary and comprehensive list of differential diagnoses.
8. Review cases with the staff radiologist.
9. Dictate and sign off reports promptly.

10. Appropriately contact the clinical service with verbal results of an urgent nature.
11. Reports for all in-patients and emergency patients will be provided on the same day as the study.
12. Submit two teaching file cases per month rotation.

RESIDENT EVALUATION:

- The resident's day-to-day performance will be evaluated. A mid-rotation informal (verbal) evaluation will be given.
- It is the responsibility of the resident to ensure that the end of rotation evaluation is completed by the supervising radiologist and reviewed with the resident within one-to-two weeks of the end of the rotation.
- Lack of completion of two teaching file cases will result in an unsatisfactory evaluation.

RECOMMENDED READING:

- Bone and Joint Imaging (mini version) – Resnick (Must read).
- Arthritis in Black and White – Brower (Must read).
- Radiology of Bone and Joint Diseases – Greenfield (Reference Text).
- Orthopedic Radiology – Weissman and Sledge (Reference Text).
- Radiology of Skeletal Trauma – Rogers (Reference Text)
- Handbook of Skeletal Radiology – Manaster (Must read)
- Skeletal Radiology – Bare Bones - Chew (Reference Text).
- Musculoskeletal Imaging: The Requisites – Sartoris (Reference Text).

MUSCULOSKELETAL COURSE CURRICULUM

This curriculum is expected to be taught over a two-year period. The expectation is that the resident will be exposed to each of these topics at least twice in their Residency.

Tumors

1) Approach to bone lesions
2) Benign and Non-aggressive bone lesions I
3) Benign and Non-aggressive bone lesions II
4) Benign and Non-aggressive bone lesions III
5) Malignant and Non-aggressive bone lesions I
6) Malignant and Non-aggressive bone lesions II
7) Malignant and Non-aggressive bone lesions III

8) Metastatic disease.

Joint Disease

9) Approach to arthritis
10) Inflammatory arthritis/joint disease.
11) Non-inflammatory arthritis/joint disease.

Trauma

12) Approach to trauma and fracture healing
13) Trauma in adults
14) Trauma in Adults – spine and pelvis
15) Trauma in Children

Miscellaneous

16) Developmental and congenital conditions
17) Metabolic, endocrine, toxic, infectious conditions
18) Paget Disease.
19) Other miscellaneous conditions

GOALS AND OBJECTIVES FOR THE NEURORADIOLOGY ROTATION

GENERAL/SPECIFIC OBJECTIVES:

Medical expert/clinical decision maker

General Requirements:

Demonstrate diagnostic and therapeutic skills for ethical and effective care for patient's who present with neurologic deficits.
Access and apply relevant information to clinical practice so as to have competence in clinical radiological skills
Demonstrate effective consultation services with respect to patient care, education and legal opinions.

Specific Requirements:

- Understand the formation of the images used in neuroradiology including plain x-rays, myelograms, CT, MRI and cerebral/spinal angiograms.
- Knowledge of safety concerns with regard to radiation exposure and magnetic field exposure.
- Knowledge of anatomy as it pertains to the brain, spine and head and neck including normal and disease states.
- Knowledge of neurological disease processes and appropriate application of modalities/techniques to answer clinical questions in a timely, cost-effective manner.
- Knowledge of the importance of obtaining informed consent including risks, benefits and alternatives to procedures/studies. Knowledge of risks of contrast media reactions and treatment.
- Understanding image artifacts, appearance, causes and remedies.
- Show competence in manual and procedural skills (myelography and angiography) and in diagnostic and interpretive skills (ability to detect pathological processes and formulate an appropriate and concise differential diagnosis).
- Understand the appropriate follow-up care of patients who have undergone investigational procedures.
- Demonstrate a sound and systematic reporting style.
- Act as an effective consultant, conduct clinico-radiological conferences and present scholarly material and lead case discussions.

Communicator

General Requirements:

Establish appropriate relationships with patients/families.
Listen effectively.
Obtain appropriate clinical information from referring physicians in order to make recommendations regarding further imaging/management of patients.
Discuss appropriate information with patients/families and the health care team, and be able to obtain informed consent for tests and procedures when required.

Specific Requirements:

- Ability to produce a concise radiologic report which describes the imaging findings, appropriate differential diagnoses and, when indicated, recommendations for further testing and/or management.
- Understand the importance of communication with referring physicians, including an understanding of when the results of an investigation or procedure should be

urgently communicated. A timely report will be provided for all inpatients and emergency patients on the same day of their examination.
- Ability to communicate compassionately with patients/families.
- Ability to answer questions and concerns of patients/families with empathy and consideration for gender, culture, age and religious background.

Collaborator

General Requirements:

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

Specific Requirements:

- Ability to function as a useful member of the neuroscience team in order to provide optimal patient care.

Manager

General Requirements:

Utilize resources effectively to balance patient care, learning and other activities.
Allocate finite health care resources appropriately.
Work effectively and efficiently in a health care organization.
Utilize information technology to optimize patient care, learning and other activities.

Specific Requirements:

- Appropriately plan and supervise cases, particularly in CT and MRI.
- Work in a congenial fashion with support staff.
- Be aware of safety considerations and quality assurance, particularly in CT and MRI.
- Allocate limited MRI and CT resources to deal with neurological conditions of the highest severity and urgency. This includes appropriate prioritization of patients in consultation with the clinical services.
- Effectively utilize workstations/Stentor to aid in study interpretation and review of cases with clinical teams.

Health Advocate

General Requirements:

Identify the important determinants of health affecting patients with neurological disorders.
Contribute effectively to improve the health of patients and communities.
Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements:

- Ability to explain potential benefits, risks of a study to clinicians, patients and their families as well as provide potential alternatives when appropriate.
- Counsel clinicians as to the appropriate use of MRI, CT, myelography and angiography and the limitations of these studies.

Scholar

General Requirements:

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.

Specific Requirements:

- Ability to monitor the medical literature for new techniques of investigation and to critically evaluate the utility of such information.
- Demonstrate ability to teach residents from radiology and other services as well as technologists, nurses and clinicians about neuroradiology.
- Contribute to the neuroradiology teaching file.
- Appreciate and/or assist/participate in research endeavors in neuroradiology.

Professional

General Requirements:

Deliver highest quality care with integrity, honesty and compassion.
Exhibit appropriate personal and interpersonal professional behavior.
Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements:

- Be able to assess one's own strengths and weaknesses and ask for assistance appropriately.
- Exhibit appropriate interpersonal relationships with clinicians and support staff by exhibiting respect, understanding and tolerance.
- Uphold confidentiality of patients and their right to make informed decisions.

Rotation Responsibilities: Junior Residents (first rotation):

Clinical:

1. Attend and observe protocol planning for MRI and CT. Gradually begin planning cases with staff guidance. This includes reviewing previous relevant imaging studies and obtaining pertinent clinical information. Be sure to check for previous studies, as this information is not always provided by the support staff.
2. Be involved in myelographic and angiographic procedures, as available, under the supervision of a staff radiologist.
3. Organize and review cases. Delineate pertinent findings and provide a summary and brief list of differential diagnoses.
4. Review cases with the staff radiologist.
5. Dictate and sign off reports promptly.
6. Appropriately contact the clinical service with verbal results of an urgent nature. Reports for all inpatients and emergency patients will be provided on the same day as the study.

Learning/Teaching:

1. Attend Neuroradiology Conferences. Collect and contribute interesting/important cases for oral presentation to the radiology residents.
2. When possible, attend weekly Neuroscience Conferences on Friday from 9:00 - 11:00.
3. Contribute a minimum of two cases to the Neuroradiology Teaching File. This may be in a hardcopy or digital format. Digital files can be e-mailed to sheri.harder@saskatoonhealthregion.ca
4. In the first rotation it may be wise to initially read a smaller volume textbook providing an overview of neuroimaging to the resident such as **MRI: Central Nervous System: Kucharczyk. This should be considered a minimum for the first rotation and reading more extensively is encouraged. Perform appropriate literature searches (Medline). Utilize the Neuroradiology Teaching File which is

located in Dr. Sheri Harder's office. This contains both digital and hardcopy teaching files.

Senior Residents (last 2 rotations):

Clinical:

1. Plan protocols for MRI and CT. The staff radiologist will evaluate the plans prior to implementation. This includes reviewing previous relevant imaging studies and obtaining pertinent clinical information. Be sure to check for previous studies, as this information is not always provided by the support staff.
2. Prioritize inpatient/ER patient requests for imaging appropriately.
3. Supervise MRI and CT examinations. Alter protocols as necessary if an unexpected finding is observed.
4. Be involved in myelographic and angiographic procedures, as available, under the supervision of a staff radiologist.
5. Organize and review cases. Delineate pertinent findings and provide a summary and comprehensive list of differential diagnoses.
6. Review cases with the staff radiologist.
7. Dictate and sign off reports promptly.
8. Appropriately contact the clinical service with verbal results of an urgent nature. Reports for all inpatients and emergency patients will be provided on the same day as the study.

Learning/Teaching:

1. Attend Neuroradiology Conferences. Collect and contribute interesting/important cases for oral presentation to the radiology residents.
2. When possible, attend weekly Neuroscience Conferences on Friday from 9:00 - 11:00.
3. Contribute a minimum of two cases to the Neuroradiology Teaching File.
4. Supplement knowledge acquired from clinical cases by reading from the list of textbooks recommended below. Perform appropriate literature searches (Medline). Utilize the Neuroradiology Teaching File which is located in Dr. Sheri Harder's office. This contains both digital and hardcopy teaching files.

Rotation Template:

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
CT	MRI	MRI	MRI	CT
CT	MRI	MRI	MRI	CT

*Myelographic and angiographic procedures will be incorporated, when possible.

RECOMMENDED READING:

The Radiology of Acute Cervical Spine Trauma:	Harris **(must read)**
Diagnostic Neuroradiology:	Osborn **(must read**)
MR of the Brain and Spine:	Atlas
MRI: Central Nervous System:	Kucharczyk **
Computed Tomography of the Head, Neck and Spine:	Latchaw
Cranial Computed Tomography and MRI:	Lee and Rao
Introduction to Cerebral Angiography:	Osborn
Pediatric Neuroimaging	Barkovich
Head and Neck Imaging:	Som and Bergeron
Handbook of Head and Neck Imaging:	Harnsberger

NEURORADIOLOGY COURSE

Course Coordinator: Dr. Peter Szkup

Organized Scholarly Activities:

1. Neuroradiology Conference: Didactic lectures with a curriculum based predominantly on Dr. Anne Osborn's textbook Neuroradiology the first Monday of each month from 12:00 – 1:00 PM. Case examples are provided in an oral format to complement current topics. Residents participating in the Neuroradiology rotation will be responsible for providing some of the case material for the oral component of these conferences. (See curriculum description).
2. Neuroscience Grand Rounds: lecture and case based rounds every Friday morning from 9:00 – 11:00. Bank day Friday's will have 1 hour of Radiology based cases from 9:00 to 10:00 AM.

3. Radiology Pathology Rounds: Scheduled Neuroradiology Pathology correlation rounds expose residents to specific clinical cases, Radiology and corresponding Pathology.

Neuroradiology Course Curriculum:

(This course is based predominantly on Dr. Osborn's textbook Neuroradiology and is intended to run over approximately a two year period)

Brain Development and Congenital Malformations

1. Normal Brain Development and General Classification of Congenital Malformations
2. Disorders of Neural Tube Closure
3. Disorders of Diverticulation and Cleavage, Sulcation and Cellular Migration
4. Posterior Fossa Malformations and Cysts
5. Disorders of Histogenesis: Neurocutaneous Syndromes

Cerebral Vasculature: Normal Anatomy and Pathology

6. Normal Vascular Anatomy
7. Intracranial Hemorrhage
8. Craniocerebral Trauma
9. Intracranial Aneurysms
10. Intracranial Vascular Malformations
11. Stroke

Brain Tumors and Tumorlike Processes

12. Brain Tumors and Tumorlike Masses: Classification and Differential Diagnosis
13. Astrocytomas and Other Glial Neoplasms
14. Meningiomas and Other Nonglial Neoplasms
15. Miscellaneous Tumors, Cysts and Metastases

Infection, White Matter Abnormalities, and Degenerative Diseases

16. Infections of the Brain and Its Lining
17. Inherited Metabolic, White Matter and Degenerative Diseases of the Brain
18. Acquired Metabolic, White Matter and Degenerative Diseases of the Brain

Spine and Spinal Cord

19. Normal Anatomy and Congenital Anomalies of the Spine and Spinal Cord
20. Nonneoplastic Disorders of the Spine and Spinal Cord
21. Cysts, Tumors and Tumorlike Lesions of the Spine and Spinal Cord

Head and Neck

22. Orbit
23. Temporal Bone/Skull Base
24. Neck and Sinus

Miscellaneous

25. Diffusion Weighted Imaging
26. MR Spectroscopy

GOALS & OBJECTIVES FOR THE NUCLEAR MEDICINE ROTATION

DEFINITION

Nuclear Medicine is a branch of medical practice concerned primarily with the use of unsealed radioactive sources in the study, diagnosis and treatment of disease.

GENERAL OBJECTIVES:

The goal of the rotating resident is to attain their competence to function independently as a radiological specialist with the ability to advise on and refer to nuclear imaging and non-imaging nuclear diagnostic procedures as appropriate within the context of Medical Imaging. The resident must acquire communication skills, knowledge, technical skills and professional attitudes appropriate to a lifetime career in Medical Imaging.

The purpose of the clinical training is to give the resident a degree of independent responsibility for clinical decisions; an opportunity for further development of the skills required in making effective relationships with patients; the consolidation of competence in primary clinical and technical skills across a broad range of medical practice; and an understanding of the nature of the relationship between the referring physician and medical imaging consultant.

The resident must establish a habit of lifelong learning and recognition of the importance of promoting a team approach to the use of Nuclear Medicine in diagnosis and therapy.

Residents must demonstrate the knowledge, skills and attitudes relating to gender, culture and ethnicity pertinent to Nuclear Medicine. In addition, all residents must demonstrate an ability to incorporate gender, cultural and ethnic perspectives in research methodology, data presentation and analysis.

SPECIFIC OBJECTIVES:

At the completion of training, the resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

General Requirements:

Demonstrate diagnostic and therapeutic skills for ethical and effective patient care.
Recognize the physical and psychological needs of the patient and their families undergoing nuclear medicine investigations and/or treatment, including the needs of culture, race and gender.
Access and apply relevant information to clinical practice.
Demonstrate effective consultation services with respect to patient care and education.

Specific Requirements:

Residents will have had an introduction to the following:

Basic Sciences:

- Relevant anatomy, pathology, physiology and pathophysiology
- Physics and instrumentation
- Radiopharmacy
- Radiation biology and protection
- Computer sciences
- Statistics
- Tracer kinetics and basic principles of radioimmunoassay
- Principals of bone densitometry

Clinical Sciences:

- A broad knowledge of clinical medicine relevant to the practice of nuclear medicine
- Diagnostic use of radionuclides including principles of their use, techniques, indications, interpretations, and pitfalls for in-vivo imaging, non-imaging and in-vitro studies including positron emission tomography and other evolving nuclear medicine technologies.
- Therapeutic uses of radionuclides including indications, contraindications, efficacy, dose calculations, adverse effects and radiation protection.
- Complementary and correlative roles of other diagnostic test relative to nuclear medicine
- Other quantitative in-vivo measurements e.g. bone densitometry.

Other:

- Radiation safety and regulatory requirements including relevant national and international guidelines governing the transport and use of radiopharmaceuticals and radiation protection.
- Quality assurance as it relates to all aspects of nuclear medicine.
- Ethical and medicolegal issues relevant to nuclear medicine practice.

Communicator

General Requirements:

Establish appropriate therapeutic relationships with patients and families.
Listen effectively.
Obtain the appropriate information during consultation with referring physicians in order to be able to make recommendations regarding the most appropriate testing and/or management of patients.
Discuss appropriate information with patients and families and the health care team and be able to obtain informed consent for tests and procedures when this is needed.

Specific Requirements:

- Understand the importance of communication with referring physicians, including an understanding of when the results of any investigations or procedure should be urgently communicated.
- Communicate effectively with patients and their families and have a compassionate interest in them.

Collaborator

General Requirements:

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

Specific Requirements:

- Have the ability to function as a member of a multi-disciplinary health care team in the optimal practice of radiology.

Manager

General Requirements:

Utilize resources effectively to balance patient care, learning needs, and other 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.

Specific Requirements:

- Be competent in conducting or supervising quality assurance including an understanding of safety issues and economic considerations.

Health Advocate

General Requirements:

Contribute effectively to improve the health of patients and communities.
Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements:

- Understand and communicate the benefits and risks of nuclear medicine investigation and treatment including population screening.
- Recognize when nuclear medicine investigation and treatment would be detrimental to the health of a patient.
- Educate and advise on the use and misuse of nuclear medicine imaging.

- Access and apply relevant information to clinical practice.
- Demonstrate effective consultation services with respect to patient care and education.

Scholar

General Requirements:

Establish a habit of continuous learning.
Critically appraise sources of medical information.
Facilitate learning of patients, house staff/students and other health professionals.
Contribute to the development of new knowledge.

Specific Requirements:

- Competence in evaluation of the medical literature.
- The ability to conduct a nuclear medicine/radiology research project which may include quality assurance.
- Appreciation of the important role that basic and clinical research plays in the critical analysis of current scientific developments related to nuclear medicine/radiology.

Professional

General Requirements:

Deliver highest quality care with integrity, honesty and compassion.
Exhibit appropriate personal and interpersonal professional behaviours.
Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements:

- Be able to accurately assess one's own performance, strengths and weaknesses.
- Understand the ethical and medical-legal requirements of radiologists.
- Demonstrate acceptance of responsibility as evidenced by punctuality, availability, self-motivation and self-conscientiousness.

Resident Responsibilities

- Gain familiarity with quality control procedures for radiopharmaceuticals and equipment. This will necessitate observing study acquisitions for most procedures. The resident will also be expected to arrange for observation in radiopharmacy.
- Attend reporting sessions as arranged with the supervising staff.
- Independent reading including relevant literature as determined by current cases.
- Make use of the existing teaching files supplementing the reporting sessions as required.
- Correlate current cases with other relevant diagnostic studies whenever feasible.
- Contribute two cases to the teaching file including relevant clinical information and literature.

	Monday to Friday
AM	Observation of study acquisition, radiopharmacy and self-study
PM	Reporting Session

Recommended Reading

Essentials of Nuclear Medicine Imaging, Fred A. Mettler.

RUH GOALS AND OBJECTIVES
PEDIATRIC RADIOLOGY ROTATION

GENERAL OBJECTIVES:

On completion of the Pediatric radiology rotation the resident will be competent to function as a consultant radiologist to referring clinicians in the area of Pediatric radiology. The resident will demonstrate ability to supervise and perform imaging procedures as well as advise referring physicians as to the appropriate investigations for the patient. These skills will be developed to a level appropriate for Royal College Certification.

SPECIFIC OBJECTIVES:

At the completion of training, the Resident will have acquired the following competencies and will function effectively as:

Medical expert/clinical decision-maker

Junior Residents:

- Demonstrate knowledge of pediatric anatomy utilizing multiplanar imaging techniques. This includes anatomy visualized with CT, U/S, MRI, Radiography, and Fluoroscopy.
- Demonstrate knowledge of clinical radiology and pathology as it pertains to pediatric radiology.
- Develop a rapport with the pediatric referring service for correlation of pediatric imaging with clinical scenarios/surgical findings.
- Develop a working knowledge of radiographic procedures associated with pediatric radiology such as: voiding cystourethrogram, pediatric upper and lower GI exams, pediatric biliary and interventional procedures, pediatric angio-interventional procedures to be covered under the angio-interventional section.
- Tailor exams as necessary to derive the maximum benefit with the least amount of intervention, with special consideration to the pediatric patient population. This would include monitoring radiation dosages (i.e.: using lowered doses in CT with limited exams to answer the clinical scenario without excessive irradiation to the patient). Adjusting intravenous contrast dosages to take into consideration the 1cc/lb or 2cc/kg guideline to avoid nephrotoxicity in the pediatric patient population.

Senior Resident:

- The senior resident will participate in supervising the junior resident if a junior and senior resident happen to on the same rotation.
- The senior resident will focus more upon their role as a consultative pediatric radiologist taking a more independent role in patient care.
- The senior resident will take on more responsibility in a graded fashion with regard to on-call pediatric cases, as well as day-to-day planning, protocol, and evaluation of day cases.
- The senior resident will be adept at tailoring a pediatric patient's imaging needs with regard to their clinical condition.

Communicator:

Specific Requirements:

- Residents will demonstrate a concise, and appropriate reporting style with use of appropriate lexicon regarding pediatric conditions.
- Appropriate, and pertinent differential diagnoses will be generated by the residents. The differential list should be inclusive without being exhaustive.

- Imaging findings requiring emergent intervention (i.e.: small bowel volvulus, pneumothorax, pneumoperitoneum, and intracranial hemorrhage) will be readily identified by the resident, and communicated to the referring service immediately.

Collaborator

Specific Requirements:

- Have the ability to function as a member of a multi-disciplinary health care team.
- Consult effectively with pediatric clinicians and other health care professionals.

Manager:

Specific Requirements:

- Demonstrate competence in conducting and supervising pediatric radiologic procedures.
- Understand the unique circumstances of pediatric radiology. Understand that imaging of pediatric patients is simply not imaging "small adults".

Health Advocate:

Specific Requirements:

- Understand the risks and complications related to all pediatric imaging, and interventional procedures.
- Develop effective imaging algorithms in evaluating pediatric patients, so as to maximize patient care, while minimizing cost, and possible morbidity/mortality to the patient

Scholar

Specific Requirements:

- Critically appraise appropriate sources of medical/imaging literature
- Demonstrate ability to develop a personal continuing medical education strategy.
- Demonstrate teaching ability to disseminate knowledge to other residents, faculty, and other health professionals.
- Contribute cases to the pediatric teaching files.
- Develop strategies/plans to initiate/participate in research activities in pediatric radiology.

Professional

Specific requirements:

- Have insight to one's strength's and weakness. Have a realistic impression of one's limitations, and know when to consult others.
- Exhibit high personal and professional attitudes.
- Deliver high quality care, in a professional and timely fashion.
- Develop a congenial and professional working relationship with all associated health professionals and patients (and family members).

RESIDENT DUTIES

Hours 8 A.M. to 5 P.M..

- All pediatric emergency x-rays to be read primarily by the resident, and reviewed with appropriate staff in a timely fashion.
- All x-rays from NICU and PICU to be read by the resident and reviewed with appropriate staff in a timely fashion.
- Pediatric cases then seen in CT, MRI, U/S and Fluoroscopy to be attended primarily by the pediatric resident when at all possible. These cases are to be protocoled, checked, and reviewed by the pediatric resident if there is no time conflict with other duties.
- All cases that are to be reviewed with staff should have first been be reviewed by the resident, as well as review of any prior imaging. Contributory clinical information should also be assembled by the resident whenever possible.
- Rounds are to be attended by the resident.
- Teaching information to be disseminated to residents, clinical house staff, and other health professionals when appropriate.
- 2 teaching file cases to be submitted at the end of each rotation.

Resident Evaluation :

- As each rotation is approximately 1 month in duration, a mid-term (2 week evaluation) informal evaluation may be given.

- A formal written evaluation is given at the end of the 1 month rotation. It is the responsibility of the resident to ensure that the supervisor is presented with an evaluation form at the end of the rotation.

- Evaluations will be provided by Dr. Wiebe, Pediatric Radiologist, in collaboration with the radiologists that supervised the residents activity during the rotation.

Required Reading:

Caffey's Pediatric Diagnostic Imaging (10th Ed. 2004) - reference
Diagnostic Imaging - Pediatrics - Donnelly (2005)
Pediatric Neuroimaging - Barkovich
Emergency Imaging of the acutely ill / injured child – Swischuk
Imaging of the newborn, infant, and young child – Swischuk

GOALS AND OBJECTIVES FOR RESIDENT TRAINING IN DIAGNOSTIC ULTRASOUND

GENERAL OBJECTIVES:

On completion of the Diagnostic Ultrasound training program the resident will be competent to function as a consultant in the discipline of Ultrasound Imaging. The resident will be able to supervise, perform, interpret and advise on Ultrasound examinations to such a level of competence as to function as a consultant to referring physicians. The skills will be developed to a level appropriate for Royal College Certification.

SPECIFIC OBJECTIVES:

On completion of training the resident will have acquired the necessary competence to function effectively as:

Medical expert/clinical decision-maker

General Requirements:

Demonstrate diagnostic skills for ethical and effective care.
Access and apply relevant information to clinical practice in order to be competent in clinical Diagnostic Ultrasound.
Demonstrate effective consultation skills with respect to patient care, education and legal opinions.

Specific Requirements:

- Understand the physical principles and technical aspects of image generation in Diagnostic Ultrasound.
- Knowledge of the theoretical, practical and legal aspects of biological effects in Diagnostic Ultrasound.
- Knowledge of human anatomy at all ages, with emphasis on aspects specific to Diagnostic Ultrasound.
- Knowledge of artifacts and imaging pitfalls in Diagnostic Ultrasound, including normal appearances that simulate disease.
- Knowledge of all aspects of clinical Diagnostic Ultrasound, including understanding of disease, familiarity with available equipment and techniques, appropriate application of imaging to patients, importance of informed consent, and factors affecting interpretation and differential diagnosis.
- Understand the fundamentals of quality assurance as it pertains to Diagnostic Ultrasound.
- Show competence in manual and procedural skills and in diagnostic and interventional skills.
- Be systematic, but flexible, in the conduct of ultrasound examinations, understanding that Diagnostic Ultrasound is a dynamic modality which frequently demands tailoring of studies based on specific clinical situations and observations made during the course of examinations.
- Show understanding of a sound and systematic style of reporting.
- Competence in effective consultation.

Communicator

General Requirements:

Establish appropriate relationships with patients and their families.
Listen effectively.
Obtain relevant information during consultation with referring physicians in order to be able to conduct examinations and make recommendations appropriate to specific clinical situations.
Discuss appropriate information with patients, their families, and referring physicians.

Specific Requirements:

- Be able to produce a Diagnostic Ultrasound report which will describe the imaging findings, most likely differential diagnoses and, when indicated, recommend further imaging or management.

- Understand the importance of communication with referring physicians, including an understanding of when the results of an examination should be urgently communicated.
- Communicate effectively with Ultrasonography staff and fellow radiologists.
- Communicate effectively with patients and their families and possess compassionate interest in them.
- Recognize the physical and psychological needs of patients and their families undergoing radiological investigation, including the needs of culture, race and gender.

Collaborator

General Requirements:

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

Specific Requirements:

- Be able to function as a member of a multi-disciplinary health care team in the optimal practice of Diagnostic Ultrasound.

Manager

General Requirements:

Use resources effectively to balance patient care, learning needs, and other activities.
Allocate finite health care resources wisely.
Work effectively and efficiently in a health care organization.
Use information technology to optimize patient care and learning.

Specific Requirements:

- Be competent in conducting quality assurance including an understanding of safety issues and economic considerations.

Health Advocate

General Requirements:

Identify the important determinants of health affecting patients.

Contribute effectively to improve the health of patients and communities.
Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements:

- Understand and communicate the benefits and risks of Diagnostic Ultrasound investigation.
- Recognize when Diagnostic Ultrasound investigation may be detrimental to a patient's health.
- Educate and advise on the use and misuse of Diagnostic Ultrasound.

Scholar

General Requirements:

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 the development of new knowledge.

Specific Requirements:

- Competence in the evaluation of the medical literature.
- Ability to teach medical students, residents, technologists and clinical colleagues about Diagnostic Ultrasound.
- Appreciation of the role that basic and clinical research plays in the critical analysis of current scientific developments related to Diagnostic Ultrasound.

Professional

General Requirements:

Deliver highest quality care with integrity, honesty and compassion.
Exhibit appropriate personal and interpersonal professional behavior.
Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements:

- Be able to assess his/her own performance, strengths and weaknesses.

- Understand the ethical and medical-legal requirements of practitioners of Diagnostic Ultrasound.

ROTATION STRUCTURE

During the second year of post-graduate training each resident is allocated a two month Diagnostic Ultrasound rotation at St. Paul's Hospital under the supervision of the attending radiologists at that institution. This period may include two weeks in the Antenatal Ultrasound section at the Royal University Hospital.

The third post-graduate year includes two months of Diagnostic Ultrasound at Royal University Hospital.

Up to two further months of Diagnostic Ultrasound rotation may be scheduled by the resident, according to the individual's choice, during the final two years of residency. This may include an elective period at Saskatoon Medical Imaging, under the supervision of the attending radiologists at that institution.

RESIDENT DUTIES AND RESPONSIBILITIES

First Rotation

Usually this is done at St. Paul's Hospital. Hours of work are Monday to Friday, 08:00 to 17:00, with attendance of scheduled academic activities mandatory.

The purpose of this rotation is to introduce the resident to the basic practical principles of Diagnostic Ultrasound. The resident is expected to learn to operate equipment used in Diagnostic Ultrasound and to use every opportunity to gain practical experience in conducting examinations, including abdominal, small parts, obstetric applications and Doppler. The resident should become familiar with the wide range of normal ultrasonographic appearances of human anatomy at various ages. In addition, the resident must study the basic physical principles as well as biologic effects of Diagnostic Ultrasound with further consultation of radiology literature pertinent to cases of interest.

By the end of this rotation the resident must be able to function as the first point of contact between the Department of Medical Imaging and referring physicians with respect to patients referred for ultrasound examinations. The resident must have basic familiarity with common problems encountered in daily Diagnostic Ultrasound practice, and the role and limitations of ultrasound in the imaging work-up of common clinical problems. The resident should demonstrate insight into the relative roles of Sonography staff and supervising radiologists in Diagnostic Ultrasound

examinations and collaborate effectively with both the sonographers and radiologists. The resident should be able to dictate basic examination reports. All ER cases are to be provided an initial interpretation via fax to the ER.

Second Rotation

Hours of work are Monday to Friday, 08:00 to 17:00, with attendance of scheduled academic activities mandatory.

The purpose of this rotation is to further refine skills acquired on the first rotation, and in particular to expand the resident's knowledge base. The resident is expected to be available at all times (except during scheduled rounds) to review all cases with sonography staff, where possible while patients are in the department, prior to presenting all cases in a structured manner to the supervising radiologist. The resident should be available to referring physicians for consultation. She/he should issue reports, including handwritten and verbal reports, in a timely fashion, appropriate to the urgency of each clinical situation.

The resident is expected to continue to take every opportunity to examine patients with findings of interest or concern. Opportunity may be provided to schedule studies for "hands-on" scanning by the resident. At these times the supervising staff radiologist will take over the role of the resident in dealing with sonographers and referring physicians.

Clinical follow-up on cases of interest is encouraged.

The resident should use this rotation to read extensively on the subject of Diagnostic Ultrasound. Dedicated recommended reading is "Diagnostic Ultrasound", by Rumack, Wilson and Charbonneau. Further study of the radiology literature on selected topics is encouraged. By the end of the rotation the resident should be able to function effectively as a consultant to referring physicians and as radiologist responsible for Diagnostic Ultrasound examinations, in collaboration with sonographers. The resident must be proficient in the operation of ultrasound equipment and be sufficiently skilled at performing examinations as to be able to function independently. Reports should be sufficiently structured and clear as to seldom require substantial correction by the supervising radiologist. All ER cases are to be provided an initial interpretation via fax to the ER. The resident's knowledge should be at a level appropriate for Royal College certification.

The resident is required to prepare at least two cases for the Diagnostic Ultrasound teaching file during the rotation and is encouraged to prepare case reports for publication when the opportunity arises. Clinical research in Diagnostic Ultrasound is also supported.

Residents must provide end-of-rotation evaluation forms to the rotation supervisor for completion within one-to-two weeks of the end of the rotation.

COURSE CURRICULUM:

To be presented in series of hour-long lectures over two years.

1. Physics of Diagnostic Ultrasound I
2. Physics of Diagnostic Ultrasound II
3. Physics of Diagnostic Ultrasound III
4. The Liver I
5. The Liver II
6. The Biliary System
7. The Pancreas and the Spleen
8. The Gastrointestinal Tract
9. The Urinary Tract I
10. The Urinary Tract II
11. The Acute Abdomen
12. Female Pelvis I
13. Female Pelvis II
14. Obstetric Ultrasound I
15. Obstetric Ultrasound II
16. Vascular Ultrasound
17. Small Parts

N) PHYSICS

Educational experience in Physics will be provided throughout the Residency Program in a number of different formats, which include:

- Lectures by Faculty which will deal with specific topics related to clinical and diagnostic components of the body system or modality based curriculum.
- Discussion of Physics as it relates to Medical Imaging issues at Journal Club
- Exposure to practical situations requiring an understanding of Physics during all rotations, including Nuclear Medicine.
- Discussion of the principles of Physics of Medical Imaging as they relate to Quality Assurance in formal QA Rounds.
- Invited professors or lectures providing information that relates to Physics.
- Attendance at an external institution Physics Review Course.

O) ELECTIVES

Out of Province Electives

Electives in areas of interest not available in Saskatchewan may be taken after consultation with the Program Director and the approval of the Postgraduate Education Committee. It should be noted that only six months (26 weeks) of training outside the Province of Saskatchewan will be supported by salary from the College of Medicine. The Program Director must notify the College of Medicine, Postgraduate Education Office in order for proper acknowledgement of training to occur.

AFIP is considered to be out of province **elective** time.

In Province Electives

Electives within Saskatoon or elsewhere in Saskatchewan may be taken within affiliated Radiology Departments, within the Department of Nuclear Medicine or within related specialties, for example, echocardiography or cardiac catheterization, pathology, endoscopy, etc. These must be taken in consultation with the Program Director and approved by the Postgraduate Education Committee.

With increasing time requirements for new modalities the total time allowed for electives will be continuously reviewed. The Program Director will discuss options with residents towards the end of their residency to allow appropriate scheduling in the PGY-5 year.

P) ARMED FORCES INSTITUTE OF PATHOLOGY (AFIP) - WASHINGTON, DC.

This four-week elective at the Armed Forces Institute of Pathology in Washington, DC. is highly recommended. Usually this elective is taken in PGY4 year The financial support provided by the Department and College of Medicine is variable.

Funding is subject to availability of funds from the College of Medicine and the Department of Medical Imaging. If you do not wish to attend the AFIP please notify the Program Director as soon as possible.

To attend the AFIP, students must bring fully documented case(s) with images and pathology specimens to the course. The number of cases and the criteria for case presentation are established by the AFIP.

Work on these files should be performed in conjunction with a supervising radiologist. Inform the Program Director of the cases you are taking so that the same case is not taken

by two Residents. Failure to bring good cases to this course can jeopardize our positions and deprive future Residents of the opportunity of attending this course.

Q) FINANCIAL SUBSIDY

The Postgraduate Education committee is provided with an annual budget by the Department of Medical Imaging. It is the responsibility of the Postgraduate Education committee to disperse these funds in a fair and equitable manner. Some of this money will be used for payment of conference expenses.

Additional funding for conference or educational leave will also be available from the College of Medicine. There are also additional funds from the College of Medicine that must be applied for, in advance, by the Residents and/or the Program Director. The amount of this funding varies. It is the responsibility of the Postgraduate Education Committee to disperse these funds in a fair and equitable manner.

Residents presenting papers at recognized scientific meetings may be supported by funding from the Department of Medical Imaging. In order to be eligible for this additional funding the project must be reviewed and approved by the Research Committee.

R) CONFERENCE LEAVE

Up to one week (seven working days) per year will be allowed for conference time. Additional time for presenting scientific papers at recognized meetings may be allowed at the discretion of the Program Director, the Postgraduate Education Committee, and the Academic Head of the Department.

Residents may carry the funding for conference travel forward if they wish. However, the time allotted for conference travel cannot be carried forward.

Attendance at a conference must be approved by the Program Director.

APPENDIX A

SUGGESTED READING - DIAGNOSTIC RADIOLOGY

GENERAL REFERENCE

1. Essentials Of Roentgen Interpretation - Paul & Juhl.
2. Textbook Of Radiology - Sutton.
3. Atlas Of Normal Roentgen Variants - Keats.
4. Gamuts In Radiology - Reeder & Felson.
5. Synopsis Of Radiologic Anatomy - Meschan.
6. An Atlas Of Normal Radiographic Anatomy - Snell & Wyman.
7. Aids To Radiological Differential Diagnosis - Chapman, Nakielny.
8. Radiology, Diagnosis, Imaging & Intervention - Taveras & Ferruci.

CHEST

1. Chest Roentgenology - Felson.
2. Synopsis Of Chest Disease - Fraser, Pare.
3. Computed Tomography Of The Thorax - Naidich, Zerhouni, Siegelman.
4. The Mediastinum - Heitzman. (Reference Text).
5. The Lung, Radiologic-Pathologic Correlation - Heitzman. (Reference Text).
6. Diagnosis Of Disease Of The Chest - Fraser, Pare, Pare, Fraser & Genereux. (Reference Text).

GASTROINTESTINAL

1. Essentials Of Gastrointestinal Radiology - Jones & Braver (Good Quick Overview For Beginners).
2. Double-Contrast Gastrointestinal Radiology - Laufer (For Performance And Interpretation Of Double Contrast Studies).
3. Gastrointestinal Radiology: A Pattern Approach - Eisenberg.
4. Alimentary Tract Radiology - Margulis & Burhenne.
5. Practical Approach To Pediatric Radiology – Poznanski
6. Alimentary Tract Radiology: A Synopsis - Margulis & Burhenne.
7 Dynamic Radiology Of The Abdomen - Meyers.
8. Abdominal Radiology - McCort.
9. Pediatric Gastrointestinal Imaging - Stringer.
10. Radiology Of The Pancreas - Freeny & Lawson.
11. Radiology Of The Gallbladder & Bile Ducts - Berk, Ferrucci & Leopold.
12. Radiology Of The Salivary Gland - Rabinov & Weber.

13. Procedures In Gastrointestinal Radiology - Dobranowski, Stringer, Somers, Stevenson.

MUSCULOSKELETAL

1. Anatomy And Positioning - Meschan.
2. **Trauma**
   Radiology Of Skeletal Trauma - Rogers.;
   Imaging Of Orthopedic Trauma And Surgery - Berquist.
3. **Tumor**
   Roentgen Diagnosis Of Diseases Of Bone - Edieken - Hodes.
4. **Congenital Anomalies**
   Practical Pediatric Imaging - Kirks.
   Pediatric Skeletal Radiology - Reed.
5. **Arthritis**
   Arthritis In Black And White - Brower.
6. **Major Reference Text**
   Diagnosis Of Bone And Joint Disorders - Resnick.
7. **Basic Material**
   Fundamentals Of Diagnostic Radiology - Brant And Helms.
   The Bare Bones - Chew.
8. **MRI** - Magnetic Resonance Imaging In Orthopedics And Sport Medicine - Stolar.
   Orthopedic MRI, A Teaching - Pomeranz.
9. **Normal Variant**
   An Atlas Of Normal Variants That May Simulate Disease - Keats.
   Normal Variants And Pitfalls In Imaging - Vogler.
   Borderlands Of The Normal And Early Pathology In Skeletal Roentgenology - Kohler.
10. Musculoskeletal Imaging: The Requisites. David Sartoris. Mosby.

SPINE

1. The Spine - Epstein.
2. The Radiology of Acute Cervical Spinal Trauma - Harris. **Must Read**.
3. CT of The Spine (Contemporary Issues In CT) - Haughton.

NEURORADIOLOGY

Basic

1. The Normal Skull - Shapiro.
2. Myelography - Shapiro. **Must Read**.
3. New Techniques In Myelography - Sackett, Strother.
4. Normal Neuroradiology and Atlas Of The Skull, Sinuses, Facial Bones - Taveras.

5. Diagnostic Neuroradiology - Taveras, Wood.
6. Radiology of The Skull and Brain - Newton, Potts.
7. Neuroradiology With CT - Ramsey.
8. Diagnostic Neuroradiology - Osborn. **Must Read**.

Special

1. Cranial Computerized Tomography & MRI - Lee & Rao. **Must Read**.
2. CT And Myelography Of The Spine And Cord: Techniques, Anatomy And Pathology In Children - Harwood-Nash, Petterson.
3. CT Of The Orbit And Sella Turcica - Jacobs.
4. An Atlas Of The Human Brain For Ct - Matsui.
5. Radiology Of The Nose, Paranasal Sinuses & Nasopharynx - Dodd.
6. Computed Tomography Of The Head, Neck & Spine: Latchaw.
7. The Radiology Of Acute Cervical Spine Trauma - Harris. **Must Read**.

ULTRASOUND

1. Diagnostic Ultrasound - Rumack, Wilson, Charboneau.
2. Introduction To Vascular Ultrasonography - Zwiebel.
3. Clinical Applications Of Doppler Ultrasound - Taylor, Burns, Wells.
4. Ultrasound Of The Prostate - Matthew D. Rifkin.
5. Abdominal Ultrasound - Mittelstaedt.

URORADIOLOGY

1. Clinical Urography - Filly, Friedland.
2. Clinical Urography - Witten.
3. Radiologic Diagnosis Of Renal Parenchymal Diseases - Davidson.
4. Radiology Of The Kidney - Davidson.
5. Radiology Of The Urinary System - Elkin.
6. Textbook Of Uroradiology - Dunnick, Reed & McCallum (New Edition).
7. Ultrasound Of The Prostate - Rifkin
8. Uroradiology - An Integrated Approach - Freedland, Filly, Goris.
9. Radiology, Diagnosis, Imaging, Intervention, Vol. IV - Tavaras, Ferrucci.

PEDIATRIC RADIOLOGY

1. Radiology Of The Newborn & Young Infants - Swischuk.
2. Pediatric Radiology - Rabinowitz.
3. Neuroradiology In Infants & Children - Harwood-Nash, Fitz.
4. Pediatric X-Ray Diagnosis - Caffey.

5. Emergency Radiology Of The Acutely Ill Or Injured Child - Swischuk.
6. Bone Dysplasias - Langer, Spranger, Wiedemann.
7. Practical Pediatric Imaging: Diagnostic Radiology Of Infants & Children - Kirks.

ANGIO/INTERVENTIONAL

1. Diagnostic Angiography – Kadir (must read).
2. Angiography - Abrams.
3. Gastrointestinal Radiology - Reuter, Redman.
4. Diagnostic Neuroradiology: Taveras, Woods.
5. Introduction To Cerebral Angiography - Osborn. Must Read.
6. A Practical Approach To Angiography - Johnsrude & Jackson.
7. Diagnostic Angiography - Kadir.
8. Essentials Of Diagnostic & Interventional Angiographic Techniques - Gerlock & Mirfakhraee.
9. Interventional Radiology - Kadir.
10. Interventional Radiology - Dondelinger.
11. Interventional Radiology - Castaneda.

COMPUTED TOMOGRAPHY (CT)

1. Computed Body Tomography - Lee.
2. Computed Tomography Of The Whole Body - Haaga, Alfidi.
3. Contemporary Issues In Computed Tomography - Siegelman Series
    a. CT Of The Pancreas
    b. CT Of The Spine
    c. CT Of The Kidneys & Adrenals
    d. CT Of The Chest.
4. CT Of The Ear, Nose & Throat - RSNA.
5. CT Of The Thorax - Naidich, Zerhouni, Siegelman.
6. Computed Tomographic Atlas Of The Head & Neck - Maue-Dickson.
7. An Atlas Of Cross-Sectional Anatomy - Kieffer, Heitzman.
8. Seminars In Roentgenology.
9. Computed Tomography Of The Head & Neck - Mancuso, Hanafee.
10. Computed Tomography Of The Body - Moss, Gamsu & Genant.
11. Atlas Of Axial, Sagittal & Coronal Anatomy With CT & MRI - Christofordis.
12. Atlas Of Computed Tomography Variants - Kuhns & Seeger.
13. Computed Tomography In The Evaluation Of Trauma - Federle & Brant-Sawadzki.
14. Computed Tomography Of The Spine - Donovan Post.
15. Cranial Computed Tomography-A Comprehensive Text - Williams & Haughton.
16. Computed Body CT With MRI Correlation - Lee, Sagel & Stanley.

CARDIOLOGY

1. Clinical Cardiac Roentgenology - Jackson, Rees.
2. Cardiac Roentgenology - Meszaros.
3. Essentials Of Cardiac Roentgenology - Chen.
4. Plain X-ray Interpretation Of Congenital Heart Disease - Swischuk.

ARTHROGRAPHY

1. Arthrography - Freiberger & Kaye.

PHYSICS

1. An Introduction To The Physics Of Diagnostic Radiology - Christenson, Lea And Febiger.
2. Intermediate Physics For Medicine And Biology.
3. Basic Radiation Biology - Pizzarello, Lea And Febiger.

MAGNETIC RESONANCE IMAGING

1. Clinical Magnetic Resonance Imaging - R. Adelman & J.R. Hesselink, 1990, W.B. Saunders.
   Single best text which covers all areas of MR Part I - Physics and Instrumentation, Part II - CNS, Part III - Chest & Abdomen, Part IV - Pelvis, Part V - Musculoskeletal. This is probably the single most useful book and can be supplemented from Reference texts in the Department.
2. Magnetic Resonance Imaging Of The Body - C.B. Higgins et al. Ravin Press, 1992.
   This is the best general text on Body Imaging in this field and is available for borrowing in the Department.
3. Mri Of The Brain & Spine - Scott Atlas, Raven Press, 1992.
   Best single source for knowledge of Neuro MR, including coverage of the orbits, ENT and spine. Available for reference in MR.
4. Pediatric Imaging - A.J. Barkovich, Raven Press, 1991.
   Excellent reference for Pediatric Neuroimaging. Available for reference in MR.
5. Magnetic Resonance Imaging - Atlas Of Extremities - Kand & Resnick, Saunders, 1993.
   This is an excellent source for Anatomy of the various joints and is available as a reference text in MR..
6. Magnetic Resonance Imaging: Central Nervous System - Kucharczyk.
7. Magnetic Resonance Imaging - Stark & Bradley.

REFERENCE LIST ADDITIONS:

1. Osborn, AG. Diagnostic Neuroradiology, St. Louis, 1994, Moseby. An extensive text covering most aspects of adult neuroradiology, excluding portions covered under the head and neck.
2. Westbrook, C. and Kaut, C. MRI in Practice, Oxford, 1994, Blackwell Science. A good MRI physics resource with a very good chapter on MRI artifacts.
3. Som, P. Head and Neck Imaging, St. Louis, 1996, Moseby. An extensive text for reference covering head and neck imaging.

MAMMOGRAPHY

1. Breast Imaging - Kopans.
2. Teaching Atlas Of Mammography - Tabar & Dean.
3. Mammographic Interpretation - Marcj, Homer.
4. Atlas Of Film-Screen Mammography - Shaw De Paredes.

APPENDIX B

MCQ LIBRARY FOR RESIDENTS & STAFF

The following are a list of books recommended for reading by residents and staff in Radiology in many programs across Canada. The book list has been reviewed and revised by the MCQ test committee. This list might be used to form the basis of a library.

	Recommendation
A. GENERAL TEXT:	
Radiology, Diagnosis, Imaging and Intervention: Taveras and Ferruci	Reference Text
Textbook or Radiology and Imaging: Sutton	Good General Text
Merrell's Atlas of Radiographic Positions and Radiographic Procedures, Vol. I, II, III: Philip Belanger	Reference Text
B. CHEST:	
Diagnosis of Disease of the Chest: Fraser, Pare and Genereux	Reference Text
The Lung: Radiological and Pathological Correlation: Heintzman – 2nd Ed.	**Must Read**
Chest Radiology: Felson	**Must Read**
Imaging of Diseases of the Chest: Armstrong	Good Readable Text
High Resolution CT Scanning: Muller	Additional Test
C. CARDIOLOGY:	
Essentials of Cardiac Diagnosis and Imaging: Higgins – 2nd ed.	Good Reference Text
Essentials of Cardiac Roentgenology: Chen	Basic Plain Film Interpretations
Plain Film Interpretation of Congenital Heart Disease: Swischuk	**Must Read**
D. MAMMOGRAPHY:	
Breast Imaging: Kopans	**Must Read**
Teaching Atlas of Mammography	**Must Read**
E. PEDIATRICS:	
Practical Pediatric Imaging: Kirks	Reference Text
Essentials of Caffey's X-ray Diagnosis: Silverman and Kuhn	Reference Text

Imaging of the Newborn, Infant and Child: Swischuk	**Must Read**
Emergency Radiology of the Acutely Ill or Injured Child: Swischuk	**Must Read**

F. GASTROINTESTINAL:

Gastrointestinal Radiology: Gohr & Levine	**Must Read**
Dynamic Radiology of the Abdomen: Normal and Pathologic Anatomy: Meyers	**Must Read**
Gastrointestinal Radiology: A Pattern Approach: Eisenberg	Additional Text
Double Contrast Gastrointestinal Radiology: Laufer	Additional Text
Computed Tomography of the Body: Moss, Gamsu, Genant	Reference Text

G. GENITOURINARY:

Textbook of Uroradiology: Dunnick, Reed and McCallum	**Must Read**
Clinical Urography (1990): Pollack	Additional Text

H. SKELETAL:

Bone and Joint Imaging (mini version) - Resnick	**Must Read**
Arthritis in Black and White: Brower	**Must Read**
Radiology of Bone and Joint Diseases: Greenfield	Reference Text
Orthopedic Radiology: Weissman & Sledge	Reference Text
Radiology of Skeletal Trauma: Rogers	Reference Text

I. NEURORADIOLOGY:

Computed Tomography of the Head, Neck and Spine: Latchaw	Reference Text
Cranial Computed Tomography and MRI: Lee and Rao	Reference Text
Introduction to Cerebral Angiography: Osborn	Reference Text
The Radiology of Acute Cervical Spine Trauma: Harris	**Must Read**
MRI: Central Nervous System: Kucharczyk	Reference Text
Diagnostic Neuroradiology: Osborn	**Must Read**

J. EAR, NOSE AND THROAT:

Head and Neck Imaging: Som and Bergeron	Reference Text

K. ANGIOGRAPHY & INTERVENTIONAL:

Diagnostic Angiography: Kadir	**Must Read**
Abrams Angiography: Vascular and Interventional Radiology: Abrams	Reference Text
Gastrointestinal Angiography: Reuter and Redman	Reference Text

L. CT AND MRI:

Computed Body CT with MRI Correlation: Lee, Sagel and Stanley	Reference Text
Magnetic Resonance Imaging: Stark & Bradley	Reference Text

M. ULTRASOUND:

Diagnostic Ultrasound: Rumack, Wilson and Charbonneau	**Must Read**

N. NUCLEAR MEDICINE:

Essentials of Nuclear Medicine Imaging: Mettler and Guiberteau	**Must Read**
Diagnosis in Nuclear Medicine – Gottschalk (2^{nd} Ed.)	Reference Text

O. PHYSICS:

Christensen's Physics of Diagnostic Radiology: Curry & Dowdey (4^{th} Ed).	**Must Read**
Introductory Physics of Nuclear Medicine: Chandra	Reference Text

P. BIOSTATISTICS:

Biostatistics in Clinical Medicine: Ingelfinger, Mosteller, et al.	Reference Text

Q. RADIOBIOLOGY:

Medical Radiation Biology: Pizzarello	Reference Text

APPENDIX C

DEPARTMENT OF MEDICAL IMAGING FACULTY ASSESSMENT

GOALS:

- To improve the quality of teaching provided to residents by faculty members of the Department of Medical Imaging.
- To make faculty members aware of teaching behaviours (strengths or weaknesses) that may affect resident learning
- To cause faculty members to reflect on their teaching.

FACULTY ASSESSMENT FORM:

An assessment form was developed by a subcommittee of the Postgraduate Education Committee to allow the residents to assess faculty teaching and interactions with residents.

PROCESS:

- At the end of June, each year, every resident will complete a Faculty Assessment Form for each Faculty member they have encountered during their training throughout the year. This form may be filled out by the Residents as a group for each Faculty Member.
- This form should not be given to the member of the faculty, nor should the faculty member ask to see the completed form. A copy should be given to the Program Director.
- Forward the Faculty Assessment Form to Dr. Sheila Harding, Educational Support and Development, Health Sciences Building, College of Medicine in a sealed envelope.
- Dr. Harding will total the results and provide statistical analysis of the data.
- The results of this analysis will be forwarded to the assessed faculty member and to the Program Director.
- The Faculty member may forward these evaluation results to other individuals or committees.
- It is the responsibility of the faculty person to act upon the results of the assessment process.
- The Program Director will ensure that the residents are receiving appropriate teaching and education, and that the environment is supportive for the residents education

APPENDIX D

SPECIALTY TRAINING REQUIREMENTS IN DIAGNOSTIC RADIOLOGY

The five years of approved training require, at first, a closely supervised practice, with the opportunity for increasing responsibility in the final years, so that the resident near the end of training can function as a general radiology consultant, requesting help from staff radiologists when necessary. The residency may be followed by one or more years of fellowship training in a subspecialty discipline, as the residency training is not intended to provide a subspecialty level of expertise.

This period must include:

1. One year of basic clinical training.

The purpose of this year is to give the resident a degree of independent responsibility for clinical decisions; an opportunity for further development of the skills required in making effective relationships with patients; the consolidation of competence in primary clinical and technical skills across a broad range of medical practice; and an understanding of the nature of the relationship between a referring physician and a clinical radiological consultant.

2a. Three years of approved resident training in "general diagnostic imaging"; this must include: respiratory, cardiovascular, gastro-intestinal and biliary, genitourinary, musculoskeletal, mammography, neurological and pediatric radiology, as well as the following modalities: fluoroscopy, ultrasound, nuclear medicine, CT, MR imaging.
Because of the varying training programs in the recognized university training centres, these 36 months may be allocated as block periods of at least three months or their equivalents.

2b. One year of approved residency that may consist of one to twelve month periods in any of the following, as long as these are appropriately integrated by the Residency Training Committee:

- further training in diagnostic radiology
- diagnostic ultrasound
- CT
- MR
- nuclear medicine
- cardiac and/or vascular radiology
- interventional radiology
- neuroradiology

- pediatric radiology
- pathology or other clinical specialty relevant to the practice of radiology (for up to three months)
- a full-time research project, relevant to diagnostic imaging, and acceptable to the program director and the Credentials Committee.

Note: In view of the amount and variety of radiology to be covered and the skills required at the time of the final examination, it will seldom be appropriate to spend the entire 12 months of the fifth year in any one of these areas.

APPENDIX E

OBJECTIVES OF TRAINING AND SPECIALTY TRAINING REQUIREMENTS IN DIAGNOSTIC RADIOLOGY

Approved by Education Committee, 2000
(Please also see Policies and Procedures for Certification and Fellowship)

DEFINITION

Diagnostic Radiology is a branch of medical practice concerned with the use of imaging techniques in the study, diagnosis and treatment of disease.

GENERAL OBJECTIVES

On completion of the educational program, the graduate physician will be competent to function as a consultant in Diagnostic Radiology. This requires the physician to have the ability to supervise, advise on and perform imaging procedures to such a level of competence, and across a broad range of medical practice, as to function as a consultant to referring family physicians and specialists.

Communication skills, knowledge, and technical skills are the three pillars on which a radiological career is built, and all are dependent on the acquisition of an attitude to the practice of medicine which recognizes both the need to establish a habit of continuous learning and a recognition of the importance of promoting a team approach to the provision of imaging services.

Residents must demonstrate the knowledge, skills and attitudes relating to gender, culture and ethnicity pertinent to Diagnostic Radiology. In addition, all residents must demonstrate an ability to incorporate gender, cultural and ethnic perspectives in research methodology, data presentation and analysis.

SPECIFIC OBJECTIVES (Revised into CanMEDS format — May 2000)

Medical Expert/Clinical Decision-Maker

General Requirements

Demonstrate diagnostic and therapeutic skills for ethical and effective patient care.

Access and apply relevant information to clinical practice so as to have competence in clinical radiological skills.

Demonstrate effective consultation services with respect to patient care, education and legal

opinions.

Specific Requirements

Understand the nature of formation of all types of radiological images, including physical and technical aspects, patient positioning, contrast media.

Knowledge of the theoretical, practical and legal aspects of radiation protection, including other imaging techniques and their possible harmful effects.

Knowledge of human anatomy at all ages, both conventional and multiplanar, with emphasis on radiological applications.

Knowledge of all aspects of clinical radiology, including understanding of disease, appropriate application of imaging to patients, importance of informed consent, complications such as contrast media reactions, and factors affecting interpretation and differential diagnosis.

Understand the fundamentals of quality assurance in radiology.

Understand the fundamentals of epidemiology, biostatistics and decision analysis.

Show competence in manual and procedural skills and in diagnostic and interpretive skills.

Demonstrate the ability to manage the patient independently during a procedure, in close association with a specialist or other physician who has referred the patient. The radiologist should know when the patient's best interests are served by discontinuing a procedure, or referring the patient to another physician.

Understand the acceptable and expected results of investigations and/or interventional therapy as well as unacceptable and unexpected results. This must include knowledge of and ability to manage radiological complications effectively.

Understand the appropriate follow-up care of patients who have received investigations and/or interventional therapy.

Show understanding of a sound and systematic style of reporting.

Competence in effective consultation, conduct of clinico-radiological conferences, and the ability to present scholarly material and lead case discussions.

Communicator

General Requirements

Establish appropriate therapeutic relationships with patients/families.

Listen effectively.

Obtain the appropriate information during consultation with referring physicians in order to be able to make recommendations regarding the most appropriate testing and/or management of patients.

Discuss appropriate information with patients/families and the health care team, and be able to obtain informed consent for tests and procedures when this is needed.

Specific Requirements

Have the ability to produce a radiologic report which will describe the imaging findings, most likely differential diagnoses, and, when indicated, recommend further testing and/or management.

Understand the importance of communication with referring physicians, including an understanding of when the results of an investigation or procedure should be urgently communicated.

Communicate effectively with patients and their families and have a compassionate interest in them.

Recognize the physical and psychological needs of the patient and their families undergoing radiological investigations and/or treatment, including the needs of culture, race and gender.

Collaborator

General Requirements

Consult effectively with other physicians and health care professionals.

Contribute effectively to other interdisciplinary team activities.

Specific Requirements

Have the ability to function as a member of a multi-disciplinary health care team in the optimal practice of radiology.

Manager

General Requirements

Utilize resources effectively to balance patient care, learning needs, and other 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.

Specific Requirements

Be competent in conducting or supervising quality assurance including an understanding of safety issues and economic considerations.

Be competent in computer science as it pertains to the practice of radiology.

Health Advocate

General Requirements

Identify the important determinants of health affecting patients.

Contribute effectively to improve the health of patients and communities.

Recognize and respond to those issues where advocacy is appropriate.

Specific Requirements

Understand and communicate the benefits and risks of radiological investigation and treatment including population screening.

Recognize when radiological investigation or treatment would be detrimental to the health of a patient.

Educate and advise on the use and misuse of radiological imaging.

Scholar

General Requirements

Develop, implement and monitor a personal continuing education strategy.

Critically appraise sources of medical information.

Facilitate learning of patients, housestaff/students and other health professionals.

Contribute to development of new knowledge.

Specific Requirements

Competence in evaluation of the medical literature.

The ability to be an effective teacher of radiology to medical students, residents, technologists and clinical colleagues.

The ability to conduct a radiology research project, which may include quality assurance.

Appreciation of the important role that basic and clinical research plays in the critical analysis of current scientific developments related to radiology.

Professional

General Requirements

Deliver highest quality care with integrity, honesty and compassion.

Exhibit appropriate personal and interpersonal professional behaviours.

Practice medicine ethically consistent with the obligations of a physician respecting the needs of culture, race and gender.

Specific Requirements

Be able to accurately assess one's own performance, strengths and weaknesses.

Understand the ethical and medical-legal requirements of radiologists.

Training in Canada

The foregoing represents the general and specific objectives that all candidates for the Royal College examinations in Diagnostic Radiology are expected to meet. For those training in Canadian programs, these objectives will be accomplished in a staged manner. Residents in Canadian programs may obtain the document describing this approach from their program directors.

APPENDIX F

COLLEGE OF MEDICINE UNIVERSITY OF SASKATCHEWAN
Regulations for Dealing with Unsatisfactory Evaluations and Disciplinary Action

PREAMBLE

Residents are appointed by the College of Medicine, University of Saskatchewan, for a one-year term. Promotion of trainees to the next level of training is contingent upon satisfactory performance as evaluated by the respective residency medical training committees. In circumstances where an evaluation(s) indicates unsatisfactory performance, the regulations set out below will apply.

A. REGULATIONS FOR DEALING WITH UNSATISFACTORY EVALUATIONS

Residents have the right to an appeal process on decisions or actions affecting their training and their evaluation. The maximum allowable time to start an appeal process is fifteen (15) calendar days from the time the resident received written notification of the unsatisfactory evaluation(s) from the program director. If no written notice of appeal is received within the fifteen (15) day period, the resident shall be deemed to have waived any right to appeal.

i) FOR RESIDENTS IN A ROYAL COLLEGE PROGRAM

There are two types of evaluations for Royal College Programs

a. There is an ongoing evaluation of all residents in training. These are done in writing by the Program Director at three or six month intervals and usually at the end of a rotation in the junior years. All evaluations are forwarded to the Associate Dean of Postgraduate Medical Education for review. The evaluations are maintained on file in the Dean of Medicine's office for the duration of the trainees' training program.
b. There are also the evaluation reports submitted by the Program Director to the Examination Committee of the Royal College of Physicians & Surgeons of Canada preceding the certification examination of the Royal College. Again, these evaluations are reviewed by the Associate Dean of Postgraduate Medical Education and a copy is maintained on file in the Dean of Medicine's Office.

In each instance the evaluation is to be reviewed with the resident prior to its submission, and the resident signs that he/she has seen the evaluation report. The

report will contain a decision by the Program Director about the competence and qualifications of the resident concerned.

If a resident is dissatisfied with the evaluation report, he/she should first indicate in writing on the evaluation sheet this dissatisfaction to the Program Director, and in discussion with the Program Director see if an alteration or upgrading of the evaluation is forthcoming. If this does not result in a change in the evaluation report satisfactory to the resident, the Program Director will summarize in writing to the resident the reason for the unfavorable evaluation and recommendation and advise the resident of his/her right to appeal as hereinafter set forth. Any appeal action shall be initiated by the resident advising the Associate Dean of Postgraduate Medical Education in writing of his/her intention to appeal the evaluation within fifteen (15) days of receipt of the written evaluation. The written submission must include the reasons for appeal.

Upon receiving the written notice of appeal, the Associate Dean of Postgraduate Medical Education will strike an Appeal Committee. This Appeal Committee shall function as an appeal body for residents in academic matters.

The **Appeal Committee** shall consist of:

1. Three members of the medical faculty chosen by the Dean of Medicine (one being the chairman).
2. A resident member of the Program Committee (who should not be the appellant).
3. One other resident from another program to be selected by P.A.I.R.S.

The Appeal Committee shall review the evaluation report, the written submissions by the appellant as set out in the notice of intention to appeal and, if the Appeal Committee in its sole discretion deems it necessary, interview the resident and the Program Director. The Appeal Committee shall have the power to uphold the decision of the Program Director or request that the Program Director modify the evaluation. If the Appeal Committee requests the Program Director to modify the evaluation and the Program Director refuses, the matter shall be referred to the Associate Dean of Postgraduate Medical Education who will review all of the evidence and make a recommendation to the Dean of Medicine. The Dean of Medicine will review all of the evidence and render a decision. If the resident is dissatisfied with the decision reached by the College of Medicine, an appeal can be made to the Joint Senate-Council Board for Student Appeals.

B. REGULATIONS FOR DEALING WITH DISCIPLINARY ACTION.

Immediate action may be necessary by reasons of clinical inadequacy, clinical incompetence, or other disciplinary problems on the part of a resident.

Any complaint concerning clinical inadequacy, clinical incompetence, or disciplinary problems must be delivered in writing to the Residency Training Program Director and written documentation of the complaint sent to the Associate Dean of Postgraduate Medical Education. These complaints will then be taken to the University Academic Department Head.

The Department Head will have four alternatives:

1. To dismiss the charges if they could be found to be unjustified.
2. If the situation is not deemed serious enough to require suspension, to place the resident on probation and allow him/her to continue his/her duties pending a suitable investigation.
3. If the situation is not deemed serious enough to require suspension, to place the resident on probation and allow him/her duties as modified by agreement between the Department Head pending a suitable investigation.
4. If the situation is deemed serious enough, to impose a temporary suspension pending further investigation.

In situation #2, #3, and #4 the Department Head should then convene an Investigation Committee as hereinafter defined. In all cases the Associate Dean of Postgraduate Medical Education, the Hospital Administrator, P.A.I.R.S, and the College of Physicians & Surgeons of Saskatchewan must receive a timely report on the nature of the complaint and subsequently on the action taken.

COMPOSITION OF THE INVESTIGATION COMMITTEE

The composition of the **Investigation Committee** should be:

1. The head of the University Department concerned.
2. The Residency Training Program Director of the department concerned.
3. The Executive Director or his Deputy of the Hospital concerned.
4. A resident to be selected by P.A.I.R.S. who shall not be the defendant.

FUNCTIONS OF THE INVESTIGATIVE COMMITTEE

The Investigation Committee will be expected to act expeditiously and will hold a hearing and call such witnesses as the Committee deems appropriate. Such witnesses may include the resident concerned, the complainant and other witnesses as it is deemed

necessary. The resident shall be fully advised in writing as to the exact nature of the complaint and of the procedure which the committee intends to follow.

The Investigation Committee after considering the evidence shall render a written decision. If the decision is that the situation merits no action and that any temporary suspension that has been imposed should be rescinded, there will be no grounds for appeal and the matter will be ended. The situation will not be entered into the permanent official record of the trainee for the purpose of ongoing evaluation or communication with any examining or licensing body. If, on the other hand, disciplinary action is deemed necessary, the Investigation Committee will make recommendations as to what this disciplinary action should be. If it is felt that the incident was serious enough to warrant discontinuation of the trainee's contract, the Associate Dean of Postgraduate Medical Education will be so informed, as well as the Executive Director or Administrator of the Hospital.

The Associate Dean of Postgraduate Medical Education will then advise the trainee of the decision to terminate his/her contract.

At the time of being informed of an adverse decision, the trainee shall be advised of his/her right to appeal as set forth in this document. The trainee shall have fifteen (15) calendar days in which to submit to the Associate Dean of Postgraduate Medical Education a written notice of appeal. The Appeal Committee shall be appointed by the Dean of Medicine and the composition of this committee will include the following individuals:

1. Associate Dean of Postgraduate Medical Education
2. A representative from the hospital administration who shall not be a member of the investigation committee.
3. A representative to be selected by P.A.I.R.S who should not be the appellant.
4. A member from the College of Medicine faculty to be selected by the Postgraduate Medical Education Committee.

ACTIONS AND ALTERNATIVES FOR THE APPEAL COMMITTEE

The Appeal Committee will meet and determine the procedure which the Committee intends to follow. The procedure shall be communicated to the resident. The Appeal Committee will determine if the resident has received due process and if the disciplinary penalty is appropriate in the circumstances of the case. If the Appeal Committee decides that the decision should be reversed or altered, they will ask the Residency Training Committee to do so. If the Program Director does not see fit to do so, the decision shall be referred to the Dean of Medicine who will review the evidence and render a decision.

If the decision made by the College of Medicine is dissatisfactory to the resident, he/she may appeal to the Joint Senate-Council Board for Student Appeals.

January 1995.

APPENDIX G

RESIDENT EVALUATION SYSTEM

1. The evaluation will typically be completed electronically via Web Eval (one45).

2. Each rotation has an assigned co-coordinator.

3. By default, an evaluation will be sent to this individual the first week following a completed rotation.

4. The co-coordinator will determine how he/she wants to obtain input from other preceptors for the evaluation form.

5. In some cases the co-coordinator may be away or have had limited exposure to the resident. In these cases, the resident should indicate to the Administrative Secretary the individual to send the evaluation to. This would also apply to elective rotations (in or out of province).

6. Once the evaluation is completed it will be available for electronic review by the resident.

7. Residents should also complete rotation evaluations at that time.

8. The resident evaluations are compiled by the Program Director for the 6 and 12-month evaluations.

9. The resident evaluations of individual rotations are compiled yearly.

APPENDIX H

IN-TRAINING EVALUATION REPORT FOR DIAGNOSTIC RADIOLOGY – (SAMPLE)

TRAINING CLASSIFICATION

PGY-1
PGY-2
PGY-3
PGY-4
PGY-5
PGY-6

Type of Rotation:

Mid Rotation
End of Rotation
Compulsory Rotation
Elective Rotation

Medical Expert

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Medical Knowledge						
Clinical Reasoning related to Diagnostic Radiology						
Understands nature of Formation of Radiographic Images						
Understands Importance of Radiation Protection						
Understanding of Human Anatomy						
Optimizes Imaging						

Protocols						
Demonstrates Ability to Detect Abnormalities						
Determines Significance of Abnormalities						
Develops appropriate Differential Diagnosis						
Proposes appropriate Management						
Ability to manage pt independently						
Management of complications						
Technical/Procedural Skills						
Understands Current Literature						

Communicator

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Verbal Communication Skills						
Written Communication Skills						
Consultancy Skills						
Communication with patients and family						
Communication with colleagues / other physicians						

Effectively provides and receives information						
Handles conflict situations well						
Produces efficient Radiological reports						

Collaborator

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Team Relationships						
Consultation/collaboration with Other Physicians						
Consultation/collaboration with Health Care Team						

Manager

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Use of computer science/info. technology related to Radiology						
Makes cost effective use of Health Care Resources						
Sets realistic priorities						
Uses time efficiently						

Understands principles of Practice Management						
Understands fundamentals of Quality Assurance						

Health Advocate

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Ensures appropriate Radiologic Investigations						
Communicates benefits and risks of Radiologic investigations						
Communicates benefits and risks of Radiologic treatments						

Scholar

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Self-directed Learning						
Critical Appraisal Skills						
Evidence Based Practice						
Teaching Skills						
Research Skills						

Health Professional

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Sense of Responsibility						
Self-Assessment Skills						
Ethics						
Physician/Patient Relationships						
Team Relationships						
Performance under Stress						

Global Performance

	N/A	1 Rarely Meets**	2 Inconsistently Meets**	3 Generally Meets	4 Sometimes Exceeds	5 Consistently Exceeds
Overall Rating						

Please provide additional information for any items marked ** (1 or 2):

Evaluator Comments :

Main Strengths:

Main Weaknesses:

Recommendations (if any):

Number of Teaching Files Submitted :
1
2
3
4

Number of

Sick Days:

Vacation Days:

Goals and Objectives achieved:

No
Yes

Interim Evaluation given:

No
Yes

Oral Examination / OSCE given:

No
Yes

Comments, if any, about Oral Examination / OSCE:

Level of competence commensurate with level of training achieved:

No
Yes

If NO, please explain :

Do you consider the resident's moral and ethical standing satisfactory?:

No
Yes

If NO, please explain :

Overall Evaluation of Resident :

Evaluation By :
Supervisor
Committee

Other
If other, please explain:

* Did you have an opportunity to meet with this trainee to discuss their performance?

Yes No

APPENDIX I

RESIDENT ROTATION EVALUATION FORM

Resident's Name:
_____

Rotation: Type: _____ Place : _____

Date: _____ Supervisor: _____

1) Were the objectives of this rotation clearly set out at the beginning of the rotation?

2) What additional objectives did you have for this rotation?

3) a) Were the stated objectives of the rotation met?

b) Were your additional individual objectives fulfilled?

4) Did you receive evaluation or feedback on your progress during the rotation in order to improve?

5) Rate the following and elaborate where needed:

	POOR	FAIR	GOOD	EXCELLENT
a) Supervision by staff members				
b) Accessibility of staff members for help and discussion				
c) Teaching				
d) Opportunity to attend clinical meetings				
e) Contact with members of clinical and other departments (e.g. Pathology)				
f) Experience with procedures				

g) X-ray reading experience				
h) Degree of responsibility				
i) Volume of work				

6) Were the education resources adequate to cover the area of radiology encompassed by this rotation?

a)	Library resources	No أ	Partly أ	Yes أ
b)	Audiovisual resources	No أ	Partly أ	Yes أ
c)	Teaching file resources	No أ	Partly أ	Yes أ
d)	Other (specify)	No أ	Partly أ	Yes أ
e)	Case volume	No أ	Partly أ	Yes أ

7. How do you rate this rotation? Poor ____ Fair ____ Good ____ Excellent ____

8. Suggestions for improvement in the rotation .

_____

_____

_____

Appendix J – Vacation/Leave Policies and Procedures

Number of days off

All residents are entitled to four calendar weeks of vacation with pay (20 regular working days off) during each year of residency training.

It is suggested that holidays be taken in 1 week blocks to minimize the impact on the administrative, clinical and academic activities of the department. Scattered requests for leave in 1 – 4 day holiday increments are possible, but are more likely to create disruption and confusion.

Request for Vacation days

All requests for vacation must be approved by the Program Director. If the Program Director is absent, the Associate Head Academic must approve vacation requests. In the event that both of these individuals are absent the Joint Head of Medical Imaging must approve of the request for vacation. It is the responsibility of the individual resident to determine which of these individuals to submit the request form to expedite the approval process.

Requests for vacation must be submitted **by at least the Wednesday of the week preceding** the expected day of leave. The request form must be dated on the day it is submitted for review.

Carry Over Policy

Vacation time is provided for rest and relaxation away form the workplace and away from clinical work in general. It is expected that each resident will take all of their vacation time during the calendar year between July 1st and June 30th.

Only in **special circumstances** will the resident be allowed to carry holidays over into the next calendar year. Requests to carry over holiday time to the next year must be approved by the Program Director. Application to carry over holiday time must be made prior to March 1st of the calendar year in question or the request may be denied. Up to a maximum of 10 days can be carried over during the duration of the residency program.

Xmas/New Year's

Each Resident is entitled to 6 consecutive days off during the Xmas or New Year's week. These 6 days are exclusive of the regular 20 days vacation and cannot be carried over if not used. Additional days off during the Xmas or New Year's period may result due to Departmental

scheduling in any given year.

Number of residents away at any one time

There are 15 – 17 residents in the program at any one time. Usually 3 of these are in the PGY1 year. Of the remaining 12 – 14 residents **a maximum of 5 residents** can be on leave at the same time. Prior approval would be required for additional residents to be on leave.

Weeks off/rotation

1 week of a 4 week rotation can be taken as vacation. The rotation schedule is created in advance for the entire year. This should give you ample time to plan ahead for multi-week holidays. If more than one consecutive week is required for leave it is best to take one week off of the beginning or end of each consecutive rotation. Only in unusual circumstances will residents be allowed to take 2 weeks off during a 4 week rotation. These requests must be approved by the Program Director.

June, PGY5

The guidelines above pertain to June of PGY5 as well. This 4 week rotation is part of your approved residency training experience submitted for evaluation of training for eligibility to sit the Royal College examination. It is not meant to be an opportunity for you to use all of your unused holidays. Please use your holidays in an orderly manner throughout your residency and do not leave them until June of PGY5. A resident can't properly complete a rotation if they are away for a significant portion of any particular rotation.

Visiting Professors/Research Day

Once the dates of these events are published it is expected that a minimum number of residents will take vacation. It is an expectation that residents will be available and present for Visiting Professor events, and Research Day. Any requests for leave over theses time periods must have prior approval by the Program Director, well in advance of the scheduled event.

Saskatoon Health Region Bank Days

These are not holiday days. Residents are to be engaged in academic or clinical activities on these days dependent upon where they are scheduled to be, i.e. RUH, SCH, SPH, or other. If you do not attend the expected academic or clinical activities you are scheduled for on these Bank Days, a holiday day will be docked from your annual allocation. Requests for holidays on Bank Days must be approved via the regular process.