



*Department of Pathology and Laboratory Medicine
Division of Hematology and Transfusion Medicine*

Hematopathology Training Program

BONE MARROW PATHOLOGY Goals & Objectives and Training Schedule (Revised March 2016)

For Dr. _____

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GOALS & OBJECTIVES

At the completion of the rotation the clinical trainee is expected to be familiar with the indications for BM biopsy, will understand the methodology regarding slide preparation (push vs. squash), will comprehend the value of additional clinical and laboratory data in the final diagnosis provided to the clinicians, will be able to describe the microscopic findings and appreciate the value of ancillary techniques to the final diagnosis/sub-classification and will be able to suggest additional studies if required to facilitate the interpretation of BM biopsy material.

In addition, the pathology resident will be familiarized with expert, educational and legal aspects of the BM pathology practice. He/she will be able to differentiate various cellular elements of BM microenvironment. It is expected that this eight weeks long exposure limited to BM pathology will result in an adequate expertise to independently handle 75% of BM pathology service and appropriately differentiate/triage top 25% complex cases.

In addition, both clinical and pathology trainees will be able to appropriately interpret and utilize data extracted from case relevant research/review papers and will be encouraged to independently pose their own investigative questions/projects.

General expectations:

1. Daily evaluation of cases and designated rounds attendance.
2. Record/log of reviewed BM pathology cases with own and final diagnoses.
3. Residents are encouraged to make formal presentations at Clinical Hematology Tumor Rounds at TBCC.
4. Self study; regular daily review of teaching slides sets, CD ROM talks/lectures, relevant papers, etc available in the department.
5. Independently select clinically interesting/relevant cases for a review with the pathologist, in order to enhance one's specialty (Non- malignant pediatric cases / post-transplant BM biopsies, infectious diseases etc) experience.
6. Writing end-of-rotation test, which will include short answer questions and pathology cases evaluation/differential diagnosis discussion (last Friday of the rotation).
7. Participate in module/preceptor evaluation.
8. Maximum one week long vacation/absences, which must be pre-approved by the hematopathology training co-ordinator prior to the start of the elective

SPECIFIC OBJECTIVES:

Medical Expert/Clinical decision-Maker competencies include:

By Week #1:

1. Demonstrates understanding of normal morphology of cells associated with BM microenvironment
2. Understands effective selection of representative slides for review.
3. Demonstrates knowledge of histology of a normal bone marrow structure, morphology and hematopoiesis.
4. For Aperio access, contact Tom Kryton to set up an account for you:

Thomas Kryton

Digital Imaging Specialist, Virtual Microscopy Lab

403-220-8322

Thomas.kryton@cls.ab.ca

Talks/lectures available on G drive:

1. Normal Histology of BM trephine
2. Diagnostic approaches to BM diagnosis

By Week #2

1. Comprehends value of ancillary techniques/data in interpretation of BM Biopsy
2. Understands the concept and distinct morphologic features of anemia, white cell disorders, platelet disorders, infectious diseases, and ancillary studies used in BM pathology.
3. Understands clinical and morphologic basis of a staging BM
4. Understands principles of diagnostic criteria to differentiate between reactive and neoplastic lymphoid aggregates.
5. Understands differential diagnosis of a granulomatosis lesion in BM biopsy.
6. For Aperio access, contact Tom Kryton to set up an account for you.

Formal talks/lectures available on G drive:

1. Ancillary techniques in lymphoma and leukemia.
2. Transformation and molecular basis of cancer
3. Disorder of WBC.
4. Myeloproliferative Disorder (2008 WHO classification)

By Week #3

1. Demonstrate knowledge of spectrum of acute leukemia
2. Understand the principles of morphologic/immunohistochemical and cytogenetics principles of subclassification of acute leukemia, as per WHO classification.
3. Demonstrate knowledge of spectrum of application of ancillary techniques in the diagnostic subclassification of acute leukemia.
4. Understand the principles of morphologic/immunohistochemical and cytogenetic principles of factors in acute lymphoblastic leukemia and acute myeloid leukemia.
5. For Aperio access, contact Tom Kryton to set up an account for you.

By Week #4

1. Demonstrate knowledge of spectrum of myelodysplasia
2. Understand the principles of morphologic/immunohistochemical and cytogenetics principles of subclassification of myelodysplasia, as per WHO classification.
3. Understand the differential features among various types of MDS.
4. Demonstrate general understanding of international prognostic indication of MDS and various treatment modalities available for each subtype of MDS.
5. Understand the principles of morphologic/molecular and cytogenetics principles of subclassification of myeloproliferative neoplasms, as per WHO classification.
6. For Aperio access, contact Tom Kryton to set up an account for you.

Formal talks are available:

1. Diagnosis and classifications of AML, MDS, myelodysplastic syndromes and myeloproliferative neoplasms.
2. Flow Cytometry, cytogenetic and cytochemical studies in the diagnosis of acute leukemia and other myeloid neoplasms.
3. Myeloproliferative disorders: past, present and future.

SPECIFIC OBJECTIVES:

Communicator

General Requirements:

- a. Establish effective working relationships with consulting haematologists/ oncologists/pathologists and surgeons.
- b. Obtain and synthesize relevant clinical history from physicians, electronic and written health records.
- c. Listen and respond effectively.
- d. Discuss in a timely fashion appropriate information with the health care team.

Specific Requirements:

- a. Understand the role of a pathology consultant
- b. Act as a consultant to clinical colleagues on the interpretation and relevance of pathological findings, with particular regard to their significance in the management of the patient.
- c. Understand the role pathologic findings should provide in a given clinical situation and be able to communicate it effectively and in a timely fashion in an oral and written form.
- d. Assist in the continuing education of clinicians/pathologists and other members of the health care team.

Collaborator

General Requirements

- a. Consult effectively with other pathologists/clinicians and health care professionals.
- b. Contribute effectively to other interdisciplinary team activities.

Specific Requirements:

- a. Must have experience in neoplastic hematopathology sufficient to achieve a sound understanding of the effects of disease and the role of pathology in clinical management.
- b. Demonstrate the ability to advise on the appropriateness of obtaining histologic/ancillary techniques specimens and following examination of these, to advise on further appropriate investigations and management

Manager

General Requirements:

- a. Utilize resources effectively to balance patient care, turn-around-time, and educational/research needs.
- b. Allocate finite health care resources wisely.
- c. Work effectively and efficiently in a health care organization.
- d. Utilize information technology to optimize patient care, life-long learning and other activities.

Specific Requirements

- a. Demonstrate knowledge of the principles of laboratory management and administration.
- b. Demonstrate knowledge of the methods of quality control in the field of neoplastic hematopathology.
- c. Demonstrate knowledge of the methods for professional quality assurance as applied to other subspecialty laboratories like flow cytometry, molecular hematology and cytogenetics.
- d. Demonstrate competence in basic computer skills with emphasis on automated electronic reporting, electronic communication and search strategies.

Health Advocate

General Requirements:

- a. Contribute effectively to improved health of patients and communities.
- b. Recognize and respond to those issues where advocacy is appropriate.
- c. Understand the role of consult pathology in patient's care

Specific Requirements:

- a. As members of an interdisciplinary team of professionals responsible for individual and population health care, the consult pathologist will endeavour to ensure that laboratory practices and test selection are regularly evaluated to determine that they meet these community needs.
- b. Reinforce to the public and to the profession the essential contribution of laboratory medicine health.

Scholar

General Requirements:

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

Specific Requirements:

- a. On completion of the rotation, the resident will be able to:
- b. Propose a research question relevant to lymph node pathology.

Professional

General Requirement:

- a. Deliver highest quality patient care.
- b. Exhibit appropriate personal and interpersonal professional behaviours.
- c. Practise medicine ethnically consistent with obligations of a physician.
- d. Demonstrate the knowledge, skills and attitudes relating to gender, culture, and ethnicity pertinent to anatomical pathology.

Specific Requirements

- a. Act as an appropriate role model for students and others.
- b. Demonstrate a professional attitude to colleagues and other laboratory staff.
- c. Have an appreciation of the crucial role of the pathologist in providing quality patient care. This will include knowledge of an individual professional limitations and the necessity of seeking appropriate second opinions.

Appendix:

Optional Clinical Training in Bone Marrow aspiration and Biopsy Procedure:

Goal: To gain skills; experience and competence in the clinical procedure of performing Bone Marrow aspiration and biopsy at the bedside for the diagnosis of Hematological disorders.

Supervisors: Dr. Karen Valentine; Director of Clinical Hematology fellowship program; will be the overall supervisor for this clinical training. Dr. Adnan Mansoor will assist with all the administrative issues and coordination. Clinical Hematology Faculty with University of Calgary and Calgary Health Region will be the preceptors.

Objectives:

4. Observe, learn and obtain “informed consent” from patient for the clinical procedure of Bone marrow aspiration and biopsy.
5. To observe, learn and skilfully apply various techniques used for local anesthesia for bone marrow aspiration/biopsy procedure.
6. To observe, learn and develop competency (independent or indirect supervision) in performing the bone marrow aspiration and biopsy procedure.
7. To understand and effectively execute the process of “triage” of various samples required for submission of bone marrow sample for ancillary techniques.

Procedure:

1. Resident will coordinate with Hematology technologist at CLS laboratory (7th Floor, McCaig Tower, FMC) to obtain the list of patients scheduled for the procedure.
2. Resident will accompany the Hematology technologist to the specific patient’s bedside and will introduce him/her to physician responsible for the procedure.
3. Resident will observe the entire procedure quietly and attentively.
4. Resident will maintain a log sheet of the patients attended for acquiring the competency for this procedure (including observed; assisted, performed). Please use an extra patient sticker for this log sheet. Resident will also document the name and obtain signatures of the physician responsible for the specific procedure.

Bone Marrow Pathology Weekly Schedule

WEEK 1

Date	Time	Description of Activities	Assigned To
Monday	09:00	Introduction and meeting with the BM Module Supervisor Goal: Over view of rotation, Bone Marrow procedure, examination, and reporting	Supervisor: Dr. Adnan Mansoor
	09:30	Goal: Bone marrow structure, morphology, and hematopoiesis Objective: Review bone marrow cellular elements with technical staff	Senior Technologist Special Haematology Laboratory FMC
	10:00	Review of individual cell morphology and perform 500 cell differential counts in routine BM aspirate cases with technical staff (minimum of FIVE cases)	Senior Technologist Special Haematology Laboratory FMC
	13:00	Self-directed reading: Bone marrow structure, morphology, and hematopoiesis	
	14:00	Self-directed review of bone marrow aspirates cases (Teaching files)	
	15:00	Self-directed study: Normal bone marrow histology/cellular element of bone marrow micro environment	
Tuesday	09:00	Review of individual cell morphology in teaching BM aspirate cases with technical staff	Senior Technologist Special Haematology Laboratory FMC
	10:00	Bone Marrow Rounds	7 th Floor Multi-headed Microscope Lab, Room 7581
	12:00	Review of bone marrow reports on file in relation to aspirate/ biopsy and ancillary studies	Senior Technologist Special Haematology Laboratory FMC
	13:00	Goal: Anemia (e.g. iron deficiency, sideroblastic anemia, aplastic anemia, anemia of chronic disease) and ancillary studies in interpretation of BM Biopsy. Objective: Review cases and other related laboratory tests	Senior Technologist Special Haematology Laboratory FMC
	14:00	Self-directed reading: Anemia and bone marrow morphology AND Leukopenia and bone marrow morphology	
	14:00	Self-directed review of bone marrow aspirates cases (Teaching files)	
Wednesday	08:30	Goal: White cell disorders (e.g. Neutrophilic maturation arrest, hemophagocytic syndrome), platelet disorders (e.g. thrombocytosis and thrombocytopenia), infectious diseases, and ancillary studies in interpretation of bone marrow morphology II Objective: Review cases	Doctor on service
	09:30	Self-directed reading: White cell and platelet disorders	
	13:00	Daily sign-out bone marrow cases with the pathologist	Doctor on service
	14:00	Review of individual cell morphology and perform 500 cell differential counts in routine BM aspirate cases (minimum of FIVE cases) / review with technical staff	Senior Technologist Special Haematology Laboratory FMC
	15:00	Self-directed review of bone marrow aspirates cases (Teaching files)	
Thursday	09:00	Goal: Introduction to acute myeloid leukemia (AML) Mini-lecture: classification of acute myeloid leukemia	
	9:30	Mini-lecture: cytochemical stain in diagnosis of AML and ALL	
	10:00	Lymphoma Review Session	7 th Floor Multi-headed Microscope Lab, Room 7581
	12:00	Hematology Rounds	TBCC Rm CC104
	13:00	Clinical Lymphoma Rounds	TBCC Radiology Conference Room
	16:00	Self-directed reading: Acute myeloid leukemia	
Friday	09:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
	13:00	Quiz (2-3 cases)	Doctor on service

Bone Marrow Pathology Weekly Schedule

WEEK 2

Date	Time	Description of Activities	Assigned To
Monday	09:00	Goal: Chronic myeloproliferative disease Mini-lecture: Introduction to Chronic myeloproliferative disease	
	11:00	Self-directed reading: CML and PV	
	13:00	Review chronic myelogenous leukemia (CML) and polycythaemia vera (PV) cases with a pathologist	Doctor on service
	15:00	Daily sign-out of bone marrow cases with a pathologist	Doctor on service
Tuesday	09:00	Goal: Chronic myeloproliferative disease: Chronic Idiopathic Myelofibrosis (CIMF) and Essential Thrombocythaemia (ET) Objective: Review CIMF and ET cases with a pathologist	Doctor on service
	10:00	Bone Marrow Rounds	7 th Floor Multi-headed Microscope Lab, Room 7581
	13:00	Self-directed reading: CIMF and ET	
	14:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Wednesday	09:00	Goal: Anemia (Chronic myeloproliferative disease: Chronic eosinophilic leukemia/hypersinophilic syndrome (CEL0. Objective: Review CEL cases with a pathologist.	Doctor on service
	10:00	Self-directed reading: CEL and chronic myeloproliferative disease, unclassifiable	
	13:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Thursday	08:30	Goal: Myelodysplastic syndromes (MDS) Mini-lecture: Introduction of myelodysplastic syndromes	
	09:30	Self-directed reading: RA and RARS	
	10:00	Lymphoma Review Session	7 th Floor Multi-headed Microscope Lab, Room 7581
	12:00	Hematology Rounds	TBCC Rm CC104
	13:00	Clinical Lymphoma Rounds	TBCC Radiology Conference Room
	14:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Friday	09:00	Goal: MDS: Refractory cytopenia with multilineage dysplasia (RCMD) and Refractory anemia with excess blasts (RAEB) Objective: Review RCMD and RAEB cases with a pathologist	Doctor on service
	13:00	Sign-out one bone marrow case by residents/fellows and discuss with a pathologist	Doctor on service
	14:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service

Bone Marrow Pathology Weekly Schedule

WEEK 3

Date	Time	Description of Activities	Assigned To
Monday	09:00	Goal: Acute myeloid leukemia diagnosis and application of ancillary techniques. Objective: Review cases with a pathologist	Doctor on service
	11:00	Self-directed reading: Acute myeloid leukemia with recurrent cytogenetic abnormalities	
	14:00	Mini-lecture: Diagnosis of Acute Leukemia: Morphology, stains and application of ancillary techniques	
	15:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Tuesday	09:00	Goal: Acute leeloid leukemia with recurrent cytogenetic abnormalities Objective: Review cases with a pathologist	Doctor on service
	10:00	Bone Marrow Review Session	7 th Floor Multi-headed Microscope Lab, Room 7581
	13:00	Self-directed reading: Acute myeloid leukemia with application of ancillary	
	14:00	Mini-lecture: Morphology and stains in diagnosis of AML and ALL	
	15:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Wednesday	09:00	Goal: Acute myeloid leukemia not otherwise categorised (M0, M1, M2) Objective: Review cases with a pathologist.	Doctor on service
	11:00	Acute myeloid leukemia not otherwise categorised (M0, M1, M2)	
	13:00	Mini-lecture: Immunohistochemical study in diagnosis of AML and ALL	
	14:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Thursday	08:30	Goal: Acute myeloid leukemia not otherwise categorised (M4-7) Objective: Review cases with a pathologist	Doctor on service
	09:30	Self-directed reading: Acute myeloid leukemia not otherwise categorised (M4-7)	
	10:00	Lymphoma Review Session	7 th Floor Multi-headed Microscope Lab, Room 7581
	12:00	Hematology Rounds	TBCC Rm CC104
	13:00	Clinical Lymphoma Rounds	TBCC Radiology Conference Room
	14:00	Mini-lecture: Flow Cytometry study and molecular tests in diagnosis of AML and ALL	
	15:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Friday	09:00	Goal: Precursor B and T-cell neoplasms	Doctor on service
	11:00	Mini-lecture: ALL	
	13:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
	14:00	Sign-out of bone marrow case by resident/fellow and discuss with a pathologist	
	15:00	Daily sign-out of bone marrow cases with a pathologist	Doctor on service

Bone Marrow Pathology Weekly Schedule

WEEK 4

Date	Time	Description of Activities	Assigned To
Monday	09:00	Goal: MDS: Myelodysplastic syndrome, unclassifiable (MDS-U) and Myelodysplastic syndrome associated with isolated del (5q) chromosome abnormality Objective: Review MDS-U and 5q syndrome case with a pathologist	Doctor on service
	13:00	Self-directed reading: MDS-U and 5q syndrome	
	14:00	Daily sign-out of bone marrow cases with a pathologist	Doctor on service
Tuesday	09:00	Goal: Myelodysplastic/myeloproliferative disease: CMML Objective: Review CMML case with a pathologist	Doctor on service
	10:00	Bone Marrow Rounds	7 th Floor Multi-headed Microscope Lab, Room 7581
	13:00	Self-directed reading: Myelodysplastic/myeloproliferative disease	
	14:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Wednesday	09:00	Goal: Bone marrow involvement by lymphoma (low-grad vs high-grade non Hodgkin lymphoma and Hodgkin lymphoma) and metastatic neoplasm Objective: Review lymphoma and metastatic cancer cases with a pathologist	Doctor on service
	10:00	Self-directed reading: lymphoma	
	13:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Thursday	08:30	Goal: Plasma cell dyscrasia: Monoclonal Gammaopathy of Undetermined Significance (MGUS) and multiple myeloma (MM) Objective: Review MGUS and MM cases with a pathologist	
	09:30	Self-directed reading: Plasma cell neoplasms	
	10:00	Lymphoma Review Session	7 th Floor Multi-headed Microscope Lab, Room 7581
	12:00	Hematology Rounds	TBCC Rm CC104
	13:00	Clinical Lymphoma Rounds	TBCC Radiology Conference Room
	14:00	Sign out two bone marrow cases by resident/fellow and discuss with pathologist	
	15:00	Daily sign-out bone marrow cases with a pathologist	Doctor on service
Friday	09:00	Goal: Mastocytosis Objective: Review mastocytosis casees with a pathologist	Doctor on service
	13:00	Post rotation exam	
	15:00	Resident evaluation, post rotation exam review	Doctor on service