This handbook can be found at http://aplis.upmc.edu/intranets/hemepath/index.htm

More information about the Hematopathology fellowship program can be obtained at: http://path.upmc.edu/fellowship/hemato-path/index.htm

The handbook is supplemented by the resident/fellow handbook that can be found at http://residents.pathology.pitt.edu/default.aspx under Documents/Pathology Manuals and also the Department of Pathology website (http://aplis.upmc.edu/intranets/hemapath.cfm).

Revised July, 2011
PRINCIPAL FACULTY

Raymond E. Felgar, MD, PhD, Director, Fellowship Program

Steven H. Swerdlow, MD, Director, Division of Hematopathology

Lydia L. Contis, MD, Medical Director, UPMC Shadyside, Hillman Cancer Center and Childrens Hospital of Pittsburgh, Hematology Laboratory Sections, and Liaison for Pediatric Hematopathology

Fiona E. Craig, MD, Medical Director, Flow Cytometry Laboratory

Miroslav Djokic, MD, Medical Director, Adult Bone Marrow Service

Christine Roth, MD, Associate Coordinator, Core Residency Rotation

Lisa J. Robinson, MD, Research Molecular Hematopathology

OTHER MAJOR FACULTY

Franklin Bontempo, MD, Director, Institute for Transfusion Medicine

Jeffrey Kant, MD, PhD, Director, Molecular Diagnostics Division

Urvashi Surti, PhD., Director, Pittsburgh Cytogenetics Laboratory
# TABLE OF CONTENTS

HEMATOPATHOLOGY FELLOWSHIP: GENERAL DESCRIPTION AND OVERALL GOALS & OBJECTIVES (COMPETENCY BASED) .............................................. 4

GENERAL COMPETENCY-BASED EXPECTATIONS FOR HEMATOPATHOLOGY FELLOWS ........................................................................ 10

PROGRESSIVE GOALS AND OBJECTIVES BY YEAR OF TRAINING ............................................................................................................. 12

SPECIFIC ROTATIONS AND EXPECTATIONS
- ADULT BONE MARROW ROTATION .................................................. 19
- ADULT CLINICAL BONE MARROW PROCEDURES AND HEMATOLOGY/ONCOLOGY CLINICAL EXPERIENCE ......................................... 22
- LYMPH NODE PATHOLOGY ................................................................ 25
- FLOW CYTOMETRY ........................................................................... 28
- PEDIATRIC HEMATOPATHOLOGY ...................................................... 31
- LABORATORY MOLECULAR DIAGNOSTICS ...................................... 34
- CYTOGENETICS ................................................................................ 37
- LABORATORY HEMATOLOGY .............................................................. 40
- COAGULATION ................................................................................... 44
- IMMUNOHISTOCHEMISTRY ................................................................. 48
- LABORATORY MANAGEMENT AND LABORATORY DECISION MAKING ................................................................................................. 51

HEMATOPATHOLOGY QUALITY IMPROVEMENT PROJECT GUIDELINES ........................................................................................................ 55

HEMATOPATHOLOGY QUALITY IMPROVEMENT PROJECT REPORT FORM ..................................................................................................... 56

SUMMARY OF EVALUATION METHODS .................................................. 57

PORTFOLIO DESCRIPTION ...................................................................... 58

FELLOWSHIP PROGRAM POLICIES ....................................................... 59
- BONE MARROW AFTER HOUR PROCEDURES ...................................... 60

WEB RESOURCES: GME SITES ................................................................. 65

RESIDENT AND FELLOW ASSISTANCE PROGRAM AND TEST TAKING ......................................................................................................... 66

CHECKLISTS .............................................................................................. 67
- BONE MARROW .................................................................................. 68
- LYMPH NODE ...................................................................................... 77
- FLOW CYTOMETRY ............................................................................... 85
- PEDIATRIC HEMATOPATHOLOGY ...................................................... 88
- MOLECULAR DIAGNOSTICS ................................................................. 95 & 96
- CLINICAL CYTOGENETICS ................................................................. 97
- GENERAL/SPECIAL HEMATOLOGY LABORATORY ............................. 99
- CYTOGENETICS CASE LOG ................................................................. 107
- IMMUNOHISTOCHEMISTRY ................................................................. 108
- FELLOWS’ INTERDISCIPLINARY CONFERENCE .................................. 109
### Hematopathology Fellowship: General Description of the Hematopathology Educational Experience

The hematopathology fellowship at UPMC-Presbyterian is a broad-based experience in all aspects of both clinical and anatomic hematopathology. The program stresses a multiparameter approach to both bone marrow and solid tissue diagnostic hematopathology combining standard morphologic techniques with data obtained from ancillary immunohistologic, in situ hybridization, flow cytometric, molecular and cytogenetic investigations. Bone marrow sign out includes review of peripheral blood and marrow aspirate smears, marrow histologic preparations and other ancillary studies.

The fellowship includes educational experiences in the following specific areas: adult bone marrow sign out, adult clinical bone marrow procedures, lymph node (and related tissue) pathology, flow cytometry, pediatric hematopathology, molecular diagnostics, cytogenetics, laboratory hematology, coagulation, histology and immunohistochemistry, and laboratory management and decision making. The precise duration of each rotation is flexible. Laboratory management and decision making is primarily a component of the laboratory-based rotations.

After the first six months, fellows also participate in the on-call schedule (with faculty back-up). The fellow is expected to actively participate in a variety of hematopathology teaching conferences. The fellow is also expected to participate in the informal and more formal teaching of medical students, pathology and non-pathology residents, hematology/oncology fellows, and medical technologists. He/she will also interact with hematologists, oncologists, and other interested clinicians. Fellows are expected to undertake at least one investigational project and are strongly encouraged to present at national meetings. The nature of the project will depend on the fellow's interest, the amount of time they wish to devote to it and whether they intend to spend one or two years in the division. Fellows are expected to perform marrow aspirates and biopsies in the Internal Medicine Hematology Section.

Conferences include a hematopathology conference (weekly), a Patient Safety and Risk Management conference that alternates with a Journal Club (weekly), a Molecular Diagnostics conference (weekly), a pediatric hematopathology slide conference (approximately 3 weeks per month), a Pediatric Leukemia Tumor Board (monthly), a Leukemia/Lymphoma Tumor Board (bimonthly) and other departmental AP or CP oriented conferences. Fellows will also take advantage of multiple interactive electronic, web-based resources to access information, including laboratory information systems, on-line radiology image resources, and literature searches.

A fellows' Interdisciplinary Conference covers a variety of important topics that are generally scheduled to be presented every two years. However, website access to this series of presentations is available at the following web site: [http://www.omed.pitt.edu](http://www.omed.pitt.edu). Click on “Video Gallery.” The topics for Fellows' Interdisciplinary Conference and Checklist can be found in the “Checklist” section of this handbook.

Levels of responsibility (see chart that follows): Because fellows will come to the program with a variable level of experience and because those from outside UPMC will not be familiar with many logistical aspects of our practice, it is expected that fellows will progress through the graded responsibility described for resident trainees, but at a more
rapid pace, and progress to a level as indicated in the chart that exceeds that of a senior resident. Fellows may strive to progress to the level expected for those who spend a second year following their fellowship in our division ("second year fellows"). Additional information about the second year fellowship and related instructor experience may be also obtained from the description of the Hematopathology Specialized Instructional Educational Program (Hematopathology SIEP).

The following 6 sections describe the general goals and objectives for the overall fellowship program in relation to the six core competencies as defined by the American Council on Graduate Medical Education (ACGME). Goals and expectations that would be specific to individual rotations are further described in the rotation specific descriptions that follow this section.

<table>
<thead>
<tr>
<th>Patient Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
</tr>
<tr>
<td>Fellows must develop diagnostic competence to provide for effective patient care.</td>
</tr>
</tbody>
</table>

**Competencies (See also specific rotation descriptions.)**

1. Demonstrate diagnostic decision-making skills appropriate to his/her level of training.
2. Manage appropriate laboratory staff.
3. Demonstrate ability to triage testing as to importance or urgency in a cost-effective and appropriately time-sensitive manner.

**Objectives (See also specific rotation descriptions.)**

1. Construct appropriate written reports in language that other physicians, especially surgeons and oncologists, will understand.
2. Demonstrate ability to order appropriate ancillary testing through ancillary laboratories and hematopathology staff.
3. Order testing on a STAT basis when appropriate for patient care and/or limit testing to those studies needed to make the most specific diagnosis by current guidelines.

<table>
<thead>
<tr>
<th>Medical Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
</tr>
<tr>
<td>Fellows must demonstrate knowledge of established and evolving aspects of hematopathology diagnostic testing and state of the art hematopathology diagnosis and classification.</td>
</tr>
</tbody>
</table>

**Competencies (See also specific rotation descriptions.)**

1. Demonstrate knowledge of the normal hematopoietic and lymphoid systems.
2. Demonstrate knowledge of both neoplastic and non-neoplastic disease entities that predominantly affect the hematopoietic/lymphoid systems.
3. Demonstrate an ability to apply this knowledge in varied clinical settings.

**Objectives (See also specific rotation descriptions.)**

1. Obtain an acceptable score on written practical examinations, including those administered within the division (with score of competent) and the ASCP Fellow In-service examination (score above the 25th percentile).
2. Demonstrate an acceptable level of performance during daily sign-out activities, as assessed by rotation specific evaluations and more broadly within the 360-
degree evaluations.
3. Demonstrate ability to decide what type of testing is needed to limit the
differential diagnoses in most cases.

Practice-Based Learning and Improvement
Goal
Fellows must be able to evaluate and adopt new knowledge as changes demand. This
includes the development or refinement of skills that will be used long after fellowship
training has ceased.

Competencies
- Identify strengths, deficiencies and limits in one’s knowledge and expertise.
- Systematically analyze practice, using quality improvement methods, and
  implement changes with the goal of practice improvement
- Locate, appraise and assimilate evidence from scientific studies related to
  hematopathology.
- Use information technology to optimize learning
- Participate in the education of medical students, residents and other healthcare
  professionals, as documented by evaluations of a fellow’s teaching abilities by
  faculty and/or learners.

Objectives
1. Demonstrate ability to search the medical literature to answer medically related
questions that arise in daily practice.
2. Appropriately utilize available texts and self-learning resources, such as study
sets, etc.
3. Construct and complete a quality improvement project with appropriate guidance.
4. Demonstrate ability to critically evaluate original publications at journal clubs,
other conferences, and in the evaluation of diagnostic cases.
5. Demonstrate progression in skill level, as assessed on bi-annual review with
fellowship director
6. Demonstrate effective and knowledgeable case presentation(s) at divisional
conferences.
7. Demonstrate ability to perform appropriate biomedical literature searches through
available electronic tools (example: Pub Med search).
8. Demonstrate ability to teach residents, students, and fellows from other
departments while on-service.

Systems Based Practice
Goal
Fellows must demonstrate an awareness of and responsiveness to the various
regulatory bodies (including institution based policies, local and national regulatory
agencies) that affect daily practice and laboratory management.

Competencies
- Incorporate considerations of cost awareness and risk-benefit analysis in
diagnostic evaluations.
- Understand the various administrative and technical functions involved in running
a hematopathology division or hematology-oriented laboratory.
- Understand the need for quality assurance assessments.
- Participate in laboratory management as appropriate on laboratory based rotations.
- Know the role of regulatory agencies that affect the practice of hematopathology.

**Objectives**
1. Participate in mock or internal College of American Pathologists (CAP) inspections when possible.
2. Attend rotation specific laboratory management meetings.
3. Demonstrate ability to choose appropriate immunohistochemistry panels, in situ hybridization studies, and molecular testing appropriate to making a specific diagnosis.
4. Participate in appropriate faculty-supervised quality improvement projects.
5. Review the roles of various regulatory organizations (CAP, state, and federal, such as the Joint Commission on Accreditation of Healthcare Organizations, JCAHO) that are involved in regulating laboratory practice and how they can impact laboratory hematology.

**Professionalism**

**Goal**
Professional behavior in one of the most basic requirements of any physician, including hematopathologists. This includes demonstrating reliability, punctuality, appropriate demeanor, appearance, completion of work assignments, and ethical behavior.

**Competencies**
- Compassion, integrity, and respect for others.
- Responsiveness to patient needs that supersedes self-interest.
- Respect for patient privacy.
- Communicate effectively with hematology-oncology, other physicians and other healthcare professionals.
- Work effectively as a member of a health care team.
- Act in a consultative role to other physicians and healthcare professionals.
- Function as a team player.

**Objectives**
1. Obtain at least satisfactory evaluations of interactions with physician colleagues, attending staff, support personnel, as evidenced by the 360-degree and other evaluations.
2. Schedule outside activities so as not to interfere with work-related activities, such as on-call responsibilities and service commitments.
3. Demonstrate an understanding and working knowledge of the Health Insurance Portability and Accountability Act (HIPAA) and sensitivity to protecting the disclosure of patient specific information by completing HIPAA on-line training modules.

**Interpersonal and Communication Skills**

**Goal**
Fellows should be able to communicate with a variety of medical center faculty, trainees, and staff. These functions are critical to being a successful hematopathologist. This must also be done with a working knowledge of patient privacy rights.
### Competencies
1. Demonstrate mutual respect for others in communicating with faculty, other trainees, and support personnel.
2. Convey diagnoses and available diagnostic testing results to other physicians and appropriate support personnel in an accurate manner that reflects the limitations of the currently available findings.

### Objectives
1. Demonstrate ability to convey preliminary diagnoses in verbal and written form that includes appropriate limitations, such as differential diagnoses still to be considered, other information still needed (and/or pending).
2. Be able to communicate information verbally and in writing in a format and style that is appropriate for the level of the practitioner or support personnel with whom one is interacting.
3. Accurately convey final diagnoses both orally and in writing to the submitting physician and other appropriate personnel (hematology-oncology fellows, nurse practitioners).
4. Discuss possible treatment implications of diagnoses with hematology-oncology professionals and other appropriate physicians.
5. Write complete reports in a timely fashion. Reports must also be accurate, grammatically correct, and easily understood.
6. Demonstrate ability to seek consultations from other members of the faculty (usually as directed by the attending) and accurately convey the consulting pathologist’s impressions to the primary sign-out attending.

### Teaching Methods
1. One-on-one teaching over the microscope during diagnostic case sign-out.
2. Observation of laboratory procedures and operations.
3. Attendance at the following conferences:
   b. Hematopathology Patient Safety and Risk Management in Hematopathology Conference.
   c. Hematopathology Case Conference.
   d. UPMC-Presbyterian/Shadyside Leukemia/Lymphoma Tumor Board
   e. Children’s Hospital of Pittsburgh Leukemia Tumor Board.
4. Attendance at didactic lectures.
5. Reading of textbooks available in the hematopathology division.
6. Review of available literature in division, either as hard copies or using electronic resources.
7. Various teaching and virtual study sets.

### Assessment Methods
1. Rotation specific electronic evaluations by attending faculty (based on direct supervision and observation).
2. Bi-monthly 360-degree evaluations.
3. Fellow In-Service examinations (administered on-line by ASCP twice per year).
4. Written practical examinations administered twice per year within the Division of Hematopathology.
5. Bi-annual evaluations with fellowship director, followed by a written summary.
6. Final written letter of competency assessment from fellowship director.
7. Verbal feedback during daily interactions with attendings and teaching faculty.
8. ASCP CheckPath Examination (quarterly).
9. See also specific rotations for any rotation specific assessment methods.

<table>
<thead>
<tr>
<th>Assessment Method (Program Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellows have periodic written opportunities to evaluate specific rotations. Trainees complete written evaluations through an on-line web-based system administered by the departmental graduate medical education office and separately through an on-line web-based system administered by the Division of Hematopathology. Faculty periodically also discuss the fellowship program at divisional staff meetings and at the Division of Hematopathology annual fellowship evaluation meeting.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>See specific rotation descriptions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Textbooks in the Division of Hematopathology.</td>
</tr>
<tr>
<td>2. Teaching sets.</td>
</tr>
<tr>
<td>3. Journals available in the Division of Hematopathology and also in the School of Medicine Health Sciences Library (hardcopy and electronic access).</td>
</tr>
<tr>
<td>4. Other electronic resources, including textbooks, hematopathology-related websites, UPMC-created educational and research modules.</td>
</tr>
<tr>
<td>5. See also specific rotation descriptions.</td>
</tr>
</tbody>
</table>
Division of Hematopathology

6 Competency Expectations for Hematopathology Fellows

1. **Patient Care:** (Professional expertise/decision-making skills in bone marrow & lymph node and related pathology, body fluid evaluation, coagulation, laboratory hematology, flow cytometry and hematopathology-related cytogenetics and molecular diagnostics)
   The trainee must develop a satisfactory level of diagnostic competence and ability to provide effective patient care. This includes decision-making skills required for making the diagnosis as well as recognition of what constitutes cost-effective practice. It also includes being able to manage laboratories and function as a critical consultant to clinical physicians and other support staff. This competency includes evaluation of the overall performance of the trainee, and whether performance is appropriate to the level of the trainee.

2. **Medical knowledge:** (Basic knowledge of hematopathology including the practice of hematopathology) Trainees must learn about all aspects of hematopathology as well as learning about how to practice state of the art hematopathology. They must be able to apply this information in different settings. They must demonstrate knowledge of the normal hematopoietic/lymphoid system and abnormal non-neoplastic and neoplastic disorders that either primarily or secondarily affects the hematopoietic/lymphoid system. Knowledge of the clinical aspects of these disorders is also critical. The trainees are assessed in this area based on both their knowledge base and their application of knowledge throughout the course of their training period. Trainees are assessed based on their level of training and with reference to the rotations they have completed.

3. **Practice-based learning and improvement:** (Acquisition and critical analysis of new knowledge and new skills with the ultimate goal of improved practice of hematopathology)
   Trainees must be able to evaluate and synthesize new knowledge in the face of an ever-changing field. These skills involve critical review of the literature and utilizing other resources to obtain new information leading to improved skills that can be applied to real-time case materials. The most successful trainees will establish practice-based learning and improvement skills that will continue long after completion of their official training. The trainees are assessed in this area based on their diligence in aiming to acquire new practical and basic knowledge, their ability to critically analyze the literature and other sources of new information and their ability to use the new information to become better hematopathologists.

4. **Interpersonal and Communication Skills:** (Communication skills with peers, technical staff, administrative staff, clinicians, and others in person, in conferences and over the telephone)
   Being able to work well with a multitude of different types of medical center faculty, other trainees and staff and being able to communicate well are critical skills for a successful hematopathologist. This includes, but is not restricted to, the effective communication both in the appropriate dissemination of information that other health professionals require for patient care and other purposes (e.g. diagnoses, preliminary reports, teaching conferences) and getting needed
support for patient care, educational and other activities from faculty, other trainees and staff. Communication must take into account all current regulatory issues (HIPAA). Interactions with faculty, other trainees and staff should be based on mutual respect, be effective and contribute to a comfortable and productive work environment. This area is assessed based on trainee’s interaction and communication with diverse members of the healthcare team.

5. **Professionalism**: (Professional behavior including reliability, punctuality, demeanor, appearance, ethical issues, sensitivity to diverse patient/staff population)

Professionalism is one of the most basic requirements of being a physician. It ranges from simple issues such as reliability, punctuality and appearance to more complex issues of ethical behavior and sensitivity to issues of diversity. Trainees are assessed on both the more tangible measures of professionalism and its more subjective aspects.

6. **Systems based-practice**: (Learning the many ways in which the larger healthcare system and national healthcare environment impact on the practice of hematopathology, how to practice in a fashion consistent with the needs of these broader units and how to take advantage of the external resources the “system” provides in our practice)

Trainees must develop an awareness and responsiveness to the larger context of being part of a healthcare system. This includes appreciation of the administrative and technical functions of running a Division of Hematopathology and its varied laboratories, learning how to utilize the many hospital-based resources required for patient care and administrative activities, learning about the impact of outside regulatory agencies/organizations on the practice of medicine and having an appreciation of basic healthcare/pathology-related financial issues. Competence in this area is documented in part by participating in CAP inspection preparations and mock inspections, demonstrating effective utilization of systems based resources (e.g. electronic and personnel) and in making administrative quality improvement contributions to the Division.
## Hematopathology Progressive Goals and Objectives

<table>
<thead>
<tr>
<th>Competency</th>
<th>Core Rotation - 1st to 3rd Year Resident</th>
<th>Core Rotation – 1st to 3rd year Resident Later in Rotation</th>
<th>Elective Rotation - 3rd and 4th year Resident</th>
<th>Fellow First Year</th>
<th>Fellow Second Year Post Fellowship Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professionalism</strong></td>
<td>Reliable, punctual, appropriate appearance, ethical behavior, sensitive to issues of diversity, HIPAA compliant</td>
<td>Same as near beginning of rotation but projects more confidence and handles difficult situations with greater ease.</td>
<td>In addition to elements already noted, can help advise more junior trainees and serves as a more senior role model.</td>
<td>In addition to elements noted for residents, functions so that others perceive fellow more like a junior faculty member. Create a professional CV. Conduct a successful job search if not continuing as a fellow.</td>
<td>In addition to prior accomplishments, interacts with other faculty and clinicians like a more confident junior faculty member, able to construct and maintain professional c.v. and biosketch</td>
</tr>
<tr>
<td><strong>Patient Care</strong></td>
<td>Preview marrow aspirate smears with direct faculty guidance. Review cases, record observations, formulate differential diagnosis.</td>
<td>Preview marrow aspirate smears semi-independently, directly interact with technologists. Review cases, record observations, formulate more complete differential diagnosis.</td>
<td>Write and dictate reports for most routine cases.</td>
<td>Independently work-up and complete the majority of cases.</td>
<td>Able to provide a complete diagnostic report to attending faculty with minimal required changes.</td>
</tr>
<tr>
<td></td>
<td>Formulate list of immunohistochemical stains, cytochemical stains, flow antibody combinations to resolve differential diagnosis. Review data from ancillary studies.</td>
<td>Formulate more educated list of immunohistochemical stains, cytochemical stains, flow antibody combinations to resolve differential diagnosis. Review</td>
<td>Independently order ancillary studies in a resource conscious way on most routine cases.</td>
<td>Independently order ancillary studies in a resource conscious way on routine and most complex cases.</td>
<td>Independently order ancillary studies in a resource conscious way on virtually all cases.</td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident Beginning of Rotation</td>
<td>Core Rotation – 1st to 3rd year Resident Later in Rotation</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-----------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>and record interpretation.</td>
<td>data from ancillary studies and record more complete interpretation.</td>
<td>Gross specimens for lymphoma work-up with directed supervision.</td>
<td>Gross specimens for lymphoma work-up with limited supervision and select ancillary testing independently for most routine cases.</td>
<td>Gross specimens for lymphoma work-up with very limited supervision and select ancillary testing independently for the majority of cases. Be able to help instruct junior trainees.</td>
<td>Able to gross and triage specimens independently and to supervise and instruct more junior trainees.</td>
</tr>
<tr>
<td>Gross specimens for lymphoma work-up with directed supervision.</td>
<td>Gross specimens for lymphoma work-up with supervision as needed (after consulting fellow or appropriate faculty).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With explicit directions, interact with clinicians and support staff.</td>
<td>With less explicit directions, interact with clinicians and support staff.</td>
<td>Function as a critical consultant to clinical physicians and support staff with some supervision.</td>
<td>Independently function as a critical consultant to clinical physicians.</td>
<td></td>
<td>Able to supervise more junior trainee’s presentations and provide guidance for preparation.</td>
</tr>
<tr>
<td>Be able to provide basic review of peripheral blood and interpret most common hematology tests.</td>
<td>Be able to provide basic review of peripheral blood, fluids and urines and interpret most standard hematology tests.</td>
<td>Provide consultative/laboratory report for general and special hematology tests, peripheral blood and fluid reviews working with faculty on more complex cases and with limited assistance on less complex cases.</td>
<td>Provide consultative/laboratory report for general and special hematology tests, peripheral blood and fluid reviews on simple and complex cases relatively independently but with final approval by faculty member.</td>
<td></td>
<td>Provide consultative/laboratory report for general and special hematology tests, peripheral blood and fluid reviews in all cases with only limited supervision.</td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident</td>
<td>Core Rotation – 1st to 3rd year Resident Later in Rotation</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Observe how others handle laboratory management issues.</td>
<td>Participate with faculty/senior technical staff in laboratory management issues.</td>
<td>Get directly involved in laboratory management issues with supervision.</td>
<td>Get involved in laboratory management issues with more limited supervision.</td>
<td>Participate in continuing education of technologists and support staff to improve patient care.</td>
</tr>
<tr>
<td></td>
<td>Present at inter-departmental CPC conferences with extensive supervision.</td>
<td>Present at inter-departmental CPC conferences with less direct supervision.</td>
<td>Present at inter-departmental CPC conferences with limited supervision.</td>
<td>Independently present at inter-departmental CPC conferences.</td>
<td>Presents cases at clinical CPC conferences without supervision.</td>
</tr>
<tr>
<td>Medical Knowledge</td>
<td>Knowledge of morphology and immunophenotype of normal lymph node, spleen, bone marrow and peripheral blood. Knowledge of multiparameter approach to diagnosis of hematologic disorders.</td>
<td>Know criteria for major neoplastic and non-neoplastic hematopathologic entities. Know specific approach used to diagnose major neoplastic and non-neoplastic hematologic entities.</td>
<td>Know criteria for some of the less common hematopathologic entities in addition to those for major entities.</td>
<td>Have an extensive knowledge of broad range of neoplastic and non-neoplastic hematopoietic/lymphoid disorders and other disorders that involve or affect the hematolymphoid system including the pathologic and clinical aspects of these disorders.</td>
<td>Further increase hematopathology knowledge base in terms of rare entities and variations within more common entities. Learn more about the type of cases that lack a definitive diagnosis. Demonstrates ability to apply and discuss knowledge learned from instructional workshops or conferences attended.</td>
</tr>
<tr>
<td></td>
<td>Recognize some of the more common neoplastic and non-neoplastic disorders. Know basic immunophenotypic/genotypic/cytogenetic features where appropriate.</td>
<td>Recognize additional common neoplastic and non-neoplastic disorders and know ways in which specific entities are further subdivided. In addition to basic ancillary data</td>
<td>Recognize most common and some uncommon neoplastic and non-neoplastic disorders of the hematolymphoid system and know the immunophenotypic, cytogenetic and genotypic characteristics.</td>
<td>Recognizes broad range of hematologic disorders and recognizes when a definitive diagnosis cannot be rendered or where consultative help may be required.</td>
<td>Demonstrates an appreciation of the limitation(s) of current diagnostic schemes/classification systems (i.e. shows recognition for “gray zones” in diagnosis).</td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident</td>
<td>Core Rotation – 1st to 3rd year Resident</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Core Rotation - 1st to 3rd Year Resident Beginning of Rotation</td>
<td>Know basic components of complete blood count and how they are obtained.</td>
<td>Know basic components of complete blood count and other major hematology tests and how they are obtained including major pitfalls. Also know basic principles of fluid and urinalysis interpretations. Know disease entities where diagnosis is based in large part on hematology laboratory testing.</td>
<td>Know full armamentarium of hematology testing, the purpose of each test and how to interpret combinations of tests. Know new developments in hematology instrumentation.</td>
<td>In addition to resident accomplishments, know details of more esoteric testing and what is on the horizon for laboratory hematology. Know how to evaluate new instrumentation.</td>
<td>Be able to teach others about laboratory hematology including factual and interpretive elements.</td>
</tr>
<tr>
<td>Core Rotation – 1st to 3rd year Resident Later in Rotation</td>
<td>Complete greater than 80% of resident version of rotation checklist.</td>
<td>Completes more of appropriate checklists and sees more entities previously encountered through reading. Complete greater than 90% of resident version of rotation checklist.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td></td>
<td></td>
<td>In addition to resident accomplishments, know details of more esoteric testing and what is on the horizon for laboratory hematology. Know how to evaluate new instrumentation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow First Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow Second Year Post Fellowship Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice-based Learning</td>
<td>Become familiar with basic hematopathology educational resources.</td>
<td>Search literature for information pertaining to cases and apply it to diagnostic appraisals at sign-out and at conferences.</td>
<td>Critically analyze literature and other sources of new information pertaining to cases.</td>
<td>Have a broad knowledge of the hematopathology resources and literature and be able to apply this information to daily practice including</td>
<td>Master all skill expectations listed for more junior residents and first year fellow. Use information independently to alter personal practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident Beginning of Rotation</td>
<td>Core Rotation – 1st to 3rd Year Resident Later in Rotation</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Start to develop diagnostic differentials for some of the more common neoplastic and non-neoplastic disorders with significant faculty input. Construct reports based on others’ examples.</td>
<td>Knows the differential diagnoses to consider for more commonly encountered neoplastic and non-neoplastic disorders. Improve reports based on comments received back from the faculty.</td>
<td>Able to construct more extensive differentials and apply knowledge by deciding what stains and ancillary testing would aid in distinguishing amongst the diagnostic possibilities being considered. Produce reports based on comments received back from the faculty who require few, if any, changes.</td>
<td>Demonstrates ability to use textbooks and medical literature to construct a differential diagnosis for most cases and decide what ancillary testing would be useful. Develop complete reports that reflect divisional style based on continued input from faculty, integrating the best suggestions from varied individuals. Independently use other colleagues and faculty as learning resources.</td>
<td>Demonstrates ability to apply knowledge from medical literature in constructing a diagnostic differential or choosing an appropriate work-up strategy of stains, ancillary testing, etc. Have established style for producing final reports that reflects an integration of input from varied faculty and integrate additional suggestions received on reports. Independently use other professional colleagues as learning resource(s).</td>
</tr>
<tr>
<td>Interpersonal/Communication Skills</td>
<td>Present with clarity in conference settings with significant faculty guidance.</td>
<td>Present with clarity in conference settings with minimal faculty assistance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident Beginning of Rotation</td>
<td>Core Rotation – 1st to 3rd year Resident Later in Rotation</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Works well with technologists and support staff and learns from them.</td>
<td>Greater interaction with technologists, including demonstrating an ability to teach them.</td>
<td>Can serve as a greater resource for technical staff.</td>
<td>Demonstrates the ability to present information to technologists and junior residents at levels appropriate for the audience.</td>
<td>Able to educate technologists and residents with ease in more impromptu settings as appropriate. Proactively seeks opportunities to educate others.</td>
</tr>
<tr>
<td></td>
<td>Contact clinicians to obtain clinical and other information.</td>
<td>Able to convey straightforward information to clinicians.</td>
<td>Discuss preliminary reports and diagnoses with clinicians with ease. Able to convey more complex information to clinicians and consulting pathologists.</td>
<td>Able to convey complex information to clinicians and consulting pathologists and can answer questions about diagnoses or work-up. Also able to discuss clinical implications of diagnoses in depth.</td>
<td>Able to function as a junior faculty in terms of providing consultative information to staff pathologists at UPMC and elsewhere as well as with clinicians.</td>
</tr>
<tr>
<td><strong>System based Practice</strong></td>
<td>Know and utilize basic aspects of resources available in health system i.e. computer systems (CoPath, MARS), laboratories (hematology, molecular diagnostics, cytogenetics, histology), grossing, bone marrow laboratories.</td>
<td>Know and more fully utilize resources available in health system.</td>
<td>Learn about outside regulatory agencies/organizations. Develop an appreciation of basic healthcare/pathology related financial issues. Perform a mock CAP inspection, if possible.</td>
<td>Learn about the administrative and technical functions of running the Division of Hematopathology. Perform a mock CAP inspection, if possible.</td>
<td>Demonstrates understanding of more complex personnel management issues. Understands the various components of a diagnostic hematopathology service and the interaction with other related, but separate services, such as cytogenetics and molecular laboratories). Has basic understanding</td>
</tr>
<tr>
<td>Competency</td>
<td>Core Rotation - 1st to 3rd Year Resident Beginning of Rotation</td>
<td>Core Rotation – 1st to 3rd year Resident Later in Rotation</td>
<td>Elective Rotation - 3rd and 4th year Resident</td>
<td>Fellow First Year</td>
<td>Fellow Second Year Post Fellowship Experience</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>of hospital budgetary issues that may be specific to hematopathology or pathology in general.</td>
</tr>
</tbody>
</table>
### Hematopathology Fellowship
#### Adult Bone Marrow Rotation

#### Description of Rotation or Educational Experience
Adult bone marrow sign-out at the UPMC involves assembling the relevant smear and histologic slides and ancillary data, an initial review including the performance of a peripheral blood and marrow differential by the fellow and bone marrow technologist, where appropriate, and then a final sign-out with a staff hematopathologist. A preliminary review of marrow smears is also performed upon their receipt. Diagnoses include an interpretation of all ancillary data such as any cytochemical stains or flow cytometric immunophenotypic studies. Interpretations of studies which have a longer turn around time such as cytogenetic studies are expected to be included in addenda to the original report. Initially the fellow reviews cases and then signs them out with a staff hematopathologist while later, with permission of the staff, they are given increasing responsibilities (all slides are ultimately reviewed by a hematopathologist). Competencies in signing out marrows and associated phenotypic, cytogenetic and genotypic studies are one of the areas stressed in this fellowship. The fellow is expected to help educate other trainees when present. The fellow is also responsible for being available to review peripheral blood and marrow aspirate smears and marrow biopsies with students, trainees and staff from other departments.

#### Patient Care
**Goal**
Fellows must be able to provide diagnostic peripheral blood and bone marrow interpretations that are appropriate to enable the effective treatment of health problems and the promotion of health. Fellows are expected to:

**Competencies**
- Demonstrate an ability to sign out peripheral blood, marrow aspirate and biopsy evaluations utilizing morphology and ancillary studies and recognize neoplastic and non-neoplastic disorders that may involve the peripheral blood and bone marrow.

**Objectives**
- Write concise diagnostic reports that include an accurate diagnostic interpretation and description, that are easily understood, as independently as current regulations allow.
- Be able to integrate cytogenetic, molecular, immunohistochemical, cytochemical, and immunophenotypic data in diagnostic reports.
- Write accurate and concise interpretive flow cytometry interpretations based on review of the raw data, interacting with the laboratory when appropriate.

#### Medical Knowledge
**Goal**
Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological sciences, as well as the application of this knowledge to patient care.

**Competencies**
- Know normal and abnormal blood and bone marrow cell morphology.
- Develop a basic understanding of the diagnostic criteria for hematologic and non-
hematologic disorders that may demonstrate bone marrow findings.

- Know the major clinical aspects of the disorders diagnosed by hematopathologists where bone marrow evaluation plays a significant role.

Objectives

- Complete checklist that includes acquisition of general knowledge related to hematopoietic disorders and bone marrow pathology as well as more specific knowledge about a list of important bone marrow neoplasms and non-neoplastic bone marrow related diagnoses.

- Write coherent diagnostic bone marrow and corresponding flow cytometry reports that indicate the ability to recognize the neoplastic hematopoietic/lymphoid disorders listed in the 2008 WHO classification and the non-neoplastic hematopoietic/lymphoid disorders that are expressed in the bone marrow.

- See also general goals and objectives section.

Practice-Based Learning and Improvement

Goal

See general section.

Systems Based Practice

Goal

See general section.

Professionalism

Goal

See general description.

Interpersonal and Communication Skills

Goal

See general descriptions.

Teaching Methods

- Direct sign-out at a multiheaded microscope with the primary attending pathologist, with one-to-one didactic and Socratic interaction.

- Use of teaching sets of glass slides and case studies.

- Reading of various textbooks and original literature available within the hematopathology division.

Assessment Method (fellows)

- End of rotation written evaluations by attending faculty (based on direct supervision and observation).

- 360-degree evaluation process.

- ASCP CheckPath Examination (quarterly).

- Direct, objective written examination administered by division (twice/year).

- Biannual review by fellowship program director or designee.

- ASCP Fellow In-Service Examination (twice/year).

- Review of rotation checklist with fellowship director or his designate.

Assessment Method (Program Evaluation)

See general section.
## Level of Supervision
One of the hematopathology attendings is assigned to cover the service (generally on a weekly basis). Fellows report directly to that faculty member. In addition, if there is an insufficient bone marrow case load on the service to which the fellow is assigned (as determined by the supervising attending pathologist), then fellows are asked to identify additional cases to sign out with the faculty on the other adult marrow services.

## Educational Resources
- A teaching set of cytochemical stains and peripheral blood and bone marrow smears is available from the bone marrow technologists. Individual faculty members also have teaching slides.
- “Articles for Residents” black binders. Classic reference articles for classification of leukemia, etc. Located in G323.
- Peripheral blood and fluid study set that can be checked out from the hematopathology secretaries (G306). The directory of cases is in X:\Hemepath_study_set.
- Foucar, K., Viswanatha, D.S., Wilson, C.S., Non-Neoplastic Disorders of Bone Marrow, American Registry of Pathology, 2008.
**Description of Rotation or Educational Experience**

Although the collection of bone marrow samples are frequently performed by hematologists-oncologists and other non-pathologist physicians or support staff, a hematopathologist must know how to perform a bone marrow biopsy and aspirate collection and may need to do so in a future practice setting. Hematopathology Fellows at UPMC are expected to perform at least ten marrow aspirate and biopsy collections in the hematology/bone marrow transplant division or to have performed them previously. In order to help accomplish this, to better learn and to appreciate the clinical aspects of the disorders we diagnose and also to learn about what the clinician expects from hematopathologists, fellows are expected to spend at least 2 and one-half days rotating with members of the hematology/oncology division. Most of this experience will be obtained at the Hillman Cancer Center. Working with the OHA physician's assistant is recommended. Additional time at Hillman may be arranged on an individual basis, if additional time is needed to complete the minimum 10 marrow procedures required.

**Patient Care**

**Goal**

Fellows must be able to perform bone marrow biopsy and aspirate collections that provide adequate aspirate and biopsy material for diagnosis, with concern also for patient safety and comfort.

**Competencies**

- Demonstrate an ability to perform successful bone marrow aspirate and biopsy collections that produce satisfactory specimens, with as little discomfort to the patient as possible, with appropriate concern for patient comfort and safety.
- Demonstrate ability to interact with both patients and other treating physicians.

**Objectives**

- Fellows will perform at least 10 marrow collection procedures on living patients in the adult bone marrow hematology-oncology clinic at UPMC-Shadyside/Hillman Cancer Center under the guidance of the hematology-oncology faculty, hematology-oncology fellows, or hematology-oncology physician assistants that are skilled in performing these procedures or have documentation of prior satisfactory competence from residency or other training.
- Know the type of information clinical hematologist/oncologists require from hematopathologists.
- Fellows should be able to obtain consent from patients for a bone marrow procedure, explaining the procedure in appropriate terms that s/he can understand, while not causing undue anxiety or alarm.

**Medical Knowledge**

**Goal**

Fellows must demonstrate knowledge of the bone marrow collection procedure followed and know the hematopathology findings for the disorders seen in clinic.

**Competencies**

- Learn the types of needles and equipment required to perform a marrow collection.
- Be familiar with the clinical aspects of the hematologic disorders encountered.

**Objectives**

- Fellows must have a formal evaluation sheet completed for each marrow
collection by the appropriate supervising physician or staff, as documentation that they have a practical working knowledge of how to perform a successful procedure. This form also documents the observer’s assessment of the fellow’s interaction with the patient.

- Fellows should also be able to provide information related to hematopathology issues to the clinician(s) for patients encountered on this brief rotation.

**Practice- Based Learning and Improvement**

**Goal**
Fellows must demonstrate the flexibility to alter their procedure as needed if review of the final bone marrow sections and aspirate smears indicates an inadequate sample collection or if unnecessary patient discomfort occurs.

**Competencies**
- Provide self assessment and positive response to criticism with regard to performing bone marrow collection procedures.
- Learn how to determine if they have obtained a specimen that is satisfactory for diagnosis.

**Objectives**
- Each marrow collection should be reviewed with appropriate hematopathology faculty who can assess whether the sample is adequate for diagnosis.
- Additionally, staff and faculty in hematology-oncology will provide feedback on-site related to issues regarding the fellow’s concern for patient comfort, safety, and general well-being, or if they suspect the collection was inadequate or likely suboptimal.

**Systems Based Practice**

**Goal**
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively upon other resources in the system to provide optimal health care.

**Competencies**
- Fellows should develop an awareness of the physical and staffing resources that may be needed to provide a marrow collection service, especially in future practice.

**Objectives**
- Observe the staff and faculty who perform marrows with discussion, as appropriate.

**Professionalism**

**Goal**
Fellows must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles.

**Competencies**
- Fellows should demonstrate compassion, integrity, and respect for others.
- Fellows should demonstrate respect for patient privacy and autonomy.

**Objectives**
- Demonstrate appropriate concern for the patient’s well-being during the marrow collection procedure, which will be assessed by the supervising physician or
staff.
- Demonstrate compliance with HIPAA privacy requirements.
- Show respect for the patient’s right to refuse a marrow collection or request that another person perform the collection.

**Interpersonal and Communication Skills**
Fellows must demonstrate an ability to communicate effectively with patients directly. This may include explaining the reasons for obtaining a marrow sample, what will be assessed, and conveying the risks and benefits of the marrow collection. S/he may also need to allay any fears or anxiety a patient may have about the marrow procedure and explain to the patient how s/he will be informed of the results.

**Competencies**
- Fellows must demonstrate flexibility in their interactions with patients and be prepared to explain some of the risks and benefits of the procedure in language that the patient can understand.
- Fellows must also be able to assess the patient’s comfort and concern during the procedure.

**Objectives**
- Fellows must be prepared to obtain consent if needed.
- Fellows should assess patient level of comfort through observation and direct verbal communication with patient.

**Teaching Methods**
- Direct supervision.
- Reading textbook materials indicated below.

**Assessment Method (fellows)**
- Direct observation by supervising personnel.
- Evaluation of the marrow samples by hematopathology faculty.
- Written assessment of each collection procedure by having supervising staff complete the requisite evaluation form.

**Assessment Method (Program Evaluation)**
See general section.

**Level of Supervision**
Fellows report to staff and faculty within the hematology-oncology bone marrow outpatient clinic at UPMC-Shadyside/Hillman Cancer Center, who directly supervise the fellow both in seeing clinical patients and when performing bone marrow collection procedures. Marrow sample evaluations are performed by the attending hematopathologist to whom the marrow case is assigned.

**Educational Resources**
- Staff and faculty within hematology-oncology.
**Description of Rotation or Educational Experience**

The hematopathology division is responsible for the gross processing and final sign-out of most diagnostic lymph node biopsies (and related solid tissue hematopathology). Fellows are responsible for handling and triaging the gross specimen, reviewing all histologic material and gathering the ancillary data such as the flow cytometric immunophenotypic findings. Depending on the experience of the fellow, they may at this point; order additional ancillary studies such as immunohistologic stains. As they progress, they are also expected to dictate cases in advance of their sign-out. After interpreting everything, the case including the ancillary studies will be signed out with the faculty hematopathologist. Addenda will be issued for ancillary studies such as genotypic studies completed after case has been signed out. This part of the fellowship will include review of any solid tissue hematopathology consults or any consults specifically sent to the faculty on this service. This functional approach to diagnostic lymph node pathology is another area, which is stressed in the fellowship. Fellows also help oversee the lymph node assistant and play a role in the education of residents, clinical fellows and hematologists/oncologists.

**Patient Care**

**Goal**

Fellows must be able to provide diagnostic lymph node interpretations that are appropriate to enable the effective treatment and the promotion of health. Fellows are expected to:

**Competencies**

- Demonstrate an ability to sign out lymph nodes and other related biopsy evaluations utilizing morphology and ancillary studies.
- Recognize the majority of neoplastic and non-neoplastic disorders that may involve tissues.

**Objectives**

- Write concise diagnostic reports that include an accurate diagnostic interpretation and description, that are easily understood, as independently as current regulations allow.
- Be able to integrate cytogenetic, molecular, and immunophenotypic data in diagnostic reports.
- Write accurate and concise interpretive flow cytometry interpretations based on review of the raw data interacting with the laboratory when appropriate.
- Learn the use of a multiparameter approach to diagnostic lymph node pathology (morphology, flow cytometric and immunohistologic phenotypic studies, genotypic studies, and cytogenetic studies).
- Learn to diagnose reactive lymphadenopathies, Hodgkin lymphomas, the non-Hodgkin lymphomas and other hematopathologic disorders seen in tissue biopsies.

**Medical Knowledge**

**Goal**

Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological features of hematolymphoid disorders involving lymph nodes and
related tissues, as well as knowing how to apply this knowledge to patient care.

Competencies
- Know normal and abnormal lymphoid and related tissue morphology.
- Have a basic understanding of the diagnostic criteria for hematopoietic/lymphoid disorders that may involve or primarily involve tissues.
- Know the major clinical aspects of disorders diagnosed by hematopathologists using lymph nodes and related tissue biopsies.

Objectives
- Complete checklist that includes acquisition of general knowledge related to lymph node and related tissue pathology.
- Understand the pathobiology of the disorders that involve lymph nodes and related tissues.
- Write coherent diagnostic lymph node and corresponding flow cytometry reports that indicate the ability to recognize the neoplastic hematopoietic/lymphoid disorders listed in the 2008 WHO classification and the non-neoplastic hematopoietic/lymphoid disorders that are expressed in extramedullary tissues.
- Obtain a score of competent on the objective test administered by the hematopathology division.
- Achieve a score above the 25th percentile on at least the spring examination of the Hematopathology Fellows In-Service Examination administered by the American Society of Clinical Pathologists (ASCP).

Practice- Based Learning and Improvement
See general section.

Systems Based Practice
See general section.

Professionalism
See general section.

Interpersonal and Communication Skills
See general must section.

Teaching Methods
- Direct sign-out at a multiheaded microscope with the primary attending pathologist, with one-to-one didactic and Socratic interaction.
- Use of teaching sets of glass slides and case studies.
- Reading of a various textbooks and original literature available within the hematopathology division.

Assessment Method (fellows)
- Review of lymph node rotation checklist with fellowship director or designee.
- Review of case log numbers with fellowship director or designee.
- ASCP Check Path examination (quarterly).
- Direct, objective written examination administered by division (twice/year)
- Biannual review by fellowship program director or designee.
- ASCP Fellow In-Service Examination (twice/year)
- End of rotation written evaluations by supervising attending faculty (based on direct supervision and observation).
<table>
<thead>
<tr>
<th>Assessment Method (Program Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>See general section.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or two of the hematopathology attendings is assigned to cover the service (generally on a weekly basis). Fellows report directly to these faculty members, who are ultimately responsible for the quality of all decisions made and for the reports signed out.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymph node chapter in Sternberg. [Highly recommended]</td>
</tr>
<tr>
<td>Swerdlow, S.H., Campo, E., Harris, N.L., Jaffe, E., Pileri, S.A., Stein, H., Thiele, J., Vardiman, J. (Eds.): WHO Classification of Tumours Pathology of Haematopoietic and Lymphoid Tumours, IARC, Lyon, 2008. [Highly recommended]</td>
</tr>
<tr>
<td>Checkpath (images, histories and explanations of faculty CME program for Hematopathology) (PUH G315 and in Dr. Swerdlow’s coordinator’s office).</td>
</tr>
<tr>
<td>Teaching/conference sets of glass slides of marrows, lymph nodes, etc. (Dr. Swerdlow’s office).</td>
</tr>
<tr>
<td>Virtual teaching set <a href="http://residents.pathology.pitt.edu/">http://residents.pathology.pitt.edu/</a></td>
</tr>
</tbody>
</table>
Hematopathology Fellowship
Flow Cytometry

Description of Rotation or Educational Experience
While most of the interpretive teaching and indications for flow cytometric immunophenotypic testing will occur during marrow and lymph node sign out, one week will be spent in the laboratory learning some of the technical aspects involved in these studies. In addition, during the laboratory hematology rotation, fellows will review the following flow cytometry tests with the hematopathologist responsible for flow onlies sign-out: paroxysmal nocturnal hemoglobinuria (PNH), neutrophil oxidative burst (NOBA), DiGeorge syndrome evaluation and leukocyte adhesion molecule.

Patient Care
Goal
Fellows must be able to provide diagnostic flow cytometry interpretations that are appropriate to enable the effective treatment of health problems and the promotion of health. In order to provide accurate interpretations, fellows must have an understanding of the technical aspects of flow cytometric testing, including compensation, quality control, quality assurance, and evaluation of new antibodies or staining methods.

Competencies
- Demonstrate an ability to interpret flow cytometry evaluations and recognize the majority of neoplastic and non-neoplastic disorders that may involve bone marrow, tissue samples, blood samples and body fluid samples. (This is an expectation that extends throughout fellowship, as the fellow will interpret and write-up marrow and tissue flow cytometric studies while rotating on the bone marrow and lymph node services.)
- Demonstrate an understanding of the diagnostic limitations of flow cytometry when evaluated in the absence of other diagnostic data such as tissue morphology, bone marrow aspirate smear morphology, or appropriately made blood smear or fluid cytologic preparations.
- Demonstrate an understanding of some of the testing that may be specific to the flow cytometry laboratory and how these tests are used in patient care (i.e. PNH testing, NOBA testing, DiGeorge syndrome analyses, lymphocyte subset testing in immunodeficiency, DNA ploidy studies).

Objectives
- Understand sample preparation, basic flow cytometry, quality control, gating on specific cell populations, determination of positive versus negative staining and methods of data presentation.
- Know indications for testing, taking into account cost effective medicine.
- Become familiar with the preparation of specimens.
- Know how specialized assays such as leukocyte adhesion assays and immunodeficiency related testing (NOBA, CD4 counts, DiGeorge testing) are performed and reported.
- Know the clinical significance of the specialized assays mentioned above.
- Develop an understanding of how analytic software is used to aid in interpretation, with review of gating concepts/strategies vs. cluster analysis and other applicable methods.

Medical Knowledge
Goal
Fellows must demonstrate knowledge of the technical aspects and specific testing
issues unique to the flow cytometry laboratory and how these influence diagnostic decision making.

**Competencies**
- Acquire a working technical knowledge of how samples are stained, how flow cytometers work, and methods of data analysis, with emphasis on the specific testing performed in the UPMC hematopathology division laboratory.
- Learn normal and abnormal flow cytometry findings in the various tissues and body fluids studies. (Much of this interpretive knowledge will be gained as part of the lymph node and bone marrow rotations.)
- Learn the expected flow cytometry findings in the immunophenotyping of disorders diagnosed by hematopathologists.

**Objectives**
- Complete checklist that includes acquisition of general knowledge related to hematopoietic disorders of the bone marrow, blood, and lymph node tissues, as well as more specific knowledge.
- Obtain a score of competent on the objective test administered by the hematopathology division.
- Obtain at least a score above the 25th percentile on the Hematopathology Fellows In-Service Examination on the spring testing administered by the American Society of Clinical Pathologists (ASCP).
- Review the aspects of the testing unique to flow cytometry (NOBA assay, PNH testing) through either direct laboratory observation or independent reading of laboratory procedure manuals or appropriate textbooks available within the hematopathology division or flow cytometry laboratory.

**Practice-Based Learning and Improvement**

**Goal**
See general description.

**Systems Based Practice**

**Goal**
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

**Competencies**
- Incorporate considerations of cost awareness and risk-benefit analysis in ordering flow cytometric testing.
- Demonstrate an awareness of regulatory requirements as relevant to hematopathology and to flow cytometry specifically, including those required by the College of American Pathologists and, if applicable, local or state regulations.

**Objectives**
- Become familiar with the technical resources used in the operation of a flow cytometry laboratory.
- Demonstrate ability to choose appropriate flow cytometry panels for making a specific diagnosis or for most effectively evaluating a particular sample.
- Participate in mock College of American Pathologists laboratory inspection, if timing of inspection coincides with fellowship, or preparation for real or mock CAP inspection.
- May participate in faculty-supervised quality improvement projects that may be relevant to flow cytometry evaluation or utilization of this testing.
<table>
<thead>
<tr>
<th><strong>Professionalism</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
</tr>
<tr>
<td>See general description.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Interpersonal and Communication Skills</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>See general description.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Teaching Methods</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of teaching sets and case studies.</td>
</tr>
<tr>
<td>Reading of various textbooks and original literature available within the hematopathology division.</td>
</tr>
<tr>
<td>Direct observation of technical staff.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Assessment Method (fellows)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of check-list with flow cytometry laboratory director or designee.</td>
</tr>
<tr>
<td>End of rotation written evaluations by attending faculty (based on direct supervision and observation).</td>
</tr>
<tr>
<td>Direct, objective written examination administered by division (twice/year).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Assessment Method (Program Evaluation)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>See general description.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Level of Supervision</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellows report directly to the medical director of the flow cytometry lab or appropriate designee.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Educational Resources</strong></th>
</tr>
</thead>
</table>
Description of Rotation or Educational Experience
The object of this rotation is for fellows to become familiar with pediatric hematopathology: interpretation of bone marrow aspirates, biopsies, and peripheral blood smears. The fellow learns how to interpret results by integrating the information obtained by these methods together with flow cytometric results, molecular findings, immunocytochemistry studies, cytogenetics and clinical hematology tests. Pediatric lymph node biopsies that have flow cytometric immunophenotyping studies are reviewed, as well. Fellows also participate either with a faculty member or independently in the Children's Hospital Leukemia Tumor Board and in the microscopic slide review conferences, which may be done at the Childrens Hospital in Lawrenceville or via a web-based microscope application (for displaying images on guest computers within the UPMC network) and a conference call set-up or speaker phone, depending on the number and location of conference participants.

Patient Care
Goal
Fellows must be able to provide diagnostic marrow interpretations on samples from pediatric patients and accurately evaluate other pediatric samples related to hematopathology that are appropriate to enable the effective treatment of health problems and the promotion of health. In addition, fellows should also be aware of some of the unique privacy issues and consent issues that may be unique to pediatric patient settings.

Competencies
- Demonstrate an ability to sign out marrow aspirate and biopsy evaluations utilizing morphology and ancillary studies and recognize the majority of neoplastic and non-neoplastic disorders that may involve bone marrow and blood.
- Provide accurate and clinically useful interpretations of pediatric peripheral blood smears, body fluid specimens, and any solid tissues seen in the Division of Hematopathology.

Objectives
- Write concise diagnostic reports that include an accurate diagnostic interpretation and description, that are easily understood, as independently as current regulations allow.
- Be able to integrate cytogenetic, molecular, immunohistochemical, cytochemical, and immunophenotypic data in diagnostic reports.
- Write accurate and concise flow cytometry interpretations based on review of the raw data, interacting with the laboratory when appropriate.
- Write accurate comments (for entry into the laboratory information system) that reflect cells or abnormalities identified on blood smear and body fluid review. This may also involve accurately instructing the technologists at Children's Hospital with regard to up-dating the differential counts and cell designations.

Medical Knowledge
Goal
Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological information, as well as the application of this knowledge to patient...
care. This requires an understanding of the unique aspects of pediatric hematopathology.

Competencies

- Learn normal and abnormal blood cell morphology.
- Learn the diagnostic aspects of the hematologic diseases that may be found primarily or exclusively in pediatric and adolescent patients.
- Develop a basic understanding of the diagnostic criteria for the hereditary hematologic diseases that are usually or often first diagnosed in children, such as hemoglobinopathies.
- Learn the interpretation of HPLC results for the detection of aberrant and normal hemoglobins.
- Learn the major clinical aspects of pediatric disorders diagnosed by hematopathologists.

Objectives

- Complete checklist that includes acquisition of general knowledge related to hematopoietic disorders and bone marrow pathology as well as more specific knowledge about a list of important bone marrow neoplasms and bone marrow related diagnoses.
- Write coherent diagnostic bone marrow and corresponding flow cytometry reports that indicate the ability to recognize the neoplastic hematopoietic/lymphoid disorders listed in the 2008 WHO classification and the non-neoplastic hematopoietic/lymphoid disorders that are expressed in the bone marrow.

Practice- Based Learning and Improvement

See general description.

Systems Based Practice

See general description.

Professionalism

See general description.

Interpersonal and Communication Skills

See general description.

Teaching Methods

- Direct sign-out at a multiheaded microscope with the primary attending pathologist, with one-to-one didactic and Socratic interaction.
- Use of teaching sets of glass slides and case studies.
- Virtual slide set.
- Reading of various textbooks and original literature available within the hematopathology division.

Assessment Method (fellows)

- End of rotation written evaluations by attending faculty (based on direct supervision and observation).
- 360-degree evaluation process.
- ASCP CheckPath Examination (quarterly).
- Direct, objective written examination administered by division (twice/year).
- Biannual review by fellowship program director or designee.
- ASCP Fellow In-Service Examination (twice/year).
- Pediatric Rotation Checklist (reviewed by Fellowship Program Director or Designee).

<table>
<thead>
<tr>
<th>Assessment Method (Program Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>See general description.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of the hematopathology attendings is assigned to cover the pediatric marrow service (generally on a weekly basis). Fellows report directly to that faculty member.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Resources</th>
</tr>
</thead>
</table>
**Description of Rotation or Educational Experience**

The molecular oncology rotation allows the fellow to become familiar with the basic molecular biologic techniques used to support hematopathology. The laboratory is responsible for a variety of clonality studies including immunoglobulin and T cell receptor gene rearrangement, specific chromosomal translocations such as those involving the \( BCL2/IGH\), \( BCR/ABL\), and other genes, as well as new assays such as assessment of the \( JAK2\ V617F\) variant associated with some myeloproliferative neoplasms.

The fellow will become familiar with the professional functions associated with sample analysis including physician responsibility for correlating clinical history with laboratory requests to ensure proper clinical testing, selection of tests to be performed, review of test progress, interpretation and communication of preliminary results, interpretation and reporting of final results in oral and written form, as well as review of quality assurance and proficiency testing results. The fellow is expected to attend key Division conferences (primarily the Thursday Professional Staff Conference) and is welcome to attend other Division functions including the monthly staff CME meeting or other meetings.

Fellows should be aware that, in addition to the activities described above and those specified in the check list, this rotation may involve working on developmental or other hematopathology-related projects that can be completed during their rotation and that will contribute to their educational experience. It is also expected that fellows will direct their efforts to the rotation during regular working hours and not take more than one week of their vacation during this rotation.

**Patient Care**

**Goal**

Fellows must have a working understanding of how related oncologic molecular testing is used in either (a) making a specific primary diagnosis, (b) follow up of patients as testing for residual disease, or (c) as a supplemental or confirmatory diagnostic tool. They should also be able to participate in a molecular diagnostics service at the faculty level, since this is a role some hematopathologists perform in practice.

**Competencies**

- Demonstrate an understanding of how molecular testing is applied to the diagnosis and follow-up of hematologic diseases.
- Be able to interpret molecular studies performed in the evaluation of hematopoietic/lymphoid disorders and write a diagnostic report.

**Objectives**

- Observe the preparation and processing of relevant samples (weeks 1) and the performance of individual assays in the lab (weeks 1 and 2).
- Demonstrate progressive responsibility to compose draft final reports on at least one-half of relevant cases (weeks 2 through 4).
- Present relevant molecular diagnostics laboratory data for the cases discussed in the weekly hematopathology interesting case conference.
- Demonstrate an ability to directly interpret routine Southern blot, PCR, and RT-PCR findings and be able to relate these results to the patient’s overall diagnosis.
### Medical Knowledge

**Goal**
Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological aspects of hematopathology-related molecular diagnostic testing, as well as the application of this knowledge to patient care.

**Competencies**
- Understand the basic concepts of molecular biology.
- Understand the testing methods used for specific hematopathology-related laboratory tests performed by the molecular diagnostics lab.
- Know the basic molecular basis for the major hematopoietic/lymphoid neoplasms.
- Know what is considered to be state-of-the-art diagnostic molecular testing in hematopathology.

**Objectives**
- Review the basic concepts of molecular biology through appropriate reading of textbooks and primary literature.
- Directly observe laboratory testing procedures.
- Review the standard operating procedure manual for the laboratory.
- Complete molecular diagnostics rotation checklist.
- Sign out of hematopathology cases with molecular diagnostics faculty.

### Practice- Based Learning and Improvement

**Goal**
See general description.

### Systems Based Practice
See general description.

### Professionalism
See general description.

### Interpersonal and Communication Skills
See general description.

### Teaching Methods
- Direct sign-out with the primary attending pathologist, with one-to-one didactic and Socratic interaction.
- Reading of various textbooks and original literature available within the hematopathology or molecular diagnostics division.

### Assessment Method (fellows)
- End of rotation written evaluations by attending faculty (based on direct supervision and observation).
- End of rotation meeting / final evaluation review with the molecular diagnostics laboratory director or designee.
- Final written evaluation of rotation performance by the molecular diagnostics laboratory director or designee.
<table>
<thead>
<tr>
<th>Assessment Method (Program Evaluation)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>See general section.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct observation and evaluation by attendings covering the molecular lab service while the fellow is on rotation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Educational Resources</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Readings provided on site.</td>
<td></td>
</tr>
<tr>
<td>2. Primary literature available in the Division of Hematopathology, the Falk Health Sciences Library, or electronically.</td>
<td></td>
</tr>
<tr>
<td>4. Interesting case collection.</td>
<td></td>
</tr>
</tbody>
</table>
## Hematopathology Fellowship

### Cytogenetics

**Description of Rotation or Educational Experience**

This rotation allows the fellow to familiarize him or herself with the procedures carried out in the Cytogenetics laboratory, their application to clinical cases, and the roles of classical and molecular cytogenetics in clinical practice, specifically in hematopathology. The majority of the specimens studied will be bloods and marrows from patients with leukemia or myelodysplastic disorder and diagnostic lymph node biopsies. It is also an opportunity to review the major cytogenetic abnormalities seen in specific types of hematopoietic/lymphoid disorders.

### Patient Care

**Goal**
Fellows must have a working knowledge of basic cytogenetics testing methods and interpretation of results in order to be able to apply such testing to the diagnosis and clinical follow up of patients with hematopoietic and lymphoid neoplasms. Increasingly, this information is being incorporated into the diagnosis and classification of diseases defined within the World Health Organization (WHO) classification of hematopoietic and lymphoid tumors.

**Competencies**
- Learn the indications for cytogenetic testing relevant to hematopathology.
- Be able to interpret classical and fluorescence in situ hybridization (FISH) cytogenetic findings.
- Develop a familiarity with microarray methodologies in assessing chromosomal gains and losses.

**Objectives**
- Know indications for testing, taking into account cost effective medicine.
- Understand the rationale and methods of procedures and the basic safety precautions practiced in the laboratory, as described in the laboratory procedure manual.
- Learn the basic laboratory procedures: cell culture initiation, harvest, banding, chromosome analysis, karyotyping and FISH (metaphase and interphase).
- Practice karyotyping and basic write-ups of the results within a cytogenetics report.
- Scan G-banded slides under the microscope to compare the results of PHA-stimulated peripheral blood, unstimulated blood, and bone marrow cultures.
- Participate actively in the sign out of cases with the Laboratory Director and colleagues and keep a list of the cases. Fellows should review all current cases related to hematopathology and hematopathology-associated specimens (bone marrow and hematopathology tissue workups).
- Observe the use and understand the limitations of microarray methods.
- Attend one of the monthly microarray case review conferences, if possible.

### Medical Knowledge

**Goal**
Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological aspects of cytogenetics as they relate to hematopathology, as well as the application of this knowledge to patient care and the basic foundation of these studies.
### Competencies
- Understand how the different types of cytogenetic tests are used in hematopathology, how they are performed, and how they are interpreted.
- Know the cytogenetic abnormalities in the major hematopathologic disorders and their clinical significance.

### Objectives
- Review recent articles and text from the classical and molecular cytogenetics literature, to become familiar with the fields of genetics and cytogenetics, cytogenetic methods, and applications to clinical medicine, particularly with regard to hematopathology.
- Review the files of interesting cases to observe the longitudinal changes in karyotypes over the course of treatment and to see how various cytogenetic findings are interpreted.
- Complete checklist for the rotation.

### Practice-Based Learning and Improvement
**Goal**
See general section.

### Systems Based Practice
See general section.

### Professionalism
See general section.

### Interpersonal and Communication Skills
See general section.

### Teaching Methods
- Direct sign-out with the service director or other designated faculty, with one-to-one didactic and Socratic interaction.
- Use of teaching sets and case reviews.
- Reading of various textbooks and original literature.

### Assessment Method (fellows)
- End of rotation written evaluation by attending faculty (based on direct supervision and observation).
- End of rotation meeting with the cytogenetics laboratory director or designee.

### Assessment Method (Program Evaluation)
See general section.

### Level of Supervision
Fellows interact directly with laboratory technologists and faculty in the cytogenetics laboratory.

### Educational Resources
- Cytogenetics Laboratory Procedure Manual
- Gersen S, Keagle M, The Principles of Clinical Cytogenetics, 2005
- Cancer Cytogenetics
  Editors: Sverre Heim and Felix Mitelman
  3rd edition 2009
  ISBN: 978-0-470-18179-9

Internet resources:
http://atlasgeneticsoncology.org/
http://cgap.nci.nih.gov/Chromosomes/Mitelman
Description of Rotation or Educational Experience

This rotation offers the fellow the opportunity not only to learn about automated and non-automated hematology testing, but also to learn about the role of the laboratory in the diagnosis of hematological disorders and learn the features of the types of disorders encountered, with emphasis on non-neoplastic hemopathology. The general hematology section of the automated testing laboratory performs complete blood counts (CBCs), routine coagulation studies, urinalysis and body fluid counts and smear evaluations on adult and pediatric patients. The fellow will become acquainted with the following principles and practice of automated laboratory hematology:

1. Coulter LH750 and LH500: specific methods and features these instruments utilize to evaluate multiple blood parameters, daily set up, instrument troubleshooting, quality control (Q.C.) procedures and understanding of instrument flags. Fellow will observe operation of instrument.

2. Coagulation automated equipment [STA-R Evolution (Diagnostica Stago, Inc)]: morning set up, trouble shooting, Q.C. procedures and understanding of instrument flags. Fellow will observe operation of instrument.

3. Urinalysis equipment including the IRIS iQ200: set-up and operation, QC/QA procedures, instrumentation principles of operation, instrument archive of abnormal crystals, casts, and cells within urine sediments.

4. Cellavision

The fellow will also have experience in the review of abnormal results, review of abnormal peripheral blood smears and body fluid cytocentrifuge preparations or smears, quality control, quality assurance and proficiency surveys.

The Special Hematology Laboratory performs cytochemical stains with the following tests sent to other UPMC or reference laboratories: hemoglobinopathy testing, red blood cell enzyme testing, osmotic fragility testing and autohemolysis. HPLC testing for hemoglobin variants is performed at Children’s Hospital of Pittsburgh. All tracings are sent to the hematopathology division on a weekly basis and kept in a binder in sign-out room G315; fellows are expected to review and read about the results from the most recent 6-12 months during their rotation and, during their the last half of the rotation, to meet and discuss interesting cases with the pathologist who signs out these cases while on rotation. All other results are returned to the special hematology laboratory for review by the hematopathologists. For both in-house and send-out special hematology tests, the fellow will review and understand the methodology for all procedures, participate in assay procedures performed at UPMC Presbyterian, review and interpret the results, relate results to clinical data, review indications for testing, and how results should be used. The fellow will also learn more about the specific disorders being investigated using these tests, such as hemoglobinopathies, red cell enzyme deficiencies, other non-neoplastic red cell, white cell, and platelet disorders.

Continuing Education in Clinical Chemistry and Hematology: The fellow will
### Patient Care

**Goal**
Fellows must be able to understand current diagnostic hematology instrumentation and the testing performed within hematology laboratories or automated laboratories that are appropriate to enable the effective diagnosis and treatment of health problems.

**Competencies**
- Demonstrate a working familiarity with modern analyzer instrumentation.
- Develop an understanding of how laboratory testing is used in the evaluation and diagnosis of patients with hematologic abnormalities.
- Learn to recognize disorders with morphologic manifestations identified in peripheral blood, body fluids, and urine samples.

**Objectives**
- Fellow will observe the instrumentation features outlined above in the general rotation description.
- Fellow will increase his/her general skill in hematologic pathology with emphasis on cell types seen in peripheral blood, body fluids, and urine microscopy.
- Know when non-neoplastic red cell, white cell, and platelet disorders should be suspected and what laboratory tests should be performed to make a definitive diagnosis.

### Medical Knowledge

**Goal**
Fellows must demonstrate knowledge of established and evolving biomedical, clinical, and epidemiological features of disorders with hematologic aspects that present with abnormalities in peripheral blood smear or automated testing data (cell counts, hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, etc.), as well as being able to apply this knowledge to patient care.

**Competencies**
- Learn normal and abnormal blood cell, body fluid, and urinary sediment morphology, including review of abnormal casts and crystals in urine sediment.
- Demonstrate an understanding of automated hematology, urinalysis and coagulation instrumentation and develop a familiarity with special hematology testing related to red blood cell, white blood cell, and platelet disorders related to red blood cell, white blood cells, and platelet disorders.
- Learn the criteria and basis for non-neoplastic hematologic disorders that are largely diagnosed by using results from a general or special hematology laboratory.

**Objectives**
- Review the major clinical aspects of disorders diagnosed by hematopathologists, concentrating on non-neoplastic disorders and clinically benign, but abnormal or atypical findings.
- Fellows must also score competently on the hematopathology division objective test and achieve an acceptable score on the ASCP in service examination. (See also the general description of fellowship goals and objectives.)
See general section.

### Systems Based Practice

**Goal**
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

**Competencies**
- Understand how considerations of cost awareness and risk-benefit analysis play a role in deciding what tests a clinical laboratory should provide in-house versus send-out testing.
- Demonstrate an awareness of regulatory requirements as relevant to the operation of a modern hematology laboratory or laboratory section.
- Know quality assurance and quality control procedures.
- Understand how a complex patient-oriented clinical laboratory is managed, including the scope of testing, specific testing methodology, and documentation of test accuracy.

**Objectives**
- Participate in mock College of American Pathologists laboratory inspection, when possible.
- Participate in faculty-supervised quality improvement projects, if possible.
- Review College of American Pathologist (CAP) checklist requirements in hematology that are utilized for most laboratory inspections and certification.
- Attend laboratory management and quality assurance / quality control meetings.
- Learn how electronic resources are used in a modern hematology or automated testing laboratory that includes hematology testing.

### Professionalism
See general section.

### Interpersonal and Communication Skills
See general section.

**Goal**
Fellows must demonstrate interpersonal and communication skills that result in the effective exchange of information and teaming with other physician colleagues and professional associates.

**Competencies**
- Communicate effectively with hematology-oncology and other physicians and other healthcare professionals.
- Act in a consultative role to other physicians and health professionals.
- Function as a team player.
- Able to interact well with laboratory technical and managerial personnel.

**Objectives**
- Accurately convey information both orally and in writing to the submitting physician and other appropriate personnel (hematology-oncology fellows, nurse practitioners).
- Discuss possible treatment implications of laboratory findings with physicians and other appropriate health-care professionals.
- Demonstrate a familiarity with laboratory management principles, especially in regard to effective communication with laboratory professionals (technologists and management personnel).
- Demonstrate ability to seek consultations from members of the faculty or staff, as necessary.
- Present clearly and effectively at the continuing education conference.
- Demonstrates ability to communicate well with laboratory technical personnel.

### Teaching Methods
- Direct review of abnormal blood smears and body fluid sample preparations at a multiheaded microscope with the primary attending pathologist, with one-to-one didactic and Socratic interaction.
- Use of teaching sets.
- Reading of a various textbooks and original literature available within the hematopathology division, as well as procedure manuals.
- Direct observation of laboratory and analyzer operation, including direct observation of technologists and bench personnel.
- Observation of interactions between faculty directors and laboratory staff or supervisors, including attendance at laboratory management meetings.

### Assessment Method (fellows)
- End of rotation written evaluations by attending faculty (based on direct supervision and observation).
- See also methods listed under general description.

### Assessment Method (Program Evaluation)
See general description.

### Level of Supervision
Fellows report directly to the faculty director of the hematology laboratory section of UPMC-Presbyterian Hospital. Fellows also interact with the hematopathology attending assigned to cover the automated testing laboratory for a review of abnormal blood and body fluid preparations, related testing issues, and review of send-out testing results on specific patients.

### Educational Resources
Various hematology textbooks are available within the Division of Hematopathology and from individual faculty. Procedure manuals are available within the laboratory. The specific rotation checklist should also be used as a resource.

Three specific texts of value are listed below:
Hematopathology Fellowship
Coagulation

Description of Rotation or Educational Experience

The coagulation rotation for the Hematopathology Fellow is 4 weeks in length and is located at the Institute for Transfusion Medicine, on the corner of Dawson and the Boulevard of the Allies (see detailed directions below). Each fellow shares a quiet office space located on the first floor Annex of the coagulation laboratory. They are provided with a syllabus of the most recent articles on coagulation, a small library including text and reference books, as well as a selection of hematology journals. The fellows are expected to utilize their time when not performing the activities described below, and take advantage of these resources to assist in mastering the goals and objectives listed for this rotation.

On your first day, ask the receptionist at the front desk for the Systems Support Technologist (Karen Grasso), Laboratory Supervisor (Linda Parkinson), or the residents and they will assist you with what to do and with whom to report. In the unlikely event that none of the above staff or other residents are in, ask for Dr. Bontempo, Dr. Kiss, or Dr. Irina Chibisov.

Clinical sign-out activities:
Once oriented to the daily routine of the laboratory, the fellow, along with the other fellows, residents, and medical students participating in the program will be provided with patient information from that given day’s laboratory blood samples. The material is divided among the rotation participants, and they are responsible for obtaining clinical information and backgrounds from the referring or admitting physicians on each patient; this is done by telephone and computer with access to the MARS system. If there are no medical students, it is the responsibility of the fellow to obtain pertinent histories on the patients through the electronic medical record or by calling the appropriate hospital or doctor’s office. This activity occurs in the afternoons beginning around 3:00 PM, except for the individual’s first day, at which time they should report by 2:30 PM.

Once the information is collected, the rotation participants meet as a group with one of the ITxM medical faculty for case sign-outs. This is the interpretation of the patient’s coagulation profile in relationship to the clinical findings (e.g., lupus anticoagulant). The results from the previous day’s testing are then discussed utilizing the clinical information that was obtained by phone, providing the trainees with the link between the clinical histories/backgrounds, the test results, and ultimately how to provide a clinical diagnosis. This activity occurs in the late afternoons, usually beginning around 4:00-4:30 PM, and depending on how many cases there are, can last until approximately 6:00 PM.

Laboratory-based activities:
During the rotation, it is the fellow’s responsibility to schedule time to observe the performance of various coagulation laboratory testing; this can be done by contacting the coagulation laboratory supervisor. Since most of the pathologist’s role in coagulation studies involves implementing
and evaluation this testing, it is critical to gain a familiarity with laboratory methodology.

Other activities:
The opportunity for small clinical research projects is available for interested fellows and their participation is encouraged and welcomed.

Patient Care

Goal
Fellows must be able to understand the various disorders that affect hemostasis in order to provide diagnostic information that is appropriate to enable the effective treatment of health problems and the promotion of health.

Competencies
- Become familiar with clinical coagulation issues.
- Develop an ability to interpret abnormal laboratory and clinical findings to make a specific diagnosis.
- Develop an understanding of how coagulation testing is performed and used in the evaluation and diagnosis of patients with abnormalities of the hemostasis pathways.
- Develop a working ability to consult on abnormalities of coagulation with other physicians and laboratory personnel.

Objectives

Learning Objectives Oriented to Patient Care:
- Understand how to formulate a written interpretive coagulation report. (Many of the reports use coded predefined text, but the fellow should understand how to formulate these or similar interpretations in practice.)
- Understand and be able to recommend therapeutic strategies for coagulation abnormalities.
- Be able to formulate testing algorithms for evaluating hemostatic problems or for the follow-up of abnormal findings.
- Be able to oversee a coagulation laboratory and provide coagulation-related consultations.

Daily Practical Expectations:
- Fellow will be provided a list of patients each day on whom coagulation studies are requested. The fellow will acquire appropriate patient clinical histories and indications for coagulation testing from review of electronic medical records, referring physician notes, and through direct conversation with the referring physician (generally by phone).
- Fellows will then present and/or discuss the clinical findings and laboratory results with the attending physician assigned (usually in afternoon).

Medical Knowledge

Goal
Fellows must demonstrate knowledge of basic coagulation biology (including its molecular basis), abnormal coagulation states, and therapeutic agents that affect coagulation (both those used for direct coagulation or anti-coagulation therapy and those used for other purposes but secondarily affect coagulation). In addition, fellows must understand established testing methods for evaluation of coagulation abnormalities, as well as the application of this knowledge to specific patient cases.
### Competencies
- Demonstrate an understanding of coagulation testing, including abnormalities of the coagulation factor pathways and platelet function.
- Know the pathogenesis of basic coagulation disorders and how these are treated.
- Know the impact of exogenously administered agents (specific medications, blood-derived products, recombinant factors) used in treating or managing coagulation abnormalities as well as those that are used for other purposes but affect hemostatic parameters.

### Objectives
- Learn normal and abnormal coagulation pathways.
- Review the major clinical aspects and the diagnostic criteria of coagulation disorders diagnosed by hematopathologists.
- Learn the specific tests utilized to define which pathway (thrombotic vs. platelet, for example) is affected, determine what the precise abnormalities are, and identify what additional testing is needed and know how these tests are performed.
- Learn which molecular assays are used to diagnose disorders characterized by hypercoagulation or other coagulation disorders.
- Obtain a score of competent on the test administered by Dr. Bontempo to assess the fellow’s proficiency in understanding coagulation.
- Achieve an acceptable score on the spring administration of the Hematopathology Fellows In-Service Examination administered by the American Society of Clinical Pathologists (ASCP) (score above the 25th percentile).

### Practice- Based Learning and Improvement
See general description.

### Systems Based Practice

#### Goal
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

#### Competencies
- Understand how considerations of cost awareness and risk-benefit analysis play a role in deciding what coagulation tests are necessary.

#### Objectives
- Demonstrate to the coagulation laboratory attending physicians that s/he can effectively interpret coagulation testing utilizing a variety of resources in the health system and can choose the appropriate panel of tests that will allow for a specific diagnosis and treatment plan through daily sign-out discussions.
- Know how consultative coagulation services organizationally relate to other aspects of hematopathology, both within UPMC and elsewhere.
- If interested, fellows may also participate in a variety of coagulation oriented projects. (Fellows should discuss this with Dr. Bontempo or other attendings.)

### Professionalism
See general description.

### Interpersonal and Communication Skills
- See general description.
Teaching Methods

- Direct review of laboratory results on specific patients during daily sign-out and discussion.
- Reading of various textbooks and original literature available within the hematopathology division or at the Institute for Transfusion Medicine (ITXM).
- Direct observation of laboratory, analyzer operation, and direct observation or interaction with technologists.

Assessment Method (fellows)

- End of rotation written evaluations by attending faculty (based on direct supervision and observation).
- Direct examination administered by Dr. Bontempo or designee.

Assessment Method (Program Evaluation)

See general description.

Level of Supervision

Fellows report directly to the faculty of ITXM during this rotation.

Educational Resources

Various textbooks and resources, including a detailed syllabus are provided by the ITXM service while on the rotation. This also includes a copy of the examination with final answers, given after fellows complete the examination for future reference. Additionally, a variety of hematology textbooks, most of which have chapters related to coagulation diagnosis and evaluation, are also available within the Division of Hematopathology. Other textbooks focusing on coagulation testing are available in the Division of Hematopathology, as well.

Directions to the Institute for Transfusion Medicine

3636 Boulevard of the Allies, Pittsburgh, PA 15213, 412-209-7270:

From Tower View: After you exit Tower View, go down Fifth Avenue and turn left onto Halket Street. Cross Forbes Avenue and go past Magee Women’s Hospital to the intersection with the Boulevard of the Allies. Instead of turning left and going to the far right lane, as you would to go to 376 East or the South Side, make the same left turn, but get into the middle lane. Once you cross the next light, you will be in the right lane of the Boulevard of the Allies. You will pass and ignore a small byway on your right and then come to a traffic light; turn RIGHT at the light into a relatively small side road (Ward Street). Now this is a strange road because the signs for left turns are on the right and vice versa. Regardless, you are to take your first LEFT (Onto Belgreen Place), which is a really small ally, and follow it to its end where it intersects with a street called Dawson. Turn LEFT on Dawson then after about half a block you will see a parking lot behind black iron railings on your left. Turn LEFT into the parking lot and park. It will be easier to walk out of the parking lot and around the pink/salmon brick building to the front entrance, which has a discrete ITXM sign on the front. Once inside, you can tell the person at the desk that you are there for sign out and she will buzz you in.
### Hematopathology Fellowship

#### Immunohistochemistry Laboratory Experience

### Description of Rotation or Educational Experience

This is a brief rotation that is designed to familiarize the fellow with the daily operations of a high-volume immunohistochemistry laboratory. The microscopic review of high quality immunohistochemical stains is an integral part of the diagnostic evaluation of most bone marrow cases and tissue samples to be evaluated for possible lymphoma or other hematologically related disease. Furthermore, hematopathologists may also be responsible for the oversight of an immunohistochemistry laboratory in future practice.

The fellow will report to the senior technologist in the Immunohistochemistry Laboratory when starting this 3-day rotation at 6:00 AM. The early start is necessary in order for the fellow to be present for the antigen retrieval and stain programming steps. The laboratory technologists will oversee the fellow’s active participation in learning the technical and administrative issues involved in the operation of the immunohistochemical and general histology laboratory.

### Patient Care

#### Goal

Fellows must be able to understand the various steps involved in the production of high quality immunohistochemical stains in order to provide diagnostic information that is appropriate to enable the effective treatment of lymphomas, leukemias, myeloproliferative neoplasms, myelodysplasias, and various related diseases.

#### Competencies

- Become familiar with basic operations and management of immunohistochemistry laboratories.
- Develop a working understanding of the steps involved in various stains in order to trouble-shoot problems in clinical diagnostic practice.

#### Objectives

- Fellow will observe the set up and preparation of immunohistochemical stains.
- Learn some of the management issues involved in operating an immunohistochemistry laboratory.

### Medical Knowledge

#### Goal

Fellows must demonstrate a working knowledge of immunohistochemistry stain preparation and be able to apply this knowledge in their daily practice of sign-out and/or assessment of staining quality to ensure accurate diagnosis.
Competencies
- To understand theoretical basis and technical aspects of immunohistochemistry.

Objectives
- Learn the principles behind immunohistochemistry and the steps involved through practical observation and appropriate reading of textbooks, primary literature, and standard operating procedure manuals of the UPMC laboratory.

Practice-Based Learning and Improvement
Goal
Fellows must demonstrate the ability to investigate and evaluate new knowledge to improve continuously patient care and diagnostic expertise, based on constant self-evaluation and life long learning.

Competencies
- Understand how to investigate and solve problems with specific stains.
- Know resources to keep abreast of changes in immunohistochemistry laboratories.

Objectives
- Investigate unusual staining results to determine if this may be an isolated problem with the specific stain or tissue or a more systematic problem with equipment or methodology.
- Know resources that the laboratory uses to learn about new developments in the field and to help in troubleshooting problems.

Systems Based Practice
Goal
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

Competencies
- Know regulatory aspects related to supervision of an immunohistochemistry laboratory.
- Understand considerations of cost awareness and resource utilization when ordering immunohistochemistry stains.

Objectives
- Understand the regulatory requirements (College of American Pathologists, state and local, as applicable) of immunohistochemistry laboratories with regard to inspection requirements and quality control.

Professionalism
See general description section.

Interpersonal and Communication Skills
See general description section.
### Teaching Methods
- Direct interaction with laboratory technical staff.
- Reading of various textbooks, procedure manuals, and original literature available within the hematopathology division or within the laboratory.
- Direct observation of laboratory personnel and automated stainer operation.

### Assessment Method (fellows)
- End of rotation written evaluations by staff.

### Assessment Method (Program Evaluation)
See general description section.

### Level of Supervision
Fellows report directly to the designated technical staff.

### Educational Resources
- Immunohistochemistry laboratory procedure manual
- Dako and Ventana literature (available in laboratory)
## Description of Rotation or Educational Experience

Training in laboratory management and decision making is basically a facet of all aspects of hematopathology practice. Training in this topic does not constitute a distinct block. Rather, it is spread across all other rotations. Fellows are considered integral members of the staff of the Department of Pathology and have the opportunity to participate in discussion of matters related to management of the hematopathology related laboratories. In addition to attending laboratory management meetings, at least as part of the flow cytometry and clinical hematology rotations, the faculty will actively involve fellows in acute and longer-term management issues. Fellows are also expected to be proactive in this regard.

## Patient Care

**Goal**

Fellows must be able to manage hematology-associated laboratories and to direct laboratory technologists and other personnel in order to provide cost-effective and accurate diagnostic or laboratory results that will aid in the effective treatment of disease. The objectives vary, depending on the specific rotation on which the fellow is working. All objectives are listed below for reference.

**Competencies**

- Be able to direct laboratory technologists and other personnel.
- Be able to assist laboratories in dealing with acute and more chronic problems.
- Be able to assist with questions of specimen handling.
- Have experience with direct responsibility for some laboratory activities.

**Objectives**

- Triage bone marrow specimens, fill out work-up requests, and tell the bone marrow technologists how to handle individual cases.
- Decide on initial flow cytometry panels and later on any additional studies needed and effectively communicate these decisions to the technologists.
- Triage fresh lymph node and related specimens by directing others.
- Advise the technologists in the hematology laboratories about technical, pathological, and other laboratory issues.
- Provide direct oversight of lymph node assistant.
- Be on call approximately one week out of four (after the first 6 months of fellowship), with faculty back-up when needed, but with primary responsibility for on-call decision making that includes direction of technologists in the hematology section of the Automated Testing Laboratory and in the flow cytometry laboratory, as well as making diagnostic decisions.

## Medical Knowledge

**Goal**

Fellows must learn the basic principles of laboratory management and decision making.

**Competencies**

- Develop an appreciation for time-management and know how to direct appropriate support personnel in the provision of patient care.
- Understand the typical hierarchy of laboratories (bench technologist, technical specialist, lead technologist, supervisors, and laboratory managers) and what role each one plays.
- Understand the role of the pathologist laboratory director in various academic and other settings.
Objectives
- Demonstrate the ability to help manage appropriate support staff and personnel.
- Know how to organize a quality assurance and quality control program and understand the difference between these two concepts.
- Understand the roles of various laboratory directors at UPMC by observation of these individuals and discussion with them.
- Attend didactic session with laboratory senior administrative director or designee covering a variety of management centered topics, (i.e. types of facilities in which fellows may one day be working, private vs. employee physician models, medical director administrative responsibilities, and importance of communication skills and various types of employer and employee relationships).
- Attend at least one Medical Executive Meeting (as observer) with Operations Vice President.
- Attend at least one Laboratory Leadership Meeting at UPMC-Presbyterian and/or UPMC-Shadyside.
- Complete the following on-line educational modules: MD000048 (Overcoming Obstacles of Performance Management 1.2) and MD000049 (Corrective Action Tools for Fixing Workplace Problems). These are available under My Hub/U-Learn/Browse Management Catalog/Management Development/iLead on-line learnings. (Please print out and save documentation of session completion and keep in fellow portfolio.) (Effective July 1, 2011).

Practice-Based Learning and Improvement
Goal
Fellows must demonstrate the ability to investigate and evaluate changes in testing offered, specimen volumes, and personnel staffing that may affect the organization and work-flow of the laboratory, based on constant self-evaluation and life long learning.

Competencies
- Use information technology to optimize learning.
- Demonstrate flexibility in personnel supervision that reflects newly acquired medical information or service needs.

Objectives
- Demonstrate progressive independence in specimen management, as assessed on bi-annual review with fellowship director.
- Investigate unusual results to determine if this may be an isolated problem with the specific stain or tissue or a more systematic problem with equipment or methodology.
- Demonstrate an awareness of changes in staffing that might affect how samples must be handled and by whom.
- Demonstrate ability to orient other fellows, residents, and students to the laboratory organization and triage of samples.

Systems Based Practice
Goal
Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

Competencies
- Understand how the various laboratories relate to the larger laboratory structure.
- Understand the division of management between anatomic pathology and clinical pathology laboratory services.
- Develop a basic understanding of how the laboratory services relate to other clinical services and how this affects laboratory decisions as to what testing to provide.
- Understand the reasoning behind decisions to perform certain testing in-house versus sending out to an external laboratory.

**Objectives**
- Develop an ability to direct and/or manage appropriate personnel to facilitate cost effective provision of healthcare, wherein all members of the team perform functions to which they are optimally suited or trained.
- Review send out test results when on the hematology laboratory rotation.
- Become involved in at least one quality control or quality assurance project.

**Professionalism**
See general section.

**Interpersonal and Communication Skills**
See general section.

**Teaching Methods**
- Direct interaction with laboratory technical staff.
- Reading of various textbooks, procedure manuals, and original literature available within the hematopathology division or within the laboratory.
- Direct observation of faculty interactions and modeling of appropriate behavior.

**Assessment Method (fellows)**
See general section.

**Assessment Method (Program Evaluation)**
See general section.

**Level of Supervision**
Fellows report directly to the designated faculty covering a specific rotation and may seek advice directly or via telephone conversation or e-mail (if during an on-call or non-urgent situation).

**Educational Resources**
- Individual faculty also acts as mentoring resource or provides additional texts on principles of lab management.
- J-B Lencioni Series. The Five Dysfunctions of a Team: A Leadership Fable.
- Collins J. Good to Great: Why Some Companies Make the Leap and Others Don't, 2001.
Hematopathology Quality Improvement Project Guidelines

Goals and Objectives: To know how quality improvement projects are performed in clinical laboratories by actively participating in the planning and execution of one.

- To learn how to better navigate a large and complex health system.
- To enhance fellow/laboratory professional interactions.
- To be able to better manage a clinical laboratory.

Guidelines: Select a clinical laboratory area and faculty mentor and jointly plan a quality improvement project. The project should involve one of the clinical laboratories and can be done either with the laboratory medical director or with another hematopathologist involved in the laboratory. It is expected that most projects will relate to the flow cytometry, bone marrow, UPMC-Presbyterian and general hematology, UPMC-Shadyside general hematology, UPMC-Magee Women’s general hematology, or Childrens Hospital of Pittsburgh laboratories. It is expected that each faculty member will be willing to work with at least one fellow. The project may be done concurrently with any of the rotations, time allowing. Quality improvement projects may also be done in laboratories outside of the Hematopathology Division (e.g. Molecular Diagnostics, Cytogenetics, or Coagulation) with permission of both the director of these laboratories and of the hematopathology fellowship director. All projects should be planned by October 1st and completed by Mar 31st. The completed report form (attached) should be reviewed and signed by both the supervising faculty member and the fellowship director.
Hematopathology Quality Improvement Project Report Form  
(Completed form to be no longer than 2 pages)

Name: _________________________________

Faculty Advisor: _________________________________

This project has been successfully completed in a competent fashion:

Faculty Advisor: _________________________________
Signature

Fellowship Director: _________________________________
Signature

Title of Project: ____________________________________________________

Nature of problem to be addressed and how it was identified (Introduction):

Quality Improvement Plan (Materials & Methods):

Results:

Outcome and Conclusions (Discussion):
Hematopathology Written Exam
1. Subject Material:
   Bone Marrow
   Peripheral Blood
   Lymph Node and other tissue interpretation including use of ancillary studies (flow cytometry, other immunophenotypic studies, molecular diagnostics and cytogenetics)
   Lab Hematology including general and special hematology testing
2. Type of Exam: Case-oriented open book written exam (no consultation with other individuals)
3. Dates administered – November and April (Be sure to get examination from Dr. Fiona Craig or her designee.)
4. Evaluation Method – Exam will be graded by Dr. Fiona Craig or her designee using the following evaluation categories: Not acceptable, Borderline, and Competent.

Six Competency Evaluation Review every 6 months with Fellowship Director

Evaluation of Fellows' Presentation and Interpersonal Skills (360 degree)

Written Hematopathology Fellow Evaluations by Faculty (from division and department)

Completion of Lymph Node, Bone Marrow, Flow Cytometry, Immunohistochemistry, Pediatric, Molecular Diagnostics and Cytogenetic Checklists (See section on “Checklists” which follows)

Completion of Quality Improvement Project

Documentation of Observation and Performance of Bone Marrow Aspirates and Biopsies by Completion of Bone Marrow Aspirate Form (need 10 plus separate form for observation of pediatric marrows)

CheckPath Test Results

Documentation of Conference Attendance including web-based interdisciplinary conference. Attendance at assigned Medical/Laboratory Management Conferences.

Documentation of the number of specimens reviewed by a fellow as provided on monthly CoPath reports tabulated by office coordinator

Personal Meeting with Director or designee at least 2 times a year with written follow-up summaries

Review of Portfolio contents by fellowship director or designee.

Fellow In-Service Hematopathology Examination (FISHE) score.
PORTFOLIO for Hematopathology Fellows:  
07/01/2009

- Diagnostic specimen sign-out (number of cases reviewed monthly); [Practice based learning and improvement, System based practice, medical knowledge, patient care]
  - PHB (Adult) - CoPath*
  - PHB (Pediatric) - CoPath
  - PHS and related- CoPath*
  - Flow Cytometry Cases- CoPath*
  - ATL (Hematology) – smears/reviews – Keep list or copy of reports and tabulate#
  - Hemoglobin evaluations - Keep list or copy of reports and tabulate#
  - Cytogenetic cases reviewed at sign-out during cytogenetics rotation – keep list and tabulate#

- Notes for Journal Club presentations, including any additional literature reviewed [Practice based learning and improvement, Medical Knowledge]

- CD with Wednesday conference and other evidence of presentations (e.g. POWERPoint slides, notices, handouts) [Practice based learning and improvement, Interpersonal and Communication Skills, Medical Knowledge, Patient Care]

- Literature searches performed for clinical sign-out [include several examples with printouts with case number and date or use form attached ] [Practice based learning and improvement]

- Use of electronic medical records, MARS Reports, and Powerchart [Systems Based Practice].

- Copies of clinical reports prepared by senior trainees comparing before/after sign-out with faculty corrections [Practice based learning and improvement, Systems based practice, Interpersonal and Communication Skills]

- Copies of any written feedback not received through routine evaluation process. [All competencies]

- Summary of any quality improvement plans/ problem solving /management issues the trainee was involved in with a description of the problem, how it was identified and the resolution. At least one quality improvement project must be completed including completion of the quality improvement report form (see guidelines). [Practice based learning and improvement, Systems based-practice, Interpersonal and Communication Skills, and Patient Care.]

- Manuscripts and abstracts prepared including initial (i.e. prior to faculty input) and final drafts [Practice based learning and improvement]

- Copy of all completed checklists/forms: [Medical knowledge, Practice based learning and improvement, Systems based practice, Patient care, Interpersonal and Communication skills, Professionalism]
  - General Hematology Checklist
  - Cytogenetics Checklist
  - Molecular Diagnostics Checklist
  - Bone Marrow Rotation Checklist
  - Lymph Node Rotation Checklist
  - Pediatric Hematopathology Checklist
  - Flow Cytometry Rotation Checklist
  - Bone Marrow Biopsies and Aspirates Form
  - Immunohistochemistry Checklist
  - Interdisciplinary Conference Form

* Numbers from CoPath will be provided to you by the Fellowship Coordinator.
# Give copy to Fellowship Coordinator after Laboratory Hematology rotation/Cytogenetics rotation.
Division of Hematopathology
FELLOWSHIP PROGRAM POLICIES

The Division of Hematopathology follows the UPMC Graduate Medical Education Institutional Policies:

Attendance at National Meetings
Duty Hour Policy Resident and Fellow Stress and Fatigue Prevention, Identification and Management
Grievance and Appeal Policy and Grievance, Resident (Non-Academic Issues)
Guidelines on Professional Conduct in the Teacher-Learner Relationship
Harassment-Free Workplace Policy
Leave of Absence
  - Institution
    - Leave of Absence/Family Medical Leave
    - Administrative Leave
    - Personal
  - Department
    - Fellowship Paid Time-off
  - Division
    - Leave of Absence/Medical Family Leave
Moonlighting Policy
On Call
Qualified Scholarship Policy
Resident/Fellow Eligibility and Selection
Resident/Fellow Faculty and Program Evaluation Policy
Resident Impairment Policy
Resident/Fellow Termination Policy
Supervision and Progressive Responsibility Policy
Transition-of-Care Patient Handoff

There is a Hematopathology Fellowship Policies and Procedures binder located in the Division office.

Procedure for on-call emergent/STAT bone marrow and lymph node biopsies. See pp. 60 - 64
Bone Marrow After Hour Procedures
AFTER-HOURS PROCEDURES (CHILDREN’S & ADULT BONE MARROWS)

1. The Bone marrow technologist is available Monday through Friday between the hours of 8:00 AM and 4:00 PM. (exclusive of weekends and all UPMC holidays). At all other times (except on the night shift), a technologist from the Automated Testing Lab (ATL) will be available to assist with the bone marrow procedure. For assistance at UPMC Presbyterian, call (412) 647-6199. For assistance at UPMC Shadyside, call (412) 623-6011. For assistance at UPMC CHP Lawrenceville, call (412) 864-9877.

2. Procedures to follow at UPMC- PUH are located in the Adult Bone Marrow Procedure Manual (room G325.1) and in the Bone Marrow Procedure Manual of the Hematology Procedure Manual (Automated Testing Lab).

3. For those bone marrows requiring immediate attention (e.g. acute leukemia) performed at UPMC-Presbyterian or CHP, the ATL technologist will triage the sample for ancillary tests, perform a quick stain of the aspirate smears and notify the ‘on call’ CLINICAL PATHOLOGY resident and hematopathologist. The schedule is posted in the Automated Testing Lab. See numbers 8 and 9 below for marrows coming from other sites.

4. Bone marrow specimen processing:
   Aspirate smears (ADULTS):
   - Emergent cases: As noted in number 3, two aspirate smears are stained and placed in a folder with requisitions, current peripheral blood slide and current CBC and differential, for pathologist to review. After pathologist review, place all material in the G325.1 Bone Marrow Reading room.
   - Non-emergent cases: Aspirate smears are left in the Automated Testing Laboratory and sent to the Bone marrow processing area in S764 Scaife Hall the following working day.

   Aspirates smears (CHP):
   - The CHP hematology technologist is available Monday through Sunday between the hours of 7 a.m. and 8 p.m. (inclusive all UPMC holidays). CALL 412-864-9877
   - The technologist will assist with the smears, triage the sample for ancillary tests, perform a quick stain, and notify the “on call” CLINICAL PATHOLOGY resident and hematopathologist.

   On Saturday, Sunday, holidays, and in emergency situations:
   - Two aspirate smears are stained at CHP laboratory. One is placed in a folder in the CHP Heme lab for the Heme/Onc clinician to review. The second BM aspirate, a current stained peripheral blood slide, current CBC results and a copy of the Hematopathology requisition are sent to the PUH ATL laboratory 5th floor ST, room 5840 to the attention of the lead technologist. The CLINICAL PATHOLOGY resident on call and hematopathologist should be paged and notified of the case by the CHP technologist. The PUH Heme lead technologists will be notified by telephone. The PUH lead technologist will page the pathologist and CP resident on call when the specimen arrives. The rest of the bone marrow aspirate smears should be placed in the plastic containers (after drying) and together with the biopsy sent to the Flow Cytometry lab, S764 Scaife Hall.

Bone Marrow biopsy on cases from UPMC-Presbyterian/Shadyside, UPMC-CHP or outside:
- Monday – Thursday evenings: All CHP biopsies designated for hematopathology, all PUH and SHY adult biopsies are left in the Hematology labs of respective hospitals.
- Monday - Friday evenings all outside bone marrow cases are delivered to the Flow Cytometry specimen drop off shelf outside S763 Scaife Hall.
- Friday evening after 5:30PM - Monday morning: the biopsy is kept with the rest of the case in the S764 Scaife Hall, specimen processing room. This procedure is also followed if Monday is a holiday.
- **Emergent bone marrow biopsies:** After Hematopathologist's approval, the AP resident on call will make the biopsy **Same Day Rush Priority.** The resident will pick up the bone marrow biopsy from S764 Scaife Hall processing area, indicate this on top of the requisition that is left with the rest of the specimen in Scaife, take biopsy to the Gross room for PA to accession and gross in. On Saturdays, gross room PA is available from 8AM – 2PM. (For accessioning and grossing in directions see AP procedure manual). AP resident on call will contact Histotechnologist on call (pager 12239) about the bone marrow biopsy and take the specimen to the Histology lab. Histotechnologist will process the specimen on the overnight processor so the specimen will be ready the next working day.

5. **Flow Cytometry:**
- If specimens cannot be delivered by 5:30 PM Monday through Thursday, leave the specimen at room temperature at the PUH or CHP Hematology lab. It will be sent to the flow cytometry lab the next working day.
- If specimens cannot be delivered by 5:30 PM on Friday, or if there is a specimen obtained before noon on Saturday, call the Flow Cytometry lab between 8 AM and 1 PM on Saturday at (412) 624-3746 to inform them that a specimen is being sent to the Flow Cytometry lab. Leave an Audix message if the flow lab is closed.
- Specimens from Saturday afternoon, Sunday, Thanksgiving, Christmas and other holidays after 1 PM, should be held at room temperature and then sent to the Flow Cytometry lab the following normal working day.
- Any holiday that falls on Monday: flow technologist is on call between 9-1 PM.
- Any holiday that falls on a weekday: flow lab is usually closed. However, flow lab is never closed 2 days in a row. Check with attending if major holiday is on weekend.
- In an **emergency** on all other Monday holidays before 1:00 PM, clinicians are to page the CP resident at (412) 572-5851 who will then contact the hematopathologist on call. The flow cytometry technologist on call is then contacted by the hematopathologist as needed.

6. **Cytogenetics:**
- Monday through Thursday, specimens that cannot be received by the Cytogenetics lab before 5:30 PM should be left at room temperature overnight. Specimens are sent to the Cytogenetics lab the next day.
- For specimens obtained Fridays that cannot be received by the Cytogenetics lab by 5:30 PM, leave the specimen at room temperature in the Cytogenetics bin in the PUH-ATL specimen processing area or CHP Hematology area for pick up on Saturday.
- **Saturday/Sunday/Holiday specimens:** Be sure that the specimen gets to the PUH-ATL specimen processor. The CHP specimen will be delivered to the Cytogenetics lab directly from the CHP Hematology. The PUH-ATL specimen processor or CHP technologists will contact the Cytogenetics lab by page at (412) 917-9458. Cytogenetic lab personnel arrange for the courier pick up of these specimens. Alternatively, call (412) 641-6688 and follow Audix instructions.

7. **Molecular Diagnostic studies:**
- Specimens should get to the lab by 4 PM if at all possible. If other arrangements need to be made or any questions answered, the attending on-call will be available at pager (412) 433-9591. They may be able to have someone come in on Saturday.
- Specimens that have to be held over the weekend or holidays are held as follows:
  - DNA testing: Keep the samples at room temperature.
- RNA testing: Refrigerate the samples at 4° C.
- DNA and RNA testing: Refrigerate the samples at 4° C.
- Tissue samples: Freeze the samples at -20° C.
- A molecular specimen drop off bin is located in the PUH-ATL specimen processing area.

8. The Flow Cytometry Lab, processing room (S-764) Scaife Hall is the central receiving area for bone marrow specimens received from UPMC and non-UPMC affiliated hospitals. The lab is open from 8:00AM to 6:00 PM, Monday through Friday and from 8:00 AM to 4:30 PM Saturday. During these hours the flow technologists/processors are responsible for triaging the specimens they receive (except as noted in numbers 3 and 4). If they receive a marrow requiring emergency review after 5 p.m. or on the weekend, they will forward the appropriate material to the ATL lab to the attention of the hematology lead technologist. A specimen drop off shelf is located outside the flow lab and is used for after-hours specimen delivery. A Special Hematology staff member will triage these samples when the lab opens. Any cases that require triaging or review outside of these hours should be sent to the UPMC-Presbyterian ATL lab to the attention of the hematology lead technologist.

- If a routine bone marrow specimen is delivered to the PUH Gross Room, hold specimen to the next working day and either send to station #36 or hand deliver to room S764 Scaife Hall.

Revised 7/2011
**AP ON-CALL HEME SPECIMENS QUICK GUIDE:**

If the doors are locked to the flow lab (after 6pm) obtain the key from the cabinet across the hall (right next to Room S764) on the top shelf, in a wooden box.

**ALL SPECIMENS MUST HAVE A REQUISITION!**

<table>
<thead>
<tr>
<th>TO PRINT CASSETTES</th>
<th>Go to room across the hall (S764). Log on to the PC next to the cassette engraver. Open up “Schedule Agent” on the desktop. Once the Engraver Manager opens up (may take a few minutes), click the “Start All” button. Now you can print the cassettes in Copath. (see procedure manual for details).</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW SPECIMEN</td>
<td>Place Flow Cytometry specimen in the refrigerator on the top shelf in a bag with the requisition in front of the black bucket. Make sure to mark requisition for “lymph panel” for Flow cytometry testing and place your initials next to your decision. Complete and time stamp a “white slip” (located on PC grossing table) and place the slip on the white board with “IN FRIG” magnet. Before making flow panel choice, please review patient history carefully. Example: (H/O Multiple myeloma dictates Multiple myeloma panel).</td>
</tr>
<tr>
<td>MOLECULAR SPECIMENS</td>
<td>Place molecular specimen in the refrigerator on the DOOR top shelf in a bag with a copy of requisition and filled out molecular form.</td>
</tr>
<tr>
<td>CYTOGENETICS SPECIMENS</td>
<td>Tube Cytogenetics specimen to the PUH ATL lab specimen processing, station 61, placed in a bag with a copy of requisition and filled out cytogenetic form.</td>
</tr>
<tr>
<td>PROCESSING OF SPECIMEN</td>
<td>Cassettes are to be placed in the white containers (or the orange lidded containers for 1 or 2 cassettes) in the Histology bin in the Gross Room. Frozen snap tissue is to be placed in capsule and in the flask containing liquid nitrogen for 2 min. then moved to the -70 freezer located in the hallway (freezer key is located in the white basket across from the flow lab fridge). After you dictate the gross, you may leave the touch preps and paperwork on the grossing bench for us to pick up the following day.</td>
</tr>
<tr>
<td>“Inside” fresh cases: Lymphoma protocol work-up (Presby, Magee, Shadyside, or if whole specimen sent)</td>
<td>Process inside heme specimens in this order: <strong>Always</strong> do histology first. If enough tissue, do flow, cytogenetics and molecular. Submit the RPMI media that specimen was placed in for flow when only enough tissue for histology.</td>
</tr>
<tr>
<td>“Outside” fresh cases sent specifically for Flow Cytometry: Lymphoma protocol work-up (“flow only” cases)</td>
<td>Process outside heme specimens in this order (first be certain outside institution has processed tissue for histologic sections): <strong>Always</strong> do flow first. Second do snap freeze, and if enough tissue, submit for H&amp;E.</td>
</tr>
<tr>
<td>Skin punch biopsy For heme</td>
<td>Call hematopathology attending on call for instructions.</td>
</tr>
<tr>
<td>Emergent Lymph Node Specimens</td>
<td>On weekends and holidays, after Hematopathologist’s approval, the AP resident on call will make the LN specimen <strong>Same Day Rush Priority</strong>. The resident will contact the histotechnologist on call (pager: 12239) to place the LN specimen on the overnight processor for the specimen to be ready the next working day. The AP resident on call will deliver the LN specimen to the histology department.</td>
</tr>
</tbody>
</table>
WEB RESOURCES: GME SITES


GME Knows:  http://spis.upmc.com/psd/home/GME/default.aspx

The Resident and Fellows Assistance Program enable residents, fellows and their household family members to successfully address personal, job-related and career needs in a confidential environment. Our goal is to help you balance your work and personal life.

**Personalized WorkLife Services**
These are specialist services which provide on-line or telephone referrals to much needed resources.
Click the areas below to go directly to your WorkLife portal. (Your click opens up a new window or tab which represents an exit from the GME Intranet and entrance into LifeSolutions WorkLife service portal.)

- **Financial Matters**
- **Health & Wellness**
- **Daily Living**
- **Relocation**
- **Childcare**
- **Home Improvement**
- **Adoption**
- **Legal Matters**
- **Eldercare**

Call now and you can speak with a WorkLife specialist on any topic. Call 1.800.647.3327

**Coaching and Counseling Services In-Person or by Telephone**
You can receive up to 6 sessions per issue, completely private and confidential and not a part of any health plan coverage. They are ready to assist you with:

- The stress of the GME program
- Balancing work and life
- Family, marital and other relationships
- Test taking skills
- Managing stress, anxiety or depression
- Alcohol and drug concerns

To schedule with our professionals, please call 1.800.647.3327

**Multiple Locations**
We have 7 offices throughout UPMC hospitals with professionals ready to assist you. Locations include Oakland near the Holiday Inn, UPMC Braddock, UPMC McKeesport, UPMC Mercy, UMC Passavant, UPMC Shadyside and UPMC St. Margaret’s. In addition to our offices at UPMC facilities, we have over 80 locations in western Pennsylvania.

To schedule with our professionals, please call 1.800.647.3327

**Resident and Fellow Test-taking Preparation Program**
This program is designed to enable residents and fellows to develop the skills needed to be successful test takers. Passing the USMLE, IN-Practice, IN-Service and Board Certification exams are necessary components of medicine and essential to practice.

**Program Components**
1) Work with test-taking professional
2) Up-to-date library of relevant test review and preparation resources
3) Test-taking stress reduction techniques
4) Assessment of strengths, weaknesses, exam taking history and analysis of old exam scores

**Program Flexibility**
1) No Cost
2) Six Sessions Per Issue
3) Free Parking

Please call 412.647.3669 between 8am - 5pm to schedule an appointment, or click HERE to download more information.
CHECKLISTS

ADULT BONE MARROW
ADULT CLINICAL HEMATOLOGY ROTATION
LYMPH NODE
FLOW CYTOMETRY
PEDIATRIC HEMATOPATHOLOGY
LABORATORY MOLECULAR DIAGNOSTICS
CYTOGENETICS
LABORATORY HEMATOLOGY
HISTOLOGY AND IMMUNOHISTOCHEMISTRY
FELLOWS’ INTERDISCIPLINARY CONFERENCE TOPICS
Bone Marrow Rotation Checklist

- Orientation with Dr. Swerdlow and Dr. Roth or his designate.

- Reviewed entire ASCP teaching set (Blood Cell Morphology).

- Reviewed aspirate smears from teaching set with Bone Marrow Technologist.

- Can recognize all normal hematopoietic cell types at all stages of maturation and knows normal bone marrow morphology.

- Knows phenotype of normal hematopoietic elements.

- Confidently can interpret flow cytometry data including histograms.

- Knows role of cytogenetics and molecular diagnostic studies in evaluating hematopoietic / lymphoid disorders in bone marrow and blood.

  **Learned diagnostic criteria using multiparameter approach and clinical implications for each of the following:**

<table>
<thead>
<tr>
<th>Diagnosis/Finding</th>
<th>Observed Actual Case</th>
<th>Observed Teaching File Case</th>
<th>Read About</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MYELOPROLIFERATIVE NEOPLASMS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic myelogenous leukaemia, BCR-ABL1 positive</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Chronic neutrophilic leukaemia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Polycythaemia vera</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Primary myelofibrosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Essential thrombocythaemia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Chronic eosinophilic leukaemia, NOS</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Myeloproliferative neoplasm, unclassifiable</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>MYELOID AND LYMPHOID NEOPLASMS WITH EOSINOPHILIA AND ABNORMALITIES OF PDGFRA, PDGFRB OR FGFR1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MYELODYSPLASTIC/MYELOPROLIFERATIVE NEOPLASMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic myelomonocytic leukaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atypical chronic myeloid leukaemia, BCR-ABL1 negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile myelomonocytic leukaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myelodysplastic/myeloproliferative neoplasm, unclassifiable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractory anaemia with ring sideroblasts associated with marked thrombocytosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MYELODYSPLASTIC SYNDROMES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractory cytopenia with unilineage dysplasia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractory anaemia with ring sideroblasts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractory cytopenia with multilineage dysplasia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refractory anaemia with excess blasts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myelodysplastic syndromes associated with isolated del (5q)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACUTE MYELOID LEUKEMIA (AML) AND RELATED PRECURSOR NEOPLASMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AML with recurrent genetic abnormalities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AML with t(8;21) (q22; q22); RUNX1-RUNX1T1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AML with inv(16) (p13.1q22) or t(16;16) (p13.1;q22); CBFB-MYH11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AML with t(9;11) (q22; q23); MLLT3-MLL

AML with t(6;9) (p23; q34); DEK-NUP214

AML with inv(3) (q21q26.2) or t(3;3) (q221;q26.2); RPN1-EVI1

AML (megakaryoblastic) with t(1;22) (p12;q13); RBM12-MKL1

AML with mutated NPM1

AML with mutated CEBPA

**AML with myelodysplasia-related changes**

**Therapy-related myeloid neoplasms**

**Acute myeloid leukaemia, NOS**

AML with minimal differentiation

AML without maturation

AML with maturation

Acute myelomonocytic leukaemia

Acute monoblastic and monocytic leukaemia

Acute erythroid leukaemia

Acute megakaryoblastic leukaemia

Acute basophilic leukaemia

Acute panmyelosis with myelofibrosis

Blastic plasmacytoid dendritic cell neoplasm

**ACUTE LEUKAEMIAS OF AMBIGUOUS LINEAGE**
<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute undifferentiated leukaemia</td>
<td></td>
</tr>
<tr>
<td>Mixed phenotype acute leukaemias</td>
<td></td>
</tr>
<tr>
<td><strong>PRECURSOR LYMPHOID NEOPLASMS</strong></td>
<td></td>
</tr>
<tr>
<td>B lymphoblastic leukaemia/lymphoma, NOS</td>
<td></td>
</tr>
<tr>
<td>B lymphoblastic leukaemia/lymphoma with</td>
<td></td>
</tr>
<tr>
<td>recurrent genetic abnormalities</td>
<td></td>
</tr>
<tr>
<td>T lymphoblastic leukaemia/lymphoma</td>
<td></td>
</tr>
<tr>
<td><strong>Lymphoid leukaemias</strong></td>
<td></td>
</tr>
<tr>
<td>Chronic lymphocytic leukemia/small lymphocytic lymphoma</td>
<td></td>
</tr>
<tr>
<td>B-cell prolymphocytic leukemia</td>
<td></td>
</tr>
<tr>
<td>Hairy cell leukemia</td>
<td></td>
</tr>
<tr>
<td>T-cell prolymphocytic leukemia</td>
<td></td>
</tr>
<tr>
<td>T-cell large granular lymphocyte leukemia</td>
<td></td>
</tr>
<tr>
<td>Aggressive NK-cell leukemia</td>
<td></td>
</tr>
<tr>
<td>Adult T-cell leukemia/lymphoma</td>
<td></td>
</tr>
<tr>
<td><strong>Plasma cell myeloma</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Bone Marrow involvement in lymphoma</strong></td>
<td></td>
</tr>
<tr>
<td>Lymphoplasmacytic lymphoma</td>
<td></td>
</tr>
<tr>
<td>Marginal zone B-cell lymphomas</td>
<td></td>
</tr>
<tr>
<td>Follicular lymphoma</td>
<td></td>
</tr>
<tr>
<td>Lymphoma Type</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Mantle cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Diffuse large B-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Intravascular large B-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Burkitt lymphoma/leukemia</td>
<td></td>
</tr>
<tr>
<td>Hepatosplenic T-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Mycosis fungoides/ Sézary syndrome</td>
<td></td>
</tr>
<tr>
<td>Peripheral T-cell lymphoma, unspecified</td>
<td></td>
</tr>
<tr>
<td>Angioimmunoblastic T-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Anaplastic large cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Nodular lymphocyte predominant Hodgkin lymphoma</td>
<td></td>
</tr>
<tr>
<td>Classical Hodgkin lymphoma</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Mastocytosis</td>
<td></td>
</tr>
<tr>
<td>BM in Post-transplant lymphoproliferative disorder</td>
<td></td>
</tr>
</tbody>
</table>
### Metastatic tumor in bone marrow

- □
- □
- □

### BM changes post chemotherapy/transplant/growth factor therapy

- □
- □
- □

### Non Neoplastic Disorders

#### Granulomas in bone marrow and differential diagnosis

- □
- □
- □

#### HIV associated disease associated bone marrow changes

- □
- □
- □

#### Autoimmune disease associated bone marrow with increased myelofibrosis

- □
- □
- □

### Red Blood Cells

#### Anemias, NOS

- □
- □
- □

- **Iron Deficiency**

- □
- □
- □

- **Anemia of chronic disease**

- □
- □
- □

- **B12/folate deficiency**

- □
- □
- □

- **Hemolytic anemia**

- □
- □
- □

- **Aplastic anemia**

- □
- □
- □

- **Erythrocytosis and secondary polycythemia**

- □
- □
- □

### White Blood Cells

- **Leukemoid Reaction/Non-Neoplastic Neutrophilia**

- □
- □
- □
<table>
<thead>
<tr>
<th>Condition</th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutropenia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Eosinophilia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Basophilia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Monocytosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lymphocytosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Infectious mononucleosis and other viral infection</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Megakaryocytes/Platelets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrombocytosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Autoimmune thrombocytopenic purpura</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Thrombotic thrombocytopenic purpura</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
PRESENTED THE FOLLOWING BONE MARROW CASES (Fellows submit presentation in portfolio).

<table>
<thead>
<tr>
<th>PHB NUMBER</th>
<th>DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UTILIZED THE FOLLOWING BONE MARROW RESOURCES

- A set of cytochemical stains and pb/bm smears is available from the bone marrow technologists. Individual faculty members also have teaching slides.

- “Articles for Residents” black binders. Classic reference articles for classification of leukemia, etc. Located in G323.


- Foucar, K., Viswanatha, D.S., Wilson, C.S., Non-Neoplastic Disorders of Bone Marrow, American Registry of Pathology, 2008.

- There is a peripheral blood and fluid study set that can be checked out from the Medical Secretaries (G306). The directory of cases is in X:\Hemepath_study_set.

NOTE: Reading is an important component of this rotation. It is recognized that not all of the above resources can be used nor can most be read in entirety. Use of electronic and other resources to find and read up-to-date journal articles is also critical.

I have completed the Bone Marrow Checklist and reviewed it with Dr. Swerdlow or his designate.

Name ________________________________ (printed)
_____________________________ (signature)
Date ________________________________
Lymph Node Rotation Checklist

☐ Orientation with Dr. Swerdlow (Division Director) or his designate.
  ☐ Done prior rotation

☐ Orientation by experienced trainee.
  ☐ Done prior rotation

☐ Orientation by Lymph Node Assistant or designate.
  ☐ Done prior rotation

☐ Competent and comfortable with gross processing and triaging of fresh lymph nodes and spleens and other specimens with possible hematopoietic/lymphoid disorders.

☐ Competent and comfortable to construct, dictate and proof full reports and to order stains using CoPath.

☐ Knows normal architecture and immunoarchitecture of lymph node, spleen and Peyer’s Patch.

☐ Knows reactivity of all antibodies used in flow cytometry panel to assess hematopoietic/lymphoid disorders in lymph node, spleen and all other extranodal sites (panels in resident/fellow handbook).

☐ Confidently can interpret flow cytometry data including histograms.

☐ Knows role of cytogenetic and molecular diagnostic studies in evaluating hematopoietic/lymphoid disorder in lymph node, spleen and other extranodal sites.

Learned diagnostic criteria using multiparameter approach and clinical implications for each of the following in lymph nodes and extranodal sites (residents to accomplish at least lower case items in bold, fellows to accomplish all over one year):

<table>
<thead>
<tr>
<th>Diagnosis / Finding</th>
<th>Observed Actual Case</th>
<th>Observed Teaching File Case</th>
<th>Read about</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-NEOPLASTIC DISORDERS (NODAL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viral-associated adenitis  (infectious mononucleosis, postvaccinal, herpes zoster, cytomegalovirus, measles, HIV)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Syphilis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Cat-scratch disease</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Granulomatous processes</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Whipple’s disease</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Bacillary angiomatosis</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Diagnosis / Finding</td>
<td>Observed Actual Case</td>
<td>Observed Teaching File Case</td>
<td>Read about</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-----------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Autoimmune disorders</strong> <em>(Rheumatoid arthritis, Sjögren’s syndrome, Adults Still’s disease, systemic lupus erythematosus)</em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Sarcoidosis</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Angiofollicular hyperplasia/Castleman’s Disease</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Inflammatory pseudotumor</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Dermatopathic lymphadenopathy</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Sinus histiocytosis with massive adenopathy <em>(Rosai-Dorfman)</em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Histiocytic Necrotizing Lymphadenitis</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Kimura’s disease/angiolymphoid hyperplasia with eosinophilia</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Drug reactions <em>(Dilantin, Tegretol)</em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Hemophagocytic syndrome</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Immunodeficiency states <em>(including ALPS, other)</em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Lymph node infarction</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>MALIGNANT LYMPHOMAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B lymphoblastic leukaemia/lymphoma</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>T lymphoblastic leukaemia/lymphoma</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Chronic lymphocytic leukemia/small lymphocytic lymphoma</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Lymphoplasmacytic lymphoma</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Extramedullary marginal zone lymphoma of mucosa-associated lymphoid tissue <em>(MALT lymphoma)</em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Nodal marginal zone lymphoma</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Follicular lymphoma</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Primary cutaneous follicle centre lymphoma</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td><strong>Mantle cell lymphoma</strong></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>*<em>Diffuse large B-cell lymphoma <em>(DLBCL), NOS</em></em></td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Diagnosis / Finding</td>
<td>Observed Actual Case</td>
<td>Observed Teaching File Case</td>
<td>Read about</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-----------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>T-cell/histiocyte rich large B-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary DLBCL of the CNS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary cutaneous DLBCL, leg type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBV positive DLBCL of the elderly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLBCL associated with chronic inflammation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphomatoid granulomatosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary mediastinal (thymic) large B-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Intravascular large B-cell lymphoma</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALK positive DLBCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasmablastic lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large B-cell lymphoma arising in associated multicentric Castleman disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary effusion lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Burkitt lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-cell lymphoma, unclassifiable, with features intermediate between diffuse large B-cell lymphoma and Burkitt lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-cell lymphoma, unclassifiable, with features intermediate between diffuse large B-cell lymphoma and classical Hodgkin lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult T-cell leukaemia/lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extranodal NK/T cell lymphoma, nasal type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enteropathy-associated T-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hepatosplenic T-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subcutaneous panniculitis-like T-cell lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mycosis fungoides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sézary syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis / Finding</td>
<td>Observed Actual Case</td>
<td>Observed Teaching File Case</td>
<td>Read about</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
<td>-----------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Primary cutaneous CD30 positive T-cell lymphoproliferative disorders</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphomatoid papulosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary cutaneous anaplastic large lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary cutaneous gamma-delta T-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary cutaneous CD8 positive aggressive epidermotropic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary cutaneous CD4 positive small/medium T-cell lymphoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peripheral T-cell lymphoma, NOS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Angioimmunoblastic T-cell lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anaplastic large cell lymphoma, ALK positive</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaplastic large cell lymphoma, ALK negative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nodular lymphocyte predominant Hodgkin lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Classical Hodgkin lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POST-TRANSPLANT LYMPHOPROLIFERATIVE DISORDERS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early lesions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasmacytic hyperplasia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infectious-mononucleosis-like PTLD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Polymorphic PTLD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Monomorphic PTLD, B-cell types, T-cell types</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hodgkin lymphoma type PTLD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HISTIOCYTIC AND DENDRITIC CELL NEOPLASMS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Histiocytic sarcoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Langerhans cell histiocytosis/sarcoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdigitating dendritic cell sarcoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follicular dendritic cell sarcoma</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Learned diagnostic criteria for the following in the SPLEEN (residents to accomplish at least items in lower case bold, fellows to accomplish all over one year):

<table>
<thead>
<tr>
<th>Diagnosis / Finding</th>
<th>Observed Actual Case</th>
<th>Observed Teaching File Case</th>
<th>Read about</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OTHER NEOPLASMS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastocytosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myeloid sarcoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blastic Plasmacytoid dendritic cell neoplasm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metastatic tumors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BENIGN</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Localized lymphoid hyperplasia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in benign systemic and infectious disorders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rheumatoid arthritis (Felty's syndrome)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Autoimmune thrombocytopenic purpura</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrombotic thrombocytopenic purpura</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hereditary spherocytosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquired immune deficiency syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial infections including bacillary angiomatosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Viral infections including infectious mononucleosis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castleman disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibrocongestive splenomegaly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Histiocytic proliferations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid histiocytes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceroid histiocytosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gaucher's disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langerhans cell histiocytosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemophagocytic syndrome</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Splenic Expression of the Following Lymphomas

<table>
<thead>
<tr>
<th>Lymphoma Type</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic lymphocytic leukemia / Small lymphocytic lymphoma</td>
<td></td>
</tr>
<tr>
<td>Lymphoplasmacytic lymphoma</td>
<td></td>
</tr>
<tr>
<td><strong>Mantle cell lymphoma</strong></td>
<td></td>
</tr>
<tr>
<td>Splenic and other marginal zone B-cell lymphomas</td>
<td></td>
</tr>
<tr>
<td>Splenic lymphoma/leukaemia, unclassifiable</td>
<td></td>
</tr>
<tr>
<td><strong>Follicular lymphoma</strong></td>
<td></td>
</tr>
<tr>
<td>Diffuse large B-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Hepatosplenic T-cell lymphoma</td>
<td></td>
</tr>
<tr>
<td>Other non-Hodgkin’s lymphomas</td>
<td></td>
</tr>
<tr>
<td>Prolymphocytic leukemia</td>
<td></td>
</tr>
<tr>
<td>Large granular lymphocytic leukemia</td>
<td></td>
</tr>
</tbody>
</table>

## Changes in Leukemias and Myeloproliferative Disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic myeloid leukemia</td>
<td></td>
</tr>
<tr>
<td>Chronic myeloproliferative neoplasm</td>
<td></td>
</tr>
<tr>
<td><strong>Hairy cell leukemia</strong></td>
<td></td>
</tr>
<tr>
<td>Acute leukemias</td>
<td></td>
</tr>
<tr>
<td><strong>Systemic mastocytosis</strong></td>
<td></td>
</tr>
</tbody>
</table>

## Nonhematopoietic Lesions

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental cysts</td>
<td></td>
</tr>
<tr>
<td>Hamartomas</td>
<td></td>
</tr>
</tbody>
</table>

## Vascular Neoplasms

### Hemangiomas

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphangiomas</td>
<td></td>
</tr>
</tbody>
</table>

### Littoral-cell Angiomas

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angiosarcomas</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonvascular sarcomas</td>
<td></td>
</tr>
<tr>
<td>Metastases</td>
<td></td>
</tr>
<tr>
<td>Inflammatory pseudotumor</td>
<td></td>
</tr>
</tbody>
</table>
PRESENTED THE FOLLOWING “LYMPH NODE” CASES (Submit Presentation in Portfolio).

<table>
<thead>
<tr>
<th>PHS NUMBER</th>
<th>DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UTILIZED THE FOLLOWING LYMPH NODE RESOURCES

- Lymph node chapter in Sternberg. [Highly recommended]
- Swerdlow, S.H., Campo, E., Harris, N.L., Jaffe, E., Pileri, S.A., Stein, H., Thiele, J., Vardiman, J. (Eds.): WHO Classification of Tumours Pathology of Haematopoietic and Lymphoid Tumours, IARC, Lyon, 2008. [Highly recommended]
- Checkpath (images, histories and explanations of faculty CME program for Hematopathology) (PUH G315 and in Dr. Swerdlow’s coordinator’s office).
- Teaching/conference sets of glass slides of marrows, lymph nodes, etc. (Dr. Swerdlow’s office).
- Virtual teaching set http://residents.pathology.pitt.edu/

NOTE: Reading is an important component of this rotation. It is recognized that not all of the above resources can be used nor can most be read in entirety. Use of electronic and other resources to find and read up-to-date journal articles is also critical.

I have completed the Lymph Node Checklist and reviewed it with Dr. Swerdlow or his designate.

Name __________________________________________ (printed)
__________________________________________ (signature)
Date  __________________________________________
Flow Cytometry Rotation Checklist

- Orientation with the Lead Technologist or her designate.
- Understand the principles of flow cytometric immunophenotyping.
- Gain familiarity with instrument set-up, compensation and quality control.
- Gain familiarity with procedures for surface and cytoplasmic antibody staining.
- Understand the principles of back-gating and gating using light scatter and antigen expression.
- Understand the procedure for DNA / ploidy analysis.
- Perform additional data analysis using DIVA software on specimens previously analyzed in the clinical Flow Cytometry Laboratory.

Know the immunophenotypic characteristics of the following entities:

<table>
<thead>
<tr>
<th>Diagnosis/Finding</th>
<th>Observed Actual Case</th>
<th>Observed Teaching Case</th>
<th>Read About</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal bone marrow</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Hematogones</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Reactive Lymph Node</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
</tbody>
</table>

Lymphoma

- Follicular lymphoma | ❑ | ❑ | ❑ |
- Chronic lymphocytic leukemia/Small lymphocytic lymphoma | ❑ | ❑ | ❑ |
- Mantle Cell lymphoma | ❑ | ❑ | ❑ |
- MALT lymphoma | ❑ | ❑ | ❑ |

Diagnosis/Finding

- Burkitt lymphoma | ❑ | ❑ | ❑ |
- T-cell lymphoma | ❑ | ❑ | ❑ |
Chronic leukemia

- Hairy Cell Leukemia
- Prolymphocytic Leukemia, B-cell phenotype
- Prolymphocytic Leukemia, T-cell phenotype
- Sézary Syndrome
- Large Granular Lymphocytic Leukemia
- Adult T-cell Leukemia / Lymphoma

Acute Myeloid Leukemia

- Acute Promyelocytic Leukemia
- Acute Myeloid Leukemia associated with t(8;21)
- Acute Myeloid Leukemia associated with inv(16)
- Acute Myeloid Leukemia with monocytic differentiation
- Acute Megakaryocytic Leukemia

Acute Lymphoblastic Leukemia

- Precursor B-cell
- Precursor T-cell
- Minimal Residual Acute Lymphoblastic Leukemia

Paroxysmal Nocturnal Hemoglobinuria

Chronic Granulomatous Disease

- Neutrophil Oxidative Burst Analysis
UTILIZED THE FOLLOWING FLOW CYTOMETRY RESOURCES


I have completed the Flow Cytometry Checklist and reviewed it with Dr. Craig or her designate.

Name __________________________________________ (printed)

__________________________________________ (signature)

Date  __________________________________________
Pediatric Hematopathology Checklist [Revised 7/2009]

- Orientation with Hematopathologist on Pediatric Hematopathology service.
- Knows how normal pediatric blood and bone marrow differ from those of adults.
- Knows special aspects of neonatal hematopathology (see K. Foucar, “Neonatal Hematopathology: Special Considerations” in Collins RD and Swerdlow SH, eds. Pediatric Hematopathology).
- Knows role of cytogenetic and molecular diagnostic studies in evaluating hematopoietic / lymphoid disorders in bone marrow and blood.
- Learn diagnostic criteria using multiparameter approach and clinical implications for each of the following:

### NEOPLASTIC DISORDERS

#### Acute Lymphoblastic Leukemia
- B-lymphoblastic leukemia / lymphoma
- T- lymphoblastic leukemia / lymphoma

#### Acute Myeloid Leukemias
- Acute Myeloid Leukemia with 11q23 abnormality
- Acute Myeloid Leukemia with recurrent cytogenetic abnormality, other
- Acute Megakaryoblastic Leukemia
- AML/MDS associated with congenital marrow failure syndromes
- Acute Myeloid Leukemia, not otherwise specified

#### Myeloid Leukemia
- Mixed lineage acute leukemia
- Myeloid proliferations associated with Down Syndrome
  - Myeloid Leukemia
  - Transient Abnormal Myelopoiesis

#### Chronic Myeloproliferative Neoplasms
- Chronic Myelogenous Leukemia

#### Myelodysplastic/Myeloproliferative Disease
- Juvenile Myelomonocytic Leukemia

#### Myelodysplastic Syndromes
- Childhood Myelodysplastic Syndromes
  - Refractory cytopenia of childhood

Diagnosis / Finding | Observed Actual Case | Observed Teaching File Case | Read About
--- | --- | --- | ---
Acute Lymphoblastic Leukemia | ☐ | ☐ | ☐
B-lymphoblastic leukemia / lymphoma | ☐ | ☐ | ☐
T- lymphoblastic leukemia / lymphoma | ☐ | ☐ | ☐
Acute Myeloid Leukemias | ☐ | ☐ | ☐
Acute Myeloid Leukemia with 11q23 abnormality | ☐ | ☐ | ☐
Acute Myeloid Leukemia with recurrent cytogenetic abnormality, other | ☐ | ☐ | ☐
Acute Megakaryoblastic Leukemia | ☐ | ☐ | ☐
AML/MDS associated with congenital marrow failure syndromes | ☐ | ☐ | ☐
Acute Myeloid Leukemia, not otherwise specified | ☐ | ☐ | ☐
Mixed lineage acute leukemia | ☐ | ☐ | ☐
Myeloid proliferations associated with Down Syndrome | ☐ | ☐ | ☐
Myeloid Leukemia | ☐ | ☐ | ☐
Transient Abnormal Myelopoiesis | ☐ | ☐ | ☐
Chronic Myelogenous Leukemia | ☐ | ☐ | ☐
Juvenile Myelomonocytic Leukemia | ☐ | ☐ | ☐
Childhood Myelodysplastic Syndromes | ☐ | ☐ | ☐
Refractory cytopenia of childhood | ☐ | ☐ | ☐
### Mature Lymphoid Neoplasms
- Burkitt Lymphoma
- Diffuse Large B-cell Lymphoma
- Anaplastic Large Cell Lymphoma, ALK+
- Pediatric Nodal Marginal Zone Lymphoma
- Pediatric Follicular Lymphoma
- Systemic EBV+ T-cell LPD of Childhood
- Hydroa Vacciniforme-like Lymphoma
- Nodular Lymphocyte Predominant Hodgkin Lymphoma
- Classical Hodgkin Lymphoma

### Histiocytic Neoplasms
- Langerhans cell histiocytosis

### Mast Cell Disease

### Metastatic Tumors
- Neuroblastoma
- Rhabdomyosarcoma
- Ewing sarcoma

### NON-NEOPLASTIC DISORDERS
#### Congenital Disorders/Syndromes with Prominent Hematologic Abnormalities (Hereditary bone marrow failure)
- Fanconi Anemia
- Diamond Blackfan Syndrome
- Congenital Dyserythropoietic Anemia
- Congenital Sideroblastic Anemia
- Pearson Syndrome
- Severe Congenital Neutropenia/Kostmann’s Syndrome
- Cyclic Neutropenia
- Shwachman-Diamond Syndrome
- Dyskeratosis Congenita
- Reticular Dysgenesis
- May-Hegglin Anomaly
Bernard-Soulier Syndrome
Wiskott-Aldrich Syndrome
Congenital Amegakaryocytic Thrombocytopenia
Familial Platelet Syndrome with Predisposition to Acute Myeloid Leukemia
X-linked thrombocytopenia
Thrombocytopenia with Absent Radii (TAR)
Gray Platelet Syndrome
X-Linked Lymphoproliferative Disorder
DiGeorge Syndrome
Severe Combined Immunodeficiency Disease
Red Cell cytoskeletal/membrane abnormalities-hemolytic anemia
Red Cell enzyme deficiencies-hemolytic anemia
Hemoglobinopathies
Sickle cell disease
Thalassemia
Other
Gaucher Disease
Niemann-Pick
Mucopolysaccharidoses

Other Anemias
Transient erythroblastopenia of childhood
Alloimmune hemolytic anemia of newborn
Iron deficiency
B12/folate deficiency

Thrombocytopenia (see also above)
Autoimmune Thrombocytopenic Purpura
TTP/Hemolytic Uremic Syndrome
Congenital syndromes
Drugs/toxins
Infection-associated
Thrombocytosis
Neutropenia
  Immune neutropenia
Neutrophilia/Leukemoid Reaction
  Infection/inflammatory disorders
  Medications
Eosinophilia
Basophilia
Lymphopenia
  Infection
  Medication
  Autoimmune
  Nutritional Deficiency
  Congenital Disorders
Lymphocytosis
  Epstein Barr Virus (infectious mononucleosis)
  Pertussis
  Infection, other
Granulomas
Myelofibrosis
**Aplastic Anemia**

- Idiopathic Drugs
- Secondary
  - Infection Associated
  - Drugs/toxins

**Hemophagocytic/Macrophage activation syndromes**

- Familial lymphohistiocytosis
- Secondary hemophagocytic/macrophage activation syndrome

**Immunodeficiencies**

- Autoimmune Lymphoproliferative Syndrome
- Other Primary Immunodeficiencies (see above)
PRESENTED THE FOLLOWING PEDIATRIC BONE MARROW OR LYMPH NODE CASES
(Submit Presentation in Portfolio.)

<table>
<thead>
<tr>
<th>PHB NUMBER</th>
<th>DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UTILIZED THE FOLLOWING BONE MARROW RESOURCES


NOTE: Reading is an important component of this rotation. It is recognized that not all of the above resources can be used nor can most be read in entirety. Use of electronic and other resources to find and read up-to-date journal articles is also critical.

I have completed the Pediatric Hematopathology Checklist and reviewed it with Dr. Contis or her designee.

Name __________________________________________ (printed)
                                           _______________________________ (signature)

Date  __________________________________________
# General Laboratory Topics Checklist

- **Rotating Fellow Name:** ________________________________
- **Rotation Period:** ________________________________

<table>
<thead>
<tr>
<th></th>
<th>Check Status</th>
<th>Staff</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sample receipt/ordering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sample Handling DNA from blood DNA from bone marrow (BM) DNA from paraffin RNA from blood/BM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MDX Database</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. MDX Administration Licensing Billing for MO tests Reimbursement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. MDX QC/QA/QI for MO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Fellow signature:** _____________________________________________
- **Date:** _________________________
The idea is to see the separate steps which go into nucleic acid-based assays. A number of these are common among procedures. The list below attempts to ‘carve out’ the unique features of certain assay types that you may not see in other assays. Coordinate with the Lab Manager, Lead Technologists, Specialty Technologists and Medical Laboratory Technologists to see what you need to.

<table>
<thead>
<tr>
<th>Step Description</th>
<th>Check Status</th>
<th>Staff</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Blot (e.g. IgH, TcR-beta)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNA quantitation/assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restriction Enzyme Digestion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrophoresis and Blotting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe Preparation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybridization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure and Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCR analysis followed by gel sizing (IgH, TCR-gamma PCR, BLC2, JAK2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCR Set-up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running PCR and Gel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrophoresis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detection of PCR Products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT-PCR analysis qualitative (e.g. PML-RARalpha, t15;17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCR Setup (2nd reaction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative PCR (e.g. BCR/ABL for CML)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RNA quantitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT-PCR Set-Up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorimetric Assay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fellow Signature: _____________________________________________

Date: _________________________
<table>
<thead>
<tr>
<th>Activity</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab tour</td>
<td></td>
</tr>
<tr>
<td>Slide presentation</td>
<td></td>
</tr>
<tr>
<td>Review of recent literature to familiarize self with the fields of genetics, cytogenetics, cytogenetic methods, and applications to clinical medicine, especially with regards to hematology/oncology/bone marrow transplantation</td>
<td></td>
</tr>
<tr>
<td>Read laboratory procedure manual in order to understand the rationale behind the methodologies and safety precautions used in the cytogenetic laboratory</td>
<td></td>
</tr>
<tr>
<td>Observe basic laboratory procedures</td>
<td></td>
</tr>
<tr>
<td>• cell culture initiation</td>
<td></td>
</tr>
<tr>
<td>• cell culture harvest</td>
<td></td>
</tr>
<tr>
<td>• banding</td>
<td></td>
</tr>
<tr>
<td>• chromosome analysis</td>
<td></td>
</tr>
<tr>
<td>• karyotyping</td>
<td></td>
</tr>
<tr>
<td>• Cytovision</td>
<td></td>
</tr>
<tr>
<td>• FISH</td>
<td></td>
</tr>
<tr>
<td>Practice karyotyping and interpret results in the form of cytogenetic reports</td>
<td></td>
</tr>
<tr>
<td>Scan G-banded slides to compare the results of PHA-stimulated peripheral blood, unstimulated peripheral blood, and bone marrow cultures to appreciate the different mitotic indices and appearance of chromosomes prepared under different culture conditions</td>
<td></td>
</tr>
<tr>
<td>Review files of interesting cases to observe the longitudinal changes in karyotypes over the course of treatment and to see how various cytogenetic and FISH findings are interpreted</td>
<td></td>
</tr>
<tr>
<td>Review files and literature of interesting cases with particular emphasis on commonly found hematopoietic chromosomal abnormalities</td>
<td></td>
</tr>
<tr>
<td>• t(1;19)(q23;p13)</td>
<td></td>
</tr>
<tr>
<td>• t(4;11)(q21;q23)</td>
<td></td>
</tr>
<tr>
<td>• del (5q)</td>
<td></td>
</tr>
<tr>
<td>• monosomy 7</td>
<td></td>
</tr>
<tr>
<td>• trisomy 8</td>
<td></td>
</tr>
<tr>
<td>• t(8;14)(q24;q32)</td>
<td></td>
</tr>
<tr>
<td>• t(8;21)(q22;q22)</td>
<td></td>
</tr>
<tr>
<td>• t(8;22)(q24;q11.2)</td>
<td></td>
</tr>
<tr>
<td>• t(9;22)(q34;q11.2)</td>
<td></td>
</tr>
<tr>
<td>• del (11)(q23)</td>
<td></td>
</tr>
<tr>
<td>• t(14;18)(q32;q21)</td>
<td></td>
</tr>
<tr>
<td>• t(15;17)(q22;q12)</td>
<td></td>
</tr>
<tr>
<td>• inv 16</td>
<td></td>
</tr>
<tr>
<td>• t(11;14)(q13;q32)</td>
<td></td>
</tr>
<tr>
<td>Time permitting, culture and karyotype peripheral blood cells from him/herself or others to practice the procedures they have learned</td>
<td></td>
</tr>
<tr>
<td>Review cases with the directors and attach case log</td>
<td></td>
</tr>
<tr>
<td>Additional procedures from the pathology residents training list if interested (not required)</td>
<td></td>
</tr>
<tr>
<td>Attend:</td>
<td></td>
</tr>
<tr>
<td>Clinical case conference (see calendar)</td>
<td></td>
</tr>
<tr>
<td>Friday noon and other seminars</td>
<td></td>
</tr>
<tr>
<td>Literature searches/research project</td>
<td></td>
</tr>
</tbody>
</table>
PARTICIPATED IN CYTOGENETICS SIGNOUT OF THE FOLLOWING CASES:

<table>
<thead>
<tr>
<th>CoPath ACCESSION NUMBER</th>
<th>DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attach additional sheets as required.
General/Special Hematology Laboratory Experience Checklist  [Revised 7/09]

This checklist indicates the areas that need to be covered during the general/special laboratory experience and the specific activities that are to be performed. This should occupy approximately half your time when combined with pediatric hematopathology (as in core resident/fellow rotation).

Check boxes to the left of specific activities when the indicated activities are completed.

This checklist is also included separately and must be signed and turned in to Dr. Swerdlow’s office at the completion of the rotation.

1. General Activities

☐ Review a spectrum of abnormal results. These should include:
  - Macrocytic and microcytic anemias
  - Thrombocytopenia
  - Granulocytosis and granulocytopenia
  - Blasts in the peripheral blood
  - Cases with intraleukocytic abnormalities as available, either as review specimens or in the study sets

If no cases of each of the above are available and you are in your last week, be sure to review teaching slides or other resources (ask Dr. Contis or designee for help if required). At the end of the 3 week rotation, meet with Dr. Contis to go over your list.

☐ Follow-up patients whom you have reviewed with abnormal peripheral bloods and body fluids to determine the significance of the abnormality on diagnostic and therapeutic decision making and ultimate clinical outcome.

☐ Keep a list of the following (include relevant clinical information that you have obtained for each patient):
  - The laboratory tests (routine and special) that you have observed (or reviewed following returns by the reference laboratories).
  - The abnormal peripheral blood films and body fluid smears that you have seen. Also see section 2B below.

☐ Give laboratory hematology presentation for Continuing Education in Clinical Chemistry and Hematology (see detailed instructions in Resident/Fellow Handbook).

2. Specific Activities

General Hematology Laboratory (ATL)

The laboratory manager, Melissa Crandall and the hematology lead technologist, Betty Austin, will help you with hematology instrumentation and identification of abnormal cases that need to be reviewed.

A. General

☐ Review procedure manuals in general hematology, coagulation and urinalysis including the procedures for operating the Iris iQ 200 urinalysis instrument.
The purpose of this review is to learn how a procedure manual is constructed, to appreciate the CLSI (formally NCCLS) format and to learn how to find a procedure when needed.

- Be sure that the Laboratory Hematology Staff Meeting fellow attendance sheet is completed with your signature at all the staff meetings/laboratory management meetings that you attend.
- Participate in troubleshooting. This includes analysis of problems with function of instruments, quality control, or patient data that appear spurious. The problems will be brought to your attention by the technical staff and/or Dr. Contis or designee.

B. Hematologic Microscopy

- Review normal PB morphology, understanding variations between adult and pediatric values. (Review ASCP sets located in room G315, if not previously reviewed or if further review is needed).
  - See criteria for evaluating red cells on sheet “Red Cell Morphology Classification (1+, 2+, 3+)” in the hard copy supplement.
- Evaluate all abnormal slides referred to the pathologist (ongoing throughout rotation). This is performed by checking to see if there are slides for review (bone marrow technologists will usually bring them to you). When slides are designated, the trainee should obtain clinical information about the patient, including checking Copath for prior pathologic evaluations, then review the slide including performing a 100-200 cell differential for peripheral blood films and a morphologic review of the cytospin slide for a fluid. The trainee should then formulate a differential diagnosis and then review the case with the pathologist on the laboratory service (see schedule). This review is an essential part of the laboratory’s function since the ATL lab is often the first place where an abnormality is detected.
  - Peripheral Blood Films
  - Body Fluid Cytospin slides

- Correlate body fluid results from cytology laboratory with hematology findings.
- Alert Dr. Christine Roth to interesting peripheral blood films or body fluid slides. Provide her the slides, a photocopy of the lab values and clinical information.

C. Automated Equipment: Coulter LH 750 and Cellavision

- Review information provided in your folder
- Review procedure manual

Observe:
- Setup/Cleaning of instrument
- QC/QA Procedures, graphing
- Operation of Coulter and Cellavision
- Understand principles of instrument. This is discussed in procedure manual and also lead techs can answer questions.
- Review interpretation of Coulter dot plots and causes of spurious results. Use procedure manual as well as cases you observe in the laboratory.
  - See examples on the “Complete Blood Count” in the hard copy supplement.
  - See 2 slides explaining histograms and dot plots.
  - See up-to-date, “Automated Hematology Instrumentation”.
  - Learn to evaluate normal and abnormal patterns.
  - Understand meaning of individual flags and mechanisms for evaluating flags.
Know what a flag is.

**Urinalysis**

1. **Iris iQ200:**
   - Review information provided in your folder
   - Review procedure manual
   - Observe set-up and urinalysis runs on the Iris iQ200

   Observe:
   - Set up, preparation of reagents, samples
   - QC/QA Procedures, graphing
   - Running, evaluation of samples

   Review urine sediment images in Iris iQ200 and know about major urine microscopy findings and their significance.

   Understand principles of instrument and manual back-up procedures (when and how)

   Understand sensitivities and specificity of color reactions and drug interference. Understand principles of instrument and back-up procedures (when and how).

   Review Educational Resources
   - Iris iQ200 archive of abnormals
     - Crystals and casts
     - Cells

2. **Coagulation automated equipment: STA-R Evolution (Diagnostica Stago, Inc)**

   Review procedure manual

   Observe:
   - Set up, preparation of reagents, samples
   - QC/QA Procedures, graphing
   - Running, evaluation of samples

   Understand significance of results for pre-operative screening and monitoring anticoagulant therapy by reading text materials or original literature and by discussion of issues with the pathologist on the laboratory service. This should include understanding the significance and use of the INR.

   Observe the D-dimer procedure and understand its clinical usage as a negative predictor for DVTs and as a positive indicator of DIC.

**Administrative Aspects of Laboratory**

Attend the weekly Hematology Laboratory meeting during your 3-week rotation.

When: Every other Wednesday at 2 p.m. (Melissa Crandall updates the meeting schedule and sends out agenda).
Where: CLSI hematology library (5924 MT).

3. **Special Hematology Laboratory**

Most tests are sent out to reference laboratories.

**A. General**
- Review test menu and procedure manual
  - Observe any test procedures being performed.

**B. Specific Tests:**

- **Hemoglobin Evaluation**
  - Understand co-migration of hemoglobins and methods for distinguishing them, clinical significance, relationship to Sickledex.
  - Understand mechanisms of false positives/negatives, effect of transfusion on findings.
  - Understand principles of HPLC for hemoglobin separation.
  - During the 1st half of the rotation, review 6-12 months of the HPLC tracings performed at Children’s Hospital of Pittsburgh, which are available in binder (CHP Hemoglobinopathy Screening by HPLC) in sign-out room G315 in the division of hematopathology.
  - Use the following resources to study hemoglobin variant testing (available in the sign-out room):
  - During the 2nd half of the rotation, meet with Dr. A. Rosendorff to go over interesting HPLC tracings that the fellow has identified from the last 6-12 months.

- **Test of RBC function**

Know how these tests are performed and how they are useful:

- RBC enzymes (G6PD, PK, GPI, etc.)
  - Teaching case /recent send out file
  - Read about

- Plasma, serum, urine, hemoglobin
  - Teaching case /recent send out file
  - Read about
- Osmotic fragility
  - Teaching case /recent send out file
  - Read about

- Heinz bodies
  - Teaching case /recent send out file
  - Read about

- Miscellaneous Tests
  - Acetylcholinesterase (ACHE)
  - Muramidase
  - Urine, serum myoglobin
  - Flow cytometry for PNH (If not reviewed in Flow rotation)
  - Neutrophil oxidative product formation analysis (If not reviewed in Flow rotation.)

- Staining of bone marrow smears
  - Routine Stains
  - Cytochemical and immunocytochemical methods/procedures

- Other Hematology Testing: (Vitamin B12, serum and RBC folate, serum iron and ferritin)
  
  These tests are now done in chemistry.

  - Discuss how they are used in the workup of hematologic disorders with Dr. Contis.
  - Review methodology utilized (see Chemistry lead tech, Theresa Humpe).

**References:**

- Clinical Diagnosis and Management by Laboratory Methods, John Bernard Henry.

---

Before completing your rotation, please review the completed checklist with Dr. Contis, sign and turn into Dr. Swerdlow’s office.

I have completed the General Hematology Laboratory Checklist and reviewed it with Dr. Contis.
Resident/Fellow Name (Printed)
Signature ___________________________       Date ___________________

___________________________________________
Signature of Lydia Contis, MD or designee
## HEMOGLOBIN ANALYSIS CASE LOG

<table>
<thead>
<tr>
<th>ACCESSION NUMBER</th>
<th>DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCESSION NUMBER</td>
<td>DIAGNOSIS</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>CASE NUMBER</td>
<td>DIAGNOSIS</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Immunohistochemistry Rotation Checklist

FELLOW NAME: _____________________________________________  

☐ Orientation to IHC Staff, facility and workflow (Mr. Tony Green or designee)

☐ Receive an overview of Ventana stainers in terms of how they work, strengths and weaknesses

☐ Observe and assist with loading of IHC run onto Ventana stainers

☐ Review in detail basic protocols for stains utilized in hematopathology

☐ Review of written technical material provided by the supervisor of the IHC laboratory

☐ Review procedure for developing and evaluating new antibody testing

☐ Assist with screening of completed immunohistochemical stains and provide feedback if appropriate on staining for the purpose of quality improvement

Fellow signature __________________________________________ Date __________

Reviewed by: ____________________________________________ Date __________
## FELLOWS’ INTERDISCIPLINARY CONFERENCE 2008-2009

### Name of Fellow: _______________________

<table>
<thead>
<tr>
<th>Topic</th>
<th>Presenter</th>
<th>Date Lecture was Viewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professionalism and the Consultant (8/21/08)</td>
<td>Dr. Rachel Givelber</td>
<td></td>
</tr>
<tr>
<td>The 80, 30, 10 Conundrum: Sleep, Learning, Safety, and Graduate Medical Education</td>
<td>Dr. Melissa (Missy) McNeil</td>
<td></td>
</tr>
<tr>
<td>Impaired Physicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpersonal Communication Skills (9/18/08)</td>
<td>Dr. Rosanne Granieri</td>
<td></td>
</tr>
<tr>
<td>Enhancing the Impact and Outcome of Lecturing</td>
<td>Dr. Terri Collin</td>
<td></td>
</tr>
<tr>
<td>The Science and Art of Assessment and Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice-Based Learning (10/23/08)</td>
<td>Dr. Hollis Day</td>
<td></td>
</tr>
<tr>
<td>Evidence-Based Practice for Educators</td>
<td>Library Staff-Charles Wessel, MLS</td>
<td></td>
</tr>
<tr>
<td>The Search for Evidence: Locating Evidence-Based Health Care Information Using the HSLS Resource Pyramid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice-Based Learning (11/6/08)</td>
<td>Dr. Doris Rubio</td>
<td></td>
</tr>
<tr>
<td>Biostatistics – Part I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice-Based Learning (11/20/08)</td>
<td>Dr. Doris Rubio</td>
<td></td>
</tr>
<tr>
<td>Biostatistics – Part II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Science</td>
<td>Dr. Doris Rubio</td>
<td></td>
</tr>
<tr>
<td>Principles of Research (12/18/08)</td>
<td>Dr. Christopher (Chris) Ryan</td>
<td></td>
</tr>
<tr>
<td>Biomedical Research Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal and Ethical Aspects of Research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Science</td>
<td>Dr. Kevin Kraemer</td>
<td></td>
</tr>
<tr>
<td>Principles of Research (1/8/08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The World of Grants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Science</td>
<td>Dr. Michael Fine</td>
<td></td>
</tr>
<tr>
<td>Principles of Research (1/22/08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing Manuscripts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Science</td>
<td>Dr. Rachel Givelber</td>
<td></td>
</tr>
<tr>
<td>Principles of Research (2/5/08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translational Research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study Design: From the Bedside to the Bench And Back Again</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>