

Educational Goals and Objectives

UNIVERSITY OF FLORIDA HEMATOPATHOLOGY FELLOWSHIP PROGRAM GOALS AND OBJECTIVES

MISSION:

Our ACGME-accredited training program emphasizes patient-centered, interdisciplinary diagnostic care that amounts to a philosophy more than a curriculum.

VISION:

We envision that our graduates will have a positive impact on diagnostic patient care and advance the field of hematopathology.

The UF Hematopathology Fellowship has the following overall aims and goal:

- **OVERALL PROGRAM GOAL:** The goal of this 1-year experience is to prepare the fellow to independently function as a primary diagnostician and consultant in all areas of hematopathology and clinical laboratory hematology.
- Training in all aspects of modern Hematopathology with emphasis on neoplastic hematologic disorders and flow cytometry. This training will include patient care, research and education.
- Proficiency in the use of all diagnostic technologies (histomorphology, flow cytometry, immunohistochemistry, cytogenetics and molecular pathology) for the evaluation and diagnosis of hematological diseases. Total integration of these diagnostic modalities with an emphasis on clinical correlations is a primary aim of the program.
- Competence in basic science, cognitive and technical skills needed to practice hematopathology in either an academic or private setting. Emphasis is placed on the development of clinical knowledge and maturity during the fellowship training as this will enable the fellow to employ skillful judgment in the assessment of disease.
- Familiarity with clinical research. All fellows are required to participate in at least one research project, and have the experience of presenting his/her research work in local or national meetings.

PROGRAM OBJECTIVES

Many individual objectives are delineated within the individual rotations. The overall objectives of the program are listed below and are linked to ACGME core competencies.

PC=Patient care, PBL=Practice Based Learning Improvement, MK=Medical Knowledge, ICS= Interpersonal Communication, P= Professionalism, SBP= System Based Practice

1. Provide competent diagnostic interpretation of all hematopathology material. [PC]
2. Develop an analytical approach to diagnoses. [PC]
3. Recognize own limitations. [PBL]

4. Serve as a consultant to health care providers. [SBP]
5. Demonstrate effective teaching of medical students, residents, pathologists, and clinicians. [ICS]
6. Demonstrate effective management of the clinical laboratory. [SBP]
7. Assume professional servant-leader responsibility for patient care in preparation to function as a laboratory medical director. [P]
8. Participate in lifelong learning. [MK]

PROGRAM DIRECTOR:

Robert P. Seifert, MD

CORE FACULTY:

Li-Jun Yang, MD

Joanna Chaffin, MD

Yu Yang, MD, MS

PROGRAM STRUCTURE

See block diagram.

I. Areas of coverage for the fellowship will include:

- 1. Diagnostic Hematopathology:** Learning pathology interpretation of lymph node, peripheral blood, bone marrow, body fluid and other tissues for hematological disease and hematopoietic neoplasm. Bone marrow biopsy training is also required.
- 2. Education** – Providing didactic or scope sessions to the residents, supervising residents/students.
- 3. Research/Scholarly Activity** – writing case reports/reviews/original papers. Participating in ongoing research projects in the hematopathology service or participating in quality improvement projects.

II. The case volumes of the hematopathology service in the fiscal year of 2017-2018 were estimated as the following:

- Bone Marrow Cases (non-Consultation): 1000/year
- Lymph node or tissue biopsies (non-Consultation): 800/year
- Peripheral blood submitted for flow cytometry: 500/year
- Body Fluid submitted for morphological examination and flow cytometry: 400/year
- Consultation cases (lymph node, non-lymph node biopsies and bone marrow specimens): 700/year

The resident/fellow will receive the training necessary to permit him/her to develop the skills essential to the performance of a board-certified hematopathologist. All diagnostic technologies the program provides to fellows (flow cytometry, immunohistochemistry, cytogenetics and molecular pathology) reside in a single centralized location. Integration of these diagnostic modalities with an emphasis on clinical correlations is the primary aim of the program. The program emphasizes the hand-on flow cytometry analysis of hematopoietic neoplasms and the program has the required instruments, software and knowledgeable faculty to provide the training.

III. Hematopathology fellow training rotations: See individual rotation goals and objectives for more details.

- 1. Hematopathology Core Rotation (three 13-week blocks):** During this rotation, fellows learn to interpret results of various diagnostic laboratory analyses performed on tissue and bone marrow biopsies and aspirates, blood, and serosal fluids for the diagnosis and characterization of hematologic and lymphoid diseases. All goals must be given and reviewed with the fellow at the beginning of the rotation.
- 2. Hematology/ Coagulation Laboratory (4 Weeks):** During this rotation the trainee is exposed to routine hematology assays, reticulocyte counts, hemoglobin electrophoresis, tests for red cell abnormalities, coagulation studies, and body fluid analysis. During this rotation, the trainee is expected to attend consult rounds, review cases to be presented and pertinent literature. Learning instrumentation and general administration aspects of the laboratory are additional responsibilities. The rotation can include daily service time to respond to consultation calls from technicians or physicians regarding abnormal smears or fluids, or unusual clotting problems.
- 3. Molecular Pathology and Cytogenetics Rotation (4 weeks):**
The molecular pathology/cytogenetics rotation is designed to train the

hematopathology fellows according to the six aspects of competency: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. Fellows will be trained in the basic concepts of molecular pathology and cytogenetics in the area of: basic concepts of molecular pathology and cytogenetics, the technologies used in molecular/cytogenetic testing, testing variables and validation, regulations and reimbursement issues. During this rotation, fellows learn to perform and interpret results of complex molecular, cytogenetics and FISH studies in the context of immunophenotypic and morphologic findings on hematopathology cases. Goals and objectives are per the resident training manual.

- 4. Elective Rotation (Other surgical subspecialty or cytopathology): (4 weeks):**
Fellows may elect to have additional rotations in surgical subspecialties (such as dermpath) or cytopathology. They may also elect to have additional training time in the Core hematopathology rotation. The dermatopathology training, for example, will emphasize the differential diagnoses of cutaneous lymphoma vs cutaneous inflammatory diseases. In the cytology rotation, fellows will be trained in reading cytology of lymph nodes and FNA of mass lesions. Goals and objectives are per the resident training manual.
- 5. Bone Marrow Biopsy (1 week):**
During this rotation, fellows partially rotate through the adult hematology oncology outpatient clinic service. There they will observe and participate in the clinical evaluation of patients and the bone marrow aspirate/biopsy procedure itself including adequacy assessment. A minimum of five procedures must be performed and all procedures must be logged in the ACGME Case Log database. This is a Monday to Friday, normal business hours rotation with no call responsibility. When no active procedures are taking place, the fellow is to report back to the main hemepath lab for core hematopathology service.

IV. Program Didactics, In-Service Exams and Multidisciplinary Conferences

Didactics occur within the Core, Heme-Coag, Molecular/Cytogenetic and Bone Marrow Biopsy (when fellow not performing biopsy) rotations.

- 1.** The smaller size of our program and nature of the hematopathology clinical service allows for a daily quality assurance conference. This daily conference occurs at 1:30PM.
 - This conference is recognized by the American Board of Pathology as a program meeting the improvement in medical practice requirements for continuing certification.
 - Chiefly, the conference involves discussion of critical, challenging and/or highly educational cases amongst the core hematopathology faculty with > 0.5 FTE in clinical hematopathology. Consensus in diagnosis,

wording/drafting of reports and therapy choice/multidisciplinary consideration are common resultant topics.

- Additional learners include pathology residents, oral pathology fellows, hematology-oncology fellows, pediatric hematology-oncology fellows and medical students. All of whom are occasional rotators who do not interfere with fellow learning or the conference experience.
- The conference also serves as journal club which occurs at least monthly. The topic typically involves critical analysis of a journal article related to a diagnosis presented, thus the journal club aspect may occur more often than monthly.
- The conference also serves as ongoing QA/QI. As stated the chief purpose is to achieve consensus or challenging cases. However, root cause analysis and discussion of near miss events is also a component.
- Journal Club and QA/QI events are recorded by the fellow and consensus is documented in the medical record.

2. Monthly Blood Smear Review

- The conference, dubbed “Don’t Fear the Smear”, is a monthly conference held with the pathology residency program in which recent blood smear and corresponding flow cytometric analyses are reviewed.
- The fellow attends and participates in the conference and occasionally presents coagulation/benign hematology topics of interest to the residents.

3. Pediatric Hematology Oncology holds a bimonthly tumor board in which recent new diagnoses as well as follow up cases are discussed along with patient management.

- Attendees regularly include hematopathology, surgical pathology, pediatric hematology oncology, radiation oncology and diagnostic radiology.
- The fellow is responsible for preparing cases for presentation at conference and essentially presents the hematopathology aspects of all cases for conference.

4. Adult Hematology Oncology Ad-hoc Case Conference

- A tumor board style conference is held on an as-needed basis with adult oncology. This occurs roughly quarterly.
- The fellow is responsible for preparing cases for presentation at conference and essentially presents the hematopathology aspects of all cases for conference.

5. Fellow In Service Exam

- The ASCP provided Fellow In Service Exam (FISHE) occurs twice a year to guide fellow’s improvement in medical knowledge. ASCP provides feedback after both exams to help prepare fellow for board certification. Feedback materials are also reviewed with PD and core faculty and with fellow. Exam

performance is reviewed as a component of CCC evaluation. Performance above the 50th percentile is encouraged as it correlates well with success on board examination.

V. Evaluations and Summative Assessment

All evaluations are kept confidential to members of the CCC and the PD.

1. Brief Evaluation of Fellow: Mid way through each core rotation the core faculty evaluate the fellow's performance with written feedback. The fellow also has an opportunity for feedback at this time similarly in NI (see below).
2. Core Fellow Evaluation: Once per block rotation (13 weeks) the fellow is evaluated by core faculty following ACGME guidelines. This includes assessment of performance on the longitudinal patient safety curriculum.
3. Rotation Evaluation: The fellow evaluates the rotation every rotation block.
4. Self-Evaluation: The fellow completes a self evaluation twice a year.
5. Program Evaluation: The fellow completes a program evaluation every 6 months.
6. Faculty Program Evaluation: The faculty complete an evaluation of the program once a year in the Spring.
7. Evaluation of Faculty: The fellow evaluates the Faculty every 6 months.
8. Bone Marrow Biopsy Evaluation: At the completion of the bone marrow biopsy experience, the fellow has the PA/MD he/she worked with fill out an evaluation form regarding performance on the rotation. This is a paper evaluation that is manually entered by the PC.
9. Coag & Hematology Evaluations: At the completion of these special rotations, a paper evaluation form is filled out by the attending on these services to evaluate the fellow and this form is uploaded to NI by the PC.
10. Peer Evaluation: Once every 6 months the fellow solicits a peer evaluation from his/her co-fellow (if available) and/or residents on service. This is a paper evaluation uploaded to NI by the PC.
11. 360 Evaluation: The fellow asks for evaluation from non-MD staff members in the lab for evaluation which includes evaluation of disagreement resolution and cultural competency. The evaluators are not in NI and this is done on paper with manual entry to NI by the PC. Minimum 3.
12. Exit Evaluation
 - Near graduation a summative exit evaluation is done by the PD of the fellow and is reviewed with the fellow.
 - Fellows who leave the program prior to completion also require timely documentation of their summative evaluation.
13. Semi Annual Eval: The PD reviews CCC feedback with the fellow after every CCC meeting and evaluates the fellow based on ACMGE milestones. See Clinical Competency Committee Policy for more details.

14. Cytogenetics & Molecular Evaluations: At the completion of these special rotations, a paper evaluation form is filled out by the attending on these services to evaluate the fellow and this form is uploaded to NI by the PC.

VI. Leave Policy

1. Per UF GME: A comprehensive leave policy is outlined in the Resident Policy & Procedure Manual and includes uncompensated leave, compensated leave, temporary military duty, absences pertaining to education and training, and maternity/paternity leave. Subject to the approval of the program director and consistent with the guidelines of the appropriate specialty board, all residents accrue fifteen (15) days of annual leave. Residents may be permitted to carry over unused annual leave to a new year, as consistent with the academic departmental policy of the University; however, such carry-over must be approved by the program director and annual leave accrued may not exceed twenty-five (25) work days. Unused annual leave is considered non-reimbursable. Residents taking a non-medical leave of absence from the training program are not automatically guaranteed re-entry into the training program. A resident will accrue ten (10) days of sick leave for each full year of completed participation in the program. The resident will be entitled to utilize sick leave for death, or in special cases, serious illness in the immediate family (spouse, parents, brothers, sisters, children, grandparents, and grandchildren of both resident and spouse). Sick leave may be advanced to housestaff proportionate to expected service. Housestaff may be permitted to carry over sick leave to a new year, as consistent with department policy; however, carryover must be approved by the program director and cannot be more than of fifteen days (15) work days. All unused leave is considered non-payable leave, and there is no entitlement for lump-sum payment of unused leave upon separation or completion of training. The total time allowed away from a graduate medical education program in any given year or for the duration of the graduate medical education program will be determined by the requirements of the specialty board involved. If leave time is taken beyond what is allowed by the University or the applicable specialty board, the resident is required to extend his or her period of activity in the graduate medical training program accordingly in order to fulfill the appropriate specialty board requirements for the particular discipline. The resident will be paid for makeup or extended time if funds are available at that time.

- VII. **Duty Hours:** The fellows in Hematopathology must comply with the ACGME Duty Hours. Hematopathology Fellows do not take in-house call. As such, the limit to on-call every third day does not apply. Call work begins after the first block (12 weeks) of core rotation provided the fellow has progressed.

- VIII. **Handover Policy:** To guarantee continuity of patient care at the end of service periods and/or rotations, the fellow on clinical service is responsible for ensuring follow-up of pending cases by doing one of the following: 1) Personally follow-up on designated cases even when off of service/rotation OR 2) Communicate all necessary information to the fellow on service/rotation so that such follow-up will be completed. In addition, the fellow must summarize all pending items to the faculty of record for the corresponding case(s), as faculty are ultimately responsible for

ensuring continuity of care during transitional periods.

- IX. Fitness for Duty:** Trainees receive fatigue mitigation training and substance abuse training. See Wellness Policy.
1. Moonlighting is not permitted.
- X. Supervision:** The faculty are responsible for the supervision of all activities of the fellows. This supervision can be “direct” or “indirect.” (CPR VI.D.3)
1. Under “direct supervision,” the fellow signs out cases at the microscope with the teaching faculty physically present. (CPR VI.D.3.a)
 2. Under “indirect supervision,” the fellow will be given the opportunity to unofficially “signout” cases without concurrent review by the faculty, but with all cases reviewed separately by the faculty prior to official sign-out. (CPR VI.D.3.b)
- XI. Diversity & Inclusion:** The training program environment must be free of discrimination, promote diversity and inclusion of all peoples. See Selection Policy for related details.
- XII. The Specific PROGRAM Objectives for all required clinical experiences include the requirement for the fellow to develop competencies in all six areas (endorsed by ACGME) to the level expected of a new practitioner.** The program follows the Hematopathology Fellow Milestones 2.0 designed by ACGME for evaluating fellow performance. The milestones are descriptors and targets for fellow performance as a fellow moves from entry into fellowship through graduation. For each period, review and reporting will involve selecting milestone levels that best describe each fellow’s current performance and attributes. Level 4 is a graduation goal but does not represent a graduation requirement as readiness for unsupervised practice is the purview of the PD and CCC.
1. <https://www.acgme.org/globalassets/pdfs/milestones/hematopathologymilestones.pdf>
 2. Expected Minimum Sub competencies at Graduation:
 - PC1: (4) Manages complex consultations independently
 - PC2: (4) Independently generates a timely, well-organized, integrated report for complex cases. Generates an amended/addended report that includes updated information, and integrates findings into a final diagnosis
 - PC3: (2) Assists in the performance of bone marrow aspiration and biopsy
 - PC4: (4) Independently prioritizes blood, bone marrow, and body fluid for required ancillary testing given indication for procedure, including limited samples. Independently prioritizes lymphoid tissue for required ancillary testing given indication for procedure, including limited samples.
 - MK1: (4) Interprets testing results for complex hematology disorders and recognizes limitations of testing
 - MK2: (3) Independently interprets testing results for common coagulation disorders and recognizes limitations of testing

- MK3: (4) Interprets flow cytometry results for complex disorders and recognizes pitfalls and limitations of testing
- MK4: (4) Independently applies knowledge of peripheral blood, bone marrow, and body fluid morphology to identify complex pathologic diagnoses. Independently applies knowledge of lymphoid tissue morphology to identify complex pathologic diagnoses
- MK5: (4) Interprets complex ancillary test reports including diagnostic uncertainty and clinical ramifications
- MK6: (4) Independently synthesizes information to inform clinical reasoning in complex cases. Independently seeks out, analyzes, and applies relevant original research to diagnostic decision making in complex clinical cases
- SBP1: (4) Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual). Discloses patient safety events to clinicians and/or patients and families, as appropriate (simulated or actual). Demonstrates the skills required to identify, develop, implement, and analyze a QI project
- SBP2: (4) Models effective coordination of patient-centered care among different disciplines and specialties. Models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems. Recommends and/or participates in changing and adapting practice to provide for the needs of communities and populations
- SBP3: (3) Discusses how individual practice affects the broader system (e.g., test use, turnaround time). Engages with clinicians and/or patients in shared decision making, such as use of preauthorization for complex testing
- SBP4: (4) Participates in an internal or external laboratory inspection. Reviews the quality management plan to identify areas for improvement. Performs analysis and review of proficiency testing failures and recommends a course of action, with oversight
- SBP5: (3) Identifies opportunities to optimize utilization of pathology resources
- PBL1: (3) Identifies and applies the best available evidence to guide diagnostic work-up of complex cases. Applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice, with supervision
- PBL2: (4) Actively and consistently seeks performance data and feedback with humility. Critically evaluates the effectiveness of behavioral changes in narrowing the gap(s) between expectations and actual performance. Uses performance data to measure the effectiveness of the learning plan and improves it when necessary
- P1: (4) Independently resolves and manages complex ethical situations. Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others.

- P2: (4) Anticipates and intervenes in situations that may impact others' ability to complete tasks and responsibilities in a timely manner
- P3: (4) Independently develops and implements a plan to remediate or improve the knowledge/skills/ behaviors of self or team. Independently develops and implements a plan to optimize personal and professional well-being
- ICS1: (4) Independently, sensitively, and compassionately delivers medical information and acknowledges uncertainty and conflict. Independently recognizes personal biases while attempting to proactively minimize communication barriers
- ICS2: (4) Coordinates recommendations from different members of the health care team to optimize patient care. Communicates feedback and constructive criticism to superiors
- ICS3: (4) Independently communicates while ensuring security of personal health information. Initiates conversations on difficult subjects with appropriate stakeholders to improve the system

Entrustable Professional Activities

Hematopathology fellowship education has grown in complexity as patient-centered treatment plans have come to depend on integration of clinical, morphologic, immunophenotypic, molecular, and cytogenetic variables. This complexity is in competition with the need for timely hematopathology care with stewardship of patient, laboratory, and societal resources. Individual Goals and objectives for each rotation are based on consensus opinion of the Hematopathology Entrustable Professional Activity Working Group which is a subcommittee of the Society for Hematopathology's Education Committee. These objectives align well with milestone evaluation. They represent the basis for a rubric for evaluating fellow performance at our program. Their work has been published here:

White, Kristie, et al. "Entrustable Professional Activities in Hematopathology Pathology Fellowship Training: Consensus Design and Proposal." *Academic pathology* 8 (2021): 2374289521990823.

As many specific goals encompass multiple ACGME defined milestone competencies, the following matrix highlights the areas covered per the 2.0 Milestones.

	EPA 1	EPA 2	EPA 3	EPA 4	EPA 5	EPA 6	EPA 7	EPA 8	EPA 9	EPA 10
PCI: Interdisciplinary Consult	x	x	x	x	x	x	x	x	x	
PC2: Reporting			x	x	x	x				
PC3: Bone Marrow Biopsy										x
PC4: Specimen Handling, Triage	x						x			x
MK1: Hematology						x				
MK2: Coagulation						x				
MK3: Flow Cytometry					x					
MK4: Morphologic Diagnosis			x	x						
MK5: Molecular, Cytogenetics	x		x	x			x			
MK6: Clinical Reasoning	x	x	x	x	x	x	x	x	x	x
SBP1: Patient Safety and Quality		x							x	
SBP2: Systems Navigation		x						x	x	
SBP3: Physician Role	x		x	x		x	x		x	
SBP4: Accreditation, Compliance									x	
SBP5: Utilization	x		x	x		x	x			
PBL1: Evidence-Based Practice	x		x	x	x	x	x	x	x	
PBL2: Reflective Practice	x	x	x	x	x	x	x	x	x	x
PROF1: Professional Behavior	x	x	x	x	x	x	x	x	x	x
PROF2: Accountability	x	x	x	x	x	x	x	x	x	x
PROF3: Self-awareness	x	x	x	x	x	x	x	x	x	x
ICS1: Patient Communication		x						x	x	x
ICS2: Team Communication	x	x	x	x	x	x	x	x	x	x
ICS3: System Communication	x	x	x	x	x	x	x	x	x	x

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; EPA, entrustable professional activity; ICS, interpersonal and communication skills; MK, medical knowledge; PBL, practice-based learning and improvement; PROF, professionalism; SBP, systems-based practice.
*ACGME Milestone names have been abbreviated to fit the table.

Hematopathology Entrustable Professional Activity 1:

Guide selection of diagnostic tests and triage and allocate specimens for ancillary studies.

Skills:

- Ordering ancillary workup necessary for diagnosis and management for lymphoid and myeloid neoplasia and non-neoplastic causes of adenopathy and blood count abnormalities
- Stewardship of limited tissue
- Providing test utilization consultation, including intervention in inappropriate test ordering, and identifying potential areas of test overutilization

Knowledge Areas:

- Pathogenesis, clinical correlation and prognostic significance; diagnostic and relevant clinical practice guidelines for hematolymphoid neoplasia, congenital, infectious, and other specific nonneoplastic entities
- Flow cytometry immunophenotyping panels, immunohistochemical stains, cytogenetic analysis, including karyotyping and fluorescence in situ hybridization (FISH) and molecular ancillary testing

Example Scenarios:

- Determine appropriate immunohistochemical stains to order when limited material available. Determine correct flow cytometry panel to perform when limited material available.
- Triage cerebrospinal fluid or fine needle aspiration/core biopsy material to appropriate diagnostic assays, including morphology (cytologic or cell blocks), flow cytometry immunophenotyping, cytogenetic and molecular analysis.
- Discuss inappropriate flow cytometry immunophenotyping orders with ordering provider.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 4: Interdisciplinary Consultation, Specimen Handling and Triaging
- Medical Knowledge 5 and 6: Selection of Molecular and Cytogenetics Testing and Interpretation of Reports, Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 3 and 5: Physician Role in Health Care System, Utilization
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 2: Identify and communicate critical values and clinically urgent results

Skills:

- Rendering clinically urgent diagnoses triggered by microscopic or ancillary test review of any specimen type
- Communication of critical values, including interdisciplinary communication
- Documentation of clinically urgent communication

Knowledge Areas:

- Disease mechanisms and clinical course of acute leukemias, consumptive coagulopathies, and systemic infections; morphologic/immunophenotypic recognition of these entities as applicable, and confirmatory testing for these entities as applicable
- Concept and rationale of critical laboratory results
- Principles and techniques of transition of care/handoffs

Example Scenarios:

- Identify and communicate acute promyelocytic leukemia, thrombotic thrombocytopenic purpura, hemophagocytic lymphohistiocytosis, blasts in cerebrospinal fluid, organisms in cerebrospinal fluid.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1: Interdisciplinary Consultation
- Medical Knowledge 6: Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 1 and 2: Patient Safety and Quality Improvement (levels 1-3), Systems Navigation for Patient-Centered Care
- Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 1, 2 and 3: Patient and Family-Centered Communication, Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 3: Complete workup and diagnostic reporting of a simple hematolymphoid diagnosis

Skills:

- Ordering appropriate initial and, if indicated, next round ancillary studies based on clinical setting and differential diagnosis. Integrating ancillary studies including immunohistochemistry, flow cytometry immunophenotyping, cytogenetics, fluorescence in situ hybridization, targeted molecular studies
- Providing a preliminary report to the patient-facing team
- Writing succinct and complete final report including any indicated synoptic reporting

Knowledge Areas:

- Acute leukemias, classic myeloproliferative neoplasms, B cell lymphomas, involving bone marrow aspirate and core, lymph node, extranodal tissue, peripheral blood and body fluids
- Indications for and interpretation of immunohistochemistry, flow cytometry immunophenotyping, cytogenetics, fluorescence in situ hybridization, and targeted molecular studies

Example Scenarios:

- Order and interpret lymphoma staging studies with appropriate flow cytometry immunophenotyping, immunohistochemistry, and fluorescence in situ hybridization studies as indicated. Initial diagnosis of small B-cell lymphomas. Work up large B-cell lymphoma and classic Hodgkin lymphoma.
- Provide verbal and/or written preliminary reports to colleagues and to the patient-facing team, including discussion of level of uncertainty and significance of pending studies.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 2 (levels 1-3): Interdisciplinary Consultation, Reporting
- Medical Knowledge 4, 5 and 6(levels 1-3): Morphologic Interpretation and Diagnosis, Selection of Molecular and Cytogenetics Testing and Interpretation of Reports, Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 3 and 5: Physician Role in Health Care System, Utilization (levels 1-3)
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship (levels 1-2), Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 4: Complete workup and diagnostic reporting of a complex or rare hematolymphoid diagnosis.

Skills:

- Ordering appropriate initial and, if indicated, next round ancillary studies based on clinical setting and differential diagnosis. Integrating ancillary studies including immunohistochemistry, flow cytometry immunophenotyping, cytogenetics, fluorescence in situ hybridization, targeted molecular studies
- Providing a preliminary report to the patient-facing team
- Writing succinct and complete final report including any indicated synoptic reporting
- Integrating relevant literature/references and/or expert consultation
- Recognizing areas of diagnostic challenge where a definitive diagnosis cannot be reached with the given material and communicating effectively to the clinician

Knowledge Areas:

- Pathogenesis, clinical correlation and prognostic significance; diagnostic and relevant clinical practice guidelines for hematolymphoid neoplasia, congenital, infectious, and other specific nonneoplastic entities
- Flow cytometry immunophenotyping panels, immunohistochemical stains, cytogenetic analysis, including karyotyping and fluorescence in situ hybridization and molecular ancillary testing
- Indications for and interpretation of next generation sequencing panel testing, fluorescence in situ hybridization testing, and esoteric/sendout testing; techniques and technical limitations of ancillary studies

Example Scenarios:

- Perform complete diagnostic workup of myelodysplastic syndromes, myelodysplastic/myeloproliferative neoplasms, T/NK cell lymphomas, gray zone lymphomas, histiocytic and dendritic cell neoplasms and nodular lymphocyte predominant Hodgkin lymphoma.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 2 (levels 3-5): Interdisciplinary Consultation, Reporting
- Medical Knowledge 4, 5 and 6 (levels 3-5): Morphologic Interpretation and Diagnosis, Selection of Molecular and Cytogenetics Testing and Interpretation of Reports, Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 3 and 5: Physician Role in Health Care System, Utilization (levels 3-5)
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship (levels 3-5), Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 5: Select a flow immunophenotyping panel and compose an interpretive report.

Skills:

- Design/select appropriate flow cytometric initial and follow-up immunophenotyping panels based on clinical and/or morphologic information
- Gate and analyze raw flow immunophenotyping data
- Recognize common technical and gating errors in flow cytometry and know how to avoid them
- Accurately describe and interpret a flow cytometric immunophenotype
- Incorporate flow cytometry data into clinical and morphologic context

Knowledge Areas:

- Flow cytometry techniques, including specimen processing and analysis, as well as pitfalls in analysis and interpretation

Example Scenarios:

- Design/pick an appropriate flow cytometry panel for a low cellularity cerebrospinal fluid specimen in a patient with known lymphoma history.
- Recognize typical and atypical immunophenotypic patterns for chronic lymphocytic leukemia.
- Distinguish between hematogones (normal B-lineage precursors) and leukemic B-lymphoblasts.
- Assign lineage to an acute leukemia. Recognize reactive and neoplastic T antigen abnormalities.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 2: Interdisciplinary Consultation, Reporting
- Medical Knowledge 3 and 6: Interpretation of Flow Cytometry, Clinical Reasoning in Hematopathology and Hematology
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 6: Interpret hematology/coagulation tests and provide consultation.

Skills:

- Answer clinical questions regarding test selection (pre-analytic) and patient results (post-analytic)
- Provide interpretative report for hemoglobin analysis and other tests (e.g., hypercoagulation panel)
- Automated hematology analyzers, coagulation testing, red cell disorder testing, hemoglobin analyses

Knowledge Areas:

- Algorithmic and/or panel testing approaches for evaluation of bleeding disorders and hypercoagulable states
- Knowledge of congenital and acquired hemostatic disorders and their management.
- Categories of anticoagulant therapies, and the indications and laboratory methods of monitoring them
- Clinical significance and methods of diagnosing common hemoglobinopathies and thalassemias

Example Scenarios:

- Provide interpretation of hemoglobin electrophoresis analysis in the context of peripheral blood findings and clinical scenario.
- A diagnostic approach to the evaluation of hemolytic anemias, congenital or acquired. Work up von Willebrand disease, factor deficiencies, and inhibitors.
- Guide and interpret testing for lupus anticoagulant testing, protein C or S deficiency. Consult on management of heparin, direct thrombin inhibitors, anti-Xa inhibitors.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 2: Interdisciplinary Consultation, Reporting
- Medical Knowledge 1,2 and 6: Interpretation of Hematology and Coagulation Testing, Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 3 and 5: Physician Role in Health Care System, Utilization

- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 7: Provide guidance on testing parameters and limitations for routine hematology, ancillary, or coagulation testing.

Skills:

- Provide guidance on appropriate testing based on the clinical question and specimen and test characteristics
- Troubleshoot discrepant/unusual/unreportable results and provide recommendations to laboratory staff and/or ordering provider
- Develop laboratory protocols/procedures for commonly occurring test issues

Knowledge Areas:

- Appropriate indications, technical requirements and techniques for routine and special hematology testing, special testing, flow cytometry immunophenotyping, cytogenetics, fluorescence in situ hybridization, immunohistochemistry, single and panel molecular testing, coagulation studies

Example Scenarios:

- Troubleshoot and provide guidance on effects of interfering substances (eg elevated bilirubin, hyperlipidemia, cryoglobulins, anticoagulation medication) on automated hematology and coagulation testing.
- Evaluate automated hematology analyzer flagging criteria, manual differential/pathologist review criteria.
- Detect and resolve platelet clumping (pseudo-thrombocytopenia).

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1 and 4: Interdisciplinary Consultation, Specimen Handling and Triage
- Medical Knowledge 5 and 6: Selection of Molecular and Cytogenetics Testing and Interpretation of Reports, Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 3 and 5: Physician Role in Health Care System, Utilization
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking

- Interpersonal and Communication Skills 2 and 3: Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 8: Present at interdisciplinary conferences and effectively communicate in a consultative role.

Skills:

- Interdisciplinary communication and presentation skills
- Able to state and support degree of confidence of diagnosis, and specify additional studies that could clarify the diagnosis

Knowledge Areas:

- Pathologic features that inform staging, prognostication or prediction of treatment response
- Ongoing clinical trials at institution that may require additional ancillary studies or reporting of specific features

Example Scenarios:

- Actively participate in multidisciplinary tumor boards.
- Present at morbidity and mortality conferences.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1: Interdisciplinary Consultation
- Medical Knowledge 6: Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 2: Systems Navigation for Patient-Centered Care
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 1, 2 and 3: Patient and Family-Centered Communication, Interprofessional and Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 9: Maintain and improve quality of care on the hematopathology service and in the hematology laboratory.

Skills:

- Identify and evaluate potential safety/quality issues in the hematopathology service/hematology laboratory and propose changes as needed
- Maintain appropriate and up-to-date hematology laboratory testing menus, flow cytometry panels, immunohistochemical stains, and fluorescence in situ hybridization and molecular tests if appropriate (in-house and reference testing)
- Apply root cause analysis and performance improvement tools (Lean, Six Sigma, Plan Do Study Act cycle) to the hematopathology service/hematology laboratory

Knowledge Areas:

- Be aware of applicable hematology, anatomic pathology, and flow cytometry laboratory accreditation requirements
- Stay up to date with new clinically relevant hematology tests and ancillary diagnostic tests

Example Scenarios:

- Monitor sendout test request patterns to prioritize new hematology test or molecular tests for in house validation.
- Identify a recurring slide quality issue, communicate the issue to the appropriate section supervisor, and provide feedback on whether changes to workflow are satisfactory.
- Evaluate, choose, and validate a new hematology laboratory or hematopathology service test, instrument or assay, such as an immunohistochemistry assay or flow cytometry panel.
- Participate in proficiency testing and sign off on protocol changes in the hematology lab, such as coagulation test, flow cytometry, or immunohistochemistry.

ACGME Hematopathology Milestones version 2.0:

- Patient Care 1: Interdisciplinary Consultation
- Medical Knowledge 6: Clinical Reasoning in Hematopathology and Hematology
- Systems Based Practice 1, 2, 3 and 4: Patient Safety and Quality Improvement, Systems Navigation for Patient-Centered Care, Physician Role in Health Care System, Accreditation, Compliance, and Quality
- Practice-Based Learning and Improvement 1 and 2: Evidence-Based Practice and Scholarship, Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 1, 2 and 3: Patient and Family-Centered Communication, Interprofessional/Team Communication, Communication within Health Care Systems

Hematopathology Entrustable Professional Activity 10: Perform bone marrow aspiration and biopsy.

Skills:

- Provide informed consent, administer local anesthetic, identify correct needle placement, sterile technique, identify bone spicules, document procedure.
- Collect and triage material for flow immunophenotyping, cytogenetic studies, and other studies in appropriate media as clinically indicated

Knowledge Areas:

- Components of informed consent, collection requirements for ancillary testing, anatomy/landmarks of the posterior superior iliac crest, appropriate post-procedural care

Example Scenarios:

- Diagnostic bone marrow biopsy and aspirate in a patient with unexplained cytopenias, with material sent for cytogenetics and flow immunophenotyping

ACGME Hematopathology Milestones version 2.0:

- Patient Care 3 and 4: Bone Marrow Aspiration and Biopsy, Specimen Handling and Triaging
- Medical Knowledge 6 (levels 1-3): Clinical Reasoning in Hematopathology and Hematology
- Practice-Based Learning and Improvement 2 Reflective Practice and Commitment to Personal Growth
- Professionalism 1, 2 and 3: Professional Behavior and Ethical Principles, Accountability and Conscientiousness, Self-Awareness and Help-Seeking
- Interpersonal and Communication Skills 1, 2 and 3: Patient- and Family-Centered Communication, Interprofessional and Team Communication, Communication within Health Care Systems