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## Goals and Objectives of the Program

- To provide superior training to graduate internal medicine physicians to enable them to develop competence in the diagnosis, evaluation and management of the full spectrum of hematologic and neoplastic diseases.
- To provide a full understanding to the internal medicine specialist in hematology and medical oncology of their appropriate role in the multi-disciplinary management of hematologic and neoplastic diseases.
- To insure the achievement of competence in the requisite technical procedures performed by the hematologist and medical oncologist.
- To instill in the trainee an appropriate understanding of the social, moral, spiritual, psychologic and economic issues inherent to the practice of their discipline.
- To create an environment which fosters a life-long spirit of inquiry and commitment to continuing medical education.
- To provide a firm understanding of the importance and methods of clinical investigation.
- To provide a firm understanding of the scientific basis of hematologic and neoplastic diseases with exposure to all of the essential components of molecular biology.

## Overall Goal of Training and Our Concept of Teaching

Welcome to the Division of Hematology/Oncology! We wish to introduce to you our educational goals as they pertain to your training. We see your fellowship training as the time to launch a successful career, either in academics or in clinical hematology/oncology.

Our aim is that at the completion of your fellowship training, you will be thoroughly prepared in terms of clinical skills, competence, proficiency, knowledge, and background for future academic endeavors. Equally important, you will be a well-rounded, mature physician who displays dedication, compassion, calmness, and friendship; a professional who sensitively, thoughtfully, and tactfully interacts with patients, peers, and senior colleagues. We emphasize that all aspects of your professional behavior and skills are important to your future success.

### ***Our Teaching Philosophy***

You will note that we offer many conferences, which are given either by staff members of our division or invited speakers, and we are deeply committed to bedside teaching. However, the most effective way to acquire long-lasting knowledge is by your active participation in this educational process. We strongly believe that the most important skill that you need to develop during your training is the skill of continuing education and self-learning. After all, the half-life of knowledge in our subspecialty is probably no more than two years. As a future subspecialist, you will constantly have to update your knowledge by employing skills of critical analysis of new literature, develop the ability to predict new directions in the field, and possess an

inquisitive attitude, constantly questioning and revising the accepted medical knowledge and practice.

To accomplish these objectives, we will promote, from the beginning of your fellowship, a clinical teaching model in which you will function as a practicing specialist. Our staff will closely supervise your activities and guide you. However, we anticipate that you will initiate the formulation of diagnostic and therapeutic strategies, and after you have done so, we will discuss them with you before they will be implemented.

Likewise, you will be responsible for preparing regular conferences during your fellowship training. Our clinical faculty will be assisting you in selecting appropriate topics and references, but we believe that this active self-learning process will lead to the development of lasting knowledge

### ***Communicating with Patients and Colleagues***

Perhaps the most important part of medical practice is effective communication. We are a clinical subspecialty service. Many patients who we treat are referred by primary care physicians who rightfully expect to continue caring for their patients. It is our duty to keep them well informed of decisions made or actions taken by us in the care of their patients. Often, this responsibility to communicate will rest on your shoulders. Please keep in mind that we will always make ourselves available to you to discuss any aspects of patient care. Please respect the following rules:

1. Avoid discussing a patient's illness, diagnosis, or treatment without thoroughly discussing this with your attending. Be sure you know the preferences of the patient's primary care physician. There is nothing more damaging than sending mixed signals to the patient. You will surely lose his/her confidence and trust.
2. Avoid admitting a patient or making major diagnostic or treatment decisions without notifying your attending or the primary care physician first. Professional courtesy is better served when all parties have the opportunity to discuss management decisions before they are implemented.
3. When the diagnosis and treatment issues have been discussed with other physicians and you are asked to discuss this with the patient, keep in mind that every patient accepts news about the illness in a different way. If serious news about an ultimately fatal disease is to be communicated to the patient, make every effort to contact the family first so that you learn about the emotional status of the patient. You should also discuss with the family members whether or not they agree that the patient should know the diagnosis, or how much he/she should know. When talking to the patient, start the conversation by asking what he/she knows. Consequently, build on his/her knowledge slowly so that the patient can adjust to the news and fully comprehend it. Always leave room for hope; there is nothing more traumatizing than bluntly defining the situation as hopeless.
4. Occasionally, differences in opinion arise among physicians participating in medical care, particularly among various subspecialists. For example, is a given treatment or procedure indicated? If this is so, please be assured that your attending will handle these situations. We will not put you in the middle, and you should always count on the support of your attending.
5. Letters to referring physicians. Please keep in mind that these letters should be both comprehensive and concise; these two goals are not mutually exclusive. Please make sure to

use subheadings to make the letters easily readable: 1) reason for referral, 2) history of present illness; 3) past history including social and family history; 4) system review; 5) physical exam; 6) review of laboratory data; 7) diagnostic summary; 8) recommendations.

### ***On-Call Coverage***

Our patients anticipate that we will be available on a 24-hour basis. Thus, it is essential that you follow this list of basic issues relating to patient coverage responsibilities:

1. Any pending issues (labs, radiographs, impending problems) have to be signed out by the responsible fellow to the on-call fellow before leaving each day. This is particularly critical with respect to weekends and holidays.
2. The on-call fellow should keep a log of all telephone calls and any medical information (labs, radiograph results, etc.) collected on various patients that needs to be conveyed to the appropriate fellow and/or attending the morning of the next working day.
3. The on-call fellow typically is called first about any medical problem. For routine issues, this fellow is often able to manage the problem without direct input from the on-call attending. However, if the problem is of a potentially serious nature (possible admission, abnormal diagnostic study, upset patient or family, etc.) or the patient is relatively unknown to the on-call fellow, the on-call attending must be consulted in all such cases in a timely manner. If the fellow has any doubt about the appropriate course of action in any situation, the safest and most professional way to proceed is to discuss the issue with the on-call attending.

### ***Responsibilities as a Teacher***

Although you are here to be trained as a subspecialist in hematology/oncology, you will likewise have a very important role as a teacher. This role is not only to provide a role model for students and house staff, it is also to stimulate their interest and intellectual curiosity, provide them with pertinent references, spend time with them to go over blood smears, bone marrows, etc. After all, some of your students or residents may be your future colleagues in the subspecialty, or may one day wish to refer their patients to you.

## Overall Program Description

The fellowship is structured as a three-year program, designed to train the participant in the full spectrum of hematology and medical oncology. After completion of the program, the fellows should be prepared to embark equally well into a career in clinical practice or academic medicine and be qualified to sit for the ABIM certifying examination in medical oncology and hematology.

During the first two years of the program, fellows are exposed to many opportunities to manage patients with a wide variety of hematologic and neoplastic diseases in both inpatient and outpatient settings. The fellows assume continuing responsibility for acute and chronically ill patients, so as to learn both the natural history of cancer and blood disease, as well as the benefits and adverse effects of various therapeutic modalities. Throughout clinical training, our program emphasizes basic physiologic mechanisms of disease and the scientific basis of therapy. Fellows learn to maintain current awareness of controversies and “cutting edge” advances in our field through active participation in clinical research. These efforts also aid fellows in their criticism of the medical literature. The fellow becomes skilled in utilization of laboratory tests, biopsies, and other procedures for both diagnosis and treatment.

In addition to strong clinical scientific training, fellows will acquire familiarity in the design and conduct of clinical research through participation in clinical studies (Southwestern Oncology Group, and pharmaceutical-industry-sponsored trials) as well as studies initiated by the clinical faculty. Through participation in a full schedule of clinical and basic science journal clubs and conferences devoted to the presentation of progress in clinical and basic research activities of the division, fellows will acquire skills of scholarly analysis and presentation of data and critical assessment of literature.

During the third year, fellows are given the opportunity to pursue a scholarly research project under the direction of a faculty member in the Section of Hematology/Oncology Research. Clinical responsibilities are limited during this year to afford fellows adequate “protected time” to pursue their respective project, with the ultimate goal of presenting their findings at regional/national meetings and publish their results in the peer reviewed literature. Under their mentor’s direction, fellows intent on pursuing a laboratory-based academic career will be encouraged to seek funding opportunities to allow the completion of an additional year of research training.

## **Clinical Rotations And Facilities**

### ***Outpatient Services***

Caritas St. Elizabeth's Medical Center continues to support its highly competitive training program in Hematology/Oncology through the provision of modern facilities, which permit the accomplishment of the goals of the training program. The hematology/oncology outpatient unit accommodates 7,000-8,000 patient visits per year, all of which are managed by the fellows (with on-site support by attending staff). The outpatient unit includes examining rooms, treatment rooms, an outpatient pharmacy area for preparation of chemotherapy, office space for the fellows and for clinical staff, a laboratory for preparing bone marrow smears, a clinical computer facility, and a reception area. Secretarial support is also provided. An excellent staff of oncology nurses provide for the day-to-day operation of the clinic and for highly skilled nursing services to our patients. The outpatient experience provides the fellow with training in the day-to-day and long-term management of patients with cancer and blood diseases, the administration of chemotherapy by intravenous, intrathecal, and other routes, the management of antiemetic orders, the management of therapeutic phlebotomy and transfusion services, and, in general, the management of subspecialty medical practice in the office setting. Each fellow is assigned to work with a given staff member for six-month blocks. The number of weekly half-day clinic sessions varies from two to three during years one and two and one session per week during the research year. In this manner, a fellow will manage his outpatients as his office practice in conjunction with the attending. Thus, the fellow manages all aspects of the patient's care, including social, economic and ethical issues related to our subspecialty.

### ***Inpatient Service***

Experience in managing inpatients with cancer and blood diseases is provided on the inpatient service. A 16 bed hematology/oncology nursing unit provides expert specialty nursing care to the majority of patients who fall under our subspecialty. The fellow on the inpatient service manages these patients as would an attending physician under the guidance of the clinical faculty. The fellow instructs the medical house staff in the care of the patients and supervises writing of orders by the interns and residents. The fellow also develops relationships with consultants from other medical and surgical services within the hospital, so as to coordinate the care of complicated patients on our inpatient service. The fellow on inpatient service makes daily inpatient rounds with the staff member on service. During these rounds, all patient management issues are reviewed and diagnostic studies, such as x-rays, CT-scans, biopsies, etc., are discussed. Management decisions resulting from these rounds are put into practice by the fellow and the medical house staff under the supervision of the fellow. This mechanism for running the inpatient service has traditionally provided for an excellent rapport between hematology/oncology fellows and both medical staff and house staff.

## **Consult Services**

### ***Oncology***

Experience in management of problems related to cancer in general medical, surgical and psychiatric patients is obtained on the Consult Service. The Consult fellow functions as consulting oncologist to the hospital. Patients may be seen in the emergency room, the intensive care units, the recovery room or operating room, or on the general patient care wards. Usually at least one medical resident and, frequently, one or two fourth year medical students rotate on the Consult Service. The fellow directs the activities of the Consult Service, delegating

individual consults to the resident and the student rotating on service. In addition, the fellow sees consults, particularly those which are the most complex ones. All consult patients are then presented to the consult attending, usually in the afternoon. Rounds are then made on the consult patients by the whole consult team and the pertinent ancillary studies (CT, biopsies, etc.) are reviewed. In general, the consult service has been an exciting and enjoyable aspect of the training program. It is a setting in which clinical problems are presented as “unknowns”, and management decisions must be made on short notice. This is both challenging and rewarding for all members of the consult team. The fellow serving as the inpatient service fellow also serves as the oncology consult fellow.

### ***Hematology and Transfusion Medicine***

Clinical hematology is both a sophisticated bedside art and a laboratory-intensive clinical science. As a tertiary training program, we incorporate the Clinical Hematology Laboratory and the Transfusion Service (blood bank, clinical apheresis) into fellowship training to provide intensive education in state-of-the-art applications of laboratory and clinical diagnostic skills to evaluate and manage hematologic disorders. While having their own primary assignments, the Hematology Consult Fellow and Transfusion Service Fellow make daily consult rounds together (with the Hematology Consult Attending) and cover for each other when one is in clinic or when either service is particularly busy with consults or therapy.

#### **A. Hematology Consult Service:**

Consultative hematology is a truly sophisticated aspect of tertiary medicine. The Hematology Consult fellow is “headquartered” in the Clinical Hematology Laboratory where he/she reviews abnormal peripheral blood films, special stains, special coagulation testing, hemoglobin electrophoresis, and other special hematology testing. Working closely with the Hematology Laboratory Supervisor and Medical Director, the fellow becomes proficient in the interpretation of specialized tests and their utilization for solving complex clinical problems. The Consult fellow takes “first call” for hematology consults on inpatients. Consults are often called on patients with perplexing presentations of medical illnesses who manifest abnormalities in blood cell counts or morphology or in coagulation function. Many will have hematology illness, including anemias, hematologic malignancies, coagulation disorders (acquired or inherited), hemoglobinopathies or bone marrow failure. The Consult Service is frequently called upon to manage coagulation emergencies in the intensive care units and high-risk obstetrics suite. Daily consult rounds typically begin in the fellows’ conference room at the multi-headed microscope where blood films and bone marrow slides from the consult patients are reviewed with the team. Other ancillary studies (scans, X-rays, etc.) are examined as the cases are presented, and the whole team visits every patient at the bedside. The Transfusion Service Fellow joins the Consult Service for daily consult rounds to benefit from the teaching provided on each case and to review the current clinical activity on the Transfusion Service with the Consult team.

#### **B. Transfusion Service:**

The Transfusion Service Fellow is “headquartered” in the Blood Bank where he/she becomes familiar with blood product testing and labeling, the indications for and preparation of, specialized blood products for transfusion, and the investigation of complex serological problems and immunohematological disorders. The fellow also manages all patients treated by therapeutic apheresis (inpatients and outpatients). This includes consulting on patients whom the Service is requested to evaluate for therapeutic apheresis,

writing the orders, and managing the procedures. The fellow coordinates these activities with the Hemapheresis Technicians, and works with the staff to schedule apheresis outpatients to conform as much as possible with the fellow's clinic and conference schedule. The fellow works closely with the Transfusion Service Supervisor and the Medical Director, and becomes the consultant to the hospital in clinical transfusion medicine. The Transfusion Service Fellow joins the Hematology Consult Team for daily consult rounds, and accepts hematology consults when the Consult Service is particularly busy or the Consult Fellow is tied up in clinic. The Consult Service Fellow reciprocates by covering for the Transfusion Service Fellow.

## ***Educational Expectations for Transfusion Medicine Service***

### **Scientific Basis of Blood Product Transfusion**

- Preparation of Blood Products for Transfusion
  - Forward Type
  - Reverse Type
  - Antibody Screen
  - Major Crossmatch
- Blood Products and Components
  - Red Blood Cells
  - Single donor and pooled platelets
  - Fresh frozen plasma
  - Cryoprecipitate
  - Cryo-poor plasma
  - Frozen-deglycerolized red blood cells
  - Leukocyte reduced blood products
  - Special coagulation factor products
  - Albumin
  - Intravenous Immunoglobulins
- Effects of Antibodies to Red Blood Cells
  - Naturally-occurring versus acquired RBC antibodies
  - Routes of sensitization to RBC antigens other than transfusion
  - Mechanism of RBC destruction by different antibody classes
  - Basic methods for testing immune-mediated RBC destruction
  - Rh sensitization and hemolytic disease of the newborn
- Significance of Leukocyte Contamination of Blood Products
  - Infectious disease
  - Alloimmunization
  - Febrile reactions
  - Pulmonary complications of transfusions
  - Graft versus host disease
  - Immunomodulation
- Fundamentals of Platelet Transfusion Therapy
  - Types of platelet products
  - Mechanisms of failure to respond to platelet transfusion
  - How to determine response to platelet transfusion
  - Role of platelet HLA selection and cross-matching
- Role of Gamma Irradiation of Blood Products in Modern Transfusion Medicine

### **Blood Donor Management**

- Selection and Deferral
  - Screening History
  - Physical requirements
  - Deferral criteria
- Transfusion-Transmitted Infectious Disease
  - Screening methods to prevent
  - Current “odds” of viral transmission by transfusion
  - Donor risk factors
  - Methods to diminish risk of transmission during transfusion

- Special at-risk recipient populations (BMT, Neonate, etc.)
- Clinical Management
  - Donor reactions: recognition and management
  - Counseling of deferred donors
- Autologous Donation
  - Indications for collection
  - Acceptance criteria
  - Constraints on collection
  - Iron and erythropoietin
  - Indications for transfusion
- Directed Donation
  - Identification of donors
  - Confidentiality
  - Indications for gamma irradiation of blood products
  - Counseling of patients and donors

### **Transfusion of Blood Products**

- Indications for Therapeutic Use
  - Pack RBC
  - Platelets
  - FFP
  - Special Products
- Transfusion Reactions (recognition, investigation, management)
  - Immediate hemolytic transfusion reaction
  - Delay hemolytic transfusion reaction
  - Febrile non-hemolytic transfusion reaction
  - Allergic reaction
  - Immediate generalized reaction
  - Fluid overload
  - Transfusion-related acute lung injury
  - Transfusion-associated graft versus host disease
- Platelet Therapy
  - Indications for transfusion
  - Monitoring response to transfusion
  - Refractoriness versus alloimmunization
  - Management of refractoriness to platelet transfusion

### **Apheresis Medicine**

- Fundamentals of Apheresis
  - Fundamentals of blood separation
  - Fluid balance
  - Types of instruments
  - Vascular access management
  - Replacement fluid
  - Complications of extracorporeal circulation
- Therapeutic Apheresis
  - Forms of treatment
    - Therapeutic plasma exchange
    - Cytoreduction

- Exchange transfusion
- Immunoabsorption
- Indications and scientific rationale for treatment
  - Hematologic
  - Neurologic
  - Nephrologic
  - Autoimmune disease
- Emergency treatment indications
  - Thrombotic microangiopathies with neurologic signs
  - Hyperleukocytosis with leukostasis
  - Hyperviscosity syndrome with paraproteins  
(Immune-mediated neuropathies with respiratory decline)
- Management of procedures
  - Orders
  - Fluid balance
  - Replacement fluid
  - Anticoagulation
  - Management of complications
  - Catheter management
  - Treatment schedule
  - Coagulopathies
- Combined modality therapy for autoimmune disease
  - Vasculitis
  - Immune-mediated neuropathies
  - Myopathies
- Donor Apheresis
  - Products collected
    - Single donor platelets
    - Single donor plasma
    - Peripheral blood stem cells
  - Donor management
    - Acceptable scheduling
    - Monitoring of plasma proteins
    - Access problems
- Stem Cell Donation
  - Priming schedule
  - Collection schedule
- Product QC
- Cryopreservation

## **Other Services and Electives**

Additional facilities available to the hematology/oncology training program include a modern hematology and coagulation laboratory, a modern vascular laboratory, a full-service pathology department, with a specialist in hematopathology and a specialist in cytology, diagnostic and therapeutic radiology services, nuclear medicine services, blood bank and pheresis service. Multidisciplinary special focus programs such as Center for Breast Care, colorectal, lung, and prostate cancer centers, hospice and palliative treatment services, emphasize interdisciplinary management of patients with malignant diseases. Medical and surgical oncology, radiation oncology, psychosocial teams, and other support services are brought to bear collectively to optimize patient care. Fellows have the opportunity to take elective rotations in any of these services. In addition, an elective rotation is offered in bone marrow transplantation, as well as other rotations.

Fellows attend a variety of conferences sponsored or cosponsored by the Division of Hematology/Oncology. These conferences are designed to provide exposure to a broad and sophisticated range of topics related to clinical hematology/oncology, therapeutic radiology, hematopathology, and basic research. Hematology/Oncology fellows also participate in these conferences by running an academic fellows' conference and journal club. A full conference schedule is included in this handbook. The Division of Hematology/Oncology also maintains a comprehensive clinical and research reprint file, as well as a library of current books and journals in hematology/oncology, medicine, and related disciplines. The Division maintains access to the National Library of Medicine Literature Data Base (MEDLINE) and Oncology Data Base (PDQ). This service is frequently used by fellows for both the presentation of conferences and for obtaining state-of-the-art information regarding chemotherapy protocols and cancer management.

## Research Opportunities

The Section of Hematology/Oncology Research, is closely allied to the training program. The facilities include over 40,000 square feet of research space, including an animal facility and are largely funded by the National Institutes of Health. Currently eight research laboratories, staffed by 30 investigators with basic and clinical interests, maintain programs employing disciplines, which include molecular and cell biology, biochemistry, enzymology, parasitology, electron microscopy, immunology, and cancer biology.

Major areas of active basic research include blood cell membranes, molecular basis of hereditary hemolytic anemias, biochemistry, and cell biology of adhesive proteins and cell-to-cell communication, molecular mechanisms of malaria parasite invasion into red blood cells, molecular basis of cell deformability, signal transduction in hematopoietic cells, tumor suppressor genes and oncogenes, and molecular biology of leukemia. Dedicated protected time is incorporated into the schedule for third year fellows to allow opportunities to pursue individual basic research projects.

Many clinical investigative protocols are ongoing in the Division. Under the direction of Dr. Paul J. Hesketh, Chief, Division of Hematology/Oncology, a large number of chemotherapy protocols, antiemetic protocols, and others related to hematology/oncology are being conducted. These clinical protocols take advantage of the large patient population served by the Division of Hematology/Oncology. The clinical trials consist of a mix of investigator-initiated in-house protocols, pharmaceutical-sponsored protocols, and national cooperative group protocols sponsored by the Southwestern Oncology Group. A fully staffed Clinical Trials office coordinates these protocols.

**All fellows are expected to participate in clinical research during the first two years of fellowship.** In the first year this generally involves entering patients on various active clinical protocols. By the second year, clinical fellows will participate in the design and execution of clinical research projects under the supervision of a staff member of the Hematology/Oncology Division. Fellows doing clinical or basic research are expected to present their work in abstract form at national meetings, such as American Society of Hematology, American Society for Clinical Oncology, or American Society for Cell Biology. It is also anticipated that research work during fellowship will result in one-to-two published papers. Outstanding research is also acknowledged by a Medical Staff Award on an annual basis.

## **Hematology/Oncology Training Requirements**

### ***Minimum of 3 years of subspecialty training of which:***

- minimum 18 months of direct patient care (in-service or consultations)
- 3 years of continuing outpatient care (minimum of one half-day clinic per week)
- 1-2 years of research

### ***Other rotations***

- Hematology laboratories
- Transfusion/pheresis services
- Hem/tumor pathology
- Cytogenetics
- Bone marrow transplantation
- Radiation therapy
- GYN/Onc
- Hospice

## **Inpatient Unit**

### ***Description of the Unit***

The inpatient unit for hematology/oncology is located on the seventh floor of the Cardinal Medeiros Building (M-7). There are 16 beds in the area with eight private rooms. Most of the nurses are trained in chemotherapy administration and deliver all of our chemotherapy. Of course, our outpatient service delivers the bulk of our chemotherapy. The only exception to this rule is administration in the intensive care units, which is administered by one of our chemotherapy-certified nurses.

### ***Responsibilities of the Fellows***

The fellow and attending assigned to the inpatient unit manage the inpatient oncology patients. Both the fellows and attendings rotate through the service on different schedules. The management of inpatients is done in conjunction with the patient's primary physician (often, but not always, another staff hematology/oncologist). The patient is seen daily by both the inpatient fellow and the attending. This may be done together or separately. The daily progress notes for our hematology/oncology service are written by the fellow on the inpatient service. Both the fellow and attending are responsible for interacting with the house staff assigned to the various patients providing the direction of patient care and also the educational experience for the house staff. It is important to realize that you must seek out the various house staff in order to supervise and direct. The chart becomes a central focus for communication, however. The house staff appreciates the small impromptu talks and also any materials that may be photocopied. It is also the responsibility of the fellow and attending on inpatient service to coordinate all aspects of patient care for our patients, including referrals to hospice, medical-legal matters, and psychosocial intervention. However, major decisions regarding patient management are done in consultation with the patient's primary hematology/oncology attending, or another private medical attending.

### ***Inpatient Chemotherapy Administration***

If patients on other hospital floors require chemotherapy, they are to be transferred to M-7 for chemotherapy administration. Chemotherapy orders for inpatients must be written the day before to assure the pharmacy adequate preparation of the chemotherapy. All chemotherapy orders must be cosigned by an attending physician. One must realize that we are in a teaching hospital and that the usual chain of command from intern, resident, fellow, and attending should be respected to assure adequate teaching.

### ***Admission of a Patient to the Inpatient Service***

Prior to admitting the patient to the inpatient service, it is absolutely essential to discuss the admission with the private attending physician. The primary care physician must be aware of the circumstances leading to admission, as he may be the first one to be approached by relatives for further information. In the event that the patient has not only a hematology/oncology attending, but also a private medical attending, it is absolutely essential that the private attending is notified at once. If the cause for the admission does not involve a hematology/oncology diagnosis (for example, pneumonia in a patient with CLL), the private medical attending must be offered the opportunity to decide whether or not he wants to admit the patient to his own service or to our hematology/oncology service.

***Documentation***

Please make sure copies of admission and discharge notes, or relevant tests are filed in the outpatient record, so that this record reflects a “complete picture.”

## **Outpatient Treatment Area - Cardinal Cushing Pavilion, 5th Floor (CCP5)**

### ***Unit Description***

The outpatient area is staffed by oncology nurses. Approximately 35 to 50 patients including routine follow-up appointments, new patient visits, all outpatient chemotherapy, transfusion of blood products and gammaglobulin and outpatient procedures are seen each day, Monday, Tuesday, Wednesday, and Friday between 8:00 a.m. and 6:00 p.m., and Thursday between 8:00 a.m. and 8:00 p.m.

### ***Scheduling of Patients***

Every effort is made to schedule patients at appropriate intervals and to limit the number of new patients to two per half-day session. One fellow and one staff person are assigned to each half-day session (see Appendix H).

As many of our referrals have serious illnesses, it is our policy to see all new patients within a week or sooner, if medically indicated. Questions regarding the scheduling of new patients will be referred to Dr. Leslie Martin, Director of the Outpatient Unit. Patients seen in consultation in the hospital who require outpatient follow-up will be scheduled to see the staff physician who initially saw the patient. Unscheduled visits ("walk-ins") or urgent sick visits will be accommodated in the outpatient treatment area when nursing time allows. Patients who require urgent or emergency care may be referred to the Emergency Treatment Center (ETC) at the discretion of the nurses and fellows.

### ***Charts/Chemotherapy Orders***

Outpatient charts, lab reports and inpatient medical records must remain on CCP5. Fellows are to review lab reports promptly and place in the staff physician mailbox. Filing will be done at least three times a week to ensure charts are up-to-date. It is essential that fellows record the chemotherapy orders both to the chemo flow sheet and the body of the records and whenever appropriate, attach a protocol (such as experimental chemotherapy). Also, a problem list (pink sheet) must be filled out for each chart and updated every six months.

Please carefully review Appendix G, which details all of the fellows responsibilities relating to the ordering and administration of chemotherapy.

### ***Review of Blood Films***

Please develop a habit of reviewing blood films at the time of your outpatient evaluation. The staining kit and the microscope are in the clinic area.

## **Documentation**

Appropriate documentation of all clinical activities is essential to ensure optimal patient care and compliance with all regulatory and insurer requirements. The fellow has a critical role in working with the attending physician to ensure that all documentation requirements have been met. The attending physician will review with the fellow the required documentation and appropriate form for use in different settings.

**See Appendix for the following:**

- **New Patient Encounter Form**
- **Interval Encounter Form**
- **Progress Note Template**
- **Chemotherapy Order Sheets**
- **Inpatient Consult Sheet**
- **Inpatient Admission Notes**
- **Trainees Log of Supervised Procedures**
- **Fellow Evaluation Forms**
- **Service Coverage Schedule**
- **Clinic Coverage Schedule**

# **Hematology/Oncology Nursing Services**

## ***Description of Nursing Services***

The oncology nursing staff consists of the nurses on CCP5 (outpatient) and M-7 (inpatient) units. All nurses complete a hospital-based chemotherapy education and training program (Appendix G). In addition, one-hundred percent of the nursing staff is nationally certified in oncology nursing (OCN). There is close communication between the inpatient and outpatient nursing staff, and inpatient nurses rotate to the outpatient area. An oncology clinical nurse specialist based in the outpatient department and Center for Breast Care is available as a resource.

Primary nursing is the practice model at Caritas St. Elizabeth's Medical Center. The primary nurse, as patient advocate, is responsible and accountable to deliver patient/family centered care that demonstrates respect for the individuality, dignity, spiritual needs and rights of others. Oncology nurses provide the following services: patient education; patient and family support; symptoms management; chemotherapy administration including non-vesicant continuous infusion, non-vesicant push, vesicant push; venous access device management; blood product administration; gamma-immune administration; and ATG administration.

## ***Continuing Nursing Care***

All oncology inpatients are assigned to a continuing care nurse who is responsible for coordinating arrangements in preparation for impending discharges. These arrangements may include visiting nurses and other home care services if appropriate, IV home infusion, or transfers to extended care facilities. The continuing care nurse works closely in conjunction with the nursing staff and oncology fellows. Frequent and timely communication among staff personnel contributes to a smooth transition from inpatient to the outpatient setting.

In the outpatient setting the primary nurse is available to make referrals to VNA and other home care agencies. This may be done in conjunction with the oncology social worker. Again, communication among involved staff is the key.

## ***Outpatient Oncology Nursing***

The outpatient department provides expert oncology care Monday through Friday. The department is staffed by 4-6 nurses and a medical assistant from 8:00 a.m. to 6:00 p.m. and Thursdays from 8:00 a.m. to 8:00 p.m. The staffing is as follows:

Patients may be scheduled no earlier than 8:00 a.m. and no later than 4:00 p.m. Afternoon patients requiring chemotherapy should be booked between 1:00 p.m. and 2:15 p.m. All patients under treatment have a primary nurse. The nurse's name is labeled on the patient's chart. A nursing assignment is posted on the board daily. If the patient's primary nurse is not scheduled to work, the patient will be assigned to another nurse. It is the physician's responsibility to notify the nurse of the patient's treatment.

In order to plan, direct, and coordinate patient care, a collaborative relationship between care givers is crucial. This can be facilitated by open communication regarding patients (new and current) and treatment plans. Outpatient nurses are available to meet with patients seen as inpatients who will be receiving chemotherapy on an outpatient basis. Advance notice of new chemotherapies and treatment facilitates care. "The sooner the nurse has the information, the

smoother the patient's experience will be". This includes all treatment. Chemotherapy orders written in advance contribute to efficient treatments. The orders must be written by 3:00 p.m. one day prior to treatment.

Nurses in the outpatient setting also provide routine and therapeutic phlebotomies as well as inserting intravenous lines. All patient treatments are scheduled with the nursing staff.

### ***Inpatient Oncology Nursing***

The inpatient department provides expert oncology care on a twenty-four hour basis. The unit is staffed to administer chemotherapy Monday through Friday. In emergency situations when patients must receive chemotherapy on the weekend, the nurse manager must be notified so that special arrangements can be made. All inpatient chemotherapy is administered on M-7. Chemotherapy orders for inpatients must be written and sent to the pharmacy the day before the chemotherapy is to be administered. For patients being admitted on Monday, it is the fellow's responsibility to write chemotherapy orders and ensure delivery to the pharmacy on the Friday before admission. Please keep in mind the complexity of the chemotherapy protocol. When ordering diagnostic procedures for inpatients, check with the primary nurse to ensure proper scheduling of all treatments.

## **Bone Marrows**

Bone marrow trays are checked at least two times per week. In the event of low supply contact an R.N. All materials (except Xylocaine and EDTA) are stored in the bone marrow room. Extra Xylocaine is stored in the med. room, and EDTA is stored in the refrigerator in the med. room. Gloves are stored in the treatment room.

### ***After Completing a Bone Marrow (See Below for Biohazard):***

- All used disposable needles, blades, lancets, etc. are discarded in the beige biohazard waste container. Please inform R.N. if biohazard waste container is full. Do not overfill container.
- All other disposable items in the tray must be discarded in a biohazard bag.
- Rinse watch glass and place in soapy water container.
- Return unused Xylocaine and EDTA to refrigerator. Empty Xylocaine bottles are discarded.

### ***Biohazard Samples:***

- Place used watch glass in tray.
- Do not return EDTA or Xylocaine to refrigerator.

### ***Bone Marrow Documentation for Fellows:***

1. Log book in marrow room - keep up to date.
2. Paperwork for marrow -
  - surgical pathology slip - goes with biopsy
  - special hem slip - stays in clinic for charging
  - special hem slip - goes in blue log book at the front desk if special procedures are done (i.e. chromosomes, tumor markers, and bone marrow cultures).
  - aspirate report - filled out by fellow and countersigned by attending.
3. Marrows should not be outstanding for more than one week.
4. Read marrows should be brought back down to hem lab for filing.
5. Keep extra unstained slides in your own box for extra stained, etc.

### ***Charge Tickets Must Include:***

- Diagnosis
- Date of Service
- Case Number
- Medical Record Number
- Patient Name (First and Last)
- Physician
- Location of Patient (Hem/Onc or Floor in Hospital)
- X Indicating Code(s) to be Charged

*Charges should be placed on nurse's desk with patient chemo charges.*

### **IMPORTANT:**

**For billing purposes, an attending physician must be present during all bone marrows.**

## **Special Testing Done Out of CSEMC**

Special testing (chromosomes, tumor markers, and bone marrow cultures) that is to be done outside of the hospital is to be logged into the blue book that is located at the secretary's station.

Samples will be brought to the Hematology Laboratory at the ACH building, 2nd floor, to be picked up by cab.

Be sure to include all the information that is asked: Patient name, medical records number, hospital test is being sent to, test being done, date, and diagnosis.

It will be very helpful if a Special Hem Charge slip is stamped with the patient's card and left in the book.

Please exercise a cautious judgment about indications for send outs. They are very expensive! Keep in mind that cost effectiveness is an integral part of outstanding patient care.

## **Educational Resources**

Self-education is an essential part of the fellowship program. Proper use of journals, texts, and other materials will improve patient care and facilitate the overall educational experience. Numerous resources have been developed to increase efficiency of reviewing relevant literature and to simplify the effort required for teaching house staff, participation in fellow's conferences, clinical rounds, etc.

### ***Libraries***

The Stohlman Library, named in honor of the former Chief of Hematology/Oncology, provides numerous books and journals in Medicine, Surgery, and Hematology/Oncology. Journals are also kept in the conference rooms on MMR3 and ACH building, 4th floor (ACH4). In general, the MMR3 journals are clinical, and the ACH4 journals are focused on basic science. The major journals are listed in the attached table.

### ***Books***

The Stohlman Library contains many of the key texts in hematology and oncology. In addition, the staff maintains many books and specialty texts, which are available to fellows. Dr. Hesketh has several texts and teaching files in the fields of cancer pharmacology, drug protocols, and experimental therapy.

### ***Review of Morphology***

Morphology review will be an integral part of all clinical conferences, including the weekly Hematology/Oncology Conference, Tumor Board, and Center for Breast Care. An introductory session will be organized in the beginning of the program, to review methods of blood smear/bone marrow preparation and analysis. In addition to the routine analysis of relevant morphologies from the outpatient clinic and the consultation service, a regular conference will be scheduled to members of the Dept. of Pathology to review recent bone marrows, and blood smears. The Hematology Videodisc, which contains over 10,000 color slides from the American Society of Hematology Slide Bank, will be available in the MMR3 conference room for review of both normal and abnormal images on the teaching monitor.

### ***Computer Search Services***

Grateful Med is a program that enables literature searching through the National Library of Medicine. This program is available in the computer located adjacent to the fellow's room, and a modem is connected to a dedicated telephone line for this purpose. This program also provides PDQ, a computerized library of current protocols for cancer treatment. The librarian in the Stohlman Library will also assist with computerized searches and retrieval of articles from other libraries.

### ***Clinical Research Protocols***

Clinical research protocols are coordinated by the Clinical Trials office located in the Section of Medical Oncology offices in House Officer's Quarters, 2nd floor (HOQ2). Fellows are encouraged to participate in the development and execution of clinical protocols. Personnel in the Clinical Trials office are available Monday through Friday from 8:00 a.m. to 5:00 p.m. to

assist fellows with any issues relating to ongoing studies. A file of current research protocols is also located in the outpatient clinic and inpatient unit.

***Patient Information***

An extensive library of pamphlets is available near the outpatient clinic. These are selected to provide information to patients and their families. Fellows are encouraged to become familiar with this material and to provide it to their patients when appropriate.

## Hematology/Oncology Conference Schedule

(Conferences designated by \* are mandatory.)

<b>Monday</b>	3:00 p.m. - 4:00 p.m.	Hematology/Oncology Clinical Conference* Case presentations and discussion. Every Monday- CCP 5
	3:00 p.m. - 4:00 p.m.	Morbidity and Mortality Conference* Once per month- CCP 5
	4:00 p.m. - 5:00 p.m.	Interdisciplinary Tumor Board* Hematology/Oncology, Therapeutic Radiology, Surgery Pathology, Diagnostic Radiology. Third Monday of the month
<b>Tuesday</b>	12:15 p.m. - 1:00 p.m.	Hematopathology Conference
<b>Wednesday</b>	7:15 a.m. - 8:00 a.m.	Lung Cancer Conference Every Wednesday- Radiology Conference Room
	8:00 a.m. - 9:00 a.m.	Medical Grand Rounds Every Wednesday- Seton
	12:00 p.m. - 1:00 p.m.	Center for Breast Care Conference Every Wednesday- CBC
	1:15 p.m. - 2:15 p.m.	Coagulation or Immunohematology Conference Once per month.
	4:00 p.m. - 5:00 p.m.	Biomedical Research Journal Club Twice per month.
<b>Thursday</b>	7:30 a.m.- 8:00 a.m.	Core Curriculum Conference* (Fellows Conference) Every Thursday- CCP 5
	7:30 a.m.- 8:00 a.m.	Fellows Journal Club* Once per month- CCP 5
	9:15 a.m.- 10:00 a.m.	Clinical Research Conference* Once per month- CCP 5
	12:00 p.m. - 1:00 p.m.	Hem/Onc Grand Rounds* Second and Fourth Thursday- St. Margaret's 3+4
<b>Friday</b>	8:00 a.m. - 9:00 a.m.	GYN/Onc Conference Every Friday- St. Margaret's 3+4

## Conference Series: Hematologic and Oncologic Emergencies

- Disseminated intravascular coagulation
- Fever and neutropenia
- Thrombocytopenias: work-up and management
- Platelets/granulocytes transfusions
- Transfusion reactions
- Superior vena cava syndrome
- Hyperviscosity/leukostasis syndromes
- Spinal cord compression
- Mass lesions in the brain
- Hypercalcemia
- Complications of chemotherapy
- Neoplastic cardiac tamponade
- Replacement therapy in hemophilia and other deficiencies
- Bleeding during cardiopulmonary bypass surgery
- Management of severe hemolytic anemia
- Sickle cell crisis
- Evaluation and management of severe anemia

## Specific Program Content

Fellows are provided opportunities to develop clinical competence in the field of hematology/oncology. The curriculum of the program includes, but is not limited to, the following content areas:

- Morphology, physiology, and biochemistry of blood, marrow, and lymphatic tissue and spleen.
- Related basic fields including immunology, pharmacology, cell biology, and molecular genetics.
- The etiology, epidemiology, and natural history of cancer.
- Basic pathophysiologic mechanisms and therapy of diseases of the blood including anemias, white blood cell disorders, and abnormalities of hemostasis and thrombosis.
- Fundamental concepts of molecular biology and tumor cell biology and immunology.
- Chemotherapy and biologic response modifier administration by various routes including intrathecal administration.
- Etiology, epidemiology, natural history, diagnosis, and management of neoplastic diseases of the blood, marrow, and lymphatic tissues.
- Hematologic presentations or complications of non-hematologic disorders.
- Management of experimental chemotherapy protocols for hematologic and non-hematologic malignancies.
- Pharmacokinetics, mechanisms of actions, clinical indications, toxicity, and complications of chemotherapeutic drugs.
- The roles and limitations of surgery and radiation therapy in the treatment of malignant disease.
- Evaluation and management of disorders of hemostasis and thrombosis, both congenital and acquired, and management of antithrombotic and fibrinolytic therapy.
- Principles and practice of transfusion medicine, including evaluation of antibodies, blood compatibility testing, use of blood component therapy, and pheresis.
- Rehabilitation and psychologic, social, and ethical aspects of clinical management of cancer patients.
- Administration and management of a tumor board.
- Opportunities are provided for fellows to gain competence in the following clinical skills:
  - \* Bone marrow aspiration and biopsy
  - \* Preparation and interpretation of blood and bone marrow smears.
  - \* Chemotherapy administration
  - \* Therapeutic phlebotomy
  - \* Pheresis
  - \* Management and care of indwelling venous access catheters
  - \* Lumbar puncture with chemotherapy
  - \* Bleeding time
  - \* Serial measurement of palpable tumor masses
  - \* Management of immunocompromised patients
  - \* Correlation of clinical information with findings of cytology, histology, and imaging techniques

## **Recommended Literature in Hematology/Oncology (Minimum Requirements)**

### ***Hematology:***

American Journal of Hematology  
Blood  
British Journal of Hematology  
Clinics in Hematology  
Seminars in Hematology

### ***Oncology:***

Annals of Oncology  
Cancer  
Cancer Treatment Reports  
Journal of Clinical Oncology  
Seminars in Oncology

### ***General Medicine:***

American Journal of Medicine  
Annals of Internal Medicine  
New England Journal of Medicine

### ***Additional:***

Journal of Clinical Apheresis  
Journal of Clinical Investigation  
Journal of Hematotherapy  
Seminars in Thrombosis and Hemostasis  
Transfusion  
Transfusion Medicine Review

## Ongoing Research Projects

### Cell and Molecular Biology of Adhesive Proteins in Erythropoiesis/Antimalarial Research

Manjit Hanspal, Ph.D.

Cell:cell interactions among various cell types in the bone marrow play an important role in supporting and regulating hematopoietic differentiation. The focus of this laboratory is to study cell:cell interactions in erythropoiesis, concentrating principally on erythroblast-macrophage interactions. In the bone marrow, erythropoiesis occurs in distinct anatomic units called erythroblastic islands, which consist of a central macrophage surrounded by a ring of developing erythroblasts. The formation of erythroblastic islands involves adhesive interactions between the central macrophage and the ring of developing erythroblasts, and between adjacent erythroblasts in the ring. These adhesive interactions are mediated by specific pairs of cell surface receptors and counter-receptors. Our laboratory has identified a novel protein termed Emp (Erythroblast macrophage protein) which is involved in erythroblast-erythroblast and erythroblast-macrophage interactions (Blood 84, November 1994). We have shown that the Emp-mediated attachment of erythroblasts with macrophages promotes erythroid maturation and is specifically required for erythroblast enucleation. We have determined the complete amino acid sequence of human Emp from a cDNA clone that was isolated from the macrophage cDNA library (Blood 92, October 1998). The recombinant Emp functions as a cell adhesion molecule when expressed in heterologous cells. The aim of Dr. Hanspal's laboratory is to characterize the molecular basis of Emp's function in promoting enucleation of erythroblasts by virtue of their association with macrophages. Current studies in the laboratory involve the development of a murine model by disrupting the Emp gene using homologous recombination in embryonic stem cells. The availability of Emp (-/-) mice will provide a unique experimental model to study the function of Emp in erythroid and nonerythroid cells.

*Development of cysteine protease inhibitors as antimalarial drugs* Plasmodium falciparum which causes the most severe form of human malaria is becoming increasingly resistant to current antimalarial drugs. Therefore, there is an urgent need to develop new antimalarial therapies. Among potential targets for new modes of chemotherapy are malarial proteases, which are involved in all stages of the erythrocytic life cycle of human malaria, including the rupture and subsequent reinvasion of erythrocytes. We have recently identified a parasite-derived cysteine protease which appears to cleave erythrocyte ankyrin specifically within its regulatory domain. The breakdown of ankyrin could be of interest in erythrocyte rupture and release of merozoites. Two additional cysteine proteases have been cloned and identified in Dr. Hanspal's laboratory. Further characterization of such proteases could lead to the development of specific inhibitors, which either by themselves or in conjunction with established therapies, may offer an alternative treatment for malaria.

### Lynn Hlatky, Ph.D.

Director, Center of Cancer Systems Biology  
Dept. of Medicine

### Role of intercellular interactions in radiation-induced carcinogenesis and cancer progression.

This is the subject of a National Aeronautics and Space Administration (NASA) Specialized Centers of Research Program Project. It is recognized that tumor progression is under the control of both genetic alterations in tumor cells and supra-genetic events, including disruption of normal epithelial-mesenchymal contacts and signaling that are now seen to control tumor dormancy and invasive potential. We propose the latter can play a crucial, often decisive, role in cancer risk - an issue of critical importance in understanding the underpinnings of cancer

and cancer prevention. Accordingly, a number of specialized groups and projects have been brought together under this Program, including: 1) a gene array analysis and bioinformatics core that will track and quantify the simultaneous response of the entire genome to environmental stimuli (e.g., radiation, antiangiogenic agents) (lead by Lynn Hlatky); 2) a mathematical modeling group (headed by Philip Hahnfeldt) that will assess tumor development under the control of signalings from adjacent *vascular endothelium* and *stromal fibroblasts* – both of which have been shown to influence tumor growth; 3) the implementation of conditional *k-ras* and spontaneous lung tumor mouse models to experimentally examine modulation of radiation action on tumor promotion and progression, with emphasis on the role of recruited circulating endothelial cells from the bone marrow (Lynn Hlatky); 4) a quantitative study of the complexity of radiation-induced chromosome aberrations to ionizing radiations to assess its connection to accelerated tumor development (Ray Sachs); and 5) the development of several new tumor dormancy murine models, now underway in the lab of Judah Folkman (Harvard).

Investigations into the modeling of DNA damage and repair in cancer biology. Our studies of chromosome damage and repair have an impact in cytogenetics as well as on interphase chromosome localization and geometry.

Our group has been investigating the interaction of the epithelial, endothelial and stromal compartments of tumors. In our recent studies of epithelial and stromal tissues exposed to ionizing radiations, DNA damage profiles were found to vary less with dose for a given tissue type than across tissue types at the same dose. This is a finding that has profound implications for the role the differentiation state plays in modulating the effects of DNA damage in the genome. Because tumor growth involves the coordinated growth of two compartments, the epithelium and its associated stroma/endothelium, this underscores the need to consider the tissue dependence of DNA damage response to cancer treatment. On the modeling front, we have revisited the kinetic theory for double-strand break repair and misrepair following ionizing radiation, and have proposed new theories for the resolution of DNA double-strand breaks. In the process, we have obtained a better understanding of these kinetics and how chromosomes are packaged within the nucleus.

**Philip Hahnfeldt, Ph.D.**

Senior Investigator, Center of Cancer Systems Biology  
Dept. of Medicine

Optimum dosing regimens and the implications of intratumor heterogeneity. The focus of these studies is on the treatment complications posed by tumor heterogeneity. In traditional cancer therapies, radiation therapy and chemotherapy, heterogeneity in sensitivity among tumor cells has been observed to reduce the relative effectiveness of intense versus protracted dosing protocols. Suggested is a benefit to tailoring the dosage to the heterogeneity displayed. An exciting new mode of chemotherapy involves dosing slowly and regularly instead of intensely with large gaps between treatment cycles. To optimize treatment, it is necessary to understand why this new approach to dose delivery yields optimal tumor suppression while minimizing the usual side effects (e.g. nausea and hair loss). Our mathematical studies point to variations in population response to doses as a possible explanation.

Tumor growth suppression under antiangiogenesis therapy. Antiangiogenic therapy in combination with chemotherapy is now demonstrating substantial benefit in clinical trial for various tumors including colon and breast. My lab is exploring empirically and theoretically the unique tumor and vascular kinetics of tumor growth under angiogenic control and,

inversely, the regression kinetics under antiangiogenesis therapy. The indirect means by which this tumor suppression is accomplished – coupled with the recent finding that tumors both stimulate and inhibit their own vascularization – points to the need for a tumor model that properly captures these dynamics. Using a two-compartment tumor-endothelial model of coordinated tumor growth, we have found that uniform simultaneous suppression of both compartments produces the most efficient tumor suppression overall. This explains the numerous recent findings that chemotherapy and antiangiogenic therapy alone consistently under-perform compared to combination chemotherapy/antiangiogenic regimens. We have also verified a concept that carries over from our more general studies of heterogeneity – that low and regular, so called ‘metronomic’, delivery of chemotherapy is not only more efficient at suppressing the tumor overall, but exhibits an endothelial targeting bias over conventional chemotherapeutic delivery that may explain its greater tolerance.

Modeling of chromosome geometry through study of DNA damage and repair. My lab is working on models of chromosome localization in an interphase cell nucleus. Chromosome localizations are related to gene expression differences and to spectra of radiation-induced inter-chromosomal aberrations as measured by mFISH. Each chromosome is modeled by a random walk and the location of the chromosome’s center of gyration within the nucleus is modeled by using a simulated annealing computer algorithm to determine regions for all 46 chromosomes, using an excluded volume effect penalty for overlaps. We have shown that the simulated annealing algorithm, in agreement with data and in contrast to other methods, tends to have the larger chromosomes near the periphery and the smaller ones near the center, apart from various biases based on gene density and/or chromosome clusters for specific chromosomes.

In the studies described above, we used imaging techniques to track response details. Now these very techniques have become a focus for improvement. To this end, we have customized the morphologic recognition process and analytical software to enhance the resolution of imaging features. With the acquisition of a new computerized imaging and analysis facility (Leica Microsystems), we will expand on these programming and acquisition capabilities.

**Rainer K. Sachs, Ph.D.**

Center of Cancer Systems Biology

Adjunct Professor, Dept. of Medicine, Tufts University School of Medicine

Professor of Mathematics and Professor of Physics, Univ. of CA Berkeley

Prof. Sachs is working on mathematical models of second cancer induction after radiotherapy to a nearby organ. The challenge is to quantify carcinogenesis due to protracted, high-dose, partial body irradiation with x-rays. The classic linear-quadratic-exponential mathematical model, predicts very little carcinogenesis in regions receiving high doses because of high cell kill in those regions. This is contradicted by recent empirical data on second cancer solid tumors. We propose the basic reason is that cell proliferation, including proliferation of a few surviving mutant cells in high-dose regions, compensates for cell killing and accounts for the large observed high-dose risk. To implement this idea, differential equation and difference equation computer models are used to track the numbers of mutant cells in time during radiotherapy protocols and during a subsequent recovery period. For leukemias, an additional factor is migration of hematopoietic stem cells. Migration tends to decrease high-dose risks because immigration of normal cells from distant, essentially unirradiated regions into heavily irradiated regions inhibits proliferation of mutant cells in the heavily irradiated regions. Corresponding data shows that, in contrast to the situation for solid tumors, high dose risks are indeed significantly smaller for leukemias than they would be if cell killing and cell repopulation did not occur. The data can be modeled by an extension of the solid tumor

models which accounts for migration among 17 bone-marrow compartments via the blood. The models can be used to get credible predictions for second cancer risks after radiotherapy protocols so recently put into use that epidemiological evidence on the risks is not yet available. Further extensions of the models to take into account stochastic, small number effects for the leukemia case are planned.

## Suggestions for Preparation of Grand Rounds, Lectures, Etc.

Below are a list of points to keep in mind when preparing outside lectures, grand rounds, etc.

- Start with a list of key points you wish to make (syllabus).
- Limit the number of key points to probably no more than ten as a maximum. The most frequent mistake made by beginners is an overabundance of information.
- Make sure that each slide is self-explanatory, clearly illustrating the point.
- All slides must be simple enough so that the audience can read all that is presented on the slide.
- Take enough time to explain the information on the slide. Never show the slide without taking the time to present the information that is on it.
- Typically, no more than seven and often even less than seven slides can be shown in ten minutes.
- Make sure that the text on the slides is legible when the slides are projected (when using a regular typewriter, print the material from which the slide is made into a space not exceeding the size of a postcard).
- When presenting a typical one hour lecture, plan 45 minutes for presentation, leaving 15 minutes for discussion and questions.
- Before a lecture, ask yourself these questions:
  - To whom am I talking?
  - How much does the audience know?
  - What is their background?
  - How quickly can they assimilate the information?
- When reviewing a given subject for the first time, you are likely to read an enormous amount of information. When writing a review article, you typically include most of the information in the review article. In a striking contrast, when presenting the same material for a lecture, you must be highly selective and edit the information presenting probably no more than 10% of what you know or what you have learned.

## **American Board of Internal Medicine Requirements for Combined Training Leading to Dual Certification**

### ***Hematology and Medical Oncology***

Dual certification in Hematology and Medical Oncology requires three years of full-time combined fellowship training. Full-time clinical training is defined as at least 80% of the trainee's professional time during a working week dedicated to clinical (patient care or educational) activities. The three years of combined training must include a minimum of 18 months of prospectively designed full-time clinical training with patient care responsibility. This full-time clinical training must include a minimum of 12 months in the diagnosis and management of a broad spectrum of neoplastic diseases including hematological malignancies and a minimum of six months of training in the diagnosis and management of a broad spectrum of non-neoplastic hematological disorders. During the entire three years, the candidate must attend to at least one outpatient clinic for a minimum of one-half day per week and have the responsibility for providing continuous care to a defined cohort of patients being managed for neoplastic and hematological disorders.

The combined training must be taken in programs in the same institution accredited in both Hematology and Medical Oncology by the ACGME, the Royal College of Physicians and Surgeons of Canada, or the Professional Corporation of Physicians of Quebec.

Candidates must complete all three years of required combined training before being admitted to an examination in either subspecialty. Those who elect to undertake an examination in one subspecialty following only two years of fellowship training will be required to complete four years of accredited training for dual certification.

The above policies pertain to trainees who entered subspecialty training in Hematology and/or Medical Oncology on or after June 1, 1990.

**CARITAS ST. ELIZABETH'S MEDICAL CENTER OF BOSTON  
DIVISION OF HEMATOLOGY/ONCOLOGY**

***CHEMOTHERAPY PROCESS***

**MULTIDISCIPLINARY PRACTICE GUIDELINES**

**I. BASELINE PROFESSIONAL EDUCATION REQUIREMENTS:**

There are three primary disciplines involved in the chemotherapy process: physicians, nurses, and pharmacists. Each professional should have a baseline knowledge of cancer chemotherapy before being involved in the chemotherapy process.

**PHYSICIANS:**

Physicians authorized to write chemotherapy orders for the treatment of neoplastic diseases should be board-certified and/or board-eligible hematologists, medical oncologists, or gynecological oncologists. Gynecologic/oncology nurse practitioners (Appendix D) may write chemotherapy orders with the co-signature of an attending gyn oncologist. The hematology/oncology fellows who have been deemed capable by the division chief to write chemotherapy orders may do so but the orders must be checked and countersigned by a qualified attending physician. Attached to these guidelines is a listing of hematology/oncology fellows, attending physicians, and gynecologic/oncology nurse practitioners authorized to prescribe chemotherapy (Appendix A).

Chemotherapy medications for non-cancer patients may be written by attending physicians with specific delineated privileges in their specialty area. Physicians of other specialties who use antineoplastic drugs for the treatment of nonmalignant conditions must adhere to practices stated in the multidisciplinary guidelines and provide the following information for each cytotoxic agent prescribed: name of the agent, acceptable dose ranges as defined in the SEMC regimen reference book, indicated disease, and published reference source(s). The chemotherapy ordering process should be followed for these drugs and if physicians are involved in the administration of these drugs (ex: intra-operative injection) they must be aware of the OSHA guidelines for the handling of these agents.

Attached to these guidelines is a listing of all practicing OB/GYN physicians at SEMC (Appendix B).

**REGISTERED NURSES:**

Registered Nurses who handle and administer chemotherapy must fulfill the theoretical and practical components of the chemotherapy educational plan and thus be deemed competent to administer antineoplastics. The following is an outline of the educational plan:

**Theoretical Component** - Attendance at the Chemotherapy Consortium of Boston program "Cancer Chemotherapy: Principles for Nursing Practice" is required. All participants complete a pre-test and obtain a self-study packet prior to the seminar. This eight hour didactic presentation focuses on basic information regarding professional responsibilities, cell cycle, pharmacokinetics, principles of chemotherapy and

administration techniques. Assessment and nursing management of treatment related side effects is also addressed. Upon completion of the program, the learner will be able to:

1. Identify the major classifications of antineoplastic agents and their actions.
2. Describe the common toxicities which can occur in response to treatments.
3. Define nursing management of potential and actual side effects and toxicities associated with antineoplastic therapy.
4. Describe the nurse's role in assuring responsible and safe handling of antineoplastic agents.

**Practical Component** - Upon successful completion of the post-test (85%) the clinical practicum is initiated. Under the supervision of a preceptor, Registered Nurses complete clinical competencies for vesicant push chemotherapy and short intermittent drip chemotherapy.

## **PHARMACISTS:**

Pharmacists involved in the chemotherapy process must complete the departmental orientation specific to the handling and use of antineoplastic agents. They must be able to demonstrate competency in safe and accurate chemotherapy compounding and handling. The training includes the following areas:

- Proper aseptic technique
- Proper procedures to follow in the event of a chemotherapeutic agent spill
- Review of antineoplastics
- Review of specific chemotherapy terminology
- SEMC policy on physician ordering of chemotherapy
- Locations of chemotherapy protocols and regimens
- Calculation of BSA
- Calculation of chemotherapy doses
- Reasoning for dose adjustments
- Calculation of measured and estimated creatinine clearance
- Calculation of area under the curve dosing
- Checking chemotherapy compatibility, appropriate volume and diluent
- Checking drug-drug interactions with chemotherapy
- Review of standard premedication protocols
- Normal limits of specific laboratory values for administration of chemotherapy
- Proper procedures for investigational chemotherapy
- Correct order entry of chemotherapy
- Correct labeling of chemotherapy
- Proper procedure for checking chemotherapy manufacturing

## **II. STANDARD PRACTICE**

- A. All parental chemotherapy is written on the approved chemotherapy order sheet. Initial creation of preprinted orders is the responsibility of a multidisciplinary committee and reviewed by all disciplines before finalization.
- B. Chemotherapy orders are written by hematology/oncology attending physicians and fellows, gynecologic oncologists and nurse practitioners (Appendix A) with the following exceptions:
  - 1. Parental methotrexate for ob/gyn indications is written by the ob/gyn attending physician (Appendix B).
  - 2. Parental methotrexate for rheumatoid indications is written by the attending primary care physician and dosed within that stated in the SEMC regimen reference.
  - 3. Intravesicular chemotherapy is written by the attending urologist.
  - 4. Chemotherapy used for ophthalmic indications is written by the attending ophthalmologist.
- C. If the dose is greater than stated in the regimen reference book, the attending physician will provide a reference article.
- D. At the discretion of the attending physician, if additional cycle of chemotherapy are to be given beyond what is stated in the Regimen Reference Article, the rationale must be stated in the plan.
- E. At the discretion of the attending physician, a regimen may be utilized for indications other than that described in the reference article.
- F. Body surface area (BSA) calculations are done with a preprogrammed calculator/computer.
- G. Parental chemotherapy is administered in specific areas (inpatient hematology/oncology unit or outpatient hematology/oncology clinic on CCP5). In unusual circumstances where chemotherapy must be administered outside the designated area (ICU, neuro unit, obstetrics, and medical nursing units), the drugs must be administered by a chemotherapy competent registered nurse.
- H. Changes that need to be made to a chemotherapy or antiemetic order sheet will require the completion of a new order sheet. Crossing out of orders will not be accepted.
- I. The "Dose to be Administered" documented on the order sheet will be rounded up or down in adherence to the "Standard Dose Rounding and Maximum Doses of Chemotherapeutic Agents" schedule (Appendix C).
- J. The "follow-up" reporting mechanism for physicians, pharmacists, and registered nurses is as follows:

The physician, pharmacist, or registered nurse who discovers an inconsistency in the plan or chemotherapy order sheet or crossing out on a chemotherapy and/or antiemetic order sheet will write "void" on the order and forward the order sheet to the designated quality control physician. The quality control physician will

present a report to the quarterly Hematology/Oncology CQI meeting summarizing this information.

### **III. PHYSICIAN RESPONSIBILITIES/Gynecologic Oncology Nurse Practitioners (GNP)**

- A. Allergy status will be documented in the space provided on the chemotherapy order sheet.
- B. The fellow/GNP writing the order documents that he/she has checked the chemotherapy regimen against the SEMC Chemotherapy Regimen Reference and writes the corresponding regimen number on the order sheet.
- C. If the first cycle schedule, dose, or route of chemotherapy is modified from the SEMC chemotherapy regimen reference, the physician/GNP must explicitly provide a rationale for this modification in the treatment plan and on the order sheet. The plan must be cosigned by the attending physician.
- D. When an order has been written for a dose reduction, the percentage or mg/m<sup>2</sup> must be stated. The rationale for the reduction will be documented by the attending physician on the chemotherapy order sheet and in the plan and cosigned by the attending physician.
- E. For patients receiving chemotherapy on an in-patient basis, the attending physician of fellow/GNP must write a treatment plan in the progress notes section specifying the chemotherapy regimen to be utilized, including the drugs, doses, routes, and frequency of administration. For patients receiving chemotherapy in the outpatient center, the ordering physician/GNP must write a plan in the clinic chart detailing the same information.
- F. In those instances where a regimen has been ordered that is not included in the SEMC Reference, another reference (article, copy of protocol) will be placed in the patient's chart by the physician/GNP for the RN and the pharmacist to utilize for dose verification. A copy of the reference must be provided to the pharmacy.
- G. When a full published article is not available for a given chemotherapy regimen, a published abstract or study protocol can be substituted, with the approval of the attending physician.
- H. The ordering physician/GNP will be responsible for noting whether or not a patient is participating in a research protocol by checking the appropriate box on the order sheet. If the patient is participating in a research protocol, the protocol number, randomization arm (if applicable) and whether or not the research drug is supplied, should be noted on the order sheet. A copy of the protocol will be provided by the physician/GNP and placed in the patient's medical record with the page(s) for dosing flagged.
- I. The ordering physician/GNP will be responsible for recording the patient's height and weight and calculating body surface area with a preprogrammed calculator. In addition, the physician/GNP will be responsible for completing all sections of the preprinted order sheets. All pertinent information must be supplied to ensure a safe and accurate order capable of verification. Abbreviations for drug name and frequency will not be used when ordering chemotherapy. Prescribed dosage of

chemotherapeutic agents will not contain decimal points. Dosages will be rounded according to the SEMC Standard Dose Rounding Schedule (Appendix C). The only exception to this rule is calculated dosages for topotecan and vincristine. Also, in no instance will a trailing zero be added to any dose calculation.

- J. All chemotherapy orders written by hematology/oncology fellows and GNP must be co-signed by an attending physician and have allergy status documented before the orders are faxed to the pharmacy and the chemotherapy is administered.
- K. The attending physician or fellow or GNP who writes chemotherapy orders for an anthracycline, bleomycin, or mitomycin must document the cumulative dose previously received by the patient on the order sheet. (This information is documented in the designated area on the order sheet separate from the current ordered dose so as not to cause confusion). Cumulative doses are not required for bladder irrigations and ophthalmic cases.
- L. The first administered dose of cisplatin and carboplatin will be based on an estimated creatinine clearance.
- M. Chemotherapy orders or any adjustments to written chemotherapy orders cannot be given verbally.
- N. Chemotherapy orders for methotrexate use in obstetric and rheumatology patients must be written by the attending physician on the approved order sheet and a treatment plan must be signed and placed in the patient's medical record.
- O. Intravesicular chemotherapy orders for bladder instillation must be written by the attending urologist on the approved order sheet.

#### **IV. REGISTERED NURSE RESPONSIBILITIES**

- A. All chemotherapy orders must be co-signed by an attending physician and have allergy status documented before the orders are faxed to the pharmacy. Orders and treatment plan for parental methotrexate used for obstetric or rheumatology patients must be written on the approved chemotherapy order sheet and signed by the attending physician. A list of attending physicians for obstetrics is attached for reference (Appendix B).
- B. For cycle #1, at the time of chemotherapy orders are faxed to the pharmacy, the RN must also fax the plan. When a treatment plan is changed/altere, the new plan is faxed to the pharmacy with the orders.
- C. In those instances where a regimen has been ordered that is not included in the SEMC Reference, another reference (article, copy of protocol) will be placed in the patient's chart by the physician/GNP for the RN to utilize for dose verification. A second RN will also check the order sheet against the article or protocol. The reference article will be faxed to the satellite pharmacy by the RN.
- D. When a full published article is not available for a given chemotherapy regimen, a published abstract or protocol can be substituted, with approval of the attending physician.

- E. If the dose or schedule of a chemotherapy regimen is modified from that stated in the SEMC Chemotherapy Regimen Reference or reference article, the physician/GNP must explicitly provide a rationale for this modification in the treatment plan and on the order sheet. All modifications and dose reductions are co-signed by the attending physician.
- F. For Day 1 of chemotherapy, weight the patient.  
\*If the weight deviates 10 pounds more or less from what is recorded on the order sheet, notify the fellow/GNP.  
Verify the patient's height.
- G. Calculate the BSA with a preprogrammed calculator/computer. If the RN calculation is not consistent with the BSA on the order sheet (0.1 or greater) notify the attending physician.
- H. The administering RN will check lab results for Day #1 of chemotherapy and document results on order sheet. If labs fall outside the criteria stated on the order sheet call the fellow/GNP with lab results for an order to proceed or hold chemotherapy. If the RN is given a verbal order to proceed or hold chemotherapy, this order will be entered by the nurse in the appropriate space on the order sheet. The research nurses are also responsible for checking laboratory parameters dictated by the research protocol.
- I. Prior to calling the pharmacy to mix chemotherapy, the check of mathematical calculations and verification of the chemotherapy order against the plan and SEMC Chemotherapy Regimen Reference will be done. If this is an investigational protocol, the ordered dose will be checked against the protocol dose sheet.
- J. Two (2) RNs will check the chemotherapy order sheet against the plan written by the physician/GNP in the patient's chart to verify the correct dose(s) has (have) been ordered. Two (2) RNs will also check the chemotherapy order sheet against the SEMC Chemotherapy Regimen Reference (reference number must be written on the order sheet by the physician/GNP) to ensure the correct dosage(s) have been ordered. Both RNs will sign off on the order sheet in the box labeled "Order Verified Against Chemo Plan, SEMC Chemotherapy Regimen Reference, and Investigational Protocol (if pertinent)" that this check has occurred.
- K. Two (2) RNs will verify that the "Dose to be Administered" documented on the order sheet is rounded up or down in adherence to the "Standard Dose Rounding and Maximum Doses of Chemotherapeutic Agents" schedule (Appendix C).
- L. The RN will check the chemotherapy bag or syringe against the original order to verify the correct drug and dose and then sign the order sheet. A second RN will do the same.
- M. At the time chemotherapy is to administered, two (2) RNs will verify that the correct drug is being given to the appropriate patient by checking the patient name band. The name band will be checked against the drug label to confirm that the medical record number, patient name, and date of birth are identical.

- N. In the rare instance that a second chemotherapy-competent RN is not available for the verification process, the pharmacist will be notified. The pharmacist will complete the double check system and sign the order sheet including status.
- O. The RN who administers the chemotherapy will be the first signature under "Administration Checked".

### **OG/GYN Methotrexate Administration**

The administration of methotrexate in the OB/GYN setting will be done by the oncology registered nurse. The oncology RN will recalculate the BSA and verify that the "Dose to be Administered" on the order sheet is correct. The oncology RN will check the SEMC Chemotherapy Regimen Reference and the treatment plan to ensure that the correct methotrexate dose has been ordered. If a dose other than that stated in the SEMC Chemotherapy Regimen Reference is ordered, a note must be written by the physician in the patient's chart stating the reason for a different dose. The oncology RN will sign off under "Order Verified Against Chemo Plan and SEMC Chemotherapy Regimen Reference" as RN Signature #1.

The "Dose to be Administered" on the OB/GYN order sheet will be rounded up or down to the nearest 5 mg per the "SEMC Standard Dose-Rounding and Maximum Doses of Chemotherapeutic Agents" schedule. If the total volume of methotrexate exceeds 2 ml, the dose will be split by pharmacy into 2 syringes.

The OB/GYN RN, together with the oncology RN, will check the syringe containing methotrexate against the original order and signed treatment plan to verify the correct drug and dose.

In the patient room, the antepartum RN, together with the oncology RN, will check that the correct drug is being given to the appropriate patient by checking the name band. The name band will be checked against the drug label to confirm that the medical record number, patient name, and date of birth are identical.

The OB/GYN RN will sign off as "Witnessing RN", under the "Administration Order and Plan Check" section on the order sheet.

The oncology RN, after administering methotrexate, will sign as the "Administering RN", under the "Administration Order and Plan Check" section on the order sheet.

## **V. PHARMACIST RESPONSIBILITIES**

- A. Verify the chemotherapy orders against the written plan and the CSEMC Chemotherapy Regimen Reference, Investigational Protocol, or reference article.
- B. Verify that the height, weight and BSA, using a preprogrammed calculator/computer, are correct.
- C. Check to ensure that the ordering physician has documented whether or not the patient is participating in a research protocol by checking the appropriate box on the

order sheet. If the patient is participating in a research protocol, the protocol number, randomization arm (if applicable) and whether or not the research drug is supplied, should be noted on the order sheet.

- D. The “Dose to be Administered” documented on the order sheet is rounded up or down in adherence to the “Standard Dose Rounding and Maximum Doses of Chemotherapy Agents” schedule (Appendix C).
  - E. Verify the final dose of each drug, including dose modifications.
  - F. Compare the current orders with the previous cycle, and call the responsible physician from the service ordering the chemotherapy if there are any significant, unexplained changes.
  - G. Check administration guidelines and solution compatibility and call RN with any special considerations.
  - H. Check antiemetics, pre and post medication orders for omissions and/or additions.
  - I. Check appropriate laboratory values to be sure that they are within normal limits for chemotherapy treatment. If not, consult the responsible physician from the service ordering the chemotherapy.
  - J. Once the order, signed by the attending physician, has been verified by the pharmacist, pharmacy personnel will begin preparing the drug. The technician must save all vials and salutation used for reconstitution, as well as any notes indicating the amount of drug used to prepare each dose. Pharmacy personnel will prepare the chemotherapy.
  - K. The pharmacist will check the following:
    - All drug vials used in compounding
    - The method of reconstitution
    - The proper dose of chemotherapy was prepared
    - The chemotherapy was prepared in a solution that is both physically and chemically stable.
    - The final concentration
    - The final product against the physician order
    - In the event the chemotherapy is prepared by a pharmacist, a second pharmacist will check the preparation. The check may occur via telephone.
  - L. In the rare instance that a second chemotherapy-competent RN is not available for the verification processes, the pharmacist will be notified. A pharmacist will complete the double check system and sign the order sheet including status.
- NOTE:** All chemotherapy orders are saved in the pharmacy computer database for 2 years and paper copies of orders are saved in the satellite pharmacy for 6 months. Orders processed prior to Meditech conversion (Sept. 2000) are not available in the computer database.
- M. Changes that need to be made to a chemotherapy or antiemetic order sheet will require the completion of a new order sheet. The pharmacist cannot accept crossing out of orders.

- N. The pharmacy will page the ordering physician for parental chemotherapy orders not written on the standard chemotherapy order sheet. The pharmacist will instruct the ordering physician in the appropriate standard order sheet to be utilized.
- O. The parental methotrexate order sheet and plan for rheumatology indications is kept in the pharmacy. The pharmacy will fax the order sheet and plan to the ordering physician with instruction that the order sheet and plan be completed and signed by the attending/primary care physician.

## CLINICAL RESEARCH

All investigational protocols must be reviewed and approved by the Research/Human Subject's Committee at Caritas St. Elizabeth's Medical Center of Boston prior to enrolling patients. When a new investigational protocol is instituted, multidisciplinary education must take place before patient enrollment. This is especially important when protocols involve investigational agents, high-dose therapy, and unusual or new combination therapies. This education must ensure adequate communication between the principal investigator, clinic nurses, inpatient nurses, research nurses, fellows, attending physicians, and all oncology pharmacists. Copies of all new protocols and amendments must be placed in the designated patient-care areas, clinics, and central and decentralized pharmacies by the clinical research nurses. Copies of SWOG protocols will be placed in the SWOG designated areas by members of the SEMC Clinical Trials Office.

Once a patient has signed consent for participating in a research study, a copy of the protocol should be placed in the patient's chart. The section of the protocol that contains the dosing regimen(s) should be flagged. A copy of the signed informed consent should also be placed on the chart. Preprinted or computer order sets should be configured by the staff of the clinical trials office and in place before patient enrollment to avoid order variability and ambiguity. New protocols or unusual therapies should not begin off-hours or on weekends unless it is an emergency situation. They should be initiated on weekdays when appropriate specialists and clinicians are available.

## Appendix A

### Hematology/Oncology Attending Physicians

Paul J. Hesketh, M.D.	Beeper # 2318
Leslie Martin, M.D.	Beeper # 2733
Thein Oo, M.D.	Beeper # 4309
Elizabeth Blanchard, M.D.	Beeper # 2991
Rekha Parameswaran, M.D.	Beeper # 3031

### Hematology/Oncology Fellows

Konstantinos Arnaoutakis, M.D.	Beeper # 9353
Daniel Rausch, M.D.	Beeper # 8252
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Santhosh Ambika, M.D.	Beeper # 8251
Niharika Dixit, M.D.	Beeper #
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Colleen Kelly Yavarow, D.O.	Beeper #

### Hematology/Oncology Nurse Practitioner

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\*\* GYN only

\*\*\*Family Practice

\*\*\*\*Midwife

## Appendix C

# Standard Dose Rounding and Maximum Doses of Chemotherapeutic Agents

### Standard Dose Rounding

Chemotherapy should be rounded to the nearest recommended dosing increment.

**Example:** Cyclophosphamide should be rounded to the nearest 50mg. A patient who is 1.75 m<sup>2</sup> is ordered for cyclophosphamide 1.5 gm/m<sup>2</sup>. This would calculate to be 2625 mg of cyclophosphamide but should be rounded to either 2600 mg or 2650 mg at the discretion of the physician. **(Note: The drug will not be made until the new order is written by the fellow or attending physician and is signed by the attending physician).**

Mandatory dose rounding will be excluded for any drugs on an investigational protocol.

### Maximum Doses

If an order is written for a dose, which is over the following recommended maximum of a drug, the pharmacist will call the physician to verify the dose. The pharmacist must document a reason in the computer why this dose is being used.

Drug	Standard Dose Rounding	Maximum Doses
Bleomycin (Blenoxane)	1 unit	30 units/day Cumulative dose 400 units
Bortezomib (Velcade)	0.1 mg	3.5 mg per dose
Carboplatin (Paraplatin)	25 mg	AUC 7 or 400 mg/m <sup>2</sup>
Carmustine	10 mg	100 mg/m <sup>2</sup>
Cisplatin (Platinol)	5 mg	120 mg/m <sup>2</sup>
Cladribine (Leustatin)	1 mg	0.1 mg/kg/day
Cyclophosphamide (Cytosan)	50 mg	1.5 gm/m <sup>2</sup>
Cytarabine (Cytosar-U)	10 mg	3 gm/m <sup>2</sup>
Dacarbazine	10 mg	375 mg/m <sup>2</sup>
Daunorubicin (Cerubidine)	5 mg	60 mg/m <sup>2</sup> (450 mg/m <sup>2</sup> lifetime)
Docetaxel (Taxotere)	5 mg	100 mg/m <sup>2</sup>
Doxil (Lipo. Doxorubicin)	5 mg	50 mg/m <sup>2</sup> (450 mg/m <sup>2</sup> lifetime)
Doxorubicin (Adriamycin)	5 mg	75 mg/m <sup>2</sup> (450 mg/m <sup>2</sup> lifetime)
Etoposide ( Vespil)	10 mg	100 mg/m <sup>2</sup>
Floxuridine	1 mg	25 mg/m <sup>2</sup>
Fludarabine (Fludara)	5 mg	25 mg/m <sup>2</sup>
Fluorouracil (Aducil)	25 mg	1 gm/m <sup>2</sup>
Gemcitabine (Gemzar)	25 mg	1 gm/m <sup>2</sup>
Ifosfamide (Ifex)	50 mg up to 5 mg/m <sup>2</sup>	1.2 gm/m <sup>2</sup>
Irinotecan (Camptosar)	5 mg	150 mg/m <sup>2</sup>
Methotrexate IV	5 mg	40 mg/m <sup>2</sup>
Methotrexate IT	IT 1 mg	IT 15 mg/dose
Methotrexate IM	5 mg	IM 50 mg/m <sup>2</sup>
Mitomycin (Mutamycin)	1 mg	20 mg/m <sup>2</sup>
Mitoxantrone (Novantrone)	5 mg	12 mg/m <sup>2</sup>
Oxaliplatin (Eloxatin)	5 mg	130 mg/m <sup>2</sup>
Paclitaxel (Taxol)	10 mg	225 mg/m <sup>2</sup>
Pentostatin	1 mg	4 mg/m <sup>2</sup>
Plicamycin (Mithramycin)	1mg	30 mcg/kg/day
Rituximab (Rituxan)	25 mg	375 mg/m <sup>2</sup>
Streptozocin	10 mg	1 gm/m <sup>2</sup>
Topotecan (Hycamtin)	0.1 mg up to 4 mg/m <sup>2</sup>	1.5 mg/m <sup>2</sup>
Trastuzumab (Herceptin)	10 mg	4 mg/kg
Vinblastine (Velban)	1 mg	10 mg/m <sup>2</sup>
Vincristine (Oncovin)	0.1 mg	(2 mg/dose)
Vinorelbine (Navelbine)	5 mg	30 mg/m <sup>2</sup>

## **Appendix D**

### **Gynecologic/Oncology Nurse Practitioners**

Nurse Practitioners in Gynecologic Oncology must be certified in general adult medicine by a nationally recognized organization of nurse practitioners (ANCC, AANP, or NCC). Nurse Practitioners may write chemotherapy orders that are reviewed and co-signed by an attending Gynecologic Oncologist. Orders are written in accordance with the standards identified in Section III: “Physician Responsibilities”. Upon the recommendation of chemotherapy, Nurse Practitioners provide patient education regarding the plan of care, chemotherapy and its side effects.

Prior to chemotherapy administration, Nurse Practitioners perform a history and physical to determine if the patient is ready for therapy. Nurse Practitioners consult with the responsible attending Gynecologic Oncologist if there is a question related to treatment eligibility.

Nurse Practitioners write needed prescriptions, order appropriate referrals/consultations, and admit patients as needed. They are the first contact for any questions, concerns, or adverse reactions related to the administration of chemotherapy.

## **Basic Science Course for Clinical Fellows**

Division of Hematology/Oncology and Department of Biomedical Research  
MMR-3 Conference Room  
Wed 4-5:00 pm

### **Unit 1**

2-Basic Methods In Molecular Biology.  
PCR and its Clinical Applications

### **Unit 2**

1-Southern Blot

### **Unit 3**

**Lab 1:** Isolation of Known DNA

#### **Theory:**

- a. Safety measures to handle Bacteria, plasmids and DNA
- b. Principles of amplification of DNA in prokaryotic cells
- c. Use of Restriction enzymes (REs) to obtain DNA of interest

#### **Practical:**

- d. Plasmid DNA isolation from bacteria
- e. Agarose mini-gel electrophoresis
- f. visualization of DNA with ethidium bromide/quantitation of product

### **Unit 4**

**Lab 3.** Transfection of DNA Into Mammalian Cells by Infection or Transfection

- a. Calcium Phosphate transfection into COS cells
- b. Electroporation into non-adherent cells
- c. Selection of cells expressing the DNA of interest Amp/G418 or HAT
- d. Probing for expression of DNA of interest
- e. transgenic mice

### **Unit 5**

Principles of protein isolation and characterization

- a. Column chromatography Hemoglobin S/A
- b. Agarose gel electrophoresis
- c. SDS-PAGE electrophoresis
- d. Western blot/Immunoprecipitation

### **Unit 6**

Growth factors and receptors

- a. mutations leading to development of oncogenes
- b. Her2 (neu) and others
- c. nuclear oncogenes

### **Unit 7**

Cell cycle progression

- a. Rb, cycle dependent kinases and their inhibitors
- b. anti-oncogenes

### **Unit 8**

- a. Bcl2 and family of BAX proteins
- b. caspases and mechanisms of apoptosis

**Unit 9**

Principles of gene therapy and cell-based therapy for cancer and hereditary disorders

## Evaluation

An integral component of any educational experience is the evaluation process. We are required by the Board of Internal Medicine and the ACGME to ensure that a comprehensive process of trainee evaluation be carried out throughout the period of the fellowship. This should be viewed by the Fellow as an opportunity to obtain constructive criticism and praise as appropriate. Evaluations are made by the divisional staff after each monthly rotation, quarterly by the clinic attending, biannually by Dr. Hesketh, and yearly by non-physician professional staff. We also are required to evaluate Fellow competence in the performance of procedures (e.g.: bone marrow aspiration and biopsy, administration of intrathecal chemotherapy via ommya reservoir and lumbar puncture, use of central venous access devices etc.) to the clinical practice of hematology oncology (CEX evaluation). Documentation of each procedure performed and the appropriate supervising staff signature should be recorded in the procedure log book. All fellows are evaluated in each of the six core competencies. Various evaluation tools are used to assess the fellows in each of the six competencies.

It is also critically important that the Fellowship program hear from the Fellows with their constructive criticism about the program and staff. Accordingly, monthly, quarterly and annual evaluations by the Fellows of the attending staff and program curricula are obtained.

Evaluation	Time of Evaluation
Attendings Monthly Rotation Evaluation of Fellows	Monthly
Fellows Monthly Rotation Evaluation of Attendings	Monthly
Attendings Clinic Rotation Evaluation of Fellows	July - December January - June
Fellows Clinic Rotation Evaluation of Attendings	July - December January - June
Bi-Annual Chief's Review	July- December January - June
Fellows Bi-Annual Review of Attendings	July- December January - June
Fellows Bi-Annual Preceptor Evaluation	July- December January - June
Professional Assessment Evaluation of Fellows by Attendings	January - June
Fellows Professional Behavior Evaluation completed by each Fellow	July- December January - June
Patient Questionnaire	December June
Bi-Annual CEX	December June
Bi-Annual Review of Fellows Doing Research Year	December June

Fellows Bi-Annual Review of Research Training	December June
Annual Nurses Evaluation of Fellows	January
Annual Former Fellows Survey of Program	January
Annual Chief's Review	June
Annual Attendings Evaluation of Program	June
Annual Fellows Evaluation of Program	June
Exit Interview for 3 <sup>rd</sup> Year Fellows	June
Promotion Sheets for 1 <sup>st</sup> & 2 <sup>nd</sup> Year Fellows	June
Technical Credentialing Form	Complete within first 6 mths
American Board of Internal Medicine Evaluation	Complete Annually (usually May)
Fellows BMT/ Good Samaritan Rotation Evaluation	Completed after the one month rotation
Procedure Logs	Annually

## Division Policies

Below you will find the Division policies regarding vacation, sick time, travel, and electives to serve as clarification to all fellows. Your cooperation and compliance with the stated policies will insure a continuum of coverage contributing to the success of the academic year. All other policies and procedures are found in the policies and procedures manual.

### **VACATION**

The Medical Center policy for vacation time is stated on page 2, Section 5, of your contract under *Responsibilities of the Medical Center*. To reiterate: "The Medical Center shall provide time off with pay to the Physician-in-Training for personal uses not to exceed three weeks during the term hereof. These weeks may not be accumulated to be used beyond the term of the Agreement, nor shall the Physician-in-Training be entitled to payment in lieu of any such time off. Such time off shall be on days approved by the Program Director."

Within the Division of Hematology/Oncology, all fellows are required to submit their vacation requests in writing addressed to Dr. Hesketh at least one month in advance of the requested dates. The request should be given to the Chief Fellow, who will incorporate it into the schedule, and will in turn submit the request to Dr. Hesketh for his approval. This request should include the dates that you will be away as well as arranged coverage for any assignments (on-call, clinics, emergencies, conferences, etc.). The request must be approved by Dr. Hesketh before it is finally scheduled. In an effort to minimize the impact of any given fellow's absence on the work load of the other fellows, all vacation time should be taken while on elective and only one fellow should be away on scheduled vacation at any given time. In addition, prior to leaving on vacation, fellows should write elective chemotherapy orders. Any time taken to prepare or take board review courses or examinations must be taken during electives and also requires pre-approval.

**N.B.:** Some uses of vacation time include but are not limited to religious holidays not included in the hospital holiday schedule, job interviews, and days added to either end of an educational conference.

### **Sick-Time**

All fellows reporting sick must notify Dr. Hesketh's administrative assistant at 789-2317 as soon as you know you will be out. You must also advise the assistant of whatever coverage you have secured for your absence so that the on-call schedules may be adjusted accordingly. The assistant will also notify Communications of the coverage.

### **JOB INTERVIEWS**

Fellows will be allowed up to a maximum of 5 work days to use for job interviews. Fellows should submit their requests in writing to Dr. Hesketh at least 2 weeks in advance for his approval. Coverage should be specified in the request. Fellows planning to use more than 5 days for interviews will be expected to use vacation time for this purpose.

### **TRAVEL**

Each year all fellows (PGY 4, 5, & 6) will receive funds for travel to one major meeting (ASH/ASCO) for the academic year. In order to be approved for funding for your meeting, you will be required to submit a memo to Dr. Hesketh indicating the meeting you wish to attend, hospital coverage, and a travel authorization & expense report well in advance of the meeting to allow ample time to secure airfare and accommodations and remain within the allocated limit. It is our goal to fund valuable educational opportunities such as attendance at major meetings

and to provide everyone with a chance to participate; therefore, your cooperation to minimize expenditures is essential.

### ***Elective Rotations***

Elective rotations must be clearly defined in writing and approved in advance by Dr. Hesketh. The rotation must be clearly defined stating what will be undertaken and accomplished, who will supervise the rotation, as well as the duration of the rotation. In addition to insuring that the elective is a meaningful and optimal experience, it is important that your participation be documented both for board requirements and to verify your presence at this facility for hospital reimbursement.

The above policies have been implemented with the objective of assuring adequate coverage and to extend professional courtesy and equity to all parties.

### ***Moonlighting Policy***

The program generally discourages residents working outside of one's authorized training program ("moonlighting") because of the potential of such employment to interfere with the educational objectives of the program.

In situations where the financial need to moonlight is compelling, the following guidelines should be adhered to:

1. Residents planning to moonlight should inform the program director in advance of their plans to moonlight, providing specific information of where and when they plan to perform these services.
2. Residents should moonlight no more than two times per month.
3. Residents cannot moonlight during periods when they have call responsibilities at CCSEMC.
4. The Program Director will monitor resident performance to determine if moonlight activities are interfering with the goals and objectives of the program. If such a determination is made, the Program Director will request that the resident refrain from moonlighting.

### **Policy on Resident Duty Hours**

Duty hours are defined as all clinical and academic activities related to the residency program, i.e., patient care (both inpatient and outpatient), administrative duties related to patient care, the provision for transfer of patient care, time spent in-house during call activities, and scheduled academic activities such as conferences. Duty hours do not include reading and preparation time spent away from the duty site.

Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities.

Residents must be provided with 1 day in 7 free from all educational and clinical responsibilities, averaged over a 4-week period, inclusive of call. One day is defined as one continuous 24-hour period free from all clinical, educational, and administrative activities.

Adequate time for rest and personal activities must be provided. This should consist of a 10-hour time period provided between all daily duty periods and after in-house call.

Each program must have written policies and procedures consistent with the Institutional and Program Requirements for resident duty hours and the working environment. These policies must be distributed to the residents and the faculty. Monitoring of duty hours is required with frequency sufficient to ensure an appropriate balance between education and service.

Each resident will complete a monthly report in which duty-hours will be recorded. The duty-hour reports will be regularly monitored by the Program Director to insure compliance with the Division's policy on duty hours.

## **Selection/Recruitment Policy**

The Hematology/Oncology Fellowship Program at Caritas St. Elizabeth's Medical Center is a three-year program with a total of seven fellowship positions. In our recruitment efforts, we are committed to diversity and equal opportunity. The recruitment process starts two years prior to the beginning of the fellowship (i.e. applicants apply in 2004 for the year 2006).

**Resident Eligibility:** Applicant with one of the following qualifications are eligible for appointment at Caritas St. Elizabeth's Medical Center of Boston

1. Graduates of medical schools in the United States and Canada accredited by the Liaison Committee on Medical Education (LCME)
2. Graduates of colleges of osteopathic medicine in the United States accredited by the American Osteopathic Association (AOA)
3. Graduates of medical schools outside the United States and Canada who have received a valid certificate from the Educational Commission for Medical Graduates or have a full and unrestricted license to practice medicine in a US licensing jurisdiction
4. Graduates of medical schools outside the United States who have graduated medical schools listed in the World Health Organization Directory of Medical Schools
  - a. Have completed all of the formal requirements of the foreign medical school except internship and/or social service
  - b. Have attained a score satisfactory to the sponsoring medical school on a screening examination
  - c. Have passed the Foreign Medical Graduate Examination in the Medical Sciences, Parts I and II of the examination of the National Board of Medical Examiners, or Steps 1 and 2 of the United States Licensing Examination (USMLE)
5. Graduates of medical schools outside the United states who have completed a Fifth Pathway program provided by the LCME-accredited medical school

### **Resident Selection:**

1. Eligible applicants should be selected on the basis of their preparedness, ability, aptitude, academic credentials, communication skills, and personal qualities such as motivation and integrity.
2. Programs must not discriminate with regard to sex, race, age, religion, color, national origin, disability, or veteran status

3. All qualified applicants so far as possible should participate in the National Resident Matching Program (NRMP)

A formal application consists of the application form, curriculum vitae, three letters of recommendation, copies of USMLE or Comlex scores and an ECFMG certificate for foreign medical graduates.

Once the application is complete, it is reviewed by the program director and program coordinator. The program director then decides which applicants will come in for an interview. Those applicants brought in for an interview will meet with the program director, two other attending physicians and one fellow from the program.

At the end of the interview period, a meeting is held with all of the staff to decide which candidates should be offered a position within the program. Once the applicant accepts the position, they are sent a one-year contract to sign and return.

## **Promotion Policy**

The Promotions Committee, which is comprised of all of the attending physicians, meets annually in June to review the performance of the fellows in the hematology/oncology Fellowship Program and to formally recommend that they be promoted. Promotion is based on the following criteria:

1. Clinical Judgment
2. Medical Knowledge
3. Clinical Skills
4. Humanistic Qualities
5. Professionalism
6. Medical Care
7. Continuing Scholarship

## **Evaluation Policy**

An integral component of any educational experience is the evaluation process. We are required by the Board of Internal Medicine and the ACGME to ensure that a comprehensive process of trainee evaluation be carried out throughout the period of the fellowship. This should be viewed by the fellow as an opportunity to obtain constructive criticism and praise as appropriate. Evaluations are made by the divisional staff after each monthly rotation, quarterly by the clinic attending, biannually by the Chief of the division, and yearly by non-physician professional staff. The fellows are also evaluated in the six general core competencies, patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning, and systems-based practice.

It is also critically important that the fellowship program hear from the fellows with their constructive criticism about the program and staff. Accordingly, monthly, quarterly and annual evaluations by the fellows of the attending staff and program curricula are obtained.

The fellows may review all evaluations submitted on their behalf at any time during their training. These files are kept in the Chief's office. The fellows are required to meet with the

Program Director at least every six months to fully evaluate the fellow's clinical and academic performance. If deficiencies are found in the fellow's performance, a remedial plan is discussed and adopted. The fellow's progress will be closely monitored by the Program Director and additional meetings may be necessary.

## **Grievance Procedure**

When problems arise among fellow house officers or between a house officer and an attending physician, or between a house officer and another Caritas St. Elizabeth's employee, there are several resources available to address the grievance. A grievance by a fellow should follow a chain of command by first bringing the grievance to the Chief Fellow. If there is no resolution at this level, the fellow may then bring his or her grievance to the Program Director, and if necessary to the Chair of the Department of Medicine. If the grievance is not resolved, the fellow may then appear before the Graduate Medical Education Committee for a final decision.

## **Reimbursement Policy**

Each year all fellows (PGY 4, 5, & 6) will receive funds for travel to **one** major meeting (ASH/ASCO) for the academic year. In order to be approved for funding for the meeting, you will be required to submit a memo indicating the meeting you wish to attend and coverage for the time you are away. It is our goal to fund valuable educational opportunities for our fellows and in order to provide everyone with this opportunity, your cooperation to **minimize expenditures** is essential.

It is the responsibility of each individual to find and pay for their own flight, hotel, meeting registration, etc. It is also the responsibility of each individual to keep proper records of all expenses. This includes original receipts of airline tickets, hotel, food, cabs, and copies of meeting registration forms. Depending on the method of payment, all credit card statements and copies of cancelled checks (both sides of check) are needed. Without these receipts and statements your reimbursement cannot be processed.

Only the expenses incurred on the dates the meeting is being held will be reimbursed. If you fly down a day or two earlier we will not reimburse for any expenses incurred on those days. There is no reimbursement for personal expenditures charged to your hotel bill such as park or museum tickets, movies etc. There is also no reimbursement for rental cars unless special approval is given prior to the meeting. Expenses incurred for meals should be kept to a minimum and should only include your individual meal.

# **Caritas St. Elizabeth's Medical Center**

## **Division of Hematology/Oncology Curriculum**

### **Introduction**

A hematologist/oncologist is a physician who specializes in the diagnosis, treatment, prevention, and/or investigation of disorders of the hematopoietic, hemostatic, and lymphatic systems and neoplastic disorders of all organ systems. Our fellowship program in Hematology/Oncology seeks to provide clinical and scientific education and clinical experience of sufficient breadth and depth to prepare our trainees for professional careers in our fields.

While accommodating the need to expose trainees to certain subjects and topics that are considered fundamental to training in our subspecialties, our program recognizes the importance of equipping our trainees with the knowledge, tools and attitude they will need to continue learning on their own after their fellowship training is completed. Accordingly, an important aspect of our training program is mentorship of subspecialty fellows by experienced faculty throughout their clinical and research training experiences. Through close, supportive mentoring, trainees are taught to challenge their own ideas, to communicate effectively in written as well as spoken form, and to appreciate the importance of the art as well as the science of practicing our subspecialty. In this manner, our fellowship training program addresses the six general competencies, patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning, and systems-based practice.

### **I. Basic Scientific Principles**

As the foundation of expertise in blood disorders and malignant disease, the trainee should know what DNA, RNA and proteins are and be familiar with their general roles in normal cellular processes. The trainee should understand basic concepts of transcription and translation as well as the normal cellular processes of cell cycle regulation and apoptosis. The trainee should have a working knowledge of standard techniques used to evaluate cellular processes at the DNA, RNA and protein level, such as Northern blot, Southern blot, Western blot, flow cytometry, cytogenetics, FISH, ELISA, polymerase chain reaction (PCR), immunoprecipitation and microarrays, sufficient to permit critical understanding of the medical and scientific literature in our subspecialties.

#### **A. *Normal and Abnormal Blood Cell and Cancer Biology:***

Trainees should have a working knowledge of the biology of normal cells and the basic processes of carcinogenesis. They should have an understanding of gene structure, organization, expression, and regulation. A fundamental understanding of the cell cycle, its control by oncogenes, and its interaction with chemotherapy is important. They should understand tumor cell kinetics, proliferation and programmed cell death and the balance between cell death and cell proliferation. The trainee should demonstrate an understanding of cell surface receptor and cell surface protein changes that occur in normal development and differentiation of cells in the bone marrow and other organs, and the inherited and acquired abnormalities in these processes that may result in a malignant phenotype. There should also be an understanding of the role of growth factors and cytokines in the development and differentiation of these cells. Specific areas to be covered include stem cell plasticity, embryology and differentiation, erythropoiesis, leukocyte and lymphocyte biology, and thrombopoiesis. Knowledge of erythropoiesis should extend to understanding hemoglobin synthesis, structure and function, iron, vitamin B<sub>12</sub> and folic

acid biochemistry and metabolism. Knowledge of thrombopoiesis should extend to understanding the function of platelet surface receptors and granules and their role in normal and abnormal platelet function.

**B. *Radiation Therapy:***

Trainees should be familiar with principles of radiation biology, mechanisms of cell death and normal tissue tolerance and toxicity, and interactions with chemotherapy. The trainee should have practical knowledge regarding various sources, methods and administration of radiation therapy e.g. electron beam, external beam, brachytherapy. The trainee should understand the short-term toxicities and the potential long-term consequences of radiation therapy (e.g. secondary malignancies, coronary artery disease) and be able to recognize interactions of radiation therapy with medications, including chemotherapy agents.

**C. *Pharmacology and Pharmacokinetics:***

Trainees should possess a working knowledge of the pharmacokinetics, mechanism of action, metabolism, route of administration, and appropriate indications and dosages of pharmacologic and biologic agents used to treat hematological and malignant disorders. They should also have a working knowledge of the toxicities and interactions of these agents, be familiar with basic principles of pharmacology and be able to interpret basic pharmacokinetic information. They should have a working knowledge of the mechanism of new drug development and the Food and Drug Administration's (FDA's) approval process for new drugs. Their education should include an understanding of pharmaceutical company responsibilities and ethics in process of drug development and approval. Accordingly they should have a general understanding of current experimental therapeutics, such as monoclonal antibodies, radioimmunotherapy, gene therapy, transcription therapy, small molecule inhibitors, farnesyltransferase inhibitors, multi-drug resistance modifiers, novel delivery systems, etc.

**D. *Epidemiology:***

Trainees should have an understanding of the epidemiology, risk factors and (where applicable) staging systems of each malignant or non-malignant disorder within the scope of hematology and medical oncology.

**E. *Immunology:***

The trainee should understand how the body identifies substances as “self” and responds to cells that are seen as “non-self.” They should have basic knowledge of the cellular and humoral components of the immune system and the regulatory action of cytokines on the immune system. They should understand the inter-relationship between tumor and host immune systems, including tumor antigenicity, immune-mediated antitumor cytotoxicity, and the direct effect of cytokines on tumors.

**F. *Clinical Research:***

Trainees should acquire a working knowledge of the design and conduct of clinical trials. They should be exposed to clinical trials developed and conducted through national cooperative groups, multi-institutional trials and or single institution in-house protocols. They should demonstrate an understanding of the significant differences, advantages and disadvantages among these types of trials. Specific elements to be covered include:

1. Clinical trial design.
2. Review of the ethical, regulatory, and legal issues involved in study design.

3. Criteria for defining response to therapy.
4. Tools used to assess quality of life.
5. Basics of statistics.
  - a. Statistical methods.
  - b. Requirement for patient numbers in designing studies.
  - c. Proper interpretation of data.
6. Toxicity assessment and grading.
7. Role and functioning of the Institutional Review Board.
8. Experience obtaining informed consent from patients.
9. Government regulatory mechanisms of surveillance and monitoring of government-sponsored studies.
10. Instruction in grant writing and information about mechanisms of support for clinical research.
11. Cost of therapy and the cost effectiveness of therapy.
12. Appreciation for the altered natural history, toxicity, and disease impact in the elderly.

**G. *Clinical Laboratory Techniques:***

The trainee should have a practical knowledge and understanding of clinical laboratory techniques including:

1. Coulter counter/automated complete blood count with white blood cell differentials
2. Prothrombin time and activated partial thromboplastin time
3. Flow cytometry
4. Cytogenetics, including fluorescent in-situ hybridization (FISH)
5. Coagulation factor and inhibitor assays
6. Bleeding time
7. Platelet function studies
8. Tissue (e.g. HLA) typing
9. Polymerase chain reaction (PCR)
10. Serum and urine protein electrophoreses and immunoelectrophoreses and/or immunofixation
11. Hematopathology tissue assessment techniques, including immunostaining
12. Blood banking techniques of cross-matching, antibody identification, direct antiglobulin test and indirect Coomb's test
13. Apheresis, plasmapheresis
14. Therapeutic phlebotomy

**H. *Geriatrics:***

The trainee should have a practical understanding of the effects of aging on normal hematologic processes and on the biology, natural history, diagnosis and management of cancer and hematologic diseases in the elderly person.

1. Normal hematologic processes (e.g. hematopoiesis, hemostasis)
2. The effects of aging on the pharmacology and side effects of agents used in the treatment of cancer and hematologic disorders.
3. The trainee should have a working knowledge of the performance and use of geriatric assessment in evaluating and managing elderly patients.
4. The trainee should acquire experience in assessing quality of life in elderly patients.

**II. *Basic Principles in the Management and Treatment of Malignant Diseases***

The management of malignant diseases require the expertise of many different medical subspecialties. The trainee should recognize the contributions of each of these subspecialties in

making the diagnosis, assessing disease stage, and treating the underlying disease and its complications. The trainee should interact with each of these disciplines in order to gain an appreciation for the benefits and limitations of each modality. Trainees should be capable of assessing the patient's comorbid medical conditions that may affect the toxicity and efficacy of treatment in order to formulate a treatment plan. The trainee should have an extensive knowledge of cancer staging with emphasis on the T, N, M staging classification for most cancers.

**A. Pathology/Laboratory Medicine:**

The trainee should have the opportunity to review biopsy material and surgical specimens with a pathologist. They should appreciate the role of the pathologist in confirming the diagnosis of cancer and in determining the severity and extent of disease. Trainees should be familiar with newer pathologic techniques (e.g., immunostaining, cytology, fine needle aspiration) and the contribution of these techniques to the staging and management of patients with cancer. Trainees should know what laboratory testing is appropriate in the staging and follow-up of patients. They should appreciate the utility of serum tumor markers and recognize their limitations.

**B. Radiology:**

Trainees should know the indications for radiographic and nuclear medicine imaging procedures in the diagnosis, staging, and follow-up of patients with malignant diseases. They should learn to assess response to treatment using these tests.

**C. Surgery:**

By interacting with surgeons, the trainees should develop an understanding of the indications and contraindications for surgery. They should become knowledgeable about the role of surgery in the staging, cure, and palliation of patients with malignant diseases. The trainee should become familiar with the indications for organ preservation and the sequencing of surgery with other treatment modalities. They should recognize the risks and benefits of surgery as a definitive treatment and as an adjunct to radiation therapy and/or chemotherapy.

**D. Radiation Oncology:**

The trainee should be familiar with the indications for radiation therapy as a curative and palliative modality. They should be familiar with the principles of treatment, planning and dosimetry. The trainee should appreciate when radiation therapy should be sequenced with surgery and/or chemotherapy. They should recognize both the acute and the late effects of radiation therapy.

**E. Chemotherapy:**

Trainees should be familiar with the indications and goals of chemotherapy in primary and recurrent cancer, in both the adjuvant setting and as neoadjuvant therapy. They should know the indications for chemotherapy as a radiation sensitizer. They should be able to assess a patient's comorbid medical conditions in order to determine the risk/benefit ratio of chemotherapy for that individual.

**F. Biologic Therapy:**

Trainees should be familiar with the activities and indications for cytokines and hematopoietic growth factors. Knowledge should include the spectrum of specific side effects and their management and therapeutic combinations with chemotherapy. The trainee also should be

familiar with basic concepts of targeted molecular therapies, such as monoclonal antibodies, tumor vaccines, cellular therapy, and gene-directed therapy.

**G. *Rehabilitation:***

The trainee should recognize the role of physical therapy, particularly in the postoperative setting (e.g., axillary dissection, amputation). Trainees should recognize the role of occupational therapy, speech therapy, and swallowing therapy.

**III. Evaluation and Management of Specific Cancers, Myeloproliferative Disorders and Lymphoproliferative Disorders.**

Having understood the general principles of treatment, the trainee should be conversant in the care of individual cancers and malignant bone marrow disorders and be aware of unique considerations for each disease.

**A. *Breast Cancer:***

Trainees should have a working knowledge in the interpretation of a mammogram and ultrasound. They should recognize the pathologic and prognostic features that assist in determining the indications for therapy. They should understand the issues that affect the choice of primary treatments. They should appreciate the benefits of hormone therapy and/or chemotherapy in advanced disease and know the indications for adjuvant therapy. The role for elective chemotherapy regimens should be reviewed and understood. They should recognize the importance of family history and the role for genetic testing.

**B. *Carcinoma of Unknown Primary Sites:***

The trainee should learn the importance of the tumor histopathology, pathologic analysis, and tumor markers in directing the work-up. In particular, they should recognize the settings on which treatment may affect survival and when it is palliative.

**C. *Central Nervous System Malignancies:***

The trainee should be aware of the roles for surgery, radiation therapy, and chemotherapy in primary and metastatic disease involving the CNS.

**D. *Gastrointestinal Cancers:***

1. *Esophageal Cancer:* Trainees should appreciate the risk factors for esophageal cancer. They should know the indications for endoscopy in the diagnosis and staging of the disease. Trainees should learn the indications for nutritional support. They should recognize the importance of combined modality therapy, as well as the role of palliative chemotherapy and other supportive care measures.
2. *Gastric Cancer:* Trainees should recognize unique risk factors for gastric cancer. They should understand major surgical approaches to the disease and recognize the potentially curative role of surgery and the relative roles of combined modality therapy.
3. *Colon Cancer:* Trainees should appreciate the importance of surgical staging and recognize the indications for adjuvant therapies in colon and rectal cancers and the role of chemotherapy in advanced metastatic disease. They should recognize heritable types of colon cancer and the differences in their patterns of spread and their management. They should understand risk factors and rationale for screening for colorectal cancer, as well as its chemoprevention, and should appreciate the role of genetic testing.

4. *Anal Cancer*: Trainees should recognize the association of papilloma virus and anal cancer. They should appreciate the role of combined modality therapy in organ preservation.
5. *Hepatobiliary Cancers*: Trainees should understand the epidemiology and risk factors for hepatobiliary cancers. They should learn the roles of alpha-fetoprotein (AFP) in diagnosis, response assessment, and screening. They should know the indications for the curative role of surgery in localized disease and the role of chemotherapy as palliation.
6. *Pancreatic Cancer*: Trainees should appreciate the risk factors for the development of pancreatic cancer. They should know the unique genetic aspects of pancreatic cancer and be familiar with the roles of endoscopy and molecular diagnosis in pancreatic cancer. They should know that surgery has a curative role in rare patients and may provide palliation in others. Combined modality treatment may provide palliation in locally advanced disease.

**E. *Genitourinary Cancers:***

1. *Renal Cell Cancer*: Trainees should understand the diagnostic aspects of renal cell cancer and be familiar with paraneoplastic aspects of the disease. They should appreciate the curative role of surgery in localized disease and the value of biologic therapies in the palliation of advanced disease. They should also understand the familial and genetic aspects of renal cell cancer.
2. *Urothelial Cancers*: Trainees should know the risk factors for urothelial cancers, the differences between localized and invasive disease, and the propensity for transitional-cell carcinoma to recur. They should recognize the role of urine cytology and cystoscopy in the staging and follow-up of patients. They should know the role of intravesical therapy in the management of superficial bladder cancer as well as the role of surgery in early-stage invasive cancers. They should appreciate the value of combined modality therapy in locally advanced disease and the management of metastatic transitional-cell carcinoma.
3. *Penile Cancer*: Trainees should appreciate the role of human papilloma virus (HPV) in the etiology of penile cancers. They should know the potentially curative role of surgery.
4. *Prostate Cancer*: Trainees should understand the epidemiology and screening of prostate cancer. They should know the indications for prostate-specific antigen (PSA) in screening and follow-up of patients with prostate cancer. They should appreciate the importance of histologic grading. They should recognize the roles for surgery, radiation therapy, or observation in the management of early-stage disease, and the application of hormone therapy in advanced disease.
5. *Germ Cell Tumors*: Trainees should know the utility of tumor markers in the diagnosis, prognosis, and follow-up of patients. They should know the roles of surgery, diagnosis, staging, and treatment after chemotherapy. They should know that chemotherapy is curative in advanced disease. They should understand the roles of radiation therapy and chemotherapy in the treatment on seminoma.

**F. *Gynecologic Malignancies:***

1. *Ovarian Cancer*: Trainees should recognize that a predisposition for ovarian cancer is heritable. They should understand the role of appropriate surgical procedures in the initial staging and initial treatment of patients and subsequent systemic treatment. They should appreciate the indications for chemotherapy in localized and advanced disease. Trainees also should be familiar with the current status of screening for ovarian cancer and which populations are most likely to benefit from this approach.

2. *Uterine Cancer:* Trainees should recognize the roles of hormones and hormonal therapies in the etiology of endometrial cancers. They should know the curative role of surgery in early-stage disease and the value of radiation therapy in the multidisciplinary approach of more advanced disease. They should recognize the role of chemotherapy and hormone therapy in the palliative management of metastatic disease.
3. *Cervical Cancer:* Trainees should have an appreciation of the role of HPV in the development of cancers of the uterine cervix. They should recognize the role of screening in the identification of localized disease and that surgery and radiation therapy play key roles in treatment. Moreover, they should understand the treatment of patients with advanced disease.
4. *Vulvar and Vaginal Cancers:* Trainees should know about the induction of clear-cell carcinoma of the vagina in women where the mother received diethylstilbestrol (DES) during surgery. They should understand proper surveillance and management of these individuals. Trainees should recognize the curative role of surgery in early-stage disease and the need for combination therapy in advanced disease.

**G. *Head and Neck Cancers:***

Trainees should know how a proper head and neck examination is performed. They should know the risk factors for head and neck cancers and natural histories of the individual primary tumor sites. Staging of the head and neck cancers should be emphasized as the proper evaluation for therapeutic recommendations. Panendoscopy is needed in staging patients. Trainees should recognize that staging is the basis for selective surgery and/or radiation therapy as definitive treatment. They should be aware of the roles of chemotherapy, as neoadjuvant therapy, and palliation of advanced disease. They should recognize when organ preservation may be an option. They should be aware of the long-term management of these patients and of risks of second malignancies.

**H. *Hematologic Malignancies:***

1. *Leukemia:* The trainee should be familiar with all the pathologic and molecular biologic techniques (cytogenetics, immuno-phenotyping, polymerase chain reaction) used in the diagnosis of leukemia. They should be familiar with the current treatment recommendations and their applications for acute lymphoblastic and myeloid leukemia in both the standard adult population and the elderly.

2. *Acute leukemia's and myelodysplasia:*

Trainees should be familiar with the risk factors for developing leukemia. They should know the French-American-British classification and its implications for treatment and prognosis. They should appreciate the potential use of marrow transplantation in patients with leukemia and the value of differentiation therapy.

3. *Chronic leukemia's:*

Trainees should be able to distinguish the chronic leukemia's on peripheral-blood smear. Trainees should understand the current therapeutic approaches in the treatment of the chronic leukemia's in addition to understanding the expectations of treatment. They should be aware of the indications for marrow transplantation.

**I. *Myeloproliferative Disorders:***

The trainee should be familiar with modern diagnostic, prognostic and therapeutic techniques relevant to the myeloproliferative disorders. This includes awareness of molecular markers and therapeutic targets for modern therapies.

1. *Chronic Myelogenous Leukemia*
  - a. The trainee should demonstrate a comprehensive working knowledge of the epidemiology pathophysiology and basic molecular mechanisms of the development of chronic myelogenous leukemia (CML). This would include an understanding of the role of the *bcr/abl* translocation (Philadelphia chromosome) in the development of the disease.
  - b. The trainee should demonstrate a comprehensive working knowledge of the phases of CML progression and the prognosis associated with them.
  - c. The trainee should demonstrate practical competency for the diagnosis and treatment of CML. Specifically, the trainee should understand the role of specific therapies for the different phases of disease. This would include knowledge of the pharmacologic agents, immunologic agents and biologic agents (e.g. interferon- $\alpha$ ) used in the treatment of CML and their indications, mechanisms of action, dosage, and toxicities. In addition, the appropriate indications for, and role of, stem cell transplantation in the management of CML should be understood. Finally, the trainee should demonstrate practical competency in the diagnosis and management of refractory and relapsed CML.
2. *Polycythemia Rubra Vera*
  - a. The trainee should demonstrate a comprehensive working knowledge of the diagnostic and staging criteria for polycythemia rubra vera and an understanding of the epidemiology and risk factors associated with the disease.
  - b. The trainee should demonstrate practical competency in making the diagnosis of polycythemia rubra vera and of choosing therapy for the disease. In particular, the trainee should demonstrate an understanding of the role of therapeutic phlebotomy, pharmacologic agents and radioactive phosphorous in the treatment of polycythemia rubra vera. The trainee should also demonstrate an understanding of the indications, pharmacology, risks and toxicities associated with each of these therapies.
3. *Agnogenic myeloid metaplasia and myelofibrosis*
  - a. The trainee should demonstrate a comprehensive working knowledge of the epidemiology, risk factors and clinical presentation of patients with agnogenic myeloid metaplasia and myelofibrosis.
  - b. The trainee should demonstrate practical competency in making the diagnosis and choosing therapy for agnogenic myeloid metaplasia and myelofibrosis.
  - c. The trainee should demonstrate practical competency with respect to the prognosis and long term outlook for patients for agnogenic myeloid metaplasia and myelofibrosis.
4. *Essential Thrombocythemia*
  - a. The trainee should demonstrate practical competency in the diagnosis of essential (primary) thrombocythemia (ET). The trainee should also demonstrate a comprehensive understanding of the risks associated with ET, including the risks of bleeding and thrombosis.
  - b. The trainee should demonstrate a comprehensive understanding and practical competency in identifying the indications for initiating therapy for ET. This should include an understanding of the role of platelet pheresis, hydroxyurea, and anagrelide in the management of ET. In addition, the pharmacology, dosing, administration and associated toxicities of these therapies should be known.
5. *Myelodysplastic Syndrome (MDS) Disorders*
  - a. The trainee should demonstrate a working knowledge of the basic molecular and pathophysiological mechanisms of the myelodysplastic syndrome disorders.

- b. The trainee should demonstrate a practical competency in diagnosis and therapy of MDS disorders. This would include an understanding of both the FAB and the International Prognosis and Staging System (IPSS) classifications of MDS
- c. The trainee will demonstrate working knowledge of genetic abnormalities associated with MDS and practical competency in the utility of cytogenetics and molecular markers in the diagnosis, prognosis and management of patients with MDS.
- d. The trainee should demonstrate an understanding of the specific pharmacologic and biologic agents, experimental approaches and the role of stem cell transplant in the management of patients with MDS.

### ***J. Lymphoproliferative Disorders:***

The trainee should be familiar with modern diagnostic, prognostic and therapeutic techniques relevant to the lymphoproliferative disorders. This includes awareness of molecular and surface markers and therapeutic targets for modern therapies.

#### ***1. Chronic Lymphocytic Leukemia***

- a. The trainee should demonstrate a comprehensive working knowledge of the epidemiology, risk factors, diagnostic criteria and staging systems (e.g. Rai and Binet), of chronic lymphocytic leukemia (CLL).
- b. The trainee should demonstrate a comprehensive working knowledge of the use of cell surface marker analysis (e.g. flow cytometry, immunohistochemical stains) and molecular analysis (e.g. FISH, cytogenetics) in the diagnosis and prognosis of CLL, and their use in distinguishing CLL from entities that are often confused with it (e.g. hairy cell leukemia, adult T-cell leukemia, prolymphocytic leukemia, and others).
- c. The trainee should demonstrate practical competency for recognizing and managing paraneoplastic syndromes that may accompany CLL.
- d. The trainee should demonstrate practical competency in the treatment of CLL. This includes knowledge of pharmacological and biological agents that are used in treating CLL and their indications, pharmacology, dosing, administration and potential toxicities. The trainee should be aware of investigational approaches, including stem cell transplantation, for the treatment of CLL.

#### ***2. Waldenström's Macroglobulinemia***

- a. The trainee should demonstrate a comprehensive working knowledge of, and practical competency in, the diagnosis of Waldenström's macroglobulinemia. This includes recognizing expected histopathologic findings on bone marrow aspirate smear and biopsy as well as the clinical and laboratory presentation of disease.
- b. The trainee should demonstrate practical competency in recognizing, diagnosing and managing complications associated with the disease, e.g. hyperviscosity syndromes.
- c. The trainee should demonstrate a practical competency for treating the disease and an understanding of the indications and proper use of pharmacological and biological agents in the treatment of this disease.

#### ***3. Hairy Cell Leukemia***

- a. The trainee should demonstrate a comprehensive working knowledge of the diagnosis and prognosis of hairy cell leukemia. Specifically, the trainee should demonstrate an understanding of the use of morphologic analysis, immunohistochemical staining and, specifically, tartrate resistant alkaline phosphatase (TRAP) staining for the diagnosis of hairy cell leukemia.

- b. The trainee should demonstrate practical competency for the clinical diagnosis of hairy cell leukemia and for recognizing the clinical presentation of the disease.
- c. The trainee should demonstrate familiarity with the various options for treating hairy cell leukemia and their indications. This includes the role of splenectomy, interferon- $\alpha$ , purine analogs and other pharmacological agents. Specifically, the trainee should demonstrate an understanding of the indications, expected outcomes, pharmacology, dosage and administration, and potential toxicities and interactions of the pharmacological and biological agents used in the treatment of hairy cell leukemia. The trainee should also be familiar with alternative therapies for refractory or relapsed disease.

**K. *Lung Cancer and Mesothelioma:*** The trainees should be aware of the risk factors for developing lung cancer or mesothelioma.

- 1. *Small-Cell Lung Cancer:* Trainees should be familiar with the multimodality approach to limited-stage disease and the role of chemotherapy in prolonging the survival of patients with advanced disease. They should know the indications for CNS treatment.
- 2. *Non- Small-Cell Lung Cancer:* Trainees should be familiar with criteria of inoperability and the surgical and nonsurgical staging of patients with localized disease. They should be familiar with the use of chemotherapy and radiation therapy in locally advanced disease, and the role of chemotherapy and/or radiation therapy in the palliation of advanced disease.
- 3. *Mesothelioma:* Trainees should be familiar with the risk factors for mesothelioma, criteria for operability, and the value of chemotherapy.

**L. *Lymphomas:***

Trainees should be familiar with the Ann Arbor Staging and World Health Organization classification as well as its strengths, limitations, and current initiatives to improve upon the staging classification.

1. *Non-Hodgkin's Lymphoma:*

Trainees should be aware of the association of lymphomas with HIV and immunosuppression. They should be familiar with the Revised European-American Lymphoma classification and the International Prognostic Factors. They should recognize the curative role of chemotherapy and the value of marrow transplantation in relapsed or refractory disease. They should understand different types of low-grade lymphomas and appreciate when treatment is indicated and when observation is appropriate. They should appreciate the roles of radiation therapy, surgery, and chemotherapy, including monoclonal antibodies in staging and treatment of intermediate grade non-Hodgkin's lymphomas. They should know the challenge and unique clinical properties of high-grade lymphomas and the role for intensive treatment of this subgroup.

2. *Post-transplantation Lymphoproliferative Diseases:*

- a. The trainee should demonstrate a comprehensive working knowledge of the risk factors, natural history and biology of the post-transplantation lymphoproliferative diseases (PTLDs). This should include demonstrating an understanding of the role of immunosuppressive therapies and viruses in the etiology of these diseases.
- b. The trainee should demonstrate a practical competency in diagnosing and staging PTLDs. This should include an understanding of the histologic variants of PTLD, the prognostic implication of these variants, the role of imaging studies in

diagnosis and staging, and the implications of the type of transplant on prognosis and epidemiology.

- c. The trainee should demonstrate a practical competency in the management of PTLDs. This should include demonstrating an understanding of the role and selection of reducing immunosuppressive therapy, antivirals, chemotherapy, radiation therapy, biologic therapies (e.g. interferon- $\alpha$ ), and investigational approaches. The trainee should also demonstrate a working knowledge of the implications of PTLD and its treatment on the transplanted organ.

3. *Hodgkin's Disease:*

Trainees should be experienced with the staging of Hodgkin's disease and the indications for surgical staging. They should be familiar with the curative role of radiation therapy in early-stage disease. They should know the indications for chemotherapy in stages II, III, and IV. Trainees should be aware of the long-term complications of treatment and know what is entailed in the follow-up of patients. They should appreciate the indications for marrow transplantation in patients with relapsed or refractory disease.

4. *Adult T Cell Leukemia/Lymphoma:*

- a. The trainee should demonstrate a comprehensive working knowledge of the epidemiology, presentation and risk factors associated with adult T-cell leukemia/lymphoma (ATLL). The trainee should be aware of the role of HTLV-I in the pathogenesis of this disorder.
- b. The trainee should demonstrate a practical competency for making the diagnosis of ATLL and for recognizing the pathognomonic "flower" cell on a peripheral blood smear.
- c. The trainee should demonstrate a practical competency in the general approach to management of patients with ATLL. This would include a general awareness of the investigational therapies that are being used for the treatment of this disease.

5. *Cutaneous T Cell Lymphoma:*

Trainees should recognize the clinical appearance of patients at different stages of the disease. They should be aware of the value of immunophenotyping in the diagnosis. They should appreciate the roles of psoralen and ultraviolet A, radiation therapy, and topical chemotherapy in the initial management of patients. They should be aware of the palliative roles of chemotherapy, biologic agents, and radiation therapy in advanced or refractory disease.

6. *Plasma Cell Dyscrasias:*

Trainees should know how to distinguish the plasma cell dyscrasias and benign and malignant monoclonal gammopathies: MGUS, Waldenstrom's Macroglobulinemia, plasmacytoma, myeloma, amyloidosis, POEMS, and plasma cell leukemia. They should know the indications for treatment in each instance.

**M. *Sarcomas:***

1. *Bone sarcoma:* The trainee should recognize the predisposing situation and condition in the development of primary bone sarcomas. They should appreciate the pathologic spectrum of these lesions and know indications and considerations for limb preservation and adjuvant chemotherapy, and the role of combined modality therapy for specific tumors.
2. *Soft Tissue Sarcomas:* The trainees should know the appropriate surgery for initial diagnosis and the indications for limb preservation. They should recognize the roles of chemotherapy, surgery, and radiation therapy, including the specific medical treatment available for gastrointestinal tumors.

**N. Skin Cancers:**

1. *Melanoma*: Trainees should have an appreciation for the risk factors and varied clinical appearance of primary melanomas and its precursor lesions, such as dysplastic nevus. They should be able to recognize skin lesions that are benign from those that are potentially malignant. They should know the value of tumor depth and other prognostic factors in assessing prognosis. They should know what surgical procedure is required in making the diagnosis and curative resection. They should be aware of the indications for biologic therapies in the adjuvant setting and the potential risks and benefits of chemotherapy and in advanced disease. Trainees should have a working knowledge in the primary prevention of melanoma as well as the recognition and counseling of patients at high risk for developing melanoma.
2. *Basal Cell and Squamous Cell Cancers*: Trainees should recognize the clinical appearance of these lesions and appreciate that their occurrence is associated with sun exposure and may be a long-term complication of cancer therapy.
3. *Cutaneous T-Cell Lymphoma (CTCL)*: Trainees should recognize the clinical appearance of patients at different stages of the disease. They should be aware of the value of immunophenotyping in the diagnosis. They should appreciate the roles of PUVA, radiation therapy, and topical chemotherapy in the initial management of patients. They should be aware of the palliative roles of chemotherapy, biologic agents, and radiation therapy in advanced or refractory disease.

**O. AIDS-Associated Malignancies:**

The trainee should be familiar with association of central nervous system tumors with immunosuppression and AIDS. The trainee should recognize the increased incidence of malignancy in the HIV-positive population. They should know the indications for treatment of those cancers and be aware of the potential of increased toxicities attributable to concurrent medical problems. Trainees should know the appropriate prophylaxis and treatment for common opportunistic infections.

**IV. Non-Malignant Hematological Disorders**

A. Hematopoiesis and disorders of erythrocytes and iron metabolism

B. Red Blood Cell Disorders

C. Hemochromatosis

1. Basic molecular and pathophysiologic mechanisms
2. Presentation and diagnosis of hemochromatosis.
3. Clinical sequelae and complications of hemochromatosis for systemic organ systems.
4. Managing patients with hemochromatosis

D. White Blood Cell Disorders

1. Granulocyte Dysfunction Disorders

E. Platelet and Megakaryocyte Disorders

1. Hereditary Platelet Disorders
2. Acquired Platelet Function Disorders
3. Thrombocytopenia
4. Thrombocytosis

## 5. Anti-platelet function drugs

### F. Bone Marrow Failure States

1. The trainee should be able to list and describe the clinical characteristics of the inherited and congenital bone marrow failure states.
2. The trainee should demonstrate a basic working knowledge and practical competency of diagnosing and managing these disorders.
3. The trainee should demonstrate practical knowledge of the role of medications, other drugs and environmental pathogens (including chemicals and infectious diseases) in the development of bone marrow failure states.
4. The trainee should demonstrate the acquisition of specific knowledge about the following acquired bone marrow failure states: Aplastic Anemia and Pancytopenia

### G. Hemostasis

1. Normal Mechanisms of Hemostasis
2. Bleeding Disorders
3. Thrombotic Disorders
4. Pharmacologic Manipulation of Bleeding and Thrombosis

## V. **Bone Marrow Transplantation (BMT)/Stem Cell Transplantation (SCT).**

Trainees should understand the evolving use of and indications for bone marrow and stem cell transplantation, both autologous and allogeneic in various diseases (leukemia, lymphoma). They should be familiar with the multiple complications of transplantation, including veno-occlusive disease, graft-versus-host disease (GVHD), and infectious complications.

- A. The trainee should demonstrate a comprehensive working knowledge and practical competency of the basic, cellular and molecular biology of hematopoiesis and BMT/SCT. In addition, the trainee should demonstrate an understanding of tumor immunology and the biologic immunologic relationships between a donor's hematopoietic cells and the host.
- B. The trainee should demonstrate a comprehensive working knowledge and practical competency of the role of autologous and allogeneic BMT/SCT in the management of hematologic and non-hematologic diseases.
- C. The trainee should demonstrate a comprehensive working knowledge and practical competency of the preparative regimens used in anticipation of autologous and allogeneic BMT/SCT.
- D. The trainee should demonstrate practical experience in (or alternatively observe and understand) the method of collecting and handling bone marrow and peripheral blood stem cells for transplantation. This would include demonstrating an understanding of the approaches used to mobilize hematopoietic stem cells.
- E. The trainee should demonstrate a comprehensive working knowledge and practical competency of the process of performing an autologous or allogeneic BMT/SCT.
- F. The trainee should demonstrate an understanding and practical competency of the need for prophylactic and supportive care measures in the management of patients undergoing BMT/SCT. These include:
  1. an understanding of the pharmacologic and environmental approaches to preventing infectious diseases
  2. the use of immunosuppressive therapies to prevent or decrease graft versus host disease
  3. the effects of different approaches of “pre-treating” the stem cells (e.g. T-cell depletion) prior to transplantation

4. the proper use of blood products while awaiting engraftment of the transplanted hematopoietic stem cells.
- G. The trainee should demonstrate an understanding and practical competency of recognizing the presentation, making the diagnosis, and managing the complications that can occur post-transplant
1. marrow engraftment failure
  2. acute and chronic graft versus host disease
  3. opportunistic infections
  4. veno-occlusive disease
  5. (and others)

## **VI. Supportive Care**

### *A. Nausea and vomiting:*

The trainee should know the various etiologies of nausea and vomiting in patients with malignancies, and recognize the mechanism of action and pharmacology of anti-emetic agents and how to use them in daily clinical practice.

### *B. Infections and Neutropenia:*

The trainee should know the principles of diagnosis and management of infections and neutropenic fever in all types of cancer patients. They should know how to treat and prevent infections. They should know the indications of the use of hematologic growth factors.

### *C. Anemia:*

The trainee should know the indications and complications of red blood cell transfusions. They should be aware of the options regarding preparation and administration of these products. They should know the appropriate use of erythropoietin.

### *D. Thrombocytopenia:*

The trainee should know the indications and complications of platelet transfusions. They should be aware of the options regarding preparation and administration of these products.

### *E. Organ protection:*

The trainee should be familiar with the use of organ-protective measurements and treatments. They should know the indications and side effects of different organ-protective agents. They should know the techniques of gonad preservation to ensure the fertility of the patient (cryopreservation techniques).

### *F. Mucositis:*

The trainee should be able to distinguish mucositis, which is infectious, from mucositis caused by chemotherapy. They should be aware of the need for pain medications and topical anesthetics as palliation.

### *G. Transfusion Medicine*

The trainee should know the indications for and complications of red-cell and platelet transfusions. They should be aware of the options regarding preparation and administration of those products.

1. The trainee should demonstrate a comprehensive working knowledge of the procedures used to collect, evaluate and prepare blood products for transfusion.
2. The trainee should demonstrate a comprehensive working knowledge of the blood components and derivatives typically administered to patients, including red blood

- cell (RBC) preparations, platelet preparations, granulocyte preparations, fresh frozen plasma and cryoglobulin. This should include an understanding of various methods by which these blood products can be handled and prepared in response to specific clinical situations, including irradiation, washing and filtering techniques.
3. The trainee should demonstrate a comprehensive working knowledge and practical competency of identifying the clinical indications for use of specific blood products and derivatives and the clinical scenarios for which they are used.
  4. The trainee should demonstrate a comprehensive working knowledge and practical competency of the potential risks associated with the administration of various blood products. This would include, but is not limited to, allergic reactions, graft versus host disease, rejection reactions, introduction of infectious organisms, alloimmunization and others.
  5. The trainee should demonstrate a practical competency and understanding of alternatives to blood product therapies.
  6. The trainee should demonstrate a comprehensive working knowledge of the indications and processes of assays typically performed in a Blood Bank. These would include direct antiglobulin tests (direct Coomb's test), indirect Coomb's test, ABO and Rh typing of red blood cells, and antibody identification procedures.
  7. The trainee should demonstrate a comprehensive working knowledge of the mechanism by which apheresis can be used to isolate and collect specific blood components from individuals.
  8. The trainee should demonstrate a comprehensive working knowledge of the use of emergent plasma exchange (as used in TTP), leukapheresis (as used in AML) and RBC exchange (as used in sickle cell anemia).

*H. Marrow and Peripheral-Blood Progenitor Cells (PBPC):*

Trainees should be familiar with the methods for marrow and peripheral-blood progenitor cells procurement and cryopreservation.

*I. Malignant effusions.*

The trainee should know the signs, symptoms, and treatments and their indication of ascites and pleural and pericardial effusions. They should be able to treat effusions by paracentesis.

*J. Extravasation.*

Trainees should know that prevention is the most important factor in extravasation. They should be able to diagnose and treat extravasation.

*k. Oncologic emergencies.*

Trainees should recognize the clinical presentations that require immediate intervention (eg, spinal cord compression, pericardial tamponade). For patients in whom a diagnosis of cancer is suspected, the trainee should know the proper approach for obtaining a tissue diagnosis. They should know what therapy is required in the acute and chronic setting.

*L. Paraneoplastic syndromes.*

Trainees should recognize the "remote effects" of malignancy, potentially manifested in every organ system. They should recognize which malignancies are most commonly associated with the individual syndromes. Trainees should know the appropriate management of each syndrome.

*M. Nutritional support.*

Trainees should know the indications for and complications of enteral and parenteral support.

## **VII. Palliative care and end-of-life care:**

A. *Pain:* Trainees should be adept in their ability to assess location and severity of pain. They should have a working knowledge of the World Health Organization pain ladder and an understanding of the pharmacology and toxicity of the opiate narcotics and other analgesics. They should be able to manage cancer pain with the available modalities and recognize when referral for an invasive palliative intervention is indicated.

B. *Other symptoms:* Trainees should be able to palliate other symptoms (respiratory tract, gastrointestinal tract, neurologic symptoms, cutaneous and mucosal symptoms, anorexia and cachexia, dehydration). They should know how to handle end of life symptoms.

C. *Communication:* The trainees should be able to communicate with the patient and his/her family. They should be able to break bad news and act adequately in difficult situations. The trainees should learn to communicate and work together with other professional health care professionals in a team (eg, nurses, social workers, psychologists).

D. *Rehabilitation.* The trainee should recognize the role of physical therapy, particularly in the postoperative setting. Trainees should recognize the role of occupational therapy, speech therapy, and swallowing therapy.

E. *Antiemetics:*

Trainees should recognize the mechanism of action and pharmacology of current antiemetic agents in addition to knowing which ones are appropriate.

F. *Multidisciplinary Care:*

The trainee should demonstrate a practical understanding of the role of a multidisciplinary approach to caring for patients with cancer or hematologic diseases.

1. understanding of the types of resources available and their individual roles for delivering care to patients
  - a. nurses
  - b. pharmacists
  - c. social workers
  - d. clergy
  - e. home care services
  - f. others (in addition to physicians)
2. Trainees should gain practical experience by participating in the development of multidisciplinary patient management plans.

## **VIII. Chemoprevention**

Trainees should know the scientific basis for using naturally occurring or synthetic agents that reverse, suppress, or prevent development of an invasive cancer. They should be familiar with the clinical trials testing prevention hypotheses.

## **IX. Screening**

Trainees should understand the basic principles of screening and risk assessment. They should know the sensitivity and specificity of the test employed and the cost-benefit ratio. They should know the situations in which screening has a well-defined role (e.g., PAP smear) and the many situations in which the role of screening is unclear or not defined (e.g., PSA). They should be aware of the principles and indications for genetic screening and counseling.

## **X. Psychosocial Aspects of Cancer**

- A. Trainees should know the psychosocial stages of cancer. They should be aware of available resources and recognize when intervention is indicated at all stages of disease.
- B. Trainees should know the cultural issues that impact on the management of disease.
- C. They should appreciate the spiritual conflicts associated with the diagnosis and treatment of cancer.
- D. Trainees should learn to recognize adaptive and maladaptive behavior in coping with disease.
- E. They should recognize acceptable coping mechanisms for patients and families within the context of the cancer diagnosis.
- F. Trainees should have an awareness of the issues involved in end-of-life care.
- G. Trainee should recognize that cancer impacts sexuality and may result in dysfunction as a result of the disease process, the treatment, or because of psychological effects.
- H. Trainees should be familiar with the indication and uses of psychotropic drugs.
- I. Trainees should have a knowledge of the bereavement process.
- J. The trainee should have an appreciation of the physicians' personal coping.
- K. Trainees also should know how to integrate family members, pastoral care, nursing support, hospice, and cancer support groups in the multidisciplinary treatment of patients.

## **XI. Patient Education**

- A. *Genetics Counseling:* The trainee should be capable of assessing the increased risk of cancer in the patient and the patient's family. They should be aware of the principles for genetic screening and counseling.
- B. *Health Maintenance:* The trainee should be capable of counseling the patients and their family about known risk factors for subsequent malignancy: diet, smoking, alcohol, and sun exposure.
- C. *Long-Term Complications:* Trainees should recognize long-term complications of each treatment modality employed.
- D. *Risk of treatment-induced cancers:* Acute myeloid leukemia after chemotherapy, and radiation induced sarcomas.
- E. *Endocrine dysfunctions.* Hypothyroidism after neck radiation, sterility with chemotherapy.

- F. Awareness of chemoprevention measures/clinical trials.
- G. Trainees should be aware of the appropriate testing and intervals for follow-up.

## **XII. Bioethics, Legal, and Economic Issues**

- A. The trainee should know the requirements for obtaining informed consent.
- B. They should understand the ethics involved in the conduct of medical research.
- C. They should know the legal issues related to institution of life support and withdrawal of life support systems.
- D. Trainees should appreciate the cost effectiveness of medical intervention in the management of cancer and hematological diseases.
- E. Trainees should be aware of guidelines to define conflict of interest within professional activities.
- F. Trainees must demonstrate professionalism and humanism in their care of patients and their families.

## **XIII. Continuous Quality Improvement**

The Division's Continuous Quality Improvement (CQI) conferences are held quarterly. The goal of these conferences is to improve patient satisfaction by working on various quality improvement projects and initiatives. At each CQI meeting the various quality improvement projects and results of those projects are discussed and improvement plans are initiated. The main objectives of the CQI conference is to have everyone participate in various quality improvement projects and initiatives and to assess areas for improvement; Identify any inconsistency in the plan or chemotherapy order sheet and ways to prevent these inconsistencies and develop areas for improvement. The Division also participates in the ASCO Quality Oncology Practice Initiative (QOPI). ASCO's QOPI is an oncologist-led, practice-based quality improvement program. QOPI's goal is to promote excellence in cancer care by helping practices create a culture of self-examination and improvement. Our staff and fellows participated in the fall 2007 QOPI project and we will continue to participate in these projects.

## **XIV. Procedures**

The ability to perform a number of noninvasive and invasive procedures in patients with cancer or hematologic diseases is an important component of the training of a subspecialist in Hematology/Oncology. For this reason, adequate training and supervision to establish competency in performing these procedures is an important component of the trainee's education. The procedural skills that are recognized as being typically used in the practice of Hematology/Oncology include:

- A. *Chemotherapy Administration:*
  1. Trainees should be familiar with the care and accessing of indwelling venous catheters.

2. Trainees should be aware of the acute toxicities of chemotherapy that are related to the administration of the drugs.
3. Trainees should be familiar with the administration of chemotherapy and biologics by all therapeutic routes.
4. Trainees should have knowledge regarding the handling and disposal of chemotherapeutic and biologic agents.

**B. *Bone Marrow Aspiration, Biopsy, and Peripheral Blood Morphology:***

A properly trained subspecialist in Hematology/Oncology should have the ability to obtain specimens of blood and marrow for examination and diagnostic interpretation.

1. Preparation of peripheral blood smear
2. Interpretation of peripheral blood smear
3. Bone marrow aspirate and biopsy
4. Interpretation of bone marrow aspirate smear

**C. *Ommaya Reservoir and Lumbar Puncture:***

Trainees must demonstrate an ability to perform a lumbar puncture and to administer chemotherapy by that route. Trainees must be capable of accessing and administering chemotherapy through an Ommaya reservoir.

**D. *Measurement of lymph node and tumor size by physical examination***

Trainees must demonstrate an ability to assess the size of subcutaneous structures by palpation and determine changes in their size by serial physical examination.

1. Tumor masses
2. Lymph nodes
3. Solid organs (e.g. liver, spleen)

**XV. Ethics**

1. The curriculum should provide a practical understanding of the ethical issues that impact patients, their families and caregivers as pertains to treatment options and treatment outcome.
  - a. end-of-life issues
  - b. resuscitation issues.
2. The trainee should gain experience in recognizing and dealing with a variety of ethical issues related to the delivery of health care.
  - a. issues related directly to patient care
  - b. delivering the care in a variety of health care settings
  - c. interacting with members of the health care service environment
  - d. interacting with external entities (e.g. pharmaceutical companies and their representatives, hospital lawyers).
3. The trainee should recognize ethical issues related to relationships with the health care industry and its representatives (e.g. pharmaceutical companies).
  - a. The trainee should be able to recognize conflicts of interest and acquire skills to avoid them.
  - b. The trainee should learn and demonstrate proper and appropriate conduct in activities that might be influenced by their interactions, and relationships, with pharmaceutical and other health care industry companies.
    - i. patient care
    - ii. research
    - iii. educational activities

4. The trainee should demonstrate a practical understanding of the ethical conduct of clinical trials.
  - a. enrollment of patients in clinical trials
  - b. the complexities of informed consent.

## **XVI. Clinical Experience**

### **A. *Inpatient Experience:***

1. Trainees should gain experience managing therapies that require care in the inpatient hospital setting.
2. Trainees should gain experience managing the complications of therapies requiring inpatient hospitalization.
3. Trainees should have specific practical experience managing complications of neutropenia, including infection and mucositis.
4. Trainees should have specific practical experience managing complications of malignant disease that require hospitalization
  - a. Pain
  - b. Bowel obstruction
  - c. Hemorrhage
  - d. Severe abnormalities of the peripheral blood counts
  - e. Fever and infection
5. Trainees should have practical experience in the management of patients receiving high-dose chemotherapy.
6. Consultative skills. Trainees should acquire and demonstrate the necessary and appropriate skills for providing medical recommendations and care of patients with cancer or hematological diseases. Included are skills in communicating with referring physicians and the willingness and ability to assume the appropriate level of responsibility for the care of the patient.

### **B. *Outpatient Experience:***

1. Trainees should be exposed to patients with a full range of cancer and hematological diseases.
2. Trainees must manage patients in a continuing care setting.
3. Trainees should have experience providing patient care through home health agencies and also have the experience of introducing the concept of hospice to patients and their families.
4. Trainees must participate in multidisciplinary ambulatory cancer care.

## **XVII. Educational Resources/ Review of Literature**

Self-education is an essential part of the fellowship program. Proper use of journals, texts, and other materials will improve patient care and facilitate the overall educational experience. Numerous resources have been developed to increase efficiency of reviewing relevant literature and to simplify the effort required for teaching house staff, participation in fellow's conferences, clinical rounds, etc.

### **A. *Libraries***

The Stohlman Library, named in honor of the former Chief of Hematology/Oncology, provides numerous books and journals in Medicine, Surgery, and Hematology/Oncology. Journals are also kept in the conference rooms on MMR3 and ACH building, 4th floor (ACH4). In general, the MMR3 journals are clinical, and the ACH4 journals are focused on basic science. The major journals are listed in the attached table.

**B. Books**

The Stohlman Library contains many of the key texts in hematology and oncology. In addition, the staff maintains many books and specialty texts, which are available to fellows. Dr. Hesketh has several texts and teaching files in the fields of cancer pharmacology, drug protocols, and experimental therapy.

**C. Review of Morphology**

Morphology review will be an integral part of all clinical conferences, including the weekly Hematology/Oncology Conference, Tumor Board, and Center for Breast Care. An introductory session will be organized in the beginning of the program, to review methods of blood smear/bone marrow preparation and analysis. In addition to the routine analysis of relevant morphologies from the outpatient clinic and the consultation service, a regular conference will be scheduled to members of the Dept. of Pathology to review recent bone marrows, and blood smears

# Curriculum For Out-Patient Clinic Rotation

## I. Educational Purpose/Rationale:

The fellowship training program includes a significant exposure to the management of out-patients with hematologic and oncologic disorders. In recent years the practice of medical oncology and hematology has shifted dramatically from the inpatient setting to the outpatient areas in all acute care hospitals. As a result, time spent in the outpatient clinic is a significant and vital part of the trainee's educational experience.

## II. Educational Setting:

The outpatient clinic rotation will take place in the Hematology/Oncology Outpatient Center on CCP5. This area is a combination of an office-type practice and an ambulatory day treatment center. The fellows-in-training will be assigned to one or two attendings at a time and will rotate every six months. This six month assignment will allow time for the fellows to get to know their patients well and provide continuity of care. At any one time, a clinical fellow will cover two or three half day clinics each week including the Center for Breast Care sessions on Wednesday mornings. Fellows on research rotations will have one half-day clinic per week.

## III. Responsibilities:

At all times, the fellow will be working side by side with the attending or the staff person designated to cover for the attending. An average of 1 – 3 new patients and 4 – 6 followup patients are seen by the fellow per session. The patients will constitute an ethnically diverse mix of men and women with a broad spectrum of benign and malignant hematologic diseases. The fellow will prepare for clinic the day before by reviewing the charts, tracking down missing reports and information, and will order the appropriate lab tests to be drawn upon the patient's arrival. The fellow will interview and examine the patient and will present his or her findings to the attending along with an assessment and proposed plan of care. The fellow and attending will revisit the patient to confirm the findings and explain the plan of care.

Additional responsibilities include:

1. Complete documentation of the encounter in the outpatient record.
2. Dictation of summary letters to all involved physicians. Letters will be reviewed promptly and sent out in a timely manner.
3. Telephone contact with the referring MD when indicated by the clinical situation.
4. Arrangement for inpatient admissions (elective and urgent) and completion of the admission note ("green sheet") and pertinent orders.
5. Completion of chemotherapy orders and orders for other infusional or subcutaneous therapies.
6. Review of all lab reports and follow-up contact with patients when indicated. Review of all diagnostic testing with the attending and contact with patients to provide the results.

7. Timely response to telephone calls and messages.

#### **IV. Educational Objectives:**

The major goal of the outpatient clinic rotation is to expose the trainees to the complex problems (medical, emotional, ethical and spiritual) that affect this patient population. The fellow-in-training will learn the pathophysiology of the disease and how to choose appropriate diagnostic testing. The trainee will develop a solid understanding of the role of chemotherapy, its pharmacology, toxicities, and clinical indications. The fellow will also be expected to learn to integrate the emotional, psychological, and spiritual aspects of an illness in the plan of care. They will work closely with the patient's family and with other disciplines (nursing, social services, dietitians, pain service) to create a coordinated, appropriate individualized plan of care.

#### **V. Ethical Issues:**

The fellow-in-training will become experienced with the ethics of clinical research and informed consent. They will be expected to become familiar with ethical issues surrounding terminal illnesses, impending death and will play a role in helping patients and their families make end-of-life decisions.

#### **VI. Teaching Methods:**

In the outpatient setting, the majority of the teaching will be done by discussions and literature reviews on individual patient problems at the time the patient is seen. The fellow will present his or her findings and thoughts to the attending and the ensuing discussion will produce a coordinated plan. Teaching at the bedside will be a vital part of the outpatient experience. The fellow will be expected to read articles that relate directly to the outpatients he or she has seen. Radiology and Pathology Rounds will be made by the fellow and attending. In addition, the fellow will attend all departmental conferences and will be an active participant in the conferences.

#### **VII. Core Literature:**

A wide variety of Hematology and Oncology textbooks are available in the fellow's room. The attendings will provide copies of pertinent articles and/or provide guidance to the fellows who are researching a subject.

#### **VIII. Procedures:**

Fellows will be supervised during all procedures. They will develop expertise in performing bone marrow aspirates and biopsies, thoracenteses, paracenteses and intrathecal administration of chemotherapeutic agents.

#### **IX. Fellow's Evaluation**

Fellows will receive ongoing informal evaluations by their attendings. The attending will do a detailed written evaluation on the fellow assigned to his or her clinic. The attendings will supervise all procedures performed by the fellow and will regularly visit the beside with the fellow to observe the fellow's skills. Fellows will also be evaluated in the six core competencies by using the following tools:

Patient Care	Patient survey, CEX evaluation
Medical Knowledge	Evaluation by Attending and Nurse
Practice based learning and improvement	Self Assessment Questionnaire
Interpersonal and communication skills	Evaluation by Nurse and Attending, Patient survey
Professionalism	Self administered survey, Patient survey
Systems-based practice	CEX evaluation, Patient survey, Evaluation by Nurse and Attending

## **X. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Hematology Consult Rotation

## I. Educational Purpose/Rationale:

The hematology consult rotation is structured to provide the fellows with fundamental knowledge in the diagnosis and treatment of malignant and non-malignant hematologic disease. Since hematology is a specialty that heavily relies on sophisticated laboratory testing along with refined bedside clinical skills, a major emphasis will be placed on the understanding of the principles and interpretation of hematologic laboratory tests.

## I. Educational Setting/Responsibilities:

The consult service team consists of a hematology attending, a fellow, a second- or third-year resident, and a medical student. An average of two to three patients are evaluated on a daily basis by this team. The patients will constitute an ethnically diverse mix of men and women with a broad spectrum of benign and malignant hematologic diseases. Patients may be seen in all types of clinical settings (inpatient and outpatient) within the hospital. The fellow is responsible, with the resident, for the initial and complete evaluation of these patients, including review of all laboratory and radiologic tests, examination of the peripheral blood smear and the bone marrow aspirate if indicated, the formulation of a comprehensive assessment, and the development of a diagnostic and therapeutic plan. All cases are reviewed and discussed extensively with the attending prior to the formulation of final recommendations. Review of pertinent articles in the literature will be strongly emphasized and directed by the attending. Furthermore, the fellow is expected to round on all patients initially evaluated and requiring follow-up. During the rotation, the fellow is required to prepare three to four short lectures focused on the topic of his/her choice (generally 15 minutes each), which are presented to the team.

## II. Educational Objectives:

Emphasis is placed on the development of bedside clinical skills as well as understanding the execution and interpretation of hematologic tests. In this context, the major educational objectives of this rotation will include:

1. Acquisition of essential knowledge pertaining to the presentation, physical findings, diagnosis, and management of the hematologic diseases encountered on the consult service.
2. Interpretation of peripheral blood smears and normal and pathologic bone marrow aspirates.
3. Understanding of the principles of performing and interpreting basic hematologic testing, including CBC, PT/PTT, DIC screening, special coagulation testing, hemoglobin electrophoresis, serum immunoelectrophoresis, and, as encountered, more specialized hematologic testing, including Lupus anticoagulant work-up, hemoglobin electrophoresis, histochemistry, cytogenetics, and flow cytometry of acute leukemias. Principles of transfusion medicine, evaluation of antibodies and blood compatibility testing, use of blood component therapy.
4. Understanding of basic indications and principles of plasmapheresis, including familiarization with the management of patients requiring this type of therapy.

### **III. Specific Educational Content**

With regard to specific diagnostic categories, fundamental knowledge of the clinical presentation, laboratory work-up, and the management of the following conditions should be acquired during the fellow's rotation on the hematology service:

1. Work-up and management of anemias.
2. Work-up and management of thrombocytopenias.
3. Work-up and management of pancytopenias.
4. Work-up and management of neutropenia in association with fever.
5. Myeloproliferative disorders, including CML, P. vera, thrombocytosis, myelofibrosis, and CMML.
6. Lymphoproliferative disorders, including lymphomas, CLL, Waldenstrom's macroglobulinemia, and plasma cell disorders.
7. Bleeding disorders.
8. Hypercoagulable states.
9. Work-up and management of acute leukemias.

### **VI. Ethical Issues:**

With regard to ethical issues, fellows will undoubtedly be exposed to difficult end-of-life decisions on the consult services. With participation in family meetings around end-of-life issues, fellows are in a position to refine their approach in discussing these important issues with patients and families.

### **VII. Teaching Methods:**

Fellows are required to attend the full conference schedule of the division as outlined below. These weekly meetings include case oriented discussions which are attended by the entire hematology/oncology staff and fellows, as well as educational conferences given by fellows, staff members, or invited speakers. They include:

- |             |               |                                  |
|-------------|---------------|----------------------------------|
| 1. Monday   | 3-4 p.m.      | Case Discussion                  |
| 2. Monday   | 4-5 p.m.      | Tumor Board                      |
| 3. Thursday | 7:30 - 8 a.m. | Fellows Conference               |
| Thursday    | 12 - 1p.m.    | Hematology/Oncology Grand Rounds |
| 4.          |               |                                  |

Friday's fellows' conference incorporates the basic science course. Each fellow is expected to present three to four talks during the course of one academic year.

In addition, the fellows must attend other weekly oncology conferences, including breast and lung conferences, which are an integral part of the fellowship training program.

### **VIII. Core Literature:**

A wide variety of hematology textbooks are readily available in the fellows' room for convenient consultation. Furthermore, literature pertinent to cases encountered during the rotation will be provided by the consulting attending on service. Finally, an up-to-date file

cabinet containing most of the crucial articles published in the past 15 years in all topics of hematology is readily available through the hematology office, provided that no article is removed from the files (a copy machine is available on the floor at no charge). Fellows are expected to keep informed of the new literature. The minimum reading recommended includes all of the following journals: *Blood*, *Journal of Clinical Oncology*, *American Journal of Hematology*, *British Journal of Hematology*, *Annals of Internal Medicine*, and *New England Journal of Medicine*.

## **IX. Procedures:**

Fellows are expected to perform all bone marrow biopsies during their rotation on the hematology consult service under the supervision of a staff member. They will also become proficient in the preparation of bone marrow particle smears. Other procedures (including thoracentesis, access of Hickman catheters and Ommaya reservoirs, lumbar punctures) will be performed under the close supervision of staff members.

## **X. Fellow's Evaluation:**

At the end of each rotation, the fellows will receive a written evaluation by the attending. These evaluations will address each of the six core competencies. Fellows are strongly encouraged to periodically review these evaluations in order to maintain an adequate feedback on their performance. Each fellow will meet with either Dr. Hesketh or Dr. Parameswaran twice yearly to review their ongoing performance.

## **XI. Program Evaluation:**

Fellows are encouraged to provide feedback to the staff on the rotation. Fellows are required to complete a written evaluation of the attending at the end of each rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Oncology Consult Rotation

## I. Educational Purpose/Rationale:

The oncology consult elective is structured to provide the fellow with fundamental knowledge in the diagnosis and treatment of the solid tumors and lymphomas, as well as an appreciation of the general approach used by oncologists in the initial evaluation and treatment of all cancer patients.

## II. Educational Setting/Responsibilities:

The consult service team consists of a medical oncology attending, a fellow, a second- or third-year resident, and a medical student. An average of two-to-three patients are evaluated on a daily basis by this team. The patients will constitute an ethnically diverse mix of men and women with a broad spectrum of malignant neoplastic diseases. Patients may be seen in all types of clinical settings (inpatient and outpatient) within the hospital. The fellow is responsible, with the resident, for the initial and complete evaluation of these patients, including review of all laboratory, pathologic, and radiologic tests, the formulation of a comprehensive assessment, and the development of a diagnostic and therapeutic plan. All cases are reviewed and discussed extensively with the attending prior to the formulation of final recommendations. Review of pertinent articles in the literature will be strongly emphasized and directed by the attending. Furthermore, the fellow is expected to round on all patients initially evaluated and requiring follow-up. During the rotation, the fellow is required to prepare three-to-four short lectures focused on the topic of his/her choice (generally 15 minutes each), which are presented to the team.

## III. Educational Objectives:

Emphasis is placed on the development of bedside clinical skills as well as understanding the execution and interpretation of diagnostic tests. In this context, the major educational objectives of this rotation will include:

1. Acquisition of essential knowledge pertaining to the presentation, physical findings, diagnosis, and management of the oncologic diseases encountered on the consult service.
2. Interpretation of histologic and cytologic materials.
3. Acquisition of essential knowledge pertaining to the appropriate use and interpretation of diagnostic radiologic studies in patients with cancer.
4. Acquisition of essential knowledge for the appropriate indications and contraindications for surgery.
5. Acquisition of essential knowledge for the appropriate indications and contraindications for radiation therapy.
6. Acquisition of essential knowledge for the appropriate indications and contraindications for chemotherapy and use of other systemic therapies.

## **IV. Specific Educational Content**

With regard to specific diagnostic categories, fundamental knowledge of the clinical presentation, diagnosis, staging, and treatment of the following neoplasms should be acquired:

1. Lung cancer
2. Breast cancer
3. Gastrointestinal cancers
4. Genitourinary cancers
5. Gynecologic malignancies
6. Central nervous system malignancies
7. Carcinoma of unknown primary site
8. Head and neck cancers
9. Leukemias
10. Lymphomas
11. Sarcomas
12. Skin cancers
13. Plasma cell dyscrasias
14. AIDS-associated malignancies

Fellows will also be expected to become familiar with the principles in managing the more common complications of cancer and its treatment, including:

1. Febrile neutropenia
2. Thrombosis
3. Spinal cord compression, SVC syndrome
4. Paraneoplastic syndromes
5. Mucositis

Fellows will also develop competence in the appropriate use and indication for:

1. Chemotherapy and biologic agents.
2. Hematopoietic growth factors
3. Transfusion therapy
4. Nutritional support

## **V. Ethical Issues:**

With regard to ethical issues, fellows will undoubtedly be exposed to difficult end-of-life decisions on the inpatient and consult services. With participation in “family meetings” around end-of-life issues, fellows are in a position to refine their approach in discussing these important issues with patients and their families.

## **VI. Teaching Methods:**

While the thrust of the teaching will be case based didactics on rounds, other forums for meeting the above stated goals include regular attendance at following conferences:

1. Monday	3-4 p.m.	Case Discussion
2. Monday	4-5 p.m.	Tumor Board
3. Tuesday	4-5 p.m.	Lung Conference
4. Wednesday	12-1 p.m.	Center for Breast Care Conference
5. Thursday	7:30-8 a.m.	Fellows Conference
6. Thursday	12 -1 p.m.	Hematology/Oncology Grand Rounds

## **VII. Core Literature:**

A wide variety of hematology and oncology textbooks are readily available in the fellows' room for convenient consultation. Furthermore, literature pertinent to cases encountered during the rotation will be provided by the consulting attending on service. This will include key review articles as well as seminal papers in the various areas.

## **VIII. Procedures:**

Fellows will be expected to perform and demonstrate competence in the following procedures:

1. Bone marrow aspiration and biopsy.
2. Use of Ommaya reservoir and lumbar puncture for instillation of intrathecal chemotherapy.
3. Complete knowledge on the appropriate ordering and administration of chemotherapy and biologic agents.

## **IX. Fellow's Evaluation**

Fellows will receive ongoing informal evaluation by their attendings. At the end of each rotation, fellows will receive a written evaluation by the attending. These evaluations will address each of the six core competencies. Fellows will be supervised by attending physicians during the conduct of designated procedures to assist in teaching and demonstration of competence.

## **X. Program Evaluation**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Inpatient Service Rotation

## I. Educational Purpose/Rationale:

The inpatient service rotation is structured to provide the fellows with a comprehensive exposure to all aspects of acute care management for the patient with malignant neoplastic and benign hematologic disease.

## II. Educational Setting:

Caritas St. Elizabeth's Medical Center has a dedicated, 16 bed Hematology/Oncology Unit located on CMP7. It is staffed by nurses with expertise and interest in caring for patients with hematologic and neoplastic disease.

## III. Responsibilities:

The inpatient service team consists of a hematology/oncology staff member, a fellow and a medical resident. The patient's will constitute an ethnically diverse mix of men and women with a broad spectrum of benign and malignant hematologic diseases. The attending and fellow rotate monthly. Medical students and pharmacy interns occasionally rotate on service.

The team makes daily rounds, Monday through Friday, and the attending and fellow on-call complete inpatient rounds on the weekends and holidays. The group meets from 10:30 a.m. to noon, and at other times when necessary. Chart review and bedside rounds are done daily by the team as a whole. Nursing staff will join rounds whenever possible. All aspects of the patient's care, including emotional, psychological, spiritual and rehabilitative issues are reviewed and short-term and long-term plans are made. The group will review x-rays, scans, blood smears, and pathology slides and incorporate these findings into the treatment plan.

Additional responsibilities of the resident and fellow include:

1. Documentation: daily notes detailing the patient's status, progress, and plans for treatment.
2. Participation in discharge planning rounds, patient care conferences, and family meetings.
3. Communication with the primary care physician and others involved with the patient's care.

## IV. Educational Objectives:

Fellows on the inpatient service will develop an understanding of the clinical presentation of hematologic and oncologic problems in the acute care setting. They will review the differential diagnosis and physician findings, and will acquire a basic, sound knowledge of management of these diseases.

Specific educational objectives will include:

1. Recognizing and appropriately managing complications of chemotherapy requiring hospital admission, including febrile neutropenia, severe mucositis, severe diarrhea, and severe emesis.
2. Recognizing and appropriately managing complications of malignancy requiring hospitalization, including spinal cord compression, superior vena caval obstruction, hypercalcemia, pain control, malignant effusions, and coagulopathies.
3. Recognizing and appropriately managing the complications of benign hematologic disease requiring hospitalization, including coagulopathies, heparin-induced thrombocytopenia, sickle cell crisis, HELLP syndrome, and thrombotic thrombocytopenic purpura.
4. Managing all aspects of the care for patients requiring inpatient admissions for administration of chemotherapy and biologic agents.

## **V. Ethical Issues:**

Fellows will be expected to develop familiarity and understanding of the full range of ethical issues involving the hematology/oncology patient, including the ethics of informed consent, medical research, and the dying and critically ill patient.

## **VI. Teaching Methods:**

1. Inpatient rounds will include bedside teaching and review of pertinent physical findings as well as focused discussions with the ward team. The attending and fellow will review the common diseases, common clinical syndromes, and practical management issues in these discussions. They will also provide pertinent articles and written materials. The fellow will prepare short discussions with a review of the literature as part of ward rounds.
2. The fellow is expected to attend conferences scheduled for the Hematology/Oncology Division unless there are urgent patient issues on the floor. These include:

a. Monday	3-4 p.m.	Case Discussion
b. Monday	4-5 p.m.	Tumor Board
c. Tuesday	4-5 p.m.	Lung Conference
d. Wednesday	12-1 p.m.	Center for Breast Care Conference
e. Thursday	7:30- 8 a.m.	Fellows Conference
f. Thursday	12-1 p.m.	Hematology/Oncology Grand Rounds

## **VII. Core Literature:**

A wide variety of hematology and oncology textbooks are readily available in the fellows' room for convenient consultation. Furthermore, literature pertinent to cases encountered during the rotation will be provided by the consulting attending on service.

## **VIII. Procedures:**

Fellows will be expected to perform and demonstrate competence in the following procedures:

1. Bone marrow aspiration and biopsy.
2. Use of Ommaya reservoir and lumbar puncture for instillation of intrathecal chemotherapy.
3. Complete knowledge on the appropriate ordering and administration of chemotherapy and biologic agents.

## **IX. Fellow's Evaluation:**

Fellows will receive ongoing informal evaluation by their attendings. At the end of each rotation, fellows will receive a written evaluation by the attending. These evaluations will address each of the six core competencies. Fellows will be supervised by attending physicians during the conduct of designated procedures to assist in teaching and demonstration of competence.

## **X. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Transfusion Service Rotation

## I. Educational Purpose/Rationale:

The practice of hematology and medical oncology requires familiarity with blood products, immunohematological assays in the clinical laboratory and blood bank, management of blood product infusion therapy and its complications and management of patients undergoing therapeutic apheresis. The transfusion service rotation provides a mechanism for providing training in these areas to fellows in our program.

## II. Educational Setting/Responsibilities:

The transfusion service team consists of a faculty attending physician and fellow. Together they function as medical director and associate medical director for the hospital transfusion service. The fellow is directly responsible for all transfusion and immunohematology consults, investigation of reported transfusion reactions, making determinations regarding deviations from standard transfusion service protocols (for example, when to transfuse Group O, Rh+ blood to an Rh- patient), and, in collaboration with the blood bank technical specialist, directing complex serological work-ups related to pre-transfusion testing. In the course of performing these functions, the fellow spends sufficient time with the laboratory staff in the blood bank to become familiar with how these evaluations are performed at the bench. The goal is not for the fellow to acquire the same technical proficiency as the laboratory workers, but rather to afford the fellow with adequate working knowledge of blood bank and transfusion procedures so that the fellow can provide expert management in appropriate situations in the clinical setting or function at the level of medical director of a hospital transfusion service.

The transfusion service fellow consults on all patients referred for consideration for therapeutic apheresis procedures. The patients will constitute an ethnically diverse mix of men and women with a broad spectrum of diseases. They may include patients with autoimmune disorders treated with plasma exchange, patients with hematological disorders referred for plasma exchange or cytoreduction procedures, patients with hemoglobinopathies or life-threatening methemoglobinemia referred for automated red blood cell exchange, or patients referred to other indications. The fellow is responsible for reviewing the pertinent literature related to patient's illness and the application of therapeutic hemapheresis, and for medically evaluating the patient with respect to the appropriateness of the procedure and the risks and benefits of therapy. The fellow gathers sufficient clinical and laboratory data for calculation of blood and plasma volume and performs physiological calculations necessary for the writing of therapeutic apheresis orders. During the course of apheresis therapy, the fellow makes rounds on active patients, including during the actual treatment procedures, and is responsible for managing complications of treatment.

In addition to specific transfusion service rounds and activities, the transfusion service fellow makes daily afternoon consult rounds with the hematology consult team and remains familiar with active patients on the hematology consult service.

## III. Educational Objectives:

Fellows in Hematology/Oncology are training in a unique environment, which requires fundamental integration of the bedside skills of the care-oriented internal medicine practitioner

with the scientific and clinical laboratory-oriented expertise of a clinical pathologist. Our program is constructed so as to recognize that, as subspecialty trainees in internal medicine, our fellows will employ their knowledge of transfusion medicine as a supplement to their clinical practice in the community or academic setting, often in a consultative fashion. With this in mind, the specific educational goals of this rotation include the acquisition of the ability to:

1. Explain the scientific basis of blood product transfusion, thereby enabling the trainee to make informed decisions related to transfusion practice and interpret medical literature in the field.
2. Describe blood components and derivatives, indications for their use, correct transfusion practices and complications of transfusion therapy.
3. Define immune mechanisms of hemolysis and transfusion reactions, how they are investigated in the blood bank, and how they are clinically managed.
4. Evaluate patients for apheresis therapy, write apheresis orders, manage the procedures and their complications, and manage venous access devices used in apheresis therapy.

#### **IV. Specific Educational Content:**

The educational goals stated above will, in part, be achieved by introducing fellows to the following specific areas of knowledge:

1. Blood groups, major and minor, and their importance in transfusion medicine.
2. Immunological basis for, and clinical relevance of, pre-transfusion testing.
3. Prevention of hemolytic disease of the newborn using anti-D blood derivatives.
4. Theoretical and clinical rationale for choice of standard and specialized blood components.
5. Use of blood components and derivatives in management of coagulation and autoimmune disorders.
6. Diagnosis, investigation and management of adverse effects of blood component transfusion.
7. Laboratory investigation of red cell all- and autoantibodies and immune hemolysis.
8. Blood product support in the surgical and intensive care setting.
9. Relevance of the HLA system to transfusion medicine.
10. Indications for therapeutic apheresis, management of the apheresis patient, complications of therapeutic apheresis, management of vascular access devices.

#### **V. Ethical Issues:**

Fellows will become familiar with the basis for, importance of and process for obtaining informed consent for blood transfusion in the elective and emergency setting and for documenting the justification for blood component transfusion in the medical record. Fellows will obtain proper understanding of alternatives to red blood cell transfusion and the appropriateness of specific alternatives in the cases of individual patients. Additional issues to be addressed include ethical decision-making in the allocation of scarce or rare blood products for transfusion, counseling patients and their families with respect to the advantages and disadvantages of directed blood donation, and counseling blood product recipients who are targets of look-back programs for transmission of transfusions-related infectious disease.

## VI. Teaching Methods:

Fellows are required to attend the full conference schedule of the Hematology/Oncology Division as described in the Division Curriculum and Curriculum for Hematology Consult Rotation. Fellows will observe Blood Bank technologists in the performance of pre-transfusion testing, serological work-ups (including Coombs testing) and investigations of transfusion reactions. Fellows will personally investigate reports of transfusion reactions including, where possible, evaluation of the patient at the bedside and review of the medical record. The fellow will complete the transfusion reaction record and submit it to the Transfusion Service attending for final review. Fellows will see patients in consultation for clinical issues in transfusion medicine and blood bank practice, formulate a diagnostic approach and/or management plan, and present the patients to the Transfusion Service attending for both didactic and practical case discussions. Final consultative recommendations will then be formulated by the consult team. Fellows will also see patients referred for therapeutic apheresis and, similarly, formulate diagnostic impression and management plans. Apheresis orders will be written by the fellow under the supervision of the attending. The fellow will interact directly with the apheresis nursing and technical staff, become familiar with the operation of the apheresis equipment and the conduct of the procedures, intervene as needed to manage significant complications. The fellow will also evaluate all venous access devices for proper placement and will make management decisions concerning the catheters. Fellows will participate in investigative protocols concerned with therapeutic apheresis during these rotations.

## VII. Core Literature:

In addition to the resources described in the Curriculum for Hematology Consult Rotation, the following resources are considered basic to the Transfusion Medicine Rotation:

### BOOKS

Rossi EC, Simon TL, Moss GS, Gould SA (eds): *Principles of Transfusion Medicine (Second Edition)*, Baltimore, Williams & Wilkins, 1996  
Mintz PD (ed): *Transfusion Therapy: Principles and Practice*, Bethesda, AABB Press, 1999.  
Mollison PL, Englfrict CP, Contreras M (eds): *Blood Transfusion in Clinical Medicine (Ninth Edition)*, Oxford Blackwell, 1993.  
Anderson KC, Ness PM (eds): *Scientific Basis of Transfusion Medicine: Implications for Clinical Practice*, Philadelphia, WB Saunders, 1994.  
Garrity G (ed): *Immunobiology of Transfusion Medicine*, New York, Marcel Dekker, 1994.  
Vengelen-Tyler V (ed-in-chief): *Technical Manual (Twelfth Edition)*, Bethesda, AABB Press, 1996.  
McLeod BC, Price TH, Drew MJ (eds): *Apheresis: Principles and Practice*, Bethesda, AABB Press, 1997.

### JOURNALS

Transfusion  
Transfusion Science  
Transfusion Medicine Reviews  
Journal of Clinical Apheresis  
Therapeutic Apheresis

## VIII. Procedures:

Therapeutic plasma exchange  
Therapeutic cytoreduction  
Automated red blood cell exchange

## **IX. Fellow's Evaluation:**

At the end of each rotation, the fellows will receive a written evaluation by the attending. These evaluations will address each of the six core competencies. Fellows are strongly encouraged to periodically review these evaluations in order to maintain an adequate feedback on their performance. Each fellow will meet with Dr. Hesketh twice yearly to review their ongoing performance.

## **X. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

## **Curriculum For Research Rotation**

### ***Molecular Hematology Research at St. Elizabeth's: A Historical Perspective***

There has been a longstanding tradition at CSEMC of fostering outstanding basic research efforts in hematologic diseases. Beginning with Dr. Fred Stohlman nearly 40 years ago, followed by Dr. Jiri Palek's leadership through the 1980's and 1990's, CSEMC has had an internationally recognized program dedicated to understanding the basic biology of a number of blood disorders. Under the leadership of

The tradition of excellence in Hematology/Oncology research continues with a very active basic research program. Ongoing efforts are focused on a variety of areas, including investigations on the structure and regulation of the red cell cytoskeleton, cytoskeleton-associated proteins in cell proliferation and tumor suppression pathways, the cellular and molecular biology of adhesive proteins in erythropoiesis, mechanism of clot retraction, ultrastructural analysis of cytoskeletal architecture in cerebral malaria, development of anti-protease inhibitors against blood stage malaria, and a newly initiated program on the development of a malaria vaccine based on the mechanism of the malaria parasite invasion of red blood cells.

### ***Organization of the Training Program***

Fellows are provided with the opportunity to participate in a number of active research programs in the area of basic and clinical research. Research facilities include over 40,000 square feet of research space located in the Center of Biomedical Research building that includes a state-of-the-art animal facility and clinical laboratories. The research program is largely funded by the extramural support from the National Institutes of Health.

## **Research Training Overview**

Fellows dedicate the third year of their fellowship program to acquire basic research training in a selected area of Hematology and Oncology. Research training involves completion of a selected research project, participation in weekly research meetings, journal clubs, and presentation of research data at National and International meetings.

### ***Detailed Structure of the Research Training Program***

- At the beginning of their third year, fellows are given an opportunity to explore various research programs by completing a short-term rotation in the laboratory. Based on their interest in a particular laboratory and the availability of research space, fellows are assigned a research project under the mentorship of a principal investigator.
- In addition to the day-to-day guidance and training of each fellow by the individual principal investigator, the research staff holds a joint weekly research meeting on Friday. Each fellow presents the details of the preceding week's experimental results and discusses the direction of future experiments.

- Fellows also participate in a weekly journal club. The format of the journal club requires selection of a recently published research article, which is then discussed in detail by the fellow in an informal setting. The fellows are instructed to underscore both strengths and weaknesses of the published study.
- Fellows are encouraged to write a research report summarizing their experimental results. If a fellow is part of an ongoing research project, then they are expected to contribute in the writing of the research publication. In general, the principal investigators guide the fellows during the course of such writing and are eventually responsible for the assembly of the final manuscript. It is anticipated that research work during the fellowship-training program will result in one or two peer reviewed research papers.
- Each fellow participates in the preparation of abstracts/short talks of the research data for presentation at the American Society of Hematology meeting held annually. Occasionally, research data obtained by the fellows are also presented in other national and international meetings such as American Society of Cell Biology, Gordon Conferences, and American Society of Tropical Medicine.

### ***Formal Teaching Curriculum***

- A formal teaching course is organized each year to introduce the basic principles of molecular and cell biology. The course entitled “Basic Science Course for Clinical Fellows” is typically organized into 8-10 units and taught by faculty whose background is in Hematology, Oncology, Cell Biology, Gene Therapy, and Cardiovascular Biology.
- Fellows are also encouraged to participate in seminars given by other Divisions such as the Divisions of Cardiovascular Research and Neuroscience located in the same research building.
- Frequently, fellows accompany other researchers to attend pertinent seminars organized by Harvard Biological Laboratories and Harvard Medical School departments.

### ***Fellow’s Evaluation:***

At the end of the research rotation, the fellows are provided with a written evaluation of their overall performance during the rotation. These evaluations will address each of the six core competencies.

### ***Program Evaluation***

Fellows are encouraged to provide feedback to the staff on the rotation. Formal review of the program content is provided in the fellow’s annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

## ***Training Research Laboratories***

### **Biology of Adhesive Proteins in Erythropoiesis/Antimalarial Research**

**Manjit Hanspal, Ph.D., Director**

*Research Objectives:* Dr. Hanspal's laboratory is studying cell-cell interactions in erythropoiesis with particular focus on erythroblast-macrophage interactions in distinct anatomic units called erythroblastic islands. Another project in the laboratory is to develop novel inhibitors of cysteine proteases against the malaria parasite during their intracellular development in red blood cells. Characterization of such proteases could lead to the development of specific inhibitors, which either by themselves or in conjunction with established therapies may offer an alternative treatment for malaria.

### **Lynn Hlatky, Ph.D.**

Director, Center of Cancer Systems Biology

Dept. of Medicine

### Role of intercellular interactions in radiation-induced carcinogenesis and cancer progression.

This is the subject of a National Aeronautics and Space Administration (NASA) Specialized Centers of Research Program Project. It is recognized that tumor progression is under the control of both genetic alterations in tumor cells and supra-genetic events, including disruption of normal epithelial-mesenchymal contacts and signaling that are now seen to control tumor dormancy and invasive potential. We propose the latter can play a crucial, often decisive, role in cancer risk – an issue of critical importance in understanding the underpinnings of cancer and cancer prevention. Accordingly, a number of specialized groups and projects have been brought together under this Program, including: 1) a gene array analysis and bioinformatics core that will track and quantify the simultaneous response of the entire genome to environmental stimuli (e.g., radiation, antiangiogenic agents) (lead by Lynn Hlatky); 2) a mathematical modeling group (headed by Philip Hahnfeldt) that will assess tumor development under the control of signalings from adjacent *vascular endothelium* and *stromal fibroblasts* – both of which have been shown to influence tumor growth; 3) the implementation of conditional *k-ras* and spontaneous lung tumor mouse models to experimentally examine modulation of radiation action on tumor promotion and progression, with emphasis on the role of recruited circulating endothelial cells from the bone marrow (Lynn Hlatky); 4) a quantitative study of the complexity of radiation-induced chromosome aberrations to ionizing radiations to assess its connection to accelerated tumor development (Ray Sachs); and 5) the development of several new tumor dormancy murine models, now underway in the lab of Judah Folkman (Harvard).

Investigations into the modeling of DNA damage and repair in cancer biology. Our studies of chromosome damage and repair have an impact in cytogenetics as well as on interphase chromosome localization and geometry.

Our group has been investigating the interaction of the epithelial, endothelial and stromal compartments of tumors. In our recent studies of epithelial and stromal tissues exposed to ionizing radiations, DNA damage profiles were found to vary less with dose for a given tissue type than across tissue types at the same dose. This is a finding that has profound implications for the role the differentiation state plays in modulating the effects of DNA damage in the genome. Because tumor growth involves the coordinated growth of two compartments, the epithelium and its associated stroma/endothelium, this underscores the need to consider the tissue dependence of DNA damage response to cancer treatment. On the modeling front, we have revisited the kinetic theory for double-strand break repair and misrepair following

ionizing radiation, and have proposed new theories for the resolution of DNA double-strand breaks. In the process, we have obtained a better understanding of these kinetics and how chromosomes are packaged within the nucleus.

**Philip Hahnfeldt, Ph.D.**

Senior Investigator, Center of Cancer Systems Biology  
Dept. of Medicine

Optimum dosing regimens and the implications of intratumor heterogeneity. The focus of these studies is on the treatment complications posed by tumor heterogeneity. In traditional cancer therapies, radiation therapy and chemotherapy, heterogeneity in sensitivity among tumor cells has been observed to reduce the relative effectiveness of intense versus protracted dosing protocols. Suggested is a benefit to tailoring the dosage to the heterogeneity displayed. An exciting new mode of chemotherapy involves dosing slowly and regularly instead of intensely with large gaps between treatment cycles. To optimize treatment, it is necessary to understand why this new approach to dose delivery yields optimal tumor suppression while minimizing the usual side effects (e.g. nausea and hair loss). Our mathematical studies point to variations in population response to doses as a possible explanation.

Tumor growth suppression under antiangiogenesis therapy. Antiangiogenic therapy in combination with chemotherapy is now demonstrating substantial benefit in clinical trial for various tumors including colon and breast. My lab is exploring empirically and theoretically the unique tumor and vascular kinetics of tumor growth under angiogenic control and, inversely, the regression kinetics under antiangiogenesis therapy. The indirect means by which this tumor suppression is accomplished – coupled with the recent finding that tumors both stimulate and inhibit their own vascularization – points to the need for a tumor model that properly captures these dynamics. Using a two-compartment tumor-endothelial model of coordinated tumor growth, we have found that uniform simultaneous suppression of both compartments produces the most efficient tumor suppression overall. This explains the numerous recent findings that chemotherapy and antiangiogenic therapy alone consistently under-perform compared to combination chemotherapy/antiangiogenic regimens. We have also verified a concept that carries over from our more general studies of heterogeneity – that low and regular, so called ‘metronomic’, delivery of chemotherapy is not only more efficient at suppressing the tumor overall, but exhibits an endothelial targeting bias over conventional chemotherapeutic delivery that may explain its greater tolerance.

Modeling of chromosome geometry through study of DNA damage and repair. My lab is working on models of chromosome localization in an interphase cell nucleus. Chromosome localizations are related to gene expression differences and to spectra of radiation-induced inter-chromosomal aberrations as measured by mFISH. Each chromosome is modeled by a random walk and the location of the chromosome’s center of gyration within the nucleus is modeled by using a simulated annealing computer algorithm to determine regions for all 46 chromosomes, using an excluded volume effect penalty for overlaps. We have shown that the simulated annealing algorithm, in agreement with data and in contrast to other methods, tends to have the larger chromosomes near the periphery and the smaller ones near the center, apart from various biases based on gene density and/or chromosome clusters for specific chromosomes.

In the studies described above, we used imaging techniques to track response details. Now these very techniques have become a focus for improvement. To this end, we have customized

the morphologic recognition process and analytical software to enhance the resolution of imaging features. With the acquisition of a new computerized imaging and analysis facility (Leica Microsystems), we will expand on these programming and acquisition capabilities.

**Rainer K. Sachs, Ph.D.**

Center of Cancer Systems Biology

Adjunct Professor, Dept. of Medicine, Tufts University School of Medicine

Professor of Mathematics and Professor of Physics, Univ. of CA Berkeley

Prof. Sachs is working on mathematical models of second cancer induction after radiotherapy to a nearby organ. The challenge is to quantify carcinogenesis due to protracted, high-dose, partial body irradiation with x-rays. The classic linear-quadratic-exponential mathematical model, predicts very little carcinogenesis in regions receiving high doses because of high cell kill in those regions. This is contradicted by recent empirical data on second cancer solid tumors. We propose the basic reason is that cell proliferation, including proliferation of a few surviving mutant cells in high-dose regions, compensates for cell killing and accounts for the large observed high-dose risk. To implement this idea, differential equation and difference equation computer models are used to track the numbers of mutant cells in time during radiotherapy protocols and during a subsequent recovery period. For leukemias, an additional factor is migration of hematopoietic stem cells. Migration tends to decrease high-dose risks because immigration of normal cells from distant, essentially unirradiated regions into heavily irradiated regions inhibits proliferation of mutant cells in the heavily irradiated regions. Corresponding data shows that, in contrast to the situation for solid tumors, high dose risks are indeed significantly smaller for leukemias than they would be if cell killing and cell repopulation did not occur. The data can be modeled by an extension of the solid tumor models which accounts for migration among 17 bone-marrow compartments via the blood. The models can be used to get credible predictions for second cancer risks after radiotherapy protocols so recently put into use that epidemiological evidence on the risks is not yet available. Further extensions of the models to take into account stochastic, small number effects for the leukemia case are planned.

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# Curriculum For Hospice Rotation

## I. Educational Purpose/Rationale:

The hospice elective is available for hematology/oncology fellows and medical residents. The elective provides exposure to all aspects of palliative care and experience in speaking with patients and families about end of life issues.

## II. Educational Setting/Responsibilities:

Fellows and residents will work with all members of the Interdisciplinary Team at Caritas Good Samaritan Hospice during their elective.

Interdisciplinary Team Meetings: Residents will attend the Team Meeting held on Tuesday mornings, 8:30 a.m. to 10:30 a.m. members of the team include the Medical Director, Assistant Director of The Hospice Program, a clinical nurse manager, Volunteer Coordinator, Bereavement Coordinator, Pastoral Care Coordinator, nurses, social workers, and home health aides. The residents will present the cases they have been following and will participate in the patient's plan of care.

Home Visits: The residents will visit patients who are receiving hospice care in their homes, in nursing homes and in the acute care setting. They will accompany the nurse and social worker that does the initial assessment of the patient and enroll patients into the hospice program. The residents will follow a group of patients throughout their elective.

Reading: During the elective, the residents will read a packet of articles that covers important topics in palliative care and care of the dying patient.

## III. Educational Objectives:

Emphasis is placed on understanding the symptoms experienced by hospice patients and considering the patient's emotional and spiritual health as well as his/her physical status. Residents are trained to care for the patient and family as a whole and taught communication skills to guide them through discussions on end-of-life issues with patients and families.

## IV. Specific Educational Content:

Specific Diagnostic Categories:

Knowledge and expertise in managing the following will be acquired during the rotation:

- Nausea/vomiting
- Pain (physical, emotional, spiritual)
- Anorexia/cachexia
- Spinal cord compression
- Dyspnea
- Retractory ascites
- Constipation

## **V. Ethical Issues:**

The resident will work closely with the hospice staff and will become experienced in discussing end-of-life issues.

## **VI. Teaching Methods:**

This rotation is primarily one of hands-on experience and learning from other members of the hospice team how to care for terminally ill patients in their homes. The Medical Director will review key concepts in symptom management and comprehensive-reading materials will be provided.

## **VII. Core Literature:**

A wide variety of Hematology and Oncology textbooks are available in the fellow's room. The Medical Director will provide copies of pertinent articles and/or provide guidance to the fellows who are researching a subject.

## **VIII. Procedures:**

None.

## **IX. Fellow's Evaluation:**

Fellows will receive ongoing informal evaluation by the attendings. At the end of each rotation, fellows will receive a written evaluation by the attending. These evaluations will address each of the six core competencies. Fellows will be supervised by attending physicians during the conduct of designated procedures to assist in teaching and demonstration of competence.

## **X. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Pathology Rotation

## I. Educational Purpose/Rationale:

The pathology elective is structured to provide the Hematology/Oncology fellows with fundamental knowledge in the recognition, diagnosis and classification of various malignant and non-malignant hematological and oncological diseases. Since the subspecialty of Hematology/Oncology depends upon proper identification and interpretation of various malignancies, a major emphasis will be placed on understanding the principles and interpretations of various pathological tests.

Emphasis is placed on development of the ability to recognize various types of solid tumors and the organ of origin and also to develop the skill to identify and classify various forms of hematologic malignancies and myeloproliferative disorders. In this context, the major educational objectives of the rotation will include:

### A: Solid Tumors

1. Acquisition of essential knowledge about pathology specimen processing, staining with H&E, immunostaining and understanding the implications of special staining with various tumor markers to arrive at a pathological diagnosis.
2. Ability to identify tumor size, grade, ploidy, and recognizing tumor margins.
3. Ability to evaluate the lymph nodes for the presence of metastasis.
4. Ability to grade special stains on biopsy specimens – e.g., PSA, CEA, ER, PR, Her 2 neu staining.
5. Ability to understand the importance of the presence of common mutations like p53, RAS, etc.

### B: Hematologic malignancies and myeloproliferative disorders :

1. Ability to recognize various normal hematologic cell lines and their dysplastic forms.
2. Understanding the principles behind identification and classification of common hematologic disorders like myeloma, myelodysplasia, acute leukemia and chronic leukemia.
3. Understanding the importance of various special stains used to recognize the various forms of acute leukemia.
4. Understanding the classification and identifying the various grades of lymphoma.
5. Understanding the importance of flow cytometry in recognizing and grading lymphoma and leukemias.

## II. Educational Setting:

General Pathology Laboratory : During the elective, the hematology/oncology fellow is required to spend their time in the pathology laboratory reviewing various types of malignancies with the attending pathologist.. As mentioned in the educational objectives, they will concentrate on identifying the organ of origin of the tumor, use of special stains to arrive at a pathological diagnosis and understanding the pathologic staging of solid tumors. During the elective, a fellow might also choose to observe frozen sections done in the operating rooms and

at the time of CT guided biopsy. This experience is considered to be very valuable to recognize tumors that need urgent therapy.

As part of the elective, they will be assigned to the hematopathologist to review bone marrow smears, bone marrow core biopsies and lymph node biopsies to recognize and grade hematologic malignancies and myeloproliferative disorders.

Flow cytometry laboratory: The fellows during one of the weeks of their rotation will spend time in the flow lab to understand the methods used in flow cytometry and the patterns of marking of various cell lines. They will review and discuss the flow patterns in detail with the pathologist and help formulating a final diagnosis. At the end of the rotation, the fellow is expected to be well versed in recognizing the various forms of lymphoma, leukemia and other hematologic malignancies.

### **III. Educational Objectives:**

The fellows are required to attend the full conference schedule of the division as outlined for the pathology residents. These weekly meetings include case oriented discussions that are attended by the entire hematology/oncology, surgical oncology, and pulmonary staff. They include:

- Hematology/Oncology clinical conference, Monday 3-4 pm, MMR3
- Tumor board conference, Monday 4-5pm, CMP1
- Lung cancer conference, Tuesday 4-5pm, Seton 3
- Center for breast care conference, Wednesday 12-1pm, St. Margaret's 5<sup>th</sup> floor

### **IV. Core Literature:**

It is expected that during the rotation on the pathology service, the fellows will become well versed in a current bone marrow pathology text. In addition, a wide variety of pathology textbooks and journals are readily available in the pathology conference room for convenient consultation. The consulting attending each week will provide literature pertinent to cases encountered during the rotation. A copier is also available on the floor.

### **V. Supervision:**

The fellow will directly report to and be supervised by the attending physician he or she is assigned to that week.

### **VI. Fellow's Evaluation:**

At the end of the rotation, the fellows are given an overall evaluation based upon their performance and interest during the elective. These evaluations will address each of the six core competencies. The pathologist will be available to go over any questions or concerns of the fellow at the end of the elective.

### **VII. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Radiation Oncology Rotation

## I. Educational Purpose/Rationale:

The radiation oncology elective is structured to provide the residents with fundamental knowledge in the initial work-up, selection and treatment of common neoplastic diseases. Since radiation oncology is a specialty that heavily relies on sophisticated imaging systems, radiobiology and radiation physics along with the bedside clinical skills, a major emphasis will be placed on the understanding of the principles of radiation physics, radiobiology and radiotherapy planning.

## II. Educational Setting:

Consult services: The consult service team consists of a Radiation Oncology Attending and a Hematology / Oncology fellow. Two-to-three patients are evaluated on a daily basis by the team. The fellow is responsible for the initial and complete evaluation of one of those patients, including review of all laboratory and radiologic tests, the formulation of a comprehensive assessment, and the development of a diagnostic and therapeutic plan. All cases are reviewed and discussed extensively with the attending prior to the formulation of final recommendations. Review of the pertinent articles in the literature will be strongly emphasised and directed by the Attending. Furthermore, the fellow is expected to round on all patients initially evaluated and requiring follow up.

Outpatient clinic: The fellow will participate two-to-three times a week in the care of patients in the outpatient clinic with the consult attending. This experience will provide the fellow with a better longitudinal exposure to patients treated with radiotherapy. In this setting the fellow will typically see one new patient ( i.e. obtain full history, perform physical examination ) and extensively discuss the case with the Attending. The fellow will also participate in the care of established patients.

## III. Educational Objectives:

Emphasis is placed on the development of bedside clinical skills as well as understanding of radiobiology, radiation physics, planning techniques and interaction with surgical and medical oncologists. In this context, the major educational objectives of the rotation will include:

1. Acquisition of essential knowledge pertaining to the presentation, physical findings, diagnosis, and management of cancers encountered in the clinic and on the consult service
2. Review of various imaging studies
3. Understanding of the principles of radiobiology, radiation physics, interaction of radiotherapy with chemotherapeutic agents, radiotherapy planning techniques
4. Understanding of cooperation among radiation oncologist, medical oncologist, surgeon and other health care providers

#### **IV. Specific Categories:**

Fundamental knowledge of the clinical presentation, work-up, and management of the following conditions should be acquired during the rotation.

1. management of spinal cord compression
2. management of superior vena cava syndrome
3. management of pain control by radiotherapy
4. concomitant versus sequential chemoradiotherapy
5. basic understanding of brachytherapy
6. basic understanding of conformal radiotherapy
7. understanding the side effects of radiotherapy

#### **V. Formal Didactic Teaching:**

Fellows are required to attend the Tumor Board Conference, lung cancer conference and breast cancer conference as outlined. These weekly meetings include case oriented discussions that are attended by the entire Radiation Oncology Staff, Surgeons and medical oncologists.

#### **VI. Core Literature:**

It is expected that during the rotation, the fellow will be familiar with the indications and side effects of radiotherapy. A wide variety of radiation oncology textbooks are readily available in the department. The Attending will provide literature pertinent to cases encountered during the rotation.

#### **VII. Supervision**

The fellow will directly report to and be supervised by a specific attending physician from the department of radiation oncology.

#### **VIII. Fellow's Evaluation**

At the end of rotation, fellows are given a written evaluation by the radiation oncology attending. These evaluations will address each of the six core competencies.

#### **VII. Program Evaluation:**

Fellows are required to evaluate the attending after each rotation and provide feedback to the staff on their rotation. Formal review of the program content is provided in the fellow's annual confidential evaluations of the program and faculty and in the annual multidisciplinary curriculum review meeting.

# Curriculum For Bone Marrow Transplant Rotation at Massachusetts General Hospital

## I. Educational Purpose/Rationale:

Trainees should understand the evolving use of and indications for bone marrow and stem cell transplantation, both autologous and allogeneic in various diseases (leukemia, lymphoma). They should be familiar with the multiple complications of transplantation, including veno-occlusive disease, graft-versus-host disease (GVHD), and infectious complications.

- The trainee should demonstrate a comprehensive working knowledge and practical competency of the basic, cellular and molecular biology of hematopoiesis and BMT/SCT. In addition, the trainee should demonstrate an understanding of tumor immunology and the biologic immunologic relationships between a donor's hematopoietic cells and the host.
- The trainee should demonstrate a comprehensive working knowledge and practical competency of the role of autologous and allogeneic BMT/SCT in the management of hematologic and non-hematologic diseases.
- The trainee should demonstrate a comprehensive working knowledge and practical competency of the preparative regimens used in anticipation of autologous and allogeneic BMT/SCT.
- The trainee should demonstrate practical experience in (or alternatively observe and understand) the method of collecting and handling bone marrow and peripheral blood stem cells for transplantation. This would include demonstrating an understanding of the approaches used to mobilize hematopoietic stem cells.
- The trainee should demonstrate a comprehensive working knowledge and practical competency of the process of performing an autologous or allogeneic BMT/SCT.
- The trainee should demonstrate an understanding and practical competency of the need for prophylactic and supportive care measures in the management of patients undergoing BMT/SCT. These include:
  - an understanding of the pharmacologic and environmental approaches to preventing infectious diseases
  - the use of immunosuppressive therapies to prevent or decrease graft versus host disease
  - the effects of different approaches of “pre-treating” the stem cells (e.g. T-cell depletion) prior to transplantationthe proper use of blood products while awaiting engraftment of the transplanted hematopoietic stem cells.
- The trainee should demonstrate an understanding and practical competency of recognizing the presentation, making the diagnosis, and managing the complications that can occur post-transplant
  - marrow engraftment failure

- acute and chronic graft versus host disease
- opportunistic infections
- veno-occlusive disease
- (and others)

## **II. Educational Objectives:**

Upon completion of the rotation, fellows should possess a working knowledge of:

- the biology of hematopoietic stem cells
- appropriate indications for the use of autologous stem cell and allogenic bone marrow transplantation in patients with neoplastic diseases
- all aspects of the medical care of this patient population
- the procedures of stem cell harvest with actual experience in bone marrow harvests
- the full spectrum of potential complications of treatment in this patient population and appropriate management of strategies for the various complications

## **III. Core Literature:**

It is expected that during the rotation, the fellow will understand the evolving use of and indications for bone marrow and stem cell transplantation and become familiar with the multiple complications of transplantation. A wide variety of textbooks are readily available in the department.

## **IV. Supervision:**

Massachusetts General Hospital is responsible for providing sufficient resources and assuring supervision for the proper conduct of the resident during the period of the resident/fellows rotation at Massachusetts General Hospital and that there is ongoing communication between the faculty at both institutions in connection with the resident/fellows' activities and progress. Massachusetts General Hospital is responsible for the monitoring of duty hours, on-call activities, moonlighting.

## **V. Fellow's Evaluation**

At the completion of each rotation, the Massachusetts General Hospital faculty will complete written resident/fellow evaluations, and provide the resident/fellow with an opportunity to meet to discuss their evaluations. These evaluations will address each of the six core competencies

## **VI. Program Evaluation**

At the end of the rotation, the fellows are asked to write a brief summary, evaluating their rotation at Massachusetts General Hospital.

# **St. Elizabeth's Medical Center Curriculum For Fellows Rotation at Caritas Good Samaritan Medical Center**

## **I. Educational Purpose/Rationale:**

This rotation will provide the fellow with significant exposure to the management of patients with hematologic and oncologic disorders. The rotation will also provide the fellow with fundamental knowledge in the diagnosis and treatment of the full range of solid tumors and lymphomas, as well as an appreciation of the general approach used by oncologists and hematologists in the initial evaluation and treatment of all hematology/oncology patients. The fellow will be evaluated in each of the six core competencies, patient care, medical knowledge, practice based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.

## **II. Educational Objectives:**

The senior fellows-in-training will be assigned to a six-month rotation at Caritas Good Samaritan Medical Center. Fellows will work under the supervision of Dr. Karim Malek. They will participate in the evaluation and care of inpatients at Caritas Good Samaritan Medical Center as well as patients in the outpatient office of Dr. Malek. Fellows will be exposed to the full range of complex problems (medical, emotional, ethical and spiritual) that affect a hematology/oncology patient population. The fellow-in-training will learn the pathophysiology of benign hematologic and malignant neoplastic disorders and how to choose appropriate diagnostic testing. The trainee will develop a solid understanding of the role of chemotherapy, its pharmacology, toxicities, and clinical indications. The fellow will also be expected to learn to integrate the emotional, psychological, and spiritual aspects of an illness in the plan of care.

## **III. Educational Setting:**

The fellow will be seeing patients every Wednesday in the outpatient office of Dr. Malek, which is located at 830 Oak St. in Brockton. This six month assignment will allow time for the fellows to get to know their patients well and provide continuity of care. The fellow will also be responsible for seeing inpatients at Caritas Good Samaritan Medical Center. The fellow is responsible for the initial and complete evaluation of these patients, including review of all laboratory, pathologic, and radiologic tests, the formulation of a comprehensive assessment, and the development of a diagnostic and therapeutic plan.

## **IV. Core Literature:**

A wide variety of hematology and oncology journals and textbooks will be available. Dr. Malek will provide copies of pertinent articles and/or provide guidance to the fellows who are researching a subject.

## V. Supervision:

Caritas Good Samaritan Medical Center is responsible for providing sufficient resources and assuring supervision for the proper conduct of the fellow during the period of the fellow's rotation at Caritas Good Samaritan Medical Center and that there is ongoing communication between the faculty at both institutions in connection with the fellow's activities and progress. Caritas Good Samaritan Medical Center is responsible for the monitoring of duty hours, and on-call activities.

## VI. Ethical Issues:

The fellow-in-training will be expected to become familiar with ethical issues surrounding terminal illnesses, impending death and will play a role in helping patients and their families make end-of-life decisions.

## VII. Teaching Methods:

The majority of the teaching will be done by discussions and literature reviews on individual patient problems at the time the patient is seen. The fellow will present his or her findings and thoughts to the attending and the ensuing discussion will produce a coordinated plan. The fellow will be expected to read articles that relate directly to the patients he or she has seen.

## VIII. Fellow's Evaluation

At the completion of the rotation, the Caritas Good Samaritan Medical Center faculty will complete a written evaluation on the fellow, and provide the fellow with an opportunity to meet to discuss his/her evaluation. The fellow will be evaluated in each of the six core competencies by using the following tools:

Patient Care	Patient survey, CEX evaluation
Medical Knowledge	Evaluation by Attending and Nurse
Practice based learning and improvement	Self Assessment Questionnaire
Interpersonal and communication skills	Evaluation by Nurse and Attending, Patient survey
Professionalism	Self administered survey, Patient survey
Systems-based practice	CEX evaluation, Patient survey, Evaluation by Nurse and Attending

## IX. Program Evaluation

At the end of the rotation, the fellow will be asked to write a brief summary, evaluating their rotation at Good Samaritan Medical Center.

## **Appendix**

**Hematology/Oncology Center New Patient Encounter Form**

**Hematology/Oncology Center Interval Encounter Form**

**Hematology/Oncology Progress Note Template**

**Chemotherapy Order Sheets**

**Inpatient Consult Sheet**

**Inpatient Admission Notes**

**Trainees Log of Supervised Procedures**

**Service Coverage Schedule**

**Clinic Coverage Schedule**