Phoenix Children's Hospital
Center for Cancer and Blood Disorders

Pediatric Hematology/Oncology
Fellowship Training Program

Fellow Handbook
Goals and Objectives

Revision: January 2009

I. Mission

The mission of the Pediatric Hematology/Oncology Fellowship Training Program at the Center for Cancer and Blood Disorders at Phoenix Children's Hospital is to develop the knowledge base, clinical experiences, professional skills, research exposure, and teaching ability that are necessary for a graduating fellow to assume the duties and responsibilities of an academic attending pediatric hematologist/oncologist.

II. Overall Level-Specific Goals and Objectives

a. First year of training:

- Effectively and confidently treat patients in both the inpatient and outpatient settings
- Thoroughly understand the pathophysiology of hematologic and oncologic processes
- Formulate, discuss, and implement a treatment plan for a new hematologic or oncologic diagnosis with a patient and/or the patient's caregivers
- Order and interpret the results of appropriate laboratory testing and imaging
- Use appropriate ancillary services, including social work, child life, psychiatry, and psychology to provide the best care for a child undergoing treatment for a hematologic or oncologic disorder
- Acquire the skill set and experience required to supervise medical trainees
- Develop proficiency in proper communication and follow-up with referring physicians and families
- Acquire the skills needed to perform evidence-based literature reviews, critique peer-reviewed journal articles, and apply the data to improve clinical practice
- Participate in ongoing clinical research trials, such as those offered through the Children's Oncology Group as well as through other phase-one oncology clinical trial consortia and hemophilia clinical treatment trials
- Establish a therapeutic relationship with patients and their families
- Communicate poor patient outcomes and manage end-of-life care for patients and their families, in conjunction with hospice services
- Appreciate the need for strong interpersonal and communication skills as a member of a multidisciplinary team
- Understand the benefits of systems-based practice and its role in health-care delivery
- Maintain a high level of professionalism as part of the daily practice routine
- Identify and initiate a research project to continue during the second and third years of training

b. Second year of training:

- All of the goals for the first year of training plus:
- Strengthen skills as a clinician and an educator
- Gain an appreciation for practice-based learning and improvement through constant feedback and evaluation of performance, critical literature review, and proper use of information technology
- Obtain the skills and experience needed to identify a research question, formulate a hypothesis, submit a grant for funding, obtain approval from an institutional review board, use proper research methodology and technique, analyze collected data, collaborate with other investigators, and prepare a manuscript for submission to a well-regarded, peer-reviewed scientific journal for publication

c. Third year of training:

- All of the goals for the second year of training plus:

- Complete a research project and prepare a manuscript for publication in a national peer-reviewed journal (in compliance with the American Board of Pediatrics subspecialty requirements)
- Attend and present research findings at scientific meetings
- Further shape and define their teaching skills while becoming adept at supervising housestaff and medical students
- Continue to sharpen clinical skills and begin to develop a competency level that enables the fellow to manage patients effectively and independently
- Sit for the American Board of Pediatrics subspecialty certifying examination at the completion of their training

III. Relationship to Other Programs

The Pediatric Hematology/Oncology Fellowship Training Program is administered by the Center for Cancer and Blood Disorders at Phoenix Children's Hospital. The Training Program is closely integrated with the core categorical Pediatric Residency Training Program (#3200332020) based at Phoenix Children's Hospital and Maricopa Medical Center (both hospitals are in close proximity to each other in Phoenix, Arizona).

During the first six months of the Training Program, fellows slowly transition into the role of teacher and supervisor of pediatric residents and medical students. This transition is made under close supervision of the hematology/oncology clinical faculty. During the second six months of the first year of the Training Program, fellows take an increasingly independent role in clinical decision making and supervision for pediatric residents and medical students. Attending physicians continue to provide the necessary supervision of fellows during this time period. Also during this time, fellows are expected to become increasingly proficient at procedures and clinical decision making while still assuming direct overall patient care responsibility (with faculty supervision).

The supervisory and teaching role of the fellows is advanced during the second and third years of the training program. This is accomplished, in part, by providing teaching in curriculum development and constructive feedback on fellows' oral presentations to both pediatric residents and program faculty. In addition, fellows become well-versed in research methods, and they apply this knowledge and experience to their own hypothesis-driven research project under the supervision of clinical research faculty in the training program. Fellows take care not to interfere with the learning objectives of the core pediatric residency program by taking a more supervisory role for the pediatric residents that are covering patients during the hematology/oncology rotation.

Pediatric residents at Phoenix Children's Hospital gain experience with hematology/oncology diagnoses during a dedicated "subspecialty" rotation during their second year of residency. Most of the patients they encounter (~60-70%) have hematology/oncology diagnoses. The pediatric residents take primary responsibility for up to five hematology/oncology patients each during their rotation. These patients are then discussed with the fellow and attending physician during formal inpatient teaching rounds seven days per week. Any extra patients on the hematology/oncology service, including routine inpatient admissions for chemotherapy, are covered by the inpatient fellow, attending physician, and inpatient nurse practitioners. The pediatric residents also provide overnight coverage for the patients (including the patients not on the teaching service, should the need for emergent intervention arise). At this time, pediatric residents do not cover bone marrow transplant patients. The inpatient fellow is expected to cover all patients on the hematology/oncology service, including bone marrow transplant patients and those covered by inpatient nurse practitioners. The inpatient fellow is expected to participate in teaching rounds as a leader and an educator for pediatric residents, medical students, and all other members of the multidisciplinary team.

Fellows in this training program provide a supervisory role for members of pediatric, family medicine, emergency medicine, radiology, and general surgery residency programs who provide care role for patients on the hematology/oncology service. Fellows are expected to provide ongoing communication with patients' primary care providers when a new diagnosis is made, or when there is a change in a patient's clinical status or treatment plan. Fellows also are expected to become comfortable and proficient at making appropriate referrals to other subspecialty teams, including general surgery, neurosurgery, urology, orthopedic surgery, radiation oncology, radiology, infectious disease, *etc*. to provide appropriate multidisciplinary patient care. Fellows are expected to give didactic and informal teaching sessions to residents and fellows of all disciplines. Fellows at Phoenix Children's Hospital also attend a regular monthly research seminar series (in addition to those seminars that are required by the research training curriculum) that is aimed at exposing the fellows to research methods and to enable a dialogue for an exchange of ideas for teaching and research methods across subspecialty training programs.

Fellows also have the opportunity to interact with fellows from other training programs, including dermatology, endocrinology, and emergency medicine at Phoenix Children's Hospital, radiation oncology, pathology, and internal medicine at Banner Good Samaritan Regional Medical Center, and pathology, transfusion medicine, and adult hematology/oncology at the Mayo Clinic Hospital. During their research experience, fellows interact with PhD degree candidates and post-doctoral candidates working in the laboratory setting.

IV. Clinical Experience

I. First Year

The first year of subspecialty training exposes the fellows to all aspects of clinical care of the general hematology/oncology and bone marrow transplant patient. This training is accomplished by the fellow spending a majority of time alternating monthly between the inpatient and outpatient services while overseeing all aspects of patient care. During this time, fellows gain experience and proficiency with procedures commonly performed on hematology and oncology patients (lumbar puncture, bone marrow aspirate, and bone marrow biopsy). Fellows also have the opportunity to develop their supervisory and teaching skills gradually under the supervision of program faculty. In addition, fellows begin their outpatient continuity clinic experience, and this experience continues throughout their time in the Training Program.

The first year of training encompasses basic hematology laboratory techniques, bone marrow aspirate and peripheral blood smear morphology interpretation, blood product collection and banking protocols, cytogenetics laboratory techniques, radiation oncology techniques, congenital and acquired immunodeficiencies, and clinical aspects of neuro-oncology. Time also is devoted to choosing and initiating a hypothesis-driven research project under the supervision of program clinical and research faculty.

1. Inpatient Service

- During the day, fellows are responsible for the overall care of the inpatients on the hematology/oncology and bone marrow transplantation service at Phoenix Children's Hospital. The services are covered by two separate attending physicians. Fellows round with the attending physicians covering each service during the day, and they are responsible for performing initial consults from other inpatient services, followed by discussion and supervision by the inpatient attending physician. All procedures are done under supervision of the program staff.

- As fellows gain more experience in clinical care, they receive more autonomy from the teaching attending, but each case still is discussed in its entirety before implementing recommendations and a plan of action. Fellows are required to keep a log of all consultations to document an adequate experience.
- Fellows are supervised in a similar manner by the teaching attending physician with regard to leading family care conferences during which complex diagnoses and treatment plans are discussed.
- Inpatient rounds typically start daily at 8:30 AM with the bone marrow transplantation team, and they continue until 9:15 AM, when the hematology/oncology team begins to round. These rounds typically last until 10:30 AM, or until all of the patients are discussed adequately with the pediatric resident team. Rounds are attended by fellows, attending physicians, inpatient nurses, pediatric residents, medical students, inpatient nurse practitioners, pharmacy staff with specialization in chemotherapy, nutritionists, and pain service staff. It is during these rounds that fellows acquire the skill set to discuss patient status changes in the prior 24 hours with the residents and medical students, to review and interpret any new findings on the patient history or physical exam, laboratory testing, or medical imaging, and to formulate a daily treatment plan based on these data. Fellows gradually attain the role of leading inpatient rounds under faculty supervision. It is expected that the fellows engage the pediatric residents and medical students in academic discussions regarding the management of the patients whom they are covering, when appropriate (formally, at least once per week). Full teaching rounds are held seven days per week, 52 weeks per year.

2. Outpatient Service
    - During the outpatient block rotations, fellows see patients in the hematology/oncology clinic at Phoenix Children's Hospital. Every attempt is made to provide a continuity experience with any patients that were initially seen by the same fellow in the inpatient setting. Fellows are supervised by two to three attending physicians that are assigned to clinic for each half-day. Fellows see patients in the outpatient clinic with increasing degrees of independence while still discussing all cases with the supervising attending physicians. All procedures are done under supervision of the program faculty.
    - Fellows spend approximately four to five months in the outpatient clinic of the Center for Cancer and Blood Disorders in their first year of training (alternating with inpatient months and clinical laboratory training). Every effort is made to ensure that continuity of care is preserved for patients that are initially seen by a fellow on the inpatient setting and that the patient is seen by the same fellow in the outpatient clinic. Fellows are required to keep a log of all patients seen in the inpatient and outpatient settings to help ensure that continuity is preserved at least 75% of the time.
    - Fellows start their own personal continuity clinic experience in their first year, and this continuity experience continues throughout their training. Fellows are assigned their own patients, and they are scheduled with the respective fellow during their continuity clinic. Each continuity clinic has an attending physician assigned to provide guidance and supervision for the fellow.
    - Fellows see patients in consultation in the emergency department (ED) under the supervision of a clinical faculty member. Consultation in the ED can occur on either of the inpatient and outpatient clinical rotations. This experience enables fellows to learn how to assess patients in the emergency department

setting and to help to determine eventual disposition of a patient (discharge to home or admit to the hospital).

- Fellows are exposed to several specialty clinics that are offered to patients in the Center for Cancer and Blood Disorders outpatient clinic. These clinics meet two to three times per month each, and they include:
    - Comprehensive Sickle Cell Disease Clinic: During this clinic, fellows learn the routine health-care maintenance and anticipatory guidance issues involved in the care of patients with sickle cell disease. This clinic is also attended by members of the pain team at PCH, who help to develop and manage the patients' pain medication regimen. Social workers, nurse clinicians, and nutritionists also participate. Topics including dental and ophthalmologic follow-up, proper surveillance with medical imaging to detect avascular necrosis and intracranial arterial hypertension, infection prophylaxis, surveillance for blood-borne infections, and chronic transfusion protocols with iron chelation are discussed.
    - Comprehensive Hemophilia Clinic: This clinic is multidisciplinary and attended by several services, including hematology/oncology, physical therapy, nursing, social work, and nutrition. Fellows learn health-care maintenance and anticipatory guidance issues surrounding the care of patients with bleeding disorders. Patients with clotting factor deficiencies, including Von Willebrand disease, are seen in this clinic. Topics including factor dose and infusion, home infusion, management of clotting factor inhibitors, immune tolerance, prophylaxis, and enrollment in clinical trials are discussed.
    - Late Effects Clinic: This multidisciplinary clinic is staffed by representatives from hematology/oncology, endocrinology, social work, nursing, and nutrition. Long-term effects from chemotherapy and radiation therapy, as well as surveillance for second malignancies is discussed. Patients in this clinic usually present only once or twice per year, but this experience represents an important learning opportunity for fellows to appreciate the ongoing multidisciplinary care of a cancer patient after therapy has been completed.
    - Neuro-Oncology Clinic: This multidisciplinary clinic is attended by representatives from hematology/oncology, neurology, neurosurgery, social work, and nursing. Fellows learn the radiographic assessment, pathologic diagnosis, formulation of treatment plans, and therapeutic follow-up for a variety of neuro-oncologic disorders. Rehabilitation plans are discussed, as well as input from other services, including physical therapy, occupational therapy, speech therapy, audiology, and endocrinology.

3. Clinical Laboratory Rotation

- Fellows spend one week exclusively with hematology and special coagulation laboratory staff at both Phoenix Children's Hospital and Banner Good Samaritan Regional Medical Center. Covered topics include preparation and interpretation of complete blood counts and the peripheral smear for a variety of disorders, as well as preparation and interpretation of special coagulation testing, hemoglobin electrophoresis, immunocytochemistry, immunohistochemistry, and other specialized laboratory tests.

4. Transfusion Medicine and Blood Banking Rotation
    - Fellows spend two weeks exclusively with the Division of Transfusion Medicine at Mayo Clinic Hospital and United Blood Services of Arizona, during which they will learn techniques of transfusion medicine, apheresis, blood product collection, and blood product manipulation.
    - Appropriate use of and transfusion of the various blood components, including apheresis, platelet pheresis and stem cell harvest and infusion will be learned during direct patient care and during this dedicated training curriculum.
    - This curriculum will be directly supervised and taught by Antonio Torloni, MD, and Thomas Wiltbank, MD, both of whom are on the teaching faculty of the fellowship Training Program and are part of the PCH medical staff. Covered topics include ABO/Rh reading and grading, ABO discrepancies, antibody screen and crossmatch issues, blood group systems and nomenclature, HLA typing, elutions and absorptions, neonatal transfusion issues, rosettes and titers, HLA and platelet refractoriness, stem cell transplant issues, therapeutic apheresis, blood product collection, immune hemolysis, transfusion reactions and subsequent workup, tissue typing, granulocyte collection and administration, blood component therapy, blood component modification and manipulation, blood component storage, and blood bank safety/regulatory issues.
    - Fellows are expected to participate in both the planning process and implementation of bone marrow and peripheral stem cell harvests, therapeutic apheresis, and stem cell infusions during their clinical rotations. Didactic sessions addressing these concepts are given by the bone marrow transplant and transfusion medicine experts of the teaching faculty.

5. Radiation Oncology Rotation
    - Fellows see patients for one week in the outpatient radiation oncology clinic at Banner Good Samaritan Regional Medical Center. This experience enables the fellows to gain an appreciation of the workup and planning process for therapeutic radiation treatments and also enables them to gain a sense of radiation therapy toxicities, modalities, and limitations as oncologic treatment regimens.

6. Neuro-Oncology Rotation
    - This rotation is designed to provide an exposure to the multidisciplinary process that is required to treat a patient with a tumor affecting the central nervous system.
    - The rotation lasts two weeks and is anchored by a core bibliography and set of didactic lectures that will cover diagnosis, treatment, long term toxicity, psychosocial, and quality of life issues related to pediatric and adolescent patients with primary brain and spinal cord tumors.
    - In addition to seeing patients on active therapy and long term follow-up, fellows are responsible for consulting on newly diagnosed and relapsed patients.
    - Fellows follow patients through various aspects of the multidisciplinary approach, including: diagnostic neuroradiology, neurosurgery (with various specialized neurosurgical techniques), histopathology, neuro-oncology tumor board, radiation oncology simulation and treatment planning, and chemotherapeutic and biologic therapy planning.
    - PCH has a comprehensive Rehabilitation Program which includes: neuro-endocrinology, audiology, physical therapy, occupational therapy, speech

therapy, nutrition/alternative therapy, and neuropsychology. Fellows spend time with these services to gain a better appreciation of the process when a patient is referred for intervention.

- There is a neuro-oncology tumor board that meets biweekly to discuss patients (see Conference section), and fellows are expected to attend and present to the tumor board during this rotation.
- Through PCH's association with the Children's Oncology Group (COG), fellows become familiar with international co-operative group and clinical Phase II & III studies, as well as biology, epidemiology, and supportive care/quality of life studies.
- Through PCH's affiliation with the Pediatric Oncology Experimental Therapeutics Investigators Consortium (POETIC) and the Children's Neuro-Oncology Consortium (CNC), fellows become involved with Phase I & II studies with pediatric neuro-oncologists from some of the leading pediatric hematology/oncology programs in North America.
- Through PCH's affiliation with the Translational Genomic Research Institute (TGEN), fellows become familiar with gene microarrays, genomic and proteomic profiling, and drug development.
- In addition to all of the above, the neuro-oncology rotation can be tailored to meet the fellows' individual education and research needs.

7. Cytogenetics Rotation
    - The educational experience lasts approximately one week, and it provides instruction in basic cytogenetic laboratory techniques, including harvest, banding, chromosome analysis, and karyotyping, and fluorescent in-situ hybridization, with applications to clinical medicine. Fellows learn common cytogenetic abnormalities associated with both liquid and solid tumors, and he/she gains an appreciation of serial sample interpretation.
    - Fellows also gain experience in basic cytogenetic nomenclature and learn how to interpret cytogenetic reports.

8. Immunodeficiency Rotation
    - Fellows have an opportunity (in a one-month dedicated block) to see patients with congenital and acquired immunodeficiencies in the outpatient setting and as inpatient consultations. The teaching attending and supervisor for this learning experience is a board-certified pediatric immunologist (Duane Wong, MD, who is on the medical staff at PCH) who supervises the fellows in both the inpatient and outpatient settings.
    - Fellows see mostly pediatric (with a minority of adult) patients with acquired and congenital immunodeficiencies in the outpatient setting, as well as perform inpatient consultations with appropriate supervision and instruction by Dr. Wong at Phoenix Children's Hospital.
    - The entire clinical experience is closely monitored and evaluated by Dr. Wong, and he provides appropriate feedback on the fellow's performance to the fellow and the program director using a standard evaluation format.

II. Second and Third Year

- The second and third years of fellowship training is spent refining those skills learned in the first year of training, as well as completing a research project to satisfy the American Board of Pediatrics requirements for a "scholarly project" while in training. PCH and the Translational Genomics Research Institute (TGEN) jointly developed a detailed research training curriculum that serves as the framework for exposure to

bench research as well as translational paths to clinical applications. This curriculum includes seminars in bench research techniques, bioethics, biomedical statistics, bioinformatics, research design, introduction to the institutional review board, presentation skills, formal instruction in grant and manuscript writing, and regular presentations at laboratory meetings.

- Fellows complete their research requirement under the supervision of faculty researchers at TGEN, PCH, or at a facility of their choosing. The Center for Cancer and Blood Disorders physicians have a very close working relationship with the researchers at TGEN, and they actively participate in the guidance of the fellows as they conduct their research.
- Fellows are in the outpatient hematology/oncology clinic approximately one half-day per week during the second and third years. Second and third year fellows spend one month of each year on the inpatient clinical service to gain more experience in supervising clinical care and in serving as a teacher for residents and medical students. At no time are there two fellows of different years of training on the inpatient rotation month at the same time.

III. Call Schedule

- Fellows take only at-home (pager) call during all three years of training.
- Fellows take first calls from the inpatient floor, emergency department, outside medical facilities and other physicians, and concerned parents. There always is an attending physician from the Center for Cancer and Blood Disorders on call for every night that a fellow is on call, and the attending physician is available for back-up supervision or questions from the fellow at all times.
- Fellows take call from home, unless the fellow needs to return to the hospital while on call to assess a patient in person. In a typical month, fellows take call from home every sixth weeknight (4:30pm – 8:30am) and every sixth weekend with the covering attending (Friday 4pm – Sunday 4pm).
- The Training Program strictly adheres to the ACGME-directed limitations on fellows' duty hours as stated in *The General Program Requirements for Subspecialties of Pediatrics* (ACGME, 7/1/07). There is no requirement for in-house call, but hours that fellows spend in-house count toward the 80-hour limit per week. Fellows are required to log their hours spent on-site engaged in patient care to ensure compliance with this directive.

IV. Hardship Policy

- Back-up support systems are provided when patient care responsibilities are unusually difficult or prolonged, or if unexpected circumstances create fellow fatigue sufficient to jeopardize patient care.
- A similar backup system is in place for the clinical teaching faculty in an effort to ensure patient safety.
- Medical or psychosocial leave is subject to approval of the program faculty and program director. Fellows must make up lost clinical or research time when they return to clinical and/or research duties. If a fellow is unable to do so, he/she may be dismissed from the Training Program.

V. Procedures

- Fellows have the first opportunity to perform all procedures on patients in the inpatient

and outpatient settings. All procedures are closely supervised by members of the program faculty, but the fellows are given gradually more independence in the ordering, preparation, performance, and coordination with the appropriate laboratory personnel for each procedure.

- It is expected that the fellows perform 10-15 (outpatient) and 5-10 (inpatient) lumbar punctures per month, and 3-5 (outpatient) and 5-10 (inpatient) bone marrow aspirates and biopsies per month, on average.
- Fellows are responsible for the interpretation and formal reporting of all bone marrow aspirations that they perform (with supervision by program faculty). All other bone marrow aspirates and any instructive peripheral blood films are reviewed at a weekly morphology conference with program faculty. Interpretation of bone marrow biopsies is performed by hospital pathologists (key program faculty), but fellows are encouraged to review the biopsies with them at that time.
- Fellows are encouraged to participate in any bone marrow harvests that are performed on donors of bone marrow transplant patients. It is expected that fellows will be able to participate in at least two of these harvests during their fellowship training.
- Fellows are required to keep a log of all procedures they perform to document competency.
- Fellows are evaluated on their ability to perform procedures using a variety of assessment methods, including directly observed care assessments, faculty evaluations, and assessments from families.

VI. Conferences

The following is a list of conferences that are offered to fellow during the Training Program:

1. Didactic conference: meets weekly in all training years to discuss an area of academic interest from the American Board of Pediatrics' content outline for pediatric hematology/oncology (attendance is required).
2. Research conference: meets weekly in training years 2-3 to discuss ongoing research projects by both clinical and research faculty and serves as a forum in which fellows present their interim and final research findings (attendance is required).
3. Evidence-based medicine course: meets every other month in training year 1 and is based on the series of articles presented in the *Journal of the American Medical Association* (http://pubs.ama-assn.org/misc/usersguides.dtl). Attendance is required.
4. Journal club: meets monthly in all training years to discuss articles in recent medical literature and their relevance to clinical practice (attendance is required).
5. Bone marrow and peripheral blood morphology teaching rounds: meets weekly in all training years to review any bone marrow aspirates and pertinent and/or interesting peripheral blood smears with pathology faculty (attendance is required).
6. Tumor Board: meets weekly in all training years to discuss new diagnoses or changes in established oncology patients using a multidisciplinary approach. Representatives from hematology/oncology, pathology, radiology, general surgery, orthopaedic oncology, radiation oncology, nursing, clinical research, and the tumor registry are in attendance (attendance is required).
7. Research Seminar Series: meets monthly in all training years to serve as an exchange of research ideas and a forum for discussing research with all clinical and translational researchers at PCH, TGEN, and elsewhere in the Arizona research community. TGEN and PCH jointly sponsors at least two of these seminars per year. Quite often,

researchers from institutions outside the local area are invited to share their ideas (attendance is required).

8. Neuro-Oncology Tumor Board: meets biweekly to discuss new diagnoses or major changes in patients with tumors of central nervous system. As in the general Tumor Board, a multidisciplinary approach is used. Attendees include hematology/oncology, neurosurgery, neuropsychology, neurology, pathology, radiation oncology, neuroradiology, nursing, social work, clinical research, physical therapy, and the tumor registrar (attendance is optional except during the neuro-oncology rotation, when attendance is required).
9. Hematology/Oncology Departmental Meeting: meets monthly to discuss administrative, scheduling, patient flow, and special programming issues with all members of the Center for Cancer and Blood Disorders, including faculty and ancillary staff. During this meeting, fellows have the opportunity to submit agenda items to be discussed (attendance is required).
10. Board Review: meets monthly to review topics of the American Board of Pediatrics' specialty content outline in hematology/oncology. Knowledge points are discussed in a question and answer format. Fellows and clinical faculty will rotate as presenters. The goal of this meeting to prepare the fellows for the subspecialty in-training examination and eventually the Board Exam (attendance is required).
11. Psychosocial Rounds: meets monthly in conjunction with the psychology, psychiatry, social work, clergy, and interpreter staff to discuss issues such as delivering bad news, the doctor/patient relationship, and socio-cultural issues that affect patient care (attendance is required).
12. Lecture to Pediatric Residents: meets at least once per week on the inpatient clinical service (attendance is required).
13. Lecture to Medical Students: meets at least quarterly on the inpatient or outpatient clinical service (attendance is required).
14. Pediatric Grand Rounds: meets weekly and is attended by pediatricians, subspecialists, and nurses in the community (attendance is optional).
15. Pediatric Morbidity and Mortality Rounds: meets monthly and is a forum during which an executive session identifies a specific clinical case where there is a need for discussion regarding clinical quality improvement. Fellows are required to present and discuss any pertinent subspecialty information during these sessions (attendance is optional unless the fellow is asked to present pertinent subspecialty information or participate in the discussion).
16. Pediatric Resident Report: meets three times per week during which the pediatric residents discuss interesting cases. When there is a hematology/oncology topic to be discussed, the fellows will be asked to participate (attendance is optional unless the fellow is asked to present pertinent subspecialty information or participate in the discussion).

- Fellows and faculty are required to attend > 75% of the required meetings and conferences per year. Failure to meet this requirement results in appropriate warning and remediation. Records of attendance by both faculty and fellows are collected at each conference and are maintained by the program director.
- Fellows are evaluated using conference evaluation forms at the end of each conference. Responses on the evaluation are averaged and summarized for review with the fellow's clinical mentor and the program director.

VII. Research Experience

A. Purpose and Structure of the Training Program

Purpose

- The purpose of this training program is to combine the clinical experience provided by the Center for Cancer and Blood Disorders Phoenix Children's Hospital and the diverse laboratory research experiences available at the Translational Genomics Research Institute (TGEN) to produce highly-trained clinician investigators in the discipline of pediatric hematology-oncology. The novel technologies and the unique resources available at TGEN provide an opportunity for fellows to receive training in laboratory-based translational studies.
- Two years of the Training Program is spent actively pursuing laboratory-based research. Tailored research projects are developed by the fellow under the guidance of, and in cooperation with, faculty members of TGEN; one of the faculty members will be the primary research mentor.
- Upon completion of the Laboratory Research portion of the program, fellows are expected to have:
  - Developed relevant and innovative scientific hypotheses focused on a cancer problem
  - Become knowledgeable about funding entities dedicated to financial support to test these hypotheses
  - Developed and demonstrated competency in performing state-of-the-art laboratory research on some aspect of the cancer problem
  - Published and/or submitted to peer-reviewed journals manuscripts communicating their research findings
  - Completed and submitted a research grant application

B. Core Requirements

The core requirements of this training program are described below.

Table 1. Core Requirements

Goal	**Specialized Training**
Research Project	Research project to be conducted with the mentor and the Scholarship Oversight Committee
Specialized Training	• Bench Research Techniques (genomic, molecular and cell biology, and bioinformatics) • Research Design • Presentation Skills • Manuscript Preparation • Grant Preparation
Core Coursework	• Proposal Preparation Seminars • Responsible Conduct of Research/CITI
Other Experiences	A. Seminars B. Retreats C. Laboratory Rotations

1. *Bench Research Techniques*: Fellows work along with research technicians, postdoctoral fellows, and graduate students to obtain experience in scientific techniques and experimental design. Fellows learn a variety of research techniques that enable him/her to pursue a specific research project.

2. *Bioinformatics*: Fellows receive rudimentary training to develop and apply pattern recognition, data mining, text mining, and data visualization techniques to research problems. A trainee is expected to undergo several hours of training prior to any practical analysis on real data. The biological relevance and statistical interpretation of technologies such as gene expression, SNP, and CGH arrays is explained in qualitative and quantitative ways.
3. *Research Design:* Fellows receive an introduction to the main issues involved in the design of a research project. They learn how to make decisions about how the research should be conducted, how the data should be collected and analyzed, and how conclusions should be drawn for the aims of the research to be realized.
4. *Presentation Skills*: Each fellow is required to present his/her research at Phoenix Children's Hospital Research Seminar series and at TGEN's Translational Genomics Seminars. Fellows receive feedback following the presentation from all faculty mentors. These discussions serve to facilitate and increase the fellow's interactions with the multidisciplinary faculty team and further enhance the mentoring received by the fellow. Fellows are expected to give regular presentations at the laboratory meetings of the Division in which they are conducting research. Fellows are coached by the mentors on presentation skills, and abstract and poster presentation. It is expected that fellows submit an abstract on his/her work to a national annual scientific meeting.
5. *Manuscript Preparation:* Fellows are required to write a manuscript related to the research project for publication in a peer-reviewed journal and to respond to reviewers' comments. Both research and clinical mentors guide the fellows through this section of their training.
6. *Grant Preparation*: The research mentor works with the fellow in the development of an application for peer-reviewed funding for continued research. The draft proposal undergoes a review by the mentors and the Scholarship Oversight Committee to facilitate the fellow's development of a strong application prior to submission. If the fellow wishes to spend an extra year pursuing his/her research project, there are funding opportunities and guidance available at both TGEN and PCH.
7. *Proposal Preparation Workshops*. Each fellow is required to attend the web-based research administration workshops and seminars offered through Arizona State University (http://researchadmin.asu.edu/training/fac_course.cfm). All fellows are expected to attend these workshops during their second year and, as a result, to complete a mock or actual grant application. This workshop provides fellows with the following skills: 1) identification of appropriate funding sources for research; 2) preparing, writing and submitting proposals proactively; and 3) managing, monitoring, and closing out the research project.
8. *Responsible Conduct of Research and Human Subjects Training.* The goal of the training is to introduce the fellows to the concepts of responsible conduct of research. Fellows are trained in scientific and policy contexts in which they must work. Fellows are required to complete the CITI Course in the Protection of Human Research Subjects.
9. *Seminars:* In addition to the seminars at Phoenix Children's Hospital and TGEN, fellows may attend other seminar series at TGEN, the University of Arizona, and Arizona State University. There are many other seminars that may supplement the training in the fellow's area of interest. The research mentor works with the fellow to determine which, if any, of these seminars would be appropriate.
10. *Retreats:* TGEN holds annual scientific retreats for its scientific staff. Fellows are expected to submit abstracts and prepare posters for this retreat. If chosen, they also give oral presentations.
11. *Laboratory Rotations*: In the first year, laboratory rotations of two weeks duration orient fellows to genomics technologies to facilitate the development of the research project. In meetings with the research mentor, technical and analytical gaps in the fellow's background are addressed and remedied.

C. Research Base and Resources

- TGEN is a not-for-profit research institute whose mission is to make and rapidly translate genomic discoveries into advances for human health. TGEN leverages unique genomic research platforms to translate genetic information of diseases into new diagnostic tests and innovative therapies to battle cancer and other diseases and disorders.
- Currently, TGEN has 225 scientists and administrative staff with projections to grow to over 300 in the next two years. Thirty-three are independent investigators. A number of TGEN scientists hold university appointments at one of Arizona's three universities. Collaborations are bi-directional, with TGEN currently providing appointments to 25 university faculty members. TGEN has successfully competed for over $25 million of research funding from 17 funding agencies. It currently occupies approximately 170,000 square feet (3 floors) of a newly constructed research building, which is the anchor institute in a 15-acre downtown Phoenix biotechnology campus that incorporates buildings for translational and clinical research, health care education, and community critical care. TGEN opened its second research facility on the campus of the Mayo Clinic in Scottsdale where its Pharmaceutical Genomics Division is housed in the state-of-the-art Mayo Clinic Collaborative Research Building.
- TGEN is a major partner of Phoenix Children's Hospital. TGEN helps to supportive collaborative research, chemotherapeutic drug development, and biorepository efforts between the two institutions. TGEN also participates in the mentorship of fellows from other fellowship training programs in the Phoenix metropolitan area.

TGEN is organized into nine research divisions, summarized below:

Table 2. TGEN Research Divisions

Research Division	Division Summary
Integrated Cancer Genomics **John Carpten, Director**	Using tools spawned by the Human Genome Project, TGEN seeks to understand the function of suspected disease-related genes in at-risk and normal individuals. Research is accelerated through large-scale familial studies, where genetic samples are collected from these populations. Melanoma, breast, ovarian, prostate cancer, and hematologic malignancies are currently under investigation in this Research Division.
Neurogenomics **Dietrich Stephan, Director**	Genomics technologies are applied to the study of the brain to understand the process of disease and to contribute to the diagnosis and treatment of neural disorders and disease, including brain tumors.
Computational Biology **Ed Dougherty and Michael Bittner, Co-Directors**	This research division provides high-performance computing resources and scientific research tools (*e.g.*, special purpose parallel computing machines, high-density storage and analysis systems) to enable investigators and biostatisticians to decode genetic information through pattern recognition, data mining, text mining and data visualization techniques and to solve complex biomedical and clinical research problems.
Clinical Translational Research **Daniel Von Hoff, Director**	This division enables genomic discoveries to be accelerated to clinical evaluation through innovative design strategies of clinical trials. The focus is on clinical utilization, pharmaceutical development, and optimal participation of patients to compassionately advance translational investigations.

Pathogen Genomics **Paul Keim, Director**	The Pathogen Genomics Division is a joint program between TGEN and Northern Arizona University that is designed to bolster the nation's biodefense through improved forensical analysis of pathogens such as those that cause anthrax. The division focuses on understanding the interactions between man and microbe to develop new therapeutics and diagnostics to alleviate the human ailments caused by dangerous pathogens. The division is also working to develop an improved understanding patterns of disease movement to reduce and control the incidence of disease.
Genetic Basis of Human Disease **Jeffrey Trent, Acting Director**	The Genetic Basis of Human Disease Division addresses important translational research questions associated with human disease. The division's researchers seek to understand the function of suspected disease-related genes and how they work in normal and "at risk" individuals, with particular emphasis on cancer and diabetes. Accelerating this research are large-scale family studies centered on genetic samples collected from individuals within isolated populations. Information derived from these studies helps determine inheritance patterns for a genetic-related disease. Identifying the patterns of disease occurrence in well-characterized families speeds the search for susceptibility or predisposition genes for that disease.
Cancer and Cell Biology **Michael Berens, Director**	By understanding basic errors underlying abnormal cell behaviors, the Cancer and Cell Biology Division is working to discover valid markers and therapeutic targets for treating human disease. The Division is primarily focused on breast cancer, melanoma, lung cancer and brain tumors, and has active collaborations with a large number of colleagues in academic and clinical research institutes nationally and internationally.
Pharmaceutical Genomics **Spyro Mousses, Director**	The Pharmaceutical Genomics Division is focused on developing and applying novel functional genomics methods and high-throughput technologies to identify areas in the human genome that may be vulnerable to drug targets. These unique targets will then be advanced to develop the next generation of molecular medicines. Additionally, new cellular pharmacogenomic strategies have been developed at TGEN to discover genes that regulate drug response. These discoveries will be advanced as biomarkers to predict clinical drug response to enable personalized medicine, in other words, getting the right drug to the right patient at the right time.
Diabetes, Cardiovascular and Metabolic Diseases **Johanna Wolford, Director**	The DCM Division utilizes genomic strategies and systems biology approaches to enhance our understanding of metabolic diseases and to accelerate prediction, treatment, and prevention of diabetes and related complications, obesity, hyperlipidemia, cardiovascular disease, and other metabolic disorders.

- In addition to these nine research divisions, TGEN has established a clinical alliance with Scottsdale Healthcare System that provides a direct clinical research site for TGEN in the fields of oncology and hematology. Located at the Jerry and Debi Bisgrove Research Building at Scottsdale Healthcare, the TGEN Clinical Research Services (TCRS) is led by Dr. Daniel Von Hoff, Medical and Research Director. TCRS moves basic science findings from TGEN and other organizations into the clinic, providing cutting-edge, state-of-the-art translational-based medicine as treatment options for patients. It is divided into three research divisions: Genomic Medicine and Individualized Therapy Center; Pancreas Cancer Center; and Pharmacokinetic/Pharmacodynamic Facility.

- Clinical investigators in the TCRS see patients at Scottsdale Healthcare but have their laboratory facilities at TGEN. The facility currently has 19 active clinical trials, which includes 13 phase I trials and six phase I/II trials. Clinical trials with agents directed at specific targets in patients' tumors were launched in November 2005. Phase I clinical trials of two new cancer drugs were also launched at this time. This relationship demonstrates existing translational infrastructure to leverage for the Fellowship Training Program.

TGEN's research divisions are supported by key core facilities. These core facilities are summarized below:

Table 3. TGEN Research Service Centers

Core Facility	Core Summary
DNA Sequencing Center	The DNA Sequencing Center at TGEN is a state of the art DNA sequencing facility capable of up to one million sequencing reactions per year and produces consistent reads of on average 800 base pairs. Genetic data, analyzed by high-throughput sequencing, provide TGEN scientists with new genetic markers, new diagnostic capabilities, and a greater understanding of the mechanisms of disease. Establishing close collaboration with several industries devoted to DNA sequencing allows TGEN to pursue real-life applications. The programs developed at the TGEN DNA Sequencing Core cover diverse areas of experimental, theoretical, and computational genomics.
Tissue Microarray Center	The TMA Center at TGEN provides a platform for validation of molecular markers on archival clinical specimens. Emerging high throughput screening technologies, such as cDNA expression profiling, identify numerous gene products that are up-regulated or down-regulated in cancer. TMAs provide a powerful tool for validation of these findings in archival clinical specimens. Specifically, the TMA Center provides the following services: high throughput method to analyze protein and DNA targets in readily available resource of archival clinical specimens; TMA service (design and construction) to outside investigators/researchers that have access to tissue block collections at their respective institutions (investigators with clinical affiliations at Arizona based institutions have priority); quality control measures implemented by board-certified pathologist who has extensive experience in tissue microarray design, construction and analysis; correlative studies with fluorescence in situ hybridization (FISH) and immunohistochemistry (IHC) to detect candidate markers that have prognostic value; and optimization of molecular assay protocols and novel antibodies / probes using the highest quality TMA slides.
Bioinformatics Core	TGEN's state of the art bioinformatics and computational biology facility lends support to all disease related program studies. This Center provides computational resources, biomedical informatics support, and knowledge-based data management systems to the TGEN scientific staff. Core staff collaborates with the TGEN scientific staff and colleagues at other research centers in applying state-of-art information technology to biomedical research problems. Through its collaboration with Arizona State University (ASU) and IBM Life Sciences, TGEN is now fueled by one of the most powerful high performance supercomputer systems in the world, allowing researchers superior computing ability.

SNP Genotyping Center	TGEN's Gene Expression Microarray Services offers a broad spectrum of array analyses including visualization, statistical analysis and bioinformatics. TGEN investigators have access to technology platforms from Affymetrix, Agilent and Illumina. TGEN's High-Throughput SNP Genotyping service provides access to the complete gamut of single nucleotide polymorphism (SNP) genotyping services, including whole genome analysis (linkage or association), fine-mapping and candidate gene studies. TGEN scientists have and continue to use gene expression profiling to: (1) classify human disease (especially cancers of the breast, prostate, and brain); (2) gain molecular insight into disease processes; and (3) identify expression profiles capable of determining whether or not a patient is more (or less) likely to respond to a treatment. Genotyping studies to identify patterns of occurrence of a disease in well-characterized families and cohorts speeds the search for susceptibility or predisposition genes for that disease. Among the diseases currently studied are cancers such as colon, melanoma, breast, and prostate, and diabetes.

D. Mentors

The program at TGEN is supported by eight faculty mentors and the Vice President for Research Administration, Jodi Black, Ph.D., MMSc:

Table 4. TGEN Mentors

Michael Berens, Ph.D.	Director, Cancer and Cell Biology Division, and Head Brain Tumor Research Lab.; Adjunct Professor, Arizona State University; Research Professor, University of Arizona College of Medicine
David Duggan, Ph.D.	Investigator, Genetic Basis of Human Disease Division; Head, Population Genetics Research Lab; Director, SNP Genotyping Center
Galen Hostetter, M.D.	Director, Tissue Microarray Lab; Associate Investigator, Integrated Cancer Genomics Division
Dietrich Stephan, M.D.	Director & Senior Investigator, Neurogenomics Division; Head, Neurobehavioral Research Unit
Daniel Von Hoff, M.D.	Director, Clinical Translational Research Division; Senior Investigator; Clinical Professor of Medicine, University of Arizona Department of Medicine
Sypro Mousses, Ph.D.	Director, Pharmaceutical Genomics Division; Head, Chemogenomics Laboratory; Head, Cancer Drug Development Laboratory
Jeffrey M. Trent, Ph.D.	President and Scientific Director; Senior Investigator, Genetic Basis of Human Disease Division; Head, Melanoma Therapeutics Lab
John Carpten, Ph.D.	Director, Integrated Cancer Genomics Division
Raoul Tibes, M.D.	Associate Investigator, Pharmaceutical Genomics Division; Assistant Clinical Investigator, Genomics Medicine and Individualized Therapy Center

E. Mentoring Process

Faculty research mentors will be assigned based on the research interests of the fellow:

Table 5. Faculty Mentoring Process

Identification of Mentor	In the second half of the first year of training, the hematology/oncology fellows have two weeks of protected non-clinical time to meet with prospective research mentors and to begin to identify a project that can be completed in a two-year period. The mentor is assigned according to research interests and availability. A Scholarship Oversight Committee is formed during the first year in conjunction with the research mentor.

Development of the Research Proposal	Once the primary mentor has been selected, the mentor and trainee develop a research proposal and training plan. Within three months, the plan must be approved by the Scholarship Oversight Committee.
Bi-Weekly Meetings to Assess Progress	The fellow and the mentor schedule regular weekly meetings to review the trainee's progress toward the research goals. Any secondary mentors are selected at this time. All mentors must be able and willing to set aside time for consultation apart from regularly scheduled progress meetings.
Semi-Annual Reports to Scholarship Oversight Committee	The fellow is responsible for semi-annual reports to the Scholarship Oversight Committee and mentor. These reports contain a summary of the research project, a timeline for completion, the accomplishments toward the defined goals, the goals planned for the next six months, all publications and/or grant submissions, times and dates of all meetings with the mentors, and issues or problems that arose during the period as well as plans for problem resolution.
Identification of Resources	The mentor assists in identifying area resources; in building linkages with community agencies and collaborating entities; in developing and adhering to timelines; and in obtaining human or animal subjects and institutional review board and scientific review committee approvals.
Seminar	The mentor assists in the preparation and rehearses his/her twice-yearly presentation with the fellow as part of the monthly research seminar series. The mentor attends and participates in the Scholarship Oversight Committee's review of this presentation.
Grant Proposal	The mentor works with the fellow in the development of an application for peer-review funding for continued research. The draft proposal will undergo a mock review by the mentors and Scholarship Oversight Committee to facilitate the fellow's development of a strong application prior to submission.

- A Scholarship Oversight Committee is formed in conjunction with the research mentor during the first year. In addition to the Program Director and faculty mentor, the Committee consists of program clinical and research staff in areas relevant to the fellow's research project. The Committee approves the training plan for the fellow, monitors and evaluates the fellow's progress, and makes recommendations for any changes. The Committee also ensures that the weekly meetings with the research mentor are taking place and provides a final evaluation of the fellows. Fellows receive a semi-annual mentoring review provided by the Scholarship Oversight Committee in response to the materials submitted by the fellows.
- Research and clinical mentors collaborate to provide fellows with the necessary guidance for successful completion of training. One faculty member serves as the fellow's primary mentor and direct supervisor. The mentor is expected to meet with their fellows at least weekly. It is critical that the fellows promptly develop productive relationships with their mentors. Changing mentors or research topics requires the review and approval of the program's Committee. The Scholarship Oversight Committee reviews the meeting frequency of fellows with his/her mentors on a semi-annual basis.

F. Timeline: A timeline for the research experience at TGEN is appended to the end of this Handbook.

VIII. Evaluation

- Copies of all evaluations are appended to the end of this Handbook. Fellows are evaluated using the following methods:

    - Clinical faculty evaluation after a clinical rotation
    - Research faculty evaluation during the research experience
    - Patient/family evaluations
    - Ancillary staff evaluations

- Secretary and clinical research staff evaluations
- Surgery and laboratory staff evaluations
- Self-assessment exercises
- Conference evaluations
- Direct observed care evaluations
- Spontaneous and immediate verbal feedback

- The methods of evaluation used for assessing fellow competence in each of the six required ACGME Competencies are listed in the following table:

Competency	Methods of Evaluation	Evaluator(s)
Patient care	Direct supervision and instant verbal feedback	Clinical teaching faculty
	Patient/family written and verbal feedback	Patient/family evaluation forms
	Departmental written feedback	Departmental evaluation forms
	Residency program and medical student written feedback	Residents and medical students on the inpatient teaching service
	Self-assessment	Self
Medical knowledge	Direct supervision and instant verbal feedback	Clinical teaching faculty
	In-training exam	American Board of Pediatrics
	Participation in didactic discussions	Clinical teaching faculty
	Scholarly presentations to the teaching faculty	Clinical and research teaching faculty
	Participation in journal club	Clinical and research teaching faculty
	Presentations and participation at regular research seminars	Clinical and research teaching faculty
	Impromptu discussions of patient cases	Clinical teaching faculty
	Evaluations of lectures given to medical students and residents	Medical students and residents
	Departmental written feedback	Departmental evaluation forms
	Self-assessment	Self
Practice-based learning & improvement	Presentation in journal club	Clinical and research teaching faculty
	Participation in local and national meetings	Clinical and research teaching faculty
	Participation in morbidity and mortality conferences	Clinical and research teaching faculty
	Participation in a quality improvement committee	Clinical teaching faculty and committee coordinator
	Participation in the evidence-based medicine course	Clinical teaching faculty

Competency	Methods of Evaluation	Evaluator(s)
	Departmental written feedback	Departmental evaluation forms
	Self-assessment	Self
Interpersonal & communication skills	Direct supervision and instant verbal feedback	Clinical teaching faculty
	Patient/family written and verbal feedback	Patient/family evaluation forms
	Departmental written feedback	Departmental evaluation forms
	Residency program written feedback	Residents on the inpatient teaching service
	Self-assessment	Self
	Participation in didactic discussions	Clinical teaching faculty
	Scholarly presentations to the teaching faculty	Clinical and research teaching faculty
	Participation in journal club	Clinical and research teaching faculty
	Presentations and participation at regular research seminars	Clinical and research teaching faculty
	Impromptu discussions of patient cases	Clinical teaching faculty
	Report from scholarly oversight committee	Scholarly oversight committee
	Participation in psychosocial rounds curriculum	Clinical teaching faculty
Professionalism	Direct supervision and instant verbal feedback	Clinical teaching faculty
	Patient/family written and verbal feedback	Patient/family evaluation forms
	Departmental written feedback	Departmental evaluation forms
	Residency program written feedback	Residents on the inpatient teaching service
	Self-assessment	Self
	CITI Human Protection Course	Course administrators
	Medical privacy and ethics course	Course administrators
	Participation in psychosocial rounds curriculum	Clinical teaching faculty
	Attendance at required seminars	Attendance record kept by program director
Systems-based practice	Direct supervision and instant verbal feedback	Clinical teaching faculty and support staff
	Departmental written feedback	Departmental evaluation forms
	Self-assessment	Self
	Participation in psychosocial rounds curriculum	Clinical teaching faculty

- The program director reviews the evaluation methods with the fellows during their orientation, and blank copies of all written evaluation forms are included in this handbook. At the beginning of each new rotation, including their research time, the specific evaluation methods and expectations of the fellow are discussed by the direct supervisor, clinical mentor, research mentor, or program director, as applicable.
- Within the last few days of or shortly after each rotation, the direct supervisor (clinical or research teaching faculty) is expected to provide verbal and written feedback using a standardized evaluation form. This feedback meeting (or "exit interview") is used to summarize the fellows' performance in all aforementioned criteria. The evaluation meeting takes place no more than two weeks after the completion of each block rotation. It is the direct supervisor's responsibility to arrange this evaluation meeting in a timely fashion. After the meeting is complete, the fellows are expected to sign the written evaluation form, indicating that he/she has reviewed the form with the supervising faculty member.
- If there is a matter that needs remediation, this evaluation session can be held in conjunction with the program director. The completed and signed evaluation form is then given to the program director for inclusion in the fellows' file. These guidelines are appended to this fellow handbook and are distributed to the fellows during their orientation and to the faculty on an annual basis.
- During their clinical months, fellows meet with their clinical mentor at least monthly to discuss their formal evaluations. During their research months, fellows meet with their research mentor at least every week to provide guidance to the fellow and to ensure project completion by the end of training. The program director meets with the fellows at least quarterly to discuss any deviations from and barriers to achieving success in their individualized learning plan.
- Faculty are evaluated by fellows on such items as teaching ability, clinical knowledge, professionalism, work ethic, support for the training program, and scholarly activity. These evaluations are performed every six months in a written, anonymous fashion using a combination of scaled responses and a narrative section. The evaluations are then compiled for each faculty member and shared with the faculty member by the program director every six months in private evaluation sessions. Any consistent or serious issues with a faculty member noted by the fellows are discussed by the program director confidentially with the chief of the hematology/oncology division.
- Fellows are given the opportunity to evaluate the program once per year using formal evaluations with scaled responses and a narrative section. Fellows are asked to evaluate such parameters as quality of teaching by the clinical faculty and research faculty, continuity experience in the outpatient clinic, guidance on both outpatient and inpatient clinical services, supervision during and availability of procedures, quality of training during laboratory and immunodeficiency rotations, and the research experience as a whole. Responses by the fellows will be reviewed yearly by the program director and clinical/research faculty during:

    - Semi-annual departmental meetings with the hematology/oncology division and key faculty (including research faculty)
    - Semi-annual meetings between the program director and fellows
    - Quarterly program directors' meetings held in conjunction with program directors of all subspecialty training programs at PCH, the Designated Institutional Official at PCH, the categorical pediatric and medicine/pediatric residency program directors at PCH, administrative staff, and fellowship representatives
    - Quarterly meeting of the Medical Education Committee at PCH, which has a section of the agenda devoted to fellowship training program issues

- Any feedback that consistently indicates the need for change in an aspect of the Training Program is discussed with the faculty and fellows at a subsequent meeting and promptly remedied.

IX. Competency-Based Goals and Objectives

a. Patient Care

Fellows must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Through supervised patient care experiences, fellows will develop their skills in physical examination, assessment of patient status and clinical changes, selection of appropriate diagnostic testing, implementation of an appropriate treatment plan, escalation of care, recognition and treatment of hematologic and oncologic emergencies, end-of-life care, and discharge planning. Fellows also accomplish these goals by learning how to counsel patients and their families, to involve appropriate support staff in the overall care of a patient, and to make appropriate use of evidence-based techniques and available information technology.

- Fellows will be expected to become proficient in clinical procedures, including lumbar punctures, bone marrow aspirates, bone marrow biopsies, and bone marrow harvests, by participating in the ordering, preparation, performance, and coordination with the appropriate laboratory personnel for each procedure. Fellows also must be able to describe and counsel patient and their families regarding risks, benefits, limitations, and complications of all procedures. Fellows also will be expected to demonstrate proficiency in the microscopic examination of peripheral blood and bone marrow preparations. Fellows are required to keep a log of all procedures they perform in order to document competency.

b. Medical Knowledge

Fellows must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care.
(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Fellows are required to demonstrate knowledge in the basic sciences and applied clinical aspects of hematologic and oncologic conditions of childhood. Knowledge is acquired through patient care and related experiences and as well as didactic lectures. Fellows are expected to participate in didactic lectures by preparing their own didactic sessions to be delivered to faculty and other fellows. Fellows are expected gain sufficient knowledge and experience to sit for and successfully pass the Board Exam in Pediatric Hematology/Oncology. Topics include (but are not limited to):

1. Hematologic disorders of the newborn
2. Hemoglobinopathies, including the thalassemia syndromes
3. Inherited and acquired disorders of the red-blood-cell membrane and of red-blood cell metabolism
4. Autoimmune disorders, including hemolytic anemia
5. Nutritional anemia
6. Inherited and acquired disorders of white blood cells

7. Hemophilia, von Willebrand's disease, and other inherited and acquired coagulopathies
8. Platelet disorders, including idiopathic thrombocytopenic purpura (ITP), and acquired and inherited platelet function defects
9. Congenital and acquired thrombotic disorders
10. Leukemias, including acute lymphoblastic leukemia, acute and chronic myeloid leukemias, and myelodysplastic syndromes
11. Hodgkin's disease and Non-Hodgkin's lymphomas
12. Solid tumors of organs, soft tissue, bone, and central nervous system
13. Bone marrow failure
14. Transfusion medicine and use of blood products
15. Management of the patient undergoing long-term transfusion therapy
16. Bone marrow reconstitution, including use of allogeneic peripheral blood stem cells and umbilical cord blood
17. Graft-versus-host disease

(Source: Program Requirements for Fellowship Education in Pediatric Hematology/Oncology (V.B.), ACGME, 7/1/07)

Other structured educational experiences included didactic, case-based, and practical training in the following topics:

1. Enteral and parenteral nutrition
2. Control of nausea and vomiting
3. Management of pain
4. Recognition and management of psychosocial stresses and problems
5. Serving as a member of a multidisciplinary team
6. Instruction in curriculum design, information delivery in clinical settings and classrooms, provision of feedback to learners, assessment of educational outcomes, and the development of teaching materials
7. Health care practice management and the business of medicine
8. Clinical outcomes
9. Prevention of medical errors
10. Preventative care
11. Multi-center clinical studies: enrollment, informed consent, data collection, and reporting
12. Demonstrating skill in communication and counseling
13. Provision of comprehensive care
14. Proper use of laboratory techniques for diagnosis, with recognition of the limitations of the various methods and the pitfalls in interpretation of laboratory results
15. Instruction in the basic sciences, including, but not limited to:
    a. Structure and function of hemoglobin and iron metabolism
    b. The phagocytic system
    c. Splenic function
    d. Cell kinetics
    e. Immunology
    f. Coagulation
    g. Genetics
    h. Principles of radiation therapy
    i. Characteristics of malignant cells
    j. Tissue typing and blood groups
    k. Pharmacology of chemotherapeutic agents
    l. Molecular biology
    m. Microbiology and anti-infective agents in the compromised host

c. Practice-Based Learning and Improvement

Fellows must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning.

(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Fellows are expected to be active and willing participants in the methods of self-critique, with the aid of faculty/research mentors and through a Scholarship Oversight Committee. Fellows are expected to reflect on their performance informally as necessary, but at least semi-annually as a formal mentoring review provided by the Scholarship Oversight Committee in response to the materials submitted by the fellows, faculty, patients/families, and support staff. The outcome of the formal reviews are documented and placed in the fellows' permanent file.

- Fellows are expected to participate in a mandatory evidence-based medicine course that is administered by the teaching faculty and ancillary staff at PCH. The format is based on the series of articles presented in the *Journal of the American Medical Association* (http://pubs.ama-assn.org/misc/usersguides.dtl). In addition, fellows are expected to present an article from the recent medical literature at a monthly journal club that is attended by faculty from PCH and TGEN. The hospital medical librarian teaches didactic sessions regarding proper and efficient use of information technology to assist in patient care issues.

- Fellows are required to complete quarterly self-assessment questionnaires in which they rate their performance using several criteria, including medical knowledge, ethical considerations, interpersonal skills, work ethic, and methods to maximize their potential as a future subspecialist and/or researcher. This self-assessment tool is reviewed with the program director and clinical mentor on a quarterly basis.

- Clinical and nonclinical staff, as well as patients and families, are invited to provide feedback of the fellows' performance. This feedback is discussed at the aforementioned meetings with the clinical mentor and program director. In this way, fellows learn how to be an important part of and work within the framework of a multidisciplinary team.

- Fellows are expected to participate in a psychosocial rounds curriculum that is devoted to reflection, self-assessment, and coping with unfavorable patient outcomes. This series of discussions is led by members of the psychology, psychiatry, child life, clergy, and social work staff at PCH.

- Fellows are expected to participate in formal morbidity and mortality rounds at PCH, during which an executive session identifies a specific clinical case where there is a need for discussion regarding clinical quality improvement. Fellows are required to present and discuss any pertinent subspecialty information during these sessions. These fellow presentations are evaluated by a formal conference evaluation by all faculty, residents, and medical students who attend the conference.

- Fellows are expected to present cases in weekly tumor boards and process feedback and critiques of the proposed clinical treatment plans. Fellows are expected to present at least five (5) cases per month in tumor board.

- Fellows are expected to teach pediatric residents and 3rd and 4th year medical students at least once per week. Fellows also are expected to present at least monthly to the teaching faculty on a topic from the hematology/oncology competency content outline. Other teaching sessions, including PCH Grand Rounds, morbidity and mortality rounds, and nursing teaching conferences are available to the fellows, and fellows are expected to participate in their implementation and delivery. Evaluations of the fellows' performance are discussed with the fellows after each conference.

d. Interpersonal and Communication Skills

Fellows must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals.

(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Fellows are expected to learn proper and efficient verbal and written communication skills by performing consults to the hematology/oncology service. Using this method, fellows have an opportunity to review pertinent aspects of the medical chart, perform a directed history and physical exam, formulate an assessment and plan for a patient's care, and discuss their findings and plan with a supervising attending physician. Fellows are expected to write or dictate their formal consultation in the medical record, followed by review and co-signature by the supervising physician.

- Fellows are expected to improve their ability to communicate efficiently over the course of their training, and this aspect of their training comprises a major portion of the self-assessment and formal assessment tools.

- Fellows are expected to bear responsibility of being the "front-line" caregiver for the inpatient services, outpatient services, and consultations. Fellows are responsible for learning accurate written documentation for all patients.

- Various techniques, including role playing, role modeling, and direct observation are used. Fellows are expected to develop appropriate interpersonal communication skills with regard to the following topics:

    1. Methods of communicating adverse patient outcomes
    2. The doctor-patient-family relationship
    3. Maintaining sensitivity toward diverse religious, ethnic, and socioeconomic backgrounds
    4. Delivering complex information at the appropriate educational level
    5. Holding a staff debriefing session after a poor patient outcome
    6. Working with an interpreter in family discussions
    7. Methods of explaining enrollment in clinical research studies
    8. Unique issues in healthcare delivery, including religious, language, sociocultural, and alternative medicine barriers (These issues are particularly challenging in Arizona, where there are large populations of both Latino-Americans who do not speak English and Native Americans)

- Fellows are expected to observe several patient/family care conferences as part of the treatment team before they are allowed to participate in these conferences. When deemed ready, fellows are expected lead the conference under the supervision of the teaching faculty.

- Fellows are expected to discuss pertinent laboratory and medical imaging results at an appropriate level of detail for the family. If there is an open clinical trial, the fellow is expected to discuss enrollment to the family.

- Fellows are expected to gain proficiency in the following:

    1. Establish a therapeutic relationship with patients and families
    2. Demonstrate a willingness to listen to nursing and allied staff
    3. Explain information to patients and family using clear, understandable terms
    4. Keep patients, families, nursing and allied staff informed of changes in the care plan
    5. Write orders that are clear and legible
    6. Maintain comprehensive, timely, and legible medical records
    7. Consistently participate cooperatively in interdisciplinary rounds
    8. Communicate effectively with other physicians, including updates to primary care providers
    9. Deliver clear, concise and organized patient presentations during rounds and tumor boards
    10. Complete consultations in a timely manner and communicates recommendations clearly and concisely with the consulting medical team

e. Professionalism

Fellows must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles.
(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Fellows are expected to improve their performance in the following areas:

    1. Consistently attend to details of patient comfort and delivery of care
    2. Accept inconvenience when necessary to meet the needs of the patient
    3. Consistently respect patient privacy when conducting examinations
    4. Provide care sensitive to patient's age, gender, disabilities, cultural/ethnic diversity, and sexual orientation
    5. Consistently be courteous and receptive to nursing and allied health staff
    6. Demonstrate consistent and excellent work ethic
    7. Consistently respond in a timely manner when paged or called
    8. Consistently follow through on cross-cover issues
    9. Demonstrate dependability/commitment (patient follow-up, continuity of care)
    10. Maintain composure during stressful/crisis situations
    11. Demonstrate honesty/integrity
    12. Demonstrate high standards of ethical and moral behavior and accountability
    13. Demonstrate commitment to teaching at all learner levels
    14. Accept responsibility for errors in medical judgment and learn from one's mistakes

- Fellows are required to complete the CITI Human Protection Course, which discusses ethical research methods, purpose and function of the institutional review board, privacy, and human protection in research and to complete a PCH-sponsored course on medical privacy laws and ethical treatment of patients and their families.
- Fellows are required to attend an annual "End-Of-Life" conference in their first training year to learn how to effectively and ethically manage issues surrounding the dying patient.
- Fellows are expected to attend a monthly psychosocial curriculum that addresses issues of professionalism through the use of patient vignettes, role-playing, and

discussion.

- Fellows are expected to self-critique and reflect upon their evaluations by faculty, patients and their families, ancillary staff, and secretarial staff and to continue to strive to become not only a competent clinician, but also an impassioned caregiver.

f. Systems-Based Practice

Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.
(Source: ACGME Program Requirements for Graduate Medical Education in the Subspecialties of Pediatrics, ACGME, 7/1/07)

- Fellows are expected to learn how to order efficient and cost-effective laboratory and medical imaging.

- Fellows are expected to promote health and preventive practice education with patients and families by providing and explaining appropriate anticipatory guidance.

- Fellows are expected to be active participants in the discussion of patient cases with insurance companies for proper insurance approval.

- Fellows are expected to participate in an introductory didactic lecture on systems-based practice from appropriate PCH personnel.

- Fellows are expected to participate actively in a regular continuity experience in the outpatient setting, which will allow them to learn health care delivery on a longitudinal basis to guide their patients through the intricacies of the health care delivery system.

- Fellows are expected to participate in monthly hematology/oncology departmental administrative meetings and will be exposed to various aspects of running a group practice within the hospital setting.

- Fellows are expected to serve on at least one medical committee at PCH. These committees are comprised of a wide variety of physicians, support staff, and pediatric residents. Serving on a committee gives the fellows exposure to and a greater appreciation for the creation and oversight of hospital policies.

- Fellows are expected to share the responsibility of arranging patient scheduling, coordinating diagnostic tests, and participating in program development within the Center for Cancer and Blood Disorders.

- Fellows are expected to learn proper aspects of medical coding and billing with respect to patient care.

- Fellows are expected to learn the function of the departmental and hospital-based administrative staff that are available to facilitate health care delivery. Fellows shadow the departmental clinical manager for a day to gain an appreciation of the key administrative and medical resources available to the health care practitioner.

- Fellows are expected to learn how to ensure efficient health care delivery by using other key personnel in the health care delivery system to best take care of their patients. Fellows are expected to demonstrate knowledge of how and when to access

the expertise of ancillary services, such as nutrition, child life, case management, physical/occupational therapy, speech therapy, and pain management.

- Fellows are expected to learn effective transitions of patients with complex medical issues from hospitalization to home care.

- Fellows are expected to participate in formal morbidity and mortality rounds at PCH, during which an executive session identifies a specific clinical case where there is a need for discussion regarding clinical quality improvement. Fellows are required to present and discuss any pertinent subspecialty information during these sessions.

- Fellows are expected to participate in the peer review process to learn how the process of performance improvement operates.

X. Moonlighting Policy

- Fellows are allowed to moonlight during their second and third years of training only. Under no circumstances may a fellow perform any moonlighting duties during the first year of training.
- Fellows must present all details of their moonlighting proposal, including time commitment, to the program director for approval prior to performing any moonlighting duties.
- Hours spent in moonlighting activities at Phoenix Children's Hospital must be in compliance with the ACGME duty-hour restrictions. All time spent in moonlighting activities at Phoenix Children's Hospital counts toward the total hours a fellow has worked in a given time period.
- Moonlighting activities must not interfere with the ability of the fellow to achieve the goals and objectives of the educational program. This includes fellow responsibilities such as being on-call, performing patient care, and participating in research activities.
- Failure to comply with these directives will result in termination of moonlighting privileges.