



# **CURRICULUM**

## **Pediatric Radiology Fellowship**



**Department of Radiology  
Faculty of Medicine  
Addis Ababa University  
Addis Ababa, ETHIOPIA**

*In collaboration with*

**Department of Radiology  
The Children's Hospital of Philadelphia  
University of Pennsylvania  
Philadelphia, USA**



**2014**

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## **1.0 PROGRAM TITLE CODE**

**Title: Pediatric Radiology Subspecialty Fellowship Program**

**Code:**

## **2.0 PROGRAM DESCRIPTION AND RATIONALE**

### **2.1 Introduction and Background**

Children and adolescents make up the majority of the population in Ethiopia. Thus, diagnostic imaging of children makes up a significant part of the overall imaging in the country's existing health services. Emphasizing and improving the pediatric part of radiology in the training and practice of radiologists is crucial to successful diagnoses. For this reason, a fellowship program will be established at Addis Ababa University to train pediatric radiologists in Ethiopia.

At the time of drafting this pediatric radiology curriculum there is not a single pediatric radiologists in Ethiopia. Creating a 2-year pediatric radiology fellowship program with a strong research component and building a pediatric radiology field in Ethiopia will improve diagnostic imaging in children. The need for pediatric radiologists in hospitals and diagnostic centers is greater than it has ever been before with general radiology comprising 50% of pediatric patients. If one compares the demographics of Ethiopia and the United States with regard to the percentage of population 14 years or younger, one will find that it is 46% in Ethiopia and only 20% in the USA. This percentage increases to 60% when one includes all children and adolescents below 20 years in Ethiopia. Inevitably, every

radiologist is confronted in his or her daily practice with a significant number of pediatric cases. Therefore, it is a paramount need in the radiology community to advance dedicated imaging in children.

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## **2.2 Country**

Ethiopia is in the process of fundamental transformations in many spheres of development. Education and health are primary components of the transformation. Higher education, in particular, has witnessed historical undertakings through the establishment of more than 20 universities in recent years. The current education strategy focuses more towards producing manpower in the natural and technological sciences. A major part of this development includes the initiation and expansion of graduate programs through the training of health professionals in biomedical and clinical sciences and public health.

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## **2.3 University**

Addis Ababa University (AAU) shoulders the main responsibility of filling this increasing need for manpower to strengthen the newly opened universities and to meet the demands set by the on-going transformation and development. To this end, the School of Medicine within the Health Sciences College at AAU has recently displayed noticeable progress towards expanding subspecialty clinical training and research PhD programs in various departments and schools. This initiative has been further enhanced by the university's desire to upgrade its staff to PhD or equivalent level. In addition to these favorable internal opportunities,

the college has secured enough financial aid to support new undergraduate and graduate programs for the next five years.

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## **2.4 Department of Radiology**

In alignment with its rapid growth performance and considerable development, the Department of Radiology at AAU is committed to taking full advantage of the opportunity to expand radiology services in Ethiopia. The Department is developing relationships with foreign institutions such as the University of Toronto, Emory University, The Children's Hospital of Philadelphia, University of Pennsylvania, and others to explore the potential collaboration and co-hosting of the staff development program.

In its 22 years of existence, the Department of Radiology has produced over 100 radiology graduates; however, the department has not maximized its full potential due to limited training and service provision within the scope of general radiology. Individual efforts by senior staff members in regards to developing their areas of interest and sub-specialty were insufficient, disjointed from the overall program development, and lacked institutional support.

Due to the disproportionate growth and development, certain departments and schools could not achieve their intended targets. A large part of that was due to a shortage in diagnostic teaching departments such as radiology and pathology. Besides the need for holistic institutional development there are several critical factors that make the introduction of sub-specialties in the Department of Radiology at AAU imperative. These include the rapid expansion and development of the healthcare provision in both the public and private sectors,

the need to staff and support the newly opened universities, the creation of various pediatric subspecialties including pediatric surgery and the increasing public demand for better and more focused diagnostic skills.

Staff development is a vital component in the progression of the Department of Radiology. One important issue is the dwindling interest of the staff and the potential threat of attrition as a result of a non-innovative and non-motivating status quo in the Department of Radiology. Recouping what is being lost and averting this dire threat is important. As an academic environment of the highest order, the modus vivendi in radiology should inspire career development into subspecialties on par with similar developments in other clinical disciplines and keep pace with advances in knowledge and technology within the discipline.

Such a venture in development will further encourage more clinicians to train in this field and increase the number of physicians going into radiology. Laying the groundwork for quality and standards of pediatric imaging in both the private and public service sectors is a major step in radiology that will revitalize the quality of diagnostic imaging within the teaching hospital and beyond.

If the envisioned goal of providing proper medical care to the population is to be realized through higher education development and transformation, radiology needs to be placed at the forefront of the overall institutional development goals including contemporary medicine that is characteristic of a proper graduate medical education.

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## **2.5 Pediatric Radiology**



In Ethiopia, children 14 years old or younger make up 46% and those 20 years old or under comprise 60% of the population. These statistics highlight the fact that pediatric radiology is the sub-specialty of radiology that needs prime focus. Any radiology practice in the country will inevitably be confronted with a significant pediatric patient population. These numbers do not only favor the introduction of the sub-specialty of pediatric radiology, but point to the critical need to strengthen the pediatric imaging part of the residency training program. A Pediatric Radiology Fellowship in University of Addis Ababa's Department of Radiology will address some of these pressing challenges. Currently, the primary participants of such a fellowship should be the faculty members of the Department of Radiology and future faculty members of other medical schools with graduate training. The first steps will focus on "teaching the teachers."

### 3.0 CREDITS AND EQUIVALENTS

Required educational activities fellows need to complete by the end of the program?

Activity	Contact Hours	ECTS equivalent	Credit hour/year
Lectures/tutorials and e-learning	300	20	12.25
Seminars/conferences	10	0.4	0.25
Attachments	2560	102.4	62.2

Ser. No.	Attachment activity	Year I	Year II	Contact Hour	ECTS equivalent	Credit Hour
1	Ultrasound	3 months	2 months	800	32	19.4
2	MRI	1 month	1 month	320	12.8	7.8
3	Plain film	2 months	1 month	480	19.2	11.6
4	Fluoroscopy	1 month	1 month	320	12.8	7.8
5	Computed tomography	1 month	1 month	320	12.8	7.8
6	Intervention		1 month	160	6.4	3.9
7	Nuclear medicine		1 month	160	6.4	3.9
	<b>Total</b>	<b>8 months</b>	<b>8 months</b>	<b>2560</b>	<b>102.4</b>	<b>62.2</b>

Research – 6 Months

Leave – 1 month/year

#### **4.0 PROGRAM DURATION**

The training program will have a total duration of two years.

#### **5.0 MODE OF DELIVERY**

The training of the pediatric radiology fellowship program will be based on the six ACGME (United States Accreditation Council on Graduate Medical Education) competencies, namely, patient care, medical knowledge, practice-based learning and improvement, systems-based practice, professionalism, and interpersonal and communication skills.

#### **6.0 COLLEGE INSTITUTION**

College of Health Sciences, Addis Ababa University.

#### **7.0 DEPARTMENT/SCHOOL/CENTER**

Department of Radiology, School of Medicine.

#### **8.0 ADMISSION REQUIREMENTS**

- Submit a written application to the Department of Radiology for the Pediatric Radiology Fellowship. The application needs to be accompanied by current curriculum vitae, at least two recommendations (at least one

being from the current place of work), and a brief descriptive letter on the reasons for choosing the sub-specialty and plans for its future implementation.

- A Doctor of Medicine degree or its equivalent and a specialist certificate in diagnostic radiology from a recognized university or college.
- Must be registered by the Federal Ministry of Health of Ethiopia as a radiologist.
- Should have completed at least two years of practice as a general radiologist.
- Should pass the written and oral entrance examinations administered by the Department of Radiology.
- Must be in good physical and mental health as ascertained by the department for effective practice of the specialty.

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## **8.1 The Interview**

The applicant will be interviewed separately by at least 4 members of the faculty of the Department of Radiology. The group of interviewers needs to encompass the current Chairman, 2 faculty members who are part of the team carrying out the pediatric radiology fellowship and 1 faculty member, other than the 3 nominated by the Chairman. Each interview will be evaluated in writing, using a standard form. In the evaluation, the curriculum vitae, recommendations, and where available, the transcripts from residency, will be considered. At the end, the 4 interviewers will come together to discuss and decide whether to allow the

candidate to sit or not to sit for the entrance examination.

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## **8.2 Entrance Examinations**

1. **Written Examination** - a written examination will be administered. This will make up 50% of the total examination score.
  2. **Oral Examination** - an oral examination will be conducted by at least 2 or more of the faculty members that had carried out the initial interview. At the discretion of the group, they may involve an external oral examiner. The oral examination will make up 50% of the total examination score.
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## **8.3 Final Selection**

The 4 faculty members will reconvene to make a final selection decision based on the following criteria:

1. The candidate must fulfill the above listed requirements.
2. The candidate must pass the entrance examination with a total score of 80% or above.
3. Preference will be given to applicants who show commitment to the manpower needs of Ethiopia.
4. Priority will be given to staff members from teaching hospitals and universities.

## **9.0 PROGRAM AIMS**

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### **9.1 General Goals**

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The goal of the Pediatric Radiology Fellowship Program is to provide sub-specialty training, expose and educate fellows in pediatric imaging, and conduct pediatric problem-solving research that will enable them to be advocates of dedicated imaging for children.

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## **9.2 Specific Goals**

- To train sub-specialists in pediatric imaging who are capable of providing high quality pediatric radiology services.
- To enable the pediatric sub-specialists to conduct appropriate problem solving approaches in the work-up and management of medical and surgical conditions of the pediatric patients.
- To produce sub-specialists who can assist other medical schools in establishing graduate programs in radiology, incorporating an appropriate level of pediatric imaging.
- To have sub-specialists who can participate and provide technical advice to policy makers in the health and graduate medical education systems pertaining to issues on pediatric health and services.
- To work with pediatricians and all pediatric sub-specialists. This includes pediatric surgical sub-specialists, in particular, pediatric surgeons (pediatric neurosurgeons, pediatric urologists, etc.), obstetricians, and all other pediatric services towards optimal care of pediatric patients.

## **10.0 GRADUATE PROFILE/COMPETENCE**

Upon completion of the training, the graduate will acquire the following knowledge, attitude and skills:

- Anatomy, normal variations, development and physiology of the fetus, neonate, infant, child and adolescent.
- Diseases and disease manifestations in the fetus, neonate, infant, child and adolescent of the brain and spine, neck, chest, abdomen, pelvis and extremities.
- An in-depth understanding relevant to medical and surgical management of pediatric diseases of the head, neck, chest, abdomen, pelvis, spine and extremities.
- Special needs of children: examination environment, sedation and child life support.
- Radiation exposure and risks of different imaging modalities.
- Dose reduction techniques in pediatric imaging.
- Use of contrast agents in children.
- Quality control of pediatric imaging studies.
- Organization of a pediatric radiology unit.

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### **10.1 Technical, Communication and Decision-Making Skills**

- Understand the principles of all methods of pediatric diagnostic imaging techniques with particular emphasis on strengths and weaknesses of the different imaging methods for different pathological conditions.
- Be able to communicate and discuss diagnoses with parents, caregivers

and older children.

- **Read and report plain radiography.**
- **Perform fluoroscopy studies tailored specifically for children and their indications.**
- **Perform an ultrasound examination, including color and duplex Doppler of the head, neck, chest, heart, abdomen, musculoskeletal and peripheral vascular structures.**
- **Perform CT examination and tailor the protocol to the specific organ, age and clinical indication.**
- **Identify the need and best type of contrast material for imaging a specific organ or body part according to the clinical indication.**
- **Determine the optimal protocol for injection of contrast agents (rate of injection, dose, and delay).**
- **Experience in the use of workstations for multiplanar and 3D reconstructions based on volume data sets.**
- **Perform common pediatric radionuclide studies and interpret findings to reach a diagnosis.**
- **Conduct MRI examination with the appropriate pulse sequences and be able to interpret findings.**
- **Carry out percutaneous drainage of collections using sonography and/or CT or MRI.**
- **Perform percutaneous biopsy of organs under sonographic and CT guidance.**
- **Perform common angiography examinations.**

- Perform selective embolization of arteries in hemorrhage and for treatment of tumors.

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## **10.2 Conduct**

- Justify and explain the indication and nature of examination to the patient and/or parent.
- Obtain a fully informed consent while performing invasive and interventional procedures.
- Inform the patient, parent or guardian of the results of the examination and evaluate the understanding of the information.
- Maintain good working relationships with referring clinicians.
- Discuss urgent, major or unexpected radiologic findings with referring clinicians.

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## **10.3 Training Duties**

- The Fellow will be involved in and responsible for all aspects of pediatric imaging and intervention under the guidance of the pediatric radiology faculty member(s).
- Conduct inter-departmental sessions with pediatrics, pediatric surgery, obstetrics and gynecology and other clinical specialties and sub-specialties as it pertains to fetal studies or pediatric patients.
- Rotate between plain radiography, ultrasound, fluoroscopy, CT, MRI, interventional units, and when available, nuclear medicine.



- **Guide and supervise radiology residents in pediatric radiology imaging.**
- **Conduct seminars on focused pediatric radiology topics.**
- **Perform and publish at least one original research project with pediatric imaging focus under the mentorship of a pediatric radiology faculty member. At the discretion of the pediatric radiology faculty member additional external advisors may be involved.**
- **Write and submit for publication at least one review article on a pediatric imaging topic.**
- **Write and submit for publication at least two case reports on pediatric imaging findings.**
- **Take part actively in the pediatric teleradiology teaching programs.**
- **Submit a semi-annual evaluation of the fellowship program.**
- **Whenever possible, attend national, regional, and international conferences, particularly those with a pediatric imaging focus.**

## **11.0 INTENDED LEARNING OUTCOMES**

**Trainees are expected to acquire acceptable levels of expertise in the following six competencies:**

- 1. Patient Care**
- 2. Medical Knowledge**
- 3. Practice-based Learning and Improvement**
- 4. Systems-based Practice**
- 5. Professionalism**

## 6. Interpersonal and Communication Skills

### **12.0 TEACHING AND LEARNING APPROACHES**

The Fellow needs to be enrolled in a radiology imaging department that conducts pediatric imaging or has a fully dedicated pediatric imaging unit for a minimum of 24 months of training.

As shown below, multiple teaching methods will be employed to enhance the teaching-learning process.

- Formal lectures, tutorials, seminars, and case presentations.
- On-site training by visiting professors.
- Observership overseas, mainly at the collaborating institution, or its affiliates.
- Online modular courses from collaborating institution or affiliates.
- Participation in pediatric teleradiologic conferences.
- Participation in paper presentations and research.

### **13.0 ASSESSMENT STRATEGIES**

- A formal sub-specialty program coordinator, a fellowship director, and a standing committee will be assigned to discharge responsibility.
- Global evaluation tool will be developed for each rotation by faculty.
- Formative and summative evaluation tools for director, faculty and fellows for semiannual and annual evaluation will be developed.
- Formal lectures and “bed-side” teaching by the pediatric radiology faculty

member(s).

- On-site training by visiting professors.
- Observership(s) overseas in pediatric radiology department(s).
- Mini-fellowship in overseas pediatric radiology departments which allow to actively work.
- On-line modules and courses with the requirement to complete at least the “Cleveland Pediatric Radiology” module.
- Participation in pediatric teleradiology.
- Keep a log book of all pediatric imaging and intervention activities.
- Collect all certificates of attendance of professional meetings or similar undertakings.
- Complete the research and publication requirements outlined above.
- Pass the progressive evaluations during the fellowship.
- Pass the final examination, consisting of both written and oral parts. All attempts will be made to incorporate external pediatric radiologist for this part.

## **14.0 PROGRAM CONTENT AND STRUCTURE**

The curriculum for this training program is designed to meet the highest standards of training in pediatric radiology and will be on an equal footing to training provided in the United States and Canada while at the same time, it is tailored to meet the needs of pediatric practice within the Ethiopian context.

### **14.1 General and Objectives**

Below is a general description of the program on the basis of the six ACGME competency requirements of the United States, namely, patient care, medical knowledge, practice-based learning and improvement, system-based practice, professionalism, and interpersonal and communication skills.

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### **14.2 Patient Care**

Pediatric radiology fellows will primarily learn and practice patient care in its fullest and should address compassion, empathy, and show utmost concern to not only bio-medical problems but also psycho-social ones.

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### **14.3 Medical Knowledge**

Fellows are expected to demonstrate knowledge of established, contemporary as well as evolving biomedical, clinical, epidemiological and social/behavioral sciences. They are expected to achieve this through a variety of modalities inclusive of case-based studies during patient care, lectures, seminars, pathologic conferences, journal clubs, video conferences and similar teleradiologic media.

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### **14.4 Practice-based Learning and Improvement**

Fellows will demonstrate and employ their ability to investigate and evaluate medical problems of their patients. They will appraise and assimilate scientific

evidence and continuously improve patient care based on constant self-evaluation and ever-continuing learning throughout life.

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#### **14.5 Systems-Based Practice**

The goal of encompassing the learning objectives within the context of the health care system and national health policy of Ethiopia will increase the fellows' awareness of holistic health approaches, which will help develop their ability to provide comprehensive care. This will enable them to contribute to overall health care at all levels.

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#### **14.6 Professionalism**

It is highly self-evident that fellows must exhibit strong commitment in discharging their professional responsibilities and adhere to ethical principles in their approach to patients, families, fellow colleagues and other staff members. They are expected to express respect, compassion, and integrity towards their patients and their families. They are also expected to be sensitive and responsive to the diversity of cultural and behavioral issues such as gender, age, ethnicity, religion and physical disabilities.

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#### **14.7 Interpersonal Communication Skills**

Fellows are expected to develop and demonstrate interpersonal and communication skills to impart expedient information to patients, their families, and professional affiliates and colleagues, health care authorities, and other related institutional agencies.

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## **15.0 CURRICULUM MODULE DESCRIPTORS**

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### **15.1 Patient Care**

An important competency requirement throughout the two year program is patient care. This will be incorporated into all of the activities and is an integral part of the lectures, practical attachments, and tele-consultations.

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### **15.2 Theoretical Knowledge (both year one and two)**

Trainees should attend regular sessions of theoretical training in the form of locally delivered tutorials, specialist pediatric radiology imaging courses, as well as local, national and international pediatric radiology imaging conferences including formal lectures and scientific presentations. Trainees will acquire an extensive knowledge of the pathology, frequency and epidemiology of diseases in the pediatric population. They should have a basic knowledge of the treatment of pediatric diseases inclusive of conservative treatment, surgery, radiotherapy and chemotherapy and be aware of the diagnostic needs of their pediatric, surgical, and radiotherapy colleagues.

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### **15.3 Acquired Knowledge**

The graduate will acquire the following knowledge, attitude and skills:

- Anatomy, normal variations, development and physiology of the fetus, neonate, infant, child and adolescent.
- Diseases and disease manifestations in the fetus, neonate, infant, child and

adolescent of the brain and spine, neck, chest, abdomen, pelvis and extremities.

- An in-depth understanding relevant to medical and surgical management of pediatric diseases of the head, neck, chest, abdomen, pelvis, spine and extremities. Read and report plain radiography in the full range of clinical sub-specialties.
- Perform fluoroscopy studies tailored specifically for children and their indications.
- Perform an ultrasound examination, including color and duplex Doppler of the head, chest, heart and abdomen, musculoskeletal and peripheral vascular structures.
- Perform CT examination and tailor the protocol to the specific organ, age and/or clinical situation to be studied. Experience in the use of workstations for multiplanar reconstructions and 3D reconstruction based around volume data sets.
- Perform common pediatric radionuclide studies and interpret findings to reach a diagnosis.
- Conduct MRI examination with the appropriate pulse sequences and be able to interpret findings.
- Carry out percutaneous drainage of collections using sonography and/or CT.
- Perform percutaneous biopsy of organs under sonographic and CT guidance.
- Perform common angiography examinations.

- Perform selective embolization of arteries in hemorrhage and for treatment of tumors.
- Special needs of children: examination environment, sedation and child life support.
- Radiation exposure and risks of different imaging modalities.
- Dose reduction techniques in pediatric imaging.
- Use of contrast agents in children.
- Quality control of imaging studies.
- Organization of a pediatric radiology unit.
- Complete the research and publication requirements outlined above.

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#### **15.4 Interpersonal Communication and Decision-Making Skills**

- Be able to communicate and discuss with parents, caregivers and older children.
- Be able to communicate and interact in a professional manner with colleagues.
- Understand the principles of all methods of diagnostic imaging techniques with particular emphasis on strengths and weaknesses of the different imaging methods for different pathological conditions.

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#### **15.5 Additional Skills**

Maintain the highest standard of ethical principles, utmost compassion, and respect to sensitive issues of religion, gender, ethnicity and disability.



- **Justify and explain the indication and nature of examination to the patient and/or parent.**
- **Obtain a fully informed consent while performing invasive and interventional procedures.**
- **Inform the patient, parent or guardian of the results of the examination and evaluate the understanding of the information.**
- **Maintain good working relationships with referring clinicians.**
- **Discuss urgent, major or unexpected radiologic findings with referring clinicians.**

## **16.0 AVAILABILITY OF ADEQUATE AND QUALIFIED FACULTY**

The appropriate faculty for the fellowship program will be drawn from the collaborating universities in the United States. A committed professor of pediatric radiology, Prof. Kassa Darge, is available from the Children's Hospital of Philadelphia (CHOP), Perelman School of Medicine of the University of Pennsylvania in Philadelphia, USA. He is also an honorary professor of radiology of the Addis Ababa University and honorary staff of the Department of Radiology. He is responsible for organizing all aspects of the pediatric radiology support from the Department of Radiology of the Children's Hospital of Philadelphia and coordinating other external pediatric radiology support. Accordingly, a link with the Department of Radiology of Cornell University for supporting the program has been established. This will be further expanded to other programs. An additional

link has been created with the South African Society of Pediatric Imaging to facilitate hands-on observerships for the fellows and also allow South African pediatric radiologist to take part in the rotating international faculties supporting the program.

The specific support from the CHOP Radiology may include:

- Regular pediatric radiology visiting professorships that will focus on intensive teaching of the pediatric radiology fellow(s) and support monitoring of the teaching activities of the fellow to the residents. In addition, the visiting professorships will be a means for initiating improvements in existing pediatric imaging procedures and for staged introduction of newer techniques and processes.
- Providing teaching cases in digital format.
- Sharing recorded pediatric radiology lectures.
- Teleradiology teaching: this may include regularly reviewing and reporting by the fellow cases submitted by a selected CHOP international teleradiology teaching faculty. It may also involve the submission by a fellow of interesting and unique teaching cases, particularly those ones involving unusual or advanced manifestations of pediatric disorders or endemic diseases.
- Organizing an observership for a fellow at the Department of Radiology, CHOP, for 3 months through the Soroosh Mahboubi fund. All attempts will be made to have the observership during the period of the CHOP continuous medical education course “Pediatric Radiology: State of the Art”.

- **Research co-mentorship: supporting the research and publication activities of the fellow in collaboration with his/her local pediatric radiology mentor.**
- **Advisory function for the pediatric radiology fellowship program.**
- **External examination function: participating in the formulation of the pediatric radiology written examination and taking part in the oral examination.**
- **Co-certification of the pediatric radiology sub-specialty by the Department of Radiology, CHOP.**
- **Supporting the participation of the pediatric radiology program in the activities of the African Society of Radiology and the World Federation of Pediatric Imaging.**
- **Conducting regularly, in collaboration with the Department of Radiology of Addis Ababa University and the Radiological Society of Ethiopia, a national continuous medical education course in pediatric radiology for radiologists, radiology fellows, residents and other clinical specialists and sub-specialists that involves the participation of the local pediatric radiology faculty and the pediatric radiology fellow(s).**

## **17.0 GOVERNANCE AND MANAGEMENT**

The Department of Radiology at AAU will be responsible for the program and the department head will assign a program director for the fellowship program. This position may be filled by someone from the collaborating overseas department

until the Department is in a position to assign one of its own staff, who will qualify after completing the two year fellowship. The program ownership is that of the School of Medicine, Addis Ababa University.

## **18.0 RESOURCE PROFILE**

### **18.1 Educational Resource**

All educational resources will be made available in soft and hard copies by the collaborating universities. Online digital image transfer, communication access to comprehensive journals, pediatric imaging text books, pediatric guidelines, and interaction through video conference with instructors at the counterpart institutions will be in place.

Critically needed resources like appropriate pediatric probes for existing ultrasound machines, additional ultrasound machines with Doppler and appropriate pediatric probes, pediatric biopsy and other interventional accessories, personal computers and/or laptops, including archiving system to facilitate pediatric imaging teleradiology and research activities will be made available by both the host and collaborating universities.

### **18.2 Equipment and Infrastructure**

The department has at its disposal one MRI scanner (1.5 Tesla), one two-slice CT scanner, and two color Doppler US scanners with multiple frequency probe options suited for multiple pediatric applications. It also has a number of mobile

US scanners, two conventional fluoroscopies, one digital radiology and one conventional multipurpose radiography.

Available facilities include Tikur Anbessa Teaching Hospital, the main referral hospital and radiology residency program, as well as the locally affiliated hospitals, namely St. Paul Teaching Hospital, Yekatit 12 Memorial Hospital and MCM Teaching Hospital in Addis Ababa. In addition, overseas institutions as the Children’s Hospital of Philadelphia will be extended teaching facilities.

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### **18.3 Financial Resource**

The financing of the program is mainly the responsibility of Addis Ababa University, but expenses related to observerships by fellows like accommodation, tuition fee and allowance will be covered by the collaborating institution which co-hosts the program; while travel expenses will be the responsibility of Addis Ababa University, expenses relating to visiting supervisors from overseas co-hosting institutions will be shared by both.

## **19.0 INDICATORS OF QUALITY AND STANDARDS; GRADUATION REQUIREMENTS**

The draft program has gone through a series of processes in terms of quality assurance. It has been reviewed internally and has also gone through external review processes by the counterpart institution overseas. It will finally be presented to the “Department Graduate Council” for endorsement and will then be forwarded to the faculty’s educational review committee which upon the

completion of its review will forward to the Academic Commission and pass it up the channel of academic authority up to the College's Council of Graduate Studies and Senate of the University for final approval.

## **20.0 MECHANISMS TO EVALUATE AND IMPROVE QUALITY STANDARDS**

Interim evaluation of the program will be done at the end of the first year which will then be followed by a complete evaluation internally and externally inclusive of the collaborating co-hosting institutions at the end of the fellowship. After that, formal program review will fall within the AAU's legislations.

## **21.0 SUB-SPECIALTY CERTIFICATION/NOMENCLATURE**

The Fellow who fulfills all requirements for graduation shall be awarded a "Sub-specialty Certificate of Pediatric Radiology". The fellow can then be recognized as a subspecialist in Pediatric Radiology. A Sub-specialty Certificate in Pediatric Radiology may jointly be awarded by an external Pediatric Radiology Department in conjunction with the Department of Radiology of Addis Ababa University.

## **22.0 PROPOSED DATE**

Proposed Date \_\_\_\_\_

Signature \_\_\_\_\_

## **APPENDIX**

A detailed course list of pediatric radiology topics just as a guide to select from for the fellowship program (adapted from the contents part of: Caffey's Pediatric Diagnostic Imaging (Eleventh Edition, Thomas L. Slovis, et. al.). Please note that it is not expected that all the listed topics will be covered during the fellowship.

### **Section I: Radiation Effects**

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1. Biological Effects of Diagnostic Radiation on Children.
2. The Acute and Late Biological Effects of Radiation Therapy in the Management of Childhood Cancer.

### **Section II: Prenatal and Neonatal Imaging**

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#### **Part I - Prenatal and Neonatal Airway**

3. Anatomy, Embryology, Physiology of the Airway.
4. Prenatal Diagnosis and Treatment of the Face, Neck, and Airway.
5. Congenital Anomalies and Acquired Lesions of the Neonatal Airway.

#### **Part II - Fetal and Neonatal Lung and Thorax**

6. Anatomy, Embryology, Physiology.
7. Prenatal Diagnosis and Therapy of Chest Anomalies.
8. Congenital and Acquired Lesions (Most Causing Respiratory Distress) of the Neonatal Lung.
9. Tumor, Tumor-Like Conditions (Masses) and Miscellaneous Lesions.

### **Part III - Prenatal and Neonatal Abdominal, Pelvic and Retroperitoneal Imaging**

10. Embryology, Anatomy, and Physiology of the Gastrointestinal and Genitourinary Tracts.
11. Prenatal diagnosis and therapy of abdominal, pelvic and retroperitoneal abnormalities.
12. Indications and Techniques for Neonatal Abdominal Imaging.
13. Congenital Anomalies of the Gastrointestinal Tract.
14. Congenital and Acquired Abnormalities of the Liver and Biliary System.
15. Tumors and Tumor-Like Conditions of the Gastrointestinal Tract, Liver, and Biliary System.
16. Necrotizing Enterocolitis.
17. Miscellaneous Conditions of the Gastrointestinal and Hepatobiliary Systems.
18. Dilated Urinary Tract.
19. Tumors and Tumor-Like Conditions of the Urinary Tract.
20. Vascular Diseases of the Kidneys.
21. Urinary Tract Infection.
22. Miscellaneous Renal and Bladder or Urinary Tract Disorders.
23. The Adrenal Gland.
24. The Genital Tract.

### **Part IV - Prenatal and Neonatal Diseases of the Heart and Great Vessels**

25. Embryology, Physiology, and Anatomy of the Fetal Heart.
26. Prenatal Diagnosis and Treatment of Congenital Heart Disease.
27. Neonatal Congenital Heart Disease Requiring Intervention in the First 28 Days.



## **Part V - Prenatal and Neonatal Central Nervous System Diseases**

28. Embryology and Anatomy of the Central Nervous System.
29. Prenatal diagnosis of Central Nervous System (CNS) Anomalies.
30. Neonatal Brain Imaging.
31. Embryology, Anatomy, and Physiology of the Spine.
32. Prenatal Diagnosis and Therapy of Fetal Spine Anomalies.
33. Ultrasound of the Neonatal Spinal Canal.

## **Section III: Neuroradiology**

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### **Part I - The Skull**

34. Anatomy of the Skull.
35. Craniosynostosis, selected Craniofacial Syndromes and other Abnormalities of the Skull.
36. Traumatic Lesions of the Skull.
37. Infections of the Calvarium.
38. Neoplasms and Neoplasm-like Lesions of the Skull.

### **Part II - The Face and Cranial Structures**

39. The Orbit.
40. The Nose.
41. The Sinuses.
42. Temporal Bone and Ear.
43. The Mandible.

### **Part III - The Brain**

- 44. **Imaging Modalities.**
- 45. **Congenital Abnormalities.**
- 46. **Inherited Metabolic and Neurodegenerative Brain Disorders.**
- 47. **Pediatric Head Trauma.**
- 48. **Infections.**
- 49. **Intracranial Neoplasms.**
- 50. **Intracranial Vascular Abnormalities.**
- 51. **Stroke.**
- 52. **Hydrocephalus.**

#### **Part IV - The Vertebrae**

- 53. **The Normal Vertebrae.**
- 54. **Congenital Malformations.**
- 55. **Vertebral Trauma.**
- 56. **Infections of the Vertebrae and Disk Spaces.**
- 57. **Neoplasms of the Vertebrae.**
- 58. **Miscellaneous Spinal Disorders.**

#### **Part V - Spinal Cord**

- 59. **Imaging Modalities.**
- 60. **Congenital Abnormalities of the Pediatric Spine.**
- 61. **Trauma.**
- 62. **Spinal Cord Infections.**
- 63. **Tumors and Tumor-like Conditions.**
- 64. **Vascular Lesions.**

## **Section IV: The Respiratory System**

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### **Part I - The Neck**

65. Neck and Upper Airway.

### **Part II - The Airway**

66. Larynx and Cervical Trachea.

### **Part III - The Lungs**

67. Normal Lung and Clinical Anatomy.

68. Congenital Lung Malformations.

69. Diseases of the Bronchi and Pulmonary Aeration.

70. Interstitial Lung Disease.

71. Pneumonia and Pulmonary Infection.

72. Immune Disorders.

73. Systemic Disease and Other Miscellaneous Conditions with Lung  
Involvement.

74. Lung Masses.

### **Part IV - The Mediastinum**

75. Mediastinum.

### **Part V - The Chest Wall, Pleura, and Diaphragm**

76. Chest Wall.

77. Pleura.

78. Diaphragm.

## **Section V: The Heart and Great Vessels**

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### **Part I – Introduction**

- 79. The Chest X-ray in Pediatric Cardiovascular Disease.
- 80. Pediatric Cardiothoracic CT Angiography.
- 81. Magnetic Resonance Imaging for Congenital Heart Disease.
- 82. Echocardiography.
- 83. Nuclear Cardiology.
- 84. Introductory Cardiac Embryology.

### **Part II - Congenital Heart Disease**

- 85. Systemic to Pulmonary Arterial Shunt.
- 86. Right Heart Lesions.
- 87. Left Heart Lesions.
- 88. Abnormalities of the Great Artery Origins.
- 89. Congenital Great Vessel Abnormalities.
- 90. Syndromes and Chromosomal Anomalies.

### **Part III - Acquired Cardiovascular Disease**

- 91. Myocardial and Valvular Diseases.
- 92. Pericardial Disease.
- 93. Coronary Artery Disease in Children.
- 94. Acquired Great Vessel Abnormalities.
- 95. Cardiac Involvement by Systemic Diseases.
- 96. Cardiac Tumors.

## **Part IV - Interventional Procedures**

- 97. Pediatric Electrophysiology.
- 98. Surgical Considerations for Congenital Heart Defects.
- 99. Introduction to Congenital Cardiovascular Catheterization.

## **Section VI: The Abdomen, Pelvis, and Retroperitoneum**

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### **Part I - Imaging Techniques**

- 100. Gastrointestinal Tract.
- 101. Genitourinary Diagnostic Procedures.
- 102. Oncology: Imaging GI and GU Tumors.

### **Part II - Abdominal Wall and Peritoneal Cavity**

- 103. Abdominal Wall and its Abnormalities.
- 104. The Peritoneal Cavity.

### **Part III - Hepatobiliary System**

- 105. Introduction to the Hepatobiliary System.
- 106. Congenital Abnormalities.
- 107. Infections of the Liver.
- 108. Diffuse Parenchymal.
- 109. Vascular Abnormalities of the Liver.
- 110. Acquired Biliary Tract Disease.
- 111. Hepatic Tumors and Tumor-Like Conditions.
- 112. The Liver.

#### **Part IV - The Spleen**

#### **Part V - The Pancreas**

#### **Part VI - The Esophagus**

- 115. The Normal Esophagus.
- 116. Congenital Esophageal Malformations.
- 117. Disorders of Deglutition, Peristalsis.
- 118. Acquired Esophageal Lesions.
- 119. Disorders of the Esophagogastric Junction.
- 120. Miscellaneous Esophageal Abnormalities.

#### **Part VII - The Stomach**

- 121. The Stomach: Normal anatomy and Imaging Techniques.
- 122. Congenital Gastric Abnormalities.
- 123. Hypertrophic Pyloric Stenosis.
- 124. Gastritis, Gastropathy and Ulcer Disease.
- 125. Tumors and Tumor-Like Conditions, Bezoars and Varices.

#### **Part VIII - The Duodenum & Small Intestine**

- 126. Normal Anatomy and Imaging Techniques.
- 127. Duodenum: Congenital Anomalies.
- 128. Duodenum: Acquired Obstruction.
- 129. Duodenum: Inflammatory Conditions.
- 130. Duodenum: Tumors and Tumor-like Condition.
- 131. The Small Intestine.

**132. The Small Intestine: Tumors and Tumor-like Conditions.**

**Part IX - The Colon**

**133. Normal Anatomy and Congenital Disorders.**

**134. Functional Disorders.**

**135. Intussusception.**

**136. Inflammatory and Infectious Diseases.**

**137. Tumors and Tumor-like Conditions.**

**Part X – The Adrenal and Retroperitoneum**

**Part XI - The Kidney**

**138. Normal Renal Anatomy, Variants, and Congenital Anomalies.**

**139. Infections.**

**140. Urolithiasis and Nephrocalcinosis.**

**141. Renal Neoplasms.**

**142. Renal Failure and Transplantation.**

**143. Renal Vascular Disorders.**

**Part XII - Lower Urinary Tract**

**144. The Ureter and Vesicoureteral Reflux.**

**Part XIII - The Bladder and Urethra**

**Part XIV - The Reproductive Organs**

**145. Anomalies of Sex Differentiation.**

**146. Abnormalities of the Male Genital Tract.**

147. Abnormalities of the Female Genital Tract.

148. Abnormalities of Puberty and Amenorrhea.

### **Part XV - Abdominal Trauma**

## **Section VII: Musculoskeletal System**

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### **Part I - Imaging of the Soft Tissues**

149. The Soft Tissue.

150. Soft Tissue Neoplasms.

151. Vascular Anomalies of the Soft Tissues.

### **Part II - Normal Anatomy**

152. Normal Anatomy, Growth and Development.

153. Anatomic Variants.

### **Part III - Congenital Malformations**

154. Congenital Malformations of Bone.

155. Skeletal Dysplasia's.

156. Selected Syndromes and Chromosomal Disorders.

### **Part IV - Metabolic and Endocrine Disorders**

157. Metabolic Bone Disease.

158. Endocrine Disorders.

159. Bone Mineral Density Assessment.

### **Part V – Trauma**



160. Skeletal Trauma.

161. Child Abuse.

162. Sports-Related Injury in Children.

**Part VI – Osteochondroses**

**Part VII - Disorders in Alignment**

**Part VIII - Infections in Bone**

**Part XIV - Benign and Malignant Bone Tumors**

**Part X - Imaging of Normal and Abnormal Bone Marrow**

**Part XI - Bone Changes in Diseases of Blood**

**Part XII - The Joints**

163. The Joints.

164. Developmental Dysplasia of the Hip.

**Section VIII: Pediatric Interventional Radiology**

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**Part I - Patient Management**

**Part II – Respiratory**

165. Emphysema and Thoracic Abscess Drainage.

166. Bronchial Artery Embolization.

**Part III - Neurological Interventions**

#### **Part IV - Heart, Great Vessels, and Vascular Access**

- 167. Pediatric Vascular Procedures: Arterial and Venous.
- 168. Vascular Anomalies in Children.
- 169. Vasculitis in Children and Adolescents.

#### **Part V - Abdomen and Gastrointestinal Tract**

- 170. Image Guided Biopsy in Pediatric Patients.
- 171. Gastrostomies and Gastrojejunostomies.
- 172. Drainage of Infected Abdominal Fluid Collections.
- 173. Interventional Radiology of the Liver and Biliary System.

#### **Part VI - Urinary Tract and Retroperitoneum**

- 174. Pediatric Genitourinary Intervention.
- 175. Interventional radiology of renovascular hypertension.

#### **Part VII - Pediatric Musculoskeletal Interventional Procedures**

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