The ASTRO Physics Curriculum: BACKGROUND

- In 2002, the American Society of Therapeutic Radiology and Oncology (ASTRO)’s Radiation Physics Committee appointed an Ad-hoc Committee on Physics Teaching To Medical Residents.
- The main initiative of the committee was to develop a core curriculum for physics education.

RESULTING DOCUMENT

- The document resulted in a recommended 54-hour course.
- Some of the subjects were based on American College of Graduate Medical Education (ACGME) requirements (particles, hyperthermia).
- Majority of the subjects along with the appropriated hours per subject were devised and agree upon by the committee.
For each subject there are learning objectives and for each hour there is a detailed outline of material to be covered.

Some of the required subjects/hours are being taught in most institutions (i.e. Radiation Measurement and Calibration for 4 hours), while some may be new subjects (4 hours of Imaging for Radiation Oncology).
3 LECTURES FOR Treatment Machines and Simulators

A. Linear accelerators
   - Operational theory of wave guides
   - Bending magnet systems
   - Photon beam delivery
   - Electron beam delivery
   - Beam energy
   - Monitor chamber

B. Linear Collimation systems and other Teletherapy
   - Primary and secondary collimators
   - Multileaf collimators
   - Other collimation systems
   - Radiation and light fields (including field size definition)
   - Cobalt units
   - Therapeutic x-ray (<300 kVp)

C. Simulators
   - Mechanical and Radiographic Operation
   - Fluoroscopy and Intensifiers
   - CT Simulation Machinery and Operation

Imaging for Radiation Oncology

Learning Objectives: The resident should learn:
1) the physical principles associated with good diagnostic imaging techniques
2) the rationale behind taking port films, how port films are used in the clinic, and the response characteristics of common films used in the radiation therapy department.
3) the types of portal imaging devices that are available in radiation therapy, the operating characteristics of these various devices, and the clinical application of this technology in daily practice.
4) the physical principles of plannar and physical and limitations as an imaging device, and its application in diagnosis and patient positioning.
5) the physical principles behind CT, MR, and PET scanning, how these modalities are applied to treatment planning, and their limitations.
6) the advantages of one imaging modality over another for various disease and body sites.
7) image fusion, its advantages in treatment planning, the difficulties and limitations associated with image fusion, and how image fusion can be accomplished.

4 Lectures for Imaging for Radiation Oncology

A. Routine Imaging
   - Diagnostic Imaging Physical principles
   - Port Films
   - XV-2 film, EDR-2 film characteristics
   - Processors

B. Other Imaging
   1. Electronic Portal Imaging
      - Overview of electronic portal imaging devices
      - Types of portal imaging devices
      - Clinical applications of EPID technology in daily practice
   2. Ultrasound
      - Physical principles
      - Utility in diagnosis and patient positioning

C. Image Based Treatment Planning
   1. CT scans
      - Physical principles
      - Hounsfield Units, CT numbers, inhomogeneity corrections based on CT scan images
   2. MRI Scanning
      - Physical principles
      - T1, T2, TE, TR imaging characteristics
      - Advantages & limitations of MRI images for diagnosis and computerized treatment planning

D. PET Imaging
   1. Physical principles
   2. Utility for Radiation Therapy
   3. Image Fusion
      - Advantages, Challenges, Techniques, Limitations
To ensure that the subject matter and emphasis remain current and relevant, the curriculum will be updated every two years.

- For example, specific IGRT courses may replace some classical physics.

- Committee is looking at recommendations for on-line supplemental learning

- Committee has not commit on references or specifics on when to teach (1st vs. 2nd vs. 3rd vs. 4th) or how frequent (i.e. 1st and 3rd vs. 2nd and 4th, etc.)