Radiation therapy depends critically on organizing and communicating information. Medical informatics is concerned with the organizational management, acquisition, storage, and retrieval of information for problem solving and decision making in support of patient care, medical education and medical research. It also involves understanding evolving technology and relationships and standards by which this information can be managed. An information system (IS) provides the backbone for communication, documentation and quality control and must integrate all necessary data/images in a seamless, reliable, efficient manner.

As radiation oncology technology and technique have advanced, the IS have become electronic and built on computer networks, which provide data communication between servers and clients, comprised of hardware and software configured in a specific topology. Networks can be connected or divided by switches that route data traffic to correct locations. Communications must be performed through standard protocols with specific information formatting.

The IS integrates and manages the interrelationships of information objects in a seamless, effective manner. The information objects in radiation oncology include patient demographics/notes, diagnostic studies, treatment planning, treatment delivery, record and verify, billing, scheduling, quality control. The simplest IS is the paper patient chart where pen, paper and sneakers represent the communication web. Electronic IS were developed to reduce errors, increase efficiency, automate recording and organize large amounts of information. The organization and interrelationship of information objects is critical in the design of a functional IS. The method by which the information model is built, determines its ultimate success or failure and its longevity. The object-oriented approach is intended to make the IS standard, open and modular and is discussed in the context of DICOM and DICOM-RT. Proprietary tools and secret database formats make universal information integration impossible.

Quality assurance and quality improvement of the IS and the underlying network help manage and maintain accurate, complete and accessible patient data. Quality control procedures and test frequencies for software and hardware must be developed, implemented and documented. Backup and failure recovery must be guaranteed if the IS is to be used in human therapy.

A comprehensive IS will include at least the following, accessible anywhere on the system:

- Patient– demographics, identification, notes, correspondence
- Diagnostic– images, reports
- Therapy– simulation, planning, delivery, validate, verify, billing
- Interface to RT-PACS, PACS using DICOM and DICOM-RT
- Scheduler for all objects
- Backup, failure recovery and routine QA.

Investment of human and capital resources in IS and networks is inevitable and ongoing. The quality and availability of information in the clinic directly influences the quality of patient care. An integrated IS, based on standards and built on an efficient, well-designed network, represents a key component in radiation therapy treatments. If radiation oncology treatments are to continue to become more complex and be successful, the fully integrated electronic IS will be part of it.

Learning objectives:

1. Introduce components and concepts in radiation oncology information systems.
2. Review network hardware, software, topology and protocols.
3. Present sample specifications and questions.