AbstractID: 4131 Title: Quality Assurance of Radiation Treatment Planning Systems: A Significant Challenge?

During the last decade there has been a technological revolution in radiation oncology. Enhanced use of imaging combined with computer-controlled methods of dose delivery provides a capability of escalating tumor doses without increasing morbidity. A pivotal component of this modern technology is the computerized radiation treatment planning system (RTPS) which is used to develop optimal treatment techniques for individual patients. Modern RTPSs make increased use of patient images, possibly from various imaging modalities, enhanced 3-D displays, more sophisticated dose calculation algorithms, more complex treatment plan evaluation tools, combined with the generation of images which can be used for treatment verification. In addition, the implementation of intensity modulated radiation therapy (IMRT) has added a further complexity to the RTPS and this is combined with automated optimization software which is essential if IMRT is going to be used to its best advantage.

In recent years, various national and international organizations have developed reports that have made recommendations regarding the commissioning and quality assurance (QA) of RTPSs. In 1998, AAPM TG53 published guidelines for users and vendors on QA for radiation therapy planning. In 2000, the International Electrotechnical Commission (IEC) produced a report (IEC 62083) specifically on safety requirements for manufacturers of RTPSs. In 2004, both the International Atomic Energy Agency (IAEA) and the European Society of Therapeutic Radiation Oncology (ESTRO) published reports on commissioning and QA of RTPSs. Furthermore, the IAEA is presently in the process of developing a protocol for the acceptance testing of RTPSs. In 2005, the Netherlands Commission of Radiation Dosimetry also produced a report on QA of RTPSs. All of these reports indicate that a thorough commissioning of a modern 3-D RTPS has become a daunting task. This refresher course will look at some of these reports and review issues associated with the commissioning and quality assurance of a modern RTPS.

Educational Objectives:
1. To demonstrate the importance of QA of RTPSs by reviewing significant treatment errors associated with their use.
2. To review the major functionality of a modern RTPS.
3. To highlight and summarize various reports that have made recommendations regarding commissioning and QA of RTPSs.
4. To discuss accuracy requirements and criteria of acceptability of the modern RTPS.
5. To summarize acceptance testing procedures as proposed by the IAEA for a modern RTPS.
6. To provide an overview of commissioning a modern RTPS.
7. To provide an overview of the QA associated with a modern TPS.

Conflict of interest: One of the QA tools described in this presentation was developed by the author and is marketed by Modus Medical Devices Inc.