Quality Assurance

The term quality assurance describes a program that is designed to control and maintain the standard of quality set for that program-in radiation oncology, a QA program is essentially a set of policies and procedures to maintain the quality of patient care. Most QA programs incorporate the standards and criteria developed by international regulatory organizations, such as the NCRP, the ICRP, the ICRU and the IEC.

Goal: Objective systematic monitoring of the quality and appropriateness of patient care. It should be related to structure, process and outcome.
Structure includes the staff, equipment and facility.
Process covers the pre- and post-treatment evaluations and the actual treatment application.
Outcome is documented by the frequency of accomplishing stated objectives,usually tumor control and by the frequency and seriousness of the treatment-related sequelae.
It is recommended that a QA team (comprising radiation oncologist, physicist, dosimetrist, therapist, nurse and administrator) be formed and meet on a regular basis to review the QA program.

Physics staffing: There should be at least one physicist per 300 patients treated. The physicist should be properly trained and certified in medical physics, including clinical training.
The responsibilities of the physicst include:

(1) Equipment selection and specification
(2) Equipment calibration and quality assurance
(3) Treatment planning
(4) Dosimetry
(5) Radiation protection
(6) Academics

A numbers of duties of a physicist can be entrusted to the dosimetrists (who may also be trained radiation technologists)-these include basic tasks like monitor unit calculations and even more complex tasks like simulation.

Equipment:
Teletherapy:

It is necessary to have at least 2 qualities of photon beams-a low –energy (cobalt-60 or 4-6 MV x-rays) and a high-energy (10MV or higher x-rays) as well as a variety of electron energies between 6-20 MeV.

Normally one teletherapy machine per 25 patients is required to allow maximum ease of treatment.

Brachytherapy:

Brachytherapy must be available for a variety of treatments, especially for gynaecologis malignancies. Remote after loaders are ideal for minimizing radiation exposure to personnel and to handle large patient loads. Isotopes normally used are Cs-137 for LDR ICRT, Ir-192 for LDR ISRT and for HDR ICRT and ISRT.

Simulator:

Optimal treatment planning and execution requires the use of a simulator, in both teletherapy and brachytherapy. Nowadays, CT scanning allows virtual simulation.

Mold room:

There should be mold room in every radiotherapy department for construction of customized blocks and immobilization devices.

Acceptance testing:

Before any radiation therapy can be used for the first time, a full set of measurements and calculations must be made to test the accuracy and safety features of the equipment-nly after this, can the equipment be commissioned. These tasks are fully the responsibility of the radiation therapy physicist.

Periodic QA:
Quality assurance must continue to be carried out periodically for optimal performance and safety of the equipment.Different tasks are carried out at different intervals of time.

Common QA tasks required in Teletherapy:

(1) Dosimetry-output constancy (daily for Lineac, monthly for cobalt-60)
PDD/TAR data (annually)
Transmission factors for beam modifiers (annually)
(2) Safety-door interlock & audiovisual monitor (daily)
manufacturer's standard recommendations (annually)
(3) Mechanical-localising lasers & optical distance indicators (daily)
light/radiation field coincidence (monthly)
cross-hair centering (monthly)
latching of wedges, shield trays (monthly)
field size indicators (monthly)
verification of isocentre (annually)

Normally there should be a less than 2% variation from the standard.

Common QA tasks required in Brachytherapy:

(1) Functional performance: console functions, source control, battery voltage, timer, decay correction, multichannel indexer, backup systems, radiation detectors

(2) Facility check and survey: door interlocks, radiation warning lights, patient viewing and communication, radiation survey

(3) Source calibration and transport: check of source specifications, calibration, transport to the applicators, autoradiograph of simulated source positions, isodose distributions