Establishing a Radiation Safety Culture in Health Care

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Increasing Use of Medical Exposure

UNSCEAR (2008):
● The global annual effective dose per capita has increased by about 100% to 0.64 mSv from 1993 to 2008
● >3.600.000.000 radiological procedures annually in the world

NCRP 160 (2009): The annual effective dose per capita has increased by more than 600% from 0.54 mSv to 3.0 mSv from 1980 to 2006.

There is a general trend of rapid increase in medical radiation exposure of the global population.
Increasing availability of radiation medicine to global pop, service scope, advancing technologies, more dependent on medical imaging, …
Radiation Safety Implications

- Increasing population dose - Higher cancer risks to the population
- Increasing risk of radiation incident in medicine - Patient safety and occupational safety implications

Both healthcare administration and healthcare professionals, including the medical physicists have an important role to play in minimizing these risks.
Need for Dose Reduction in Medical Imaging

Medical exposure dose can be minimized through:

- Justification of each medical exposure
- Dose optimization
  - Achieving clinical objectives using the minimum amount of radiation, e.g. use less exposures
  - Use optimized exposure techniques, including optimum kV and MAs parameters, minimize volume of normal tissue irradiation
  - Use low dose or non-ionizing equipment & procedures
- QA measures to ensure equipment quality & on procedure to minimize repeated exposure
- Use of appropriate radiation shields on patient
Potential Risks of Radiation Accident

Numerous reports on radiation injuries in diagnostic and therapeutic radiology happened in different parts of the world. Many incidents and injuries might not have been unreported.
Preventing Radiation Incidents

- Appropriate quality and risk management system should be implemented to build up a robust safety structure and culture in every healthcare system to reduce or prevent radiation incidents/accidents to occur.

- The commitment and support from the hospital/healthcare management and active support and participation of the frontline staff is essential in preventing such incidents.
Establishing a Sense of Safety Culture in Clinics

- All front line staff in radiation medicine (doctors, radiographers, medical physicists, nurses, …) should take active participation in building a sense of safety culture in their routines.

- What is more important is the commitment and support of the hospital management in driving the development of a radiation safety culture. They should:
  - Send a clear message to all staff of the importance of a safety culture in the clinics.
  - Recognize radiation safety is an important part of the hospital quality and risk management system.
  - Provide resources needed, particularly for training.
  - …
Hospital Quality & Risk Management System

Hospital Chief Executive

Hospital Q&RM Committee

Q&RM Committees, other departments

Q&RM Committee, Radiation Oncology

QA Committee

HMC, Health Authority, Media,

Incident Reporting System
Oncology Quality & Risk Management System

Oncology Q&RM Committee

QA Committee

Information & Performance
- Performance reporting
- Disease coding
- Data quality
- Patient resources

Clinical Quality
- Clinical standards
- Clinical protocols
- Service delivery
- Clinical audits

Systems & Risks
- Manpower
- Equipment
- Workload
- Workflow/processes
- Training
- Incidents
Radiotherapy QA Committee

Chairman: Head of radiation oncology or medical physics

Members: Representatives from:
- Clinical teams
- Medical physics
- Radiation therapists
- Nursing
Key Objectives

• Prevent clinical incident (including radiation incident)
• Maintain standard of service quality
  ▪ Prevent systematic errors
  ▪ Avoid/Minimize procedural errors in every process in the radiotherapy service chain.
QA Committee - Responsibilities

• Develop/review QA structure
• Define objectives and quality standard
• Identify service areas, especially areas where QA is critical in preventing clinical incident and maintaining quality standard
• Form QA teams to develop/review specific QA measures/protocols
• Monitor & review QA measures
• Internal & external audit
# Radiation Oncology QA Teams

<table>
<thead>
<tr>
<th>QA Team</th>
<th>Team Member</th>
<th>Key Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical management</td>
<td>ROs, nurse</td>
<td>QA of patient management process, clinical protocols &amp; guidelines</td>
</tr>
<tr>
<td>Patient data</td>
<td>RO, RTT, nurse, Record Clerk</td>
<td>QA of patient data &amp; documentation, record</td>
</tr>
<tr>
<td>Ext. beam treatment</td>
<td>RO, MP, RTTs</td>
<td>QA of external beam treatment delivery</td>
</tr>
<tr>
<td>Brachy. Treatment</td>
<td>RO, MP, RTT</td>
<td>QA of brachytherapy treatment planning &amp; delivery</td>
</tr>
<tr>
<td>Medical Physics</td>
<td>MPs</td>
<td>QA of equipment, radiation dosimetry, treatment plan dose calculation</td>
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Radiation Therapy QA Structure

**Internal Audit**
Terms of ref:
Independent review of QA system, QC protocols and compliance

**RT QA Committee**
Terms of ref:
Design, implement & manage QA system
Define standards/policy
Quality manual
Monitor, review & remedy QA measures

**QA Teams**
Terms of ref:
QA programme
QC protocols
Procedural guidelines
Documentation
Compliance checklist
Review & update

**External Audit**
Terms of ref:
Quality audit of key products/services
Monitoring & Review

The QA teams, including the medical physics team should regularly monitor and review their protocols and make improvement or upgrade whenever:

- New treatment modalities/technologies, e.g. VMAT, SBRT, particle beam are introduced.
- Findings and recommendations of incident reports are available
- New and more efficient or appropriate QA techniques are developed
- Better QA equipment are available
Internal Audit

Heads of units or their delegations to:

• Regular check if the QA and QA procedures are performed according to the respective protocols

• Review of QA data
External Audit

Every hospital should be subject to regular external accreditation by an independent body. (This is mandatory in some countries)

The audit review on:

Service objectives
Work protocols & procedures
Risk & safety management, including radiation safety
Research, development, education & training
Documentation

...
External Audit- IAEA Comprehensive Audit in Radiotherapy

- IAEA Quality Assurance Team for Radiation Oncology (QUATRO)- IAEA audit team comprising radiation oncologist, ROMP and RTT conduct comprehensive audit of RT centre upon request by member state.
External Audit- Dosimetry Calibration

- IAEA-WHO Postal TLD Dosimetry Intercomparison Programme (Radiotherapy dosimetry audit upon request by member state).
- Dosimetry audit by Radiological Physics Centre (RPC), University of Texas MD Anderson Cancer Centre, USA- Pre-requisite for participation in RTOG clinical trials in radiotherapy.
- National/regional multi-centre dosimetry inter-comparison.
Training of Staff

- Staff training is an essential part of quality & risk management system.
- Every staff must be properly trained and qualified for their specific jobs and responsibilities.
- They also need to know hospital & departmental policy & organization structure on quality & safety, including communication & reporting.
- A continued training and development program for members of staff is important, especially when new treatment procedures are introduce to ensure that the defined service quality can be maintained.
Unique Role of MP in Radiation Safety

- Establish & implement or supervise the implementation of:
  - A framework of radiation safety in hospital
  - Radiation safety guidelines
  - Site specific safety rules in radiation workplace
  - ALARA principle in the clinics
  - Contingency planning
- Advise on dose optimization and protection of patient & staff
- Training of staff on radiation safety
Training of Medical Physicists

Guidelines are given in IOMP Policy Statement No.2, IAEA Human Health Series No. 25, …:

• Medical physicists need to have appropriate clinical training in addition to academic degrees before they are qualified to practice independently

• They should undertake a continued professional development program to ensure that they are competent to face future challenges in maintaining quality standard
Thank you!