

18th Annual General Meeting of
Hong Kong Radiation Protection Society
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Establishing a Radiation Safety Culture in Healthcare

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Increasing Use of Medical Exposure

Medical exposure has been the largest exposure to the human population from man-made radiation sources. This has increased significantly during the past decade.

UNSCEAR (2010):

- 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 in the US has increased by more than 600% from 0.54mSv to 3.0 mSv from 1980 to 2006.

Improving service availability, advances in technology, increasing use of image guided clinical procedure, ...



Medical Exposure- An issue of Risk and Benefit

- Essential in patient management- They provide accurate diagnostic information needed for clinical procedures
- Help save lives and improve the quality of life of the cured
- The increasing use of medical exposure is an indication of global improvement in quality of healthcare

The benefits can be realized only if the exposures were justified and made correctly. Are they?

Some quality control and monitoring measures are needed to be implemented in the clinics to ensure this.

Radiation Safety Implications

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

Both healthcare administrations and healthcare professionals, including medical physicists have an important role to play in minimizing these risks.

Dose Reduction in Medical Imaging

Radiation dose in medical exposure can be minimized through:

- Improvement in health technology
- Justification of medical exposure
- Dose optimization
 - Achieving clinical objective using the minimum amount of radiation
 - Optimization of exposure technique, exposure parameters, and volume of irradiation
- QA measures to ensure equipment functionality & proper procedure to minimize errors and repeated exposure
- Use of appropriate radiation protection equipment
- Use of non-ionizing equipment

Campaign for Dose Reduction in Medical Imaging

Campaigning for change in practice to lower radiation dose in medical imaging.



Potential Risks of Radiation Accident

Numerous reports on medical radiation incidents occurred in both developed & developing countries. Many might not have been reported.

Ottawa
Short-staffing led to dosage error
An Ottawa hospital department was alerted by almost half at the time that a calculation error was made that caused hundreds of cancer patients to receive less than required radiation doses over three years.

SKY NEWS
Teen May Die After Radiation
A teenager faces an uncertain future as a hospital gave her a potentially fatal overdose of radiation. Lisa Norris, 15, was given the wrong dose while she received treatment for the Beatson Oncology Centre in Glasgow.

INVESTIGATION OF AN ACCIDENTAL EXPOSURE OF RADIOTHERAPY PATIENTS IN PANAMA
Report of a Team of Experts: 26 May - 1 June 2001

Cancer error well handled
Report says hospital reacted properly following blunder

Accidental Overexposure of Radiotherapy Patients in San José, Costa Rica

Accidental Overexposure of Radiotherapy Patients in Bialystok

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THE RADIATION BOOM
Radiation Offers New Cures, and Warnings
By WALT BOGDANICH
Published: January 23, 2010

As Scott Jerome Parks lay dying, he clung to this wish: radiation overdose — which left him deaf, struggling to swallow, burned, with his teeth falling out, with ulcers and throat, nauseated, in severe pain. He wanted to be studied and talked about publicly so he could live his nightmare.

LESSONS LEARNED FROM ACCIDENTAL EXPOSURES IN RADIOTHERAPY

International Organization for Medical Physics
IOMP

Radiotherapy incidents reported in England under IR(ME)R during 2000-2006 (source: RCR(UK))

Cause	No. of incidents
Incorrect referral information	5
Patient identification error	4
Element of the design or delivery of an individual treatment	167
Inadvertent exposure of a foetus	3
Equipment error rather than human error (and therefore reportable to Health and Safety Executive)	2
Total	181

- ~0.2% of all treatment courses
- Human error is the main cause of radiation incidents
- About 20% of the cases involving a total dose error $> 10\text{Gy}$

IOMP Initiatives on Strengthening Radiation Safety in Medicine

- Strengthening the role of medical physics in radiation protection, particularly in developing countries through education and training
- Strengthening education and training of medical physicists
- Improving the professional status of medical physicists
- International medical physicist certification board
- Raising the visibility and awareness of medical physicists in the medical and public communities
- International Day of Medical Physics (IDMP)
- Collaboration with international statutory and professional organizations



Strengthening the Role of Medical Physicists in Radiation Protection in Medicine

Statement of Collaboration between IOMP and IRPA on the Use of Ionizing Radiation in Health Care

1. INTRODUCTION

In 2010 the International Organization for Medical Physics (IOMP) and the International Radiation Protection Association (IRPA) signed a Memorandum of Understanding as a platform for further joint actions. IOMP and IRPA believe that, whilst each has its specific contributions to the use of radiation in healthcare, collaboration between the two organizations will contribute to the overall joint goal of the safe use of radiation in healthcare without compromising on quality of care.

2. OBJECTIVES

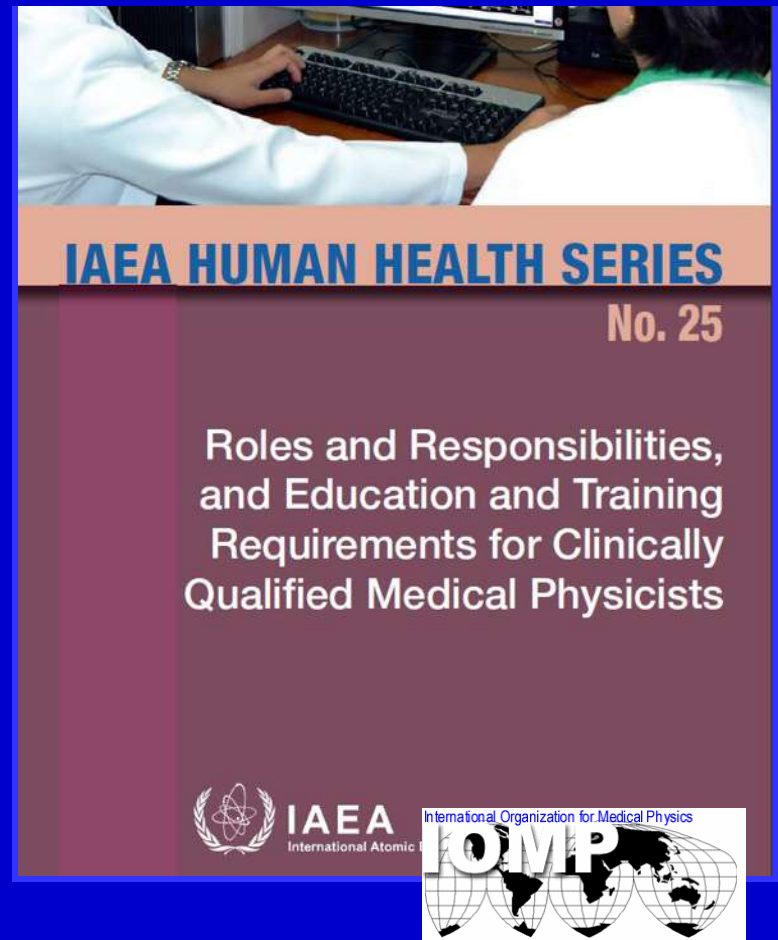
This document refers to the following areas of collaboration:

- a. Develop Guidance for Fostering and Enhancing Radiation Protection Culture in Health Care
- b) Fostering Medical Physics in Developing Countries

Improving Standard of Practice

Two important guidance documents developed by IOMP or contributed by IOMP on education & professional training of medical physicists

**IOMP Policy Statement No.2:
Basic Requirements for
Education and Training of
Medical Physicists**
(www.iomp.org/?q=node/5)



International Scientific Exchange Program (ISEP)

Since 1992, IOMP in collaboration with AAPM conducted a total of 35 training courses/workshops in developing countries:

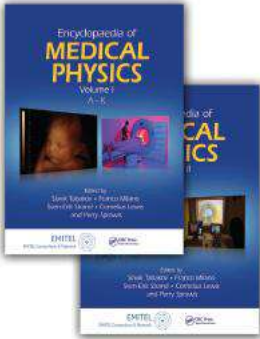

- 22 Therapy Physics courses/workshops
- 13 Diagnostic & Nuclear Medicine Physics courses/workshops

IOMP-AAPM Library Program

Started in 1989, currently 77 libraries in developing countries.

- Solicit donated books and journals & ship to IOMP libraries
- Agreement with Taylor & Francis on publication of IOMP Series (Medical Physics & Biomedical Engineering series):
 - For every new publication in the Series, T&F donate 10 books to IOMP libraries
 - 25% discount for all IOMP members
 - ...

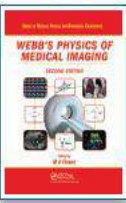
Noteworthy Books in Medical Physics from CRC Press



Encyclopaedia of Medical Physics
Edited by Slavik Tabakov, Franco Milano, Sven-Erik Strand, Cornelius Lewis, and Perry Sprawls

Co-published by the EMITEL consortium and supported by the IOMP, this all-encompassing reference contains nearly 2,800 cross-referenced entries relating to medical physics and associated technologies. Featuring over 100 contributors who are specialists in their respective areas, the encyclopaedia describes new and existing methods and equipment in medical physics. It covers x-ray diagnostic radiology, MRI, nuclear medicine, radiation protection, radiotherapy, and ultrasound imaging. Most articles include references, further reading, images, graphs, formulas, and examples.

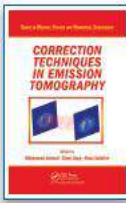
December 2012 | \$719.00 / £458.00 | 908pp
Catalog no: K12085 | ISBN: 978-1-4398-4652-0



Webb's Physics of Medical Imaging, Second Edition
Edited by M.A. Flower

Since the publication of the best-selling first edition, the technology and clinical applications of medical imaging have changed significantly. Gathering these developments into one volume, this comprehensive second edition presents the basic physics, modern technology, and up-to-date examples of clinical application across all the modalities of medical imaging.

June 2012 | \$89.95 / £49.99 | 864pp
Catalog no: IP743 | ISBN: 978-0-7503-0573-0



Correction Techniques in Emission Tomography
Edited by Mohammad Dawood, Xiaoyi Jiang, and Klaus Schäfers

Written by an interdisciplinary team of medical doctors, computer scientists, physicists, engineers, and mathematicians, this volume presents various correction methods used in emission tomography to generate and enhance images.

April 2012 | \$119.95 / £76.99 | 287pp
Catalog no: K10659 | ISBN: 978-1-4398-1298-3

IOMP Official Publications



International Organization for Medical Physics

IOMP

eMPW

Volume 3 Number 2 December, 2012

MEDICAL PHYSICS International
www.MPIJournal.org

Leading the Way in Cancer Therapy.

7 November
International Day
of Medical Physics

Medical Physics World

ICMP 2013

Medical Physics World

IOMP

The central graphic is a globe composed of puzzle pieces, each containing a different image related to medical physics. Logos for IAEA, EFOMP, and VARIAN are visible. The text 'Medical Physics World' and 'ICMP 2013' are overlaid on the globe.



Raising Professional Standard of MP- International Medical Physics Certification Board



(www.impcb.org)

President: Colin Orton (USA)

CEO: Raymond Wu (USA)

Secretary General: Ti-Chuang Chiang (Taiwan)

Chief Examiner: Tomas Kron (Australia)



Raising the Visibility & Awareness of MP in the Communities

- Collaboration with national and international statutory and professional organizations in sensitizing state agencies (especially those in developing countries) on the important role of MP in radiation medicine and their training and developmental needs
- Expand collaborative network with professional medical organizations, e.g. ESR, ESTRO RSNA, ASTRO
- Release of public educational materials
- **International Day of Medical Physics (IDMP)**



The International Day of Medical Physics (IDMP) 7 November



**International Day of Medical Physics
November 7, 2013**

Radiation Exposure from Medical Procedures: Ask the Medical Physicist!

An annual event starting from 2013.

A series of scientific, E&T & media activities are organized globally to:

- Promote the visibility of medical physicists and their role in medicine in the worldwide medical scene
- Raise the awareness of the MP profession

The theme for 2013: “Radiation Exposure from Medical Procedures: Ask the Medical Physicist”



IDMP 2013- Celebration in 23 countries



- Scientific symposia/seminars/activities
- IDMP quizzes
- Press releases
- Webcasts/Videos: Professional & educational
- IDMP Poster
- IDMP T-shirt
- ...

IDMP 2014

“Looking Into the Body-
Advancement in Imaging
Through Medical
Physics”

International Day of Medical Physics
November 7, 2014

Looking Into the Body - Advancement in Imaging
through Medical Physics

IOMP
International Organization for Medical Physics

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Collaborators on Radiation Safety

- IAEA - Collaboration on many projects aiming to strengthening medical physics in radiation medicine, e.g. guideline on role & responsibilities of MPs, syllabus on E&T of MPs, QUATRO, BSS, Advisory Group on Increasing Access to Radiotherapy (AGaRT), ...
- WHO – Signed an MOU and now working towards NGO status to strengthening radiation safety in medicine, appropriate health technology, training and education, joint sessions at international conferences, ...
- IRPA – Signed an agreement on collaboration in education and training of medical physicists and radiation protection officers in medicine in developing countries,
- Collaborating with 84 national member organizations and 6 regional members organizations in promoting medical physics and radiation safety



Joint IOMP-IRPA-WHO workshops/symposia at major conferences

- IRPA AFRIRPA2013
- IOMP ICMP2013
- WHO Forum on Medical Device 2013
- IRPA AOCRP2014
- IRPA AFRIRPA 2014
- WC2015



International Conference on
RADIATION PROTECTION IN MEDICINE
Setting the Scene for the Next Decade

3–7 December 2012
Bonn, Germany



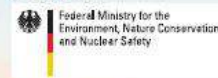
Organized by the



Co-sponsored by the
World Health
Organization

Hosted by the
Government of Germany

through the



www.iaea.org/meetings
CN-192

To address the issues of
radiation safety & protection
in medicine

The Bonn Conference on RP
in Medicine was organized by
IAEA, sponsored by WHO
and German Government
and attended by
representatives from 77
countries and 16 professional
organizations



An important outcome of the Bonn conference was the “Bonn Call-for-Action”

This was the identification of responsibilities and a proposal for priorities for stakeholders regarding radiation protection in medicine for the next decade.

The aims were to strengthen the radiation protection of patients and health workers overall, ... and enhance the safety and quality of radiological procedures in medicine

Bonn Call-for-Action

10 actions have been identified at Bonn:

1. Enhance the implementation of the principle of justification
2. Enhance the implementation of the principle of optimization of protection and safety
3. Strengthen manufacturers' role in contributing to the overall safety regime
4. Strengthen radiation protection education and training of health professionals
5. Shape and promote a strategic research agenda for radiation protection in medicine

6. Increase availability of improved global information on medical exposures and occupational exposures in medicine
7. Improve prevention of medical radiation incidents and accidents
8. Strengthen radiation safety culture in health care
9. Foster an improved radiation benefit-risk-dialogue
10. Strengthen the implementation of safety requirements globally

IOMP Initiatives in Response to Bonn Call-for-Action

Partnership with WHO, IAEA, IRPA, ... in promoting the Bonn Call-for-Action.

One of the key actions identified by IOMP is “**Establishing a Radiation Safety Culture in Medicine**”

What is Culture?

The culture of an organization is the shared attitudes, values, goals, responsibilities and practice amongst all its management and operation staff.

– William Hendee

Establishing a radiation safety culture in a medical organization requires the support from all the management and operation staff.

Establishing a Safety Culture in Medicine

Objective:

- Motivate support and active participation of hospital management and all operational staff on strengthening radiation safety in medicine
- Raise staff awareness on radiation safety while performing clinical procedures
- Raise staff appreciation on the need for implementation of quality and risk management system for patient safety and dose reduction
- To ensure all management and operation staff to share the same values, goals, and practice

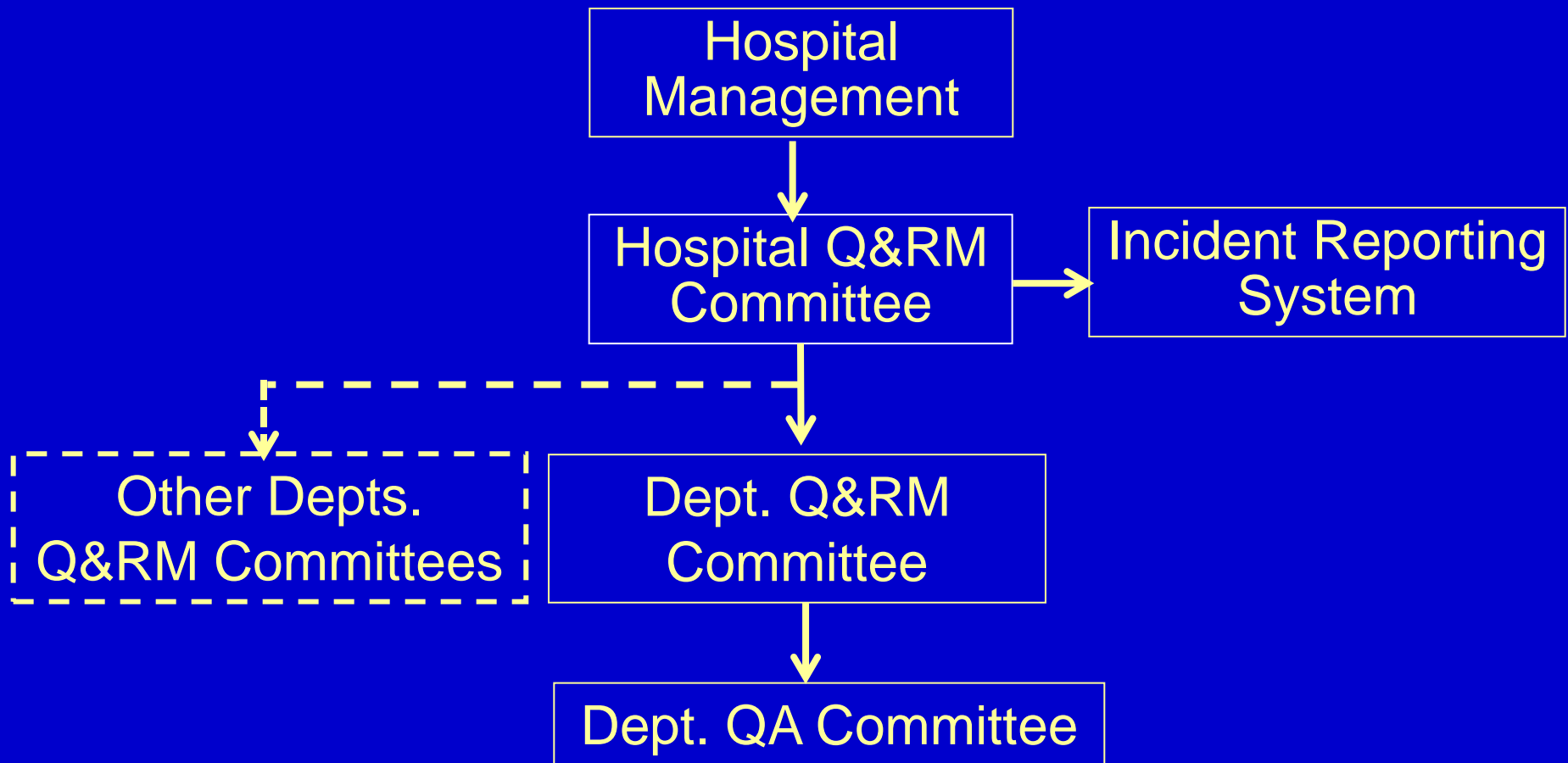
Establishing Radiation Safety Culture in Clinics

- All front line staff should take active participation in building a sense of radiation safety culture in their routines
- Hospital management plays a more important role in driving the development of the safety culture. They should:
 - ❑ Send a clear message to all staff on the importance of radiation 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
 - ❑ ...

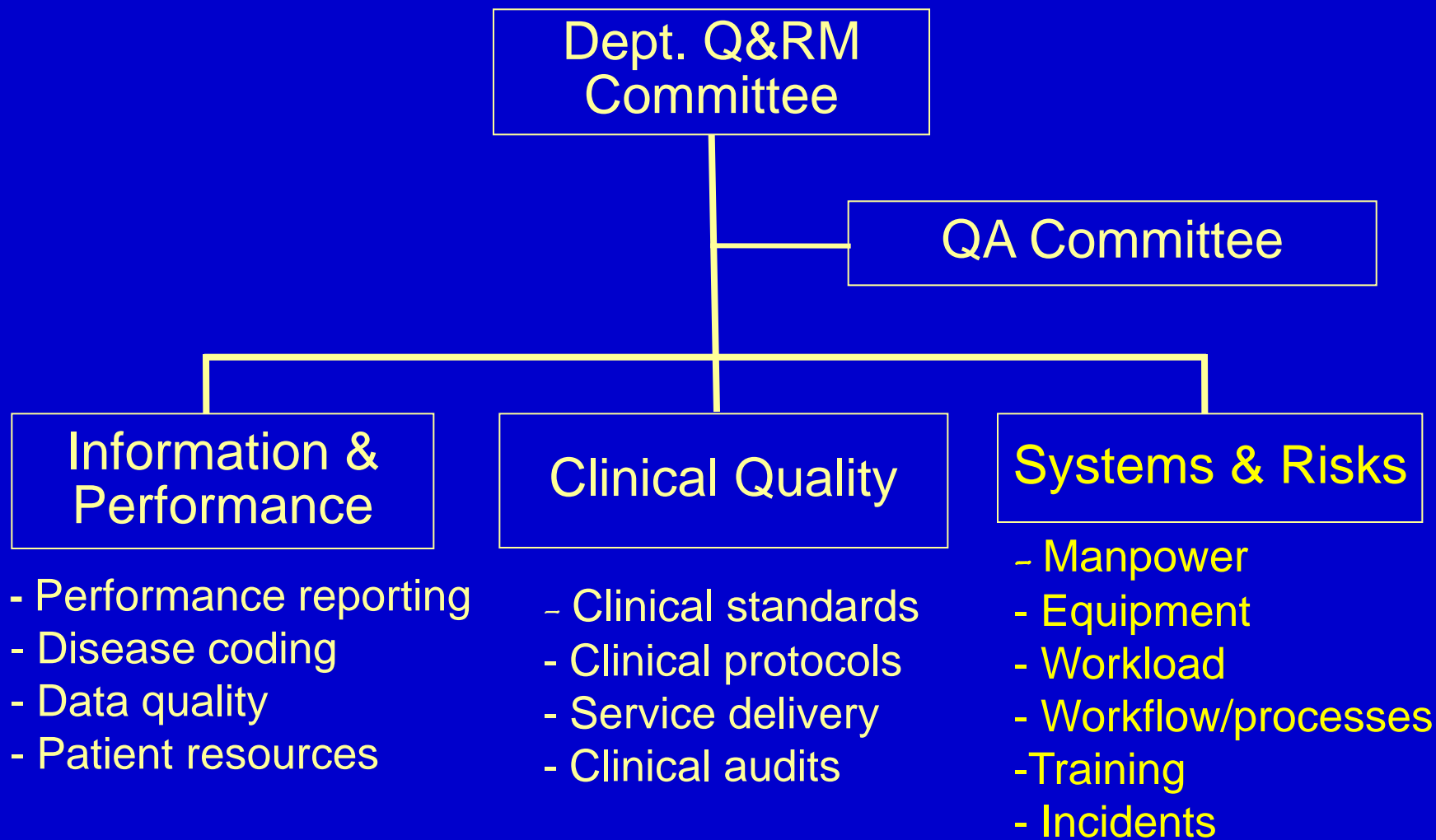
Quality & Risk Management (Q&RM) Structure in Medical Institutions

- Each medical Institution should establish a formal organization structure for implementation and management of quality and safety measures in the clinics
- The structure, its lines of authority, role and responsibility of the hospital management and the individuals in each clinical department/unit. This should be made known to all staff concerned.
- Radiation safety could be incorporated in such system.
- There should be a official mechanism for reporting of incident.

Example: Organization Structure of Q&RM System in a Hospital



Example: Q&RM System in a Department



Example: Radiotherapy Dept. QA Committee

Chairman: Head of department or designation

Members: Representatives from :

Medical QA team

Medical physics QA team

Radiation therapist QA team

Nursing QA team

....

QA Committee- Key Responsibilities

- Define objectives and quality standard
- Identify service areas, especially areas where QA is critical in preventing clinical incident and maintaining quality standard
- Develop/review QA structure, protocols, etc.
- Form QA teams to develop and implement specific QA measures/protocols
- Monitor & review QA measures
- Implement internal & external audit

Example: Departmental QA Structure

Internal Audit

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

Dept 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 own safety and QA protocols and procedures and make improvement or update whenever:

- Change in practice, e.g. when new treatment modalities/technologies are introduced
- Findings and recommendations of incident reports are available
- New/better QA techniques are adopted
- New/better QA equipment are used

Internal Audit

Heads of units/teams or their delegates to:

- Monitor regularly if the QA procedures are performed according to protocols
- Review of QA data
- Provide feedback to QA teams

External Audit

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

The audit review includes (for all clinical specialties & supporting services) :

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

External Comprehensive Specialty Audit in Radiotherapy

- IAEA quality audit team for radiation oncology (QUATRO) conduct comprehensive audit of RT centre upon request by member state.
- QUATRO team comprise radiation oncologist, radiation oncology medical physicist and radiation therapist.
- The team reports on findings and give recommendations for improvement if found needed

External Audit- Radiation Dosimetry

- IAEA-WHO Postal Dose Audit for Radiotherapy Centres is a TLD dosimetry intercomparison programme.
 - The radiotherapy dosimetry audit service is available upon request by RT centres in member state.
- Alternatively, RT centres can amongst themselves establish a national or regional multi-centre dosimetry inter-comparison programme as a means of external audit.

Training of Staff

- Staff training is an essential part of quality & risk management system, particularly on dose reduction/optimization
- Every staff must be qualified for what he does
- They also need to be familiarized with hospital and departmental policy and organization structure on quality and safety, including communication & reporting system
- Adequate training should be provided to staff when new procedures or technologies are introduced to ensure that the defined service quality can be maintained
- A continued training and development program for staff members is important to ensure staff are ready to face new challenges

Summary

- Implementation of a system of patient dose optimization and procedural QA is warranted in radiation medicine in view of the escalating medical exposures in recent years
- Such a system should be formally incorporated in the hospital safety and risk management system
- Successful implementation of the system in the clinics demands support from both management and frontline staff
- Establishing a radiation safety culture in healthcare is one of the 10 actions identified by Bonn-Call-for-Action to motivate participation and support for radiation safety and patient dose reduction in medical exposure
- IOMP in collaboration with IAEA, WHO, IRPA, ... is promoting such culture in healthcare

Thank you!