Ethical Dimension of the Radiological Protection System

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Activities involved radiation
Radiation application

- Medical application
- Non destructive testing
- Power supply
- Electricity generation
- Food irradiation
• Radiation protection can no longer be treated as an isolated practice

• The growing applications of ionising radiation in various industries demand a network of practitioners with strong sense of responsibility for radiation safety

• In strengthening radiation protection culture, involved:
  - different groups and
  - specialised services in related field
Radiation Protection in Workplace

- About 24000 radiation workers in Malaysia
- In various application such as medical, industry, research institute, education and others

![Radiation Worker in Malaysia](chart)

- Medical: 60%
- Industry: 37%
- Other: 3%
International Commission on Radiological Protection (ICRP)

Principles of Radiological Protection

- The Justification of practices
- The Optimisation of Protection (ALARA)
- Individual Dose and Risk Limits
The Optimisation of Protection

- In relation to any particular source within a practice:
  - the magnitude of individual doses,
  - the number of people exposed,
  - the likelihood of incurring exposures where these are not certain to be received

Should be kept as low as reasonably achievable, economic and social factors being taken into account.

- This procedure should be related to
  - the dose to individuals (dose constraints),
  - the risks to individuals in the case of potential exposures (risk constraints)
Is patient a female of reproductive age?

**YES**

Will primary beam irradiate the pelvic area, or does the procedure involve radioisotopes?

**YES**

Can the patient exclude the possibility of pregnancy?

**NO**

Is menstrual period overdue? ("28 day rule")

**NO**

Is it a high dose procedure?

**NO**

Will examination take place in first 10 days of menstrual cycle? ("10 day rule")

**NO**

If patient were pregnant, could examination wait until after delivery?

**YES**

Re-book patient for first 10 days of next cycle.

**NO**

**Record result & proceed with examination**

**Proceed with examination**

**Record result and proceed with examination**

**Review justification for procedure. If proceeding, keep fetal dose to minimum.**

**Record result and proceed with examination**
Individual Dose and Risk Limits

- The exposure of individuals resulting from the combination of all the relevant practices should be subject:
  - to dose limits,
  - to some control of risk in the case of potential exposure.

- Not all sources are susceptible of control by action at the source and it is necessary to specify the sources to be included as relevant before selecting a dose limit.

- Prevent deterministic effects & Limit risk of stochastic effects to acceptable level.
### Effective dose

The effective dose to the embryo or foetus is limited to 1 mSv.

### Annual equivalent dose

- **the lens of the eye**: 150 mSv
- **the skin (4)**: 500 mSv
- **the hands and feet**: 500 mSv

1. The limits apply to the sum of the relevant doses from external exposure in the specified period and the 50-year committed dose (to age 70 years for children) from intakes of radioactive nuclides in the same period.
2. With the further provision that the effective dose should not exceed 50 mSv in any single year.
3. In special circumstances, a higher value dose could be allowed in a single year, provided that the average over 5 years does not exceed 1 mSv in any single year.
4. The limitation on the effective dose provides sufficient protection for the skin against stochastic effects. An additional limit is needed for localised exposures to prevent deterministic effects.
ICRP’s Three Types of Exposure

- Occupational
- Medical
- Public
Occupational exposure definition

All exposures of workers incurred in the course of their work, with the exception of exposures excluded from the Standards (BSS) and exposures from practices or sources exempted by the Standards.
Regulations Stipulated Under ACT 304

- P.U. (A) 149 Radiation Protection (Licensing) Regulations 1986
- P.U. (A) 206 Atomic Energy Licensing (Appeal) Regulations 1990 (English & Malay)
- P.U. (A) 456 Radiation Protection (Transport) Regulations 1989
- P.U. (A) 145 Radiation Protection (Transport)(Amendment) Regulations 1991 (English & Malay)
- P.U. (A) 46 Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010 (English & Malay)
- P.U.(A) 274 Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011 (English & Malay)
The Basic Safety Standards

- Responsibilities
- Conditions of service
- Classification of areas
- Local rules and supervision
- Personal protective equipment
- Co-operation between employers registrants and licensees
- Individual monitoring and exposure assessment
- Monitoring of the workplace
- Health surveillance
- Records
- Special circumstances
Medical Exposure

- “exposures incurred by individuals as part of their own medical diagnosis and treatment.”
- “and . . . individuals helping in the support and comfort of patients undergoing diagnosis and treatment (not occupationally) . . .”

- No dose limits apply
- Consider dose constraints
Public Exposure

- Limits apply to exposures from human activities
- 1 mSv a year effective dose
  - in special circumstances, average over 5 years
- 15 mSv a year to lens of eye
- 50 mSv a year to 1 cm\(^2\) of skin
  - (i.e 1/10 of worker limit)
Ethical Dimension
LIAISON AND COOPERATION (ICRP, Code of Practice, Law under Delegation Authority and Local Rules)
• To understand essential elements and concepts to be addressed in legislation applied in RADIATION SAFETY and RADIATION PROTECTION.

• To appreciate the roles and responsibilities of regulatory authorities, licensee (operating agency), manufacturer and other related bodies.

• To understand the relationship between licensor – licensee – staffs, regulatory and operating agencies.
Delegation Of Authority

- Authority is a vehicle for Radiation Protection Officer
  - Covers Radiation Safety Program Actions including
    - Initialization
    - Recommendations
    - Corrections
    - Compliance
    - Add the oversight of Ionizing Radiation Equipment
Relationship with Other Organisations

- Maintain good rapport with licensee and appropriate national organisations
- Establish good networking with national and international establishments
- Hierarchical communication and dissemination of information
- Service delivery system to address the need of stakeholder
  - efficient, effective and ethical
  - continual improvement
Radiation Protection Committee

• Assist the organisation in term of expert advice in addressing issues and problem solving both at national level and agency level

• Members comprising the expert and practitioner, can be within or outside organisation, appointed by the government at national level and the licensee at agency level
Line of Communication

Regulatory Body
- Regulation, standard and procedures
- Guidelines
- Code of practice
- Advisory materials

Operating Agency

National Committee
- Expert advice and recommendation

Safety Committee
- Radiation protection program
- Expert advice and recommendation
- Code of conducts
Safety Communication Hierarchy at Agency Level

Radiation Protection Committee

Person Responsible Toward License

RPO

RPS

OPERATOR/RAD. WORKERS
Radiation Safety Program

- **Measure**: Tools and processes to systematically track public and occupational radiation exposures.
- **Analyze**: Independent assessment to identify highest priority opportunities to optimize radiation dose or minimize occupational exposure at the facility.
- **Optimize**: Implement tailored radiation safety “best practices” to address evolving technology, safety and regulatory needs.
Optimization of protection

- Unacceptable
  - Risk/dose
  - Dose limit

- Source related constraints

- Tolerable

- Optimized working procedures

- Acceptable

- Occupational exposure
Opportunities for dose management are numerous, fragmented and can be overwhelming.

Responsible Imaging enables clients to transform many fragmented dose management opportunities into a comprehensive picture, and focus on those that are complimentary and address your evolving needs.
Evolving Technology, Regulatory And Safety Needs....

<table>
<thead>
<tr>
<th>TECHNOLOGY</th>
<th>REGULATORY</th>
<th>SAFETY</th>
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</thead>
<tbody>
<tr>
<td>• Rapid evolution of equipment</td>
<td>• ACT and regulations stipulated under the ACT</td>
<td>• Radiation safety Manuals</td>
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<td>• Dose reduction features and</td>
<td>• Accreditation requirements</td>
<td>• Local Rules</td>
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<td>software</td>
<td>• Code of practices</td>
<td>• International</td>
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<td>• Exposure alerting system</td>
<td>• Congressional / Public Hearings</td>
<td>recommendations</td>
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<td>• Standard Dose Registry</td>
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<td>• Consumer Reports</td>
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<td>• Independent radiation dose</td>
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<td>on hazard and risk</td>
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<td>tracking software</td>
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<td>and measurement solutions</td>
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...leaves healthcare leaders wondering

“What Should I Do About Radiation Dose???”
Radiation Safety – One of A Growing National Concern

- Awareness
- Local Intervention
- National Regulations
- Self-Regulation
- Government Authority

**Training**
- Hazard & Risk
- Safety Culture Assessment

**Program**
- Monitoring
- SOPs / Protocols

**Law**
- ACT and Regulations
- Accreditation requirements
<table>
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<tr>
<th>Suggested Action For Practices Quality Improvement (PQI)</th>
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<tbody>
<tr>
<td><strong>Right Procedure</strong></td>
</tr>
<tr>
<td>• Techniques can be used</td>
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<tr>
<td>• Education</td>
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<tr>
<td><strong>Right Dose</strong></td>
</tr>
<tr>
<td>• Adhere to ALARA and quality of work</td>
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<td>• Review dosing protocols</td>
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<tr>
<td>• Record the dosage or exposure</td>
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<td><strong>Effective Processes</strong></td>
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<td>• Password – protect protocols</td>
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<td>• Involve the RPO in safety at workplace</td>
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<td>• RPO will be the member of Safety Committee</td>
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<td>• Proper Training For all staffs</td>
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<tr>
<td><strong>Safe Technology</strong></td>
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<tr>
<td>• Audit equipment for potential risks</td>
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<tr>
<td>• Have equipment inspected by qualified person</td>
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<tr>
<td><strong>Safe Culture</strong></td>
</tr>
<tr>
<td>• Refer to applicable standard</td>
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Chain Established In Radiation Safety

<table>
<thead>
<tr>
<th>1. Leadership Safety Values and Actions</th>
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<td>Leaders demonstrate a commitment to safety in their decisions and behaviors</td>
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<th>2. Problem identification and Resolution</th>
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<td>Promptly and fully identify, evaluate, and correct safety issues commensurate with significance.</td>
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<th>3. Personal Accountability</th>
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<td>Take personal responsibility for safety.</td>
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<th>4. Works Process</th>
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<td>Plan, implement, and control work activities so that safety is maintained.</td>
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<th>5. Continuous Learning</th>
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<td>Seek out opportunities to learn and implement ways to ensure safety.</td>
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<th>6. Environment for Raising Concerns</th>
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<td>Encourage raising safety concerns without fear of retaliation, intimidation, harassment, or discrimination.</td>
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Chain Established In Radiation Safety cont.

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<td>Maintain a focus on safety.</td>
<td>Permeate trust and respect through the organization.</td>
<td>Avoid complacency and continually challenge existing conditions to identify discrepancies that might result in inappropriate action.</td>
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Establishing adequate and proper communication By MARPA
THE ROLE OF MARPA:

- Encourage activities and information exchange in RP field
- Assist in informing both the public and professionals on the problems and requirement related to radiation protection
- Promote professional training in radiation protection
- Operate with other body or association at national or international level
- Networking: Exchange information and experience
- Promote professional training in radiation protection