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Radiation Protection Officer (RPO) Role Descriptor for Radiographers

2020

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Procedure

In March 2016, the EFRS outlined its recommendations regarding the national implementation of the Basic Safety Standards Directive (BSS 2013/59), (1) which emphasised the need for national radiography societies to define detailed roles and responsibilities of the Radiation Protection Officer (RPO) and to establish education, training and retraining options, to ensure the RPO role can be recognised (Article 14:3) as a radiographers' role. Further to this aim, in December 2016, the EFRS requested member organisations to: a) agree and detail specific roles and responsibilities of the RPO within the medical exposure setting and communicate these to the national competent authority; and b) agree and define education, training and retraining requirements for the RPO role for radiographers and again communicate these with the competent authority (2).

To this end, in October 2018 the EFRS established a Radiation Protection Officer Descriptor Working Group with the following Terms of Reference. The EFRS General Assembly (GA) have asked the EFRS to produce an RPO European Qualifications Framework (EQF) benchmarking document so that this role can be further defined in terms of knowledge, skills, and competences. This could support radiographers in many countries in being formally identified or appointed as RPOs. This also follows the ongoing work of the EFRS to publish benchmarking documents for Level 6 (Bachelors) and Level 7 (Masters) qualifications (3,4).

The EFRS feel strongly that the RPO role for radiographers is essential to the medical exposure setting – although not specified within the BSS Directive – as a means to further encourage a culture of patient safety within radiography and also to promote best practice in radiation protection. This document aims to elaborate on the above recommendations.

This document draws upon, and adapts, guidance produced by Heads of the European Radiological Protection Competent Authorities (HERCA): European Guidance on the Implementation of the Requirements of the Euratom BSS with respect to the Radiation Protection Expert (RPE) and the RPO to provide a specific focus on the radiographer's role as an RPO in the medical exposure setting.

Purpose of this document

The purpose of the European Qualifications Framework (EQF) Radiation Protection Officer (RPO) Document is to serve as a benchmark to:

- Define the radiographer role as RPO;
- Define RPO in terms of knowledge, skills, and competences;
- Support radiographers in many countries in being formally identified or appointed as RPOs;
- Inform readers about the EFRS membership agreed RPO criteria for the radiography profession in Europe;
- Be the point of reference for use by professional bodies, educational institutions, employers, and other relevant bodies throughout Europe.

Background information

According to the Council Directive 2013/59 EURATOM of 5 December, RPO "means an individual who is technically competent in radiation protection matters relevant for a given type of practice to supervise or perform the implementation of the radiation protection arrangements" (1).

According to the European Commission Report 175, the education and training in Radiation Protection should be mandatory for all the professionals involved in imaging modalities that use ionising radiation taking into account the regulatory requirements, local rules and procedures (5).

According to 2013/59 EURATOM depending on the nature of the practice RPO tasks can be the following:

a. ensuring that work with radiation is carried out in accordance with the requirements of any specified procedures or local rules;
b. supervise implementation of the programme for workplace monitoring;
c. maintaining adequate records of all radiation sources;
d. carrying out periodic assessments of the condition of the relevant safety and warning systems;
e. supervise implementation of the personal monitoring programme;
f. supervise implementation of the health surveillance programme;
g. providing new workers with an appropriate introduction to local rules and procedures;
h. giving advice and comments on work plans;
i. establishing work plans;
j. providing reports to the local management;
k. participating in the arrangements for prevention, preparedness and response for emergency exposure situations;
l. information and training of exposed workers;
m. liaising with the radiation protection expert.

RPO competence and suitability

The RPO needs to have an understanding of radiation protection principles and arrangements that are relevant to the practice they are involved with. It follows that, to be competent in the role, the RPO will need to have a practical understanding of the principles of radiation protection, the relevant regulatory requirements and operational arrangements.

In addition to having the knowledge and understanding described above, an RPO will need to be effective in the roles of supervision, communication and local management. Since radiation protection is part of the general Health and Safety structure, the RPO should have a direct communication channel with the Health and Safety managers within the undertaking. This will ensure that an independent channel is in place for the reporting of radiation safety issues to the appropriate managers and will facilitate the implementation of corrective measures. To carry out the required functions, the RPO will need to command respect and be in a position of authority or have local management responsibility for the work being undertaken.

The RPO needs to have competence, communication and managerial skills and line management position in relation to the work being supervised.

The duties of the RPO

Employees appointed to act as RPO will need to have an adequate level of understanding of concepts related to radiation protection and should also be acquainted with the safe and secure use of radiation sources as relevant to the application (2,3,6,7).

Technical

- Develop, implement, maintain and monitor a radiographer-led quality assurance (QA) programme for the imaging department in conjunction with medical physics expert (MPE) and the Radiation Protection Expert (RPE).
- Establish, coordinate, and lead a QA team (where applicable).
- Organise the routine personnel radiation monitoring of staff. Maintaining individual radiation dose records for all monitored staff and submitting reports as appropriate.
- Organise, in conjunction with the RPE, routine risk assessment in relation to the working environment, staff doses, potential doses to members of the public and non-monitored staff.
- Together with the RPE, implement a system for recording, and learning from, errors and incidents.
- Develop and implement a system to establish and systematically review Diagnostic Reference Levels (DRLs).
- Lead /be involved in conducting investigations when DRLs are exceeded and taking corrective actions where appropriate.
- Develop and implement a system to ensure all personal radiation safety devices are checked annually for faults/deficiencies.
- Liaise with service providers / manufacturers / service managers regarding the routine service and maintenance of radiographic equipment.
- Develop and implement a record keeping system whereby all technical duties are recorded and appropriately addressed.
- Advise on the selection, purchase, replacement or upgrading of appropriate QA equipment in conjunction with the RPE / Radiography Services Manager (RSM).

Implementation of Legislative Requirements (Policy and Procedure)

- In conjunction with the RPE, create, maintain and update a departmental radiation safety manual and policies; making sure these are accessible to all.
- Ensure all legislative requirements, regulatory body guidelines, licensing requirements and accepted best practice guidelines are fulfilled and represented by the policies and procedures of the facility.
- Ensure structures are in place to record all relevant information relating to all radiation policy for the purposes of inspection, investigation, external report and audit.
- Ensure adequate radiation protection-related clinical audit structures are in place.
- Liaise with radiation safety committee members responsible for radiation safety in other areas of the hospital.
- Assist in the development of risk management and health and safety strategies in association with appropriate personnel within the hospital.

Education and Research

- Participate in research activities consistent with the position. This should include the promotion and participation in research projects involving radiation safety. It should also include participation in clinical audits as relevant to the post.
- Maintain up to date knowledge of recommendations, legislation, relevant guidelines and standards pertaining to ionising radiation.
- Attend approved courses to improve the knowledge base and to keep up to date with current advances in the field and with changes to the legislative requirements as part of their own continuous professional development (CPD).
- Ensure, in collaboration with the RSM and the RPE, that each monitored member of staff receives appropriate radiation safety induction and updates where necessary.

- Ensure, in collaboration with the RSM and the RPE, all un-monitored staff are adequately informed about the hazards of radiation, potential occupational exposures and associated risks.
- Be involved in the education of authorised referrers for examinations involving ionising radiation.
- Be involved in the education of designated medical specialists and the delivery of radiation safety courses.
- Ensure all radiation protection training/education and updates are appropriately recorded for audit / review purposes.
- Lead learning opportunities and processes arising from reported radiation incidents, errors, and near misses.
- Provide advice on the selection, purchase, or replacement of imaging equipment, protective shielding devices, and accessory equipment, both in the main department and across the site.

Primary duties of the Radiation Protection Officer

Duty	Main actions
Ensuring work carried out in accordance with local rules	Carry out close supervision of the work activities associated with sources of ionising radiation and ensure that the radiation safety procedures/local rules are followed. Provide guidance and instruction to the workers healthcare professionals and other workers to ensure safe working, including appropriate use and care of personal protective equipment.
Supervise programme for workplace monitoring	Carry out or oversee the periodic dose, dose rate and/or contamination monitoring in the work environment, particularly in controlled areas and in areas where radioactive sources are stored or used. Maintain a record of the monitoring results. Review the results of the monitoring and initiate any required remedial actions.
Maintain radiation source records	Maintain the radioactive source accountancy record and ensure that it is always up-to-date. Enter the details of any new radioactive sources and record disposal details of old sources. Carry out or oversee the regular checks on the location of the radiation sources in the practice and enter details in the source accountancy record. Implement the relevant actions in the event of a source going missing.
Carry out periodic assessments of safety and warning systems	Oversee or carry out periodic checks on the satisfactory operation of interlock systems and visual/audible warnings. Maintain a record of these checks and arrange for the repair of any faulty systems. Take similar responsibility for the periodic checking of personal protective equipment and other shielding devices, and evaluation of its adequacy (in consultation with the RPE). Take appropriate action where faults/deficiencies are found.
Supervise personal monitoring programme	Oversee the provision of personal dosimeters to the relevant workers and maintain the associated dose records. In collaboration with the RPE, initiate a review of any unusually high recorded doses and promptly investigate any overexposures. Arrange the pre-classification medical examination for new workers and the periodic health review for all category A workers (where relevant).

Duty	Main actions
Provide new workers with introduction to local rules and procedures	Explain the content of the radiation safety procedures/local rules, radiation safety policy and associated procedures to all workers. Ensure that they have read the local rules and understand the safety procedures they must follow.
Advising on work plans	Provide advice to management on the radiation protection implications of any new work plans or proposed changes to existing work plans. Where any new plans or changes to existing plans have potential dose significance, advice should also be obtained from the RPE.
Establishing work plans	In collaboration with the RPE, draw up any required new work plans to ensure doses to workers and members of the public are optimised.
Providing reports to local management, regulators / competent authorities	Periodically provide reports to the local management giving an update on the current status of the radiation protection arrangements in the workplace, and the level of radiation doses being received by the workers. Promptly report any potential incidents, high dose or overexposures. Provide recommendations on actions needed to optimise the radiation protection arrangements. Take account of the recommendations of the RPE. To underpin this duty the RPO should take a lead role in all relevant audits of practice relating to radiation safety.
Participating in emergency exposure response arrangements	Carry out the actions specified for the RPO in the exposure response arrangements, including providing input to arrangements for prevention, preparedness and response for emergency exposure situations. This will include providing input to risk assessments associated with the use of ionising radiation and investigation into dRLs being consistently exceeded.
Management and reporting of radiation incidents	As part of the above, the requirement to oversee, keep appropriate records, and report incidents. Provide information and participate on the investigation of examination dose levels, according to BSS roles. The RPO must be involved in incident investigations, for example when DRLs are consistently exceeded.
Provide information and training for exposed workers	Provide or arrange for relevant information and training to be provided. Ensure retraining is provided at appropriate intervals. The RPO should ensure that they themselves receive regular updates and retraining, particularly regarding updates in legislation and professional guidance.
Liaise with the RPE	Provide the RPE with regular updates on the status of radiation protection in the practice. Promptly inform the RPE of any unusual high exposures or overexposures to persons, and significant changes to work practices that will have radiation dose implications. Consult the RPE on the radiation protection aspects of new equipment or proposed work plans.

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Core Learning outcomes in radiation protection		
Fundamental concepts and dose descriptors		
K1. Explain physical principles of radiation generation, interaction, modification and protection; K2. Expain radiation physics, radiation hazards, radiation biology and dosimetry; K3. Be aware of the mechanisms of ionising radiation production and detection; K4. Understand the diagnostic and treatment dose descriptors per modality; K5. Explain the physical principles of radionuclides production and shielded; K6. Understand biomedical physics underpinning the scientific, effective, safe and efficient use of medical devices used in medical imaging and radiation therapy; K7. Explain exposure in patients and staff;	S1. Use devices which can be used to monitor and also minimise radiation dose; S2. Use all relevant equipment; S3. Analyse stochastic and tissue effects; S4. Be able to carry out measurements using dose rate and contaminations monitors; S5. Use and record the integrated dose descriptors and checks the measured values against DRLs and/or threshold doses for tissue effect in order to prevent deleterious effects on patients whenever possible;	C1. Carry out periodic assessments of dose values per procedure; C2. Compare dose measurements readings or equivalent to National or European DRLs; C3. Calculate and analyse the radiation risk taking into account the diagnostic or treatment conditions; C4. Analyse and compare staff dose measurements according to the clinical practice; C5. Guarantee the use of proper equipment and measurements to promote safety;
Biological effects of ionising radiation and risk communication		
K8. Explain the mechanism of DNA damage due to ionising radiation; K9. Describe the cellular effects of radiation and mechanisms of cell death; K10. Explain the cell survival curves; K11. Explain the effects of oxygen, sensitizers and protectors;	S6. Recognise the complicated situation pertaining to radiation protection regarding scientific knowledge on the one side and societal concern and personal emotions on the other side; S7. Lead the staff to explain and communicate effectively the nature and magnitude of radiation risk and benefits, in order to obtain informed consent;	C6. Carry out periodic assessments of safety and warning; C7. Place radiation risks in relation to other risks within a societal context and patient radiation risk perception; C8. Advise proper use of personal protection; C9. Guarantee that patients' consent for diagnostic and treatment procedures is obtaining;

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Biological effects of ionising radiation and risk communication - cont.		
K12. Understand the risk benefit philosophy in medical imaging procedures and radiotherapy treatments; K13. Describe the risk to pregnant women and foetus involved in radiotherapy, NM, and diagnostic and IR; K14. Understand the differences between tissue and stochastic effects; K15. Identify the different determinants of radiation risk perception; know the pit-falls of communication on radiation risks; K16. Understand biological and physical half-lives of the radiopharmaceuticals used for diagnostic and therapeutic procedures; K17. Understand the particular protection aspects of pregnant women (includes pregnant radiographer/ employee), carers and children and knows how to take care of these persons; K18. Indicate which diagnostic examinations carry radiation risk to breastfeeding babies; indicate the contingencies which might apply; K19. Explain the risk of induction of radio-induce pathologies;	S8. Be able to communicate effectively with patients and carers so that diagnostic examination requirements are met but not at the expense of compromising the patient experience; S9. Be aware of the fact that a patient after a radioactive injection is to be separated from other patients and public; S10. Offer appropriate radiation protection advice to patients undergoing ionising radiation procedures; S11. Approach occupational risks, health and safety such as safe moving and handling of patients and equipment in a safe and effective manner; S12. Draw up shielding and safety & warning systems requirements for common practices and document same; S13. Participate in the follow-up of patients who have exceeded threshold recommendation doses and exposure parameters;	C10. Create guidance and local rules to explain procedures to the patient and respond appropriately to their questions; C11. Supervise the clinical workflow such that exposure of risk individuals (e.g. pregnant females) from other patients is minimised; C12. Create guidance and local rules for appropriate radiation protection advice to patients undergoing diagnostic and treatment procedures; C13. Create guidance and local rules for appropriate radiation protection advice to public and staff;

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Radiation detection and measurement and optimisation		
K20. Explain dose, quantities and units and their relevance to own professional practice; K21. Explain the concepts and tools for RP optimisation; K22. Understand how patient position affects image quality and dose to radiosensitive organs; K23. Understand the purpose and importance of patient shielding; K24. Explain how paediatric doses can be calculated; K25. Explain what practical steps can be taken to minimise radiation risk to radiosensitive organs; K26. Outline how developments in imaging technology can be used to minimise dose, and therefore risk; K27. Explain the practical measures that should be undertaken to minimise dose to staff, patient and members of the public for hybrid procedures; K28. For the radio-labelling of human products (e.g. white cells) explain how good manufacturing practice principles can be applied to minimise the incidence of radiation accidents; K29. Explain how dose to pregnant females can be minimised when a diagnostic procedure must be undertaken;	S14. Correctly interpret dose, dose rate and surface contamination data; S15. Use effective, safe and efficient radiation protection methods in relation to staff, patients and the general public applying current safety standards, legislation, guidelines and regulations; S16. Use the appropriate medical devices in an effective, safe and efficient manner; S17. Identify the principles of evidence-based practice and the research process; S18. Identify different image quality standards for different techniques; S19. Apply the concepts and tools for radiation protection optimisation; S20. Performs the medical procedure with the appropriate equipment suited and optimised for the specific medical procedure; S21. Identify various types of patient shielding and state the advantages and disadvantages of each type; S22. Verify if the basic principles of pre-venting (unnecessary) exposure are put in practice S23. Calculate and draw up the correct quantity of radiopharmaceutical required for administration;	C14. Avoid unnecessary exposures and minimise necessary exposures as part of optimisation; C15. Analyse and promote the process of creating and guaranteeing maximum safety for the patient, one-self and others during examinations /treatments involving ionising radiation and maintain the ALARA principle; C16. Instruct other personnel participating in matters relating to appropriate RP practices; C17. Application of the principle of radiation protection to workplace situation; C18. Refuse to accept or carry out a request or referral which, in his/her professional opinion, is dangerous or inadvisable; C19. Analyse and promote the use of proper exposition parameters and devices according to type of modality and to medical imaging and radiotherapy procedure; C20. Promote the establishment and use of local Diagnostic Reference levels (DRLs); C21. Take responsibility for conforming to national regulations for all handling of unsealed radioactive substances; C22. Promote the optimisation process regarding to National or European DRL and standards;

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Radiation detection and measurement and optimisation - cont.		
K30. Be aware of different types of monitoring equipment that available for measurement and dose rate and surface contamination monitoring, and advances limitations of each type of monitor; K31. Understand occupational risks, health and safety that may be encountered such as safe moving and handling of patients and equipment; K32. Be aware of general design and safety principles for the practices;	S24. Be involved in discussions and decisions related to the management of specific patient considerations in terms of the selection of the best examination/procedures options taking into account the potential radiation dose; S25. Be able to interpret the monitoring results for comparison with relevant criteria;	C23. Optimise ionising radiation procedure to fit for pregnant women and use appropriate paediatric protocols; C24. Analyse and promote safe and efficient measures in radiation contamination episodes; C25. Evaluate results, take corrective action as per protocol and report any inconsistency;
Legal issues and international framework in radiation safety		
K33. Understand the concepts of justification and optimisation; K34. Know recommendations and legal requirements applying to medical, occupational and public exposure; K35. Identify current national and international radiation protection legislation and regulations relating to staff, patients, carers and the wider general public; K36. Describe professional roles and responsibilities in terms of aspects of justification and optimisation; K37. Explain the legal and clinical basis on which procedures, both diagnostic and therapeutic, are requested and justified;	S26. Critically review the justification of a given procedure and verify it in the light of appropriateness guidelines and in case of doubt consult the responsible specialist; S27. Translate guidance and local rules into practical working routines so as to minimise dose to staff, patients and the public; S28. Be able to discuss with the referrer on whether the requested procedure is appropriate in part or in whole; S29. Consent patients for diagnostic procedures; explain procedures to the patient and respond appropriately to questions; S30. Use radiation protection methods relating to staff, patients and the general public, taking into account current safety standards, guidelines and regulations;	C26. When taking decisions about care for patients our staff be able to make use of relevant national and international (scientific) insights, theories, concepts and research results and integrates these approaches in one's own professional actions (evidence-based practice); C27. Optimise the use of equipment according to ALARA principles; C28. Practise effectively, accurately and safely and within the guidance of legal, ethical and professional frameworks; C29. Establish safe working conditions according to the recommendations and the statutory requirements of European, national, regional legislation, where applicable;

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Legal issues and international framework in radiation safety - cont.		
K38. Explain the radiation protection principles, legal requirements and practical solutions which can be used to enhance safe storage, handling and disposal of radioactive materials; K39. Understand the national requirements for the maintenance of dose records; K40. Identify which non-ionising radiation diagnostic examinations can be used as possible alternatives to ionising radiation procedures;	S31. Be able to draw up appropriate local rules and safety procedures for a range of applications; S32. Be able to interpret the monitoring results for comparison with relevant criteria;	C30. Draw up and issue suitable local rules for practice and supervise tier implementation; C31. Maintain suitable records of the sources of radiation at the practice; C32. Periodically analyse if the diagnostic and treatment procedures are suitable to standards and recommendations, C33. Promote teamwork in an independent, methodical and evidence-based manner in terms of quality;
Quality Control and Quality Assurance		
K41. Explain QA and QC practices to include: legislation, regulations and guidelines, test equipment and methodologies, programme design and implementation and reporting to thus ensure the provision of an effective, safe and efficient service; K42. Describe the importance of audit, research and evidence-based practice to include: the stages in the research process, research governance, ethics, statistics and statistical analysis to facilitate a deeper understanding of research findings and clinical audit; K43. State which QC tests should be applied to which equipment component, why, how and their frequency; K44. State how time, distance, shielding, monitoring and audit can be used to minimise dose received by staff, patients and public;	S33. Use and undertake clinical audits; S34. Perform and interpret QC tests to determine whether equipment is within manufacturer specification; S35. Organise clinical workflow so that radioactive patients have minimal contact with at risk individuals; S36. Use radiation verification systems safely, effectively and efficiently;	C34. Carry out a programme of workplace monitoring: including the selection of radiation monitors, interpretation of results and associated record keeping; C35. Promote and evaluate the results of QA and QC tests, and incidents and near incidents reports; C36. Promote clinical audit and applied research, to improve the quality of care; C37. Routinely inspect the area to ensure that radiation protection measures are in place and functional; C38. Assess the practical problems associated with machine and accessory equipment limitations and respond accordingly;

Knowledge (facts, principles, theories, practices)	**Skills** (cognitive and practical)	**Competence** (responsibility and autonomy)
Emergency planning		
K45. Explain the management of accidental/ unintended exposures; K46. Outline the role of the physicist and physician in relation to adverse radiation incidents (e.g. administration of a dose to the wrong patient); K47. Outline the role of the physicist in minimising dose to the environment and humans; K48. Understand the emergency responses arrangements and the respective RPO roles; K49. Understand the regulatory requirements for emergency.	S37. Calculate dose rates at varying distances from source; S38. Be able to draw up emergency response arrangements for a range of common applications.	C39. Examine any incident or near incidents and how they can be prevented in the future; C40. Draw up emergency response plans for the practice in collaboration with the team. Implement the emergency response plans.

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Appendix

Example of a training course content for RPO

The course must include theoretical and theoretical-practical classes.

Syllabus

1. **Fundamental concepts and dose descriptors**
   - Review of basic concepts of atomic structure, radionuclides concept of radioactive decay;
   - Production of ionising radiation per modality;
   - Radiation quantities and units, exposure and dose values;

2. **Biological effects of ionising radiation and risk communication**
   - Interaction of radiation with the cells and tissues;
   - Stochastic and tissue effects;
   - Effects of low doses;
   - Risk communication for patients and staff;

3. **Radiation detection and measurement and optimisation**
   - Assessment of internal and external exposures
   - Practical aspects of radiation protection;
   - Supervision of work;
   - Safety and warning systems;
   - Practical application of ALARA concept;
   - Protection against occupational exposure;
   - Implementation of local rules;

4. **Legal issues and international framework in radiation safety**
   - Radiation protection legislation;
   - Tasks and duties of the RPO in a multidisciplinary team;
   - Principles of radiation protection; justification, optimisation and dose limits;
   - Codes of practice, guidelines and recommendations;
   - Regulatory requirements for monitoring;

5. **Quality Control and Quality Assurance**
   - Monitoring instruments and proper use in current practice;
   - Dose rate and surface contamination monitoring
   - Personal dosimeters and monitoring;
   - Quality control and quality assurance criteria per modality;
   - Radiation Protection clinical audit;

6. **Emergency planning**
   - Lessons learned from incidents and accidents;
   - Regulatory requirements
   - Emergency response arrangements;
   - The RPO in emergency response;

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