COMPETENCIES FOR THE EUROPEAN NUCLEAR MEDICINE TECHNOLOGIST

Foreword

The tasks of nuclear medicine technologists as well as their curricula greatly vary from one European country to the other. Defining the competencies is a first and very important step towards a common appreciation of the role of nuclear medicine technologists in daily clinical work, research, development and teaching.

Not all of the activities that have been listed among the competencies of the nuclear medicine technologists by the EANM Technologists Committee may be performed by technologists in all European countries and even in all centres of a given country. It was obviously the wish of the authors to indicate what could be considered today the highest possible standard of competence of nuclear medicine technologists. Even if these requirements need to be adapted to local regulations and rules of many countries, they allow to describe the role and to emphasise the professional identity of nuclear medicine technologists in Europe. This list of competencies will be helpful for setting up training programs, be it for the pre-graduate curriculum or for continuing education. Defining the tasks that may be performed by technologists, may also contribute to the standardisation and quality assurance of nuclear medicine practice in Europe.

There is no doubt that the ultimate responsibility in nuclear medicine departments lies with the physicians, but the specific professional knowledge and skills of the technologists are necessary to ensure high quality practice and to favour the development of the speciality. Final decisions on the activities to be delegated to technologists have to be taken on the national, regional or local level taking into account local rules and regulations as well as the level of training and competence of the co-workers. Well trained technologists have the necessary critical mind to recognise potential problems and to refer to the medical staff, physicists or radiopharmacists whenever necessary. By their professionalism they contribute to the excellence of the whole department.

The present selection of competencies can be integrated progressively into training programs and into the professional activity of technologists, either totally or partially, according to the local conditions, and it can easily be adapted to the future development of our speciality. Without questioning the authority of the nuclear medicine physician, the proposed list of competencies is aimed at promoting the qualification of the nuclear medicine technologists and may thus contribute to the quality enhancement of nuclear medicine practice in Europe.

Angelika Bischof Delaloye, MD
President EANM
July 1998

Preface

It has been said that the nuclear medicine technologist does not exist in all European countries. It is true that there is no one professional group that carries out the work of the technologist within every country of Europe. It is also true that the range of tasks permitted of the technologist varies from country to country and there is considerable overlap with other professional groups. In fact, national laws may prevent technologists in one country from carrying out tasks that are required of a technologist in another. However, it is also true that a broad range of tasks are carried out, under the direction of a physician, by technologists in many countries.

The role of the physician within the nuclear medicine department is quite clear. The tasks that are carried out by the technologist are clearly under the direction and in support of a medical practitioner. It is in the interest of high quality healthcare that the technologist should be well trained and able to take responsibility for provision of a high quality service to their head of department. A well designed set of competencies can assist in this by defining the tasks, standards and methods that are expected of a well-trained technologist, working under the ultimate authority of a nuclear medicine physician.

The following document is based upon work by a group of Nuclear Medicine Technologists from the U.K. and Ireland, led by Sue Huggett, of the Department of Radiography, City University, London on behalf of the Council of the British Nuclear Medicine Society Technology Group (BNMSTG). It was presented in 1996 for use by the EANM Technologists Committee. It was agreed that it was acceptable to use the BNMSTG working party as a special working party for the EANM Technologist Committee and to modify their work for use in Europe.

Discussions with national technologist representatives from many European countries demonstrated that these competencies reflected the work of technologists in many countries. There was no point in writing an entirely new set of competencies to reflect European practice. In fact, at a later EANM congress, representatives from some countries reported that their national technologist groups were already using the draft competencies. A final version of the British document was published in April 1998 in the BNMS journal Nuclear Medicine Communications. That copyright is acknowledged and reproduction here is with permission.

It is recognised that the practice of nuclear medicine varies from department to department within a country and from country to country. Not all technologists will perform all tasks described within this document. However, where a task is performed the relevant competencies represent what is thought to be good practice.

Entry Level
Much discussion has centred around level for these competencies. Should an entry level practitioner (i.e. somebody who has received the basic training such that they are qualified to practice without close supervision) be capable of all tasks that can be carried out by a nuclear medicine technologist? Should management of resources and or staff be expected at this level?

It is appreciated that in many countries a degree of independence is expected of a professional practitioner, but it is recognised that most nuclear medicine departments have a hierarchical structure. It would be difficult, if not impossible, for all technologists in a department to carry out all management tasks expected of a senior technologist. There is a need for clear lines of authority and boundaries of responsibility and these will normally be defined in departmental protocols and rules. The competencies have therefore been kept to a lower (entry) level, without implying that all practitioners must be limited to that level. We certainly do not suggest that there should be one level of technologist only. These entry level competencies can provide a framework upon which more advanced skills can be built.

Advanced level
Advanced Level competency has yet to be defined. It is hoped that discussion that is instigated by this document will lead to some consensus on what is required for advanced practice.

Management of people and resources are clearly required in higher grade (management grade) posts, however, advanced practice may have a different focus for some individuals and posts. For example: management or propagation of research may be required, special individual responsibility for carrying out (or managing) specialist tests, protocol development and maintenance, special radiation protection duties (e.g. Radiation Protection Supervisor), teaching of students (in class or the workplace), making presentations at conferences, writing documentation, commissioning new equipment. Any or all of these tasks may be required in higher grade posts, with or without staff or resource management responsibilities. There is much scope for discussion on which of these tasks should define advanced level practice. It is hoped that this document will be a starting point.

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DEFINITION: THE NUCLEAR MEDICINE TECHNOLOGIST

Nuclear Medicine is a medical speciality in which radioactive materials are used for diagnosis by imaging and non-imaging techniques and for therapy in many disease processes.

The Nuclear Medicine Technologist is a health care professional who is able to undertake the whole range of nuclear medicine procedures. He/she is part of a team of health care specialists which may include doctors, physicists, radiochemists, radiopharmacists, other clinical scientists, technologists, nurses and others who support and care for the patient during diagnostic and therapeutic procedures, under the direction of a Nuclear Medicine Physician.

The responsibilities of the nuclear medicine technologist are to maintain the highest possible standard of results in procedures carried out, which may include imaging, non-imaging, labelling and therapeutic procedures, to maintain the highest standards of patient care and to deliver the lowest radiation dose to patients, staff and the public that is compatible with valid results.

EDUCATION AND TRAINING: AIMS AND OBJECTIVES:

The objective of the training is to produce qualified nuclear medicine technologists. The nuclear medicine technologist will, when employed as such, be responsible for the verification and implementation of nuclear medicine procedures of patients prescribed by a medical practitioner.

To allow the nuclear medicine technologist to accomplish these tasks competently requires a thorough knowledge in three associated areas:

1. academic and theoretical knowledge.
2. clinical and practical experience
3. management experience

The training will ensure that the technologist attains the appropriate level and experience in these areas.

COMPETENCIES FOR THE NUCLEAR MEDICINE TECHNOLOGIST - ENTRY LEVEL -

Introduction

The possible uses of a set of competencies were seen to be:

- To ensure that safe and effective patient care which complies with current regulations is being practised by the profession of Nuclear Medicine Technology.

- To provide guidance on **basic** practical and clinical requirements for in house training and to academic courses leading to qualifications to practice as a nuclear medicine technologist.
- As starting points for any future national registration requirements for NM Technology.

- Assessing transferability of national, European and international qualifications.

Competency is defined as *having the ability, knowledge and authority to carry out effectively and efficiently the work required*. Competency standards are a formal description of how work should be carried out. The competencies are divided into the following units:

1 . Patient Care and Welfare
2 . Departmental Organisation
3 . Instrumentation with Quality Control
4 . Performance of Imaging
5 . Performance of In-vitro Tests
6 . Radiotherapeutic Procedures
7 . Radiopharmacy
8 . Radiation Protection
9 . Occupational Health and Safety

The competencies relate to the practical skills and in-service training required. An educational underpinning is also required. This is described below.

Syllabus of Education:

The following are a list of modules to be undertaken during the training:
1 Physics and instrumentation of nuclear medicine
2 . Clinical application of radionuclide imaging
3 . Radiation protection and quality control
4 . Anatomy, physiology and pathology as applied to nuclear medicine
5 . Radiopharmacy including labelling and quality control of radiopharmaceuticals
6 . Computer technology and image analysis
7 . Research methods
8 . Management of a quality service
9 . Case studies

This educational underpinning will assist in achieving competence. Competencies are described in the remainder of this document.

1. PATIENT CARE AND WELFARE

1.1 PATIENT IDENTIFICATION AND PREPARATION

The Nuclear Medicine Technologist ensures patient care and welfare by:-

1.1.1 Checking patient's identity.

1.1.2 Checking study is appropriate to clinical history provided.

1.1.3 Checking that there are no contraindications to proceeding routinely.

1.1.4 Giving instructions and explanation concerning procedure effectively to patient and/or other relevant persons (including family) and checking their comprehension.

1.1.5 Assuring that sufficient and accurate information is given to ward staff to ensure that the patient is correctly prepared and available at the appointed time.

1.1.6 Checking correct patient preparation has been undertaken.

1.1.7 Checking for possible pregnancy or breast feeding in women of reproductive capacity.

1.1.8 Checking activity and identity of radiopharmaceutical before administration.

1.1.9 Administering radiopharmaceutical by appropriate route, where permitted by law , under the direction of a nuclear medicine physician or other authorised medical practitioner.

1.1.10 Instructing patients in any manoeuvres they will need to do (e.g. breathing techniques).

1.1.11 Documenting all administrations according to department protocol and national law.

1.2 EXPLANATION OF PROCEDURE TO RELEVANT PERSONS

The Nuclear Medicine Technologist ensures patient care and welfare by

1.2.1 Conveying information at a level of understanding suitable to the patient or the relevant persons. This to include avoiding unnecessary use of technical language, using interpreters appropriately and giving consideration to abilities of patient.

1.2.2 Developing lines of communication with other relevant persons.

1.2.3 Responding to patient feedback appropriately.

1.2.4 Identifying and explaining any aftercare that is required and then applying it appropriately.

1.3 PATIENT COMFORT, PRIVACY AND SAFETY

The Nuclear Medicine Technologist ensures patient care and welfare by:

1.3.1 Establishing a professional communicative relationship with patient.

1.3.2 Assessing patient's needs continually and responding in an appropriate time frame.

1.3.3 Preserving the patient's privacy, security and confidentiality.

1.3.4 Performing all procedures safely and with adequate supervision of the patient to ensure that s/he is not placed at undue risk of injury. In particular it is important that patients are not left unattended with moving equipment.

1.3.5 Performing all procedures with due regard to the patient's medical condition.

1.3.6 Ensuring that the patient’s dignity is preserved as far as possible, e.g. by ensuring that patient is not undressed more or longer than absolutely necessary for the procedure.

1.4 MONITORING OF PATIENT'S MEDICAL STATUS

The Nuclear Medicine Technologist ensures patient care and welfare by:

1.4.1 Referring any request without adequate information to appropriate senior staff.

1.4.2 Maintaining basic resuscitation training.

1.4.3 Completing written documentation of procedures as required.

2. DEPARTMENTAL ORGANISATION

The Nuclear Medicine Technologist assists with departmental organisation by:

2.1 Making appointments appropriately with regard to
- (a) sessional arrangements
- (b) radiopharmaceutical availability
- (c) equipment availability
- (d) staff availability

2.2 Informing the patient (or suitable proxy) of the time which should be allowed for the procedure and any waiting required between stages.

2.3 Checking the need for and organising hospital transport for the correct time.

2.4 Knowing and understanding the requirements of national law on data protection as applied to the department and storing data according to local protocol and national regulations.

2.5 Understanding and following department protocols for the management of patients' reports in respect of :
- (a) To whom reports may be given and any procedures for checking identity of telephone callers etc.
- (b) Approved methods of communication (telephone, post, fax or on-line)
- (c) Protocols for sending out reports.
- (d) Any policy for technologist reporting (e.g. provisional/ technical only).

2.6 Assessing and organising the appropriate supply of radiopharmaceuticals for each session.

2.7 Noting low levels of stock items and reporting this to the appropriate person.

Where permitted and required to do so by local management structure, as necessary for the provision of the nuclear medicine service, the technologist should:

2.8 Place orders for radiopharmaceuticals and radionuclides.

2.9 Place orders for other pharmaceuticals and chemicals.

2.10 Place orders for other consumables.

3. INSTRUMENTATION WITH QUALITY CONTROL AND QUALITY ASSURANCE.

General principle of quality control:
The technologist must have knowledge about national and hospital rules concerning QC and QA and should comply with local protocols and national legislation. When a fault is discovered, the action required should be clearly understood. It is not sufficient to record a fault. The appropriate, responsible person should be informed, or action taken directly by the technologist, to ensure that the equipment is removed from service and the fault is repaired. Quality control procedures are particularly important because incorrect adjustments or equipment faults can alter a diagnosis and affect patient welfare.

3.1 QC OF GAMMA CAMERA

The Nuclear Medicine Technologist evaluates the performance of scintillation cameras by:

3.1.1 Preparing an appropriate source.

3.1.2 Checking for radioactive contamination of the environment or equipment which could interfere with accurate measurements.

3.1.3 Obtaining uniformity images using standardised parameters.

3.1.4 Being aware of the action thresholds at which remedial action is deemed necessary for any particular camera.

3.1.5 Evaluating the images qualitatively and quantitatively against local standards and reporting any variations.

3.1.6 Checking the physical and mechanical condition of the camera and collimators on a daily basis and reporting any faults discovered.

3.1.7 Checking analogue and/or digital images output for quality (focus, brightness, contrast).

3.1.8 Performing any additional SPET QC procedures required such as:
Centre of rotation measurements.
High count flood acquisitions.
Multihead detector alignment.

3.1.9 Verifying accuracy of ECG gating.

3.1.10 Assisting in the performance of other camera QC procedures such as: determining linearity, spatial resolution, sensitivity.

3.1.11 Acquiring energy and spatial correction floods.

3.2 OTHER COUNTING EQUIPMENT.

The Nuclear Medicine Technologist evaluates the performance of scintillation probes, well counters and liquid scintillation counters by:

3.2.1 Checking background and determining the cause of levels greater than or different from established norms.

3.2.2 Using standard sources to check sensitivity at specified energies against local standards and reporting any deviations.

3.2.3 Assisting in the performance of other QC procedures such as determining energy resolution and sensitivity.

3.3 SURVEY METERS

The Nuclear Medicine Technologist operates survey meters by;

3.3.1 Ensuring that the meter is functioning normally in routine use by checking power supply and background levels.

3.3.2 Performing a reference source check, comparing results with local standards and reporting any unexpected deviations.

3.4 DOSE CALIBRATOR

The Nuclear Medicine Technologist evaluates the operation of the dose calibrator by:

3.4.1 Checking background and determining the cause of levels greater than or different from established norms.

3.4.2 Using standard sources to check sensitivity at specified energies against local standards and reporting any deviations

3.4.3 Assisting in the performance of other QC procedures such as:
Using calibrated sources to verify calibrations.
Ascertaining linearity over the range of activities to be measured
Testing for significant geometric variation in activity measured as a function of sample volume or configuration and determining correction factors.

3.5 FILM PROCESSORS AND HARDCOPY DEVICES

The Nuclear Medicine Technologist operates and maintains film processors by:

3.5.1 Monitoring operating parameters (e.g. temperature, water flow) and reporting/rectifying any deviations from local norms.

3.5.2 Performing sensitometry following local procedures.

3.5.3 Observing routine output of the film processor and routinely checking individual

films for faults.

3.5.4 Taking or initiating appropriate action when a fault is observed.

The Nuclear Medicine Technologists operates and maintains hardcopy devices by:

3.5.5 Performing calibration checks and routine maintenance as specified by the manufacturer and local protocols.

3.5.6 Observing routine output of the hardcopy device and routinely checking individual hardcopy for faults.

3.5.7 Taking or initiating appropriate action when a fault is observed.

3.6 DOCUMENTATION

The Nuclear Medicine Technologist maintains the documentation necessary to demonstrate the QA program is being undertaken satisfactorily.

4. PERFORMANCE OF DIAGNOSTIC PROCEDURES

The Nuclear Medicine Technologist should be able to perform all the following competencies at a reasonable pace.

4.1 PRIOR TO IMAGING

The Nuclear Medicine Technologist will select a technique by:

4.1.1 Checking for previous radionuclide investigations adapt technique accordingly if required.

4.1.2 Allowing appropriate time to elapse between administration and imaging.

4.2 IMAGING EQUIPMENT

The Nuclear Medicine Technologist will perform the examination by:-

4.2.1 Selecting and preparing suitable equipment for the examination

4.2.2 Selecting correct energy settings and energy and uniformity correction matrices if appropriate.

4.2.3 Selecting appropriate parameters for the acquisition and/or acquisition protocol as appropriate.

4.2.4 Operating the equipment correctly.

4.2.5 Identifying means of operation of any safety features of the equipment. (e.g. emergency stop apparatus).

4.3 IMAGING PROTOCOL

The Nuclear Medicine Technologist will perform the study according to departmental protocol by:

4.3.1 Using a technique appropriate to the patients condition.

4.3.2 Asking for help when required to care for patient in a poor clinical condition. (i.e. to lift out of chair etc.)

4.3.3 Using supportive or immobilising equipment as needed.

4.3.4 Optimally positioning camera and/or patient to obtain all views required in selected established protocol.

4.3.5 Adapting protocols to the condition of the patient.

4.3.6 Recording the appropriate projections in a logical order for minimum patient disturbance.

4.3.7 Recording the projections at the appropriate time intervals.

4.3.8 Obtaining, or causing to be obtained, any relevant medical samples e.g. blood samples, at the relevant point in the study.

4.3.9 Identifying normal and abnormal biodistributions.

4.3.10 Identifying anatomical features on the study and using surface anatomy for the positioning of markers where necessary.

4.3.11 Identifying sufficient pathology to recognise a possible need for extra views including SPET studies and refer/perform as appropriate.

4.3.12 Recognising the need for further intervention e.g. lasix or fatty meal and organise its administration.

4.3.13 Identifying possible artefacts on the image, checking with patient whether possible causes are present and taking appropriate action.

4.4 COMPUTER ANALYSIS

The Nuclear Medicine Technologist will operate the computer system by:

4.4.1 Choosing appropriate programs for performing data collections, processing and/or analysis in accordance with established protocols.

4.4.2 Illustrating correct interactions with the software as required. i.e. choosing parameters as required by the program.

4.4.3 Justifying the reasons for the choice of parameter.

4.4.4 Defining Regions of Interest in a manner suitable to the agreed protocol and/or specific methods necessary to comply with the requested clinical information.

4.4.5 Recognising image anomalies and possible errors.

4.4.6 Manipulating images as required.

4.4.7 Producing and manipulating curves.

4.4.8 Preserving and retrieving data from storage.

4.4.9 Transferring data to a viewing station where reports are made from screen.

4.4.10 Transferring data to wards or other hospital departments.

4.5 PRODUCTION OF HARDCOPY

The Nuclear Medicine Technologist will produce hardcopy images by

4.5.1 Selecting suitable equipment for production of hardcopy images.

4.5.2 Producing correctly exposed hardcopy images

4.5.3 Labelling images correctly (e.g. Name, Time, Anatomy) to comply with local protocols and national regulations (where these exist).

4.5.4 Identifying artefacts from the imaging process and rectify/report as appropriate.

4.6 IMAGE INTERPRETATION

The Nuclear Medicine Technologist will use the information on the images by

4.6.1 Identifying possible pathology and referring possibly urgent cases to medical staff immediately.

4.6.2 Prioritising urgent reports.

5. PERFORMANCE OF IN-VITRO TESTS

The Nuclear Medicine Technologist should be able to perform all the following competencies at a reasonable pace.

5.1 PRIOR TO PERFORMING IN-VITRO TESTS

The Nuclear Medicine Technologist will prepare the laboratory area by:

5.1.1 Assembling the required equipment on a tray to contain spillage.

5.1.2 Selecting and preparing suitable counting equipment

5.1.3 Selecting correct energy settings and window widths where appropriate.

5.1.4 Selecting appropriate parameters for counting specific samples

5.1.5 Operating equipment correctly

5.1.6 Using such safety clothing and/or equipment as is provided.

5.2 IN-VITRO PROTOCOL

The Nuclear Medicine Technologist will perform an in-vitro test by:

5.2.1 Ensuring correct sample identification.

5.2.2 If necessary preparing plasma samples from previously taken blood samples.

5.2.3 Preparing standard stock solution according to written protocols.

5.2.4 Preparing counting samples according to written protocols, if necessary pipetting sample of varying volumes with adequate precision to produce reproducible results.

5.2.5 Setting up and counting samples on the appropriate sample counter

5.2.6 Processing data according to protocols.

5.2.7 Safely handling all biological samples.

5.3 AFTER IN-VITRO TESTING

The Nuclear Medicine Technologist ensures a safe working environment by:

5.3.1. Safely disposing of all waste materials.

5.3.2 Cleaning the working area after the test has been performed to remove bacterial contamination.

5.3.3 Monitoring the area to detect any radioactive contamination.

5.3.4 Performing all the necessary decontamination according to written protocols.

6. RADIOTHERAPEUTIC PROCEDURES

It is recognised that depending on national regulations and departmental protocol a Nuclear Medicine Technologist may not perform a complete radiotherapeutic procedure, but would work and liaise with senior staff and Medical Physics. However, the Technologist must show knowledge of the procedure within this competency.

6.1 PREPARATION PRIOR TO ADMINISTRATION

Please note that the following checks are intended to ensure patient safety. Questioning whether the correct patient is to receive the correct therapy and dose of radiation for their condition is a duty of all staff involved in an administration. A therapy dose of radioactive material may be harmful, rather than therapeutic if administered to the wrong person.

It is better to question a physician's instructions than for a mistake to be made. However, it is recognised that the ultimate clinical responsibility lies with the nuclear medicine physician who is in charge of the administration of the radiotherapeutic dose, it is not the duty of the technologist to countermand the doctor>s instructions.

The Nuclear Medicine Technologist confirms that the administration can go ahead safely by:

6.1.1 Checking that the request form has been completed and signed by the authorised clinician.

6.1.2 Checking the radiotherapeutic procedure is appropriate to clinical history provided.

6.1.3 Checking the patient's consent has been given for the radiotherapeutic procedure to proceed.

6.1.4 Giving instructions and explanation concerning the radiotherapeutic procedure and aftercare to ward staff/carers and checking their comprehension.

6.1.5 Ensuring that necessary radiation protection protocols can be complied with following administration.

6.2 PATIENT IDENTIFICATION AND PREPARATION

The Nuclear Medicine Technologist ensures patient care and welfare by:

6.2.1 Checking patient identity.

6.2.2 Checking for possible pregnancy or breast feeding in women of reproductive capacity.

6.2.3 Checking correct patient preparation has been undertaken.

6.2.4 Checking that there are no contraindications to proceed.

6.2.5 Giving instructions and explanation concerning the Radiotherapeutic Procedure to the patient and checking their comprehension.

6.3 ADMINISTRATION

6.3.1 Checking activity and identity of radionuclide before administration.

6.3.2 Ensuring that the radionuclide is administered by the correct route.

6.4 AFTERCARE

6.4.1 Documenting the administration according to departmental protocol.

6.4.2 Providing patient with completed radionuclide administration card, or such other documentation as required by national regulations or local protocols.

6.4.3 Radiation monitoring of area and equipment as appropriate.

6.4.4 Radiation monitoring of patients following therapy as required, e.g. prior to release of a patient from the ward or nuclear medicine department.

6.5 IMAGING PROCEDURES

6.5.1 Where a scan is required to confirm correct uptake, ensuring that appropriate arrangements are made for the correct image procedure to be carried out.

6.5.2 Carrying out appropriate imaging procedures, according to local protocol.

6.5.3 While post-therapy imaging procedures are in progress, taking appropriate radiation protection measures for the radionuclide and dose that were administered .

7. RADIOPHARMACY COMPETENCIES

7.1 EQUIPMENT.

The Nuclear Medicine Technologist can establish whether radiopharmacy equipment is working adequately by:

7.1.1 Performing daily pre-use precision checks (e.g. measuring long lived source in isotope calibrator)

7.1.2 Checking environmental integrity (e.g. leaks on isolators or room pressures within suite)

7.2 GENERATOR ELUTION

The Nuclear Medicine Technologist will use radiopharmaceutical generators according to manufacturers of local instruction by:

7.2.1 Following manufacturers or local guidelines regarding
- (a) assembly
- (b) maintenance
- (c) elution procedure
- (e) first line quality control (e.g. inspect for particles, radionuclide purity, expected elution activity)

7.2.2 Applying radioactive decay calculations to determine required volume necessary to deliver the prescribed activity by:
- (a) initial estimate
- (b) use of decay calculations or decay factors

7.2.3 Selecting appropriate geometry and radioisotope correction factors on the dose calibrator for measurement.

7.3 KIT PRODUCTION

The Nuclear Medicine Technologist will reconstitute technetium radiopharmaceuticals from commercial kits by:

7.3.1 Employing aseptic technique.

7.3.2 Adhering to manufacturers or local instructions (e.g. heating, incubation time, expiry time).

7.3.3 Estimating total activity needed and appropriate activity concentration in reconstituted kit based on number of patients, usual injected activity and investigation times.

7.4. DISPENSING.

The Nuclear Medicine Technologist will dispense correct activity of radiopharmaceuticals for specific investigation by:

7.4.1 Consideration of patient factors (e.g. pregnant, paediatric, breast feeding) pre-injection check measurement

7.4.2 Labelling all preparations adequately according to local protocol

7.5 SAFETY CONSIDERATIONS

The Nuclear Medicine Technologist will carry out all procedures with due regard for the safety of self and other people by:

7.5.1 Monitoring for contamination (see safety competencies)

7.5.2 Achieving whole body and finger radiation doses as low as reasonably achievable by
- (a) manual dexterity to reduce handling time
- (b) use of shielding, distance and time in working practice
- (c) observing the ALARA principle (keeping doses as low as reasonably achievable)

7.5.3 Maintaining sterility of product at all stages of manipulation by:
- (a) use of aseptic technique
- (b) adhering to local protocols and procedures

(c) pass local assessment (e.g. broth transfer test)

7.5.4. Labelling and segregating radioactive waste for disposal as required locally

7.5.5 Taking immediate action following a spillage of radiopharmaceutical by:
(a) taking initial action to control spillage
(b) marking contaminated area
(c) decontaminating area if appropriate
(d) seeking assistance from relevant personnel

7.6 RECORD KEEPING

The Nuclear Medicine Technologist will keep adequate records as required of radiopharmaceutical procedures to include:

7.6.1 Receipt of active and non active products
7.6.2 Batch and expiry dates for all constituents
7.6.3 Quality assurance according to local protocol

8. RADIATION PROTECTION PRACTICES

PREAMBLE

The administration of radioactive substances is based on three requirements.

1. No practice shall be adopted unless its introduction produces a positive net benefit.

2. All exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account.

3. The dose equivalent to individuals shall not exceed the limits recommended for the appropriate circumstances.

These central requirements of Radiological Protection are as expressed by the International Commission on Radiological Protection (ICRP).

A Nuclear Medicine Technologist under the control and supervision of the directing Physician and the Radiation Protection Advisor understands and complies with Local Rules and National Legislation. He/she understands and complies where appropriate with European Directives and International Regulations on Radiation Protection.

Radiation Protection is to include protection of:

1. Patient - to include the pregnant patient or patients of reproductive capacity.

2. Hospital Staff. This term includes all Hospital Staff who deal directly with radioactivity or with radioactive patients and may include medical staff, radiographers, nuclear medicine technologists, physicists, nurses, porters and receptionists.

3. General Public. The dose limits to the public will not be normally subject to monitoring individually, it is therefore necessary to ensure by other means that their Radiation Exposure is kept to a minimum.

Competency standards on Radiation Safety in Nuclear Medicine may be looked at in the following areas:

1. Legislation.
2. Preparation and administration of radiopharmaceuticals.
3. Imaging and patient handling.
4. Acceptance, storage, handling and waste disposal of radioactive materials.
5. Radiation incidents.

8.1 LEGISLATION

The Nuclear Medicine Technologist practices radiation safety by:

8.1.1 Being aware and demonstrating understanding of National Legislation, European Directives and National and International Recommendations on radiation safety.

e.g. A. ICRP Publications
B. European Directives
C. Guidelines from National Organisations

8.1.2 Knowing and understanding their responsibilities to the Radiation Protection Supervisor and licensed medical practitioner for their department.

8.1.3 Knowing and adhering to local rules.

8.2 ACCEPTANCE, STORAGE, HANDLING AND WASTE DISPOSAL OF RADIOACTIVE MATERIALS

The Nuclear Medicine Technologists ensures radiation hygiene by:

8.2.1 Receiving, checking, recording date, time and activity of radioactive sources.

8.2.2 Storing radioactive material appropriately as directed by local protocols and national law.

8.2.3 Monitoring radiation levels using appropriate meters.

8.2.4 Ensuring radioactive material for transport is packaged and labelled correctly following local protocols

8.2.5 Storing waste until below background levels of radiation if required. Removing radioactive markers before disposal. Separating waste according to half-life. Being aware of disposal activity limits.

8.2.6 Disposing of active and other waste according to written local rules and good practice via approved routes

8.3 PREPARATION AND ADMINISTRATION OF RADIOPHARMACEUTICALS

The Nuclear Medicine Technologist maintains appropriate protection procedures by:

8.3.1 Maintaining required record of:
- a. QC of radiopharmacy
- b. Calibration of dose calibrators
- c. Molybdenum breakthrough
- d. Ordering and receipts of Radiopharmaceuticals.
- e. Activities dispensed and administered to patients.

8.3.2 Using shielding to reduce exposure e.g.: syringe shields, lead bins, screens, lead bricks etc. in accordance with local protocol

8.3.3 Performing and recording wipe tests where appropriate to ensure that the working environment is not contaminated.

8.3.4 Following good work practices according to department protocols.
i.e.
- a. Use of aseptic techniques in radiopharmaceutical preparation
- b. Use of appropriate preparation area - isolation and flow cabinets
- c. Ensuring that injection trays are lined with absorbent material, gloves worn at all times
- d. Ensuring that work surfaces are clear
- e. Carrying out correct and prompt disposal of radioactive waste
- f. Clearly explaining radiation protection precautions to patients prior to administering radioactive substances
- g. Measuring and recording activity administered to patient prior to administration

8.4 IMAGING AND PATIENT HANDLING

The Nuclear Medicine Technologist ensures Radiation Protection by:

8.4.1 Imaging patients efficiently and maintaining appropriate distance from them.

8.4.2 Following systems of work with regard to personnel allowed into supervised and controlled areas.

8.4.3 Using injection techniques which reduce hand dose to staff and the possibility of extravasation in patients.

8.4.4 Ensuring that activity appropriate to examinations are administered to patients

8.4.5 Applying radiation protection to patients such as increased fluid intake and frequent bladder emptying in appropriate radiopharmaceuticals.

8.4.6 Wearing appropriate protective clothing when necessary, according to local regulations.

8.4.7 Ensuring radioactive gases and aerosols are only used in a properly ventilated area.

8.4.8 Ensuring radioactive marker sources are handled and stored safely.

8.4.9 Storing active patient waste in a suitable place away from Imaging Room and dispensing area. Ensuring waste is segregated into short and long lived categories to facilitate subsequent disposal.

8.5 RADIATION INCIDENTS

The Nuclear Medicine Technologist is aware how decontamination procedures are performed by:

8.5.1 Prioritising safety of other staff and patients.

8.5.2 Being aware what constitutes a major or minor incident.

8.5.3 Ensuring containment of contamination and knowing when to call for the help of the Radiation Protection Supervisor

8.5.4 Following an incident, restricting movements of patients or staff until checked for contamination.

8.5.5 Cleaning up spill safely if appropriate.

8.5.6 Contributing to the compilation of records of the incident.

8.6 RADIATION PROTECTION COMMUNICATION

The Nuclear Medicine Technologist may participate in hospital, clinic and departmental training to instruct other personnel about radiation protection and radiation hygiene by:

8.6.1 Informing about:

a. Doses and Hazards to patients.
b. Hazards arising from patients to ward staff and other hospital personnel.
c. Appropriate instructions for the nursing care of patients after nuclear medicine procedures for diagnosis and treatment.
d. Appropriate instructions for pregnant staff and relatives.

The Nuclear Medicine Technologist will perform all the above duties with knowledge of "Duty of Care" to self, other staff, patients and members of the public and so ensure that a safe environment is maintained for all.

9. OCCUPATIONAL HEALTH AND SAFETY

Occupational Health and Safety: requires familiarity with Health and Safety law and local policies and protocols to ensure a continued safe working environment and also requires the exercise of judgement to minimise risks to both patients and staff.

9.1 AWARENESS OF LEGISLATIONS.

A Nuclear Medicine Technologist shows awareness of legislation and written policies by:

9.1.1 Knowing and understanding the local written Safety Policy.

9.1.2 Complying with the national law on Manual Handling of loads (including patients).

9.1.3 Being familiar with national law on the use of computer display screens and workstations.

9.1.4 Knowing who in the hospital/directorate operates Health and Safety training and undertaking such training as is deemed appropriate for them.

9.1.5 Knowing individual responsibilities regarding NM departments.

9.1.6 Understanding the powers of the Health and Safety Inspector.

9.2 ACTIONS IN THE WORKPLACE

The Nuclear Medicine Technologist minimises departmental risks by:

9.2.1 Knowing the major hazards of the workplace.

9.2.2 Being familiar with the risk assessment process.

9.2.3 Ensuring that both workplace and work systems are safe and without risk to health.

9.2.4 Correctly handling substances.

9.2.5 Selecting, using and caring for appropriate work equipment.

9.2.6 Monitoring health and safety in the workplace and communicating needs to an appropriate authority.

9.2.7 Reporting accidents and dangerous occurrences.

9.2.8 Knowing and fulfilling responsibilities to visitors to the department, including Estates and Maintenance staff.

9.2.9 Understanding and applying management principles for handling and disposing of all wastes which apply to the NM department.

9.2.10 Implementing local policies on fire safety, infection control and confidentiality.

9.2.11 Undertaking any Health and Safety related courses and refresher courses required by their department.

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