

EANM Benchmark Document on
**NUCLEAR MEDICINE
TECHNOLOGISTS'
ADVANCED
COMPETENCIES**

DOI:

<https://doi.org/10.52717/JZGV2901>

Publisher:

European Association of Nuclear Medicine
Schmalzhofgasse 26,
1060 Vienna, Austria

Phone: +43 1 890 44 27 | +43 1 890 44 27-9

Email: office@eanm.org |

URL: www.eanm.org

English Language Editing:

Angela Parker

Layout & Design:

Ekaterina Maslova, EANM Executive Office
Esra Köymen, EANM Executive Office

Content:

No responsibility is taken for the correctness of this information.
Information as per date of printing October 2024.

Contents

ACKNOWLEDGEMENTS	4
INTRODUCTION	5
STRUCTURE OF THE DOCUMENT	6
Departmental Management and Leadership	7
Radiopharmacy	9
Nuclear Cardiology	11
Hybrid Imaging Performance and Reconstruction	13
Radionuclide Therapy	14
Theranostics	16
Radiation Protection	18
Research	19
Clinical Trials	20
Artificial Intelligence, Machine Learning & Deep Learning	22
Education	23
Instrumentation Quality Assurance (Imaging, Non-Imaging and Radiation Protection Instruments	24
REFERENCES	25

Acknowledgements

This document is a response for the need to call for the Nuclear Medicine Technologists' (NMTs) continual development in terms of their skills, knowledge and competencies that are as advanced as required by the Nuclear Medicine (NM) field continuous evolution. The effort taken by the European Association of Nuclear Medicine Technologists Committee (EANM-TC) supported by their colleagues and fellow societies, aimed to gather the most relevant and updated set of current and future competencies reflecting the factual demands for the advanced NMTs willing to continue their education and professional work as the advanced practitioners.

After two years of researching and consulting professionals working in the field, the EANM-TC Competencies Working Group drafted the document in July 2022, extensively focusing on its development to the present form. Authors of this document are very much indebted to the whole EANM-TC team for their support and document revision, British Nuclear Medicine Society (BNMS), The Belgian Association of Nuclear Medicine (BELNUC), as well as the European Federation of Radiographers Societies (EFRS) fellows, and the Institute of Physics and Engineering in Medicine - Nuclear Medicine Special Interest Group for their detailed, extended revision and valuable input. Eventually, the creation of this highly relevant document was only possible with the support of the EANM Board, EANM Guidelines & Publications Procedures Council (EANM-GPC), and EANM Office.

We remain committed to the work that serves the NMTs community in Europe.

Andrea Santos
Giorgio Testanera
Luisa Roldão Pereira
Christelle Terwinghe
Pedro Fragoso Costa
Agata Karolina Pietrzak

July 2024

Introduction

Nuclear Medicine (NM) is a multidisciplinary medical specialisation in which a broad level of knowledge is required, including anatomy, pathophysiology, radiobiology, physics, engineering, radiation protection, radiochemistry, and — last but not least — patient care. The increasing complexity of NM subdisciplines such as drug development, radiation detection, artificial intelligence or the increasing participation in clinical trials, combined with ingenious concepts such as theranostics, has led NM to a current period of great potential.

Nuclear Medicine Technologists (NMTs) are members of a team of healthcare specialists who can undertake the whole range of conventional and modern NM procedures. The goal of this multidisciplinary team is to support and care for the patient during diagnostic and therapeutic procedures in collaboration with a NM physician. One of the decisive moments for NMTs was the educational reform, shifting from a qualification pathway based on vocational training to a university-equivalent Bologna degree. This has been observed in almost all countries in Europe. The European Association of Nuclear Medicine's Technologists Committee (EANM-TC) responded to that shift by creating a Task Force dedicated to defining the European Qualification Framework (EQF) level 6 for NMTs, prioritising the need to act in response to the lack of harmonisation of NM practice at the European level. The Task Force carried out this work in parallel with the revision of previous publications and in consultation with our external peer societies, such as the Canadian Association of Medical Radiation Technologists (CAMRT), the Australian and New Zealand Society of Nuclear Medicine (ANZSNM) and the European Federation of Radiographer Societies (EFRS)^{1,2}.

In view of both the technological and clinical developments in NM, the need for an EQF Level 7 description for NMTs has become increasingly evident³. The current document follows the EQF typology and reflects the EANM-TC vision on the topic of advancing competencies, focusing on the requirements for delivery of high-quality NM services. It is also our intent to provide for harmonisation and standardisation of the minimum expectations for training curricula throughout Europe, considering the advanced competencies (recognised as Master's level, EQF7) with reference to the existing curricula and previously defined sets of competencies, and aiming to establish the minimum requirements for basic competencies (all recognised as for the Bachelor's degree level, EQF6).

Looking at NMT practice across European countries, significant differences can be identified. Differences can be seen at national level, not only in NM practice

and NMTs' level of education, but also with regard to the regulated competencies. In some countries, some of the defined advanced competencies are seen as basic and entry-level (EQF6), whereas in others, the defined competencies may not be required. This document is intended to be read as an evolving reference document for European practice of NMT at an advanced level, although it may not apply in exceptional cases.

Structure of the Document

The EANM document on NMTs' advanced competencies is based on the framework for qualifications of the European Higher Education Area, included in the second cycle. This document defines the advanced competencies for NMTs in 12 different areas of subspeciality within the NM scope of practice. For each of these 12 areas, a table was created, following the Knowledge (K), Skills (S) and Competencies (C) model explained in **Table 1**.

The 12 areas covered by the document are as follows:

1. Departmental Management and Leadership
2. Radiopharmacy
3. Nuclear Cardiology
4. Hybrid imaging performance and reconstruction
5. Radionuclide Therapy
6. Theranostics
7. Radiation Protection
8. Research
9. Clinical Trials
10. Artificial Intelligence, Machine Learning & Deep Learning
11. Education
12. Instrumentation quality assurance (imaging, non-imaging and radiation protection instruments)

Table 1. Summarises the learning outcomes of the academic master's degree, corresponding to the EQF level 7⁴:

Table 1. EQF Level 7, equivalent to an academic Master's degree⁴.

Knowledge (K)	Skills (S)	Competencies (C)
Highly specialised, interdisciplinary knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for critical thinking and/or research.	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields.	Managing, modifying and taking responsibility for various work, study and research contexts which require specific strategic approaches, contributing to professional knowledge and practice, as well as managing and reviewing the performance of the interdisciplinary professional team.

1. Departmental Management and Leadership⁵⁻⁸

Knowledge	Skills	Competencies
K1.1 Understand the differences between leadership and management and how these two concepts can be adapted to task division	S1.1 Identify the correct management structure required to achieve the needs of a Nuclear Medicine (NM) Department, including the ability to delegate appropriately	C1.1 Be able to organise the department and delegate tasks considering the multidisciplinary nature of the NM teams, proactively and reactively adapting to unexpected changes and circumstances (adverse events)
K1.2 Be aware of the management and staffing structure of the institution and where the NM department is located, as well as the local team arrangements	S1.2 Consider different management and staffing models in order to choose the most suitable ones in the department's context, and apply them taking into consideration the needs and requirements of the institution	C1.2 Align the NM management and staffing structure with the institutional reporting chain, ensuring representation of the clinical teams at board level
K1.3 Be aware of recruitment procedures, principles and staffing models	S1.3 Recruit staff following fair, measurable criteria and precise job descriptions	C1.3 Organise, plan and maintain an efficient and collaborative workforce, appropriate for the targets of the department, and ensure the correct set of skills is achieved, developed and sustained
K1.4 Possess knowledge of risk management and associated governance	S1.4 Organise risk assessments of the procedures and manage mitigation and control measures	C1.4 Apply governance procedures to risks and incidents in the department to ensure safe practice and promote dissemination of learning across the team
K1.5 Have an understanding of human resources procedures, including induction, rotas and performance evaluation	S1.5 Contribute positively to the optimisation of the NM department's organisation, maintaining a balance between individual and collective performance targets, staff satisfaction and patient safety	C1.5 Care about and promote the safety and welfare of the staff working in a NM environment
K1.6 Outline the complete skillset needed to run the NM department efficiently and safely	S1.6 Optimise task division according to staff members' skills, capabilities and responsibility level. Maintain updated list of individual competencies	C1.6 Avoid overlaps in task division and ensure procedures are carried out by the most appropriate professional group. Ensure career opportunities are offered to staff
K1.7 Recognise and uphold the institution's patient access policy, including communication, respect and integrity, welcoming procedures and administrative tasks ⁷	S1.7 Optimise, organise and plan patients' pathways ensuring individual dignity and comfort is maintained. Ensure that each patient's pathway is individually tailored to their specific needs and requirements	C1.7 Efficiently manage the patient waiting list, making arrangements as per individuals' needs (e.g., disability, caregivers, dealing with aggressive behaviour)

Knowledge	Skills	Competencies
<p>K1.8 Understand the different quality management systems (QMS) applicable to NM</p>	<p>S1.8 Adopt and coordinate use of the QMS applicable to NM</p>	<p>C1.8 Take responsibility for systematic and periodic quality management audits in the clinical environment</p>
<p>K1.9 Understand business plans and how to integrate sustainable management of resources</p>	<p>S1.9 Identify and seize opportunities for an environmentally conscious approach</p>	<p>C1.9 Use resources sparingly and sustainably, considering financial and environmental factors when drawing up business plans for the department</p>
<p>K1.10 Describe key performance indicators (KPI) relevant for NM departments</p>	<p>S1.10 Collaborate with internal and external stakeholders to create plans for meeting KPIs without compromising goals and safety of patients and staff</p>	<p>C1.10 Employ a risk-based approach designed to achieve a balance between safety and performance</p>
<p>K1.11 Identify external key stakeholders that have a significant interest in or are directly affected by NM</p>	<p>S1.11 Discuss the role and potential impact of external key stakeholders on service delivery and development</p>	<p>C1.11 Appraise the relationships with other services to ensure consistency and continuity of service</p>
<p>K1.12 Define extended and advanced practice and how it can be implemented for different tasks</p>	<p>S1.12 Evaluate the potential for advanced practice roles to efficiently perform tasks, avoiding overlaps between professional groups</p>	<p>C1.12 Implement education and training opportunities for advanced practice with an appropriate career ladder while maintaining efficient teamwork</p>
<p>K1.13 Understand the components of a department's management plan</p>	<p>S1.13 Explain the most applicable key performance indicators in terms of the departmental objectives</p>	<p>C1.13 Critically evaluate the management systems in place and propose modifications depending on the issue</p>

2. Radiopharmacy^{1,4,8-10}

Knowledge	Skills	Competencies
K2.1 Understand the general principles of Good Manufacturing Practice (GMP), current Good Manufacturing Practices (cGMP) and current Good Radiopharmacy Practices (cGRPP) in radiopharmacy, including separation of tasks	S2.1 Apply the GMP, cGMP and cGRPP regulations in accordance with the assigned task	C2.1 Be able to operate in GMP radiopharmaceutical labs following the regulatory requirements and act as a mentor/supervisor for induction of new staff
K2.2 Understand the requirements of QMS and implementation of same in the production of radiopharmaceuticals	S2.2 Practice autonomously within the scope and guidance of established Standard Operating Procedures (SOPs) and Protocols to undertake assigned tasks for production and Quality Control (QC)	C2.2 With adequate training from Senior Radiochemist/Radiopharmacist, be able to operate independently in production and QC with a trackable system for all steps of the assigned tasks and act as a mentor/supervisor for induction of new staff members
K2.3 Critically understand the importance of sterility in radiopharmaceutical production and Implement measures to achieve the goals	S2.3 Be responsible for monitoring the sterility of the environment and ensure adherence to institutional and best practice guidelines	C2.3 Work effectively in a sterile environment for radiopharmaceutical production and QC monitoring of microbiological elements and act as a mentor/supervisor for induction of new staff members
K2.4 Understand radionuclide production using dedicated radionuclide generators, cyclotrons and reactors	S2.4 Operate cyclotron production and eluate generators as per institutional protocols and SOPs as well as best practice guidelines	C2.4 Safely and effectively produce required radionuclides for radiopharmaceutical production (including performing QC for the equipment)
K2.5 Have a deep knowledge of chemical interactions between precursors and radionuclides in both kit reconstitution and automated synthesis	S2.5 Ability to produce all required radiotracers according to departmental needs following the related protocols and best practice guidelines	C2.5 Be an active and efficient senior member of the production team in synthesising the required radiopharmaceuticals
K2.6 Have a wide understanding of different QC methods relevant to the specific task and departmental requirements	S2.6 Produce and maintain high-quality radiopharmaceuticals according to the departmental requirements and protocols	C2.6 Collaborate with the QC team in efficient and accurate evaluation of the production of radioisotopes and tracers according to their specification
K2.7 Understand the importance of quality assurance (QA) principles and working with detailed SOPs. Understand the monitoring of production and QC steps	S2.7 Operate in a reproducible, standardised manner for all laboratory tasks following best practice guidelines and departmental protocols	C2.7 Benchmark the actions with the requirements of the procedures and track them in accordance with QMS
K2.8 Know the basic engineering requirements of radiopharmaceutical production and QC equipment	S2.8 Operate the available equipment with an insight into its functioning, ensuring operator and radiation safety	C2.8 Be able to identify potential faults in the equipment and their impact on the required outcome, taking appropriate action to prevent incidents

Knowledge	Skills	Competencies
<p>K2.9 Have a deep understanding of radiopharmaceutical labelling, shielding and packing and methods of transportation, according to the respective isotopes and measured dose rates</p>	<p>S2.9 Be able to prepare the appropriate documentation regarding the release of radiopharmaceuticals ready for transportation, according to their characteristics and the respective national requirements</p>	<p>C2.9 Be accountable for the reception, preparation and validation of radiopharmaceuticals and responsible for their clearance for transportation, in compliance with good practice guidelines and national requirements for the radiopharmaceutical supply chain</p>
<p>K2.10 Critically understand the principles of radiation protection in a laboratory environment</p>	<p>S2.10 Follow and train junior staff in radiation protection procedures applicable to the respective environment</p>	<p>C2.10 Be able to act as a laboratory facility's radiation protection officer (RPO) when necessary. This will depend on the local regulations and may require specific certification.</p>

3. Nuclear Cardiology^{7,11,12-14}

Knowledge	Skills	Competencies
<p>K3.1 Have a deep knowledge of cardiovascular physiology and a sound understanding of clinical pathways related to cardiac disease</p>	<p>S3.1 Collect and review patient history and evaluate for patient pathology</p>	<p>C3.1 Monitor heart rate and blood pressure response to vasodilators and adrenergic agents, perform frequent evaluation of patient vital parameters, and manage side effects, diabetic complications, or other conditions as allowable under local regulations, where applicable</p>
<p>K3.2 Possess advanced theoretical expertise in cardiopulmonary resuscitation beyond the scope of Basic Life Support certification</p>	<p>S3.2 Effectively oversee procedural policies and standards for cardiac emergencies within daily operations, including the management of crash trolley compliance</p>	<p>C3.2 Act as designated crash team lead in the event of emergency, and expertly hand over to the resuscitation team once they arrive</p>
<p>K3.3 Understand physiological patterns in electrocardiography (ECG) and identify changes that may occur in response to vasodilators or adrenergic agents</p>	<p>S3.3 Prepare patient and perform electrocardiography testing within the context of NM procedures</p>	<p>C3.3 Become the responsible person for ECG testing, including patient assessment and QC and assurance of ECG equipment, where applicable</p>
<p>K3.4 Comprehend and maintain awareness of cardiac arrhythmias and their corresponding treatments, encompassing high-grade ventricular arrhythmias and heart blocks</p>	<p>S3.4 Evaluate ECG tracings and PQRST changes for specific pathology and cardiac events, escalating appropriately to the cardiac specialist team</p>	<p>C3.4 Use reporting systems and generate coherent, meaningful supporting reports that maximise clinical utility and inform the final report of the NM cardiac stressing scan</p>
<p>K3.5 Understand risk factors for coronary artery disease (including demographics, symptomatology and previous ECG results) and be familiar with common related drugs</p>	<p>S3.5 Conduct patient assessment which is shared with the multidisciplinary clinical team, including ambulatory capacity, tolerability of the procedure and review of the patient's medication</p>	<p>C3.5 Accurately document patient history, obtain valid consent, record relevant occurrences and consider contraindications to testing</p>
<p>K3.6 Know the principles of the perfusion assessment: physiological background of pharmacological stress and its relation to the timing of tracer administration</p>	<p>S3.6 Administer interventional drugs for pharmacological stress and conduct stress tests, ensuring rigorous adherence to departmental protocols</p>	<p>C3.6 Actively participate in multidisciplinary medical team to calibrate dedicated equipment (e.g., cardiovascular stress testing apparatus) according to the specific operational benchmarks. Collaborate with cardiology specialists for an integrated, evidence-based approach to patient diagnosis</p>
<p>K3.7 Relate sensitivity/specificity of radionuclide cardiac stress imaging (e.g., myocardium stress scintigraphy, cardiac PET-CT with ⁸²Rb or [¹³N]ammonia) to diagnosis of coronary artery disease</p>	<p>S3.7 Protocol the referral, indicating the most suitable protocol (exercise or pharmacological) and the different radiopharmaceutical and scanning options available</p>	<p>C3.7 Participate in modifying protocols and adapting the acquisition of images in radionuclide cardiac stress imaging with SPECT or PET, incorporating a comprehensive analysis of patient-specific variables as well as institutional protocols to ensure optimal diagnostic outcomes</p>

Knowledge	Skills	Competencies
<p>K3.8 Have extensive knowledge of Nuclear Cardiology imaging and its relationship to perfusion defects on the myocardium</p>	<p>S3.8 Be able to process acquired Nuclear Cardiology images, reducing artefacts and providing high-quality diagnostic imaging</p>	<p>C3.8 Assess quality of Nuclear Cardiology images processed, identifying possible sources of misinterpretation, and act accordingly</p>
<p>K3.9 Knowledge of drug interaction with stress agents, including antagonist</p>	<p>S3.9 Identify complications and appropriately treat them, including use of adenosine/ dipyridamole antagonists such as theophylline and aminophylline</p>	<p>C3.9 Initiate protocol modification as per clinical judgement (e.g., adverse effect). Provide indicated intervention per patient emergent event, following the established protocol and collaborate with the crash team in administering cardiac interventional medications as indicated by patient signs and symptoms</p>
<p>K3.10 Knowledge of impact of extent and severity of perfusion defects and reversibility on prognostic implications of imaging results in ischemic heart disease and myocardial viability</p>	<p>S3.10 Proficient in gated and ungated SPECT-CT display, QC, choice of filters, quantitative image analysis and QC</p>	<p>C3.10 Interpret data, including regional and global ventricular function, perfusion defects (with detailed description of location, extent, severity, reversibility), wall motion, ejection fraction, bull's eye polar maps and summed stress scores. Recognise non-cardiac incidental findings</p>
<p>K3.11 Theoretical and working knowledge of computer display, systems, standard formats for display of images (SPECT and planar) and display and normalisation of images</p>	<p>S3.11 Assess QC and QA testing of imaging systems</p>	<p>C3.11 Identify and correct technical sources of error (including motion, contamination, attenuation, body habitus, adjacent/overlap uptake, and reconstruction and count statistical artefacts)</p>

4. Hybrid Imaging Performance and Reconstruction⁷

Knowledge	Skills	Competencies
K4.1 Possess in-depth knowledge about the applications of hybrid imaging systems for diagnostic and/or therapy support and be aware of major clinical pathways	S4.1 Recognise the appropriateness of NM hybrid imaging scan for specific conditions	C4.1 Provide expertise in the application of diagnostic scanning procedures, not only by adhering to established protocols and reconstruction methods, but also by demonstrating the competency to optimise protocols in each patient case. Ensure that all procedures are executed in line with the specific diagnostic request, integrating evidence-based practices and collaborating with relevant medical specialists for optimal patient outcomes
K4.2 Be aware of the mathematical principles of image reconstruction, the more frequently used models and the computing power requirements	S4.2 Select the correct reconstruction according to diagnostic request, taking account of strength and downsides	C4.2 Be responsible for the diagnostic quality of the co-registered images after post-processing
K4.3 Understand issues and limitations relating to post-processing and alignment	S4.3 Identify qualitative and quantitative artefacts connected to post-processing and image reconstruction; recognise root cause and potential solutions	C4.3 Be able to adapt reconstruction parameters to improve potential artefacts and validate the results through audit methodology
K4.4 Realise the complexity of hybrid Imaging and the interactions between the different components, including technical challenges and environment requirements	S4.4 Have an understanding of technical design and specifications of hybrid imaging equipment as well as department maps, including infrastructure	C4.4 Actively participate and collaborate in hybrid imaging equipment installation and services, ensuring the system complies with department's operational needs and is fully integrated in the environment
K4.5 Be aware of the added value provided by multimodal imaging and the post-processing action required to optimise its use	S4.5 Compare image quality and quantitative performance using different acquisition protocols and reconstruction algorithms	C4.5 Collaborate in a multidisciplinary environment to validate hybrid image reconstruction, thus optimising the diagnostic potential
K4.6 Have a general understanding of software development and steps to be followed to implement it in a clinical setting	S4.6 Understand basic programming principles, to allow collaboration in implementing customised post-processing software	C4.6 Realise all audits and steps of software validation process for implementing a tailored solution for a clinical setting
K4.7 Acquire presentation and teaching skills for both acquisition protocols and Image reconstruction software	S4.7 Present the protocols and software to a peer audience, highlighting strengths and solutions to bypass potential pitfalls	C4.7 Operate as an application specialist for equipment and software, implementing solutions tailored to the needs of the department

5. Radionuclide Therapy^{7, 14}

Knowledge	Skills	Competencies
K5.1 Be aware of the established radionuclide therapeutic procedures and remain knowledgeable about novel therapies	S5.1 Ensure that the department is maximising its possible participation in delivering therapies	C5.1 Proactively participate in creating the evidence-based therapeutic SOPs
K5.2 Understand the pre-requirements for therapeutic intervention, including underlying disease, imaging and biochemistry information in line with regulatory compliance, funding, reimbursement and use of high-cost drug management system, patient access through inclusion criteria, compassionate use and legal conditions of treatment	S5.2 Analyse the individual indication for treatment, ascertain contraindications and risk of complications and take detailed patient history. Order and interpret complementary diagnostic tests in consultation with the lead consultant	C5.2 Conduct a comprehensive patient risk assessment and discuss the findings with the consultant and the Physics team to confirm profile suitability and delineate the therapeutic plan
K5.3 Have an in-depth knowledge and understanding of patient safety issues relevant to the area of specialisation	S5.3 Have the ability to communicate complex medical information in a manner easily understandable to those without specialised medical training	C5.3 Communicate effectively with patients, caregivers and other healthcare professionals to address the safety implications and personalisation of treatment
K5.4 Understand the roles of each member of the multidisciplinary team and how they impact the patient's pathway	S5.4 Coordinate all aspects of patient care within the internal (NM) and external (referring team) multidisciplinary teams	C5.4 Proactively participate in leading, planning and managing patients' pathways, sharing information, organising appointments and scheduling procedures
K5.5 Know the structure, meaning and importance of the informed consent procedure and the ethical considerations relating to all therapeutic procedures in the NM department	S5.5 Be able to explain the elements of the informed consent procedure and communicate them to the patient	C5.5 Obtain the informed consent and ensure that the procedure has been performed in accordance with the appropriate ethical principles
K5.6 Understand best practices for effective communication with patients, caregivers and other healthcare professionals	S5.6 Demonstrate effective communication with patients, caregivers and other healthcare professionals	C5.6 Effectively present professional knowledge to both specialists and non-professionals (e.g., patients and their caregivers)
K5.7 Understand the principles of cooperation in a multidisciplinary professional team in the clinical environment	S5.7 Be able to work in a multidisciplinary clinical team	C5.7 Be able to lead the multidisciplinary medical team when appropriate

Knowledge	Skills	Competencies
<p>K5.8 Understand the requirements of operational therapy management</p>	<p>S5.8 Be able to oversee preparation of therapy components (equipment, agents) as well as patients undergoing therapy management</p>	<p>C5.8 Co-ordinate delivery of therapeutic dose, preventing and managing adverse events as well as possible side effects, equipment QC, and ordering of agents</p>
<p>K5.9 Have an in-depth knowledge of radiopharmaceutical preparation</p>	<p>S5.9 Prepare the radiopharmaceutical, calculating its activity and the volume to be administered, and dose it using the appropriate set-up</p>	<p>C5.9 Be responsible for activity calculation and radiopharmaceutical dosing</p>
<p>K5.10 Understand the discharge process, i.e. national regulatory parameters as well as clinical considerations</p>	<p>S5.10 Write departmental procedure for standard discharge with input from Medical Physics and authorisation from the consultant/physician</p>	<p>C5.10 Lead the standard discharge process, documenting the steps and sharing updated patients' notes with the treating team</p>
<p>K5.11 Sound knowledge of critical factors relating to radiation protection, including elimination routes and possible contamination events</p>	<p>S5.11 Issue radiation protection advice to patients and their families/friends/ caregivers regarding personal hygiene and social contact</p>	<p>C5.11 Liaise with responsible persons (e.g. physicists, NM specialists) when more personalised radiation protection advice is required and communicate the radiation exposure guidance to the patient/family to maximise compliance. Collaborate with clinical and radiation protection experts to draw up contingency plans for common incidents or contamination scenarios and take the lead in case decontamination procedures are needed</p>
<p>K5.12 Have an in-depth knowledge of pre- and post-therapeutic imaging procedures, including physiological and pathological uptake patterns and imaging settings</p>	<p>S5.12 Organise pre- and post-therapeutic imaging time points and recognise imaging features of flare effect, treatment response, disease progression</p>	<p>C5.12 Comparatively analyse pre- and post-therapeutic imaging and support the multidisciplinary team in interpreting results in the context of the patient's case. Depending on local regulations, refer for follow-up imaging (positron and multimodal). Cooperation with the responsible NM physician may be needed in specific contexts</p>
<p>K5.13 Know the legislative and methodological background of dosimetry and quantitative imaging</p>	<p>S5.13 Perform dosimetry and educate less experienced personnel about the principles of the dosimetry procedural pathway</p>	<p>C5.13 Independently perform the necessary imaging and post processing established in the NM department, co-ordinating imaging settings modification where applicable</p>

6. Theranostics¹⁴

Knowledge	Skills	Competencies
K6.1 Know the pharmacological properties and pharmacodynamic principles of different radiopharmaceuticals that can be used in theranostics	S6.1 In line with national guidance, use theranostics expertise to produce local molecular diagnostic algorithms for investigation of specific conditions, while anticipating their possible dual use for therapy	C6.1 Act as an operational lead for theranostics, actively implementing and monitoring the daily run of combination protocols
K6.2 Understand the benefits and potentials of theranostics	S6.2 Raise awareness of theranostics for clinical pathways across the healthcare system	C6.2 Represent the department in external multidisciplinary meetings, and advocate the use of theranostics
K6.4 Understand theranostics protocol variables and their optimisation possibilities	S6.4 Assemble structured plans and protocols to ensure that the established patient and personnel protocols are met	C6.4 Conduct a rigorous and comprehensive critical evaluation of local protocols, applying an advanced understanding of evidence-based practices and integrating both theoretical and empirical perspectives
K6.7 Be educated to interpret imaging uptake patterns, taking account of typical differentiating biodistribution from the diagnostics and post-therapeutic imaging workout	S6.7 Review imaging results taking account of the clinical indication and recognise unexpected outcomes that can affect treatment plan (e.g., no uptake, disease recurrence, disease progression)	C6.7 Act on imaging findings: based on (preliminary) imaging results, identify patients who have been referred for diagnostic procedures who could potentially benefit from consideration for radionuclide therapy and report to the physician; or patients who are on the theranostics pathway who no longer meet the imaging eligibility criteria for therapy
K6.8 Understand the need to optimise risk/benefit balance for diagnostic and therapeutic uses	S6.8 Correlate imaging findings from the diagnostic and therapeutic contexts, including previous cross-modality and laboratory results and present relevant summaries to the multidisciplinary team	C6.8 Reproduce optimised positioning for pre- and post-therapeutic images, including ensuring continuity of strategies for patient's comfort, dignity and privacy, thus ultimately augmenting patient's engagement
K6.9 Understand dosimetry principles and practice	S6.9 Operationalise imaging protocols to collect data for dosimetry purposes	C6.9 Supervise the data collection for dosimetry purposes

Knowledge	Skills	Competencies
<p>K6.10 Be knowledgeable about possible side-effects and the pharmacology of the commonly used medication, its side-effects and contraindications</p>	<p>S6.10 Define the protocol for anticipating and managing side-effects (manage routine medication availability and application)</p>	<p>C6.10 Support patients in the immediate follow-up period during and after treatment sessions</p>
<p>K6.11 Define development of patient assessment and review clinics in other departments and settings by other professional groups</p>	<p>S6.11 Compile data on support facilities to enable patient access from and to other departments, if required</p>	<p>C6.11 Establish specific patient review clinics and prepare patient technical reports, evaluate individual patient processes and requirements and apply adaptation to individual therapeutic needs</p>

7. Radiation Protection^{1, 4,7,15,16}

Knowledge	Skills	Competencies
K7.1 Know the international and national requirements for radiation protection	S7.1 Apply the national requirements for radiation protection to departmental setting	C7.1 Be responsible for meeting the national requirements for the application of radiation protection on a departmental level, participating in inspections where applicable
K7.2 Understand the requirements for licensing the NM facility	S7.2 Collaborate to ensure the licensing requirements for the NM facility are met	C7.2 Be responsible for verifying that the national requirements and licensing details are being applied and respected
K7.3 Be aware of the existing radioactive sources that may be in use in NM, their physical characteristics and the regulations around keeping them safe	S7.3 Ensure radiation protection regulations are met and that radioactive sources in the department are safely maintained	C7.3 Collaborate in actively respecting the existing radiation protection programme and supervise other professionals' actions when using unsealed sources
K7.4 Understand the risks associated with manipulation of the different sealed or unsealed radioactive sources	S7.4 Identify risks and develop corrective procedures	C7.4 Verify and execute the implemented corrective action plan
K7.5 Be aware of the existing radiation safety committee, where applicable	S7.5 Be part of the radiation safety committee, where applicable	C7.5 Actively contribute to the radiation safety committee meetings, where applicable
K7.6 Be able to provide radiation protection education for other staff members	S7.6 Understand the need for radiation protection education according to the background of different staff members	C7.6 Implement educational programmes and updates for staff members
K7.7 Know the regulated dose limit for exposed professionals and public	S7.7 Regularly check the staff dosimetric records and analyse in accordance with the legal exposure limits	C7.7 Monitor and analyse the dosimetric information of staff members collaborating in mitigating actions, where applicable
K7.8 Understand the principles and purposes of radiation protection audits	S7.8 Define internal audits for radiation protection verification and be available to collaborate with external auditors	C7.8 Implement internal audits and follow up on external radiation protection audits, actioning any suggested changes where applicable
K7.9 Understand the impact of image and protocol design details on dose optimisation	S7.9 Be able to define acquisition details and injected activity in accordance with radiation protection criteria	C7.9 Be responsible for protocol development with regard to dose optimisation, balancing image quality and exposure
K7.10 Understand waste management principles	S7.10 Be aware of the waste products and how to dispose of them	C7.10 Implement and verify waste management system
K7.11 Understand the principles of radiation protection and body irradiation and be familiar with the existing protective equipment (EPI) and monitoring devices (dosimeters)	S7.11 Make protective devices, e.g., shielding, dosimeters, available to the exposed personnel, participating in the commissioning process where necessary	C7.11 Verify the correct use of protective equipment and dosimeters

8. Research^{2, 17}

Knowledge	Skills	Competencies
K8.1 Define the basics of establishing the research hypotheses and the study objectives	S8.1 Customise the study hypotheses and the study objectives	C8.1 Define the study's research question and adapt the study hypotheses accordingly to achieve the study objectives
K8.2 Recognise the scientific and clinical value of the study	S8.2 Explain the possible outcome and impact of the proposed research project	C8.2 Critically assess the importance of the study's expected outcome for science and clinical practice
K8.3 Understand the principles of descriptive and analytical study design (survey, qualitative study, observation, intervention)	S8.3 Select the most suitable research strategy and methods	C8.3 Plan for the study to be reliable and unbiased by integrating specific decisive components in a concise and logical manner
K8.4 List the study settings	S8.4 Define the requirements for performance of the study, taking account of ethical and legal regulations	C8.4 Define the resources necessary for study efficacy and assist in writing project proposals to submit to the Ethics Committee
K8.5 Understand the methodology of putting together a credible research database	S8.5 Create the research database based on specific inclusion and exclusion criteria in accordance with Helsinki principles	C8.5 Select and customise the most appropriate sampling method to avoid bias and false results
K8.6 Pinpoint the necessary measurements and analytical tools for preparation of the scientific analysis	S8.6 Perform the appropriate measurement validation using suitable analytical methods (including statistical analysis)	C8.6 Verify the obtained results, revise the reports from the evaluation made during research
K8.7 Define the study timeline	S8.7 Schedule research stages in accordance with the established study strategy	C8.7 Review possible events and propose methods of preventing and resolving those events to minimise disruption of the agreed timeline
K8.9 Understand how to validate the obtained results according to the applied methodology	S8.9 Obtain the results of the analysis and draw conclusions in accordance with the study objectives	C8.9 Evaluate the significance of the obtained results, extract relevant data and critically assess the study efficacy
K8.10 Have knowledge of various data validation methods	S8.10 Validate the data in accordance with the principles of data processing, reproduction, and dissemination	C8.10 Determine the most appropriate data validation method (primary or secondary publications, communications, other) and employ it to present the results to the wider scientific community
K8.11 Understand how peer-reviewed publications work	S8.11 Critically evaluate scientific literature	C8.11 Create and organise a literature database to support scientific literature research

9. Clinical Trials^{18,19}

Knowledge	Skills	Competencies
K9.1 Know the drug discovery pathway and the legal regulations governing drug approval	S9.1 Address the specific elements of drug discovery (e.g. compound screening, testing, time and cost-effectiveness, approval requests to authorities, licenses, documentation)	C9.1 Participate in preparing and implementing SOPs for management of the Investigational Medicinal Product Dossier (IMPD)
K9.2 Understand the basic concepts and phases of clinical trials	S9.2 Collaborate with the research team in establishing and interpreting objectives and phases of the clinical trial	C9.2 Be able to propose specific objectives and activities in the various clinical trial phases
K9.3 Be aware of Good Clinical Practice (GCP) principles	S9.3 Apply GCP principle to your role and responsibility in the research team	C9.3 Critically assess the quality of the clinical study design and performance
K9.4 Understand the ethical aspects of medical research (e.g. declaration of Helsinki)	S9.4 Prepare the request for approval by the (local) Ethics Committee	C9.4 Be able to decide when ethical approval is required and take responsibility for the ethical aspects of your task in the research team
K9.5 Recognise roles and responsibilities of the clinical trial research team (e.g. Contract Research Organisation, Sponsor, Principal Investigator)	S9.5 Collaborate in performing specific activities assigned to research team members	C9.5 Take responsibility and critically evaluate your work outcome within the research team
K9.6 Be aware of clinical trial endpoints and the role of NM in the trial	S9.6 Schedule and implement the assigned tasks timeline and prepare SOPs to meet the timelines	C9.6 Take responsibility for efficacy of the assigned tasks
K9.7 Know the procedures needed from other departments to meet the requirements of the protocol	S9.7 Communicate with other departments (e.g. radiology, laboratory) to proceed with the clinical trial steps	C9.7 Coordinate performance of examinations in accordance with the established protocol
K9.8 Define the standardised and quantifiable imaging procedures in PET and SPECT modalities	S9.8 Educate the NM technologist about the PET and SPECT imaging procedures and coordinate performance of the procedures	C9.8 Co-coordinate the scanning protocol and study performance with the medical physicist and physician
K9.9 Understand the importance of safety and efficacy with regard to the researched intervention (Suspected Unexpected Serious Adverse Reaction, SUSAR; Serious Adverse Events, SAE; Adverse Events, AE)	S9.9 Recognise SUSAR SAE/AE events	C9.9 Critically evaluate the risk and benefit intervention ratio and possible adverse events; prepare the necessary documentation in case of adverse events

Knowledge	Skills	Competencies
K9.10 Understand the principles of data processing, reproduction, validation, and dissemination	S9.10 Collaborate in dataset preparation and analysis	C9.10 Review the correctness of the study report
K9.11 Know how to manage the (Electronic) Case Report Form (e)CFR	S9.11 Enter data in (e)CRF and resolve any queries	C9.11 Educate personnel to complete (e)CRF properly
K9.12 Understand the structure of Site Investigator Files (SIF)	S9.12 Prepare and maintain SIF	C9.12 Collaborate with Clinical Research Associate (CRA) inspectors during monitoring visits
K9.13 Understand financial requirements relating to clinical trials	K9.13 Plan and prepare the financial plan for your tasks within the research team	C9.13 Be able to present the financial report during visits by the sponsoring institution

10. Artificial Intelligence, Machine Learning & Deep Learning^{20,21}

Knowledge	Skills	Competencies
K10.1 Be acquainted with the basic concepts of Artificial Intelligence (AI), Machine Learning (ML) Deep Learning (DL) and radiomics	S10.1 Identify opportunities where AI, ML and DL can be applied to optimise NM procedures	C10.1 Collaborate in a multidisciplinary team to identify projects where AI, ML, DL and radiomics can benefit clinical or research procedures
K10.2 Understand the functional basis of AI, ML and DL in the context of NM and hybrid imaging	S10.2 Evaluate and validate the accuracy of results when algorithms are applied to image reconstruction, image interpretation or other quantifications	C10.2 Recognise and create standards of evaluation for AI, ML and DL in hybrid imaging in the context of NM procedures
K10.3 Understand the importance of standardisation of image quality in the process of data acquisition	S10.3 Perform and oversee the correct labelling of data to ensure compliance with guidelines	C10.3 In a multidisciplinary team, assume responsibility for performing and overseeing the correct labelling of data to ensure compliance with guidelines
K10.4 Identify NM needs that could be tackled using AI, ML and DL	S10.4 Review current practices in the light of current findings in AI, ML and DL	C10.4 Critically review current practices and the opportunities and challenges associated with an AI, ML and DL-based approach
K10.5 Be acquainted with the European Artificial Intelligence Act	S10.5 Ensure that generated data is compliant with the European Artificial Intelligence Act	C10.5 Critically review the current software providers in the light of the European Artificial Intelligence Act
K10.6 Have basic knowledge of the approval pathway for medical devices or products related to NM and incorporating AI, ML and DL	S10.6 Handle AI, ML and DL solutions proactively and with due consideration for safety	C10.6 Participate in supervision of AI, ML and DL systems

11. Education^{1,3,8,9,22-26}

Knowledge	Skills	Competencies
K11.1 Understand the necessity for comprehensive education of all professionals working together in NM	S11.1 Communicate and exchange experiences with multidisciplinary teaching team	C11.1 Ensure comprehensive learning and teaching methods covering all aspects of NMT responsibilities and expertise are in place for all staff grades and students/trainees, and that staff members participate in multidisciplinary learning
K11.2 Be aware of the importance of psychological and educational background in establishing good communication with students	S11.2 Observe and react to the students' needs and requests, encouraging them to learn from their mistakes	C11.2 Act with fairness and inclusivity when designing learning activities and assessments, taking account of individual needs and departmental standards
K11.3 Understand the necessity of self- excellence and continuous teacher training	S11.3 Participate in internships, educational courses and training programmes	C11.3 Critically review abilities, knowledge, experience and teaching programme
K11.4 Identify novel NM techniques, instrumentation and radiopharmaceuticals	S11.4 Adjust the teaching model to incorporate novel findings	C11.4 Ensure the material taught is consistent with the latest state of knowledge in the NM field
K11.5 Review the validated curriculum for trainee technologists	S11.5 Incorporate all mandatory elements of the curriculum in the Nuclear Medicine teaching model	C11.5 Customise the local teaching model in line with the curriculum and revise individual elements where necessary
K11.6 Understand the principles of education quality assurance and quality excellence as part of continuous professional development	S11.6 Follow credible local and international teaching and learning guidelines and initiatives (e.g., EQAR, ENQA, IREG)	C11.6 Ensure successful teaching and learning outcomes
K11.7 Be acquainted with modern teaching models and methods	S11.7 Research, train and apply modern teaching methods	C11.7 Apply learner-centred and activity-based teaching techniques
K11.8 Understand the key characteristics of theoretical and practical education for NMTs	S11.8 Select and define the practical activities and tasks to be performed by the students	C11.8 Maintain a strongly activity-based teaching model in line with current NM practice
K11.9 Be familiar with the national professional standards for NMTs	S11.9 Appraise junior staff members' performance and develop teaching sessions for the team	C11.9 Conduct team gap analysis to identify learning needs and train peers accordingly

12. Instrumentation Quality Assurance (Imaging, Non-Imaging and Radiation Protection Instruments)^{1,27,28}

Knowledge	Skills	Competencies
K12.1 Have an in-depth understanding of the physics of image acquisition and the parameters of image quality in hybrid Nuclear Medicine equipment	S12.1 Identify the scope of practice for equipment QC, together with required materials and expected results	C12.1 Be able to perform QC of the equipment according to protocols, read the results and act accordingly
K12.2 Know the different types of phantoms commonly used and which parameters they test	S12.2 Identify the correct phantoms and radioactive sources for QC	C12.2 Manage the materials for QC, checking their availability, status, integrity and fitness for purpose
K12.3 Be able to explain how the QA procedures influence the clinical value of the acquisitions and images in hybrid imaging	S12.3 Read QC results correctly, compare them with the expected values and identify root causes of variations	C12.3 Analyse QC results and discuss variations with Physics and physicians teams to identify potential impact on imaging, quantification and diagnosis
K12.4 Understand the importance of standardisation of images for clinical or research purposes and the role of QA in this regard	S12.4 Be aware of standardisation programmes for scanners used in clinical trials and how to operate according to these standards	C12.4 Perform QC for standardisation programmes and be able to implement any required modifications
K12.5 Have a wide knowledge of international regulations and how to ensure equipment meets them	S12.5 Collaborate with Physics team in benchmarking internal protocols for QC with applicable regulations	C12.5 Identify potential discrepancies between current practice and latest regulations and act to rectify
K12.6 Understand the impact of regular QA and correction factors in quantitative imaging with hybrid NM equipment	S12.6 Ensure that QC and corrections do not affect precision in analysing quantitative parameters	C12.6 Be able to apply correction factors to ensure certainty of quantitative parameters
K12.7 Be aware of the importance of a proper QMS for the equipment to avoid potential misinterpretation and diagnostic errors	S12.7 Prepare written procedures adapting vendors' specifications to the needs of the department	C12.7 Play an active role in preparing, checking and monitoring the use of the department's Quality Assurance Manual

References

1. EANM official website: EANM Benchmark Document on Nuclear Medicine Technologists' Competencies
<https://doi.org/10.52717/AEGO6915>
2. Fragoso Costa, P., Santos, A. & Testanera, G. An insight into the EANM technologist committee benchmark document on nuclear medicine technologists' competencies. *Eur J Nucl Med Mol Imaging*. 2017.
<https://doi.org/10.1007/s00259-017-3>.
3. Waterstram-Rich K, Hogg P, Testanera G, Medvedec H, Dennen SE, Knapp W, Thomas N, Hunt K, Pickett M, Scott A, Dillehay, G. Euro-American discussion document on entry-level and advanced practice in nuclear medicine. *J Nucl Med Technol*. 2011.
<https://doi.org/10.2967/jnmt.111.096354>.
4. European Union Official Website: Description of the eight EQF levels | Europass.
<https://europa.eu/europass/en/description-eight-eqf-levels>
5. International Atomic Energy Agency official website:
<https://www.iaea.org/publications/14917/basics-of-quality-management-for-nuclear-medicine-practices>
6. Johnson SL. Authentic Leadership Theory and Practical Applications in Nuclear Medicine. *J Nucl Med Technol*. 2019.
<https://doi.org/10.2967/jnmt.118.222851>.
7. Mary Anne (Mimi) Owen, Martha W. Pickett, Paul E. Christian, Gary L. Dillehay, Lynnette A. Fulk, Leonie L. Gordon, Robert E. Henkin, Marcia Hess-Smith, William L. Hubble, Kathy Thompson Hunt, Frances K. Keech, Cybil Nielsen and Anne Stachowiak. Nuclear Medicine Practitioner Competencies. Prepared by the members of the SNMTS Advanced Practice Task Force. *J Nucl Med Technol*. 2007. PMID: 17337656.
<https://tech.snmjournals.org/content/35/1/39>
8. Bolin JD. The Use of Integrative Leadership in Providing Excellent Patient Care While Overcoming Hospital Challenges. *J Nucl Med Technol*. 2019.
<https://doi.org/10.2967/jnmt.118.219212>.
9. Gillings N, Hjelstuen O, Behe M, Decristoforo C, Elsinga PH, Ferrari V, Kiss OC, Kolenc P, Koziarowski J, Laverman P, Mindt TL, Ocak M, Patt M, Todde S, Walte A. EANM guideline on quality risk management for radiopharmaceuticals. *Eur J Nucl Med Mol Imaging*. 2022.
<https://doi.org/10.1007/s00259-022-05738-4>
10. EANM official website: Guidelines On Current Good Radiopharmacy Practice (cGRPP) In The Preparation Of Radiopharmaceuticals.
<https://doi.org/10.1186/s41181-021-00123-2>
11. EANM official website: EANM Technologists' Guide – Myocardial Perfusion Imaging.
<https://doi.org/10.52717/SBZR5415>
12. British Nuclear Medicine Society official website:
https://cdn.ymaws.com/www.bnms.org.uk/resource/resmgr/resources/clinical_competence_in_myoca.pdf
13. Rodgers GP, Ayanian JZ, Balady G, Beasley JW, Brown KA, Gervino EV, Paridon S, Quinones M, Schlant RC, Winters WL Jr, Achord JL, Boone AW, Hirshfeld JW Jr, Lorell BH, Rodgers GP, Tracy CM, Weitz HH. American College of Cardiology/American Heart Association Clinical Competence Statement on Stress Testing. A Report of the American College of Cardiology/American Heart Association/American College of Physicians-American Society of Internal Medicine Task Force on Clinical Competence. *Circ*. 2000.
<https://doi.org/10.1161/01.cir.102.14.1726>
14. Nuclear Medicine Technology Certification Board official website: Nuclear Medicine Advanced Associate Curriculum Guide 1st Edition.
https://www.nmtcb.org/documents/resources/Nuclear_Medicine_Advanced_Associate_Curriculum_Guide_1st_E.pdf

15. European Federation of Radiographers Societies official website. Radiation Protection 2020 Officer (RPO) Role Descriptor for Radiographers.
<https://api.efrs.eu/api/assets/posts/174>
16. Costa PF, Testanera G, Camoni L, Terwinghe C, Bailey EA, Bolus NE, Alden TM; EANM Technologists' Committee; on behalf of the ANZSNM Technologists Special Interest Group; on behalf of the SNMMI Technologist Section; CAMRT. Technologist Approach to Global Dose Optimization. *J Nucl Med Technol*. 2019.
<https://doi.org/10.2967/jnmt.118.218131>.
17. NHS England official website:
<https://www.hee.nhs.uk/sites/default/files/documents/multi-professionalframeworkforadvancedclinicalpracticeinengland.pdf>
18. Jeffers CD, Frye SA, Hoffman JM. SNMMI Clinical Trials Network Research Series for Technologists: Clinical Research Primer- Regulatory Process, Part I: How and When Radiopharmaceuticals Can Be Used. *J Nucl Med Technol*. 2022.
<https://doi.org/10.2967/jnmt.121.263499>.
19. Frye S, Butterfield R, Hoffman JM. SNMMI Clinical Trials Network Research Series for Technologists: Introduction. *J Nucl Med Technol*. 2021. DOI:
<https://doi.org/10.2967/jnmt.121.263099>.
20. Visvikis D, Lambin P, Beuschaus Mauridsen K, Hustinx R, Lassmann M, Rischpler C, Shi K, Pruim J. Application of artificial intelligence in nuclear medicine and molecular imaging: a review of current status and future perspectives for clinical translation. *Eur J Nucl Med Mol Imaging*. 2022.
<https://doi.org/10.1007/s00259-022-05891-w>.
21. Hustinx R, Pruim J, Lassmann M, Visvikis D. An EANM position paper on the application of artificial intelligence in nuclear medicine. *Eur J Nucl Med Mol Imaging*. 2022.
<https://doi.org/10.1007/s00259-022-05947-x>.
22. Matos AC, Massa RC, Lucena FM, Vaz TR. Nuclear medicine technologist education and training in Europe: literature and web- based findings. *Nucl Med Commun*. 2015.
<https://doi.org/10.1097/MNM.000000000000286>.
23. Mathews J, Grewal H, Gillan C, Menezes R, Cornacchione P, Catton J. Development of nuclear medicine image quality assessment criteria for use in a technologist peer review program. *J Med Imaging Radiat Sci*. 2021.
<https://doi.org/10.1016/j.jmir.2020.11.009>.
24. The European Quality Assurance Register (EQAR) for Higher Education official website:
<https://www.eqar.eu/>
25. European Association for Quality Assurance (ENQA) in Higher Education official website:
<https://www.enqa.eu/>
26. Observatory on Academic Ranking and Excellence (IREG) official website:
<https://ireg-observatory.org/en/>
27. EANM official website: A Technologist's Guide: Quality Control of Nuclear Medicine instrumentation and protocol standardisation. DOI:
<https://doi.org/10.52717/IFSD3470>
28. International Society of Radiographers & Radiological Technologists Official website: ISRRT's Position Statement: of the Radiographers/Radiological Technologists Role in Quality Assurance and Quality Control as a Team Approach.
<https://www.isrrt.org/proffesional-practice/position-statements/qa-qc/>



www.eanm.org