SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED QUALIFICATION:

Bachelor of Nuclear Medicine Radiography

SAQA QUAL ID	QUALIFICATION TITLE			
66950	Bachelor of Nuclear Medicine Radiography			
ORIGINATOR		**ORIGINATING PROVIDER**		
Task Team - Radiography and Clinical Technology				
QUALITY ASSURING BODY				
-				
QUALIFICATION TYPE	**FIELD**		**SUBFIELD**	
National First Degree(Min 480)	Field 09 - Health Sciences and Social Services		Curative Health	
ABET BAND	**MINIMUM CREDITS**	**PRE-2009 NQF LEVEL**	**NQF LEVEL**	**QUAL CLASS**
Undefined	480	Level 7	NQF Level 08	Regular-ELOAC
REGISTRATION STATUS		**SAQA DECISION NUMBER**	**REGISTRATION START DATE**	**REGISTRATION END DATE**
Reregistered		SAQA 0695/12	2012-07-01	2015-06-30
LAST DATE FOR ENROLMENT		**LAST DATE FOR ACHIEVEMENT**		
2016-06-30		2019-06-30		

In all of the tables in this document, both the pre-2009 NQF Level and the NQF Level is shown. In the text (purpose statements, qualification rules, etc), any references to NQF Levels are to the pre-2009 levels unless specifically stated otherwise.

This qualification does not replace any other qualification and is not replaced by any other qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

The purpose of this Qualification is to develop a professional Radiographer who will specialise in the field of Nuclear Medicine. This qualification will enable the qualified specialist to work in the public or private

health care sectors or operate as an independent practitioner.

This Qualification enables the learner to competently apply an integration of theory, principles, proven techniques, practical experience and appropriate skills to the solution of well-defined and abstract problems in the selected field of Nuclear Medicine. It aims at ensuring reflective practice and life-long learning in the profession, thereby benefiting the community and society. This will be achieved by the learner meeting the following outcomes:

- Providing holistic patient care within the nuclear medicine environment.
- Performing a range of nuclear medicine imaging procedures for purposes of diagnosis and treatment.
- Operating and ensuring quality function of nuclear medicine instrumentation.
- Dispensing and administering radiopharmaceuticals.
- Performing in-vitro and non-imaging nuclear medicine procedures.
- Assuring the quality of nuclear medicine service provided.

Skills in management and research will also be developed allowing the holder of this Qualification to work independently and in a supervisory capacity within a health care team.

Successful completion of this Qualification will enable the graduate to be registered by the relevant Statutory Health Council.

Rationale:

Healthcare is set to change in the future from the curative paradigm of the 20th century to a pre-emptive model. Imaging is central to this model and will drive that change to the benefit of the patient. Medical imaging in general plays a key role in understanding complex biological systems and Nuclear Medicine in particular is relevant in tracking changes at a molecular, cellular and organ tissue level. Nuclear Medicine in South Africa is currently experiencing an expansive growth phase with the advent of Positron Emission Tomography (PET)/Computerised Tomography (CT) Imaging Technology. PET/CT is an invaluable tool in the area of oncology, and is set to be very promising in the areas of neurology and cardiology.

Nuclear Medicine Radiographers are part of an integral team comprising; Nuclear Medicine Physicians, Medical Physicists, Radiopharmacists and Nursing staff who are responsible, in general, for delivering a nuclear medicine service. In particular the Nuclear Medicine Radiographer is responsible for performing the Nuclear Medicine investigation in toto, from preparation and administration of the radiopharmaceutical, to imaging the patient and finally to processing the data acquired. The qualified Nuclear Medicine Radiographer needs to display expertise in the many and varied Nuclear Medicine investigations; predominantly in vivo investigations but also non-imaging (in vitro) and to a lesser extent therapeutic investigations.

Nuclear Medicine facilities in South Africa are located mainly in high population areas both in the public and private sectors. Registration to practice as a Radiographer in the category; nuclear medicine is through the Health Professions Council of South Africa (HPCSA).

This Qualification is recognised by the Statutory Health Council as a requirement for registration to practise in the field of Nuclear Medicine Radiography. Achievement of this qualification should provide the learner with direct access to a Master's degree.

The Qualification is necessary for employment in both the public and the private sector as part of a team providing a holistic health care service in general and a nuclear medicine service in particular.

The exit level outcomes for this degree describe the foundational, practical and reflexive competencies, which together constitute the applied competence required of Nuclear Medicine Radiographer at this level.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

- Mathematics at NQF Level 4.

- Communication at NQF Level 4.
- Life Sciences at NQF Level 4.

Computer Literacy at NQF Level 3 is strongly recommended.

Recognition of Prior Learning:

This Qualification may be achieved in part through the recognition of relevant prior learning and through prior experience as a practitioner in another field of Radiography. Providers are required to develop structured and accredited means of the assessment of individual learners against exit-level outcomes of the qualification on a case-by-case basis. Recognition of prior learning will be conducted in accordance with the institutions' accredited RPL policy and the agreement of the relevant ETQA. Such procedures and the assessment of individual cases are subject to moderation by independent assessors.

Access to the Qualification:

Access to the qualification is open to learners in possession of a Senior Certificate or equivalent NQF Level 4 qualifications and who meet the entry requirements of the institution offering the Qualification, as well as the specifications of the relevant Statutory Health Council.

RECOGNISE PREVIOUS LEARNING?

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QUALIFICATION RULES

Fundamental and Core Component:

Exit Level Outcomes 1 to 7 constitute the Fundamental and Core Components of the Qualification and together total 440 credits. They are compulsory for all learners.

The allocation of credits to each Exit Level Outcome can be done by the individual institutions offering the qualification on condition such allocation meets the minimum number of credits for each Exit Level Outcome as stipulated by the relevant Statutory Health Council in its curriculum guidelines.

Elective Component:

The Elective Component consists of two parts:

The research Exit Level Outcome (Outcome 8) in which learners may choose any aspect or topic in the field which is relevant to them and for which they are required to produce the outcomes of their research in a manner, format and to a standard acceptable to the institution offering the Qualification. (40 credits minimum).

This may be assessed in an integrated way with Exit Level Outcomes 1 to 7 or be incorporated into the research project (Exit Level Outcome 8).

The application of theoretical knowledge and skills in one of the chosen fields as listed below:

- Small and Medium Business Enterprises.
- Paediatric Nuclear Medicine.
- Advanced practice in hybrid imaging systems i.e. PET/CT and PET/MRI.
- Therapeutic use of radionuclides.
- Radioimmunoassays.
- Medical law and bioethics.
- Education in health.
- Specialised Nuclear Medicine Procedures.

EXIT LEVEL OUTCOMES

1. Apply principles of human rights, ethics and relevant medical law to ensure the well-being of the patient.

2. Perform a range of conventional and specialised nuclear medicine imaging procedures in order to facilitate diagnosis and treatment of the patient.

3. Operate and ensure quality functioning of all nuclear medicine instrumentation to provide the best diagnostic capability of the instruments.

4. Function in a type 'B' radiopharmacy laboratory to safely dispense radiopharmaceuticals for nuclear medicine imaging procedures.

5. Perform a range of in vitro and in vivo non-imaging nuclear medicine procedures in a type 'C' radiopharmacy laboratory.

6. Assure quality of all aspects of a nuclear medicine investigation and the service provided.

7. Plan, develop and apply total quality management appropriate to the nuclear medicine context.

8. Demonstrate research skills and foster a research climate in nuclear medicine.

9. Apply the principles, specific knowledge, skills and values related to the chosen elective subject. Range of possible electives:

- Small and Medium Business Enterprises.
- Paediatric Nuclear Medicine.
- Advanced practice in hybrid imaging systems i.e. PET/CT and PET/MRI.
- Therapeutic use of radionuclides.
- Radioimmunoassays.
- Medical law and bioethics.
- Education in health.
- Specialised Nuclear Medicine Procedures.

Critical Cross-Field Outcomes:

The qualification promotes the critical cross-field outcomes in the following manner:

- Identify health problems in the context of nuclear medicine and suggest and implement a solution or plan of action in order to solve the problem professionally.
- Perform professional duties with confidence in collaboration with other health care professionals and where appropriate assume leadership in tasks or projects to assure that quality action is taken to minimise the risks associated with adverse reactions and radiation accidents for the protection of both patients and the public.
- Keep up with the current trends and changing needs of a nuclear medicine service on a regional, national and international level in relation to both the radiopharmacy legislation and work practices to ensure an efficient functioning and administration of the type 'C' laboratory.
- Contribute towards and facilitate continuing professional development of nuclear medicine staff with the view of ensuring that nuclear medicine equipment and accessories are competently operated in order to provide the best diagnostic capability of the equipment.
- Communicate effectively in the learning and health care environment to ensure that the patients' needs are recognised, assessed and responded to with due regard to human dignity.
- Reflect on and explore a variety of strategies in order to improve nuclear medicine practice by participating in the social, political and academic debate about what research is and how it should be conducted in nuclear medicine technology.
- Demonstrate understanding of nuclear medicine principles in order to solve practical problems within the nuclear medicine context through the application of research methods for nuclear medicine procedures.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level outcome 1:

1.1 Patients physical and psychological needs are recognised, assessed and responded to with due regard for human dignity.
1.2 Patient rights as a member of society are acknowledged and adhered to according to the Bill of Rights and Patient Charter.
1.3 Communication is effective and appropriate with both the patient and other members of the health care team in a multicultural context with due regard for human dignity and patient confidentiality.
1.4 Appropriate caring skills and the ability to act in an emergency and apply first aid are demonstrated during patient intervention.

Associated Assessment Criteria for Exit Level outcome 2:

2.1 Knowledge and skills related to the theoretical, clinical and technical practices and principles of nuclear medicine radiography are applied in order to perform, assist in developing protocols and apply research methods for nuclear medicine procedures.
2.2 Comprehensive knowledge of human anatomy, cross-sectional anatomy, physiology, biological processes at a molecular level and related pathophysiology is applied in order to acquire nuclear medicine scintigrams of optimal diagnostic quality and to recognise normal and abnormal nuclear medicine image patterns.
2.3 Comprehensive knowledge of the physical characteristics and biodistribution of up-to-date radiopharmaceuticals is applied in order to select, administer and evaluate radiopharmaceuticals appropriate to the nuclear medicine investigation.
2.4 Comprehensive theoretical and clinical knowledge of physics, radiation physics, and radiobiology is applied to ensure safety of the patient and the health care team.
2.5 Principles of digital image processing are applied to display qualitative and/or quantitative data in order to facilitate the diagnostic capability of the nuclear medicine investigation.
2.6 Normal and abnormal radiopharmaceutical biodistribution patterns are recognised and verbally communicated or documented in order to manage the investigation or inform other members of the health care team.
2.7 Comprehensive up-to-date knowledge of specialised nuclear medicine imaging procedures is applied in order to perform investigations such as Positron Emission Technology (PET).
2.8 Specialised knowledge and the sensitive handling of the child as a patient is applied in order to perform paediatric nuclear medicine procedures.
2.9 Specialised procedures using hand held gamma probes in a surgical environment are performed, as part of a surgical team.

Associated Assessment Criteria for Exit Level outcome 3:

3.1 All nuclear medicine imaging devices and accessory equipment are competently operated in order to provide the best diagnostic capability of the equipment.
3.2 The performance of conventional and specialised gamma cameras is evaluated by performing regular quality control tests and taking corrective action where necessary.
3.3 Up-to-date knowledge of Nuclear Medicine (NM) Computerised Tomography Imaging devices is integrated into the operation of the instruments and their performance regularly monitored.
3.4 Quality control tests are performed on all counting devices and data meticulously recorded to ensure quality function.
3.5 Operation of all hard copy recording devices and processing units is appropriately applied.
3.6 Underpinning theoretical and technical knowledge is applied during the operation and quality performance of PET cameras.

Associated Assessment Criteria for Exit Level outcome 4:

4.1 Radionuclide generators are operated and maintained in order to ensure quality safe, sterile eluate for use in radiopharmaceuticals.
4.2 Detailed knowledge of radiochemistry and physiochemical aspects of radiolabelling compounds and

blood components is applied for use in preparation of radiopharmaceuticals.
4.3 Quality control tests are regularly performed in order to ensure the product identity, biological safety and efficacy of the radiopharmaceutical.
4.4 Appropriate dispensing techniques are used in the preparation of radiopharmaceuticals to ensure safety during patient administration whilst minimising radiation hazard to self and other personnel.
4.5 Comprehensive knowledge of factors which will affect the integrity of radiopharmaceuticals is applied and adverse reactions are noted and the event is reported.
4.6 Up-to-date knowledge of radiopharmacy legislation and appropriate work practices is applied for efficient functioning and administration of a type 'B' laboratory.

Associated Assessment Criteria for Exit Level outcome 5:

5.1 Knowledge of current, relevant radiopharmacy legislation and work practices is applied for efficient functioning and administration of a type 'C' laboratory.
5.2 Comprehensive knowledge of radionuclide tracer principles, physiology and biochemical processes is applied in order to perform in vitro and in vivo non-imaging nuclear medicine procedures safely, and accurately.
5.3 Counting systems, statistics and results are evaluated in order to insure quality results which are reliable and valid.
5.4 Normal and abnormal results are correctly interpreted.

Associated Assessment Criteria for Exit Level outcome 6:

6.1 A comprehensive Quality Assurance programme is developed, implemented and audited.
6.2 Quality control tests on nuclear medicine instrumentation are performed according to National Electrical Manufacturers Association (NEMA) standards.
6.3 Quality control tests on radionuclides, radiopharmaceuticals and the radiopharmacy environment and equipment are performed.
6.4 Required procedures are utilised in order to prevent contamination from unsealed sources and any possible contamination is monitored.
6.5 Adverse reactions and radiation incidents are immediately reported to relevant authorities and regulatory bodies.
6.6 Customer-orientated quality service is provided to the nuclear medicine patient.

Associated Assessment Criteria for Exit Level outcome 7:

7.1 Principles of quality assurance and quality control are demonstrated in the development of departmental protocols.
7.2 Equipment and accessories are selected, purchased and maintained within an available budget to provide a cost-effective service.
7.3 Communication and co-operation between all role players are effectively developed and maintained in order to provide optimal service.
7.4 Performance management strategies are developed in a manner which shows an understanding of management principles and current, relevant legislation.
7.5 Departmental records and statistics are accurately maintained in accordance with the departmental and professional council requirements.
7.6 Integrated knowledge of management, technology and current, relevant legislation is demonstrated in the ability to design and equip a new, or alter an existing, nuclear medicine facility.

Associated Assessment Criteria for Exit Level outcome 8:

8.1 Contributions are made in the debate on social, political and academic matters, the need for research and how it should be carried out in the health sector.
8.2 The research of others is analysed and interpreted to replicate or inform own research.
8.3 Pertinent literature is reviewed in order to design a research project.
8.4 Research principles and methodology in the field of nuclear medicine research are demonstrated in the form of a research project.
8.5 Results of the research project are reported according to scientific norms.

Associated Assessment Criteria for Exit Level outcome 9:

9.1 Apply and integrate the principles and/or philosophy of the subject into related activities.
9.2 Apply the specialised techniques required to achieve the contextual objective.
9.3 Apply quality assurance principles to ensure optimal results within the context of the subject.

Integrated Assessment:

Integrated assessment incorporates an appropriate variety of assessment methods for example; written and oral examinations, problem-solving assignments, projects, presentations, case studies, portfolios, log books, clinical reports, assessment of clinical competence through simulated and clinical assessment in situ, objective structure clinical examinations (OSCE) and the successful completion of a research project.

The qualification will be awarded to a learner who has provided evidence to the satisfaction of the assessors that the stated competence of the qualification, as detailed in the stated outcomes, has been achieved, either through education and training in a single provider's learning programme or though experience that complies with the stated specific outcomes, i.e., RPL is recognised.

Integrated assessment should have the following characteristics:

- Assess the extent to which the learners can practice Nuclear Medicine Radiography competently, effectively and safely in any clinical context nationally and internationally.
- Measure the extent to which learners have integrated knowledge, skills and professional roles as reflected in the course content.
- Provide opportunities for reflection-in-action and reflection-on-action to develop reflective competence.

INTERNATIONAL COMPARABILITY

The primary reason for designing this Qualification was to meet the needs of the South African community as identified by the National Department of Health. To evaluate how this qualification compares with qualifications offered and competency profiles accredited in other countries, an analysis of nuclear medicine qualifications and competency profiles in countries that are leaders in the field, developing countries and SADC countries was conducted.

Nuclear Medicine in South Africa is registered as one of the four radiography categories. Internationally it is either a stand alone qualification or is linked to Diagnostic Radiography, Radiation Therapy or Medical Physics. Initially individuals with qualifications in related fields were recruited into Nuclear Medicine and as the speciality evolved so too did the availability of de novo qualifications in Nuclear Medicine. Training programmes available globally have not kept pace with the expansive growth of Nuclear Medicine. North American countries are leaders in the field with established training programmes. Developing countries are yet to catch up with International training trends and mostly offer nuclear medicine as a component of or as an 'add on' to a related qualification. The IAEA has done much to address the problem of lack of formal training in Nuclear Medicine technology in developing countries by offering Fellowship Training and Distance Assisted Training (DAT) programmes for Nuclear Medicine Technologists in Asia, Africa and Latin America.

The United States of America (USA) is one of the leaders in the field of Nuclear Medicine. The formal academic nuclear medicine technology education system in the USA is accredited through the Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT). The JRCNMT is recognised by the USA Department of Education (USDE) and the Council for Higher Education Accreditation (CHEA). The mandatory requirements and prerequisites for these programmes are outlined in the Essentials and Guidelines for an Accredited Educational Program for Nuclear Medicine Technologists. The tasks detailed align closely with the Exit Level Outcomes as stated in the South African Qualification.

The tasks broadly cover the following;

- Patient care.
- Radiation safety.
- Nuclear Medicine instrumentation-quality control.
- Radiopharmaceuticals.
- Diagnostic procedures (including in-vitro and non-imaging procedures).
- Radionuclide therapy.

Critical Cross field outcomes are made explicit in the Guidelines for learning opportunities to develop personal and professional attributes and values relevant to practice and to a large extent match those of the South African CCFOs. There is no national standard but varying levels of terminal degrees are available in the USA; such as certificates, Associate degrees and Baccalaureate degrees. Baccalaureate programmes generally require additional mathematics, science and liberal arts as part of the pre-professional core curriculum. Accreditation is gained through examinations administered by the Nuclear Medicine Technology Certification Board (NMTCB). Components of Preparedness Statements to achieve accreditation are grouped into; Radiation Safety, Instrumentation, Clinical procedures and Radiopharmacy.

The following section looks at the nuclear medicine education programme as offered by two education institutions, namely, the Cedar Crest College and the University of Findlay. Both these institutions are accredited by the NMTCB and follow the mandatory requirements and prerequisites for these programmes as outlined in the Essentials and Guidelines for an Accredited Educational Program for Nuclear Medicine Technologists.

Cedar Crest College:

This College offers a B.Sc. Degree and a Post-Baccalaureate Certificate in Nuclear Medicine Technology.

The BSc degree spans four years. The first three years are spent in the academic environment where theoretical tuition is offered. The fourth year consists of the clinical component and this is offered at the accredited training centres. This format of education and training of learners differs from the way nuclear medicine education and training is offered in South Africa as the clinical component is structured as Work Integrated learning (WIL), starting from the first year of study. The education institutions offer the theoretical component of the course and learners receive clinical training at the various clinical platforms which have been accredited by the registration council to offer this training.

To be accepted at the Cedar Crest College, learners must have a high school diploma or equivalent. They should have obtained a grade C symbol in Anatomy and Physiology and College Algebra. These entrance requirements compare well with the requirements for the South African Qualification. Cedar College has not however stipulated how RPL is applied or whether they do consider learners with entrance requirements different from that which they have listed.

According to the Cedar Crest College programme, acceptance in the clinical year is competitive and not guaranteed by satisfaction of the minimum requirements. It is based on academic performance with the minimum credits to be accumulated, pitched at gross points average (GPA) of 2.75. The learners are further subjected to an interview by the educational and clinical coordinators. This is different to the South African model where the education institution admits learners to the course with established and accredited clinical platforms for training.

Entrance requirements for the Post-Baccalaureate Certificate are:

- Bachelor's degree in Nuclear Medicine Technology or any other four-year bachelor's degree from an accredited university of college.
- Have completed and received a GPA of 2.75 and a grade "C" or above in Anatomy, Physiology, Physics, Chemistry, Algebra and two English courses.

What is particular about entrance requirements for this Post-Baccalaureate Certificate is that, despite the

fact that it is a post basic qualification; the students' academic performance at school is taken into consideration. No mention is made of RPL as it is in South Africa. This makes the entrance requirements for South African Qualification different from those offered by the Cedar Crest College.

University of Findlay:

The Nuclear Medicine Institute at the University of Findlay offers a One- year-certificate programme in Nuclear Medicine Technology. The course is accepted by most education institutions in the USA as an entrance to the two or four-year degree or associate degree programmes in nuclear medicine.

To be accepted into the one-year certificate course, the student must have successfully completed the postsecondary education with the 70% grade or higher. The following courses are prerequisites to the nuclear medicine programme, namely, human anatomy, human physiology, general chemistry, general physics, college algebra, English composition, basic speech and communication as well as computer operation. In addition, the learner must have successfully completed a cardio-pulmonary resuscitation (CPR) course for adults, children and infants.

These entrance requirements compare reasonably well with those for the South African Qualification except for the CPR course which usually forms part of orientation in South African programmes. In as far as the science subjects are concerned; mathematics is a prerequisite in South Africa and not "Algebra" as it is the case at the University of Findlay.

The course is structured in a way that allows the learner to spend time in both the academic and clinical environments. Classes are held for 28-32 hours per week over one semester. Clinical training is scheduled for 40 hours per week. This is allocated for 35 weeks during the academic programme. At the end of the clinical block, the learner is given a week for review, after which an examination is conducted. During the clinical block, the learners are expected to document successful completion of the specified clinical projects. The university has further specified the contents to be covered during the clinical training period. These have been grouped into Clinical Nuclear Medicine 1 and 2.

The way the course is offered by this university compares well with the way the nuclear medicine programme is offered in South Africa. Various education institutions have different models for the division of the clinical and academic components. Important to note is that in South Africa the learners can only receive clinical training at the hospitals and clinics which have been accredited to do so by the relevant Statutory Health Council. The Statutory Health Council also expects that the education institutions allow the learners to keep records of their personal clinical training in the form of log books. The Statutory Health Council further specifies the amount of time the learner should spend in the clinical environment to be deemed competent and thus eligible for post graduation registration.

The certificate course offered by the University of Findlay is accepted as an entrance to the degree programme at that university and other education institutions accredited by the JRCNMT to offer nuclear medicine education and training.

Canada:

The Canadian Association of Medical Radiological Technologists (CAMRT) outlines the competency profile of Nuclear Medicine Technologists. The Nuclear Medicine Technology Competency Profile is divided into modules:

- Professional Practice.
- Patient management.
- Radiation Health and Safety.
- Quality Management.
- Radiopharmacy and Laboratory Procedures.
- Modules related to nuclear medicine clinical applications.

Accreditation for entry-level practice is administered and examined by the CAMRT for registration to work. The standards of practice governing registration are guided by the CAMRT Code of Ethics and are reflected in four standards of professional practice namely; knowledge, clinical proficiency, communication and accountability. These characteristics of professional standards of practice are both

explicit and implicit in the ELOs outlined in this Qualification.

United Kingdom, Ireland and Europe:

There are no agreed national standards governing Nuclear Medicine basic education, training or professional development in the United Kingdom. Radiographers or Medical Technical Officers (MTOs) typically undergo three years of training in diagnostic and therapeutic radiography followed by one - two years of clinical experience to consolidate knowledge. Thereafter they can sub-specialise. Nuclear Medicine is a sub-speciality leading to a post graduate certificate or Master of Science degree, with curricula varying from centre to centre. No state registration is required. However, the Consortium for the Accreditation of Nuclear Medicine Education (CANME) will assess practical competence on a voluntary basis for validation. Currently hospitals are awarding consultant/advanced practitioner status to those radiographers who are competent in basic aspects of nuclear medicine and in addition:

- Administer radiopharmaceuticals.
- Perform computer analyses of imaging data.
- Demonstrate evidence-based practice.
- Have involvement in training staff.
- Interpret images.
- Manage a team of professionals.

These competencies are inherent in the graduate Exit Level competencies as stated in this document. The situation in Ireland is similar to that in the United Kingdom with variations in legislation and training practice. In Europe the education of nuclear medicine technologists differs considerably from country to country. There is no harmonisation of curricula in Europe and both University-based and non-University based training is offered. In some countries, e.g., Greece and Croatia, there is no established training.

Developing Countries:

No international harmonisation of training exists and structured courses in Nuclear Medicine Technology are mostly non-existent in developing countries despite a nuclear medicine service being offered. This is recognised by the International Atomic Energy Agency (IAEA) in the "Resources Manual in Nuclear Medicine" regarding training of Nuclear Medicine Technologists. The lack of structured training has resulted in a broad range of individuals from school leavers to science graduates being employed in nuclear medicine departments and receiving in-house training. The suggested syllabus outlined in the IAEA Human Resource manual includes:

- Basic nuclear physics.
- Safe handling of radionuclides.
- Nuclear Medicine instrumentation.
- Computers in nuclear medicine.
- Anatomy and physiology.
- Human behaviour.
- Nuclear Medicine applications.

These topics and additional topics have been incorporated into the IAEA Distance Assisted Training (DAT) programme which has been completed by approximately 400 students in 23 countries across Asia, Latin America and Africa. This is a work-integrated distance learning programme consisting of 12 modules, incorporating:

- Basic physics.
- Radiation safety.
- Nuclear Medicine (NM) instrumentation.
- Radiopharmacy.
- Computers in NM.
- Behavioural Science/patient care.
- NM applications according to systems e.g. cardiac, renal.
- Paediatric techniques.

- Radio-immunoassays and non-imaging techniques.
- Human biology and sectional anatomy.
- Literature review.
- SPECT and PET physics.
- Infection and tumour imaging.
- Radionuclide therapy guidelines.

The material has been developed with South African input for use by member states where no training exists. No qualification is awarded. An IAEA certificate of completion is given.

SADC and other African countries:

Technologists working in Nuclear Medicine departments in sub-Saharan African countries do not have access to formal training in Nuclear Medicine. Technologists offering nuclear medicine services have mostly been recruited from related fields of Radiological Technology. The IAEA DAT programme has been used to rectify this situation, with coordinated assistance from South Africa as this country's expertise in the field of nuclear medicine technology training is recognised by the IAEA. Training in North Africa, as in Europe, varies from country to country and no de novo qualification is available. An IAEA initiative to harmonise training in Africa led to the issuing of guidelines for training. These stipulate entry points, possible training pathways, types of assessments and competency standards. These guidelines for training were accepted for implementation in 2000 by each participating country as a basic standard for training and were, to a large extent, based on the South African model.

Central and Latin America:

The University School of Medical Technology in Uruguay is the only Higher Education Institution in South America offering a de novo course in Nuclear Medicine. It is a four-year professional degree. There is, however, no integration of clinical practice as a license from the National Regulatory Authority is required to handle radioactive material. Formal training is a prerequisite for the license. At present candidates from Argentina, Bolivia, Colombia, Cuba, Peru and Venezuela are training through the IAEA/DAT course, coordinated from Uruguay.

Conclusion:

The Bachelor of Nuclear Medicine compares well with countries that are leaders in the field of Nuclear Medicine Technology, such as USA and Canada. Together with the help of the IAEA, South Africa leads the way on the African continent for establishing standards for Nuclear Medicine Technology practice and training.

ARTICULATION OPTIONS

Vertical articulation:

- ID 66229: Master of Radiography, NQF Level 8.

Horizontal articulation:

- ID: 63449: Bachelor of Radiography: Diagnostic Ultrasound, NQF Level 7.
- ID: 66949: Bachelor of Diagnostic Radiography, NQF Level 7.
- ID: 66951: Bachelor of Radiation Therapy, NQF Level 7.

MODERATION OPTIONS

- Internal and external assessment and moderation of learner achievement should be undertaken by those who have qualifications at or above the level of qualification and who have been accredited by the relevant ETQA.

- Assessments are conducted by one or more internal assessors/examiners employed by the relevant

provider as well as an by external moderator appointed from industry/other academic institution, in agreement with the relevant ETQA.

- Assessors and moderators are required to be in possession of a professional degree in Nuclear Medicine Radiography or equivalent or higher, or appropriate research/teaching/academic/clinical experience and appointed in agreement with the relevant ETQA.

NOTES

As per the SAQA decision, after consultation with the Quality Councils, to re-register all qualifications and part qualifications on the National Qualifications Framework that meet the criteria for re-registration, this qualification has been re-registered from 1 July 2012.
All learners for this Qualification are required to be registered as learner radiographers with the relevant Statutory Health Council, for the duration of the period of study in an accredited clinical training centre with accredited mentoring.

UNIT STANDARDS:

This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION:

NONE

PROVIDERS CURRENTLY ACCREDITED TO OFFER THIS QUALIFICATION:

This information shows the current accreditations (i.e. those not past their accreditation end dates), and is the most complete record available to SAQA as of today. Some Quality Assuring Bodies have a lag in their recording systems for provider accreditation, in turn leading to a lag in notifying SAQA of all the providers that they have accredited to offer qualifications and unit standards, as well as any extensions to accreditation end dates. The relevant Quality Assuring Body should be notified if a record appears to be missing from here.

NONE