PROFESSIONAL STANDARDS

NURSING

Nurses Undertaking the Practical Aspects of Dual Energy X-Ray Absorptiometry (DXA) Scanning for Adults

Standards and Requirements for Education Programmes

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Bord Altranais agus Cnáimhseachais na hÉireann
Nursing and Midwifery Board of Ireland

This document outlines the Standards and Requirements for Nurse Education Programmes for Nurses Undertaking the Practical Aspects of Dual Energy X-Ray Absorptiometry (DXA) Scanning for Adults (1st Edition, 2023).

About NMBI
The Nursing and Midwifery Board of Ireland (NMBI) is the independent, statutory body which regulates the nursing and midwifery professions in Ireland. For more information about our role and functions, visit www.NMBI.ie/What-We-Do.

Governance
These standards and requirements are governed by the Nurses and Midwives Act 2011 as amended, and by the Nurses and Midwives (Education and Training) Rules 2018. For more information on the act, and on the Nurses and Midwives Rules, visit the 'What we do/Legislation' section of NMBI's website, www.NMBI.ie.

NMBI has a statutory responsibility to approve education bodies (EBs) and associated healthcare providers (AHCPs) in respect of post registration nursing education programmes. Details of approval of EBs and AHCPs for provision of such education programmes are published on our website. For more information, visit www.nmbi.ie/Education/Education-bodies.

Glossary
A full glossary of all the terms used in this and other NMBI publications are published on our website at www.nmbi.ie/Standards-Guidance/Glossary.

Acknowledgement
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Introduction

Education for undertaking the practical aspects of Dual Energy X-ray Absorptiometry (DXA) scanning is now a legislative requirement. This is set out in S.I. 256 of 2018 and its amendments, and the European Commission's Guidelines on Radiation Protection Education and Training of Medical Professionals in the European Union (EU) (Radiation Protection (RP) No. 175) (referred to as RP 175 throughout this document). In this legislation, nurses may be "delegated to undertake the practical aspects" of DXA scanning, provided they have education, information, theoretical and practical training for that purpose. Nurses undertaking DXA scanning are required to demonstrate that they can complete the practical aspects of DXA scanning competently.

The purpose of these standards and requirements is to ensure there is a standardised approach to the education and competency for nurses undertaking the practical aspects of DXA scanning, incorporating both the legislative requirements and the established presence of nurses in such practice in Ireland. DXA scanning includes both the qualitative and quantitative acquisition of DXA information including images, measurements and assessments. Fundamental measurements such as bone mineral density (BMD) and the estimation of fracture risk are obtained. The production of quality images used to acquire such measurements and assessments for the presence of vertebral fractures, and other pathologies must be consistent and accurate. More advanced assessments are also included, such as trabecular bone score (TBS) and body composition analyses, assessments for the presence of vertebral fractures (VFA), full-length femoral imaging (FFI) and other new developments. This also includes some understanding of DXA software to select the most appropriate reference populations, scan moves and applications required for a holistic quality DXA-based examination.

The development and endorsement of standards is necessary to support a quality service and to provide guidance for those requiring further training. They are essential to provide a structured set of goals and accomplishments for new entrants to support their training and development to become competent DXA professionals within their scope of practice.

These standards and requirements apply to education bodies (EBs) and their associated healthcare providers (AHCPs) to inform the development, delivery and evaluation of nurse educational programmes to undertake the practical aspects of DXA scanning. These programmes must be delivered in accordance with the National Framework of Qualifications (NFQ) of Ireland and approved by NMBI.

DXA scans are an essential component of the clinical assessment of many patients. The information obtained assists clinicians' decision-making and management in a growing number of diseases. In osteoporosis care, DXA plays a central role in estimating fracture risk, diagnosis and monitoring changes following intervention. Other measures and images, such as body composition analyses, are also valuable tools for assessing and monitoring diseases such as cystic fibrosis, anorexia nervosa, HIV, sarcopenia and muscular dystrophy.

DXA is a modern technology which combines X-rays, a computer and software providing quantitative and qualitative assessment of body tissues. Two X-ray beams, generated in an X-ray tube with different energy levels, enable better definition between bone and soft tissues. The DXA process provides a low radiation dose to the service user.

The operator combines the use of DXA technology with clinical information including risk factors, other measurements such as age, weight and treatments in order to effectively inform clinical decision-making. The quality of DXA services is critical and errors in scan acquisition, reporting or interpretation has potential to result in considerable harm to patients. Therefore, it is essential that all those involved are familiar with the details and importance of quality DXA scanning.

Since scan acquisition is very operator dependent, nurses must have access to the required education and training in order to undertake the practical aspects competently and to ensure the safety of staff when iodine radiation is being used.

Education programmes and certifications represent an essential aspect of training and maintenance of knowledge and skills for those involved in the practical aspects of DXA scanning. Such programmes are designed to ensure that those undertaking DXA scan acquisition and analysis have the requisite knowledge, skills and competencies to perform their work to agreed standards. These are based on best practice principles which include quality assurance, radiation protection and DXA calibration.

On successful completion of the education programme, and following appropriate clinical referrals, the nurse is expected to perform the practical aspects of DXA scanning, exercising clinical judgement and decision-making specific for the service user.

European Council Directive 2013/59/EURATOM lays down basic safety standards for protection against the dangers arising from exposure to medical ionising radiation. It was introduced in Europe and subsequently transposed into Irish law by separate Statutory Instruments (S.I.); S.I. 256 of 2018 and its amendments (S.I. No. 332 and S.I. No. 413 of 2019) and S.I. 30 of 2019. NMBI supports and recognises that the delivery of nurse education programmes for nurses qualified to perform the practical aspects must also include training in radiation safety and requires interprofessional input and collaboration.

Following successful completion of the NMBI-approved education programme, all EBs and AHCPs involved in the development and provision of the nurse education programmes must ensure that the nurse is competent and confident in undertaking the practical aspects of DXA scanning.

01

Legislative Frameworks

1.1 Nurses and Midwives Act 2011

The Nurses and Midwives Act 2011 and accompanying Nurses and Midwives Rules provide for the titles of recognised qualifications under the Register of Nurses and Midwives.

For information on the Act and the Rules please visit: https://www.nmbi.ie/What-We-Do/Legislation.

1.2 Approval of higher education bodies (EBs) and associated healthcare providers (AHCPs) and programmes leading to registration

The Nurses and Midwives (Education and Training) Rules 2018 and (Amendment Rules) 2020 provide the regulatory framework for the approval of programme applications and monitoring of education programmes.

- Nurses and Midwives (Education and Training) Rules 2018 - SI No 218 of 2018
- Nurses and Midwives (Education and Training) (Amendment) Rules 2020 (S.I. No. 501 of 2020)

The Rules establish:

- Criteria for application of programmes
- Requirement for annual reports and notification of any proposed material changes to a programme
- Review and monitoring of programmes
- Inspections of EBs and AHCPs
- Responses and resolutions following reporting of inspections.

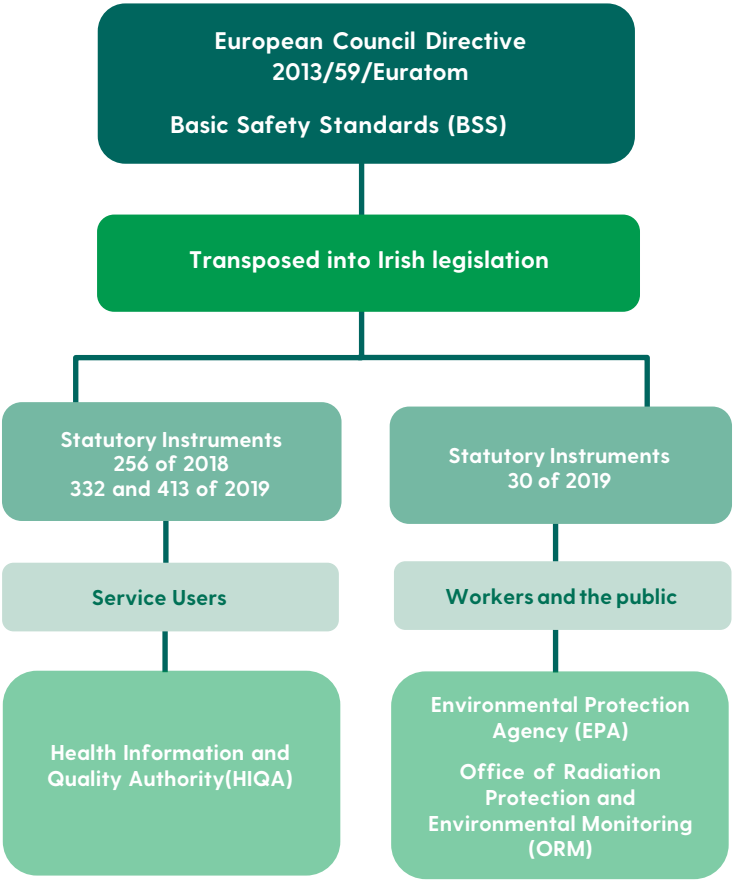
1.3 Legislative Framework for Practical Aspects of DXA Scanning

This section provides extracts from the relevant directives from the European Council 2013 as they subsequently apply to Irish legislation from 2018 and 2019 for the guidance of the education relating to radiation protection and the practical aspects of DXA scanning.

Regulatory authority for medical ionising radiation procedures

Under S.I. 256 of 2018, the Health Information and Quality Authority (HIQA) is the competent and regulatory authority for medical ionising radiation procedures. The Office of Radiation Protection and Environmental Monitoring (ORM), which is an office of the Environmental Protection Agency (EPA), is responsible for workers and the general public.

Figure 1: Legislative framework for radiation protection



Definitions for practical aspects of undertaking a DXA scan

In S.I. 256 of 2018 the definition of the **Practical Aspect** is:

> "practical aspects of medical radiological procedures" means the physical conduct of a medical exposure and any supporting aspects, including handling and use of medical radiological equipment, the assessment of technical and physical parameters (including radiation doses), calibration and maintenance of equipment, preparation ... and image processing".

In S.I. 256 of 2018 the definition of **the Undertaking** is:

> "a person or body who, in the course of a trade, business or other undertaking (other than as an employee), carries out, or engages others to carry out, a medical radiological procedure or the practical aspects of a medical radiological procedure".

In S.I. 256 of 2018 in Part 2 (5) the definition of **the Practitioner** is:

> "A person shall not take clinical responsibility for an individual medical exposure unless the person taking such responsibility ("the practitioner") is—
>
> (a) a registered dentist within the meaning of the Dentists Act 1985 (No. 9 of 1985),
>
> (b) a registered medical practitioner within the meaning of the Medical Practitioners Act 2007 (No. 25 of 2007), or
>
> (c) a person whose name is entered in the register established and maintained by the Radiographers Registration Board pursuant to section 36 of the Health and Social Care Professionals Act 2005 (No. 27 of 2005)".

Roles and responsibilities for practical aspects of undertaking a DXA scan

S.I. 256 of 2018 states in paragraph 22. (2), an undertaking shall ensure that–

(a) practitioners, and

(b) individuals to whom the practical aspects of medical radiological procedures are delegated pursuant to Regulation 10(4) have adequate education, information and theoretical and practical training for that purpose, as well as relevant competence in radiation protection, in accordance with the provisions of this Regulation.

This S.I. 256 of 2018 was subsequently amended by S.I. 413 of 2019 and states:

"(4) Practical aspects of a medical radiological procedure may be delegated by–

1. the Undertaking, or
2. the Practitioner,

as appropriate to one or more individuals–

...

(iii) registered by the Nursing and Midwifery Board of Ireland,

...

as appropriate, provided that such person has completed training in radiation safety prescribed or approved pursuant to Regulation 22(3) by the appropriate body."

Pre-inspection and during on-site inspections, HIQA, as the regulator, will require examples of documents, information and records relating to medical exposures that have been carried out to identify:

- Individuals undertaking the practical aspects of DXA scanning are trained and competent.
- Training records for individuals who are delegated the practical aspects of undertaking DXA scanning.
- Undertaking's records for each delegation of the practical aspects of undertaking DXA scanning, as made by the undertaking or the practitioner.

- Records of registration or recognition by the appropriate body for individuals who are delegated to undertake the practical aspects of a DXA scan.
- Schedules and rosters for practitioners, referrers and those delegated to undertake the practical aspects of a DXA scan.

Therefore, the undertaking is responsible to have systems in place to ensure that the responsibilities for medical exposures along the service user pathway are allocated to appropriate persons, as required by this regulation. The service user pathway, when undergoing a medical exposure, involves referral, justification and optimisation, the practical aspects of the exposure and communication of the outcome (HIQA, 2019).

02

Standards for Education Programmes for Nurses Undertaking the Practical Aspects of DXA Scanning

These standards and requirements are intended to facilitate the development of nurse education programmes to enable nurses to undertake the practical aspects of DXA scanning. Nurses must have successfully completed training, including theoretical knowledge and supervised clinical experience, in DXA scanning and radiation protection as prescribed by NMBI, having regard to RP 175. Under RP 175, all healthcare professionals who work with ionising radiation must acquire core knowledge, skills and competencies in radiation safety.

Nurses undertaking the practical aspects of DXA scanning must also complete continuing education and training after qualification, including the relevant radiation protection requirements. Documented evidence of education and continuing professional development (CPD) must be maintained for a rolling period of five years by the nurse and the health service provider, and be available for inspection by the regulator. Relevant CPD for radiation protection must be completed every five years.

2.1 Entry requirements

Nurses applying to undertake the practical aspects of DXA scanning are required to meet the following criteria:

- Be currently registered as a general nurse on the NMBI Register
- Have a minimum of one-year post registration experience within the last three years
- Be working within the area of DXA scanning.

2.2 Learning outcomes

The purpose of the education programme is to ensure that, upon successful completion of the course, the nurse has the knowledge, skills and competencies to undertake the practical aspects of DXA scanning safely, within their scope of practice.

The education programme enables the nurse to:

- have the knowledge, skills and competencies to safely perform the practical aspects of DXA scans to an appropriate recognised set of standards
- critically utilise evidence-based knowledge and skill in undertaking the DXA scan in a holistic approach to the service user's care
- apply clinical decision-making skills as appropriate, in relation to the service user for a DXA scan, within their scope of practice
- demonstrate a systematic understanding of the legislative and regulatory requirements for DXA scans
- complete the required radiation safety training for service users and staff
- know and understand the International Commission for Radiological Protection (ICRP) principles of justification, optimisation and dose limitation
- demonstrate an appropriate knowledge of DXA equipment quality assurance, imaging technique and their implication for a service user's safety
- demonstrate effective communication skills and knowledge of the role of the multidisciplinary team management involved for the safe and appropriate application of DXA scanning
- demonstrate an appropriate knowledge of their DXA equipment positioning and procedures for scanning patients and software to make appropriate adjustments for selecting appropriate regions of interest, reference data and critical clinical information, and
- understand the role and responsibilities of the practitioner in the DXA scanning process.

2.3 Domains of Competence

The Domains of Competence are distinguishable areas of competence that collectively represent a general descriptive framework for the nursing profession (Englander et al., 2013). Each domain comprises a specific competency statement with corresponding indicators of capacity, the aim of which is to assist with the assessment of a student's professional competence.

A team and partnership approach must be applied when assessing the student (in this case, a nurse). The assessor (a practitioner) will be responsible for determining the student's competence.

The EBs and the practice sites collaborate in relation to the assessment process. Students are deemed to be either competent or not competent. There are no ratings in the verification of competence. The achievement of competence is required for a nurse to undertake the practical aspects of DXA scanning.

Domain 1: Professional values and conduct of the nurse

Knowledge and appreciation of the virtues of caring, compassion, integrity, honesty, respect and empathy as a basis for upholding the professional values of nursing and identity as a nurse.

Practises safely

- Practises within the legislative and professional regulation and guidelines for practice relevant to their scope of practice and care setting.
- Adheres to the national legislation and the regulatory framework and professional regulations.
- Adheres to the national and local health service provider's policies, procedures, protocols and guidelines (PPPGs).

Practises compassionately

- Supports the service user during the process, practising in a manner that is caring, kind, sensitive, holistic, impartial and non-judgmental.
- Demonstrates respect for the diversity, dignity, integrity and uniqueness of the service user through a collaborative partnership that recognises their autonomy during the process.

Practises professionally, responsibly and accountably

- Accepts personal accountability for performing the DXA scan competently, understanding the legal and regulatory implications of doing so.
- Practises within the limits of their own scope of practice and competence, and takes measures to develop and maintain competence.

Domain 2: Nursing practice and clinical decision-making

Knowledge and understanding of the principles of delivering safe and effective nursing care through the adoption of a systematic and problem-solving approach to developing and delivering a person-centred plan of care based on an explicit partnership with the service user and family.

Assesses the service user's nursing and healthcare needs

- Justifies the net benefit, weighing the total potential diagnostic or therapeutic benefits the proposed DXA scan produces, including the health of an individual and the individual risk that the radiation exposure may cause.
- Considers the efficacy, benefits and risks of available alternative diagnostic techniques, having the same objectives but not involving exposure to medical ionising radiation.
- Initiates life-preserving measures in response to critical changes in a service user's health status or in emergency situations.

Domain 3: Knowledge and cognitive

Knowledge and understanding of the health continuum, life, and behavioural sciences and their applied principles that underpin a competent knowledge base for nursing and healthcare practice.

Practises from a competent knowledge base

- Accepts personal responsibility for professional development and the maintenance of professional competence.
- Is aware of and maintains knowledge of best practice and advances in DXA scanning.
- Applies current and relevant aspects of legislation, regulation, research, and national and international policies that influence the practical aspects and referral criteria for DXA scanning.
- Applies knowledge and understanding of current and relevant aspects of principles of health information technology.

Uses critical thinking and reflection to inform practice

- Develops analytical skills for problem-solving, critical thinking, reasoning, evaluation, synthesis for application to DXA scanning practice situations and interventions.
- Develops personally and professionally through reflection to enhance resilience and practice.

Domain 4: Communication and interpersonal

Knowledge, appreciation and development of empathic communication skills and techniques for effective interpersonal relationships with people and other professionals in healthcare settings.

Communicates in a person-centred manner

- Establishes and maintains caring therapeutic interpersonal relationships for the safe and effective performance of the DXA scan.
- Communicates in an effective, compassionate, age-appropriate, respectful, culturally sensitive and non-discriminatory manner with the service user and their family as appropriate.
- Communicates effectively in a balanced way regarding the benefits versus the risks of the radiation dose involved in the DXA scan.
- Empowers the service user referred for the DXA scan and their family as appropriate to express concerns about their experience of nursing, procedures and interventions.

Communicates effectively with the healthcare team

- Identifies the roles and responsibilities of other healthcare professionals in the DXA scanning process.
- Establishes relationships with other healthcare professionals involved in the DXA scanning process based on understanding and mutual respect.

Participates in interdisciplinary team collaboration

- Negotiates with other healthcare professionals to ensure that the rights, beliefs and wishes of the service user are not compromised.
- Develops professional links with other healthcare professionals practising in the same specialist area.
- Maintains comprehensive documentation and plans care within a legal and ethical framework.

Domain 5: Management and team

Using management and team competences in working for the service user's wellbeing, recovery, independence and safety through the recognition of the collaborative partnership between the service user, their family and their multidisciplinary healthcare team.

Practises collaboratively

- Works towards the service user's wellbeing, recovery, independence and safety through a collaborative partnership between the service user, their family, where appropriate, and the multidisciplinary health and social care team.
- Collaborates effectively with other healthcare disciplines, members of the nursing team and the service user's family, if appropriate, in the decision-making process for continuity of care.

Manages team, others and self safely

- Assesses priorities, manages time, caseload and resources safely and effectively including the process for DXA scanning.
- Participates in DXA scanning practice audits and quality improvement initiatives and processes within the health service setting.
- Shares the findings of audits with other healthcare disciplines and members of the nursing team.
- Integrates the principles of clinical risk management and health and safety in the DXA scanning process.
- Complies with the requirements and relevant PPPGs of the health service provider, for example:
    - open disclosure
    - reporting DXA scanning errors, incidents and near misses as per the local health service provider's processes and HIQA guidance on reporting incidences
    - regular audit of DXA scanning patterns and practice
    - data protection (General Data Protection Regulation (GDPR), Freedom of Information Act).
- Demonstrates quality assurance and quality management in the DXA scanning process through a structure of audit.

- Uses the outcomes of the audit of DXA scanning to maintain and improve service provision and practice development.
- Uses reflection and learning from incidents to support shared learning and to improve DXA scanning, service provision and practice development.
- Contributes to the learning experiences of other colleagues through the provision of support, supervision and facilitation of learning.

Domain 6: Leadership potential and professional scholarship

Developing professional scholarship through self-directed learning skills, critical questioning/reasoning skills and decision-making skills in nursing as the foundation for lifelong professional education, maintaining competency and career development.

Develops leadership potential

- Enhances the personal performance of the professional role through constructive use of feedback, supervision, audit and service evaluation of DXA scanning.
- Reflects on and applies insights derived from aspects of DXA scanning practices and all incidents to enhance self-awareness and personal competence.

Develops professional scholarship

- Recognises and responds to situations that require referral to experienced colleagues, senior managers and other healthcare professionals.
- Learns from experience to adapt clinical interventions and to update DXA scanning competence in response to changing health environments.
- Accepts personal responsibility for professional development and the maintenance of competence in respect of DXA scanning.
- Maintains current knowledge of advances in practice associated with DXA scanning and the management of results.
- Demonstrates a commitment to lifelong learning.

2.4 Scope of Practice

When considering their scope of practice, the nurse must primarily consider the *Code of Professional Conduct and Ethics for Registered Nurses and Registered Midwives* (the Code), (NMBI, 2021) as part of the framework of professional guidance. Professional accountability, competency and the quality of professional practice are based on this framework, supported by other guidelines and standards.

The purpose of the Code is to guide nurses and midwives in their day-to-day practice and to help them understand their professional responsibilities in caring for a service user in a safe, ethical and effective way. All registered nurses in each area of practice should adhere to the Code's principles, values and standards of conduct.

Each nurse has a responsibility to uphold the values of the profession; care, compassion and commitment, to ensure high standards of professional practice and to protect the public. Each nurse is responsible for their practice, actions and omissions.

NMBI defines the scope of practice as the range of roles, functions, responsibilities and activities which a registered nurse is educated, trained and competent in, and has authority to perform. The individual practitioner's scope of practice is determined by a range of factors that gives them the authority to perform a particular role or task (NMBI, 2015).

The scope of practice for nurses to undertake the practical aspects of DXA scanning is determined by national, European and international legislation, professional regulations, education information and training, and the individual level of competence.

Competence is understood as the attainment of knowledge, intellectual capacities, practical skills, integrity, and professional and ethical values required for safe, accountable and effective practice as a registered nurse (NMBI, 2015). Through its standards and requirements for the education programme for nurses to undertake DXA scanning, NMBI indicates that nurses are professionally and personally responsible to maintain competency to practise. Nurses are obliged to commit to and engage in CPD relating to the assurance of competency for DXA scanning.

These standards and requirements recognise that a registered nurse who has successfully completed an approved education programme has the required training to independently complete a DXA scan.

The clinical governance arrangements, to which local healthcare teams are accountable for the quality, safety and satisfaction of a service user in the care they deliver, must have supporting structures in place including PPPGs for DXA scanning based on standards, evidence and research. While the clinical governance arrangements should be in place, it is important that the requirements of S.I. 256 of 2018 are met, irrespective of the clinical setting. In DXA scanning this should include, but not be limited to:

- A practitioner-led service with clinical responsibility for the conduct of medical exposures
- Integration of a clinical audit in the service should be multidisciplinary and not just the practice of an individual.

The interests of no single professional group should dominate interprofessional service and education initiatives, and such initiatives should be planned and carried out in a collaborative manner.

The registered nurse with authority to undertake the practical aspects of DXA scanning within their scope of practice, makes an independent decision and is professionally accountable for their decision. It is understood that while the nurse is operating within their scope of practice to complete a DXA scan, it is the practitioner who is responsible for the clinical evaluation of the outcome and overall delegation of the practical aspects to the nurse. It is the service user's lead medical clinician who holds ultimate responsibility for their care and assumes responsibility for treatment actions that may be necessary as a result of the findings of a DXA scan. Prior to deciding to complete a DXA scan, the nurse must be satisfied that they are working within their scope of practice.

Therefore, the nurse must:

- have successfully completed an NMBI-approved education programme
- comply with national legislation, professional regulation for medical radiological procedures
- refer to the *Scope of Nursing and Midwifery Practice Framework* and remain within the parameters of the local health service provider's PPPGs for DXA scanning
- engage in a clinical audit of their practice, and
- undertake CPD, including radiation protection training.

CPD is a requirement of S.I. 256 of 2018. Nurses who undertake DXA scanning must participate in continuous education and training after qualification. This includes in new techniques, training related to these techniques and the relevant radiation protection requirements.

When the nurse has been deemed competent to undertake the practical aspects of DXA scanning accurately, it is recommended that for consistency the Least Significant Change (LSC) of BMD is measurable for each nurse undertaking the practical aspects of DXA scanning.

The process for measuring consistency requires the scanning of 30 service users twice or 15 service users three times on the same machine for each skeletal site for which they must calculate the LSC. This calculates the LSC (coefficient of variation with a 95% confidence interval) for the specific skeletal site. The accepted international standard is <5% for the total hip and lumbar spine. A more detailed outline of the process to determine the LSC of the nurse undertaking the practical aspects of DXA scanning is available in statistical books and from professional societies.

Nurses undertaking the practical aspects of DXA scanning, who are unable to measure BMD consistently to achieve values below these thresholds, should consider additional training.

2.5 Syllabus/Indicative Content

Nursing is an interpersonal caring process that acknowledges the uniqueness of the service user. Students may enter an education programme with a wide range of previous professional and educational experiences which should be acknowledged and developed. The education programmes for nurses to undertake the practical aspects of DXA scanning contain the essential elements that facilitate the development of the professional knowledge, skills, attitudes and competences necessary to meet the needs of a service user within this area of practice expansion.

Medical imaging using ionising radiation is increasing nationally due to technological advances and service requirements, as well as the longevity of our population. General X-ray (radiography) is the most common type of procedure currently requested and uses a single energy beam generated by the X-ray tube. DXA equipment uses two photon beams of different energy levels, also generated in an X-ray tube. The radiation dose is generally lower than the dose received from a chest X-ray. However, all radiation exposure can cause some risks.

Nurses with authority to perform the practical aspects of DXA scanning within their scope of practice will be required to understand and be competent in imaging techniques and many other skills.

Justification, which is the responsibility of the referrer and the practitioner, requires that the benefit from the DXA scan for the service user must outweigh the radiation risk. Under S.I. 256 of 2018, an undertaking shall ensure that:

> "all medical exposures take place under the clinical responsibility of a practitioner
>
> (10.1), the
>
> justification process of individual medical exposures involves (10.3)–
>
> (a) the practitioner, and
>
> (b) the referrer."

Optimisation as per S.I. 256 of 2018 (9.1) requires that an undertaking shall ensure that all doses due to medical exposure are kept as low as reasonably achievable, consistent with obtaining the required medical information. Additional requirements are that the undertaking:

- "shall ensure that all medical exposures take place under the clinical responsibility of a practitioner,
- shall ensure that the optimisation process for all medical exposures involves:
    (a) the practitioner
    (b) the medical physics expert
    (c) those entitled to carry out the practical aspects of medical radiological exposures."

Dose limitations apply to all workers undertaking the practical aspects of radiological procedures. Under S.I. 30 of 2019, workers can be designated as category A or B which takes into account the potential exposures of the worker. Category B workers are described as an exposed worker who is liable to receive an effective dose greater than 1 mSv. Nurses undertaking DXA scanning are categorised as category B.

The list of topics included in the syllabus provides an indication of the content of the education programmes for nurses undertaking the practical aspects of DXA scanning. Curriculum planners will be required to demonstrate that the programmes are relevant and responsive to the most recent evidence, policy, legislative and regulatory changes.

To meet the learning requirements for nurses undertaking the practical aspects of DXA scanning, it is expected that education programmes will include the following elements and develop these into a detailed curriculum. These elements will include the required knowledge, skills and competences as set down in RP 175.

Required knowledge, skills and competencies

Knowledge

The required knowledge from the education programme must include the following principles and facts for nurses delegated the practical aspects of DXA scanning:

- Know and understand the legislative and regulatory framework governing the use of medical ionising radiation.
- Explain atomic structure, X-ray production and interaction with matter.
- Understand the ICRP principles of justification, optimisation and dose limitation.
- Know and understand the joint responsibilities of the referrer and the practitioner in the justification process.
- Understand the principle of optimisation, As Low As Reasonably Achievable (ALARA).
- Know and understand the legislation, and the radiation dose limits as they apply to workers and the general public.
- Explain why certain individuals are more susceptible to the harmful effects of ionising radiation, i.e. pregnant individuals.
- Discuss the principles governing the use of ionising radiation in females of childbearing age.
- Understand how the 10 day/28 day rule is applied to females of childbearing age.
- Know and understand the potential risks of foetal exposure to ionising radiation.
- Understand the potential risks of exposure to ionising radiation during childhood.
- Know and understand the approximate radiation doses for DXA scanning and other diagnostic investigations.
- Be aware of national and local Diagnostic Reference Levels (DRLs).
- Know and understand why a service user's clinical details and information from previous diagnostic tests and DXA scans are important.

- Describe the physical characteristics of DXA scanning and general X-ray systems.
- Know and understand the diagnostic procedures that utilise ionising and non-ionising radiation.
- Know and understand how service user positioning affects the image quality of a DXA scan.
- Know and understand which skeletal site is appropriate to scan and when.
- Know and understand the correct selection, labelling and placement of regions of interest (ROI).
- Discuss how to give a service user information relating to benefits and risks of DXA scans.
- Know and understand how to explain information relating to the benefits and risks of DXA scans simply to service users and carers.
- Know the detailed anatomy of the spine, hip and forearm.
- Know and understand the complex composition of bone.
- Know and understand the specific terminology associated with DXA, for example BMD and VFA.
- Know and understand the physics of DXA.
- Know and understand the correct method of analysing DXA scan images including selection of appropriate reference database.
- Know and understand when use of T-scores and/or Z-scores is most appropriate.
- Know and understand the changes likely to occur in patients who are or are not taking various treatments such as glucocorticoids, hormonal antagonists or osteoporosis medication.
- Know and understand when patients should not be scanned.

Skills

The education programme must include the cognitive, clinical and practical skills required for nurses to undertake practical aspects of a DXA scan:

- Be able to communicate and explain effectively to the service user the benefits, risks and alternatives of all aspects of the DXA scan to obtain informed consent.
- Know, understand and demonstrate practically the imaging technique required to perform a DXA scan.
- Know and understand how to choose imaging protocols appropriate to the service user's clinical information.
- Know and demonstrate the importance of consistent positioning and the imaging technique in repeat scans.
- Know and demonstrate the relevant centring points in the spine, hip and forearm.
- Ensure the correct use of positioning aids to effectively position the different areas of the body to be scanned.
- Apply radiation protection practice measures.
- Know and demonstrate how to position service users of different sizes for different areas of the body.
- Know and demonstrate the importance of incorporating DRLs into practice.
- Understand the specific technical details of each different type of scanner in the location.
- Know and understand the different dose area product (DAP) values, according to the parameters chosen.
- Be aware and have the knowledge of where the DAP values are displayed on the system.
- Know and demonstrate the basic principles of time, distance and shielding to prevent unnecessary exposure to radiation to staff.
- Know and demonstrate the equipment set up.
- Demonstrate skills to use specific software options on different DXA machines.
- Perform the DXA scan with the appropriate equipment suited and optimised for the specific DXA scan.
- Demonstrate how artefacts on DXA scan images are recognised and how to make appropriate adjustments.

- Analyse a DXA image.
- Analyse images for artefacts and pathologies i.e. scoliosis, osteoarthritis and so on.
- Demonstrate how to record, adjust and use Z-scores and T-scores.
- Demonstrate how to conduct a precision study and ensure their values are under recommended thresholds.
- Know and demonstrate how to carry out daily and weekly quality controls required for a DXA scanner.
- Undertake clinical audits regularly.

Competences

The competences must include the following responsibilities and autonomy required for nurses to undertake the practical aspects:

- Practise DXA scanning accurately, consistently, safely and effectively within the guidance of professional, legal and ethical frameworks.
- Correctly identify service users and seek informed consent before performing the scan.
- Check and record the pregnancy status of the service user, if appropriate.
- Avoid unnecessary radiation exposure to the service user (ALARA).
- Wear a personal dosimeter to monitor radiation dose.
- Know the scope of one's own competence and seek advice, when necessary.
- Seek further clarification regarding a request or referral if in one's own professional opinion it is unjustifiable.
- Where a prior scan was performed at a different facility, every effort should be made to have that patient accommodated at the previous facility first. It is recommended that scans should be performed at the same facility to maintain consistency and comparability to allow for appropriate clinical decision-making.
- Explain to patients, if a scan is being performed at a different facility, that this will serve as a new baseline scan, but is not for comparison to previous scans or intended to alter their underlying diagnosis.
- Optimise the DXA scan and use appropriate protocols.
- Optimise the use of the DXA equipment.

- Take responsibility for understanding and choosing post-processing tools.
- Be able to recognise artefacts on scans.
- Know and understand the local PPPGs to perform the DXA scan.
- Record and report any inadvertent radiation exposure of a service user.
- Act as a role model for colleagues to support information sharing relating to DXA scanning.

The manner in which the content is interwoven and interlinked is individual to each education programme. The indicative content outlined in this section should not be viewed as discrete, neither is the list of topics included in the syllabus exhaustive.

Professional accountability and responsibility

The list of indicative topics and elements of learning should include:

- Professional regulations and guidelines.
- Evidence-based practice and clinical governance in relation to undertaking DXA scans.
- Critical review and clinical audit.
- Risk management.

Legal and ethical aspects

- Know and understand the legal framework governing radiation protection legislation at international, European and national level.
- Know the regulator's functions for assessing compliance of undertakings providing medical exposure to ionising radiation.
- Report all adverse incidents and events in line with local health service provider's and national policy in accordance with regulatory and statutory requirements.
- Know and understand legal liability, and that clinical indemnity is in place to cover health and social care professionals undertaking DXA scans.

- Practise in accordance with NMBI's *Scope of Nursing and Midwifery Practice Framework* and the *Code of Professional Conduct and Ethics for Registered Nurses and Registered Midwives*.
- Obtain informed consent from the service user undergoing the DXA scan.
- Know and understand that the sharing of records must comply with the GDPR and Freedom of Information Acts.

Radiation protection topics

- Understand how X-rays are produced.
- Understand the process of ionisation.
- Understand atomic structure and interaction of radiation with matter.
- Discuss the different sources of ionising and non-ionising radiation in medical imaging.
- Know ionising radiation dose units, absorbed dose, equivalent dose and effective dose.
- Know ICRP principles of radiation protection justification, optimisation and dose limitation.
- Understand the fundamentals of radiobiology (biological effects of radiation).
- Understand the risks for foetal exposure to ionising radiation.
- Understand the fundamentals of radiation detection.
- Describe deterministic and stochastic effects of medical ionising radiation.
- Know the risks of cancer and hereditary diseases, and the effective dose.
- Understand typical doses from diagnostic general X-ray and DXA scans.
- Be able to list the typical radiation dose from different types of DXA scanning equipment.
- Describe various sources of X-ray generation and dual-energy X-ray absorptiometry.

- Understand the DRLs defined for DXA scans and other radiological procedures.
- Describe the management of accidents or unintended radiation exposures.
- Understand and adhere to the written national and local health service provider's PPPGs that define who is entitled to perform the practical aspects of a medical radiological procedure.
- Ensure that the specific DXA scan has not previously been performed.
- Ensure relevant clinical information is provided.
- Know the principles of time, distance and shielding for the protection of staff.
- Understand attenuation of radiological procedures.
- Know how to protect pregnant and breastfeeding staff.

Collaboration referral with other healthcare professionals

- Understand the importance of interpersonal and communication skills to foster collaborative relationships with other members of the multidisciplinary team.
- Understand the role and function of other healthcare professionals involved in undertaking the practical aspects of the DXA scanning process, providing and/or interpreting medical radiological procedures.
- Promote interdisciplinary sharing of a service user's medical records and documentation.
- Work within and adhere to the *Scope of Nursing and Midwifery Practice Framework* at all times.
- Participate in multidisciplinary clinical audits.
- Share audit results with key stakeholders, including service users, as appropriate.

2.6 Essential theory and clinical instruction

This section presents the requirements for the nurse education programmes to undertake the practical aspects of DXA scanning. The education programmes are developed on the assumption that nurses are pursuing an expansion of practice beyond the point of initial registration.

The theory and clinical instructions are intended to be broad statements of principles that the EBs can apply in a dynamic and flexible manner to permit meaningful and applicable programmes of education. These programmes may be provided as stand-alone modules or assigned academic credits that the nurse may transfer to a larger programme of study.

***Theory*:** shall be a minimum of 40 hours instruction and assessment.

***Clinical instruction*:** shall be no fewer than 100 episodes that are documented and recorded in a clinical portfolio as evidence of supervised DXA scanning , leading to final competency assessment of nurses performing DXA scans by the practitioner.

These episodes of documented and recorded competency should include:

- Spines.
- Hips.
- Forearms.
- Vertebral fracture assessment (VFA) scans.
- Other appropriate anatomical sites, for example, whole body.

Clinical instruction must be delivered while undertaking the education programme. There must be confirmation from a practitioner for supervision of the nurse and an agreement to provide the required term of supervised practice. This supervised practice should include imaging techniques and other related topics for undertaking the practical aspects of DXA scanning. The nurse must be working in an area where the clinical practicum will occur.

The methodology of the EBs, in partnership with AHCPs, to support the nurse in the clinical practicum must be identified in the curriculum. Learning outcomes and objectives to be achieved by the nurse in the clinical area must also be made explicit.

Practice placements should be of sufficient length of time to enable the nurse to achieve the professional competence required. The curriculum should indicate how this will be facilitated and completed within a six-month period.

Discretionary practice placement experiences may be selected as appropriate, based upon the identified needs of the student, the competences to be achieved, and the current health and social care policy initiatives and developments. The discretionary placements will be selected to enable the student to achieve the programme learning outcomes and develop the competences essential to undertake DXA scanning.

Following any interruption in the education programme, EBs, in partnership with AHCPs, must ensure that the nurse meets the theoretical and practice requirements.

2.7 Nurses currently undertaking DXA scanning

It is acknowledged that there are nurses undertaking DXA scanning within healthcare services. Due to changes in legislation and regulation, the following section provides a pathway for those nurses who already have experience in undertaking DXA scanning.

Nurses who have a minimum of one year's full-time experience undertaking DXA scanning and are currently in practice or have been within the past two years, will be required to undertake the following aspects of the educational programme to demonstrate that their knowledge, skills and competency meet the regulatory and professional requirements:

- Attend a radiation safety programme accredited by an appropriate professional body and obtain a certification of attendance or attestation.
- Complete a clinical portfolio showing or stating a minimum of 100 DXA procedures as detailed above, documented as competent and signed by a practitioner.
- Provide 30 duplicate episodes which were used to calculate the LSC for each skeletal site – this must include a printed colour copy of each pair of scans and the values obtained, and the calculation and results of their LSC.

- Provide a certificate of knowledge related to DXA and related procedures from a recognised organisation in this area.
- Attend a certified practical clinical workshop on imaging technique, including other topics, related to DXA scanning and obtain a certification of attainment.

These requirements are intended to ensure that nurses currently undertaking the practical aspects of DXA scanning meet the required compliance with the regulator, to ensure service user safety.

CPD is a requirement of S.I. 256 of 2018. Nurses undertaking DXA scanning and all healthcare professionals who conduct radiological procedures, must undertake continuous education and training after qualification. This includes the clinical use of new techniques, training related to these techniques and the relevant radiation protection requirements.

03

Requirements of the Approval Process

3.1 Requirements for higher education bodies (EBs), associated healthcare providers (AHCPs) and education programmes

We have a statutory responsibility to approve EBs and AHCPs in respect of educational programmes for nurses undertaking the practical aspects of (DXA) scanning for adults.

Our role in relation to the approval of professional education is distinct from academic accreditation of a programme by the EB or by its awarding body. We set the standards and requirements, including supporting guidance that must be achieved by the EBs and AHCPs to ensure educational quality. These benchmark how an application for approval is considered.

Education bodies are required to comply with criteria for programme approval as outlined in the Policy for Programme Approval and Monitoring Process. https://www.nmbi.ie/Education/Standards-and-Requirements/Policy-for-Programme-Approval-and-Monitoring-Proce

To submit an education programme for nurses undertaking the practical aspects of DXA scanning, please complete the application form, available on the NMBI website: https://www.nmbi.ie/Education/Higher-Education-Institutions/Post-Registration-Program-Submission.

3.2 National Framework of Qualification (NFQ) Learning Outcomes for Nurse Education Programmes

Learning outcomes at this level relate to the demonstration of knowledge and understanding that is the forefront of a field of learning. Outcomes relate to the application of knowledge, understanding and problem-solving abilities in new or unfamiliar contexts related to a field of study, (nurse authority to undertake the practical aspects of DXA scanning for adults). The outcomes are associated with an ability to integrate knowledge, handle complexity and formulate judgements (National Qualifications Authority of Ireland, 2003).

The EBs must outline the programme and learning outcomes of the education for nurse authority to undertake the practical aspects of DXA scanning as indicated by the NFQ at a minimum Level 8 learning outcomes grid. The EBs must clearly outline the expected knowledge, competency and skills that the post-graduate student will have gained at the end of the programme.

NFQ Level 8 Learning Outcomes for Nurses Undertaking the Practical Aspects of DXA Scanning for Adults

All cognate areas within the discipline of nursing (nurse authority to undertake the practical aspects of DXA scanning for adults) must be at a minimum Level 8 standard on the NFQ.

Level 8 Standards	Description	Indicators
1. Knowledge – Breadth	Understanding of the theory, concepts and methods pertaining to a field (nurse authority to undertake the practical aspects of DXA scanning for adults) of learning.	The graduate should be able to: 1. Demonstrate an understanding of the theory, concepts and methods pertaining to relevant clinical practice skills, essential for safe and effective nurse practice in DXA scanning. 2. Demonstrate a valid certification and a copy of a valid IOF attestation.
2. Knowledge – Kind	Detailed knowledge and understanding in nurse authority to undertake the practical aspects of DXA scanning for adults.	The graduate should: 1. Know and demonstrate an understanding of relevant biological and related sciences as they apply to the nurse with authority to undertake the practical aspects of DXA scanning for adults. 2. Know and demonstrate an understanding of the sciences as they apply to the nurses DXA practice. 3. Critically analyse and evaluate relevant knowledge in nursing DXA practice. 4. Critically analyse and evaluate relevant knowledge in health promotion and healthcare policy. 5. Demonstrate relevant knowledge to adopt systematic approaches to nursing DXA practice based on the best available evidence. 6. Know how to manage service user safety including incident management, reporting and analysis of adverse incidents as per the local health service providers and HIQA guidance.

Level 8 Standards	Description	Indicators
3. Know-how and Skill – Range	Demonstrate mastery of a complex and specialised area of nurse DXA scanning skills and tools. Use and modify these skills and tools to conduct research, and professional and advanced technical activity.	The graduate should be able to: 1. Assist individuals, families and groups to achieve optimum health, independence and recovery in a professional, caring manner. 2. Provide and manage direct practical nursing, whether healthcare is promotional, preventive, curative, rehabilitative or supportive, to individuals, families or groups. 3. Demonstrate evidence-based clinical practice skills essential for safe DXA scanning. 4. Identify and implement, optimisation priorities in the relevant area of DXA practice. 5. Implement health strategies for service user groups in accordance with the public health agenda.
4. Know-how and skill – Selectivity	Exercise appropriate judgement in a number of complex planning, design, technical and/or management functions related to products, services, operations or processes, including resourcing.	The graduate should be able to: 1. Identify and meet the nursing needs of the individual, family, and community in relevant healthcare settings. 2. Demonstrate the skills of: • imaging • service user positioning • critical thinking • problem solving • reflection in nursing practice as it applies to DXA scanning. 3. Act as an effective member of the healthcare team, in an appropriate setting and participate in the multidisciplinary team approach to the care of the service user. 4. Evaluate practice and use current research findings to underpin clinical practice in DXA scanning. 5. Communicate effectively, with service users and carers as appropriate to enable them to fully participate in decisions relating to DXA scanning.

Continued

Level 8 Standards	Description	Indicators
4. Know-how and skill – Selectivity	Exercise appropriate judgement in a number of complex planning, design, technical and/or management functions related to products, services, operations or processes, including resourcing.	The graduate should be able to: 6. Communicate effectively, with service users and carers as appropriate to enable them to fully participate in decisions relating to DXA scanning. 7. Implement changes in service provision in response to service demand.
5. Competence – Context	Use advanced skills to conduct research, or advanced technical or professional activity, accepting accountability for all related decision-making; transfer and apply diagnostic and creative skills in a range of contexts.	The graduate should be able to: 1. Adopt a holistic approach to DXA practice and the integration of knowledge. Conduct a systematic holistic assessment of the service user's needs to be based on evidence-based practice. 2. Plan care in consultation with the service user taking into consideration the therapeutic regimes of the multidisciplinary team. 3. Implement planned nursing care/ interventions to achieve the identified outcomes. 4. Evaluate a service user's progress toward outcomes and review plans in accordance with the current data and consultation with the service user. 5. Establish and maintain caring therapeutic interpersonal relationships with service users. 6. Perform a nursing assessment; plan and initiate care and treatment modalities within agreed interdisciplinary protocols to achieve person-centered outcomes and evaluate their effectiveness. 7. Identify, critically analyse, disseminate and integrate nursing and other evidence into the area of DXA practice.

Continued

Level 8 Standards	Description	Indicators
5. Competence – Context	Use advanced skills to conduct research, or advanced technical or professional activity, accepting accountability for all related decision-making; transfer and apply diagnostic and creative skills in a range of contexts.	The graduate should be able to: 8. Initiate and/or participate in and evaluate audit and use the outcome of an audit to improve DXA practice. 9. Contribute to service planning and budgetary processes using audit and specialist knowledge.
6. Competence – Role	Act effectively under guidance in a peer relationship with practitioners, including complex and heterogeneous groups.	The graduate should be able to: 1. Effectively manage the care of the service user. 2. Contribute to the overall goal/ mission of the healthcare institution. 3. Demonstrate the ability to work as a team member. 4. Determine priorities for care based on need, acuity and optimal time for an intervention. 5. Utilise referral guidelines effectively and efficiently, for example, iRefer, as appropriate. 6. Utilise methods to demonstrate quality assurance and quality management. 7. Delegate to other nurses' activities commensurate with their competence and within their scope of professional practice, having due regard for the principles outlined in the Scope of Nursing and Midwifery Practice Framework when delegating a particular role or function. 8. Facilitate the coordination of care. This is achieved through working with all team members to ensure that care is appropriate, effective and consistent. 9. Provide leadership in clinical practice and act as a resource and role model for DXA practice.

Level 8 Standards	Description	Indicators
7. Competence – Learning to Learn	Learn to act in variable and unfamiliar contexts, learn to manage learning tasks independently, professionally and ethically.	The graduate should be able to: 1. Take responsibility for personal and professional development. 2. Act to enhance the personal and professional development of self and others. 3. Demonstrate a commitment to lifelong learning. 4. Contribute to the learning of DXA practices of colleagues through support, supervision and teaching. 5. Educate the service user to maintain and promote health. 6. Provide mentorship, preceptorship, teaching, facilitation and professional supervisory skills for nurses, midwives and other healthcare professionals.
8. Competence – Insight	Express a comprehensive internalised, personal world view manifesting solidarity with others.	The graduate should be able to: 1. Provide and articulate professional and ethical nursing practice. Safe and effective DXA practice requires a sound underpinning of theoretical knowledge that informs practice and is in turn informed by that practice. 2. Practise in accordance with legislation relevant to nurse authority to undertake the practical aspects of DXA scanning practice. 3. Practise within the limits of own competence and take measures to develop further competencies 4. Demonstrate an understanding and consciousness of nursing DXA practice issues through the process of reflection on experience. 5. Generate and contribute to the development of clinical standards and guidelines relevant to DXA practices. 6. Use relevant knowledge to support and enhance knowledge and practice in DXA scanning.

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