Friends Medical Service

DXA Authorisation and Referral Guidelines

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Distribution	Electronic copy to FMS Staff

Authorisation of Exposure based on Referral Criteria and Protocols for DXA (Dual-energy X-ray Absorptiometry)

Under the Ionising Radiation (Medical Exposures) Regulations IR(ME)R NI 2018 no medical exposure to radiation can take place without prior justification of the exposure by an entitled practitioner.

DXA (Dual-Energy X-ray Absorptiometry) exposures can be authorised by specific operators if the referral complies with the enclosed authorisation guidelines and referral criteria which have been justified by the entitled practitioner.

Referrers should provide sufficient medical data relevant to the medical exposure requested to enable the operator to authorise the examination.

Specific DXA trained Radiographers, acting as operator authorising the exposure, should be satisfied that the information provided by the referrer conforms to the approved referral criteria.

The person authorising the exposure should be recorded on RIS within the notes section in line with Employers Procedure, Procedure A.

Referrers using these guidelines should be aware of patient information provided on the Friends Medical Service website. Referrers must provide the patient with sufficient knowledge of their referral to assist in the appropriate and valid process of consent by imaging professionals prior to examinations. Referrers must also add to requests for imaging, any issues which may be relevant to the consent process such as lack of capacity.

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Benefits/Risks to Radiation

The use of radiological investigations is an accepted part of medical practice justified in terms of clear clinical benefits to the patient, which should far outweigh the small radiation risks. However, even small radiation doses are not entirely without risk. A small fraction of the genetic mutations and malignant diseases that occur in the population can be attributed to background radiation.

Diagnostic medical exposures – the major source of man-made radiation – account for one-sixth of the total population dose.

One important means of reducing the radiation dose to the patient is to avoid undertaking procedures unnecessarily (especially repeat examinations).

DXA (Dual-energy X-ray Absorptiometry)

DXA (Dual-energy X-ray Absorptiometry) is the established standard method of measuring bone mineral density (BMD). It is a low radiation dose examination used to help diagnose bone conditions such as low bone mass and osteoporosis. The effective dose from a DXA scan is among the lowest doses resulting from commonly used radiological examinations. The effective dose from a DXA scan of the hip and spine is similar to the dose we receive every day from background radiation.

Typical Effective Dose from DXA (Dual-energy X-ray Absorptiometry) Examinations.

Table 1: Effective doses for DXA spine and hip examinations in adults on a Hologic Discovery Scanner for different scan modes.

DXA Model	**Scan mode**	**PA Spine** (µSv)	**Hip** (µSv)
Hologic Discovery	Express	4.4	3.1
Hologic Discovery	Fast array	6.7	4.7
Hologic Discovery	Array	13.3	9.3

Authorisation Guidelines for DXA (Dual-Energy X-ray Absorptiometry)

Radiographers are reminded that it is their responsibility to follow IR(ME)R NI 2018 regulations at all times.

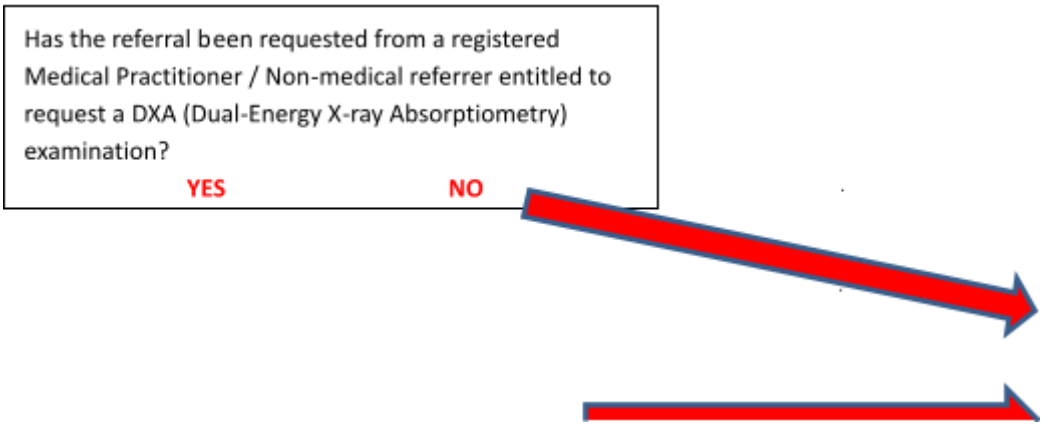
Request Form / E-referral

If the referral satisfies the following, the operator can authorise the exposure:

- The referral has been requested from a registered Medical Practitioner or entitled Non-medical referrer.
- There is a clear patient's name, address and date of birth on the referral and Health and Care (H&C) Number.
- The clinical history matches the examination requested. If there are any unknown abbreviations on the request, seek advice and attempt to contact the referrer.
- The request is in line with the following referral criteria.

Operators must **not** authorise Referrals in the following circumstances:

1. Non-medical exposures, where there is no net health benefit to the patient. These Referrals must be justified and authorised by an appropriate entitled practitioner (consultant radiologist).



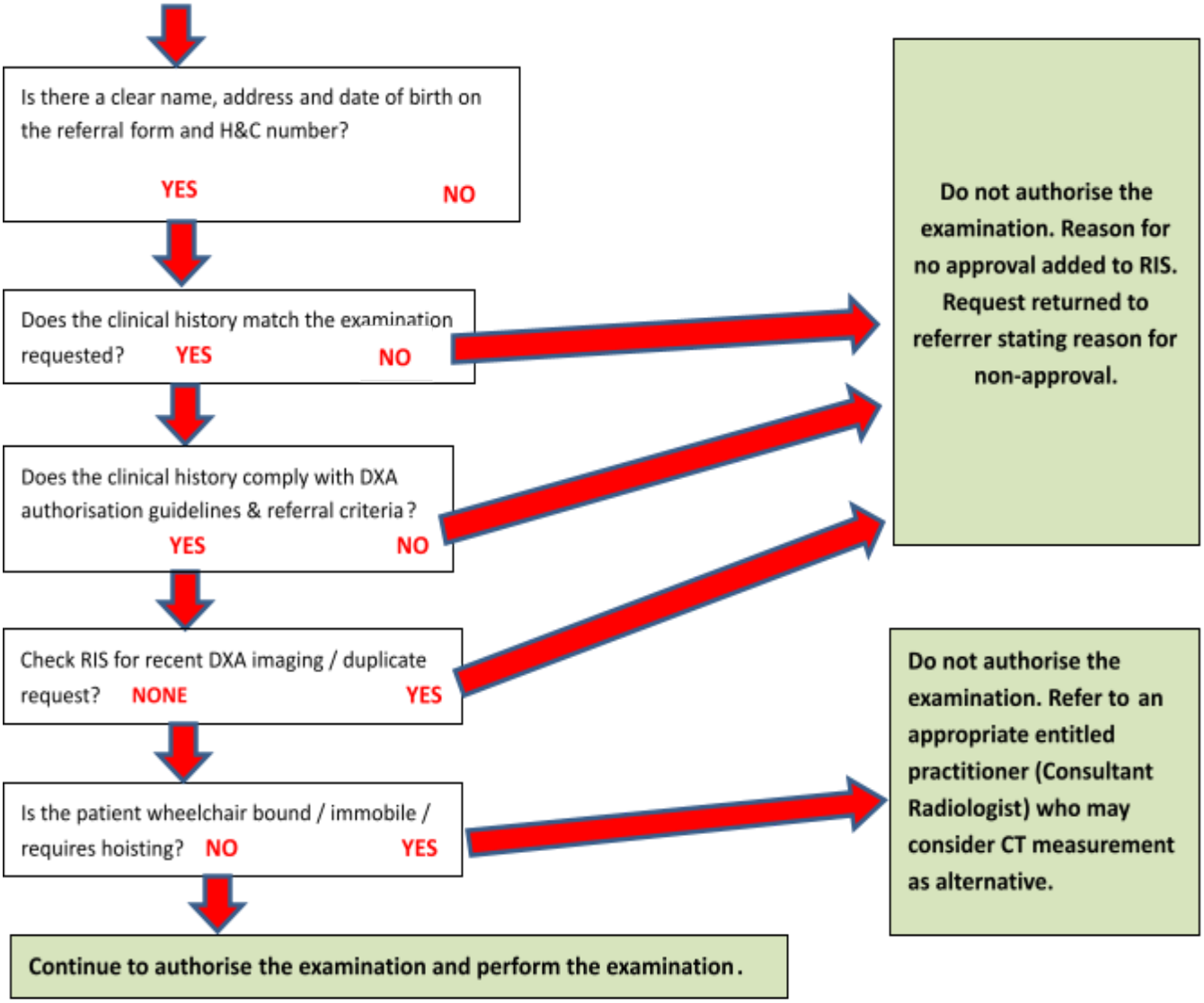
2. For DXA referrals, any referral with a confirmed pregnancy or when pregnancy cannot be excluded, then the DXA scan should be deferred and not performed until either pregnancy is excluded or after pregnancy.
3. Any Referral with insufficient clinical information, does not meet the criteria of the authorisation guidelines or inadequate demographic data must be returned to the Referrer for further information.

Contraindication Guidelines for DXA (Dual-Energy X-ray Absorptiometry)

- Patient who has had a DXA scan performed within the last 2 years.
- Patient who is under the age of 20. These requests are forwarded and performed at Musgrave Park Hospital.
- Pregnancy or risk of pregnancy. 28 day rule applies.
- Patient who would exceed weight limit of DXA scanner which is 204kg.
- Patient who has had a recent contrast or isotope radiological exam within the last 3 weeks
- Where DXA is unfeasible (including patient bed/wheelchair bound or confused and cannot physically access the DXA scanning table and cannot tolerate a forearm scan). DXA requires sufficient mobility to get up onto and off the scanner unaided. There is currently no hoisting facility in the Southern Trust to scan immobile patients in DXA. These patients can be facilitated with a CT measurement as an alternative. These requests must be authorised and approved by a Radiologist.
- Patients who cannot remain still throughout the scanning process (has to lie flat and remain still for up to 10 mins).
- Where the Lumbar spine and Hip cannot be measured, the forearm should not be used for monitoring change in BMD.

Authorisation of Medical Exposures flowchart

A typical process following receipt of a request for DXA (Dual-Energy X-ray Absorptiometry)


Is there a clear name, address and date of birth on the referral form and H&C number?
YES
NO
Do not authorise the examination. Reason for no approval added to RIS. Request returned to referrer stating reason for non-approval.
Does the clinical history match the examination requested?
YES
NO
Does the clinical history comply with DXA authorisation guidelines & referral criteria?
YES
NO
Check RIS for recent DXA imaging / duplicate request?
NONE
YES
Do not authorise the examination. Refer to an appropriate entitled practitioner (Consultant Radiologist) who may consider CT measurement as alternative.
Is the patient wheelchair bound / immobile / requires hoisting?
NO
YES
Continue to authorise the examination and perform the examination.

Part 2 Referral Criteria for

DXA (Dual-energy X-ray Absorptiometry)

Referral Criteria for DXA (Dual-Energy X-ray Absorptiometry)

Clinical risk factors are used to identify those patients with a high risk of fracture risk and most likely to develop osteoporosis. The following referral criteria has been written to ensure appropriate justification for a DXA scan under Ionising Radiation (Medical Exposure) Regulations IR(ME)R (NI) 2018.

Indications	Additional considerations
Women aged 65 years and older and men aged 70 years and older, regardless of clinical risk factors.	As indicated by 2019 ISCD Official Positions – Adult
Post-menopausal women younger than age 65 if they have a clinical risk factor for low bone mass.	Clinical risk factors include • Low body weight • Prior fracture • High risk medication use • Disease or condition associated with bone loss
Women during the menopause transition with clinical risk factors for fracture.	Clinical risk factors include • Low body weight • Prior fracture • High risk medication use
Men aged less than 70 years of age if they have a clinical risk factor for low bone mass.	Clinical risk factors include • Low body weight • Prior fracture • High risk medication use • Disease or condition associated with bone loss

Assessment of bone mineral density recommended by FRAX/NOGG	Following the assessment of fracture risk using FRAX in the absence of BMD, the patient may be classified to be at low, intermediate or high risk. • Low risk – reassure, give lifestyle advice, and reassess in 5 years or less depending on the clinical context. • Intermediate risk - measure BMD and recalculate the fracture risk to determine whether an individual's risk lies above or below the intervention threshold. • High risk - can be considered for treatment without the need for BMD, although BMD measurement may sometimes be appropriate, particularly in younger postmenopausal women. Note- These thresholds are for guidance only and the final decision to assess BMD lies with the individual clinician.

Following QFracture assessment	QFracture can be used to select high risk patients for bone mineral density measurement as part of their assessment following identification of their high risk status for fracture.

Early / premature menopause or oestrogen deficiency (age < 45 years) Bilateral oophorectomy / hysterectomy Prolonged amenorrhoea > 6 months not due to pregnancy or contraception	• Women during the menopause transition with clinical risk factors, such as low body weight, prior fracture, or high risk medication use can be considered for BMD measurement. • Eating disorders/ over-exercise with amenorrhoea can indicate BMD measurement
Low Body Mass Index BMI <19kg/m2, anorexia nervosa	• Low BMI is associated with low BMD. • National Osteoporosis consensus group (NOGG) recommended threshold (<19kg/m2).
Untreated hypogonadism in men	Males with low testosterone levels
First degree relative with osteoporosis (t-score < -2.5 or history of hip fracture	People with a parental history of osteoporosis, particularly those over the age of 50.
Vitamin D deficiency/ osteomalacia	As indicated by referrer
Low trauma fracture	A fracture sustained as the result of a force equal to, or less than a force from a fall from standing height.

	• People with a history of a fragility fracture over the age of 50 should be offered DXA scanning. • Low trauma fracture in a younger patient – particularly of the hip, spine or wrist without significant trauma • Fractures of fingers and toes are excluded.
Radiographic evidence of osteopenia or vertebral fracture (<75 years)	Postmenopausal women over age 75 may be considered for treatment without prior BMD (NICE HTA 161, www.nice.org.uk)
Disease or condition associated with low bone mass or bone loss	Disease/conditions including • Inflammatory Rheumatic Disorders (e.g. Rheumatoid Arthritis / Systemic Lupus Erythematosus) • Connective tissue disease • Malabsorption state e.g. coeliac, crohns, ulcerative colitis, chronic malnutrition, major gastric surgery • Chronic liver or renal disease (CKD <stage 4 or bilirubin over 3 times normal limit for 6 months) 🎬 Transplantation (pre and post) 🎬 Endocrine disease e.g. (thyrotoxicosis even when young), hyperparathyroidism (included elevated blood calcium levels), cushing's • Immobilising neurological disease 🎬 Respiratory disease e.g. Asthma/COPD/emphysema/cystic fibrosis • Anorexia nervosa or bulimia

	• Male hypogonadism • Type I insulin dependent diabetes • Prolonged immobilisation • History of falls (high risk group over 65s).
Medication Associated with low bone mass or bone loss	Medications include • Corticosteroid therapy 3 months duration (more than 7.5mg prednisolone or equivalent for 3 months or longer) • GnRH inhibitors • Prolonged antiepileptic therapy • Prolonged heparin therapy • Prolonged antidepressant therapy • Aromatase inhibitors • Androgen deprivation therapy in men • Prolonged high dose Proton Pump Inhibitor PPI therapy • Depo-Provera contraceptive injection • Long-term antidepressants • Thiazolidinediones • Long term clexane treatment
Alcohol excess	Intake of 3 or more units/daily
Current smoker	Smoking is a well-established risk factor for fracture.
Loss of height / thoracic kyphosis with or without back pain	Referral for DXA and lateral spine imaging to assess for suspected vertebral deformity/fracture
Anyone being considered for pharmacologic therapy	This includes anyone not receiving therapy in whom

	evidence of bone loss would lead to treatment
Anyone being treated, to monitor treatment effect	• Repeat BMD testing may be considered when the results are likely to influence clinical management. • Example - consider DXA measurement at the end of a course of treatment e.g. 3-5 years of oral bisphosphonate in high risk patient, e.g. significant ongoing risk factors that are likely to need further treatment after a treatment break. • Patients should return to the same DXA scanner/centre that was used to perform their most recent prior study. • Follow-up Scans should not be repeated any sooner than 2 years as a minimum to ensure change in BMD is real and not just the imprecision of measurement. • Multiple repeat BMD testing is not indicated where previous scans have stable BMD and there are no new additional risk factors.

PRIORITISATION FOR DXA SCANS

To ensure timely access to scanning, the following groups referred for DXA are be approved and vetted as follows:

Referral Group	Prioritisation
Fracture Liaison Service Urgent Referrals	Prioritised as Urgent
Oncology	Prioritised as Planned with a planned date in the next 1-2 months.
Where an urgent treatment decision is required: • Transplant pre/post assessment • Hyperparathyroidism	Prioritised as Planned with a planned date in the next 1-2 months.

Part 3 Protocols for DXA

(Dual-Energy X-ray Absorptiometry)

Protocols for DXA (Dual-Energy X-ray Absorptiometry)

Local site specific standard operating Procedures (SOP) are available within the Bone Densitometry Department and on Radiology Q-Pulse System.

The standard World Health Organisation (WHO) recommended sites for DXA measurements are the Lumbar spine, unilateral proximal femora and in some cases, the forearm.

Skeletal sites to measure

- Measure BMD routinely at both the spine and femur in all patients.
- Measure BMD at the spine, femur and forearm in all patients with hyperparathyroidism (confirmed or suspected).
- Forearm BMD measurements can be considered when the spine and/or femur cannot be measured or interpreted:

1. Abnormalities of the spine:
    - Scoliosis
    - Spina Bifida
    - Spinal haemangioma
2. Degenerative changes within the spine:
    - Disc-space narrowing
    - Osteophyte formation
    - End plate sclerosis
3. Vertebral fractures
4. Spinal abnormalities resulting from surgical interventions:
    - Laminectomy
    - Vertebroplasty
    - Kyphoplasty
    - Fusion
    - Discectomy
    - Fusion hardware
5. Abnormalities of the Femur:
    - Moderate-severe degenerative changes resulting in increased BMD

- Rickets
- Paget's disease
- Fractures
- Polio
- Avascular necrosis
- Surgical intervention e.g. hip replacement

6. Other artefacts overlying Region of interest (ROI):
   - Aortic calcification
   - Stenting
   - Ankylosing spondylitis with associated calcification
   - Gallstones / porcelain gall bladder
   - Sclerotic bony metastases
   - Benign bone lesion such as an enostosis
   - Pagetoid vertebral body from Paget disease
   - Soft tissue leiomyofibroma with calcifications
   - Calcified retroperitoneal lymph nodes
   - Renal stones
   - Buttock granulomata
   - Ventricular-peritoneal shunt connector
   - Ventricular pacemaker wire
   - Lap-band port
   - pain nerve stimulator
   - fat panniculus

7. Very obese patients (over the weight limit for DXA table or anatomy cannot be visualised.)

8. Large discordance in BMD of hip and spine.

SPINE REGION OF INTEREST (ROI)

- Use L1-L4 for spine BMD measurement
- Use all evaluable vertebrae and only exclude vertebrae that are affected by local structural change or artefact. Use three vertebrae if four cannot be used and two if three cannot be used.
- Anatomically vertebrae may be excluded from analysis if:
  - They are clearly abnormal and non-assessable within the resolution of the system; or
  - There is more than a 1.0 T-score difference between the vertebra in question and adjacent vertebrae

- BMD based diagnostic classification should not be made using a single vertebra.
- If only one evaluable vertebra remains after excluding other vertebrae, Spine skeletal site should be disregarded and forearm BMD should be measured in addition to hip.
- When vertebrae are excluded, the BMD of the remaining vertebrae are used to derive the T-score.

Hip Region of Interest (ROI)

- Use femoral neck, or total proximal femur, whichever is lowest.
- BMD may be measured at either hip.

Forearm Region of interest (ROI)

- Use 33% radius (one-third radius).
- Only scan forearm that has not previously been fractured.
- BMD may be measured at either forearm.
- Repeat forearm measurements are not performed for monitoring change/response to treatment.

References/ Evidence base

- National Osteoporosis Guideline Group (NOGG) 2017 - Clinical guideline for the prevention and treatment of osteoporosis.
- National Institute of Health & Care Excellence
    - Clinical Guideline 146 - Osteoporosis: assessing the risk of fragility fracture Clinical guideline

  - Quality Standard 149 – Osteoporosis Quality standard
  - Technology Appraisal 161 – Falls in older people: assessing risk and prevention
  - Technology Appraisal 464 – Bisphosphonates for treating Osteoporosis

- Scottish Intercollegiate Guideline Network (SIGN) 142 - Management of osteoporosis and the prevention of fragility fractures
- Centre for Metabolic Bone Diseases, University of Sheffield - FRAX® Fracture Risk Assessment Tool
- International Society for Clinical Densitometry (ISCD) – Official ISCD Positions Adult 2019
- Guidance for the Management of Breast Cancer Treatment Induced Bone Loss – A consensus position statement from a UK Expert Group
- Royal College of Physicians (2002) - Glucocorticoid induced osteoporosis: guidelines for prevention and treatment
- Royal Osteoporosis Society (ROS) (2019) -Reporting dual energy X-ray absorptiometry scans in adult fracture risk assessment'