VITAMIN D: PREVENTION & TREATMENT OF DEFICIENCY IN ADULTS

TARGET AUDIENCE	Primary and secondary care prescribers
PATIENT GROUP	Adults at risk of, or with deficient/insufficient vitamin D

Clinical Guidelines Summary

- Guidelines for the assessment of vitamin D status, and replacement in adults.
- See Flowcharts 1 and 2 for assessment and approach to replacement in different clinical scenarios.

Vitamin D: Prevention and treatment of deficiency in adults

BACKGROUND:

The Scottish Government released updated guidance (available here) in November 2017 on the advice of The Scientific Advisory Committee on Nutrition (SACN). NICE guidance was also updated in line with the SACN advice (available here).

In brief, the current recommendations for adults (living in Scotland) are:

- All pregnant and breastfeeding women should take a daily supplement containing 10 micrograms (400 units) of vitamin D, to ensure the mother's requirements for vitamin D are met and to build adequate fetal stores for early infancy.
- SACN also recommends people who are not exposed to much sunlight, such as frail or housebound individuals, or those that cover their skin for cultural reasons; and people from minority ethnic groups with dark skin such as those of African, African-Caribbean and South Asian origin, (because they require more sun exposure to make as much vitamin D) should also consider a daily supplement all year round.
- The Scottish Government recommends that everyone should consider taking a daily supplement of 10 micrograms (400 units) of vitamin D particularly during the winter months (October to March).
- A Public Health Scotland patient information leaflet titled 'Vitamin D and You' is available here.

Most of the population of the West of Scotland has low levels of vitamin D because of low levels of UV/sun exposure. The important clinical syndrome that can result from deficiency of vitamin D is osteomalacia – a syndrome characterised by malaise, multifocal bone pain with tenderness and proximal myopathy. Osteomalacia is associated with abnormal biochemistry – high serum alkaline phosphatase, serum calcium low/low normal, serum PTH high & low vitamin D, usually <30 nmol/L. The prime aim in giving vitamin D to our patients is to prevent this vitamin D deficiency syndrome. Diverse health problems ranging from MS to heart disease, from TB to cancers at various sites have been ASSOCIATED with low levels of vitamin D (and with higher latitude) BUT there is NO or INSUFFICIENT evidence to support a causal link between low vitamin D and any of these problems; furthermore there is no evidence that giving vitamin D alters the incidence of any of these conditions.

Vitamin D levels of <30 nmol/L are generally considered to be 'deficient' (however even at this level most patients do not have osteomalacia). Vitamin D levels of above 50 nmol/L are generally viewed as 'sufficient'. In terms of description; vitamin D levels in the range of 30-50 nmol/L are described as insufficient however use of vitamin D supplements are often not required in this context - see National Osteoporosis Society (NOS) - Vitamin D and Bone Health: A Practical Clinical Guideline for Patient Management (available here)

The vitamin D that is routinely measured in the laboratory is 25-hydroxyvitamin D_3 ($25(OH)D_3$). This compound is inactive, but is stable, and serum levels correlate reasonably well with vitamin D activity. This is the vitamin that is measured when "vitamin D" measurement is requested through biochemistry.

1,25-dihydroxyvitamin D (1,25(OH)2D3) is the biologically active form of vitamin D. This can be measured biochemically but it is unstable and levels do not correlate well with vitamin D activity. Measurement of $1,25(OH)_2D_3$ should be reserved for patients with hypercalcaemia complicating granulomatous disease such as sarcoidosis or in patients with vitamin D resistant rickets. There may rarely be course to measure$1,25(OH)_2D_3$ in patients taking calcitriol or alfacalcidol.

Vitamin D: Prevention and treatment of deficiency in adults

WHEN TO MEASURE VITAMIN D:

1. Patients with low adjusted serum calcium (<2.2 mmol/L) and/or where other blood results suggest possible osteomalacia.
2. Patients with malabsorption syndromes.
3. CKD (eGFR <30) - measurement in this context should usually be carried out by specialist clinics only.

WHEN NOT TO MEASURE VITAMIN D:

1. Patients prescribed Vitamin D at daily doses of less than 5000 units/day. Toxicity is unlikely at these doses and where required should be undertaken by secondary care specialists.
2. Patients on alfacalcidol or calcitriol (not measured by assay – see $1,25(OH)_2D_3$ above)
3. Vitamin D is not a test that is helpful in investigation of tiredness, chronic fatigue / fibromyalgia or non- specific aches and pains (with normal bone biochemistry).

HOW FREQUENTLY TO MEASURE VITAMIN D:

Follow-up measurements are generally not required but there are occasional exceptions, for example in patients with malabsorption with suboptimal Vitamin D. But repeat testing is only appropriate after at least 6 months' supplementation and is available at specialists' request. Current evidence based practice shows that measurement of vitamin D should not be required more than once a year in routine clinical practice and as such vitamin D analysis will not be performed more frequently, unless specifically arranged and agreed with a biochemist.

PRESCRIBING VITAMIN D:

See the following flowcharts for advice on when supplementation of vitamin D is indicated and what to prescribe.

Note: If prescribing vitamin D in a patient with a calcium level at the upper end of the normal range it is best practice to re-check calcium levels after 6-8 weeks.

- Flowchart 1 - Vitamin D: Prevention & Treatment of Deficiency in Adults
- Flowchart 2 - Vitamin D: Deficiency in Adults in the context of (or at increased risk of) osteomalacia, osteoporosis or increased risk of fracture

Flowchart 1 – Vitamin D: Prevention & treatment of deficiency in adults

Which patient population are you managing?

Patients with
- Proven or possible osteomalacia
- Osteoporosis
- Increased risk of fracture

→ Refer to Flowchart 2 below

Pregnant or breastfeeding women particularly teenagers and young women.
Vitamin D blood measurement NOT required.

The Scottish Government[1] recommends a daily supplement containing 10 micrograms (400 units) of vitamin D.
High strength formulations are not recommended in pregnancy or breastfeeding.

Healthy Start women's vitamins are available free to all pregnant women via their community midwives. Women with a child under one year old can obtain free women's vitamins from their health visitor or most local Health Centres. These contain the correct amount of vitamin D for this purpose.
Further information for NHSL staff is available at the Maternal and Infant Nutrition FirstPort page

General Population
Vitamin D blood measurement NOT required.

- The Scottish Government[1] recommends that everyone from birth should consider taking a daily supplement of vitamin D, particularly during the winter months (October to March).
- For age 1 and over a daily supplement containing 10 micrograms (400 units) of vitamin D is recommended.
- People at particular risk of vitamin D deficiency, who may also benefit from a daily supplement all year round, include:
  - Patients from ethnic groups with dark skin
  - Institutionalised, frail or housebound patients
  - Chronic alcohol misusers
  - People who observe vegetarian, vegan, halal, kosher or nut free diets
  - Obese patients
  - People who wear concealing clothing (e.g. Muslim men and women)
  - Medical risk factors: renal/hepatic disease unless attending specialist clinics
  - Specific medicines (e.g. anticonvulsants and antiretrovirals)

→ Give advice on dietary sources of vitamin D (Panel 1), regular sun exposure (Panel 2) and buying over the counter vitamin D supplements particularly in the winter.

Panel 1: Dietary Sources of Vitamin D[2]
- Oily fish
- Cod liver oil or other fish oils
- Eggs
- Fortified breakfast cereals (see individual product packaging)
- Margarine
- Infant milk formula

Panel 2: Sun exposure advice[3]
When possible, only a limited amount of time should be spent in strong sunlight. People who choose to expose their skin to strong sunlight to increase their vitamin D status should be aware that prolonged exposure (for example, leading to burning or tanning) is unlikely to provide additional benefit. Exposing commonly uncovered areas of skin such as forearms and hands, for short periods when in strong sunlight provides vitamin D. Longer periods of exposure may be needed for those with darker skin.

1. Scottish Government, Scientific Advisory Committee on Nutrition (SACN) advice available here.

2. BMJ 2010; 340 doi: http://dx.doi.org/10.1136/bmj.b5664 (Published 11 January 2010) Cite this as: BMJ 2010;340:b5664 http://www.bmj.com/content/340/bmj.b5664

3. NICE 34 Sunlight exposure: risks and benefits available at https://www.nice.org.uk

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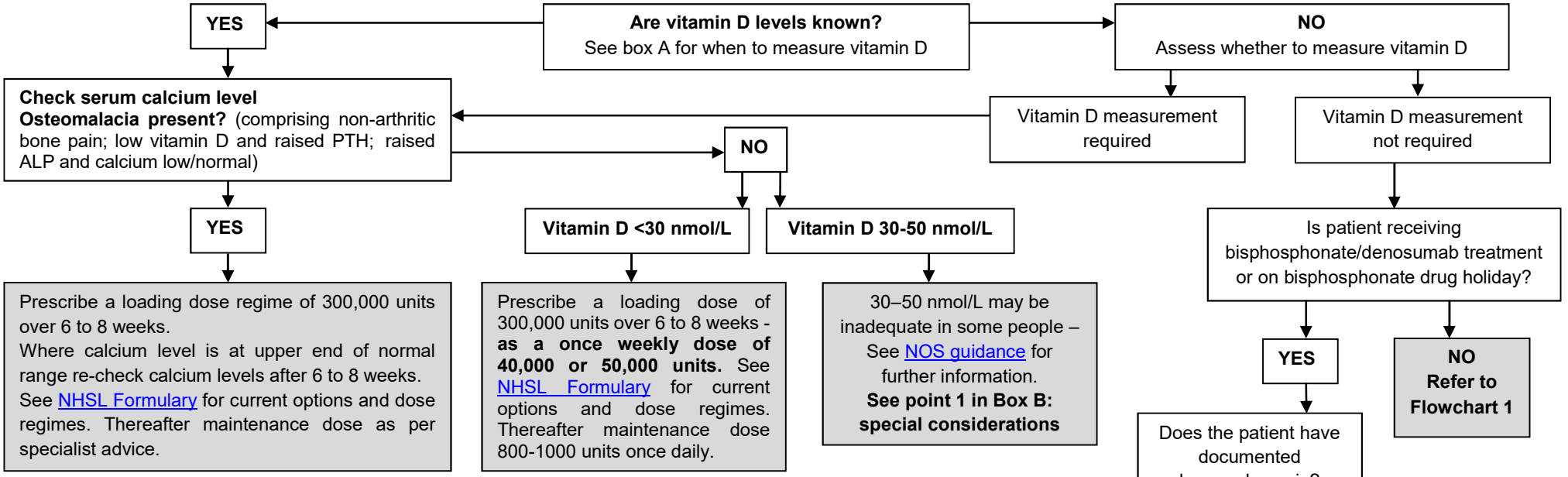
Flowchart 2 – Vitamin D: Deficiency in adults in the context of (or at increased risk of) osteomalacia, osteoporosis or increased risk of fracture



Box A: Measuring vitamin D levels

When to Measure Vitamin D:

1. Patients with low adjusted serum calcium (<2.2 mmol/L) and/or possible osteomalacia
2. Patients with malabsorption syndromes
3. CKD (eGFR <30), measurements will be carried out by specialist clinics only

When NOT to Measure Vitamin D:

1. Patients prescribed Vitamin D at daily doses of less than 5000 units/day. Toxicity is unlikely at these doses and where required should be undertaken by secondary care specialists.
2. Patients on alfacalcidol or calcitriol (not measured by assay)
3. Vitamin D is not a test that is helpful in investigation of tiredness, chronic fatigue / fibromyalgia or non-specific aches and pains (with normal bone biochemistry).

Box B: Special considerations

1. If fracture/osteoporosis and for IV zoledronic acid or SC denosumab, give 4 doses of 50,000 units colecalciferol orally as per Hip Fracture Acute Treatment Pathway, and then treat with appropriate ongoing calcium and vitamin D or if calcium contraindicated with separate colecalciferol supplement.
2. Patients with malabsorption such as coeliac disease / pancreatic insufficiency (e.g. cystic fibrosis) or with chronic liver disease, & low Vitamin D should be treated as for patient with a vitamin D level of <30 nmol/L unless osteomalacia in which case follow guidance above.
3. Patients with chronic kidney disease (& eGFR <30) merit discussion with specialists.

Notes - The use of vitamin D in patients with Primary Hyperparathyroidism should be determined through specialist referral to Endocrinology. Potent vitamin D analogues such as calcitriol or alfacalcidol are typically reserved for patients with renal osteodystrophy or for patients with Primary Hypoparathyroidism and should be used in the context of guidance from appropriate specialists - as they carry risk of hypercalcaemia / hypercalciuria.

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APPENDICES

1. Governance information for Guidance document

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		.	4
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