Vitamin D Deficiency in Adults (18 years +)

Vitamin D Deficiency in Adults from Age 18 years Onwards with eGFR ≥30ml/min/1.73m^2 – Diagnosis, Treatment and Prevention Primary Care Pathway

DO NOT ROUTINELY TEST FOR VITAMIN D DEFIENCY – ONLY TEST IF:

Does patient have symptoms of vitamin D deficiency?

Symptoms of osteomalacia such as:

- Bone discomfort or pain (often throbbing) in lower back, pelvis, and lower extremities.
- Impaired physical function.
- Muscle aches and weakness – can cause difficult in rising from a seating position, or a waddling gait
- Symmetric lower back pain.

Chronic widespread pain.

Is there a clinical reason to test?

- Prior to specific treatment where correcting vitamin D deficiency is appropriate.
- If the person has a bone disease that may be improved with vitamin D treatment, such as osteomalacia, osteoporosis or Paget's disease.
- If the person has had a fall.
- If the person has features of hypocalcaemia (rare) including muscle cramps, carpopedal spasm, numbness, paraesthesias, tetany, or seizures.

Patients at higher risk of vitamin D deficiency:

- Insufficient exposure to sunlight.
- Those with darker skin.
- Nutritional deficiency.
- Certain co-morbidities (i.e. malabsorption syndromes).
- Use of certain drugs (i.e. corticosteroids, anti-epileptic drugs).
- Elderly (65 years and older).
- Obese or have had gastric bypass surgery.
- Pregnant or breastfeeding.
- Family history of vitamin D deficiency.

YES

Test for vitamin D deficiency by measuring serum 25-hydroxyvitamin D (25[OH]D) levels

To aid diagnosis and rule out other concerns consider arranging:

Bone profile (calcium, phosphate, ALP), renal, liver and thyroid function tests, parathyroid hormone (PTH) level, FBC including haemoglobin and ferritin levels (to identify other possible vitamin deficiencies), malabsorption screen, rheumatoid and other autoimmune screening and Inflammatory markers. Although uncommon symptoms of hypoglycaemia are also diagnostic factors for vitamin D deficiency.

Serum 25 (OH) D levels are above 50nmol/L = ADEQUATE

DO NOT PRESCRIBE VITAMIN D.

ADVISE MEASURES TO PREVENT VITAMIN D DEFICIENCY (see lifestyle advice). All adults living in the UK, including people at increased risk of vitamin D deficiency should take a daily supplement containing 400 IU (10mcg) vitamin D throughout the year, including winter months.

If patient has musculoskeletal symptoms despite adequate level, consider alternative diagnosis.

Check adequacy of Calcium intake.

Serum 25 (0H) D levels are in the range 30 – 50nmol/L = INSUFFICIENT

Does patient have the following? (Refer/Seek specialist advice where appropriate)

- Has a fragility fracture, osteoporosis or high fracture risk.
- Is being treated with an antiresorptive drug for bone disease.
- Has symptoms suggestive of vitamin D deficiency.
- Is at increased risk of developing vitamin D deficiency in future e.g. reduced sunlight exposure.
- Has raised parathyroid hormone.
- Is taking an antiepileptic drug or an oral corticosteroid or is on long-term treatment with other drugs known to cause vitamin D deficiency, such as colestyramine.
- Has a malabsorption disorder i.e. bile acid malabsorption, inflammatory bowel disease, coeliac disease, pancreatic exocrine insufficiency or liver disease. If concerns about malabsorption exist, please refer to a community gastroenterology dietitian to optimise absorption of nutrients.
- Or has another condition known to cause vitamin D deficiency such as chronic kidney disease.

NO

YES

Serum 25(OH) D levels are less than 30nmol/L = DEFICIENT

TREAT FOR DEFICIENCY

(LOADING DOSE)

Check adequacy of Calcium intake.

Where hypercalcaemia is a concern contact secondary care for advice.

SELF-CARE FOR INSUFFIENCY

(MAINTENANCE DOSE)

Check adequacy of Calcium intake.

Consider alternative diagnosis (this list is not exhaustive):

- Certain cancer.
- Fibromyalgia.
- Fracture.
- Osteomyelitis.
- Paget's disease of the bone.
- Parathyroid disease.
- Polymyalgia rheumatica.
- Rheumatoid arthritis.
- Polymyositis and dermatomyositis.
- Thyroid disease.
- Muscular dystrophies.

Refer to secondary care

If a serious underlying condition such as cancer or a malabsorption disorder (e.g. Crohn's) is suspected.

Refer/Seek specialist advice:

- Malabsorption disorders (e.g. Crohn's disease). Consider referral to community gastroenterology dietician.
- Condition which causes vitamin D deficiency (e.g. Chronic kidney disease eGFR <30ml/min/1.73m^2)
- Co-existing condition associated with increased sensitivity to vitamin D (sarcoidosis, tuberculosis, lymphoma or primary hyperparathyroidism.
- Is a pregnant woman.
- Has an unexplained deficiency.

Management and Prescribing Information

Table 1 - Vitamin D Treatment Regimens for Adults 18 years and over

Treatment	Dose (Vitamin D – international units (IU))	Regimen	Formulary choice (PRESCRIBE BY BRAND)	Cost per course	Quantity to prescribe (FULL course as ACUTE prescription)	Considerations correct as of May 2019
Deficiency <30nmol/L	Fixed loading dose of 300,000 IU *The serum vitamin D and serum calcium levels should be rechecked after the high dose correction treatment to ensure the serum vit D has been corrected and check for an unmasked hyperparathyroidism.*	50,000 IU once a week for 6 weeks (300,000 IU total)	***First Line:*** **InVita D3 50,000 IU soft gel capsule ONCE WEEKLY for 6 weeks**.	£9.90	SIX capsules	• Not suitable for vegetarians or vegans due to gelatin content. • Overall product does not have either halal or kosher certification but gelatin used is certified as both halal and kosher. • Free from peanut, soya beans and their derivatives.
			If patient is unable to tolerate capsule formulation: **InVita D3 50,000 IU/ml 1ml oral solution ampoule ONCE WEEKLY for 6 weeks.**	£12.50	SIX ampoules	• Suitable for vegetarians. • Free from gelatin, nuts, lactose and soya.
	Fixed loading dose of 268,800 IU *The serum vitamin D and serum calcium levels should be rechecked after the high dose correction treatment to ensure the serum vit D has been corrected and check for an unmasked hyperparathyroidism.*	3,200 IU once daily for 12 weeks (268,800 IU total)	***Second line or for pregnant or breastfeeding women:*** **Fultium-D3 3,200 IU capsules ONE DAILY for 12 weeks.**	£37.30* Rebate	84 capsules	• Not suitable for vegetarians or vegans due to gelatin content. • Capsules are halal and kosher certified. • Capsules include refined soybean oil as an ingredient. • Peanut-oil free capsules have been formulated since October 2014 but the peanut (arachis) oil version of will continue to be available at wholesalers for some time, so it is recommended that the product formulation is checked before dispensing to patients with a known peanut or soya allergy.
Insufficiency 30 – 50nmol/L with risk factor(s)	Maintenance treatment of 800 IU daily (higher doses of upto 2000 IU a day, occassionally up to 4000IU a day may be used for certain groups of people (e.g. those with malabsorption syndromes – see arranging referrals and seeking advice). *Check adequacy of calcium intake also.*		**SELF-CARE, RECOMMEND PATIENT TO PURCHASE LONG-TERM UNLESS RISK FACTORS IMPROVE** (see table 2 for formulations available over the counter)			
			Only in exceptional cases where self-care is not possible: **InVita D3 25,000 IU/ml 1ml oral solution ampoule once MONTHLY.**	£1.49	Consider advising patient to take long-term unless risk factors improve.	• Suitable for vegetarians. • Free from gelatin, nuts, lactose and soya.
Adequate/ Sufficiency >50nmol/L	Sufficiency (for almost the whole population). **No treatment required**; provide reassurance and give lifestyle advice including national guidance that all should take 400 IU (10mcg) vitamin D daily.					

If a patient has an allergy it is important this is highlighted to their doctor or pharmacist so the relevant product may be checked for suitability at the point of dispensing (noting that manufacturers can change their formulations at any time).

Where a patient requires a specific formulation or the above recommendations are not suitable Please contact the Medicines Optimisation Team via CAPCCG.prescribingpartnership@nhs.net for further advice and support.

Please note the reference ranges slightly differ to NICE due to the way vitamin D levels are reported by our local pathology laboratory.

Vitamin D Toxicity and Adverse Effects[1]

- **Vitamin D toxicity rarely occurs** unless the vitamin D dose is very high.
- Manifests mainly through chronic hypercalcaemia:
  - Nausea and vomiting.
  - Diarrhoea.
  - Constipation.
  - Anorexia and weight loss.
  - Lethargy.
  - Polyuria and thirst.
  - Sweating.
  - Headache.
  - Vertigo.
  - Raised concentrations of calcium and phosphate in plasma and urine.
- **If hypercalcaemia is suspected,** *check serum calcium levels*:
  - If hypercalcaemia is identified, assess the person's state of hydration, and consider admission if the person is dehydrated.
  - If the person is taking a calcium supplement, advise that it should be stopped.

Other adverse effects that have been linked with high vitamin D intakes or high serum 25 (OH)D levels:

- An increased incidence of falls and fractures.
- An increased rate of pancreatic and prostate cancer.
- An increased total mortality (that is, from all causes combined).
- However, evidence for these associations is less robust and consistent than that relating to hypercalcaemia.

Drug Interactions[1]

Seek specialist advice as appropriate during concurrent treatment with these drugs.

- **Antiepileptic drugs (phenytoin or barbiturates) —** can increase the metabolism of vitamin D, leading to a reduction in the effects of vitamin D. *Higher doses of vitamin D may be needed.*
- **Cardiac glycosides —** excessive dosing of vitamin D can induce hypercalcaemia, which may enhance the effects of digoxin and other cardiac glycosides (leading to an increased risk of digoxin toxicity and serious arrhythmias). *Close monitoring (and possibly a dose reduction of vitamin D) is needed during concurrent use.*
- **Corticosteroids —** may increase vitamin D metabolism and elimination. *Higher doses of vitamin D may be needed.*
- **Ion exchange resins (such as colestyramine) or laxatives (such as paraffin oil) —** may reduce the gastrointestinal absorption of vitamin D. *Higher doses of vitamin D may be needed.*
- **Miconazole —** the effects of vitamin D are possibly reduced by miconazole. *Higher doses of vitamin D may be needed.*
- **Orlistat —** may prevent the absorption of vitamin D, even in people also taking multivitamins. *Advise that vitamin D preparations should be taken at least 2 hours after taking orlistat. It may be necessary to monitor vitamin D levels, even if multivitamins are given.*
- **Thiazide diuretics (such as Bendroflumethiazide) —** may reduce the urinary excretion of calcium thereby increasing the risk of hypercalcaemia. *Close monitoring (and possibly a dose reduction of vitamin D) is needed during concurrent use.*

Table 2 – Examples of Vitamin D Preparations Available to Purchase (not exhaustive)

Adults 18 years and over – Nutritional Supplements				
Product/ Licensed Status/ Constituents	**Approximate price and pack size**	**Source**	**Suitability for vegetarians/ vegans and halal/kosher certification**	**Suitability in peanut/soya allergy**
Boots Pharmaceuticals Vitamin D Colecalciferol 400IU (10 micrograms) tablets	90 tablets £2.29 (3p per tablet)	Available for purchase only from Boots www.boots.com	Suitable for vegetarians but not vegans. Free from artificial colours, flavours and preservative. Lactose free.	Does not contain peanut. Contains tocopherol – source unknown.
Boots Pharmaceuticals Vitamin D3 Colecalciferol 1000 IU (25 microgram) tablets	90 tablets £4.99 (6p per tablet)	Available for purchase only from Boots www.boots.com	Suitable for vegetarians but not vegans. Free from artificial colours, flavours and preservative. Lactose free.	Does not contain peanut. Contains tocopherol – source unknown.
Boots Vegan Vitamin D3 Colecalciferol 1000 IU (25 microgram) tablets	90 tablets £5.99 (7p per tablet)	Available for purchase only from Boots www.boots.com	Free from artificial flavour, colours and preservatives. Lactose free. Suitable for those following a vegetarian and vegan diet.	Does not contain peanut. Contains tocopherol – source unknown.
Fultium Daily D3 Capsules Colecalciferol 400 IU (10 microgram) capsules	90 capsules £5.79 (6p per tablet)	Available for purchase only from pharmacies and online https://shop.thorntonross.com/products-c1/vitamins-fultium-daily-d3-c10	Not suitable for vegetarians or vegans. Gelatin used is halal and kosher certified.	Does not contain peanut. Contains tocopherol – source unknown.
Holland and Barrett Vitamin D3 Colecalciferol 400 IU (10 microgram) caplets	100 tablets £3.59 (4p per tablet)	Available for purchase only from Holland and Barrett www.hollandandbarrett.com	Suitable for vegetarians not vegans.	Does not contain peanut. Contains tocopherol – source unknown.
Holland and Barrett Vitamin D3 Colecalciferol 1000IU (25 microgram) caplets	100 tablets £8.19 (8p per tablet)	Available for purchase only from Holland and Barrett www.hollandandbarrett.com	Suitable for vegetarians not vegans.	Does not contain peanut. Contains tocopherol – source unknown.
Tesco High Strength Vitamin D Vitamin D (25mcg) tablets	90 tablets £3.50 (4p per tablet)	Available for purchase only from Tesco www.tesco.com	Suitable for vegetarians not vegans.	Does not contain peanut. Contains tocopherol – source unknown.
Pregnancy and Breastfeeding – Nutritional Supplements				
Holland and Barrett Folic acid with Vitamin D Each tablet: vitamin D3 400 IU (10 micrograms) tablets and folic acid 400 micrograms	90 tablets £5.99 (7p per tablet)	Available for purchase only from Holland and Barrett www.hollandandbarrett.com	No information available.	Does not contain peanut. Contains tocopherol – source unknown.
Healthy Start Women's Vitamin Tablets Each tablet: vitamin D3 400 IU (10 micrograms), vitamin C 70mg, folic acid 400 micrograms	Free of charge where eligible voucher scheme in place	Available from midwives, health visitors and children's centres and also some pharmacies. For more information visit www.healthystart.nhs.uk	Suitable for vegetarians and free from milk, egg and gluten, soya and peanut residues.	Free from soya and peanut residues.
Pregnacare Each tablet: vitamin D3 400 IU (10 micrograms and various other constituents	90 tablets £14.95 (17p per tablet)	Available from various pharmacies and supermarkets. For more information visit www.vitabiotics.com	Suitable for vegetarians not vegans. Free from preservative, artificial colours, yeast and gelatin.	Made in a factory that contains nut. Contains soya.

Please note - Manufacturers may change the formulation of their products or the suppliers of the excipients. The current status of the peanut or soya content of the product should therefore be obtained from the manufacturer.

Background[1]

Vitamin D deficiency is the most common nutritional deficiency in the world. It affects people of all ages, especially if there are risk factors.

Vitamin D deficiency is most commonly caused by insufficient exposure to sunlight (which is the main source of vitamin D for most humans. The amount of vitamin D synthesised in the skin depends on skin exposure to solar ultraviolet B. Solar UV levels in the UK are highest in summer months (between March and October) and around midday (between 11am and 3pm) but are reduced by cloud cover.

Management of vitamin D deficiency and correction of risk factors (where possible) should restore vitamin D levels and reduce the risks, or improve the symptoms of complications such as osteomalacia, falls and muscle weakness.

Following treatment for vitamin D deficiency or for those with insufficiency, patients will require lifestyle changes in addition to self-care with daily vitamin D supplement to maintain optimum vitamin D levels.

Patients at higher risk of vitamin D deficiency[1]

In the UK people at higher risk of vitamin D deficiency include those:

- With limited sun exposure
  - Cover up skin for their cultural reasons.
  - Spend very little time outdoors (housebound patients).
- With dark skin
  - African, African – Caribbean, or Asian or Middle – Eastern ethic origin.

Vitamin D deficiency can also in occur in people who:

- Are at increased risk of nutritional deficiency e.g. vegans or those who do not eat fish, or generally have a poor diet.
- Are pregnant or breastfeeding.
- Are elderly (65 years and older) as often tend to spend more time indoors, wear more clothing and are more likely to develop conditions that affect the bioavailability of vitamin D (such as reduced kidney or liver function).

- Have certain conditions (such as malabsorption syndromes – coeliac disease, cystic fibrosis and Crohn's disease) or are taking certain drugs (anti-epileptic drugs, colestyramine, rifampicin, corticosteroids, drugs that reduce fat absorption e.g. orlistat and highly active antiretroviral treatment) that may increase risk of vitamin D deficiency.
- Are obese (BMI >30 kg/m^2) or have had gastric bypass surgery.
- Have a family history of vitamin D deficiency.

Dietary Calcium Intake

- Adequate levels of both vitamin D and calcium are needed to ensure optimum serum calcium levels, and it is important to ensure that both are maintained to prevent long-term adverse effects on the bones.
- Once deficiency of vitamin D is corrected, check adequacy of calcium intake to determine if maintenance treatment of vitamin D alone should be recommended or whether supplementation with both vitamin D and calcium will be required. Please recommend self-care where the patient is both willing and able.
- Use an online calculator i.e. the Institute of Genetics and Molecular Medicine calcium calculary to determine patient's dietary calcium intake.
- Patients may check their own adequacy of calcium intake by using the British Dietetic Association website (available at www.bda.uk.com).
- For people with inadequate calcium intake (less than 700mg a day for most people or less than 1000mg a day for people with osteoporosis) or people with confirmed hypocalcaemia, advise on dietary measures to correct this.
- See appendix 1 for the British Dietetic Association (BDA) factsheet on calcium (available at www.bda.uk.com) for information on how the daily calcium intake may be achieved. Patients can assess the adequacy of their calcium intake using this factsheet via the assessment tool.
- Dietary calcium deficiency is common in people with a diet low in meat and milk products. Dietary calcium deficiency is worsened where there is a high dietary intake of phytate (i.e. chapatti flour, wholegrain and wholemeal flour) as this binds calcium in the intestine.
- Calcium supplementation may be considered (in addition to high-dose vitamin D) for patients who are unable or unwilling to increase their dietary calcium.
- We would not recommend a combined calcium and vitamin D preparation for patients on high-dose vitamin D treatment because they contain low levels of vitamin D which may result in high dosing of calcium, increasing the risk of hypercalcaemia.
- **Check serum calcium levels 1 month after starting calcium supplements (and as clinically indicated thereafter).**
    - If hypercalcaemia is detected, stop the calcium supplement and investigate the cause of hypercalcaemia.

Arranging referral or seeking specialist advice

- If a serious underlying cause is suspected such as cancer or malabsorption disorder refer immediately.
- Patients with malabsorption disorders or chronic liver disease despite compliance with oral vitamin D therapy may require referral for higher doses of vitamin D, preferably via the parenteral route to improve absorption.
- For patients with established malabsorption conditions consider contacting a Community Gastroenterology Dietitian for advice on adequacy of vitamin D and calcium intakes to optimise nutrient absorption and ensure adequacy in regard to intake of appropriate supplementation.
- Patients will chronic kidney disease may require treatment with a short-acting vitamin D analogue i.e. alphacalcidol or calcitriol via specialist initiation.
- Patients with co-existing conditions associated with increased sensitivity to vitamin D are at increased risk of vitamin D toxicity and therefore need lower doses of vitamin D and more frequent monitoring.
- Pregnant women at high risk of vitamin D deficiency require specialist advice for their management plan and in relation to prescribing high dose vitamin D preparations.

Lifestyle Advice – MUST BE GIVEN TO ALL PATIENTS

Advise that all adults living in the UK, including people at increased risk of vitamin D deficiency, should take a daily supplement containing 400 IU (10 micrograms) of vitamin D throughout the year, including in the winter months.

Pregnant and breastfeeding women eligible for the NHS Healthy Start scheme can obtain free vitamin tablets by taking their coupons to a local distribution point. The daily dose of one tablet contains 400 IU of vitamin D, 400 micrograms of folic acid, and 70 mg of vitamin C. The Healthy Start vitamin tablets are suitable for vegetarians; free from wheat, fish, egg, and salt; and have no colours, flavours, preservatives, or gluten-containing ingredients.

All other people can purchase multivitamin preparations (tablets, capsules, and liquids) containing 400 IU of vitamin D from pharmacies (see table 2). Allergies and dietary restrictions should be considered before buying these preparations to ensure that their content is safe and appropriate.

Provide the following advice to all patients with vitamin D deficiency or insufficiency.

- **Safe sun exposure:**
  - Exposing commonly uncovered areas of the 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.
  - Many people will have experienced sunburn. They can use this experience to know what their skin looks like normally, how it reacts to sunlight, how long they can be exposed without risking sunburn, and how to protect their skin accordingly.
  - Advise that skin that is not usually exposed to sunlight (for example the back, abdomen and shoulders) is particularly likely to burn, so extra care is needed.
  - Prolonged exposure to strong sunlight (for example leading to burning or tanning) **DOES NOT** lead to excess production of vitamin D, as a regulation mechanism exists to destroy excess vitamin D but increases the risk of skin cancer.
  - Between March and October in the UK, people should protect their skin from burning by covering up with suitable clothing (such as long-sleeved tops, a broad-brimmed hat, or long skirts and trousers); seeking shade (especially between 11am and 3pm); and applying sunscreen, which should:
    - Meet minimum standards for ultraviolet A (UVA) protection — the label should have the letters 'UVA' in a circle logo and should preferably state that it provides good UVA protection (for example at least '4-star UVA protection').
    - Provide at least sun protection factor (SPF) 15 to protect against UVB.
    - Be applied liberally and frequently, according to the manufacturer's instructions. If the sunscreen is applied too thinly, the amount of protection it gives is reduced.
  - Sunbeds are **NOT** an effective method of protecting against vitamin D deficiency because they emit high levels of UVA, which do not contribute to vitamin D synthesis but increase the risk of skin cancer.

- **Dietary intake of vitamin D:**
  - It is important to maintain dietary intake of vitamin D by taking vitamin D supplements (available to purchase over the counter), especially during the winter months, as it is difficult to obtain sufficient vitamin D from food sources alone because they are limited.
  - Rich sources include cod liver oil (this also contains vitamin A which can be harmful in high doses and should be avoided in pregnancy), oily fish (such as salmon, mackerel, and sardines). Egg yolk, meat, offal, milk, mushrooms, and fortified foods (such as fat spreads and some breakfast cereals and yoghurts) contain small amounts.

- **Dietary intake of calcium:**
  - It is also important to maintain dietary intake of calcium, as both calcium and vitamin D are needed to prevent long-term adverse effects on the bones.
  - Rich sources of calcium include dairy foods (milk, cheese, and yoghurts) and tinned sardines with bones.

- **Adherence to long-term supplementation** and where necessary, calcium, in order to prevent recurrence of deficiency and to maintain bone health. *Please see useful links for patients' section.*

Follow Up

- **Within one month of completing the high-dose vitamin D treatment course,** check adjusted serum calcium levels.
- *Consider checking serum calcium levels more regularly (for example every 1–2 weeks in the first months of treatment) in people receiving calcium supplements in addition to high-dose vitamin D treatment.*
- *Consider referral to a Community Gastroenterology Dietitian for assessment of calcium and vitamin D intakes and to optimise absorption in patients with malabsorption conditions.*
- **If hypercalcaemia is identified, consider referral:**
  - Assess the person's state of hydration and consider admission if the person is dehydrated.
  - If the person is taking calcium supplements, advise them to stop taking them.
- **If calcium levels are normal:**
  - Do not recommend long-term calcium supplements.
  - If the person is taking calcium supplements, advise them to stop taking them.
  - Advise patient to complete the BDA Calcium factsheet assessment tool to review their calcium intake and for patients with malabsorption conditions consider referring for a dietary review by a dietician.
- **If hypocalcaemia is identified:**
  - Advise the use of an over-the-counter calcium supplement containing 1 – 2 g of calcium. This may be needed long term (in addition to vitamin D maintenance treatment) for people with inadequate dietary calcium intake.
  - If the person is already taking a calcium supplement, refer to secondary care.
- **After 3 – 6 months of treatment with high-dose vitamin D,** check serum 25(OH)D levels.
  - **If compliance confirmed and serum 25(OH)D levels are below 50 nmol/L,** refer to secondary care for consideration of possible causes, including, drug interactions, or an underlying disease, such as renal disease, liver disease, or malabsorption.
  - **If compliance confirmed and serum 25(OH)D levels are greater than 50 nmol/L and there are no signs of hypercalcaemia –** Recommend patient to purchase a daily maintenance dose of 800 international units (IU) (see table 2). (Higher doses of up to 2000 IU

a day, occasionally up to 4000 IU a day, may be used for certain groups of people, for example those with malabsorption disorders.) and reinforce lifestyle advice to prevent recurrence.

- **If compliance confirmed and symptoms and signs have not improved despite satisfactory 25(OH)D levels,** consider an alternative diagnosis.

- **If patient was unable to comply with the formulary choices of high dose vitamin D deficiency or these formulations are unsuitable:**
  - Please contact the Medicines Optimisation Team via CAPCCG.prescribingpartnership@nhs.net for further advice and support.

References

1. CKS – Vitamin D deficiency in adults – treatment and prevention, last revised September 2018
2. NHS England. Conditions for which over the counter items should not routinely be prescribed in primary care: Guidance for CCGs. Published March 2018. Available at http://www.england.nhs.uk/wp-content/uploads/2018/03/otc-guidance-for-ccgs.pdf
3. NICE evidence [PH56] Vitamin D: supplement use in specific population groups, last updated August 2017.
4. The Royal College of Obstetricians and Gynaecologists – Vitamin D in Pregnancy. Scientific Impact Paper No. 43. Published June 2014. Available at: https://www.rcog.org.uk/globalassets/documents/guidelines/scientific-impact-papers/vitamin_d_sip43_june14.pdf (Accessed 10/05/2019)
5. UKMI Which dose of vitamin D should be prescribed for the treatment of vitamin D deficiency? Last revised March 2019. Available at: https://www.sps.nhs.uk/articles/what-dose-of-vitamin-d-should-be-prescribed-for-the-treatment-of-vitamin-d-deficiency-2/ (Accessed 3 May 2019)
6. UKMI Which oral vitamin D dosing regimens can be used to correct deficiency in pregnancy? Last revised January 2019. Available at https://www.sps.nhs.uk/articles/which-oral-vitamin-d-dosing-regimens-correct-deficiency-in-pregnancy/ (Accessed 10 May 2019)
7. UKMI Is there a suitable licensed vitamin D product for a patient with a peanut or soya allergy? Last revised June 2018. Available at https://www.sps.nhs.uk/articles/is-there-a-suitable-vitamin-d-product-for-a-patient-with-a-peanut-or-soya-allergy/ (Accessed 3 May 2019)
8. UKMI Is there a suitable licensed vitamin D product for a patient with a peanut or soya allergy? Last revised June 2018. Available at: https://www.sps.nhs.uk/articles/is-there-a-suitable-vitamin-d-product-for-a-patient-with-a-peanut-or-soya-allergy/ (Accessed 8 May 2019)
9. UKMI What vitamin D preparations are suitable for a vegetarian or vegan diet? Last revised August 2017. Available at: https://www.sps.nhs.uk/articles/which-vitamin-d-preparations-are-suitable-for-a-vegetarian-or-vegan-diet/
10. Summary of product characteristics. InVita D3 50,000 IU Capsules. Date of first authorisation: 07/16. Date of revision: 07/16. Available at: https://www.medicines.org.uk/emc/product/656
11. Summary of product characteristics. InVita D3 50,000 IU Oral solution. Date of first authorisation: 07/15. Date of revision: 07/15. Available at: https://www.medicines.org.uk/emc/medicine/31321
12. Summary of product characteristics. Fultium-D3 3,200 IU capsules. Date of first authorisation: 04/14. Date of revision: 01/18. Available at: https://www.medicines.org.uk/emc/product/5355/smpc

13. NHS Choices – Vitamin D. Available at: https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-d/ (Accessed: 7 May 2019)
14. British Dietetic Association (BDA) factsheet on Vitamin D. Available at www.bda.uk.com (Accessed: 3 May 2019)
15. British Dietetic Association factsheet Calcium. Available at www.bda.uk.com (Accessed: 3 May 2019)
16. PrescQipp Bulletin 120 – Vitamin D. Published May 2016. Available at: https://www.prescqipp.info/media/1728/b120-vitamin-d-spot-list-22.pdf (Accessed 9 May 2019)
17. Joint Formulary Committee (2019) *British National Formulary*. Available at: http://bnf.nice.org.uk (Accessed: 1 May 2019)

Useful links for patients

- The British Dietetic Association has useful factsheets on Vitamin D and Calcium (available at www.bda.uk.com).
- The NHS choices website has a useful publication on Vitamins and minerals - Vitamin D (available at www.nhs.uk).
- The Met Office (www.metoffice.gov.uk) provides information on the UV index, which is an indicator of the sun's strength for a given location, date and time. This information, combined with skin type and behaviour, can be used to assess someone's risk of sunburn.

BDA The Association of UK Dietitians

Food Fact Sheet

Calcium

Calcium is important at all ages for strong bones and teeth. This Food Fact Sheet lists the recommended amounts of calcium for different groups of people and the foods and drinks that are rich in calcium. It also gives you some ideas on how you might achieve your recommended intake.

You are more at risk of calcium deficiency if you:

- are on a cow's milk or lactose free diet
- have coeliac disease
- have osteoporosis
- are breastfeeding
- are past the menopause

Meals and snack ideas

- Start the day with cereal (calcium-fortified) with milk or a milk substitute (calcium-fortified).
- Use tinned sardines or pilchards (with the bones) instead of tuna in a sandwich or on toast.
- Have a stir fry including tofu, broccoli spears and chopped nuts for lunch or dinner.
- Add yoghurt/soya yoghurt to fruit as a pudding or use milk or a milk substitute (calcium-fortified) to make custard and milk puddings.
- Try a glass of low-fat milk as a snack or to help rehydrate after exercising.
- Don't forget that low-fat dairy products have as much and often more calcium than the full-fat versions.
- Remember to check non-dairy sources have added or are 'fortified' with calcium.
- Try to avoid sugary drinks and snacks. If you choose a calcium-rich food which contains sugar, it is best to eat this as part of a meal instead of as a snack.

Healthy lifestyle advice for healthy bones

- Be active – weight bearing activities are best e.g. walking, aerobics, cycling, running and tennis. Aim for at least 30 minutes of activity, five times a week.
- Smoking is associated with an increased risk of osteoporosis, low bone density and increased risk of hip fracture. Stopping smoking prevents further excess bone loss.

Vitamin D and calcium

Vitamin D helps the absorption of calcium from foods. Most of our vitamin D is made by the action of sunlight on the skin. Between April and September, going outside for 15 minutes, two or three times a week between 11am and 3pm without sunscreen should be enough to produce sufficient vitamin D.

All adults and children over the age of one should consider taking a daily supplement containing 10µg vitamin D, especially during autumn and winter. A daily supplement is recommended all year round for those who are at risk of low vitamin D including: all pregnant and breastfeeding women, babies and young children, people aged 65 years and over and people with darker skin or who are not exposed to much sun.

Foods rich in vitamin D include oily fish, eggs and fortified breakfast cereals/spreads but you cannot get enough vitamin D from food alone. You may need to take a supplement if you do not get enough (safe) sun exposure or if you are over 65 years old.

Calcium supplements

Calcium supplements are available from chemists/pharmacies, supermarkets and health food shops.

If you are unable to meet your daily requirements from food, these supplements can be of use but ask your doctor for advice.

Calcium supplements are available free of charge to women and children who are eligible for Healthy Start vouchers. Ask your health visitor about this.

BDA The Association of UK Dietitians

Food Fact Sheet

Vitamin D

Sunshine, not food, is where most of your vitamin D comes from. So even a healthy, well balanced diet, that provides all the other vitamins and goodness you need, is unlikely to provide enough vitamin D. Read on to find out the best ways to get enough vitamin D safely.

What is vitamin D?

You make vitamin D under your skin when you are outside in daylight, which is the reason vitamin D is sometimes called the 'sunshine vitamin'. A vitamin is something that helps our body function – a 'nutrient' – that we cannot make in our body. Vitamin D is different because even though we call it a vitamin, it is actually a hormone and we can make it in our body.

What does vitamin D do in my body?

Vitamin D works with calcium and phosphorus for healthy bones, muscles and teeth. The Scientific Advisory Committee on Nutrition (SACN) report Vitamin D and Health (July 2016) highlights the importance of vitamin D in protecting muscle strength and preventing rickets, osteomalacia and falls. Even if you have a calcium-rich diet (for example from eating plenty of low-fat dairy foods and green leafy vegetables), without enough vitamin D you cannot absorb the calcium into your bones and cells where it is needed. Vitamin D may have other important roles in the body, but there isn't enough evidence at the moment to make any conclusions.

What happens if i don't get enough vitamin D?

Some babies are born with low levels of vitamin D and some do not get enough in breast milk; this

can result in fits or rickets. Older children who do not get enough vitamin D can also develop rickets. Rickets can cause permanent deformities to the bone, weaken muscles and reduced growth.

Adults who don't get enough vitamin D can develop osteomalacia. This makes the bones softer as the minerals needed to keep them strong cannot get into the bone. People with osteomalacia experience bone pain and muscle weakness.

When is vitamin D made in skin?

The amount of vitamin D you make depends on how strong the sunlight is. You will make more in the middle of the day, when the sun is strongest. You will also make more when you are in direct sunlight than in the shade or on a cloudy day.

Sun safety

It is the sun's ultraviolet rays that allow vitamin D to be made in the body. You do not have to sunbathe to make vitamin D. In the UK, ultraviolet light is only strong enough to make vitamin D on exposed skin (on the hands, face and arms or legs) during April to September. However strong sun also burns skin so we need to balance making vitamin D with being safe in the sun - take care to cover up or protect your skin with sunscreen before you turn red or get burnt. Find out more about sun safety on the NHS Choices website: http://www.nhs.uk/livewell/skincpages/sunsafe.aspx

During the autumn and winter, we get vitamin D from our body's stores and from food sources but the SACN report says these are insufficient to keep up vitamin D levels. SACN recommends the only way to ensure a healthy vitamin D status is to take a supplement.