

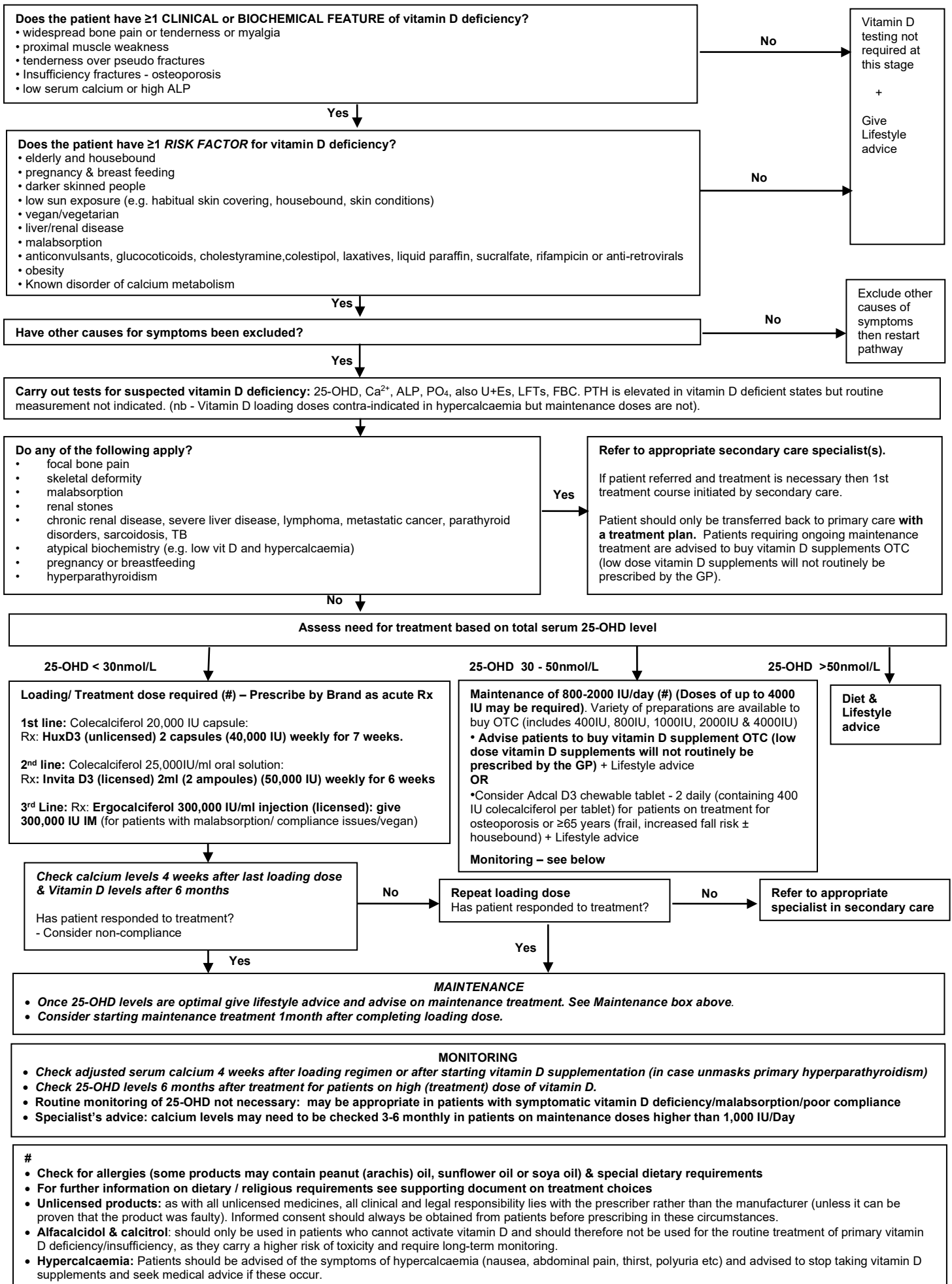
Guidance on Vitamin D Deficiency/Insufficiency – November 2011
(updated February 2012, December 2015, December 2016 and December 2018)

This guidance aims to provide general advice for clinicians in a community setting including areas where clinical uncertainty remains.

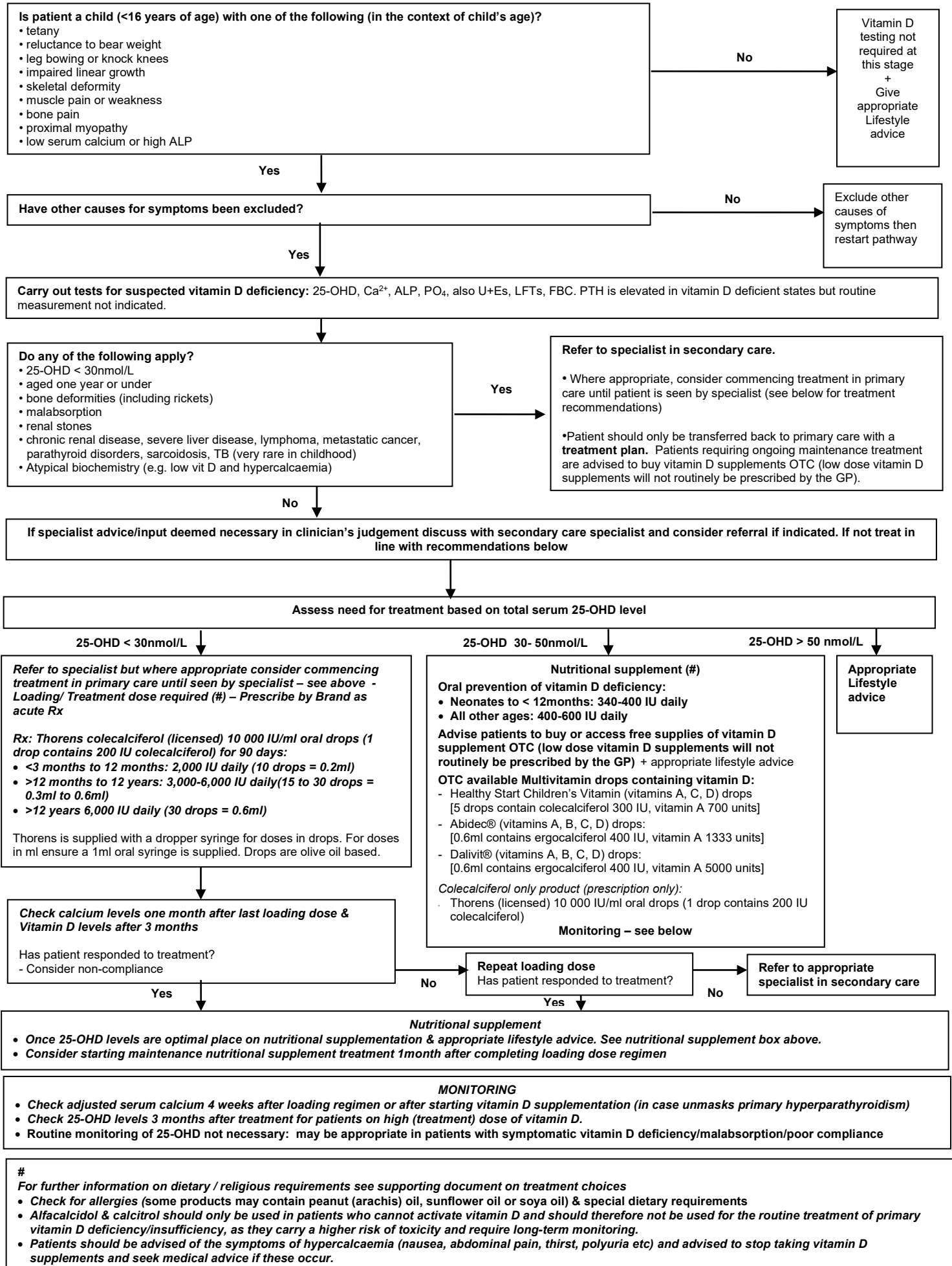
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Investigation and treatment of Vitamin D deficiency / insufficiency in adults Flowchart



Investigation and treatment of Vitamin D deficiency / insufficiency in children Flowchart



Vitamin D levels

- Opinions on the ideal level of vitamin D and optimal serum concentrations vary.
- For the purpose of this guideline the following definitions for vitamin D status measured by total serum 25-hydroxyvitamin D (25-OHD) taken from the National Osteoporosis Society (NOS) guidelines will be used:
 - Vitamin D levels <30 nmol/L probably indicate vitamin D deficiency & treatment is required.
 - Vitamin D levels 30-50 nmol/L probably indicates vitamin D inadequacy in some patients.
 - Vitamin D levels >50 nmol/L probably indicate normal vitamin D status.
- Individual laboratory assays may vary in their definitions of thresholds for deficiency and insufficiency. However, the above definitions are those which have been agreed locally and will be used as intervention thresholds.
- Vitamin D status may be reported separately as 25-hydroxyvitamin D2 and 25-hydroxyvitamin D3. The two values should added together to obtain the total serum 25-hydroxyvitamin D (25-OHD).

All patients, where appropriate, should receive lifestyle advice to help to meet their vitamin D requirements (see Lifestyle Advice section page 4).

Investigation and Treatment of Vitamin D deficiency and insufficiency

For guidance on investigation and treatment of vitamin D deficiency and insufficiency:

- **in adults - refer to the flowchart on page 2**
- **In children - refer to the flowchart on page 3**

Further Considerations

The regimes recommended in the flowchart have taken into account potential costs and availability (also **see product choice document**).

Loading/treatment dose

- There are now various licensed as well as unlicensed products containing just colecalciferol, available in the UK. This is an important determinant for clinicians to note when considering product selection for the treatment of vitamin D deficiency.
- There is a licensed ergocalciferol injection but there are often availability issues with this. However it has recently been suggested that large doses of vitamin D given intermittently are ineffective and may actually increase fracture risk.
- As with all unlicensed specials, all clinical and legal responsibility lies with the prescriber rather than the manufacturer (unless it can be proven that the product was faulty). Informed consent should always be obtained from patients before prescribing in these circumstances.

Maintenance Treatment

All patients, where appropriate, should receive lifestyle advice to help to meet their vitamin D requirements (see Lifestyle Advice section page 4).

- **Patients requiring ongoing oral maintenance treatment should be advised to take over the counter (OTC) vitamin D supplements (a variety of preparations and strengths (including preparations containing 400IU, 800IU, 1000IU, 2000IU & 4000IU) are available to buy OTC) and that low dose vitamin D supplements will not routinely be prescribed by the GP (unless Adcal D3 is indicated (see flowchart page 2 and page 7). Also refer to supplements section page 5.**
- NICE recommends that suitable supplements should be available for people with particular dietary needs for example those who avoid nuts, are vegan, or have a halal or kosher diet. **Refer to treatment choice document for further information**

Pregnancy/breast feeding

- For symptomatic, high risk patients refer to secondary care as per flowchart. Advice regarding treatment of deficiency in pregnant women can be found in the UKMI Medicines Q&A: Dose of oral vitamin D during pregnancy [[LINK](#)]
- **Advice regarding supplementation is available on page 5.**

Lifestyle Advice

Sun Exposure advice

- The body creates most vitamin D from modest exposure to direct UVB sunlight.
- Our bodies make vitamin D when our skin is exposed to summer sunlight (late March/early April to end of September) so during the winter months it can be particularly difficult to get enough.
- During the winter (October to early March), we get vitamin D from our body's stores and from food sources as sunlight doesn't contain enough UVB radiation for skin to be able to make vitamin D.
- The amount of time you need in the sun to make enough vitamin D is different for everyone. Most people will make enough vitamin D if they have a short daily period of sun exposure with their

forearms, hands or lower legs uncovered and without sunscreen during the summer months (late March/early April to October), mostly between 11am and 3pm. Exposing yourself for longer is unlikely to provide any additional benefits.

- People with dark skin, such as those of African, African-Caribbean or south Asian origin, will need to spend longer in the sun to produce the same amount of vitamin D as someone with lighter skin.
- However, patients should be advised:
 - the longer they stay in the sun, especially for prolonged unprotected periods, the greater the risk of burning and skin cancer.
 - to stay covered up & use sunscreen (SPF at least 15) for the majority of time spent outside
 - to always cover up or protect the skin before it starts to turn red or burn.
 - in view of the risk of skin cancer, sun beds are not recommended.
 - you can't make vitamin D if you are sitting indoors by a sunny window because UVB rays can't get through the glass.
- Children aged under six months should be kept out of direct strong sunlight.
- From March to October in the UK, children should:
 - cover up with suitable clothing (including wearing a hat and wearing wrap-around glasses)
 - spend time in the shade (particularly from 11am to 3pm)
 - wear at least sun protection factor (SPF) 15 sunscreen.
- **All patients, where appropriate, should be advised about sun exposure and vitamin D and increasing safe sun exposure.** Sunshine advice for patients: <http://www.nhs.uk/Livewell/Summerhealth/Pages/vitamin-D-sunlight.aspx>
- **All patients, where appropriate, should be advised to improve their dietary intake and consider buying OTC vitamin D supplements.**

Dietary Sources

- Patients should be advised that food can contribute to vitamin D levels, but the average daily intake is just 2–4 micrograms (80 to 160 IU). It is difficult to obtain enough vitamin D from diet alone.
- Vitamin D is found in oily fish (e.g. salmon, mackerel and sardines), eggs and meat.
- In the UK, margarine, infant formula milk, breakfast cereals, soya products, dairy products and powdered milks are often modestly fortified with vitamin D
- Vitamin D content of selected foods:

| Type of Food | Average amount vitamin D per 100 grams |
|-----------------------------|---|
| Oily fish | 200-400 IU (5-10 micrograms) |
| Fortified margarine | 280 IU (7 micrograms) |
| Fortified breakfast cereals | 120-320 IU (3-9 micrograms) |
| Red meat | 40 IU (1 microgram) |
| Egg yolk | Approximately 20 IU per egg yolk (0.5 micrograms) |
| Mushrooms | Small quantities |

- **All patients, where appropriate, should be advised to improve their dietary intake of vitamin D.** Dietary advice for patients : www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-D.aspx

Supplements

- A variety of oral vitamin D supplements (including multivitamin preparations for adults and children) are available to buy OTC at most pharmacies, health food shops and supermarkets (includes preparations containing 400IU, 800IU, 1000IU, 2000IU & 4000IU).
- Strength may be stated in IU (international units) or micrograms - 1000 IU = 25 micrograms.
- From late March/early April to September the majority of the population should get enough vitamin D through sunlight on the skin and a healthy, balanced diet.
- Based on findings from the Scientific Advisory Committee on Nutrition (SACN), Public Health England advises that:
 - Adults and children over five years old (including pregnant and breastfeeding women) should consider taking a daily supplement containing 10 micrograms (400IU) of vitamin D particularly during the winter months (October until the end of March). From late March/early April to September most should be able to get enough vitamin D from sunlight, so they may choose not to take a vitamin D supplement during these months.
 - People who have low or no exposure to the sun e.g. those who are frail or housebound; are in an institution such as a care home; usually wear clothes that cover up most of their skin when outdoors; people who regularly use high-factor sunscreen should take a daily supplement containing 10mcg of vitamin D throughout the year.
 - People from minority ethnic groups with dark skin, such as those of African, African-Caribbean or South Asian origin, might not get enough vitamin D from sunlight and should consider taking a daily supplement containing 10mcg of vitamin D throughout the year.

- Breastfed babies from birth to one year of age should be given a daily supplement containing 8.5 to 10mcg (340-400 IU) of vitamin D.
- Babies fed infant formula should not be given a vitamin D supplement until they are receiving less than 500ml (about a pint) of infant formula a day, because infant formula is fortified with vitamin D
- Children aged 1 to 4 years old should be given a daily supplement containing 10mcg (400 IU) of vitamin D
- NICE Clinical Guideline on Antenatal Care states: all women should be informed about the importance for their own and their baby's health of maintaining adequate vitamin D stores during pregnancy and whilst breastfeeding.
- In order to achieve this, women should be advised to take a vitamin D supplement (10 micrograms of vitamin D per day), as found in the Healthy Start multivitamin supplement. Particular care should be taken to enquire as to whether women at greatest risk are following advice to take this daily supplement.
- Supplements of vitamin D containing vitamin A should not be taken in pregnancy as excessive vitamin A doses are associated with foetal CNS malformations.

Healthy Start vitamins

- Healthy start vitamins are vitamin supplements that contain vitamin D. They are recommended for pregnant women, women up to 1 year after delivery of baby and children under 5 years old (women supplement provides 10 micrograms/day; children vitamin drops provides 7.5 micrograms/day). For further information visit www.healthystart.nhs.uk
- Hertfordshire Children's Centres are now offering Healthy Start vitamins to all women who are pregnant or breastfeeding and all babies aged from 6 months up to 4 years old. Children who are having 500ml or more of formula a day do not need Healthy Start vitamins.
- Hertfordshire's offer is universal and free; parents do not need vouchers to collect vitamins. Please signpost parents to their local children's centre to collect their vitamins: www.hertsdirect.org/childrenscentres
- **All patients, where appropriate, should be advised about meeting their vitamin D requirements through safe sun exposure, diet and be advised to take OTC vitamin D supplements.** General Vitamin D advice for patients: <http://www.nhs.uk/conditions/vitamins-minerals/pages/vitamin-d.aspx>
- **Low dose vitamin D supplements should not routinely be prescribed.**
- **Some supplements may contain peanut (arachis), sunflower oil or soya oil. Allergy to these may lead to severe allergic reactions including anaphylaxis. Patients should be advised to raise allergies & dietary restrictions at the point of purchase to ensure the content of the product is safe and appropriate to take.**

Safety and Other Considerations

- High dose vitamin D may be harmful. Adults and children over 11 years old should not take more than 100mcg (4,000 IU) of vitamin D a day; Children aged 1-10 years should not have more than 50mcg (2,000 IU) a day; Infants under 12 months should not have more than 25mcg (1,000 IU) a day.
- Vitamin D loading doses are contraindicated in patients with hypercalcaemia or metastatic calcification, or where there may be significant interactions with other medications.
- A local specialist has advised that modest hypercalcaemia (< 2.8 mmol/l) with marked vitamin D deficiency and hyperparathyroidism would be managed with a trial of vitamin D treatment under specialist care with monitoring of the calcium, vitamin D and PTH response along with monitoring of renal function.
- Supplements of vitamin D containing vitamin A should not be taken in pregnancy as excessive vitamin A doses are associated with foetal CNS malformations.
- Alfacalcidol & calcitrol should only be used in patients who cannot activate vitamin D and should therefore not be used for the routine treatment of primary vitamin D deficiency/insufficiency, as they carry a higher risk of toxicity and require long-term monitoring.
- There is a small risk of hypercalcaemia developing in the presence of undiagnosed sarcoidosis in patients taking vitamin D.
- Vitamin D treatment can unmask previously undiagnosed primary hyperparathyroidism.
- Some products may contain peanut (arachis) oil, sunflower oil or soya oil. Allergy to these may lead to severe allergic reactions including anaphylaxis. Some patients have other particular dietary requirements (eg vegan, halal or kosher diet) Healthcare professionals should check for allergies and dietary restrictions before prescribing or when recommending supplements. Patients should also be advised to raise allergies and dietary restrictions at the point of dispensing or purchase to ensure the content of the product is safe and appropriate. Current status of the product ingredients should be obtained from the manufacturer as formulations may change. **Refer to product choice document for further information and also UKMI documents on suitable products for**

patients with peanut or soya allergies, halal, kosher vegan & vegetarian status in references section on page 8.

- Do not recommend vitamin D supplements to prevent chronic disease because clear evidence does not currently exist and adverse effects cannot be excluded.
- Note: a local specialist has advised that Vitamin D normalisation with standard dosage is often ineffective in the elderly with secondary hyperparathyroidism and/or those of South Asian origin.

Hertfordshire Guidelines on Management of Osteoporosis

The following recommendations are included in the guideline:

- All patients on treatments for osteoporosis (e.g. bisphosphonates) must also be prescribed calcium 1 – 1.2 gram + colecalciferol 20 micrograms (800 IU) daily unless the clinician is confident the patient has adequate calcium intake and is vitamin D replete.
- Patients, who are frail, increased fall risk and housebound should take calcium 1 – 1.2 gram and colecalciferol 20 micrograms (800IU) daily.
- Note it may not always be clinically appropriate to give calcium and colecalciferol e.g. in primary hyperparathyroidism when calcium supplements must be avoided.

Vitamin D deficiency

- Vitamin D deficiency develops when there is inadequate sunlight exposure or lack of dietary vitamin D and usually takes a long time to develop due to the slow release of the vitamin from body stores.
- Prolonged vitamin D deficiency in infants and children results in rickets.
- In adults, vitamin D deficiency results in osteomalacia, the clinical symptoms of which include skeletal pain and muscle weakness and pathological fractures.
- Evidence suggesting that vitamin D might protect against non-bone health outcomes (e.g. cancer, heart disease, diabetes, multiple sclerosis) is insufficient, conflicting or inconclusive. More randomised trials are needed.
- Current data is insufficient to clarify relationships between intake, biochemical status and chronic illness outcome.

Risk Factors for reduced Vitamin D levels

Groups at high risk of vitamin D deficiency include:

- pregnant and breastfeeding women (including multiple, short interval pregnancies)
- young children (under the age of 5, particularly infants who are exclusively breast fed)
- older people (65 years and over)
- darker-skinned people
- low sun exposure (those who avoid the sun, wear whole-body coverings, live in institutions or are housebound, skin conditions e.g. skin cancer, habitual sunscreen use)
- obese individuals
- malabsorption or other dietary problems
- vegetarian or fish free diet
- severe liver disease
- chronic kidney disease and nephrotic syndrome
- certain medicines e.g. use of anticonvulsants (e.g. carbamazepine, phenobarbital, phenytoin, primidone), rifampicin, cholestyramine, colestipol, glucocorticoids, laxatives, liquid paraffin, sucralfate and highly active antiretroviral treatment

Background Information

- Awareness of Vitamin D deficiency in the UK population has increased substantially in recent years and there have been numerous articles published on the subject. National surveys suggest that about a fifth of adults and 8 – 24% of children may have low vitamin D status.
- There are different opinions regarding the ideal levels of vitamin D and the potential consequences of deficiency and insufficiency. The NOS published a practical clinical guideline in April 2013 to support health professionals with the aim of providing a uniform approach in the management of adult patients with vitamin D deficiency.
- Vitamin D includes ergocalciferol (calciferol, vitamin D2) and colecalciferol (vitamin D3). The BNF states the forms of colecalciferol and ergocalciferol should be considered bioequivalent and interchangeable. It has been reported that colecalciferol raises serum vitamin D concentrations more effectively than ergocalciferol due to high affinities of colecalciferol and its metabolites for liver enzymes, plasma vitamin D binding protein and vitamin D receptors.
- The evidence-base is not completely defined in relation to best management of vitamin D deficiency states and the monitoring required following treatment.
- Population screening of Vitamin D levels is not currently recommended.
- Further guidance is needed on how patients with possible suboptimal vitamin D status should be investigated and managed.

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- Barnet and Chase Farm Hospitals NHS Trust – Management of Vitamin D Deficiency in Adults, November 2010.
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- Pearce SH and Cheetham TD - Diagnosis and management of vitamin D deficiency, BMJ 340:142-147, January 2010
- Royal College of Paediatrics & Child Health – Guide for Vitamin D in Childhood , October 2013
- The Scientific Advisory Committee on Nutrition (SACN) recommendations on vitamin D (July 2016). <https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report>
- UKMi Medicines Q&As (check [LINK](#) for more up to date versions):
 - Dose of vitamin D to treat deficiency [[LINK](#)] (06/05/2015)
 - Vitamin D supplements for vegetarians and vegans [[LINK](#)] (05/03/2015)
 - Calcium and vitamin D supplements for vegetarians and vegans [[LINK](#)] (19/09/2014)
 - Dose of oral vitamin D during pregnancy [[LINK](#)] (12/09/2014)
 - Vitamin D products for patients with peanut or soya allergy [[LINK](#)] (21/06/2013)
 - Information on Kosher and Halal medicines [[LINK](#)] (10/01/2014)
- Vitamin D advice on supplements for at risk groups February 2012 UK CMO CAS Letter Vitamin D
- Public Health England (PHE) updated advice on vitamin D, July 2016.
<https://www.gov.uk/government/news/phe-publishes-new-advice-on-vitamin-d>
- NHS Choices: Vitamins and minerals - Vitamin D <http://www.nhs.uk/conditions/vitamins-minerals/pages/vitamin-d.aspx> ; How to get vitamin D from sunlight
<http://www.nhs.uk/Livewell/Summerhealth/Pages/vitamin-D-sunlight.aspx>