Vitamin D Management in Children

V3.0	Last reviewed: 25/02/2021	Review date: 25/02/2024

Nottinghamshire Area Prescribing Committee

Vitamin D deficiency is common and its management can be an area of confusion owing to lack of high quality evidence for children. The Royal College of Paediatrics and Child Health issued interim practical "consensus" guidance in October 2013 regarding suggested definition, prevention, investigation and management of Vitamin D deficiency. This guideline is based on their recommendations alongside local recommendations regarding specific management options (see separate secondary care guidance). It has been updated in 2016 to reflect the current recommended Vitamin D preparations for each dosing strategy. See also the Guide for Vitamin D in Childhood, October 2013, RCPCH (http://www.rcpch.ac.uk/guide-vitamin-d-childhood) for further information.

Note there is separate guidance regarding vitamin D targets and supplementation for certain patient groups, e.g. cystic fibrosis and chronic renal disease. Please consult the relevant specialist guidelines for these patients.

Routine vitamin D level testing of asymptomatic patients is not recommended, but address lifestyle factors and assess the need for prevention dose supplements. Investigate if symptomatic (see appendix 1 for risk factors and symptoms / signs).

Children with chronic illness including renal/liver disease, malabsorption will require monitoring of vitamin D levels as per their own specialist guidance.

Lifestyle advice for all - see appendix 2
Safe sun and dietary advice

Measure:
· **25OH vitamin D (2ml in yellow top bottles)**
· Bone profile (Ca, PO4, Alk phos)
· PTH (if hypocalcaemic or rickets)
· X-ray wrist/knee if concerns re rickets (see appendix 1)

< 25 nmol/L

Refer to secondary care if the patient has any of the following:
· Symptomatic Vitamin D deficiency i.e. clinical evidence of rickets
· symptomatic of hypocalcaemia or bone disease (same day referral needed)
· Treatment failure due to absorption or compliance issues (this could be via a phone call discussion or advice and guidance request)

There is a paediatric endocrinologist available for advice to healthcare professionals across the East Midlands 24 hours a day; contact via QMC switchboard on 0115 924 9924.

Referral not needed

Prescribe **TREATMENT DOSE** for 7 weeks – see appendix 4
Recheck vitamin D and bone profile to ensure normal at end of treatment course:
· If not normal: check compliance, consider malabsorption or genetic rickets – discuss with Paediatric Endocrinology.
· If normal, continue long term prevention dose (**purchased OTC**) . Prescribe only in exceptional cases if self care not appropriate—see appendix 3. Screen +/- treat other family members

25-50 nmol/L

Is the patient symptomatic?
See appendix 1

NO

YES

> 50 nmol/L

Reinforce safe sun and dietary advice

Prevention / maintenance dose supplements (**purchased OTC**) advised for the following groups of patients:
· breastfed babies from birth to 1 yr.
· formula-fed babies having less than 500ml of infant formula a day.
· children aged 1-4 years old should be given a daily supplement.
· Children who have had treatment for vitamin D deficiency and symptoms – these children need long-term prevention supplements.
· Children in at risk group – see appendix 1.

See appendix 3 for doses.

Supplements to be purchased OTC. Prescribe only in exceptional cases if self-care not appropriate — see appendix 3.

Appendix 1: Risk factors and symptoms / signs of deficiency

Routine vitamin D level testing of asymptomatic patients is not recommended, but address lifestyle factors and assess the need for prevention dose supplements (appendix 2). **Investigate if symptomatic** as per flowchart on page 1.

Children with chronic illness including renal/liver disease, malabsorption will require monitoring of vitamin D levels as per their own specialist guidance.

Table 1: Risk factors for vitamin D deficiency

Inadequate UVB light exposure	Inadequate dietary intake or absorption	Metabolic factors
• Pigmented skin (non-white ethnicity) • Lack of sunlight exposure or atmospheric pollution • Skin concealing garments or routine use of sun protection factor 15 or above • Housebound or indoor living (e.g. care homes) • Seasonal	• Vegetarian (or other fish-free diet) • Prolonged breastfeeding, even if mother has sufficient vitamin D • Exclusion diets e.g. milk allergy • Malabsorption (e.g. coeliac disease, Crohn's disease etc.) • Short bowel • Cholestatic liver disease, jaundice • children and young people with family members with proven vitamin D deficiency	• Drug interactions e.g. rifampicin, anticonvulsants (carbamazepine, oxcarbazepine, phenobarbital, phenytoin, primidone and valproate), isoniazid, cholestyramine, sucralfate, glucocorticoids, highly active antiretroviral treatment (HAART) • Chronic liver disease • Chronic renal disease

Symptoms / signs of vitamin D deficiency

- Hypocalcaemic seizures (usually in infancy)
- Tetany due to low serum calcium
- Cardiomyopathy
- Aches and pains e.g. long-standing (>3 months), unexplained bone pain
- muscular weakness (e.g. difficulty climbing stairs, waddling gait, difficulty rising from a chair or delayed walking)
- Rickets: swollen ankles/wrists, rachitic rosary (swelling of the costochondral junctions), progressive bowing of legs, progressive knock knees, craniotabes (skull softening with frontal bossing and delayed fontanelle closure), delayed tooth eruption and enamel hypoplasia.
- Incidental investigation finding (osteopenia, low serum calcium or phosphate, high Alk Phos)

Appendix 2: Patient information about vitamin D and lifestyle advice

Link to printable local patient information leaflet:
Notts APC website / Patient Info / Vitamin D - Patient information leaflet

Lifestyle advice

Advice for children under 5 years:

The Department of Health recommends that:

- breastfed babies from birth to one year of age should be given a daily vitamin D supplement to make sure they get enough.
- formula-fed babies should not be given a vitamin D supplement until they are having less than 500ml (about a pint) of infant formula a day, as infant formula is fortified with vitamin D
- children aged 1-4 years old should be given a daily supplement containing 400 units (10micrograms) of vitamin D

You can buy vitamin D supplements or vitamin drops containing vitamin D (for under-fives) at most pharmacies and supermarkets.

See appendix 3 for recommended prevention / maintenance doses.

Advice for children and young people over 5 years:

Public Health England suggest that people should consider taking a daily supplement containing 400 units (10 micrograms) of vitamin D during autumn and winter when there is limited sun exposure. All year round supplements should be considered for people, who have very little or no sunshine exposure e.g. housebound, in a residential home, usually wear clothes that cover up most of the skin. Patients should be advised to purchase over the counter.

See appendix 3 for recommended prevention / maintenance doses.

Safe Sun (provides 85-90% of our vitamin D)	Recommended short periods outside around midday in the UK between May-September, exposing minimum of face/hands/forearms WITHOUT sunscreen. The time should be less than the time taken to redden or burn (in Caucasian children approx. 10 minutes but the exact time will depend on skin pigmentation, pollution, age). If children have sun-sensitive conditions or are using medication which may predispose this, exposure should be restricted as per dermatologist advice. Between October and early March we do not get enough vitamin D from sunlight and it is difficult to get the recommended daily intake from diet alone. See NHS website for more information on how to get vitamin D from sunlight.
Diet (only 10-15%)	Vitamin D can be found in a small number of foods including: • Egg yolks • Formula milk • Fortified foods – such as most fat spreads, soy yogurts, soy milk, almond milk, some orange juices and some breakfast cereals • Liver • Mushrooms • Oily fish – such as salmon, sardines, herring and mackerel* • Red meat • Ricotta Cheese **note that tuna (fresh or canned) does not count as oily fish (NHS website)* Dairy products are not routinely fortified so are not sources of vitamin D but are good sources of calcium.

More information for patients is available on the following websites:

- NHS Website – Vitamin D
- National Osteoporosis Society: A balanced diet for bones
- Royal National Orthopaedic Hospital: FAQs about Vitamin D in childhood
- Royal College Obstetrics and Gynaecologists: Healthy eating and vitamin supplements in pregnancy
- BDA food fact sheet on Vitamin D

Appendix 3: Prevention / maintenance supplements

Prevention / maintenance doses:
Newborn up to 1 month: 300 - 400 units daily (equivalent to 7.5 – 10 micrograms)

1 month to 12 years: 400 - 800 units daily (equivalent to 10 – 20 micrograms)
300 units (7.5micrograms) daily if using Healthy Start Vitamin Drops

Patients should buy vitamin D supplements unless they meet one of the specific vitamin D exception criteria in the NHS England guideline: summarised in local vitamin D position statement and full guidance on page 16 of conditions for which over the counter items should not routinely be prescribed in primary care**.**

Note that the need for maintenance or preventative treatment is not an exception for vitamin D self-care. Exceptions to self-care are also listed in the Nottingham & Nottinghamshire CCG vitamin D position statement. Prescriptions for vitamin D should be reserved for the treatment of patients with symptoms of deficiency or confirmed deficient vitamin D levels that require treatment with loading doses. Subsequent maintenance doses should then be purchased over the counter.

Vitamin D supplements and multivitamin preparations (tablets, capsules, and liquids) containing 400 units (10 micrograms) of vitamin D can be purchased from pharmacies. Advise families to check vitamin D strength as this may be relatively low in multivitamin or combined preparations.
Women and children who qualify for the Healthy Start* scheme can get free supplements containing the recommended amounts of vitamin D. The NHS website can provide additional information for patients.

* **Healthy Start vitamins**
Healthy Start vitamins (www.healthystart.nhs.uk) for women and children are free of charge for low income families and are available from Sure Start centres and some other health centres. You can also ask your midwife or health visitor for where they are available locally.
Women qualify for free Healthy Start vitamins from the tenth week of pregnancy or if they have a child under four years old, and if she or her family receives any of the following:

- Income Support
- Income-based Jobseeker's Allowance
- Income-related Employment and Support Allowance
- Child Tax Credit (but only if the family's annual income is £16,190 or less)
- Universal Credit (but only if the family earns £408 or less from employment)
- Working Tax Credit (but only if the family is receiving the 4 week 'run-on*' payment)

**Working Tax Credit run-on is the payment received for a further 4 weeks immediately after ceasing to qualify for Working Tax Credit.*

Women who are under 18 and pregnant also qualify, even if they do not get any of the above benefits or tax credits.
Some Sure Start centres will also sell them to other customers (at minimal charge), but not all have the facility to take money.

There are two different Healthy Start products:

- Healthy Start **children's** vitamin **drops**. The daily dose of five drops contains: 300 units (7.5 micrograms) of vitamin D3 (as well as 233 micrograms of vitamin A and 20 milligrams of vitamin C). Suitable for vegetarians and free from milk, egg, gluten, soya, and peanut residues. 10ml pack will last for 56 days.
- Healthy Start **women's** vitamin **tablets.** The daily dose of one tablet contains: 400 units (10 micrograms) of vitamin D3 per tablet (as well as 70 micrograms of vitamin C and 400 micrograms of folic acid)

For those people in whom Healthy Start vitamins are not suitable, a range of vitamin D3 supplements are available for purchase over the counter.

If preventative / maintenance vitamin D is prescribed (as per NHSE exception criteria):

Oral Vitamin D preparation Prescribe by brand name	**Cost**	**Notes** For info on peanut/soya allergy – see SPS document "Vitamin D: Is there a licensed product suitable for a patient with peanut or soya allergy?"
Multivitamin Drops: Abidec® Dalivit® Children under 1 year, 0.3ml = 200 units (5 micrograms) daily; 1-12 years, 0.6ml = 400 units (10 micrograms) daily	Abidec®: £3.87 for 25ml Dalivit®: £6.50 for 25ml	**GSL**; Children under 1 year, 0.3ml daily; 1-12 years, 0.6ml daily Abidec® and Dalivit® are suitable for a vegetarian or vegan diet.
Colecalciferol 2,740units/ml oral drops sugar free Brand is Fultium® D3 drops 6 drops = 400 units (10 micrograms)	£10.70 for 25 ml of oral solution (1020 Drops /pack) Shelf life once opened is 6 months	**POM** – licensed from birth Does not contain gelatin. Suitable for a vegetarian* diet and are Kosher and Halal.
Colecalciferol 800 unit (20 micrograms) capsules Brands include: Strivit-D3® InVita® D3 Fultium® D3	DT Nov18: £3.60 for 30 capsules Preferred brands: **Strivit-D3®**: £2.34 for 30 caps **InVita® D3**: £2.50 for 28 caps **Fultium® D3**: As per drug tariff price	**POM**. Not recommended for children under 12 years old Fultium® D3 and InVita® D3 contain glycerol and gelatin. The gelatin used in the Fultium® D3 capsule shell is certified to Halal and Kosher standards (see website)
Colecalciferol 800 unit (20 micrograms) tablets Brands include: Desunin® 800 unit colecalciferol tablets (30 tabs)	DT Nov18: £4.59 for 30 tablets Preferred brand: **Desunin®**: As per drug tariff price	**POM**. Not recommended for children under 12 years old Desunin® does not contain gelatin. Colecalciferol is derived from healthy **live** sheep's wool fat – may be acceptable to vegetarians*.

***** There is currently no licensed oral vitamin D preparation available that would be suitable for a vegan diet (but note that Abidec® and Dalivit® *multivitamin* drops are vegan). There are unlicensed products available that may be suitable, please see the Specialist Pharmacist Service document "Which vitamin D preparations are suitable for a vegetarian or vegan diet?" for more information.

Appendix 4: Treatment doses

Treatment Options

There are two types of simple Vitamin D preparations: ergocalciferol (D2) which is plant-derived, and colecalciferol (D3) which is an animal product. In the BNFc they are equivalent in dosing. Costs and availability of Vitamin D preparations change regularly. This guideline will therefore be reviewed regularly and updated to reflect the most cost effective preparations at that time, as necessary.

Oral is the preferred route of treatment. See chart below for prevention and treatment doses.
A dose of 10 micrograms of Vitamin D = 400 units.

Remember: treatment doses should be followed by a maintenance prevention daily dose of vitamin D long-term (certainly until growth completed) – see appendix 3.

Treatment Doses

Prescribe as weekly dosing where possible, as this is the most cost effective preparation:
Invita D3® Oral Solution, 25,000 units/1ml "snap ampoules"

Age	Dose	Course length
Below 6 months	25,000 units (1 ampoule) as a single dose, once a week	7 weeks
6 months – 12 years	50,000 units (2 ampoules) as a single dose, once a week	7 weeks
Over 12 years	75,000 units (3 ampoules) as a single dose, once a week	7 weeks

*These doses are an extrapolation of the dose for ergocalciferol (which is equivalent to colecalciferol), as per the BNF, RCPCH & NOS.
The daily dose has been scaled up to a measurable weekly dose.

If daily dosing is felt to be more appropriate, **use Fultium D3® drops: 2740 units/ml.** The dropper cap on the bottle can be easily removed which allows dose measurement by syringe.

Age	Dose	Course length
Below 6 months	2740 units (1mL) once a day	7 weeks
6 months – 12 years	5480 units (2mL) once a day	7 weeks
Over 12 years	8220 units (3mL) once a day	7 weeks

Please be aware some preparations contain nut oils. Fultium D3® drops and InVita D3® snap ampoules contain coconut oil and palm kernel oil, and olive oil respectively. They are suitable for patients with peanut allergies. They are also suitable for vegetarians, and are Kosher and Halal.

There is currently no licensed oral vitamin D preparation available that would be suitable for a vegan diet. There are unlicensed products available that may be suitable, please see the Specialist Pharmacist Service document "Which vitamin D preparations are suitable for a vegetarian or vegan diet?" for more information.

Tablets or capsule preparations are also available:

- 800 units = 20 micrograms (e.g. Fultium D3®) or 1000 units = 25 micrograms (e.g. Stexerol D3®)
- 20,000 units (e.g. Aviticol®, Fultium D3®, Plenachol®)

Note:

- Activated preparations of Vitamin D such as alfacalcidol or calcitriol are NOT indicated for the treatment of simple vitamin D deficiency.
- Combination preparations of vitamin D/calcium are not required to treat vitamin D deficiency – however it is important to assess that dietary intake of calcium is sufficient and to supplement where insufficient or where there is documented hypocalcaemia (see hypocalcaemia guideline).

Secondary Care Only Alternative Options

a) **High Dose Oral Treatment:** In secondary care, higher single oral doses can be given instead of daily or weekly dosing:
e.g. daily dose x 30 given as one single dose (mainly used in older children, where compliance may be an issue).

b) **Vitamin D Stoss Therapy (secondary care only)**
A High Dose vitamin D therapy given intramuscularly in a single dose (secondary care only).

Advantages:

- Compliance is not an issue
- Faster improvement in biochemical marker (4-7 days), compared with daily dose (2-3 weeks)
- Overcome malabsorption problems

Disadvantages:

- IM injection (needle phobia issues)
- Some concerns regarding risk of intoxication (In the context of confirmed vitamin D deficiency there is no evidence of increased risk of vitamin D intoxication with the single high doses suggested below)

Doses over the age of one month:

1 month up to 6 months:	Ergocalciferol 150 000 units
6 months up to 12 years:	Ergocalciferol 300 000 units
12 years and over:	Ergocalciferol 500 000 units

Maintenance Stoss therapy:
In older children and adolescent patients with poor compliance, a maintenance treatment can be given over winter period to prevent the relapse of vitamin D deficiency

Doses: Two (IM) doses of 100 000 units. First dose at the beginning of autumn (Oct) and second dose 3 months later (Jan).

Monitoring of response
If hypocalcaemia at presentation follow hypocalcaemia guideline (secondary care hypocalcaemia guideline is here). If calcium is normal at presentation, no need to recheck during Vitamin D treatment. Blood test should be repeated at the end of treatment to ensure normalisation of Vitamin D level and other biochemical abnormalities (PTH is a good marker for normal Ca haemostasis).

If definite rickets changes on initial X-rays consider a repeat X-rays to document improvement in radiological features after few months (the skeletal deformities may take years to normalise).

If Vitamin D deficiency or rickets do not resolve at end of treatment:

- Check compliance: consider Stoss therapy.
- Investigate for malabsorption disorder (e.g. Coeliac disease)
- Consider genetic rickets (X-linked Hypophosphataemic rickets):

Discuss with Paediatric Endocrinology Team

Once on maintenance treatment do twice a year blood screen in early autumn (Sept/October) and early spring (March/April).

For further advice on the management of Vitamin D deficiency cases please discuss with Paediatric Endocrinology Team

NUH Contact numbers:
Paediatric endocrine secretary – 0115 924 9924 ext 62336
For in or out of hours advice, contact the on call Paediatric Endocrinology Consultant via QMC switch board 24 hours/day 0115 924 9924

SFH Contact numbers:
Paediatric secretaries – 01623 622515 ext 4399

References and further resources:

Information on available vitamin D preparations:

- BNF for Children available at www.bnf.org
- Drug Tariff available at http://www.drugtariff.nhsbsa.nhs.uk/
- Summaries of Product Characteristics available at www.medicines.org.uk/emc

National Guidance:

- Guide for Vitamin D in Childhood, Royal College of Paediatrics and Child Health, October 2013 available here
- Vitamin D and Bone Health: A practical clinical guideline for management in children and young people, National Osteoporosis Society, June 2015, full guidance available here Summary available here.
- NICE Clinical Knowledge Summary (CKS) Vitamin D deficiency in children, last revised in November 2016. https://cks.nice.org.uk/vitamin-d-deficiency-in-children
- NICE PH56: Vitamin D: supplement use in specific population groups Nov14 (updated Aug17) https://www.nice.org.uk/guidance/ph56
- NICE NG34: Sunlight exposure: risks and benefits Feb16 https://www.nice.org.uk/guidance/ng34
- NHS England: Conditions for which over the counter items should not routinely be prescribed in primary care: Guidance for CCGs. March 2018 https://www.england.nhs.uk/wp-content/uploads/2018/03/otc-guidance-for-ccgs.pdf

Papers:

- J. Dayre McNally et al. Rapid Normalization of Vitamin D Levels: A Meta-Analysis. Pediatrics 2015; 135 (1): e152, available
- Elder C, Bishop N. Rickets. Lancet 2014; 383; 9929; p1665-1676
- Misra et al. Vitamin D insufficiency and deficiency in children and adolescents. Up to Date, accessed January 2015.
- Shah BR, Finberg L. Single-day therapy for nutritional vitamin D-deficiency rickets: a preferred method. J Pediatr. 1994
- Duhamel JF, Zeghoud F, et al. Prevention of vitamin D deficiency in adolescents and pre- adolescents. An interventional multicenter study on the biological effect of repeated doses of 100,000 IU of vitamin D3. Arch Pediatr. 2000 Feb;7(2):148-53.

SPS Medicines Q&As:

- What dose of vitamin D should be prescribed for the treatment of vitamin D deficiency? Feb17 (updated Mar18) https://www.sps.nhs.uk/articles/what-dose-of-vitamin-d-should-be-prescribed-for-the-treatment-of-vitamin-d-deficiency-2/
- Is there a suitable vitamin D product for a patient with a peanut or soya allergy? May16 (updated Jun18) https://www.sps.nhs.uk/articles/is-there-a-suitable-vitamin-d-product-for-a-patient-with-a-peanut-or-soya-allergy/
- Which vitamin D preparations are suitable for a vegetarian or vegan diet? May15 (updated Aug17) https://www.sps.nhs.uk/articles/which-vitamin-d-preparations-are-suitable-for-a-vegetarian-or-vegan-diet/
- Which oral vitamin D dosing regimens correct deficiency in pregnancy? Sep14 (updated Aug16) https://www.sps.nhs.uk/articles/which-oral-vitamin-d-dosing-regimens-correct-deficiency-in-pregnancy/

Version Control- **Vitamin D Management in Adults**			
Version	Author(s)	Date	Changes
3.0	Jill Theobald	Jan 2021	- Updated the link to the local position statement - Updated prices - Appendix 3 - Removed statement about avoiding inadvertent use of unlicensed products - Removed info about peanut/soya allergy and added link to SPS document that covers this instead. - Added standard header & version control.

2.0	Jill Theobald	Dec 2018	
1.0			This document is based on guidance written by NUH authors, specifically Dr Maria Moran SpR Paediatric Endocrinology & Dr Louise Denvir Consultant Paediatric Endocrinologist.