**Children’s pathway for vitamin D deficiency in primary care**

### Does the patient exhibit symptoms or signs strongly suggestive of rickets or other bone disease?**
- **Yes** → Refer to, or discuss with, paediatrician
- **No**

### Does the patient have at least 1 risk factor for vitamin D deficiency and is symptomatic?**
- **Yes** → Measure bone profile and 25-hydroxyvitamin D
- **No** → Vitamin D testing not required at present
  - First exclude other causes for symptoms and manage the primary diagnosis

### Measure bone profile and 25-hydroxyvitamin D**
- **Low calcium and/or markedly raised alkaline phosphatase (i.e.2x upper limit of normal range for age)**
  - **Yes** → Refer to, or discuss with, paediatrician
  - **No**

### 25-hydroxyvitamin D
- **≤30nmol/l**
  - **Yes** → Treat for vitamin D deficiency
    - **1 month - 2 years** – 3000 units daily for 8 wks (Pro D3, 2000 units/ml liquid, 1.5ml daily)
    - **2-11 years** – 6000 units daily for 8 wks (Pro D3, 2000 units/ml liquid, 3ml daily)
    - **12-16 years** – 10000 units daily for 8 wks (Pro D3, 10000 unit capsules, 1 capsule daily)
  - **No**

### 25-hydroxyvitamin D
- **between 30nmol/l - 50nmol/l**
  - **Yes** → Give general advice about vitamin D supplementation
    - (between 200-400 units/day dependent on age and product).
    - *see NHS Choices.
  - **No**

**Treat for vitamin D deficiency**
- **1 month - 2 years** – 3000 units daily for 8 wks (Pro D3, 2000 units/ml liquid, 1.5ml daily)
- **2-11 years** – 6000 units daily for 8 wks (Pro D3, 2000 units/ml liquid, 3ml daily)
- **12-16 years** – 10000 units daily for 8 wks (Pro D3, 10000 unit capsules, 1 capsule daily)
  - (see overleaf for details)

**Give general advice about vitamin D supplementation**
- Healthy Start vitamins are available to eligible families
- Various products are available to buy over the counter and should not be prescribed

This pathway is intended for use by General Practitioners for the treatment of symptomatic children up to the age of 16 years.

Approved at Calderdale CCG Quality Committee May 2014
It is not a screening pathway and Vitamin D testing should not be used as a screening tool. It has been designed in partnership between primary care (Calderdale, North Kirklees, Greater Huddersfield and Wakefield CCGs) and secondary care (Calderdale and Huddersfield NHS Foundation Trust and The Mid Yorkshire Hospitals NHS Trust). It will be reviewed in 2016 or earlier if needed.

Vitamin D deficiency in children
- Healthcare professionals should provide advice regarding obtaining vitamin D from safe sun exposure and diet.
- The Department of Health recommends daily vitamin D supplements in all children between the ages of 6 months to 5 years (unless they are receiving over 500mls of formula milk daily).
  - The vitamin D requirement set for this age group is 280-340 units/day (7 - 8.5 micrograms a day).
  - Breastfed infants may need to receive drops containing vitamin D from one month of age if the mother has not taken vitamin D supplements throughout pregnancy or if the mother is known to be either vitamin D deficient or insufficient.
- Children from families who are eligible for the Government’s Healthy Start scheme should be signposted to their local ‘Children’s Centre’ to receive their supplements.
- Consider investigating possible underlying cause if no risk factors are present or patient fails to respond to treatment.
- Consider monitoring maternal vitamin D status if infant is treated for deficiency.
- During treatment of deficiency consider referral to secondary care at any stage if new symptoms cause concern.

Identification of children at risk of vitamin D deficiency
Any child whom you suspect to be hypocalcaemic secondary to vitamin D deficiency should be urgently referred to secondary care.

Risk factors for vitamin D deficiency include:
- Reduced exposure to sunlight due to routine covering of face and body, housebound or prolonged institutional care and excessive use of high factor sun block.
- Pigmented skin.
- Prolonged breastfeeding without vitamin D supplementation and / or delayed weaning.
- Maternal vitamin D deficiency.
- Chronic disease (renal, hepatic or malabsorption syndromes e.g. coeliac disease, cystic fibrosis).
- Rare genetic causes including vitamin D resistant rickets, and renal tubular acidosis.
- Medication that induces hepatic enzymes e.g. anticonvulsants.
- Obesity (vitamin D is fat soluble and as such obese patients may have increased requirements due to deposition in the adipose tissue).

Symptoms and signs of rickets include:
- bowing of legs (genu varum) or knock knees (genu valgum)*
- anterior bowing of the femur
- painful wrist swelling (distal radius)
- prominent costochondral joints (“rickety rosary”)
- softening of the skull with frontal bossing, and delayed fontanelle closure
- spinal curvature
- bone pain or leg pain
- dental deformities (delayed tooth formation, enamel hypoplasia)

When to test
If a patient presents with any of the symptoms combined with one or more of the risk factors above, or there are other strong reasons to suspect vitamin D deficiency, then a blood sample can be taken in primary care and sent for bone profile and vitamin D (25-hydroxyvitamin D-25-(OH)D).

- Note that patients with a low calcium and/or markedly raised alkaline phosphatase (i.e. 2x upper limit of what is normal for the age) should be referred to or a discussion had with secondary care.

Management of vitamin D deficiency (serum 25(OH)D ≤ 30nmol/l)

- 1 month-2 years – 3000 units daily as an oral dose for 8 weeks
- 2-11 years – 6000 units daily as an oral dose for 8 weeks
- 12-16 years – 10000 units daily as an oral dose for 8 weeks

Consider the need for calcium supplementation. Many children with vitamin D deficiency will have a depleted calcium status and/or a poor calcium intake and may therefore benefit from advice about dietary calcium intake.

Management of vitamin D insufficiency (serum 25(OH)D between 30nmol/l and 50nmol/l)

- Advise supplementation with vitamin D at a dose of 200-400 units/day (dose dependent on age).
- Various products are available to buy over the counter and should not be prescribed.
- This should be continued until the child is 5 years old.

If asymptomatic and compliant with supplements then a re-test of vitamin D levels is not normally required.

Follow-up after treatment for vitamin D deficiency

Unless already referred to an outpatient clinic then follow-up should be in primary care.

Repeat bone profile and 25-hydroxyvitamin D concentration shortly after completion of treatment (i.e. 2-3 months after commencement of treatment) only if patient is still symptomatic

- If serum 25-hydroxyvitamin D concentration is ≥50nmol/L advise to continue with vitamin D supplementation with vitamin D at a dose of 200-400 units/day (dose dependent on age) until fully grown if risk factors for deficiency continue.
- If any abnormality has not resolved despite compliance with adequate vitamin D treatment consider referral.
- If non-compliance is suspected discuss with a paediatrician.

Patients who are diagnosed and subsequently treated for vitamin D deficiency may be reviewed annually for symptoms and compliance with supplements. If asymptomatic at annual review and patient is compliant with vitamin D ± calcium supplements then further re-tests of vitamin D levels are not normally required.

Further Information & Reading:
BNF for children.
NHS Choices: http://www.nhs.uk/Planners/birhtofive/Pages/Vitamins.aspx
Chief Medical Officer; Central Alerting System: https://www.cas.dh.gov.uk/ViewandAcknowledgment/ViewAlert.aspx?AlertID=101726
NICE; The scientific basis of nutrition education: http://www.nice.org.uk/nicemedia/documents/scientificbas_nutreduc.pdf
Available products
Licensed products should be used where available: however in the UK there is currently no licensed Vitamin D preparation suitable for treatment of vitamin D deficiency in children under 12 years.

**High dose Vitamin D preparations for children**

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<tr>
<th>Product</th>
<th>Dosing</th>
<th>Other considerations</th>
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| **Pro D3**: 2000units/ml (colecalciferol 2000unit/ml) | 1 month-2 years: 3000 units (1.5ml) daily for 8 weeks  
2-11 years: 6000 units (3ml) daily for 8 weeks  
12 years and over: 10000 units (5ml) daily for 8 weeks | Gelatin Free  
Halal approved  
Free from peanut and soya related ingredients  
Prescribe as Pro D3, 2000units/ml liquid to avoid unlicensed specials |
| Does not have UK marketing authorisation.  
Marketed as a nutritional supplement. | |

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| **Pro D3**: 10000 units / capsule (colecalciferol 10000units / capsule) | 12 years and over: 10000 units (1 capsule) daily for 8 weeks | Gelatin free  
Halal approved  
Free from peanut and soya related ingredients  
Prescribe as Pro D3, 10000 unit capsules |
| Does not have UK marketing authorisation.  
Marketed as a nutritional supplement. | |

Various formulations of unlicensed ‘specials’ are available from specials manufacturers

**Preparations for Vitamin D supplementation for children**

<table>
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<tr>
<th>Product</th>
<th>Vitamin D content</th>
<th>Dose</th>
<th>Other considerations</th>
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| Healthy Start Drops (10ml). Multivitamin preparation | Colecalciferol 300 units per 5 drops | 300 units / dose (5 drops) daily | See the Healthy Start website  
Does not contain peanut oil or soya |
| Dalivit (25ml or 50ml bottles). Multivitamin preparation  
Licensed product. | Ergocalciferol 400 units per 0.6 mL  
6 weeks- 1 year: 200 units/ 0.3ml dose (7drops) daily  
≥ 1 year: 400 units/ 0.6ml dose (14 drops) daily | Can be added to squash, juice, milk or jam for ease of administration.  
Contains 5000 units/14 drops (0.6ml) of vitamin A - consider vitamin A obtained from the diet, in order to prevent excessive intake.  
Does not contain peanut oil or soya |
| Abidec (25ml) Multivitamin preparation  
Licensed product. | Ergocalciferol 400 units per 0.6 mL, Birth -1 year: 200 units/ 0.3ml dose (7drops)  
≥ 1 year: 400 units/ 0.6ml dose (14 drops) daily | Contains peanut oil.  
Contraindicated in patients with a peanut allergy.  
Also avoid in patients with a soya allergy. |
| Adcal D3 chewable tablets / caplets  
Contains calcium and vitamin D  
Licensed product. | Chewable tablets - Colecalciferol 400 units /tablet (+ 600mg Calcium)  
Caplets – colecalciferol 200units/caplet (+ 300mg Calcium) | Children ≥ 12 years  
Chewable tablets – One daily  
Caplets – Two daily | Contains soya oil in the chewable tablets.  
Refer to SPC for full list of excipients.  
Note the difference strengths between the chewable tablets and the caplets |

Various products are available to buy over the counter