Diagnosis and Management of Vitamin D Deficiency in Adults

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CCG GP Prescribing Leads and Heads of Prescribing

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Patient information links:
Public Health England leaflet (general information on prevention of deficiency)
LMSG leaflet (information on treatment of deficiency)
**Flowchart for Adults with Suspected Vitamin D Deficiency**

Patient's family is likely to have similar risk of Vitamin D deficiency – consider investigation and treatment
(For clarity around strengths and units please see appendix 5)

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**Risk factors or symptoms? (see p3)**

- **No**
  - No investigations required
  - Lifestyle advice (Appendix 1)

- **Yes**
  - **Risk Factors Only (no investigations are required)**
    - Lifestyle advice (Appendix 1 p4)
    - Advise patient to purchase supplement of 400 IU/units (10 micrograms) Vitamin D daily (Appendix 2)
    - All pregnant & breastfeeding women (Appendix 3) and all people aged over 65 should take a daily dose of 400 IU/units (10 micrograms)

  - [Chie Medical Officers advice](#)
    - N.B. Local opinion is that doses of 400 IU/units (10 micrograms) are only enough to prevent severe rickets and osteomalacia, therefore 1000 IU/units (25 micrograms) daily is preferable for those with risk factors especially in patients that are frail, housebound, vegetarian, wear enveloping garments, are obese or have co-morbidities).

- **Risk Factors AND Symptoms / Signs**
  - Lifestyle advice (Appendix 1)
  - Investigations
  - Therapeutic intervention

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**Arrange Investigations**

- Renal function, calcium, phosphate, alkaline phosphatase, 25-OH Vitamin D levels

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**Does the patient meet all the criteria for management in primary care?**

- Normal serum calcium
- Patient is not on active vitamin D (alfacalcidol or calcitriol)

- **Yes**
  - Specialist advice (metabolic bone or endocrine clinic if eGFR<30)

- **No**
  - **Vitamin D levels > 50nmol/L:**
    - Advice as for ‘Risk Factors Only’ (top right hand box)
  
  - **Vitamin D levels 30-50nmol/L (may be inadequate in some people)**
    - Prescribe formulary choice calcium and vitamin D for the following patients (or as advised by medicines optimisation team in primary care):
      - *documented osteoporosis*
      - *malabsorption*
      - *frail elderly*
      - *housebound*
      - *poor mobility*
    - *on oral glucocorticoids/antiepileptics and increased risk of developing Vitamin D deficiency (see p3)*
    - **OTHER PATIENTS** → advise patient to purchase colecalciferol 1000-2000 IU/units (25-50 micrograms) daily.

  - **Vitamin D levels < 30nmol/L (deficiency)**
    - Prescribe colecalciferol 3,000 IU/units daily for 12 weeks or 20,000 IU/units twice weekly for 7 weeks or 50,000 IU/units weekly for 6 weeks.
    - Prescribe by brand in primary care (medicines optimisation team will advise on preferred product)

  - **Vitamin D levels < 15nmol/L (severe deficiency)**
    - Assess patients for osteomalacia, if significant osteomalacic symptoms present then they may need referral to the metabolic bone clinic (Appendix 4). If osteomalacia is not present or not significant then advice is as for vitamin D levels < 30nmol/L.

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**Following treatment of deficiency**

- Check serum calcium one month after treatment course completed in case primary hyperparathyroidism has been unmasked.

- There is no need to repeat vitamin D levels unless symptoms recur or serum calcium is deranged.

- If vitamin D levels are repeated the minimum interval is 6 months to ensure that steady state is reached.

- Advise patient to follow lifestyle advice (Appendix 1).
  - [Public Health leaflet](#)

- **Consider a lifelong maintenance regimen:**
  - Prescribe formulary choice calcium and vitamin D for the following patients (or as advised by medicines optimisation team in primary care):
    - *documented osteoporosis*
    - *malabsorption*
    - *frail elderly*
    - *housebound*
    - *poor mobility*
    - *on oral glucocorticoids/antiepileptics and increased risk of developing Vitamin D deficiency (see p3)*

- **ALL OTHER PATIENTS** → advise patient to purchase colecalciferol 1000-2000 IU/units (25-50 micrograms) daily lifelong (Appendix 2).
**Background information**

**Vitamin D physiology**
Vitamin D₃ (colecalciferol) is normally synthesised in the skin through the action of ultraviolet light (UVB) on cholesterol. In the UK, this can only occur from April to September between the hours 11am-3pm. In order to exert its effects on bone metabolism and calcium absorption Vitamin D is converted in the liver to 25-OH vitamin D which is the major storage form and what is measured in the laboratory. Further hydroxylation occurs in the kidney to form 1, 25-OH Vitamin D. Colecalciferol is also available in the diet, and largely obtained from seafood and its derivatives.

It is unusual to get more than 10% of total requirement from a normal diet. Colecalciferol is the preparation of choice as it is the natural vitamin in humans. However dietary supplements of a plant derived sterol (Vitamin D₂ or ergocalciferol) are also available. Vitamin D₂ has equal potency but a shorter half-life.

Currently >70-80% of patients screened in UHL endocrinology clinics (and >90% of Indo-Asian origin patients) have Vitamin D deficiency or insufficiency.

**Risk factors for Vitamin D deficiency**

<table>
<thead>
<tr>
<th>Inadequate UV light exposure</th>
<th>Poor oral intake</th>
<th>Metabolic risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern latitude</td>
<td>Vegetarian (or fish-free diet)</td>
<td>Reduced synthesis: Elderly (over 65 years)</td>
</tr>
<tr>
<td>Air pollution</td>
<td>Malabsorption, including short bowel and cholestatic jaundice</td>
<td>Increased breakdown</td>
</tr>
<tr>
<td>Occlusive garments</td>
<td>Cholestryramine use</td>
<td>e.g. Drugs (rifampicin, anticonvulsants, HAART therapy, glucocorticoids)</td>
</tr>
<tr>
<td>Pigmented skin</td>
<td>All infants and young children aged 6 months to 5 years, if receiving less than 500 ml infant formula per day</td>
<td>Pregnant or breastfeeding women</td>
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<tr>
<td>Habitual sunscreen use</td>
<td>All breastfed infants from 1 month onwards whose mothers did not take Vitamin D supplements during pregnancy</td>
<td>Reduced stores: Liver disease</td>
</tr>
<tr>
<td>Institutionalised / housebound and people with poor mobility i.e. wheelchair bound</td>
<td></td>
<td>Multiple short interval pregnancies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced hydroxylation: Liver and/or kidney disease</td>
</tr>
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</table>

**Clinical features of Vitamin D deficiency**

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<tr>
<th>Symptom, Sign, Biochemistry</th>
<th>Children</th>
<th>Adult</th>
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<tbody>
<tr>
<td>Seizures</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tetany</td>
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<td>✓</td>
</tr>
<tr>
<td>Hypocalcaemia</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Irritability</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Leg bowing</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Knock knees</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Impaired linear growth</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Delayed walking</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Limb girdle pain</td>
<td>✓</td>
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<tr>
<td>Muscle pain</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Proximal myopathy</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Impaired innate antimycobacterial immunity</td>
<td>✓</td>
<td>✓</td>
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</table>
Appendix 1

Lifestyle Advice

Sunlight
It is impractical to offer a one-size-fits-all recommendation for the amount of sun exposure that people need to make sufficient vitamin D, because this varies according to a number of environmental, physical and personal factors.

The time required to make sufficient vitamin D is typically short and less than the amount of time needed for skin to redden and burn. Regularly going outside for a matter of minutes around the middle of the day without sunscreen should be enough. When it comes to sun exposure, little and often is best, and the more skin that is exposed, the greater the chance of making sufficient vitamin D before burning. However, people should get to know their own skin to understand how long they can spend outside before risking sunburn under different conditions. Persons wearing enveloping garments can be advised to have sunlight exposure of face, arms and legs in the privacy of their garden.

Sun exposure is the main source of vitamin D, but excessive sun exposure is the main cause of skin cancer, including melanoma, the fastest rising type of cancer in the UK. Enjoying the sun safely, while taking care not to burn, can help to provide the benefits of vitamin D without unduly raising the risk of skin cancer.

Diet
Diet is a poor source of Vitamin D compared to sunlight. Vitamin D can be obtained from dietary sources (e.g. salmon, mackerel, tuna, egg yolk), fortified foods (e.g. cow, soya, oat or rice milk), and supplements. There are no plant sources that provide a significant amount of vitamin D naturally. Consider dietary supplementation especially during the winter months.

Available Products & Supplements

- Licensed medicines should be prescribed where available; unlicensed medicines (limited guarantee of quality) or food supplements (no guarantee of quality) may be suitable following a proper consideration of potentially increased risks associated with such products as well as what may be substantial costs.

- Vitamin D supplements can be bought from pharmacies, health food shops and on the internet by patients in dosages ranging from 400 IU/units (10micrograms) to 10,000 IU/units (250micrograms) per tablet / capsule. If the patient pays prescription charges it may actually work out cheaper to buy over the counter than pay a prescription charge, as well as being more convenient.

- Some patients may wish to avoid gelatine and / or peanut oil which is used in some available preparations.

- Colecalciferol (Vitamin D₃) is the preparation of choice as it is the natural vitamin in humans.

- Ergocalciferol injections are not recommended (unless unable to take oral supplements e.g. intramuscular ergocalciferol 300,000 IU/units stat then as per guidance for ‘following treatment of deficiency’).
Appendix 2

Vitamin D products available without prescription

Free of charge for low income families - Healthy Start vitamins (www.healthystart.nhs.uk) for women, containing 400 IU/units colecalciferol per tablet are available from Sure Start Centres. Women qualify for free Healthy Start vitamins from the 10th week of pregnancy or if they have a child under four years old, and if she or her family receives:
- Income Support, or
- Income-based Jobseeker’s Allowance, or
- Income-related Employment and Support Allowance, or
- Child Tax Credit (but not Working Tax Credit unless the family is receiving Working Tax Credit run-on only) and has an annual family income of £16,190 or less.

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 sell them to other customers, but not all have the facility to take money.

Supplements can be purchased from local pharmacies, supermarkets, health food shops or from internet companies.

Appendix 3

Severe features of osteomalacia

Severe osteomalacia is associated with hypocalcaemia, raised alkaline phosphatase and pseudo-fractures or looser’s zones on x-ray (narrow radiolucent lines with sclerotic borders).

Appendix 4

Strengths of colecalciferol preparations quoted in this guidance

<table>
<thead>
<tr>
<th>Strength in units/IU</th>
<th>Equivalent strength in micrograms/µg</th>
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<tbody>
<tr>
<td>400 IU/units</td>
<td>10 micrograms/µg</td>
</tr>
<tr>
<td>1000 IU/units</td>
<td>25 micrograms/µg</td>
</tr>
<tr>
<td>2000 IU/units</td>
<td>50 micrograms/µg</td>
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<tr>
<td>20,000 IU/units</td>
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</tr>
<tr>
<td>25,000 IU/units (oral solution unit dose ampoules available)</td>
<td>625 micrograms/µg</td>
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</table>

References

2. Vitamin D Deficiency and insufficiency, using appropriate available products, October 2012, East and South East England Specialist Pharmacy Services
6. Consensus statement, December 2010. British Association of Dermatologists. Cancer Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the
7. BMJ Best Practice Osteomalacia Updated 20/05/2014

Version Control Log

<table>
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<td>8.2</td>
<td>Updated with NewLMSG Logo and Version control Table</td>
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<td>8.3</td>
<td>Flowchart updated to include “severe deficiency” after &lt;15nmol/L. Maintenance treatment – comment about patients buying OTC and discussing calcium level with community pharmacist. Appendix 5 added to show conversions of iu to micrograms</td>
<td>26/11/2015</td>
<td>DSud</td>
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<td>8.4</td>
<td>Deleted reference to prescribing for insufficiency in adults. Treatment for deficiency changed to 25,000 units twice weekly or 50,000 units weekly for 6 weeks or 3000 units daily for 12 weeks. Appendix 3 (pregnancy &amp; breastfeeding) deleted pending creation of a separate guideline. IU/units and micrograms added to all doses of vitamin D. Calcium and vitamin D treatment choice amended to as per formulary/primary care medicines optimization team recommendation. Guidance added on when to recheck vitamin D levels.</td>
<td>July 2016</td>
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<td>Treatment of deficiency – 25,000 units twice weekly dose amended to 20,000 units twice weekly as more cost-effective</td>
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<td>8.6</td>
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<td>October 2016</td>
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