9. Nutrition and blood

9.1 - Anaemia and some other blood disorders
9.1.1 Iron deficiency anaemias
9.1.1.1 Oral Iron

Prescribing points
- Haemoglobin should rise by 2g/dL over 3-4 weeks. Once it has reached the reference range, treatment should continue for a further 3 months to replenish iron stores.
- Gastrointestinal side effects are common. Although iron is absorbed better on an empty stomach, taking it with food may reduce these side effects.
- Vitamin C in the form of orange juice aids absorption of iron and may also counteract constipation caused by iron preparations.
- Sustained release iron products should not be used as they have no therapeutic advantage and can result in lower absorption of iron.
- Ferrous gluconate tablets may also be used but the treatment dose is 4 to 6 tablets daily.
- Sytron®’s used for treatment of iron deficiency in children

Iron and Folic acid

Prescribing points
- Pregaday® should only be used during pregnancy in women who are at high risk of developing iron and folate deficiency.

9.1.1.2 Parenteral Iron

Prescribing points
- Parenteral iron is reserved for use when oral therapy is unsuccessful due to intolerance or non-compliance, continuing blood loss or malabsorption.
- Parenteral iron products should not be administered in general practice due to the risk of anaphylaxis.
- Ferric carboxymaltose (Ferinject®) is significantly more expensive than Cosmofer® but requires only a 15 minute administration time. A maximum dose of 1000mg of Ferinject® can be administered per day. If the required dose is greater than 1000mg, a second dose at least one week later may be required. Ferinject® is approved for use as an alternative to Cosmofer® in patients where a shorter administration time would be advantageous to the patient or service.

S - Iron dextran (Cosmofer®)
S - Iron sucrose (Venofer®)
S - Ferric carboxymaltose (Ferinject®)

KEY:-
H – Hospital Use Only
S – Specialist Initiation or Recommendation
R – Restricted Use Only

Fife Formulary
September 2008
Last amended May 2014
Safety Advice for Parenteral Iron Preparations

- Prescribers of parenteral iron preparations should be aware of the following advice issued by the MHRA -
  - An IV iron product should not be used in patients with known hypersensitivity to the active substance, the product itself, or any of its excipients; it should also not be used in patients with known serious hypersensitivity to any other parenteral iron product.
  - The risk of hypersensitivity is increased in patients with: known allergies (including drug allergies); immune or inflammatory conditions; or those with a history of severe asthma, eczema, or other atopic allergy. In these patients, IV iron products should only be used if the benefits are clearly judged to outweigh the potential risks.
  - IV iron should not be used during pregnancy unless clearly necessary. Treatment should be confined to the 2nd or 3rd trimesters, if the benefit is clearly judged to outweigh the potential risks for both mother and foetus.
  - Caution is needed with every dose of IV iron that is given, even if previous administrations have been well tolerated.
  - IV iron products should only be administered when staff trained to evaluate and manage anaphylactic or anaphylactoid reactions - as well as resuscitation facilities - are immediately available.
  - Patients should be closely monitored for signs of hypersensitivity during, and for at least 30 minutes after every administration of an IV iron product. In the event of a hypersensitivity reaction, treatment should be stopped immediately and appropriate management initiated.

For further information see MHRA Drug Safety Update, August 13  
www.mhra.gov.uk/home/groups/dsu/documents/publication/con300408.pdf

9.1.2 Drugs used in megaloblastic anaemias

Folic acid

Hydroxocobalamin

Prescribing points

Folic acid in pregnancy

- To prevent first occurrence of neural tube defects, women planning a pregnancy should take folic acid 400micrograms daily before conception and during the first 12 weeks of pregnancy.
- Women, who suspect they are pregnant but have not been taking folic acid, should start at once and continue until the 12th week of pregnancy.
- Women with a previous pregnancy affected by a neural tube defect should take folic acid 5mg daily.
- Women taking antiepileptic drugs may also be advised to take higher doses of folic acid.

Vitamin B_{12} Deficiency

- Intramuscular injections of hydroxycobalamin are used to treat vitamin B_{12} deficiency. The usual dosage regime is 1mg three times a week for 2 weeks then 1mg every 3 months.
9.1.3 Drugs used in hypoplastic, haemolytic and renal anaemias

**S –** Darbepoetin (Aranesp®)

**S –** Epoetin beta (NeoRecormon®)

Prescribing points

- These drugs may be prescribed using a shared care protocol for treatment of anaemia related to renal disease.

**Iron overload**

**H –** Desferrioxamine mesilate

**H –** Deferasirox (Exjade®)

Prescribing points

- Desferrioxamine may be used to manage iron overload associated with haemochromatosis and in treatment of iron poisoning.
- Deferasirox may be used in the management of chronic iron overload in rare acquired or inherited anaemias (thalassaemias) requiring recurrent blood transfusions.

9.1.4 Drugs used in platelet disorders

**H –** Anagrelide (Xagrid®)

**R–** Eltrombopag (Revolade®)

Prescribing points

- Anagrelide is used for reduction of elevated platelet counts in ‘at risk’ patients with essential thrombocythaemia.
- R – Eltrombopag is approved for restricted use by a hospital specialist for adult chronic immune (idiopathic) thrombocytopenic purpura (ITP) splenectomised patients who are refractory to other treatments (e.g. corticosteroids, immunoglobulins). Eltrombopag may be considered as second-line treatment for adult non-splenectomised patients where surgery is contraindicated. Use is restricted to patients with severe symptomatic ITP or a high risk of bleeding.
- R – Eltrombopag is also approved for restricted use by a hospital specialist for the treatment of thrombocytopenia in patients with chronic hepatitis C virus infection. Where the degree of thrombocytopenia is the main factor preventing the initiation or limiting the ability to maintain optimal interferon-based therapy.

9.1.6 Drugs used in neutropenia

**1st Choice**

**H –** Filgrastim (Zarzio®)

**H –** Lenograstim (Granocyte®)

**H –** Pegfilgrastim (Neulasta®)

Prescribing points

- Filgrastim is the first line granulocyte-colony stimulating factor.
- Lenograstim is mainly used prior to harvesting before stem cell transplant.
- Pegfilgrastim is a long-acting product which is given along with cytotoxic chemotherapy in

**KEY:**

- **H –** Hospital Use Only
- **S –** Specialist Initiation or Recommendation
- **R –** Restricted Use Only

Fife Formulary

September 2008

Last amended May 2014
haematology and oncology

9.2 - Fluids and Electrolytes

9.2.1 Oral preparations for fluid and electrolyte imbalance

9.2.1.1 Oral potassium

**Potassium chloride**

**Prescribing points**

- Liquid or effervescent preparations (Sando K® effervescent tablets or Kay-Cee-L® syrup) are the preferred formulations.
- Slow K® should only be used in patients unable to tolerate liquid or effervescent preparations.
- Long term use of potassium supplements is not generally recommended but if clinically indicated then serum potassium levels should be checked regularly.
- Potassium supplements are seldom required with the small doses of diuretics given to treat hypertension.
- Potassium-sparing diuretics are preferable to supplementation for prevention of hypokalaemia due to furosemide and thiazides when these are given to eliminate oedema.
- Potassium supplements may be necessary in patients taking digoxin or anti-arrhythmic drugs, in secondary aldosteronism or excessive potassium loss in the faeces.
- Potassium may also be required in patients on corticosteroids, and in elderly patients with inadequate dietary potassium.
- Potassium supplementation is also used in prevention of refeeding syndrome.

**Potassium removal**

**H - Calcium polystyrene sulfonate (Sorbisterit®)**

**Prescribing points**

- Ion-exchange resins may be administered orally in mild or moderate hyperkalaemia where there are no ECG changes.
- Severe hyperkalaemia requires urgent treatment with IV calcium gluconate, insulin and glucose (see Hyperkalaemia protocol).

9.2.1.2 Oral sodium and water

**H - Sodium chloride**

**Prescribing points**

- In sodium depletion sodium chloride is usually given intravenously.
- Oral supplementation may be indicated in chronic conditions such as salt-losing bowel.

**Oral rehydration salts**

**Dioralyte®**

**Prescribing points**

- Oral rehydration salts are first line treatment for acute diarrhoea.
9.2.1.3 Oral bicarbonate

Prescribing points

- Sodium bicarbonate capsules can be used in sodium depletion and chronic acidotic states such as uraemic acidosis or renal tubular acidosis. It should not be used in respiratory acidosis.

9.2.2 Parenteral preparations for fluid and electrolyte imbalance

9.2.2.1 Electrolytes and water

**Glucose (dextrose)**

**Sodium chloride**

**Water for injection**

Prescribing points

- Glucose 5% and sodium chloride 0.9% are used to replace fluid deficit and maintain fluid and electrolyte balance in patients unable to take oral fluids.
- Lower strengths of sodium chloride, higher strengths of glucose and mixtures of dextrose and sodium chloride are available for specialist use.
- Water for injection is used in preparation of injectable medicines. See BNF section and local guidelines for further details.

**H - Potassium chloride**

**H - Sodium bicarbonate**

Prescribing points

- Intravenous potassium is used in acute or severe potassium depletion.
- It is available as an infusion in glucose or sodium chloride containing 20 or 40 mmol/L.
- Concentrated potassium chloride injection 15% is also available for restricted use in specialist areas. It should be stored in the Controlled Drugs cupboard and is ordered from Pharmacy using a Controlled Drugs order book.
- Intravenous sodium bicarbonate is used in metabolic acidosis and to alkalinise the urine prior to, during and after high dose methotrexate infusions.

9.2.2.2 Plasma and plasma substitutes

**H - Albumin solution**

**H - Gelatin (Gelofusine®)**

Prescribing points

- Plasma and plasma substitutes are often used in very ill patients whose condition is unstable.
- Close monitoring is required and fluid and electrolyte therapy should be adjusted according to the patient’s condition at all times.
Albumin solutions, isotonic (4%) or concentrated (20%) are available from the Blood Bank.

**9.3 – Intravenous nutrition**

**Prescribing points**

- Intravenous or parenteral nutrition (PN) is indicated where adequate feeding via the alimentary track is not possible. Intravenous nutrition is a solution of amino acids, glucose, fat, electrolytes, trace elements and vitamins.
- The nutrition solution is infused through a central venous catheter or alternatively a peripheral vein may be used for short periods.
- A dedicated line must be used for nutrition.
- A request should be made via the Nutrition Team to initiate a patient on PN.
- Before starting intravenous nutrition an assessment of the patient's basic requirements for water, calories, protein and electrolytes is required. The patient's renal function, fluid balance, bone profile, magnesium and glucose should also be determined.
- Nutritional support should be cautiously introduced for those patients at risk of refeeding syndrome.
- The patient should be monitored throughout treatment, daily fluid balance and U&E's, LFT's, bone profile, magnesium and glucose until stable and regular inspection of administration site.

**Current PN regimens used in NHS Fife are as follows:**

- Peripheral PN bag containing 9g Nitrogen
- Central PN bag containing 8g, 11g or 14g Nitrogen
- Central PN bags without electrolytes containing 12g or 16g Nitrogen.

**9.4 - Oral Nutrition (ACBS)**


**Nutritional Supplements for General Prescribing**

**Nutritional Supplements**

<table>
<thead>
<tr>
<th>Ensure® Plus Milkshake</th>
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<tbody>
<tr>
<td>Ensure® Plus Juce</td>
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<tr>
<td>Ensure® Plus Fibre</td>
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</tbody>
</table>

**Prescribing points**

- Prescribing of Oral Nutritional Supplements (ONS) **should not be regarded as first line treatment** of under nutrition & should always follow dietary intervention (Food First advice). See Appendix 9A
- The ONS listed above represent the most cost effective products based on the rebate structure of the current national borderline substances contract. The Ensure® brand should be prescribed even if the NHS list price of alternative brands seems cheaper.

**KEY:-**

<table>
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<tr>
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<tr>
<td>S</td>
<td>Specialist Initiation or Recommendation</td>
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<td>R</td>
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September 2008  
Last amended May 2014
Patients prescribed ONS should meet ACBS criteria
- ONS are of most benefit in patients with a BMI of <20
- The maximum prescription should be 1 bottle twice daily and should not be prescribed for greater than 3 months duration unless under dietetic guidance
- For cost effective prescribing, patients on non-formulary products should be changed to a formulary ONS

**Dysphagia Products**

**S -** Multithick® x 225g tub  
**S -** Fresubin® thickened stage 2 (200ml)

**Prescribing points**
- Patients may experience dysphagia due to a number of conditions, predominately neurological
- Thickened fluids or pre-thickened supplements may be required to improve patient safety when eating & drinking
- Dysphagia products should be prescribed only under dietetic &/ or SALT guidance

**Energy/Protein Dense**

**S -** Ensure® TwoCal 200ml (High energy/protein)  
**S -** Enshake® 96g (Powdered)  
**S -** Procal® Shot 200ml (Low dose)

**Prescribing points**
- The above products may be recommended for patients with additional protein/ calorie requirements or where standard ONS alone are insufficient to meet nutritional needs.
- Energy/protein dense ONS should be prescribed only under dietetic guidance
- Procal® Shot should generally be prescribed in 30-50ml doses.

**Tube Feeds**

**S -** Osmolite®/Osmolite® Plus/Osmolite® 1.5  
**S -** TwoCal Tube Feed  
**S -** Jevity®/Jevity® Plus/ Jevity®1.5/ Jevity® Promote

**Specialist Feeds**

**R -** Perative®  
**R -** E028 Extra liquid x 250ml  
**R -** Modulen® IBD x 400g  
**R -** Nepro® x 500ml/1000ml

**Prescribing points**
- For patients unable to swallow or unable to take sufficient nutrition via the oral route, enteral feeding via a nasogastric, gastrostomy or jejunostomy tube may be required.
- The majority of patients will be set up on a home delivery service via Abbott Hospital to Home (H2H) Service

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<td>R</td>
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</table>

Fife Formulary  
September 2008  
Last amended May 2014
Tube feeds should be prescribed only under strict dietetic guidance.

- **R** – Perative® is restricted to use in patients with malabsorption.
- **R** – E028 Extra liquid and Modulen® IBD are restricted to use in patients with inflammatory bowel disease.
- **R** – Nepro® is restricted to use in patients with renal restrictions.

**On occasions dietitians may request other products based on the clinical need of the patient. The rationale for any such request will be provided by the treating dietitian**

### Gluten sensitive enteropathies

- Gluten–free products can be prescribed for patients with gluten-sensitive enteropathies including steatorrhoea due to gluten sensitivity, coeliac disease and dermatitis herpetiformis
- Prescribe as per patient preference and BNF guidance.
- Guidance on quantities of gluten-free products to supply for various age groups of patients is available at: [www.coeliac.co.uk/healthcare_professionals/168.asp](http://www.coeliac.co.uk/healthcare_professionals/168.asp)

### Specialist Formula Milks

*Also see Appendix 9B – Diagnosis and Management of Infants with Suspected Cow’s Milk Protein Allergy*


<table>
<thead>
<tr>
<th>1st Choice</th>
<th>2nd Choice</th>
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<tbody>
<tr>
<td>Nutamigen® 1</td>
<td><strong>Nutramigen® 2</strong></td>
</tr>
<tr>
<td><strong>Wysoy®</strong></td>
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### 9.5 - Minerals

#### 9.5.1 Calcium and magnesium

#### 9.5.1.1 Calcium supplements

- **Calcium carbonate**
- **Calcium phosphate**
- **Calcium Sandoz®**
- **Sandocal®**

### Prescribing points

- Oral calcium supplements are required only if dietary calcium intake is deficient.
- Calcium carbonate (Calcichew®) is used as a phosphate binder in chronic renal failure.
- Calcium is usually used in combination with vitamin D in prevention and treatment of osteoporosis (see section 9.6.4).
- The administration time for calcium therapy is important: if used as a phosphate binder it should be prescribed 5-10 minutes before meals, but if used as a calcium supplement it should be prescribed away from mealtimes, often at night.

**H** - Calcium chloride injection
H - Calcium gluconate injection

Prescribing points

- Calcium gluconate is used in treatment of hypocalcaemic tetany or acute deficiency states in surgical patients.
- Low plasma calcium often co-exists with low plasma magnesium and this must also be corrected.
- Calcium chloride is used in the preparation of TPN regimens

9.5.1.3 Magnesium supplements

S - Magnesium aspartate (unlicensed)

Prescribing points

- Magnesium is not well absorbed from the gastro-intestinal tract but magnesium aspartate sachets (unlicensed product) may be used by specialists in chronic magnesium deficiency.
- This product can be prescribed in primary care as a 'pay and report' item.

H - Magnesium sulfate injection

- Magnesium sulfate injection is used in treatment of hypomagnesaemia, prevention of recurrent seizures in pre-eclampsia and preparation of TPN regimens.

9.5.2 Phosphorus

9.5.2.1 Phosphate supplements

H - Addiphos®
H - Phosphate Sandoz® effervescent tablets
H - Phosphate infusion
H - Sodium glycerophosphate

Prescribing points

- Oral or parenteral phosphate supplementation may be required in acutely ill patients particularly if nutritionally compromised or at risk of refeeding syndrome.
- Addiphos® and sodium glycerophosphate are used in preparation of TPN regimens

9.5.2.2 Phosphate –binding agents

1st Choice

H - Aluminium hydroxide (Alu-Cap®)
H - Calcium acetate
H - Calcium carbonate

2nd Choice

H - Lanthanum carbonate (Fosrenol®)
H – Sevelamer hydrochloride (Renagel®)

Prescribing points

- Aluminium and calcium salts are used in the management of hyperphosphataemia complicating renal failure.

KEY:-

H – Hospital Use Only
S – Specialist Initiation or Recommendation
R – Restricted Use Only
Lanthanum carbonate and sevelamer are second line agents for use in patients who require a non-aluminium, non-calcium binding agent.

Sevelamer is not recommended by SMC but its use has been approved locally for patients who experience side effects with lanthanum carbonate.

9.5.3 Fluoride

**Sodium Fluoride**

Prescribing points

- Fluoride supplementation is used in patients at increased risk of dental caries or who are medically compromised.
- Several factors should be considered prior to prescribing fluoride treatment - local fluoride level in water supply, concentration of fluoride in the toothpaste that the patient uses and whether the patient uses fluoride rinses.
- Sodium fluoride is available in a range of products - oral drops, mouthwash, tablets, and toothpaste. Tablets or oral drops are used for supplementation.
- Mouthwashes and toothpastes can also be used for additional protection.
- For further details see BNF or Drug Prescribing for Dentistry via: [www.scottishdental.org/cep](http://www.scottishdental.org/cep)

9.5.4 Zinc supplements

**H - Solvazinc® effervescent tablets**

**H - Zinc sulfate injection**

Prescribing points

- Zinc supplements should only be given in proven zinc deficiency and zinc-losing conditions such as burns.
- Zinc sulphate injection or Additrace®, a solution containing zinc and other trace elements, are used in preparation of TPN regimens.

9.5.5 Selenium

**H - Sodium selenium pentahydrate (Selenase®)**

Prescribing points

- Selenium deficiency can occur with prolonged parenteral nutrition.
- Selenium injection is used in preparation of TPN regimens.

9.6 - Vitamins

9.6.1 Vitamin A

- Vitamin A deficiency is rare in the UK. High levels of vitamin A are associated with birth defects so supplements should not be taken during pregnancy.
- Vitamin A is available as a supplement in combination with vitamin D or vitamins C and D and is also included in multivitamin products (see section 9.6.7).
- Healthy Start Children’s Vitamin Drops containing vitamins A, C and D are available free of charge to children under 4 years through the Healthy Start Scheme.
- Healthy Start Vitamin tablets containing vitamins C and D and folic acid also available for women
during pregnancy and until baby is one year old).

9.6.2 Vitamin B group

Also see Addiction Services Guideline A9 – Inpatient Management of Alcohol Withdrawal

Also see Addiction Services Guideline A5 – Detoxification of Alcohol Dependence in the Community

| Pyridoxine | Thiamine |

Prescribing points

- Deficiency of pyridoxine (vitamin B6) is rare but may occur during isoniazid therapy or penicillamine treatment in Wilson’s disease and is characterised by peripheral neuritis.
- Pyridoxine may also be used in idiopathic sideroblastic anaemia and premenstrual syndrome.
- The safety of long term use of pyridoxine in doses above 10mg daily has not been established. Long term use of doses above 200mg has been associated with neuropathy.
- Thiamine is used in alcohol dependence at a dose of 50mg three times daily. See Addiction Services guidelines for further details.
- Vitamin B complex preparations are not generally recommended but may be used in prevention of refeeding syndrome.

H - Pabrinex®

Prescribing points

- Pabrinex® is used in the prevention and treatment of Wernicke’s encephalopathy associated with alcohol dependence.
- Pabrinex® is available as an IM or IV preparation and choice of route will depend on the ward setting.
- The IV preparation is administered as an infusion.
- See Addiction Services Guidelines for further details.

9.6.3 Vitamin C

| Ascorbic acid |

Prescribing points

- Vitamin C (ascorbic acid) is indicated in the prevention and treatment of scurvy. Scurvy is rare but less severe deficiency may be seen, especially in the elderly.
- Ascorbic acid should be given in divided doses due to its low renal threshold.

9.6.4 Vitamin D

Also see Appendix 6A - Guidance on the Diagnosis and Management of Osteoporosis
### Vitamin D Products

<table>
<thead>
<tr>
<th>Product</th>
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<tbody>
<tr>
<td>Alfacalcidol</td>
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<tr>
<td>Adcal D₃®</td>
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<tr>
<td>Colecalciferol (Fultium D₃®, Desunin®)</td>
</tr>
<tr>
<td>Calcitriol</td>
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</tbody>
</table>

#### Prescribing points

- Adcal D₃® is available in several formulations e.g. caplets, chewable tablets, effervescent tablets. Caplets can be swallowed whole and are preferred but the formulation prescribed should be done in agreement with the patient to aid compliance.
- For the appropriate prescribing of colecalciferol products refer to Appendix 9C.
- Calcitriol is reserved for use in patients with severe renal impairment.

### 9.6.5 Vitamin E

<table>
<thead>
<tr>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>H - Alpha tocopheryl acetate</td>
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</tbody>
</table>

#### Prescribing points

- Vitamin E suspension is used in patients with malabsorption due to cystic fibrosis.

### 9.6.6 Vitamin K

<table>
<thead>
<tr>
<th>Product</th>
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</thead>
<tbody>
<tr>
<td>Menadiol sodium phosphate</td>
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<tr>
<td>Phytomenadione</td>
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</table>

#### Prescribing points

- Menadiol sodium phosphate is water-soluble and should be used to prevent vitamin K deficiency in malabsorption syndromes.
- Phytomenadione is used to prevent vitamin K deficiency bleeding in newborn babies and to reverse the anticoagulant effects of warfarin.

### 9.6.7 Multivitamin preparations

<table>
<thead>
<tr>
<th>Product</th>
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<tbody>
<tr>
<td>Abidec®</td>
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<tr>
<td>Dalivit®</td>
</tr>
<tr>
<td>Vitamin Capsules</td>
</tr>
<tr>
<td>H - Renavit® (ACBS)</td>
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</table>

#### Prescribing points

- Multivitamin products are used to prevent vitamin deficiency.
- Abidec® is suitable for infants including neonates while Dalivit® is licensed for use in infants from 6 weeks upwards.
- Vitamin capsules can be used in adults.
- Renavit® is approved by the ACBS as a Food for Special Medical Purposes (FSMP), indicated for the dietary management of water soluble vitamin deficiency in Renal Failure patients receiving dialysis. Patients receive Renavit® from the renal department when attending for haemodialysis.

### Vitamin and mineral supplements and adjuncts to synthetic diets

**KEY:**

- **H** – Hospital Use Only
- **S** – Specialist Initiation or Recommendation
- **R** – Restricted Use Only
9.8 - Metabolic disorders
9.8.1 Drugs used in metabolic disorders

**Wilson's disease**

- **H** - Penicillamine

**Carnitine deficiency**

- **H** - L-carnitine (Carnitor®)

**Homocystinuria treatment**

- **R** - Betaine (Cystadane®)

**Gaucher's disease**

- **H** - Velaglucerase alfa (VPRIV®)
- **H** - Miglustat (Zavesca®)

**Prescribing points**

- Treatments may be available for other metabolic disorders. These medicines, often classified as 'orphan drugs', have a high cost and are funded centrally within Scotland via a risk-sharing scheme. Request to use such agents should be made via the Medical Director, NHS Fife.

- **R** - Betaine is approved for restricted hospital use as adjunctive treatment of homocystinuria involving deficiencies or defects in cystathionine beta-synthase, 5,10-methylene-tetrahydrofolate reductase or cobalamin cofactor metabolism. Restricted to patients who are not responsive to vitamin B₆ treatment.

- Velaglucerase alfa and miglustat are approved for use as long-term enzyme replacement therapy in patients with type 1 Gaucher disease.