cyanocobalamin (sye-an-oh-koe-bal-a-min)
Nascobal, Rubramin PC

Classification
Therapeutic: antianemics, vitamins
Pharmacologic: water-soluble vitamins

Pregnancy Category C

Indications
Vitamin B₁₂ deficiency (parenteral products or nasal spray should be used when deficiency is due to malabsorption). Pernicious anemia (parenteral products should be used for initial therapy; nasal or oral products are not indicated until patients have achieved hematologic remission following parenteral therapy and have no signs of CNS involvement). Part of the Schilling test (vitamin B₁₂ absorption test) (diagnostic).

Action
Necessary coenzyme for metabolic processes, including fat and carbohydrate metabolism and protein synthesis. Required for cell reproduction and hematopoiesis.

Therapeutic Effects:
Corrects manifestations of pernicious anemia (megaloblastic indices, GI lesions, and neurologic damage). Corrects vitamin B₁₂ deficiency.

Pharmacokinetics
Absorption:
Oral absorption in GI tract requires intrinsic factor and calcium; well absorbed after IM, subcut and nasal administration.
Distribution:
Stored in the liver and bone marrow; crosses placenta, enters breast milk.
Metabolism and Excretion:
Primarily excreted unchanged in urine.
Half-life:
6 days (400 days in liver).

TIME/ACTION PROFILE (reticulocytosis)

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<tr>
<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
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<tbody>
<tr>
<td>IM</td>
<td>unknown</td>
<td>3–10 days</td>
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<tr>
<td>SC</td>
<td>unknown</td>
<td>3–10 days</td>
<td>unknown</td>
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<tr>
<td>Nasal</td>
<td>unknown</td>
<td>1–10 days</td>
<td>unknown</td>
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Contraindications/Precautions
Contraindicated in:
- Hypersensitivity
- Pedi: Avoid using preparations containing benzyl alcohol in premature infants (associated with fatal "gasping syndrome.

Use Cautionally in:
- Hereditary optic nerve atrophy (accelerates nerve damage);
- Renal dysfunction (when using aluminum-containing products); Uremia, folic acid deficiency, concurrent infection, myelodysplasia (response to vitamin B₁₂ will be impaired).

Adverse Reactions/Side Effects
CNS: headache.
CV: heart failure.
GI: diarrhea.
Derm: itching, swelling of the body.
F and E: hypokalemia.
Hemat: thrombocytosis.
Resp: pulmonary edema.
Local: pain at IM site.
Misc: hypersensitivity reactions including anaphylaxis.

Interactions
Drug-Drug: Chloramphenicol and antineoplastics may impair hematologic response to vitamin B₁₂. Colchicine, aminosalicylic acid, or excessive intake of alcohol, or vitamin C may impair absorption/effectiveness of vitamin B₁₂.

Route/Dosage
Oral products are usually not recommended due to poor absorption and should be used only if patient refuses the intramuscular, deep subcutaneous, or intranasal routes of administration.

Vitamin B₁₂ Deficiency
PO (Adults and Children): Amount depends on deficiency (up to 1000 mcg/day have been used).
IM, Subcut (Adults): 30 mcg/day for 5–10 days, then 100–200 mcg/month.
IM, Subcut (Children): 0.2 mcg/kg for 2 days, then 1000 mcg/day for 2–7 days, then 100 mcg/week for 1 mo.
Intranasal (Adults): 500 mcg (one spray) in one nostril once weekly.

Pernicious Anemia
IM, Subcut (Adults): 100 mcg/day for 6–7 days. If improvement, give same dose every other day for 7 doses, then every 3–4 days for 2–3 wk; once hematologic values return to normal (transient), can give maintenance dose of 500 mcg/month (doses up to 1000 mcg have been used for maintenance) (caution: alternatively use oral or intramuscular formulations below for maintenance at specified doses).
PO (Adults): For hematologic remission only — 1000–2000 mcg/day.

Dosage Forms
Nascobal: Tablets 500 mcg (Jelmar) (oral); 5000 mcg (Al.Refresh) (nasal); 5000 mcg/60 mL (subcut, IM) (Al.Pedi); 1000 mcg/6 mL (subcut, IM) (Al.Baby); 2000 mcg/6 mL (subcut, IM) (Al.Pediatrics).
**Intranasal (Adults):** For hematologic remission only—500 mcg (one spray) in one nostril once weekly.

**IM, Subcut (Children):** 30–50 mcg/day for 2 or more weeks (to a total dose of 1000–5000 mcg), then give maintenance dose of 100 mcg/month (doses up to 1000 mcg have been used for maintenance).

**Schilling Test**

**IM, Subcut (Adults):** Flushing dose is 1000 mcg.

**NURSING IMPLICATIONS**

**Assessment**

- Assess patient for signs of vitamin B12 deficiency (pallor; neuropathy; psychosis; red, inflamed tongue) before and periodically during therapy.

**Lab Test Considerations:** Monitor plasma folic acid, vitamin B12, and iron levels, hemoglobin, hematocrit, and reticulocyte count before treatment; 1 mo after the start of therapy, and then every 1–6 mos. Evaluate serum potassium levels in patients over 50 mg/day for pernicious anemia for hypokalemia during the first 48 hr of treatment. Serum potassium levels and platelet counts should be monitored routinely during the course of therapy.

**Potential Nursing Diagnoses**

- Imbalanced nutrition: less than body requirements (Indications)
- Activity intolerance (Indications)

**Implementation**

- Usually administered in combination with other vitamins; solitary vitamin B12 deficiencies are rare.
- Administration of vitamin B12 by the oral route is useful only for nutritional deficiencies. Patients with small bowel disease, malabsorption syndrome, or gastric or ileal resections require parenteral administration.
- **IM, Subcut:** Vials should be protected from light.
- IM, Subcut: Use subcutaneous administration technique.
- IV: IV route is not recommended.
- PO: Administer with meals to increase absorption.
- May be mixed with fruit juices. Administer immediately after mixing; ascorbic acid alters stability.

**Patient/Family Teaching**

- **Intranasal:** Dose should not be administered within 1 hr of hot foods or liquids (these substances may result in the formation of nasal secretions which may result in a loss of effectiveness of nasal spray).
- **Schilling Test:** Encourage patient to comply with diet recommendations of health care professional. Explain that the best source of vitamins is in a well-balanced diet with foods from the four basic food groups.
- Foods high in vitamin B12 include meats, seafood, egg yolk, and fermented cheeses; few vitamins are lost with ordinary cooking.
- Patients self-medicating with vitamin supplements should be cautioned not to exceed RDA. Efficacy of megadoses for treatment of various medical conditions is unproved and may cause side effects.
- Inform patients with pernicious anemia of the lifelong need for vitamin B12 replacement.

**Evaluation/Desired Outcomes**

- Resolution of the symptoms of vitamin B12 deficiency.
- Increase in reticulocyte count.
- Improvement in manifestations of pernicious anemia.

**Why was this drug prescribed for your patient?**