NPH insulin (isophane insulin suspension)  
Humulin N, Novolin N, Novolin ge N  

**Classification**  
Therapeutic: antidiabetics, hormones  
Pharmacologic: pancreatics  

**Pregnancy Category:** B  

**Indications**  
Control of hyperglycemia in patients with diabetes mellitus.  

**Action**  
Lowers blood glucose by stimulating glucose uptake in skeletal muscle and fat, inhibiting hepatic glucose production. Other actions of insulin: inhibition of lipolysis and proteolysis, enhanced protein synthesis.  

**Therapeutic Effects:** Control of hyperglycemia in diabetic patients.  

**Pharmacokinetics**  
Absorption: Rapidly absorbed from subcutaneous administration sites. Presence of protamine delays peak effect and prolongs action.  

Distribution: Identical to endogenous insulin.  

Metabolism and Excretion: Metabolized by liver, spleen, kidney, and muscle.  

Half-life: Unknown.  

**TIME/ACTION PROFILE (hypoglycemic effect)**  

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPH subcutaneous</td>
<td>2–4 hr</td>
<td>4–10 hr</td>
<td>10–16 hr</td>
</tr>
<tr>
<td>NPH/Regular</td>
<td>30 min</td>
<td>2–12 hr</td>
<td>24 hr</td>
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**Contraindications/Precautions**  
Contraindicated in: Hypoglycemia, allergy or hypersensitivity to a particular type of insulin, pancreatitis, or other additives.  
Use Cautiously in: Stress or infection (may temporarily increase insulin requirements); Renal/hepatic impairment (may increase insulin requirements); Concomitant use with pioglitazone or rosiglitazone (may increase fluid retention and worsen HF); OB: Pregnancy may temporarily increase insulin requirements.  

**Adverse Reactions/Side Effects**  
**Endo:** Hypoglycemia, pruritus, erythema, swelling.  
**Misc:** Allergic reactions including anaphylaxis.  

**Interactions**  
Drug-Drug: Beta blockers, clonidine, and reserpine may mask some of the signs and symptoms of hypoglycemia. Corticosteroids, thyroid supplements, estrogens, isoniazid, niacin, phenothiazines, and rifampin may increase insulin requirements. Alcohol, ACE inhibitors, MAO inhibitors, thiazide, or oral hypoglycemic agents, and salt substitutes, may increase insulin requirements. Concurrent use with pioglitazone or rosiglitazone may increase risk of fluid retention and worsening HF.  

Drug-Natural Products: Glucosamine may worsen blood glucose control. Fenugreek, chromium, and coenzyme Q-10 may produce additive hypoglycemic effects.  

**Route/Dosage**  
Dose depends on blood glucose, response, and many other factors.  

**Subcut (Adults and Children):**  
0.5–1 unit total insulin/kg/day. Adolescents during rapid growth—0.8–1.2 units total insulin/kg/day.  

**NURSING IMPLICATIONS**  
**Assessment**  
Assess patient periodically for signs and symptoms of hypoglycemia (anxiety; restlessness; tingling in hands, feet, lips, or tongue; chills; cold sweats; confusion; cool, pale skin; difficulty in concentration; drowsiness; nightmares or trouble sleeping; excessive hunger; headache; irritability; nausea; nervousness; tachycardia; tremor; weakness; anxiety; fear; agitation; unusual thirst) and hyperglycemia (confusion, drowsiness; flushed, dry skin; fruity or breath odor, rapid, deep breathing, polyuria, loss of appetite; central nervous system) during therapy.  

Monitor body weight periodically. Changes in weight may necessitate changes in insulin dose.  

**Lab Test Considerations:** Monitor blood glucose every 6 hr during therapy, more frequently in ketoacidosis and times of stress. A1C may be monitored every 3–6 mo to determine effectiveness.  

**Nursing Considerations:**  
Monitor for signs and symptoms of hypoglycemia, which may occur if insulin dose is increased.  

**Patient/Family Teaching**  
- Instruct patient to take medication as directed. Do not discontinue without consulting health care professional.  
- Inform patient that blood glucose should be monitored every 6 hr during therapy and more frequently in ketoacidosis or times of stress.  
- Instruct patient to report hypoglycemia (trembling; headache; sweating; weakness; faintness; dizziness; confusion) to health care professional.  
- Advise patient to notify health care professional of medication regimen before treatment or surgery.  

**Pharmacodynamic/Absorption**  
Unknown.  

**Stability**  
Store at controlled room temperature. Insulin suspension should be protected from light. Do not refrigerate.  

**Interactions**  
Drug-Drug: Beta blockers, clonidine, and reserpine may mask some of the signs and symptoms of hypoglycemia. Corticosteroids, thyroid supplements, estrogens, isoniazid, niacin, phenothiazines, and rifampin may increase insulin requirements. Alcohol, ACE inhibitors, MAO inhibitors, thiazide, or oral hypoglycemic agents, and salt substitutes, may increase insulin requirements. Concurrent use with pioglitazone or rosiglitazone may increase risk of fluid retention and worsening HF.  

Drug-Natural Products: Glucosamine may worsen blood glucose control. Fenugreek, chromium, and coenzyme Q-10 may produce additive hypoglycemic effects.  

**Administer as directed.**  
- Do not use if discoloration or decompression is noted.  
- Do not confuse Humulin N with Novonate (NPH insulin suspension).  
- Consult current drug list for specific precautions.
Severe hypoglycemia is a life-threatening emergency; treatment consists of IV glucose, glucagon, or epinephrine.

Potential Nursing Diagnoses
Noncompliance (Patient/Family Teaching)

Implementation
- High Alert: Medication errors involving insulins have resulted in serious patient harm and death. Clarify all ambiguous orders and do not accept orders using the abbreviation “u” for units, which can be misread as zero or the numeral 4 and has resulted in tenfold overdoses. Insulins are available in different types and strengths. Check type, dose, and expiration date with another licensed nurse. Do not interchange insulins without consulting physician or other health care professional.
- Do not confuse Humulin with Humalog. Do not confuse Novolin with Novo{}
- Use only insulin syringes to draw up dose. The unit markings on the insulin syringes must match the insulin’s units/mL. Special syringes for doses >50 units are available. Prior to withdrawing dose, rotate vial between palms to ensure uniform solution, do not shake.
- When mixing insulins, draw regular insulin or insulin lispro into syringe first to avoid contamination of regular insulin vial.
- NPH insulin should not be used in the management of ketoacidosis.
- Subcut: Administer NPH insulin within 30–60 min before a meal.

Patient/Family Teaching
- Instruct patient on proper technique for administration. Include type of insulin, equipment (syringe, cartridge pens, alcohol swabs), storage, and place to discard syringes. Discuss the importance of not changing brands of insulins or syringes, rotation of injection sites, and compliance with therapeutic regimen. Caution patient that insulin pens should not be shared with others, even if clean needles are used.
- Demonstrate technique for mixing insulins by drawing up regular insulin or insulin lispro first and rolling intermediate-acting insulin vial between palms to mix, rather than shaking (may cause inaccurate dose).
- Explain to patient that this medication controls hyperglycemia but does not cure diabetes. Therapy is long term.
- Instruct patient in proper testing of serum glucose and ketones. These tests should be closely monitored during periods of stress or illness and health care professional notified of significant changes.
- Emphasize the importance of compliance with nutritional guidelines and regular exercise as directed by health care professional.
- Advise patient to notify health care professional of all Rx or OTC medications, vitamins, or herbal products being taken and to consult with health care professional before taking other medications or alcohol.
- Advise patient to notify health care professional of medication regimen prior to treatment or surgery.
- Advise patient to notify health care professional if nausea, vomiting, or fever develops, if unable to eat regular diet, or if blood glucose levels are not controlled.
- Instruct patient on signs and symptoms of hypoglycemia and hyperglycemia and what to do if they occur.
- Advise patient to notify health care professional of pregnancy if planned or suspected or if breast feeding or planning to breast feed.
- Patients with diabetes mellitus should carry a source of sugar (candy, glucose gel) and identification describing their disease and treatment regimen at all times.
- Emphasize the importance of regular follow-up, especially during first few weeks of therapy.

Evaluation/Desired Outcomes
- Control of blood glucose levels in diabetic patients without the appearance of hypoglycemic or hyperglycemic episodes.

Why was this drug prescribed for your patient?