**Caffeine Citrate** (ka-feen si-trate)

**Classification**
- Therapeutic: central nervous system stimulants
- Pharmacologic: respiratory stimulants

**Pregnancy Category C**

**Indications**
Short-term treatment of apnea of prematurity in infants between 28 and 33 wk gestational age.

**Action**
Increases levels of cyclic AMP by inhibiting phosphodiesterase. Acts as a bronchial smooth muscle relaxant. Suggested mechanisms of action include:
- Stimulation of the respiratory center
- Increased minute ventilation
- Decreased threshold to hypercapnea
- Increased response to hypercapnea
- Increased skeletal muscle tone
- Decreased diaphragmatic fatigue
- Increased metabolic rate
- Increased oxygen consumption

**Therapeutic Effects:** Decrease in periods of apnea.

**Pharmacokinetics**

**Absorption:** IV administration results in complete bioavailability; also absorbed after oral administration.

**Distribution:** Rapidly distributes to the brain; CSF levels in neonates are similar to plasma levels.

**Metabolism and Excretion:** Mostly metabolized by the liver (cytochrome P450 1A2) enzymes; 3–8% converted to theophylline.

**Half-life:** Infants—9 mo, Children, and Adults: 5 hr; Neonates—3–4 days.

**TIME/ACTION PROFILE**

<table>
<thead>
<tr>
<th>Route</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>rapid</td>
<td></td>
<td>24 hr</td>
</tr>
<tr>
<td>PO</td>
<td>rapid</td>
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</tbody>
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**Contraindications/Precautions**

**Contraindicated in:** Hypersensitivity.

**Use Cautiously in:**
- History of seizure disorders
- History of cardiovascular disease
- Pedi: Increased risk of toxicity in neonates with impaired hepatic or renal function.
- Use with caution in infants with impaired hepatic or renal function.

**Adverse Reactions/Side Effects**

**CNS:** insomnia, irritability, restlessness, agitated, tremor, rebound hyperactivity.

**CV:** tachycardia, flushing.

**GI:** NECROTIZING ENTEROCOLITIS, feeding intolerance, gastritis, GI bleeding.

**GU:** increased urine output.

**Derm:** dry skin, rash, skin breakdown.

**Endo:** hyperglycemia, hypoglycemia.

**MS:** muscle tremors, twitches.

**Interactions**

**Drug-Drug:** Cimetidine, fluconazole, and ketoconazole inhibit metabolism (dose reduction of caffeine may be necessary). Phenytoin may increase caffeine metabolism (dose reduction of caffeine may be necessary). Theophylline is a significant metabolite of theophylline, concurrent administration is not recommended.

**Route/Dosage**

**IV (Neonates):**
- Loading dose—20 mg/kg caffeine citrate (10 mg/kg caffeine base).

**IV, PO (Neonates):**
- Maintenance dose—starting 24 hr after loading dose 5 mg/kg caffeine citrate (2.5 mg/kg caffeine base) q 24 hr.

**NURSING IMPLICATIONS**

**Assessment**

- Monitor respiratory status frequently throughout therapy.
- Monitor patient for signs of necrotizing enterocolitis (abdominal distension, feeding intolerance, lethargy). May be fatal.
- Evaluate need for fluid restriction during therapy.
- Monitor apnea and respirations during therapy.
- Monitor for signs of toxicity (tachycardia, increased metabolic rate, irritability, tremor, rebound hyperactivity).
- Monitor serum caffeine levels before and periodically during therapy.
- Monitor for signs of hyperglycemia, hypoglycemia.
- Monitor serum glucose levels. May cause hyperglycemia or hypoglycemia.
- Monitor for signs of neurotoxicity. May cause neurotoxicity.
- Monitor for signs of hyperactivity. May cause hyperactivity.

**Implementation**

**PO:** Maintenance doses may be administered orally.

**Dosage Considerations***

- PO: Maintenance doses may be administered orally.

**Patient Education**

- Instruct parents to closely observe child for signs of toxicity.
- Instruct parents to report any signs of toxicity immediately.
- Instruct parents to maintain fluid intake as ordered.

**Nursing Considerations**

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**Potential Nursing Diagnoses**

- Ineffective breathing pattern (indications)
- Pain

**Outcome Evaluation**

- Ineffective breathing pattern (outcome)
- Pain (outcome)

**Consultations/Referrals**

- Nutritionist
- Neurologist
- Pediatrician

**Guidelines for Discontinuation**

- Discontinued.

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IV Administration

- **pH:** 4.7.
- **Intermittent Infusion:** Solution should be clear, without particulate matter.
  
  **Rate:** Initial loading dose should be administered over 30 min. Maintenance doses may be administered over 10 min every 24 hr beginning 24 hr after loading dose. Syringe pump should be used to ensure accurate delivery.

- **Syringe Compatibility:** alprostadil, amikacin, aminophylline, calcium gluconate, cefotaxime, cimetidine, clindamycin, dobutamine, dopamine, enalapril, fenoldopam, heparin, lidocaine, metoclopramide, morphine, nitroglycerin, penicillin G, phenobarbital, phenylephrine, sodium bicarbonate, vancomycin.

- **Syringe Incompatibility:** acyclovir, furosemide, lorazepam, nitroglycerin, oxacillin, pantoprazole.

- **Y-Site Compatibility:** doxapram, levofloxacin.

- **Additive Compatibility:** amino acids, calcium gluconate, D5W, D50W, dopamine, fentanyl.

Patient/Family Teaching

- Instruct parent on correct technique for administration. Measure oral dose accurately with a 1-mL syringe. If apnea events continue, consult health care professional; do not increase dose.

- Advise parent to consult health care professional immediately if signs of necrotizing enterocolitis occur.

Evaluation/Desired Outcomes

- Decrease in apneic episodes in premature infant.

Why was this drug prescribed for your patient?