HYPOMAGNESEMIA

DEFINITION: Total serum Mg$^{2+}$ levels less than the normal range (1.5-2.3 mg/dL).

INCIDENCE IN CRITICAL ILLNESS: 15-60%.

ETIOLOGY:

- **Inadequate intake of magnesium.**
- **Renal losses:** Diuretic use; alcohol abuse; diabetes; acute tubular necrosis; administration of aminoglycoside, amphotericin, cyclosporine, cisplatin, digoxin.
- **Gastrointestinal losses:** Vomiting; diarrhea; nasogastric suction; pancreatitis.
- **Acute intracellular shift of magnesium:** Refeeding; insulin administration; excessive catecholamines, metabolic acidosis.
- **Miscellaneous:** Burns; massive blood transfusion; cardiopulmonary bypass; hepatic transplantation; severe sepsis; large-volume plasma expansion.

CLINICAL MANIFESTATIONS:

- **Cardiovascular:** Atrial fibrillation/flutter; ventricular tachycardia (torsade de pointes).
- **Metabolic:** Frequently identified in conjunction with hypokalemia, hypocalcemia and hypophosphatemia.
- **Neuromuscular:** Seizures; bronchospasm (smooth muscle contraction).

TREATMENT:

- **Caution:** When renal dysfunction is present.
- **Recommendations:** Limited (lack of adequately controlled studies).
- **Intravenous:**
  - Preferred in symptomatic, critically ill patients.
  - MgSO$_4$ (1 gm = 4 mmol); MgCl$_2$ (1 gm = 4.5 mmol).
  - Torsade de pointes: 1-2 gm MgSO$_4$ bolus over 5 minutes.
  - Example of urgent treatment: Consider 2-3 gm MgSO$_4$ bolus followed by infusion of 10 gm MgSO$_4$ over 5 hours.
  - ICU sliding scale repletion regimens.
- **Enteric:**
  - Magnesium oxide (400 mg = 6 mmol); magnesium gluconate (500 mg = 1.2 mmol).
  - Chronic losses: Consider 800-1600 gm magnesium oxide per day.

KEY REFERENCES: