Hypoglycemia in Infants

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1. Definition (2–3 lines)

Hypoglycemia is a plasma glucose concentration low enough to cause symptoms or risk neurological injury.

Practical thresholds

Age	Treat if Plasma Glucose
First 48 hours	<45 mg/dL (2.5 mmol/L) if symptomatic or persistent
>48 hours	<60 mg/dL (3.3 mmol/L)
Any age	Immediate treatment if symptomatic regardless of value

Remember: Symptoms are more important than the absolute glucose value.

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2. Clinical Presentation

History

Ask about:

- Prematurity
- Low birth weight or SGA
- Infant of diabetic mother
- Poor feeding
- Vomiting
- Prolonged fasting
- Sepsis risk factors
- Birth asphyxia
- Family history of metabolic disease
- Consanguinity
- Previous episodes

Symptoms

Early (Adrenergic)

- Jitteriness
- Tremors
- Sweating
- Tachycardia
- Irritability
- Hunger

Neurogenic/Neuroglycopenic

- Poor feeding
- Lethargy
- Hypotonia
- Apnea
- Cyanosis
- Seizures
- Coma

Physical Examination

Assess:

- ABCDE
- Vital signs
- Level of consciousness
- Hydration
- Signs of sepsis
- Hepatomegaly
- Dysmorphic features
- Hyperpigmentation (adrenal insufficiency)
- Midline defects (pituitary disorders)

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3. Diagnostic Approach

Step 1. Confirm hypoglycemia

Bedside glucose → Confirm with laboratory plasma glucose whenever possible.

Do NOT delay treatment while awaiting laboratory confirmation.

Step 2. Determine if infant is symptomatic

Symptoms present?

→ Treat immediately

No symptoms?

→ Feed promptly and repeat glucose.

Step 3. Look for cause

Common transient causes

- Delayed feeding
- Prematurity
- Infant of diabetic mother
- SGA
- Perinatal stress
- Sepsis

Persistent/recurrent causes

- Hyperinsulinism
- Endocrine deficiency
- Inborn errors of metabolism
- Liver disease

Practical Diagnostic Algorithm

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Low glucose detected

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Assess symptoms

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Symptomatic?
      /      \
    Yes      No

IV dextrose    Feed immediately

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Repeat glucose after 15–30 min

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Persistent hypoglycemia?

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Obtain critical sample
Investigate underlying cause
Refer if persistent
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4. Differential Diagnosis

Most common

- Delayed feeding
- Prematurity
- Infant of diabetic mother
- Sepsis

Endocrine

- Congenital hyperinsulinism
- Adrenal insufficiency
- Growth hormone deficiency
- Hypopituitarism

Metabolic

- Glycogen storage disease
- Fatty acid oxidation defects
- Organic acidemias
- Galactosemia

Other

- Severe liver disease
- Cardiac failure
- Hypothermia
- Polycythemia

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5. Investigations

Initial investigations

- Bedside glucose
- Plasma glucose
- Electrolytes
- Blood gas
- Lactate
- CBC
- CRP
- Blood culture (if sepsis suspected)

Critical sample (before glucose if feasible and safe)

Obtain during hypoglycemia:

- Insulin
- C-peptide
- Beta-hydroxybutyrate (ketones)
- Free fatty acids

- Cortisol
- Growth hormone
- Lactate
- Ammonia
- Acylcarnitine profile
- Urine ketones
- Urine organic acids

Do not delay emergency treatment to obtain these samples.

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6. Management Algorithm

Initial Stabilization

ABCDE

- Airway
- Breathing
- Circulation
- Neurologic assessment
- Temperature control

If glucose ≥45 mg/dL and infant is well

- Feed immediately (breast milk or formula)
- Recheck glucose after 30 minutes

If symptomatic OR glucose <25–30 mg/dL (first hours) or <45 mg/dL with symptoms

IV Dextrose

10% Dextrose

Bolus

2 mL/kg IV

(Provides 200 mg/kg glucose)

Follow immediately with continuous infusion.

Continuous infusion

Start:

10% Dextrose

GIR 4–8 mg/kg/min

Adjust according to glucose measurements.

Increase GIR if glucose remains low.

Unable to obtain IV access

Consider

- Buccal glucose gel (for selected neonates ≥35 weeks with mild hypoglycemia)
- IO access in emergencies
- IM glucagon (if hyperinsulinism not suspected and glycogen stores are adequate)

Persistent hypoglycemia

Increase GIR gradually.

If GIR >8–10 mg/kg/min is required:

→ Suspect hyperinsulinism.

Consult pediatric endocrinology.

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7. Drug Summary Table

Drug	Dose	Comments
10% Dextrose bolus	**2 mL/kg IV**	First-line for symptomatic hypoglycemia
10% Dextrose infusion	GIR 4–8 mg/kg/min	Adjust according to glucose
40% Oral glucose gel	0.5 mL/kg buccally (200 mg/kg)	Mild hypoglycemia in selected late preterm/term neonates; follow with feeding
Glucagon	0.03–0.1 mg/kg IM/IV (max 1 mg)	Temporary measure when IV access is delayed; less effective with depleted glycogen stores
Hydrocortisone	Specialist-guided	Suspected adrenal insufficiency
Diazoxide	Specialist only	Persistent hyperinsulinism

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8. Admission Criteria

Admit infants with:

- Symptomatic hypoglycemia
- Seizures
- Need for IV glucose
- Recurrent hypoglycemia
- Suspected endocrine disease
- Suspected metabolic disease
- Sepsis
- Feeding difficulty
- Unknown cause

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9. Referral Criteria

Refer urgently to **pediatric endocrinology/metabolic specialists** if:

- Persistent hypoglycemia beyond 48–72 hours
- Need for GIR >8–10 mg/kg/min
- Recurrent episodes
- Suspected hyperinsulinism
- Endocrine deficiency
- Metabolic disorder
- Unexplained seizures

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10. Follow-up

Before discharge:

- Stable glucose on full oral feeds
- Feeding well
- Parents educated about feeding frequency and warning signs
- Follow-up arranged

Long-term follow-up is required for infants with:

- Persistent hypoglycemia
- Congenital hyperinsulinism
- Metabolic disease
- Neurological injury

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11. Clinical Pearls

- **Treat the infant, not just the glucose value.**
- Confirm low bedside glucose with laboratory testing, but **do not delay treatment** in symptomatic infants.
- Jitteriness is not always benign; always check glucose.
- Recurrent hypoglycemia requiring high glucose infusion rates strongly suggests **hyperinsulinism**.
- Hypoglycemia and sepsis commonly coexist in neonates.
- Persistent hypoglycemia may be the first sign of an endocrine or metabolic disorder.
- Maintain normothermia, as hypothermia increases glucose consumption.

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12. Common Mistakes in Exams and Practice

❌ Waiting for laboratory confirmation before treating a symptomatic infant

❌ Omitting a glucose check in infants with seizures, apnea, cyanosis, or lethargy

❌ Assuming a single normal glucose excludes hypoglycemia

❌ Stopping IV glucose abruptly instead of gradual weaning

❌ Missing sepsis as an underlying cause

❌ Failing to obtain a critical sample in persistent or recurrent hypoglycemia (when feasible)

❌ Discharging infants before demonstrating stable glucose levels on normal feeds

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13. Key Take-home Messages

1. Hypoglycemia is a **medical emergency** because prolonged episodes can cause permanent neurological injury.
2. **Symptoms take priority**—do not delay treatment while awaiting laboratory confirmation.
3. Immediate bedside glucose testing is essential in any infant with poor feeding, lethargy, apnea, jitteriness, or seizures.
4. Initial treatment for symptomatic hypoglycemia is **10% dextrose 2 mL/kg IV**, followed by a continuous infusion adjusted to maintain euglycemia.
5. Oral feeding or buccal glucose gel may be appropriate for selected well-appearing infants with mild hypoglycemia.
6. Recurrent or persistent hypoglycemia should prompt evaluation for **hyperinsulinism, endocrine disorders, or inborn errors of metabolism**.
7. Always consider **sepsis** in ill infants with hypoglycemia.
8. A **critical sample** obtained during hypoglycemia is invaluable for diagnosis but should never delay emergency treatment.
9. Ensure glucose stability on full oral feeds before discharge and educate caregivers on warning signs.
10. Early recognition and prompt treatment are the most effective measures to prevent long-term neurodevelopmental impairment.

High-Yield Examination Box

Situation	Best Next Step
Symptomatic infant with low glucose	Immediate IV 10% dextrose (2 mL/kg bolus), then continuous infusion
Poor feeding + lethargy	Check bedside glucose immediately
Seizure of unknown cause	Check glucose before other investigations
Recurrent hypoglycemia despite adequate feeds	Evaluate for hyperinsulinism or endocrine/metabolic disease
Hypoglycemia with fever or signs of illness	Treat hypoglycemia and investigate for sepsis simultaneously

Key References

- **American Academy of Pediatrics (AAP).** Postnatal Glucose Homeostasis in Late-Preterm and Term Infants (clinical report; reaffirmed guidance).
- **Pediatric Endocrine Society (PES).** Recommendations for Evaluation and Management of Persistent Hypoglycemia in Neonates, Infants, and Children (2015).
- **World Health Organization (WHO).** *Pocket Book of Hospital Care for Children*, 3rd edition (2022).
- **European Society for Paediatric Endocrinology (ESPE).** Guidance on congenital hyperinsulinism and persistent neonatal hypoglycemia.