# QUICK REFERENCE GUIDE TO DIABETES FOR HEALTH CARE PROVIDERS

**A special project of the Michigan Diabetes Outreach Network**

## Chapter 18

# Acute Complications of Diabetes:

## Hypoglycemia and Hyperglycemia

## Hypoglycemia

**Definition:** plasma blood glucose (BG) levels lower than 70 mg/dl with or without the presence of symptoms. The specific BG level at which one develops symptoms is difficult to define and hypoglycemic episodes can vary greatly in severity of symptoms. Hypoglycemia is typically categorized into **mild** or **severe** based on symptoms.

### Signs/Symptoms

Mild: sweating, trembling, difficulty concentrating, lightheadedness, lack of coordination
Severe: inability to self-treat due to mental confusion, lethargy or unconsciousness.

### Causes

Too much diabetes meds/insulin
Too much physical activity
Not eating enough carbohydrate
Drinking too much alcohol
Advancing age and poor nutrition

### Treatment

**Mild hypoglycemia: 15/15 rule**

1. Check blood glucose (BG)
   If BG is 50-69 mg/dl: give 15 grams carbohydrate*
   If BG is < 50 mg/dl: give 30 grams carbohydrate

   *15 grams of carbohydrate = 3 glucose tablets, 8 Lifesavers®, 2 Tbsp raisins, 4 oz non-diet soft drink, 4 oz fruit juice or 8 oz nonfat milk.

Avoid foods high in fat content as they may slow gastric emptying and absorption of carbohydrate, taking longer to raise blood glucose levels.

2. Wait 15 minutes and recheck BG
   Repeat Step 1 if BG < 70 mg/dl
   Seek medical treatment if BG remains < 70 mg/dl after 3 treatments (45 minutes).

3. Instruct that BG levels may fall again if next meal/snack is more than 1 hour away.

**Severe hypoglycemia:**

1. Can the person swallow without risk of aspiration?

   If YES: offer non-diet soft drink or juice or place glucose gel, honey, syrup or jelly into side of mouth

   If NO: Inject glucagon* IM or SQ. Recommended doses are:
   1 mg for older children and adults > 20 kg
   0.5 mg for children <20 kg
   0.25 mg for infants
   OR
   Administer 50% glucose solution intravenously (D50W) per agency protocol.

   * Nausea and vomiting are frequently seen after glucagon injection. Turn person on their side after injection to prevent aspiration.

3. Upon awakening, give some carbohydrate following the glucagon or IV glucose (until nausea subsides) then a small snack or meal.

4. Monitor blood glucose levels closely for the next several hours to insure level does not fall again and to prevent over-treatment, resulting in hyperglycemia.

## Hyperglycemia

### Signs/Symptoms

| | | |
|---|---|---|
| Increased thirst | Increased urination | Weakness |
| Excessive hunger | Headache | Lethargy |
| Blurred vision | Weight loss (related to lack of insulin). | Malaise |

Nausea, vomiting, fruity breath and abdominal pain (related to ketosis).
Difficulty breathing (related to the metabolic acidosis).

### Causes

Not enough diabetes meds/insulin
Not enough physical activity
Eating too much carbohydrate
Stress/illness

### Treatment

Fluids (caffeine free and carbohydrate/calorie free)
Check ketones
Insulin to correct hyperglycemia for some

Prolonged hyperglycemia can lead to diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemic state (HHS), both of which are life threatening. DKA is a complication that results from a lack of insulin and is most frequently seen in those with type 1 diabetes or persons with type 2 diabetes after they become insulin deficient. It is characterized by hyperglycemia, ketosis, acidosis, dehydration and electrolyte imbalance.

HHS is most frequently seen in older adults with type 2 diabetes. It is similar to DKA except that insulin deficiency is not as prevalent. Severe hyperglycemia, absence of significant ketones, profound dehydration and mental status changes are characteristics of HHS.

| Comparison of DKA and HHS Features | | |
|---|---|---|
| **Feature** | **DKA** | **HHS** |
| Age | Under 40 years of age | Over 60 years of age |
| Duration of symptoms | Less than 2 days | More than 5 days |
| Plasma BG level | < 600 mg/dl | > 600 mg/dl |
| Sodium concentration | Normal or low | Normal or high |
| Bicarbonate concentration | Low | Normal |
| Ketone bodies | 4 + | Less than 2+ |
| Arterial pH | Low | Normal |
| Serum osmolality | < 320 mOsm/kg | >320 mOsm/kg |
| Prognosis | 3-10% mortality | 10-20% mortality |
| Priorities of Treatment | 1. Provide insulin<br>2. Correct fluid/electrolyte imbalances | 1. Fluid/electrolyte replacement<br>2. Adequate insulin |

| Treatment Goals for Diabetic Ketoacidosis (DKA) |
|---|
| 1. Provide adequate fluids to rehydrate |
| 2. Provide adequate insulin to restore and maintain normal glucose metabolism. |
| 3. Correct electrolyte deficits and acidosis if needed |
| 4. Prevent complications (hypoglycemia, hyperglycemia, hypokalemia) |
| 5. Provide source of glucose when BG levels reach 250 mg/dl to minimize risk of cerebral edema and reduce ketosis secondary to starvation. |
| 6. Provide client and family education and follow-up |

| Treatment Goals for Hyperosmolar Hyperglycemic State (HHS) |
|---|
| 1. Provide adequate fluids to rehydrate |
| 2. Correct electrolyte deficits |
| 3. Provide adequate insulin to restore and maintain normal glucose metabolism. |
| 4. Prevent complications |
| 5. Treat underlying medical condition(s) which are often primary contributors to dehydration and hyperglycemia. |
| 6. Provide patient and family education and follow-up to prevent reoccurrence. |

## References:


American Diabetes Association (2008). Clinical Practice Recommendations. *Diabetes Care*, Vol 31 (1).

Mensing C et al. The Art and Science of Diabetes Self-Management Education 2006, American Association of Diabetes Educators, Chicago, Illinois.

Franz MJ et al. (2003). A Core Curriculum for Diabetes Educators, 5th Ed., Diabetes Complications. American Association of Diabetes Educators, Chicago.