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Normal Threshold Plasma Glucose Levels for Activation of Counterregulation and Symptoms

- Suppression of Insulin Secretion
- Growth Hormone
- Pancreatic Polypeptide
- Epinephrine
- Glucagon
- Cortisol
- Norepinephrine

Glycemic Threshold (arterial glucose, mg/dL)
Risk Factors for Severe Hypoglycemia

- Low HbA1c
- Factors interfering with counterregulation
- Increases of insulin sensitivity
- Changes in drug metabolism
- Inadequate nutrition
- Other medical conditions (e.g., impaired cognition)

How Often Does Hypoglycemia Occur in Diabetes?

- Daily to about 1/wk: T1DM 64.5%, T2DM 40.2%
- 1/mo to several times/mo: T1DM 23.5%, T2DM 34.9%
- Only a few times/y or very rarely: T1DM 12%, T2DM 24.9%

NSHE, nonsevere hypoglycemic events.
Survey 409 US patients with T1DM (n = 200) and with T2DM (n = 209).
When Does Hypoglycemia Occur With Diabetes?

- Awake and at work: 50%
- Awake but not at work: 30%
- During sleep at night: 20%

1/5 of all nonsevere hypoglycemia occurs nocturnally

NSHE, nonsevere hypoglycemic events.
Survey 409 US patients with T1DM (n = 200) and with T2DM (n = 209).

All Hypoglycemia Negatively Affects Quality of Life in Patients With T2DM

<table>
<thead>
<tr>
<th>Hypoglycemia Severity</th>
<th>Alvarez-Guisasola¹ (N = 1709; 38% with events)</th>
<th>Marrett² (N = 1984; 63% with events)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>-2.68</td>
<td>-0.01</td>
</tr>
<tr>
<td>Moderate</td>
<td>-6.12</td>
<td>-0.06</td>
</tr>
<tr>
<td>Severe</td>
<td>-16.09</td>
<td>-0.13</td>
</tr>
</tbody>
</table>

Hypoglycemia is also associated with lower treatment satisfaction, poorer adherence, and greater resource utilization³

P < .05 vs no reported hypoglycemia.

Severe Hypoglycemia Is Associated With Increased Risk of Mortality and CV Events

**ADVANCE Trial Results**

- Macrovascular events: 3.45 (2.34-5.08); \( P < .001 \)
- Death—any cause: 3.30 (2.34-4.72); \( P < .001 \)
- Death—CV cause: 3.73 (2.34-5.11); \( P < .001 \)
- Death—non-CV cause: 2.86 (1.67-4.90); \( P < .001 \)

**VADT Results**

- Macrovascular events: 1.88 (1.03-3.34); \( P = .04 \)
- Death—any cause: 6.37 (2.57-15.79); \( P = .001 \)
- Death—CV cause: 3.73 (1.34-10.36); \( P = .0117 \)

**Hypoglycemia, by Age**

- Rate per 100,000 Patient-Years
- Year:
  - 1999: 70
  - 2001: 121
  - 2003: 126
  - 2005: 152
  - 2007: 141
  - 2009: 72
  - 2011: ≥85

**References**

   http://webcasts.prous.com/netadmin/webcast_viewer/Preview.aspx?type=0&lid=9473&pv=2&preview=False&lid=0
Hospitalization for Hyperglycemia and Hypoglycemia

Adjusted for Diabetes Prevalence
Hypoglycemia Hospitalizations as % of All-Cause T1DM and T2DM Hospitalizations

- T1DM: 6.4%
- T2DM: 3.4%

Length of Stay

T1DM patients with hypoglycemia stayed longer compared to those with all-cause hospitalizations.

- All-cause Hospitalizations: 4.6 days
- Type 1 Diabetes hospitalizations length of stay: 5.0 days
- Hypoglycemia Hospitalizations in Type 1 Diabetes: 7.2 days
Charges for Hospitalizations with Hypoglycemia in T1DM
(US$ per admission)

National Bill: Total Charges for Hypoglycemia Hospitalizations in T1DM

- Total hospitalizations = 20,839 (95% CI = 19,233 - 22,445)
- Charge per hospitalization = $46,039 (CI = $42,144-$49,934)
- Total charges = $959,406,721

As a comparison, hypoglycemia hospitalizations in T2DM:

- Total hospitalizations = 248,422 (CI = 234,321-262,523)
- Charges per hospitalization = $48,569 (CI = $45,781-$51,357)
- Total charges = $12.07 billion

Average Charge of US All-Cause Hospitalization: $33,232