Hypoglycemia Unawareness in the Geriatric Patient: A Safety Concern

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Objectives:
• Describe the concept of hypoglycemia unawareness
• Articulate and identify physiologic, sensory, and cognitive changes associated with aging that contribute to hypoglycemia unawareness
• Analyze the relationship of hypoglycemia to frailty and dementia
• Formulate implementation strategies to mitigate hypoglycemic episodes in the elderly
Definition of Hypoglycemia

**Unawareness**

Onset of neuroglycopenia before the appearance of autonomic warning symptoms (palpitations, sweating, hunger, anxiety, tremors, etc.)

Impairment or inability of an individual to recognize the presence of hypoglycemia

(Elliott & Heller, 2011)

Definition of Neuroglycopenia

Neuroglycopenia refers to a shortage of glucose in the brain.

(Martin-Timon & Canizao-Gomez, 2015)

The brain uses glucose as an exclusive energy source, using up to 25% of the total glucose in the body.

(Cryer, 2012)

Diabetes Facts:

- 29.1 million people in the US have diabetes (1 of 11 people)
- 1 of 4 do not know they have it
- 86 million people have prediabetes
- 9 of 10 do not know they have it
- 5% of people with diabetes have Type 1; 95% have Type 2
- Annual cost of care of diabetes in 2012: $245 billion

(CDC, 2012)
Classification of Hypoglycemia

- **SEVERE**: an event requiring assistance of another person (glucose levels may not be available)
- **DOCUMENTED HYPOGLYCEMIA**: symptoms are present and confirmed with a glucose of ≤ 70 mg/dL
- **ASYMPTOMATIC HYPOGLYCEMIA**: no symptoms present, but glucose < 70 mg/dL
- **PROBABLE SYMPTOMATIC HYPOGLYCEMIA**: typical symptoms but not confirmed with glucose readings
- **PSEUDOHYPOGLYCEMIA**: typical symptoms with glucose readings > 70 mg/dL

(American Diabetes Association Workgroup on Hypoglycemia, 2013)

Incidence and Prevalence of Hypoglycemia Unawareness

More likely in Type 1 Diabetes, but also occurs in Type 2, particularly those on insulin.

Type 1: 20-40%

Type 2: 10-20%

The literature varies widely in this regard.

(Martin-Timon & Canizo-Gomez, 2015)

Regulation of Glucose Levels

Hypoglycemia generally results from excess insulin or the inability to raise blood glucose through endogenous or exogenous methods.

Regulation is a complex interaction between the liver, kidneys, muscles, pancreas, and neuroendocrine system.
Regulation of Glucose Levels

The liver is responsible for about 80% of endogenous glucose release.

Kidneys are responsible for about 20%.

(Kreider, Padilla, & Pereira, 2017)

Physiology of Hypoglycemia

Glucose approaches ~80-85 mg/dL

Body attempts to restore glucose control

First counter-regulatory measure is halting insulin production

Physiology of Hypoglycemia

Glucose approaches 65-70 mg/dL

Second counter-regulatory measure occurs as alpha cells of pancreas begin to release glucagon.

Body releases epinephrine, cortisol, and growth hormone.
Physiology of Hypoglycemia

All of these mechanisms are dependent upon proper functioning of pancreatic alpha cells, the liver, and the kidneys. Impairment of any of these elements effect glucose control. (Kreider, Padilla, & Pereira, 2016)

In individuals with repeated episodes of hypoglycemia, normal protective mechanisms sometimes will not be triggered at normal thresholds, but at lower numbers before recognizable autonomic symptoms occur (palpitations, sweating, hunger, anxiety, tremors, etc.) resulting in hypoglycemia unawareness. This is referred to as Hypoglycemia-associated Autonomic Failure (HAAF). (Kreider, Padilla, & Pereira, 2016)

Contributing Factors to Hypoglycemia Unawareness

- Long duration of diabetes
- Antecedent hypoglycemia
- Alcohol—inhibits counter regulation through effects on liver; reduces peripheral autonomic responses such as tremor and cognitive function
- Increasing age
- Antecedent exercise
- Sleep
- Polypharmacy (some drugs in particular)
- Multiple comorbidities
- Under nutrition
- Obsession over tight control

(Elliott & Heller, 2011)
Factors Affecting Recognition of Hypoglycemia in Older People

- Symptoms may be nonspecific
- Easily misdiagnosed: stroke, vertigo, or visual disturbance
- Misinterpreted as dementia with related Sx of agitation/behavior changes
- Atypical presentation: confusion or passive delirium
- Little warning or awareness of autonomic symptoms
- Patients with dementia are unable to communicate feelings or Sx


Chronic Consequences Associated with Hypoglycemia in Older People

Aging modifies cognitive, symptomatic, and counter-regulatory responses to hypoglycemia.

- General physical functional decline
- Reduced ability to perform ADLs
- Complete dependence
- Frequent falls
- Increased risk of Frx, (hip, etc.)
- Frequent hospitalizations
- Increased risk of vascular disease
- Impaired cognitive function
- Increased risk of dementia
- Increased fear & anxiety
- Increased social isolation
- Behavioral changes
- Increased panic attacks
- Increased risk of frailty
- Increased risk of disability
- Increased risk of mortality

(Noel-Haiz et al., 2015)
Prevention and Management of Hypoglycemia Unawareness

Some authorities speculate that if hypoglycemia could be prevented that this might lead to recovery of counter-regulatory measures and symptomatic awareness. (Elliott & Heller, 2011)

Prevention and Management of Hypoglycemia Unawareness

• Work with patients individually and use insulin therapy flexibility to match to eating and other activities
• Education regarding insulin self-management (CDE)
• Insulin pumps
• Continuous Glucose Monitoring
• Islet Cell Transplantation

(Elliott & Heller, 2011)

Prevention and Management of Hypoglycemic Unawareness

Because of increased potential of hypoglycemia in older people with limited life expectancy or multiple comorbidities, the ADA recommends a higher A1C goal of <8%. (ADA, 2017)

European Diabetes Working Group for Older People recommends A1C goals of 7.5%-9% for frail elders which includes those with multi-system disease or dementia or those in skilled nursing facilities.

(Sinclair, Paolisso, Castro, Foufelle, Merchaw, Gaidshy, & Manas, 2011)
Questions?

References


