Elderly Patients with Diabetes and Insulin-Related Complications: Overview of the Problem and Efforts at Prevention

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Health Services Advisory Group
“Everyone With Diabetes Counts” Learning and Action Network Webinar
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Disclosure/Disclaimers

- Financial Disclosures: None

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Objectives

- Describe the national epidemiology of insulin-related Adverse Drug Events (ADEs), particularly hypoglycemia among insulin-treated older adults

- Identify recent changes in nationally-recognized diabetes treatment guidelines, to reduce hypoglycemia risk

- Discuss key public health actions for advancing diabetes agent safety identified in the HHS National Action Plan for ADE Prevention
Insulin ADEs: Opportunity for Impact
Diabetes: Early History

- Egypt, 1500 B.C.E.:  
  - “Too great emptying of the urine. Diabetes is one of the hardest diseases to live with.”

- No effective treatment for >3,000 years  
  - Diabetic ketoacidosis universally fatal

- Discovery of Insulin  
  - 1922: Toronto General Hospital  
  - 1923: Nobel Prize

http://livinghistory.med.utoronto.ca/artifact/vials-insulin-produced-connaught-laboratories
Diabetes in the U.S.

- Diabetes Mellitus (DM): Deficiency of insulin (blood glucose-regulating hormone)
  - 5%: Type 1 DM (T1DM, formerly “juvenile-onset”)
  - 95%: Type 2 DM (T2DM, formerly “adult-onset”)

- Public health significance of diabetes
  - Affects 29.1 million persons in the U.S.
    - 9.3% of the US population
    - Almost one-third Undiagnosed (8.1 million people)
  - $176 billion in direct medical costs (2012)
  - $69 billion in indirect costs from lost workdays, disability, and early death
  - Increased prevalence in U.S.

Diabetes in the U.S.

http://www.cdc.gov/diabetes/data/center/slides.html
Diabetes in the U.S.

- Adults with diagnosed diabetes:

http://www.cdc.gov/diabetes/data/center/slides.html
Age-adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

**Obesity (BMI ≥30 kg/m²)**

1994

2000

2013

- No Data
- <14.0%
- 14.0%–17.9%
- 18.0%–21.9%
- 22.0%–25.9%
- ≥26.0%

**Diabetes**

1994

2000

2013

- No Data
- <4.5%
- 4.5%–5.9%
- 6.0%–7.4%
- 7.5%–8.9%
- ≥9.0%

Hyperglycemia in Diabetes: Consequences

- Prolonged hyperglycemia in diabetes: significant morbidity/mortality
  - Microvascular (eye, kidney)
  - Macrovascular (heart, brain)

- Public health impact of diabetes
  - Leading cause of amputations, kidney failure, blindness
  - 7th Leading cause of death in U.S.

Hyperglycemia in Diabetes: Measurement

- **Short-term control: serum blood glucose**
  - Hyperglycemia: >140 mg/dL
  - Hypoglycemia: <70 mg/dL

- **Long-term control: Hemoglobin A₁c (HbA₁c)**
  - Diabetes: HbA₁c ≥6.5%

Diab Care 2013; 36:S11-66.
Managing Hyperglycemia: “Tight” Control

- Clinical Trials: Evidence supported tight control of blood glucose

- Clinical guidelines: Adoption of tight HbA₁c targets
  - ADA (1999): HbA₁c ≤ 7%
  - AACE (2002): HbA₁c ≤ 6.5%

- National healthcare quality measures
  - NCQA (2004): HbA₁c < 7%
  - Healthy People 2020 (2009): HbA₁c < 7%
Managing Hyperglycemia: Insulin Therapy

- **Insulin**
  - Cornerstone of T1DM
  - Increasingly introduced early in T2DM
  - HbA\(_{1c}\) optimization

- **Insulin-treated DM increasingly prevalent**
  - 2000’s: ~50% increase in insulin-treated DM patients
  - 2011: ~One-third of DM patients receiving insulin
  - 2012: Insulin costs: $6 billion

Managing Hyperglycemia: Insulin Therapy

- Insulin types (selected):
  - Rapid: Aspart (NovoLog®), Lispro (Humalog®)
  - Short: Regular (Novolin-R®)
  - Intermediate: NPH (Humulin-N®)
  - Long: Glargine (Lantus®), Detemir (Levemir®)

- Delivery:
  - Vial
  - Pen
  - Pump
Hypoglycemia: Challenges in Insulin Therapy

- Most serious adverse event: low blood glucose (Hypoglycemia) – Potentially fatal

- Preventing hypoglycemia
  - Risk factors for hypoglycemia
  - Principles of intensive glycemic control
    - Drug selection
  - Selectively apply diabetes treatment technologies
  - Individualize glycemic targets
  - Structured education

Hypoglycemic ADEs

- Impact of “tight” blood glucose control increasingly studied
  - Clinical trials:
    - ADVANCE (2008), ACCORD (2008)
    - NICE-SUGAR (2009)

- Findings of increased morbidity/mortality
  - Early trial discontinuation (ACCORD)
  - Increased death (ACCORD, NICE-SUGAR)
Hypoglycemic ADEs

- Impact of “tight” blood glucose control increasingly studied
  - Clinical trials:
    - ADVANCE (2008), ACCORD (2008)
    - NICE-SUGAR (2009)

What about older adults?
Older adults: vulnerable to ADEs

ADEs by Age: Inpatients

- Adults 65 y/o +:
  - Comprise 35% of all inpatient stays, but 53% of inpatient stays complicated by ADEs

ADEs by Age: Outpatients

- Adults 65 y/o +:
  - 2-3x more likely to have ADE requiring doctor office or ED visit
  - 7x more likely to have an ADE requiring hospital admission

Budnitz DS et al. JAMA 2006;296:1858–66.
Hypoglycemic ADEs: Role of Cognitive Impairment

- Older adult Veterans with diabetes
  - Dementia and Cognitive Impairment independently associated with Hypoglycemia
  - Regimen complexity and Hypoglycemia

Hypoglycemic ADEs: National Epidemiology
Hypoglycemic ADEs: Outpatients

- Hospitalizations for **HYPOglycemia** exceeding those for **HYPERglycemia**

Hypoglycemic ADEs: Outpatients

- Hospitalizations for HYPOglycemia exceeding those for HYPERglycemia

Hypoglycemic ADEs: Outpatients

- ADEs responsible for ~100,000 emergent hospitalizations in older Americans, annually*
  - ~ 67% resulting from just four medication classes (anticoagulants, insulin, oral hypoglycemics, antiplatelets)
  - ~ 66% resulting from unintentional overdoses or supratherapeutic effects

*Based on data from 2007-2009 in adults ≥65 years of age.
Hypoglycemic ADEs: Outpatients

- Insulin-related hypoglycemia and errors commonly result in U.S. emergency department (ED) visits for ADEs – ~100,000 ED visits for such ADEs, annually – 60% severe neurologic signs/symptoms – 30% hospitalized
- 1 in 8 insulin-treated patients aged ≥80 visited ED
  - Patients aged ≥80: twice as likely to visit ED; 5x more likely to be hospitalized

Hypoglycemic ADEs: Outpatients

- Precipitating factors documented in 20.8% (CI: 14.8%–26.9%) of ED visits

<table>
<thead>
<tr>
<th>Precipitating Factor</th>
<th>National estimate, % (CI)</th>
<th>Illustrative Case Excerpt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal-related misadventure</td>
<td>45.9 (38.2–53.6)</td>
<td>75-year-old male is an insulin-dependent diabetic, had a syncopal episode at home, found with blood glucose in the 20s by paramedics. EMS gave patient an ampule of D50 [dextrose 50%] intravenously. Per wife, patient has been having low blood glucose and it has been difficult to keep elevated. She feels it is due to chemotherapy, possibly not eating enough. Diagnosis: hypoglycemia.</td>
</tr>
</tbody>
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## Hypoglycemic ADEs: Outpatients

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<tr>
<td>52.3% (CI: 42.5%–62.0%) took rapid-instead of long-acting insulin</td>
<td></td>
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</table>

# Hypoglycemic ADEs: Outpatients

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<td>Unintentionally took wrong dose/ confused units</td>
<td>12.2 (9.2–15.2)</td>
<td>Patient started new insulin regimen, 30-35 units of Lantus, 3-6 units of NovoLog; patient took 35 units of NovoLog accidentally; blood glucose 40. Diagnosis: insulin overdose.</td>
</tr>
</tbody>
</table>
## Hypoglycemic ADEs: Outpatients

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<th>National estimate, % (CI)</th>
<th>Illustrative Case Excerpt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentionally took “additional” dose</td>
<td>6.0 (4.4–7.6)</td>
<td>69-year-old male hypoglycemic—patient’s blood glucose was over 400; took 12 units insulin in addition to his insulin pump; blood glucose dropped to 38; found unresponsive by wife. Diagnosis: insulin shock</td>
</tr>
</tbody>
</table>

## Hypoglycemic ADEs: Outpatients

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<th>Illustrative Case Excerpt</th>
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<tbody>
<tr>
<td>Other misadventure</td>
<td>13.4 (10.4–16.4)</td>
<td>76-year-old male with syncopal episode after mowing lawn for 3 hours; took usual insulin at noon rather than in the morning—passed out. Diagnosis: hypoglycemic reaction.</td>
</tr>
</tbody>
</table>

Hypoglycemic ADEs: Inpatients

- Hypoglycemia among hospital inpatients:
  - 3rd most common ADE in a nationally representative sample of hospitalized Medicare beneficiaries (2008)
  - Contributed to 5 of 12 deaths due to all adverse events (drug and non-drug related)

- Hypoglycemia among skilled nursing facility (SNF) residents
  - Most common ADE in a nationally representative sample of SNF resident Medicare beneficiaries (2011)
Diabetes Treatment Guidelines: Older Adults
Table G-1. Determination of Target HbA1c Level

<table>
<thead>
<tr>
<th>Major Comorbidity (d) or Physiologic Age</th>
<th>Microvascular Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absent or Mild (a)</td>
</tr>
<tr>
<td>Absent</td>
<td>&lt;7%</td>
</tr>
<tr>
<td>&gt;10 years of life expectancy</td>
<td></td>
</tr>
<tr>
<td>Present (e)</td>
<td>&lt;8 %</td>
</tr>
<tr>
<td>5 to 10 years of life expectancy</td>
<td></td>
</tr>
<tr>
<td>Marked (f)</td>
<td>8-9% *</td>
</tr>
<tr>
<td>&lt;5 years of life expectancy</td>
<td></td>
</tr>
</tbody>
</table>

Glycemic targets:
- $\text{HbA}_{1c} \leq 6.5\%$ for patients without concurrent serious illness and at low hypoglycemic risk
- $\text{HbA}_{1c} > 6.5\%$ for patients with concurrent serious illness and at risk for hypoglycemia
### Table 6.2—Summary of glycemic recommendations for nonpregnant adults with diabetes

<table>
<thead>
<tr>
<th>Metric</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C</td>
<td>&lt;7.0%*</td>
</tr>
<tr>
<td>Preprandial capillary plasma glucose</td>
<td>80–130 mg/dL* (4.4–7.2 mmol/L)</td>
</tr>
<tr>
<td>Peak postprandial capillary plasma glucose†</td>
<td>&lt;180 mg/dL* (&lt;10.0 mmol/L)</td>
</tr>
</tbody>
</table>

*More or less stringent glycemic goals may be appropriate for individual patients. Goals should be individualized based on duration of diabetes, age/life expectancy, comorbid conditions, known CVD or advanced microvascular complications, hypoglycemia unawareness, and individual patient considerations.

†Postprandial glucose may be targeted if A1C goals are not met despite reaching preprandial glucose goals. Postprandial glucose measurements should be made 1–2 h after the beginning of the meal, generally peak levels in patients with diabetes.
Approach to the management of hyperglycemia

**PATIENT / DISEASE FEATURES**

Risks potentially associated with hypoglycemia and other drug adverse effects

- **Risk Level:**
  - low
  - high

Disease duration

- **Duration:**
  - newly diagnosed
  - long-standing

Life expectancy

- **Expectancy:**
  - long
  - short

Important comorbidities

- **Severity:**
  - absent
  - few / mild
  - severe

Established vascular complications

- **Severity:**
  - absent
  - few / mild
  - severe

Patient attitude and expected treatment efforts

- **Motivation:**
  - highly motivated, adherent, excellent self-care capacities
  - less motivated, nonadherent, poor self-care capacities

Resources and support system

- **Availability:**
  - readily available
  - limited

**A1C 7%**

**more stringent**

**less stringent**

**Potentially modifiable**

**Usually not modifiable**
### Table 10.1—Framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes

<table>
<thead>
<tr>
<th>Patient characteristics/health status</th>
<th>Rationale</th>
<th>Reasonable A1C goal†</th>
<th>Fasting or preprandial glucose (mg/dL)</th>
<th>Bedtime glucose (mg/dL)</th>
<th>Blood pressure (mmHg)</th>
<th>Lipids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy (few coexisting chronic illnesses, intact cognitive and functional status)</td>
<td>Longer remaining life expectancy</td>
<td>&lt;7.5%</td>
<td>90–130</td>
<td>90–150</td>
<td>&lt;140/90</td>
<td>Statin unless contraindicated or not tolerated</td>
</tr>
<tr>
<td>Complex/intermediate (multiple coexisting chronic illnesses* or 2+ instrumental ADL impairments or mild-to-moderate cognitive impairment)</td>
<td>Intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, fall risk</td>
<td>&lt;8.0%</td>
<td>90–150</td>
<td>100–180</td>
<td>&lt;140/90</td>
<td>Statin unless contraindicated or not tolerated</td>
</tr>
<tr>
<td>Very complex/poor health (long-term care or end-stage chronic illnesses** or moderate-to-severe cognitive impairment or 2+ ADL dependencies)</td>
<td>Limited remaining life expectancy makes benefit uncertain</td>
<td>&lt;8.5%†</td>
<td>100–180</td>
<td>110–200</td>
<td>&lt;150/90</td>
<td>Consider likelihood of benefit with statin (secondary prevention more so than primary)</td>
</tr>
</tbody>
</table>

This represents a consensus framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes. The patient characteristic categories are general concepts. Not every patient will clearly fall into a particular category. Consideration of patient and caregiver preferences is an important aspect of treatment individualization. Additionally, a patient’s health status and preferences may change over time. ADL, activities of daily living.

†A lower A1C goal may be set for an individual if achievable without recurrent or severe hypoglycemia or undue treatment burden.
### Table 1. Glycemic Control for People with Diabetes*

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Goal</th>
<th>Additional action suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whole blood values</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average preprandial glucose (mg/dl)</td>
<td>&lt;100</td>
<td>80-120</td>
<td>&lt;80/&gt;140</td>
</tr>
<tr>
<td>†</td>
<td>&lt;110</td>
<td>100-140</td>
<td>&lt;100/&gt;160</td>
</tr>
<tr>
<td>Average bedtime glucose (mg/dl) †</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plasma values</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average preprandial glucose (mg/dl) †</td>
<td>&lt;110</td>
<td>90-130</td>
<td>&lt;90/&gt;150</td>
</tr>
<tr>
<td>‡</td>
<td>&lt;120</td>
<td>110-150</td>
<td>&lt;110/&gt;180</td>
</tr>
<tr>
<td>Average bedtime glucose (mg/dl) ‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HbA₁c</strong></td>
<td></td>
<td>&lt;6</td>
<td>&lt;7</td>
</tr>
</tbody>
</table>

*The values shown in this table are by necessity generalized to the entire population of individuals with diabetes. Patients with comorbid diseases, the very young and older adults, and others with unusual conditions or circumstances may warrant different treatment goals. These values are for nonpregnant adults. "Additional action suggested" depends on individual patient circumstances. Such actions may include enhanced diabetes self-management education, comanagement with a diabetes team, referral to an endocrinologist, change in pharmacological therapy, initiation of or increase in SMBG, or more frequent contact with the patient. HbA₁c is referenced to a nondiabetic range of 4.06.0% (mean 5.0%, SD 0.5%). † Measurement of capillary blood glucose. ‡ Values calibrated to plasma glucose.
Hypoglycemic ADEs: Prevention Pearls

- Patients treated with a sulfonylurea, a glinide, or insulin should:
  - Be educated about hypoglycemia.
  - Treat SPMG levels ≤ 70 mg/dL to avoid progression to clinical iatrogenic hypoglycemia.
  - Regularly be queried about hypoglycemia, including the glucose level at which symptoms develop.
    - Those developing symptoms at a glucose level <55 mg/dL should be considered at risk.

Hypoglycemic ADEs: Prevention Pearls

When hypoglycemia becomes a problem, the diabetes health-care provider should:
- Consider conventional risk factors for hyperinsulinemia:
  - Dosing excessive, ill-timed, or of wrong type
  - Decreased glucose intake (low-carb meal, during an overnight fast)
  - Decreased glucose production (alcohol ingestion)
  - Increased glucose utilization (during/post-exercise)
  - Increased insulin sensitivity (middle of night, post-weight loss/improved fitness)
  - Decreased insulin clearance (renal or hepatic failure, hypothyroidism)
Hypoglycemic ADEs: Prevention Pearls

- When hypoglycemia becomes a problem, the diabetes health-care provider should:
  - Consider risk factors for compromised defenses against hypoglycemia (impaired glucose counterregulation):
    - Absolute endogenous insulin deficiency
    - Frequency of hypo increases with duration of DM
    - Predicts loss of glucagon response to hypo
    - History of severe hypoglycemia (and possible relationship to recent prior hypo, sleep or exercise)
    - Impaired awareness of hypoglycemia
    - Intensive glycemic therapy (low HbA$_1^c$ target)

When hypoglycemia becomes a problem, the diabetes health-care provider should:

- Avoid SU (and glinides), using insulin analogs when insulin is required, and consider using CSII/CGM in selected pts
- Provide structured education and, if impaired awareness of hypoglycemia, prescribe short-term scrupulous avoidance of hypo
- Seek to achieve the lowest HbA1c level that does not cause severe hypoglycemia and preserves awareness of hypo with an acceptable number of less-than-severe episodes of hypo, provided that benefit from glycemic ctrl can be anticipated.
National Action Plan for Adverse Drug Events

Federal Partners Represented

Office of the Assistant Secretary for Health
Administration for Community Living/
Administration on Aging
Agency for Healthcare Research and Quality
Assistant Secretary for Planning and Evaluation
Bureau of Prisons
Centers for Disease Control and Prevention
Centers for Medicare & Medicaid Services
Department of Defense
Food and Drug Administration
Health Resources and Services Administration
Indian Health Service
National Institutes of Health
Office of Disease Prevention and Health
Promotion Office of the National Coordinator for
Health IT Veterans Health Administration
The Charge

- Form inter-Departmental, public, and public-private partnerships

- Initiate discussions that identify coordinated Federal approaches to ADEs that are:
  - Common
  - Clinically significant (complicate care, resource-consuming)
  - Measurable (local, regional, or national)
  - Preventable

- Incorporate approaches into a National Action Plan for ADE Prevention
What the ADE Action Plan is About

✓ **Identify** medication safety **targets** for Federal efforts

✓ **Catalyze** Federal agency efforts in medication safety

✓ **Catalogue** Federal agency best practices in medication safety (e.g., IHS, VA)

✓ **Coordinate** Federal agency activities in medication safety

✓ **Communicate** among Federal agencies and with public & private stakeholders

IHS  Indian Health Service;  VA  Veterans Administration
What the ADE Action Plan is Not About

- Creating clinical guidelines

- Preventing all ADEs
  - Acknowledgment: subset of patients for whom harms (hypoglycemia) cannot be prevented

- “Penalizing” clinicians
  - Instead: helping to facilitate path for optimal diabetes management
Past Success: HAI Action Plan

National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination

Health Care-Associated Infections (HAIs)

Health care-associated infections, or HAIs, are infections that people acquire while they are receiving treatment for another condition in a health care setting. HAIs can be acquired anywhere health care is delivered, including inpatient acute care hospitals, outpatient settings such as ambulatory surgical centers and end-stage renal disease facilities, and long-term care facilities such as nursing homes and rehabilitation centers. HAIs may be caused by any infectious agent, including bacteria, fungi, and viruses, as well as other less common types of pathogens.

http://www.health.gov/hai/prevent_hai.asp
Using Data for Action: Reductions in HAIs

~20% reduction in SSIs from 2008 to 2012

~44% reduction in CLABSIs from 2008 to 2012

http://www.cdc.gov/hai/progress-report/index.html; HAIs Healthcare-associated infections; CLABSIs Central line-associated bloodstream infections; SIR Standardized Infection Ratio; SSIs Surgical Site Infections
The Targets (Phase 1)

- Inpatient and outpatient harms resulting from:
  1. Anticoagulants
  2. Diabetes agents (oral agents, insulin)
  3. Opioids
     - Acute pain
     - Non-malignant, chronic pain

http://www.health.gov/hai/ade.asp
**Federal Interagency Workgroup for Diabetes Agent ADEs**

- Convened from December 2012 to June 2013
- Participation by ~11 Federal agencies
- Lead Federal SME: Len Pogach, MD
- Input from SMEs/organizations (academia, hospital care, ambulatory care, state QIOs)

**DIABETES AGENTS**

- Surveillance
- Evidence-Based Prevention Tools
- Incentives & Oversight
- Research (Unanswered Questions)
Key Action Plan Recommendations

- To **minimize population harms** from hypoglycemic agents, Federal partners will need to:

1. Support advancement of surveillance strategies that better identify real-world burden and scope of hypoglycemic ADEs

2. Support development, dissemination, and uptake of optimal diabetes management strategies, especially in critical, under-addressed settings such as care transitions and long-term care (e.g., nursing homes)

3. Support policies (e.g., quality measures, EHR standards) that incentivize optimal glycemic management and that minimize payment/coverage barriers to such management

4. Support research of real-world glycemic management (e.g., health literacy/numeracy role in patient education, patient-centered/individualized glycemic targets)
So there’s an Action Plan, Now (and So) What?

- Progress collaboratively
  - Continue communication and coordination across Federal agencies
  - Initiate collaboration with and seek input from public & private sector stakeholders

- Generate momentum
  - Implementation and uptake of evidence-based policies, practices, and guidelines at national and local (hospital or clinic) levels

- Evaluate impact
  - Biggest challenge?
Conclusions
Conclusions

- Hypoglycemia from insulin is a challenge nationally
  - Esp. among older adults with DM

- Treatment guidelines have evolved
  - Individualizing glycemic targets for risk vs. benefit

- Federal efforts at addressing hypoglycemia coalescing around National Action Plan for ADEs
  - Surveillance, Prevention, Incentives/Oversight, Research
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- Maribeth Lovegrove, MPH
- Division of Diabetes Translation

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- Christine Lee, PharmD, PhD
- Mishale Mistry, PharmD, MPH
- Andrew York, PharmD

**Federal Steering Committee and Workgroups for ADEs**

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Department of Health and Human Services.
Thank You

- Hypoglycemia from insulin is a challenge nationally
  - Esp. among older adults with DM

- Treatment guidelines have evolved
  - Individualizing glycemic targets for risk vs. benefit

- Federal efforts at addressing hypoglycemia coalescing around National Action Plan for ADEs
  - Surveillance, Prevention, Incentives/Oversight, Research
Thank You

National Action Plan for ADE Prevention:
http://www.health.gov/hai/ade.asp

1. Support advancement of surveillance strategies that better identify real-world burden and scope of anticoagulant ADEs

2. Support development, dissemination, and uptake of optimal AC management strategies, especially in under-addressed settings such as care transitions and long-term care (e.g., nursing homes)

3. Support policies (e.g., quality measures, EHR standards) that incentivize optimal AC management and that minimize payment/coverage barriers to such management

4. Support research of real-world management of newer oral anticoagulants (e.g., drug selection, transitions among agents, adherence, laboratory testing, reversal strategies)

AC  Anticoagulation;  EHR  Electronic Health Record