National Trends in Treatment Initiation for Nursing Home Residents with Diabetes Mellitus, 2008-2010

Andrew R. Zullo, PharmD, ScM; David D. Dore, PharmD, PhD; Lori Daiello, PharmD, ScM; Rosa Baier, MPH; Roee Gutman, PhD; Robert J. Smith, MD.

1. Department of Health Services, Policy, and Practice, Brown University
2. Department of Pharmacy, Rhode Island Hospital
3. Optum Epidemiology
4. Department of Neurology, Rhode Island Hospital
5. Department of Biostatistics, Brown University
6. Division of Endocrinology, Brown University

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Background

- Approximately 1 in 4 nursing home (NH) residents aged 65 and older have a diagnosis of diabetes
- Projections estimate that between 2005 and 2050, the prevalence of diabetes will increase 449% among those older than 75 years
Background

- Little is known about current treatment practices for NH residents with diabetes
- Temporal trends in glucose-lowering medication use in the NH are necessary to inform future efforts to improve the quality of prescribing
  - Provide benchmark for future improvement interventions
Objectives

- To describe aggregate patterns and temporal trends in the use of different glucose-lowering medications in the management of diabetes in the long-term care NH setting
Methods I: Data Source

- Medicare Part D
  - Source of information about medication use
- National Minimum Data Set (MDS), a federally mandated needs assessment performed on all U.S. NH residents at least quarterly
  - Source of nurse-recorded cognitive and physical functioning measures validated in prior research
- Part D and MDS linked to Medicare Parts A and B as well as OSCAR NH facility data
Methods II: Study Population

1. Had a glucose-lowering medication dispensing in Part D in one of 50 U.S. states, the District of Columbia, Puerto Rico, or the Virgin Islands, 2007-2010

2. Newly initiated on the medication after four months of non-use
   - maintained continuous Medicare Part D insurance eligibility for the 6 months preceding tx initiation

3. 65 years or older with diabetes

4. Long-stay nursing home resident, 90+ days in nursing facility
Methods II: Study Population

- Date of each resident’s first eligible glucose-lowering medication prescription while long-stay was the index date
- Excluded residents who were prescribed a combination product (consisting of two or more glucose-lowering agents) on their index date
  - Reincluded them in a separate secondary analysis
Methods III: Analyses

- Descriptive statistics used to characterize patients and NH facilities in cohort
- Initiation of glucose-lowering medications was examined graphically by plotting the proportion of new use in each of the 12 quarters in our three year study period
Methods III: Analyses

- Assessed linear trends in the use of each class of medications over time using simple linear regression models
  - estimate (with 95% confidence limits) of the rate of change in the proportion of each class of glucose-lowering medications by quarter during the study period
  - checked model assumptions through a variety of plots, including observed versus predicted values, residuals versus predicted values, and normal quantile plots
## Selected Characteristics (I): Demographics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N=11,531</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
</tr>
<tr>
<td>Age—mean (SD), years</td>
<td>81 (8.5)</td>
</tr>
<tr>
<td>Male Sex—%</td>
<td>39.9</td>
</tr>
<tr>
<td>Race—%</td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>77.2</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>15.8</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>Body mass index, mean (SD)</td>
<td>27.9 (7.3)</td>
</tr>
<tr>
<td>Inpatient hospitalization, past year</td>
<td>3,487 (30.1)</td>
</tr>
</tbody>
</table>
Selected Characteristics (II): Geriatric Syndromes

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N=11,531</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>MDS-ADL Score, mean (SD)</td>
<td>17.5 (7.5)</td>
</tr>
<tr>
<td>Bladder incontinence</td>
<td>8,544 (74.1)</td>
</tr>
<tr>
<td>Dementia</td>
<td>4,844 (42)</td>
</tr>
<tr>
<td>Fell, past 180 days</td>
<td>3,646 (31.6)</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>1,759 (15.3)</td>
</tr>
<tr>
<td>Antipsychotic medication use, last MDS assessment</td>
<td>2,575 (22.3)</td>
</tr>
</tbody>
</table>
## Selected Characteristics (III): Facilities

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N=7,158</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>Part of a Chain</td>
<td>3,935 (55)</td>
</tr>
<tr>
<td>For profit</td>
<td>5,201 (72.7)</td>
</tr>
<tr>
<td>Hospital-based</td>
<td>234 (3.3)</td>
</tr>
<tr>
<td>More than 100 beds</td>
<td>4,603 (64.3)</td>
</tr>
<tr>
<td>Direct care hours/day/resident, mean (SD)</td>
<td>3.5 (0.9)</td>
</tr>
<tr>
<td>Percent of residents physically restrained, median (IQR)</td>
<td>1.8 (0-4.7)</td>
</tr>
<tr>
<td>More than 50% of residents on Medicaid</td>
<td>5,928 (82.8)</td>
</tr>
</tbody>
</table>
Trends in Noninsulin Meds

National trends in the use of noninsulin glucose-lowering medication classes in the nursing home, 2008-2010

Proportion of Newly Initiated Medications

Time (Quarters)

- Sulfonylureas
- Metformin
- DPP-4 Inhibitors
- Thiazolidinediones
- Meglitinides
Trends in Noninsulin Meds

- Metformin use has remained stable
- Sulfonylurea use has decreased
  - On average, about 1% per quarter (p<0.01)
- DPP-4 inhibitor use has remained stable
- TZD use has decreased
  - On average, about 0.2% per quarter (p<0.001)
- Meglitinide use has decreased
  - On average, about 0.1% per quarter (p<0.001)
Trends in Insulin Use

National trends in the use of different types of insulin in the nursing home, 2008-2010

Proportion of Newly Initiated Medications

Time (Quarters)

- Rapid-acting Insulin
- Short-acting Insulin
- Intermediate-acting Insulin
- Long-acting Insulin
Trends in Insulin Use

- Rapid-acting insulin use has increased
  - On average, about 1.4% per quarter (p<0.0001)
- Short-acting insulin use has marginally increased
  - On average, about 0.6% per quarter (p=0.09)
- Intermediate-acting insulin use has remained stable
- Long-acting insulin use has decreased
  - On average, about 0.6% per quarter (p<0.01)
Sulfonylurea Use by Drug

Sulfonylurea Use Over Time in the Nursing Home, 2008-2010

Percentage of Newly Initiated Sulfonylureas

Time (Quarters)

Drug  Glipizide  Glyburide  Glimepiride

1Q08  2Q08  3Q08  4Q08  1Q09  2Q09  3Q09  4Q09  1Q10  2Q10  3Q10  4Q10
TZD Use by Drug

Thiazolidinedione Use Over Time in the Nursing Home, 2008-2010

Percentage of Newly Initiated Thiazolidinediones

Time (Quarters)

Drug Pioglitazone Rosiglitazone
Bolus Insulin Use by Type
Bolus Insulin Use by Drug

Bolus Insulin Use Over Time in the Nursing Home, 2008-2010

Percentage of Newly Initiated Bolus Insulins

Time (Quarters)

Drug: Regular, Aspart, Lispro, Glulisine
Basal Insulin Use by Type

Basal Insulin Use Over Time in the Nursing Home, 2008-2010
Basal Insulin Use by Drug

Basal Insulin Use Over Time in the Nursing Home, 2008-2010

Percentage of Newly Initiated Basal Insulins

Time (Quarters)

Drugs:
- Glargine
- NPH
- Detemir

1Q08, 2Q08, 3Q08, 4Q08, 1Q09, 2Q09, 3Q09, 4Q09, 1Q10, 2Q10, 3Q10, 4Q10
Combination Products

- 4.3% of all glucose-lowering medication initiations were for combination insulins
  - Use has decreased: On average, 0.3% per quarter (p<0.0001)

- 0.8% of all glucose-lowering medication initiations were for combination oral products
  - Use has decreased: On average, 0.06% per quarter (p=0.04)
Limitations

- Lack of laboratory data allowing us to confirm the diabetes diagnosis using HbA1c
- Study duration of just 3 years
  - Diabetes care rapidly changing and new treatments being introduced often
- Unable to distinguish between Type 1 and 2 diabetes
Strengths

- Nationally representative population from many health systems in the U.S
  - Includes non-veteran females, who comprise 70% of the nursing home population in the U.S.
- New initiation rather than prevalence so as to capture the prescribing decision
- Unlike priori studies, insulin use measured in our data, so did not need to impute
- Include drugs not captured in prior studies (e.g., glimepiride)
Conclusions

- During the period from 01/2008 to 12/2010, there were some marked changes in prescribing practices in the NH
  - Decrease in glyburide use not as dramatic as that seen in VA, but decrease in sulfonylurea use similar to VA
- Newer medications like DPP-4 inhibitors and GLP-1 agonists do not appear to have been rapidly adopted in the NH setting
RECOMMENDATIONS FOR CURRENT PRACTICE
Current Best Practices

- 2013 Update: American Geriatrics Society (AGS) Guidelines for Improving the Care of the Older Adult with Diabetes Mellitus
- October 2015: New AGS Beers Criteria released!
Beers 2015: Sliding Scale Insulin

- Recommendation: Avoid
- Evidence Quality: Moderate
- Strength of Recommendation: Strong
Beers 2015: Sliding Scale Insulin

- **Rationale**
  - Higher risk of hypoglycemia without improvement in hyperglycemia management (regardless of care setting)
  - Refers to sole use of short- or rapid-acting insulins to manage or avoid hyperglycemia in the absence of basal or long-acting insulin
  - Does not apply to titration of basal insulin or use of additional short or rapid-acting insulin in conjunction with scheduled insulin (i.e., correction insulin)
Beers 2015: Sulfonylureas (Chlorpropamide)

- Recommendation: Avoid
- Evidence Quality: High
- Strength of Recommendation: Strong
Rationale

– Prolonged half-life in older adults
– Can cause prolonged hypoglycemia
– Causes syndrome of inappropriate antidiuretic hormone secretion
  • Hyponatremia and hypo-osmolality due to impaired water excretion (hormone continues to work despite normal or increased plasma volume)
    – Results in delirium, seizures, coma, death
Beers 2015: Sulfonylureas (Glyburide)

- Recommendation: Avoid
- Evidence Quality: High
- Strength of Recommendation: Strong
Beers 2015: Sulfonylureas (Glyburide)

- Rationale
  - Higher risk of severe prolonged hypoglycemia in older adults
Recommends short-acting sulfonylureas

- Glipizide
- Gliclazide (not actually used much)

Caveat: hypoglycemia risk still greater than metformin and increases with age
Beers 2015: Alternatives to Sulfonylureas

- **Recommend: metformin**
  - Still first-line
    - Lowest risk of hypoglycemia and most effective at cardiovascular risk reduction
  - Estimated glomerular filtration rate (eGFR)
    - Should be used to guide metformin use, not CrCl
    - <30 ml/min/1.73m²: Do not use
    - 30-60: Use lower dosages (500-750 mg/day)
  - Lactic acidosis **extremely** rare: should **not** be a reason for not recommending
Final Points I

  - Oral hypoglycemic agents, *insulin*, warfarin, and oral antiplatelet agents implicated in 67% of hospitalizations among adults ≥65 years of age

- Use of metformin, short-acting sulfonylureas (glipizide), and careful use of basal/bolus (not sliding scale only) insulin could potentially prevent some of those hospitalizations
Final Points II

- If a sulfonylurea is being initiated, check to be sure that person has previously tried metformin and that use is currently contraindicated

- Remember: No evidence that using medications to achieve tight glycemic control (HbA1c < 6.5%) in older adults with T2DM is beneficial
  - Tight control associated with harms: hypoglycemia and mortality
  - A “gentler” approach is warranted for geriatric patients