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NATIONAL GLUCOSE-LOWERING TREATMENT COMPLEXITY IS GREATER IN NURSING HOME RESIDENTS THAN COMMUNITY-DWELLING ADULTS

Andrew R. Zullo, PharmD, ScM,
Department of Health Services, Policy, and Practice, School of Public Health, Brown University, Providence, Rhode Island

David D. Dore, PharmD, PhD,
Department of Health Services, Policy, and Practice, School of Public Health, Brown University, Providence, Rhode Island Optum Epidemiology, Boston, Massachusetts

Roee Gutman, PhD,
Department of Biostatistics, School of Public Health, Brown University, Providence, Rhode Island

Vincent Mor, PhD,
Department of Health Services, Policy, and Practice, School of Public Health, Brown University, Providence, Rhode Island

Robert J. Smith, MD
Department of Health Services, Policy, and Practice, School of Public Health, Brown University, Providence, Rhode Island; Department of Medicine, Alpert Medical School, Brown University, Providence, Rhode Island

To the Editor:

The recent American Diabetes Association position statement on the management of type 2 diabetes mellitus in long-term care settings highlights the need for different pharmacological treatment approaches to community-dwelling adults and long-stay nursing home (NH) residents.[1] The position statement recommends simplified medication regimens with a lower risk of adverse effects for NH residents,[1] but there is little information on how glucose-lowering treatment use in NHs compares with that in the community.[2] Identifying and

Author Contributions: Zullo: study concept, data analysis. Zullo, Mor: acquisition of data. All authors: study design, data interpretation, drafting the manuscript, critical revision for important intellectual content, approval of final version to be published.

Conflict of Interest: David D. Dore is an employee of Optum and stockholder in UnitedHealth Group, Optum's parent company. Vincent Mor's research is in a related area to that of several different paid activities. He also periodically serves as a paid speaker at national conferences at which he discusses trends and research findings in long-term and postacute care. He holds stock of unknown value in PointRight, Inc. an information services company providing advice and consultation to various components of the long-term care and postacute care industry, including suppliers and insurers. PointRight sells information on the measurement of nursing home quality to nursing homes and liability insurers. Vincent Mor was a founder of the company but has subsequently divested much of his equity in the company and relinquished his seat on the board. Vincent Mor chairs the Independent Quality Committee for HRC Manor Care, Inc., a nursing home chain, for which he receives compensation in the range of $20,000 to $40,000. He serves as chair of a scientific advisory committee for NaviHealth, a postacute care service organization, for which he also receives compensation in the range of $20,000 to $40,000 per year. He serves as a technical expert panel member on several Centers for Medicare and Medicaid Services quality measurement panels. Vincent Mor is a member of the board of directors of Tufts Health Plan Foundation, Hospice Care of Rhode Island, and The Jewish Alliance of Rhode Island.

quantifying common glucose-lowering medication patterns would help inform future efforts to improve glucose-lowering medication management and prioritization of pharmaceutical comparative effectiveness research (CER) questions for NH residents.[1,3]

This letter describes and juxtaposes common glucose-lowering medication usage patterns for a national cross-section of U.S. adults aged 65 and older residing in NH and community settings between January 1, 2007, and December 31, 2010. A random 20% national sample of Medicare fee-for-service beneficiaries with Parts A, B, and D claims linked to the Minimum Data Set (MDS), a federally mandated NH health assessment tool, was used. Individuals could have Medicare insurance coverage for any duration. All beneficiaries had at least one dispensing of a glucose-lowering treatment during the study period.

Prevalent glucose-lowering medication use was assessed using Part D data. Medication use patterns were mutually exclusive and defined without regard to the time sequence of the dispensings. *International Classification of Diseases, Ninth Revision* (ICD-9) diagnosis codes from Part B claims during the study period were used to ascertain the prevalence of comorbidities and geriatric conditions. Hospitalizations during the study period were identified through Part A claims. MDS version 2.0 and the Residential History File algorithm were used to identify Medicare beneficiaries who resided in a NH for the long term (≥90 consecutive days).[4,5] The study cohort was then divided into two mutually exclusive subpopulations: community-dwelling adults and long-stay NH residents.

Two-sample *t*-tests and chi-squared tests were used to compare the characteristics of those who resided in the community with the characteristics of those who resided in a NH. The period prevalences of glucose-lowering medication usage patterns were then calculated in each subpopulation. Exact (Clopper-Pearson) binomial 95% confidence intervals were calculated to facilitate comparisons of the pattern prevalences between and within the subpopulations.[6] The institutional review board of Brown University reviewed and approved this study.

Of 1,215,715 individuals, 1,119,874 (92.1%) were identified as community dwelling and 95,841 (7.9%) as long-stay NH residents. Mean age of the community-dwelling subpopulation was 75.4, 56.9% were female, and 36.8% had been hospitalized during the study period. Mean age of the NH subpopulation was 82.3, 68.8% were female, and 76.6% had been hospitalized ($P < .001$ for all). All examined comorbidities were more prevalent in the NH than the community subpopulation, including coronary artery disease (53.6% vs 34.9%), heart failure (57.5% vs 21.8%), hypertension (87.6% vs 67.4%), depression (47.4% vs 12.0%), and dementia (68.8% vs 9.9%) ($P < .001$ for all comparisons).

In the community-dwelling population, 42.7% (95% confidence interval (CI) = 42.6–42.8%) were dispensed a single class of glucose-lowering medication during the study period. The prevalence of single class use was lower in the NH (28.2%, 95% CI = 27.9–28.5). Most NH residents (71.8%) were dispensed medications from two or more classes, 41.6% were dispensed three or more, and 19.9% four or more. Of community-dwelling adults, 57.3% were dispensed two or more medication classes, 25.6% three or more, and 9.6% four or more ($P < .001$ vs NH subpopulation). The 20 most-prevalent glucose-lowering medication

use patterns (Table 1) accounted for a large proportion of all observed patterns. In the community, the five most-common patterns of medication class use were oral therapies. In the NH, three of the five most-common patterns involved parenterally administered drug classes. Biguanides (metformin) and sulfonylureas were commonly used in the community and NH, but use was greater in the community ($P < .001$).

The complexity of glucose-lowering medications is greater in NH than community-dwelling populations, with substantial differences in the prevalence of various drug combinations between the two cohorts. In combination with existing evidence, these results suggest that continued efforts are warranted to improve glucose-lowering medication management and simplify treatment regimens in the NH.[7] They also suggest that the relative importance of CER questions regarding specific glucose-lowering treatments may differ according to care setting.[8] The data further indicate that CER studies of glucose-lowering treatments in older adults must address the combination use of medications, especially in NH residents.[9,10]

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Table 1.

Prevalence of the Most-Common Glucose-Lowering Medication Class Patterns for U.S. Community-Dwelling and Nursing Home Subpopulations Aged 65 and Older, 2007–10

	Community, n = 1,119,874			Nursing Home, n = 95,841		
Rank	**Pattern**	**n**	**% (95% CI)**	**Pattern**	**n**	**% (95% CI)**
1	Biguanide	247,920	22.14 (22.06–22.22)	Sulfonylurea	7,729	8.06 (7.89–8.24)
2	Biguanide + sulfonylurea	158,482	14.15 (14.09–14.22)	Short-acting insulin	6,678	6.97 (6.81–7.13)
3	Sulfonylurea	138,560	12.37 (12.31–12.43)	Biguanide	5,372	5.61 (5.46–5.75)
4	Biguanide + sulfonylurea + thiazolidinedione	49,248	4.40 (4.36–4.44)	Rapid- + long-acting insulin	5,080	5.30 (5.16–5.44)
5	Biguanide + thiazolidinedione	30,590	2.73 (2.70–2.76)	Short- + long-acting insulin	4,124	4.30 (4.18–4.43)
6	Rapid- + long-acting insulin	30,002	2.68 (2.65–2.71)	Biguanide + sulfonylurea	3,749	3.91 (3.79–4.04)
7	Sulfonylurea + thiazolidinedione	28,315	2.53 (2.50–2.56)	Rapid- + short- + long-acting insulin	3,272	3.41 (3.30–3.53)
8	Thiazolidinedione	25,904	2.31 (2.29–2.34)	Sulfonylurea+ short-acting insulin	3,079	3.21 (3.10–3.33)
9	Short-acting insulin	19,401	1.73 (1.71–1.76)	Rapid-acting insulin	2,569	2.68 (2.58–2.78)
10	Biguanide + sulfonylurea + dipeptidyl peptidase-4 inhibitor	16,991	1.52 (1.49–1.54)	Long-acting insulin	2,105	2.20 (2.10–2.29)
11	Biguanide + sulfonylurea + long-acting insulin	16,029	1.43 (1.41–1.45)	Biguanide + sulfonylurea + short-acting insulin	2,031	2.12 (2.03–2.21)
12	Long-acting insulin	13,488	1.20 (1.18–1.22)	Sulfonylurea + short-+ long-acting insulin	1,919	2.00 (1.92–2.09)
13	Rapid-acting insulin	12,691	1.13 (1.11–1.15)	Biguanide + short-acting insulin	1,773	1.85 (1.77–1.94)
14	Sulfonylurea + long-acting insulin	11,284	1.01 (0.99–1.03)	Short- + intermediate-acting insulin	1,649	1.72 (1.64–1.80)
15	Biguanide + dipeptidyl peptidase-4 inhibitor	10,624	0.95 (0.93–0.97)	Sulfonylurea + rapid-+ long-acting insulin	1,584	1.65 (1.57–1.74)
16	Biguanide + sulfonylurea + thiazolidinedione + dipeptidyl peptidase-4 inhibitor	10,125	0.90 (0.89–0.92)	Rapid- + short-acting insulin	1,484	1.55 (1.47–1.63)
17	Biguanide + long-acting insulin	9,858	0.88 (0.86–0.90)	Sulfonylurea + rapid- + short- + long-acting insulin	1,346	1.40 (1.33–1.48)
18	Biguanide + rapid- + long-acting insulin	9,705	0.87 (0.85–0.88)	Biguanide + sulfonylurea + short- + long-acting insulin	1,287	1.34 (1.27–1.42)
19	Sulfonylurea + dipeptidyl peptidase-4 inhibitor	8,485	0.76 (0.74–0.77)	Thiazolidinedione	1,236	1.29 (1.22–1.36)
20	Biguanide + sulfonylurea + rapid- + long-acting insulin	7,909	0.71 (0.69–0.72)	Sulfonylurea + rapid-acting insulin	1,187	1.24 (1.17–1.31)
>20	All other patterns	264,263	23.60 (23.52–23.68)	All other patterns	36,588	38.18 (37.87–38.48)

CI = confidence interval.