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Fingerstick glucose monitoring by cognitive impairment status in Veterans Affairs nursing home residents with diabetes

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Abstract

Background: Guidelines recommend nursing home (NH) residents with cognitive impairment receive less intensive glycemic treatment and less frequent fingerstick monitoring. Our objective was to determine whether current practice aligns with guideline recommendations by examining fingerstick frequency in Veterans Affairs (VA) NH residents with diabetes across cognitive impairment levels.

Methods: We identified VA NH residents with diabetes aged 65 residing in VA NHs for >30 days between 2016 and 2019. Residents were grouped by cognitive impairment status based on the Cognitive Function Scale: cognitively intact, mild impairment, moderate impairment, and severe impairment. We also categorized residents into mutually exclusive glucose-lowering medication (GLM) categories: 1) no GLMs, 2) metformin only, 3) sulfonylureas/other GLMs (+/− metformin but no insulin), 4) long-acting insulin (+/− oral/other GLMs but no short-acting insulin), and 5) any short-acting insulin. Our outcome was mean daily fingersticks on day 31 of NH admission.

Results: Among 13,637 NH residents, mean age was 75 years and mean hemoglobin A1c was 7.0%. The percentage of NH residents on short-acting insulin varied by cognitive status from 22.7% in residents with severe cognitive impairment to 33.9% in residents who were cognitively intact. Mean daily fingersticks overall on day 31 was 1.50 (standard deviation=1.73). There was a greater range in mean fingersticks across GLM categories compared to cognitive status. Fingersticks ranged widely across GLM categories from 0.39 per day (no GLMs) to 3.08 (short-acting insulin), while fingersticks ranged slightly across levels of cognitive impairment from 1.11 (severe cognitive impairment) to 1.59 (cognitively intact).

Conclusion: NH residents receive frequent fingersticks regardless of level of cognitive impairment, suggesting that cognitive status is a minor consideration in monitoring decisions.

Future studies should determine whether decreasing fingersticks in NH residents with moderate/severe cognitive impairment can reduce burdens without compromising safety.

Keywords

cognitive impairment; dementia; diabetes; fingerstick; nursing home

INTRODUCTION

Diabetes is common among older adults residing in nursing homes (NH) with an estimated prevalence ranging from 25% to 35% across studies.[1–3] The benefits of tight glycemic control in NH residents are unclear with recent guidelines highlighting the need to tailor glycemic targets and simplify glucose-lowering regimens.[4–7] Despite these guidelines, NH residents are often over-treated which can lead to complications such as hypoglycemia resulting in hospitalization.[8–10]

One understudied burden associated with greater treatment intensity is increased fingerstick glucose checks.[11] Qualitative studies of fingerstick monitoring in NHs suggest that they can burden staff and residents due to discomfort and time costs.[12] The recommended frequency of fingersticks in NH-specific diabetes guidelines varies but could range from once every three days for those only on long-acting insulin to no routine monitoring for those on oral glucose lowering medications (GLM).[4] However, a 2021 study of Veterans Affairs (VA) NHs found that fingersticks in individuals recently discharged from the hospital occurred much more frequently than recommended by guidelines.[13] This may be related to the high prevalence of sliding scale insulin usage that often persists well into a NH stay, standardized order sets that automatically order multiple fingersticks per day, and lack of awareness from clinicians that fingersticks are still being performed even after insulin is discontinued.[14]

Individuals with cognitive impairment frequently receive GLMs and are treated to intensive glycemic targets despite the risks and lack of benefit.[15–17] Since NH residents with cognitive impairment may not understand why fingersticks are necessary, fingersticks may also trigger behavioral disturbances that can reduce resident and staff well-being. However, little is known about fingerstick practices in NH residents across different levels of cognitive impairment. Therefore, we examined fingerstick frequency among VA NH residents with diabetes stratified by cognitive impairment level and GLM categories. We hypothesized that while the type of GLM received would matter the most in determining fingerstick frequency, NH residents with more severe cognitive impairment would receive fewer fingersticks compared to cognitively intact residents within GLM categories.

METHODS

Study cohort

Our study cohort included VA NH residents aged 65 years with Type 2 diabetes mellitus (T2DM) who resided in one of 110 VA NHs for longer than 30 days between 1/1/2016 and 9/30/2019. We focused on day 31 of NH stay, since we felt that this timepoint was far enough removed from NH admission that residents would likely be clinically stable and

at a steady-state in terms of their diet and medications. We classified residents as having T2DM if they had (1) hemoglobin A1c level of 6.5%, (2) used GLMs, or (3) *International Classification of Diseases* (*ICD*) code for T2DM (*ICD-9*: 250.xx and 249.xx; *ICD-10*: E11.x and E09.x) in the year prior to NH admission up to 7 days after NH admission. During this time range, we also chose the HbA1c measured closest to day 31 of NH admission, either before or after.[13,18,19] We excluded those with diagnosis codes for Type 1 diabetes (*ICD-9*: 250.x1 and 250.x3; *ICD-10*: E10.x) and NH hospice admissions.

We identified NH admission and discharge date using VA inpatient Corporate Data Warehouse (CDW) data. Demographic information was obtained using linked VA inpatient and outpatient data. Chronic conditions were ascertained through *ICD-9 and 10* codes (congestive heart failure: 428, I50; hypertension: 401, I10; chronic kidney disease: 585, N18; chronic pulmonary disease: 491, 492, 496, J41, J42, J43, J44; cancer: 140–208, 209.0–209.3, 230–239, C00-C96, D00-D09, D37-D49) in the year prior to day 31 of NH admission up to 7 days after day 31 of NH admission. Hospice use was identified via VA CDW inpatient data such as bed section codes.

Cognitive impairment categories

Cognitive impairment status was assessed using the Cognitive Function Scale (CFS), an integrated measure of cognitive function performed routinely in NHs as part of the Minimum Data Set (MDS). It is based on the Brief Interview for Mental Status (BIMS) and/or Cognitive Performance Scale (CPS).[20] The BIMS asks residents to self-respond to three questions gauging orientation and two questions assessing recall.[21] For NH residents unable to complete the BIMS, nurses calculate a CPS score using five items: comatose status, short-term memory, cognitive skills for decision making, making themselves understood, and self-performance for eating.[22] Based on the BIMS or CPS score, residents were classified as cognitively intact, mild impairment, moderate impairment, and severe impairment (Supplementary Table S1).[20] The NH resident's CFS result was selected from an MDS assessment of any type that was closest to the midpoint of their NH stay (i.e., midpoint between their admission and discharge dates) either before or after day 31 of NH admission. For residents with more than one CFS result, we selected the score closest to day 31 of NH admission when our outcome when ascertained.

Medication categories

NH residents were classified into one GLM group using medication administration data: no GLM, metformin only, sulfonylureas and other GLMs, long-acting insulin, and short-acting insulin (Supplementary Table S2). We grouped sulfonylureas and other GLMs (dipeptidyl peptidase 4 inhibitors, sodium-glucose cotransporter 2 inhibitors (SGLT2i), glucagon-like peptide 1 (GLP-1) agonists, and thiazolidinediones) into a single category due to the small numbers of patients only on these other GLMs. Medication group was classified based on the medications the resident was receiving on day 31 of NH admission when the mean number of fingersticks was assessed. Residents on multiple GLMs were classified based on the medication associated with the highest hypoglycemic risk (short-acting insulin>long-acting insulin>sulfonylureas/other GLMs>metformin>no GLMs). For example, a resident on long-acting insulin and sulfonylurea was categorized in the long-acting insulin group.

This categorization was chosen as we expect that residents on insulin will receive more fingersticks compared to those on oral medications regardless of cognitive impairment level.

Fingerstick measurements

Our outcome was the mean number of fingersticks on day 31 of NH admission stratified by cognitive impairment status and GLM groupings. We chose day 31 of NH admission since our goal was to examine a steady state of NH care, removed from acute illness or hospitalization when glycemic management may be more dynamic (e.g., due to stress associated with critical illness or decreased appetite). Information on fingersticks was obtained from the VA electronic health record. For residents admitted multiple times to a VA NH during the study period, we selected the NH stay with the longest duration and assessed the mean number of fingersticks on day 31 of that NH admission. To assess the sensitivity of our results to the chosen time point, we conducted additional analyses to quantify the number of fingersticks across GLM and cognitive impairment groups on days 45 and 60.

Statistical analysis

To compare the mean number of fingersticks on day 31 stratified by cognitive impairment, we performed a test for trend within each medication class using linear regression. Analyses were conducted using statistical software SAS 9.4 (SAS Institute Inc.) and STATA 16.1 (Stata Corp). The statistical significance threshold was 2-sided p-value<0.05. The study was reviewed and approved by the University of California, San Francisco Committee on Human Research and the San Francisco VA Research and Development Committee.

RESULTS

We identified 36,431 NH residents with diabetes aged 65 admitted with a date of VA NH admission between 1/1/2016–9/30/2019. After excluding residents admitted for hospice, with Type 1 diabetes, and length of stay (LOS) 30 days, the final cohort included 13,637 residents with T2DM (Supplementary Figure S1). Among our final cohort, 28.2% (N=3850) had multiple NH stays during the study period. The mean age was 75 years (standard deviation (SD)=8), 98% were men, and 75% were White (Table 1). The mean hemoglobin A1c was 7.0%, and median NH LOS was 67 days (interquartile range=43–125 days). Residents with more severe cognitive impairment tended to be older, have higher median NH LOS, and higher degree of functional impairment.[23]

Most residents were classified as cognitively intact (52.9%) with 7.1% and 6.8% classified as moderate and severe impairment, respectively (Table 2). Most residents were categorized as being on no GLMs (45.9%) or short-acting insulin (31.7%) (Table 2). Among NH residents on GLMs, 58.7% were using short-acting insulin. The percentage of residents on short-acting insulin ranged from 33.9% in cognitively intact residents to 22.7% in those with severe impairment. Among those with moderate or severe cognitive impairment on GLMs, 77.8% were on long or short-acting insulin.

Overall, the mean number of fingersticks on day 31 of NH admission in those classified as cognitively intact, mild impairment, moderate impairment, and severe impairment was 1.59, 1.49, 1.30, and 1.11, respectively (p=0.003 on test-of-trend) (Figure 1). The mean number

of fingersticks was higher in GLM categories with greater hypoglycemic risk regardless of cognitive impairment. The range of fingersticks was much larger across GLM categories than cognitive impairment levels. For example, mean fingersticks on day 31 was 1.50 (SD=1.73) overall and varied from 0.39 (SD=0.98) for residents on no GLMs to 3.08 (SD=1.51) for residents on short-acting insulin.

A trend in decreasing fingersticks with more advanced cognitive impairment was observed with some, but not all, classes of GLMs (Figure 1). Specifically, a trend was observed in the no GLMs (p<0.01) and sulfonylurea/other GLMs (p<0.01) groups. No statistically significant trend was seen in the metformin only (p=0.35), long-acting insulin (p=0.19), and short-acting insulin (p=0.49) groups. For example, among those receiving long-acting insulin, cognitively intact residents had an average of 2.06 fingersticks compared to 1.92 fingersticks in those with severe impairment.

Figure 2 displays that there was relatively little variation in the frequency distribution of fingersticks across cognitive impairment categories within GLM groups. For example, on day 31 of NH admission regardless of cognitive impairment status, ~50% of NH residents on short-acting insulin received 4 fingersticks, ~35–40% on long-acting insulin received 3 fingersticks, ~55–66% on sulfonylureas and other GLMs received 1 fingersticks, and ~50% on metformin received 1 fingersticks.

In our sensitivity analysis using days 45 and 60 of NH admission, we found similar results to the main analysis with a trend in decreasing fingersticks with more advanced cognitive impairment observed with some, but not all, classes of GLMs (Supplementary Tables S3 and S4). For example, for short-acting insulin on Day 31, mean number of daily fingersticks ranged from 3.08 in cognitively intact residents to 3.03 in severely cognitively impaired residents (p for trend = 0.49). For short-acting insulin on Day 60, mean number of daily fingersticks ranged from 3.52 in cognitively intact residents to 3.43 in severely cognitively impaired residents (p for trend = 0.42).

DISCUSSION

In a national study of 13,637 VA NH residents with T2DM, we found that residents receive frequent fingersticks regardless of cognitive impairment level. While residents with higher levels of cognitive impairment received fewer fingersticks overall and in some GLM categories, the differences were relatively small suggesting that cognitive status may be a minor consideration in fingerstick monitoring decisions. Our results are aligned with a previous study in VA NH residents recently discharged from the hospital documenting the high burden of fingerstick monitoring.[13] We extend these results by demonstrating that fingersticks occur more frequently than recommended by guidelines across cognitive impairment levels in NH residents at day 31 after NH admission.[4]

Previous studies have found that individuals with severe cognitive impairment often receive high hypoglycemia risk GLMs, which can result in adverse events.[15–17] In this study, ~25% of residents with moderate/severe cognitive impairment were on short-acting insulin and received ~3 fingersticks per day. Despite guidelines in the long-term care setting

recommending less-intensive glycemic goals for "patients with…life-limiting comorbid illnesses, or substantial cognitive or functional impairments," our results suggest that clinicians may not be reducing the intensity of glycemic control in patients with moderate/severe cognitive impairment.[5]

Excessive fingersticks are an underrecognized harm and burden associated with intensive diabetes control in the NH. Disruptions from fingerstick measurements may cause distress and decrease well-being in NH residents with cognitive impairment who may not understand the purpose behind fingersticks. Clinicians should regularly re-evaluate diabetes management goals in light of comorbidities and life expectancy estimates. Setting less stringent blood glucose control targets may help to reduce polypharmacy, avoid unnecessary adverse events, and reduce treatment burdens.

Fingerstick monitoring frequency in NH residents with diabetes can be decreased in 2 ways. First, we found that for each type of GLM, fingerstick monitoring was more frequent than recommended. For example, most residents on stable doses of oral medications including sulfonylureas likely do not need routine fingerstick monitoring.[4,7] However, we found that residents taking sulfonylureas received 0.89 to 1.48 fingersticks daily. Second, we found that many residents were using higher hypoglycemia risk medications such as short-acting insulin. Specifically, 59% of residents on GLMs were using short-acting insulin. Use of short-acting insulin drives more frequent fingerstick monitoring. Thus, the most important way to decrease fingerstick monitoring in NH residents with cognitive impairment may be to avoid short-acting insulin wherever possible. One previous study found that short-acting insulin can safely be substituted with oral and long-acting insulin in older adults with diabetes.[24] Simplifying glycemic regimens and reducing unnecessary fingersticks represents a "low-hanging fruit" intervention that can reduce treatment burden and may improve resident well-being.[25]

The primary strength of our study is that it is the first to examine fingerstick frequency stratified by cognitive impairment status across NHs nationally. Individuals with moderate/severe cognitive impairment represent an important subgroup at high risk for adverse events and are increasingly becoming a focus for deprescribing interventions. A few limitations should be acknowledged. First, VA NHs differ from non-VA NHs, including a mostly male population (98%). Subsequent studies should replicate our findings in non-VA NHs, focusing on fingerstick monitoring in older women and at later timepoints after NH admission. Second, few NH residents were on newer GLMs, such as SGLT2i and GLP-1 agonists. This may reflect our study's time-period and VA-specific formulary rules. As our study combined these residents with those receiving sulfonylureas, we cannot assess fingerstick frequency for residents on these newer GLMs. Finally, we were unable to explore potentially legitimate reasons for more intensive fingerstick monitoring among individuals with moderate/severe cognitive impairment, such as erratic food intake. Future research should explore how often NH residents with moderate/severe cognitive impairment require more frequent fingerstick monitoring.

In summary, fingerstick glucose monitoring in NH residents occurs more frequently than generally recommended by guidelines across all levels of cognitive impairment. Our results

indicate that intensity of glycemic control is not being adequately decreased for NH residents with cognitive impairment. Given the potential for patient burdens and harms, additional research is needed to investigate whether fingerstick frequency can be safely decreased in tandem with short-acting insulin use in cognitively impaired NH residents with T2DM.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Sponsor's Role:

The views expressed in this article are those of the authors and do not necessarily represent the views of the Veterans Affairs or the United States government.

References:

1. Newton CA, Adeel S, Sadeghi-Yarandi S, et al. Prevalence, quality of care, and complications in long term care residents with diabetes: a multicenter observational study. J Am Med Dir Assoc. 2013;14(11):842–846. doi:10.1016/j.jamda.2013.08.001 [PubMed: 24055534]

2. Dybicz SB, Thompson S, Molotsky S, Stuart B. Prevalence of diabetes and the burden of comorbid conditions among elderly nursing home residents. Am J Geriatr Pharmacother. 2011;9(4):212–223. doi:10.1016/j.amjopharm.2011.05.001 [PubMed: 21659006]

3. Zarowitz B, Allen C, O'Shea T, Dalal MR, Haumschild M, DiGenio A. Type 2 diabetes mellitus treatment patterns in U.S. nursing home residents. Postgrad Med. 2015;127(5):429–437. doi:10.1080/00325481.2015.1035621 [PubMed: 25850712]

4. Munshi MN, Florez H, Huang ES, et al. Management of diabetes in long-term care and skilled nursing facilities: a position statement of the american diabetes association. Diabetes Care. 2016;39(2):308–318. doi:10.2337/dc15-2512 [PubMed: 26798150]

5. American Diabetes Association. 12. Older Adults: Standards of Medical Care in Diabetes-2021. Diabetes Care. 2021;44(Suppl 1):S168–S179. doi:10.2337/dc21-S012 [PubMed: 33298423]

6. American Diabetes Association. (13) Diabetes care in the hospital, nursing home, and skilled nursing facility. Diabetes Care. 2015;38 Suppl:S80–85. doi:10.2337/dc15-S016 [PubMed: 25537715]

7. Mallery LH, Ransom T, Steeves B, Cook B, Dunbar P, Moorhouse P. Evidence-informed guidelines for treating frail older adults with type 2 diabetes: from the Diabetes Care Program of Nova Scotia (DCPNS) and the Palliative and Therapeutic Harmonization (PATH) program. J Am Med Dir Assoc. 2013;14(11):801–808. doi:10.1016/j.jamda.2013.08.002 [PubMed: 24074961]

8. Lipska KJ, Ross JS, Miao Y, Shah ND, Lee SJ, Steinman MA. Potential Overtreatment of Diabetes Mellitus in Older Adults With Tight Glycemic Control. JAMA Internal Medicine. 2015;175(3):356–362. doi:10.1001/jamainternmed.2014.7345 [PubMed: 25581565]

9. Petrillo LA, Gan S, Jing B, Lang-Brown S, Boscardin WJ, Lee SJ. Hypoglycemia in Hospice Patients With Type 2 Diabetes in a National Sample of Nursing Homes. JAMA Internal Medicine. 2018;178(5):713–715. doi:10.1001/jamainternmed.2017.7744 [PubMed: 29279891]

10. McCoy RG, Lipska KJ, Yao X, Ross JS, Montori VM, Shah ND. Intensive Treatment and Severe Hypoglycemia Among Adults With Type 2 Diabetes. JAMA Internal Medicine. 2016;176(7):969–978. doi:10.1001/jamainternmed.2016.2275 [PubMed: 27273792]

11. Pandya N, Wei W, Meyers JL, Kilpatrick BS, Davis KL. Burden of sliding scale insulin use in elderly long-term care residents with type 2 diabetes mellitus. J Am Geriatr Soc. 2013;61(12):2103–2110. doi:10.1111/jgs.12547 [PubMed: 24479142]

12. Barnhart C, McClymont K, Smith AK, Au-Yeung A, Lee SJ. "Everyone else gets ice cream here more often than i do—it burns me up" - perspectives on diabetes care from nursing home residents and their doctors. BMC Geriatrics. 2016;16(1):28. doi:10.1186/s12877-016-0199-0 [PubMed: 26813788]

13. Jeon SY, Shi Y, Lee AK, et al. Fingerstick Glucose Monitoring in Veterans Affairs Nursing Home Residents with Diabetes Mellitus. Journal of the American Geriatrics Society. 2021;69(2):424–431. doi:10.1111/jgs.16880 [PubMed: 33064879]

14. Lam K, Gan S, Nguyen B, Jing B, Lee SJ. Sliding scale insulin use in a national cohort study of nursing home residents with type 2 diabetes. Journal of the American Geriatrics Society. doi:10.1111/jgs.17771

15. Lega IC, Campitelli MA, Matlow J, et al. Glycemic Control and Use of High-risk Antihyperglycemic Agents Among Nursing Home Residents With Diabetes in Ontario, Canada. JAMA Internal Medicine. 2021;181(7):992–994. doi:10.1001/jamainternmed.2021.0022 [PubMed: 33646263]

16. Thorpe CT, Gellad WF, Good CB, et al. Tight Glycemic Control and Use of Hypoglycemic Medications in Older Veterans With Type 2 Diabetes and Comorbid Dementia. Diabetes Care. 2015;38(4):588–595. doi:10.2337/dc14-0599 [PubMed: 25592195]

17. Feil DG, Rajan M, Soroka O, Tseng CL, Miller DR, Pogach LM. Risk of Hypoglycemia in Older Veterans with Dementia and Cognitive Impairment: Implications for Practice and Policy. Journal of the American Geriatrics Society. 2011;59(12):2263–2272. doi:10.1111/j.1532-5415.2011.03726.x [PubMed: 22150156]

18. Khokhar B, Jette N, Metcalfe A, et al. Systematic review of validated case definitions for diabetes in ICD-9-coded and ICD-10-coded data in adult populations. BMJ Open. 2016;6(8):e009952. doi:10.1136/bmjopen-2015-009952

19. Chen G, Khan N, Walker R, Quan H. Validating ICD coding algorithms for diabetes mellitus from administrative data. Diabetes Res Clin Pract. 2010;89(2):189–195. doi:10.1016/j.diabres.2010.03.007 [PubMed: 20363043]

20. Thomas KS, Dosa D, Wysocki A, Mor V. The Minimum Data Set 3.0 Cognitive Function Scale. Med Care. 2017;55(9):e68–e72. doi:10.1097/MLR.0000000000000334 [PubMed: 25763665]

21. Saliba D, Buchanan J, Edelen MO, et al. MDS 3.0: brief interview for mental status. J Am Med Dir Assoc. 2012;13(7):611–617. doi:10.1016/j.jamda.2012.06.004 [PubMed: 22796362]

22. Morris JN, Fries BE, Mehr DR, et al. MDS Cognitive Performance Scale. J Gerontol. 1994;49(4):M174–182. doi:10.1093/geronj/49.4.m174 [PubMed: 8014392]

23. Morris JN, Fries BE, Morris SA. Scaling ADLs Within the MDS. The Journals of Gerontology: Series A. 1999;54(11):M546–M553. doi:10.1093/gerona/54.11.M546

24. Munshi MN, Slyne C, Segal AR, Saul N, Lyons C, Weinger K. Simplification of Insulin Regimen in Older Adults and Risk of Hypoglycemia. JAMA Intern Med. 2016;176(7):1023–1025. doi:10.1001/jamainternmed.2016.2288 [PubMed: 27273335]

25. Ouslander JG. Improving Drug Therapy for Patients With Life-Limiting Illnesses: Let's Take Care of Some Low Hanging Fruit. J Am Geriatr Soc. 2020;68(4):682–685. doi:10.1111/jgs.16395 [PubMed: 32129903]

Impact Statement:

Veterans Affairs nursing home residents receive frequent fingerstick glucose checks regardless of level of cognitive impairment. Our results suggest that cognitive status is a minor consideration in fingerstick glucose monitoring decisions, highlighting a potential opportunity to reduce burdens and harms for nursing home residents and staff. We certify that this work is novel.

Key Points:

- In this nationwide study of Veterans Affairs nursing homes, nursing home residents with diabetes received frequent fingerstick glucose checks regardless of the severity of their cognitive impairment.

- The type of glucose lowering medication received mattered the most in determining fingerstick frequency.

- While nursing home residents with more severe cognitive impairment tended to receive less frequent fingersticks across glucose lowering medication categories, the differences were relatively small.

Why Does this Paper Matter?

Fingersticks may hurt and burden nursing home residents and staff, especially among residents with more severe cognitive impairment. Determining the current frequency of fingerstick monitoring in nursing homes is the first step in identifying which nursing home residents may benefit from reduced fingerstick monitoring without compromising safety.

Mean Fingersticks on Day 31 by Cognitive Status and Medication Class

	Overall (n=13,637)	No GLM (n=6,258)	Metformin (n=973)	SU & other GLM (n=770)	Long-acting insulin (n=1,307)	Short-acting insulin (n=4,329)
Overall (n=13,637)	1.50	0.39	0.98	1.41	2.04	3.08
Cognitively Intact (n=7,215)	1.59	0.40	0.98	1.48	2.06	3.08
Mild impairment (n=4,528)	1.49	0.39	0.99	1.38	2.08	3.11
Moderate impairment (n=963)	1.30	0.38	1.11	1.27	1.79	2.99
Severe impairment (n=931)	1.11	0.33	0.80	0.89	1.92	3.03
Test of trend:	p = 0.003	p = 0.009	p = 0.35	p = 0.004	p = 0.19	p = 0.49

Figure 1:

Mean number of fingersticks on day 31 of nursing home admission across the glucose lowering medication and cognitive impairment groups

The reported p-values represent the probability values from the test of trend of the null hypothesis that there is no linear trend in mean fingersticks across the four cognitive status categories (cognitively intact, mild impairment, moderate impairment, and severe impairment) within each glucose lowering medication category.

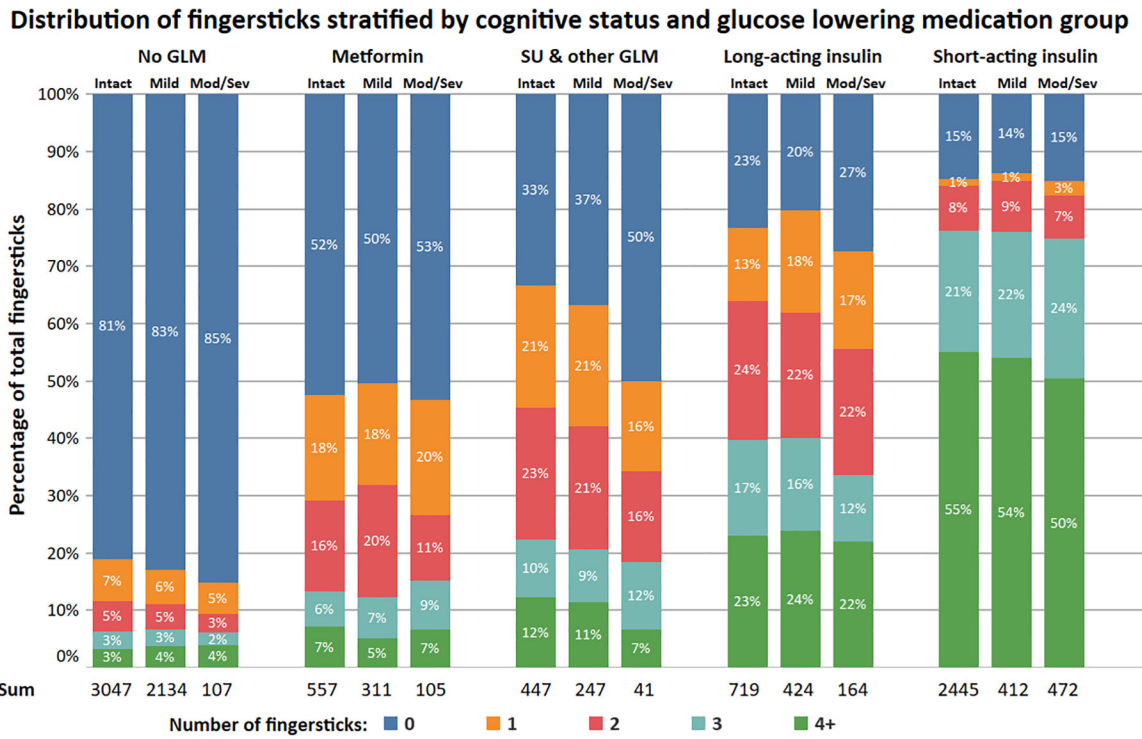Abbreviations: GLM, glucose lowering medication; SU, sulfonylurea

Figure 2.
Frequency distribution of the number of fingersticks on day 31 of nursing home admission across the glucose lowering medication categories and cognitive impairment groups[a]
Abbreviations: GLM, glucose lowering medications; mod, moderate cognitive impairment; sev, severe cognitive impairment; SU, sulfonylurea
[a] The moderate impairment and severe impairment groups were combined due to small numbers within each fingerstick category

Table 1:

Characteristics of Veterans Affairs nursing home residents with Type 2 diabetes across different levels of cognitive impairment

Patient characteristics	Overall (n=13,637)	Cognitive Function Scale category			
		Intact (n=7,215)	Mild (n=4,528)	Moderate (n=963)	Severe (n=931)
Age, mean (SD), years	75 (7.9)	74 (7.1)	76 (8.2)	78 (8.8)	78 (8.6)
Female, %	279 (2.1)	176 (2.4)	73 (1.6)	14 (1.5)	16 (1.7)
Race/ethnicity, %					
White	10237 (75.1)	5495 (76.2)	3451 (76.2)	666 (69.2)	625 (67.1)
Black	2650 (19.4)	1335 (18.5)	836 (18.5)	240 (24.9)	239 (25.7)
Other	750 (5.5)	385 (5.3)	241 (5.3)	57 (5.9)	67 (7.2)
Nursing home length of stay, median (IQR), days	67 (43–125)	63 (42–112)	69 (43–129)	82 (49–164)	86 (49–208)
Nursing home admission year					
2016	4180 (30.6)	2089 (29.0)	1446 (31.9)	319 (33.1)	326 (35.0)
2017	4108 (30.1)	2153 (29.8)	1352 (29.9)	309 (32.1)	294 (31.6)
2018	3242 (23.8)	1793 (24.9)	1039 (22.9)	207 (21.5)	203 (21.8)
2019	2107 (15.5)	1180 (16.3)	691 (15.3)	128 (13.3)	108 (11.6)
Baseline HbA1C, mean (SD)	7.0 (1.6)	7.0 (1.6)	7.0 (1.6)	6.9 (1.7)	6.8 (1.4)
Diagnoses (%)					
Congestive heart failure	6369 (46.7)	3390 (47.0)	2213 (48.9)	428 (44.4)	338 (36.3)
Hypertension	11890 (87.2)	6301 (87.3)	3966 (87.6)	831 (86.3)	792 (85.1)
Chronic kidney disease	6365 (46.7)	3330 (46.2)	2173 (48.0)	472 (49.0)	390 (41.9)
Chronic pulmonary disease	5977 (43.8)	3263 (45.2)	2043 (45.1)	348 (36.1)	323 (34.7)
Cancer	6189 (45.4)	3266 (45.3)	2123 (46.9)	422 (43.8)	378 (40.6)
ADL score (range 0–28)[a]					
< 6	3501 (25.7)	2428 (33.7)	1012 (22.4)	53 (5.5)	8 (0.9)
6–12	3461 (25.4)	2064 (28.6)	1214 (26.8)	118 (12.2)	65 (7.0)
13–18	3479 (25.5)	1792 (24.8)	1314 (29.0)	251 (26.1)	122 (13.1)
19+	3196 (23.4)	931 (12.9)	988 (21.8)	541 (56.2)	736 (79.0)

Abbreviations: ADL, activities of daily living; HbA1c, hemoglobin A1c; IQR, interquartile range; SD, standard deviation

[a]Scores were based on Minimum Data Set assessments with higher scores indicating greater functional impairments. For example, a score of 0 means the resident was independent in 7 ADLs, while a score of 28 means the resident was totally dependent in all 7 ADLs.

Table 2:

Number of participants in each glucose lowering medication and cognitive impairment category as assessed by the Cognitive Function Scale[a]

		Glucose lowering medication category				
		No GLM	Metformin	SU & other GLM	Long-acting insulin	Short-acting insulin
Cognitive Function Scale category	Overall cohort (n=13,637)	6,258 (45.9%)	973 (7.1%)	770 (5.6%)	1,307 (9.6%)	4,329 (31.7%)
	Cognitively intact (n=7,215)	3,047 (42.2%)	557 (7.7%)	447 (6.2%)	719 (10.0%)	2,445 (33.9%)
	Mild impairment (n=4,528)	2,134 (47.1%)	311 (6.9%)	247 (5.5%)	424 (9.4%)	1,412 (31.2%)
	Moderate impairment (n=963)	516 (53.6%)	55 (5.7%)	41 (4.3%)	90 (9.4%)	261 (27.1%)
	Severe impairment (n=931)	561 (60.3%)	50 (5.4%)	35 (3.8%)	74 (7.9%)	211 (22.7%)

Abbreviations: GLM, glucose lowering medications; SU, sulfonylurea.

[a] Percentages represent the proportion of participants on a specific glucose lowering medication within each cognitive impairment category.