

Status of Diabetes Management in the Nursing Home Setting in 2008: A Retrospective Chart Review and Epidemiology Study of Diabetic Nursing Home Residents and Nursing Home Initiatives in Diabetes Management

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Purpose: Diabetes mellitus (DM) is associated with significant morbidity and mortality, and can present with atypical signs and symptoms in elderly residents of nursing homes who often have altered functional and cognitive capacity representing a particularly challenging population to manage. Researchers conducted this study to better understand the current status of DM management in the long-term care facility from the perspective of the facility (use of guidelines, policies, and so forth) as well as that of a resident.

Methods: Thirteen nursing home facilities in 6 states were studied. A 13-question survey instrument was used to collect data from interviews of the directors of nursing and medical directors. A 26-question data collection form was also used to perform a retrospective chart review of studied residents.

Results: Data from the interview surveys showed that only 15% of facilities studied had a policy for the use of treatment algorithms to manage residents with DM. In addition, only 1 of 13 facilities had a quality improvement tool to evaluate compliance with current policies. In regard to hemoglobin A1C (A1C) testing, only 7.1% of facilities had a house policy in place. Furthermore, only 1% of studied residents had an established target for their A1C despite American Diabetes Association (ADA), American Geriatrics Society (AGS), and American Medical Directors Association (AMDA) guidelines recommending

target values and monitoring frequency for A1C testing. The survey instrument also found that just 30.8% of facilities had a policy in place for blood glucose monitoring. Data from the chart review shows that only 57% of residents in this study were taking aspirin or clopidogrel bisulfate, although prevention of cardiovascular disease (CVD) is recommended by the American Heart Association (AHA) and ADA in persons with diabetes who are older than 40. Data from this study indicate serious hypoglycemia occurs only occasionally in the nursing home because hypoglycemic episodes requiring hospitalization occurred in only 1% of studied residents. Furthermore, researchers found each of these residents were sent to the hospital only once in the preceding 6 months. One unanticipated finding of the study reports the incidence of delusions from patients' Minimum Data Set (MDS) was 87.63% compared with the national average of 3.7%.

Conclusion: Data obtained through this study demonstrates numerous opportunities for improvement in the quality of care for nursing home residents with DM. A multidisciplinary approach is required to properly manage this complex disease in a challenging elderly population. The development of protocols and tools that embrace the latest strategies and treatment algorithms for the management of DM in the geriatric resident are necessary, while implementation of a quality improvement tool can help facilities to further

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improve on management of DM in the long-term care setting. (J Am Med Dir Assoc 2009; 10: 354-360)

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According to Centers for Medicare and Medicaid's minimum data set (MDS) data, for the third quarter of 2008, the prevalence of diabetes mellitus (DM) in the nursing home setting nationwide was 32.1%.¹ DM has been associated with significant morbidity and mortality, and can be particularly challenging to manage in the geriatric population with altered functional and cognitive capacity. Furthermore, it is common for DM to present with atypical signs and symptoms in elderly patients.² Inadequate management of DM is associated with advanced age and multiple comorbidities, as well as being a resident of a nursing home.³ After review of the current published literature regarding the management of DM in long-term care, the researchers decided to study this topic to better understand the current status of this area of interest in 2008. To achieve this task, researchers evaluated components of DM management from both the perspective of the long-term care facility (use of guidelines, policies, and so forth) as well as from resident care.

METHODS

Thirteen nursing home facilities in 6 states (California, Connecticut, Florida, Illinois, Indiana, Massachusetts, and Texas) were studied. Each facility's consultant pharmacist conducted interviews and collected data retrospectively from 372 residents' medical records. Data sets included demographics, laboratory orders and monitoring, medication orders, dietary orders, adverse events, and MDS data. Consultant pharmacists were trained via a conference call in the 2 specific methods of data collection that would be used in this study. First, a 13-question survey instrument, using interview questions, was designed to collect data from 24 interviews of the directors of nursing (DON) and medical directors (MED.DIR). An effort was made, when possible, to interview these individuals separately to determine if they provided consistent responses about their awareness of DM management within their facility, and 85% of the interviews were conducted separately. Interviewees were provided with some of the questions at least 3 days in advance, where it was expected they would not know the answer from memory (hospitalization rates, and so forth). Comparisons of responses were made between the DON and MED.DIR, when interviewed separately. The second survey instrument was a 26-question data collection form used by the consultant pharmacist in a retrospective chart review of the studied residents. Collected data were blinded by the consultant pharmacist for resident and facility identifiers. The unidentified data were then sent on to the primary investigators for entry into a database. Data were analyzed and compared, when possible, to other comparative published data. Resident selection required a current diagnosis of DM (Type 1 or Type 2) in the medical record or a current order for a medication used in DM

management. No known diabetic patients were excluded. Multiple fields of data were collected from the residents' medical records including the most current MDS assessment.

RESULTS

For those residents studied, demographic information is illustrated in Table 1. There were insufficient data, in most of the medical records, to determine the onset date of DM. Therefore, admission dates of residents with DM were used to calculate the number of years living with DM. Residents were found to be living with DM from 1 month to 18 years, with a mean of 3.02 years.

The American Diabetes Association (ADA), American Geriatrics Society (AGS), and American Medical Directors Association (AMDA), as well as other published literature have set guidelines that address treatment standards regarding the management of DM in the long-term care setting.⁴⁻⁷ However, data from the interview surveys showed that only 2 (15%) of the 13 facilities studied had a policy for the use of treatment algorithms to manage residents with DM, and one of these facilities using guidelines had been using outdated 2003 guidelines from the American Association of Diabetes Educators (AADE). In addition, only one facility had a quality improvement tool to evaluate compliance with the policies in place. Researchers also evaluated if nursing staff had been in-serviced about DM within the past 2 years. It was found that 46% of interviewees reported having an in-service for nurses; however, 46% of interviewees were also not sure if nurses had been in-serviced and 8% stated nurses were not in-serviced on this topic in their facilities. Facilities were asked if they tracked outcome data related to DM management, and only 1 (8%) of the facilities reported tracking these data. This one facility reported that monthly audits of sliding scales, DM residents' conditions, and compliance with policy made it easier to assess the condition of patients and improved regulatory compliance. In addition,

Table 1. Resident Characteristics

Demographic	Findings
Gender	Female: 61.37% tcgqMale: 38.63%
Age	tcgqRange from: 35 to 102 years of age tcgqMean: 79 years old
Race	tcgqAfrican American: 9.73% tcgqNot African American: 90.27%
Most recent serum creatinine value	tcgqRange: 0.4 to 9 mg/dL tcgqMean: 1.25 mg/dL
Category of diabetes mellitus	tcgqType I: 10.2% tcgqType II: 89.9%

researchers evaluated MDS data and found that the latest MDS assessment was done as a result of a change in the resident's status secondary to DM in only 2% of residents studied.

Another area of focus in this study was to determine what policies were in place regarding hemoglobin A1C (A1C) testing in long-term care residents. According to the interview survey, only 7.1% of facilities had a house policy for A1C testing even though the ADA, AGS, and AMDA all have guidelines to suggest A1C target values and monitoring frequency. The general consensus from these organizations indicate the recommended target A1C is between 6% and 8%.⁴⁻⁶ The ADA has the most stringent guidelines in regard to A1C monitoring, suggesting that it be done every 6 months for those meeting treatment goals with a stable glycemic control, every 3 months in patients whose therapy has changed or are not meeting goals, and using point-of-care A1C testing for timely decisions on therapy changes, when needed. However, given that only 1% of studied residents had an established target for their A1C, facilities first need to set a resident-specific goal for A1C testing before being able to comply with current guidelines. General recommendations for older residents with DM suggest that A1C goals be individualized.^{5,8} An A1C goal of 7% in residents with good cognitive and functional status is appropriate and decreasing the A1C as close to normal (6%) as possible should be done in residents without significant hypoglycemia.⁶ However, a target of 8% may be appropriate in residents with a history of severe hypoglycemia, limited life expectancy, comorbid conditions, longstanding DM with minimal or stable microvascular complications, and others in whom the risks of intensive glycemic control appear to outweigh the benefits.^{5,6} When asked at what A1C values above which interviewees felt there was a need to reevaluate a resident's pharmacotherapy, responses ranged from less than 6% to greater than 8%. Despite the facilities' lack of policies, about 88% of residents' most recent A1C values obtained from the chart review were within established guidelines having been below 8%, as presented in Figure 1.

ADA guidelines suggest monitoring of capillary blood glucose (CBG) should be carried out 3 or more times daily for patients using multiple daily insulin injections or insulin pump therapy, but does not clearly define a frequency for

other patients with DM.⁴ AMDA guidelines are more stringent, suggesting twice-daily finger sticks 2 to 3 days of the week if residents are on oral therapy or 3 to 4 days of the week if the residents are receiving insulin regimens with 1 or 2 shots daily, and at least 4 times every day in residents receiving a minimum of 3 shots daily.⁶ However, both AMDA and ADA guidelines are in consensus that blood glucose monitoring should be individualized based on the particular needs and goals of each resident.^{4,6} Data from the interview surveys found that only 30.8% of facilities had house policies in place for blood glucose monitoring. The survey determined at which glucose levels interviewees believed warranted initiation of pharmacotherapy treatment or a change in current pharmacotherapy. Interviewees responded with values ranging from less than 100 to more than 400 mg/dL for random glucose and from less than 120 to more than 400 mg/dL for fasting glucose. Data from the chart review found that only 35% of residents had established glucose parameters indicating when nurses should alert the attending physician of serious hyperglycemia or hypoglycemia. Of these residents, the upper limit of glucose to notify physicians of hyperglycemia ranged from greater than 150 mg/dL to greater than 500 mg/dL as presented in Figure 2.

Lifestyle modifications such as dietary restrictions and exercise are particularly challenging in long-term care residents with DM. These patients are more likely to be insulin deficient and require pharmacologic treatment. The ADA and AMDA guidelines do not recommend dietary restrictions in the long-term care setting, as adequate nutrition is required to prevent adverse outcomes associated with malnutrition in this population.^{6,7} However, data from the chart reviews shows that 50% of residents in this cohort had restrictions on their diets. Elderly residents often have impaired exercise tolerance, and exercise may not be ideal for long-term care residents, as it is associated with potential risks such as cardiac ischemia, musculoskeletal injuries, and hypoglycemia in patients treated with insulin or insulin secretagogues.^{9,10} For these reasons, elderly residents are often required to take multiple oral medications, insulin, or a combination of these to properly manage their DM. Treatment medication use for studied residents is presented in Table 2 and includes

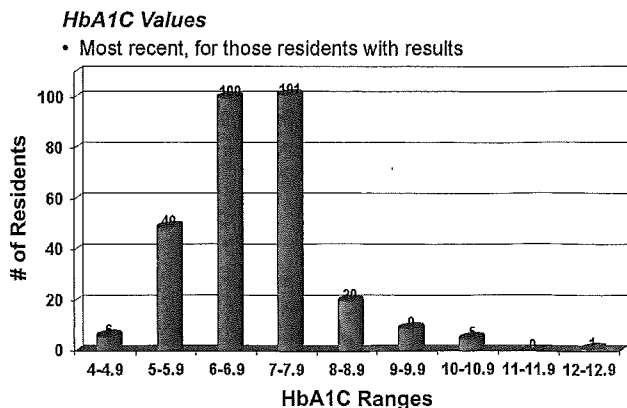


Fig. 1. HbA1C Values.

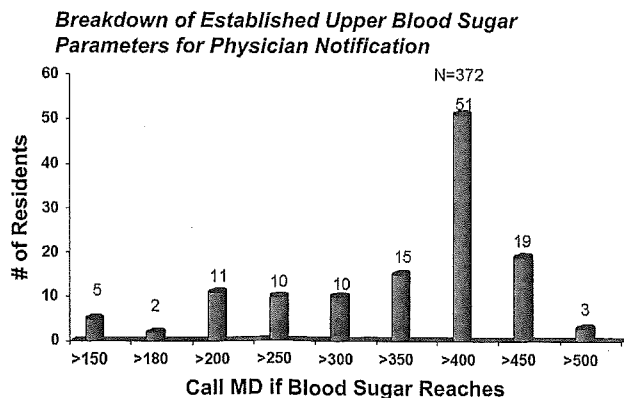


Fig. 2. Breakdown of Established Upper Blood Sugar Parameters for Physician Notification.

Table 2. DM Medication Use: Number of Medications Ordered (Includes All Oral Antidiabetic Agents and Insulin)

No Meds	1 DM Med	2 DM Meds	3 DM Meds	4 DM Meds	5 DM Meds
20 residents 5.38%	131 residents 35.22%	162 residents 43.55%	52 residents 13.98%	4 residents 1.08%	3 residents 0.81%

DM, diabetes mellitus.

oral medications as well as insulin. AMDA guidelines recommend initiating insulin when lifestyle modifications and oral agents fail or oral agents are contraindicated. AMDA guidelines also state that insulin may be a first-line agent when random blood glucose levels are greater than 180 mg/dL after several readings.⁶ Data from the chart review showed that 58% of residents in this study were using insulin to manage their DM.

AMDA guidelines do not suggest using sliding-scale insulin (SSI) because of its retrospective way of treating hyperglycemia and the lack of evidence to support its efficacy in meeting physiologic needs of the body.⁷ SSI regimens lack basal coverage of hepatic glucose output, and only serve to reactively treat existing hyperglycemia. Basal-bolus insulin regimens more closely mimic the normal physiologic insulin requirements and are becoming the preferred strategy for long-term insulin therapy.¹¹ Pandya et al¹¹ examined the use of SSI regimens in nursing homes, and found that 54% of residents who were initiated on insulin were started on an SSI regimen. Of the patients who were not initially started on SSI, 33% of them were later switched to a sliding-scale regimen. At follow-up, 83% of patients initiated on SSI remained on their initial regimen. Similarly, 71% of the residents using insulin in our study were doing so on a sliding-scale basis. The interview survey asked if facilities had a policy in place regarding sliding-scale insulin. Eleven of thirteen facilities (85%) stated they did not have a policy in place, whereas the DON and MED.DIR replied with conflicting responses in the 2 other facilities. However, 7 facilities allowed SSI if residents were admitted on it, and 6 facilities allowed SSI with absolutely no restrictions in place.

The American Heart Association (AHA) and ADA recommend aspirin therapy in persons with diabetes over the age of 40 who have no contraindications to its use for the prevention of cardiovascular disease (CVD). In addition, other antiplatelet agents should be used as an alternate if there is a contraindication to the use of aspirin.¹² However, only 57% of residents in this study were taking aspirin or clopidogrel bisulfate despite the fact that all but 1 of the residents was older than 40. Additionally, the AHA and ADA recommend lipid-lowering therapy in persons with DM over the age of 40 with the primary target of a LDL-C level lower than 100 mg/dL to decrease the risk of major coronary associated with hyperlipidemia.¹² Furthermore, the ADA recommends adding this pharmacological treatment in residents older than 40 with other CVD risk factors regardless of baseline LDL values.⁴ However, only 44% of residents' charts noted receiving a medication for hyperlipidemia.

Safety of metformin and the risk of lactic acidosis, especially in the elderly, is a topic of much discussion. Serum

creatinine is commonly used as the marker of renal function to assess the safe use of the drug. Because renal function declines in the elderly relative to constant serum creatinine values, appropriate dosing guidelines in relation to estimated glomerular filtration rate (GFR) are desirable.^{13,14} Conservative recommendations state that metformin use should be contraindicated with GFR lower than 60 mL/min, although other recommendations allow for cautious use with GFR as low as 30 mL/min.¹³⁻¹⁶ Patients older than 80 should not be initiated on metformin therapy without demonstrating normal clearance, and the maximum dose used in this population may be reduced in comparison with younger individuals.¹⁷ It was found that 29% of residents taking metformin had a GFR lower than 60 mL/min and may require careful assessment of their therapy.

Despite findings from Bertoni et al¹⁸ that hypoglycemia was the most frequent metabolic complication in elderly residents with diabetes, data from this study is contrary. The survey found that 46% of interviewees reported no episodes of hypoglycemia in their facilities within the preceding 6 months. Furthermore, 75% of interviewees reported that, in the preceding 6 months, no residents treated with insulin were sent to the emergency room (ER) for hypoglycemia. The chart review was also used to evaluate hospital visits for hypoglycemic episodes, and found that only 1% of residents studied were sent to the hospital as a result of symptoms of hypoglycemia. For this group who were sent to the hospital for hypoglycemia, researchers found that each of these residents were sent only once during the previous 6-month period. Upon review of residents' medical records, it was found that only 6% of residents studied had symptoms of hypoglycemia noted. In addition, facilities had to use the emergency drug box to manage symptoms of hypoglycemia in only 1% of residents during the preceding 12 months.

Upon review of Section J of the patients' MDS, one unanticipated finding of the study suggests that the incidence of delusions within the group of residents studied was 87.63%. However, MDS data from the Centers for Medicare and Medicaid Services' (CMS) Web site, third quarter of 2007, reports that only 3.7% of all residents nationwide (with and without DM) exhibited delusions.¹⁹ Our study results indicated serious episodes of hypoglycemia were not as prevalent as others have reported¹⁸; hypoglycemic unawareness may provide one hypothesis for the increased prevalence of delusions reported on the MDS in this patient population. Hypoglycemic unawareness occurs when individuals do not exhibit cardinal signs of hypoglycemia (as defined by AMDA guidelines), and instead manifest with behavioral disturbances, which can progress to seizures, coma, and even death if untreated.²⁰ Although these behavioral changes may lead to additional

morbidity and mortality, if the hypoglycemic condition persists, these symptoms may be classified as a delusion, or other behavioral conditions, and hypoglycemia may remain unrecognized. In addition, comorbidities such as a urinary tract infection (UTI) may account for an increase in reporting of delusions. UTIs may be associated with mental status changes, are commonly encountered in elderly residents of nursing homes, and often have atypical clinical manifestations making them easily overlooked.²¹ Researchers used MDS data to evaluate the prevalence of complications of DM in regard to skin conditions. It was found that 10.76% of the studied residents had skin ulcers, and 3% of residents had a wound that was infected.

Despite widespread use of MDS data in various studies, recent publications bring the accuracy of certain data elements into question.²²⁻²⁴ Underreporting of behavioral symptoms in the MDS compared with measurements done with research instruments has recently received attention.²⁴ Based on our inclusion criteria for residents (including a diagnosis of DM [Type 1 or Type 2] or having an order for a medication used to manage DM), we found an inconsistency with the number of residents diagnosed with DM in MDS assessments. The percentage of studied residents with a diagnosis of DM, according to the facility's MDS data, was 96.24% instead of 100%. This difference may provide some insight into the accuracy of the MDS data from the facilities studied.

DISCUSSION

Current published literature suggests that clinical outcomes can be improved in long-term care residents with the development and oversight of protocols and tools to properly manage DM in this population.^{7,25,26} Furthermore, medical directors face daily pressures of dealing with acute medical issues and may not have sufficient time to set standards of DM management that could improve the care and outcomes in nursing home residents with DM. The minimal use of appropriate, published guidelines by the studied facilities indicates an opportunity for facilities to improve upon management of DM. Additionally, increasing the number of staff in-services may be beneficial in updating nurses on current issues regarding DM management because less than half of interviewees reported that a nursing in-service had taken place in their facility within the preceding 2 years. Despite recommendations of published guidelines to avoid dietary restrictions in the studied population,^{6,9} the study data suggest dietary restrictions are commonly used in this population. In addition to these aspects, tracking outcome data was found to be a useful tool in the 8% of facilities that compiled this data. Bertoni et al¹⁸ suggest that elderly residents can benefit from Medicare data being used as a surveillance tool for monitoring trends in diabetes-related morbidity and mortality over time. Outcome data can be further used to make it easier to assess the condition of residents as well as improving regulatory compliance. These improvements were reported by the one facility that tracked outcome data and used it to audit sliding scales and DM residents' conditions on a monthly basis.

Although 88% of residents' most recent A1C values were below 8% and fell within established guidelines, facilities can further increase this number by setting policies in regards to monitoring frequency and establishing resident-specific target goals. Alam et al²⁷ suggest that goals and frequency of A1C monitoring may require modification in nursing home residents with DM who are frail and elderly with substantial DM-related comorbidities as well as limited cognitive and physical functioning. However, given that only 1% of residents within the study had a target for their A1C, an individualized target first needs to be set for each resident before being able to follow the recommended guidelines. Despite the recommendation that monitoring of blood glucose should be individualized based on particular needs and goals of each resident by both the ADA and AMDA,^{6,9} there is concern as to how and how often blood sugar trends are reviewed. In addition, it was found that the upper limit of blood glucose values that required notification of the doctor on call was as high as greater than 500 mg/dL, suggesting the prescribers do not want to receive phone calls for every mild elevation. However, maintaining serum glucose levels within recommended parameters is a particular concern in elderly patients to prevent hyperosmolar states, infection, and other preventable complications. Cox et al²⁸ reported that cognitive deficits will be exhibited by more than half of patients in a battery of tests at blood glucose levels greater than 270 mg/dL. The authors suggest that blood glucose levels outside the range of 72 to 270 mg/dL may result in cognitive changes. Nevertheless, 68% of residents studied had physician notification limits set that were greater than 400 mg/dL. Mader et al²⁵ developed a protocol for capillary blood glucose (CBG) testing in nursing home and rehabilitation settings that allowed providers to manage residents in a moderate control group, minimal control group, or a provider-defined control option. They found CBG testing improved management of DM in the long-term care setting and concluded this protocol would be successful in other such facilities.

Although 85% of facilities did not have a policy in place regarding the use of SSI, 7 facilities allowed its use if residents were admitted on it, whereas 6 facilities allowed it without having a policy. Furthermore, there is an overwhelming amount of evidence showing that SSI is neither effective in meeting physiologic needs nor efficient in the inpatient setting.^{6,11} However, 71% of study residents treated with insulin had an order for sliding scale insulin. DM management in the nursing home can be improved if facilities follow evidence-based recommendations that have shown initiating basal insulin first and advancing to basal-prandial insulin replacement, if needed, is a safe and effective way to manage hyperglycemia.²⁹

Management of DM in the long-term care facility can be further improved by following guidelines for the prevention of CVD in residents with DM. Despite AHA/ADA recommendations, only 57% of residents were on aspirin therapy and only 44% were taking a medication for hyperlipidemia. Research has shown aspirin's efficacy in reducing cardiovascular deaths.¹² In addition, there is evidence that nursing home residents with DM receive the greatest mortality

benefit from treating hypertension first, lipids second, and blood glucose third.^{26,30} Treating hyperlipidemia can provide mortality benefit within 2 to 4 years compared to approximately 8 years with aggressive glucose management.²⁶ The prevalent use of metformin in renal-compromised residents (29%) provides an opportunity for facilities to improve management of DM by properly monitoring renal function in residents prescribed this medication.

Current published literature suggests hypoglycemia is a major concern in elderly people with DM.^{18,31,32} Researchers found that only 3 of the 372 residents studied were each sent to the hospital, for treatment of hypoglycemia, only once during the preceding 6 months. One explanation for this discrepancy is that comorbidities, and not hypoglycemia, are responsible for most hospitalizations in this patient population. Evidence supporting this conclusion comes from a study by Ben-Ami et al.³² They studied 102 diabetic patients hospitalized with drug-induced hypoglycemia. Five of these patients died, all of whom suffered from serious comorbidities. Amiel et al.³³ suggest that hypoglycemia has substantial cost implications regarding direct hospital costs as well as indirect costs associated with inability to work. However, our study showed that less than 1% of residents were admitted to the hospital for hypoglycemia, and in addition indirect costs are less of a concern in long-term care facilities because residents are no longer part of the work force. Holstein et al.³¹ conducted a prospective population-based study and found the rate of severe hypoglycemia to be 3.8 episodes per 100 patients per year in Type 1 DM and 0.4 episodes per 100 patients per year in Type 2 DM. Given Holstein et al's results, the low incidence of hypoglycemia in our study is not unexpected as almost 90% of subjects had Type 2 DM.

Although MDS data from the third quarter of 2007 reports that 3.70% of residents nationwide exhibited delusions, MDS data specific to residents in our study was inconsistent with national data showing a rate of 87.63%.¹⁹ As previously noted, the researchers in this study provided possible explanations for this unanticipated finding. Mental status changes may be associated with poor glycemic control.²⁸ Nursing home patients are also prone to comorbidities such as UTIs.²⁰ Boyko et al.³⁴ examined whether the presence of DM has an effect on the incidence of UTIs in postmenopausal women and confirmed that DM is associated with a higher risk of having an acute symptomatic UTI. In addition, Midthum et al.³⁵ found the most significant symptoms that influenced the diagnosis of UTI, as well as choice of antibiotic therapy, was a decline in mental or functional status.

A limitation of this study is that the interview survey instrument used solicited subjective responses from the DON and MED.DIR at each facility. In addition, the chart review may have provided an incomplete picture of each resident's current condition if health care professionals failed to thoroughly document in the residents' medical records.

CONCLUSION

DM is a particularly complex disease, requiring a multidisciplinary management approach in the long-term care setting. Data obtained through this study clearly demonstrate

numerous opportunities for improvement in the quality of care for nursing home residents with DM. DM requires management strategies that may include diet, medication, and exercise. Facilities should involve all disciplines including nurses, nurse aides, attending physicians, mid-level prescribers, consultant pharmacists, and dieticians working together to obtain, review, and implement protocols. There needs to be buy-in from the top (administrator, Director of Nursing Services, and Medical Director) down to the unit staff. Facilities should develop tools for their facility that adhere to the latest strategies and treatment algorithms for the management of DM in the geriatric resident. Practice guidelines requiring aggressive interventions and tight diabetic control should not be applied to the entire population of nursing home residents. Clinicians should individualize DM treatment goals for each nursing home resident and communicate that plan by documentation in the medical record. Finally, a quality improvement program should be developed and implemented that will allow a facility to track utilization of their established DM management plan and identify both successes and continued areas requiring further improvement. During the interviews, when DONs were asked to express any frustrations regarding the management of DM in their facilities, one response was, "Too many different approaches—standardization would be helpful (old guidelines, new guidelines)." The authors of this study agree that planned management strategies are needed for the treatment of DM in nursing home.

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