Medication Management: Diabetes Mellitus

Glucose is the brain's main source for fuel and is the main energy source for muscle and tissue cells. Diabetes Mellitus (DM) occurs when insulin (hormone produced by beta cells in the pancreas to help glucose get into body cells for energy) is no longer produced, the pancreas does not produce enough, or the body cells cannot use the insulin properly. The glucose stays in the blood causing elevated blood glucose levels because it cannot reach the cells.

Elevated blood glucose levels over time increase the risk for complications such as diabetic neuropathy (weakness, numbness, and pain from nerve damage), diabetic nephropathy (deterioration of kidney function), diabetic retinopathy (damage to blood vessels in the tissue at the back of the eye), cataract, glaucoma, stroke, cardiovascular disease, peripheral vascular disease, and cerebrovascular disease. Other complications may include reduced ability for wounds to heal, foot damage, skin and mouth infections, hearing impairment, depressive symptoms, and DM may increase risk for dementia. Facility staff must understand the difference between the types of DM to ensure appropriate measures are taken to manage blood glucose levels and prevent complications. Interventions should be indicated on the plan of care.

Comparing Type 1 and Type 2 Diabetes Mellitus

Type 1 DM

- Cannot be prevented or cured
- The body does not create any or enough insulin
- Causes are unknown, genetics may play a role
- Immune system attacks and destroys cells in the pancreas that make insulin
- Can be diagnosed at any age but more common in children and young adults
- Requires insulin replacement for life

Type 2 DM

- Can be delayed or prevented through lifestyle modifications

- The body does not create enough insulin or develops insulin resistance and cannot use insulin properly
- Causes include genetics, aging, inactivity, obesity, and more
- Requires insulin as needed, non-insulin medications may also be used
- Can develop at any age
- Accounts for 90% to 95% of all diabetes cases

Both Type 1 and Type 2 DM

- Can cause serious health problems and complications
- Requires a healthy lifestyle and medical supervision
- Symptoms include thirst, frequent urination, and blurry vision

Management of Type 1 and Type 2 Diabetes Mellitus

Many types of insulin and non-insulin medications are used to manage DM. There are several classes of oral and injectable non-insulin medications that work in different ways to lower blood glucose.

The physician/health care provider will prescribe the best insulin(s), non-insulin medication(s), or combination regimen that is individualized for each person based on several factors including but not limited to:

- Type of DM
- Diabetes duration
- Level of activity
- Level of physical ability/level of dependence
- Level of cognition
- Amount and types of foods consumed
- Fluid intake
- Ability to manage blood glucose levels
- Age
- How long it takes the body to absorb insulin
- How long insulin stays active in the body
- Insulin resistance
- Comorbidities
- Renal/cardiovascular complications
- Number and types of medications prescribed
- Risk for infections
- Depression/mental illnesses
- Adherence to therapy
- Life expectancy
- Quality of life goals

Insulin Therapy

Insulin is classified by how fast and how long it works in the body. **Onset** is how quickly insulin lowers your blood glucose. **Peak time** is when insulin is at maximum strength. **Duration** is how long insulin works to lower blood glucose. Insulin may have different onset, peak, and duration of action for different individuals, dosages, times of day, circumstances, and injection sites.

Insulin types include:

- **Rapid acting** insulin is usually taken right before a meal and often used with longer acting insulin. The onset is 15 minutes with peak time of 1 hour and duration of 2 to 4 hours.
- **Rapid acting inhaled** insulin is usually taken right before a meal and is often used with injectable long-acting insulin. The onset is 10 to 15 minutes with peak time of 30 minutes and duration of 3 hours.
- **Regular/short acting** insulin is usually taken 30 to 60 minutes before a meal. The onset is 30 minutes with peak time of 2 to 3 hours and duration of 3 to 6 hours.
- **Intermediate acting** insulin covers insulin needs for half a day or overnight and is often used with rapid- or short-acting insulin. The onset is 2 to 4 hours with peak time of 4 to 12 hours and duration of 12 to 18 hours.
- **Long acting** insulin covers insulin needs for about a full day and is often used, when needed, with rapid- or short-acting insulin. The onset is 2 hours does, does not peak, and duration of up to 24 hours.
- **Ultra-long acting** insulin provides steady insulin for long periods. The onset is 6 hours, does not peak, and duration is 36 hours or longer.
- **Premixed insulin** combines intermediate- and short-acting insulin and is usually taken 10 to 30 minutes before breakfast and dinner. The onset is 5 to 60 minutes, peak time varies, and duration is 10 to 16 hours.

Refer to the Centers for Disease Control and Prevention for a table listing the types of insulin and additional information. Types of Insulin | Diabetes | CDC

The American Diabetes Association provides extensive guidance for diabetes care. Simplification of Complex Insulin Therapy is available in the Standards of Care in Diabetes-2024. 13. Older Adults: Standards of Care in Diabetes—2024 | Diabetes Care | American Diabetes Association (diabetesjournals.org)

Non-insulin Medication Classes to Manage Type 2 DM

- Biguanides (Metformin)
- Sulfonylureas second generation (Glimepiride, Glipizide, Glyburide)
- Thiazolidinediones "TZD's" (Pioglitazone)
- DPP-4 inhibitors (Algoliptin, Linagliptin, Saxagliptin, Sitagliptin)
- GLP-1 Receptor Agonists (Dulaglutide, Exenatide, Exenatide extended release, Liraglutide, Semaglutide)
- Dual GIP and GLP-1 receptor agonist (Tirzepatide)
- Sodium-Glucose Cotransporter 2 inhibitors (SGLT2 inhibitors) (Canagliflozin, Dapagliflozin, Empagliflozin, Ertugliflozin)
- Meglitinides (Insulin Secretagogues) (Nateglinide, Repaglinide)
- Alpha Glucosidase Inhibitors "AGI's" (Acarbose, Miglitol)
- Dopamine Agonists (Bromocriptine)
- Bile Acid Sequestrant (Colesevelam)
- Amylin-mimetic (Pramlintide)

Type 1 DM requires management with insulin. Type 2 DM may or may not include the use of insulin. Managing Type 2 DM may require multiple drug combinations that include medications to address comorbidities such as cardiovascular or renal disease.

Clinicians may refer to the American Diabetes Association Standards of Care in Diabetes – 2024 that includes current clinical practice recommendations.

9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2024 | Diabetes Care | American Diabetes Association

Sliding Scale Insulin (SSI) Should Not Be the Primary Means for Long-Term Control of Blood Glucose

Sliding scale insulin (SSI) is an insulin regimen that contains only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin.

SSI has been widely used as the primary diabetes management in long-term care facilities.

Numerous studies have shown the sole use of SSI to manage DM long term is not best practice and several professional organizations have produced guidelines to

improve the quality of care provided to people living in long-term care facilities. The guidelines do not recommend specific medications or insulin regimens but do recommend transitioning to scheduled basal insulin (and prandial as required) shortly after admission if only prescribed SSI. The guidelines serve as a resource for practitioners to use when determining individualized therapy to achieve optimal blood glucose control in this population.

From the American Medical Directors Association (AMDA)

"SSI is a reactive way of treating hyperglycemia after it has occurred rather than preventing it. Good evidence exists that SSI is neither effective in meeting the body's physiologic insulin needs nor is it efficient in the LTC setting in medically stable individuals. Use of SSI is associated with more frequent glucose checks and insulin injections, leads to greater patient discomfort and increased nursing time and resources. With SSI regimens, people with diabetes may be at risk from wide glucose fluctuations or hypoglycemia when insulin is given when food intake is erratic. SSI does not reduce glucose fluctuations. (AMDA, paltc.org)" The sole use of SSI is not recommended and has been added to the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults.

Guidelines and Position Statements

The full guidelines and position statements for managing diabetes in long-term care (LTC) populations from the American Medical Directors Association (AMDA), Americans with Diabetes Association (ADA), the International Association of Gerontology and Geriatrics (IAGG), and the European Diabetes Working Party for Older People (EDWPOP) are available for review using the links below. Some may require membership or fees to view/purchase.

- Management of Diabetes in Long-term Care and Skilled Nursing Facilities: A Position Statement of the American Diabetes Association | Diabetes Care | American Diabetes Association
- Diabetes Mellitus in Older People: Position Statement on behalf of the International Association of Gerontology and Geriatrics (IAGG), the European Diabetes Working Party for Older People (EDWPOP), and the International Task Force of Experts in Diabetes - Journal of the American Medical Directors Association
- Diabetes Management CPG | AMDA | The Society for Post-Acute and Long-Term Care Medicine

Summary of Recommendations from AMDA, ADA, IAGG, EDWPOP

- Management of DM among older adults living in LTC facilities is challenging due to heterogeneity in this population. Careful evaluation of medical, psychosocial, functional abilities, social domains, and overall health is needed before developing goals and treatment strategies for diabetes management.
- Diabetes management in people living in LTC facilities requires different approaches because of unique challenges faced by this population and the workings of those facilities.
- Hypoglycemia risk is the most important factor in determining glycemic goals due to the catastrophic consequences in this population. Episodes of hypoglycemia should be ascertained periodically and addressed as needed. This includes during routine visits.
- Continuous glucose monitoring is recommended to reduce hypoglycemia for older adults with Type 1 DM and should be considered for those with Type 2 DM to improve glycemic outcomes and reduce hypoglycemia.
- Consider the use of automated insulin delivery systems and other advanced delivery devices such as connected pen for older adults with Type 1 DM to reduce the risk of hypoglycemia based on individual ability and support system.
- Screen for geriatric syndromes (e.g., cognitive impairment or dementia, depression, urinary incontinence, falls, persistent pain, and frailty), and polypharmacy.
- Individualize care goals, management, and treatment for each person.
- Simplified treatment regimens are preferred and better tolerated.
- Sole use of SSI should be avoided.
- Avoid insulin regimens that include only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin.
- Medications with low risk of hypoglycemia are preferred in older adults with Type 2 DM, especially in those with hypoglycemia risk factors.
- Avoid overtreatment of diabetes in older adults.
- Liberalized diet plans have been associated with improvement in food and beverage intake in this population. To avoid dehydration and unintentional weight loss, restrictive therapeutic diets should be minimized. Meals tailored to a person's culture, preferences, and personal goals may increase quality of life, satisfaction with meals, and nutrition status.

- Physical activity and exercise are important and should depend on the current level of the person's functional abilities.
- Care transitions are important times to revisit DM management targets, perform medication reconciliation, provide patient and caregiver education, reevaluate the person's ability to perform DM self-care behaviors, and have close communication between transferring and receiving care teams to ensure patient safety and reduce readmission rates.
- At the time of admission to a facility, transitional care documentation should include the current meal plan, activity levels, prior treatment regimen, prior self-care education, laboratory tests (including A1C, lipids, and renal function), hydration status, and previous episodes of hypoglycemia (including symptoms and person's ability to recognize and self-treat).
- People admitted to LTC facilities are not seen daily by a physician, nurse practitioner or physician assistant. Successful diabetes care needs to include a dedicated interprofessional team that may be composed of those practitioners, as well as RNs, LVNs, CNAs, diabetes educators, dietitians, food service managers, consultant pharmacists, physical therapists, and/or social workers.
- Provide adequate DM detection training and institutional assessment and protocols to LTC staff who may be operating without the presence of a practitioner for prolonged periods. Training should include use of continuous glucose monitoring devices, insulin pumps, and advanced insulin delivery systems.
- Consider treatment plan simplification and deintensification/deprescribing in older adults with DM. Decrease the complexity of treatment and a higher threshold for additional diagnostic testing including capillary monitoring of glucose should be considered.
- Goals for diabetes management at end of life need to focus on promoting comfort; controlling distressing symptoms (including pain, hypoglycemia, and hyperglycemia); avoiding dehydration; avoiding emergency room visits, hospital admissions, and institutionalization; and preserving dignity and quality of life.
- Consider decreasing complexity of treatment and a higher threshold for additional diagnostic testing including monitoring of glucose at end-of-life
- It is important to respect a person's right to refuse treatment and withdraw oral hypoglycemic agents and/or stop insulin if desired during the end-of-life care.

Goals and Management of Diabetes Mellitus in LTC

Older adults with DM have higher rates of functional disability, accelerated muscle loss, coexisting illnesses (hypertension, chronic kidney disease, coronary artery disease, stroke), and premature death compared to those without diabetes.

DM goals and management should be individualized for each person based on comorbidities and several issues should be considered when using glucose-lowering agents in the long-term care population.

Older adults with DM should be screened for diabetes complications frequently since complications can arise quickly. Treatment goals and therapeutic approaches may need to be adjusted as needs change.

Clinicians must understand the characteristics, challenges, and barriers related to the older population living in long-term care facilities to individualize diabetes management while lowering the risk of hypoglycemia and improving quality of life.

Management of DM among older adults residing in LTC facilities requires different approaches because of unique challenges faced by this population and how the facilities function.

People living in LTC facilities can have diversity in:

- Stages of disease
- Comorbidities
- Complications from multiple coexisting medical conditions
- Number of medications prescribed and drug interactions
- Changes in health impacting glucose levels
- Levels of cognitive functioning
- Level of physical impairment
- Self-care ability
- Life expectancy

Some of the challenges of managing DM in people living in LTC facilities include:

- Risk of adverse drug events
- Irregular and unpredictable meal consumption
- Inadequate staffing
- Rapid change in condition
- Frequent transitions in care

Staff must be able to recognize a change of condition in a person living in a NF, report, document, and act on the change. This may require more frequent monitoring, physician/clinician notification, implementation of additional interventions, or possible transfer to a higher level of care.

Careful evaluation of each person's comorbidities and overall health is essential in developing individualized goals and treatment strategies for diabetes management.

The interdisciplinary team should systematically address each person individually to develop a DM care management plan that should be reviewed frequently and updated as needed.

References

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Downloadable Resources

Choosing Wisely | AMDA | The Society for Post-Acute and Long-Term Care Medicine
Fifteen Things Physicians and Patients Should Question in Post-Acute and Long-Term Care

American Diabetes Association Standards of Care in Diabetes – 2024
Volume 47 Issue Supplement_1 | Diabetes Care | American Diabetes Association (diabetesjournals.org)