Individualizing Diabetes Care for Long Term Care Residents: A Guidebook

Practical information for diabetes management in Long Term care settings

Created by:
Long Term Care Working Group
Of Health Care Professionals working in the Central Local Health Integration Network (Ontario)
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The Diabetes in Long Term Care Working group is a diverse group of inter-professional health care providers who either work in long term care homes, or are diabetes experts in the Central LHIN (Ontario). This group is made up nurses, pharmacists, dietitians and long term care health care providers. Thank you to all our contributors and reviewers for making this guidebook evolve from a wish to a reality.

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INTRODUCTION

Diabetes is a chronic, debilitating disease that may lead to complications including blindness, kidney disease, heart disease, stroke, nerve damage and amputation. As of 2011, approximately 9.4% of Ontarians have diabetes, an increase from previous years.¹

The rising prevalence of type 2 diabetes has been attributed to changes in lifestyle and health outcomes (e.g. sedentary behaviour, dietary patterns, obesity), as well as socio-demographic trends, including an aging population and increasing immigration from high-risk populations.² Taken together, these factors have implications for health services planning. Ontario is divided up into 14 Local Health Integration Networks (LHIN’s), it has been reported that between 2009 and 2019 the Central LHIN’s population growth will exceed the rest of Ontario by an additional 7%.² Those aged 65 years of age and older are also expected to exceed the rest of the Ontario population over the next 10 years, therefore affecting the number of people requiring Long Term Care; increasing the need for diabetes and chronic disease management.

PURPOSE

The “Individualizing Diabetes Care for Long Term Care Residents: A Guidebook” was developed in response to the growing need to promote optimal, standardized diabetes care guidelines for glycemic management, and discuss glycemic targets among non-palliative frail/older residents living in long term care. These needs were identified following a Needs Assessment survey conducted between May and December 2011. It was distributed among the 46 long term care facilities in the Central LHIN of Ontario, with a 73% response rate. The 2011 Diabetes in Long Term Care Needs Assessment covered several topics: clinical assessment, foot care, diet, blood glucose monitoring, and hypo/hyperglycemic management. Each respondent also provided information on: provider to patient ratio, screening on admission, protocols and/or medical directives, individual exercise programs, individual meal plans, and continuing education for staff and if there were electronic medical records in use. From these results, a “Diabetes in Long Term Care” working group was formed consisting of multidisciplinary health care professionals in order to focus on gathering existing guidelines and compiling them into an easy to read document.

This Guidebook is intended for use by health care professionals in long term care to help promote individualized glycemic goals, improve quality of care, avoid adverse diabetes outcomes, and decrease emergency department visits and/or hospital admissions.
Glycemic Targets for Frail/Older Residents with Diabetes

Objective

To minimize significant glucose fluctuations leading to hyperglycemia and hypoglycemia.

Glycemic management in Long Term Care residents is essential to prevent wide variations in blood glucose levels, preventing hyperglycemia and hypoglycemia, and preserving quality of life. There is a renewed interest in individualizing glycemic targets based on duration of diabetes, age or life expectancy, presence of co-morbid conditions, cardiovascular disease or advanced micro-vascular disease, and risk of hypoglycemia. In those residents who are frail and dependent on others for activities of daily living, the goals can be less rigid.\textsuperscript{3,4} Glycemic targets and outcomes found in diabetes clinical practice guidelines are normally based on large studies in patients from all ages. In all cases, it is imperative to avoid situations where the older resident needs to seek emergent care in the primary health care system.

Rationale

1. Optimize glucose control and quality of life;
2. Reduce the risk of complications/adverse health outcomes;
3. Reduce the frequency of Emergency Room admission related to diabetes.

Devising individual diabetes care plans and glycemic goals will promote euglycemia (normal concentration of glucose in the blood). Residents living in long term care may already have existing macro and/or micro-vascular complications, therefore it is essential to try to achieve optimal glycemic control that is most appropriate and safe; this can be achieved by using a multidisciplinary team approach.\textsuperscript{5,6,7} The most recent ADA/EASD (2012) position statement advocates for a resident centered approach that is responsive to an individual’s preferences, needs, and values and encompasses an individuals choices in clinical decision making.\textsuperscript{7} Treatment choices may need to include a review of the facility's ability to manage increasing complex oral and/or insulin based regimens while maintaining quality care for increasingly medically complex frail/older residents.\textsuperscript{8}
### Suggested Therapeutic Targets

<table>
<thead>
<tr>
<th>If...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>A1C less than 7.5 %</td>
</tr>
<tr>
<td>Mobile</td>
<td>BP less than 130/80 mmHg&lt;sup&gt;9&lt;/sup&gt;</td>
</tr>
<tr>
<td>Good cognition</td>
<td>LDL less than 2</td>
</tr>
<tr>
<td>Relatively long life expectancy</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or Two Person Assist</td>
<td>A1C less than 8.5 %</td>
</tr>
<tr>
<td>Using mobility aids</td>
<td>Avoid hypoglycemia and severe hyperglycemia</td>
</tr>
<tr>
<td>Cognitively impaired</td>
<td>Avoid intrusive monitoring</td>
</tr>
<tr>
<td>Short life expectancy</td>
<td>Symptom control</td>
</tr>
<tr>
<td>Multiple disease states</td>
<td>BP less than 150/90 mmHg&lt;sup&gt;42,43,44&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Decisions on A1C and blood glucose targets are not well defined in the frail/older population. Published studies focus on control of blood pressure and lipids with glycemic targets being individualized based on comorbidities and functional status.<sup>7,8,17,27</sup>
The above framework is one tool that could be used when establishing individualized target goals.

How to use:

1. Review each category (coloured triangle)
2. Score the resident by placing a mark that best describes them for each triangle
3. Choose the one category (coloured triangle) that has a marking that is furthest to the right.

This is a possible A1C target.

*This scale is not designed to be applied rigidly but merely to help guide discussions for residents individualized target goals.

The 2013 Canadian Diabetes guidelines also include an interactive tool for choosing an A1C target. Please see the Individualizing your Patient’s A1C Target for Type 1 and Type 2 Diabetes interactive tool at [http://guidelines.diabetes.ca/BloodGlucoseLowering/A1Ctarget](http://guidelines.diabetes.ca/BloodGlucoseLowering/A1Ctarget).
Frailty

Frailty describes a multidimensional syndrome. Frail residents often have multiple chronic illnesses (multi morbidities) with associated vulnerabilities such as dementia, functional decline, falls, impaired mobility, and use of multiple medications. It is recommended that residents diagnosed with diabetes shall also be screened for frailty.\(^{10,11,12}\) (See Appendix 1 – Clinical Frailty Scale \(^{10}\))

### Summary of Recommendations for the Older Resident and the Frail/Older Resident

<table>
<thead>
<tr>
<th></th>
<th>Older Resident</th>
<th>Frail Older Resident</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A1C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Diabetes Working Group 2011(^{13})</td>
<td>7.0 to 7.5 %</td>
<td>6.5 to 7.5 mmol/L</td>
</tr>
<tr>
<td>Diabetes Care Program of Nova Scotia 2010(^{14})</td>
<td>7.0 to 9.9 mmol/L</td>
<td>7.6 % to 8.5 %</td>
</tr>
<tr>
<td>Va/DOD 2010(^{15})</td>
<td>7.0 to 9.0% based on presence of comorbidities and expected life span</td>
<td>7.0 to 9.0% based on presence of comorbidities and expected life span</td>
</tr>
<tr>
<td>CDA 2008(^{5}), Revised 2013(^{16})</td>
<td>7% or lower. Goals can be less stringent in those with multiple comorbidities, high levels of functional dependency or limited life expectancy</td>
<td>4.0 to 7.0 mmol/L</td>
</tr>
<tr>
<td>Diabetes in Older Adults 2012(^{17})</td>
<td>7.5% to 8.0%</td>
<td>5.0 to 8.3 mmol/L</td>
</tr>
</tbody>
</table>

* All guidelines reinforce the principle of individualized goals and targets.
Blood Glucose Monitoring (BGM)

Objective

Monitoring Blood Glucose (BGM) provides guidance to prevent drastic fluctuations in blood glucose such as hypoglycemia and prolonged hyperglycemic episodes.\textsuperscript{5,18}

Rationale

Optimizing glucose levels provides a foundation for a better quality of life. Glucose testing helps detect hypoglycemia and prolonged hyperglycemia.\textsuperscript{18}

The frequency of blood glucose monitoring should be determined on an individual basis.\textsuperscript{4} The frequency of blood glucose monitoring depends on the type of diabetes, treatment used, nutritional intake, exercise, and any changes in health status.\textsuperscript{19}

Monitoring of Blood Glucose

In all cases, testing of blood glucose should serve a purpose and guide decisions in adjusting medication or in preventing hypoglycemia or prolonged hyperglycemia.\textsuperscript{18,19} \textit{The definition of hypoglycemia is less than 4.0 mmol/L. The definition of prolonged hyperglycemia will depend on the individualized targets for a particular resident.}\textsuperscript{15} In most cases, blood glucose values of 14.0 mmol/L or higher for more than one value may be used to describe prolonged hyperglycemia.\textsuperscript{13}
Suggested Monitoring of Blood Glucose for Stable Elderly Residents
Living in Long Term Care
Adapted from the Canadian Agency for Drugs and Technologies in Health

Blood glucose testing should be meaningful. Understanding the patterns in the blood glucose results determines further action. Patterns of blood glucose should be reviewed frequently to adjust medications to meet targets. Once individualized blood glucose targets are met then frequency may be reduced based on health status and care plan target.

<table>
<thead>
<tr>
<th>Type of Diabetes</th>
<th>Suggested Blood Glucose Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Admission or New Diagnosis</td>
<td>QID for 3-4 days then adjust medications or switch to stable testing regimens</td>
</tr>
</tbody>
</table>
| Type 2 on oral therapy (sulphonylureas) or basal insulin (Lantus, LenteNPH, NPH) | 1. If A1C targets are met and blood glucose is stable, **test once a day on 4 days of the week** (different times) (4 tests per week)  
   (E.g., Fasting on Monday and Friday AND Pre-lunch on Tuesday AND Pre-supper on Wednesday)  
   2. If taking oral medications that cause hypoglycemia, may increase to 8 tests per week.  
   3. If taking medications that do not lower blood glucose, routine testing not recommended.  
   4. Always test when symptoms of hypoglycemia are suspected |
| For Basal/Bolus Insulin (Basal/Bolus = Lantus, LenteNPH, Novolin NPH, or Humulin NPH WITH Novolin R, NovoRapid, Humalog, Humalog Kwik pen, Humulin R, or Apidra) OR Bolus insulin at one or more meals OR Pre-mixed Insulin (Humalog Mix25, Humalog Mix50, Humalog Mix25 and Mix50 Kwik pen, NovoMix-30, Novolin 30/70, Humulin 30/70) | 1. If A1C targets are met and blood glucose is stable, **test 2 or 3 times per day on 4 days of the week** (8-12 tests per week)  
   (E.g., Fasting on Monday and Wednesday AND Pre-lunch on Tuesday and Friday AND Pre-supper on Monday and Friday)  
   2. Always test when symptoms of hypoglycemia are suspected |
| Targets are not met (any regimen) and medications being adjusted every 1-2 weeks | 1. If A1C target not met or unstable blood glucose **test twice daily staggered** (different times) (14 tests per week)  
   (E.g., Fasting daily AND Pre-lunch on Monday and Friday AND Pre-supper on Tuesday and Thursday AND Bedtime on Wednesday, Saturday, and Sunday)  
   2. Always test when symptoms of hypoglycemia are suspected |
| Type 1                                                | At least 3 times per day                                                                          |

**NOTE:** Bedtime blood glucose reading is 2 ½ to 3 hours after supper. Give any evening snacks AFTER the blood glucose reading is taken. If using supplemental scale insulin, avoid the use of rapid and short acting bolus insulin at bedtime.
Suggested Blood Glucose Testing for Elderly Residents With Stable Type 2 Diabetes. 18,19, 20, 21

**On oral therapy or basal insulin** (4 tests per week) – Eg. once per day at variable times. If taking oral medications that can cause hypoglycemia, may increase to 8 tests per week and test when medications are known to cause hypoglycemia.

<table>
<thead>
<tr>
<th></th>
<th>Sun</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pre lunch</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Bedtime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Using basal/bolus or premixed insulin** (8-12 tests per week) – Eg. two or three times per day on 4 days of the week at variable times. If testing 3 times per day on 4 days of the week, test before each meal or add HS testing.

<table>
<thead>
<tr>
<th></th>
<th>Sun</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pre lunch</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Bedtime</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**If medications are being adjusted or A1C targets not met** (14 tests per week) – Eg. Twice daily at variable times. May test 2 hours after breakfast or lunch meal in place of HS values if adjusting bolus insulin.

<table>
<thead>
<tr>
<th></th>
<th>Sun</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pre lunch</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Supper</td>
<td></td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Bedtime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Results should be reviewed by phone or during weekly visit immediately after the testing period.

Always test when hypoglycemia suspected.

Please note that specific times on a given day may be individualized and adjusted based on specific resident patterns.

Use of HS or weekend values is minimized to reflect early bedtimes in LTC (usually 2 hours post supper) and to account for leaves of absence (weekend visits away from the home/facility) by residents.
More Frequent Blood Glucose Testing

In case of an unstable resident or during a change in health status, more frequent testing may be needed. Possible reasons to increase testing include:\textsuperscript{19, 20}

- Illness
- Infection such as a urinary tract infection (UTI)
- Post-surgery
- Falls
- Change in nutritional intake
- Behavioural changes
- Change in diabetes medications, especially sulphonylureas or insulin doses.
- Oral steroids such as prednisone

More frequent testing involves a temporary increase in blood glucose testing until resident is stable. It may include testing \textbf{up to four times daily for a few days or up to a week to allow resident to stabilize.}

Once blood glucose is in range and stable (minimal fluctuations, no hypoglycemia and no prolonged hyperglycemia) for about a week, \textbf{testing can be reduced} based on the chart on the previous page. Ensure that orders for increases in blood glucose testing orders are temporary and have instructions on how to reduce frequency once resident is stable.

Be sure to discuss all blood glucose testing orders with the prescriber.
Sliding Scale versus Supplemental Scale

Sliding scales focus on reacting to single glucose value out of range and can lead to large fluctuations in blood glucose values. It attempts to fix a high glucose value from the last meal by adding more insulin to the next meal. According to the 2012 update of *The Beers List of Potentially Inappropriate Medications for Frail/Older Residents* the use of sliding scale insulin is to be avoided.22,23

A rational approach to managing blood glucose that is out of range is to add on a supplemental dose of insulin, called a supplemental scale.24 This approach assumes that basal and bolus therapy (oral or insulin) is being used.

**Type 2 Diabetes:**
Supplemental scale is a proactive method of addressing mealtime hyperglycemia. It uses rapid acting insulin before meals, along with usual diabetes medication to combat prolonged hyperglycemia. These scales are to be used with caution and for a short term only.

Always adjust current therapy by incorporating data from the supplemental scale usage.

A key component of a supplemental scale is that it adds bolus insulin (usually rapid insulin) to an existing regimen that includes basal/bolus insulin, or basal insulin and oral medications.

A supplemental scale should include a testing of blood glucose before each meal to determine the need for additional bolus insulin to address the glucose load from the upcoming meal.

Supplemental scales should be avoided at bedtime, remembering that many blood glucose tests at bedtime may, in fact, be a post prandial supper value.

**Type 1 Diabetes:**
May require longer use of supplemental scales.
**Purpose of Blood Glucose Logs**

- Allow caregivers, care team and residents to track blood glucose readings and respond accordingly to changes to diet, oral medication, insulin, and/or exercise.
- Blood glucose readings allow monitoring of blood glucose trends; for example: monitoring if readings are high/low at particular times of day. Recorded results should be written across the page from left to right -- breakfast to bedtime (see example below).
- Keep records in one single place in an electronic chart or monitoring log
- Review blood glucose logs using pattern management

Long Term Care staff and organizations should work with electronic charting vendors to request appropriate blood glucose reports that promote best practice guidelines for diabetes pattern management.

**Example - Blood Glucose Log formatted for Pattern Management**

<table>
<thead>
<tr>
<th>Date</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Bedtime</th>
<th>Other</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/30</td>
<td>7:00</td>
<td>11.4</td>
<td>12:00</td>
<td>8.8</td>
<td>17:00</td>
<td>10.9</td>
</tr>
<tr>
<td>1/31</td>
<td>7:30</td>
<td>12.2</td>
<td>11:30</td>
<td>9.9</td>
<td>17:30</td>
<td>10.5</td>
</tr>
<tr>
<td>2/01</td>
<td>7:00</td>
<td>9.5</td>
<td>11:30</td>
<td>7.9</td>
<td>17:30</td>
<td>10.3</td>
</tr>
</tbody>
</table>

* See Appendix 4 for Sample Blood Glucose Log
Principles of Pattern Management

Trends of glucose levels can be identified by using pattern management. As a result, appropriate adjustments to diabetes management can be instituted.

Pattern Management is a multistep, logical approach that identifies glycemic patterns. Patterns are identified from blood glucose values collected at the same time of day over a number of days (e.g., fasting blood glucose). Pattern management assumes consistent meal intake and activities and no intercurrent illness.

**Principles of Pattern Management**

1. Review blood glucose reading for one-two weeks (between 10-20 values)

2. Identify any lows (under 4.0mmol/L), noting the time of day

3. Identify any highs (over 14.0 to 15.0 mmol/L) noting time of day

4. Review, adjust, and increase testing (insulin’s and orals)

5. Address the highest meal of the day

6. Continue to evaluate changes frequently (once a month or more if needed)

---

Identify factors that LOWER glucose:

I. Lack of food and fluid intake
II. Increased exercise
III. Time action profile of insulin/orals

Identify factors that INCREASE glucose:

I. Increased food intake, extra snacks or sweets
II. Decrease in mobility or lack of exercise
III. Treatments for hypoglycemia that raise the blood glucose to a high value
IV. New infection (UTI, URTI, pneumonia, etc.)
V. Time-action profile of insulin/orals

Review all medications with prescriber

II. Adjust one medication at a time. No more than 10% of the total daily dose of insulin (TDD)
III. If doses are changed, increasing the frequency of blood glucose testing may be needed for a short period of time

I. Testing blood glucose 2hr after a meal can assist with meal time insulin adjustment
II. Time action profile of insulin or orals should be considered

Repeat steps 1 through 5 when needed.
Key Points to Remember

- Eliminate lows
- Address fasting value
- Target first problem meal of the day
- If A1C is still out of range, consider 2 hour post meal evaluation
- The elderly may often have normal fasting values and elevated post meal values

Adjustment of Insulin based on Blood Glucose Values

<table>
<thead>
<tr>
<th>Blood glucose value out of range</th>
<th>Insulin to be adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>Bedtime or supper basal</td>
</tr>
<tr>
<td>Pre-lunch (post breakfast)</td>
<td>Bolus insulin at breakfast</td>
</tr>
<tr>
<td>Pre-supper (post lunch)</td>
<td>Bolus insulin at lunch or basal insulin in the morning</td>
</tr>
<tr>
<td>Bedtime (Post supper)</td>
<td>Bolus insulin at supper</td>
</tr>
<tr>
<td>During the night</td>
<td>Supper or bedtime basal insulin</td>
</tr>
</tbody>
</table>

* For mixed insulin, consider the two components (bolus and basal) in using the chart above

Knowledge of which insulin to adjust when blood glucose values are out of range can assist in pattern management review.

Time-action profiles of insulin

Note: action curves are approximations for illustrative purposes. Actual patient response will vary.

Hypoglycemia Management

Objective

- To increase awareness and recognition of low blood glucose readings (hypoglycemia), reduce the number of hypoglycemia incidents, and ensure the safe and timely adjustment of therapy of residents living with diabetes.
- The reduction in the frequency of incidents of hypoglycemic episodes can reduce the frequency of falls, development of dementia and episodes of cardiovascular diseases and ultimately improve the quality of life for residents.4,27

Definition

The Canadian Diabetes Association defines hypoglycemia when following conditions are present:

1. A low blood glucose of less than 4.0 mmol/L
2. Signs and/or symptoms of hypoglycemia
3. Signs and symptoms that respond to the administration of carbohydrate

Rationale

Hypoglycemia may occur as a result of:

- Decrease or delay in food intake
- Vomiting or diarrhea
- Increase in activity
- Intake of alcohol
- Recent weight loss
- Medications
Symptoms - Detecting Hypoglycemia

It is important for all care providers to recognize the signs and symptoms of hypoglycemia.

<table>
<thead>
<tr>
<th>Symptoms of Hypoglycemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Blurred Vision</td>
</tr>
<tr>
<td>Confusion</td>
</tr>
<tr>
<td>Difficulty speaking</td>
</tr>
<tr>
<td>Dizziness</td>
</tr>
<tr>
<td>Drowsiness</td>
</tr>
<tr>
<td>Headache</td>
</tr>
<tr>
<td>Hunger</td>
</tr>
<tr>
<td>Nausea</td>
</tr>
<tr>
<td>Palpitations</td>
</tr>
<tr>
<td>Sweating</td>
</tr>
<tr>
<td>Tachycardia</td>
</tr>
<tr>
<td>Tremors</td>
</tr>
<tr>
<td>Weakness</td>
</tr>
</tbody>
</table>

*Sweating, tachycardia and tremors may not be present in the frail elderly.

Untreated severe hypoglycemia can lead to unresponsiveness, unconsciousness, seizures and/or coma. This requires immediate action.

Hypoglycemia Unawareness

Residents may not be aware of their own internal clues for hypoglycemia and may not be able to communicate or inform direct care providers of their signs and symptoms, particularly in cases of cognitive impairment. The frequency of episodes of hypoglycemia may cause a blunting of or lack of hypoglycemic symptoms. Beta blockers may also blunt symptoms of hypoglycemia.

Pseudo-hypoglycemia

When adjusting medications for hyperglycemia there can be a rapid drop in blood glucose (e.g., more than 5 mmol/L) resulting in pseudo-hypoglycemia. This is when the resident reports signs or shows symptoms of hypoglycemia with blood glucose in the normal to high range. This should be treated as true hypoglycemia.
Algorithm for Management of Hypoglycemia

Suspect Hypoglycemia when the Resident presents with:
Anxiousness, blurred vision, confusion, difficulty speaking, dizziness, drowsiness, headache, hunger, irritable, nausea, palpitations, sweaty, tachycardia, tremors, or weakness.

Measure Blood Glucose

If over 4.0 mmol/L AND no signs/symptoms of hypoglycemia

Follow standard nursing & dietary policy/procedures

If less than 4.0 mmol/L OR showing signs & symptoms of hypoglycemia

If Conscious and under 4.0 mmol/L

Give 15 grams of Carbohydrate:
- 3 pkgs of sugar dissolved in water or
- 4 Dextrose tablets or
- 1 Liquiblast bottle (59 mL) or
- 175 mL of juice or regular pop (3/4 cup)
- 15 mL honey (1 tbsp)
** may need thickened fluids for residents with swallowing issues**

Retest Blood Glucose in 15 minutes
- If blood glucose is less than 4.0 mmol/L then give another 15 grams of carbohydrate & retest

If Conscious and blood sugars are less than 2.8 mmol/L

Give 20 Grams of Carbohydrate:
- 4 pkgs of sugar dissolved in water or
- 5 Dextrose tablets or
- 1 ¾ bottles of Dextrose Liquiblast (75mL)
- 250 mL fruit juice or regular pop
**may need thickened fluids for residents with swallowing issues**

If Unconscious, unable to swallow, agitated or resistive to oral treatment

Administer Glucagon 1mg IM /SC
Turn resident on side. It may take up to 45 minutes to work. May repeat 15-30 minutes based on clinical judgment. Call prescriber for further orders and/or call 911 if no response.
Retest blood glucose every 15 minutes

If Blood glucose is above 4.0 mmol/L

If next meal is less than 1 hour away:
- Set up next meal as soon as possible
- Document intake

If next meal is more than 1hr away:
Give protein plus carbohydrate snack:
- 1 slice bread with 15 mL peanut butter or
- 6 crackers & 1 ounce cheese or
- ½ sandwich or
- 1 pudding cup or
- 1 muffin with 1 ounce cheese or
- 90 mL Boost supplement

Notify:
- Prescriber/Physician
- Registered Dietitian
- Pharmacist
**Important Note**

Residents taking acarbose (Glucobay, Prandase) who experience hypoglycemia must use a source of glucose **not** sucrose.

- 4 glucose (dextrose) tablets
- 1 tablespoon (15ml) honey
- 1 cup (250 ml) milk

**Special Circumstances**

- Residents requiring thickened fluids shall have thickened juice available for use at all times.
Do you know the signs of hypoglycemia?

1. Recognize Symptoms Early
   No matter how carefully you manage diabetes with insulin, hypoglycemia (low blood sugar) may still develop very quickly. Symptoms include:
   - Sweating
   - Blurry Vision
   - Dizziness
   - Nervous
   - Hunger
   - Irritability
   - Shakiness
   - Fast Heartbeat
   - Headache
   - Weakness

2. Eat Something
   - 15 g of glucose in the form of glucose tablets
   - 15 ml (3 teaspoons) or 3 packets of table sugar dissolved in water
   - 175 ml (3/4 cup) of juice or regular soft drink
   - 6 Life Savers® (1=2.5 g of carbohydrate)
   - 15 ml (1 tablespoon) of honey

3. Untreated hypoglycemia may become severe and cause you to pass out. Be prepared to treat it with the GlucaGen® HypoKit.

Simple steps for using the GlucaGen® HypoKit.

- Please see complete instructions for use on reverse side.

GlucaGen® is used to treat severe hypoglycemic reactions (unconsciousness due to low blood sugar), which may occur in patients with diabetes treated with insulin.

GlucaGen® HypoKit – For patients with Severe Hypoglycemic Reactions

This emergency kit contains an injection of glucagon, a hormone that raises the level of glucose in the blood to help patients recover from severe hypoglycemia.

- Show family, friends, coworkers, and teachers how to use the kit – just in case.
- It may be a good idea to ask your doctor for two prescriptions, so you have one GlucaGen® HypoKit at work and one at home.
- Check the expiration date. Do not use expired glucagon.
**Important Dosing Information**

- Dosage for adult patients: Administer 1 mL. ²
- Dosage for pediatric patients:
  - Administer 1 mL (children above 25 kg or older than 6-8 years) or 0.5 mL (children below 25 kg or younger than 6-8 years). ²

How to use GlucaGen® HypoKit 1mg (glucagon)

To prepare GlucaGen® for injection: Use the enclosed prefilled disposable syringe with the attached needle to reconstitute GlucaGen® before giving the injection.

1. Remove the plastic cap from the vial. Pull the needle cover off the syringe. Insert the needle through the rubber stopper (within the marked circle) of the vial containing GlucaGen® and inject all the liquid from the syringe into the vial. ²

2. Without taking the needle out of the vial, gently shake the vial until GlucaGen® has completely dissolved, and the solution is clear. ²

3. Make sure the plunger is completely down. While keeping the needle in the liquid, slowly withdraw all the solution back into the syringe. Do not pull the plunger out of the syringe.

   It is important to remove any air bubbles from the syringe as follows:
   - With the needle pointing upwards, tap the syringe with your finger
   - Push the plunger slightly to release any air that has collected at the top of the syringe.

   Continue to push the plunger until you have the correct dose for injection. A small amount of liquid will be pushed out when you do this. ²

4. Inject the dose into a muscle. ²

   After intramuscular injection the patient will normally respond within 10 minutes. If they do not respond within 10 minutes, medical attention should be sought immediately.

   When the patient has responded to the treatment give oral carbohydrate (a high sugar snack) to prevent relapse of hypoglycemia.

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**REFERENCE**

Please contact the manufacturer Novo Nordisk Canada Inc. for additional information or Product Monograph at (905) 629-4222 or 1-800-465-4334.

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www.paladinlabs.com

P0912444E
Hypoglycemia Treatment Kit

This is a list of items that can be included in a typical hypoglycemia treatment kit. Most treatment kits are kept in a centralized area for easy access. (e.g., one per unit)

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum Quantity</th>
<th>Contact for Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dextrose tablets</td>
<td>1 to 2 Rolls</td>
<td>Pharmacy</td>
</tr>
<tr>
<td>Dextrose Liquiblast</td>
<td>59 mL</td>
<td>Pharmacy</td>
</tr>
<tr>
<td>Table sugar</td>
<td>9 packets</td>
<td>Dietary</td>
</tr>
<tr>
<td>Dietary Supplement</td>
<td>1 carton (240 mL)</td>
<td>Dietary</td>
</tr>
<tr>
<td>Glucagon Injection</td>
<td>1</td>
<td>Pharmacy</td>
</tr>
</tbody>
</table>

*MUST BE REPLENISHED AFTER USE*

Each facility should review the following to ensure residents have access to prompt treatments for hypoglycemia:

- policies and procedures related to administration of hypoglycemia treatment kit;
- medical directives for glucagon injection for residents with diabetes; or
- individualized orders for glucagon injection for residents with diabetes.
Hyperglycemia Management

Objective

- Management of hyperglycemia in residents with diabetes is essential for minimizing acute complications of prolonged hyperglycemia (ie, urinary tract infection (UTI), polyuria, nocturia)\(^6\)
- Long term goals include prevention of end organ damage, such as macro-vascular complications (stroke, myocardial infarction), and micro-vascular complications (nephropathy, neuropathy and retinopathy)\(^5\)

Definition

- Hyperglycemia is an excessive amount of glucose in the blood stream
- In Type 2 diabetes, the pancreas is unable to produce enough insulin and/or the body is unable to convert the glucose into energy
- Symptoms of hyperglycemia are not always apparent in older adults with diabetes and could be asymptomatic. Hyperglycemia can present with changes in behavioural, cognitive or functional status (e.g. falls, urinary incontinence, agitation, dementia, delirium, depression)\(^6,7\)

*For the purpose of this document, the goal is to avoid drastic fluctuations over a number of days. It is important to note what the resident’s usual blood glucose ranges are.*

Rationale

- Early identification of hyperglycemic trends can prevent prolonged hyperglycemia and avoid medical emergencies
- During intercurrent illness, implementation of a Sick Day Management plan can avoid medical emergencies\(^28,29\)
Contributing factors for Hyperglycemia

- Change in diet
- Gifts of candies, cookies, etc.
- Decrease physical activity

* Have the Registered Dietitian review diet with the resident and any family or friends who may visit with food gifts

Acute Hyperglycemia

Signs and Symptoms of Acute Hyperglycemia

- Voiding frequently, large amounts of urine, incontinence
- Infections (e.g., Urinary Tract Infection (UTI), skin or other)
- Intercurrent illness (respiratory infection)
- Excessive thirst or excessive hunger
- Weakness
- Emotional stress
- Dizziness
- Trembling
- Increased sweating
- Fatigue
- Irritability
- Confusion
- Blurred vision
Sick Day Management of Diabetes

Rationale

There are a few key factors to consider when a resident with diabetes has an intercurrent illness:

- Blood glucose levels fluctuate during illness due to stress hormones
- Significant dehydration can result during illness
- It is imperative to continue insulin and/or oral medications unless otherwise ordered by the prescriber

Sick Day Management Plan

When to Initiate:

A sick day management plan should be implemented if blood glucose is more than 15.0 mmol/L on two consecutive readings (for example, within an 8 – 12 hour time frame). Hyperglycemia symptoms, plus an intercurrent illness (UTI, pneumonia, upper respiratory infection, MI, etc.) are often accompanied by lack of intake and rising blood sugars.
Managing your S.I.C.K. Resident

S is for **Sugar Testing.** TEST BLOOD GLUCOSE OFTEN (as often as every 4 hours around the clock)\textsuperscript{34} at least 4 times per day (before meals and at bedtime)\textsuperscript{35}

I is for **Insulin** (more insulin or diabetes medications needed) ALWAYS GIVE DIABETES MEDICATIONS, NEVER OMIT.

- When ill, the body may release its own stored glucose, causing a rise in blood glucose even if your resident may not be eating as much. If on insulin, do not hold it; extra insulin is usually needed.
- In those with type 2 diabetes with vomiting and diarrhea, there is a risk of dehydration. Stop medications that increase risk for a decline in kidney function or have a reduced clearance and increased risk of adverse effects:
  - Sulfonylureas
  - ACE-inhibitors
  - Diuretics, direct renin inhibitors
  - Metformin
  - Angiotensin receptor blockers
  - Non-steroidal anti-inflammatory medications
- Vomiting may cause low blood glucose in those treated with sulphonylureas or glitinides. These medications may need to be reduced according to blood glucose or ketone levels. Check with the prescriber.

C is for **Carbohydrates and Fluids.** DRINK PLENTY OF EXTRA FLUIDS AND CHECK VITALS OFTEN. The body needs about 9 cups (2200 ml) of fluid daily to prevent dehydrations so 125 – 250 ml every hour is suggests. If your resident cannot eat as usual, replace solid food with sugar containing fluid (see below)

- If your resident is unable to consume solid food, and the blood glucose is less than 15 mmol/L, ingest carbohydrate containing fluids (10 – 15 g every 12 hours)
- If your resident is unable to consume solid food, and blood glucose is over 15 mmol/L, ingest sugar free fluids to prevent dehydration. Choose from diet po (caffeine free), water, broth, sugar free Jello

K is for **Ketone testing.** KETONE TESTING is needed in those with a blood sugar over 20mmol/L for 8 – 12 hours or longer, especially if on insulin or a frail elderly resident. Test urine ketones as often as blood glucose are tested, if possible. Testing ketones in those with type 1 diabetes every 2 – 4 hours when blood glucose over 15 mmol/L. Once blood glucose is under 15 mmol/L and urine ketones are none to trace, there can be a reduction in the frequency of testing for ketones.

- If ketones are present (moderate to large) in urine and blood glucose is over 15.0 mmol/L increase to basal insulin dose or implement a supplemental scale.
- If there are ketones in the urine (moderate to large) and blood glucose is under 15.0 mmol/L this means there is an inadequate carbohydrate intake; liquid or solid carbohydrate (sugar containing foods) foods are needed (see below).\textsuperscript{34,35}

<table>
<thead>
<tr>
<th>Suggested 15 gram servings of liquid carbohydrates (sugars)\textsuperscript{32,34,35,36}</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>125 (1/2 cup) Juice</td>
<td>75 mL (1/3 cup) sugar-sweetened Kool-aid</td>
</tr>
<tr>
<td>125 (1/2 cup) regular Jello</td>
<td>50 mL (1/4 cup) pudding</td>
</tr>
<tr>
<td>175 mL (3/4 cup) regular pop</td>
<td>1 Popsicle</td>
</tr>
<tr>
<td>175 mL (3/4 cup) sweetened yogurt</td>
<td>125 mL (1/2 cup) Glucerna</td>
</tr>
<tr>
<td>125 mL (1/2 cup) ice cream or sherbet</td>
<td>75 mL (1/3 cup) non-diabetic Boost</td>
</tr>
<tr>
<td>250 mL (1 cup) milk (avoid if vomiting or diarrhea)</td>
<td>250 mL (1 cup) Gatorade</td>
</tr>
</tbody>
</table>
**WHEN TO SEND TO EMERGENCY FOR ASSESSMENT:**  

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to eat/drink for more than 24 hours</td>
</tr>
<tr>
<td>Diarrhea more than every 6 hours or for more than 24 hours</td>
</tr>
<tr>
<td>Chest pain, trouble breathing, severe stomach pains, dry cracked lips,</td>
</tr>
<tr>
<td>signs of dehydration, or fruity breath</td>
</tr>
<tr>
<td>Severe disorientation (not caused by low blood sugar)</td>
</tr>
</tbody>
</table>

Once intercurrent illness is resolved, and blood sugars are in previous acceptable range, discuss reduction in blood glucose testing and stopping supplemental scale with prescriber.
Hyperglycemic Hyperosmolar Syndrome (HHS) and Diabetic Ketoacidosis (DKA)

**Hyperosmolar hyperglycemic state (HHS) used to be called hyperosmolar hyperglycemic non-ketotic syndrome (HHNK). It has been renamed because ketosis may or may not be present. Coma or altered state of awareness may occur due to profound dehydration**. 

HHS is a complication of hyperglycemia and polyuria. It may occur as a result of a myocardial infarction or concurrent infection. The blood glucose level is often higher than seen in DKA. HHS is more common in older people, who may be unable to keep up with hydration when ill and then become progressively more confused and dehydrated. HHS takes longer to develop, usually over a period of days to weeks. Abdominal pain with nausea and vomiting may develop and can be mistaken for an acute abdomen. HHS is a medical emergency and the person must be admitted to hospital.

This condition is best treated in an acute care setting. Typically this condition accompanies untreated dehydration and can quickly deteriorate.

Nurses and personal support workers should work together to ensure that all residents with diabetes drink plenty of fluids. Dehydration must be recognized and treated as quickly as possible.

### Symptoms of HHS

- Severe dehydration
- Extreme elevation of glucose usually over 20-30 mmol/L after taking extra insulin
- Mental confusion and drowsiness (may appear stroke or seizure-like)
- Abdominal pain
- Nausea and vomiting

*If not treated, can progress to seizures, coma and death*

If HHS is suspected the resident must be sent to hospital for further evaluation.

**Diabetic Ketoacidosis is a state of absolute or relative insulin deficiency that results in the breakdown of fat and muscle for energy.** Hyperglycemia is present, usually with a blood glucose over 13.8 mmol/L, and infection being the most common cause. Other causes are a new diagnosis of type 1 or type 2 diabetes.

Older adults may have DKA as a complication of heart attack, stroke or serious infection. DKA is a combination of dehydration and acidosis. The person with DKA will present with polydipsia and polyuria. Abdominal pain and nausea and vomiting is common. DKA is a medical emergency and the person must be admitted to the hospital.
Appendix 1 – Clinical Frailty Scale

Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

Well – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally.

Managing Well – People whose medical problems are well controlled, but are not regularly active beyond routine walking.

Vulnerable – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up”, and/or being tired during the day.

Mildly Frail – These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

Moderately Frail – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.

Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

Terminally Ill - Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In severe dementia, they cannot do personal care without help.


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## Appendix 2 - Therapeutic Options for Older Adults living with Type 2 Diabetes

In collaboration with the Prescriber, review parameters with resident specific outcomes and determine which agent(s) to use (adapted from Rx files and The Centre for Effective Practice). For usual doses and dose maximums, please consult the product monograph or consult your pharmacist.

<table>
<thead>
<tr>
<th>Class</th>
<th>Agents and common side effects</th>
<th>A1C change</th>
<th>Weight Change</th>
<th>Hypoglycemia risk</th>
<th>Heart failure or Cardiac history</th>
<th>Renal dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biguanides</strong></td>
<td>Metformin (Glucophage)</td>
<td>1 - 2%</td>
<td>Weight loss</td>
<td>Rare</td>
<td>+++</td>
<td>CrCl 30-60 mL/min: reduce dose &lt;30 mL/min: avoid</td>
</tr>
<tr>
<td></td>
<td>GI intolerance, B12 deficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alpha-glucosidase inhibitors</strong></td>
<td>Acarbose (GlucoBay)</td>
<td>0.5 - 0.8%</td>
<td>Neutral or weight loss</td>
<td>Rare</td>
<td>+++</td>
<td>&lt;30 mL/min: use with caution or avoid</td>
</tr>
<tr>
<td></td>
<td>GI intolerance, flatulence, diarrhea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DPP-4 Inhibitors</strong></td>
<td>Sitagliptin (Januvia)</td>
<td>0.5 - 0.8%</td>
<td>Neutral or weight loss</td>
<td>++</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nausea, diarrhea, edema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saxagliptin (Onglyza)</td>
<td>0.5 - 0.8%</td>
<td>Neutral or weight loss</td>
<td>++</td>
<td>&lt; 50mL/min: 50mg daily &lt;30 mL/min: 25mg daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache, edema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Linagliptin (Trajenta)</td>
<td>0.5 - 0.8%</td>
<td>Neutral or weight loss</td>
<td>++</td>
<td>&lt; 50mL/min: 2.5mg daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache, constipation, edema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Incretins (GLP-1) injection</strong></td>
<td>Liraglutide (Victoza)</td>
<td>1.0 - 1.5%</td>
<td>Weight loss</td>
<td>++</td>
<td>&lt;30 mL/min: avoid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SC injection, GI intolerance, rare pancreatitis, long term safety unknown</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exenatide (Byetta)</td>
<td>1.0 - 1.5%</td>
<td>Weight loss</td>
<td>++</td>
<td>&lt;30 mL/min: avoid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SC injection, GI intolerance, long term safety unknown</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulin</strong></td>
<td>Human Insulin (Novolin N, Humulin N, 30/70)</td>
<td>1.5 - 3.5%</td>
<td>+++</td>
<td>+++</td>
<td>Adjust dose per blood sugars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight gain, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog Insulin (Apidra, NovoRapid, Humalog, Lantus, Detemir, HumaMix25, HumaMix50, NovoMix30)</td>
<td>1.5 - 3.5%</td>
<td>+++</td>
<td>+++</td>
<td>Adjust dose per blood sugars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight gain, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulin Secretagogues/ sulphonylureas and meglitinides</strong></td>
<td>Gliclazide (Diamicron)</td>
<td>1 - 2%</td>
<td>+++</td>
<td>++</td>
<td>Best for CrCl &lt; 30mL/min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight gain, headache, diziness, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glimepiride (Amaryl)</td>
<td>1 - 2%</td>
<td>+++</td>
<td>++</td>
<td>CrCl &lt; 30mL/min: use lowest dose, titrate carefully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight gain, headache, diziness, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glyburide (Diabeta)</td>
<td>0.5 - 1.5%</td>
<td>+++</td>
<td>+++</td>
<td>CrCl &lt; 60mL/min: use with caution CrCl &lt;30 mL/min: avoid Beers Criteria – avoid in elderly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight gain, headache, diziness, hypoglycemia (Beers criteria)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nateglitinide (Starlix)</td>
<td>0.5 - 1.5%</td>
<td>+++</td>
<td>++</td>
<td>CrCl &lt; 30mL/min: use lowest dose, titrate carefully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repaglinide (GlucoNorm)</td>
<td>0.5 - 1.5%</td>
<td>+++</td>
<td>++</td>
<td>CrCl &lt; 40mL/min: use lowest dose, titrate carefully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headache, hypoglycemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TZDs</strong></td>
<td>Pioglitazone (Actos)</td>
<td>0.5 - 1.4%</td>
<td>++</td>
<td>Rare</td>
<td>Fluid retention possible; increased risk of heart failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edema, risk of heart failure, bladder cancer, fractures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rosiglitazone (Avandia)</td>
<td>0.5 - 1.4%</td>
<td>++</td>
<td>Rare</td>
<td>No dose adjustment needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Edema, risk of heart failure, cardiac ischemia, fractures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Choices of diabetes medication based on pre-existing conditions

<table>
<thead>
<tr>
<th></th>
<th>In overweight or obese residents</th>
<th>To avoid hypoglycemia risk</th>
<th>For those with renal impairment</th>
<th>For those with cardiac or heart failure history</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best choice</strong></td>
<td>GLP-1 MF DPP-4 Acarbose</td>
<td>MF Acarbose DPP-4</td>
<td>Acarbose Insulin Gliclazide Linagliptin</td>
<td>MF Insulin Gliclazide Acarbose</td>
</tr>
<tr>
<td><strong>Use with Caution</strong></td>
<td>Glitinitides Gliclazide</td>
<td>GLP-1 TZD Gliclazide Glitinides</td>
<td>DPP-4 GLP-1 Glitinides Glyburide</td>
<td>DPP-4 GLP-1 Glitinide</td>
</tr>
<tr>
<td><strong>Poor choice</strong></td>
<td>Glyburide TZD Insulin</td>
<td>Glyburide insulin</td>
<td>MF Insulin</td>
<td>Glyburide TZD</td>
</tr>
</tbody>
</table>

MF: Metformin, GLP-1: liraglutide or exenetide, DPP-4: sitagliptin, saxagliptin or linagliptin, Glitinides: netaglinide, repaglinide, TZD: pioglitazone, rosiglitazone.
Appendix 3 – Sample Blood Glucose Log

**Blood Glucose Monitoring Log**

Enter results of capillary blood glucose monitoring (CBGM) and urine ketones (if tested) in the appropriate time columns.

*When blood glucose level is less than 4 mmol/L or > 15 mmol/L action must be taken and documented in progress notes.*

<table>
<thead>
<tr>
<th>Date</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Bedtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm/dd/yyyy</td>
<td>AC PC</td>
<td>AC PC</td>
<td>AC PC</td>
<td>AC PC</td>
</tr>
<tr>
<td>06:01-08:30</td>
<td>08:31-11:00</td>
<td>11:01-12:00</td>
<td>12:01-16:00</td>
<td>16:01-19:00</td>
</tr>
</tbody>
</table>
Appendix 4 - Hypoglycemia Treatment Kit
*Must be replenished after use and checked once per month

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum Quantity</th>
<th>Expiry Date</th>
<th>Contact for Replacement</th>
<th>Checked By: (Initials)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dextrose tablets</td>
<td>2 Rolls</td>
<td></td>
<td>Pharmacy</td>
<td></td>
</tr>
<tr>
<td>Dextrose Liquiblast</td>
<td>3 x 30 mL</td>
<td></td>
<td>Pharmacy</td>
<td></td>
</tr>
<tr>
<td>Table sugar</td>
<td>9 packets</td>
<td></td>
<td>Dietary</td>
<td></td>
</tr>
<tr>
<td>*Dietary Supplement</td>
<td>1 carton (240 mL)</td>
<td></td>
<td>Dietary</td>
<td></td>
</tr>
<tr>
<td>Glucagon Injection</td>
<td>1</td>
<td></td>
<td>Pharmacy</td>
<td></td>
</tr>
</tbody>
</table>

*Glucose Meter
  - Control Solution
  - Batteries for meter
  - Test Strips
  - Lancets

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Glucometer Meter and other supplies should be readily available on each resident home area.
Appendix 5 – Insulin Injection Technique

NB. ENSURE EACH RESIDENT HAS THEIR OWN LABELLED PEN(S) – DO NOT SHARE INSULIN PENS

From TWH and reference 41

1. Prepare pen for use
   - Pull off cap
   - Check correct insulin type, expiry date and appearance
   - If insulin is cloudy, gently roll pen and invert 20 times to ensure evenly mixed
   - Swab rubber seal on end of pen with alcohol swab

2. Attach BD AutoShield™ Duo needle
   - Take the peel tab off of pen needle.
   - Holding the outer cover, push and twist the pen needle onto the pen in a clockwise direction until meets resistance.
   - Do not over-tighten

3. Prime pen
   - Before every injection the insulin flow must be checked
   - Set dose to 4 units by turning dose button at end of pen
   - Note – for Novopen™ pull out dose button before turning

4. Select insulin dose
   - Turn dose button until the required dose lines up with the dose indicator
   - Do NOT touch the outer shield prior to injection. Any pressure on the shield may cause the safety mechanism to lock, making the needle unusable.
   - Obtain independent double check of dose dialled on pen compared to patient’s order

5. Perform injection
   - Insert the needle straight into flat skin at a 90-degree angle until the clear outer shield retracts and the white sleeve is flush with the skin
   - Maintain constant pressure against skin, then deliver dose by depressing dose button with your thumb
   - Hold for 10 seconds while continuing to press button

6. Dispose of pen needle
   - Ensure entire dose has been given (check dial is at zero) then lift pen away from skin
   - The shield will automatically lock in place.
   - A RED indicator band will appear confirming shield is locked
   - Remove needle from pen by holding the white shield and twisting the pen counter-clockwise
   - Dispose of used needle in yellow sharps container inside patient room
Appendix 6 – Insulin Adjustment During Sick Days

Suggested adjustment of insulin in the case of intercurrent illness (for those with Type 1 diabetes or Type 2 diabetes on insulin):¹⁰,²⁶

1. Calculate total daily dose (TDD) – add total units of insulin given in 24 hours (pre meal and basal).

(a) Mrs. Smith is taking 24U NovoMix-30 in am and 20U NovoMix-30 before supper = 45 units total. Sugars are taken before lunch and are 16.5 with moderate urine ketones. She has not eaten a full meal since yesterday morning.

(b) Monitoring Plan:
   i. Stop medications that increase risk for a decline in kidney function or have a reduced clearance and increased risk of adverse effects:
      - S sulfonylureas
      - A ACE-inhibitors
      - D diuretics, direct renin inhibitors
      - M metformin
      - A angiotensin receptor blockers
      - N non-steroidal anti-inflammatory medications
      See also 2013 Canadian Diabetes Guidelines Appendix 7, [http://guidelines.diabetes.ca/Browse/Appendices/Appendix7](http://guidelines.diabetes.ca/Browse/Appendices/Appendix7)
   ii. Encourage fluid intake of 125 – 250 mL per hour of sugar free fluids. Once sugars are under 14, encourage fluid intake of 10 – 15 g carbohydrates every 1 – 2 hours.
   iii. Give usual insulin dose this am and give additional (from chart below – 6 to 7 units Humalog)
   iv. Continue blood sugar monitoring TID ac meals and QHS. Check Ketones as often as blood sugars are tested if possible. Once ketones are negative to trace or sugars are under 14, no further need for ketone testing.

Table 1 – Adjustment to make based on blood glucose:²⁰

<table>
<thead>
<tr>
<th>Blood glucose</th>
<th>Ketones</th>
<th>Extra Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 – 16.0</td>
<td>Neg to large</td>
<td>10% of TDD</td>
</tr>
<tr>
<td>16.1 – 22.0</td>
<td>Neg to trace</td>
<td>10% of TDD</td>
</tr>
<tr>
<td>16.1 – 22.0</td>
<td>Mod to large</td>
<td>15% of TDD</td>
</tr>
<tr>
<td>22.1 or more</td>
<td>Neg to trace</td>
<td>15% of TDD</td>
</tr>
<tr>
<td>22.1 or more</td>
<td>Mod to large</td>
<td>20% of TDD</td>
</tr>
</tbody>
</table>
Table 2 – additional insulin needed based on total daily dose

<table>
<thead>
<tr>
<th>Total Daily Dose (TDD)</th>
<th>Extra 10% short acting insulin</th>
<th>Extra 15% short acting insulin</th>
<th>Extra 20% rapid insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 – 20 units</td>
<td>1 – 2 units</td>
<td>2 – 3 units</td>
<td>2 – 4 units</td>
</tr>
<tr>
<td>21 – 30 units</td>
<td>2 – 3 units</td>
<td>3 – 4 units</td>
<td>4 – 6 units</td>
</tr>
<tr>
<td>31 – 40 units</td>
<td>3 – 4 units</td>
<td>4 – 6 units</td>
<td>6 – 8 units</td>
</tr>
<tr>
<td>41 – 50 units</td>
<td>4 – 5 units</td>
<td>6 – 7 units</td>
<td>8 – 10 units</td>
</tr>
<tr>
<td>51 – 60 units</td>
<td>5 – 6 units</td>
<td>7 – 9 units</td>
<td>10 – 12 units</td>
</tr>
<tr>
<td>61 – 70 units</td>
<td>6 – 7 units</td>
<td>9 – 10 units</td>
<td>12 – 14 units</td>
</tr>
<tr>
<td>71 – 80 units</td>
<td>7 – 8 units</td>
<td>10 – 12 units</td>
<td>14-16 units</td>
</tr>
<tr>
<td>81 – 90 units</td>
<td>8 – 9 units</td>
<td>12 – 13 units</td>
<td>16 – 18 units</td>
</tr>
<tr>
<td>91 – 100 units</td>
<td>9 – 10 units</td>
<td>13 – 15 units</td>
<td>18 – 20 units</td>
</tr>
<tr>
<td>101 – 120 units</td>
<td>10 – 12 units</td>
<td>15 – 18 units</td>
<td>20 – 24 units</td>
</tr>
</tbody>
</table>
Case Studies

1. Mrs. Smith is nauseated and does not think she will eat her dinner. She is on Diamicron (gliclazide) 40 mg by mouth at breakfast and dinner. Her before dinner blood glucose level is 7 mmol/L.

**Question A: Do you give the Diamicron (gliclazide) tablet?**
**Answer:** You would not give the Diamicron (gliclazide).
**Rationale:** Diamicron (gliclazide) is a sulphonylurea and lowers blood glucose; therefore if there is no intake of carbohydrates, there is an increased risk of hypoglycemia.

**Question B: If her blood glucose was 9.0 mmol/L would you give the Diamicron?**
**Answer:** You would not give the Diamicron (gliclazide).
**Rationale:** Diamicron (gliclazide) is a sulphonylurea that promotes insulin secretion and therefore will lower the blood glucose level. If Mrs. Smith does not feel like eating there will be no intake of carbohydrates which places her at risk for hypoglycemia. An order should be obtained to hold the Diamicron (gliclazide) if she is not eating even if her blood glucose is above target.

2. Mr. Jones has blood glucose of 4.0 mmol/L at 2200 hrs. He is on Novorapid insulin SC before each meal and he is due for 22 units of Lantus now.

**Question C: Do you give Mr. Jones the Lantus?**
**Answer:** The Lantus insulin should be given.
**Rationale:** The 4.0 mmol/L is a reflection of what occurred at supper with the amount of food intake and the dose of insulin at that meal. The dose of Novorapid at supper should be reassessed according to his food intake. You can give the resident a snack containing a protein and 15 grams of carbohydrate and then give him his Lantus dose. If concerned about possible low blood sugars overnight, check blood glucose between 02:00 and 04:00 am. Remember Lantus is basal insulin that is peakless therefore should not cause hypoglycemia.
3. Mr. Charles has a fasting blood glucose reading of 3.8 mmol/L in the early morning. His insulin regimen consists of Novo-Mix 30 before breakfast and 30 units of Novo-Mix 30 before dinner. You treated the low blood glucose with 4 tablets and 15 minutes later his blood glucose reading is 6.9 mmol/L. He is hungry and wants to eat his breakfast.

**Question D: Do you give his insulin? Which insulin should be adjusted?**

**Answer:** Once his hypoglycemia is treated give the prescribed dose of NovoMix-30, as he will be eating his breakfast soon. Determine if there are any hypoglycemic episodes on previous days. These indicate that an insulin dose should be reduced.

**Rationale:** The 3.8 mmol/L fasting blood glucose level reflects the activity level/food intake/ insulin from dinner the day before. It is the dinner insulin dose that should be reduced. The morning insulin manages the glucose released from food at breakfast and during the day so it should not be held. Glucose meter readings done after breakfast and before supper reflect the effectiveness of the morning dose of this mixed insulin.

4. Mrs. Rogers is an unpredictable eater. At times she will refuse to eat and at other times will eat a large meal. She is prescribed Novorapid 10 units Sub Q with meals and Lantus insulin at night.

**Question E: What can be done to allow flexibility with her insulin doses?**

**Answer:** A solution is to give the Novorapid insulin after Mrs. Roger’s meal to allow review of actual food intake.

**Rationale:** Assessment of food intake is essential. Contact her prescriber for an order to adjust insulin dose based on her actual intake. A possible order could be: (1) hold pre-meal insulin if not eating; (2) give 10 units if eating 75-100% of meal, and (3) give 4 units if eating 50% or less. Staff can also check blood glucose every 2 hours after a meal to determine if food and insulin match.

5. Mr. Hill is fed via a G tube and is normally very alert and involved in activities. Today there is a sudden change in his condition; slurred speech, blurred vision and he is restless. You check his blood glucose and his reading is 3.6 mmol/L.

**Question F: What would be your first option to treat Mr. Hill’s hypoglycemia?**

**Answer:** Provide Mr. Hill with 15 grams of fast-acting carbohydrate via his G tube. Some options in your hypoglycemic kit are: one (1) Dextrose 4 Liquidblast, or; two (2) crushed Dextrose tablets dissolved in water, or; three (3) sugar packets dissolved in water. After the hypoglycemic event has resolved, to see what may have caused it. Review food intake, activity level and medications with his prescriber.

**Rationale:** Dextrose tablets or Liquidblast are the first choice for treatment of hypoglycemia.
Mrs. Downs was admitted to your LTC facility 7 days ago. She uses a walker to get around, and is beginning to get forgetful. She had a heart attack 10 years ago and a history of renal impairment. She is able to walk to the dining room when the staff has reminded her it is time to eat. It is noted by staff that she is unsteady on her feet, but she has not fallen since admission. She is on Glyburide 2.5 mg po twice daily, and Metformin 250mg with each meal. She was not testing her blood glucose at home.

**Question G: What is a possible A1C target for her? What is the primary goal of therapy for her?**

**Answer:** Her A1C could be up to 8% or higher. Due to her frailty you want to AVOID any hypoglycemia. You should have the glyburide reassessed as it is known to cause hypoglycemia in the older adult with kidney impairment. Gliclazide is a better option for her.

**Rationale:** Hypoglycemia must be avoided in the older adult as it can lead to more cognitive decline, cardiovascular events and increases her risk for falls.

**Question H: How often should her blood glucose be tested? What times should they be tested?**

**Answer:** Test her blood glucose QID x 3-4 days ac meals and at bedtime for a baseline, then fasting 1-2 times per week. Review A1C and individualize.

**Rationale:** You want to establish her patterns in order to individualize her treatment.

**Question I: She develops a UTI and her blood glucose readings are now running between 15-16 mmol/L for the past 2 days. How often should you be testing her blood glucose? What other actions are needed?**

**Answer:** She will need up to QID blood glucose testing until she is stabilized and her intercurrent illness has resolved. She may need a short duration of a supplemental scale of rapid acting insulin to keep her blood glucose in range (i.e. give 3 units if pre meal blood glucose is over 14 and give 5 units if pre meal blood glucose is over 18). The order should include a date to reassess the QID blood glucose testing and the supplemental scale. She also needs to drink at least 125-250mL per hour.

**Rationale:** In this case, we want to avoid prolonged hyperglycemia and avoid dehydration and a progression to a Hyperglycemic Hyperosmolar State (HHS).
7. Mr. Marks is an 84 year old gentleman diagnosed with Type 2 Diabetes 10 years ago. He also has a history of dementia, coronary artery disease and arthritis. Medications include: Metformin 500 mg po bid; Glyburide 10 mg po bid; Metoprolol 25 mg po daily; enteric-coated aspirin 81 mg po daily; Acetaminophen 325mg po prn for arthritic pain. He is more agitated at times. Recently, the staff has noticed he has been frequently falling asleep during his meal time. The resident is also becoming increasingly weaker and now is incontinent of urine. Until recently, his glucose levels have been checked 3 times per week, and they have been stable in the range of 10 mmol/L. Yesterday, staff started to check the glucose levels twice daily. Glucose level ac lunch was 23 mmol/L and at HS (bedtime) the meter read ‘hi’. A urinalysis was also collected and a urinary infection was suspected.

**Question J:** What caused the change in glucose level? What should be done?

**Answer:** Infection is the most common cause of Hyperglycemic Hyperosmolar State (HHS). The resident should be sent to the Emergency Room unless appropriate health services are on site.

**Question K:** What is the priority of treatment for this resident?

**Answer:** Rehydration is usually done by IV in the Emergency Room (unless IV therapy and related care is available on site). Treatment of the underlying cause of the HHS is required as well.
Glossary

**A1C**: Glycated hemoglobin is a measurement of the mean plasma glucose levels over the previous 3-4 months. Hemoglobin has a lifespan of three months. It carries a protein that is coated with glucose that can be measured as a percent.

**ante cibum (ac)**: Glucose meter reading before the first bite of a meal. Glucose testing before meals provides insight into baseline insulin requirements and reflects the glucose management of the previous meal. It provides the basis of pattern management.

**Basal Insulin**: The insulin required to interact with the stored glucose released from the liver and muscles in between eating and during the night; examples include Novolin NPH, Humulin N, Levemir, and Lantus.

**Bolus Insulin**: The insulin required to interact with the glucose released from the consumption of foods; examples include Novorapid, Humalog, Apidra, Humulin R, and Novolin Toronto.

**Delirium**: An acute decline in attention and cognition; it is a potentially reversible clinical syndrome but should be treated immediately. It can become life threatening.

**Dextrose**: Form of carbohydrate and simple sugar.

**Diabetes**: Diabetes Mellitus is a metabolic disorder that results from inadequate insulin secretion, insulin action or both and is identified by elevated blood glucose levels: hyperglycemia.

- **Type 1 Diabetes**: Results from the destruction of the beta cells in the pancreas leading to absolute insulin deficiency. The etiology may be an auto-immune response or be unknown. This form of diabetes is prone to the development of Diabetes Ketoacidosis.

- **Type 2 Diabetes**: A chronic progressive disease with islet cell malfunction and insulin resistance of the cells where the pancreas inadequately produces insulin or the body is resistant to the insulin it makes.

- **Pre-diabetes**: State of impaired fasting glucose (IFG), impaired glucose tolerance (IGT) or both. Blood glucose levels do not indicate diabetes but are elevated enough to negatively impact the vascular system. Management targets improved eating habits and activity.

**Diabetes Ketoacidosis (DKA)**: is a potentially life-threatening condition that occurs predominantly in individuals with type 1 diabetes, but it can occur in those with type 2 diabetes. DKA results from insufficient insulin (physiological or endogenous) where the body breaks down fatty acids as an alternative fuel source producing acidic ketone bodies that cause most of the symptom.
**Euglycemia:** Normal concentration of glucose in the blood; also called normoglycemia.

**Fasting Blood Glucose (FBG):** The glucose meter reading taken in the morning after eight hours of not eating. It indicates the body’s ability to metabolize the glucose that is released by the liver during the night. This reading may be elevated if the resident ate a large evening meal, HS (bedtime) snack or bedtime glucose was elevated.

**Glucose:** See Dextrose.

**Hyperglycemia:** The presence of an abnormally high concentration of glucose in the blood. Reference ranges for glucose levels are individualized.

**Hyperglycemic Hyperosmolar State (HHS):** Is a potentially life-threatening with markedly high blood glucoses and profound dehydration which can carry a 15% risk of mortality. It usually evolves over several days or weeks and presents in older patients with type 2 diabetes mellitus with an acute illness, decreased fluid intake, new diagnosis of diabetes, or introduction of a new psychotropic medication or other reason. Transferring the resident to an acute care facility is imperative (if this is in keeping with the resident’s wishes).

**Hypoglycemia:** As plasma glucose levels decrease below cell requirements various physiological consequences occur. The symptoms can range from mild autonomic to severe cognitive impairment which can result in seizures, coma, or death.

**Medical Directive:** A facility specific list of instructions and treatments that can be initiated without calling the prescriber. For example: acetaminophen 325 – 650 mg po 4h prn for fever for 48 hours only. It should include clinical situation requiring therapy, duration of use and monitoring parameters.

**Pattern Management:** A multistep, proactive approach that identifies glycemic patterns with glucose monitoring. Through pattern management the review of several days of blood glucose readings in conjunction with food intake, activity and doses of medication doses enables health care providers to make the appropriate changes in therapy based on those results.

**Physiological Insulin:** This refers to the normal patterns of insulin release from a healthy pancreas in response to the rise in blood glucose. Rising blood glucose may be in response to carbohydrate intake, hormonal changes, and physiological changes within the body (stress hormones, gluconeogenesis, and infection).

**Post prandial (pc):** Blood glucose reading tested 2 hours after the “first bite of a meal”. This indicates the ability of insulin (produced by the pancreas or injected) to transport the blood glucose produced when carbohydrates are ingested into the cells.

**Sucrose:** See Dextrose.
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35 Sick Day Diabetes Management Guidelines. Leadership Sinai Centre for Diabetes, Mount Sinai Hospital, 2004


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Additional Resources can be found at:
