

Diabetes Considerations in Stages 4 - 5 Renal Disease

This document refers to diabetes management in stages 4 and 5 of chronic kidney disease (CKD) to supplement the information in the Diabetes Canada guidelines.

Stage 4 GFR < 30

Stage 5 GFR < 15 and dialysis or conservative care if chosen by client

General Differences in Diabetes Management

1. Hypoglycemia: Individuals with advanced renal disease are at increased risk of hypoglycemia, particularly overnight and in the fasting state. Some clients requiring insulin may not require evening basal insulin. Some clients may experience significant drops in overnight blood glucose readings without evening insulin injections (e.g. of up to 8 mmol/L)
Contributing factors:
 - Reduced clearance of medications/insulin
 - Impaired renal gluconeogenesis (decline in renal mass)
 - Dietary factors: uremia increases anorexia/nausea/vomiting; suboptimal nutrition due to reduced clearance.
 - Additional factors: gastroparesis, hypoglycemia unawareness secondary to autonomic neuropathy
2. Targets: Should be individualized.
3. A1c: Rely on SBGM as A1c may not be reliable marker of glycemia in CKD.
A1c can be falsely increased with altered glycation or iron deficiency
A1c can be falsely decreased with decreased RBC lifespan seen in CKD and use of (erythropoetin) EPO, iron supplement
4. Diabetes medications: Medications should be prescribed and adjusted to suit individual client glucose patterns and lifestyles Some diabetes medications may be discontinued in stage 5 renal disease. Glyburide is usually, but not always, discontinued by the nephrologist, given reduced clearance and risk of hypoglycemia. Nephrologists may continue to use select oral anti- hyperglycemic agents including repaglinide and metformin if deemed appropriate in individual clients. See [Diabetes Canada Guidelines for the section on Therapeutic Considerations for Renal Impairment \(Appendix 7\)](#).
5. Insulin:
 - Starting insulin doses are usually less in stage 4-5 compared to stage 1-3 (which is similar to the population of people with diabetes and no kidney disease).
 - Some insulin-requiring clients may require morning basal insulin only, with no evening dose. Morning basal insulin may be increased to address elevated fasting readings.
 - Meal bolus insulin should be matched to the client's rate of digestion. In the case of delayed emptying due to neuropathy, rapid insulin may be given post meal or regular insulin may given with the meal, depending on the degree of delayed digestion.
6. Nutrition:
 1. Bedtime snack is often recommended in insulin users for the prevention of hypoglycemia
 2. Some foods or supplements may be limited due to sodium, potassium, phosphorus, fluid or protein content and individual client lab results.
 3. Glucose from dialysate, not just food, can impact blood glucose levels. Source: SARP, 2010

Hemodialysis (HD)

Clients often have poor appetites and intake before the HD run due to uremia, and significantly improved appetites after the run. SARP nurses monitor blood glucose levels carefully before, during and after runs and usually suggest snacks. Snacks are often necessary after HD run as more likely to have dropping glucose levels after dialysis ends (no glucose from dialysate transferring in). Clients are advised to carry food and treatment for hypoglycemia with them on the handibus or car.

Many clients eat large meals after the HD run, as they are feeling better. Rapid or short acting hypoglycemic medications may need to be increased for that larger meal.

Peritoneal Dialysis (PD)

CAPD explained: Continuous ambulatory peritoneal dialysis involves 3 – 4 daytime exchanges with varied glucose solutions and one overnight exchange with Extraneal® (no glucose dialysate). Clients are exposed to a hyperglycemic environment for approximately 16 hours daily.

CCPD explained: Continuous cycler peritoneal dialysis. Either a dialysis solution is used during the day or no solution is used (the client is 'dry'). At night, the PD catheter is connected to a dialysis machine called a cycler, which loads various PD dialysis fluids during the night. These clients are exposed to a hyperglycemic environment for approximately for 8 – 9 hours daily.

- Dialysates for peritoneal dialysis (PD) contain glucose, which can affect blood glucose levels or alternatively, modified starch or amino acids, which do not affect glucose levels. Extraneal® is an example of the latter. Extraneal is not normally used as the sole type of dialysate. It may be used for one of the 3-4 bags during the day.
- Recent changes to concentrations of glucose in dialysate solutions can affect blood glucose. Asking if the percentage glucose in the client's solutions has changed can help problem-solve blood glucose logbooks.
If Extraneal dialysate is used in the evening, clients may require a bedtime snack.
- Bolus insulin (rapid or regular) is usually used to adjust for glucose containing dialysis solutions. In some centres, insulin is added to the PD glucose solution, although not typically in Calgary. In type 2 diabetes, repaglinide may be used with meals or with TID dialysate exchanges, by some physicians.
- Blood glucose levels can alter with peritonitis (infection or inflammation) and with obstructed drainage of dialysate. Constipation can impair drainage of dialysate.
- With CCPD, the client may require basal insulin 2 – 3 hours before starting the cycler (usually at night). This allows for onset of insulin action close to the time that the cycler starts. Long acting insulin may continue to work after the cycler (and the glucose infusion) stops. Hypoglycemia may be avoided by directing the individual to have small amount of apple juice before rising and becoming more active.
- Meals and carb intake may vary due to less hunger from volume of fluid in abdomen, increased caloric intake from dialysate and, early on, due to lingering symptoms of uremia. Obesity, dyslipidemia and low muscle mass are common in CKD. Glucose calories supplied by the dialysis solution are usually about 400kcal per day. Dietary carbohydrate is usually subtracted from the diet to compensate and to help prevent obesity. Further reduction in carbohydrate intake may be recommended for hypertriglyceridemia. Intake of protein is liberalized to 1.2 g/kg daily and monitored carefully due to renal protein losses and in dialysis fluids Source: American Journal of Kidney Diseases. Feb 2007. Vol 49(2) suppl 2, pages S1-179