MANAGEMENT OF GLYCEMIA IN CKD\textsuperscript{1-4}

Intensive treatment of hyperglycemia can prevent diabetic kidney disease (DKD) and may slow the progression of established CKD.

- The target HbA\textsubscript{1c} for all patients with diabetes, with or without CKD, should be <7%.

- Pharmacologic options for glycemic control are limited in patients with advancing CKD (stages 3 to 5) because drugs excreted even in part by the kidney will accumulate (\textit{Table}).
  - Discontinue or avoid: metformin, most sulfonylureas, nateglinide, α-glucosidase inhibitors, GLP-1 receptor agonists.
  - Reduce dosage of DPP-4 inhibitors.
  - Glipizide, repaglinide, and TZDs can be used safety (undergo hepatic metabolism and/or clearance).

BLOOD PRESSURE MANAGEMENT IN CKD\textsuperscript{1-4}

Treatment of hypertension slows the progression of CKD by reducing the rate of GFR decline and the time to end-stage renal disease and renal transplantation.

- Target BP in diabetes and CKD stages 1-4 is <130/80 mm Hg.

- Individuals with diabetes and hypertension in CKD stages 1-4 should be treated with an ACE-I or an ARB, usually in combination with a diuretic (\textit{Table}).

- Other agents, such as calcium channel blockers, and β-blockers, may be used to further lower BP in patients already taking an ACE-I or ARB.

LIPID MANAGEMENT IN CKD\textsuperscript{1-4}

- The LDL-C goal should be <100 mg/dL, with a level <70 mg/dL as a therapeutic option (\textit{Table}).

- Statin therapy is recommended for diabetic patients with CKD stages 1 to 4 and an LDL-C >100 mg/dL.

- The NKF advises against statin therapy in patients with type 2 diabetes on maintenance hemodialysis therapy who do not have a specific CV indication for treatment.

NUTRITIONAL MANAGEMENT IN DIABETES AND CKD\textsuperscript{1-4}

- The recommended daily allowance of dietary protein for individuals with diabetes and CKD stages 1 to 4 is 0.8 g/kg body weight.

REFERENCES


<table>
<thead>
<tr>
<th>Stage and Description</th>
<th>GFR (mL/min per 1.73 m² BSA)</th>
<th>Management Recommendations</th>
<th>Pharmacologic Recommendations</th>
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<tr>
<td>1: Renal damage with normal or mildly increased GFR</td>
<td>≥90</td>
<td>• HbA₁c goal: ~7%&lt;br&gt;• BP goal: &lt;130/85 mm Hg&lt;br&gt;• LDL goal: &lt;100 mg/dL</td>
<td>• Add ACE-I/ARB if urine microalbumin ≥30 mg/g creatinine</td>
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<tr>
<td>2: Renal damage with mildly decreased GFR</td>
<td>60-89</td>
<td>• Same glucose, BP, and lipid goals as stage 1</td>
<td>• ACE-I/ARB recommended for all patients</td>
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<tr>
<td>3: Moderately increased GFR</td>
<td>30-59</td>
<td>• Same glucose, BP, and lipid goals as stage 1&lt;br&gt;• Refer to nephrology to prepare for impending renal failure if not meeting treatment goals&lt;br&gt;• Monitor for anemia&lt;br&gt;• Monitor for secondary hyperparathyroidism</td>
<td>• ACE-I/ARB recommended for all patients&lt;br&gt;• Discontinue metformin, all sulfonylureas except glipizide, nateglinide, α-glucosidase inhibitors, GLP-1 analogs&lt;br&gt;• Reduce doses of DPP-4 inhibitors&lt;br&gt;• Add erythropoietin if Hgb &lt;9 g/dL&lt;br&gt;• Add ergocalciferol when 1.25-dihydroxyvitamin D is &lt;30 ng/mL or when PTH &gt;2 x ULN</td>
</tr>
<tr>
<td>4: Severely decreased GFR</td>
<td>15-29</td>
<td>• Same glucose, BP, and lipid goals as stage 1&lt;br&gt;• Refer to nephrology to prepare for impending renal failure and consideration of shunt placement&lt;br&gt;• Monitor for anemia&lt;br&gt;• Monitor for secondary hyperparathyroidism</td>
<td>• ACE-I/ARB recommended for all patients with careful monitoring of serum potassium&lt;br&gt;• Insulin therapy recommended for most patients&lt;br&gt;• Add erythropoietin if Hgb &lt;9 g/dL&lt;br&gt;• Add ergocalciferol when 1.25-dihydroxyvitamin D is &lt;30 ng/mL or when PTH &gt;2 x ULN</td>
</tr>
<tr>
<td>5: End-stage renal failure</td>
<td>&lt;15 or dialysis</td>
<td>• Dialysis or kidney transplantation</td>
<td></td>
</tr>
</tbody>
</table>

ACE-I = angiotensin-converting enzyme inhibitor; ADA = American Diabetes Association; albumin-creatinine ratio (ACR); ARB = angiotensin receptor blocker; BSA = body surface area; BP = blood pressure; CKD = chronic kidney disease; CVD = cardiovascular disease; DPP-4 = dipeptidyl peptidase-4; GFR = glomerular filtration rate; GLP-1 = glucagon-like protein-1; HbA₁c = glycated hemoglobin; Hgb = hemoglobin; LDL = low-density lipoprotein cholesterol; NKF = National Kidney Foundation; PTH = parathyroid hormone; TZDs = thiazolidinediones; ULN = upper limits of normal.