NephU™
Improving Awareness & Patient Outcomes

Diabetic Kidney Disease:
What Does It Mean For Patients?

One in three adults diagnosed with diabetes has Chronic Kidney Disease (CKD)[1]

Every 24 hours, 170 patients with diabetes begin kidney replacement therapy[1]

90% of patients with CKD do not know that they have it[2]

Pathophysiology Of Diabetic Kidney Disease

Diabetes Mellitus (DM) frequently causes CKD and is called diabetic kidney disease (DKD).[1] DKD progresses more rapidly with type 2 diabetes than type 1.[4]

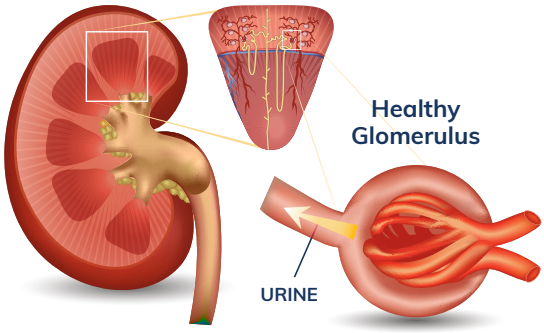
INSULIN
The hormone, insulin, facilitates the transportation of blood glucose into cellular structures for energy synthesis.[3]

GLUCOSE DYSREGULATION
In patients with diabetes, impaired insulin production or utilization by the pancreas results in dysregulation of glucose homeostasis.[3]

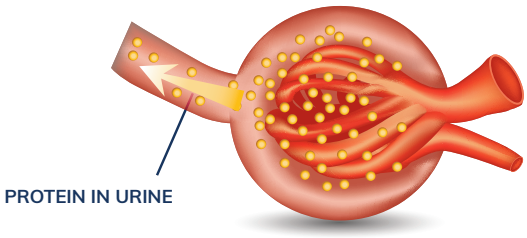
KIDNEY DAMAGE
Over time, hyperglycemia due to diabetes mellitus causes damage to both renal nephrons and blood vessels, resulting in decreasing kidney function.[1]

DIABETIC KIDNEY DISEASE (DKD)
In early stages, no signs or symptoms are obvious but over time, diabetes often causes DKD.[1]

Nephron[7]



Glomerulus With Diabetic Kidney Disease
Protein leaks from capillary walls into Bowman's Capsule



Patient Education & Empowerment

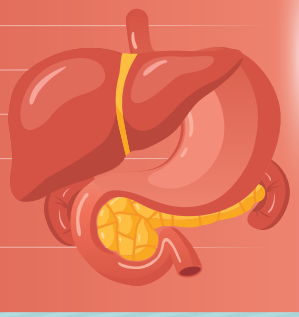
RISK FACTORS
Educate patients on modifiable and nonmodifiable risk factors for DKD.[4,5]

MEDICATION COMPLIANCE
Educate patients on importance of medication compliance.[4,5]

PATIENT EMPOWERMENT
Encourage patients to be an active participant in their multidisciplinary healthcare team.[4,5]

NONMODIFIABLE RISK FACTORS OF DKD[4]

1. Age at time of diagnosis
2. Family health history
3. Level of formal education
4. Being male
5. Having either type 1 or type 2 diabetes mellitus



MODIFIABLE RISK FACTORS OF DKD[4]

1. Control of blood sugar
2. Control of blood pressure
3. Alcohol usage or abuse
4. Control of lipid/cholesterol levels
5. Obesity
6. Exercise and being physically fit
7. Having a social support network

References:
1. Diabetes and Chronic Kidney Disease. Centers for Disease Control and Prevention (CDC). https://www.cdc.gov/diabetes/managing/diabetes-kidney-disease.html Updated December 2022. Accessed January 2024.
2. Chronic Kidney Disease in the United States, 2023. Centers for Disease Control and Prevention (CDC). https://www.cdc.gov/kidneydisease/publications-resources/ckd-national-facts.html Accessed January 2024.
3. The Surprising Link Between Chronic Kidney Disease, Diabetes, and Heart Disease. Centers for Disease Control and Prevention (CDC). https://www.cdc.gov/kidneydisease/publications-resources/link-between-ckd-diabetes-heart-disease.html Updated July 2022. Accessed January 2024.
4. Diabetic Kidney Disease: Diagnosis, Treatment, and Prevention. American Family Physician. https://www.aafp.org/pubs/afp/issues/2019/0615/p751.html Published June 2019. Accessed January 2024.
5. Top 10 Takeaways for Patients from the KDIGO 2022 Clinical Practice Guideline for Diabetes Management in CKD. KDIGO. https://kdigo.org/wp-content/uploads/2022/10/KDIGO-2022-Diabetes-Management-in-CKD-Guideline-Top-10-Takeaways-for-Patients.pdf Accessed January 2024.
6. Executive Summary of the KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease: An Update Based on Rapidly Emerging New Evidence. Kidney International. https://doi.org/10.1016/j.kint.2022.06.013 Accessed January 2024.
7. Diabetic Nephropathy. Reineg [Vector]. Adobe Stock. https://stock.adobe.com/images/diabetic-nephropathy-kidney-disease/94404681

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Routine Tests for DKD

Glucose Testing used for diagnosing patients who have DKD or are at risk for DKD[4]

- Blood Glucose testing[4]
- Hemoglobin A1c (HbA1c)[4]

Kidney Function Tests for patients with or at risk for DKD[4]

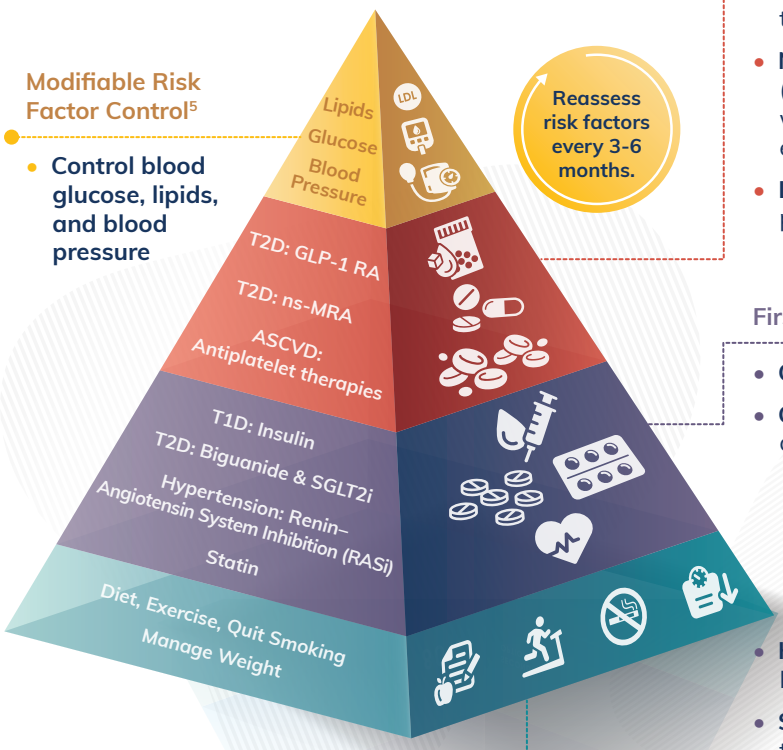
- Estimated glomerular filtration rate (eGFR)[4]
- Serum creatinine (sCr)[4]
- Spot urine albumin/creatinine ratio testing[4]
- Screen for micro/macroalbuminuria[4]

Recommended HbA1c Targets

HbA1c Targets From The American Diabetes Association (ADA)[4]

- **<6.5%** is a target for patients without hypoglycemia or complications and carries an expectation for a long life[4]
- **<7%** is an optimal target goal for many adults[4]
- **<8%** is an acceptable target goal for these patients:[4]
  - Those with advanced Chronic Kidney Disease (CKD)
  - Elderly or frail patients
  - Patients with significant comorbidities
  - Those with increased risk of hypoglycemia
  - Patients who have experienced long disease duration or have limited life expectancy

Medical Management, Diet, & Lifestyle Recommendations From Kidney Disease Improving Global Outcomes (KDIGO)[5,6]



Modifiable Risk Factor Control[5]

- **Control blood glucose, lipids, and blood pressure**

Second-Line Drugs: Heart & Kidney Protection[5,6]

- **Glucagon-like peptide-1 receptor agonists (GLP-1 RA):** Recommended for patients with T2D if 1st line glycemic treatments are ineffective
- **Nonsteroidal Mineralocorticoid Receptor Antagonist (ns-MRA):** May be added to first-line therapy for patients with T2D and high risk for CKD and cardiovascular events (persistent albuminuria >30 mg/gram)
- **Lifelong Aspirin Administration:** Recommended to prevent atherosclerotic cardiovascular disease (ASCVD)

First-Line Drug Therapy[5,6]

- **Glycemic control for T1D:** Insulin
- **Glycemic control for T2D:** Biguanide anti-diabetic drug and sodium-glucose cotransporter-2 inhibitors (SGLT2i)
  - Biguanide anti-diabetic drug initiation when eGFR is ≥ 30ml/min/1.73m^2
  - SGLT2i medication should be initiated when eGFR is ≥ 20 ml/min/1.73m^2 and continued until renal replacement therapy is required
- **Hypertension & Albuminuria Treatment:** Renin-angiotensin system inhibition (RASi)
- **Statin treatment:** Recommended for all patients with type 1 diabetes (T1D), type 2 diabetes (T2D), and CKD

Healthy Lifestyle Intentionality[5,6]

- **Nutritious Diet:** Fruits, vegetables, whole grains, legumes and nuts, plant-based proteins, and unsaturated fats
- **Limited Intake:** Processed meats, simple carbohydrates, and sweetened drinks
- **Salt Intake:** <5 grams/day (2 grams sodium)
- **Daily Protein:** 0.8 grams/kilogram of body weight
- **Registered Dietitian Nutritionist Education:** With routine dietary patient monitoring
- **Exercise**
- **Stop smoking**

References:
1. Diabetes and Chronic Kidney Disease. Centers for Disease Control and Prevention (CDC). https://www.cdc.gov/diabetes/managing/diabetes-kidney-disease.html Updated December 2022. Accessed January 2024.
2. Chronic Kidney Disease in the United States, 2023. Centers for Disease Control and Prevention (CDC). https://www.cdc.gov/kidneydisease/publications-resources/ckd-national-facts.html Accessed January 2024.
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4. Diabetic Kidney Disease: Diagnosis, Treatment, and Prevention. American Family Physician. https://www.aafp.org/pubs/afp/issues/2019/0615/p751.html Published June 2019. Accessed January 2024.
5. Top 10 Takeaways for Patients from the KDIGO 2022 Clinical Practice Guideline for Diabetes Management in CKD. KDIGO. https://kdigo.org/wp-content/uploads/2022/10/KDIGO-2022-Diabetes-Management-in-CKD-Guideline-Top-10-Takeaways-for-Patients.pdf Accessed January 2024.
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