



Diabetes and Kidney Disease
AADE Practice Paper
March 2017

Over the past quarter-century, both type 2 diabetes and end-stage renal disease (ESRD) attributable to diabetes have become global health challenges. Diabetes is the leading cause of kidney failure, accounting for 44% of all new cases in 2011.¹ Duration of diabetes before signs of diabetes kidney disease (DKD) and subsequent progression of DKD are similar in type 1 and type 2 diabetes.² Major risk factors for kidney disease include high blood pressure, diabetes, cardiovascular disease and family history of kidney failure. Additional risk factors include obesity, autoimmune diseases, urinary tract infections, systemic infections, and kidney damage, injury or infection.³ Greater awareness and earlier diagnosis of DKD, along with more routine application of renoprotective management practices, now appear to be reversing this trend—offering hope of further reduction in diabetes-related ESRD.⁴ The diabetes educators' role in education of preventive and management strategies for DKD is also influential to optimize outcomes.

While hyperglycemia is the most likely contributing factor for kidney disease in people with diabetes, other causes are possible and should be considered such as family history of nephropathy, hypertension, and increased duration of diabetes.⁵ A key step in evaluating each patient with diabetes and kidney disease is to determine the etiology. In most patients with diabetes, chronic kidney disease (CKD) may be attributable to diabetes if albuminuria and retinopathy are present and a screening evaluation for causes unrelated to diabetes is negative.⁶ Under-diagnosis of both diabetes and CKD leads to lost opportunities for prevention, and inadequate or inappropriate care of patients with diabetes and CKD contributes to disease progression.² The two key markers for CKD are elevated urine albumin and estimated glomerular filtration rate (eGFR). Albuminuria is present when urine albumin-to-creatinine ratio (UACR) is greater than 30 mg/g and is a marker for CKD or/and when eGFR is <60 mL/min/1.73 m².⁷ Less than 20 percent of people with moderate to severe kidney disease are aware of their condition.⁸ Even among patients followed by a nephrologist, educational gaps are large with

almost one third of patients acknowledging they do not understand their diagnosis, potential complications, or treatment options.⁹ This is a great opportunity for diabetes educators to address these educational deficiencies, promote self-management, and support coordinated management of kidney disease with other co-morbidities. As trusted providers of information and advice on self-management, diabetes educators are in a unique position to assist patients in understanding their disease and learning how to cope with the complexities and fears that often go along with it.

Reducing the burden of kidney disease requires early intervention in the course of disease, well before referral to a nephrologist. Pharmacologic and nutritional interventions are effective in slowing the progression of kidney disease in people with diabetes and may prevent or delay the development of complications and need for renal replacement therapy (dialysis or transplantation).²

Recommendations for Prevention and Management of Renal Disease Progression

AADE7 Self-Care Behaviors™	
Healthy Eating	<ul style="list-style-type: none"> • Maximize opportunities for glycemic control through nutrition meal timing and carbohydrate consistency. • Limit dietary sodium to 2,300 milligrams per day (may help lower albuminuria) and as needed for certain individuals 1,500 milligrams per day.¹⁰ • Protein intake of 0.8gm/kg per day is recommended (for those not on renal replacement therapy)³ <ul style="list-style-type: none"> ○ Reduced animal protein intake may result in an increase in serum bicarbonate, as animal protein is a source of metabolic acids. ○ Evaluate protein and calorie intake. Hypoalbuminemia is common and multifactorial. The patient may report aversion to meat as the eGFR declines. • Prevent hyperkalemia.

	<ul style="list-style-type: none"> ○ Do not replace salt with salt substitutes such as potassium chloride. ○ Limit dietary potassium when serum level is elevated. ○ Double check over-the-counter calcium supplements for added potassium. ● Dietary management of nontraditional risk factors including abnormal mineral and electrolyte metabolism (calcium, phosphorus, and potassium) may be needed; based on laboratory findings. ● Review dietary treatment of dyslipidemia. ● Monitor vitamin D supplementation as may increase risk of hypercalcemia and hyperphosphatemia.
Being Active	<ul style="list-style-type: none"> ● There are no activity level changes related to DKD.
Monitoring	<ul style="list-style-type: none"> ● Guide the patient to help achieve optimal blood glucose management. ● If appropriate, monitor blood pressure at home and encourage keeping a log to share with care team. ● Individualize the blood glucose goals. <ul style="list-style-type: none"> ○ An A1C goal of <7% for those individuals with newly diagnosed diabetes may delay the onset or progression of DKD. ○ 70- 180 mg/dl for random blood glucose is an appropriate goal for most patients. ○ In diabetes of long duration, achieving glycemic targets may not slow progression.¹¹ ● An unexplained improvement in glucose control may reflect DKD progression. ● Review and discuss eGFR and UACR.

<p>Taking Medication</p>	<ul style="list-style-type: none"> • Monitor blood glucose for possible medication adjustment. <ul style="list-style-type: none"> ○ Insulin requirements may be lower due to reduced insulin clearance by the kidneys. ○ Some oral hypoglycemic agents may need to be discontinued or reduced in people with decreased kidney function. • Monitor albumin levels as medications (ACE inhibitors and ARBs) that affect the renin angiotensin aldosterone system (RAAS) may lower urine albumin. • Educate patients regarding medications that may increase risk of hyperkalemia. • Expect that the patient will be on medications for treatment of dyslipidemia. • Make patients aware of the risks of using non-steroidal anti-inflammatory drugs (NSAIDS) especially in association with volume depletion and concurrent use of RAAS antagonists.
<p>Problem Solving</p>	<ul style="list-style-type: none"> • Include education on hypoglycemia, hyperkalemia, and sick day management, remembering special considerations such as: <ul style="list-style-type: none"> ○ Treat hypoglycemia with juices low in potassium such as apple and cranberry ○ The potential need for medication adjustment as renal function declines ○ Signs and symptoms of advanced renal failure may mirror symptoms of DKA • Address issues related to the other health care behaviors for

	<p>example blood pressure, hyperkalemia, hyper or hypoglycemia.</p> <ul style="list-style-type: none"> • Treat hypoglycemia appropriately. <ul style="list-style-type: none"> ○ Use low potassium juice (such as apple or cranberry as opposed to orange) when hyperkalemia is present.
<p>Healthy Coping</p>	<ul style="list-style-type: none"> • Communicate the importance of annual renal function evaluation, blood pressure monitoring, and how DKD is diagnosed. • Explain the progressive nature of DKD and the basics of treatment. • Begin to speak about dialysis and transplantation. • Support the patient and family: realizing potential lifestyle changes including personal and family role changes and financial concerns including changes in employment. • Assess for depression and diabetes distress.
<p>Reducing Risks</p>	<ul style="list-style-type: none"> • Encourage smoking cessation. • Blood pressure management is the key to slowing progression of DKD. Goal is <140/90 mmHg. Individuals with albuminuria, who are at increased risk of CVD and CKD progression, lower blood pressure targets (<130/80 mmHg) may be considered.¹ • Support treatment of risk factors for cardiovascular disease. • Educate patients that the degree of risk of CV events or progression to ESRD increases as albuminuria levels rise, and as eGFR falls. • Monitor calcium, phosphorus, vitamin D, parathyroid hormone as abnormal mineral metabolism and bone disease is common.

Problem Solving	<ul style="list-style-type: none"> • Address barriers to achieving goals of healthy eating, being active, and monitoring. • Review access to care (e.g. providers and medications).
------------------------	---

DKD is a complication that effects almost one out of four people with diabetes. Achieving blood pressure and blood glucose goals, and maintaining healthy lifestyle habits are key factors in preventing and managing DKD. Early education and routine monitoring are important in those that may be at increased risk for this complication. Appropriate care for patients diagnosed with DKD requires interdisciplinary collaboration involving the full spectrum of healthcare professionals in the primary care setting. Collaborative management by primary care providers and renal consultants can maintain the continuity of care and improve outcomes. Diabetes educators are part of the interdisciplinary care team to identify patients at risk for development and help manage those who have developed DKD.

Acknowledgements

Andrew S. Narva, MD, FASN; Mary M. Julius, RD, LD, CDE; Lois Hill, MS, RD, LD, CSR, LDE; Donna P. Stevens, DNP, FNP-C, BC-ADM, CDE

References

1. Centers for Disease Control and Prevention. National Diabetes Fact Sheet Available: <http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>. Accessed February 20, 2017.
2. KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Diabetes and Chronic Kidney Disease. *Am J Kidney Dis.* 2007;49(2 Suppl 2):S12-154.
3. Standards of Medical Care in Diabetes-2017: Summary of Revisions. *Diabetes care.* 2017;40(Suppl 1):S4-S5.
4. System USRD. Annual Data Report Available: <https://www.usrds.org/adr.aspx>. Accessed February 20, 2017.
5. Joslin's Diabetes Deskbook - A Guide for Primary Care Providers. Boston, MA: Joslin Diabetes Center 2014.
6. KDOQI Clinical Practice Guideline for Diabetes and CKD: 2012 Update. *Am J Kidney Dis.* 2012;60(5):850-886.
7. American Diabetes Associaton. Standards of Medical Care in Diabetes-2017 Abridged for Primary Care Providers. *Clin Diabetes.* 2017;35(1):5-26.

8. Tuot DS, Plantinga LC, Hsu CY, et al. Chronic kidney disease awareness among individuals with clinical markers of kidney dysfunction. *CJASN*. 2011;6(8):1838-1844.
9. Wright JA, Wallston KA, Elasy TA, et al. Development and results of a kidney disease knowledge survey given to patients with CKD. *Am Journal Kidney Dis*. 2011;57(3):387-395.
10. Van Horn L, Carson JA, Appel LJ, et al. Recommended Dietary Pattern to Achieve Adherence to the American Heart Association/American College of Cardiology (AHA/ACC) Guidelines: A Scientific Statement From the American Heart Association. *Circulation*. 2016;134(22):e505-e529.
11. Buehler AM, Cavalcanti AB, Berwanger O, et al. Effect of tight blood glucose control versus conventional control in patients with type 2 diabetes mellitus: a systematic review with meta-analysis of randomized controlled trials. *Card Therap*. 2013;31(3):147-160.