

phosphate-containing bowel preparations, or high doses of iodinated contrast agents.

Persons with CKD in DM should undergo annual or more frequent assessment of electrolytes to assess potassium and acid-base status; blood counts to assess anemia status; and calcium, phosphorus, 25(OH) vitamin D, and parathyroid hormone (PTH) measurements to assess mineral metabolism.²⁰⁹ Hyperkalemia may be managed by dietary restriction, potassium binding agents, and adjustment of antihypertensive medications. For those with a serum bicarbonate level <22 mEq/L, the addition of oral sodium bicarbonate is recommended to correct the serum bicarbonate level. Anemia, defined as hemoglobin <13 g/dL in men and <12 g/dL in women, should be further investigated with iron, transferrin saturation, ferritin, vitamin B₁₂, and folate levels.⁴⁸⁴ Deficiencies should be replaced and a transferrin saturation target of ≥30% achieved, regardless of ferritin level.⁴⁸⁴ Iron given intravenously may produce better results than oral replacement. AACE recommends adequate calcium intake and achievement of 25(OH) vitamin D levels of >30 ng/dL in all persons. Supplementing vitamin D₂ or D₃ may reduce PTH in persons with CKD and secondary hyperparathyroidism.^{484,485} Active vitamin D preparations are usually necessary to keep the PTH level from increasing as eGFR declines. Hyperphosphatemia should be corrected into the normal range with dietary modification and use of phosphate binders.

Referral to a nephrologist is appropriate when the presentation is atypical, progression of albuminuria or decline in eGFR is rapid, or when secondary manifestations of CKD require expert advice. Referral of persons with stage 4 CKD to a nephrologist allows time for sufficient planning to accommodate individual personal needs.⁴⁸⁶ Kidney transplantation is the preferred kidney replacement therapy for persons with DM because long-term outcomes are superior to those achieved with dialysis. For persons with T1D, the possibility of combined kidney-pancreas transplantation delivers considerably better outcomes.⁴⁸⁷

Question 7: How should retinopathy be managed in persons with DM?

Recommendation 7.1

It is recommended that persons with T2D or adult-onset T1D should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist at the time of diagnosis or shortly after diagnosis. Individualized subsequent screening can be based on type and duration of DM, A1C or mean BG, BP, and the presence and grade of retinopathy.

Grade A; BEL 2 and expert opinion of task force

Recommendation 7.2

In persons with T1D, an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist should be performed within 5 years of diagnosis in children and adolescents.

Grade B; BEL 4 and expert opinion of task force

Recommendation 7.3

Women who are pregnant and have preexisting T1D or T2D should be monitored with eye examinations every trimester during pregnancy and in the postpartum period as determined by the severity of retinopathy during pregnancy.

Grade B; BEL 2

Recommendation 7.4

Persons with greater than mild nonproliferative retinopathy should have examinations at least once a year and more frequently as advised by their eyecare specialist.

Grade B; BEL 4 and expert opinion of task force

Recommendation 7.5

Follow-up with eyecare specialists typically should occur on an annual basis, but persons with T1D or T2D who have had a normal ocular examination may be screened every 2 to 3 years.

Grade B; BEL 2 and expert opinion of task force

Recommendation 7.6

Optimal glucose, BP, weight, and lipid control should be implemented to slow the progression of retinopathy.

Grade B; BEL 1

Recommendation 7.7

Artificial intelligence systems, authorized by the FDA for detecting greater than mild diabetic retinopathy, can be used as an alternative to traditional screening approaches. These systems can facilitate diagnosis of vision-threatening retinopathy and identification of persons who require ophthalmologic visits for treatment.

Grade B; BEL 1

Evidence Base 7: How should retinopathy be managed in persons with DM?

Diabetic retinopathy is the leading cause of blindness in adults. The stages of diabetic retinopathy include nonproliferative retinopathy, preproliferative retinopathy, and proliferative retinopathy, with macular edema occurring at any stage. The prognosis for retaining vision has improved dramatically over the past 40 years owing to improved metabolic and BP control.^{78,432,488–490} Diabetic retinopathy is present in 25% to 45% of persons with T2D, and between 2% and 8% of persons with T2D have proliferative retinopathy and/or macular edema.⁴⁹¹ Diabetic retinopathy is present in approximately 20%, 40%, and 70% of persons with T2D after <10, 10 to 20, and >20 years of the disease, respectively, with prevalence rates of proliferative retinopathy and/or macular edema around 2%, 10%, and 25% at the respective durations.⁴⁹² A 2020 meta-analysis of data from Europe revealed that any retinopathy was present in 25.7% of persons and diabetic macular edema occurred in 3.75%.⁴⁹³ The prevalence of diabetic retinopathy is predicted to continue to increase through the next 2 decades.⁴⁹⁴

Moreover, teenagers and young adults with T1D and T2D diagnosed during childhood (mean 7.8 years duration) have a prevalence of retinopathy of 9.1% and 5.6%, respectively.^{417,495} Higher levels of glycemia and BP, as well as the presence of nerve and renal diabetic complications, are associated with a greater likelihood of developing retinopathy.^{496,497} Nonhealing ulcers and bacterial infections increase the rate of progression of retinopathy,^{496,498} so persons with infections may merit close ophthalmologic care during this period; African American and Hispanic populations have increased likelihood of diabetic macular edema compared with non-Hispanic Whites.⁴⁹⁹

Like other complications, it is important to detect greater than mild nonproliferative retinopathy before vision is threatened. Ophthalmoscopy without pupil dilation is suboptimal so referral to an experienced ophthalmologist or optometrist for an annual dilated eye examination is recommended.⁵⁰⁰ Annual examinations have long been recommended as the standard approach, but data