

Care of the Patient with Diabetes Mellitus



American Optometric Association

A. DESCRIPTION AND CLASSIFICATION

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects of insulin secretion and/or increased cellular resistance to insulin. Chronic hyperglycemia and other metabolic disturbances of DM lead to long-term tissue and organ damage, as well as dysfunction, involving the eyes, kidneys, and nervous and vascular systems. DM can affect all structures of the eye and many aspects of visual function. The most serious sight-threatening complication of diabetes is diabetic retinopathy (DR).

1. Type 1 DM

- Results from destruction of beta cells in the pancreas
- Can occur at any age but is more common in persons <30 years of age
- Acute, symptomatic onset
- Absolute dependency on exogenous insulin

2. Type 2

- Results from predominant insulin resistance with relative insulin deficiency to predominant insulin secretory defect with insulin resistance
- Occurs more frequently in adults, with incidence increasing with age (>40 years of age)
- Insidious, asymptomatic onset
- Increased hyperglycemia and decreased insulin secretion

3. Impaired Glucose Tolerance (IGT)

- Hyperglycemia at above normal levels but below diagnostic criteria for DM.

4. Impaired Fasting Glucose (IFG)

- Fasting glucose levels ≥ 100 mg/dl but less than 125 mg/dl.

5. Gestational Diabetes Mellitus (GDM)

- Results from glucose intolerance during pregnancy.

6. Other Types of Diabetes

- Occur secondary to genetic defects in beta cell function or insulin action, pancreatic disease or other endocrinopathies, medications, or toxic chemicals.

B. RISK FACTORS

1. Risk Factors for Diabetes Mellitus

- Age** Persons ≥ 40 years of age
- Gender** Pregnant women
- Race** African Americans, Hispanics, and Native Americans
- Family History** Parents or siblings with DM
- Medical History** Vascular disease, obesity, glucose intolerance, gestational diabetes, or delivery of babies over 9 pounds

NOTE: This Quick Reference Guide should be used in conjunction with the Optometric Clinical Practice Guideline on Care of the Patient with Diabetes Mellitus (3rd Edition, Revised June 2009). It provides summary information and is not intended to stand alone in assisting the clinician in making patient care decisions.

Published by:

American Optometric Association • 243 N. Lindbergh Blvd. • St. Louis, MO 63141

2. Risk Factors for Diabetic Retinopathy

- Duration of diabetes
- Ocular surgery
- Poor control of DM
- Ethnic influences
- Pregnancy
- Dyslipidemia
- Proteinuria
- Lack of exercise
- Hypertension
- Smoking

C. COMMON SIGNS, SYMPTOMS, AND COMPLICATIONS OF DIABETIC RETINOPATHY

1. Signs

Clinical signs of DR may appear early in the natural history of the disease. The retinopathy severity scale provided in Table 1 describes a baseline retinopathy level and risk of progression.

Individual retinal lesions that identify the risk for progression of the disease may include:

- Microaneurysms (MA)
- Intraretinal hemorrhages
- Intraretinal microvascular abnormalities (IRMA)
- Venous caliber abnormalities
- Growth of new vessels at or near the optic disc (NVD) or elsewhere in the retina (NVE)
- Fibro-glial tissue forming and adhering to the adjacent vitreous

2. Symptoms

Symptoms may not be experienced until relatively late, at which time treatment may be less effective. Common ocular symptoms include:

- Recent onset of blurred, distorted, night vision problems or fluctuating vision
- New-onset diplopia
- Flashes or floaters

3. Complications

Ophthalmic manifestations of DM may present as ocular (i.e., nonretinal and retinal) and visual complications. Tables 2 and 3 provide overviews of ocular and visual complications of DM.

D. EARLY DETECTION AND PREVENTION

Early diagnosis and treatment of DR are effective in preserving vision. The following individuals with DM should be examined for eye disease:

- Patients (10-30 years of age) with a 3-5 year history of type 1 DM--annual followup examinations or as indicated by clinical findings
- Patients with type 2DM at the time of initial diagnosis--annual followup examinations
- Patients with poorly controlled DM or proteinuria--examinations at least annually
- Women with DM who become pregnant--an eye examination during the first trimester with subsequent monitoring throughout the pregnancy.
- Patients with macular edema, moderate to severe nonproliferative retinopathy, or proliferative retinopathy--refer to a retina specialist.

E. EVALUATION

The evaluation should include the elements of a comprehensive eye and vision examination with particular attention to the ocular and systemic signs and symptoms of DM.

1. Patient History

- Ocular complaints and symptoms related to DM (blurred or fluctuating vision, diplopia, night vision problems, flashes, or floaters)
- Systemic complaints and symptoms related to DM (polyuria, polydipsia, polyphagia, weight changes, dry mouth, pruritus, leg cramps or pains, impotence, delayed healing of bruises or wounds, and recurrent infections of the skin, genitalia, or urinary tract)
- Previous ocular disease or surgery
- Type and duration of DM, if diagnosed
- Diet, oral medications, insulin type and dosage, recent laboratory values for glycosylated hemoglobin levels (HbA1c), presence of proteinuria, and method, frequency, and results of self-monitoring of blood glucose levels
- Name, address, telephone of patient's primary care physician

2. Ocular Examination

- Best corrected visual acuity
- Pupillary reflexes
- Ocular motility
- Visual field screening
- Refraction

- Biomicroscopy
- Tonometry
- Stereoscopic fundus examination with pupillary dilation

3. Supplemental Testing

- Color vision assessment
- Contrast sensitivity testing
- Fundus photography or validated retinal imaging
- Gonioscopy
- Macular function assessment
- Optical coherence tomography (OCT)
- Ocular ultrasound (US)
- Blood pressure measurement

F. MANAGEMENT

Management of nonretinal ocular complications from DM is outlined in Table 2. An overview of management of diabetic retinopathy and retinal complications from DM is provided in Table 3.

1. Basis for Treatment

The care of the patient with DM is directed toward three goals:

- Identifying patients with undiagnosed DM
- Reducing the risk of vision loss
- Educating patients as to ocular manifestations of DR and progression of the disease

2. Available Treatment Options

For Diabetes Mellitus

- Patients suspected of having DM should be screened for fasting plasma glucose levels and those with values of 126 mg/dl or greater referred to their primary care physician for further evaluation and treatment.
- All patients with DM should be given diet recommendations by their primary care physician. Diet therapy alone may be sufficient for controlling type 2 DM.
- Insulin therapy is required for all patients with type 1 DM and for those with type 2 DM that are unresponsive to diet and oral medications.
- Intensive therapy to maintain normal or near normal blood glucose levels can prevent or slow the onset and progression of eye, nerve, and kidney complications in persons with type 1 and type 2 DM.

For Ocular Complications

- Communication with patient's primary care physician regarding ocular and visual status following each examination
- Consultation with retina specialist for management and consideration of focal or scatter laser photocoagulation for severe levels of nonproliferative diabetic retinopathy (NPDR), high-risk proliferative diabetic retinopathy (PDR), and clinically significant macular edema (CSME)
- Low vision evaluation and prescription of appropriate low vision optical devices.

3. Patient Education

- Instruct patient as to the rationale for prescribed topical treatment and the specific dosages, frequency, and duration
- Provide information about the disease process and risks for developing ocular conditions that may result in vision loss and the value of available treatments to preserve vision
- Inform patients that retinopathy may be present even with good vision
- Encourage patients to report all ocular symptoms
- Stress the importance of followup examinations and management of the condition
- Instruct patients of their higher risk for complications (e.g., cataracts, neovascular glaucoma, and open angle glaucoma)
- Advise patients about organizations that provide resources and support for DM patients

4. Prognosis and Followup

The prognosis for diabetic patients with nonretinal ocular complications depends on early diagnosis of DM and patient compliance with therapy. These patients should receive annual dilated fundus examinations. The frequency and composition of followup evaluations for retinal complications of DM are provided in Table 3.

TABLE 1 ***Clinical Levels of Diabetic Retinopathy****I. NONPROLIFERATIVE DIABETIC RETINOPATHY (NPDR)****A. Mild NPDR**

- At least one microaneurysm
- One or more of the following:
 - retinal hemorrhages
 - hard exudates
 - soft exudates
- Definition not met for B, C and D (below) and PDR

B. Moderate NPDR

- H/Ma \geq Standard Photo 2A
- Soft exudates, venous beading, and IRMA definitely present
- Definition not met for C and D (below) and PDR

C. Severe NPDR

- One or more of the following:
 - H/Ma \geq Standard Photo 2A in all four quadrants
 - Venous beading definitely present in at least two quadrants
 - IRMA \geq Standard Photo 8A in at least one quadrant
- Definition not met for D (below) and PDR

D. Very Severe NPDR

- Two or more lesions of severe NPDR (C above)

II. PROLIFERATIVE DIABETIC RETINOPATHY (PDR)**A. Mild PDR**

- One or more of the following:
 - NVE
 - FPD or FPE present with NVD and NVE absent
- Definition not met for B and C (below)

B. Moderate PDR

- One or more of the following:
 - NVE elevated
 - NVD $<$ Standard Photo 10A (1/4 - 1/3 DA)
 - VH/PRH and NVE $<$ 1/2 DA and NVD absent
- Definition not met for C (below)

C. High-Risk PDR

- One or more of the following:
 - NVD \geq 1/4-1/3 DA (Standard Photo 10A)
 - NVD and VH/PRH
 - NVE \geq 1/2 DA and VH/PRH

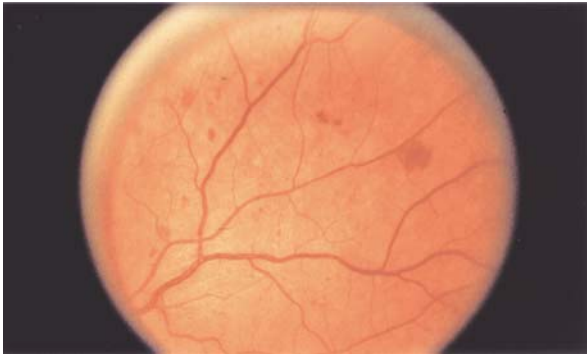
III. CLINICALLY SIGNIFICANT MACULAR EDEMA (CSME)

- One or more of the following:
 - Thickening of the retina \leq 500 microns (1/3 DD) from the center of the macula
 - Hard exudates \leq 500 microns (1/3 DD) from the center of the macula with thickening of the adjacent retina
 - A zone(s) of retinal thickening \geq 1 DA in size, any portion which is \leq 1 DD from the center of the macula

Legend:

DA	Disc area	NVD	New vessels on or within 1 DD of disc margin
FPD	Fibrous proliferations on or within 1 DD of disc margin	NVE	New vessels elsewhere in the retina outside of disc and 1 DD from disc margin
FPE	Fibrous proliferations elsewhere, not FPD	PRH	Preretinal hemorrhage
H/Ma	Hemorrhages/microaneurysms	VH	Vitreous hemorrhage
IRMA	Intraretinal microvascular abnormalities		

* Adapted from Table 6 in the Optometric Clinical Practice Guideline on Care of the Patient with Diabetes Mellitus



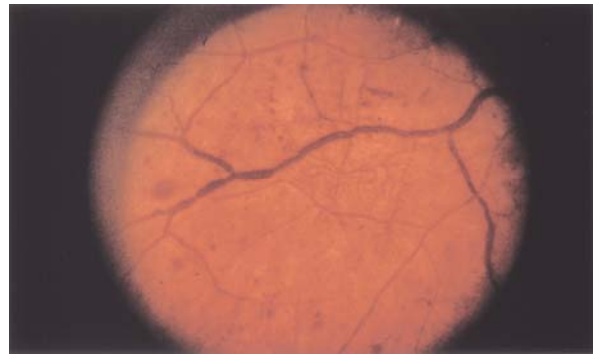
Moderate nonproliferative diabetic retinopathy
(standard photograph 2A)



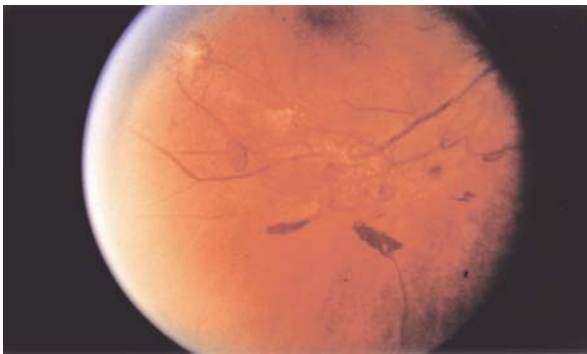
Macular edema



IRMAs (standard photograph 8A)



Venous beading (standard photograph 6B)



NVE (standard photograph 7)



NVD (standard photograph 10A)

Photo references use the Airlie House classification system.

TABLE 2 ***Management of Nonretinal Ocular Complications of DM**

Category	Ocular Complications	Management**
Functional	Tritan color vision loss	Dilated fundus examination to rule out diabetic maculopathy; counseling; low vision evaluation; review of independent living aids as necessary
	Refractive error changes Accommodative dysfunction	Consultation with patient's physician regarding degree of blood glucose control; modification of spectacle prescription as necessary
	Visual field defects	Low vision evaluation; orientation and mobility training as necessary
Extraocular Muscle Anomalies	Mononeuropathies	Neuro-ophthalmology or neurology consultation; temporary prism spectacle prescription as needed; eye patching as indicated
Pupils	Sluggish pupillary reflexes Afferent pupillary defects	Workup to rule out optic neuropathy
Conjunctiva	Bulbar microaneurysms	Monitoring
Tear Film	Dry eye syndrome	Prescription of artificial tears, ocular lubricants, and other dry eye management techniques; monitoring for corneal complications
Cornea	Reduced corneal sensitivity	Monitoring for abrasions, keratitis, or other ulcerations
	Basement membrane anomalies, recurrent corneal erosions	Prescription of NaCl solution/ointment; artificial tears; patching as necessary
	Descemet's membrane wrinkling	Monitoring
	Endothelial cell changes	Monitoring
		<i>Note:</i> All corneal injuries should be monitored carefully for secondary infection or evidence of delayed wound healing. This is particularly important in patients who wear contact lenses.
Iris	Depigmentation	Monitoring; routine gonioscopy and tonometry
	Rubeosis iridis (Neovascularization on the Iris)	Gonioscopy to rule out anterior chamber angle involvement and neovascular glaucoma; dilated fundus examination to search for proliferative retinopathy; referral to retina specialist for possible laser surgery
Lens	Cataracts	Monitoring of both degree of lens opacification and status of any retinopathy; cataract extraction at any time after careful preoperative retinal evaluation; surgery indicated if adequate visualization of the retina is no longer possible
Vitreous	Hemorrhage	Dilated fundus examination; consultation with retina specialist

* Adapted from Table 5 in the Optometric Clinical Practice Guideline on Care of the Patient with Diabetes Mellitus.

** Patient education, recommendations for followup visits, and referral for treatment of DM are integral to management for all conditions.

Table 3*

Frequency and Composition of Evaluation and Management Visits for Retinal Complications of DM

	Severity of Condition	Frequency of Followup	Composition of Followup Evaluations		Management Plan**		
			Fundus Photography	Fluorescein Angiography	Referral for Consultation and/or Treatment	Scatter Laser Treatment	Focal Laser Treatment
Mild NPDR	No macular edema	12 mos	No	No	Communicate with patient's physician	No	No
	Macular edema	4-6 mos	Yes	Occasionally	Obtain retinal consult in 2-4 wks	No	No
	CSME	2-4 mos	Yes	Yes	Obtain retinal consult in 2-4 wks	No	Yes
Moderate NPDR	No macular edema	6-8 mos	Yes	No	Communicate with patient's physician	No	No
	Macular edema (not CSME)	4-6 mos	Yes	Occasionally	Obtain retinal consult in 2-4 wks	No	No
	CSME	2-4 mos	Yes	Yes	Obtain retinal consult in 2-4 wks	No	Yes
Severe NPDR	No macular edema	3-4 mos	Yes	No	Obtain retinal consult in 2-4 wks	Rarely	No
	Macular edema (not CSME)	2-3 mos	Yes	Occasionally	Obtain retinal consult in 2-4 wks	Occasionally after focal	Occasionally
	CSME	2-3 mos	Yes	Yes	Obtain retinal consult in 2-4 wks	Occasionally after focal	Yes
Nonhigh-risk PDR	No macular edema	2-3 mos	Yes	No	Obtain retinal consult in 2-4 wks	Occasionally	No
	Macular edema	2-3 mos	Yes	Occasionally	Obtain retina consult in 2-4 wks	Occasionally after focal	Occasionally
	CSME	2-3 mos	Yes	Yes	Obtain retinal consult in 2-4 wks	Occasionally after focal	Yes
High-risk PDR	No macular edema	2-3 mos	Yes	No	Obtain retinal consult in 24-48 hrs	Yes	No
	Macular edema	1-2 mos	Yes	Yes	Obtain retinal consult in 24-48 hrs	Yes	Usually
	CSME	1-2 mos	Yes	Yes	Obtain retinal consult in 24-48 hrs	Yes	Yes

* Adapted from Table 6 in the Optometric Clinical Practice Guideline on Care of the Patient with Diabetes Mellitus.

** Patient education and written communication with patient's primary care physician are integral to management of DR.