How to Review and Incorporate Primary Care Records into Eye Care

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Diabetes affects 37.3 million individuals (11.3% of the U.S. population) and impacts all organ systems (28). Diabetes-related retinal disease (DRD) is a neurovascular complication of type 1 and type 2 diabetes and a leading cause of vision loss and blindness (5). Approximately 35% of individuals with diabetes will develop some form of DRD, and 10% of those individuals will develop vision-threatening complications (43). As understanding of DRD has evolved in recent decades, the rate of vision impairment resulting from it has significantly declined (44,45). The primary reasons for this improvement are advances in systemic management of diabetes combined with improved screening and the advent of new therapeutic options for vision-threatening DRD. A multidisciplinary approach involving diabetes health care professionals (HCPs) and eye care professionals (ECPs) is essential in optimizing outcomes.

Adoption of electronic medical record (EMR) systems has transformed health care delivery. Although much has been written about the challenges of EMR design and implementation, the ability of these systems to improve access to information and enhance collaboration may improve diabetes care (21,22,46). This chapter reviews the systemic components of diabetes that are associated with vision outcomes. It describes the usual routes of information flow via EMR systems and explains how EMR systems can enhance interprofessional communication between HCPs and ECPs. Finally, it explores how ECPs may benefit from reviewing HCPs' medical records for the patients they share.

Systemic Components of Diabetes and Their Relationship to DRD

Several systemic components of diabetes are related to the development and progression of DRD. It is important for HCPs to recognize that A1C is not the only correlate to DRD and to actively treat all of the conditions and processes that may lead to DRD progression (Table 1) (1).

Hyperglycemia is the most widely recognized risk factor for DRD. Diabetes duration and, to a lesser extent, the degree of hyperglycemia, are well established as the leading risk factors for the development of DRD, and once DRD is present, the degree of glycemic control better predicts its progression (1,18,47,48). Worsening of DRD is slowed by achieving glycemic targets (2,19,20,49–51). In fact, lowering A1C by 1 percentage point reduces the risk of DRD by 35% and the risk of its progression by ~20% (52). Improved glycemic control also reduces the risk of cataract formation and the need for cataract surgery (53,54). However, rapid correction of elevated A1C levels is associated with a transient worsening of DRD (55,56). There is no consensus on the optimal rate at which A1C should be reduced. However, implementing intensive glycemic control has been shown to result in significant reduction in DRD progression in the long term (19).

TABLE 1 Key Components of Diabetes That Are Related to the Progression of DRD

Component	Considerations
Hyperglycemia	▸ Glycemia has the strongest link to DRD progression. ▸ Its degree and duration correlate with DRD. ▸ DRD progression is slowed by achieving glycemic targets.
Hypertension	▸ DRD progression is slowed by achieving a systolic blood pressure <130 mmHg. ▸ There may be reduced need for intravitreal anti-VEGF injections when blood pressure targets are achieved.
Dyslipidemia	▸ Treatment with statin therapy, when appropriate, may reduce the risk of DME. ▸ Treatment of hypertriglyceridemia with fenofibrate, when appropriate, may reduce DRD progression.
Diabetes-related nephropathy	▸ The presence of renal insufficiency may be a risk factor for DRD progression. ▸ Initiation of dialysis may improve DME.
Diabetes-related neuropathy	▸ The presence of neuropathy may be a risk factor for DRD progression.
Pregnancy	▸ Pregnancy is associated with transient but rapid worsening of DRD. ▸ Increase surveillance to occur in each trimester of pregnancy and for 1 year postpartum based on the degree of DRD.

Adapted from ref. 1.

Hypertension is another important risk factor for DRD. Treating hypertension reduces its progression and the likelihood of vision-threatening complications such as diabetes-related macular edema (DME), the most common cause of reduced vision in people with DRD (57,58). More recently, hypertension was identified as a risk factor for the need to receive intravitreal anti-vascular endothelial growth factor (VEGF) medication for DRD (59). No specific antihypertensive regimen has been shown to be superior in reducing DRD progression.

Complications of diabetes affect small blood vessels and include nephropathy, neuropathy, and DRD. In the United States, 57.9% of people with diabetes have at least one of these complications, and 14.3% have three or more (60). The presence of nephropathy and neuropathy are risk factors for DRD (61). DME has been shown to improve with the initiation of dialysis in people with renal insufficiency (62–64), and statin therapy for dyslipidemia is associated with reduced DME risk, although there is no clear evidence about its effect on DRD progression (65). Similarly, treatment of hypertriglyceridemia with fenofibrate reduced retinopathy in several trials (49,66). There are no specific guidelines for lipid therapy as it relates to DRD.

Pregnancy is also a risk factor for DRD progression (67–69) and can temporarily accelerate the rate of progression, with the highest risk occurring in the second trimester (56). This increased risk of DRD progression can persist for up to 12 months postpartum. Factors associated with DRD progression during pregnancy include diabetes duration, DRD severity at conception, and the previously discussed general risk factors for DRD progression. The American Academy of Ophthalmology's Preferred Practice Pattern for DRD (18) recommends that pregnant women with type 1 or type 2 diabetes receive screening in the first trimester, with subsequent follow-up determined by DRD severity. Similarly, as reviewed earlier in this compendium (p. 4) , the American Diabetes Association recommends an eye exam within the first trimester and continued monitoring every trimester and for 1 year postpartum as indicated by the degree of DRD (16).

As our understanding of diabetes as a systemic disease has evolved, we have come to better appreciate new risk factors for DRD progression. Traditionally, ECPs have relied on A1C as the primary marker of glycemic control. As noted earlier, hyperglycemia has the strongest link to DRD, but taking stock of other conditions such as hypertension and nephropathy is important to more fully understand a person's overall health status. Some of these new relationships, such as the link between hypertension and the need for intravitreal anti-VEGF injections, arose in part because of the ability of EMR systems to capture large amounts of data for analysis (59).

There is a great need for ongoing collaboration between ECPs and HCPs who share patients—for ECPs to communicate their findings after eye exams and for HCPs to treat and communicate pertinent information regarding hyperglycemia, hypertension, dyslipidemia, and other conditions linked to DRD progression. It is important for ECPs to know the status of these other diabetes-related factors, which will enable them to better stratify risk of DRD progression than when relying on A1C data alone. EMR systems may help to facilitate this crucial bidirectional communication.

Use of EMR Systems for Diabetes Care

The adoption of EMR systems in the United States was founded on the idea that their implementation would lead to numerous benefits, including enhanced patient care, increased efficiency, and improved safety, all while reducing health care costs (21,46). Despite concerns such as a possible loss of information integrity with EMR systems, there is great potential for EMRs to facilitate interprofessional collaboration and ultimately improve patient care.

Early detection of vision-threatening complications of DRD and prompt intervention can result in a 90% reduction in vision impairment. However, less than two-thirds of people with diabetes in the United States receive appropriate screening—a statistic that underscores the importance of improving access to diabetes-related eye examinations and fostering interprofessional communication (2,70,71).

Before the widespread adoption of EMR systems, studies looking at the relationship between HCPs and ECPs reported that adoption of an EMR system was the number one suggestion for improving the rate of referrals for diabetes-related eye exams (72). Even today, some of the main barriers to DRD screenings are a lack of their integration with other processes of diabetes care and challenges accessing ECPs (73,74). In practice settings in which clinics are unified by a single EMR system, such as academic hospitals or large health care networks, the system can assist in both scheduling screening appointments and acquiring information. Eye care reports can be made easily accessible to HCPs, while ECPs can just as easily access data on their patients' overall health status. However, practitioners who are not part of these networks and whose EMR systems, if any, cannot interface with others may be at a disadvantage (75).

EMR systems can be overly complex and both costly and challenging to maintain. Despite these drawbacks, their adoption has been shown to improve diabetes care outcomes (21–23). Their advantageous features include drug interaction identification, laboratory test reminders, clinical intervention tools, and data-driven decision-support mechanisms. EMR systems may also serve as data repositories for clinical research. Thus, modern EMR systems offer much more than merely a digital simulacrum of a paper chart.

Finally, although EMR systems have been shown to be an asset in improving interprofessional collaboration on and access to diabetes-related eye care, it is important to mention that other barriers to receiving both diabetes care and related eye care exist. As described elsewhere in this compendium (p. 16–19), these include the inequitable distribution of social determinants of health that can lead to food insecurity, financial strain, poor housing conditions, and lack of social support (76). The importance of these factors cannot be overstated.

ECPs' Review of HCPs' Records

When people are referred for an eye exam, ECPs should carefully review their medical chart, if possible. The availability of a shared EMR system may help ECPs ascertain the reason for the referral and more easily collect key information about patients' overall health status. It is particularly important to review the factors beyond A1C that may affect a person's DRD progression and risk of developing vision-threatening complications, as listed in Table 1. Understanding a patient's overall health will allow an ECP to make better decisions and identify optimal treatment recommendations based on individual factors.

This information may be readily available when both clinics are part of the same system and document patient care in the same EMR system, but if a person is referred from a clinic outside of the local network, the necessary data may be fragmented and more challenging to acquire. However, emerging EMR tools such as the Care Everywhere Network in Epic (Epic Systems, Verona, WI), are helping to alleviate this challenge by integrating similar electronic data from different institutions into a unified record (77). Clinical decision-support tools that help to collate relevant data may be embedded in EMR systems. Because of the complexities and variations among EMR systems, it is impossible to describe in detail an exact protocol for locating information of interest. ECPs and HCPs should familiarize themselves with the features of their own EMR systems that facilitate access to essential patient health information. It may be prudent for referring HCPs to collate and emphasize the risk factors for and status of DRD progression in their documentation, especially if communication between ECPs and HCPs is occurring across different records systems.

Understanding patients' overall health status is also important in that it may allow ECPs to recognize potential barriers to receiving eye care. These barriers may affect the ECPs' treatment recommendations or ability to provide timely care. For example, a person with diabetes-related nephropathy who is receiving hemodialysis several days per week may be a poor candidate for monthly intravitreal anti-VEGF injections to mitigate proliferative diabetes-related retinopathy. Studies have shown that people with DRD are subject to significant lapses in follow-up caused by illness or other social factors and that these lapses may result in irreversible vision loss if their DRD is being managed with anti-VEGF injections alone (78,79).

Finally, a thorough review of patients' HCP records may help to identify confounding diagnoses that mimic DRD. Classic findings of DRD such as intraretinal hemorrhages or retinal neovascularization may also be found in other conditions such as ocular ischemic syndrome (a sequela of carotid artery disease), radiation retinopathy, or sickle cell retinopathy.

Conclusion

DRD is a leading cause of vision impairment, but progress in understanding systemic components of diabetes that are risk factors for its progression, in combination with improved collaboration between ECPs and HCPs, has helped to reduce the risk of vision loss. EMRs aid in placing referrals for screening exams and may improve data availability and acquisition by both ECPs and HCPs. Careful review of HCPs' records may improve the ECPs' understanding of their patients' medical status and thereby allow for more informed treatment decisions.