Integrating eye care with disease management:

It's not just about diabetes anymore.

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The integration of eye care with diabetes management has been well documented. Eye care professionals can identify persons with diabetes and partner with primary care providers in the care of their disease. But diabetes is only one of many conditions which can be noted and monitored with a comprehensive eye exam. It's not just about diabetes anymore.

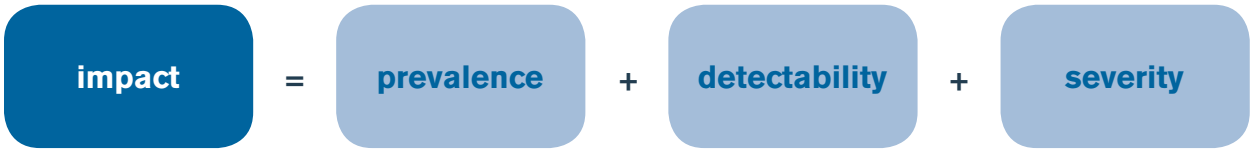
The eyes are windows to overall health.

Eye care is one of the few health care specialties that may routinely engage healthy patients. Many eye examinations are scheduled as a result of minimal or no symptoms. Objective, routine procedures included in a comprehensive eye examination give the eye care practitioner (ECP) an opportunity to help patients continue in wellness, identify risk factors associated with chronic disease, or manage diagnosed medical conditions. People often visit their ECP more frequently than their primary care provider[1], so ECPs have the opportunity to be gatekeepers to health.

The eye, with a direct connection to the brain, is made up of muscles, nerves and blood vessels. A disease that compromises these systems in any part of the body can affect those components of the visual system as well. Add the fact that the eye is the only place on the body that provides a non-invasive view of blood vessels and nerves, and the stage is set for eye care to intervene in the disease process and contribute to the management of chronic conditions. Clearly there are many conditions that are related to the state of the visual system.

Several factors must be evaluated when determining the diseases that are most commonly identified or monitored through eye care. The prevalence of the disease and the likelihood and extent of complications involving the eye are equally important. For the ECP to be part of early identification of the disease, there must be associated risk factors that involve the visual system, and they must be present in the early stages of the disease (detectability). In order to predict the effect on the patient's overall health and quality of life, the severity of the disease must be considered, or the consequences of lack of treatment due to delayed diagnosis. Finally, there must be an uncomplicated way of capturing data by diagnosis codes.

Figure 1. Several factors determine impact of diseases ECPs can monitor and report



Eye care practitioners play a critical role in monitoring chronic conditions.

Eye care can also play an important role in monitoring chronic conditions. A comprehensive dilated eye examination can assess the advancement of the disease, how well the disease is being controlled, and any ocular effects of medication used to treat the disease. By dilating the pupil, an ECP obtains a more expansive view of the internal ocular structures including the retina, blood vessels, optic nerve, and visual media. Although there are some eye conditions that can be found without dilation, a dilated exam is necessary to rule out additional complications inside the eye.

Each chronic condition has specific signs that assist with diagnosis and monitoring. The signs are not always limited to the retina; deposits on the eyelids and involvement of eye movements can be seen in some conditions. Cholesterol plaques can be seen within the retinal arteries that are related to plaques in the carotid arteries, revealing advanced vascular disease and the increased risk of stroke. Persons with auto-immune diseases as varied as ulcerative colitis or rheumatoid arthritis are at risk of developing a chronic inflammation within the eye that, if left untreated, can lead to cataracts and glaucoma, resulting in blindness. Some medications used in the treatment of chronic conditions have been found to cause ocular side effects. Corticosteroids, used to treat asthma and inflammatory diseases, can cause cataracts. Certain medications used to treat arthritis can create irreversible damage to the retina, resulting in loss of vision. Patients receiving these treatments must be monitored with comprehensive eye examinations by an ECP to identify ocular complications.

Diabetes is an excellent example of eye care's integral part in the identification and monitoring of chronic disease. Retinal blood vessel changes indicate damage due to the lack of adequate control of blood sugar levels. Additionally, there are retinal vascular changes that signal hypertension, lipid deposits that are linked to high cholesterol and symptoms of blurred vision associated with pseudotumor cerebri. In many instances the diagnosis of multiple sclerosis is preceded by an episode of optic nerve inflammation found by an ECP. Dry eye symptoms that occur in Sjogren's, an autoimmune disease accompanied by arthritis, are a hallmark for identification. Inflammation within the eye is often an early identifier of Crohn's disease. Tumors can be discovered from visual field loss. All these signs and symptoms are often first addressed during a comprehensive eye examination.

Beyond diabetes, eye care practitioners can impact many other chronic conditions.

"The range of diseases – and the drugs to treat them – that have impact on the eyes is vast, and likely underappreciated. PCP partnership with an ECP can help assure that optimal outcomes are reached, both for the preservation of vision as well as the early detection and monitoring of disease progression."

Michael R. Rosnick, MD, ABFP, MPA

Based on an analysis of prevalence, detectability and impact for numerous diseases, 23 chronic conditions, in addition to diabetes, were identified that can be impacted by an ECP's identification and integration into care management. Table 1 summarizes the diseases identified. It is based on the results of an extensive evaluation, which included the following data elements for each of the diseases analyzed:

1. **Disease description** – description of the disease and consequences of lack of treatment due to delayed diagnosis
2. **Ocular findings** – impact of the diseases involving the eye that are seen by ECPs
3. **Disease prevalence data** – proprietary data based on medical claims from 4 million UnitedHealthcare members, a good representation of an employer's workforce demographic
4. **Detectability** – the ability for detection by the ECP is ranked as Early (the first to diagnose or identify early signs of the disease), Advanced (can diagnose or identify disease, but usually when the disease is advanced) or Late (the ECP is primarily involved in the monitoring of the condition)
5. **Severity** – the effect of the disease on overall health. Ranked as Low (quality of life is affected), Impairment (evidence of the disease is found that can impair function) and High (there is a risk of death due to the condition)

6. **Average Annual Medical Cost** – average annual allowed medical costs, including payments by all responsible parties; based on UnitedHealthcare commercial medical and biological pharmaceutical claims data for 2011, excluding pharmacy costs. The dollar symbols in Table 1 represent the following ranges of average annual medical costs:

   • $ = less than $1,000
   • $$ = 1,000 - $4,000
   • $$$ = more than $4,000

For 10 of the diseases evaluated, the impact of the disease may be increased due to ocular complications of medications used to treat the disease. These diseases are identified in **bold** in Table 1.

Based on the analyses performed, Table 1 highlights diseases for which an ECP can have the greatest impact based on high severity and/or early detectability.

For additional diseases highlighted in Table 1, ECPs can have a significant impact based on the combination of their ability to detect the condition before it's too late, along with the disease severity.

Table 1. Impact of diseases eye care providers can monitor and report

	Disease	1. Disease description (references)	2. Ocular Findings	3. Prevalence	4. Detectability	5. Severity[17]	6. Average Annual Medical Cost
Blood Vessels	Diabetes	A condition caused by the body's inability to use blood sugar for energy. Complications include heart disease and stroke, blindness, chronic kidney disease, and amputations[2]	Blood vessel changes in the retina (can also result in glaucoma, cataracts, eye muscle palsies, corneal inflammation, dry eye, increased risk of eye infection)	6.2%	Advanced	High	$$
	Diabetic Retinopathy	Changes in the retina of the eye due to uncontrolled diabetes. A leading cause of blindness.	Retinal swelling and hemorrhage or leakage from new, abnormal blood vessels	0.6%	Early	Impairment	$
	Hypertension	Elevated blood pressure that can lead to heart attack, stroke, congestive heart failure and kidney disease[3]	Blood vessel changes in the retina (can also result in optic nerve swelling)	8.3%	Early	High	$$
	Hypertensive Retinopathy	Blood vessel changes in the retina of the eye due to uncontrolled hypertension. Can lead to blindness.	Changes in the appearance of the retinal blood vessels, as well as hemorrhages and leaking	0.6%	Early	Impairment	$
	Cardiovascular Disease	Disease of the heart and blood vessels. The leading cause of death for both men and women[4]	Episodes of vision loss (transient ischemic attacks), Retinal stroke, deposits in retinal blood vessels	2.6%	Early	High	$
	High Cholesterol	Higher than normal fat and cholesterol levels in the blood. Increases the risk for developing cardiovascular disease[5]	Deposits in the retinal blood vessels , cornea, and the eye lids	11.1%	Advanced	Impairment	$
	Sickle Cell Anemia	An inherited condition that causes changes in red blood cells. The miss-shapened cells block blood flow to blood vessels of limbs and organs resulting in pain, and organ damage.[6]	Changes in retinal blood vessels and hemorrhages	0.02%	Late	High	$$$
Inflammatory	**Crohn's Disease**	An autoimmune disease that results in chronic inflammation of the gastrointestinal tract[7]	Inflammation of the anterior part of the eye (Uveitis: pain, light sensitivity, blurred vision and can cause cataract and glaucoma)	0.4%	Early	High	$$$
	Lupus	An autoimmune disease that affects the skin, joints, kidneys, brain, resulting in organ failure	Inflammation of the retinal blood vessels, optic nerve, and anterior layers of the eye	0.2%	Advanced	High	$$

	Disease	1. Disease description (references)	2. Ocular Findings	3. Prevalence	4. Detectability	5. Severity[17]	6. Average Annual Medical Cost
Inflammatory	**Rheumatoid Arthritis**	An autoimmune disease that causes inflammation of the joints and surrounding tissues; may also inflame other tissues including heart, lung[8]	Uveitis, dry eye, and inflammation of the anterior layers of the eye	0.6%	Advanced	Impairment	$$
	Juvenile Rheumatoid Arthritis	Childhood autoimmune disease resulting in joint pain and swelling[9]	Uveitis, cataracts, glaucoma	0.6%	Late	Impairment	$$
	Pseudotumor Cerebri	Increased pressure within the brain that can cause vision loss, headaches, nausea, vomiting[10,11]	Optic nerve swelling (papilledema)	2.2%	Early	Low	$$
	Sarcoidosis	Inflammation of abnormal tissue growth in organs of the body, predominently in the lungs	Retinal blood vessel inflammation, Uveitis, Optic nerve swelling	0.3%	Advanced	Impairment	$$
	AIDS	A disease caused by a virus that attacks the body's immune system resulting in vulnerability to infections and cancer	Cytomegalovirus (CMV) Retinopathy	3.0%	Late	High	$
	Sjogren's Disease	An autoimmune disease resulting in chronic dryness of the mucous membranes (primarily mouth and eyes) and arthritis[12]	Dry eye	0.2%	Early	Low	$
	Lyme Disease	Bacterial infection resulting in chronic fatigue, muscle pain and headaches	Uveitis and inflammation of the retina	0.3%	Advanced	Low	$
Muscles	Graves Disease	An autoimmune disorder that results in overactivity of the thyroid gland[13]	Double vision, eye lid retraction, proptosis ("prominent eyes"), dry eyes	3.4%	Early	Low	$
Nerves	**Multiple Sclerosis**	An autoimmune disease that affects the brain and spinal cord resulting in episodes of muscle weakness, spasms, and numbness[14,15]	Optic nerve inflammation, double vision	0.2%	Early	Impairment	$$$
	Herpes Zoster	A viral infection that causes a rash of painful blisters on the skin. Can result in chronic neuralgia and depression[16]	Corneal and eye lid lesions	3.0%	Early	Low	$
Eyes	Cataract	Opacification of the lens of the eye. Can lead to blindness	Lens opacities	1.3%	Early	Impairment	$
	Glaucoma	Increased pressure within the eye that damages the optic nerve. Can lead to blindness	Increased intraocular pressure, visual field defects, retinal and optic nerve changes	1.6%	Early	Impairment	$
	Age-Related Maculopathy	Damage to the area of the retina used for seeing fine detail. Can lead to blindness	Changes in central retina including swelling and hemorrhages	0.6%	Early	Impairment	$
	Toxicity related to prescribed medications for chronic disease: Corticosterioids, Plaquenil, Tegretol, Accutane	Complications of the eye depend on the medication that is being taken. Can lead to vision loss or blindness	Glaucoma, cataracts, retinal changes, eye movement dysfunction	Data not available (N/A)	Early	Impairment	$
Multiple Etiologies	Tumors	Dependent on site of tumor; can range from headaches to death	Visual field loss, double vision, optic nerve swelling (papilledema)	1.1%	Early	High	$$$

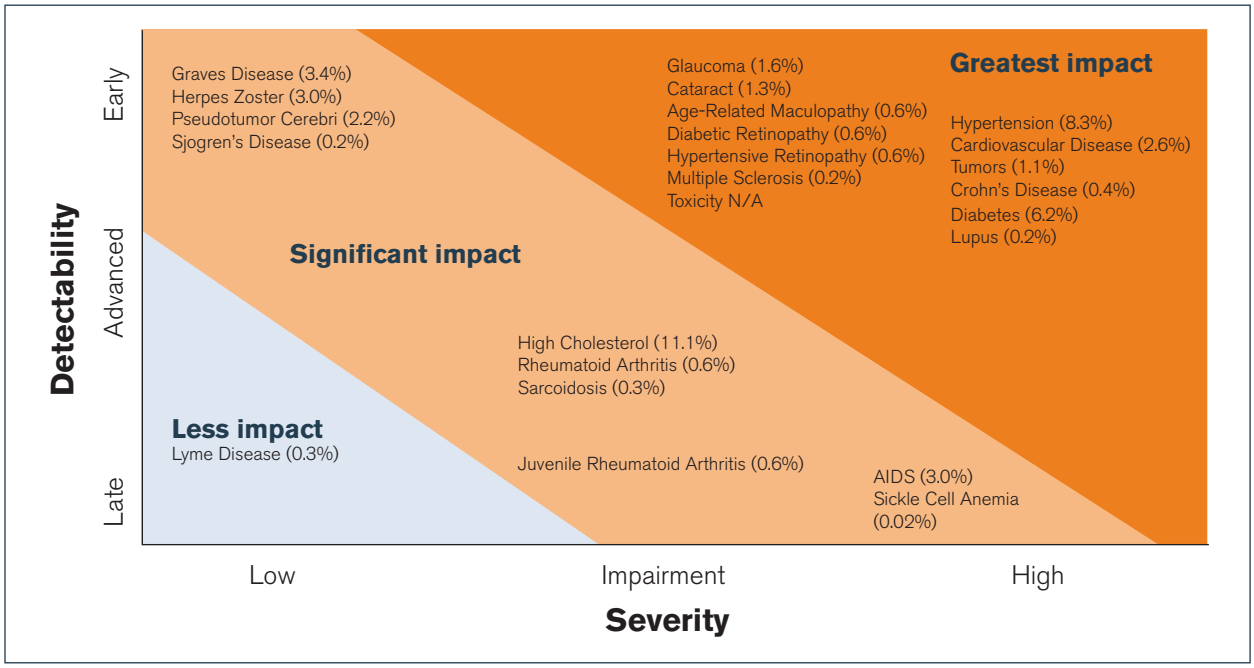
Where eye care practitioners make the greatest impact

Based on the analyses performed, Figure 2 highlights diseases for which an ECP can have the greatest impact based on high severity and/or early detectability. Beyond diabetes, this analysis revealed several unexpected conditions where eye care can have the greatest impact – multiple sclerosis, tumors, Crohn's disease and sickle cell anemia. For some conditions, such as sickle cell anemia, the value of eye care is in monitoring the disease, rather than identification. For others, such as Crohn's disease, the impact is increased when the comprehensive eye exam aids in early identification and monitoring the condition as well as the ocular complications of medications used in treatment.

For additional diseases, ECPs can have a significant impact through their ability to detect the condition before it's too late, along with the disease severity. This list includes many well-known, yet unexpected, diseases: high cholesterol, rheumatoid arthritis and juvenile rheumatoid arthritis, Graves disease, AIDS, lupus and Sjogren's disease.

Of the diseases evaluated, the ECP's impact is less for Lyme disease in comparison to the other diseases evaluated, because the severity is lower and detectability is later.

Figure 2. Identification of high-impact diseases



Using this knowledge to make a difference: Impacting medical costs through better information and better decisions.

When eye care providers share information about diseases, such as those highlighted in this white paper, with patients and other care providers, it can lead to better information, better decisions and, ultimately, better outcomes.

Figure 3. Better information and decisions result in better outcomes

Better information	Better decisions	Better outcomes
• Patient education • ECP identification and monitoring of chronic conditions (beyond diabetes)	• Comprehensive dilated eye exams • Referrals and care coordination with primary or specialty care	• Ongoing, proactive management of wellness and chronic conditions can reduce medical costs and improve productivity.

Better information begins with patient education. As gatekeepers to health, eye care professionals educate their patients on how to keep the eyes healthy, how to prevent disease and the relationship between eye health and chronic conditions, including, but not limited to, those discussed here. As ECPs identify and monitor patients' chronic conditions, they share this information with primary care providers, specialists and case managers directly through referrals and consultations or indirectly through diagnostic codes on claims.

Dilated eye exams are included as part of the comprehensive eye exam. They are valuable for making timely and data-driven health care decisions for all patients and critical for patients with many eye diseases and chronic conditions. There are additional tests an ECP may perform along with a comprehensive eye exam, but none replace the necessity of a dilated retinal evaluation. Retinal imaging (photography) is often used for documentation of existing eye disease, but the American Diabetes Association has noted, "it is not a substitute for a comprehensive eye exam, which should be performed at least initially and at intervals thereafter as recommended by an eye care professional".[18]

Patients who may have chronic conditions can be referred to primary care providers (PCPs) or specialists by their eye doctors. Referrals are critical. The PCP, in order to perform further testing that may lead to diagnosis, must be notified of risk factors observed by the ECP. Alternately, when a PCP first identifies a patient with chronic disease, the PCP may determine there is a need for either baseline evaluation of the visual system or further evaluation of any symptoms noted by the patient. Information outlining the need for an eye examination should accompany the patient's visit to their ECP. Ongoing communication between all care providers allows for monitoring and management of the patient's chronic condition and treatment.

Timely and data-driven health care decisions result in better outcomes. Ongoing, proactive management of wellness and chronic conditions can reduce medical costs and improve productivity. Cost of medical claims and lost productivity from diabetes and hypertension alone can average $170 per employee per month[19], while reducing HbA1c levels in diabetic patients can decrease medical utilization and produce an annual savings of $1,200 to $1,872 per patient.[20] Considering the severity of health risks of many other chronic conditions that can be identified and monitored by ECPs, as discussed in this paper, eye care providers are instrumental in maintaining wellness and improving overall health resulting in avoidance of medical cost associated with undiagnosed and unmanaged diseases.

A real world example

The impact of timely information and data-driven decisions on outcomes is apparent in the UnitedHealthcare Bridge2Health program. The program integrates vision care, medical care and disease management in a holistic, proactive approach to patient-centered care. Bridge2Health supports patients and care professionals with information, decisions and outcomes with several program elements.

Figure 4. A real-world example – Bridge2Health

Better information for engagement	Better decisions for chronic and everyday care	Better outcomes benefiting individuals and organizations
• Current, high-impact education for consumers and providers • Claims coded for 23 chronic categories, with automatic referral to OptumHealth disease management programs	• Dilated exam recommendations • Eye exam reminders for chronic conditions including diabetes, hypertension, vascular disease and high cholesterol • ECP/PCP referral forms available online	• Members identified and engaged in proactive health and wellness management can reduce medical costs and improve productivity • Impact reports for clients

Information is used to actively engage members in protecting their eye health as well as their overall health. Members are educated on current, high-impact health topics through a variety of videos, webinars and fliers available anytime on a website accessible to the general public. Eye care practitioners are encouraged to code claims with chronic condition categories. Those diagnoses are automatically referred to disease management programs for follow-up as appropriate.

Data-driven decisions are supported by dilated exam recommendations, reminders and referrals. As part of the Bridge2Health program, ECPs are notified of patients with at-risk conditions during the exam authorization process, with a recommendation to include a dilated fundus exam as part of the comprehensive eye examination. Patients with diabetes, diabetic retinopathy, hypertension, hypertensive retinopathy, vascular disease or high cholesterol are called about the importance of their annual eye exam, which is much more effective than sending a single postcard. For patients who may have chronic conditions, referrals to primary care providers or specialists are supported via specially designed, bidirectional forms available online to ECPs.

The value and impact of this integrated approach includes savings from everyday vision care and savings from early identification and management of chronic conditions. Annual reports for employers provide evidence of Bridge2Health program impact.

Final thoughts

This white paper has illustrated the interconnection between eye health and overall health. The connections expand far beyond diabetes into many well-known and perhaps unexpected diseases such as high cholesterol, multiple sclerosis, rheumatoid arthritis, tumors and Crohn's disease. Eye care professionals are critical members of the health care team that helps patients manage these and many other chronic diseases. This paper also serves to establish the areas where eye care can have the greatest impact, based on a novel analytical approach that combines disease prevalence and early detectability by an eye care practitioner, along with the severity or consequences of lack of treatment due to delayed diagnosis.

The authors have identified many of the chronic conditions that can integrate eye care with medical management of disease, but the list does not end there. As an example, signs of tuberculosis and Fabry's disease can be found by an ECP. Those who suffer from migraine headaches often first visit their eye doctor. Displacement of the lens of the eye is an identifier of Marfan's syndrome. The authors, along with their teams, are actively working to increase the ability to integrate vision care, medical care and disease management in a holistic, proactive approach to patient-centered care.

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About UnitedHealthcare

UnitedHealthcare is dedicated to helping people nationwide live healthier lives by simplifying the health care experience, meeting consumer health and wellness needs, and sustaining trusted relationships with care providers. The company offers the full spectrum of health benefit programs for individuals, employers and Medicare and Medicaid beneficiaries, and contracts directly with more than 704,000 physicians and care professionals and 5,580 hospitals nationwide. UnitedHealthcare serves more than 38 million people and is one of the businesses of UnitedHealth Group® (NYSE: UNH), a diversified Fortune 50 health and well-being company.

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