



Changing the way the world sees.

The Integration of Autonomous Artificial Intelligence

*in Diabetic Retinopathy Screening
Programs in Canada*

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The Importance of Collaboration and Reconciliation with the Indigenous Communities Considering Adopting Artificial Intelligence in Eye Screening

Supporting the health of those living in remote and rural communities is a key element of Orbis Canada's artificial intelligence (AI) screening project. Many of those living in these communities are Indigenous—including First Nations, Inuit or Metis. Working in collaboration with Indigenous communities, including partnering with Indigenous-led health organizations, is essential to the success of this project. In order to meet the needs of these communities, members must not only be at the table, but guiding the conversation.

At Orbis Canada, our board member, Robert Byers, a member of the Little Black Bear First Nation and President and CEO of Regina's Namerind Housing Corporation, sees the essential role that AI can play in meeting the needs of his community.

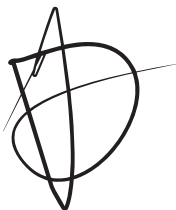
He shares his thoughts below:

It is important to me to be on the board of an organization that works to increase access to eye care for the people most in need around the world and here in Canada. In this country, that means working with community members and partners who are passionate about ensuring essential eye care is delivered to remote communities, where the majority of the population is often Indigenous.

As the people of Canada work to understand what reconciliation means to us as Indigenous Peoples, it is exciting to know that Orbis Canada is focusing on and finding ways to connect with remote communities in a meaningful way. As an Indigenous Canadian, I see these actions as reconciliation through health and eye care.

In this project, which uses artificial intelligence to assess patients and then send that information to ophthalmologists in the southern regions of Canada, I believe we are leaders. What is even more remarkable is that we can train people in remote communities to use this technology, creating opportunities for Indigenous healthcare teams to support the needs of their people. And with continuing technology advancements, we can provide accurate information to determine the individual needs of patients in ways that reduce the burden of unnecessary travel and ensure they receive quality, tailored assessments close to home.

This is a powerful opportunity for Northern communities, and one which creates a potential pathway to bring other healthcare innovations to those in remote and rural communities. The positive impact that comes from investing in these communities and collaborating services across sectors is immeasurable. To me, this is true reconciliation, and I am proud to be a member of Orbis Canada.



Robert Byers
Director, Orbis Canada

*Changing the way
the world sees.*



EXECUTIVE SUMMARY

Diabetic retinopathy (DR) is a leading cause of vision loss among working-age adults globally¹ and one of the most feared complications of diabetes.

Early detection and treatment are crucial to prevent vision impairment and blindness, and in Canada, we are not meeting the mark. A recent study showed that almost 40% of people living with diabetes in Ontario had not had their eyes screened in more than two years.² Ontario is not alone in experiencing this issue. Across Canada, there is a gap in accessibility of eye screening, in particular in rural, remote, and underserved communities. We recognize that there are multiple opportunities to use technologies and models to improve access to vision care. Our belief is that artificial intelligence (AI) will have a pivotal role in this ecosystem, and collaboration will be a key factor to success.

Autonomous AI offers a promising solution to change this trajectory by making DR screening easier to access and less resource intensive.

This white paper advocates for the integration of autonomous AI in DR screening as part of a sustainable eye care program for people living with diabetes in Canada. It discusses the potential benefits, real world implementation strategies, and the socioeconomic impact of adopting AI-driven screening models to prevent vision loss.



INTRODUCTION

The number of people living with diabetes is increasing throughout the world, and the disease is considered one of the largest global health emergencies.¹

Diabetes Canada estimates that 29% of Canadians live with diabetes or prediabetes,³ and disproportionately high rates of diabetes have been documented among Indigenous Peoples in the country.⁴

The prevalence of diabetes in Canada is rising, necessitating efficient and scalable screening methods.

One of the complications of diabetes is diabetic retinopathy (DR). DR is a chronic, progressive complication of diabetes that affects the microvasculature of the retina, which if left untreated, can result in vision loss and blindness.

In Canada, approximately 25% of people diagnosed with diabetes have some form of DR,³ and Indigenous Peoples have been shown to develop severe DR at a faster rate than other populations.⁵ The gap between Indigenous communities and other populations requiring treatment for severe DR is especially prominent among younger people.⁴ Early detection and treatment of DR can prevent potential blindness, and screening programs have proven to be effective in managing the complication.

However, traditional DR screening methods, which rely heavily on eye care specialists, face challenges such as limited accessibility, high costs, and delayed diagnosis.

Autonomous AI systems have shown promise in addressing these challenges by providing accessible, timely, accurate, and cost-effective screening.⁶

The Challenges Currently Faced in Diabetic Retinopathy Screening

There are many barriers that currently affect the ability of a person living with diabetes to have their eyes screened in Canada. Despite many provinces offering free screening for those living with diabetes, many still do not access care.

Some of the reasons for this include:



ACCESSIBILITY

Remote communities and underserved urban areas often lack sufficient eye health professionals and screening facilities.



COMPLIANCE

In Canada, up to one-third of patients living with diabetes do not receive an annual eye examination,⁷ and this problem is compounded in remote, rural, and underserved areas.



RESOURCES

Traditional screening methods are resource-intensive, limiting their scalability.



TIMELINESS

Delays in screening and diagnosis can lead to progression of DR and increased risk of vision loss.



FEAR OF COST

Many people living with diabetes do not know that their eye screenings are covered under provincial healthcare plans, as this is not the case for those without diabetes.

The Role in Diabetic Retinopathy Screening

AI AS A FORCE MULTIPLIER FOR TELE-OPHTHALMOLOGY

Tele-ophthalmology is a form of telemedicine that uses digital tools and telecommunications technology to help deliver eye care.

Evidence supporting tele-ophthalmology for DR screening in Canada is robust, indicating that it improves access to care, ensures high diagnostic accuracy, is cost-effective, and enhances patient satisfaction.⁸⁻¹⁷

*However,
challenges persist.*

- physician review of images
- physician shortages
- physician remuneration
- physician licensing
(in different jurisdictions)
- liability coverage

AI is a potential solution to scaling tele-ophthalmology efforts and overcoming some of tele-ophthalmology's barriers.



The Benefits *of Integration*

ACCURACY

AI algorithms have demonstrated high sensitivity and specificity in detecting DR, comparable to expert ophthalmologists.

EFFICIENCY

Camera systems have become automated and user-friendly, and AI systems can analyze retinal images rapidly, reducing the burden on healthcare professionals.

SCALABILITY

AI-driven screening can be deployed widely, including in remote and underserved areas, improving accessibility.

COST-EFFECTIVENESS

By reducing the need for specialist intervention in the initial screening phase, autonomous AI systems can lower overall healthcare costs.⁵

Additionally, DR screening programs have been shown to save significant healthcare resources by preventing advanced stages of DR through early detection and timely treatment.

ENHANCED ACCESSIBILITY CONTRIBUTING TO HEALTH EQUITY

Autonomous AI systems can be deployed in various healthcare settings, including primary care clinics, pharmacies, and mobile screening units. This flexibility enhances access to DR screening, especially in rural and remote areas where eye care specialists are scarce, but screening is still needed.

POSITIVE PATIENT AND PROVIDER FEEDBACK

Studies have shown high levels of satisfaction among patients and healthcare providers integrating AI-based DR screening.

INCREASED REFERRAL UPTAKE

Studies and real-world implementation programs report high levels of patient referral adherence, meaning that patients who need treatment are accessing treatment to prevent vision loss.

The Challenges of Integration

While challenges around regulatory approvals, data privacy, algorithm bias, and liability issues are still present and important, ways forward exist to address each. Organizations—including NGOs, academic institutions, and healthcare providers—across Canada and globally see the strong potential for AI and are working collectively to find solutions to the current barriers.

Here, we would like to address the practical application challenges that we have experienced, which include:

WORKFLOW INTEGRATION

While AI-based screening can be performed quickly, the addition of another task during a routine primary care visit must be fit into the current workflow of each clinic.

STAFF “BUY-IN”

Raising awareness around the importance of DR screening and ensuring staff feel like time spent on the screening will be a value-add to their patients and have a positive impact on their patients’ health outcomes is critical for both subsequent confidence in the technology for patients and in sustained support for implementation from the staff.

Ensuring confidence through strong training is also a contributor to staff “buy-in”.

HR ALLOCATION, TIME, AND “BURNOUT”

There is already a great demand on primary care clinics. While there can be value-add in offering DR screening that may not be currently accessible, it can feel like one more thing on the ever-growing list of tasks for primary care providers and workers, especially in the post-COVID era.

FUNDING FOR SUSTAINABILITY

While there are many who want to make AI-based DR screening available in their communities, there is significant concern over offering the service and then having to take it away if there is not sustainable funding to continue to offer the screening.

ENSURING REFERRAL UPTAKE

Implementing a model in which patient follow-up on necessary referrals and offering supports to navigate the health system if/when needed is crucial for the success of any screening program.

Fortunately, studies have shown that immediate results from AI, and the opportunity for education during the screening, increase referral uptake. However, there is still work to be done to ensure follow-up exams and treatment plans are completed.

Implementation Strategies in Canada

CASE STUDIES

Recent and ongoing initiatives by Orbis International and Vision Loss Rehabilitation Canada demonstrate the feasibility of AI-based DR screening models.

01

AI-BASED SCREENING FOR DR PILOT PROGRAM

Orbis launched an initial feasibility study, using Eyenuk's Health Canada-approved EyeArt AI platform and the iCare DRS Plus fundus imaging system, in a primary care clinic with close proximity to an ophthalmologist's office in Thunder Bay, ON. The pilot reported a high level of successful exams completed in the primary care office with almost a quarter of exams detecting referable DR. High levels of satisfaction around the technology and convenience of screening were documented. Outcomes from the successful pilot are being used to inform expanded screening initiatives in more remote communities where there are few to no eye care professionals available.

“

Diabetic retinopathy (DR) is one of the leading causes of blindness in Canada since it accounts for 80% of blindness in persons living with diabetes and is the leading cause of blindness in working-age individuals. Even though early detection through regular DR screening effectively avoids vision loss by enabling earlier intervention and treatment, we are still falling short when it comes to DR screening rates in Canada.

Screening rates across the country vary depending on where a person lives in Canada; up to 60% of individuals living with diabetes have not had their eyes or feet examined within one year. Part of this gap in DR screening with respect to geography and lack of resources, we could bridge by using the AI-driven DR screening model.

It is very important to engage with and include the AI-driven DR screening model when we plan the provincial and national DR screening strategies and programs.

Valeria E. Rac, MD, PhD Co-Lead, Diabetic Retinopathy Screening Program and Knowledge Mobilization and Evaluation Program, Diabetes Action Canada, CIHR SPOR

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PARTNERING WITH INDIGENOUS HEALTH ORGANIZATIONS

02

Vision Loss Rehabilitation Canada (VLRC) has successfully implemented the Eye Health Screening Initiative (EHSI) using the AI-driven EyeArt platform, combined with handheld fundus cameras, to screen underserved, rural, remote, and Indigenous communities across Ontario. This program emphasizes culturally safe, community-centered care by partnering with Indigenous health organizations and local providers, ensuring screenings are conducted closer to home, in language of choice, and in a trauma-informed manner. The initiative has expanded across all regions of Ontario with positive patient and provider satisfaction and has demonstrated 100% referral uptake for follow-up care. VLRC's integration of nurse practitioners has further strengthened follow-up and referral pathways, especially for unattached patients. These efforts have resulted in faster diagnosis, reduced wait times through tele-ophthalmology, and a reduction in the burden of vision loss, contributing to long-term health cost savings and improved population health outcomes.

INTEGRATION OF AI SCREENING TO INCREASE ACCESS IN SMALLER COMMUNITIES

03

In Marathon, ON, a screening initiative integrated AI tools to enhance DR detection in communities outside of urban cities. Similar to the pilot program, a high percentage of exams were completed without dilation, and there was high community, patient, and provider satisfaction. The project demonstrated the ease of training staff with little to no ophthalmic imaging experience, and a referral pathway that prioritized severity of disease was established. Success is driving plans to expand similar models into other provinces through partnerships with the local community and aligned organizations.





CONCLUSION

The evidence supporting the use of autonomous AI for DR screening in Canada is compelling.

We have an opportunity to use technology to save the sight of some of the most vulnerable Canadians—something organizations serving these populations see as a critical need. National leaders in the diabetes space, including Diabetes Canada and Diabetes Action Canada, have invested in research that could increase access to DR screening using tele-ophthalmology and AI-based solutions.

High diagnostic accuracy, regulatory approvals, improved efficiency, enhanced accessibility, increased adherence, cost-effectiveness, and positive feedback from patients and providers underscore the potential of AI-driven screening to transform eye care. Continued investment in AI technologies and their integration into the healthcare system will be crucial for expanding access to effective DR screening and preventing vision loss among Canadians living with diabetes.

With the current stresses on the Canadian healthcare system highlighted almost daily in the media, it is clear that innovative ways to increase access to care while decreasing the burden on frontline teams are desperately needed. Efficiencies are demonstrated in the case study implementations with only positive screens reviewed by ophthalmologists, conserving specialist and patient time. This allowed for a faster, more streamlined

referral process for those who required further intervention. The use of AI ensures that individuals at risk of DR are identified early, while reducing unnecessary follow-up for those without signs of the condition.

The AI model is not limited to DR. As screening models are established, a clear pathway is created for screening for additional vision-related or other systemic health conditions. AI companies are actively developing new technologies targeting other diseases and providing a fuller spectrum of solutions within eye health and beyond. Once a screening program is implemented, it has the potential to be expanded to additional eye conditions and then to areas beyond eye health. As an example, there is currently research looking at the association between DR and diabetic foot ulcers.¹⁷ A dual screening program could one day reduce the risk of vision loss and amputation for people living with diabetes—two of the disease's most feared complications.

Making eye screening more accessible will improve the lives of Canadians.

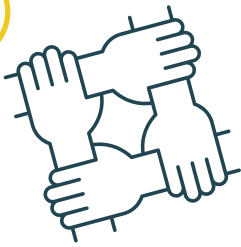
Increased access will create a more equitable healthcare landscape where needed health screening is available regardless of location, socioeconomic status, or access to a primary care physician or eye care professional.



Call to Action

Next Steps

1



CONTINUED COLLABORATION

Foster partnerships among stakeholders including: eye health specialists, diabetes care providers, community leaders, technology providers, and policy makers.

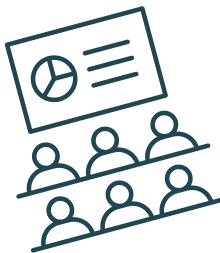
2



FUNDING AND SUPPORT

Secure funding for sustainability of existing and new projects with a long-term goal of nationwide implementation from government and private sectors.

3



PUBLIC EDUCATION

Raise awareness about the importance of regular DR screening and the benefits of AI-driven approaches.





Artificial Intelligence will play a big role in improving access to eye care, including diabetic retinopathy screening, for underserved and remote communities in Canada in the near future.

Dr. Vishaal Bhambhwani, an ophthalmologist working in Thunder Bay, ON and an Orbis partner in implementing diabetic retinopathy screening programs using artificial intelligence in Canada



Thank you for considering the Marathon Family Health Team to be part of this project. We appreciated the opportunity to provide AI DR screening locally. The diabetic patients who attended were grateful for their appointment and ease with which it was scheduled in order to complete long-overdue eye health examinations.

Joanne Berube, Executive Director, Marathon Family Health Team



It's extremely rare that a proposed solution to an epic and devastating problem transecting our entire country has such overwhelming and widespread support – experts, professionals, healthcare organizations – specifically within the diabetes and diabetic retinopathy space. At the end of the day, for me it can be distilled to this one remarkable moment – the moment a 23-year-old visited his physician in Thunder Bay for a regular checkup. When offered an autonomous AI DR screen, he accepted. 90 seconds later, after testing positive for DR, he was on his way to a sight-saving procedure. And 60 minutes after that, he was on his way to the rest of his life – with sight intact. Although this solution will likely save the healthcare system billions of dollars over time, more importantly, it will save sight for millions of Canadians of all ages and ensure they have a quality of life full of the potential we all hope and strive for. The real question is: What is the cost of not scaling this solution?

Lisa McKeen, CEO, Orbis Canada



Reconciliation is viewed as a process of healing relationships and is an important step in improving Canada's healthcare system for all. As we move forward with this project, it will not only strengthen health services, I believe over time it will open doors for other health sectors and providers to recognize the unique needs of remote communities. I am proud to be a member of the Orbis Canada Board of Directors as we move forward in reconciliation and improving health outcomes for our people.

Robert Byers, Member of the Little Black Bear First Nation
President & CEO, Namerind Housing Corporation





First off, I want to thank you for the opportunity to coordinate and run this project here at MFHT. We were able to see over 100 diabetic patients from Marathon, Biigtigong Nishnaabeg, and Netmizaaggamig Nishnaabeg between late October 2023-April 2024 and make necessary referrals for further evaluation, all while keeping patients local - which is huge!

Lindsay Nutbrown, Research Administrator,
Marathon Family Health Team



Diabetic retinopathy is a leading cause of blindness among working-age Canadians. With over 3 million people affected by diabetes across the country, early detection and treatment are critical to preventing irreversible vision loss. Yet, access to screening remains inconsistent, particularly in remote and underserved communities, widening health disparities and placing unnecessary strain on individuals and the healthcare system.

The urgency for a comprehensive, accessible national diabetic retinopathy screening program has never been greater. Integrating AI-mediated screening initiatives like VLRC's EHSI into broader healthcare frameworks will ensure that all Canadians—regardless of geography or socioeconomic status—have access to preventive eye care that can preserve vision, improve quality of life, and reduce the long-term healthcare costs associated with advanced diabetic retinopathy.

Josie McGee, VP Healthcare Innovation, VLRC



This is the first step to truly reaching the most vulnerable population through adopting technology that's easy to use and portable. It will also be a force multiplier for our limited number of ophthalmologists in Canada.

Dr. Vivian Yin, Ophthalmologist on the Canadian Ophthalmological Society (COS)
Foundation Task Force on Access to Care





Orbis is an international nonprofit that builds strong and sustainable eye care systems globally that put treatment and prevention within reach.

At Orbis, research and evidence are fundamental to our mission. What we learn informs our evidence-based approach to build long-term sight-saving programs. Our findings also have implications that can strengthen outcomes in the wider eye care sector. As Dr. Hunter Cherwek, Vice President, Clinical Services and Technologies at Orbis states,

“Our research team helps support data-driven programming based on models and results that have held up to peer review, scientific scrutiny, and are, ultimately, shared globally through published research.”

Some examples of Orbis’s published research include a study published in [Nature Digital Medicine](#)^{*1} showing the power of AI for improving the productivity of eye care teams.

This peer-reviewed study is the first to demonstrate significant improvements in the productivity of medical professionals when using autonomous AI to test for diabetic eye diseases.

Two original Orbis studies show benefits of AI for rural eye care. These peer-reviewed Orbis studies in the [British Journal of Ophthalmology](#)^{*2} and [Ophthalmology Science](#)^{*3} show the potential for AI to transform eye care in hard-to-reach communities. This includes a first-of-its-kind study in which AI screenings improve eye care access and adherence to referral in sub-Saharan Africa. An additional Orbis [study](#)^{*4} finds AI-led screenings are a highly successful tool in detecting DR in children living with diabetes. Until now, very few studies with children and young adults existed.



^{*1} <https://www.nature.com/articles/s41746-023-00931-7>

^{*2} <https://bjo.bmj.com/content/108/6/840.long>

^{*3} [https://www.ophtalmologyscience.org/article/S2666-9145\(22\)00057-4/fulltext](https://www.ophtalmologyscience.org/article/S2666-9145(22)00057-4/fulltext)

^{*4} <https://journals.sagepub.com/doi/10.1177/11795514231203867>



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