

The Future of Home-Based OCT for Retina Patients



Products in the pipeline could improve outcomes and reduce burdens on patients and physicians.

BY JOHN B. MILLER, MD; AND REBECCA ZENG, BA

Telemedicine is on the rise. Today, the landscape of telemedicine ranges from remote patient consultations to handheld apps to at-home monitors for chronic conditions. With these new technologies, patients can access health care without having to travel to the clinic.

Ophthalmology is rife with opportunities for advances in remote care technology, including videoconferencing for consultations and devices that turn a smartphone into an ophthalmoscope. Home-based OCT is another emerging technology in the field of teleophthalmology. If it lives up to its promise and overcomes barriers to adoption, it could potentially revolutionize care for patients with certain chronic ophthalmic conditions.

In December 2018, the US FDA granted breakthrough device designation to the Home OCT (Notal Vision). This designation means that the FDA intends to provide interactive and timely communication with the sponsor during device development and throughout the review process. The device pairs a patient-operated, lightweight OCT unit with cloud-based artificial intelligence (AI) software, the Notal OCT Analyzer, to monitor disease status.¹

Another home OCT device in development is the Multiple Reference OCT (MRO; Compact Imaging), a miniature OCT device that may be able to detect

progression of advanced age-related macular degeneration (AMD) and diabetic retinopathy (DR). Compact Imaging announced in 2018 that it had signed a collaboration agreement with Novartis, which agreed to fund the development of the MRO.²

These devices have yet to enter the market. The implementation of home-based OCT would benefit both patients and physicians by optimizing patient access and treatment and improving the efficiency of health care services.

OPTIMIZING PATIENT CARE

Transportation is a major barrier to eye care, especially among underserved and elderly populations.^{3,4} Many patients depend on relatives or others to get to their appointments. In addition,

people in rural areas may have to drive hours to reach a qualified specialist. The availability of a home-based OCT would increase patients' access to retinal imaging technology and improve physicians' ability to monitor chronic eye diseases.

Home-based OCT could reduce the number of patient no-shows because patients would have to attend clinic visits only when in-person physician expertise is required. The device would help these patients save travel time and costs while maintaining or even increasing the frequency of OCT scans.

Increased access to OCT technology with a home-based platform should allow more personalized treatment approaches. Particularly in high-risk patients, frequent home-based OCT

AT A GLANCE

- ▶ Home-based OCT would allow patients to acquire images in the comfort of their homes and send them for evaluation.
- ▶ Home-based OCT could optimize patient care by increasing the feasibility of prn-based treatments, expediting detection and treatment of disease progression.
- ▶ Pairing this technology with AI software to analyze subretinal fluid and notify physicians of changes could reduce unnecessary clinic visits.

monitoring could detect early vision-threatening changes such as choroidal neovascularization or fluid, leading to timely intervention. It could also increase the feasibility of prn regimens for intravitreal injections in patients with lower treatment needs.

CUSTOMIZING CARE AND REDUCING COSTS

Home monitoring may reduce costs and burdens incurred due to repeated, sometimes unnecessary, clinic visits. By optimizing injection frequency, home-based OCT could provide a cost-effective approach that results in a similar, or even better, patient outcome.

An excessive number of injections in a patient with AMD could lead to the development of geographic atrophy.⁵ By contrast, an injection schedule that is too infrequent may result in suboptimal outcomes. With home-based OCT imaging, patients could receive treatment informed by imaging, creating a more customized treatment plan.

Wittenborn et al found that a home-based visual field monitoring system for AMD was cost-effective for a subset of patients who were at a high risk of choroidal neovascularization.⁶ Similarly, although the literature on the topic is scarce, home-based OCT could be a potentially cost-effective and worthwhile alternative to regular clinic visits for a growing subset of the population, especially as the technology improves.

IMPROVING PHYSICIAN WORKFLOW

The advent of home-based OCT would make it possible to avoid clinic visits for disease monitoring and, instead, allow patients to come in only when necessary. Reduction in clinic visits could free up providers' time so that they can aim their energy at more complex and severe cases. Although the implementation of home-based OCT may result in lost revenue for in-office patient visits and OCT scans, the expected gains in patient outcomes should be promoted.

Concerns exist that increased OCT data from home monitoring could hinder the workflow of busy clinicians, but the rise of automated technologies presents promising solutions to improve the efficiency of image analysis. The Home OCT system already incorporates AI to analyze fluid accumulation in images with sensitivity, specificity, and accuracy similar to those of three retinal specialists.⁷ In addition, investigators are developing AI programs to enhance the detection and evaluation of many ophthalmic diseases, including DR,⁸ AMD,^{9,10} and retinopathy of prematurity.¹¹ AI can also potentially be used to predict treatment requirements for the ophthalmic conditions of individual patients,¹⁰ relieving physicians of this workload.

CHANGING ATTITUDES

A major obstacle to the adoption of home-based OCT and other teleophthalmology devices is the level of comfort

HOME OCT BY THE NUMBERS



By Judy E. Kim, MD

Home-based OCT has the potential to profoundly alter the management of patients with retinal conditions. It may also affect clinic workflows.

Wondering how well home-based OCT platforms currently perform? Here are a few data points to illustrate current capabilities. (All data is on file with Notal Vision.)

Performance and Usability

A study completed earlier this year on the performance and usability of the patient-operated Home OCT, version 2.5 (Notal Vision), found that 90% of 196 patients diagnosed with age-related macular degeneration were able to successfully operate the prototype device and obtain OCT images of their own eyes.

Sensitivity and Specificity

Based on the images of 309 eyes captured in that study, the Home OCT demonstrated 92% sensitivity and 97% specificity in detecting fluid compared with technician-operated commercial OCT devices.

Ease of Use

Of those surveyed in association with the study, 97% of patients responded *agree* or *strongly agree* to this statement: The tasks I had to do to scan my eyes were easy.

A home-based OCT platform could help detect fluid recurrence or progression between visits, providing patients and physicians with vital knowledge about disease status. This dream is fast becoming a reality, and it is important for our community to be aware of these data so that we can distill this information to patients who may one day rely on this platform.

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and acceptance of these technologies among patients and physicians. Patients' willingness to participate in telemedicine is influenced by a number of factors. In a study on attitudes toward telemedicine in patients with DR, it was found that patients are more willing to participate if there is a prospect of increased convenience or if they have more systemic comorbidities, but may be less willing if they have a longer duration of diabetes or place greater value in the physician-patient relationship.¹²

MODIFICATION OF PHYSICIAN WORKFLOWS AND TRAINING TO INCORPORATE THESE NEW DEVICES WILL BE ANOTHER OBSTACLE TO ADOPTION.

Regarding that last point, however, it may be that home-based OCT can enhance the physician-patient relationship by empowering patients to play a larger role and work alongside their physicians to improve their care. For example, at-home blood pressure monitoring has been shown not only to help with disease monitoring, but also to improve treatment compliance,¹³ perhaps by giving patients more responsibility and control of their condition. As teleophthalmology becomes more prevalent, attitudes among patients may increasingly shift in favor of home OCT.

Physicians' opinions of the feasibility and safety of home-based OCT, as well as their level of comfort with these devices, present another challenge. In a survey of 58 eye care physicians at the University of Michigan, 59% of respondents said that they had low confidence giving a professional opinion based only on remote monitoring.¹⁴

Modification of physician workflows and training to incorporate these new devices will be another obstacle to adoption. Despite lingering discomfort, however, 82% of physicians responding to the University of Michigan survey reported that they would be willing to participate in teleophthalmology.¹⁴ This statistic may be a signal, at the very least, of a growing propensity toward integration of remote devices, such as the Home OCT and the MRO, into the workflow of the academic physician. Concerns are to be expected, as home-based OCT and other teleophthalmology devices are still new to the practice of ophthalmology.

INSURANCE ISSUES

The financial reimbursement paths for home-based OCT are unclear at present. However, remote monitoring of chronic conditions is being gradually incorporated into reimbursement policies. In 2018, CMS approved reimbursement for remote physiologic monitoring of weight, blood pressure, pulse oximetry, and more, as well as related health care professional time.¹⁵ The ForeseeHome device (Notal Vision), an FDA-approved diagnostic device, is already covered by Medicare and most private insurers.¹⁶ These recent developments are optimistic for the financial future of home-based OCT, especially as the technology improves and its use becomes more widespread in the management of ophthalmic conditions.

CONCLUSION

According to the National Eye Institute, the number of people affected by the most common eye diseases, including AMD and DR, is projected to double from 2010 to 2050.¹⁷ The growing need to monitor these and other chronic eye diseases will increasingly burden limited resources. Home-based OCT presents a way to reduce the use of human resources while increasing patient access, personalizing patient care, and potentially improving patient outcomes. ■

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