How technology improves the glaucoma workflow for better outcomes in rural India

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Peer perspectives in the ophthalmic practice

ZEISS

Seeing beyond

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Challenges of treating glaucoma in a middle-income country

Currently in India, about 12 million people suffer from glaucoma, making it a leading cause of blindness, with up to 1.5 million people affected.[1] The prevalence could be much higher, as more than 75% of glaucoma cases are undiagnosed in India. Adding to the problem, many patients receive their glaucoma diagnosis when the disease is already in an advanced stage, because early glaucoma often has no symptoms and disease awareness remains low in both rural and urban communities in India.

Currently, the cornerstones of diagnosing and managing glaucoma are clinical skills, patient awareness, and dependence on intraocular pressure (IOP) measurement as a primary screening tool. As a result, the clinical exam with slit-lamp findings is still the mainstay for most eyecare practitioners who are screening for and diagnosing glaucoma, and the quality of the equipment—like a good slit-lamp and reliable tonometer—is crucial.

Managing data is another challenge in glaucoma care. In India, gonioscopy, hand-written notes, and drawings of the optic disc and retina are common forms of exam data, which are reliable if neat and well-crafted—but suffer from significant inter-observer variations, as you might imagine. This type of note-taking has the disadvantages of taking more time to create and can be difficult to reproduce. Missing or poor-quality data in any aspect can seriously hamper the clinical judgment needed for accurate diagnoses and early prognoses.

How technology helped us establish a high-quality eyecare center in rural India

When we set up an eyecare specialty clinic in a non-urban area of Maharashtra, India, we faced many of the above challenges, which we overcame with top-class training and innovative technology.

At that time, I had completed a fellowship in comprehensive ophthalmology with a concentration in glaucoma at L V Prasad Eye Institute (LVPEI) and had started private practice in Aurangabad, Maharashtra, India. I invested in a HFA 730i, ZEISS Yag II laser, a good slit-lamp, and an applanation tonometer, which I considered the minimal requirements to start a glaucoma practice.

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In the first few years, we established ourselves in the community by organizing and participating in several glaucoma seminars and workshops for fellow clinicians in the district. Gradually, with the support of colleagues, the number of referrals for glaucoma increased over the years. Our model was to help the referring clinicians manage the patients in their clinics and extend support with treatment advice. We also provided specialized diagnostic tests, laser treatments and surgeries.

Today, the practice has two clinicians including myself, six optometrists, two technicians for perimetry and optical coherence tomography (OCT), and administrative and support staff. Each month we see about 750 glaucoma patients, who benefit from our investment in technology. I am rewarded by the quality of patient care we provide, our level of precision, and our efficiency. More importantly, technology has resulted in earlier detection of glaucoma, accurate diagnoses and clinical decisions, and the ability to handle a large volume of patients who come through our door. We hope to provide even more patient education by using data generated from our equipment to increase awareness of glaucoma and its care in the community.

## How technology empowers care

Our glaucoma practice generates and processes enormous amounts of data, because for every patient, we document the clinical presentation, family history, medical history, clinical images, gonioscopy findings, pachymetry, perimetry, ganglion cell analysis (CGA), and retinal nerve fiber layer (RNFL) data to obtain a comprehensive diagnosis of glaucoma, including the status (staging), prognosis, and course of therapy.

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Our previous low-tech workflow included:

- History and clinical exams with handwritten notes

- Hand drawings of disc/retina and gonioscopy

- Conversations with patients to explain the diagnosis of glaucoma

- Manual comparison of Humphrey field analyzer (HFA) visual fields serially with guided progression analysis (GDx) scanning laser polarimeter and clinical perception of optic disc changes

- Assessment of disease progression using guided progression analysis (GPA) of each device separately

Essentially, this low-tech workflow involved a lot of chair time and limited our patient conversations to abstract explanations they weren't always able to understand intuitively. Since we have adopted much more sophisticated equipment, we're able to do much more and follow best-practice protocols that result in greater efficiency as well as meaningful patient education.
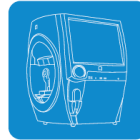
Perimetry—Identify visual field defects for the purposes of screening, monitoring, and assisting in the diagnosis and management of ocular diseases such as glaucoma and related neurological disorders.
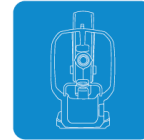
Fundus photography—Document and analyze color images of disease pathology in early treatment stages, i.e., diabetic retinopathy studies and ETDRS scores.

OCT—Analyze retinal nerve fiber layer thickness (RNFL), ganglion cell analysis (GCA), optic nerve hypoplasia (ONH), and macular OCT-A.

FORUM—All raw data is available for further analysis in a scalable format both in the office and remotely.

The new workflow allows:

- Real-time analysis of data from previous visits that can be shown to patients.
- Ability to look at current ocular data from a variety of perspectives in real time.
- GPA and structure & function analysis to give a comprehensive status on the patient's condition and trending outlook.
- Capacity to detect early changes and monitor them over time.

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Naturally, glaucoma management today is more dependent on technology than ever before. Accuracy, reliability, reproducibility, and quick results were essential parameters for selecting equipment. Over the years, the practice has been upgrading its technology and acquired five-step slit-lamps, applanation tonometers, an HFA 730i, a GDx VCC scanning laser polarimeter, a CIRRUS® photo 800 OCT and fundus imager, a YAG II laser, and a 577 nm yellow multispot laser (MLT). Later on we added an HFA3, a ZEISS IOLMASTER® 500, a CIRRUS® 6000 with Angioplex, FORUM Glaucoma Workplace software and installed an EMR system.

We have invested in new technologies and upgrades whenever possible, because I have seen first-hand that innovations result in better patient management and practice development. For example, the reason behind acquiring the ZEISS CIRRUS photo 800 was because it integrated the fundus camera and OCT. As a result, it saved us time, was more convenient, and offered the ability to recall data or analyses in any exam room terminal. As an extension of the data integration idea, we opted for the ZEISS FORUM Glaucoma Workplace software. We found a natural progression of data integration from a simple fundus and OCT combination in CIRRUS

photo to a complete structure-function integration with Glaucoma Workplace that enables combined perimetry and OCT analysis coupled with fundus images for a longitudinal study of disease per a wide range of parameters along with added connectivity due to the FORUM platform. Additionally, we experienced benefits from attaching soft copies of the reports in the electronic medical records (EMR).

When adopting any new technology, training operators of the new instruments is essential. We trained all operators to ensure the quality of the tests and scans was excellent. The operators provided regular feedback to ZEISS about challenges that they were facing. We were often aided by a ZEISS Applications Specialist who helped us overcome specific challenges.

Today, our clinic has six computer terminals where we can interact with patients. We have multiple viewer licenses as well as two Glaucoma Workplace licenses. As a result, we can initiate new work orders on FORUM from anywhere. More importantly, the raw data can be accessed and analyzed at any terminal through Glaucoma Workplace. We've recently added the Retina Workplace application in FORUM, which helps immensely in cases where

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a patient may have retinal problems in addition to glaucoma. Now we are able to easily discern overlapping conditions, such as epiretinal membrane (ERM) interfering with ganglion cell layer (GCL) inner plexiform layer (IPL) analysis.

Finally, we created an intuitive workflow protocol for glaucoma and retina tests that makes the most of our technology.

"Technology helped me in several ways. Cutting-edge research has shown us that technology does indeed help in preserving useful vision for our patients. At the same time, technology helps in weeding out management principles that would have otherwise taken years to disprove or abandon."

- Dr. Hazari

How technology benefits patient education

Another advantage of technology is that it enhances our patient communication. A well-informed patient has more realistic expectations, understands his or her condition well, and displays better compliance with prescribed treatment, thus having a better chance at positive clinical outcomes. ZEISS Glaucoma Workplace had a substantial positive impact on patient satisfaction and clinical outcomes.

Across the board, when we involve patients in their clinical decision-making and management, it empowers them. Using FORUM Glaucoma Workplace makes it so much easier for patients to understand their condition. Glaucoma Workplace saves time so we can spend quality time with patients without compromising efficiency—while still decreasing chair time. We can quickly recall previous tests and see the changes over time, which enables us to explain a patient's condition with greater confidence. In turn, patients find it reassuring that we are taking such good care of them, resulting in better compliance and adherence to treatment protocols.

We often have glaucoma patients who become worked up at any minor variation in their IOP. Now, when we show them images paired with GPA

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graphs from Glaucoma Workplace and explain that their eyes are stable and doing well, they are able to relax. On the other hand, we have glaucoma patients who can't understand that their eyes are deteriorating even while their central vision remains strong. In these situations, the reports with the structure-function graphs in Glaucoma Workplace help in driving home the message that they need to follow their treatment plan and get tested at regular intervals.

"We are now routinely doing OCT-A for all our glaucoma patients along with their regular OCT with the Cirrus 6000; it hardly takes a couple of additional minutes. We are yet to start using the acquired data in the clinic, but the data will definitely become more relevant and useful in the near future as finer protocols for OCT-A in glaucoma come into play."

- Dr. Hazari
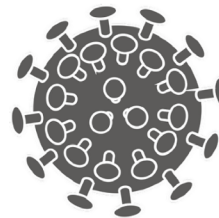
COVID19 tweaks

- On the OCT, as a default, we started doing optic nerve hypoplasia (ONH) OCT angiography (OCTA) and macular OCTA.
- On the perimetry front, we shifted as a default to 24-2C program; this saved us time and helped us decide which patients needed further testing with 10-2 program for central defects.
- While analyzing the patient data and reports, we preferred to do it at a remote workstation rather than the same room in front of the patient.

How we adapted to COVID-19 challenges

The COVID19 pandemic brought in many challenges to ophthalmology practices all over the world. In particular, the biggest challenges we faced were:

- The challenge of maintaining social distance while using perimeter and OCT and fundus camera
- Fogging of optics and patient discomfort due to masks
- Maintaining a dust-free environment, especially with the need for increased ventilation

Because glaucoma is such a major cause of vision

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loss, we didn't have the luxury of closing our practice. Therefore, it was essential to adjust our workflow to keep our staff and patients as safe as possible. Glaucoma Workplace was very helpful in implementing a low-contact workflow while it enabled remote access to the raw data from the machines as well as data analyses and report generation. This reduced the exposure time and facilitated social distancing.

Additionally, we realized that examining the retina photographs on the screen helped us study images more carefully than rushing through them during a stereoscopic retina evaluation. Because we were already using Glaucoma Workplace extensively, we did not have to change our protocol much. Reducing the time we spent with patients for assessment, education and glaucoma management were important in the time of social distancing, but Glaucoma Workplace demonstrated for us that less chair time didn't reduce the quality of our care. As a result, we were able to reduce crowding in the hospital, allowing for better implementation of social distancing.

COVID-19 Pivots

- As part of our new standards, we began performing optic nerve head (ONH) OCT angiography (OCT-A) and macular OCT-A on CIRRUS OCT.

- The CIRRUS 6000 has higher resolution and is much faster than the CIRRUS photo. Pivoting to the CIRRUS 6000 resulted in significant time savings and much better decision-making for us.

- On the perimetry front, we shifted to the 24-2C program. This saved us time and helped us decide which patients needed further testing to detect central defects with the 10-2 program.

- While analyzing the patient data and reports, we preferred to do it at a remote workstation rather than the same room in front of the patient.

Future perspectives for our practice

What we learned from successfully navigating our patients and practice through the COVID-19 pandemic made us realize that remote analysis of data works well and is beneficial in that it allows us greater efficiency and flexibility.

As we look to the future, we know from our past successes that technology upgrades are worth the investment because of the subsequent improvement in the quality of patient care we are able to provide.

"We realized that we could study the data or reports more intently and carefully when we look at it remotely. As a result, now we prefer to look at all the reports before we see the patient in the exam room so that we spend more focussed time 'with' the patient and less with the 'computer screen'. This is the key learning that we are taking to post-COVID19 era."
- Dr. Hazari

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References

1. Senjam SS. Glaucoma blindness-A rapidly emerging non-communicable ocular disease in India: Addressing the issue with advocacy. J Family Med Prim Care. 2020;9(5):2200-2206. doi:10.4103/jfmpc.jfmpc_111_20