VISUAL FIELD ASSESSMENT ON THE GO

New technology may reduce reliance on expensive machinery.

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Visual field (VF) testing is one of the most important cogs in the wheel of glaucoma diagnosis, decision making, and follow-up. VF diagnostic devices, however, cost as much as a luxury sedan. Purchasing a machine that promises efficacy, repeatability, and dependable statistical interpretation is an expensive and difficult task.

Affordable technology has ushered in a revolution in almost every sector of human living, including health care. This has turned around how we approach disease; unfortunately, the classical history-taking approach is being replaced by the investigational outlook of modern physicians. Patients, however, bear the cost of research and development into these investigational aids. The need of the hour is to bridge the gap between lab and field.

MOBILE APPLICATIONS: MOBILE AND AFFORDABLE

VF assessment via a mobile application is an exciting frontier for physicians engaged in glaucoma care. The promised positives of this approach are fewer visits, faster screening time, and easier follow-up. Above all, it would allow patients to take a particularly tiring test in the privacy and comfort of their own homes. The ability to take this test repeatedly to overcome the learning phase quickly and without compromising the already sparse resources of government-funded institutions, especially in developing nations, would be yet another benefit.

Additionally, standard automated perimetry has a relatively weak ability to assess parameters that may be related to functional impairment from the disease, such as risk for motor vehicle collisions or falls, which can now be ascertained with the use of certain mobile applications.

From the use of applications made for laptops and paired virtual reality devices (VirtualEye and Kasha)[1,2] now to mobile applications, accurate VF testing on the go no longer seems a distant dream.

TELEOPHTHALMOLOGY VERSUS CONVENTIONAL CLINICAL PRACTICE

In one study comparing teleophthalmology to conventional clinical assessment, the former had high diagnostic accuracy and was sensitive in detecting cataract and corneal eye diseases, showed moderate accuracy in detecting retinal diseases, and had low accuracy for glaucoma detection.[3] This research was based on ophthalmic imaging alone, but if that imaging were to be corroborated by mobile VF testing, the potential is quite exciting for community outreach programs, especially in countries with weak primary health care.

A meta-analysis evaluating the effectiveness of teleglaucoma versus in-person examinations of patients found that the mean time for screening, making a diagnosis, reporting, and patients' travel were less with teleglaucoma. This resulted in less mean access time (time from a patient's referral to the date a visit was booked) of 59.7 ±9.9 minutes compared with 73.7 ±29.8 minutes for an in-person examination. The mean cycle time (time from registration until the patient leaves the clinic) for teleglaucoma was 81.7 ±6 minutes versus 116 ± 2.5 minutes for in-person examination. The mean proportion of patients' satisfaction with tele-glaucoma was higher than with in-person examination (47.3 ±8.8% compared with 42%).[4]

Teleglaucoma has been shown to reduce patients' travel time by 61 hours and waiting times by 30% compared with in-person examinations.[5] Teleglaucoma costs $872 per patient screened, which is 80% less than with an in-person examination. Based on this figure, the former could save $27,460 for each additional quality-adjusted life year gained. In the long term, teleglaucoma could prevent 24% of cases of glaucoma-related blindness after 30 years.[5]

SCIENTIFIC EVIDENCE ON MOBILE APPLICATIONS

Currently, the evidence regarding the utility of mobile applications is sparse. Although one part of the world welcomes the most sophisticated and costly imaging devices with dedicated proprietary software, another part desperately looks forward to an affordable, accurate, and

TABLE. MOBILE APPLICATIONS

Application Name	Icon	Developer	Platform	Price	Remarks
Visual Fields Easy		George Kong Software	iPad	Free	• Has been successfully used for visual field screening in Nepal. Shown to correlate with 24-2 SITA standards • Has been used to detect early, moderate, and advanced glaucomatous and diabetic retinopathy-associated visual field loss • Currently under trial for use in stroke, age-related macular degeneration, diabetic retinopathy, and glaucoma • Lacks a statistical data pack for interpretation of the presented data
My Scotoma		Radtastical	iPhone, iPad, and iPod Touch	Free	• A modified Amsler grid for quick visual field assessment • No statistical data interpretation is available • Has not been clinically validated
MRF free		Glance Optical	iPad	Free	• Has been developed as an advancement of the Visual Fields Easy application • Offers full-threshold and screening strategies for the central and 300 field, along with calculation of mean deviation, pattern deviation, and visual capacity percentage • Offers progression analysis for longitudinal test result comparison • Has been clinically validated[6]
PERCEPT (Performance Centered Portable Test)		Research Application	iPad	N/A	• Identifies functional loss in glaucoma by imposing a demanding central visual task (low contrast orientation task), while requiring simultaneous detection of a peripheral low-contrast stimulus at increasingly shorter stimulus presentation times. • Functional loss correlated with a history of falls and motor vehicle crashes in glaucoma patients[7]

Abbreviation: SITA, Swedish Interactive Threshold Algorithm. iPhone, iPad, and iPod Touch are manufactured by Apple.

easily accessible mobile health care platform. Once validated, these applications may help ease the burden on tertiary care hospitals by reducing the frequency of visits, because patients will easily be able to monitor their VFs themselves and alert their physicians to any significant changes.

CAUTION

At present, mobile/web applications cannot completely replace the gold standard "white-on-white" perimetry. These applications are meant to be used as an accessory to help diagnose disease in patients who live in remote areas and rural medical camps where the permanent installation of heavy machinery is difficult. A cafeteria approach can be used with these application programs to provide the best possible option to the patient. Physicians should recommend the use of applications cautiously until there is sufficient evidence that they are effective and provide comparable and reproducible results compared with white-on-white perimetry. One day, however, glaucoma diagnosis and follow-up may just be a click away. ■

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