

Next-Generation Eye Care: A Virtual Reality-Based Comprehensive Eye Examination

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Introduction

- A comprehensive eye examination is a critical component of a patient's medical evaluation, as it can identify early signs of serious ophthalmic and systemic conditions.
- This exam is typically done by an ophthalmologist or optometrist, but many patients may not visit these healthcare providers unless they already have eye concerns and symptoms.
- Limited access to professionals trained to perform and interpret these examinations as well as the necessary equipment are barriers preventing routine completion of the exam
- The use of virtual reality (VR) has shown promise to provide improved access to portions of the comprehensive eye exam including visual acuity, pupillary function, extraocular motility, color vision, contrast sensitivity, and visual field testing with more tests currently in development.
- The use of this emerging technology has begun within Bascom Palmer Eye Institute, a tertiary care academic eye center, in several research settings to understand the effect on workflow and patient experience.

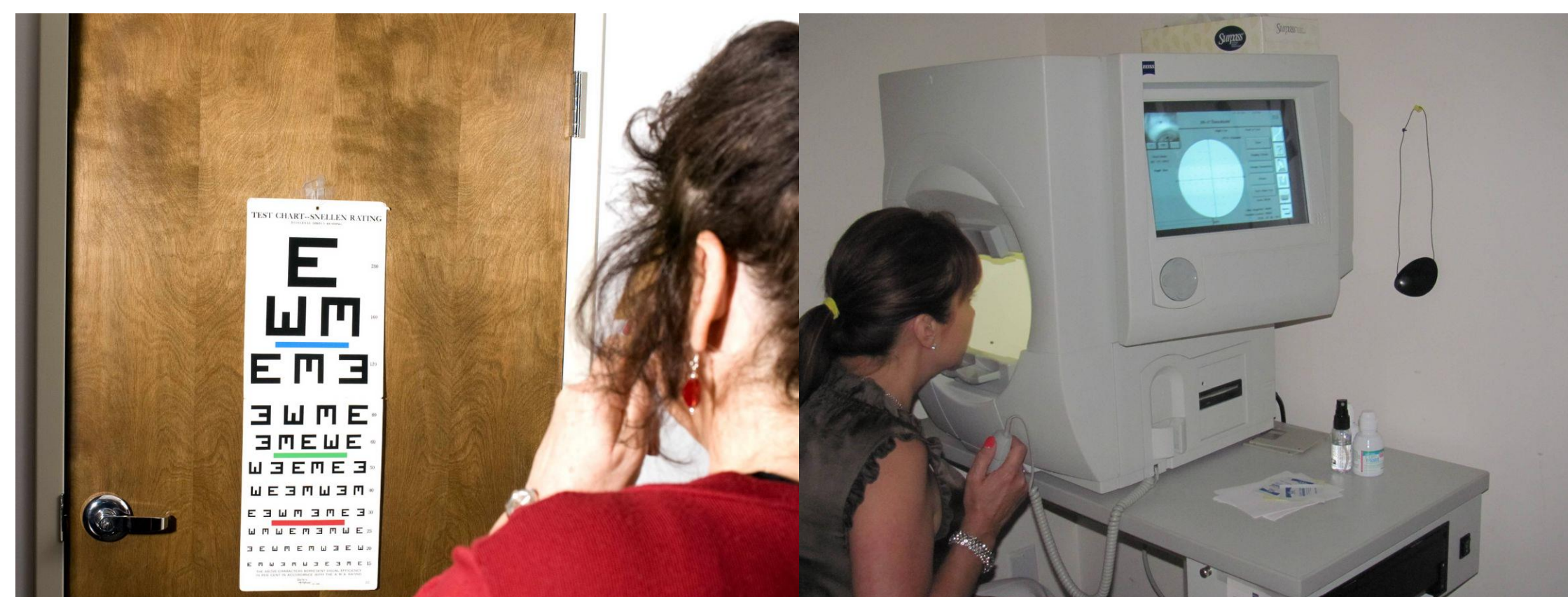


Figure 1. Example of patient completing traditional visual acuity test using the tumbling E chart (left) and Humphrey Visual Field Test (right) which are space consuming and limited in availability

Results

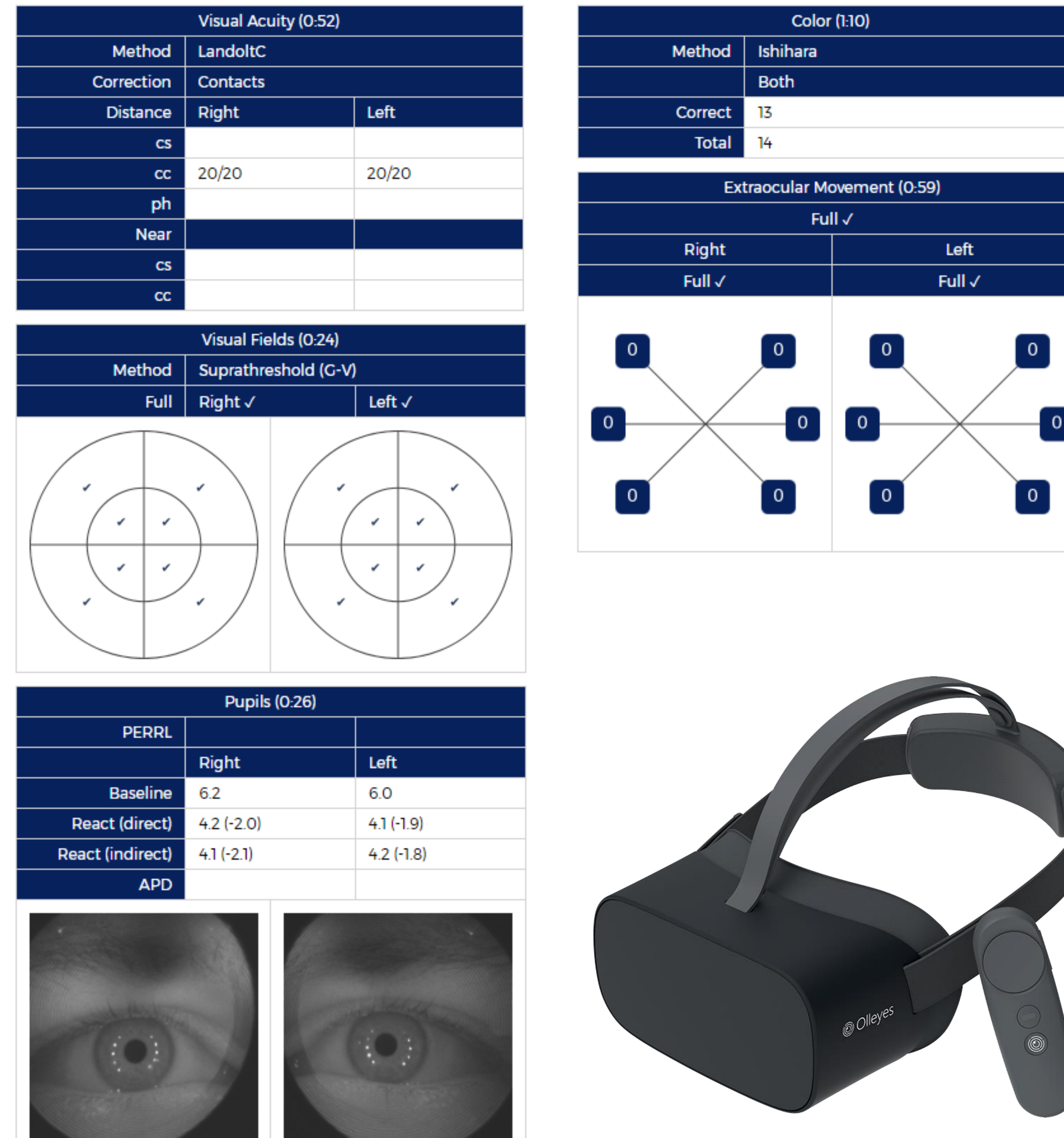


Figure 2. Example report generated by the VisuALL (Olleyes, Inc., Summit, NJ) device which can immediately be viewed by the medical team, and stored in the electronic medical record

Initial Experience

- Patients within the Bascom Palmer Eye Institute emergency department and the neuro-ophthalmology clinic have begun testing with the VR device
- N of patients have completed the exam
- In the neuro-ophthalmology setting, patients showed preference to the virtual reality headset over the Humphrey Visual Field Test due to improved ergonomics and reduced time needed to complete the test
- In the emergency department setting, almost every patient (95.7%) has been able to successfully complete the VR based comprehensive eye examination typically performed by a highly trained nurse practitioner
- In a post test survey, a large majority of patients reported strongly agreeing that the VR test provided value to their visit (74.5%), that they would be willing to do this test again in the future (85.1%), and that they would recommend this test to a family member or friend (85.1%)

Future Directions

The benefits of the VisuALL device come into focus when deployed in a setting where portability is needed and access to ophthalmic equipment and trained personal is limited. Future deployments within the following settings has promise to improve delivery of eye care.

- Home patient monitoring – physicians will be able to monitor patients from the comfort of their home in a longitudinal fashion or over discrete periods
- Schools – access to ophthalmic evaluation during the formative years of a child's life is paramount to intervene on possible site threatening conditions
- Community Outreach – the portable nature of a VR headset allows healthcare to be brought to patients, such as community health fairs and medical missions trips to underserved areas
- Space – access to a lightweight and portable device capable of monitoring eye health may help address concerns for spaceflight associated neuro-ocular syndrome
- Primary care settings – access to a user-friendly device which can be deployed where patients regularly receive healthcare will make eye exams more routine like monitoring blood pressure

