

# A tele-ophthalmology model for remote monitoring of patients with age-related macular degeneration

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## INTRODUCTION

Age related macular degeneration (AMD) is a leading cause of blindness in the United States.

The disease starts in its dry form, but about 10-15% of the patients convert to the more severe vision threatening wet form called neovascular AMD (nAMD). Over the last two decades anti-VEGF treatments have shown efficacy in managing wet disease in clinical trials.

### The Unmet Need

A vast majority of patients with nAMD lack functional vision. The two key factors underlying the underperformance in the real world are:

- Late detection of conversion from dry to wet AMD. A strong correlation between visual acuity (VA) at conversion and long-term outcomes emphasizes importance of early detection.[1]
- Lack of data to appropriately personalize treatment regimens for a highly heterogenous disease to optimize outcomes,[2] as well as keeping patients on therapy due to high treatment burden.[3]

### Role of Remote Monitoring

Remote monitoring can play a substantial role in addressing these challenges. Regular monitoring of patients with dry AMD allows for prompt detection of conversion to the wet stage. This, in turn, results in treatment initiation while the patient's VA is still good. Regarding wet AMD treatment management, remote monitoring can allow patients to arrive in the clinic only when treatment is needed, reducing burden both on patients and practices.

### Purpose

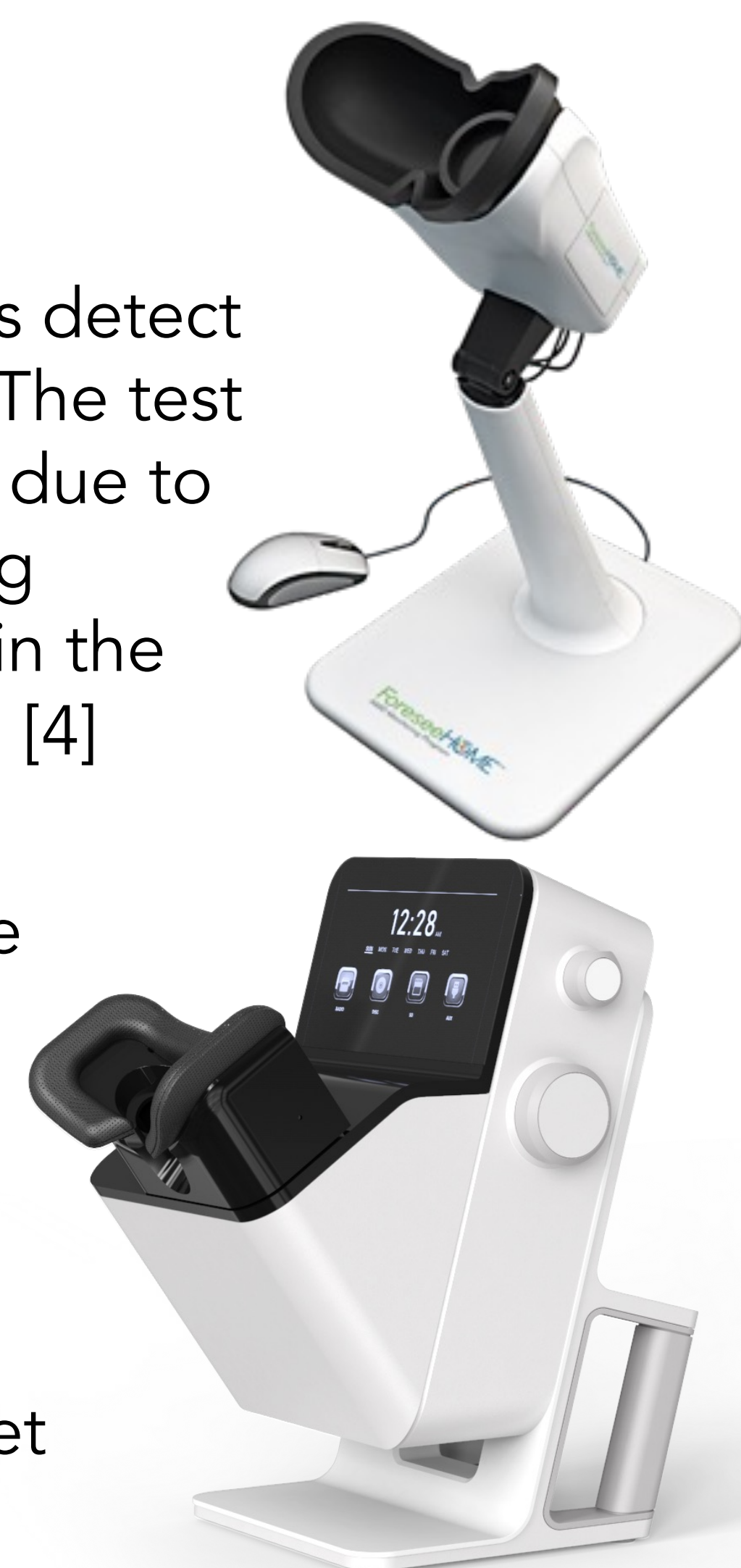
In this work, we evaluate performance of a digital teleophthalmology model to administer successful remote monitoring for AMD patients, specifically focusing on patient compliance, retention, and satisfaction with the monitoring program.

### ForeseeHome

ForeseeHome is a preferential hyperacuity perimetry (PHP) test used to help physicians detect the conversion from dry to wet AMD early. The test relies on detecting conversion to wet AMD due to change in metamorphopsia. This monitoring program was proven to be highly effective in the HOME study, a randomized controlled trial. [4]

### Home OCT

Optical coherence tomography (OCT) is the standard of care technology for managing wet AMD treatment. The potential of using such a device unassisted by the patient at home has been demonstrated in early studies.[5] Home-based use of OCT promises to allow remote monitoring for wet AMD patient management.



## DIGITAL HEALTH MODEL

In this work, we explore the efficacy of a digital health model that involves 3 components: management by eye care provider, at-home testing by patient, and remote care by a monitoring center. This model has been employed both with ForeseeHome and home OCT.

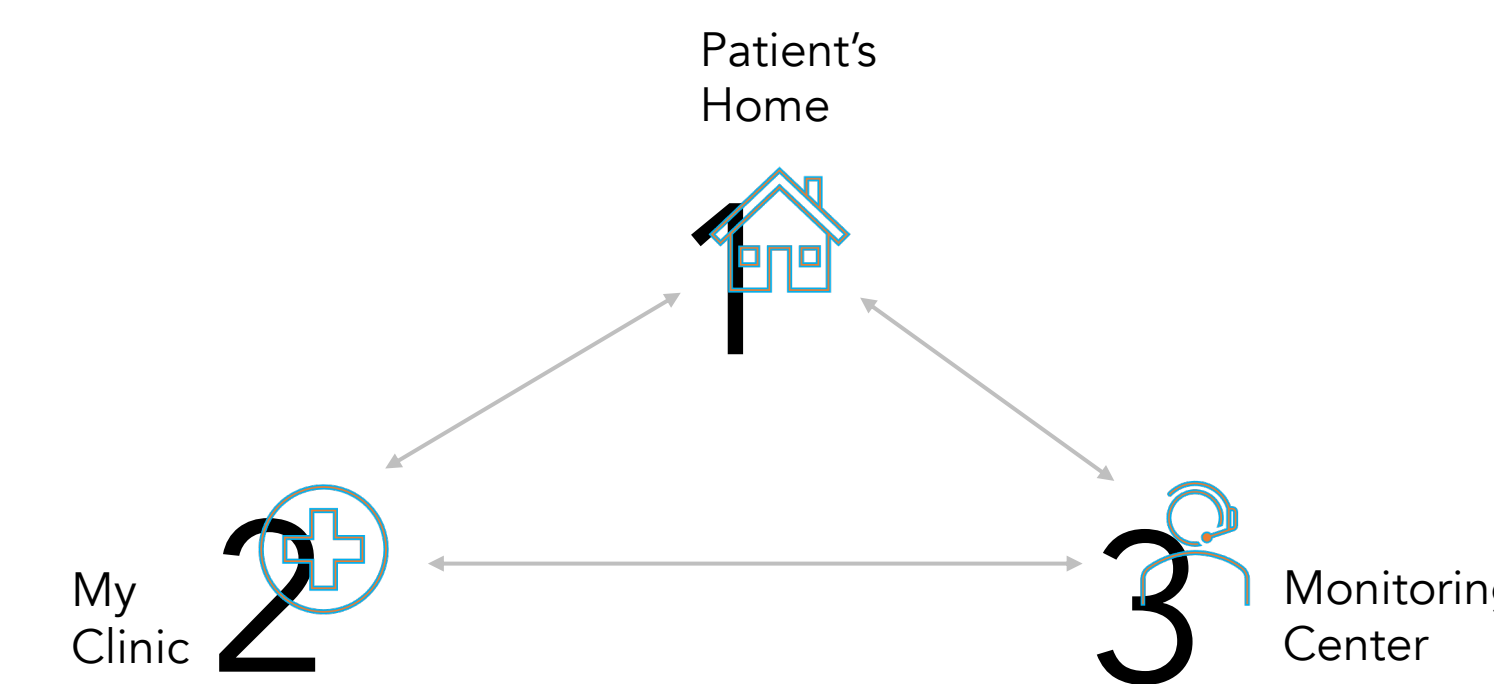


Figure 1. Digital Health Model

## METHODS

Performance metrics of this digital health model were demonstrated in two peer-reviewed studies.[5,6] The first study was a retrospective analysis of outcomes for intermediate dry AMD patients on the ForeseeHome monitoring program. The second study was a prospective trial demonstrating use of home OCT by nAMD patients. Additional data from the Notal Vision Monitoring Center (Manassas, VA), provider of the services, was used to further understand patient compliance.

Compliance for dry AMD patients in the first study was evaluated by the mean number of tests performed per week for participating patients. Longitudinal compliance was measured by the variation in testing rate as a function of time spent by the patient on the program. Patient retention rates were measured by the average duration on the program. The monitoring center's data was further used to understand compliance as defined by current procedural terminology (CPT) codes, which is defined by completing at least 8 tests over a period of 30 days.

Compliance for the nAMD patients in the second study was again measured using number of tests per week. Patient experience was measured using survey questions, with 1 being strongly disagree and 5 being strongly agree. (Note that the scale in Figure 3 is inverted compared to the original study for ease of understanding).

Overall, 15 questions were used to measure patient experience. We highlight some questions specifically related to role of digital health model and patient experience. The complexity of self-alignment in automated home OCT imaging can be high, patient rating on ease of use was measured. The patient experience with the recommendation for daily use was assessed and overall patient experience with the monitoring center support was captured.

**Disclosure:** Dr. Jennifer Jacobs and Dr. George Sanborn are employed as Medical Directors at Notal Vision Monitoring Center

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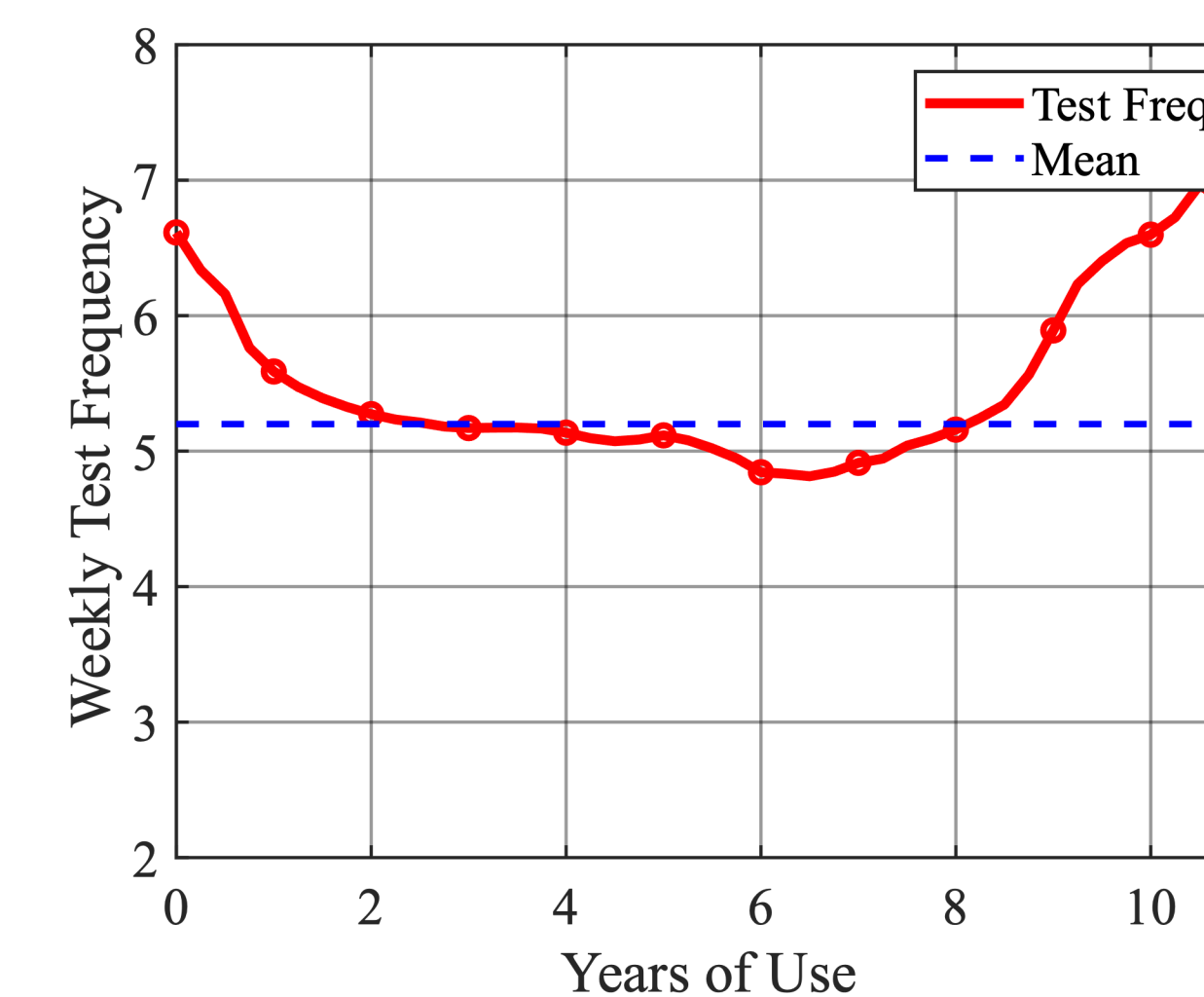


Figure 2. The weekly testing frequency stay relatively close to the mean over long periods of ForeseeHome testing.

## RESULTS

Testing frequency for intermediate dry AMD patients was 5.2 tests/week. The longitudinal compliance is demonstrated in figure 2, which shows there is no major dip in the mean testing rate over time, ranging from 4.8 to 6.9 tests/week. A Kaplan-Meier analysis predicted patients to be on the program for median (IQR) of 4.5 (4.3-4.7) and mean (SD) of 3.7 (3.4-4.0) years. The monitoring center data demonstrates a more than 90% compliance as defined by CPT codes, excluding patient-initiated pauses.

The testing frequency for the patients in the nAMD study was 5.7 tests per week. Patient rated ease of use at a mean of 3.67 out of 5, and convenience of daily testing at a mean of 3.63 out of 5. Patients rated service calls at a mean of 3 out of 5. The results associated with all 15 survey questions are shown in figure 3.

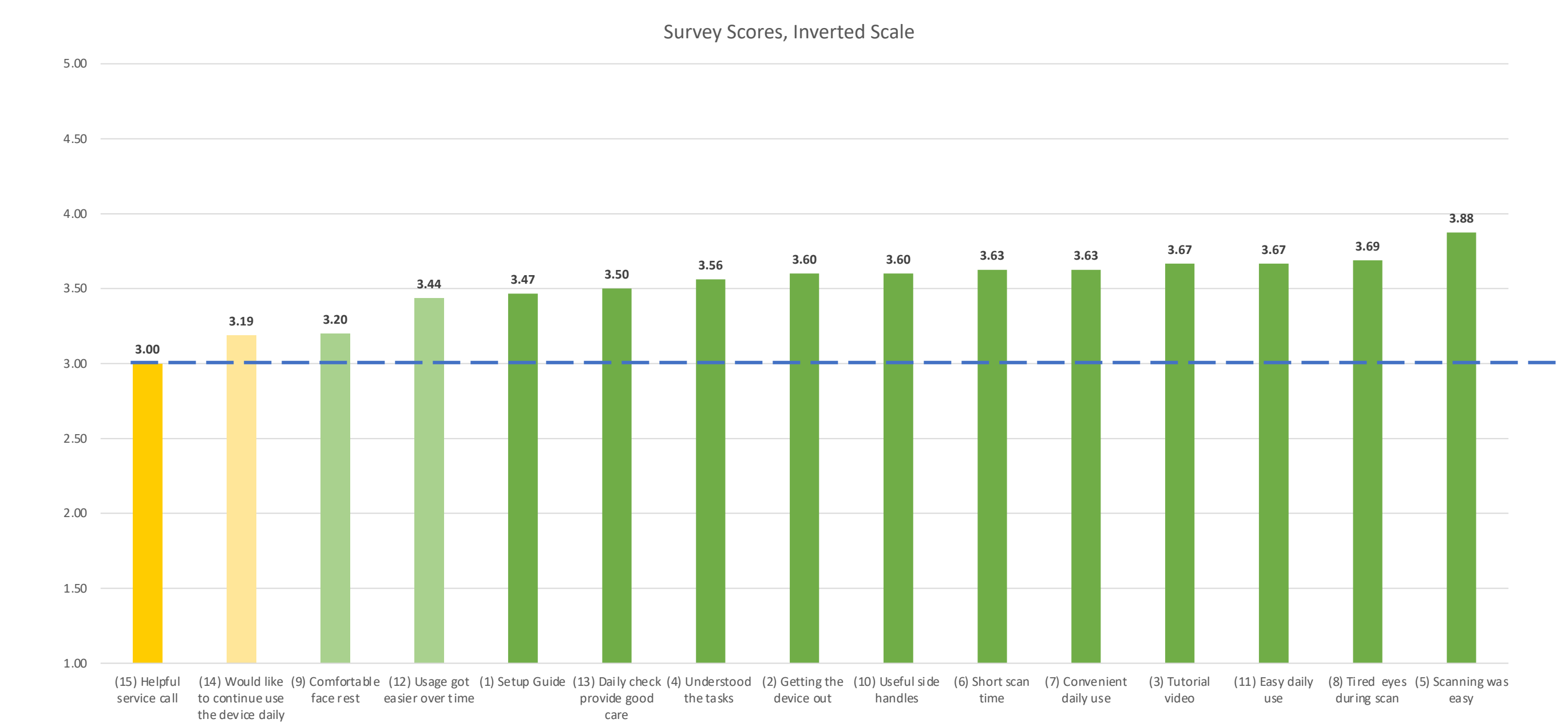


Figure 3. Results of nAMD patient survey related to the digital health model

## CONCLUSION

- Remote monitoring is a promising solution to enhance outcomes for AMD patients
- A digital health model that includes a monitoring center has so far shown strong results in administering remote monitoring for both intermediate dry AMD and nAMD patients, retention on the program and patient experience
- This tele-ophthalmology model in which the physician's care of the AMD patient is extended to the home by employing an in-home device together with a monitoring center is a viable solution with clinical usefulness and patient feasibility.

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