ADOPTION OF THE AUTOMATED PHOROPTER BY MICHIGAN OPTOMETRISTS

By

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ADOPTION OF THE AUTOMATED PHOROPTER BY MICHIGAN OPTOMETRISTS

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ABSTRACT

Background: The automated phoropter is currently being manufactured and sold by many prominent optical instrument companies including Marco, Zeiss, Reichert, Essilor, Topcon, and more. These companies have made significant investments in instrument design and marketing of the automated phoropters and propose that these instruments are superior in terms of efficiency and accuracy. This research project will investigate the adoption of automated phoropters by optometrists in Michigan and will thereby provide important information to universities and newly graduating optometrists. Methods: Data will be collected using a survey that will be sent via email to members of the Michigan Optometric Association. The survey will include questions about current use or plans to incorporate this technology into their practices. Survey questions will also provide information regarding what type of practices have the highest adoption rate. Results: The data collected in this survey will be reported in the appropriate format such as percentages, graphs, and tables. Conclusions: The results of this survey will provide colleges and optometry students with information regarding the likelihood of encountering automated phoropters in practice. This will in turn demonstrate to graduating optometrists the need to be familiar with automated phoropters prior to employment. It will also allow the schools and colleges of optometry to make proactive decisions on the need to integrate a more formal training on the use of automated phoropters into their curriculum

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CHAPTER 1

INTRODUCTION OF THE AUTOMATED PHOROPTER

The adoption of the automated phoropter is on the rise. Although some optometrists have embraced it as the future, others believe that the standard phoropter will not be readily replaced by the automated phoropter.[1,2]

According to Richard Mark Kirkner, the beginning of the automated phoropter technology advancement started around the year 2000 with the marketing of the automated phoropter sold by Marco.[1] Today, much competition has arisen in the marketing of the automated phoropter which is now being manufactured and sold by many prominent optical instrument companies including Marco, Zeiss, Reichert, Essilor, Topcon, Visionix, and more. These companies have made significant investments in instrument design and marketing of the automated phoropter and propose that these instruments are superior to the standard phoropter.

The automated phoropter offers many of the same features provided by the standard refraction system. This includes features necessary to perform a standard refraction, such as the ability to change power, cylinder, and axis.[3,4,] Marco and Topcon advertise that they also provide phoria and aniseikonia testing.[3,4] Some features available with the

standard phoropter system are provided by specific automated phoropter companies. Marco provides ease of switching cylinder, axis, and power during retinoscopy by utilization of an advanced dial a with sphere/cylinder/axis (S/C/A) mode key.[3] Marco advertises that it additionally provides divergence and convergence testing, near point convergence, near point of accommodation, positive and negative relative accommodation, worth 4 dot, and distance stereopsis.[3] Topcon offers additional features such as astigmatism, contrast, and a variety of optotypes for acuity testing.[4] Visionix advertises that it provides color blindness charts, glare testing, and is ideal for patients with hyper acuity, as well as low vision due to its ETDRS capabilities.[5]

Many automated phoropters sold by various companies offer similar features unique to the automated phoropter and are advertised as being superior to the standard phoropter. A common feature provided by many manufactures is a variety of programmable refraction options.[6,7] Marco specifically advertises that its programmable TRS-1500 automated phoropter makes it easier for doctors to delegate refractions to technicians by ensuring that the refraction steps are performed in the preferred order.[6] Another unique feature, common amongst automated phoropters, is the automated phoropter set up. By utilizing a control pad and screen located off the head piece, doctors are able to remain comfortably seated throughout the entire refraction; this set up is advertised to minimize repetitive stress injuries of the examiner's neck and soulders.[3] Many manufactures state that their instruments increase refraction speed and ease of patient data entry into the electronic health record form both the phoropter and pretest instruments.[3,5,7] This not only allows for testing time to be cut significantly, but also decreases data entry errors into the electronic health record.[3] The split prism feature provided by many companies, including

Marco and Topcon, allows for simultaneous viewing of both Jackson Cross images resulting in better patient experience and ease of performing refractions.[6,7]

While many features are common amongst multiple brands of automated phoropters, some features are unique. Visionix utilizes a tablet to control the phoropter instead of the more common control pad and LCD screen.[5] Visionix advertises that its tablet functionality allows for the updated technology benefits of the automated phoropter without requiring the doctor to relearn a new system.[5] Special features of the Marco TRS-1500 include quick and smooth transition between the patient's old and new Rx.[3] According to Dr. Ruser, a writer for the publications page of the Marco website, this feature eliminates the guess work in determining if an Rx change will be noticeable.[8] This allows providers to make better recommendations on glasses updates and leaves patients feeling better about their decision to purchase new eyewear.[8] Topcon offers near simulation with daily near and distance scenes, allowing the patient to check the final presentation.[4] Topcon also has a sales support function which offers clear image displays of different lens designs such as single vision, near range, and full range progressives.[4]

CHAPTER 2

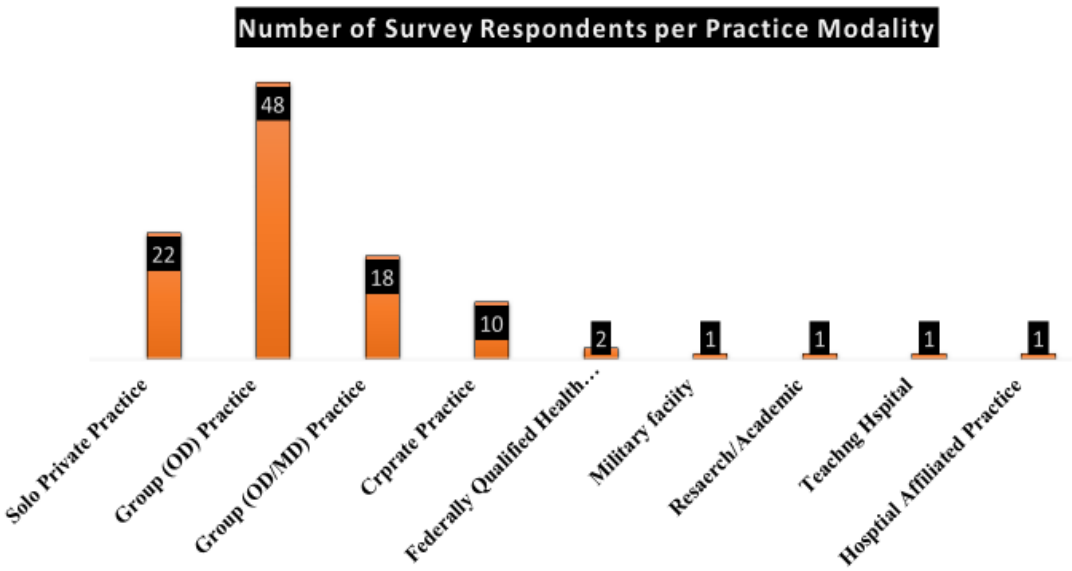
METHODS

To gain more information on the current utilization of automated phoropters by Michigan Optometrists, a survey was created via Google Forms and sent electronically to each member optometrist of the Michigan Optometric Association (MOA). The survey was reviewed by Ferris IRB prior to sending it out and was excluded because it did not deal with human subjects. The survey was targeted at discovering the current utilization of automated phoropters or future plans to incorporate this technology into practices. It also gathered information regarding optometrist's opinions on how well the automated system performs compared to expectations gathered from advertisements. This survey was designed to take between 5-10 minutes to complete if all the information was available to the survey respondent. All survey questions had multiple choice answer options except one fill-in-the-blank and one multiple choice/fill-in-the-blank combination. Many survey questions had "non-applicable" listed as a survey choice to be used by optometrists who did not have an answer/opinion. In order to keep information as accurate as possible all surveys submitted were used in data analysis and percentages calculated were averaged to the nearest thousands place.

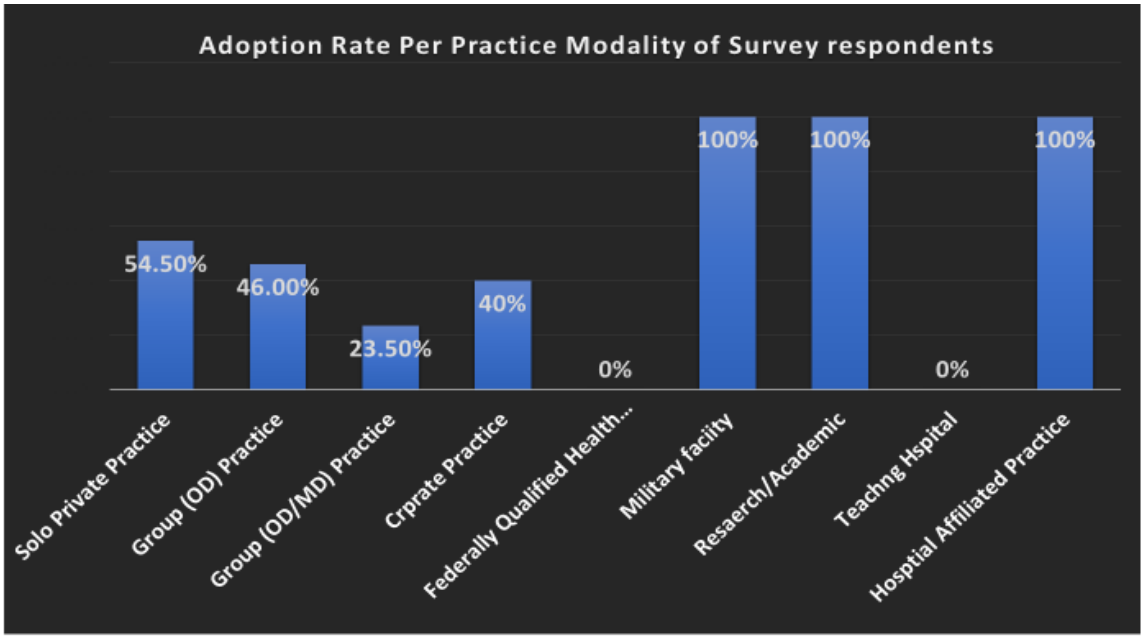
CHAPTER 3

RESULTS

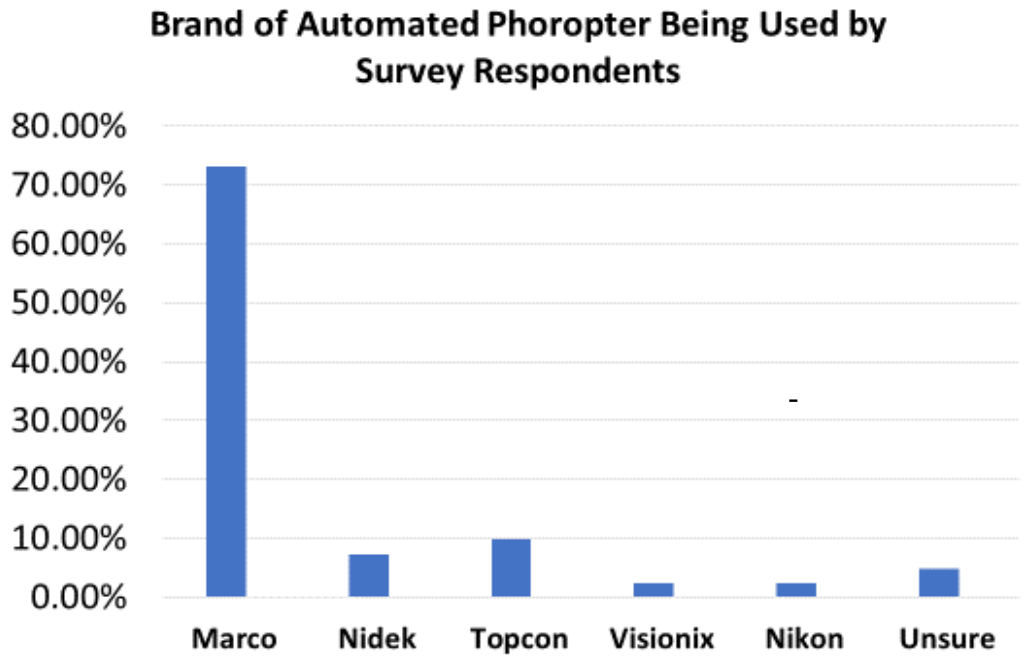
The survey was sent out to 1,102 members with a return of 100 completed surveys and 4 partially completed surveys, for a total of 9.4%. Though most of the questions regarding automated phoropter expectations and usage were answered by optometrists currently utilizing automated phoropters in their primary practice, a few optometrists who were not currently utilizing automated phoropters in their primary practice were still able to answer some of the additional questions. Survey respondents represented a large group of different optometric practice modalities including: group (OD) private practice being the most popular at 46.2%, solo practice at 21.2 %, (OD/MD) group practice at 17.3%, corporate practice at 9.6%, and each of the following at less than 2% (hospital affiliated practice, teaching hospital, veteran's administration, federally qualified health center, research/academic, and military facility).



For practice modalities representing greater than 2% of returned surveys, solo practice represented the highest adoption rate at 54.5%, group (OD) practice at 46.0%, cooperate practice at 40%, and (OD/MD) group practice at 23.5%.

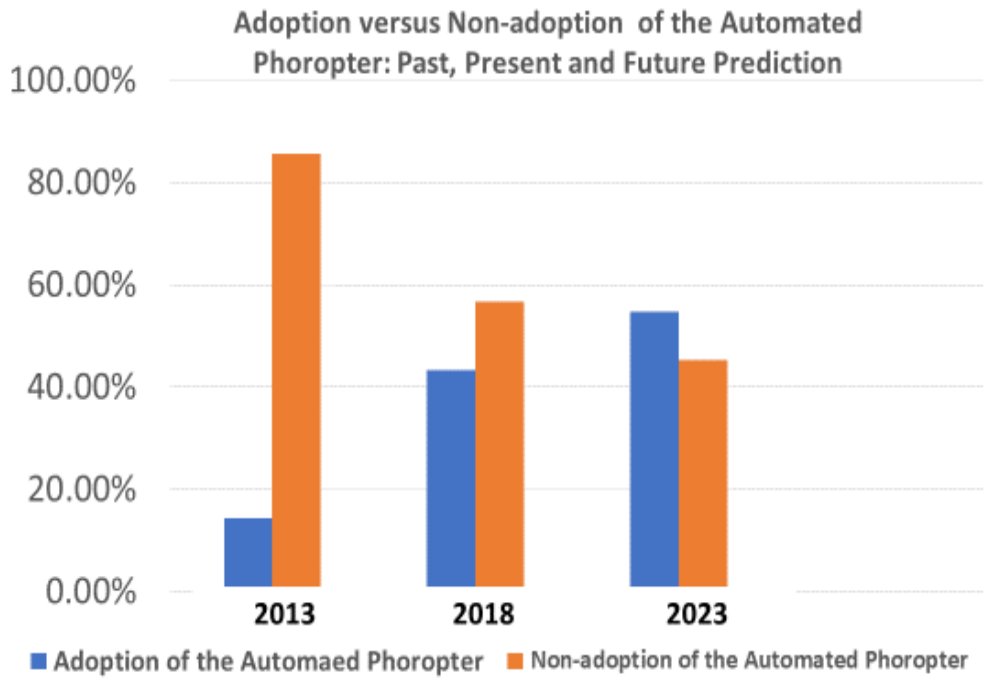


Survey results showed that most optometrists have not yet adopted the automated phoropter, though only by a slight majority, as 56.7% of optometrists stated that they are not currently utilizing automated phoropters and 43.3% stated that they were currently utilizing automated phoropters. The majority of optometrists currently utilizing automated phoropters have recently incorporated them into their practices. Results show that 66.7% of optometrists utilizing automated phoropters have incorporated them into their practice less than 5 years ago, 20% between 5-9 years ago, and 13.3% have been using them for 10 or more years. These statistics show a large increase in adoption of automated phoropters within the last 5 years. The majority of optometrists reporting utilization of the automated phoropter are using them for the majority of their refractions, though not all. Of Optometrists utilizing automated phoropters, 56.5% use them for 75-100% of refractions, 10.9% use them for 50-75% of refractions, 17.3% use them for 25-



regarding the accuracy of the automated phoropter in comparison to a manual phoropter, 57.1% believed the automated phoropter to be just as accurate as the manual phoropter, 25.4% believed the automated phoropter is more accurate, and 17.5% believed the automated phoropter is less accurate. Sixty-eight point two percent of optometrists with a knowledge of the efficiency of the automated phoropter state that automated phoropters are more efficient when compared to the manual phoropter, 19.7% state that they are just as efficient, while 12.1% state that they are less efficient. Of optometrists familiar with the physical stress level of the two systems when performing a refraction, 79.2% state that the automated phoropters provide much less physical stress on the doctor when compared to the manual phoropter, 11.1% were unsure of a difference in the physical stress level, and 9.7% state that the automated phoropter provides more physical stress to the doctor versus the manual phoropter. Seventy-eight point one percent of optometrists familiar with the difference between the automated and manual phoropters in regards to data entry into the electronic health record reported that that automated phoropter provides more ease of data entry when compared to the automated phoropter, 12.5% were unsure of any difference between the two systems, and 9.4% reported that the automated phoropter provided less ease of data entry into the electronic health record. Of the optometrist familiar with both the automated and manual phoropters, 56.4% do not believe that the automated phoropter makes it easier to delegate refractions to technicians, 41.9% are not sure if it does or not, 17.7% believe that the automated phoropter makes it easier for the doctor to delegate refractions to technicians. Over all, optometrists reported that they were satisfied with the automated phoropters as 61% reported satisfaction, 27.1% reported dissatisfaction, and 11.9% reported neither

satisfaction nor dissatisfaction with the automated phoropter. Of those currently not utilizing automated phoropters, 20.3% expressed plans to incorporate automated phoropters into their practice within the next 5 years.



CHAPTER 4

DISCUSSION

The survey results provide much useful information regarding the automated phoropter. The results indicate that 20.3% of optometrists have plans to incorporate the automated phoropter into their practice within the next five years. If these plans come to fruition, optometrists utilizing automated phoropters will soon be in the majority at 53.8%, over those not utilizing them. This information regarding the current and future predictions of automated phoropter utilization is important for optometry schools, as well as new graduates. Optometry schools have historically taught students how to perform a standard refraction using the manual phoropter; however, the survey results indicate that it would be beneficial for students to have a high level of formal training on the automated phoropter. This should be in addition to the current emphasis on the manual phoropter, as the manual phoropter is still commonly used. Even amongst optometrists who have chosen to adopt the automated phoropter, many are still using the standard phoropter for a percentage of their refractions. Survey results indicate that 43.5% of optometrists who have already adopted the automated phoropter still use the standard phoropter for a significant number of refractions. This suggests that it would be in the

best interest of future graduates to be proficient in the usage of both the automated and standard phoropter systems.

Currently the majority of optometrists would not expect a new hire to be proficient with how to use the automated phoropter system; however, 39.3% reported that they would expect that of a new hire. Most doctors have recently incorporated the automated phoropter into their practice, which is most likely the reasoning for not expecting a new hire to be familiar with the system. With passing time, the percentage of optometrists expecting a new hire to be familiar may increase. For new graduates in search of a job, it is beneficial that most practices currently reported that they would not expect a newly hired optometrist to be familiar with the system.

Most of the benefits advertised by automated phoropter manufactures were upheld by optometrists responding to survey questions regarding the topic; however, some advertised benefits were not. Seventy-nine point two percent of optometrists stated that the automated phoropter provides less physical stress on the doctor when performing a refraction, this is in confirmation to what many manufacturers advertise. Similar results were shown regarding other advertised benefits, ease of patient data entry into the electronic health record, and refraction efficiency. Seventy-eight point one percent of optometrists indicated an increased ease of data entry, and 68.2% indicated increased efficiency. Advertised benefits not upheld by the majority of optometrists included: increased accuracy and increased ease of delegating refractions to technicians. Only 25.4% of optometrists reported the automated phoropter to be more accurate than the manual phoropter and only 17.7% of optometrists agreed that the automated phoropter made it easier to delegate refractions to technicians. This statistic regarding refraction

delegation to technicians may not be very influential in the future of the automated phoropter amongst optometrists, as many optometrists prefer to perform the refraction themselves versus delegating it to a technician. Overall, optometrists were satisfied with the automated phoropter and the majority of optometrists agreed with most advertised benefits that were questioned on in the survey.

REFRENCES

1. Kirkner R. M. (2015, November 16). Refraction Revisited ECPs Talk About Their Experiences with the Latest Digital Technologies. Retrieved March 9, 2019, from. http://www.visionmonday.com/CMSDocuments/2015/11/coverstory_VM111615.pdf
2. Cole J. (2017, September 15).Your Phoropter on Steroids?. Review of Optometry. Retrieved March 9, 2019, from. https://www.reviewofoptometry.com/article/ro0917-your-phoropter-on-steroids
3. Marco. (n.d.). TRS-5100 digital refractor Brochure. Retrieved March 9, 2019, from. https://marco.com/media/1603/br-trs-5100-trs-5100-brochure.pdf
4. Topcon. (n.d.). CV-5000S Automated Vision Tester Brochure. Retrieved March 9, 2019, from. file:///C:/Users/LR/Downloads/CV-5000_Brochure.pdf
5. Visionix. (n.d.). Visionix VX55 Digital Refraction System. Retrieved March 9, 2019, from. https://visionixusa.com/ecp-products/refraction-instruments/digital-refractors/visionix-vx55-digital-refraction-system
6. Marco. (n.d.). TRS-5100 digital refractor. Retrieved March 9, 2019, from. https://marco.com/products/xfraction-process/trs-5100-digital-refractor/
7. Topcon. (n.d.). CV-5000S Automated Vision Tester. Retrieved March 9, 2019, from. http://www.topconmedical.com/products/cv5000s.htm

8. Rudser, A. (n.d.). The TRS-5100 Makes a Difference. Retrieved March 9, 2019, from. https://marco.com/media/2152/om_marco_rudser_fcr-final.pdf

APPENDIX A

SURVEY

Utilization of Automated Phoropters

Please select the most appropriate answer for the following questions.

1. Which of the following modalities best represents your primary practice location?

- solo private practice
- group (OD) private practice
- group (OD/MD) practice
- corporate practice
- veteran's administration
- federally qualified health center
- research/academic
- Other…

2. Does your primary practice utilize automated phoropters?

- yes
- no

3. Is your primary practice planning to incorporate automated phoropters into the practice and if so, when?

- yes, within 1 to 2 years
- yes, within 3 to 5 years
- no
- N/A

If your primary practice DOES utilize automated phoropters, please answer ALL remaining questions. If your primary practice does NOT utilize automated phoropters, please select N/A where applicable on ALL remaining questions.

4. How many years has the practice utilized automated phoropters?

- < 5 years
- 5-9 years
- >10 years
- N/A

5. What percentage of eye exams at your practice are performed using an automated phoropter vs a manual phoropter?

- <25%
- 25-50%
- 50-75%
- 75-100%
- N/A

6. How long did it take for the optometrist(s) to gain proficiency with the automated refactors?

- < 2 weeks
- 2-3 weeks
- 1-2 months
- 3-5 months
- 6+ months
- N/A

7. If you hired a new doctor for the practice, would you expect the doctor to be familiar with how to use an automated phoropter?

- yes
- no
- N/A

8. What brand(s) automated phoropter are you using?

- _____

Based on your experience, please select an answer for each of the following statements that most accurately represents your opinion of this technology.

9. Automated phoropters are _____ accurate in comparison to manual phoropters.

- much less
- slightly less
- just as
- much more
- slightly more
- N/A

10. Automated phoropters are _____ efficient in comparison to manual phoropters.

- much less
- slightly less
- just as
- much more
- slightly more

- N/A

11. When performing a refraction, automated phoropters provided less physical stress on the doctor when compared to manual phoropters.

- strongly disagree
- disagree
- not sure
- agree
- strongly agree
- N/A

12. An automated phoropter provides more ease of data entry into the patient's electronic health record vs a manual phoropter.

- strongly disagree
- disagree
- not sure
- agree
- strongly agree
- N/A

13. Automated phoropters make it easier to delegate refractions to technicians.

- strongly disagree
- disagree
- not sure
- agree
- strongly agree

- N/A

14. How satisfied are you with automated phoropters?

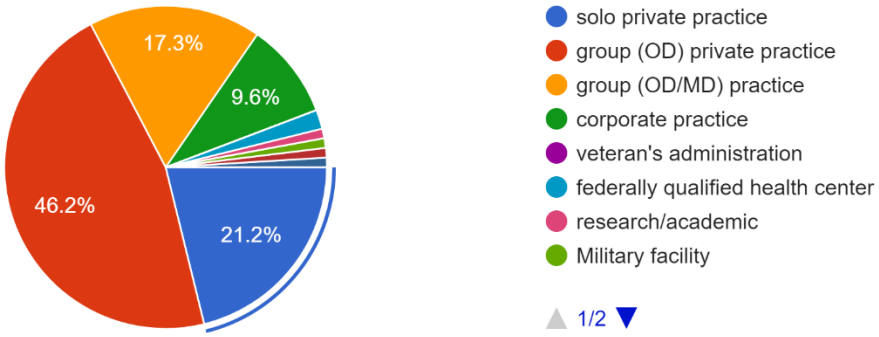
- completely dissatisfied
- somewhat dissatisfied
- neither satisfied nor dissatisfied
- somewhat satisfied
- completely satisfied
- N/A

APPENDIX B

RAW SURVEY REDULTS

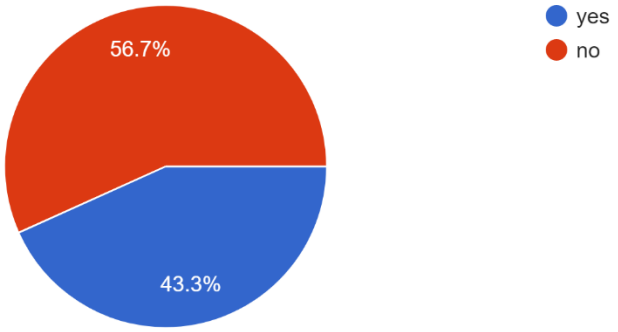
Which of the following modalities best represents your primary practice location?

104 responses



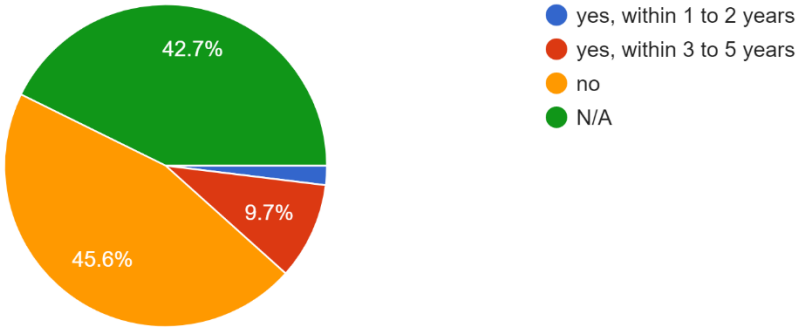
Does your primary practice utilize automated phoropters?

104 responses



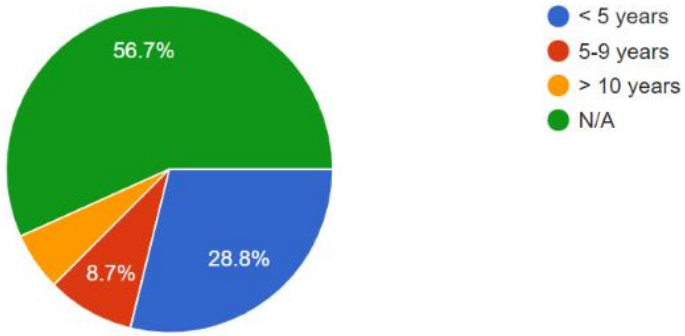
Is your primary practice planning to incorporate automated phoropters into the practice and if so, when?

103 responses



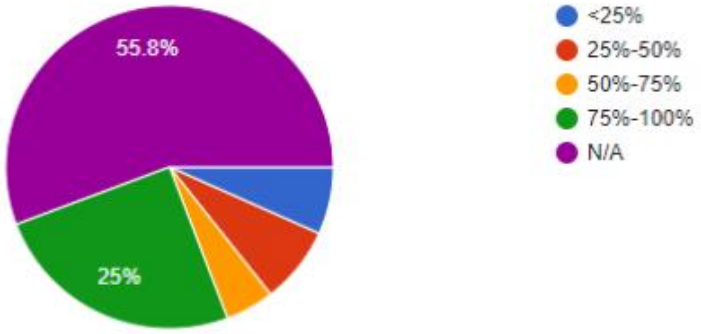
How many years has the practice utilized automated phoropters?

104 responses



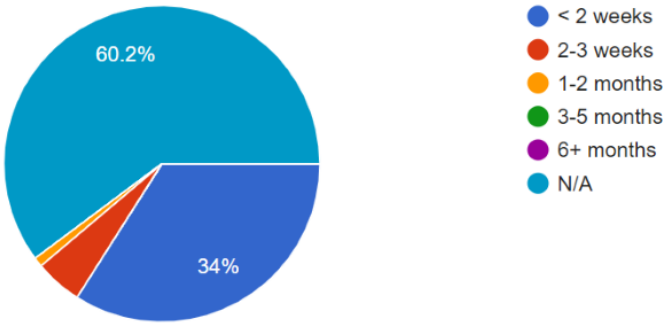
What percentage of eye exams at your practice are performed using an automated phoropter vs a manual phoropter?

104 responses



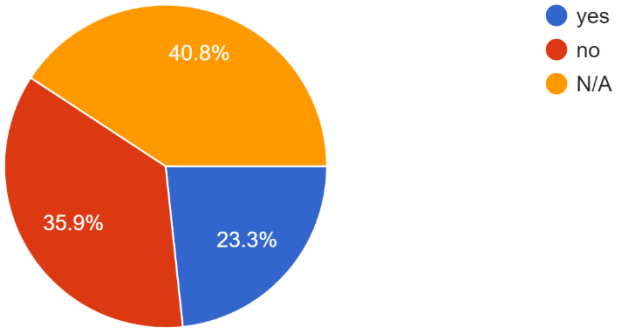
How long did it take for the optometrist(s) to gain proficiency with the automated refactors?

103 responses



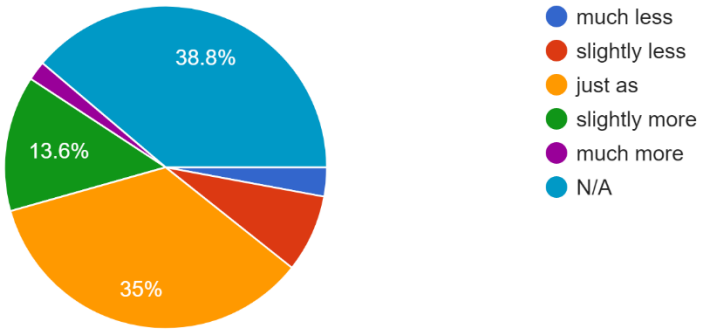
If you hired a new doctor for the practice, would you expect the doctor to be familiar with how to use an automated phoropter?

103 responses



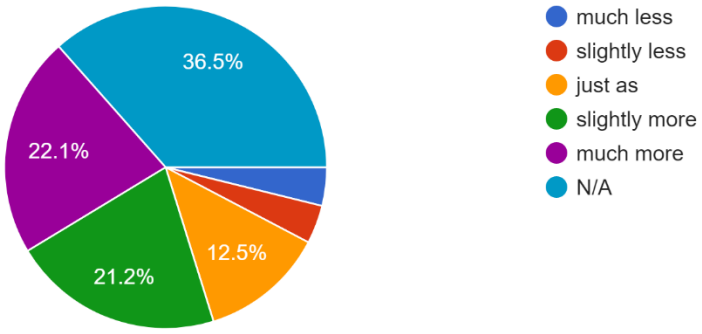
Automated phoropters are _____ accurate in comparison to manual phoropters.

103 responses



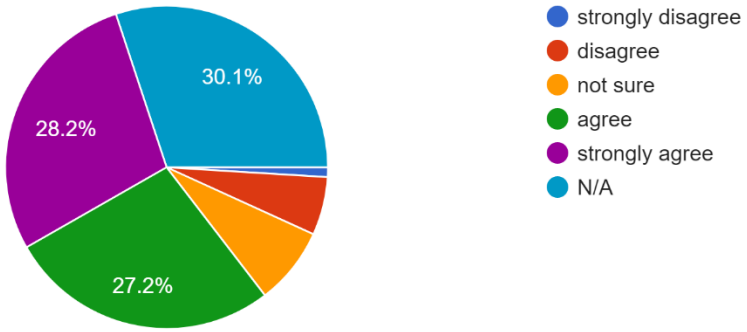
Automated phoropters are _____ efficient in comparison to manual phoropters.

104 responses



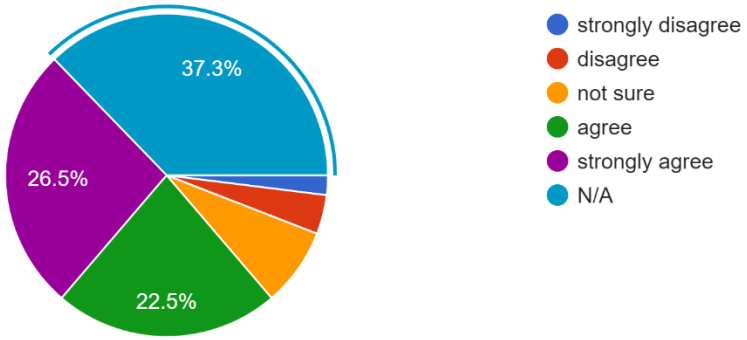
When performing a refraction, automated phoropters provided less physical stress on the doctor when compared to manual phoropters.

103 responses



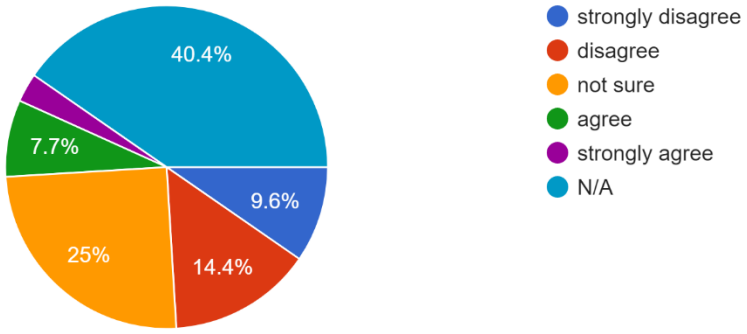
An automated phoropter provides more ease of data entry into the patient's electronic health record vs a m l phoropter.

102 responses



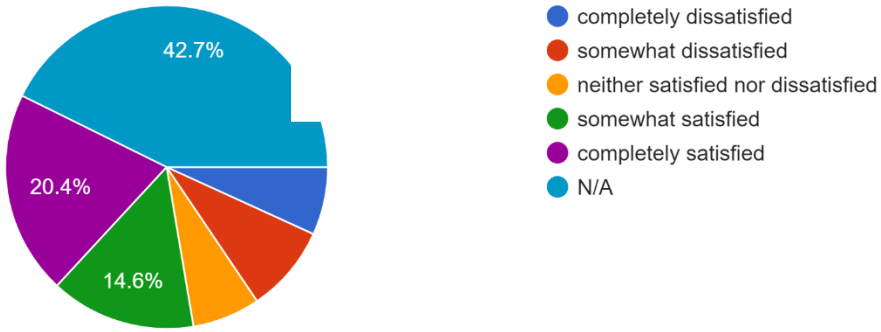
Automated phoropers make it easier to delegate refractions to technicians.

104 responses



How satisfied are you with automated phoropters?

103 responses



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Katie Ratliffe

Doctoral Candidate

4-24-2019

Date