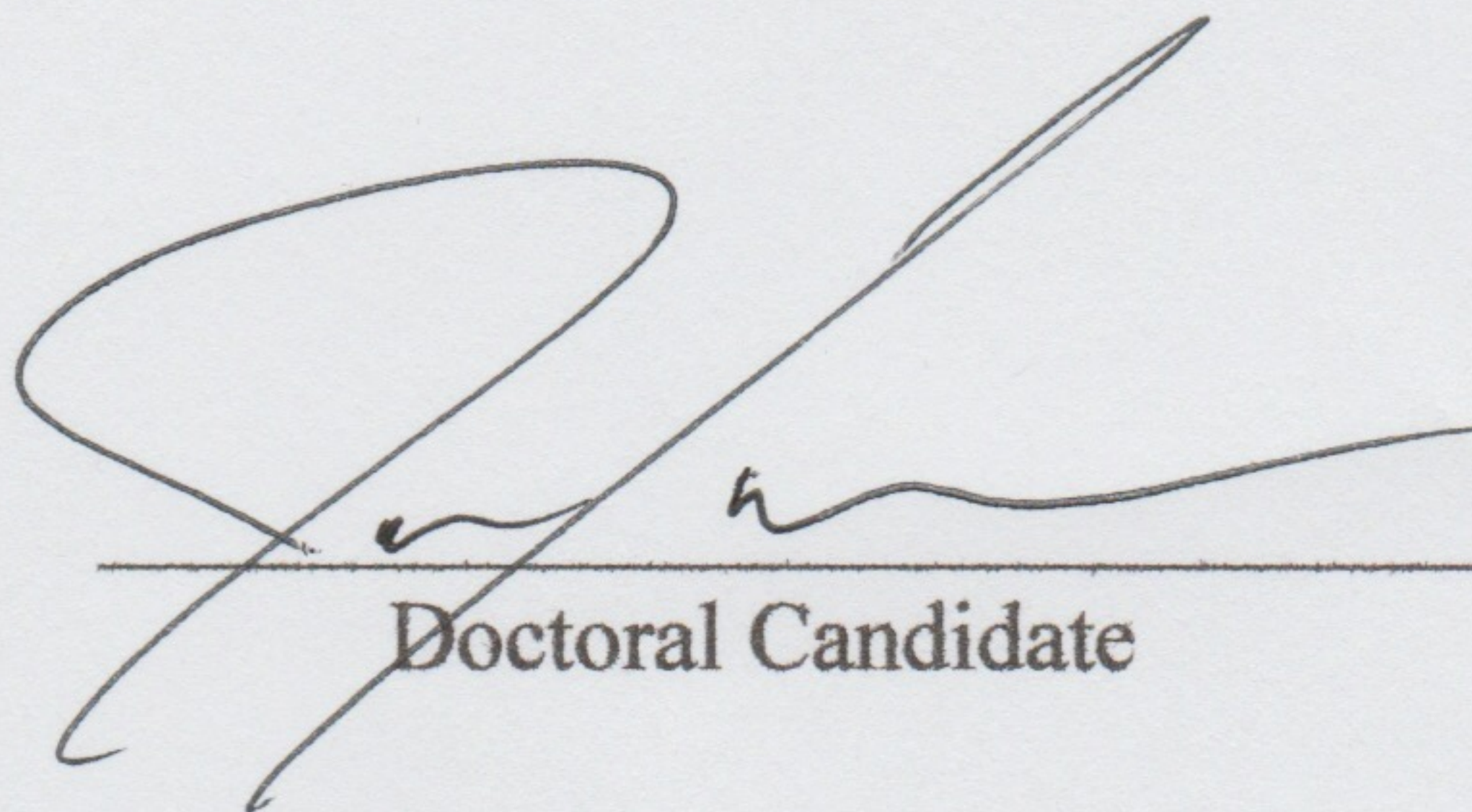Ferris State University
Doctor of Optometry Senior Paper
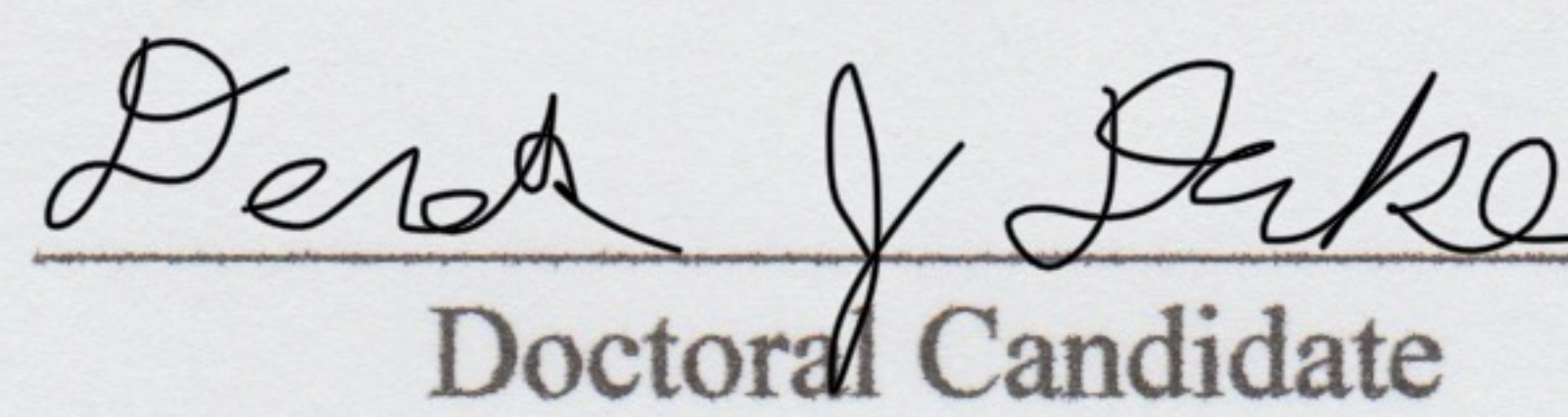Library Approval and Release

COMPUTER BASED EHR SYSTEMS

We, Jonathan Connors and Derek Dake, hereby release this Paper as described above to Ferris State University with the understanding that it will be accessible to the general public. This release is required under the provisions of the Federal Privacy Act.

_____
Doctoral Candidate

_____4/17/18_____
Date

_____
Doctoral Candidate

_____4/17/18_____
Date

COMPUTER BASED EHR SYSTEMS

By

Jonathan Connors

And

Derek James Dake

This paper is submitted in partial fulfillment of the

requirements of the degree of

Doctor of Optometry

Ferris State University

Michigan College of Optometry

May, 2018

COMPUTER BASED EHR SYSTEMS

By

Jonathan Connors

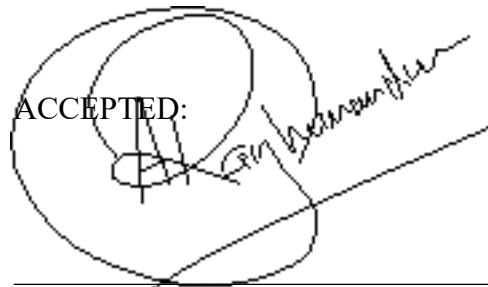And

Derek James Dake

Has been approved

April 2, 2018

APPROVED:

David G. Dundee, O.D.

____   _____
Faculty Advisor:

ACCEPTED:

_____
Faculty Course Supervisor

Ferris State University
Doctor of Optometry Senior Paper
Library Approval and Release

COMPUTER BASED EHR SYSTEMS

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Doctoral Candidate

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Date

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Doctoral Candidate

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Date

ABSTRACT

Background : Since the implementation of the HITECH act, Electronic Health Records are becoming more and more commonplace. There are two main types of EHR systems which include an older, server-based system, with information stored on a physical server stored in the office, and a cloud-based system where the information is stored by the EHR company. *Methods :* A ten question survey was sent out to the Michigan Optometric Association email listing. The first five questions had to do with the population of optometrists taking the survey. The next five questions were focused on their satisfaction with EHR systems, what they value in a system, and whether they value the features that are common in either cloud-based systems. *Results :* There were 135 Michigan optometrists who took the survey. The survey showed the most important factor in choosing an EHR system is ease and efficiency. Those using a cloud-based system have a better attitude toward cloud-based gathering than those who use a server-based system. Most optometrists believe that EHR systems should be connected to their medical health records. The two most important fears for the optometrists taking this survey are having a system malfunction and having a security breach. *Conclusions :* Overall, cloud-based EHR users seem to have favorable opinions of many features of their systems. The cloud-based EHR companies must understand that some of the most important factors when making an EHR system would be to make the system secure, efficient, and reliable. The optometric community seems united that medical health records should be included in EHR systems so that optometrists may be able to see their other diagnoses.

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CHAPTER 1

INTRODUCTION

There is no denying the fact that in the world we occupy, technology is king. Technology is integrated in almost every aspect of our lives. It leads our entertainment, allows us to maintain our personal information, connects us, and allows us to perform our duties with efficiency and increased ease. This is not something that is just an integrated part of a few countries like the United States either, all countries, developed and developing, rely on technology to perform tasks essential to life as we know it.

With all the technology we use, it is a bit confusing that many medical professionals, across all modes of discipline, were still relying on the use of paper records to document, diagnose, prescribe, and communicate with other health care professionals. This would occur whether they were communicating within their discipline or not. This way of doing things came to an end in 2009 when the American Recovery and Reinvestment Act (ARRA), also known as "the stimulus package" was signed into law. The reasoning behind the ARRA was to bring America's infrastructure into the modern era. One of the act's systems to help with this goal was the Health Information Technology for Economic and Clinical Health (HITECH) Act (CDC.gov).

At the core of the HITECH Act was the concept of Meaningful Use. The core objectives of Meaningful Use were to bring about improvements in patient health outcomes, reduce the high cost of patient care, and an overall increase in the satisfaction of healthcare for patients and professionals and staff alike (Chin et al.) According to

HealthIT.gov, Meaningful Use is initiated with the use of an Electronic Health Record, also known as an EHR. They state that in order to properly use an EHR to implement Meaningful Use, the EHR must provide the following,

- Improve quality, safety, efficiency, and reduce health disparities

- Engage patients and family

- Improve care coordination, and population and public health

- Maintain privacy and security of patient health information

To better understand how to properly use an EHR system as it is written out in the ARRA, you must have a better understanding of basic parts of an EHR system. EHR systems have been shown to satisfy all of the requirements and then some. Menachemi et al gave evidence in their paper entitled Benefits and drawbacks of electronic health record systems. In this work, the authors stated that there are three main functionalities of EHR systems that show promise in making healthcare more efficient and to provide the best care for patients. They refer to these functionalities as clinical decision support (CDS) tools, computerized physical order entry (CPOE) systems and health information exchange (HIE).

A CDS system is one that allows better clinical decision making with regard to patient care. It gives the practitioner feedback on drug interactions and possible patient allergies. The CPOE allows clinicians to prescribe medications and order tests. Doing so by computer greatly reduces the risk of errors made by poor handwriting. This not only provides a greater safety to the patient, but it also has the potential to reduce costs due to tests being done improperly or when not needed due to misinterpretation of directions. In a study conducted by Bates et al., It was found that serious errors made in the prescribing

of medication could be reduced by 55% with the CPOE system alone. When combined with a CDS system however, this percentage climbs to an impressive 83% (Bates et al). It is truly astonishing that prior to the use of EHR systems, 83% of serious medication mishaps could have been prevented. The HIE is aptly named as it allows health care providers to share data with each other. Paper mail and fax machines, although still used, will be sidelined due to the ability to instantaneously share data provided by the HIE function.

All these functions improve patient care, increase efficiency, and save money. The experience for the patient is improved because they are able to receive quality care quickly. They are more rigorously protected as the EHR system is able to deduce possible drug complications and then properly order the patient's medication. There will be no question as to what medications the patient needs by the pharmacist, no translating sloppy penmanship. The patient will better receive the medication that was intended. Costly tests will not have to be repeated because past tests cannot be received or not received in time. This will ease the burden on the patient, as they will not have to sit through any more testing than what is required. Increased efficiency and information leads to a better, more productive care for patients and leads to increased revenue for the practitioners that employ them.

This new technology does not come without risk however. In research done by Jamshed et al, they describe four areas that could prove problematic for EHR systems. The areas that they concentrated on were privacy and confidentiality, security breaches, system implementation, and data inaccuracies.

With all this data available, there must be a way to protect it. Staff not involved with a patient's care should not have access to data. As such, there are systems in place to restrict the availability of this data. Usernames and passwords determine which personnel have access to information. Encryption devices that use random generated "keys," shield sensitive information when it is transmitted digitally. These systems don't always work however, and breaches do occur. There must be a protocol to alert patients when their privacy has been breached so that necessary steps can be taken in a timely manner.

The researchers also showed that these systems meant real change for many providers. The cost and disruption that comes with this technology is not something to be overlooked. Initial startup costs can be in the thousands of dollars. This does not consider the time and cost for training staff. And with all new things, there will always be unexpected adversities down the road. There is much evidence that this increased cost upfront will create great benefit in the years to come. However, even the real efficiency of this platform could create inherent problems when it comes to data collection. The authors feared that the mere ease of inputting data into these systems could lead to incorrect data entry or essential tests and procedures being forgotten or ignored.

When it comes to the latest EHR systems, consumers have a couple options in the route they want to take. Today's systems operate in two different ways. The older of the two is server-based, also known as client-based systems and the newer system is cloud-based, where everything is stored on the web. These systems house data on servers that are stored at the practice itself. These systems require extra space and technicians to maintain them. These two things require extra resources. If a system goes down, and the technicians are not onsite, time is lost as they travel to your location. However, even with

server-based systems, many problems can be solved via remote access. Server-based systems also add 100% control to the practice owners. With cloud-based systems, a lot of faith is put into the company that created the software. You must rely that they will provide essential updates to protect the data of your patients. However, there is no need for extra space. Most sources say that despite the high cost of start-up, money is usually saved in the long run. This type of system also allows the doctors and staff to concentrate more on the practice as another company is taking care of all the needs of the EHR.

The age of the EHR is pushing us more into the modern era when it comes to healthcare and those that receive it. Both the pros and cons are evident. It is not a question of if we are going to choose this technology because it is already here to stay. The question this research aims to answer is what do the practitioners want in their EHR and are they getting what they put in when they trade high cost for improved patient care and efficiency.

CHAPTER 2

METHODS

The goal of the experiment was to find out optometrist's opinions on their own health record systems and the features of many current cloud-based EHR systems. The link to the ten-question survey was sent out to Michigan optometrists using the Michigan Optometric Association email database. The survey was hosted on Survey Monkey, and the results were analyzed using the same site. The survey gave the option to skip a question or to continue with the survey. Information was collected anonymously for the survey.

The survey consisted of ten questions, five of the questions identified the characteristics of the population that took the survey including experience, number of doctors at the practice, practice location, their role in the practice, and their type of health records currently being used in the office. The next few questions examined their attitudes with their current EHR, their ability to use their own EHR, and their attitudes towards features currently used by cloud-based EHR systems. Two more questions asked in the survey were to rank the factors important to them when buying an EHR system, and to rank their biggest fears when using an EHR system. A copy of this survey is found in Appendix B. The results were then analyzed.

The survey was available to the optometrists for two weeks on the Survey Monkey website, and then the link was taken down after the two weeks were up. The Survey Monkey website also helped with data analysis by using the filter feature.

CHAPTER 3

RESULTS

The two-week survey aiming to determine optometrist's attitudes on electronic

health record systems, including cloud-based systems, had 135 optometrists take the

survey. Of the 135 optometrists, 73 of them use a server-based EHR, 41 use a cloud-

based EHR, and 20 use a paper based electronic health system.

The optometrists taking the survey came from a diverse practice background. The

information on the amount of eyecare professionals in the practice, the experience of the

doctors, and the practice location are found in the tables below.

Table 1 – Population Characteristics of Optometrists Taking EHR Survey

Number of ODs/OMDs at Practice	Server-Based (n=73)	Cloud-Based (n=41)
1	6.85%	26.83%
2	28.77%	29.27%
3	15.07%	14.63%
4+	49.32%	29.27%
OD Years of Experience	Server-Based (n=72)	Cloud-Based (n=41)
Less than 5 years	19.44%	24.39%
5-10 years	19.44%	12.20%
10-20 years	16.67%	2.44%
20-30 years	16.67%	36.59%
30+ years	27.78%	24.39%
Practice Location	Server-Based (n=73)	Cloud-Based (n=41)
Urban	12.33%	17.07%
Suburban	45.21%	41.46%
Rural	42.47%	41.46%

The most important factor when deciding the EHR system for the population of optometrists was Ease and Efficiency, including data entry. The least important factor when deciding on an EHR system was the interoperability with other EHR systems. The weighted score dependent on the ranking is found below. This weighted score is an average of the importance given to each data set. The highest possible score in this ranking would be six, and the lowest possible score would be one.

Table 2 – Factors when Choosing an EHR System

Factor	Server-Based (n=71)	Cloud-Based (n=39)
Ease and Efficiency, including data entry	5.21	5.00
Security	3.83	3.85
Customization	3.55	3.55
Integration with instrumentation	3.46	3.55
Cost	3.16	2.97
Interoperability with other EHRs	1.97	2.21
	6 = Most Important 1 = Least Important	

This set of data simply means that the most important factor when deciding on their new EHR system is the ease and efficiency of using the system, which includes data entry. The least important factor by a wide margin was the interoperability with other EHR systems. This was found to be true with both server based EHR users and cloud based EHR users.

In a similar style, participants were asked to rank their most frightening problem that they survey takers could incur when using an EHR system. The results ranked from most frightening to least frightening are below. The highest possible score weighted score in this set of data would be 5, and the lowest possible weighted score would be 1.

Table 3 – Fears when Using an EHR System

Problem	Server-Based (n=71)	Cloud-Based (n=41)
Security breach	3.72	3.32
System malfunction	3.45	3.83
Data entry distracts from quality patient care	3.03	3.00
High cost of implementation	2.80	2.58
Learning a new EHR system	2.10	2.24
	5 = Most Frightening 1 = Least Frightening	

The two most important factors for the optometrists taking this survey are having a system malfunction and having a security breach. Compared with the other problems, learning a new EHR system was the least worrisome problem. In the population using cloud-based EHR systems, a system malfunction had a rating of 3.83 and a security breach had a rating of 3.32. The same ratings for the population using server-based systems were 3.45 and 3.72 respectively.

Another set of data that was analyzed was the optometrist's opinions on EHR systems and the security of cloud-based EHR data gathering. The survey taker was asked to grade each on a scale of 1 (very unfavorable) to 5 (very favorable).

Table 4 – Attitudes Towards EHR Systems and Cloud-Based Data Gathering

Attitude Toward Feature	Server-Based	Cloud-Based
EHR Systems	3.40	3.63
Security of Cloud-Based Gathering	3.41	3.83
	5 = very favorable 1 = very unfavorable	

The optometrists using a server-based system had a slightly lower rating of both EHR systems and the security of cloud-based gathering than those using a cloud-based system.

The optometrists were also asked to scale how they much they agreed with the below statements from 1 (strongly disagree) to 5 (strongly agree). The results are found below.

Table 5 – Optometrist Values of EHR Systems

Statement	Server Based	Cloud Based
EHR Systems help achieve Quality Payment Programs	3.41	3.76
Cost would turn you away from a well-rounded EHR	3.11	3.10
Optometry EHR should be linked with a patient's general health records	4.04	4.02
It would be helpful to access patient records at home	3.67	4.15
One common EHR across all disciplines of medicine	3.36	3.51
The practice should be responsible for stolen data during a breach	2.41	2.34
EHR systems greatly increase efficiency, no matter what system they are using	2.29	2.63
EHR systems greatly increase patient quality of care	2.47	2.73
Cost of EHR is offset by money that is saved during operation	2.20	2.38
	5 = strongly agree 1 = strongly disagree	

Some of the main results from these ratings would be that optometrists believe that their EHR system should be linked to the patient's general health records. The optometrists also seem that they would like to access their records at home. With the results of the survey, they believe cost can be in issue because the cost of the implementation of the EHR is not offset by the money it saves

CHAPTER 4

DISCUSSION

There are many reasons that an optometrist may use a cloud-based EHR. They may include to increase their efficiency in practice, to be able to access their patient records at home, and to have less reliability on a server. This study tried to define what optometrists valued in an EHR system and what they thought of some of the features in many EHR systems, especially cloud-based systems.

The most crucial factor for optometrists when using an EHR system is the ease and efficiency of data entry, by a large margin. This makes sense because optometrists want to worry about patient care over trying to make their charting perfect. This was found to be in both the population with a cloud-based EHR system and a server-based system.

The optometrists also are most worried about a data breach and a system malfunction when it comes to an EHR system. The data breach is worrisome to them likely due to the fact it will violate HIPPA, and that the practice needs to pay a penalty in case of a data breach. Our survey found that most optometrists believe that the optometry practice owning the EHR should not have to pay for the stolen data breach.

The most important thing that can be taken away from this survey is that optometrists would like to have their EHR system integrated with their medical EHR system. This is likely for two reasons. It eases entry into the system while taking a history, and, more importantly, to be able to see some of the patient's underlying conditions. An underlying condition found on an EHR could mean the difference

between a correct and incorrect diagnosis of an eye condition. While taking a history with a patient, the patient may not know the name of a certain diagnosis, so the chart may be inaccurate or incomplete. The patient may also not feel that a certain diagnosis has anything to do with the eyes, which is not always the case.

Another interesting finding in this study was that people using cloud-based systems trust the security of cloud-based gathering more than those who use other types of data gathering services. This may be because people who use the cloud-based system are impressed by the security of their system. It may also be that the people that are now using cloud-based EHR systems always trusted cloud-based data gathering and storing which caused them to buy the cloud-based system in the first place. This study found that people using a cloud-based system are less worried about a security breach than those using other types of health records. This could likely be due to the same factors as stated above. It is impossible to tell from the data in this survey, but the reason for the cloud-based users thinking like this could be studied in the future.

Overall, cloud-based EHR users seem to have favorable opinions of many features of their systems. The cloud-based EHR companies must understand that some of the most important factors when making an EHR system would be to make the system secure, efficient, and reliable. The optometric community seems united on the fact that a good feature for cloud-based systems is to be able to include patient's medical records from other facilities. This may be difficult to accomplish, but it seems to be something that the cloud-based EHR systems can work towards.

With the advent of the modern EHR, many companies were created to keep up with the increasing demand for digital record keeping. Many systems are out there,

giving the user powerful advantages in the proper management of patients and their ailments. The abilities of these modern systems are similar to one another. Many provide vital tools essential to efficiency in the practice. Prices range from a few hundred dollars a month with no start-up fees to fees of almost $6,000 plus monthly fees after. The prices differ broadly and offer customizable packages made for their practice setting. A quick look into the statistics of many of the top companies offering EHR systems can allow practitioners to refine their searches quickly. In this research, the hope is to answer the following questions. What are medical care practitioners looking for in these systems? Does it adhere to the principals created by the ARRA? Is it worth the extra cost of these systems?

This section begins with a look and the prices and features of some of the top EHR systems available at this time as provided by the companies themselves from their respective websites. Many have similar features as one might expect due to the nature of complying with the HITEC act. This does not mean that all are the same.

Revolution EHR (revolutionehr.com) is one of the larger EHR system creators out there. The company's website claims 20,000 users log on daily. The company charges a one-time setup fee of $5,988. After this fee, service is kept with monthly installments that depend on how many clinicians will be using the system. Revolution charges $385 per month for the first doctor, $275 for the second, $165 for the third and $110 per additional doctor. Revolution determines price based on full-time equivalent staff members. Prices for staff that are not full-time are adjusted as such. With this price tag, Revolution offers cloud-based EHR systems combined with software for the management of the practice, full support and all necessary updates.

Liquid ERH (liquidehr.com) is another system available to consumers. Unlike Revolution, Liquid does not charge a start-up fee. They also offer both cloud-based and in-office servers for EHR systems. The prices differ based on which system the consumer decides in. In-office servers will cost $199 per month while cloud-based will cost $299 per month according to the companies website liquidehr.com. This price includes unlimited workstations at a particular location. Like Revolution, Liquid is both an EHR and practice management system that offers full tech support.

Compulink, according to their website, compulinkadvantage.com, is also a cloud or in-office based system that combines EHR and practice management solutions similar to both Revolution and liquid. Prices for Compulink start at $149 per month per user. This price is subject to change as the system is tailor fit to the practice to which it will serve.

Other companies adopting the dual system approach are IO Practiceware (eyecareleaders.com) and OD Online (odonline.net). They are both cloud-based or in-office and contain both EHR systems and practice management software. According to IO Practiceware's website, the system is heavily influenced by Ophthalmology but is used by both Optometrists and Ophthalmologists. The website claims 7,500 members including both OD's and OMD's. The company's website does state that there are no start-up costs, there is no pricing provided on the website.

OD Online also charges based on the system you want to incorporate. The company charges $7,000 for integration of their in-office serves with no monthly fees. Cloud-based fees depend on the number of locations the software will be serving. For a single location, cloud servers are $1,200 initially with a monthly cost of $300 for

unlimited users at that location. For one to three locations, prices jump to $1,800

initially and a monthly fee of $550. Each additional location is $200 per month

Other companies take a different approach to their pricing. OD Link (odlink.com),

another system offering both cloud-based and in-office setups, determines their pricing

on how well the practice does. Prices are based on gross income and whether you use

cloud or in-office based packages. Initial setup fees are based on whether you are a new

cold start practice or an established one. New practices will pay $495 per computer for

initial setup while established practices will pay $995 per computer. No doubt

encouraging new practices to consider them when deciding on a system to implement.

OD Link's prices get a little more diverse from there. Below is a table (Table 6) with the

pricing based on gross income a company will pay to use services provided by OD Link.

Table 6 - Monthly charges per user for services provides provided by the EHR system OD Link. Prices for setup fees and monthly pricing from ODLink.com

	Pricing ($/month)	
Gross Income	Cloud-based	In-office
< 200k	155	125
200k-500k	185	150
500k-900k	215	175
900k-1.3M	245	200
1.3M -2.0M	275	225
> 2.0M	305	250

One company decided they would cater to tablets. This company is called Eye Pegasus (eyepegasus.com). Eye Pegasus is different in that their EHR system was built on the Apple iPad. The company's website states that the system will work on desktop computers, but it was built for tablets. Companies like this are important because of the advantages that tablets could create if made in a manner that is easy to navigate. Prices were not provided on the company's website, but they show they understand the importance of how a modern health care center will operate. Patients are able to check in, provide demographics and watch demos on tablets, provided by the software Eye Pegasus provides.

Other systems available to practitioners are systems that track progress and document weak areas in compliance of HIPAA (Health Insurance Portability and Accountability Act) protocol. These systems make sure that training is up to date, provide training, assign security officers, and create risk assessments for areas where HIPAA compliance is lacking. These systems help make sure that your practice is in compliance with HIPAA in all matters. This helps protect patient information, makes compliance easier for practitioners, and helps avoid costly fees incurred by non-compliance. One such company is Accountable (accountablehq.com). This system contains no EHR or practice management options. Its sole purpose is to make sure your practice is in complete compliance with the laws set by HIPAA. The company has a free version of their system, although, as one might expect, it does not contain all the important features included in the pay versions. These packages begin at $99 per month. Other packages are $249 and $449 per month. Pricing depends on how many security officers are needed and how many business associate agreements the practice needs. This system reminds employees of required training and tracks their progress. It will give warnings for areas in need of work. Applications like this may prove very useful in making the transitions required by the HITEC Act.

This is just a small sample of the available software packages available to health care practitioners. Many of these systems are customizable to fit the particular need of the person using it. A system that includes both EHR and practice management software allows doctors and staff to store patient demographics, exam data, e-prescribe functions, referral systems, etc. Practice management software aids in optical sales, ordering, scheduling and recall systems among many others. Most of the products available to

consumers provide these functions. All systems listed in this work are ONC-ACB certified, meaning that they all fulfill the requirements set forth by the U.S. Department of Health and Human Services. There is no single best EHR system. It depends on the needs and wants of the consumer.

REFERENCES

1. Centers for Disease Control and Prevention. (2017). *Meaningful Use*. [online] Available at: 1. https://www.cdc.gov/ehrmeaningfuluse/introduction.html [Accessed 22 Dec. 2017].

2. Chin, B. and Sakuda, C. (2012). Transforming and Improving Health Care through Meaningful Use of Health Information Technology. *Hawaii Journal of Medicine and Public Health*, [online] 71(4), pp.50-55. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3347738/ [Accessed 27 Dec. 2017].

3. Jamshed, N., Ozair, F., Sharma, A. and Aggarwal, P. (2015). Ethical issues in electronic health records: A general overview. *Perspectives in Clinical Research*, [online] 6(2), p.73. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4394583/ [Accessed 28 Dec. 2017].

4. Healthit.gov. (2018). *Meaningful Use Definition and Meaningful Use Objectives of EHRs | Providers & Professionals | HealthIT.gov*. [online] Available at: https://www.healthit.gov/providers-professionals/meaningful-use-definition-objectives [Accessed 4 Feb. 2018].

5. Menachemi, N. and Collum (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy*, [online] 4, pp.47-55. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3270933/ [Accessed 29 Dec. 2017].

6. Bates, D. (1998). Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors. *JAMA*, [online] 280(15), p.1311. Available at: https://www.ncbi.nlm.nih.gov/pubmed/9794308 [Accessed 28 Dec. 2017].

APPENDIX A

IRB APPROVAL LETTER

FERRIS STATE UNIVERSITY

Institutional Review Board for Human Subjects in Research

Office of Research & Sponsored Programs, 1010 Campus Drive, FLITE 410D · Big Rapids, MI 49307
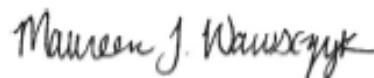
Date: January 23, 2018

To: Dr. David Durkee, Mr. Jonathon Connors and Mr. Derek Dake
From: Maureen Wawsczyk, Research Integrity & Compliance Officer
Re: IRB Application, *Cloud Based EHR Systems in Optometry*

The Ferris State University Institutional Review Board (IRB) has reviewed your application for using human subjects in the study, *"Cloud Based EHR Systems in Optometry"* and determined that it does not meet the Federal Definition of research on human subjects, as defined by the Department of Health and Human Services or the Food and Drug Administration. This project does not meet the federal definition of research on human subjects because the unit of analysis is not human subjects, but the Electronic Health System. As such, approval by the Ferris IRB is not required for the proposed project.

This determination applies only to the activities described in the submission; it does not apply should changes be made. If changes are made and there are questions about whether these activities are research involving human subjects, submit a new request to the IRB for determination. This letter only applies to Ferris IRB Review; it is your responsibility to ensure all necessary institutional permissions are obtained and policies are met prior to beginning the project, such as documentation of institutional or department support. Note that quality improvement project findings may be published, but any findings presented or published should be clearly identified as part of a quality improvement initiative and not as research.

Your project will remain on file with the Ferris IRB for purposes of tracking research efforts at Ferris. Should you have any questions regarding the determination of this letter, please contact the IRB.

Regards,

Maureen J. Wawsczyk

Ferris State University Institutional Review Board
Office of Research and Sponsored Programs

APPENDIX B

SURVEY INSTRUMENT
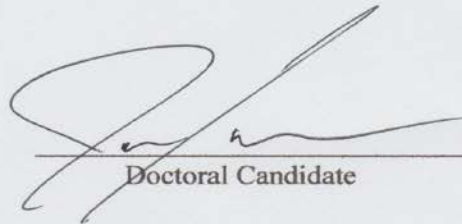
1. How many ODs/OMDs are currently at your practice?
    a. 1
    b. 2
    c. 3
    d. 4+
2. How many years have you been a licensed OD?
    a. Less than 5 years
    b. 5-10 years
    c. 10-20 years
    d. 20-30 years
    e. 30+ years
3. How would you describe your practice location?
    a. Urban
    b. Suburban
    c. Rural
4. Role in your current practice
    a. Patient Care only
    b. Business side only
    c. Both business and patient care
5. What kind of health records do you currently have in your office?
    a. Paper
    b. Server based EHR
    c. Cloud-based EHR
6. On a scale of 1 (very unfavorable) to 5 (very favorable), how would you describe your attitude toward these features.
    a. EHR Systems in general
    b. The security of cloud based EHR gathering
    c. Your competency using computers and tablets
    d. Your competency using your current EHR system
7. On a scale of 1 (strongly disagree) to 5 (strongly agree), how would you describe your attitude toward these statements.
    a. EHR systems help achieve the goals of Quality Payment Programs, like Meaningful Use or MIPS
    b. Cost would turn you away from a system that you feel fits your criteria of a well- rounded EHR system
    c. Optometry EHR systems should be linked to a patient's general health records so that patient data can be viewed by the OD.
    d. As the OD it would be helpful to access patient records from my home.
    e. There should be one common EHR system across disciplines of medicine so that all information is available at any given time
    f. In the event of a data breach, the practice using the EHR should be responsible for the stolen data.

g. EHR systems greatly increase the efficiency of a practice, no matter which system they are using.
h. EHR systems greatly increase the quality of care for patients.
i. The cost of implementation of an EHR system is offset by the money that is saved by its use during normal day-to-day operating

8. Rank these potential EHR problems from most frightening (1) to least frightening (6):
   a. Security breach
   b. High cost of implementation
   c. Learning a new EHR system
   d. Data entry distracts from quality patient care
   e. System malfunction

9. Rank these factors from most important (1) to least important (6) when deciding which EHR system is best for you:
   a. Cost
   b. Integration with instrumentation
   c. Customization
   d. Interoperability with other EHRs
   e. Security
   f. Ease and Efficiency, including data entry

10. What is a feature that you would like to see in an EHR that you don't have with your system?

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COMPUTER BASED EHR SYSTEMS

We, Jonathan Connors and Derek Dake, hereby release this Paper as described above to
Ferris State University with the understanding that it will be accessible to the general
public. This release is required under the provisions of the Federal Privacy Act.

_____
Doctoral Candidate

_____4/17/18_____
Date

_____
Doctoral Candidate

_____4/17/18_____
Date