Prevalence and Perceptions of Electronic Health Records in Veterinary Practice: A Statewide Survey of Ohio Registered Veterinary Technicians

THESIS

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By

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Abstract

This survey explored the perception of Registered Veterinary Technicians regarding electronic health records in veterinary clinics, hospitals, and other settings in the State of Ohio. It also explored the prevalence of electronic health records along with the relationship of electronic health record usage among Registered Veterinary Technicians practicing in different settings and demographics.

A total of 341 surveys were mailed to Registered Veterinary Technicians in the State of Ohio on May 18, 2014. A total of 33 surveys were returned with 24 surveys completed for data analysis. Out of 322 usable questionnaires, the adjusted response rate was 24/322 = 7%. To address the low response rate a Goodness of Fit Test was performed to make certain the respondent profile was consistent with the distribution Registered Veterinary Technicians in the population. Of the 88 counties in the State of Ohio, 17 are represented, which supports evidence that the survey is representative of the state.

Nearly 91% (n=22) of the Registered Veterinary Technicians that responded to the survey indicated that their practice use an electronic health record and 63.7% (n=14) rated their electronic health record experience as being positive. The average number of years the respondents reported that their practices have been using an electronic health record is 7. The extent, availability, and use of electronic health records were also included in the survey.

Respondents were asked if their practice used any components of an electronic health record. If the respondents had answered ‘yes’ to having an electronic health record at their practice, the survey also asked which components were used and to what extent. The electronic health record components that were ranked highest for availability (features that were provided by the vender) to use were: laboratory order entry 63.6% (n=14), electronic visit notes 90.1%, (n=20), reminders for care activities 95.4% (n=21), and electronic medication list for each patient 77.3% (n=17).

The electronic health record components that were ranked highest for ‘use most of the time’ were radiology tests 59% (n=13), radiology order entry 63.5% (n=14), electronic problem list 54.5% (n=12), ability to transmit prescriptions to pharmacy electronically or via electronic faxing 68.1% (n=15), electronic referrals or clinical messaging (secure e-mailing) 86.4% (n=19), and client portal 59.1% (n=13).

A total of 66.7% (n=16) of Registered Veterinary Technicians indicated suburban as the primary geographic location of their practice of which 68.2% (n=15) use an electronic health record. Of the 20.8% (n=5) of respondents that chose urban of which 18.2% (n=4) use an electronic health record and 12.5% (n=3) that chose rural of which 13.6% (n=3) use an electronic health record. A total of 75% (n=18) of Registered Veterinary Technicians indicated small animal as their practice environment of which 72.7% (n=16) use an electronic health record. A total of 79% (n=19) of Registered Veterinary Technicians indicated general as their practice setting of which 77.3% (n=17) use an electronic health record. The two respondents that are not using an electronic health record also practice at a small animal general practice setting.

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Fields of Study

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Chapter 1: Statement of the problem

The medical record is an important part of healthcare. It has documented the medical treatment and diseases in humans and animals for many centuries. The information contained in an early medical record varied greatly due to the lack of standardization. Over time the medical record has become the main source of billing information that doctors and hospitals use for reimbursement from insurance companies. The medical record is used for research purposes and is a primary means of communication among doctors, hospitals, laboratories, and specialty services. As with the medical record of a human, the main purpose of a veterinary medical record is to document patient care. It is also a legal document that can be subpoenaed to court in malpractice cases and other lawsuits.

Veterinary hospitals across America use the medical record to capture client, patient, and financial data. In veterinary medicine the patient is referred to as the animal being seen and the client is referred to as the owner of the animal. There are similarities and differences between veterinary and human medicine with regard to the use and purpose of the medical record, and one difference is reimbursement. Veterinary medical records are not coded for insurance companies, but when a client does have veterinary insurance, the client must submit the claim instead of the hospital or clinic. The client must first pay the hospital bill out of pocket and then submit the claim to the insurance company for reimbursement. Research is one of the missions of veterinary teaching hospitals and the information about a patient's visit is coded for research purposes instead

of reimbursement purposes. Other veterinary hospitals that do not perform research do not use coding in their daily practices.

The electronic health record (EHR) has dramatically improved the collection of patient data. Most veterinary hospitals have information systems that are used for the master patient index, financial transactions, and inventory management of supplies. While these information systems are useful and contain important information, they do not provide the hospital with an EHR. The EHR combines the collection of a patient's medical information, master patient index, financial transactions, inventory, and the coding database in an electronic environment. An EHR would replace manual documentation with electronic documentation and provide multiple user access. It would also provide the hospital with a more efficient means of collecting a patient's medical history, physical exam, diagnosis, diagnostics, and treatment through a standardized method of data collection. This contrasts with a paper medical record, where there are many opportunities for variances in the information collected, one being the legibility of different handwriting styles.

Background of the Problem

Until the twentieth century all medical records were paper. The introduction of technology has advanced the capabilities of the medical record. Computers have infiltrated the healthcare system and have made several ancillary services electronic, including laboratory, radiology, and pharmacy. The EHR has revolutionized the way patient information is collected, shared, retrieved, and stored. The paper medical record is slowly being replaced with an EHR that can be viewed, edited, and completed by people in several departments simultaneously. The silo viewing of a patient's medical record

will be obsolete when each and every hospital, doctors' office, and veterinary hospital implements an EHR.

One of the barriers to the implementation of an EHR is the expense. In human healthcare there have been several pieces of legislation that have encouraged hospitals and doctor's offices to implement an EHR. The Health Information Technology for Economic and Clinical Health Act (HITECH) supports the advancement of an EHR and has established several programs that encourage the development and growth of the effective use of an EHR through the presence of financial incentives (Dimick 2010, 1). The State Health Information Exchange Cooperative Agreement Program supports establishing health information exchange capability to states or state designated entities among healthcare providers and hospitals and the Beacon Community Program supports the health information technology (HIT) infrastructure and exchange capabilities for communities (U.S Department of Health and Human Services, n.d.). This financial support has been the catalyst for making the transition from paper medical records to an EHR in human healthcare settings. The same is not true for veterinary medicine. To date no federal legislation has supported the implementation of EHRs in veterinary medicine as it has done for human healthcare purposes. However, because of the benefits of EHRs to patient care, veterinary practices are slowly migrating in that direction.

There are several professionals responsible for providing healthcare to animals. One profession is the Registered Veterinary Technician. Registered Veterinary Technicians (RVTs) are equivalent to Registered Nurses (RNs) in human healthcare. RVTs work under the supervision of a Doctor of Veterinary Medicine (DVM). Each veterinary hospital employs RVTs to assist with appointments, patient care, and

surgeries. The RVT is involved in documenting in the patient's medical record, including the history and vitals of the patient. The RVT is trained to work in each area of the hospital and has more documentation responsibilities than any other position.

As more veterinary hospitals switch to EHRs from paper medical records, the more job duties and job functions will change for RVTs as well as other veterinary hospital personnel. Currently, the RVT is responsible for running fecal tests, blood smears, ear smears, or other routine laboratory tests as well as preparing an animal for surgery, assisting with appointments, animal restraint, and medical record documentation. RVTs are trained to administer anesthesia, assist in surgery with the DVM, take radiographs, clean teeth, perform laboratory testing, and fill prescriptions. The RVT is trained throughout the veterinary hospital to work in pharmacy, radiology, and the laboratory. Veterinary hospitals do not have ancillary services to provide services compared to human hospitals.

According to the Ohio Veterinary Medical Licensing Board (OVMLB) there are 3,040 RVTs eligible to practice in the State of Ohio as of January 2014. Little is known about their beliefs and attitudes towards EHRs, although RVTs will have a major role in the conversion of paper medical records to EHRs as more veterinary clinics and hospitals implement EHRs. This is because the RVT is a key member of the veterinary care team and does the majority of the documentation in the patient's medical record. This allows the DVM to focus their time on practicing medicine by diagnosing the patient and spending time communicating with the client.

The veterinary profession is moving towards EHRs and will be changing the workflow and work processes from its current state. All veterinary hospital personnel will

be involved in the implementation process. It is important to begin implementation with staff buy-in to make the transition smooth. The attitudes and beliefs of veterinary staff about EHRs may determine their success after one is implemented. The prevalence of EHRs in veterinary practices is important to study because the information may assist other veterinary practices in their decision to purchase an EHR system.

Purpose of the study

The purpose of the study was to investigate the perception of Ohio RVTs toward EHRs and to determine the prevalence of EHRs by RVTs in veterinary practice.

Significance of Study

The medical record contains important information that is needed to make diagnostic and/or therapeutic decisions. The widespread accessibility of an EHR is one major benefit compared to a paper medical record. The sharing of a patient's medical information electronically is fast, convenient, and vital to patient care. An EHR has on-line capability and can reach clients, referring veterinarians (rDVMs), specialty hospitals, laboratories, and the Veterinary Medical Data Base (VMDB). The VMDB collects data from almost all veterinary teaching hospitals in America for research purposes. Each entry in the database includes breed, age, sex, geographical region, and date of disease onset. This provides valuable information regarding the effectiveness of treatment as well as animal diseases (VMDB, n.d.).

In veterinary teaching hospitals, rDVMS can receive information in real time as lab results or treatment information becomes available through electronic sharing of information. The rDVM will receive a summary of the patient's visit that lists the

diagnosis, diagnostic test, treatment, and prognosis. This happens automatically and saves time by eliminating the step required by personnel. A paper medical record must be manually faxed or emailed by personnel in order to share the information. As a result, the person or clinic requesting the information must wait for the request to be completed. Additionally, paper medical records can be lost. They may become misplaced in a busy veterinary hospital and subsequently unavailable for any requests. However, despite the benefits, the prevalence of EHRs in veterinary practice is not known. This study will help to better understand the current use of EHRs by RVTs in veterinary practices and what perceptions RVTs have towards them.

Conceptual Frame of Reference

This study is based on previous research conducted by Taylor (2008) and Simon (2006). Taylor's research thesis, *Use and Perceptions of Electronic Health Records Among Ohio Physician Assistants; A Statewide Survey* was based on the work of Simon who studied the adoption of EHRs in physician office practices (2006). The surveys used in these studies were modified for this study to address RVTs practicing in the State of Ohio. Further details of the content in the questionnaire will be discussed in the Methodology section of the study.

Research Questions

1. What is the perception of Ohio RVTs regarding EHRs in the workplace?
2. What is the prevalence of EHR use by Ohio RVTs?
3. What is the relationship of EHR usage among Ohio RVTs and practice settings and demographics?

Definition of Terms

American Recovery and Reinvestment Act (AARA) - an economic stimulus package signed into law in 2009. The primary objective was to save and create jobs and the secondary objective was to invest in infrastructure, education, health, and renewable energy.

Computerized Physician Order Entry (CPOE) - an electronic process that allows a physician to request treatments for a patient under his or her care.

Doctor of Veterinary Medicine (DVM) - a doctor who practices veterinary medicine by treating animal diseases and injuries.

Electronic Health Record (EHR) - is comprised of many electronic components that work together to capture, create, share, maintain and store an accurate and complete patient health record.

Health Information Technology (HIT) - area of IT involving the design, development, creation, use and maintenance of information systems for the healthcare industry.

Health Information Technology for Economic and Clinical Health Act (HITECH) - legislation that provides for the United States Department of Health and Human Services to fund billions of dollars to promote the meaningful use and adoption of health information technology.

Meaningful use - using certified EHR technology to improve quality, safety, efficiency, and reduce health disparities.

Referring veterinarians (rDVMs) - a DVM that refers a patient to a specialty hospital or clinic.

Veterinary Medical Data Base (VMDB) - started in 1964 by the National Cancer Institute to study cancer in animals. Now it collects patient encounter data from nearly all veterinary medical universities in the United States. The data collected encompasses all the cases being seen at the universities, not just cancer cases.

Registered Veterinary Technician (RVT) - veterinary professional with a 2-year or 4-year degree in veterinary technology who has passed the Veterinary Technician National Exam.

Registered Veterinary Technologist - veterinary professional with a 4-year degree in veterinary technology who has passed the Veterinary Technician National Exam.

Ohio Veterinary Medical Licensing Board (OVMLB) - provides examinations for licenses, issues licenses, investigates complaints, and approves continuing education courses for DVMs, RVTs, and veterinary specialists.

Veterinary Assistant - works under the supervision of a DVM or RVT; usually has experience working with animals, but is not required to have any education or certification.

Veterinary specialist - a DVM who specialized in a clinical field of veterinary medicine.

Limitations of the Study

There are several limitations to this study. External validity of the study may be affected by sampling error and non-response error. The results of the survey may be a non-representative sample due to several factors. A percentage of selected RVTs may not respond to the survey due to incorrect mailing address, unemployment, or unwillingness to complete the survey; surveys may be incomplete or submitted late, and unsigned

consent forms may be present. Testing will be done to determine if there is any non-response bias by comparing values that prevail in different subgroups of the survey to determine if there is any significant difference. If the response rate is low there is a greater chance of non-response bias. Response bias may also be an issue if the RVTs don't answer the survey questions according to their own beliefs, but instead answer how they feel they should answer. It is also possible that those who respond are particularly positive or negative in their opinions.

Chapter 2: Review of the Literature

Background

As with medical records in human healthcare, veterinary medical records have historically existed in a paper format. The medical record is a collection of a patient's medical information that includes symptoms, history, and physical exam. The information is then used to assist the doctor in indentifying the diagnosis, prognosis, and treatment plan. Laboratory results, treatments, surgeries, and medications are also included in the medical record along with the prognosis and aftercare instructions. Each section of the medical record is important in capturing patient care and telling the story of the patient's encounter with the doctor. Communications between the patient and the doctor are important to document in order to track the patient's progress. The patient's outcome with regard to treatment, therapies, or medications is important to capture as well.

The accuracy of medical records can save or harm a patient's life, to the same degree in veterinary medicine that it can in human healthcare. Inside the medical record is information regarding treatment of a patient's disease or condition. If the incorrect lab result, biopsy result, or x-ray report is filed or reported in the wrong patient's medical record the outcome could be fatal for the patient. The accuracy of the medical record is also extremely important in end-of-life decision-making. This is because, in veterinary medicine, the cost of treatment of an animal is the responsibility of the owner and according to Jergle (2013, 1) only one percent of U.S. dogs and cats are insured. This

statistic is low and shows that owner's do not have outside financial resources and have to make medical decisions about their animals based on their ability to afford the costs. One treatment option that is offered to clients who do not have the financial means to treat their animal is, unfortunately, euthanasia. This ends the suffering of an animal and is inexpensive for the client.

The positive effects seen after implementation of an EHR include: greater access of the patient's medical record, reduction of medical errors due to real-time prompts, increase in the safety of the distribution of medications, the standardization of workflow practices, and increased patient involvement. The use of the Computerized Physician Order Entry (CPOE) has been linked to reducing mistakes due to handwriting misinterpretations, decreasing errors due to incorrect or duplicate doses, and increased efficiency with inventory and charge capture which can lead to the saving the healthcare organization millions of dollars (Bell and Thornton, 2011, 52).

Current State of EHR

The implementation of EHRs is an evolving process, both in human and veterinary healthcare. However, human healthcare has had the advantage of governmental involvement for EHR support, installation of EHRs, and funding. Veterinary healthcare has not had the benefit of government incentives and, as a result, it is believed that the presence of EHRs in the veterinary setting lags behind. In 2009, President Barack Obama signed the Health Information Technology for Economic and Clinical Health (HITECH) Act, which was part of the American Recovery and Reinvestment Act (AARA), to increase the use of HIT for human healthcare (Buntin, et al, 2011, 464). This piece of legislation also created programs to help assist health care

organizations to implement EHRs within their facilities. Twenty-seven billion dollars have been allocated to achieve the goal of making EHRs a reality for many providers (Buntin, et al, 2011, 464).

The goal of the EHR is increase patient care with regard to accessibility, safety, and quality. This will also increase the efficiency of processes that will save the hospital or other healthcare organization money. Access to the patient's medical record along with the ability to capture information in a safe and secure electronic environment will provide better patient care. Communication between the different departments in a provider setting, communication between referring physicians, and communication between the physicians and the patients will be greatly improved. The sharing of a patient's information between physicians will be easier and will improve the quality of care too.

These programs that are distributing financial resources to healthcare facilities in human medicine for switching to an EHR are not doing so for veterinary facilities at this time due to the priority being human healthcare facilities. The federal government has realized the benefits of having EHRs in place that address the issues of continuity of care and the need to have immediate access to a patient's medical record. The smaller privately owned practices are benefiting the most with the government's financial assistance and would not be able to make the investment in an EHR on their own. The cost of an EHR is high and offers return on investment when weighing the positive benefits; however it is not feasible for many veterinarians that have to pay full price and do not qualify for federal financial incentives.

There are also limited veterinary EHR vendors that offer EHRs. Due to the fact that all animal species have four legs and vary greatly from humans it is not possible to

use human EHRs for veterinary medicine. The anatomy of animals is different from humans and the requirements of an EHR are species specific. The requirements of an EHR for ruminants (cows, goats, and alpacas) are different than the requirements of non-ruminants (dogs and cats). The main difference between animals and humans is animals have four legs and are missing arms. The popular EHRs in human medicine seem to have found their niche and have not experimented with veterinary EHRs. There are a few pet-based companies that have launched veterinary EHRs. However, a concern when purchasing an EHR for veterinary medicine is the type of practice it is. Veterinary medicine encompasses several species including farm animals and the type of practice could also differ between general, specialty, and teaching. The number of animals a practice sees is a consideration also when looking at purchasing an EHR. The specific needs of a veterinary clinic may lead to purchase of an EHR that will require customizations and enhancements from the original product on the market.

Design and Implementation

To make implementation successful it is important to involve the physicians and DVMs in the design of the EHR and to evaluate how the new system will change the current workflow and processes. Training and ongoing staff support will benefit the transition as well. It is important to have staff buy-in and create a vision that is supportive of the EHR. The main purpose of the vision of the organization is to promote the implementation goals and timeline. Having key physicians, nurses, and other healthcare workers involved in the design of the EHR and the implementation process should increase the success rate of the system in regards to the usability of the system (Bell and Thornton, 2011, 53). Considerable amounts of training should be given to all staff that

will use the system regardless of their computer skills. Initial training should be followed up by opportunities for staff feedback.

The design of an EHR should focus on the end user and be easy to learn and easy to use. The information entered into the system should be easily captured and retrievable. According to Acosta et al (2011, 331), "The International Organization for Standardization defines usability as the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." Usability can improve system performance, shorten the learning curve, increase efficiency, and decrease patient care errors. It can also decrease training costs and the need for user support. The most important time to identify problems with end user issues associated with usability is the design phase. The sooner the problems are identified then the sooner they can be addressed. Additional costs associated with development and design can be avoided with the identification of end user concerns and issues (Acosta, et al, 2011, 334).

One challenge during the implementation process is change management. For the end users change in work flow can be difficult and often stressful. Learning a new system takes time and can vary between people. Scheduling should be a considering factor because the new work flow will be initially slower and learning a new routine efficiently is generally done in a slower environment. The different departments and specialties use different aspects of the patient's medical record and each department desires fast and easy access to the system. Looking at each department's needs before implementation and designing a new work flow for the new system will produce better results than not taking the time to access specific needs of the various departments (Dunn, 2007, 159).

The implementation of an EHR is time consuming, expensive, and can be very stressful. The decision to change over to an EHR should be made with careful planning. The support of the staff and end users is necessary and the project must have strong leadership. The success of an EHR is not guaranteed, but can be greatly increased with the proper design, work flow analysis, training, and support. Patient care will be affected by the switch to an EHR and that is the goal in the end.

Training for EHR Use

To gain the most benefit from an EHR the organization must focus on training. The work flow process must be evaluated and considered during the implementation of new computer software. The same process that is used for a paper medical record should not be the same for an EHR. The goal is to decrease the amount of time it takes to document patient care, prescribe medication, and enter orders. The failure rate of software implementation has been due to the lack of staff training (Kulhanek 2011, 25).

In 2010, a study was done to evaluate the EHR training process. The study included board-certified informatics nurses. The top listed barriers to staff training were finding appropriate areas to deliver the training and monitoring the attendance of the staff required to take the training. Some organizations required the passing of competency tests while other organizations gave surveys and had pass/fail evaluations. Some organizations only required the attendance of the training class to evaluate the success of the training class. The training materials that were used varied from paper materials to training support from leadership. The key to success was identified as leadership support and change management (Kulhanek 2011, 25).

The barriers to training varied from lack of leadership, various levels of staff computer literacy, spaces to conduct the training, and timing of the training in regards to implementation of the EHR. The issues that surrounded inadequate training included an increase in incidence reports, staff turnover, increase time spent on the computers by staff, and low staff morale. To address these issues it is important to view training as revolving and not a one-time event. New employees will need considerable amount of training and having an established training program developed will be most beneficial. The goal is to focus on patient care and the EHR is a way to safely and accurately assist the staff with that goal (Kulhanek 2011, 26).

Benefits and Concerns

The ongoing success of HIT implementation that brings positive change to the health care organization is not in the quality of the system or how expensive the system is, but how the system can improve work flow within the organization and make tasks safer, easier, and faster. HIT can bring change to work flow in many ways and should not be limited to the automation of the current work flow. This train of thought has lead to many implementations that have been less successful than planned due to the lack of effort in examining the current work flow. The needs of the patient should come first and HIT should focus on improving care. The focus should be less on hospitals, physician offices, pharmacies, laboratories, and health care payers competing for patient services, but instead the focus should be on working together to share patient data. This will keep the focus on the patient which is the primary goal of implementing HIT (Frisse 2009, 379-380).

Continuity of care is greater with an EHR than with paper records. The sharing of patient data is much greater with an EHR and information is easily accessible to all health care providers. This increases the delivery of patient care while at the same time helps to decrease patient care errors. The EHR facilitates the standardization of the collection of patient data and makes the process more consistent and efficient compared to paper records which have much more variability (Bell and Thronton, 2011, 55-56).

The access to the patient's medical record along with the ability to capture information in a safe and secure electronic environment will provide better patient care. Communication between the different departments in a provider setting, communication between referring physicians, and communication between the physicians and the patients will be greatly improved. The sharing of a patient's information between physicians will be easier and will improve the quality of care too. The variation of the collection of patient data will be reduced with an EHR. This will increase the efficiency on reporting data since the information will be standardized. This will provide hospitals, clinics, and physician office's standards for collecting patient data and will benefit the patient during transfers and when visiting different healthcare facilities (Dunn, 2007, 159-160).

After EHR implementation some negative results that were found included the length of time it took to use the electronic prescription system (e-prescribing) versus the traditional handwriting method. Other negative results found that implementation in a small rural hospital yielded dissatisfied staff members due to the lack of vendor punctuality of product delivery, lack of leadership of the project, and an unrealistic implementation schedule. Once the system was implemented the hospital documented

errors associated with patient care that included patient falls, medication errors, and other patient care errors (Buntin, et al, 2011, 468-469).

Other negative results of HIT have been noted including less communication during rounds than with paper medical records. This could be due to the fact that paper medical records are more accessible during rounds and may prompt more discussion due to their portability. Work flow changes have been noted as becoming insufficient. The implementation of an EHR provides better access, but the information contained within the medical record is less specific and detailed on critical patients compared to paper medical records. The collaboration between nurses and physicians regarding patient medication decreases with the use of provider order entry systems. One hospital's emergency room complained that the provider order entry system was insufficient and shifted staff responsibilities. Some implementations in HIT are unsuccessful do to the staff's knowledge about computers and lack of training on the new system. Some patients did not see the benefit of having e-mail communication between their physicians through the patient portal (Buntin, et al, 2011, 468-469).

Patient privacy is a major concern with HIT. Each component of the EHR must be reliable and secure that protects patient information from being accessed by non-authorized parties. The data itself must be accurate and transmitted with integrity. There must be clear and precise policies and procedures on how the patient's data is collected, used, and shared. The accuracy and integrity of the data must be kept at a high priority especially in an electronic environment. There must be oversight and audit trails in place to safeguard the data. A comprehensive approach to privacy is extremely important in an EHR or other health information exchange (Halamka, 2009, 388-389).

EHRs and Registered Veterinary Technicians

According to the OVMLB there are 3,040 RVTs eligible to practice in the State of Ohio as of January 2014. To apply for an Ohio Registered Veterinary Certificate one must graduate from an accredited school of animal technology and pass the Veterinary Technician National Exam to become a Registered Veterinary Technician in the State of Ohio (OVMLB, n.d.). There are 2-year and 4-year degrees. To become a Veterinary Technologist one must earn a 4-year bachelor degree; the difference between technologists versus technicians is generally only based on educational background. There will be an increase in the RVT profession over the next seven years according to the Bureau of Labor Statistics, and more students will be entering the field. The profession is growing on average faster than other professions and is expected to grow 52 percent from 2010 to 2020 (Bureau of Labor Statistics, n.d.).

This survey will explore the perception of RVTs regarding EHRs in veterinary clinics, hospitals, and other settings in the State of Ohio. It will also explore the prevalence of EHRs, hybrid records, and paper records will be discussed along with the relationship of EHR usage among RVTs practicing in different settings and demographics. The relevance of this study is important because the increasing number of graduates entering the profession signifies that the profession is strong and profitable. Such, RVTs will be highly involved in veterinary clinics' and hospitals' conversion from paper medical records to EHRs. Discovering the perception RVTs have toward EHRs and their current usage of EHRs are the main goals of this survey and will help the veterinary profession understand the current attitudes and beliefs RVTs have towards EHRs.

Chapter 3: Methodology

The following chapter will outline the design of the study and the specific details included in the research that was conducted. The research design, pilot study, population and sample design, data collection procedures, data collection instrument, and data analysis will be discussed in detail. The statistics that were used will also be defined and expanded upon along with the level of significance.

Research Design

A cross sectional descriptive research design was used to conduct the research in this study.

Pilot Study

A pilot study was done first to validate the questionnaire for content validity. A random sample of twenty RVTs were given a survey and asked for feedback. The goal of the pilot study was to get feedback on the survey questions to assure proper comprehension of the questions to obtain the most accurate results from the survey.

Population and Sample Design

The population targeted for the study was RVTs who have active registrations in the State of Ohio. A mailing list was obtained from the OVMLB. The list reported 3,040 RVTs as of January 2014. From the mailing list of 3,040 a sample of twenty RVTs was selected to receive a questionnaire for the pilot study. The twenty RVTs that participated in the pilot study were removed from the mailing list, leaving 3,020 RVTs. A random

sample of 341 RVTs was selected from the list of 3,020 RVTs to receive a questionnaire to participate in the study.

The formula used to calculate sample size (SS) was:

$$SS = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Z = 1.96 for 95% Confidence Level

p = 0.5 used for sample size

C = 0.05; (+/-) 5 used for Confidence Interval

$$SS = \frac{1.96^2 * (0.5) * (1-0.5)}{0.05^2} = 384.16$$

The formula used for finite population correction factor was:

SS / [1 + (SS-1/pop)] pop = population; 3,020 RVTs

384.16 / [1 + (384.16-1/3020)] = 340.9

A sample size of 341 RVTs was calculated from the formula.

Data Collection Procedures

The random sample of 341 RVTs was mailed a survey via U.S. mail on May 18, 2014. The list of RVTs from the OVMLB only contained home addresses and did not contain email addresses so each survey was mailed. The initial survey included an enclosed letter describing the study, its significance to the veterinary profession, and detailed instructions on how to complete the survey. The letter also included a stamped addressed return envelope.

A two-week time frame was given to all the survey recipients from the date the survey was mailed. At the end of two weeks, the survey recipients that did not respond to the survey were mailed a reminder card stating that the survey was extended for an

additional two weeks. The reminder cards were mailed on June 4, 2014. This gave the survey participants four weeks total to complete the survey and mail it back.

Data Collection Instrument

The survey used in this study was a modified version of the surveys used in the studies by Taylor (2008) and Simon (2006). The original questionnaire developed by Simon was designed for a systematic review of literature measuring the correlates of EHR adoption in physician office practices in Massachusetts in 2005 which included surveying physicians. His questionnaire was modified by Taylor in 2008 to include office statistics, EHR perceptions, and EHR usage among Physician Assistants in the State of Ohio.

For the purpose of this study the questionnaire was modified from the questionnaire by Taylor (2008) to address the sample population of RVTs in the State of Ohio. The following sections were included in the survey: I. Practice Characteristics, II. Health Information Technology, III. Personal Computer Experience, IV. Electronic Health Records and Veterinary Medicine, and V. Personal Characteristics. Each section was modified to reflect veterinary medicine more accurately. The modified survey is in Appendix A.

Survey question 22 addressed question 1 of the research questions (What is the perception of Ohio RVTs regarding EHRs in the work place?). Survey questions 1-10 and 11-17 addressed question 2 of the research questions (What is the prevalence of EHR use by Ohio RVTS?). Survey questions 18-21, and 23-26 addressed question 3 of the research questions (What is the relationship of EHR usage among Ohio RVTs and practice settings and demographics?).

Data Analysis

The statistical test that was used to analyze the data received from the survey was the T-Test of Independent Means. Descriptive and summary statistics were used to describe the practice characteristics and demographics. All the data was entered into a statistical computer software program GraphPad InStat to perform the data analysis. The a priori level of significance was set at $p < 0.05$ and the confidence interval was set at 0.05 (+/-) 5.

Chapter 4: Results

The purpose of the study was to investigate the perception of Ohio RVTs towards EHRs, to determine the current use of EHRs in veterinary practice, and to determine the relationship of EHR usage among Ohio RVTs and practice settings and demographics.

The first section of this chapter discusses the results of the pilot study and the response rate. The second section discusses the respondents' perception of EHRs in veterinary medicine. The third section discusses prevalence of EHR and components of EHR usage. The fourth section discusses relationships of EHR usage among respondents and practice settings and demographics. The fifth section discusses personal characteristics of the respondents and their personal computer experience.

Pilot Study

Twenty RVTs were randomly selected to evaluate the survey questionnaire for content validity. There were only minor changes noted from the twenty respondents. No changes were made to the survey questionnaire based on the pilot study.

Response Rate

To determine the frequency and percentages of practice demographics and characteristics of the survey results, descriptive and summary statistics were calculated. A total of 341 surveys were mailed to Ohio RVTs on May 18, 2014. Ten surveys were returned via US mail that were undeliverable to the current address, nine recipients of the

survey responded that they were not currently practicing as veterinary technicians, and 24 surveys were completed and returned. Thirty usable surveys were returned after the original mailing on May 18, 2014 and three usable surveys were returned after the June 4, 2014 reminder cards were mailed out. A total of 33 RVTs responded to the survey with 24 surveys completed for data analysis. Out of 322 usable questionnaires the adjusted response rate was 24/322 = 7%.

The time of year the survey was sent out could be a factor in the low response rate. The final days of school occur at the end of May and it is the time of year when people take vacations. Another factor may have been mailing the survey instead of sending it out electronically since email addresses were not provided by the OVMLB. There was a drawing of a $25 gift card to Target offered for the completion of the survey; however this incentive may not have supported the time involved to complete the survey.

To address the low response rate a Goodness of Fit Test on one variable, zip code, was performed. This was performed to make certain the respondent profile was consistent with the distribution of RVTs in the population. The results showed the survey responses were spread throughout the state. Of the 88 counties in the State of Ohio, 17 are represented, which supports evidence that the survey is representative of the state (see Table 1).

Counties	Count of Zip Code
Ashland County	1
Butler County	1
Champaign County	1
Clermont County	3
Cuyahoga County	3
Delaware County	1
Erie County	1
Franklin County	7
Hamilton County	2
Lucas County	4
Medina County	1
Mercer County	1
Montgomery County	2
Ross County	1
Summit County	2
Union County	1
Total	**33**

Table 1: Goodness of Fit Test Results

1. **What is the perception of Ohio RVTs regarding EHRs in the work place?**

Effect of EHRs in Veterinary Medicine

Respondents were asked to rate their perception of the effect EHRs have in selected areas of veterinary medicine. Overall the results were positive (see Table 2). A total of 87.5% (n=21) of RVTs agreed that EHRs have a positive effect on interactions within the veterinary care team, 87.5% (n=21) DVMs access' to up-to-date knowledge, and 79.2% (n=19) quality of care given to patients. Only 54.1% (n=13) of RVTs agreed that EHRs have a positive effect on client and patient privacy. A total of 20.8% (n=5) of RVTs agreed that EHRs have no effect on medication errors while 58.4% (n=14) agreed that EHRs have a positive effect. A total of 70.8% (n=17) of RVTs felt that EHRs have a

positive effect on controlling costs of veterinary medicine. A total of 12.5% (n=3) of RVTs felt that EHRs have no effect on client-veterinary communication, while 70.8% (n=17) felt EHRs have a positive effect. A total of 79.1% (n=19) of RVTs felt that EHRs have a positive effect on the efficiency of providing care. In addition, 4.2% (n=1) of RVTs felt that EHRs have a negative impact on controlling costs of veterinary medicine, 4.2% (n=1) client and patient privacy, and 4.2% (n=1) the efficiency of providing care.

The RVTs who still use paper medical records felt that EHRs have a positive effect on controlling costs of veterinary medicine and providing the veterinarian access to up-to-date information. A total of 50% (n=1) of RVTs who do not use EHRs felt there is no effect on quality of care, interactions within the veterinary care team, client-veterinary communication, efficiency of providing care, and medication errors. A total of 50% (n=1) of RVTs who do not use EHRs have no opinion if the quality of care, client and patient privacy, and medication errors are affected by an EHR.

Effect of EHRs in Veterinary Medicine	**Positive**	**Negative**	**No effect**	**No opinion**
Controlling costs of veterinary medicine	17 (70.8%)	1 (4.2%)	2 (8.3%)	4 (16.7%)
Quality of care	19 (79.2%)	0 (0%)	3 (12.5%)	2 (8.3%)
Interactions within the veterinary care team	21 (87.5%)	0 (0%)	2 (8.3%)	1 (4.2%)
Client-veterinary communication	17 (70.8%)	0 (0%)	3 (12.5%)	4 (16.7%)
Client and patient privacy	13 (54.1%)	1 (4.2%)	4 (16.7%)	6 (25%)
Veterinarians' access to up-to-date knowledge	21 (87.5%)	0 (0%)	1 (4.17%)	2 (8.3%)
Efficiency of providing care	19 (79.1%)	1 (4.2%)	4 (16.7%)	0 (0%)
Medication errors	14 (58.4%)	0 (0%)	5 (20.8%)	5 (20.8%)

Table 2: Effect of EHRs in Veterinary Medicine

2. What is the prevalence of EHR use by Ohio RVTs?

Practice Characteristics

Table 3 summarizes practice environment and practice settings, population geographic location, and total number of DVMs. The survey asked respondents about their practice environment and 75% (n=18) indicated working in a small animal hospital, 16.7% (n=4) mixed practice (large and small animals), and 8.3% (n=2) other locations. Respondents were also asked about their practice setting and 79% (n=19) indicated working in a general practice setting, 4.2% (n=1) emergency setting, 4.2% (n=1) university setting, and 12.6% (n=3) work in a specialty setting. Two respondents reported working in a small animal and exotic animal practice. A total of three practice specialties were reported that included anesthesia 4.2% (n=1), dermatology 4.2% (n=1), and spay/neuter 4.2% (n=1).

The estimated number of patient visits per week per practice was 169.46 with a range of 30-1200. The average number of visits per week by RVT was 213.53 with a range of 35-796. For RVTs not using an EHR, the average number of visits per week is (130/week) compared to RVTs who are using an EHR is (173/week). Respondents who did not use an EHR saw fewer patients per week than those that indicated using an EHR. The practice with an EHR saw (211/week) versus (229/week). The practices not using an EHR saw more patients per week than practices using an EHR. In order to determine significant findings with the average number of visits per week by RVT and by veterinary practice the T-Test of Independent Means was used. Significant findings were any

relationship that was $p<0.05$. The results are considered not significant; $p=0.81$ for RVT and $p=0.89$ for veterinary practices.

The respondents tend to work in suburban cities with populations between 2,500-50,000 people 66.7% (n=16), 20.8% (n=5) work in an urban area, and 12.5% (n=3) work in a rural area. The average number of DVMs at a practice was 5.67, the average number of RVTs was 6.58, and the average number of Veterinary Assistants was 3.04. The minimum number of DVMs at a practice was n=1, RVTs n=1, and Veterinary Assistants n=0. The maximum number of DVMs was n=50, RVTs n=50, and Veterinary Assistants n=11.

Practice Environment	**Frequency**	**Percentage**
Small Animal	18	75%
Equine	0	0%
Farm Animal	0	0%
Mixed	4	16.7%
Other	2	8.3%
Practice Setting	**Frequency**	**Percentage**
General	19	79%
Ambulatory	0	0%
Emergency	1	4.2%
University	1	4.2%
Specialty	3	12.6%
Population	**Frequency**	**Percentage**
<5,000	2	8.3%
5,001-25,000	10	41.7%
25,001-100,000	4	16.7%
100,001-200,000	1	4.2%
>200,001	7	29.1%
Location Type	**Frequency**	**Percentage**
Rural (<2,500)	3	12.5%
Suburban (2,500-50,000)	16	66.7%
Urban (>50,000)	5	20.8%
Number of:	**Average number at site**	**Min-Max**
Veterinarians	5.67	1-50
Registered Vet Technicians	6.58	1-50
Veterinary Assistants	3.04	0-11

Table 3: Practice Characteristics of Respondents

Job Satisfaction

A five point Likert-type scale, where 5 represented "very satisfied" to 1 "very dissatisfied", was used to access the job satisfaction of the respondents. A total of, 54.2% (n=13) reported being satisfied with their current practice (see Table 4).

Practice Setting Satisfaction	Frequency	Percentage
Very Satisfied	5	20.8%
Satisfied	13	54.2%
Somewhat Satisfied	6	25%
Dissatisfied	0	0%
Very Dissatisfied	0	0%

Table 4: Job Satisfaction of Respondents

EHR Use In Veterinary Practices

A total of 91.7% (n=22) respondents indicated that their practice uses an EHR, whereas 8.3% (n=2) indicated they did not use an EHR at their practice (see Table 5). A total of 63.7% (n=14) of RVTs rated their EHR experience as being positive and 13.7% (n=3) as being very positive. A total of 4.5% (n=1) of RVTs felt that their EHR experience was somewhat negative and very negative, 4.5% (n=1) indicated no effect, and 9.1% (n=2) did not respond to the question. The average number of years the respondents reported that their practices have been using an EHR is 7.

EHR Use	Frequency	Percentage
Yes	22	91.7%
No	2	8.3%
Number of Years	**Average**	
	7.8	
Experience Rating	**Frequency**	**Percentage**
Very Positive	3	13.7%
Positive	14	63.7%
Somewhat Negative	1	4.5%
Very Negative	1	4.5%
No Effect	1	4.5%
No Response	2	9.1%

Table 5: EHR Use In Veterinary Practices

Interest in EHR Use

Only 8.3% (2) respondents indicated they were not using an EHR, with one converting to an EHR within the next 1-2 years and the other indicating no specific plans to do so. The respondents not currently using an EHR stated that they would be interested, or have no opinion, in implementing an EHR in their practice.

Components of the EHR

Respondents were asked if their practice used any components of an EHR. If the respondents had answered 'yes' to having an EHR at their practice, the survey also asked which components were used and to what extent. Tables 6 & 7 summarize these results. The EHR components that were ranked highest for availability (features that were provided by the vendor) to use were: laboratory order entry 63.6% (n=14), electronic visit notes 90.1%, (n=20), reminders for care activities 95.4% (n=21), and electronic medication list for each patient 77.3% (n=17) (see Table 6).

Features	Availability			
	Yes	**No**	**Don't Know**	**No Response**
a.) Laboratory test results	15 (68.2%)	5 (22.8%)	1 (4.5%)	1 (4.5%)
b.) Laboratory order entry	14 (63.6%)	6 (27.3%)	2 (9.1%)	0 (0%)
c.) Radiology tests results	9 (40.9%)	8 (36.4 %)	4 (18.2%)	1 (4.5%)
d.) Radiology order entry	10 (45.5%)	9 (40.9%)	2 (9.1%)	1 (4.5%)
e.) Electronic visit notes	20 (90.1%)	2 (9.1%)	0 (0%)	0 (0%)
f.) Reminders for care activities (e.g. overdue health wellness)	21 (95.4%)	1 (4.6%)	0 (0%)	0 (0%)
g.) Electronic medication list for each patient	17 (77.3%)	2 (9.1%)	3 (13.6%)	0 (0%)
h.) Electronic problem list	11 (50%)	5 (22.7%)	6 (27.3%)	0 (0%)
i.) Can transmit prescriptions to pharmacy electronically or via electronic faxing	4 (18.2%)	12 (54.5%)	6 (27.3%)	0 (0%)
j.) Electronic referrals or clinical messaging (secure e-mailing between providers)	6 (27.3%)	11 (50%)	5 (22.7%)	0 (0%)
k.) Client portal	12 (54.5%)	5 (22.7%)	5 (22.7%)	0 (0%)

Table 6: Availability of EHR Features

The EHR components that were ranked highest for 'use most of the time' were radiology tests 59% (n=13), radiology order entry 63.5% (n=14), electronic problem list 54.5% (n=12), ability to transmit prescriptions to pharmacy electronically or via electronic faxing 68.1% (n=15), electronic referrals or clinical messaging (secure e-mailing) 86.4% (n=19), and client portal 59.1% (n=13). The features of the EHR that were ranked lowest for usage were reminders for care activities 68.2% (n=15), laboratory test results 45.4% (n=10), and electronic visit notes 40.9% (n=9) (see Table 7). The high

rate of ‘no response’ (n=3), may be due to the location of the question on the survey at the bottom of the second page.

Features	Use most of the time	Use some of the time	Do not use	No Response
a.) Laboratory test results	8 (36.4%)	2 (9.1%)	10 (45.4%)	2 (9.1%)
b.) Laboratory order entry	11 (50%)	4 (18.3%)	6 (27.2%)	1 (4.5%)
c.) Radiology tests results	13 (59%)	2 (9.1%)	5 (22.7%)	2 (9.1%)
d.) Radiology order entry	14 (63.5%)	2 (9.1%)	4 (18.3%)	2 (9.1%)
e.) Electronic visit notes	7 (31.7%)	4 (18.3%)	9 (40.9%)	2 (9.1%)
f.) Reminders for care activities (e.g. overdue health wellness)	3 (13.6%)	1 (4.5%)	15 (68.2%)	3 (13.7%)
g.) Electronic medication list for each patient	9 (40.9%)	3 (13.6%)	8 (36.4%)	2 (9.1%)
h.) Electronic problem list	12 (54.5%)	4 (18.3%)	5 (22.7%)	1 (4.5%)
i.) Can transmit prescriptions to pharmacy electronically or via electronic faxing	15 (68.1%)	1 (4.5%)	2 (9.1%)	4 (18.3%)
j.) Electronic referrals or clinical messaging (secure e-mailing between providers)	19 (86.4%)	3 (13.6%)	0 (0%)	0 (0%)
k.) Client portal	13 (59.1%)	3 (13.6%)	4 (18.2%)	2 (9.1%)

Table 7: Features of EHR Usage

Prescriptions

Computer decision support systems are designed for making therapeutic and diagnostic decisions for patients. Respondents were asked about the method of medication prescription generation and 59.1% (n=13) indicated they were computerized without decision support, 27.3% (n=6) handwritten, and 13.6% (n=3) computerized with decision support. Of the respondents, 72.7% (n=19) reported using electronic means to

generate prescriptions and only 27.3% (n=6) are still hand writing prescriptions (see Table 8).

Prescription generation method	Frequency	Percentage
Computerized with Decision Support	3	13.6%
Computerized without Decision Support	13	59.1%
Hand written	6	27.3%

Table 8: Prescription Format

3. **What is the relationship of EHR usage among Ohio RVTs and practice settings and demographics?**

Practice Settings with EHR Use

A total of 66.7% (n=16) of RVTs indicated suburban as the primary geographic location of their practice of which 68.2% (n=15) use an EHR. Of the 20.8% (n=5) of respondents that chose urban of which 18.2% (n=4) use an EHR and 12.5% (n=3) that chose rural of which 13.6% (n=3) use an EHR. A total of 75% (n=18) of RVTs indicated small animal as their practice environment of which 72.7% (n=16) use an EHR. A total of 79% (n=19) of RVTs indicated general as their practice setting of which 77.3% (n=17) use an EHR. The two respondents that are not using an EHR also practice at a small animal general practice setting (see Table 9).

When comparing EHR use to practice size the survey results concluded, that the greater the amount of total DVMs the more likely the practice uses an EHR. On average the total number of DVMs in a practice using an EHR was 6. On average the total

number of DVMs in a practice not using an EHR was 2. The average number of RVTs in a practice using and not using an EHR was 6. The average number of Veterinary Assistants in a practice using an EHR was 3 and not using an EHR was 1 (see Table 9).

	EHR Use			
	Yes n=22		**No n=2**	
Practice Location	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Small Animal	16	72.7%	2	100%
Equine	0	0%	0	0%
Farm Animal	0	0%	0	0%
Mixed	4	18.2%	0	0%
Other	2	9.1%	0	0%
Practice Setting				
General	17	77.3%	2	100%
Ambulatory	0	0%	0	0%
Emergency	1	4.5%	0	0%
University	1	4.5%	0	0%
Specialty	3	13.7%	0	0%
Population				
<5,000	1	4.5%	1	50%
5,001-25,000	10	45.5%	0	0%
25,001-100,000	4	18.2%	0	0%
100,001-200,000	1	4.5%	0	0%
>200,001	6	27.3%	1	50%
Location Type				
Rural	3	13.6%	0	0%
Suburban	15	68.2%	1	50%
Urban	4	18.2%	1	50%
Number of:	**Average Number**		**Average Number**	
Veterinarians	5.9		2.5	
Registered Veterinary Technicians	6.6		6	
Veterinary Assistants	3.2		1	

Table 9: Practice Settings with EHR Use

Knowledge of EHRs in Veterinary Medicine

Respondents were asked to rate their knowledge of EHRs in veterinary practices on a Likert-type scale of 1=Very Knowledgeable to 5=No knowledge. The majority of respondents indicated they were "somewhat knowledgeable" 41.6% (n=10), followed by "very knowledgeable" 20.9% (n=5), and "above average knowledgeable" 12.5% (n=3). While 8.3% (n=2) rated themselves as having no knowledge of EHRs (see Table 10). There were several EHRs that the respondents indicated using in their practices. A total of 22.7% (n=5) use Cornerstone, 22.7% (n=5) Intravet, 9% (n=2) ImproInfinity, 4.6% (n=1) Avimark, 4.6% (n=1) RX WORKS, 4.6% (n=1) Animal Intelligence, 4.6% (n=1) Humane Solution, 4.6% (n=1) VetStar, 4.6% (n=1) AVS, and 9% (n=2) no response.

Knowledge of EHRs	Frequency	Percentage
Very Knowledgeable	5	20.9%
Above Average Knowledge	3	12.5%
Somewhat Knowledgeable	10	41.6%
Very Little Knowledge	4	16.7%
No Knowledge	2	8.3%

Table 10: Knowledge of EHRs in Veterinary Medicine

Personal Characteristics

Of the 24 respondents, only 4% (n=1) was male and 96% (n=23) were female. The average age of the respondents was 37 years old with only one male slightly older (42 years old) than females (36 years old). Age ranged from 25 to 56. On average the respondents have been in practice for 12 years. Years in practice ranged from 0.5 to 31 years.

Personal Computer Experience

Of the respondents, 95.8% (n=23) indicated that they use a personal computer at home, of which 75% (n=18) use the Internet or e-mail several times a day (see Table 11). Of the respondents 61% (n=14) indicated having basic personal computer training, 34.3% (n=8) had training in their RVT academic program on how to use an EHR, and 4.7% (n=1) had training on how to purchase and manage EHR.

Computer use at home	**Frequency**	**Percentage**
Yes	23	95.8%
No	1	4.2%
Frequency of personal computer use		
Several times a day	18	75%
Daily	5	20.8%
Weekly	0	0%
Monthly	1	4.2%
Less than monthly/not at all	0	0%
Computer training (RVT academic program)		
Basic personal computer skills	14	61%
How to use an EHR	8	34.3%
Steps in purchasing an EHR	1	4.7%

Table 11: Personal Computer Experience and Usage

Chapter 5: Summary, Conclusions, and Recommendations

Summary

A total of 33 RVTs responded to the survey in the allotted timeframe; of which 24 were used for the data analysis. 2002 was the mean year of graduation from RVT programs. There were 39.1% (n=9) of respondents who had been practicing for 0-10 years, 56.5% (n=14) who had been practicing for 11-20 years, and 4.3% (n=1) who indicated practicing for 21+ years. Over half of the respondents have been practicing over 10 years. The average age of RVTs was 37. This data shows that the majority of the respondents have 10 + years of experience working in veterinary practices.

Based on the results of the survey, the perception of Ohio RVTs towards EHRs in the work place is overall positive. The RVTs that don't have experience using EHRs may rate their perceptions based on subjective ideas. There is, however, a potential of bias of survey respondents who were partial to using EHRs and therefore were more likely to respond to the survey. One trend noted was respondents over the age of 50 gave more negative responses than respondent under 50. This could be due to the lack of education and knowledge on computer usage in health care that is now being offered in Veterinary Technician academic programs.

Conclusion

Client and patient privacy along with medication errors were rated the lowest in the category of 'Positive Effects of EHRs in Veterinary Medicine' in this study. In regards to patient privacy, findings were consistent with Halamka, who suggest the goals of supported technologies with the right protocols is to build trust that information will be protected as it is shared and it is trust that enables and supports information-sharing efforts (Halamka, 2009, 388). Client and patient privacy is an important factor in EHRs and did raise concern by the RVTs in this study.

Medication errors were also rated low in the category of 'Positive Effects of EHRs in Veterinary Medicine' in this study. These findings are consistent with Kulhanek, who suggest new EHR implementation must be supported by precise training or an unprepared unit can contribute to patient-care errors, cause organizational turbulence, and impact a facility for months or years (Kulhanek, 2011, 25).

These findings are also consistent regard to the research done by Buntin, Burke, Hoaglin, and Blumenthal, which describes an EHR implementation that was, associated with an increase in patient care errors, including medication errors, procedure errors, and patient falls (Buntin, et al, 2011, 468).

Based on the results of the survey, the perception towards EHRs in the work place is overall positive. These findings are consistent with regard to the research done by Buntin, Burke, Hoaglin, and Blumenthal, in which a literature review of 92% of recent articles on HIT reached conclusions that were positive overall (Buntin, et al, 2011, 464).

Recommendations

This study contributes valuable information to the veterinary profession regarding the current use of EHRs in veterinary practices by RVTs in the State of Ohio since little is known about the usage and perception of EHRs by RVTs. This study serves as a basis for future research studies on current and future use of EHRs by RVTs in Ohio. Based on the response rate, it is recommended to replicate this study. The mailing list for this study was obtained by the OVMLB, which was not a good source for obtaining complete data on RVTs, since the information did not include email addresses.

It is recommended to electronically send the survey through web link, blog, SurveyMonkey, Facebook, or Twitter to obtain a higher response rate. Possible sources to obtain email addresses for RVTs may be professional organizations, such as, The Ohio Veterinary Medical Association or the National association of Veterinary Technicians of America. This may provide better sampling potential for future studies, however, it is not a requirement to join a professional organization and the membership list of RVTs may not be complete. For that reason, the OVMLB was chosen to obtain the mailing list of RVTs for the study.

If email addresses are unable to be located and the study is replicated as is, it is recommended to add an additional step to the data collection procedure. Mail the initial survey including an enclosed letter describing the study, its significance to the veterinary profession, detailed instructions on how to complete the survey, and a stamped addressed return envelope. At the end of two weeks, mail a reminder card to the survey recipients that did not respond to the survey, stating that the survey will be extended for an additional two weeks. At the end of two weeks, mail another complete survey to the

survey recipients that did not respond, stating that the survey will be extended for another two weeks. This gives the survey participants six weeks total to complete the survey and mail it back.

This study evaluated RVTs and EHRs and may serve as a basis for future studies. A suggestion for a future research study is to survey veterinary teaching hospitals and their prevalence and perceptions of EHRs. There are less than twenty veterinary teaching hospitals in the United States which would provide a higher probability of an increased response rate. Another approach would be to survey the RVT academic programs on their course work related to EHRs.

The RVT profession is growing and is expected to increase over the next decade. With the expansion of HIT, veterinary practices will switch to EHRs in the future to improve patient care, save time and money, and standardize the collection of patient data. As younger generations of RVTs enter the work force they will be highly involved in the EHR implementation process as EHRs become more prevalent in veterinary practice settings. As more RVT academic programs offer courses on EHRs, RVTs will develop their views, attitudes, and beliefs towards EHRs.

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Appendix A: Cover Letter and Consent Form

Dear Colleague,

My name is Katrina Fagan. I am a Registered Veterinary Technician working in Columbus, Ohio. I am conducting a statewide survey of Registered Veterinary Technicians investigating the prevalence and use of Electronic Health Records (EHRs) in veterinary practice. An EHR is comprised of many components that work together to capture, create, share, maintain, and store an accurate and complete patient health record. This survey study is being conducted to fulfill my thesis requirement to complete my Master of Science degree at The Ohio State University.

This study will contribute valuable information to the veterinary profession regarding the current use of EHRs in veterinary medicine. With the expansion of health information technology, it is anticipated that the use of EHRs will become more prevalent in veterinary practice settings. This study will provide valuable information since little is known regarding the current use of EHRs in practice.

Please complete and return the enclosed survey and signed consent form in the stamped return envelope by June 1st, 2014. The survey should take approximately 10 minutes to complete. Please be assured that your response will be held in strict confidence with survey results reported in the aggregate form only without reference to individuals or practices. The code number on the questionnaire will be used for mailing and follow up purposes only.

If you are interested in receiving a summary of the study results, please write your name and address in the space provided on the last page of the survey. If you have any questions regarding the study please feel free to contact me (614) 746-8716, fagan.59@osu.edu) or my advisor, Laurie Rinehart-Thompson (614)-292-3694, rinehart-thompso.1@osu.edu.

Thank you in advance for participating in this study. Your participation is greatly appreciated.

Sincerely,

Katrina Fagan, RHIA, RVT
Graduate Student
School of Health and
Rehabilitation Sciences

Laurie Rinehart-Thompson, JD, RHIA
Interim Director and Associate Professor
of Clinical Health and Rehabilitation
Sciences

The Ohio State University Consent to Participate in Research

Informed consent to participate in the statewide survey of Registered Veterinary Technicians investigating the prevalence and use of Electronic Health Records (EHRs) in veterinary practice. This study is being conducted by Laurie Rinehart-Thompson, JD, RHIA and Katrina Fagan, RHIA, RVT. This survey is expected to take about ten minutes to complete.

The purpose of this study is to investigate the perception of Ohio RVTs towards EHRs and to determine the current use of EHRs in veterinary practice. With the expansion of health information technology, it is anticipated that the use of EHRs will become more prevalent in veterinary practice settings. This study will provide valuable information to the veterinary profession since little is known regarding the current use of EHRs in practice.

Your responses to the survey will be held in the strictest confidence. No names or other information that could identify you as an individual will be collected on the survey itself. There is a very small risk of a breach of privacy. The confidentiality of information collected will be maintained until the project is completed then the records will be destroyed.

Participation is voluntary. You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

There are no specific benefits or reasonably foreseeable risks or discomforts to you as an individual based on completing the survey. You may choose to not do this survey at all. You may skip answering any questions that you do not want to answer.

If you would like to be entered into a drawing for a $25 gift card to Target for your participation, please indicate so on the survey. The odds of winning are 0.29%.

If you have any questions about your study participation, or if you feel you have been harmed by participation, you may telephone Laurie Rinehart-Thompson at 614-292-3694 or Katrina Fagan at 614-746-8716. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not of the research team, you may contact Sandra Meadows in the Ohio State University Office of Responsible Research Practices at 1-800-678-6251.

Signing the consent form

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form**.**

Printed name of subject	**Signature of subject**
	AM/PM
	Date and time

Investigator

I have explained the research to the participant before requesting the signature above. There are no blanks in this document. A copy of this form has been given to the participant.

Printed name of person obtaining consent	**Signature of person obtaining consent**
	AM/PM
	Date and time

Appendix B: Survey

Survey of Ohio Registered Veterinary Technicians and Electronic Health Records

Instructions
This survey asks about factors related to the use of certain computer technology, particularly electronic health records (EHRs; also called electronic medical records) in your practice. All responses are private and confidential. Results will be analyzed only in the aggregate and individual responses will not be reported.

Section I. Practice Characteristics

1. Do you currently work in a veterinary practice?

1	Yes (If ***"Yes"*** then continue to question number ***#2***)
2	No (If **"No",** you are finished with this survey. Thank you for your time!

2. How would you describe the practice environment in which you spend the majority of your time? (Please circle one)

1	Small Animal
2	Equine
3	Farm Animal
4	Mixed
5	Other (Specify)_____

3. How would you describe the practice setting you work in? (Please circle one)

1	General
2	Ambulatory
3	Emergency
4	University
5	Specialty

4. In what specialty do you work in? Example) cardiology, behavioral, oncology etc. (if any):
_____

5. How many full and part-time veterinarians, technicians, and/or assistants work at your practice?
_____Veterinarians
_____Veterinary Technicians
_____Veterinary Assistants

6. Please **estimate** the number of patients you see in a **typical week** in this practice.
_____Patients

7. Please **estimate** the **<u>total number</u>** of patient visits in a **typical week** in this practice.

_____Visits

8. Select the number that best describes the population of the city where you practice? (Please circle one)

1	<5,000
2	5,001-25,000
3	25,001-100,000
4	100,001-200,000
5	> 200,001

9. How would you classify your primary practice location? (Please circle one)

1	Rural (<2,500)
2	Suburban (2,500-50,000)
3	Urban (>50,000)

10. Overall, how satisfied are you with your current practice situation (Please circle one)

5	Very satisfied
4	Satisfied
3	Somewhat satisfied
2	Dissatisfied
1	Very dissatisfied

Section II. Health Information Technology

11. Does the practice have components of any electronic health record (EHR), that is, integrated clinical information system that tracks patient health data, and may include such functions as visit notes, prescriptions, lab orders, etc?

1	Yes (If ***"Yes",*** what is the name of the EHR vendor or product that you use?) _____. Then skip to number ***#14*** and continue)
2	No (*If* ***"No",*** *please* ***answer #12 and 13*** *then* ***SKIP to Question #18***)

If you don't have an EHR answer questions 12-13

12. How interested are you in having the practice implement an EHR? (Please circle one)

5	Extremely interested
4	Interested
3	Somewhat interested
2	Not interested
1	No opinion

13. When does the practice plan to implement an EHR? (Please circle one)

1	Within the next 12 months
2	Within the next 1-2 years
3	Within the next 3-5 years
4	No specific plans; unknown

If using an EHR start at question 14

14. How long has the practice been using an EHR? _____(years)/ _____ (months) **or *circle****:* Don't Know?

15. How would you rate your experience using an EHR in your practice? (Please circle one)

5	Very Positive
4	Positive
3	Somewhat negative
2	Very negative
1	No effect

If you answered somewhat negative to no effect please explain why._____

16. How are medication prescriptions generated in your office? (Please circle one)

1	Computerized, with decision support (e.g., drug interaction alerts)
2	Computerized, no decision support
3	Handwritten
4	Other:_____

17. Please indicate all **features of the EHR** that are **available** in the practice. THEN, for those features, indicate the extent to which **you use** them: *(Circle **one** choice for each item; Available and Use)*

	Available			***Use***		
Features of your EHR	Yes	No	Don't Know	I Do Not Use	I Use Some of the Time	I Use Most of the Time
a.) Laboratory test results	1	2	3	1	2	3
b.) Laboratory order entry	1	2	3	1	2	3
c.) Radiology tests results	1	2	3	1	2	3
d.) Radiology order entry	1	2	3	1	2	3
e.) Electronic visit notes	1	2	3	1	2	3
f.) Reminders for care activities (e.g. overdue health wellness)	1	2	3	1	2	3
g.) Electronic medication list for each patient	1	2	3	1	2	3
h.) Electronic problem list	1	2	3	1	2	3
i.) Can transmit prescriptions to pharmacy electronically or via electronic faxing	1	2	3	1	2	3
j.) Electronic referrals or clinical messaging (secure e-mailing between providers)	1	2	3	1	2	3
k.) Client portal	1	2	3	1	2	3
l.) Other (Specify)_____	1	2	3	1	2	3

Section III. Personal Computer Experience

18. Do you use a computer at home? (Please circle one)

1	Yes
2	No

19. How often do you use the Internet for personal and/or professional use, including e-mail from home, work, or another location? (Please circle one)

1	Several times a day
2	Daily
3	Weekly
4	Monthly
5	Less than monthly or not at all

20. Did your RVT academic program require coursework in any of the following content areas: (Please circle all that apply)

1	Basic personal computer skills
2	How to use an EHR
3	Steps in purchasing products to manage Health Information Technology (HIT)? (HIT)-used to manage health information in a digital format

21. How would you rate your knowledge of EHRs in veterinary practices? (Please circle one)

1	Very Knowledgeable
2	Above Average Knowledge
3	Somewhat Knowledgeable
4	Very Little Knowledge
5	No Knowledge

Section IV: Computers and Veterinary Medicine

22. Please rate your perception of the effect computers in veterinary medicine have on the following: (Please circle one number for each item a.-h.)

Effect of computers on…	Positive	Negative	No effect	No opinion
a.) Controlling costs of veterinary medicine	4	3	2	1
b.) Quality of care	4	3	2	1
c.) Interactions within the veterinary care team	4	3	2	1
d.) Client-veterinary communication	4	3	2	1
e.) Client and patient privacy	4	3	2	1
f). Veterinarians' access to up-to-date knowledge	4	3	2	1
g.) Efficiency of providing care	4	3	2	1
h.) Medication errors	4	3	2	1

Section V: Personal Characteristics

23. In what year did you graduate from your Veterinary Technician Program? _____

24. What is your current age? _____ years

25. How many years have you been actively practicing as a RVT? _____years

26. Are you? (Please circle one)

1	Male
2	Female

Please feel free to add any additional comments (i.e., use of EHRs by Veterinary Technicians, education in use of EHRS, etc.)

_____
_____
_____

If you would like a summary of the study results please list your name, address or e-mail address below. If you would also like to be entered into a drawing for a $25 gift card to Target for your participation in the survey please check here _____.

Please return the completed survey in the stamped return envelope.

Thank you for your time and effort
Katrina Fagan, RHIA, RVT