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An Overview of Clinical Trials with the Integration and Introduction of an Electronic-Based Records System

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Abstract

Currently the Office of Clinical Trials (OCT) at the University of North Texas Health Science Center relies on a paper-based records retention system. Conversion to an electronic-based records system will decrease data misplacement, improve study communication, and provide a firm foundation for file organization. In compliance with FDA regulations and OCT's standard operating procedures, a shared drive was created for the retention of clinical records. Regulatory binders, patient records, study related source documents and protocols will be scanned and organized into folders and saved to in an organized system on the shared drive. The one-terabyte shared drive is backed up daily to maintain record accountability. In addition to the implementation of electronic record storage during my internship, I also saw subjects, entered data, organized records, and other site specific tasks.

**AN OVERVIEW OF CLINICAL TRIALS WITH THE INTEGRATION AND
INTRODUCTION OF AN ELECTRONIC-BASED RECORDS SYSTEM**

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**AN OVERVIEW OF CLINICAL TRIALS WITH THE INTEGRATION AND
INTRODUCTION OF AN ELECTRONIC-BASED RECORDS SYSTEM**

Internship Practicum Report

Presented to the Graduate Council of the

Graduate School of Biomedical Sciences

University of North Texas

Health Science Center at Fort Worth

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

IN CLINICAL RESEARCH MANAGEMENT

By

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Fort Worth, Texas

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CHAPTER 1

INTRODUCTION

The purpose of clinical trials is to determine the safety and efficacy of either a new or existing drug or device ¹. There are four different phases of clinical trials following the preclinical phase, which includes non-human testing to determine toxicology and pharmacokinetic information ². The focus of phase 1 studies is to determine the safety of a new investigational product. Sample sizes for these studies are small and generally enroll healthy individuals to examine the safety of the product. After completion of a phase 1 study, the product has the opportunity to proceed to phase 2 trials. Phase 2 trials enroll a larger sample size at multiple research sites. Since subjects of phase 2 trials are individuals that could possibly benefit from the investigational product, known as the target population, researchers can focus on the efficacy as well as the safety of the product being tested.

The Office of Clinical Trials (OCT) at UNTHSC primarily conducts phase 3 trials. These trials tend to have a large sample size and are conducted at multiple research sites. Many research trials are performed on a global scale to gather the most information about the investigational product. Phase 3 trials provide researchers with a risk-benefit analysis of the product to determine whether the product should proceed to phase 4, also called post-market research ². The main purpose of phase 4 research is to understand additional risk-benefit and safety information after the product passes the previous phases and enters the market. For this reason, clinical research can continue for years after the product is available to consumers.

There are three main parties involved in conducting a clinical research trial: the sponsor, the investigational site, and the institutional review board (IRB). The sponsor, typically a

company specializing in the production of drugs and devices, is responsible for the proper monitoring of the investigational site as well as ensuring proper regulations and protocols are followed³. Monitors are appointed by the sponsors, either directly or through a clinical research organization (CRO), and visit the investigational site to ensure drug accountability, research protocol is followed, and data is stored properly⁴. A monitor is also responsible for making sure that the research site is following GCP guidelines by checking the integrity of the data and making sure regulations are followed.

At the investigational site, a principal investigator (PI) is responsible for properly conducting the study as per the sponsor's protocol and is considered the leader of the research team⁴. PIs need to be familiar with the investigational product in order to recommend subjects to enter the study and monitor subjects throughout the study. PIs are also responsible for being present during meetings with sponsor representatives, such as investigational meetings, site selection visits, and site initiation visits.

During subject recruitment, the PI can advise subjects to meet with clinical research coordinators. These coordinators are responsible for subject recruitment, obtaining informed consent, completion of study visits, and act as a liaison between the PI and the monitor. In addition, clinical research coordinators oversee the organization of a study's budget, the entering of data into eCRF, and the conduction of study procedures for the entirety of the study. The coordinators are also in charge of study procedures, such as obtaining vitals, drawing blood, gathering patient information, and providing patients with study related information.

Although the study-related research is a continuous exchange between the sponsor and the investigational site, there needs to be an unbiased third party to ensure the welfare and rights of all human subjects. The IRB provides ethical oversight for all studies being conducted at the

investigational site⁵. The IRB for the OCT is a part of the UNTHSC and is comprised of representatives from both the scientific and non-scientific communities to ensure that study risks are minimized and benefits are maximized. The IRB needs to approve study procedures before research can begin and are kept informed of any study amendments, protocol deviations, adverse events, serious adverse events, and suspected unexpected serious adverse reactions (SUSARs) during the study.

LITERATURE REVIEW & BACKGROUND

Retaining medical records in a physician's office is a critical aspect of giving patients top quality care. Patient records contain information such as family history, known allergies, previous surgeries and examination, etc. Just as medical records aid physicians in treating their patients, clinical research trials rely on sponsor's protocols, data obtained from subjects, guidelines from the FDA and other regulatory agencies, budgets, product accountability, and source documentation (source document template seen in Appendix B)⁴.

Even though subject records and research protocols are highly important to a study, there is some debate about how these records should be collected and stored⁶. Currently the UNTHSC OCT uses a paper-based charting system to retrieve and store all specific documentation of a study. A paper-based records system does have its advantages compared to an electronic-based records system. The main benefit of paper-based records system that personnel do not need to have any technical training or electronic hardware⁷. In addition, some regulatory agencies require paper documentation to include paperwork with 'wet ink' signatures.

A fear of transferring data to an electronic system is that there may be a loss of individualistic record keeping style⁷. On the other hand, the exchange of individualism for

standardization may benefit a clinical research site as a whole ⁸. In the transfer of records between one clinical researcher to a physician, monitor, or other clinical research staff member, standardization would reduce document misplacement, duplication, and inaccuracy.

It was not until the late 1960's, with the advent of Problem-Oriented Medical Record and the SOAP (Subjective, Objective, Assessment and Plan) charting structure, that electronic records really began to take shape in the United States ⁹. This structured charting style allowed for a unified method of creating patient charts which could easily be converted into a standard electronic record. With the rate of EHR (electronic health records) nearly doubling in the past five years, there is an expectation that clinical research sites should keep up with the technologically progressive nature of the medical field ¹⁰.

Past studies have shown that the benefits of an electronic-based records system greatly outweigh the cost ⁶. One of the greatest benefits of using EHR is the potential for monetary savings that can be attributed to cost reduction in supplies, storage, and time management ⁶. A comparison of health information technology with other industries use of electronic systems performed by Hillestad et al., showed an annual savings of \$81 billion ¹¹. Even though this study has extrapolated savings based on a nationwide improvement of health care efficiency and safety, the study highlights the economic value of electronic records.

Following the trend of different areas of healthcare, clinical research sites should strive to use electronic records to improve cost, organization, and file accuracy. The benefits of converting a clinical research site from paper-based records to electronic-based records are well documented with very little documented opposition and disadvantages ⁶.

CHAPTER 2

SPECIFIC AIMS

The combination of regulatory binders, patient records, and the copious amount of paperwork associated with one study, later discussed in Chapter 4, can be overwhelming both in terms of storage needs and data management. Keeping paperwork organized is made more difficult by the need to share the information with other research coordinators, physicians, sponsors, and site monitors.

Currently, the OCT uses hard copies of all significant records, which not only must be kept for the duration of the study, but also for two years or longer after a study's completion in order to comply with Federal regulation 45 CFR 46.115(b)¹². During the first weeks of my internship, I was given the task to sort through cabinets storing records of old studies performed by various researchers in order to make space for new studies. The time and storage cost associated with sorting through the old studies could have been easily avoided by using an electronic-based record system, rather than a paper-based record system.

I was also introduced to site monitors, who are tasked with sorting through study relevant paperwork kept at a clinical research site. Site monitors are responsible for the integrity of the sites data and checking that the on-site records match the reports given to the sponsor. Having an electronic-based record system that provides documentation in an organized and searchable format would allow for a more efficient monitoring process. This electronic based record system would also reduce the risk of site errors produced from lost/misplaced documentation and increase overall site productivity and, hopefully, good clinical practice. The specific aim of this

practicum project is to implement an organizational system in which the OCT can convert their paper-based records into electronic-based records.

SIGNIFICANCE

According to the CDC, only 18.1% of physicians used an electronic health records (EHR) system in 2001¹⁰. By 2013, 78.4% of office based physicians used a form of EHR, as seen in Figure 1. Electronic records will soon be the only form of data storage due to their many advantages to hard-copy storage. Electronic records will provide the OCT with efficiency, cost savings and a more effective data management. By updating the OCT systems UNTHSC with the current trends of clinical research, research methods can stay relevant in addition to a reduction in documentation misplacement and an increase in good clinical practice.

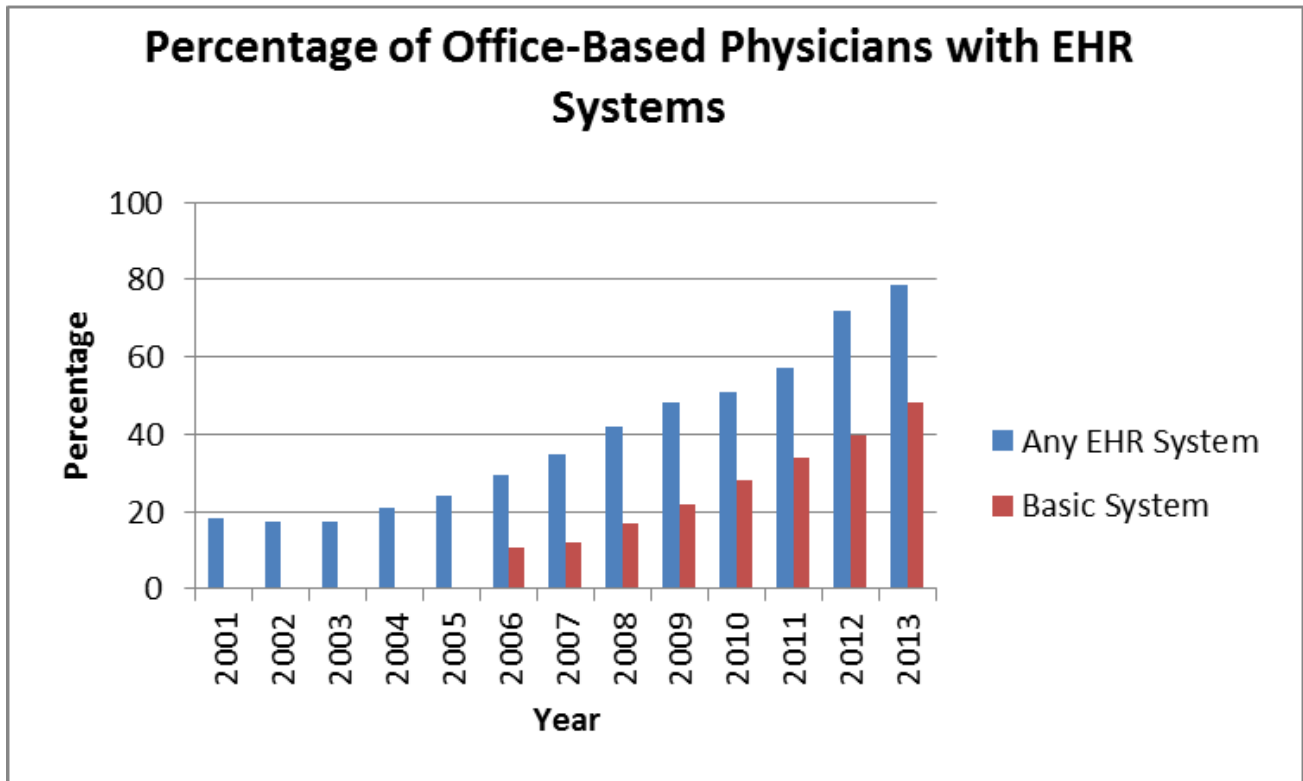


Figure 1: Percentage of office-based physicians with EHR systems: United States, 2001-2013¹⁰

CHAPTER 3

MATERIALS & METHODS

To initiate the process of converting paper data to electronic data an electronic storage location has to be created. For example, a shared drive is a storage space that is set up through an organization's shared server that allows for different users in different locations to store data in a common location. The protocol for creating a shared folder can be found on the Microsoft website or created by a site's Information Technology (IT) department¹³. UNTHSC's IT department backs-up the OCT's one-terabyte shared drive daily to ensure data is preserved in the event of a system wide failure.

After a shared drive is established, folders for each study coordinator are created. Nested within the coordinators folder are subfolders for each study that the coordinator is overseeing. Each coordinator may want to structure their individual folders differently, but key documents must be included. Figure 2 is a template of a nesting tree to help coordinators with file organization. There are three subcategories under each study including Regulatory, Clinical Trial Agreement (CTA)/Budget, and Subjects that lay the foundation for the study's organization.

Once the organizational format is created, the coordinator will have a few options for scanning documentation onto the shared drive. A coordinator can manually scan in the documents and organize them into the predesigned folders. This will give the coordinator full control and knowledge about where all the documentation is being stored. However, the process of manually scanning is very time consuming. A second option is for a coordinator to request from the sponsor and IRB to have documentation sent to them electronically. This method eliminates the time-consuming scanning process. Following the initial scanning, the research coordinator would be responsible for the upkeep of electronic documentation, including updating

signature logs, maintaining current protocol amendments, adding new relevant information provided by the sponsor.

This process can be repeated for new studies and even performed for old studies to reduce the storage of paper documentation within the clinical research site.

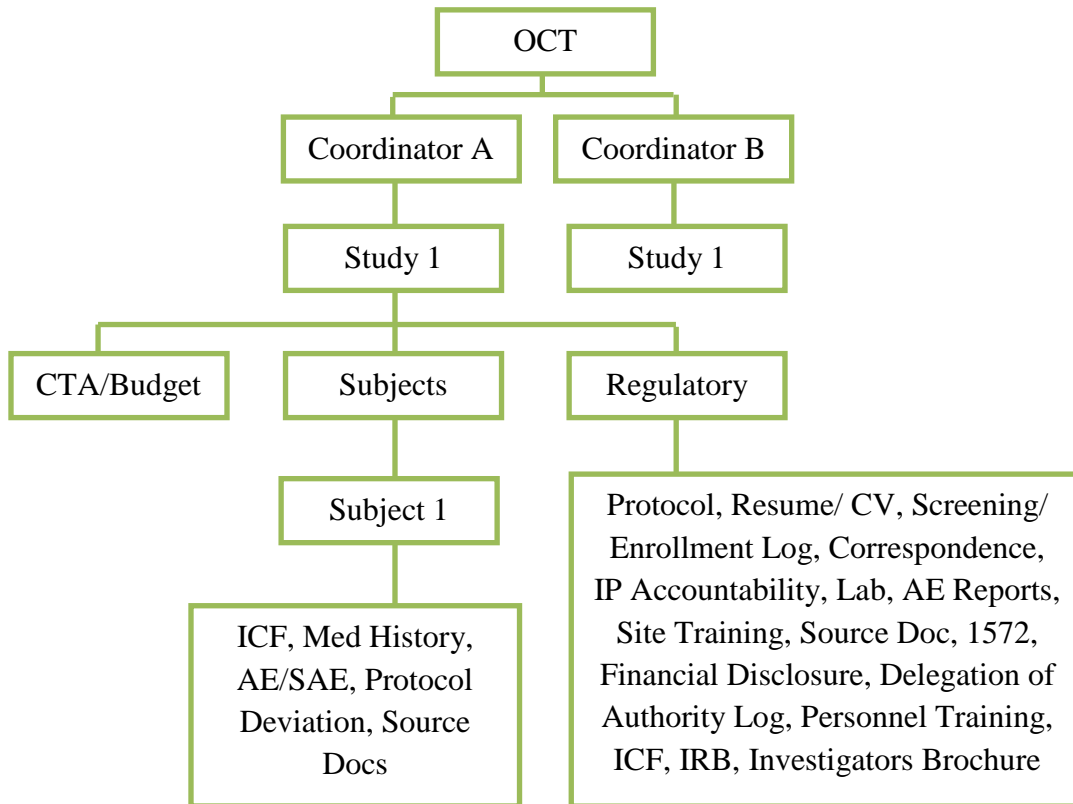


Figure 2: A nesting tree depicting how the Office of Clinical Trials could divide their shared drive. The commas represent folder separation within a subcategory.

*Abbreviations: CTA- clinical trial agreement, ICF- informed consent form, AE/SAE- adverse event/severe adverse event, IP- investigational product, IRB- institutional review board

CHAPTER 4

RESULTS & DISCUSSION

The division of each study folder (Regulatory, CTA/Budget, and Subjects) outlines the types of documentation stored at a clinical research site during a study. Whereas all the documentation at a research site can be stored electronically, there are a few documents that require paper storage due to the necessity of a ‘wet ink’ signature on select documents. The OCT at UNTHSC has a standard operating procedure that provides the following guidelines for electronic document storage: records must be kept on a closed system, meet the requirements of the Food and Drug Administration (FDA) regulations in Title 21 CFR 11, and records must utilize an audit trail ¹⁴. The audit trail must include the date the document is created and the date it is modified. The OCT shared drive meets all of these criteria, however the standard operating procedures should be updated to specifically mention the shared drive. The following outlines how folders should be structured and the importance of the documentation found in each.

CTA & Budget

Budget: It is important for a clinical research site to negotiate a budget with a sponsor so that all the study’s expenses will be covered. The clinical research coordinator can work alongside the research site’s financial department to predict the cost of a future study based on the study’s protocol. An example of a budget template used at the OCT at UNTHSC is provided in Appendix C.

CTA: A CTA (Clinical Trial Agreement) is a legal contract between the sponsor and the clinical research site that outlines both parties’ study obligations, risk, and funds. The CTA also sets the terms of confidentiality, publications and patents. At the OCT it is the responsibility of

upper management to review the CTA and send it to an attorney for approval. The PI and coordinator both have access to the CTA and are in constant communication with the OCT management. The CTA does not need IRB approval and can be stored electronically.

Regulatory Folder

AE/SAE: (Adverse Events/Severe Adverse Events) During a clinical investigation, subjects may experience an unintended medical event that may or may not have be related to the investigational product ¹⁵. Severe adverse events (SAEs) are defined as AEs that are fatal, life-threatening, leads to hospitalization, or leads to a disability. SAEs must be reported to the IRB within 24 hours of the event and reported to the sponsor within 10 days ¹⁶.

It is important for the clinical coordinator to maintain AE/SAE documentation on case report forms (CRF). If there is determined to be a causal relation between the investigational product and the event, the study will need to be reevaluated to maintain the safety of subjects. The CRF can be stored electronically on the shared drive as long as the sponsor and IRB are still notified promptly and site specific standard operating procedures are followed.

Correspondence: The duration of a clinical trial can range from months to years, depending on the type of study. Before the study starts, during the study and even after a study, the clinical research coordinator is constantly in communication with the sponsor, the CRO, monitor, labs, radiology and other collaborators. Monitoring reports, emails, confirmation letters, documentation of site-selection visits, and study close out visit logs should all be stored at a clinical research site under the category of study correspondence ¹⁷. Because all communications can be stored electronically, the amount of paper data stored at a research site will be significantly reduced ¹⁴.

Delegation of Authority Log: To ensure that every member of the clinical research team is aware of study-related tasks, the Delegation of Authority Log describes the responsibilities of each study member. Study-specific tasks are assigned by the PI and agreed upon by the research team. The form can also serve as a signature log for the duration of the study. Because the Delegation of Authority Log can be modified for new staff members entering the study and requires a signature, a ‘wet ink’ copy must be kept onsite during the study. A study coordinator may scan the log onto the shared drive for personal record keeping, but the original must be stored as well.

FDA Form 1572: (Statement of Investigator) When a PI signs a Statement of Investigator, he/she is agreeing to follow the regulations for clinical research outlined by the FDA. By agreeing to follow FDA regulation, the PI is also agreeing to conduct research that is ethical and scientifically sound. The PI acknowledges that he/she has the proper background to conduct the study¹⁸. The form can be scanned and stored electronically after the PI’s signature is obtained, but the original paper copy will need to be stored throughout the study.

Financial Disclosure: Under 21 CFR 54, clinical investigators are required by law to disclose any significant financial interest in the study. Significant financial interest is defined by the FDA as receiving payments from the sponsor of more than \$25,000 that could create a sense of obligation or holding equity interest in a sponsor over \$50,000¹⁹. Having a significant financial interest in study does not exclude the clinical investigator from the study, they are simply required to disclose their financial interest. If there are financial interests, a copy of Form FDA 3455 can be stored on the electronic database.

Informed Consent Form: Informed consent is a process to inform subjects about the purpose of the study, including the risk and benefits. According to 21 CFR 50.20, the informed

consent form (ICF) must outline alternative procedures, confidentiality, compensation, and convey an understanding that the research is completely voluntary. An investigator may not involve a subject in a trial without first going through the process of informed consent.

The consent form must be carefully designed to give the patient the most information to make an informed decision about enrolling in the study. The IRB is responsible for eliminating coercive language and making sure the ICF is understandable to subjects. The IRB's edited copy of the ICF should be dated and given a verification stamp by the IRB. This original copy must be stored on site for the duration of the study, but it can also be scanned onto the shared drive for the coordinators records and further distribution.

New ICFs can also be introduced to an ongoing study. One reason a new consent form may be required is because there is new information about the investigational product that is pertinent for the subject to make an informed decision. These new consents must also be approved by the IRB and stored for the duration of the study.

Investigational Product Accountability: It is critical that detailed records about distribution of an investigational product (IP) be maintained at a clinical research site. The information on an IP Accountability log may differ from study to study depending on the sponsor's requirements. The coordinator is also responsible for recording the date that the IP is dispensed. These records can be maintained on the shared drive as long as they are updated daily.

Other logs related to drug storage can also be place under this folder. For example, a log must be kept for the temperature ranges where drug is stored, a log must be kept for drug monitoring, and a log must be created when excess or outdate drug needs to be destroyed.

Institutional Review Board: The institutional review board (IRB) reviews studies to ensure that patient welfare and rights are upheld throughout a study. There is a continuous dialog

between the IRB and coordinators that must be recorded and stored within a clinical research site. The IRB reviews documentation such as protocol amendments, continuing reviews, correspondences, initial study applications, protocol violations, and reportable new information.

An initial study application is necessary to start a new study. This is the first time that the IRB reviews the study to determine if the study is both ethical and humane. Research on human subjects cannot begin until the IRB has approved the study. Once approved, study protocols are often amended by the sponsor throughout clinical trial. Each amendment must be submitted for IRB approval to ensure that the study is still safe and ethical. All of these amendments and initial application can be stored on the shared drive.

Research that was previously approved by the IRB must be constantly reviewed by the IRB to protect the safety and welfare of the subjects. The FDA requires that a study be reviewed at least yearly. Depending on the type of research, however, a study may be reviewed as often as the IRB meets. At UNTHSC continuing reviews can be required annually or biannually. Continuing review forms can easily be stored electronically.

Investigator's Brochure: Since the trials conducted at the OCT are phase 3 trials, there is previous data on the investigational product that needs to be included in the regulatory folder of a study. The Investigator's Brochure (IB) is a collection of all the clinical data on the product being researched including: its purpose, safety, efficacy, methods of administration, frequency of dosing, physical and chemical properties, adverse reactions, and previous pharmacological data from past human subjects. This section typically requires the most space in the regulatory binder. Moving the IB to an electronic platform will significantly reduce the amount of paper documentation included in a study. Depending on approval from the sponsor's standard

operating procedures, a digital copy of the IB can be sent to the research coordinator directly in place of the paper documentation.

Laboratory Certifications: In research that requires the use of an in-house laboratory reporting, laboratory certification must be kept and updated through the duration of the study. Such certification includes a Clinical Laboratory Improvement Act (CLIA) certification and records of participation in the College of American Pathologists (CAP) Laboratory Accreditation Program. Along with the CLIA and the CAP, a copy of the lab director's CV should be kept on file. Some sponsors also require that normal lab references are stored in this section as well. All laboratory certification can be stored electronically as long as it is updated in as soon as new information is available.

Monitoring Log: To ensure that a clinical research site is following study specific protocol, the sponsor will send a monitor to verify the site's compliance. Every time a monitor visits, documentation of their visit must be recorded. Monitoring records that can be stored on the shared drive may include monitor sign-in logs.

Personnel Training: All key personnel should have adequate training documentation for each study in addition to the qualifications enumerated in their CVs. In addition, many IRBs, including UNTHSC's, will require that all researchers be good clinical practice (GCP) certified. Sponsors may use online training sites to prepare PIs and study coordinators for their roles in the study. Some training may review enrollment criteria, whereas other training may provide certification on entering data to sponsor websites. Clinical research sites require International Air Transport Association (IATA) training for any study that ships biohazardous material to ensure proper shipping methods are taken. Each certification will be saved on the shared drive and accessible to the site monitor with this new system of electronic storage.

Protocol: The protocol is one of the longest portions of a coordinator's regulatory binder. The protocol gives a detailed background and rationale highlighting the importance of the study and its experimental procedure. Along with the study's objectives, the protocol will also identify the potential risk and benefits of the clinical trial. The study design will outline the inclusion and exclusion factors as well as treatment procedures.

Once a sponsor sends the protocol to either the PI or the research coordinator, the PI must approve and agree to be a part of the study. A PI should consider his/her patient population, available equipment and proper training before agreeing to be part of a study. If the PI is willing to join the study, the coordinator must get the protocol, consent forms, and the initial application approved by the IRB. For a protocol to be approved by UNTHSC's IRB it must include a risk/benefits analysis, description of the study population, terms of financial compensation, and a list of key personnel with their qualifications²⁰. After approval, the protocol, with PI signature and IRB approval date, can be scanned onto the shared drive.

Resume/ CV: A resume should be collected from each member of the research team, including the PI, to assure the sponsor that everyone conducting the study is qualified. The resumes or CVs need to be signed and dated by the research members before being given to the coordinator. These signed copies are already stored electronically and updated every two years or more frequently to include new studies. However, a coordinator should organize CVs under their study within the shared drive.

Screening/Enrollment Log: Every subject that is a part of the study, including those potential subjects screened from participation, should be recorded. On the Screening/Enrollment Log, subjects should be referred to using an ID number without any other personal identifying

information. The date of the consent and the consent version should also be recorded along with the screening date. The log can be stored and updated electronically via the shared drive.

Subject Folder

Concomitant Medication: A concomitant medication (Con. Med.) is any drug that is taken during clinical research other than the study medication. A list of current medications should be collected at the very beginning of a clinical trial, usually during the screening phase. It is important to have an accurate and complete list of medications to make sure that there are no drug interactions with the IP. Since the Con. Med. list is constantly being updated at every study visit, it is difficult to maintain an electronic record. During storage on the OCT shared drive, a subject's medication, dose, and indication needs to be updated constantly. Since Con. Meds. are continuously updated, it may be easier for a coordinator to keep a paper record and wait until the end of the study to update the shared drive.

Source Document: A source document is a series of questions provided by the sponsor to ensure all study related information is collected from the subject (blood work, vitals, study specific questionnaires, etc.). The source document ensures that the coordinator does not omit any steps enumerated in the protocol. If source documents are not provided by the sponsor, the research coordinator can create their own forms using the study's protocol. Since no study is exactly the same, each source document must be tailored for to provide study specific information. However, source documents may have a similar format from which a template form can be created. An example of a source document template can be seen in Appendix B. These forms can be saved on the shared drive.

Informed Consent Form: Subjects are given a copy of the IRB-approved ICF to read and sign. After the informed consent process is completed and the subject agrees to participate, the subject is given a copy of the signed ICF and the coordinator keeps the original signed document. The coordinator can make an electronic copy of the subjects ICF. However, an original ‘wet ink’ copy must be stored on site for the duration of the study.

Medical History: A full medical history is critical for determining whether or not a subject will be a candidate for a clinical research trial. Medical history is collected directly from the subject and requested from the subject’s primary care physician. Because medical records need to be maintained throughout the study for each subject, paper-based record keeping require substantial physical storage space. Most medical records can be transferred electronically and moved directly into OCT’s shared drive.

Protocol Deviation: If at any point the study procedures are not followed according to the sponsor’s protocol, a coordinator needs to report the event via the Protocol Deviation form. There are four deviation categories: Safety, Informed Consent, Eligibility, and Protocol Implement. A safety deviation typically includes AE/SAE not being reported in a timely manner and may also include the omission of a required laboratory test. Informed consent deviations include failure to obtain consent before the start of the study or using an outdated consent form. If a subject is ineligible to participate in the study, but is enrolled in the study an enrollment deviation needs to be recorded. Finally a protocol implementation deviation implies a missed visit/assessment, failure update IRB approval, a patient is seen outside of their visit window or is given the wrong treatment. These deviations need to be reported to the sponsor and IRB, and can be stored electronically for the coordinator’s records.

SUMMARY

The UNTHSC Offices of Clinical Trials currently relies on a paper-based records retention system. Each clinical research coordinator has a slight variation or preference in how they store and maintain records that pertain to their individual studies. Although these differences in organization of studies meet all of the requirements of FDA regulation, it is a challenge to compare records of different coordinators and physicians.

While seeing subjects, entering data, organizing records, and other site specific tasks for my internship, I also created a shared drive for the electronic storage of research documentation. The creation of a secure shared drive for the Office of Clinical Trials (OCT) that is routinely backed-up provides the clinical research site with an efficient way to organize and share study related material. Regulatory binders, patient records, study related source documents and protocols will be scanned and organized into folders accessible through the shared drive.

LIMITATIONS

One of the main limitations associated with this project was the time constraint place by the length of the internship. It would be advantageous to understand how an electronic-based records system will affect the site during a longer time span for follow-up analysis. This would allow for a more in depth cost analysis as well as an understanding of long term efficiency.

Another limitation is the requirement for study-specific paper documentations because of regulation requiring ‘wet ink’ signatures. Because the OCT does not use electronic signatures, most documentation needs to be printed, signed, and scanned back into the electronic database. Hopefully in the future, the OCT will incorporate electronic signatures with this electronic database to increase productivity and efficiency.

FUTURE ELECTRONIC DATA INTEGRATION

The integration of electronic data storage in clinical research is a great jumping off point for further improvements to the OCT's record retention and review. For example, with the completion of storing a study on UNTHSC's private network a VPN (virtual private network) can be established with the study's monitor. The VPN will give the monitor selective access to the OCT network folders remotely. Remote access will allow for the monitor to inspect a study's progression without having to be at the clinical research site. A VPN will save the clinical researcher time and allow for a quicker response to monitor concerns.

Secondly, electronic signatures can be incorporated in the OCT. According to 21 CFR 11.2 "persons may use electronic records in lieu of paper records or electronic signatures in lieu of traditional signatures"²¹. While the OCT is centered in UNTHSC's Patient Care Center, some studies take place off-site either due to PI clinic locations or the availability of resources. Proper documentation maintenance is greatly hindered by the physical separation of PI and clinical research coordinator. However with electronic signatures, information can be sent digitally to a PI and returned to a clinical research coordinator with verification of PI review.

CHAPTER 5

INTERNSHIP SITE

The Office of Clinical Trials (OCT) is located in the Patient Care Center and reports directly to the dean of Texas College of Medicine (TCOM). Working closely with TCOM and UNTHSC's IRB allows for the OCT to conduct more than 20 industry sponsored clinical trials each year (http://web.unthsc.edu/info/200877/patient_care/3039/clinical_trials). The site has eight clinical research coordinators that perform studies ranging from pediatrics to Alzheimer's research. Working closely with April Bell, one of the clinical research coordinators at the OCT, our research focused on cardiac and diabetic foot ulcer studies.

JOURNAL SUMMARY

The OCT is located in the UNTHSC Patient Care Center, which is where the majority of the offices cardiac studies take place. Research is also conducted offsite at Ben Hogan Sports Therapy Institute on subjects enrolled in diabetic foot ulcer studies. Tasks associated with the internship included seeing subjects at both sites alongside clinical research coordinators and physicians. After visits, I was responsible for entering data into study specific databases (Medidata, Merge CTS, Datatrack, Bracket) and the processing of blood samples if necessary. I was also responsible for creating and organizing subject binders, sorting through old studies to prepare them for long-term storage, and ordering study-specific materials.

I have also had the opportunity to participate in IRB meetings, site initiation meetings, and study conference calls. Since the OCT had multiple ongoing trials, I was able to see studies at their beginnings and other studies at their endings.

APPENDIX A:
INTERNSHIP JOURNAL

Week 1

June 2, 2014

My internship is with the UNTHSC's Office of Clinical Trials under direct supervision of the site mentor April Bell. As for the first day, I was given a tour of the site and introduced to the staff members, including the PIs of currently running research trials. I was also introduced to the types of clinical research that take place at UNTHSC. The two ongoing research studies that are taking place in the OCT are a cardiology investigational drug study called Odyssey and a study named Oasis whose primary focus is on patients with diabetic foot ulcers.

In the afternoon, we met with a patient that was placed on the Odyssey study. As the study protocol indicated we drew blood that was later shipped offsite as well as updating the patient's medical records in case of an unreported adverse event.

June 3, 2014

The morning was started with a budget meeting, where we discussed itemization of a studies invoice to send to the sponsor. Following that meeting, we went to the committee meeting I had setup to discuss the research I would be conducting for the next six months. Due to the time constraints of the CRM program I decided to peruse a problem-based project rather than a hypothesis-based project. I hope to transition the OCT from a paper data system to more of an electronic system in order to increase efficiency and decrease cost.

After the committee meeting, we went to the Ben Hogan Sports Therapy Institute where studies pertaining to patients with diabetic foot ulcers are conducted. Following our trip, we attended an IRB meeting for the approval of the Commander study. I was able to see how an IRB meeting was run and the first steps of getting study approval.

June 4, 2014

Most of the morning was spent completing IATA training. The training provided procedural information about shipping biological items safely and appropriately. Following the completion of my training, I was able to sit in on a conference call about updates being made to the Commander protocol. It was very interesting to hear other sites concerns about the study and really provided prospective about the size of the study.

June 5, 2014

We started the morning at Ben Hogan to perform follow up procedures on patients who were on the Oasis (diabetic foot) study. We inspected the wound and used a camera to record the size of the ulcer (area, width, depth). Following the data collection, we redressed the wound after the application of the investigational drug. Each patient was made to fill out a study related questionnaire as provided by the study's protocol.

Week 2

June 9, 2014

We started the morning with a meeting to revise protocol relating to how the Office of Clinical Trials handles storage and disposal of investigational product. Following the meeting I was given time to work on my project proposal. I was also provided with access to an online database containing seminars discussing the topic of transitioning a Clinical Research site from a paper based system to more of an electronic based system.

June 10, 2014

This morning I learned how to use Merge CTS, which is a system that allows a clinical research site to log and update their patient files. After doing some data entry into Merge, I was taught about the Delegation of Authority log and was placed on the Odyssey study. Next, I faxed primary care physicians request for medical records of our patients in the Odyssey study. Following an inventory of our IP, I was instructed on how to place orders for resupplies.

June 11, 2014

I spent the morning participating in a meeting about informed consent revisions for the Office of Clinical Trials. Following the meeting I completed training for a study provided by our sponsor that prepares me for using their online site. After completing my training I worked on my research proposal.

June 12, 2014

I made copies of the informed consent process we use for the Odyssey study. While making copies I reviewed the process and gained an understanding with how the Office of Clinical Trials provides subjects with information about the study. Afterwards we went to Ben Hogan to see a patient who is in the Oasis study. The patient was on the last day of treatment and on their next visit we will do follow up procedures and end the subjects study.

June 13, 2014

Doing some housekeeping, we sorted through boxes of old case files to see what needed to be thrown away and what needed to go into storage. I learned what portions of old studies are need to stored even after the study is concluded. Following that we saw a patient for the Odyssey study. Since it was the patients visit three we proceeded to move him from the screening phase to the randomization phase of study. After the visit, we processed and shipped the blood that was drawn from the subject.

Week 3

June 16, 2014

We spent most of the day in a site initiation meeting for the new Commander study. During the meeting we were presented with a summary of the study, a list of the inclusion/exclusion criteria, access to Bracket software to do training modules and drug accountability.

June 17, 2014

We spent most of the day at Ben Hogan in a site initiation meeting for the new Santyl study. We were presented with the studies protocol, new equipment relative to the study, a list of the inclusion/exclusion criteria.

June 19, 2014

This morning we went to Ben Hogan to see a patient in the Oasis study. Standard care was provided since this was one of the patient's last visits and according to protocol the patient is no longer on the investigational product. I returned to the PCC and uploaded the patient in Datatrack, the software the sponsor uses for the Oasis study. After that I created/filed source documents into patient binders to help in the preparation of seeing patients in the Odyssey study.

June 20, 2014

We filed and sorted old study protocols and case files to determine what could be thrown away and what needed to be moved into storage. Afterwards, we saw a patient in Odyssey study and processed blood work as required by the protocol. The patients visit was also logged and updated in the sponsor specific online site.

Week 4

June 23, 2014

We spent most of the day finishing the storage project that we started last week. After boxing the study files, we put the boxes in a storage room to be picked up and moved to a central storage facility. This side project really highlights the need for electronic storage. Not only will it be cost efficient, but it will also save a lot of time to eliminate the storage process.

June 24, 2014

We drove to Ben Hogan today to get signatures from the PI on the Oasis study. I notice that there is a lot of travel time just to receive signatures to proceed/maintain studies. While researching the rules and regulation associated with digital data storage, the FDA also has set regulations on electronic signatures. I think in the future it would be nice to move the OCT to a system that supports electronic signatures as well.

June 25, 2014

Today was spent on a conference call for the Commander study. We were updated on the study protocol changes. These changes were put in place to make patient recruitment easier.

June 26, 2014

With the introduction of our new studies there are a lot of online trainings that are associated with each study and each sponsor. I spent the day completing training for a website called Intralinks. The certificates of course completion are printed off and stored in our regulatory binder. Copies are also sent to the sponsor to give verification that I am certified to be involved with the study.

Week 5

June 30 – July 4, 2014

This week was given as a 4th of July vacation. During this time I finished my practicum proposal.

Week 6

July 7, 2014

Finished my practicum proposal and compiled the necessary forms that accompany it.

July 8, 2014

We collected signatures from the Ben Hogan center this morning. However, the highlight of the day was going to a full length IRB. I was able to see how the meeting was conducted from start to finish. I think it's interesting how the IRB must contain people from both scientific and non-scientific backgrounds. Everyone brings a very unique perspective to each study.

July 9, 2014

We obtained a new study called STRENGTH. I took the morning to read over the details of the study and then spent the afternoon creating source documents. Making source documentation means going through the study protocol and creating "checklist-styled" form to use during patient visits. This ensures that no steps will be skipped and the subject will receive treatment in compliance with the sponsors protocol.

July 10, 2014

After making the source documents for the STRENGTH study yesterday, I decided today to create the source documentation we could use for the Dipexium study.

Week 7

July 14, 2014

Using a template from past studies, I created a budget for both the Odyssey and STRENGTH studies. I was able to see how a clinical research site negotiates with the sponsor to receive funding for the study.

July 16, 2014

Today we had a monitoring visit for Oasis. After the monitor reviewed our patient binders, we sat in on a conference call for the new STRENGTH study. The conference call outlined the details of the study and described the type of subjects we would need to be recruiting.

July 17, 2014

This morning I met with the IT department to set up a shared drive for the OCT. Hopefully this will facilitate the sharing and storage of study information. Following my meeting with the IT department, we went back over to Ben Hogan to see a patient for Oasis. Since the study is finished, this is the last patient we will ever see for the Oasis study.

July 18, 2014

I started today doing online data entry for the Oasis patient we saw yesterday. Then we attended a conference call for the Egrifta study, a study that has been put on hold for a year due to drug availability. Following the call, we saw a patient enrolled in Odyssey. I processed and shipped his blood work.

Week 8

July 21, 2014

I completed data entry for our Odyssey subject that we saw on Friday. We also obtained signatures from the PI's that work in PCC.

July 22, 2014

Today we had our site selection visit for STRENGTH. A monitor came to inspect our office and give us a description of the study.

July 23, 2014

I sent today focusing on my research project.

July 24, 2014

A new patient for the Odyssey study came into the clinic today. I was able to see how the informed consent process worked and how to describe the study to a new patient. After the subjects visit I centrifuged her blood work and shipped to be processed.

Week 9

July 28, 2014

I completed data entry for the patient we consented on Thursday. We also obtained signatures from the PI's that work in PCC.

July 29, 2014

Since we had already seen the last subject for the Oasis study, a monitor visited today to perform a close out visit. This allows for the monitor to look over all of our subject binders and make sure they correlate with the data we entered into the sponsor's website.

July 30, 2014

I sent today focusing on my research project.

July 31, 2014

Today we met with Jim Moss in the MET to discuss budgeting on our studies. I was able to see how clinical research operates on a financial perspective, rather than just being exposed to the scientific aspects of clinical research. After our budgeting meeting, one of our PI's told us about a potential Odyssey patient. We explained the study and provided the subject with informed consent forms. We then agreed to schedule a screening visit in the future.

Week 10

August 4, 2014

The patient that we saw on 7/24 met all of the inclusion criteria so we could proceed to the randomization visit of the study protocol. After drawing blood, we assigned the subject to either the placebo or the investigational product. Following the visit I centrifuged the patient's blood work and shipped it for processing.

August 5, 2014

I spent today doing data entry from yesterday's patient. All data is entered into the sponsor's website called Medidata and the subject's visit is recorded for our records in a program called Merge.

August 6, 2014

Today we had another conference call and training session on how to use the camera for our upcoming Dipexium study.

August 7, 2014

We saw two patients today for the Odyssey study. Blood work was drawn and centrifuged for both patients as per protocol. After centrifuging, the samples were sent out to Covance labs for processing.

August 8, 2014

I performed data entry for both of the patients we saw yesterday.

Week 11

August 11, 2014

Today was spent focusing on my research project.

August 12, 2014

The patient that we saw on 7/31 came in today for their screening visit. After going through the informed consent process one more time, the subject agreed to join our study. We drew blood to test if the patient qualified for the study. After centrifuging the blood, we shipped to Covance for processing.

August 13, 2014

I entered data into the sponsor's website about the patient that we saw yesterday.

Week 12

August 19-21, 2014

I used this time that we were not seeing any patients to work on my research project

August 22, 2014

Today we saw two patients for the Odyssey study. As per protocol we drew blood, resupplied the patients with drug, and had the patients complete a questionnaire. After seeing them we centrifuged their blood work and shipped it to Covance for processing.

Due to one of our packages not being picked up by the delivery service, the blood work that we drew on 7/24 was no longer viable, so we had the patient come in again for a re-draw. That blood was centrifuged and shipped with the other patients we saw today.

Week 13

August 25, 2014

I did data entry today for the two patients that we saw on Friday.

August 26, 2014

We spent today over at Ben Hogan learning how to use the camera and software provided by the sponsor. We took test photos and uploaded software on the computer. We then sent in the test photos to the sponsor to make sure that everything was working properly so that we wouldn't have any problems when we saw future patients.

August 27-29, 2014

I used this time that we were not seeing any patients to work on my research project.

Week 14

September 1, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 2, 2014

Today we screened the first patient for our Santyl, our non-infected DFU study. Screening involves drawing blood (as well as shipping it to the lab), going through the procedure of informed consent, performing an ankle-brachial pressure index (ABI), getting an international normalized ratio (INR) to test clotting factors, and dressing the wound. After seeing the patient we entered data into Datatrack as per protocol.

September 3, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 4, 2014

This morning we screened our second subject for our Santyl study. Again this meant drawing blood, going through the procedure of informed consent, performing an ankle-brachial pressure index (ABI), getting an international normalized ratio (INR) to test clotting factors, and dressing the wound. After seeing the patient we entered data into Datatrack as per protocol.

After that we saw another potential subject, but the placement of the patient's ulcer disqualified them from the study.

Week 15

September 8, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 9, 2014

Since patients for Santyl come in every week, we started the morning performing a baseline visit for our first patient. This included cleaning the wound, taking a picture, getting a wound exudate collection, and performing a punch biopsy. Afterwards we randomized the patient to either Santyl or the placebo and explained how to use the product according to the sponsor's protocol. The PI debrided the wound before wrapping it.

Following the first patient we screened two more patients for the study. After seeing the patient we entered data into Datatrack as per protocol.

September 10, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 11, 2014

We started the morning performing a baseline visit for our second patient. This included cleaning the wound, taking a picture, getting a wound exudate collection, and performing a punch biopsy. The PI debrided the wound before wrapping it. Following that we screened another patient for the study.

Week 16

September 15, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 16, 2014

This morning we saw our first Santyl patient today for their second study visit. At this visit we cleaned the wound, took a photo and had the PI debrided the wound before we wrapped it. Following that visit we saw our next two patients who were both randomized to either Santyl or Hydragel, the placebo. After cleaning their wound we followed baseline procedures including exudate, biopsy, photo and debridement. Following patient visits data was entered into Datatrack.

September 17, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 18, 2014

Today we randomize our patient who was at their baseline visit. After that we followed visit 2 procedures for our next patient. Then we ended the day by screening our fifth patient into our study using screening procedures provided by the sponsor. Following the visits I entered their data into Datatrack.

Week 17

September 22, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 23, 2014

This morning we saw our first Santyl patient today for their third study visit. At this visit we cleaned the wound, took a photo, did an exudate collection and had the PI debrided the wound before we wrapped it. Afterwards, we saw our next two visits and followed visit 2 protocol procedures. Following patient visits data was entered into Datatrack.

September 24, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 25, 2014

This morning we performed study procedures for visit 2, visit 3, and a baseline visit. The baseline visit was for our fifth and newest patient. Following all of these patients we saw another potential Santyl patient. However, the patient did not meet study qualifications due to the DFU being completely healed prior to visit.

Week 18

September 29, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

September 30, 2014

This morning we saw our three weekly patients at their respective scheduled visits. Following their routine visits, we screened two more potential patients for the Santyl study.

October 1, 2014

Back at PCC today, we saw one of our patients for the Odyssey cardiology study. It was the patients month 2 visit. We dispensed the patient more study medication after performing blood work and recording vitals. After the patient visit, I centrifuged the blood work and shipped it to the offsite lab.

October 2, 2014

This morning we performed study procedures for visit 3 and visit 4 for our weekly Santyl patients. Our fifth patient who was screened on September 18 had the formation of a second ulcer in close proximity to the study ulcer. Consequently, this excluded the patient from the study. After performing exit visit procedures for this patient, we screened two more potential subjects for the study.

Week 19

October 6, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 7, 2014

This morning we saw our three weekly patients at their respective scheduled visits. Following their routine visits, we screened two more potential patients for the Santyl study. After those screenings we were able to randomize a patient during their baseline visit

October 8, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 9, 2014

This morning we preformed study procedures for visit 4 and visit 5 for our weekly Santyl patients. After seeing these patients, we randomized the patient that we saw last week. After randomization we screened another patient for the Santyl study.

Week 20

October 13, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 14, 2014

This morning we saw our three weekly patients at their respective scheduled visits. Due to last Thursday's patient's schedule, we saw them for their visit 2. After seeing that patient we screened another potential subject for the study.

October 15, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 16, 2014

This morning we preformed study procedures for visit 5 and visit 6 for our weekly Santyl patients. After seeing these patients, we randomized the patient that we saw last week.

Week 21

October 20, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 21, 2014

This morning we saw our three weekly patients at their respective scheduled visits 2. After seeing our routine patients, we randomized the patient that we screened last week.

October 22, 2014

Since the doctors for our new study are only in clinic on Tuesdays and Thursdays, I have been given the day to further work on my practicum report.

October 23, 2014

This morning we performed study procedures for visit 6 and visit 7 for our weekly Santyl patients. To get the patient that we saw last Tuesday back on schedule, we performed visit 3 procedures today.

APPENDIX B:
SOURCE DOCUMENT TEMPLATE

Pt Initials _____ Subject # _____

Visit __/Month __ Source Document

Date of Visit _____

- Update Subject Contact Info
- Review Con Meds
- Review Diary for Study Drug Administration & Compliance
- EQ-5D completed

Weight _____

Heart Rate _____

Blood Pressure _____ sitting 5min prior (Right / Left)

Any new AEs/SAEs? No Yes (describe) _____

Modification to statin &/or LMT? No Yes

Additional Notes: _____

CENTRAL LAB KIT

- No blood draws needed

STUDY DRUG

- Contact IXRS, dispense study drug & provide new diary, as needed
- Provide statin vouchers, as needed

Schedule Next Visit

Investigator or Designee Signature

Date

APPENDIX C:
BUDGETING TEMPLATE

| UNTHSC BUDGET SUBJECTS RANDOMIZED TO _____ | Cost of Item | Screening Visit SCR | Baseline/ Visit 1 | Week 4 (- 4/+2 days) | Week 12 (± 4 days) | Week 24 (± 6d) | Week 36 (± 6d) | Week 48 (± 6d) | Week 60 (± 6d) | Week 72 (± 6d) | Early Perm. Discontin- uation | End of Study (30 ± 15d) | Total per Patient |
|--|---------------------|--------------------------------|------------------------------|---------------------------------|-------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--|--|--------------------------|
| Screening/Administrative | | | | | | | | | | | | | |
| Informed Consent, HIPAA | \$150 | \$150 | | | | | | | | | | | \$150 |
| Inclusion/Exclusion Criteria | \$50 | \$50 | \$50 | | | | | | | | | | \$100 |
| Review Medical History (including smoking history) | \$75 | \$75 | | | | | | | | | | | \$75 |
| Demographics, weight, height, & blood pressure | \$75 | \$75 | | | | | | | | | | | \$100 |
| Preplanned surgical/procedure(s) | \$20 | \$20 | \$20 | | | | | | | | | | \$40 |
| Urine pregnancy test | \$10 | | \$10 | | | | | | | | \$10 | \$10 | \$30 |
| Study Drug Administration | | | | | | | | | | | | | |
| Randomization | \$50 | | \$50 | | | | | | | | | | \$50 |
| Record NYHA classification | \$10 | | \$10 | | | | | | | | \$10 | \$20 | \$40 |
| Record LVEF | \$10 | | \$10 | | | | | | | | | | \$10 |
| Dispense Study Drug | \$50 | | \$50 | | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | | | \$350 |
| Study drug accountability | \$40 | | \$40 | \$40 | \$40 | \$40 | \$40 | \$40 | \$40 | \$40 | \$40 | \$40 | \$400 |
| Safety & Efficacy Assessments | | | | | | | | | | | | | |
| Clinical Status Review : Record Outcome Events | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$550 |
| Adverse Events | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$25 | \$275 |
| Review Con Meds related to HF & CAD | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$220 |
| Review antiplatelet, anticoagulant, PPIs, prothrombin complex concentrates | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$20 | \$220 |
| Medical resource utilization | \$10 | | | \$10 | \$10 | \$10 | \$10 | \$10 | \$10 | \$10 | \$10 | \$10 | \$90 |
| Hemoglobin | \$20 | \$20 | \$20 | | | | | | | | | | \$40 |
| Personnel | | | | | | | | | | | | | |
| Investigator Fee | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$135 | \$1,485 |
| Coordinator Fee | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$100 | \$1,100 |
| Patient Travel Stipend | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$50 | \$550 |
| <i>Sponsor Offer</i> | | \$685 | \$509 | \$271 | \$307 | \$307 | \$307 | \$307 | \$307 | \$307 | \$271 | \$305 | \$3,883 |
| Sub Total per Patient | | \$790 | \$660 | \$450 | \$500 | \$500 | \$500 | \$500 | \$500 | \$500 | \$470 | \$480 | \$5,850 |
| Overhead | 30.00% | \$237 | \$198 | \$135 | \$150 | \$150 | \$150 | \$150 | \$150 | \$150 | \$141 | \$144 | \$1,755 |
| Total per patient | | \$1,027 | \$858 | \$585 | \$650 | \$650 | \$650 | \$650 | \$650 | \$650 | \$611 | \$624 | \$7,605 |

BIBLIOGRAPHY

1. NIH. Clinical Trails & Clinical Research. 2012.
<http://www.nichd.nih.gov/health/clinicalresearch/Pages/index.aspx>. Accessed October 1, 2014.
2. ClinicalTrials.gov. Clinical Trial Phases. 2008.
<http://www.nlm.nih.gov/services/ctphases.html>. Accessed October 1, 2014.
3. NIH. Who Sponsors Clinical Research Trials? 2006.
4. ClinicalTrials.gov. Learn About Clinical Studies. 2012.
5. Saylor.org. Institutional Review Board Guidebook: Chapter 3- Basic IRB Review. 2011.
<http://www.saylor.org/site/wp-content/uploads/2011/08/PSYCH202A-3.1.4-Institutional-Review-Board.pdf>. Accessed October 1, 2014.
6. Smith CA. Paper versus electronic documentation in complex chronic illness: A comparison. 2006. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839347/>. Accessed October 1, 2014.
7. Struik M, Koster F, Schuit A, Nugteren R, Veldwijk J, Lambooi M. The preferences of users of electronic medical records in hospitals: quantifying the relative importance of barriers and facilitators of an innovation. *Implementation Science*. 2014;9(1):69.
<http://www.implementationscience.com/content/9/1/69>. Accessed June 25, 2014.
8. O'Malley A, Grossman J, Cohen G, Kemper N, Pham H. Are Electronic Medical Records Helpful for Care Coordination? Experiences of Physician Practices. *J GEN INTERN MED*. 2010;25(3):177-185. <http://dx.doi.org/10.1007/s11606-009-1195-2>. Accessed June 25, 2014.

9. Lee Jacobs M. Interview with Lawrence Weed, MD- The Father of the Problem-Oriented Medical Record Looks Ahead. *The Permanente Journal*. 2009;Volume 13(No. 3).
<http://www.thepermanentejournal.org/issues/2009/summer/395-interview-with-lawrence-weed-md.html>. Accessed June 25, 2014.
10. Chun-Ju Hsiao PD, and Esther Hing, M.P.H. Use and Characteristics of Electronic Health Record Systems Among Office-based Physician Practices: United States, 2001-2013. *NCHS Data Brief*. 2014. <http://www.cdc.gov/nchs/data/databriefs/db143.htm>. Accessed June 25, 2014.
11. Hillestad Rea. Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, And Costs. *Health Affairs*. 2005;24(5):1103-1117.
<http://content.healthaffairs.org/content/24/5/1103.abstract>. Accessed June 25, 2014.
12. FDA. Code of Federal Regulations Title 45: Protection of Human Subjects. 2009.
<http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html#46.115>. Accessed September 29, 2014.
13. Microsoft-Support. How To Share Files and Folders Over a Network for Workgroups in Windows 2000. 2006; <http://support.microsoft.com/kb/301281>. Accessed June 25, 2014.
14. Record Retention. 2010. http://web.unthsc.edu/downloads/file/2130/record_retention. Accessed September 29,2014.
15. Roche YZ. AE/SAE Reporting 2012.
http://stat.smmu.edu.cn/uppic/file/notice/09%20AE,%20SAE%20and%20coding_Send%20out%20%20Zhang%20YU.pdf. Accessed September 29, 2014.

16. FDA. Reporting Serious Problems to FDA. 2014.
<http://www.fda.gov/Safety/MedWatch/HowToReport/ucm053087.htm>. Accessed September 29, 2014.
17. Murray B. Regulatory Binder. 2011. <http://clinicaltrials.georgetown.edu/binder>. Accessed September 29, 2014.
18. NCI Dictionary of Cancer Terms. 2014.
<http://www.cancer.gov/dictionary?cdrid=635419>. Accessed September 29, 2014.
19. FDA. Guidance for Clinical Investigators, Industry, and FDA Staff *Financial Disclosure by Clinical Investigators*. 2013.
<http://www.fda.gov/downloads/RegulatoryInformation/Guidances/UCM341008.pdf>. Accessed September 29, 2014.
20. UNTHSC. Instructional Guidance and Sources for Human Subject Investigators. 2014.
http://web.unthsc.edu/info/20016/office_for_the_protection_of_human_subjects/1318/instructional_guidance_and_sources_for_human_subject_investigators#two. Accessed September 29, 2014.
21. FDA. Code of Federal Regulations Title 21 Part 11: Electronic Records and Electronic Signatures. 2014.
<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=11&showFR=1>. Accessed September 29, 2014.