Date of IRB Review: January 2009
81st Medical Group
Keesler AFB, Mississippi

Exempt (Human) Research Protocol

This is a Progress Report _____ / Final Report __X__

1. Protocol Number: FKE20070007E

2. Title: "Evaluation of Telepathology Systems and Practices"

3. Principal Investigator (PI):

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4. Purpose:
The purpose of this research project is to determine the feasibility and utility of Whole Slide Imaging (WSI) and Robotic Microscopy in a number of pathology laboratory environments. Our research project involves three phases. Phase 1 evaluates the utility and feasibility of a WSI-Based Educational Slide/Image Collection. Phase 2 evaluates inter- and intra-facility Quality Assurance (QA) practices using WSI. Finally, Phase 3 compares the utility and feasibility of real-time robotic microscopy for consultations to that of WSI.

5. Status of the Study. Mark the status of the study (a-e).

a. _____ Active with ongoing data collection. Request approval to remain open.

b. _____ Active with data collection complete. Request approval to remain open.

c. _____ Study was never initiated and request termination of the study.

d. __X__ Completed, research implemented and results available. Request approval to close.

e. _____ Inactive, protocol never initiated, but want to keep in open. Request approval to remain open.

6. Summary of Progress: This report covers the following period of time: April 2007 to January 2009.
Provide a brief summary of any results (preliminary or final) obtained in the study, even if results are not yet statistically significant.

a. Since last progress report or initiation of study:

IRB Status:

Please refer to the table below as it reports the status of this exempt protocol throughout different Air Force sites.

Report Documentation Page

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

The purpose of this research project is to determine the feasibility and utility of Whole Slide Imaging (WSI) and Robotic Microscopy in a number of pathology laboratory environments. Our research project involves three phases. Phase 1 evaluates the utility and feasibility of a WSI-Based Educational Slide/Image Collection. Phase 2 evaluates inter- and intra- facility Quality Assurance (QA) practice using WSI. Finally, Phase 3 compares the utility and feasibility of real-time robotic microscopy for consultation to that of WSI. The Telepathology projects have been successfully implemented and results are encouraging. Primary goals include evalaluation of WSI and robotic microscopy as potential platforms for USAF pathology. USAF advocates and leaders for digital pathology are working to strategize integration of digital pathology into the AFMS. It is hypothesized that digital slides can be effectively implemented within existing workflows and will be useful in establishing timely inter-facility diagnoses and consultation across multi-facility health systems. In summary, current Telepathology systems, especially whole slide imaging, are capable of providing useful levels of surgical pathology reviews across distributed health systems and they will only improve over time.

15. SUBJECT TERMS

Telepathology; Whole Slide Imaging; Robotic Microscopy

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Travis AFB	7/1/2007	7/25/2007
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Phase 1: Whole Slide Image (WSI) Based Educational Slide Collection

The University of Pittsburgh Medical Center's (UPMC) Innovative Medical Information and Technologies (IMITS) Center has developed an educational database of over 200 digital images of interesting pathology cases. As part of the Evaluation Project, a Needs Assessment survey (pre-implementation) was distributed across approved Air Force Bases to determine the need and feasibility of an educational database named PathEd. This questionnaire evaluated current capabilities of Telepathology as well as current practices. The Evaluation Team received twelve responses from Air Force Pathologists. Below is a table containing a summary of base response rates.

Air Force Base	Number of Responses
Lackland AFB	9
Offutt AFB	1
Travis AFB	1
Eglin AFB	1

In order to evaluate user satisfaction and other parameters, the evaluation team developed a 12 question assessment questionnaire (Post-implementation Questionnaire/Interview) which was to be incorporated into the educational database. It was to appear after the subject has viewed five cases. This questionnaire was to be voluntary, and if after the participant had declined three times to complete the questionnaire, the questionnaire would not present itself again. It was not written into the programming for PathEd and thus was never launched.

However, in the spring of 2008, UPMC resident pathologists were asked to complete a survey (PathEd Application Survey) that assessed the ease of use of the PathEd application. This information was used to provide feedback to the UPMC PathEd development team. As a result of this survey, many issues were identified and resolved and suggestions were incorporated into the applications.

Phase 2: Inter- and Intra-facility WSI Quality Assurance Study

Case Selection

A CoPath (Cerner Corporation, Kansas City, MO) laboratory information system (LIS) electronically queried its surgical pathology database for all cases in 2004 that had been previously viewed for quality assurance. This initial query resulted in 1150 possible cases. For research purposes, investigators decided to exclude cases that had over five blocks. This exclusion factor resulted in 497 cases available for study purposes. The computer selected every tenth case from this pool until thirty cases were selected. The thirty cases selected resulted in 67 diagnosable parts, comprised of 202 slides. De-identified pathology reports and slides of the thirty cases were obtained and used for the study.

Digital Slide Preparation and Viewing

Glass slides of the thirty surgical pathology cases were scanned using an Aperio T2 scanner. The T2 scanner used a 20x microscope objective and had a spatial sampling period of 0.47 μm per pixel. The scanner was equipped with dual 2.4 GHz Xeon processors with 4 GB of RAM. Digital slides were placed on a server with dual 3 GHz Xeon

processors and 4 GB of RAM running Microsoft Windows Server 2000. The digital slides were viewed using Aperio's Spectrum webviewer. Aperio's webviewer could be accessed from any computer that the pathologist had access to. Typical computers had Pentium processors with 512 to 2048 megabytes RAM, Microsoft Windows 2000/XP, and connectivity to the internet.

Participant Recruitment
Interested pathologists were identified on USAF bases and within UPMC. All sites were IRB/SGR approved. If possible, project personnel met with the pathologists directly to personally discuss the project in detail and to confirm participation. A recruitment handout and tri-fold were developed and sent with a letter or email to eligible pathologists at both UPMC and USAF bases. Six pathologists were recruited from multiple UPMC sites.

Data Collection
We collected data at three time points during the study. The first time point occurred prior to the study. A questionnaire was designed that asked pathologists about their pathology experience, foreseeable roles of digital pathology, potential obstacles, and digital slide familiarity.

The second data collection time-point was during the analysis of digital slides. Participants were asked to complete slide and case surveys. For slide surveys, variables such as focus quality, artifact presence, and tissue component (nuclear, cytoplasmic, red blood cell, non-cellular, vascular, and lymphocytic detail) focus quality were recorded. Focus quality and tissue component focus quality used a five point Likert scale that ranged from excellent to very poor. "Excellent" focus quality ratings indicated a flawless image both in color and in sharpness. A rating of "Good" meant nearly flawless with adequate sharpness. "Fair" quality meant that 25% to 50% of the image was out of focus, but evaluation of the digital slide is still possible. "Poor" ratings indicated that most of the slide was out of focus, and it prevented diagnosis. "Very Poor" meant that the entire slide was out of focus, which precluded a diagnosis. Image response speed, apparatus ease of use, and internet stability were also recorded. These variables used a low, medium, and high scale as perceived by the pathologist. The slide surveys incorporated in an electronic time stamp that determined the relative time to complete the evaluation of a slide.

Case surveys were developed in order to record the level of diagnostic agreement. After analyzing every slide for a biopsied part, participants would view the original diagnosis and rate their agreement level using a five point Likert scale. A rating of "Complete Agreement" meant that all aspects of the original diagnosis were agreed upon. A "Reporting Error" rating meant there was a typographical error in the original report, but it did not affect patient management or prognosis. "Mild Disagreement" indicated a disagreement in the subtype of diagnosis. For example, the wrong type of sarcoma was reported. "Moderate Disagreement" rankings indicated a disagreement, but it did not affect patient management or prognosis. Finally, a rating of "Marked Disagreement" indicated a disagreement with the original diagnosis that affected patient prognosis and/or management. Diagnostic agreement was rated for every diagnostic part of every case. The smallest cases had one biopsied part, while the largest case had ten biopsied parts. Cases that received any disagreement rating were reviewed by the principal investigator in order to determine if the original pathologist needed notification. Case surveys also recorded perceived case complexity, diagnostic confidence, and time-to-complete. Case surveys had a timestamp incorporated into them that tracked case-completion values.

Once participants completed case and slide surveys, they were asked to complete a post-study questionnaire. This questionnaire recorded responses to variables such as confidence in use of digital pathology technology, strengths and weaknesses of digital slides, digital slide feasibility, and the role of digital slides in the everyday practice of pathology.

Data was collected using a Microsoft Access database. Forms were designed to help the participant matriculate through the study and provided an interface where pathologists could enter their own responses. Participants could submit their data with a click of a mouse to the study's honest broker.

We have prepared one paper which discusses the use of the Microsoft Access database as an evaluation tool. This is only now in DRAFT form and will be submitted to an evaluation or pathology journal.

Phase 3: Robotic Microscopy vs. Whole Slide Imaging For Real Time Diagnosis

Case Selection

Forty cases were selected from UPMC hospitals. The diagnostic intraoperative consultation (frozen section) slides were selected by the principal investigator. Intraoperative consultation is an important component in the practice of surgical pathology. Digital pathology technology may be useful in situations where a local pathologist is not available. Tissues analyzed during intraoperative consultation are often thicker than the permanent tissue preparations, therefore, these tissue samples may present challenges to current digital slide technologies in providing pathologists with diagnostic grade images

Digital Slide Preparation and Viewing

Whole Slide Images were created using a Trestle/Zeiss fifty slide loading apparatus paired with a Olympus BX51 microscope equipped with a Jai 3CCD RGB camera. These digital slides were placed on a machine equipped with dual 3 GHz Xeon processor with 4 GB of RAM and Microsoft Windows 2000 Server.

Pathologists used an Olympus BX-41 microscope equipped with a Jai M7 camera. Digital slides viewed with robotic microscopy and whole slide imaging used Trestle's Medmicro software. Data was collected using a Microsoft Access database.

Participant Recruitment

Interested pathologists were identified on USAF bases and within UPMC. All sites were IRB/SGR approved. If possible project personnel met with them personally to discuss the project in detail and to confirm participation. A recruitment handout and tri-fold were developed and sent with a letter or email to eligible pathologists. In February of 2008 a Digital Pathology Training Seminar was held at UPMC. This allowed time for UPMC and USAF pathologists to meet and work together on the evaluation study. At that time we were able to solicit participation from three USAF bases, one VA, and one UPMC pathologist. They were able to complete or complete in part the robotic microscopy portion of the study. Our total sample included six UPMC and four military pathologists.

Data Collection

We collected data at three time points during the study. The first time point occurred prior to the study. A questionnaire was designed that asked pathologists if they had ever used either WSI or robotic microscopy. It also assessed their pathology experience, opinions on foreseeable roles of digital pathology and potential obstacles,

The second data collection was accomplished during the analysis of slides. Participants were asked to complete case properties surveys. They were asked to rate the image on a four point scale; "Excellent" focus quality ratings indicated a flawless image both in color and in sharpness. A rating of "Good" meant nearly flawless with adequate sharpness. "Fair" quality meant that 25% to 50% of the image was out of focus, (i.e., distortion makes evaluation difficult or lack of quality impedes the ability to render a diagnosis). "Poor" ratings indicated that most of the slide was out of focus, and it prevented diagnosis. The pathologists were also asked to provide a diagnosis. They were also asked their opinion on the use of use of the apparatus, complexity of the case and confidence in their diagnosis.

Once participants completed case properties surveys, they were asked to complete a post-study questionnaire. This questionnaire recorded responses to variables such as major strengths of either WSI or robotic microscopy, confidence of diagnosis and if they had a preference between the two technologies.

Data was added to a Microsoft Access database. Forms were designed to help the participant matriculate through the study and provided an interface where pathologists could enter their own responses. Participant could submit their data with a click of a mouse to the study's honest broker.

We plan to subsequently publish results in an appropriate journal.

b. For the entire study:

Digital pathology QA controlled trial studies were conducted at UPMC in FY04, and the results of those studies affirm the reliability and usefulness of WSI in the clinical setting. The goal of the evaluation projects was to determine the utility of inter-facility QA based on WSI technology within the AFMS.

Whole slide imaging is a method of scanning slides and posting the digitized images on servers and transmitting them over computer networks. This process permits independent viewing of images by large numbers of people in diverse locations. It involves a fusion of microscopy and digital technologies. Since these image files tend to be quite large, they are usually served up as "tiles" transmitted just in time as the viewer needs them; only the desired tiles are actually transmitted. Advances in digital technologies make it possible to view images of slides with resolutions nearing those visible under an optical microscope. Image quality remains an issue for consumers, however, and scanning manufacturers continuously strive to make improvements. These improvements increasingly focus on changes that will impact the integration of these systems into the clinical pathology environment. Scanners are expensive and vary in performance. Rigorous assessments of system features and their fitness for today's medical environments are required.

c. If this is a FINAL REPORT:
   1. Were the protocol objectives met and how will the outcome benefit the DoD/USAF?

- Phase 1: Create a WSI-Based Educational Slide/Image Collection

Typical pathology education includes providing slide sets in a given domain for students to diagnose. There are many obvious limitations with this form of education. A few include: cases with little information; difficult access to slides, especially when slides must be shared among students; and instructor expectations that students can determine the pertinent diagnostic/prognostic features that lead to a diagnosis. PathEd was designed to be used to augment pathology education for USAF and UPMC pathologists and pathology students, addresses the limitations of typical pathology education. PathEd allows input of any relevant case information including information from the pathology report and added metadata such as Category and Subcategory. With each case posted, additional electronic files, such as PDFs and JPEGs can also be uploaded to the case. PathEd uses digital slides scanned from a variety of whole slide imaging systems with digital slides organized in a tree based on the case's Organ, Category and Subcategory. It provides instructors with the ability to annotate digital slides and highlight pertinent case features and offers instructors the option to create quizzes, which may be linked to digital slides or cases, for assessment of the students' comprehension.

To date, over 200 de-identified cases have been uploaded to the repository and are ready for viewing by the pathologists. Feedback from initial users has improved layout of the interface and the performance of system. It is anticipated that users will continue to provide feedback that will be used to shape PathEd's features and capabilities. PathEd applications can readily be expanded to encompass other domains and support training for other allied health professionals.

- Phase 2: Conduct WSI-Based Inter-Facility Quality Assurance (QA)

This project extended the FY04 IMITS Telepathology QA studies conducted at UPMC to include members of the USAF network of pathologists. The goal of this project was to determine the utility of inter-facility QA-based WSI technology. Inter-facility WSI QA may allow for more cost effective, higher quality QA procedures in the USAF system.

WSI technology is still relatively new; the first digital slide scanner were built in 2000 and the technology is rapidly improving. For automated, high-speed WSI to reach its potential in pathology practice, it must undergo continuous evaluation and validation by the pathology community. During the FY04 Telepathology Project, UPMC established a protocol for assessing image quality and clinical functionality of advanced image scanning systems. At the conclusion of the FY04 Telepathology Project, results from a series of controlled clinical validations studies indicated that whole slide image information is sufficient for pathologists to make reliable diagnostic decisions. These published studies have contributed to the acceptance of digital pathology in clinical practice; however, more research is needed to better assess clinical capabilities.

The following controlled clinical validation studies were completed during the FY05 project

EVALUATION OF WHOLE SLIDE IMAGE IMMUNOHISTOCHEMISTRY (IHC) INTERPRETATION IN CHALLENGING PROSTATE NEEDLE BIOPSIES

The IHC study was designed to test the pathologist's ability to interpret IHC staining in prostate needle biopsies by comparing automated WSI with traditional glass slide microscopy. Additionally, and perhaps more importantly, the study tested the potential application of WSI across geographically dispersed health systems, such as UPMC, which has a single central IHC lab that serves many hospitals. The study took place in the Division of Anatomic Pathology at UPMC (primarily at Shadyside and Presbyterian Hospitals) and included evaluators from UPMC and Johns Hopkins University. This retrospective study evaluated the interpretation of IHC stains performed in difficult prostate biopsies using WSI. The study included 30 foci with IHC stains identified by the original pathologist as both difficult and pivotal to the final diagnosis. WSI were created from the glass slides. An evaluation form was designed to capture data in two phases: 1) interpretation of whole slide images, and 2) interpretation of glass slides. Data included stain interpretations, diagnoses, and other parameters such as time required to diagnose and image/slide quality. WSI diagnostic validity was 'almost perfect' for one pathologist, 'substantial' for three pathologists, and 'moderate' for one pathologist. Except for one instance, WSI technology was *not* felt to be the cause of disagreements. Data was also collected from an expert prostate pathologist. Diagnostic agreement between the final consensus diagnoses of the group and those of the domain expert was 'almost perfect'. These results are encouraging and compare favorably with other efforts to quantify diagnostic variability in surgical pathology. We concluded that WSI-based technology can currently permit accurate interpretation of IHC stains in the setting of diagnostically difficult prostate biopsies. Comparison of a consensus diagnosis to a "gold-standard" expert opinion also confirmed well-established fact that certain difficult cases may defy confident diagnosis by a single pathologist, even with glass slides. These findings provide evidence supporting the validity of WSI technology for interpretation of IHC in prostate biopsies, and, further, these findings suggest that development of other "virtual" IHC applications is feasible and should be pursued (including relevant specific validation studies). Results subsequently published in Human Pathology.

FROZEN SECTION EXAMINATION USING WSI FOR QUALITY ASSURANCE

The use of frozen sections or intra-operative consultations is an important part of surgery, providing critical guidance to the surgeon about margin status and/or tumor type while the patient is still on the operating table. UPMC researchers assessed the use of WSI for evaluation of frozen section specimens. Five pathologists compared the concordance between intra-operative and final diagnosis using WSI technology. Twenty four entire cases (including 47 surgical parts and 391 slides) from the genitourinary surgical bench were selected randomly and were scanned by Aperio T2 WSI system. Pathologists diagnosed cases using glass slides or WSI. During examination of the specimens, pathologists completed the standard QA form and evaluated diagnostic concordance, confidence, case complexity, and time to complete the case. After six weeks, approximately 20% of the cases were assigned to the same pathologists for intra-observer reliability assessment.

Results indicated that the diagnostic confidence for both the glass and WSI interpretation was high. Fifteen cases with 234 images were evaluated across both conditions with 12 reported as high confidence and 3 reported as medium confidence. There were no disagreements by the pathologists. The diagnosis remained unchanged after reviewing the corresponding WSI or glass slides in all 15 of these cases which were also concordant with the primary diagnosis in original pathology report.

This study helped refine research methodologies that were applied to other studies. The study indicated that diagnostic confidence as well as intra-observer reliability for the WSI appeared high in the cases selected for this assessment. And, although the study was done on a small number of cases, the results were encouraging and support WSI as a useful tool in pathology practices, especially for QA studies in surgical pathology. Study results were subsequently presented in both an oral and poster presentation.

FROZEN SECTION QUALITY ASSURANCE PILOT STUDY

Twenty difficult cases were selected by a pathologist who did not participate in the reading of the slide images. All slides associated with the cases were scanned using the Aperio Scanscope T2. A total of 184 slides were scanned. Four surgical pathologists volunteered to participate in the QA study. A survey was developed that recorded the pathologists' perceptions of diagnosis, image/slide quality, case complexity, diagnostic confidence, and time to complete case. The study design required each participant to view 10 cases via WSI and 10 cases via light microscopy. The 10 cases viewed via light microscopy were different than the cases viewed via WSI. Each participant scheduled an hour of time to complete the study, and no two pathologists participated in the study at the same time. A member of the evaluation team used a stop watch to measure the amount of time spent on each case.

The WSI portion of the project was not completed by any of the participating pathologists because of a number of problems relating back to study design and implementation. Study design issues included case selection, lack of "telepathology" training, incorrect labeling of slides/images, and ambiguity of frozen section parts. The project was halted by the University of Pittsburgh Principal Investigator. However, many lessons were learned during this pilot study with design improvements incorporated into future evaluation projects.

CONDUCT WSI-BASED INTER-FACILITY QUALITY ASSURANCE (QA)

Study design and data collection have already been discussed in detail in section **6. Summary of Progress**.. Preliminary results were presented at the American Telemedicine Association 13th Annual International Trade Meeting and Exposition. April 6-8, 2008. Seattle, WA. We have prepared one paper which discusses the use of the Microsoft Access database as an evaluation tool. This is only now in DRAFT form and will be submitted to an evaluation or pathology journal.

- Phase 3: Compare Robotic Microscopy with WSI for Real Time Consultations

Telepathology allows microscopic images of stained tissue specimens and other forms of visual data to be shared among pathologists for diagnosis, quality assurance and training, regardless of physical location. Through the IMITS Telepathology Project, UPMC is helping the AFMS create an enterprise Telepathology network. Network security certifications are now in place for the robotic microscope and will be secured for whole slide imaging systems in the near future.

This is happening at a time when the need for prompt diagnostic services in the military is increasing. Combat environments are experiencing threats for the release of biological and infectious agents that could potentially cripple our forces. Homeland security has identified similar threats here in the U.S. In addition, the military must be prepared to respond to natural catastrophes, such as Hurricane Katrina, with diagnostic services that can aid in recovery and disease management.

Through project funding, four robotic microscopes were ordered for USAF locations in late December 2006. It was anticipated that these systems would be deployed at identified USAF locations early in 2007. The rigors of the DITSCAP approval processes, however, extensively delayed system installations. DITSCAP certification was finally achieved in September 2007. Installation then continued to be delayed pending USAF Communications Agency signed Authority to Connect. AtC was acquired in March 2008. Base-level approval and configuration was required next before installations could be scheduled. Robotic microscopes installations at all four USAF locations were completed in September 2008.

Although the static image and robotic systems are basic to a Telepathology network, both systems have limited applications and built-in constraints. The extension of these technologies into every day practice is restricted. Static image systems have numerous restrictions but perhaps the most important is that single field, camera-on-microscope systems cannot document the entire slide and forces the pathologist to spend valuable time finding and capturing limited fields of interest and therefore necessitates highly trained individuals on both ends.

Robotic systems have proven to be successful in promoting digital pathology and they are expected to be of value in the USAF environment. They are, however, real-time, remote control systems that require hands-on involvement at the scope site with real-time coordination by the remote pathologist on the diagnosing side. As part of the core operations, robotic systems do not provide permanent image storage.

Whole slide imaging systems are the most promising for advancing digital pathology within the AFMS and elsewhere. These systems represent a series of technologies for capturing an entire glass microscopic slide at high resolution, storing this image on a server, and displaying the image on demand over a broadband network. Like robotic systems, the user has access to the entire histologic section and can "pan and zoom" across the "digital slide" as desired, thus simulating the exam carried out on the microscope. Like static image systems, the whole slide image is persistent, can be archived for future use, and can be integrated with other electronic data (such as pathology reports or laboratory information systems). Most importantly, because whole slide image capture is done automatically by robotic scanners, it can be done "behind the scenes" and does not require technical imaging skills on the part of the pathologist. It is more important than ever that we continue to support this initiative.

For the USAF to realize the potential of digital pathology technologies, we recommend the purchase of whole slide imaging scanning systems for each major medical facility within the AFMS. With a suitable network of digital systems in place, research and development activities can be conducted to advance knowledge of digital pathology applications and practices, particularly within the military.

In the emerging world of digital pathology, it is important to have a definitive study that compares side-by-side real-time robotic Telepathology with WSI-based Telepathology. The goal of this evaluation project was to determine the utility of robotic microscopy for real-time consultation in the USAF, and compare it with the utility of WSI consultation. The University of Pittsburgh Evaluation Team designed a research study to compare the merits of robotic microscopy systems with whole slide imaging systems.

Study design and data collection have already been discussed in detail.
We plan to subsequently publish results in an appropriate journal.

2. Protocol Outcomes Summary:

The Telepathology projects have been successfully implemented and results are encouraging. Primary goals include evaluation of WSI and robotic microscopy as potential platforms for USAF pathology. USAF advocates and leaders for digital pathology are working to strategize integration of digital pathology into the AFMS. It is hypothesized that digital slides can be effectively implemented within existing workflows, and will be useful in establishing timely inter-facility diagnoses and consultations across multi-facility health systems. In summary, current Telepathology systems, especially whole slide imaging, are capable of providing useful levels of surgical pathology reviews across distributed health systems and they will only improve over time.

◄ IF THIS IS A FINAL REPORT PROCEED TO # 9 ►

7. Protocol Changes:

a. _____ No changes are anticipated and the project will continue as previously approved by the IRB.

b. _____ Changes are anticipated as described below: *(Description……)*

c. When do you anticipate PCSing or separating? _____ *(Insert Date)*

8. Protocol Personnel Changes:

Has there been any Principal or Associate Investigator (PI/AI) changes since approval of protocol or the last continuation review? ____ Yes ___ No. If yes, complete the following sections (Additions/Deletions). For PI/AI changes, indicate whether or not the IRB approved this change.

a. Additions:

b. Deletions:

9. Status of Approved Funding:

a. Funding from the Surgeon General Office (SGO) in the amount of $_____0_____ was approved in my original protocol. I have utilized $_____0_____ of these funds to date.

b. Request funding in the amount of $_____0_____ for FY __09___ in addition to amount originally approved. Describe or itemize here, or attach a separate sheet.

c. I have received External Resources to support this study in the form of: (describe all those applicable: loaned equipment, consumable supplies, drugs from a non-DoD source, and/or funds from an external source, in this case give the name and amount)

The UPMC work is supported by funding from the U.S. Air Force administered by the U.S. Army Medical Research Acquisition Activity (USAMRAA), 820 Chandler Street, Fort Detrick MD 21702-5014, Contract No. DAMD17-03-2-0017. Funding provided by AF/SGR is from a withhold taken from the appropriation for this purpose prior to awarding this contract. The content of the information does not necessarily reflect the position or policy of the U.S. Government and no official endorsement should be inferred.

10. Publications/Presentations/Awards

Suh, N, Jukic, DM, Ho, J, Gilbertson, JR, Fine, , Anthony, L, Silowash, R, and Parwani, AV (2007). *Intra-observer Reliability of Whole Slide Images in Pathology Quality Assurance Studies.* United States and Canadian Academy of Pathology Annual Meeting, March 2007. San Diego, CA.

Parwani, AV; Suh, N; Ho, J; Grzybicki, D; Anthony, L; and Jukic, DM (2007). *Whole Slide Imaging and Telepathology for Interoperative Frozen Section Examination.* American Telemedicine Association International Meeting and Tradeshow. May 13-15, 2007. Nashville, TN.

Silowash, R., Wilson, R., Grzybicki, D., & Anthony, L. (2007). *Improving Study Design and Technique in Whole Slide Imaging Studies.* American Telemedicine Association International Meeting and Tradeshow. May 13-15, 2007. Nashville, TN.

Silowash, R., Anthony, L., Wilson, R., & Grzybicki, D. (2007). *Introducing Digital Pathology to the Air Force: a Preview of Intra-facility QA Studies.* Advancing Practice, Instruction, and Innovation Through Informatics Conference. September 9-12, 2007. Pittsburgh, PA.

Fine, J.; Grzybicki, D.M.; Silowash, R.; Ho, J.; Gilbertson, J.R.; Anthony, L.; Wilson, R.; Parwani, A.V.; Bastacky, S.I.; Epstein, J.E.; and Jukic, D.M. (1/2008)*Evaluation of Whole Slide Image Immunohistochemistry Interpretation in Challenging Prostate Needle Biopsies.* Human Pathology 39: 564-2.

Cecil, RA., Jukic, DM., & Zalme, RC. (2008). *Pathology Education as a Web Application: an Advanced Tool for the Future Pathologist.* United States and Canadian Academy of Pathology Conference. March 1-7, 2008. Denver, CO.

Silowash, R., Wilson, R., Grzybicki, D., Anthony, L., & Zalme, R. (2008). *Evaluation Results for a Collaborative Digital Slide Quality Assurance Study.* American Telemedicine Association 13th Annual International Trade Meeting and Exposition. April 6-8, 2008. Seattle, WA.

11. Certification of Principal Investigator

My signature certifies that the above titled research has been conducted in full compliance with the HHS/FDA Regulations and IRB requirements/policies governing human subject research. I understand that a Progress Report is required in order to maintain continuation approval and any changes in the study/methodology must be approved by the IRB prior to implementation. If the study has never been initiated and I am requesting termination (Item 5.c. above), my signature certifies this request. If the study is completed (Items 5.d. & 6.c. above) and I am requesting closure, my signature certifies that the information provided on this form represents an accurate final report.

Robert Zalme
Signature of Principal Investigator

19 Dec 08
Date

Robert C. Zalme, Colonel, USAF, DC
Oral and Maxillofacial Pathologist
Keesler Medical Center

Signature of Civilian Principal Investigator

12/19/03
Date

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