Proposal to National Science Foundation 12-3-09

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 09-29

NSF 09-609 **12/03/09**

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

IIP - SMALL BUSINESS PHASE I

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

270683974

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

iCare Academic LLC

AWARDEE ORGANIZATION CODE (IF KNOWN)

6250020359

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

2450 E J CHAPMAN DRIVE
Knoxville, TN 37996-0001

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS
☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **SBIR Phase I:Usability of iCare: An Academic Electronic Health Record Clinical Simulation Tool**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **150,000**	**24** months	**07/01/10**	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
☒ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
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_____
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT
Industrial and Information Engineering

PI/PD FAX NUMBER
865-974-5888

PI/PD POSTAL ADDRESS
1534 White Avenue

Knoxville, TN 379961529
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **Xueping Li**	**PhD**	**2005**	**865-974-7648**	**xueping.li@utk.edu**
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 09-29). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

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Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Certification Regarding Nondiscrimination

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Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

(1) community in which that area is located participates in the national flood insurance program; and
(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
(2) for other NSF Grants when more than $25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME		

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER

* EAGER - EArly-concept Grants for Exploratory Research
** RAPID - Grants for Rapid Response Research

NATIONAL SCIENCE FOUNDATION
Program Solicitation/Instruction Guide Number **NSF 09-609**

SBIR PHASE I - PROPOSAL COVER PAGE

TOPIC	SUBTOPIC LETTER (if any)	TOPIC TITLE
EA	**EA1**	**Education Applications**

PROPOSAL TITLE **SBIR Phase I:Usability of iCare: An Academic Electronic Health Record Clinical Simulation Tool**

COMPANY NAME	EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)
iCare Academic LLC	**270683974**

NAME OF **ANY** AFFILIATED COMPANIES (Parent, Subsidiary, Predecessor)

ADDRESS (Including address of Company Headquarters and zip code plus four digit extension)
2450 E J CHAPMAN DRIVE
Knoxville, TN 37996-0001

REQUESTED AMOUNT	PROPOSED DURATION	PERIOD OF PERFORMANCE
$150000	**24**	

THE SMALL BUSINESS CERTIFIES THAT:	**Y/N**
1. It is a small business as defined in the solicitation.	Y
2. It qualifies as a socially and economically disadvantaged business as defined in the solicitation. (FOR STATISTICAL PURPOSES ONLY.)	Y
3. It qualifies as a women-owned business as defined in the solicitation. (FOR STATISTICAL PURPOSES ONLY)	Y
4. NSF is the only Federal agency that has received this proposal (or overlapping or equivalent proposal) from the small business concern. If No, you must disclose overlapping or equivalent proposals and awards as required by this solicitation	Y
5.SBIR: A minimum of two-thirds of the research will be performed by this firm in Phase I. STTR: It will perform at least 40 percent of the work and the collaborating research institution will perform at least 30 percent of the work as described in the proposal.	Y
6. The primary employment of the Principal Investigator will be with this firm at the time of the award and during the conduct of the research.	Y
7. It will permit the government to disclose the title and technical abstact page, plus the name, address and telephone number of a corporate official if the proposal does not result in an award to parties that may be interested in contacting the small business for further information or possible investment.	Y
8. It will comply with the provisions of the Civil Rights Act of 1964 (P.L. 88-352) and the regulations pursuant thereto.	Y
9. It has previously submitted proposals to NSF.	N
10. It previously submitted this proposal (which was declined) and significant modifications have been made as described in the solicitation.	N
11. It has received Phase II awards from the Federal Government. If "yes" provide a company commercialization history in the supplementary documents module.	N
12. It is located in a Historically Underutilized Business Zone (HUBZone) as verified by the Small Business Administration (to verify HUBZone participation go to http://map.sba.gov/hubzone/init.asp).	Y

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR

NAME **Xueping Li**

SOCIAL SECURITY NO.	HIGHEST DEGREE / YEAR	E-MAIL ADDRESS
not displayed intentionally	**PhD/2005**	**xueping.li@utk.edu**
TELEPHONE NO.	FAX NO.	WEB ADDRESS
865-974-7648	**865-974-5888**	

COMPANY OFFICER (FOR BUSINESS AND FINANCIAL MATTERS)

NAME	TITLE	TELEPHONE NO.
Matt Bell	**COO**	**865-292-8234**

OTHER INFORMATION

PRESIDENTS NAME **Tami Wyatt** YEAR FIRM FOUNDED **2009**

NUMBER OF EMPLOYEES (including Parent, Subsidiary, Predecessor)
AVERAGE PREVIOUS 12 MO.: **4** CURRENTLY: **4**

RESEARCH INSTITUTION NAME
iCare Academic LLC

RESEARCH INVESTIGATOR NAME
Xueping Li

RESEARCH INVESTIGATOR TELEPHONE NO.
865-974-7648

PROPRIETARY NOTICE: See instructions concerning proprietary information.
Check Here ☒ if proposal contains proprietary information.

TABLE OF CONTENTS

For font size and page formatting specifications, see GPG section II.B.2.

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

Project Summary

Usability of *iCare*: An Academic Electronic Health Record Clinical Simulation Tool

Intellectual Merit. Widespread adoption of health information technologies holds the promise of transformational change in the way health care is delivered—improving quality, enhancing safety, and reducing costs. The American Recovery and Reinvestment Act (ARRA) of 2009 made 19 billion dollars available for health care providers to adopt meaningfully use of electronic health records (EHRs). Recent research has identified shortcomings in EHRs "usability" or broadly, information design, which represents the art and science of preparing and conveying information so that it can be used by human beings with efficiency and effectiveness. These shortcomings contribute to the poor uptake of EHRs in the market as well as new categories of errors in care delivery. Recognizing the urgent need for a better understanding of the usability of EHR systems and to train health care professionals to use EHRs, the **primary goal** of this Phase 1 project is to develop a systematic methodology for the usability study of academic EHR systems to guide the development of *iCare*, an academic EHR clinical simulation tool, with the aim to provide undergraduate and graduate students nationwide with exposure to, and experience in utilizing EHRs. To determine the feasibility of *iCare*, we will examine its usability using Neilsen's Usability Model to guide the testing with faculty and health care students through focus groups, following eXtreme Programming development process.

Broader Impacts. EHRs are penetrating health care and new graduates must be proficient in using EHRs prior to entering the workforce. Currently, there are over ***3,000* nursing schools** in the U.S., with approximately ***400,000* students** enrolled annually and only ***1%*** of these schools with access to academic EHRs. There is excellent opportunity in this market when one considers the growth in EHRs in clinical settings, the need for extensive training, the movement toward simulation learning, and the requirements of accrediting bodies to integrate health information technology and EHRs into curricula. This Phrase I project will seamlessly **integrate research and education** through the commercialization of *iCare* and the findings and insights with focus group studies aiming to close the competency gaps between preparing health care students and accessing state-of-the-art EHRs to train health care professionals. This Phase I will investigate the feasibility of the academic EHR usability method in collaboration with The University of Tennessee Research Foundation (UTRF), The Center for Entrepreneurial Growth (CEG), and researchers at three beta-test universities.

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

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NSF 09-609 12/03/09

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PI/PD DEPARTMENT
Industrial and Information Engineering

PI/PD POSTAL ADDRESS
1534 White Avenue
Knoxville, TN 379961529
United States

PI/PD FAX NUMBER
865-974-5888

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME Xueping Li	PhD	2005	865-974-7648	xueping.li@utk.edu
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

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NAME		

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER

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** RAPID - Grants for Rapid Response Research

NATIONAL SCIENCE FOUNDATION
Program Solicitation/Instruction Guide Number **NSF 09-609**

SBIR PHASE I - PROPOSAL COVER PAGE

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REQUESTED AMOUNT	PROPOSED DURATION	PERIOD OF PERFORMANCE
$150000	**24**	

THE SMALL BUSINESS CERTIFIES THAT:	**Y/N**
1. It is a small business as defined in the solicitation.	**Y**
2. It qualifies as a socially and economically disadvantaged business as defined in the solicitation. (FOR STATISTICAL PURPOSES ONLY.)	**Y**
3. It qualifies as a women-owned business as defined in the solicitation. (FOR STATISTICAL PURPOSES ONLY)	**Y**
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6. The primary employment of the Principal Investigator will be with this firm at the time of the award and during the conduct of the research.	**Y**
7. It will permit the government to disclose the title and technical abstact page, plus the name, address and telephone number of a corporate official if the proposal does not result in an award to parties that may be interested in contacting the small business for further information or possible investment.	**Y**
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9. It has previously submitted proposals to NSF.	**N**
10. It previously submitted this proposal (which was declined) and significant modifications have been made as described in the solicitation.	**N**
11. It has received Phase II awards from the Federal Government. If "yes" provide a company commercialization history in the supplementary documents module.	**N**
12. It is located in a Historically Underutilized Business Zone (HUBZone) as verified by the Small Business Administration (to verify HUBZone participation go to http://map.sba.gov/hubzone/init.asp).	**Y**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR

NAME **Xueping Li**

SOCIAL SECURITY NO.	HIGHEST DEGREE / YEAR	E-MAIL ADDRESS
not displayed intentionally	**PhD/2005**	**xueping.li@utk.edu**
TELEPHONE NO.	FAX NO.	WEB ADDRESS
865-974-7648	**865-974-5888**	

COMPANY OFFICER (FOR BUSINESS AND FINANCIAL MATTERS)

NAME	TITLE	TELEPHONE NO.
Matt Bell	**COO**	**865-292-8234**

OTHER INFORMATION

PRESIDENTS NAME **Tami Wyatt** YEAR FIRM FOUNDED **2009**

NUMBER OF EMPLOYEES (including Parent, Subsidiary, Predecessor)
AVERAGE PREVIOUS 12 MO.: **4** CURRENTLY: **4**

RESEARCH INSTITUTION NAME
iCare Academic LLC

RESEARCH INVESTIGATOR NAME
Xueping Li

RESEARCH INVESTIGATOR TELEPHONE NO.
865-974-7648

PROPRIETARY NOTICE: See instructions concerning proprietary information.
Check Here ☒ if proposal contains proprietary information.

02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS

Submit only ONE copy of this form **for each PI/PD and co-PI/PD** identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.C.a. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. ***DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.***

PI/PD Name: Xueping Li

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☒ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☐ U.S. Citizen ☐ Permanent Resident ☒ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☐

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

Ethnicity Definition:
Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.
Race Definitions:
American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
Black or African American. A person having origins in any of the black racial groups of Africa.
Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information recieved from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational oppurtunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

Project Summary

Usability of *iCare*: An Academic Electronic Health Record Clinical Simulation Tool

Intellectual Merit. Widespread adoption of health information technologies holds the promise of transformational change in the way health care is delivered—improving quality, enhancing safety, and reducing costs. The American Recovery and Reinvestment Act (ARRA) of 2009 made 19 billion dollars available for health care providers to adopt meaningfully use of electronic health records (EHRs). Recent research has identified shortcomings in EHRs "usability" or broadly, information design, which represents the art and science of preparing and conveying information so that it can be used by human beings with efficiency and effectiveness. These shortcomings contribute to the poor uptake of EHRs in the market as well as new categories of errors in care delivery. Recognizing the urgent need for a better understanding of the usability of EHR systems and to train health care professionals to use EHRs, the **primary goal** of this Phase 1 project is to develop a systematic methodology for the usability study of academic EHR systems to guide the development of *iCare*, an academic EHR clinical simulation tool, with the aim to provide undergraduate and graduate students nationwide with exposure to, and experience in utilizing EHRs. To determine the feasibility of *iCare*, we will examine its usability using Neilsen's Usability Model to guide the testing with faculty and health care students through focus groups, following eXtreme Programming development process.

Broader Impacts. EHRs are penetrating health care and new graduates must be proficient in using EHRs prior to entering the workforce. Currently, there are over ***3,000*** **nursing schools** in the U.S., with approximately ***400,000*** **students** enrolled annually and only ***1%*** of these schools with access to academic EHRs. There is excellent opportunity in this market when one considers the growth in EHRs in clinical settings, the need for extensive training, the movement toward simulation learning, and the requirements of accrediting bodies to integrate health information technology and EHRs into curricula. This Phrase I project will seamlessly **integrate research and education** through the commercialization of *iCare* and the findings and insights with focus group studies aiming to close the competency gaps between preparing health care students and accessing state-of-the-art EHRs to train health care professionals. This Phase I will investigate the feasibility of the academic EHR usability method in collaboration with The University of Tennessee Research Foundation (UTRF), The Center for Entrepreneurial Growth (CEG), and researchers at three beta-test universities.

Project Description

Part 1: Identification and Significance of the Innovation

Heath Information Technology (Health IT or HIT) holds great promise in supporting the transformation and improvement of health care in America. The American Recovery and Reinvestment Act (ARRA) of 2009 made 19 billion dollars available for health care providers to adopt "meaningfully use" certified electronic health records (EHRs). An oft-cited limitation in the use of health IT is the "usability" or more broadly, information design, of EHRs. Information design represents the art and science of preparing and conveying information so that it can be used by human beings with efficiency and effectiveness [2, 14]. Recent articles in peer-reviewed and popular literature have identified shortcomings in usability and information design as both contributing to the poor uptake of EHRs in the market as well as new categories of errors in care delivery [15, 17, 32].

The usability of EHR systems, while recognized as critical for successful adoption and meaningful use, has not historically received the same level of attention as software features, functions, and technical requirements (e.g., interoperability specifications). This is also the case of academic EHRs, which is the same as certified EHRs but without sensitive patient information for the protection of privacy. Recognizing the importance of usability, the Certification Commission for Health Information Technology (CCHIT) recently formed a Usability Workgroup; however, current CCHIT criteria do not assess EHR product usability [6]. Moreover, little is known in the literature about how to develop academic versions of EHR to train health care professionals.

Our goal is to **develop a systematic methodology for the usability study of academic EHR systems to guide the development of *iCare*, an academic EHR clinical simulation tool**, with the aim to provide undergraduate and graduate students nationwide with exposure to, and experience in utilizing EHRs. A precedent for quick action toward EHRs was established during a State of the Union address in 2004 when President Bush introduced the goal of universal adoption of electronic health records by 2014. While this goal is unlikely, the health care industry is diligently working toward this goal with federal and state government initiatives. These goals have implications that affect the education of health care providers. In 2008, the *American Nurses Association* (ANA) published its latest Scope and Standards of Practice for Nursing, which includes competencies for undergraduate nursing programs. In these competencies, nursing programs must incorporate nursing informatics, with a focus on EHRs, into their undergraduate curriculum. Meeting these competencies is a challenge because to date, there are no universal or interoperable applications to these programs while the few academic EHR applications have exorbitant price tags. The proposed research is of great significance with **broad impacts** to approximately ***3,000* nursing programs** in the United States, with approximately ***400,000* undergraduate nursing students** in attendance, **through the commercialization of *iCare* via the startup company *iCare Academic LLC***. It was founded by the inventors of the *iCare* product, one of which is a woman, Dr. Tami Wyatt, key personnel of this proposal.

To determine the feasibility of *iCare*, we will examine the usability using Neilsen's Usability Model (NUM) [23, 24] to guide the testing. The XP software development process [9] will be followed to develop elements of the product while testing those elements with faculty and health care students through focus groups. The NUM theoretical framework guiding the feasibility

testing of *iCare* will determine how usable (usability) the interface and design of *iCare* is according to a specified set of factors, as will be discussed later. NUM is the process of identifying user (usability) problems and devising solutions that are incorporated into the next sequence of program development. Problems are identified by a group of individuals representing the intended users. These problems may be varied in nature: engineering, design, interface, and interaction. A focus group of users evaluates the product because no one user can identify all of the problems, yet when users work together in focus groups, they will often reveal problems or viewpoints that would not be discovered when evaluating the program alone. This academic EHR usability study framework is based on and will be extended from the PI and the Senior Personnel Dr. Wyatt's previous research (funded by the National Institutes of Health, award #:*1R03NR011352-01*). **The proposed usability of *iCare* is built on solid a theoretical foundation**; therefore, this feasibility testing of this study will likely be accomplished in a timely manner with little or no requirements for information design technology.

As a **women-owned small business** in an NSF **ESPCoR** state, the iCare Academic LLC is located in a **Historically Underutilized Business Zone** (HUBZone). The background section that follows describes relevant literature on EHR and usability study methods. The section also discusses the technical rationale and objectives.

Part 2: Background and Phase I Technical Objectives

2. 1. EHR and Usability

Widespread adoption of health information technologies holds the promise of transformational change in the way health care is delivered—improving quality, enhancing safety, and reducing costs. The increased availability of patient information and decision support at the point of care has tremendous potential for reducing errors and increasing evidence-based care delivery. In pursuit of these goals, various initiatives have sought to foster the adoption of technology including the Institute of Medicine (IOM) which in 1991 called for paperless records in 10 years [34], the establishment of the Office of the National Coordinator for Health Information Technology with the goal of nationwide EHRs use by 2014 [10] and, more recently, EHR-related incentives and penalties introduced through ARRA [5]. This and other initiatives have established the impetus for advanced training of health care students in data entry, retrieval and manipulation in EHRs.

The National Institute of Standards and Technology (NIST) defines usability as the "*...effectiveness, efficiency and satisfaction with which the intended users can achieve their tasks in the intended context of product use*" [22]. This concept is critically important in promoting both the widespread adoption and "meaningful use" of EHRs prescribed in ARRA. Usability has been cited as a major factor in both the acceptance [20,27] and effectiveness [16, 29] of EHRs in the clinical setting. Examples describing potential negative impacts of EHRs on efficiency [8], cognitive load [31], team collaboration [12], and medical errors [3] can all be linked, at least in part, to issues directly related to usability and design.

While much attention is paid to the financial and technical barriers of EHR use in this country, the usability of these systems and their ability to effectively integrate with clinical decision making and workflow has not been adequately explored to date [11,28]. Information design, the art and science of preparing information so that it can be used by human beings efficiently and effectively [13], is central to system usability and implementation success [4]. As such, the further exploration of EHR information design has been identified by AHRQ as an opportunity

for innovation in health IT that will improve the safe, efficient, effective, patient-centered, equitable, and timely delivery of care.

2. 2. Current State of Research and Design

While the broad issue of usability is often cited in the literature in relation to less than ideal results of EHR use, there is evidence that this issue is often poorly understood and is not adequately addressed by EHR developers and users alike [28]. Even CCHIT, the prevailing body for setting standards and certifying the use of EHRs, specifically excluded usability requirements in their original certifications [6] and have only recently formed a usability workgroup to address this issue.

There are many potential reasons for this lack of attention on EHR usability. Unlike the more straightforward identification of desired software features, functions, and interoperability goals, EHR usability can be a more subjective and elusive concept. Effective usability measures involve a combination of heuristics and observations of direct use in clinical settings along with noting unexpected patterns of workarounds and design influenced errors. The complexities of outpatient clinical environments are difficult to replicate in laboratory settings, and ethical and privacy concerns may prevent some types of usability evaluations in clinical settings [19]. This is further complicated by an inability or unwillingness of the vendor community to invest heavily in usability constructed user acceptance testing, information design, and usability expert involvement in product development. The market's inability or unwillingness to consistently pay for the level of implementation support required to appropriately incorporate technology into clinical practice (which can involve a level of process improvement beyond the change capital available in many practices) has also limited the quality of usability "evidence" available. It is uncommon for EHR implementation teams to include usability experts, and EHR end users, so critical for evaluating usability, typically lack the skills or training required to assist in designing for usability [33]. These factors combine to create an environment where usability has not received the required level of attention and investment, despite the best intentions of both EHR vendors and users.

2. 3. Rationale and Technical Objectives

The proposed work aims to prepare health care professional students for rapidly shifting health care responsibilities by refining a product to train those students how to use EHRs. President Obama has allocated $19 billion for health care initiatives. Approximately $9 billion is specifically earmarked to develop and refine electronic health records ensuring all Americans have electronic medical records. This has implications for training health care professionals who not only deliver quality care but also use data and resources to ensure access to evidence. Students must have opportunities to query patient data during simulation learning to efficiently use electronic health records as practitioners during their career.

The overall objective of this project is to develop an academic EHR usability framework to guide the research and development of *iCare*, an academic EHR clinical and simulation tool. This Phrase I project is the continuation of PI's previous work. An XML-based *iCare* prototype has been developed and three focus group studies have been completed at the College of Nursing (CON) at the University of Tennessee, Knoxville (UTK).

The work involving the development of the overall academic EHR usability framework will be performed at iCare Academic LLC. The usability procedures will be carried out by three beta

test institutions, including *UTK, Kennesaw State University*, and *Shenandoah University.* The PI has received letters of support/participation from these universities (Dr. Joan Creasia, Dean of UTK CON, Dr. Jane Brannan, Kennesaw State, and Dr. Kathryn Ganske, Shenandoah University). Only one of the letters is enclosed, due to the limitation of supporting letters allowed by this solicitation.

The PI and Dr. Wyatt will prepare training materials and travel to these sites to train the participating faculty members. Research plans in Phase I research and development efforts are described in details below.

Part 3: Phase I Research Plan

The research plan for this usability study will follow guidelines of Nielsen's Usability Model (NUM). When using the NUM [23, 24] process products are evaluated on five components as described in TABLE 1. In a traditional NUM evaluation with focus groups, data collectors allow users to discover mistakes and recover without assistance because this provides more data than simply helping the user. Data collectors will, however, intervene and assist users only after it is determined that they can no longer proceed. While observing, data collectors record user behaviors, actions, and comments.

TABLE 1: NIELSEN'S USABILITY COMPONENTS

Component	Description
Learnability	How easily can the user learn the product? If the user returns to the product, how long will it take to reorient/relearn the product?
Efficiency	How quickly can the user learn the product?
Memorability	Once the user returns to the product, how long will it take to reorient or relearn the product?
Errors	How many errors does the user make?
Satisfaction	How pleasant or unpleasant is the design and functionality and does the product deliver what the user expects?

By using NUM to guide focus group testing of *iCare,* throughout the development process, expensive and difficult revisions can be avoided in the latter stages while creating a more robust and effective program that will teach users how to use EHRs to improve patient outcomes. All researchers participating in the study (lead collaborators at beta tester sites) will be key personnel in the research conducted including organizing and moderating focus groups, assisting with data analysis, and dissemination of the research. Dr. Wyatt who has expertise in NUM usability testing will serve as the consultant for all lead collaborators. This will include activities such as developing protocol, obtaining human subjects internal review board approval, moderating groups, organizing data, and using multiple methods to collect data such as observation field notes and audio recordings. The procedures below will describe the steps and methods for the collective six focus groups in any given beta tester site and will be followed by each beta tester site verbatim.

3. 1. Usability Procedures

Sample and Recruitment: The convenience sample for this study includes undergraduate students enrolled in nursing programs and faculty at the three beta tester sites mentioned above. These universities represent the typical student body of bachelor programs and faculties

of these programs represent a combination of tenured, tenure track, and clinical faculty. A total of 3 focus groups per site per year (5 users per group) will evaluate elements of *iCare*. Any given participant will only participate in one focus group during the 2 year period. A maximum number of 5 to 7 participants are recommended for focus group work because saturation of data is met more quickly than those focus groups with a greater number of participants [25].

Inclusion/Exclusion criteria*:* Students who meet the following criteria will be eligible to participate in this study: (1) those enrolled in the undergraduate nursing program of their home institution (2), those without extensive experience with EHRs, and (3) those able to complete consent forms approved by their home University's human subjects protection review board. Faculty who meet the following criteria will be eligible: (1) those who teach primarily in their respective undergraduate program, and (2) those able to complete consent. Faculty who do not teach in an undergraduate program will be excluded.

Recruitment: Dr. Wyatt will work closely with lead collaborators from each beta tester site to develop protocols that mirror those in this proposal and meet the unique specifications of each beta tester site's internal review board of human subjects. Dr. Wyatt will also help lead collaborators/researchers develop recruitment materials including emails, flyers, and announcements to ensure that vulnerable students are not specifically targeted but that all students have opportunity to participate. One faculty member per focus group will be recruited. Because the lead collaborator may also be faculty to students who agree to participate, protocol will include ways to protect students' confidentiality and reduce the potential for coercion but those steps will be unique to each institution based on their policies. If a student faculty relationship exists between potential student participants and the lead collaborator, another faculty not involved with the potential subjects will assist with recruitment and gathering consent.

Data Collection*:* All data from students and faculty will be gathered during 90 minute focus groups to be held at the participants' respective schools. Computers located in a computer lab will be used to test portions of *iCare*. All focus groups will be audio recorded and field notes will be recorded by the research team, which includes PIs, lead collaborators and research assistants. Users will be led through a series of questions and activities to provide formative evaluative data that will guide the proceeding stage of development.

Focus Group Format: Each of the six focus groups per site over the 2 year period will be conducted in the same manner. Each will start with an introduction explaining the activities and directions. All participants will introduce themselves before the focus group begins. Focus group introductions and directions will take approximately 15 minutes. The next 30 minutes of each focus group will require the participants to complete activities by answering a series of predetermined questions. The faculty participant's activities will vary slightly to ensure feedback is gathered that is unique to instructor features. The research team will make observations and record the user behaviors to better evaluate the interface, design and usability of the program based on NUM. After 30 minutes of focus group work, users will receive a 15 minute break with snacks. The remaining 30 minutes of the focus group will be dedicated to discussions with the participants about activities that were confusing and ways to improve *iCare*. During the discussion, users will be encouraged to talk about their likes and dislikes and make suggestions for improvements.

Each focus group will target various features of *iCare*. See TABLE **2** for the features that will be examined during each focus group. According to NUM [23, 24], to evaluate and test the usability of each aspect of a program, it is necessary to create at least one mock up of every different

possible activity so that users can provide feedback. This procedure was carried out with the first phase of testing. It will be replicated in this phase of usability testing.

TABLE 2: FEATURES TESTED DURING EACH OF THE SIX FOCUS GROUPS

Focus Group	Features Evaluated
Focus Group 1	Medication Administration Record & Documentation, Nursing Notes, Patient Orders
Focus Group 2	Flow Sheets, Instructor Dashboards, Student Dashboards
Focus Group 3	Learning Mode, Testing Mode, Student Reports, Course Management
Focus Group 4	Help Hints and Guides, Tags associated with terms
Focus Group 5	Patient Teaching, Data Mining Techniques, Patient & Census Reports
Focus Group 6	Care Planning & Mapping

In every focus group, users will compare the design and functionality of at least 2 mock up interface options and report those elements that are most useful to input and retrieve patient data. The precise interview questions for each focus group cannot be determined until the design elements have been created. In general, questions will ascertain which interface is preferred and how any of the interfaces can be improved. The research team (PIs, lead collaborators, and research assistants) will not assist or guide users in any way during focus groups to prevent influencing what they explore and what difficulties they may have with the features. The research team will make observations about user behavior and identify confusing elements within the tested features.

All data collected from all focus groups will be analyzed using NUM and the results will guide modifications for the next stage of development. Audio-taped focus group data will be transcribed line by line. Analysis techniques and procedures for each focus group will be described in the analysis section of this proposal. All lessons learned from data collected during the earliest focus groups will inform the mock up design and interface elements for each successive focus group.

3. 2. Data Analysis

Nielsen's usability heuristics techniques [21] will be used to analyze data captured after each focus group. The steps described below will occur after each focus group and prior to the next focus group so that the analysis of the data can inform the next development stages of *iCare.* All audio-tapes from the six focus groups will be transcribed line by line but users will not be identified on the transcripts. Field notes recorded during observations will be compiled from each data collector and compared to the audio tapes for clarity and consistency. Observations on the field notes will be added to the transcripts. Next, transcripts will undergo a multi-step analysis plan. First, initial content analysis will be performed on each focus group by the researchers to detect any differences in user responses in three phases: all themes will be coded, categorized and then summarized. Next, each transcript will be reviewed for initial themes and then subjected to line-by-line analysis to reveal categories and themes [1,7,30].User problems identified in the focus groups will be categorized according to the themes and added to Nielsen's heuristic evaluation tool (see TABLE 3). All usability issues will be assigned to one of the ten Nielsen factors to ensure that it is a flaw and not a personal user preference (see TABLE 4). All usability issues will be ranked by researchers according to the importance of correcting the function and the feasibility of modifying the application. Those

items ranking highest will be modified and re-evaluated by the users in the follow-up focus group until all data are collected from all focus groups.

TABLE 3: HEURISTIC EVALUATION OF *ICARE* (SAMPLE SHEET)

***iCare* FOCUS GROUP 1**		**IMPORTANCE**	**EASE of ACHIEVEMENT**	**PRODUCT**
iCare, version 1.5 **Content Issues**	**Heuristic Flaw**	**Low .....High** 1 2 3 4 5	**Difficult .....Easy** 1 2 3 4 5	
Insert user issue here.	Insert Flaw	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	
Insert user issue here.	Insert Flaw	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	
...	...	...	...	

TABLE 4: NIELSEN'S USABILITY HEURISTIC FACTORS

Nielsen's Usability Heuristic Factors
1. *Visibility of System Status:* The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
2. Match between system and the real world: The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
3. *User control and freedom:* Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
4. *Consistency and standards:* Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
5. *Error prevention:* Even better than good error messages is a careful design, which prevents problems from occurring in the first place.
6. *Recognition rather than recall:* Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7. *Flexibility and efficiency of use:* Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8. *Aesthetic and minimalist design:* Dialogues should not contain information, which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
9. *Help users recognize, diagnose, and recover from errors:* Error messages should be express in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
10. *Help and documentation:* Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Limitations: This feasibility study uses the standard usability testing procedures for product development. The goal of usability testing is to identify system failures and user issues through planned and systematic observations during focus group work with a small number of individuals from a population who represents the intended user of the product. There is an inherent limitation in a usability study; they are narrow in scope and deal largely with micro-design issues or delivery issues. This type of data will be gathered in this study but the programmers and engineers will also evaluate the structural architecture and functionality of *iCare*. This is a unique feature in the XP software development process that strengthens this feasibility study.

Tasks	Year 1				Year 2				Project Personnel	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Dr. Li	Dr. Wyatt
Develop Academic EHR usability framework									X	X
Manage/Train Beta Test Participants									X	X
Focus Groups (FGs) Study										
-University of Tennessee	FG1-FG3				FG4-FG6				X	X
-Kennesaw State University	FG1-FG3				FG4-FG6					
-Shenandoah University	FG1-FG3				FG4-FG6					
Conduct Initial Assessment									X	X
Prepare Publications and Presentations									X	X
Develop and Maintain Website									X	
Final Assessment and Discussion									X	X

FIGURE 1: MILESTONE CHART FOR THE PHRASE I EFFORT

A milestone chart plotting the expected progress of the Phrase I effort is shown in Figure 1.

Part 4. Commercial Potential

4. 1. The market opportunity

Market Size: There are three interfaces to the market: student, faculty and administration. The nursing schools, themselves, are considered the primary customer. They establish policies and curricula that are followed by faculty and students. Those faculty and students represent iCare Academic's consumers. There are approximately 3,000 nursing programs in the United States, with approximately 400,000 undergraduate nursing students in attendance. Student enrollment is increasing at a rate of approximately 4% annually. iCare Academic estimates the number of faculty who will use EHR's to be approximately 2-3 out of 10-15 per school, making our faculty customer base between 6,000 and 9,000.

Assessing a value of $2,000 per school per year, and $100 per student per year, the annual revenue opportunity of the market is approximately $46 million. This value is consistent with iCare Academic's pricing structure. The total market size figure will be as varied as the varying pricing structure of iCare Academic's competitors. On the lower end of market value, using Elsevier's pricing structure for *Evolve*, the market revenue opportunity is $34 million. On the high end, Cerner's pricing for AES would put the market value at $180 million. Elsevier's US operational revenue is approximately $2.8 billion. Cerner's revenues are approximately $1.7

billion. Approximately $5 billion is spent annually on tuition at nursing schools. Beyond nursing education, the software industry's revenues exceed $150 billion. Nursing schools as users of EHR training tools are a very niche market relative to the size of the healthcare IT competitors moving into this new market, the size of the nursing school industry, and the size of the software industry in general.

Trends: Few schools of nursing currently offer EHR training. However, what has been a latent demand is now at the forefront due to recent changes in both the healthcare industry and the healthcare education system. Proficiency in the use of EHR's is an expectation of recent nursing graduates. In 2008, the two largest certifying bodies for colleges of nursing in the U.S., the *American Association of Colleges of Nursing* and *National League for Nursing*, published position statements encouraging nursing programs to incorporate the use of EHR's and HIT into program curricula. Full featured simulation, such as the use of computer driven patient simulation mannequins, is becoming the norm for nursing education. The 2009 American Recovery and Reinvestment Act (aka the Stimulus) committed $19 billion to creation of EHR's for every American by 2014. When this comes to fruition in healthcare, nursing programs must arm their future graduates with the ability to navigate EHR's upon their first day of clinical practice. Finally, data mining skills within EHR's are becoming mandated as part of the "Rapid Learning" movement, which is a quality improvement initiative based upon evidence based healthcare delivery practice gleaned from EHR data.

Compounding the problem nursing programs face inadequate options for EHR training due to trends toward reduced state and federal funding to schools and universities. The costs students pay in pursuit of their degree can vary widely. While tuition for a bachelor's degree in a distinguished private university can cost as much as $100,000, tuition for an associate degree in a local community college can cost under $5,000. An average four year public university degree costs approximately $26,000 for tuition alone. As the costs of an education continue to rise for students, the funding received by the universities continues to fall. As a result, both consumer and customer are increasingly sensitive to added costs of new educational requirements. For this reason, the cost structure of EHR training tools will be very critical to determining success in the market

4. 2. The Company/Team

Historic and Current Roles and Responsibilities: iCare Academic LLC is co-founded by an interdisciplinary team of four members: Dr. Xueping Li, a healthcare IT guru; Dr. Tami Wyatt, an expert in nursing instructional technology; Matt Bell, a veteran from U.S. Army Nurse Corps and an active nursing student at UTK; and Yo Indranoi, a healthcare systems analyst with 15+ years of experiences.

The team started to collaborate in January 2008 when Mr. Bell attempted to search for free shareware and commercial offerings to fill the College of Nursing need for educational EHR for Dr. Wyatt's Senior Projects. While Mr. Bell was not able to find usable educational EHR, he was introduced to Dr. Wyatt's research collaborator, Dr. Li, and his Ph.D. student, Mr. Indranoi. Since the team was unable to locate a viable product, the team built a product and iCare Academic was born. We have built a XML based prototype and finished three focus group studies at UTK.

The PI of the project, Dr. Li, is the Director of the Intelligent Information Engineering Systems Laboratory (IIESL) at UTK. Dr. Li's areas of research interest and expertise include healthcare

simulation and logistics modeling, complex systems modeling, simulation and optimization, information systems assurance, supply chain management and so on. His research has been funded by the National Science Foundation (NSF), the National Institutes of Health (NIH), the Oak Ridge National Laboratory (ORNL) and a variety of industries. He provides support for *iCare* backend database design, application development and deployment including the role of Chief Technology Officer (CTO). Senior Personnel, Dr. Wyatt's duties include the role of Chief Executive Officer (CEO), research and development lead, and lead nursing program liaison. Mr. Bell's duties include content expertise and business development as Chief Operating Officer (COO). Mr. Indranoi's primary focus is functionalities between the base programming and the user interface as Chief Information Officer (CIO). Drs. Li and Wyatt will both oversee the research and continued development of *iCare*. More complete biographical information of the PI and Senior Personnel is in the Biographical Sketches section.

Advisors and Future Executives: iCare Academic has sought out a board of advisors with appropriate experience for guidance as we enter the market. Geoff Robson, the director of the Center for Entrepreneurial Growth (CEG) at Tech2020, has participated in the planning and execution of strategic plans for 24 start-up and early stage companies directly affiliated with the broad research base of The University of Tennessee. The UT CEG client companies are projected to exceed $12M in revenue, outside capital raised of $8M to date, and employment totals exceeding 100 people in 2009. Geoff also manages a capital fund that has completed 20 debt and convertible debt transactions including warrant agreements.

Jonathan Russell, the first member of iCare Academic's advisory board, was one of three founders of NetLearning, founded in 1997. NetLearning is a leading provider of web-based training solutions for health care with over 500 licensed hospitals in the United States. Mr. Russell was instrumental in the development of the core software products during the early stages of the business. In his tenure with NetLearning he served as the CFO and board member until the sell of the business to Thomson Corporation in 2004. Mr. Russell is currently the Director of Operations for the Knoxville office of NetLearning.

Harry King has seven years experience in engineering and program management at Ford Motor Company. Mr. King has held the role of lead engine systems engineer and program manager for a wide variety of programs, including an all new engine program with an investment of $250 million. Some of the programs Mr. King has led for Ford eliminated up to 45% complexity, and are saving Ford approximately $30 million per year. Mr. King was a founding member of Emitting Light, LLC, a high-tech LED company. Mr. King has been providing business advice and financial services to iCare Academic, and we are in negotiations to bring him on board to be our first external hire as Chief Financial Officer (CFO) when he finishes his MBA in December, 2009.

With guidance from its board of advisors, iCare Academic is in discussion with a few individuals for potential executive level positions to be filled at different points in time. The criteria for these positions are experience in a start-up, and experience with electronic media in the health care and/or education fields.

4. 3. Product, Technology and Competition

Description of Product: *iCare* is an EHR designed specifically for use in the education of healthcare professional students. *iCare* provides familiarization with EHR use as well as HIT.

Additionally, *iCare* teaches a logical approach to retrieving and documenting electronic patient care data and reinforces the healthcare professional student's physical assessment of their patients. *iCare* offers similar functionality to EHRs that are in widespread use in U.S. healthcare facilities currently.

iCare will be launched to its beta testers as a Windows based system hosted remotely, using a remote desktop protocol, with the primary system to be deployed via the internet. The only user end IT requirement is an internet ready computer. *iCare* offers "dashboards" which allow different functions for each user type: student, instructor, and administrator. The student dashboard allows student users to set up secure accounts, access assigned case studies, submit completed assessments to appropriate faculty, and view grading and feedback from instructors. The instructor dashboard allows the instructor to create a secure account and populate courses with case studies within *iCare*. Additionally, instructors can review reports that display what the student entered into the EHR, as well as how the student navigated the software. The administrator dashboard allows pre-designated faculty at each customer site access to all of the functionality of instructors as well as the ability to add/change instructors. A screen shot of an *iCare* prototype is shown in Figure 2.

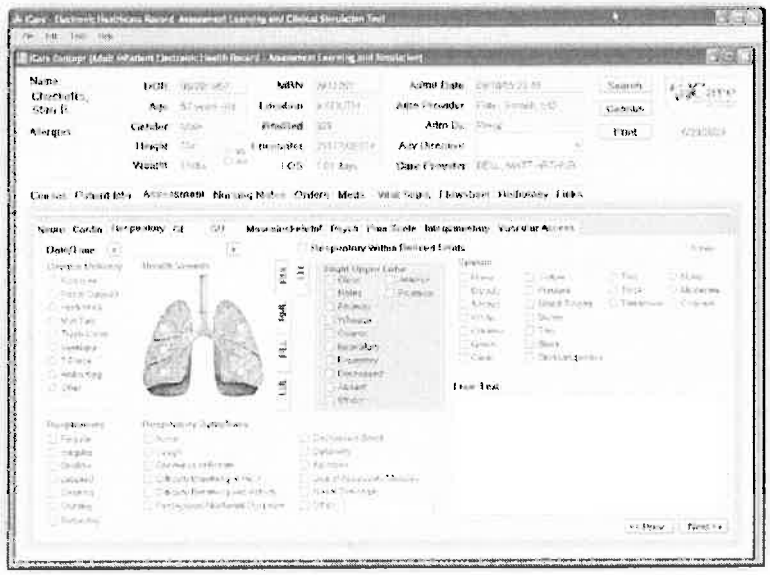

FIGURE 2: A SCREEN SHOT OF ICARE PROTOTYPE

Related and Future R&D:

Future upgrades will include an upgrade from windows to web based interface, and care planning and patient teaching tabs. The current version, 1.0, will only be launched to Beta testers. Version 2.0 will launch in the summer of 2010, which will migrate to a web based interface. Finally, care planning and patient teaching is being planned simultaneously. To date, there are no standardized guidelines for patient teaching and care planning. As the field moves towards consensus, this feature will be added.

iCare is currently designed for nurses in this Phrase I project, can be refitted to address the learning needs of all health care professionals since all who provide health services must be versed in electronic health records to access, record and query patient data. This will be our future tasks after we finish this Phrase I project.

Support: Research and development will be continuous on the part of *iCare* personnel as well as on the part of contracted beta testers. Semiannual software upgrades will be provided coincidental with fall and spring semesters. All upgrades will be free of charge to customers. 24/7 web based IT support for students and faculty with general *iCare* navigation and features

instruction, as well as a FAQ section that will be available on the internet. 24/7 phone and internet based support for pre-designated customer administrators will also be available.

Competitive Landscape: The direct competitors to iCare Academic are discussed in this section.

NEEHR Perfect: NEEHR Perfect is the most similar company to *iCare.* NEEHR Perfect is a subsidiary of Archetype Innovations, LLC, which offers IT tools to various segments of the healthcare industry. It was founded by a nursing instructor and her husband, an experienced software development professional. NEEHR Perfect became available in July, 2009.

Nurse²: Nurse² is a company started by a nurse educator who has developed an educational EHR which offers robust content and functionality. However, the user interface is unprofessional in appearance. The founders of iCare Academic initially considered Nurse² for use in UT's academic setting, but found it to be in adequate, a sentiment echoed by many in the customer base.

Evolve (Elsevier): Elsevier is primarily a book publishing company. Its product in EHR training is an electronic addendum to one of its books. Its primary strength is its distribution network, which is firmly established in the academic environment. However, its core competencies are out of line with those required to create a viable EHR. Elsevier's strategy appears to leverage its publishing market to distribute its software. While Evolve can be purchased directly, it is marketed as an adjunct to textbooks published by Elsevier. Evolve became available in the Spring of 2009.

AES (Cerner): Cerner is a large healthcare services company with a broad scope. Academic Education Solution (AES) is its offering to EHR training. AES is not designed specifically for use in nursing schools, but a much more broad range of applications. While AES has most of the features required by nursing programs, its broad scope drives up the cost to a point where most nursing schools cannot justify the cost. The ongoing annual cost for AES is approximately $60,000 for each school, in addition to a per user fee.

OpenVista: Medsphere Systems Corp., a provider of Open Source healthcare IT solutions, announced in December of 2008, that the University of Oklahoma College of Nursing contracted with Medsphere to participate in the new Academic Incubator Program, an effort to help educate students in nursing and medical schools about healthcare. OpenVista is the purchase of rights to commercialize the use of the Veteran's Administration's Vista EHR software.

Others: The remaining competitors are less direct, comprised of individual schools developing their own systems. Most of them are pursuing grant money to help offset the development costs. The predominant trend among them is to use an existing database system, such as Microsoft's Access, and modify it to meet their needs. There are no known examples of schools attempting to take their systems to market.

*Systems in use:*_ NEEHR Perfect appears to have four collaborators in Minnesota, New York, New Jersey, and North Carolina. Cerner claims that AES has the largest number of users at 7,000 students in over 40 programs, worldwide. The rest of the competition is in early stages of market entrance. No individual educational EHR offering holds more than 1% total market share.

Competitive (Five) Forces: EHR training is a new industry. Many of the market forces are still being established. Due to the internal development of the EHR training software, the bargaining power of suppliers is very low. While some of *iCare*'s development will be subcontracted to reduce the time to market, contract work in the current economy is highly sought after, leaving suppliers with very low bargaining power. Furthermore, a core competency of iCare Academic is its ability to develop the necessary software internally. Beyond satisfying immediate needs, bargaining power of supplies will not be a large factor, as a majority of product development will be done in house.

Bargaining power of buyers is moderate. As mentioned, accreditation will ensure adoption of some form of EHR training. The ARRA has set aside grant money into which some schools are tapping to develop their own EHRs, giving those schools some degree of leverage. Due to the different set of competencies required to create EHRs; however, this occurrence is primarily a result of the absence of any good option currently in the market. Once *iCare* becomes widely available, the bargaining power of the buyers will be a function primarily of the competition in the marketplace.

The threat of potential entrants into the market is also moderate. The fiscal barriers to entry are sufficiently low that any entity will be able to enter if it wishes to do so. However, the nature of the market as a niche product will serve as an artificial barrier by deterring companies with high levels of resources from entering due to relatively low net present values (NPVs) of projects. As a result, the greatest threat of potential entrants comes from companies like iCare Academic, which will have been created solely for the purpose of entering the market. A greater barrier to entry is the specific technical proficiency required to create a useful product.

The lack of options for EHR simulation has created the existing market. While EHRs are organized in a similar manner to databases such as Microsoft's Access, there remains no viable alternative of a true academic EHR tool. While the inaction of educational EHR adoption remains an option, the impending requirement of EHR training for accreditation will ensure that all schools eventually use EHR simulation tools such as *iCare*.

Competitive Advantage: iCare Academic's competitive advantage is the ability to build an EHR from the clinicians' perspective. **Based upon usability research and the insight of our cofounders, we are able to determine what *iCare* users want and need in an educational EHR. We have, and will continue to, directly incorporate that feedback into *iCare* with subsequent software updates. Our software is directly built by consumers - students and faculty.**

Due to the unique insight by iCare Academic's founders, several features are available that are unique to *iCare*. One prominent feature is the ability to structure the cases by college course. Whereas the competition does not allow a case study (simulated patient) to undergo different treatment or present different conditions depending on the course, *iCare* does. Faculty for each individual class can modify their case studies without affecting case studies of other faculty. Time/Date stamps are automatically reset at user login to maintain realistic scenarios between interface sessions (students using *iCare*). iCare Academic is building a learning mode within the software where instructional information is displayed, and a testing mode allowing faculty to disable features during student testing. Certain aspects of the electronic patient assessment screens, such as the Braden Scale, are automatically calculated as data are entered. Finally, *iCare* has a links tab that ties directly to the databases and electronic resources offered to

students of their schools, enabling a direct interface with additional evidence based reference sources.

No other educational EHR offers these features, which have been added based on the insight of the founders, in conjunction with feedback from schools currently in negotiations with iCare Academic for Beta testing. In addition to the voice of customer and consumer insight our cofounders provide, we also have cofounders proficient in IT interface systems, as well as healthcare IT. Unlike most of our competitors, we are positioned to not only see customer needs change before anyone else, we are also positioned to develop solutions to as yet unseen needs before others can identify them.

4. 4. Financing and Revenue Model

iCare Academic expects to capture approximately 20% of the nursing school market within five years. The number of students represented by these schools will exceed 20% of nursing students, due to the size of the schools most interested in EHR training. We project to be profitable by year two. By year five, operating profit is approximately 25% of gross revenues. Our noteworthy assumptions for costs are:

- Royalties to UTRF at 6.5% of gross revenues
- Research and Development spending is 10% of gross revenues
- Sales and Marketing costs are 35% of gross revenues, which includes a provision of approximately 10%
- General and Administrative costs, including executive compensation are 7% of gross revenues

TABLE 5: STATEMENT OF CASH FLOWS OF *ICARE*

Operating Activities	2010	2011	2012	2013	2014	2015
Net Income	($43,363)	$265,583	$317,231	$692,599	$1,485,837	$3,057,702
Depreciation	$0	$0	$0	$0	$0	$0
Change in Deferred Tax	($4,258)	$7,490	$3,860	$8,086	$15,098	$30,474
Change in Accounts Receivable	$0	($63,071)	($77,190)	($161,720)	($301,967)	($609,477)
Change in Other Short Term Operating Assets	$0	($9,461)	($11,579)	($24,258)	($45,295)	($91,422)
Change in Accounts Payable	$0	$63,071	$77,190	$161,720	$301,967	$609,477
Change in Accruals	$0	$69,378	$84,909	$177,892	$332,163	$670,425
Change in Other Current Liabilities	$0	$19,552	$23,929	$50,133	$93,610	$188,938
Net Cash from Operating Activities	($47,621)	$352,542	$418,350	$904,453	$1,881,413	$3,856,117

The statement of cash flow is as TABLE **5**. Year zero is for the fiscal year ending in June, 2010. Costs for the first two years are broken down to specific costs to the degree possible. From year three forward, all estimates are based on percents of revenue. The major early costs are Research and Development, in the form of development cost to meet timing requirements of the first Beta testers and an estimated $2,000 per event for six conventions for marketing costs. The proposed usability study is critical to the R&D since through this study, insights and feedback from the end customers will be directly incorporated into the development of the product.

Valuation and Investment Opportunity

Investments: As can be seen from the income statement, iCare Academic will be operating at a loss in year zero. The founders have invested in excess of $40,000 in *iCare* to this point. iCare Academic is in discussions with local investors for a share of equity in exchange for funding.

UTRF has agreed to grant iCare Academic $10,000 from a technology maturation fund. iCare Academic is also in the process of applying for grants and SBIRs.

Valuation: iCare Academic is projecting a future value at the end of year five. The value ranges depending on the multipliers used. The NPV of projected cash flows for the next five years discounted at 35% yields a current value of $1.6 million. In five years, the value of iCare Academic will range from $24-36 million, depending on the multipliers used.

Exit Strategy/Options: iCare Academic is evaluating options for exiting the market. As the EHR training industry is new, the future market is not well known. Cerner and Elsevier are both potential candidates for an acquisition due to their presence in the market. *Laerdal* is a manufacturer of simulation mannequins that may be a candidate for a company looking to expand its scope within the simulation nurse training field. There may also be some companies that are in the academic software industry, but not specific to healthcare, that may also be interested. The goal is to exit in approximately five years.

On November 23, 2009, iCare Academic was approached by a representative from *Elsevier* about a potential partnership. Elsevier has the largest customer base of medical literature in the world. At this point in time, no discussions have taken place, but this opportunity will be investigated for potential growth to expand the customer base or to explore exit strategies.

Part 5. Consultants and Subawards/Subcontracts.

None. During this project, the PI and the iCare Academic LLC is in partnership with *The University of Tennessee Research Foundation* (UTRF) and The *Center for Entrepreneurial Growth* (CEG). Dr. Hopkins is the Vice President of UTRF who manages a team with extensive experiences in helping transform inventions into products and services for the market, including evaluation and assessment of inventions, funding and managing the patent process, marketing inventions to potential licensees, registering copyrights or trademarks, consulting on intellectual property (IP) provisions in research agreements, and so on. Mr. Robson is the Director of CEG and will participate in the planning and execution of strategic plans for the iCare Academic LLC. The letters of support are enclosed. The services provided by Dr. Hopkins and Mr. Robson will be at no cost to this Phrase I project.

Part 6. Equivalent or Overlapping Proposals to Other Federal Agencies.

No similar proposals have been submitted.

Part 7. Prior NSF Support

Dr. Li is currently working as Co-PI on the NSF sponsored project *Innovation and Entrepreneurship in Production Development and Commercialization* [Dr. Sawhney (PI), Award #0438641, $600,000, 08/15/05 – 7/31/11]. His primary responsibilities are in the curriculum development of an Engineering Entrepreneurship Minor and establishing an *Idea Bank* of new product ideas drawing from university discovery and ORNL. An innovative MBA/MS dual degree program has been developed that integrates the disciplines of business, engineering, and law to produce graduates with a unique entrepreneurship skill-set. A number of products have been designed and developed during the course of the NSF project, including *Safelight*™ (safelightstore.com) a braking light system that provides an early warning signal for vehicle drivers in the event of an abrupt stop or extreme braking. Dr. Li, himself, is benefiting from this project, which motivated him to co-found the iCare Academic LLC.

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APPOINTMENTS

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SELECTED LIST OF RELEVANT PUBLICATIONS

1. Chayawat Indranoi, Tami Wyatt and Xueping Li (2009), "Development and Usability of iCare: An Electronic Health Record System", Proceedings of the 2009 Industrial Engineering Research Conference, May 30 - June 3, Miami, FL. pp. 797-802.
2. Xueping Li, Laigang Song and A. Garcia-Diaz (2008) "Adaptive Web Presence and Evolution through Web Log Analysis", *International Journal of Electronic Customer Relationship Management*, Vol. 2, No. 4.
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5. Xueping Li, Nong Ye, Xiaoyun Xu and Rapinder Sawhney (2007) "Influencing Factors of Job Waiting Time Variance Minimization", *European Journal of Industrial Engineering*, Vol. 1, No. 1., pp. 56-73.

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SYNERGISTIC ACTIVITIES

- Co-Founder of iCare LLC, Modeling and Simulation of Electronic Health Record Assessment Learning Tool - *By educators, for educators.*
- Grant Proposal Panelist: National Institutes of Health (NIH), 2009; NSF CMMI, Washington DC, 2008; NSF CMMI Engineering Research and Innovation Conference, Knoxville, TN, 2008.
- Editorial board member of *International Journal of Data Mining, Modeling and Management* (IJDMMM), *International Journal of Operations Research and Information Systems* (IJORIS), and *International Engineering and Technology (IETECH).*
- Reviewer for journals of *Operations Research, IIE Transactions, IEEE Transactions on Reliability, IEEE Transaction on Systems, Man and Cybernetics, Part A & C, Computers and Operations Research, Computers and Industrial Engineering, INFORMS Journal of Computing* et al.
- Innovating in *Teaching with Technology* (TWT), University of Tennessee 2006; developing online modules for Information Engineering education.

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1. Keeling, A. W., Snyder, A., **Wyatt, T.H.,** & Krauskopf, P. (2003). Practice Pointers: Accessing PDA Information. *The Nurse Practitioner, 28*(1), 10.
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3. Phillippi, J. & **Wyatt, T.H.** (In review). Smartphones in Nursing Education. Computers, Informatics, Nursing.
4. **Wyatt, T.H.,** Krauskopf, P.B., Gaylord, N., Ward, A., Hawkins-Huffstutler, S. Y., & Goodwin, L. (In Press). Cooperative M-learning with Nurse Practitioner Students, Nursing Education Perspectives. (Data based).
5. **Wyatt, T.H.** (1999). Patient Education and Instructional Technology: Assimilating Theory into Practice. *International Electronic Journal of Health Education*, 2(3) 85-93;

SYNERGISTIC ACTIVITIES

- Co-Founder of iCare LLC, Modeling and Simulation of Electronic Health Record Assessment Learning Tool - *By educators, for educators.*
- Grant Proposal Panelist: University of Tennessee Innovative Technology Center Research in Technology and Education. Knoxville, TN, 2008.
- Manuscript Reviewer of CIN: Computers, Informatics and Nursing.
- American Nursing Informatics Association member
- Sigma Theta Tau International Nursing Honor Society, International Technology in Public Health Education Award Recipient

COLLABORATORS & OTHER AFFILIATIONS

Patricia Burkhart, PhD, RN, University of Kentucky, Xupeing Li, PhD, University of Tennessee, Chayawat Indranoi, MS, University of Tennessee, Matthew Bell, BSN, RN, University of Tennessee, Maureen Nalle, PhD, RN, University of Tennessee, Trena Paulus, PhD, University of Tennessee, Debra Lee, MS, University of Tennessee, Carole Myers, PhD, RN, University of Tennessee, Sandra Mixer, PhD, RN, University of Tennessee, Nan Gaylord, PhD, RN, University of Tennessee, Patricia Krauskopf, PhD, RN, Shenandoah University, Shelly Y. Hawkins, DNSc, RN, University of North Carolina at Chapel Hill, Linda Goodwin, PhD, RN, Duke University, Hyegung Rhee, PhD, RN, University of Virginia, Emily Hauenstein, PhD, RN, University of Virginia, Gina Roberts Phipps, PhD, University of Tennessee, Iryna Laboda, PhD, University of Tennessee, Steffen Fleisher, RN, University of Halle, Germany

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION	FOR NSF USE ONLY		
iCare Academic LLC	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR	AWARD NO.		
Xueping Li			

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Xueping Li - Dr.**	2.00	0.00	0.00	$ 16,889	$
2. **Tami Wyatt - Dr.**	1.00	0.00	0.00	8,444	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	3.00	0.00	0.00	25,333	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				25,333	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				8,360	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				33,693	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				4,000	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **6,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
(**0**) TOTAL PARTICIPANT COSTS				6,000	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				3,000	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				10,800	
TOTAL OTHER DIRECT COSTS				13,800	
H. TOTAL DIRECT COSTS (A THROUGH G)				57,493	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 40.5660, Base: 40693)**					
TOTAL INDIRECT COSTS (F&A)				16,508	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				74,001	
K. FEE (IF REQUESTED MAXIMUM = 7% OF J)				0	
L. TOTAL COST AND FEE (J + K)				$ 74,001	$

PI/PD NAME	FOR NSF USE ONLY		
Xueping Li	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG

1 *ELECTRONIC SIGNATURES REQUIRED ONLY FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION	FOR NSF USE ONLY		
iCare Academic LLC	PROPOSAL NO.	DURATION (months) Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR **Xueping Li**	AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Xueping Li - Dr.**	2.00	0.00	0.00	$ 17,396	$
2. **Tami Wyatt - Dr.**	1.00	0.00	0.00	8,698	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	3.00	0.00	0.00	26,094	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (**0**) GRADUATE STUDENTS				0	
4. (**0**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				26,094	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				8,611	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				34,705	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				4,320	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **6,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
(**0**) TOTAL PARTICIPANT COSTS				6,000	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				3,090	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				10,800	
TOTAL OTHER DIRECT COSTS				13,890	
H. TOTAL DIRECT COSTS (A THROUGH G)				58,915	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 40.5660, Base: 42114)**					
TOTAL INDIRECT COSTS (F&A)				17,084	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				75,999	
K. FEE (IF REQUESTED MAXIMUM = 7% OF J)				0	
L. TOTAL COST AND FEE (J + K)				$ 75,999	$

PI/PD NAME	FOR NSF USE ONLY		
Xueping Li	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG

*ELECTRONIC SIGNATURES REQUIRED ONLY FOR REVISED BUDGET

Facilities, Equipment, and Other Resources

The PI and the iCare team have access to the following facilities that can be used to support the planned work through the strategic partnership with the University of Tennessee Research Foundation (UTRF), the Center for Entrepreneurial Growth (CEG) and the College of Nursing at the University of Tennessee. Letters of support are provided.

Intelligent Information Engineering and Systems Laboratory: Dr. Xueping Li is the Founder & Director of the Intelligent Information Engineering and Systems Laboratory (IIESL) at the University of Tennessee. This Lab is located at 301 East Stadium Hall. The computer equipments in the lab include 3 PowerEdge Servers, 10 high-end PCs, 2 network switches, 2 wireless gateways, 5 wireless adapters, 2 Linksys hubs, 1 scanner, and 2 HP Laser printers. The computers have been configured to form a high speed local area network. The Servers constitute a Higher Performance Cluster with 64GB RAM, 3T GB storage with RAID 5 support, and 16 Quad-Core Opteron CPUs, hosting a variety of software including ILOG CPLEX/OPL, LINGO, GAMS, Arena, MatLab, JMP, Statistica, SAS, SVN, Visual Studio and so on, which are available to the PI team and their graduate students through Terminal Services.

The University of Tennessee and Its Research Mission: The University of Tennessee (UT) is a federal land grant university whose mission embraces a commitment to teaching, scholarship, research, and service. UT is comprised of several campuses: UT Knoxville (UTK), UT Health Science Center at Memphis, UT Space Institute at Tullahoma, and the UT Institutes of Agriculture and Public Service. UT is committed to the premise that good teaching requires contributions from active scholarship, meaning that students will be exposed to research and research processes. The ultimate goal of research and teaching at UT is the health, welfare, and development of communities served by the university on local, statewide, national, and global levels.

The University of Tennessee-Knoxville (UTK), the flagship campus of UT, is the premier research institution in Tennessee. In 2008, *U.S. News and World Report* ranked UTK 53rd of the nation's public universities. UTK has 13 Colleges and Schools with over 300 degree granting programs. In Fall 2008, UTK student enrollment was approximately 26,400 students. Of that number, 20,400 were undergraduates and 6,000 were graduate students. About 100 different countries are generally represented on the Knoxville campus. UTK employs approximately 4,704 faculty and 2,270 clerical staff, and is the only public university in Tennessee that has the distinction of having a Carnegie Foundation Classification of RU/VH (a research university with very high research activity). As a research-extensive university, UTK takes on challenges including but not limited to: a) hiring and retaining research-competitive faculty and attracting more outstanding graduate students; b) continuing to provide faculty and students with modern facilities, equipment and information technology for instruction and research; c) continuing to strengthen the interrelationship between teaching and research; and d) continuing to contribute to the solution of social problems through research, education, and public service. UTK is currently reorganizing and consolidating programs to enhance research and scholarship capabilities of its component campuses. During the fiscal year 2007-2008, UTK received a total of $99 million in research awards and contracts, which has been higher for the last several years. The source of these funds is: federal (83.2%), TN state (5.7%), TN local (0.1%), private non-profit (3.1%), private for profit (7.1%), non-TN government (0.3%) and foreign (0.5%). UT has created eight Research Centers (RC), many of which are affiliated with private, community,

state and federal scientific programs. Together, the eight RC generated $5.5 million in fiscal year 2006-2007 and $7.5 million in fiscal year 2007-2008.

UT Knoxville College of Nursing: The UT Knoxville College of Nursing (UTKCON) was established in 1971 in response to the need for nurses to be prepared at the baccalaureate level. The masters program began in 1977. Students in the undergraduate program are prepared as generalist professional nurses. The UTKCON has an RN to BSN program that addresses the continuing need in the Knoxville area for baccalaureate-prepared nurses. There are seven concentration areas in the MSN program: adult health, administration, anesthesia, family nurse practitioner, women and children's health, mental health, and homeland security nursing. The MSN program also offers a second-degree option. Such enhances the interdisciplinary and diversified atmosphere within the MSN program by accepting into the program eligible individuals with baccalaureate degrees in disciplines other than nursing. The PhD Nursing program began in 1989 and is a joint venture with the UT Health Science Center College of Nursing at Memphis. In Spring 2003, the BSN to PhD program was approved and opened for enrollment in Fall 2003. The baccalaureate and masters programs are accredited by the American Association of Colleges of Nursing, and have full approval status from the Tennessee Board of Nursing. For the 2008-2009 academic year the UTKCON faculty consists of 38 full-time and 20 part-time members. Over 50% of the faculty has a doctoral degree. Fourteen are tenured and nine are on the tenure track. In Fall 2008, there were 850 lower-division students, 223 BSN, 13 RN to BSN, 141 MSN, and 21 PhD students. Among our generic baccalaureate students, approximately 11% are male and 15% are minority or international students.

UT Knoxville College of Engineering: Established in 1838, the University of Tennessee's College of Engineering (UTKCOE) has a long tradition of commitment to excellence in scientific research and the training of engineering professionals. The college consists of seven departments of study, four nationally renowned research centers and over 100 state-of-the art laboratories. The UTKCOE features an enrollment of over 2,700 undergraduate and graduate students and research expenditures top over $32 million. The UTKCOE is fully accredited by the ABET Board of Engineering and Technology and offers many nationally recognized programs. The mission of the UTKCOE is: 1) to provide high quality education in the major engineering disciplines from the undergraduate through doctoral levels through a creative balance of academic, professional and extracurricular programs; 2) to foster and maintain mutually beneficial partnerships with our alumni, friends, industry, and local, state and federal governments through public services assistance and collaborative research; and 3) to be a major contributor to our nation's technology base through scholarship and research.

UT Library Informational System: The University of Tennessee Libraries' extensive collection of resources for students includes 2,303,967 print volumes, 13,508 serial titles, 2,649,669 microforms, and 170,412 audiovisual materials. Most of the print collection, faculty studies, graduate student carrels, general seating, and study areas are located on floors 3-6 of the John C. Hodges Library, a 350,000 square-feet facility completed in 1987 with 2,000 seats for users. Hodges second floor includes public service departments and The Commons, a collaborative partnership between the Libraries and the Office of Information Technology. Recently renovated, the Commons is equipped with over 130 computer workstations, reference assistance, computer support, a practice presentation room, and laptop checkout from noon Sunday–midnight Friday and 8 a.m.–midnight Saturday each academic year. First-floor public

service departments include the Periodicals/Documents and Microforms Unit for access to current periodicals, newspapers, microforms research collections, International, State, and 45 percent of current Federal publications (Federal Depository Library since 1907). The campus wireless network is available throughout the Hodges Library.

The UT Libraries offer access to full-text services, electronic journals, and more than 250 indexes and other electronic research tools. Several full-text periodical collections include Academic Search Premier, Factiva, JSTOR, LexisNexis, Project Muse, Alt-HealthWatch, Springer LINK, Wiley InterScience, and Science Direct (Elsevier). The Homeland Security Digital Library provides access to a wide variety of policy and national strategy documents. The Cochrane Library offers the full-text of systematic reviews. The Social Science Electronic Data Library (SSEDL) and the University's membership in the Inter-University Consortium for Political and Social Research (ICPSR) provide access to additional electronic data collections. All are accessible from the Databases menu at http://www.lib.utk.edu/databases/. Individual titles in the collections are included on the e-journals list at http://www.lib.utk.edu/ej/. Additionally, electronic books are available via NetLibrary and Springer LINK.

UT Office of Information Technology: The Office of Information Technology (OIT) provides computing and telecommunications resources and services for students, faculty, and staff. Information about OIT is available on the OIT web site http://oit.utk.edu. OIT provides the core information technology equipment and services for The University of Tennessee. OIT provides public-access computer labs, central computing, administrative information systems and network services, as well as information security for UT. Individual computer accounts are provided at no charge for all UT students. These accounts may be used for email, course work, research, and personal Web pages. Students are also encouraged to download and use AntiVirus software supplied by OIT at no cost to the student. Students on the Knoxville campus may access the Internet through direct Ethernet, wireless, or dial-up accounts. All students can take advantage of UT's wireless network found throughout the UTK campus. To provide access to computing facilities on campus, OIT maintains seven staffed computing labs, several unstaffed labs, and supports computing installations in residence halls. The computing labs are equipped with more than 300 microcomputers including current models of Apple, Dell, and Gateway machines. In addition, there are laser printers, scanners, and CD-Writers available. A variety of industry standard software applications are available for use on the machines in the computing laboratories. Please refer to http://oit.utk.edu/labs.html for more information.

Innovative Technology Center: The Innovative Technology Center (ITC) of the University of Tennessee Knoxville. The ITC has a full time staff of 22 professionals that includes instructional designers, multimedia specialists, web developers, graphic interface designers, and programmers who enable faculty to significantly enhance the effectiveness of the educational process and enrich the learning experience of students. Specifically, ITC experts will contribute to this project by providing graphic design expertise, for the instructional elements and interface.

Summary: "*Designed by educators, for educators*". The iCare Academic LLC is in partnership with the University of Tennessee, a research-intensive university with a mission-guided, developing infrastructure that supports faculty and student research in many areas of scientific inquiry. The iCare team is committed and poised to move the research endeavors of academic EHR to advance its research mission. In collaboration with UTRF, CON and CEG, the PI and the iCare team has required facilities and resources to carry out the proposed research tasks.

UNIVERSITY OF TENNESSEE
RESEARCH FOUNDATION

IDEAS TO ENTERPRISE

November 20, 2009

Dr. Xueping Li
iCare Academic, LLC
2450 E.J. Chapman Drive
Knoxville, TN 37996

Dear Dr. Li:

As per our discussions during the last several months, I am pleased to assist and support the ongoing business development efforts of iCare, including those related to your project for consideration by NSF/SBIR: Usability of iCare – An Academic Electronic Health Record Clinical Simulation Tool. This proposal is related to the existing University of Tennessee creation disclosure (UTRF File No. CD08082), entitled "Development and Usability of iCare™: An Electronic Health Record System." The purpose of which is to develop an academic EHR tool that provides undergraduate and graduate students with exposure to, and experience in, utilizing healthcare information technology (HIT).

The University of Tennessee Research Foundation (UTRF) assists inventors at The University of Tennessee (UT) turn their ideas and discoveries into products and services that benefit society. As iCare Academic LLC's strategic partner, UTRF is prepared to commit funds of $10,000 to mature the underlying technology and support the $30,000 funds contributed by the co-Founders. Moreover, we and our business development partners are experienced in providing services to help transform UT inventions into products and services for the market, including evaluation and assessment of inventions, funding and managing the patent process, marketing inventions to potential licensees, registering copyrights or trademarks, consulting on intellectual property (IP) provisions in research agreements, and providing business incubation facilities and services. As we discussed, we look forward to working with iCare Academic LLC as it grows. I enthusiastically support your efforts in the area of health care and am anxious to begin this cooperative effort.

Sincerely,

John Hopkins, Ph.D., P.E.
Vice President

November 24, 2009

National Science Foundation
Industrial Innovation and Partnerships
4201 Wilson Boulevard
Arlington, VA 22230

RE: Letter of Support for the Proposal
SBIR Phase I: Usability of iCare – An Academic Electronic Health Record Clinical Simulation Tool

Dear National Science Foundation:

I am writing this letter to confirm my willingness to participate in the planning and execution of strategic plans for iCare Academic, LLC and to serve as a Senior Personnel on the NSF/SBIR Phrase I Proposal entitled, "Usability of iCare – An Academic Electronic Health Record Clinical Simulation Tool", submitted by Drs. Xueping Li and Tami Wyatt, the co-founders of iCare Academic, LLC.

The American Recovery and Reinvestment Act (ARRA) of 2009 has made available billions of dollars for health care providers to adopt and "meaningfully use" certified Electronic Health Records (EHRs). The usability study of EHR is recognized as critical for successful adoption and meaningful use. The proposed work is to conduct a usability study of an academic EHR tool named "iCare" and guide its development. Hence, it holds potential to fill the gap between preparing health care students, meeting accreditation criteria of National League for Nursing (NLN) and the American Association Colleges of Nursing (AACN), and accessing state-of-the-art EHRs to train health care professionals.

I have participated in the planning and execution of strategic plans for 24 start-up and early stage companies directly affiliated with the broad research base of The University of Tennessee. The Center for Entrepreneurial Growth (CEG) client company results are projected to exceed $12M in revenue, outside capital raised of $8M to date, and employment totals exceeding 100 people in 2009. I am looking forward to working with iCare Academic, LLC on this project and urge your favorable review of this proposal.

Sincerely,

Geoff Robson
Director – UT CEG
Center for Entrepreneurial Growth
A division of Technology 2020

Kennesaw State University

WELLSTAR School of Nursing

December 1, 2009

Xueping Li, PhD
iCare Academic LLC
2450 E J Chapman Drive
Knoxville, TN 37996
Phone: 865-292-8234

Dr. Xueping Li:

As a representative of Kennesaw State University, I, along with my colleagues and students, are pleased to become a beta tester of iCare, an academic electronic health record. I have reviewed many of the available products, and iCare is the best value on the market based on the quality and functionality of the product. Further, I believe that by participating as a beta tester, our department will provide valuable feedback and data to help refine iCare.

Our students will benefit by using the product, even in its current version. Students will gain experience in electronic documentation and navigating systems to gather information about patients. My colleagues and I will benefit because we are motivated to learn more about usability testing and participate as a active member of the research and development team, including data collection, presentations, and publications.

It is with enthusiasm that I offer support of this proposal and I am excited to be involved in beta testing iCare at no cost to Kennesaw State University. Please let me know if you need any other information.

Sincerely,

Jane Brannan

Jane Brannan, EdD, R.N.
Associate Professor and Assistant Director for Undergraduate Nursing

1000 Chastain Road MD 1601 Bldg 16 Kennesaw GA 30144-5591
Phone: 770-423-6061 Fax 770-423-6627 www.kennesaw.edu

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Posts by Others

Stacy Lambaren **Law Office of Houston S. Havasy**
November 20

Well done!

Like · Comment · Share

Katie Bolt Martin **Law Office of Houston S. Havasy**
November 15 near Knoxville, TN

Congratulations! Best wishes with your new practice!

Like · Comment · Share

Andrew Ingalls **Law Office of Houston S. Havasy**
November 15 near Chattanooga, TN

When Houston goes to court his hair alone is enough to win any dispositive motion. This is why he has never been to trial.

Like · Comment · Share

Barbara Lambaren, Kourtney Hennard and Natalia Lambaren Havasy like this.

Natalia Lambaren Havasy this just made me bust out laughing. thanks for making my day.
November 15 at 8:55am

Linda Scherer **Law Office of Houston S. Havasy**
November 14

Impressive...impressive indeed!

Like · Comment · Share

Leonardo Lambaren **Law Office of Houston S. Havasy**
November 14 near Fullerton, CA

Nice job Houston!

Like · Comment · Share

Val Meyer Beenken **Law Office of Houston S. Havasy**
November 14

So very proud of you, Houston! We had some fun times while you and Jesse went to GHS together, and afterwards! Hope to keep in touch....

Like · Comment · Share

Earlier in 2013

AMENDED AND RESTATED BASIC AGREEMENT

THIS AMENDED AND RESTATED BASIC AGREEMENT, including the Appendix attached hereto and incorporated herein by reference, is entered into as of the Effective Date (defined below) by and among:

UNIVERSITY OF TENNESSEE RESEARCH FOUNDATION, a non-profit Tennessee corporation with offices at UT Conference Center, Suite 211, 600 Henley Street, Knoxville, Tennessee 37996-4122 ("UTRF");

THE UNIVERSITY OF TENNESSEE, a public higher educational institution of the State of Tennessee with its principal office in Knoxville, Knox County, Tennessee ("University");

ANY INDIVIDUAL named as an Originator in the Appendix (Part 1); and

ANY INDIVIDUAL OR ORGANIZATION named as an Other Recipient in the Appendix (Part 1).

WITNESSETH:

[**Terms that are not defined when first used are defined in Article 9 below.**]

WHEREAS, UTRF is a not-for-profit Tennessee corporation which has as one of its primary functions the management of inventions and other creative works; and

WHEREAS, the Originator(s) has/have contributed to the development of Subject Technology;

WHEREAS, the contribution of one or more Originator(s) was made, in whole or in part, while such Originator(s) was/were employed by the University;

WHEREAS, the parties wish to enter into this Agreement to acknowledge any previous assignment of the Subject Technology to UTRF, to assign to UTRF all Subject Technology that has not been previously assigned to UTRF, to provide for the assignment to UTRF of Subject Technology developed after the Effective Date, to provide for the distribution of the Originator(s) Share of UTRF's revenue from commercialization of Subject Technology, and to address certain other matters pertaining to the business relationship among the parties;

WHEREAS, the parties previously entered into a Basic Agreement effective August 17, 2010, and the parties now wish to amend and restate that Basic Agreement and replace it entirely with this Amended and Restated Basic Agreement.

NOW THEREFORE, in consideration of the mutual obligations and upon the terms and conditions herein contained, the parties hereto agree as follows:

ASSIGNMENTS AND REPRESENTATIONS

The University hereby assigns and agrees to assign to UTRF its entire right, title, and interest throughout the world in and to the Subject Technology.

Each of the Originator(s) hereby assigns and agrees to assign to UTRF such Originator's entire right, title, and interest throughout the world in and to the Subject Technology. The Originator(s) represent and warrant that they are collectively the owners of the entire right, title, and interest in and to the Subject Technology, except: (a) Subject Technology previously assigned to UTRF, such previous assignment(s) being hereby acknowledged and affirmed; and (b) any right, title, or interest in Subject Technology held by the University or by any third party named in the Appendix (Part 5).

With regard to all copyrighted or copyrightable works included in the Subject Technology, such assignments to UTRF shall include, without limitation, all rights incident to ownership of copyright under the copyright laws of the United States and all other countries, including but not limited to the right to reproduce, distribute, translate, publicly perform or display, and prepare derivative works and the right to cause or allow others to do all of the foregoing. The Originator(s) represent and warrant that such works are the original work of the Originator(s) and, except as set out in the Appendix (Part 5), a valid release, assignment, or license, as appropriate, has been secured from each and every third party whose copyrighted or copyrightable work is included in the Subject Technology.

Each of the Originator(s) represents and warrants that (a) he or she has full power and authority to enter into this Agreement, to make the foregoing assignments, and to carry out the transactions contemplated hereby; and (b) neither the execution and delivery nor the performance of this Agreement by him or her will violate the terms of any agreement, policy, judgment, order or decree to which such Originator is bound.

It is understood and agreed that any rights granted by or to any party by the terms of this Agreement shall be subject to any rights held by the United States government and any restrictions imposed by the laws and regulations of the United States or by any agency thereof.

OBLIGATIONS OF THE ORIGINATOR(S)

Each of the Originator(s) agrees not to take action inconsistent with this Agreement or in derogation of the rights in the Subject Technology granted to UTRF or by UTRF to a third party.

Each of the Originator(s) agrees (a) to promptly disclose to UTRF in writing all Related Developments as soon as reasonably possible; (b) to provide UTRF at its request all relevant notes, laboratory records, drawings, blueprints and other documents in his or her possession or control pertaining to the Subject Technology; and (c) to make all disclosures

and execute any contracts or other documents and to provide any other assistance reasonably requested by UTRF in the patenting, administration, and commercialization of the Subject Technology, in the prosecution, defense, or settlement of any lawsuit, arbitration, mediation, or other proceeding pertaining to the Subject Technology, and in general to effectuate the intent of this Agreement.

COMMERCIALIZATION OF SUBJECT TECHNOLOGY

In consideration of the foregoing assignments, UTRF agrees to attempt to commercialize the Subject Technology and to secure revenue therefrom in such manner and in such form as its sole judgment best dictates. In its discretion, UTRF may at any time cease its commercialization efforts for the Subject Technology or any part thereof.

The parties agree, and the Originator(s) hereby specifically consent to, UTRF's exercise of its sole judgment to grant University students access, use, options, licenses, or assignments of Subject Technology ("student access") for purposes of their University course work, for example in connection with a University course on entrepreneurship where the Subject Technology might be the subject of an application for a small business innovation research (SBIR) or small business technology transfer (STTR) grant, or similar effort. The parties recognize that UTRF is authorized by this consent, within its sole discretion, to fix the terms and conditions for such student access on a blanket, scheduled or fixed basis, without regard to the particular actual value or potential for the Subject Technology. Even if no Originator withholds consent, UTRF may unilaterally and in its sole discretion deny student access to Subject Technology. Recognizing the possible advantages and disadvantages to Originator(s), University, UTRF and any involved students of allowing such student access, Originator(s) specifically waive any objection and hereby release UTRF from any claim or cause of action for loss or injury under contract or tort based on any act or omission of UTRF or such students with regard to the adequate, reasonable, prudent or diligent commercialization of the Subject Technology.

DISTRIBUTION OF THE ORIGINATOR(S) SHARE

UTRF shall disburse the Originator(s) Share of Revenue as set out in the Appendix (Part 3) subject to the remaining provisions of this Agreement.

Where there are multiple Originators, UTRF may disburse the Originator(s) Share of Revenue in accordance with the percentages set out in the Appendix (Part 3) even though one or more of the Originators may not have contributed to the conception or reduction to practice of the particular part or aspect of Subject Technology that generated the Revenue. In the event the Originator(s) Share of Revenue is reduced as a result of any one or more of the Originators' acts or omissions in connection with the commercialization of the Subject Technology (by way of illustration, but not limitation, if an Originator is obligated, but fails, to perform some research or consulting for a third party licensee or assignee of the Subject Technology, which failure causes a reduction of the Originator(s) Share of Revenue),

UTRF may unilaterally and its sole discretion modify this Agreement to reallocate the Originator(s) Share of Revenue to provide all Originators with percentages of the Originator(s) Share that UTRF deems appropriate under the circumstances.

If it is determined by UTRF that an individual who is not named as an Originator under this Agreement has the right to share in Revenue or that an individual who is named as an Originator under this Agreement does not have the right to share in Revenue, UTRF may unilaterally and in its sole discretion modify this Agreement to (a) add (or remove, as the case may be) such individual as an Originator under this Agreement and (b) reallocate the Originator(s) Share in order to provide all Originators and Other Recipients with a percentage of the Originator(s) Share that UTRF deems appropriate under the circumstances. Each of the parties hereby agrees to any increase, decrease, or elimination of such party's share of Revenue resulting from UTRF's reallocation of the Originator(s) Share pursuant to this provision.

If it is determined by UTRF that an Originator or Other Recipient has been overpaid for any reason, UTRF may deduct the over-payment from subsequent payment(s) that may be due to such Originator or Other Recipient.

By execution of this Agreement, each Originator and Other Recipient hereby irrevocably waives all right to receive a portion of the revenue or other proceeds from commercialization or use of Subject Technology by UTRF and/or the University except as provided herein.

Each of the Originator(s) and Other Recipient(s) is responsible for notifying UTRF of his/her/its current address and for updating that information as appropriate. UTRF shall have discharged its obligations to any Originator or Other Recipient if it directs payment to such Originator or Other Recipient at the last address provided to UTRF. If payment is not deliverable to the last address provided, such payment will be held by UTRF and will be available to such Originator or Other Recipient if claimed within one (1) year after the date of UTRF's letter transmitting the original check. After one (1) year, uncashed checks from UTRF to any Originator or Other Recipient shall become void and UTRF's payment obligation to such Originator or Other Recipient shall be discharged. In the event that such Originator or Other Recipient contacts UTRF with a current address after a period in which UTRF had no current address, UTRF shall resume payments to such Originator or Other Recipient, but UTRF is under no obligation to make payments for any prior period during which UTRF had no current address. Email or facsimile contact information does not constitute an address under this paragraph.

PAYMENTS, NOTICES AND OTHER COMMUNICATIONS

Any notice or other communication required or permitted hereunder (hereinafter "notice") shall be in writing and shall be delivered in person or sent by nationally-recognized overnight courier, by certified United States mail, return receipt requested, by email, or by facsimile. Notice shall be deemed given and received five (5) days

after being deposited with the U.S. Postal Service certified mail postage prepaid, or upon the date of actual delivery if notice is hand-delivered, or if sent by overnight courier, upon the date of delivery as indicated by the courier's records, or if sent by facsimile or email, upon the date the receiving party acknowledges receipt in writing. All communications shall be sent to a party at such party's address, email, or facsimile number, set forth in the Appendix (Part 1) or at such other address as a party designates by written notice.

INSPECTION OF RECORDS

The Originator(s) and any Other Recipient(s) shall have the right for a period of two (2) years after receiving any payment hereunder to examine and make extracts of books and records maintained by UTRF pertaining to the distribution of revenue from the commercialization of Subject Technology for the sole purpose of verifying the accuracy of such payment, during regular business hours only and not more often than once in any calendar year. The failure of any party to request verification of any payment made during said two (2) year period shall be deemed acceptance of the accuracy of such payment, and UTRF shall have no obligation to maintain any records pertaining to such payment beyond said two (2) year period.

DISPUTE RESOLUTION

Procedure. Any and all claims, disputes or controversies (hereinafter "dispute(s)") among any Originator(s), Other Recipient(s) and/or UTRF arising under, out of, or in connection with this Agreement shall be resolved by the University pursuant to the provisions of the University's Policy on Patents, Copyrights, and Other Intellectual Property (hereinafter "Policy") currently in effect or as hereafter renamed, substituted, or amended.

Arbitration. Any disputes arising out of or relating to this Agreement that are not resolved by the University pursuant to Article 7.1 above, shall be settled by binding arbitration in accordance with the Commercial Arbitration Rules of the American Arbitration Association then in effect. The arbitrator shall enforce, and shall have no power to add to, subtract from, or modify any of the terms or conditions of this Agreement, the University's Policy, or UTRF's specific written policies relative to the sharing of income *with* inventors and creators. Judgment upon the award rendered by the arbitrator may be entered in any court having *in personam* and subject matter jurisdiction. The provisions of this Article 7.2 shall not apply to the University, and the University shall not be bound by any award rendered as a result of such arbitration.

GENERAL MATTERS

Assignment. Neither this Agreement nor any rights or duties created hereunder may be assigned in whole or in part by any party without the prior written consent of UTRF; provided, however, that any Originator may transfer his or her right to receive payments

hereunder to a third party without the consent of UTRF provided that such transfer shall not be effective until such Originator notifies UTRF in writing of the identity and address of the assignee, and further provided that no such assignment shall relieve an Originator of his or her duties and obligations hereunder.

Entire Agreement: No Oral Modification. The parties hereto acknowledge that this Agreement (including the Appendix) sets forth the entire agreement and understanding of the parties as to the subject matter hereof, and supersedes and cancels any prior agreements or understandings between the parties, written or oral, with respect to such subject matter, including specifically, but not by way of limitation, the Basic Agreement previously entered into by the parties effective August 17, 2010 which is replaced by this Amended and Restated Agreement. Except for modifications to this Agreement that UTRF is permitted to make unilaterally, any modifications must be signed by the party(ies) against whom the provision is sought to be enforced.

Cooperation of the Parties. The parties agree to use their best efforts to cooperate with each other in the further perfection and commercial promotion of the Subject Technology.

Choice of Law. This Agreement is entered into in the State of Tennessee and shall be construed, interpreted, and applied in accordance with the laws of the State of Tennessee without reference to the conflicts-of-law rules of such State.

Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original but all of which shall constitute the same document.

DEFINITIONS

When used in this Agreement, the following terms shall have the meanings set out below. The singular shall be interpreted as including the plural and vice versa, unless the context clearly indicates otherwise.

"Basic Technology" shall mean (a) all developments, inventions, discoveries, know-how, designs, methods, improvements, technology, products, data, works of authorship, marks, trade secrets, mask works, and derivative works named, described, illustrated, referenced in, or otherwise attributable to the Disclosure named in the Appendix (Part 2); (b) the Patent Rights; and (c) all copyright, trademark, and other intellectual property rights pertaining thereto.

"Commercialization Agreement" shall mean any agreement whereby UTRF is entitled to receive cash and/or Securities as consideration for a grant of rights in the Subject Technology to a third party.

"**Disclosure**" shall mean (a) a written document submitted to UTRF by UT whereby one or more Originators report the development of one or more inventions or creations and (b) the invention(s) and/or creation(s) reported in such document, as well as any intellectual property rights pertaining thereto.

"**Effective Date**" shall mean October 21, 2009.

"**Expenses**" shall mean attorney fees and other actual out-of-pocket expenses incurred by UTRF before or after the Effective Date, excluding the salary paid to any UTRF staff member. By way of illustration, but not limitation, Expenses may include amounts expended in:

the acquisition and maintenance of intellectual property rights, including but not limited to copyright and trademark registration and the preparation, filing, prosecution, and maintenance of patent rights;

the negotiation, implementation, monitoring and enforcement of commercialization agreements and other agreements;

the prosecution or defense of any lawsuit or participation in any mediation, arbitration, interference or other proceeding;

research and development, testing, marketing, and general administration;

compensation of any joint owner, co-inventor, co-author, or other third party who has the right to share in Revenue;

excise, sales, use, value added and other taxes; delivery charges; and expenses connected with the import and export of goods; and

the determination, judicial or otherwise, of any issues involving or arising out of this Agreement.

"**Net Revenue**" shall mean Revenue allocated to commercialization of Subject Technology less Expenses allocated to Subject Technology, provided that:

UTRF may deduct Expenses incurred in the administration or commercialization of one part or aspect of Subject Technology from Revenue generated by another part or aspect of Subject Technology.

UTRF may deduct Expenses from Revenue even though such Expenses are incurred after the receipt of Revenue.

When Expenses are expected to exceed Revenue, UTRF may set aside sufficient funds from Revenue to cover those Expenses.

Where Revenue is received from a Commercialization Agreement that covers Other Technology as well as Subject Technology, UTRF may allocate Revenue (and the Expenses pertaining to any or all technologies covered by that Commercialization Agreement) between Subject Technology and Other Technology as UTRF deems appropriate under the circumstances. UTRF may set forth in the Appendix (Part 6) the procedure(s) to be used in allocating Revenue and Expenses to Subject Technology under particular Commercialization Agreement(s) (even if not yet finalized), and UTRF may unilaterally modify any such procedure as it deems appropriate.

"Originator(s) Share" shall have the meaning set forth in the Appendix (Part 3).

"Other Technology" shall mean all developments, inventions, discoveries, know-how, designs, methods, improvements, technology, products, data, works of authorship, marks, trade secrets, mask works, and derivative works other than Subject Technology that are commercialized by UTRF pursuant to a Commercialization Agreement.

"Patent Rights" shall mean:

any United States or foreign patents and patent applications listed in the Appendix (Part 4);

any United States or foreign patent applications not listed in the Appendix (Part 4) that are directed to subject matter included in Subject Technology, and the resulting patents;

any divisionals, renewals, extensions, additions, continuations and continuation-in-part applications directed in whole or in part to subject matter described in any patent or patent application described in paragraph A. or B. above, and the resulting patents;

any patents resulting from reissues or reexaminations of the United States patents described in subparagraph A., B., or C. above; and

any foreign patents resulting from equivalent foreign procedures to United States reissues and reexaminations of the foreign patents described in paragraph A., B., or C. above.

"Related Developments" shall mean inventions, discoveries, know-how, designs, methods, improvements, technology, products, works of authorship, trademarks, trade secrets, mask works and derivative works (collectively referred to as "developments") related to the Basic Technology that (a) were developed, conceived, and/or reduced to practice by one or more Originators prior to the Effective Date in the course of employment by the University and/or with substantial use of University funds or facilities or (b) are developed, conceived, and/or reduced to practice by one or more Originators after the Effective Date in the course of employment by the University and/or with substantial use of University funds or facilities.

"Revenue" shall mean UTRF's actual cash revenues from a Commercialization Agreement (including cash revenues from sale of Securities). Revenue shall not include payments to the University or UTRF for support of research and development activities.

"Securities" shall mean all securities of every kind and rights and options with respect thereto, including stock, notes, bonds, debentures, evidences of indebtedness and other equity or debt ownership interests in any partnership, corporation, limited liability company, joint venture, proprietorship or other entity, domestic or foreign, accruing to UTRF's benefit pursuant to a Commercialization Agreement.

"Subject Technology" shall mean and include Basic Technology and Related Developments and all intellectual property rights pertaining thereto, including but not limited to patent rights, copyrights, trademarks, trade secrets, and mask work rights.

IN WITNESS WHEREOF, signifying their acceptance of an agreement to be bound by the terms and conditions of this Agreement, the signatures of the parties are affixed hereto.

ATTEST:

Witness

THE UNIVERSITY OF TENNESSEE RESEARCH FOUNDATION

By: _____
Name: Randall W. Gentry
Title: President
Date: November 23, 2010

THE UNIVERSITY OF TENNESSEE

_____
Witness

By: _____
Name: _____
Title: Vice President
Date: _____

Witness

TAMI H. WYATT

(signature)

Date: November 23, 2010

Witness

MATTHEW A. BELL

(signature)

Date: November 23, 2010

IN WITNESS WHEREOF, signifying their acceptance of an agreement to be bound by the terms and conditions of this Agreement, the signatures of the parties are affixed hereto.

ATTEST:

UNIVERSITY OF TENNESSEE RESEARCH FOUNDATION

By: Randall W. Gentry
Name: Randall W. Gentry
Title: President
Date: November 23, 2010

_____
Witness

Jammie Cole
Witness

THE UNIVERSITY OF TENNESSEE

By: Charles M. Peccolo
Name: Charles M. Peccolo
Title: Vice President
Date: 11-23-10

TAMI H. WYATT

_____
(signature)

Date: _____

_____
Witness

MATTHEW A. BELL

_____
(signature)

Date: _____

_____
Witness

Witness

CHAYAWAT INDRANOI

(signature)

Date: November 23, 2010

Witness

XUEPING LI

(signature)

Date: November 23, 2010

APPENDIX TO BASIC AGREEMENT

Part 1: Names and Addresses of the Parties

[It is agreed that UTRF may unilaterally modify this Appendix (Part 1) to reflect the addition or deletion of parties in accordance with the terms of this Agreement and to reflect changes in the addresses, emails, and facsimile numbers of the parties as they may designate by written notice to UTRF.]

UTRF:

University of Tennessee Research Foundation
UT Conference Center, Suite 211
600 Henley Street
Knoxville, Tennessee 37996-4122
Email:
Facsimile:

University:

The University of Tennessee
Office of the Vice President for Research
5th Floor, Andy Holt Tower
Knoxville, Tennessee 37996

Originator(s)

Tami H. Wyatt
2535 Coning Road
Maryville, TN 37803

Matthew A. Bell
8919 Maple Ridge Lane
Knoxville, TN 37923

Chayawat Indranoi
191 Portland Drive
Lenoir City, TN 37771-6811

Xueping Li
1350 Pershing Hill Ln
Knoxville, TN 37919-0700

Other Recipient(s)

NONE

APPENDIX TO BASIC AGREEMENT

Part 2: Basic Technology

"**Basic Technology**" means software and all associated content and Intellectual Property developed, conceived, and/or reduced to practice by one or more Originators in the course of employment by University and/or with substantial use of University funds or facilities to support the teaching, testing and assessment of nursing, other health care and veterinary students and professionals relating to their ability to (i) work with eHRs and to access, record and query them, (ii) engage in patient teaching and care planning and mapping in connection with eHRs, and (iii) participate in medical billing and coding in connection with eHRs, as such software exists as of the date of execution of this Agreement, including source code, object code, any related interfaces and workflow tools, all technical, development, operational, end-user, and marketing documentation, third party license rights, dashboards, screen views, what appears to be actual patient health information (but in fact is based on fictional persons with fictional health conditions), database support, stored lists, and business rules.

"**eHR**" means electronic health or medical records.

"**Intellectual Property**" means (a) patents, patent applications, inventions and statutory invention registrations, (b) registered trademarks (where the term "trademark" as used in this Agreement includes all trademarks of any type, including service marks, certification marks and all other indicia of source or origin) and applications for same, including all goodwill associated therewith, (c) unregistered copyrights, registered copyrights and applications for same, (d) trade names, logos, common law and unregistered trademarks, Internet domain names, Internet and World Wide Web URLs or address, unregistered works of authorship, (e) computer software, records and data, including business rule data and user interface data, (f) confidential and proprietary information, including trade secrets and know how, and (g) all other intellectual property.

APPENDIX TO BASIC AGREEMENT

Part 3: Distribution of the Originator(s) Share of Revenue

[It is agreed that UTRF may unilaterally modify this Appendix (Part 3) to reflect changes in the distribution of the Originator(s) Share in accordance with the terms of this Agreement.]

The Originator(s) and any Other Recipient(s) as a unit are entitled to receive, as the "Originator(s) Share," fifty percent (50%) of Net Revenue.

UTRF will distribute the Originator(s) Share, if any, not less frequently than once each calendar year as follows:

Originator:	Allotted Percentage of the Originator(s) Share:
Tami H. Wyatt	Twenty-five percent (25%)
Mathew A. Bell	Twenty-five percent (25%)
Chayawat Indranoi	Twenty-five percent (25%)
Xueping Li	Twenty-five percent (25%)

Other Recipient:	Allotted Percentage of the Originator(s) Share:
NONE	NONE

APPENDIX TO BASIC AGREEMENT

Part 4: Patent Rights

[It is agreed that UTRF may unilaterally modify this Appendix (Part 4) to add patent applications and patents, domestic and foreign, that it believes should be included in Patent Rights or to delete patent applications or patents that it believes should not be included in Patent Rights.]

United States Provisional Patent Application(s):	NONE, as of Effective Date
United States Patent Application(s):	NONE, as of Effective Date
United States Patent(s):	NONE, as of Effective Date
Foreign Patent Applications:	NONE, as of Effective Date
Foreign Patents:	NONE, as of Effective Date
Copyright Registration:	NONE, as of Effective Date

APPENDIX TO BASIC AGREEMENT

Part 5: Third Party Rights in Subject Technology

Third parties holding right, title, or interest in the Subject Technology as of the Effective Date:

iCare Academic, LLC (pursuant to Software License between University of Tennessee Research Foundation and iCare Academic, LLC effective January 13, 2010)

APPENDIX TO BASIC AGREEMENT

Part 6: Allocation of Revenue and Expenses to Subject Technology

[It is agreed that UTRF may unilaterally modify this Appendix (Part 6) to reflect changes in the procedure(s) for allocating Revenue and/or Expenses under particular Commercialization Agreement(s) to Subject Technology in accordance with the terms of this Agreement.]

THE UNIVERSITY of TENNESSEE
Legal Clinic
1505 W. Cumberland Avenue
Knoxville, TN 37996-1810
Phone: (865) 974-2331
Fax: (865) 974-6782

November 4, 2009

SENT VIA REGULAR MAIL

iCare Academic, Limited Liability Company
c/o Matthew Bell
8919 Maple Ridge Lane
Knoxville, TN 37923

Re: Filing Acknowledgment from Tennessee Secretary of State

Dear Board of Directors of iCare Academic, LLC:

Congratulations! The Filing Acknowledgment has been received from the State of Tennessee and iCare Academic LLC has successfully filed Articles of Organization with the State effective October 22nd 2009. We have enclosed the original document and four copies for each of the iCare founding Members and Board of Directors.

Please note the instructions on the Filing Acknowledgment to file the document in the office of the Register of Deeds in Knox County. Filing with the Register of Deeds is not required but recommended, and the cost is approx. $5. The Knox County Register of Deeds is located in the City and County Building on Main Street. Please also note that iCare Academic LLC is expected to file an Annual Report with the Secretary of State by the date on your Acknowledgment, which is 04/01/2010.

Please do not hesitate to contact me if you have any questions at all.

Sincerely,

Hannah Lowe
Clinic Attorney

HSL/cja

Enclosures: Filing Acknowledgment original and 4 copies

THE UNIVERSITY of TENNESSEE KNOXVILLE

COLLEGE of LAW

Douglas A. Blaze, Dean
Suite 278
1505 W. Cumberland Avenue
Knoxville, TN 37996-1810
(865) 974-2521
Fax: (865) 974-6595
E-mail: blaze@utk.edu

January 13, 2011

iCare Academic, LLC
ATTN: Harry King
2450 E. J. Chapman Drive
Knoxville, TN 37996

Dear Harry:

Thank you for your recent gift to the Charles H. Miller Legal Clinic Fund and the Center for Entrepreneurial Law Endowment. I truly appreciate your philanthropic investment in the University of Tennessee College of Law.

During the past two years as dean and seventeen years on the faculty, I have seen first hand the difference that is made by the generosity of donors, such as you. Thanks to folks like you, we have increased the amount of scholarship dollars available to our students so that we can attract some of Tennessee and the nation's best and brightest students. We have also added numerous professorships which enable us to retain and recruit our outstanding faculty. The Charles Miller Legal Clinic, the Center for Advocacy and Dispute Resolution, the Joel A. Katz Law Library, and the Clayton Center for Entrepreneurial Law are a small sampling of the areas within the College of Law that continue to excel because of private support.

Your gift makes a real difference in the legal education of every student in the College. Thank you again for your support. If I can ever be of assistance, please do not hesitate to contact me.

Best,

This is so exciting - thanks!!

Douglas A. Blaze
Dean
Art Stolnitz & Elvin E. Overton
Distinguished Professor of Law

KENT STATE
UNIVERSITY

The Centennial Campaign

January 6, 2011

Mr. Harry King
iCare Academic LLC
2450 E.J. Chapman Drive
Knoxville, TN 37996

Dear Mr. King:

On behalf of the students, faculty and staff at Kent State University, thank you for the generous gift from iCare Academic of $1,800 to the Stark Campus Scholarship. The success of our students is our number one priority, and your generosity supports that goal by providing them with the opportunity to achieve academic excellence and to build a strong foundation for their future.

This year, our 100th anniversary, has been focused firmly on the future. With the launch of the public phase of our Centennial Campaign we have set the stage for the next century of stability and growth.

We also completed several capital improvement projects, including renovations to the library and the transformation of Risman Plaza. We added the College of Public Health to the Kent State family of distinguished colleges, only the second college of public health in Ohio. And we completed the Roe Green Center for the School of Theatre and Dance, which allows students to create, collaborate and learn in state-of-the-art classrooms, studios and labs. These are just a mention of many exciting changes here at Kent State made possible in large part by our generous donors.

We remain committed to keeping pace with the expectations of our students, our supporters and our peers by focusing on excellence. Again, please accept my thanks on behalf of the entire university community. We are grateful that your philanthropic vision includes the support of Kent State.

Sincerely,

Stephen G. Sokany
Senior Associate Vice President for
Institutional Advancement

TAKE ACTION
ACHIEVE EXCELLENCE

Institutional Advancement
P.O. Box 5190 • Kent, Ohio 44242-0001
1061 Fraternity Circle • 330-672-2222 • Fax: 330-672-3049 • advancement@kent.edu