RESEARCH ARTICLE

LACK OF MOTIVATION AMONG HEALTH WORKERS (RADIOLOGY) TO CONDUCT CLINICAL RESEARCH AT KFSH&RC

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ABSTRACT

The Department of Radiology in King Faisal Specialist Hospital and Research Center is committed to excellence in research, particularly in pioneering new advances in technological innovation. As one of the top Radiology Departments in the world, it is recognized for its strength in physics, engineering, molecular imaging and clinical medicine. The Radiology Department provides clinical services in Diagnostic Radiology, Interventional Radiology, Ultrasound, Vascular Laboratory, Cross Sectional Imaging (CT) scan, Magnetic Resonance Imaging (MRI), Nuclear Medicine and Positron Emission Tomography (PET). There are also several cooperative interdepartmental activities with the Department of Surgery, Department of Oncology, Internal Medicine, and Emergency, etc…. This study is enlightened the factors that associated with lack of motivation to conduct clinical research within radiology technologists whether this factors are quantitative or qualitative to improve the research activities within the area and add benefit of our joint clinical projects through participation of faculty from the College of Applied Medical Sciences, School of Medicine and other areas in teaching and learning research activities that enrich the educational experience and create a multidisciplinary collaborative research environment. Special emphasis is placed on the teaching of radiology technologists both during their internship a year rotation in the department which is part of their regular yearly curriculum and also during their career to help improving the experience and maintain the medical and clinical productivities outcomes. The goal of the research initiative in the Department of Radiology is to apply new and innovative technologies to challenging clinical problems, in order to improve patient health, practice quality, and scientific knowledge.

INTRODUCTION

The field of radiology has grown significantly over the past 15 years. This can in large part be attributed to advances in research and, indeed, the future of the field depends on this continued tradition. Although supporting to radiology research has increased substantially in the past decade, much of the research is being carried out by researchers who are not technologists. There are clear indications that too few technologists are performing research for a variety of reasons, including a shortage of time, training and manpower. At the same time, there are indications that technologists (seniors, juniors and students) are interested in a future dual clinical technical research career. The field of radiology has experienced remarkable growth in the past 15 years.

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Existing modalities have been improved upon extremely (e.g., computed tomography [CT], ultrasonography), and new modalities have been developed (e.g., magnetic resonance imaging [MRI], positron emission tomography [PET]). Digital imaging is increasingly replacing traditional photographic records. There is so much to learn, and so many imaging possibilities, those diagnostic technologists are often sub specialized by modality. Expressed lack of academic, research-oriented technologists will affect after period of time the department productivity. The key to the past and future success of radiology, both diagnostic and interventional, is research. Research depends on funding and resources, manpower, skill and training, motivation and opportunity of the technologists. It is well known that there is a shortage of academic technologists, particularly those performing high-quality researches. A lack of radiology research may have devastating effects on the future of the specialty, and technologists may quickly find themselves falling behind competing specialties. The future of strong research carried out by technologists is the

motivation and ability of trainees to perform academic research.

The purpose of the study is to explore the factors associated with poor motivation level among radiology technologists to conduct clinical research.

Literature Review

It is common knowledge that research productivity among technologists in the Radiology Department at King Faisal Specialist Hospital and Research Center is essentiality not existent. Virtually no publication or research projects have appeared in the last decade. This is a very large and well equipped department, and radiology physicians have also been asked why no research is conducted to capitalize on their resources. But, as the literature shows, this is not a unique situation.

"The United States National Institute of Health's (NIH) defines clinical research as: Patient-oriented research; epidemiologic and behavioral studies; and outcomes health services research".There are many studies discussing lack of conducting clinical research among Radiology Technologists in the West. Many of them have tried to develop an approach to treat this problem in different ways.

Embi *et al2009,*conducted a joint multiphase study at the University of Cincinnati and Ohio State University to report major challenges and opportunities in Clinical Research Informatics (CRI) the Appendices 3 and 4 show the method and the results of their study. They used a four-phase methodology to develop a systematic understanding of the definition, challenges, and opportunities inherent to CRI. As their data show, the authors deduced 13 categories, including problems with research planning, data access, educational needs, fiscal issues, leadership needs, etc. Among the limitations which they found in their study were: biases in qualitative analyses due to use of internal participant observations; possible selection bias based on dependence on self-selective convenience samples; and assumed failure to capture all the challenges and opportunities facing the CRI domain. The use of qualitative multiexpert validation techniques mitigated these short comings somewhat and enhances the validity of their findings.

In another study, Chrysanthopoulou *et al., 2007,* in the University Of Patras Department Of Clinical Radiology, emphasized three issues: the importance of continuous medical education; improving interdepartmental communication and collaboration; and adopting well documented protocols throughout the hospital setting to reduce costs and minimize risks. However the study did not constitute formal research. Rather it used informal observations and discussions to render its conclusions.

In a third study, Alderson *et al., 2004*, conducted a panel in the Department of Radiology, Columbia University Medical Center, to discuss ways to enhance research productivity and broaden the base of research strength in as many academic radiology Departments as possible. They suggested five important resources for a research program: "enlightened leadership; a culture that values research; a core resource strategy; ability to leverage institutional resources; and ongoing academic support from the dean."

The experienced barriers to success while they found were "(a) lack of support from the dean;(b) time required to provide clinical service; (c) diminished income associated with doing research rather than clinical service; (d) lack of protected time for conducting research; e) lack of appropriate space to support competitive research; (f) perception of the role of radiology in the institution as a service provider only; (g) misperception and poor communication within radiology, which causes lack of respect between clinical radiologists and investigators both physicians and no physicians; (h) Cultural conflicts between departments; and (i) selection of residents who have little or no interest in research." As in the previous study the panel findings did not constitute formal, controlled research.

In a fourth study, Itagaki and Spellman *et al* 2005,in the University of Illinois, College of Medicine, asserted in their review of radiology articles indexed in the National Library of Medicine Medline database that research productivity in academic Radiology can be measured on both the departmental and individual levels by using publication volume and quality. Their subsequent analysis encompassed all research output from 1996 through 2003. These data concerned the residency program size and faculty ratios: the number of fellows and the ratio of fellows to faculty accounted for between 75% and 88% of all variation in research output between departments, depending on the productivity measure used. They claimed that the importance of continued government support for academic research in Radiology department cannot be overemphasized.

While these studies offer many useful points, the present study, rather than relying on informal and document study methods, will utilize a survey research methodology, both to yield controlled data and to broaden the scope of data sources to all practitioners.

Aim of the Study

To explore the factors associated with poor motivation level among Radiology Technologists to conduct clinical research.

This study attempts: To study the differences of motivation factors between female and male technologists to conduct clinical research, also to study the differences of motivation factors between different levels of experience, (senior with more than 10 years working in KFSH&RC and junior with less than 5 years working in KFSH&RC), and to study the differences of motivation factors between different level of degrees (diploma, bachelors, master).In addition this study begins to assess appropriate needs to support competitive research between technologists (e.g. space, time, and resources).

Study Area and Study Subjects

Study Area

The study was conducted in all Radiology sections at King Faisal Specialist Hospital and Research Center, These are:

Nuclear Medicine, Ultrasound, Fluoroscopy, Angiography, Computed Tomography, Magnetic Resonance Imaging, Mammography, X-Ray and Bone Mineral Densitometry BMD. It confined for Radiology technologists at King Faisal Specialist Hospital exclusively. Other KFSH&RC department and other hospitals are not included.

Methodology

The research is conducted by using two methods:

A. Qualitative Research.
B. Quantitative Research.

For the Qualitative research, five focus groups were conducted. For the Quantitative research a questionnaire were distributed.

Study Design and Sample Size

Cross-sectional study design

The questionnaire and the focus group were distributed among all technologists of the KFSH&RC Radiology Department. Subgroups were formed to examine possible differences in motivation between them: the subgroups were formed include gender, age, expertise level, and degree.

Sample Size:

Input criteria: Radiology Technologists at King Faisal Specialist Hospital.
The projected sample size for this study is **100** total.

Sampling Technique

All 110 KFSH&RC Radiology Technologists will be included. This is the entire study group population full participation depends on supervisor distribution. It is anticipated that follow up reminder must be used to achieve high response rate.

Advantages

- No members are omitted.
- Ideal for statistical purposes (high N).

Disadvantages

- Requires an accurate list of the whole population.
- Expensive to conduct as those sampled may be scattered over a wide area.
- Depends on supervisor distribution.
- Follow up reminders must be used to achieve high response rate.

### Data Collection methods, instruments used, measurements

The Quantitative research conducted using a two page questionnaire (appendix 1) with Likert-type scales and qualitative comments.
This was forwarded by the principal investigator to the quality assurance department, who distributed it to section supervisors during their meeting for administration radiology technologists in their charge.

E-mail reminder used and the data of questionnaires collected by the P.I.

The scheme of questionnaire distribution
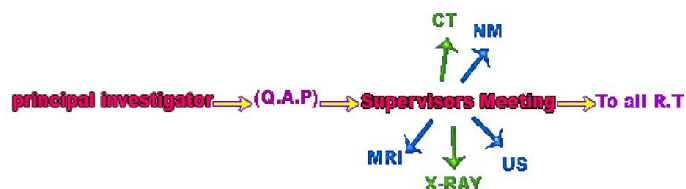
The qualitative research conducted using focus group five focus groups were conducted until saturation was reached when there is no addition or conflicting has been occurred and all questions have been answered. Every meeting had specific objectives and intended outcomes.

The brainstorming technique is proper to bring up different perceptions, points of view, and thoughts, without worrying about censorship. The duration of each was 30-60 minutes, scheduled according to the participants' requests. Each group discussion was tape recorded. Each facilitator (one per session = 5 total) was trained by the principle investigator. Participants include technologists from different departments.

Guidelines for Focus Group discussion

1. Importance of research.
2. How to enhance radiologist research productivity.
3. Research barriers.
4. Hindering and motivating factors.
5. Recommendation for improvement.
6. Contribution of research to personal and professional development.

The Results

Data management and analysis plan

In the Quantitative research by using the SPSS program which analyze the data collected by the questionnaires from 30 technologists of 100. I found three main factors affect the productivity of research, they are:
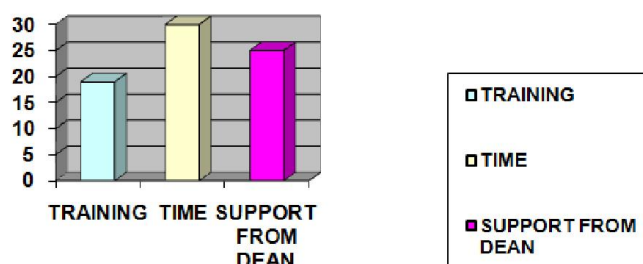
1- Time
2- Training
3- Support from dean

Table 1. Illustrate the factors affect the productivity of research

Lack of protected time for conducting research	The department has long list of patients load whether out-in patients,
The support from dean	The radiology department is always supporting the ideas that will lead for a good feedback and outcomes to the patient care but the supporting might be affected by the conflict of interest if the research problem was not matching the needs of the dean or culture.
Training	Major roadblock to advancing research is the lack of experienced technologists to conduct research.

In the Qualitative research data were analyzed using Content Analysis – Shared Themes across groups.

The main findings have been divided into three categories:

1- Importance of Research

a. Improve quality of patient care.
b. Enhance technologists' research knowledge and keep them updated.
c. Research leads to better professional performance.
d. Research contributes to personal development.
e. Research contributes to institutional recognition.
f. Sharing findings with others increases mutually beneficial collaboration

2- Research Barriers

a. Research phobia
b. Time constraints
c. Financial constraints
d. Lack of resources – facilities, equipment, etc
e. Lack of availability of references
f. Lack of support from leaders
g. Cultural factors including the perception that radiologist job description is only limited to service provision.

3- Recommended Motivating Factors

a) Protected time for research.
b) Appreciation and recognition from Department leaders.
c) Team work and collaboration in conducting research.
d) Moral and financial support.

The Discussion

- A Qualitative study proved to be an appropriate tool to explain the data regarding issues of motivation to conduct clinical research among radiology technologists.
- This is the first study in Kingdom which provoked the opinions of radiology technologists toward research productivity.
- The study showed radiology technologists are a ware of the problem as well as the barriers and the motivation factor, this is very important for establishing a program to enhance the research skills.

Recommendations

Based on the result

- Develop a research supportive culture in radiology departments based on a vision, incentives and rewards system.
- Recruit more PhDs and MD/PhDs into radiology departments and promote cooperation and communication between them and the technologists.
- Better research outcomes will be achieved by the full support and supervision from medical experts, technical experts, and medical physics experts.
- Development of a stronger research education curriculum as part of technical training
- Assure available personnel and other resources for research mentoring in Radiology.
- Financial support.

Conclusion – Main Challenges

In radiology departments that are not currently successful in research, the biggest challenges may be:

1. Getting started to create a research culture.
2. Promoting the use of interdisciplinary collaboration
3. Setting validation techniques/standards to enhance the validity and productivity of the research.

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Chrysanthopoulos A, Kalogeropoulos A, Terzis G .Trends and future needs in clinical radiology: Insights from an academic medical center, 2007; 194–201.

Embi PJ, Payne PRO, Peter J. Clinical research informatics: challenges, opportunities and definition for an emerging domain, *Journal of the American Medical Informatics Association*, 2009; 16: 316-27.

Itagaki W, Spellman J. Research productivity in academic radiology. *Radiology*, 2005; 237.

Appendix1: The questionnaire that has been used for the research

Survey on Perceptions about Research

Lack of motivation among Radiology Technologists to conduct clinical research at KFSH&RC.

This survey is a research project exploring issues and perceptions about research productivity. Your full responses are encouraged and your cooperation is gently appreciated. Your participation is voluntary and your answers will be confidential.

Please check the box if you agree participation ⊞ .

Name (optional):_____   Age:____   Sex: Male/Female

Work experience: Senior/Junior.   Section:_____

Degree: Master- Bachelors- Diploma- Other.

To what extent do you agree with the following statements. Please indicate by ticking in the relevant box on the scale:

1) Team members have adequate knowledge of the importance of clinical research within the institute.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

2) Our team has a coherent plan for achieving our vision and they have the information they need to set priorities related to research principles.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

3) Team members are generally aware of the way work flow proceeds around here and they know what is expected from research outcome to patient health and work environment.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

4) Team members' have a large areas of responsibility so there is no time to conduct clinical technical research.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

5) The research that we will use to move ahead on tasks is fairly simple and efficient.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

6) The research will be supported by the dean to achieve our research vision.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

7) Misperception and poor communication within the department (radiology) through the research could cause a lack of respect between clinical radiologists and investigators both physicians and non-physicians.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

8) The main barriers hiding behind allowing technologists to conduct clinical research are time and the patient load.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

9) There is sufficient time and opportunity allowed for **junior** Radiology Technologists to participate in research workshops, seminars, mini courses, etc.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

10) There is sufficient time and opportunity allowed for **senior** Radiology Technologists to participate in research workshops, seminars, mini courses, etc.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

11) Radiology Department often finds that research will add more for the future of technical and academic aspects of the Radiology Department.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

12) Better research outcomes will be achieved by the full support and supervision from medical experts, technical experts and medical physics experts.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

13) The Research will enhance the team members theoretically as well as practically and will increase the output of the institute.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

14) To motivate the team members the departmental leadership should reinforce clinical research by rewarding the sections which conduct such research, and by celebrating success in obtaining funding and/or reaching study goals.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

15) Radiology Department needs resources from outside the department to support departmental research for successful research programs.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

16) A common complaint is that research takes too long and is a waste time.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

17) The development of a stronger research education curriculum as part of technical training will enhance the research skills and increase the motivation to conduct clinical research.

□ Strongly agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree

Appendix2: The consent form

Consent form of Lack of Motivation Among Radiology Technologists to Conduct Clinical Research at King Faisal Specialist Hospital and Research Center: A Qualitative and Quantitative Study

Dear Mr. /Miss: --

The research has been explained in the preceding oral presentation the procedures involved in this research project including the purpose and what will be required for it. Any benefits and risks were also described. All of your current questions regarding your participation in this project have been answered. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

This insures that research involving people follows specific regulations questions regarding your rights as a participant in this project can be answered by calling Dr. Kholoud bin Haikel (01)-464-7272. EXT# 38877. Any new information that develops during the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are agreeing to participate in the project.
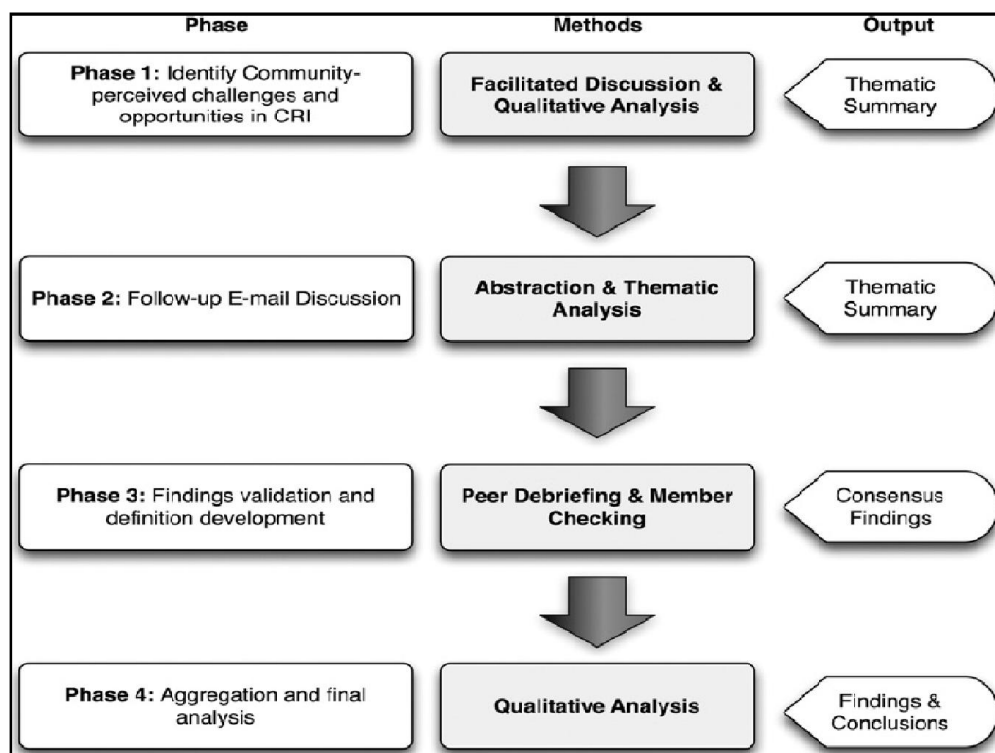
_____.
_____

Subject's Signature

Appendix3:

Figure 1. Overview of the four-phase methodology used to develop a systematic understanding of the definition, challenges and opportunities inherent to clinical research informatics (CRI)

Appendix4:

Themes	Underlying Categories	Representative Quotations
1. Research planning and conduct	Improved research planning tools Advanced clinical research design Tools cumbersome/poorly integrated Need for advanced analysis tools/methods	"…the issue is that the tools are cumbersome and poorly integrated with the workflow of patient care, and so you can't recruit either the investigators or the patients." "(Investigators) over-promise because the work is too hard to accomplish with the tools they are given" "Our computing power is great, yet we are basically using the calculating capability that was available to Fisher and his contemporary 80 yrs ago, without real appeal to the "knowledge level.""
2. Data access, integration, and analysis	Poor data access Lack of data integration Secondary use of data issues Incorporate research into clinical systems Need improved analysis across sites	"I think one of the largest challenges institutionally is data access and integration, and that's the barrier for the investigator." "…the interface between the electronic medical record and the clinical research is critical." "In the era of integration between clinical systems and clinical trials systems, there remain some interesting unsolved problems."
3. Educational needs	Educate students, investigators, clinicians about CRI Educate those working in CRI Educate informaticians about CRI Need for cross-discipline education Educate senior leadership about CRI	"…it might be worth considering what is the training required, because it is a tremendous leap for a DEA to understand the regulations for running a clinical trial. It is a tremendous leap for an electronic health records guy. CIOs and academic centers do not get it. No offense. This is a big leap here." "…(We should) educate some of our informatics colleagues… about the obstacles and roles and needs that we have in this research environment."
4. Fiscal and administrative issues	Research billing challenges Costs of research software Improved business processes needed Lack of incentives for adopting research tools/need to demonstrate ROI for CRI solutions	"We are struggling with the appropriateness of tracking research costs and research charges and making sure that we are compliant with that and what is research and what is not. So, there is a whole other set of business processes on the investigator's side that need to be somehow linked and coordinated with processes on the study side" "So one of the big things driving this is the complete lack of money or incentive to move beyond paper."
5. Regulatory and policy issues	International CRI activities Regulatory frameworks Political obstacles Regulator mis/over-interpretation as impediments to progress Security and privacy issues	"A broad issue is the international nature of clinical research, especially clinical trials; for example, clinical trials in developing countries where the informatics infrastructure and the regulatory and ethical oversight are sometimes not as well developed—trials having to respond to a patchwork of national, regional, and international regulations and responsible agencies" "…overly conservative or incorrect interpretations of a regulation can become an inadvertent impediment to clinical research"

6. Leadership and coordination	Need for coordinated CRI agenda Need for setting practical goals Need for coordination between initiatives/among stakeholders Desire for leadership/guidance from professional organization Need for coordination between regulators and CRI community Need to have CRI professionals represented in institutional leadership No clear channel for CRI decision making within academic institutions	"...(the part) AMIA can play a role in is keeping up with all of this... so creating this portal that allows people from this group to be able to contribute and to go and understand what is going on in this space." "(We need to encourage) open comment from all the different perspectives so we are hearing from the investigator, the vendor, the institution, the NCI and other NIH institutes; it would be fabulous to get that input (about CRI initiatives)." "...absent leadership from CRI sitting at the table in the Regent's meeting and at the Hospital board meeting and in the corridors of the Capitol, there is little hope of the software developer curing the problem." "...no group across academic medical institutions fully 'own' the problem of solving clinical research informatics."
7. Recruitment issues	Ineffective subject recruitment Current tools make recruitment difficult Lost opportunities to recruit Investigator recruitment challenges Not maximizing existing clinical information systems for recruitment	"Recruitment is the single biggest challenge. The investigators always over-promise. They do feasibility assessment. They try to target as best they can but there is under-performance that causes them to have to do rescues mid-way through. They have to close down sites, start up new sites. They cannot get a good handle on how to predict or estimate, or enhance and augment recruitment." "So the issue again rests on what can we do to make it easier so that clinicians are interested in becoming investigators."
8. Scope of CRI	Recognize CRI is about more than informatics for clinical trials Include support for nursing research Include research partners in agenda (e.g., pharma, government)	"(We should) expand our vision from clinical trials to encompass all of clinical research, because I think this is going to be critical as we move forward. It is not just the trials. It is the outcomes, the biomarkers. It is the epidemiology studies." "Nurses use a wide range of research techniques, and I think we need to be investigating those as well."
9. Socio organizational issues	Research/clinical missions not integrated/coordinated Inadequate/inappropriate resource allocation, use, adoption Poor stakeholder collaboration Inappropriate expectations of informatics versus IT groups	"There are some obvious technical challenges (to providing data integration and access), but ... one of the biggest challenges coming is actually integrating the research mission into the academic health care environment and ensuring that (removal of) these barriers that we have to data and systems and use of them for research is able to happen."
10. Standards	Need for CRI data standards, models Apply clinical standards to research Need ways to span biological to clinical ontologies Need to standardize nontechnical institutional and sponsor requirements	"...properly representing medical concepts and the right terminology in order to access anything down stream which includes real world data from insurance and electronic medical records, databases, as well as other knowledge bases." "...sponsors/pharma don't have standards and make each center create things according to each sponsor separately, like invoices, budgets, data entry, SAE reporting, and subject tracking"
11. Workflow	Integrate tools into workflow Inefficiency of research processes, need for effective models IRB (Institutional Review Board)/regulatory challenges Need to consider users needs	"...we all complain about the time it takes for IRB review." "(Current systems suffer from) a complete lack of integration between patient care processes and clinical research." "While a lot of talk has been made about standards, (so) we can move data back and forth, what is actually happening is there's no work processes that make that happen."
12. CRI innovation and investigation	Research in CRI is critical to advancing field Research in CRI often secondary to fulfilling current/practical needs CRI needs to focus on transformative advances rather than just supporting current practice Academic promotion process does not reward CRI practice	"The paucity of such thinking and research (about transformational approaches and theory) in CRI means that information and technology management advances have been subservient to the current process. There has been little of the disruption and leapfrogging that would change the environment." "the leadership in CRI gets bogged down in "pet projects" because that is the nature of their funding, and disruptive theory and models (that help advance CRI), instead of being the raison d'être for their departments, actually is rather scary for them." "Academic promotion committees do not require or reward data sharing or data standardization efforts"
13. Lessons not learned	Concern about repeating clinical informatics mistakes Need for best practices Under-use of current tools/best practices	"...the problems and the hopeful solutions (being proposed) are so analogous to the issues that have swirled around the electronic health record here at AMIA for the last 15 or 20 years or so, and I would be a little more comfortable if more was said about what went wrong with that. Because to start all over again with the same good hopes and the same stuff about standards and we will make software and all the rest of it, it didn't cut it the last time, so I am hoping that the lessons from the past will be incorporated into the work on the clinical research (agenda)."

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