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Program Committee Report December 2008

Regenstrief Center for Healthcare Engineering

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I. RESEARCH EFFECTIVENESS

A. Research Partners

The Regenstrief Center forms research partnerships to assure research pertinence, clinician participation in research, implementation of research findings, and dissemination to promote impact. RCHE has developed new partnerships this year to complement research with our established partners.

Mayo Clinic

Discovery Park and RCHE have established a research partnership with the Mayo Clinic's Innovation Center. Within this relationship, RCHE will focus on applying the Medical Home model to Mayo's primary care delivery and exploring the role of virtual consultation in primary care delivery. These points of collaboration include, but are not limited to:

- Joint conferences that will cover the prediction and prevention of disease, e-medicine and the competency of innovation;
- Targeted research seed grants to support Mayo and Purdue co-principal investigators;
- Student internship programs; and
- Faculty exchanges.

VHA, Inc.

RCHE announced a new partnership with VHA, Inc. to the Regenstrief Board in June of 2008. This partnership continues to develop with joint efforts focused upon how leading practices in hospital operation can successfully be transferred across hospitals. The objective of this research is to improve hospital performance by identifying and disseminating leading hospital practices to peer hospitals. Identifying the factors necessary for initial success and ongoing sustainability of this program will serve VHA member hospitals and the healthcare community at large.

American College of Physicians

RCHE's partnership with ACP continues to develop and demonstrate effective primary care delivery using the Patient-Centered Medical Home (PCMH) concepts. RCHE is developing a quantitative primary care practice model by care practice that can be used to assess the value of specific changes on practice performance. This model is viewed as a planning and assessment tool in the roll-out of the PCMH. RCHE researchers are also conducting research on primary care delivery processes for patients with chronic illnesses and will assess the implications of these processes within the PCMH model.

B. Research Validation

The Regenstrief Center for Healthcare Engineering seeks external sources of information to validate the focus and quality of its research. In addition to the input of our partners, RCHE derives useful information from competition for competitive funding, publication in peer reviewed journals and professional conference presentations, and advice from our Advisory Council. This year the following events have served to assist in setting research direction.

National Competitive Awards

- *U.S. Department of Health and Human Services*
- *Centers for Disease Control and Prevention*
- *Indiana Family and Social Services Administration*

Invited Professional Presentations

- *American Academy on Communication in Healthcare Conference*
10/17 – 10/19/08
“Interdisciplinary Research Between Purdue & IU School of Nursing Psycho-Oncology Intervention: Breast Cancer Survivor Activation Study”
Cleveland Shields, Purdue Child Development and Family Studies
- *National Cancer Institute Technical Workshop – Methodological and Conceptual Issues in Conducting Research on Racial/Ethnic Discrimination in Health Care Delivery*
9/29/08
“Using Standard Patients to Measure Discrimination in Health Care Delivery”
Cleveland Shields, Purdue Child Development and Family Studies
- *Gerontological Society of America’s 61st Annual Scientific Meeting*
11/22 – 11/24/08
“Amount of Attendant Care is Associated with Risk of Hospitalization among Medicaid Waiver Recipients with Dementia”
Laura P. Sands, PhD, Purdue Nursing
- *3rd Annual INFORMS Workshop on Data Mining and Health Informatics*
10/11/08
“Temporal Prediction Models for Mortality Risk among Patients Awaiting Liver Transplantation”
Nan Kong, Purdue Biomedical Engineering
“Applying Agent-based Modeling and Simulation (ABMS) to the U.S. Organ Transplantation and Allocation Network”
Nan Kong, Purdue Biomedical Engineering
- *Safety Across High-Consequence Industries Conference*
9/10 – 9/12/08
“Healthcare Engineering: Applying Engineering Principles and Techniques to Healthcare Challenges”
Kenneth Musselman, RCHE

RCHE Advisory Council

RCHE’s advisory council met twice during 2008. The most recent meeting was October 30th. Its agenda was focused on research opportunities for RCHE. The council addressed the opportunities for healthcare engineering research in:

- Healthcare policy;
- Industrial collaboration;
- Inter-university collaboration; and,
- International healthcare delivery.

C. Collaborations with Other Universities

RCHE was a founding member of the Healthcare Engineering Alliance (HEA). The Alliance is working to develop the practice of healthcare engineering modeled after the recommendation of the NAE/IOM 2005 report, *Building A Better Delivery System, A New Engineering/Health Care Partnership*. The members meet once per year.

II. RCHE OPERATIONS

A. Research Collaboration with IU Medical School and the Regenstrief Institute

RCHE, IU Medical School, and the Regenstrief Institute have been working together on several research projects, Cancer Care Engineering, Indiana Patient Safety Center, and the Veterans Engineering Resource Center. While each of these continues as research priorities, new joint projects were initiated this year.

Clinical and Translational Science Institute

The Indiana Clinical and Translational Science Institute (ICTSI) is a medical research initiative that will work towards adopting and implementing agreed-on best practices, policies, procedures, and other measures to advance collaborative clinical and translational research and reducing the burdens on individual investigators. The ICTSI is funded by the National Institute of Health for five years. RCHE participated in writing the CTSI proposal and is represented on four standing committees:

- Mapping and Oversight Program;
- Tracking and Evaluation Program;
- Translating Research into Practice (TRIP) program development team; and,
- Purdue's program development team.

A Springboard for Smart Pump Informatics: Creating a Comparative Alaris © Database

This project recognizes the importance of timely and accurate data collection to improve medication administration safety. It research results will aggregate multi-hospital IV pump data and enable researchers to compare their performance with that of all other hospitals. Purdue's pharmacy and computer science faculty are working under the auspice of Indiana Health Information Exchange to develop a data base and data transfer mechanisms from the infusion pumps to the data repository. This project has been fund by a grant from the Cardinal Health Foundation and is being conducted with support from hospital members of the Indianapolis Consortium for Patient Safety.

Pharmacy Quality Alliance

Through partial support from a RCHE research seed grant, Dr. Kim Plake and Carol Birk (Purdue School of Pharmacy) and Dr. Marc Rosenmann (Regenstrief Institute) are conducting research on drug safety for medications distributed by retail pharmacies. The research team will be administering a survey to retail pharmacists to collect performance information in specific areas of pharmacy practice and customer interaction. Information on retail pharmacy medication use, derived from insurance claims information and collected by the Regenstrief Institute, will be used to augment the survey data. RCHE believes this study has significant value and will improve stronger coordination between retail pharmacies and clinicians.

Regenstrief Institute Collaboration

RCHE has jointly established a with Drs. Tierney, Marrero and Rosenmann a series of discussions to expand collaborative opportunities between RCHE and RCHIR. The intent is to identify common research interests and expanded applications for the use of Regenstrief Institute information in healthcare engineering research.

B. Foundation Supplemental Funding

Patient Scheduling

Purdue PI: Mark Lawley

Partner: IU Medical Group (North Arlington Clinic) and Clarian Health (Cottage Corner Clinic)

Primary Objective:

- Development of new scheduling theory and implementation to improve functionality and efficiency of patient scheduling process for healthcare workers and patients.
- Development of predictive patient no-show models based on demographics, patient communication needs, appointment parameters, procedure codes and diagnoses
- Linkage between clinical and scheduling information; matching physician and patient characteristics (i.e., communication needs and abilities) to reduce disparities.

Status:

The research team has finished clinical operations process mapping, including patient and information flow. Important performance measures have been identified (i.e., no-show rates, percentage of calls answered in one minute visits per FTE, waiting times). A time study was conducted during the spring of 2008 to collect clinic process and patient waiting times. Such information will be used in a discrete event simulation model, which is almost complete. An initial sample of patient no-show data from the IU Medical Group clinics has been received and is currently being evaluated.

During summer 2008 research characterized the effect of physician practice styles on patient flow, and (2) completed the clinic simulation models. Models have been used to evaluate the impacts of clinic factors such as staffing levels, exam-room management styles, and scheduling methods on clinic performance. The team has begun discussions with the software vendor, McKesson, to develop a software outlet for the scheduling theory that is being developed.

Seven journal manuscripts have been accepted, submitted, or are in progress. Nine presentations on clinical scheduling were given between March and April 2008.

Promoting Patient Self-Care and Monitoring in Congestive Heart Failure Management

Purdue PI: Bart Collins

Partner: St. Vincent Health

Primary Objectives:

- Evaluate the use of information and communication technologies to improve self-care effectiveness among patients with chronic illnesses.
- Assess how these technologies can be used to improve primary care physicians' medical management of patients with chronic illnesses.

Status:

A pilot evaluation of one set of communication technologies is in progress. We have identified a primary care practice in Indiana who serves large number chronic disease patients. We are developing a pretest-posttest control group study of the use a automated telephone and web-based system to provide daily tracking of key indicators of the chronic disease management. We will randomly assign approximately 160 patients to the experimental or control group. Both groups will complete a survey on their current health status, self-care behaviors, barriers to managing their care, and their assessment of primary care support for their chronic disease. The experimental group will be tracked for up to six months through the telephone and web-based system. At the end of six months, both groups will receive an exit survey and data related to health outcomes, hospitalizations, and related factors will be collected. This protocol will allow us to examine several key issues related to the impact patient tracking has on a variety of health outcomes and to better understand which chronic diseases will be most impacted by this type of intervention.

Research Database Management

Purdue Co-PIs: Ken Musselman and Steve Witz

Primary Objectives:

- Develop research support infrastructure enabling the development and maintenance of complex databases and the computational resources needed to analyze these data.
- Recruit staff that will be dedicated to this function and will assure data accuracy, accessibility and security.

Status:

Server hardware is in place and three statistical application packages, Stata, R, and SAS have been installed and are being used in data management and statistical analysis. One additional statistical package, SPSS has been purchased and is being installed and tested. SPSS has been acquired and placed on several RCHE computers to assist in the analyses of smaller data files and remote data analyses. State Medicaid, Healthy Purdue and data know reside on RCHE's research server.

A Data Analyst, Zhiyi Tian, has been hired and began work on August 19. She has completed IRB training on Human Subjects, is currently preparing data documentation files to assist in faculty use of data resources and is providing analytic support for multiple projects using data residing on the research. Most recently Zhiyi worked as a research lab specialist for the Geriatrics Center at the University of Michigan. She earned her Master of Arts degree in applied mathematics at Eastern Michigan University and also completed a Master of Science degree in biostatistics from the University of Michigan, Ann Arbor.

A Ph.D. candidate in Pharmacy Administration and Gerontology, Lori Ward, has been hired and to provide research support in validation, management and use of research data files residing on the research server.

Cancer Care Engineering

CCE-1 Multi-Agent Approach to Modeling of the Indiana CRC Care System

PI: Seza Orcun, Ph.D.

Primary Objective:

Develop a robust and scalable, multi-agent framework where characteristics of Indiana CRC care constituents (patients, hospitals, doctors, nurses, insurers/ payers) and their interactions are configured to study system behavior.

Status:

The IRB approval and data request approval for Roudebush VA Medical Center cancer registries have been obtained. Natural history of CRC development and screening procedures are being verified and validated using data available at the literature. Modeling of treatment procedures is in progress.

CCE-2 Indianapolis CRC Quality Improvement Initiative*PI:* Brad Doebbeling, MD, MSc (Regenstrief Institute)

Primary Objective:

Improvement of the quality of CRC care in Indianapolis by implementing discoveries among patients who need them. The outcome will be:

- to understand EMR implementation impact of clinical processes;
- optimize patient flow; and
- remove clinical process barriers limiting CRC screening rates.

Status:

Project is on track to:

- assess primary care processes related to CRC screening,
- provide assistance in development of data infrastructure to support sustainability of initiative,
- develop and administer cultural assessment to determine organizational readiness for IT implementation and implementation of systems redesign initiative
- facilitate IUMG and VAMC project teams in application of systems engineering and Lean tools to ultimately improve CRC screening performance.

VAMC has continued to move forward and is simultaneously implementing rapid cycle improvement as well as systematically looking for ways to improve overall process efficiency by streamlining scheduling process and system. As processes and data tracking systems are being examined in more detail, additional opportunities for overall improvements are being identified and followed up on outside the scope of this project

CCE-3 Holistic Best Practice Process Flow and Navigation for CRC Patients with Psychosocial Problems*PI:* Joe Pekny, Ph.D., Purdue University

Primary Objective:

The rationale for this study continues to be the mapping of care processes for cancer patients with common psychosocial problems, in order to implement and evaluate systems interventions to improve patient navigation, consistent treatment delivery and follow-up independent of traditional referral-based care.

Status:

- Complete review of literature to extend beyond CRC, including mental health needs and nursing care related to cancer based psychosocial distress. Review of literature completed on 8/08. Manuscript development is in progress.
- Develop a process flow map for psychosocial needs of cancer patients and families along the continuum of care. Incorporate content for evidence-based patient/family screening and care delivery
- Conduct 120 structured interviews with practitioners who are in a role to address the psychosocial needs of cancer patients. The sample consists of both nationally recognized cancer centers and Indiana practitioners. Results will be evaluated in terms of a positive deviance approach. IRB approval was received 11/08, survey process to begin prior to 12/08.
- Design site-specific process flow maps
- Plan and implement a systems-redesign pilot project at a working partner location.

CCE-4 Bridging Clinical Expertise with Fundamental Cancer Biology Research Using Predictive Computational Cancer Models

PI: Seza Orcun, Ph.D., Purdue University

Primary Objective:

Cellular-level population balance model that captures major characteristics and stages of cell growth processes for predicting efficacy of colorectal cancer treatment options given patient features such as genomics, proteomics, metabolomic and traditional clinical data.

Status:

Preliminary study to demonstrate the need to study the dynamics of CRC development has been completed using a reported model in literature and CRC incidence data. This initial model, which considers only genetic mutations, is being expanded to tissue-level models. Clinical data collection of patient neoplastic findings is underway which will support the refinement of the cellular models.

CCE-5 Fusion Center for Cancer Care System Information – The Cancer Care Situation Room

PI: David Ebert, Ph.D., Purdue University

Primary Objective:

Full-fledged, interactive, integrated visual and statistical analysis capability in a visual analytic environment that brings together massive, disparate, incomplete and time-evolving -omic, EMR treatment and claims data sets.

Status:

In collaboration with CCE-6, visualization tools are being integrated into the HUB environment to visualize modeling results from CCE-4 and -omic data within the cceHUB environment. HealthcareTAP supplied data has been integrated into a prototype FusionCenter display for cancer care decision making. A proposal has been submitted to the Regenstrief Institute to acquire INPC data for age, sex, race, and colonoscopy screening occurrence, FBOT screening occurrence, cancer diagnosis and stage at diagnosis. This data will be used to provide a visual representation over time of the screening tendencies and cancer diagnosis rates in the represented counties in Indiana.

CCE-6 Information Infrastructure and Raw Data Analysis

PI: Marietta Harrison, Ph.D. , Purdue University

Primary Objective:

Repository and tools for all CCE project data. Includes advice from statisticians.

Status:

The cceHUB for CCE collaboration and community-shared resources was established in July, 2008. Existing HUB infrastructure together with new HUB technology developed through CCE-6 now provides a unified knowledge discovery environment for CCE OMIC research and health services data linkage. Currently, 50 CCE researchers have registered, 142 content resources have been contributed (tutorials, video presentations, protocols, presentations, etc), and 6 statistical and population-based models are under development for HUB integration and publication. Development has begun on the data infrastructure to support the OMIC *experiment* workflow and the OMIC *data analysis* workflow. Key components of the data infrastructure which are near completion are the following:

- shared repository for OMIC datasets
- OMIC metadata database
- data up-loader
- workflow forms
- visual analytics

The cceHUB environment is now used on an ongoing basis.

CCE-7 Augmenting Physical Sample Collection, Clinical Data Collection, OMICs Laboratory Analysis and Conversion to Digital Design

PI: Steve Williams, M.D., Gabi Chiorean, M.D.

Primary Objective:

Physical collection, storage, transport and analysis of blood and tissue samples from undiagnosed control individuals and CRC patients treated in the Indiana University Cancer Center Multidisciplinary Oncology Clinic.

Status:

Approval granted from the Scientific Review Committee and the Institutional Review Board at IU and at Purdue. The protocol is now at the Department of Defense for review.

Sample acquisition process defined. Meeting with IUSCC to confirm process. Process done in concert with CCE-6 personnel to utilize the cceHUB for sample tracking.

CCE-8 Master Project Management

PI: Joe Pekny, Ph.D., Purdue University

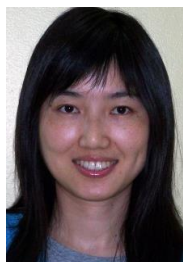
Primary Objective:

Management of the portfolio of all projects to maximize impact and to leverage success by further incremental investment.

Status:

- NCSU has hired a graduate student. Literature review is in progress.
- USF collaboration has been presented in annual INFORMS meeting.

C. New RCHE Research Personnel



Zhiyi (Jur-Yee) Tian joined the Regenstrief Center on August 19 as the department's first biostatistician. Most recently she worked as a research lab specialist for the Geriatrics Center at the University of Michigan. There she performed statistical analyses of studies on frailty, multimorbidity, disability and geriatric syndrome. She earned her Master of Arts degree in applied mathematics at Eastern Michigan University and also completed a Master of Science degree in biostatistics from the University of Michigan, Ann Arbor.



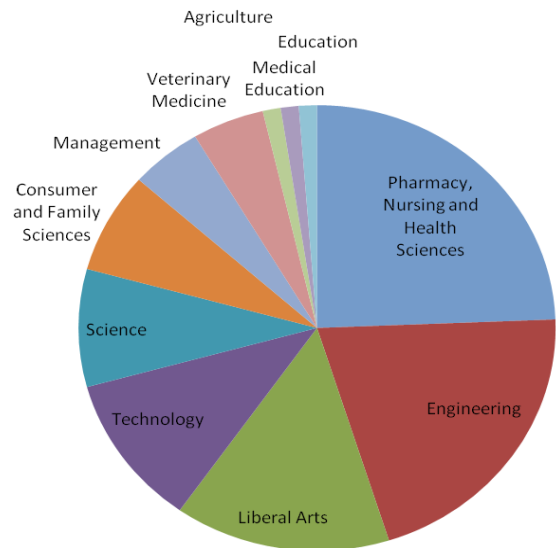
Lori Ward is a third-year Ph.D., majoring in Pharmacy Administration and Gerontology in the School of Pharmacy and Pharmaceutical Sciences, Department of Pharmacy Practice. Lori provides research support in validation, management and use of research data files residing on a research server.

D. Affiliate Faculty

As of October 2008, RCHE has 85 affiliate faculty members.

Colleges			
Pharmacy, Nursing and Health Sciences	22	Management	4
Engineering	17	Veterinary Medicine	4
Liberal Arts	13	Medical Education	1
Technology	9	Education	1
Science	7	Agriculture	1
Consumer and Family Sciences	5	Library Science	1

Faculty Participation by College



E. Website

Between 1/1/08 and 10/30/08, the RCHE website was viewed 7,613 times by 2,064 individuals in 49 U.S. states (all but Wyoming) and 62 countries.

Country/Territory	Visits
United States	7,199
Canada	71
India	33
United Kingdom	29
China	26
Turkey	24
Italy	18
South Korea	13
Taiwan	13

State	Visits
Indiana	5,528
Illinois	270
Texas	120
Michigan	117
New Jersey	110
California	99
Minnesota	71
New York	71
Virginia	71

III. LEARNING AND INNOVATION

A. Data Support

(See report on research database management, p. 6)

B. RCHE Fall Conference

Transforming Healthcare Delivery: Advancing Multi-disciplinary Research at Purdue

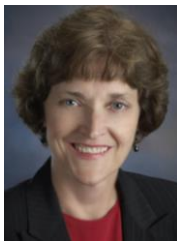
9/16/08, Burton D. Morgan Center

This year more than 160 faculty, students, and healthcare professionals attended RCHE's fall conference which highlighted some of RCHE's research topics. In addition, 19 graduate and undergraduate research teams displayed project posters during the conference.

The conference's final session featured representatives from three of RCHE's healthcare partners highlighting the research priorities of their respective organizations.

- **Cindy Adams, Ph.D., A.N.P.-B.C.**
Director, Healthy Hearts Center, Community Health Network
Director, Nursing Research, Community Health Network
- **Patrick J. Healey, M.D.**
Director, Institute on Aging, St. Vincent Health
Clinical Assistant Professor, IU School of Medicine
Director, St. Vincent Hospital Geriatric Medicine Fellowship training program
- **James F. Malec, Ph.D.**
Research Director, Rehabilitation Hospital of Indiana Foundation
Professor Emeritus, Mayo Clinic

C. Pioneer Speaker Series



"Indiana's Public Health Priorities"

Judith A. Monroe, M.D. FAAFP

State Health Commissioner, Indiana State Department of Health

9/26/08

Indiana is facing many public health challenges ranging from natural disasters to an increasing burden of chronic disease. Solutions to these challenges require systems-thinking and "all hands on deck." Dr. Monroe will discuss the priorities of the Indiana State Department of Health and the research questions posed by these challenges and priorities.

IV. FINANCIAL MANAGEMENT

A. Awards

Full award amounts are reported in the year in which RCHE is notified of the award. Grant funders in 2008 include:

Centers for Disease Control and Prevention

Indiana State Department of Health

New Jersey Sharing Network

U.S. Department of Health and Human Services

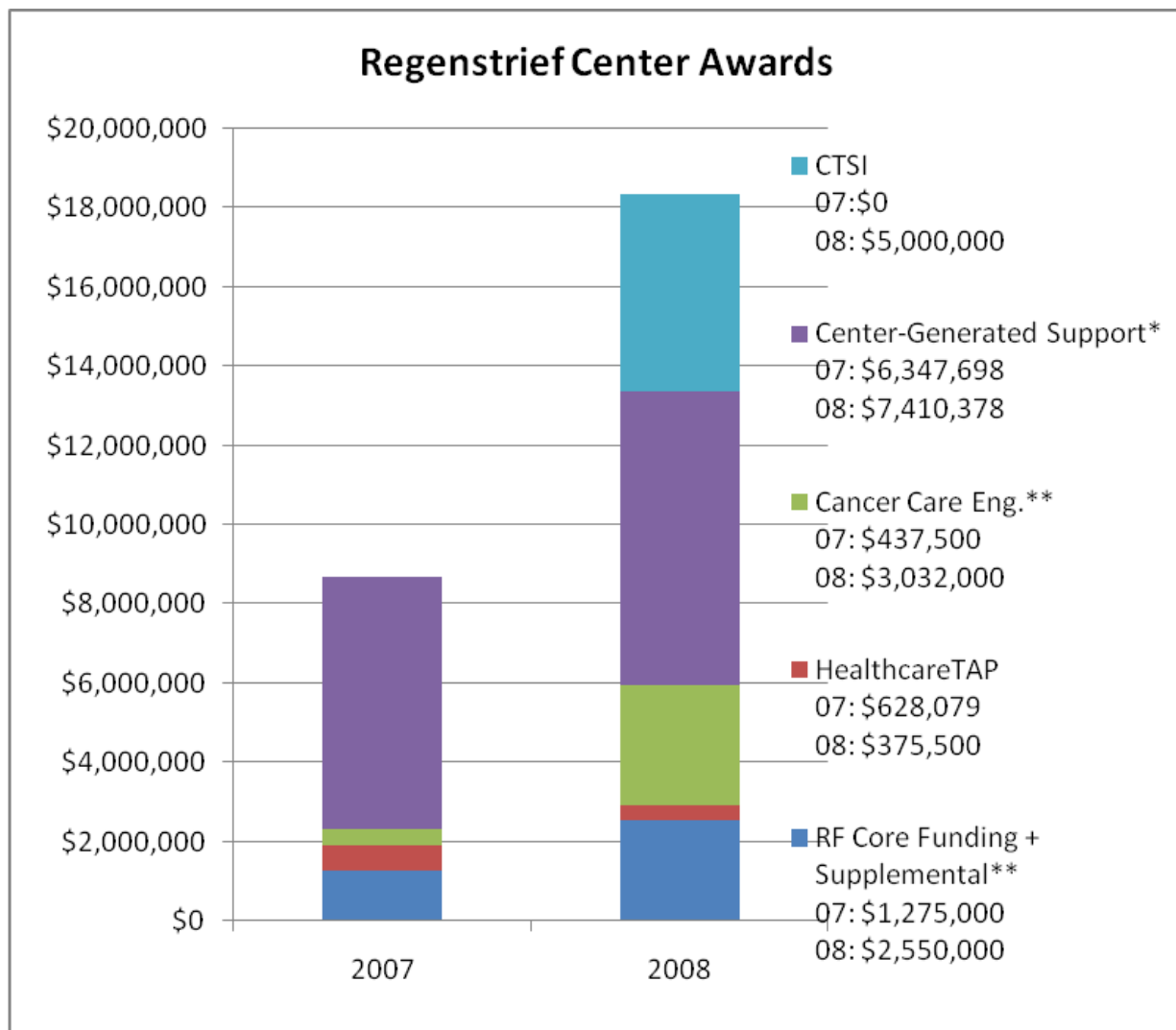
Walther Cancer Institute

Indiana Family and Social Services Administration

National Cancer Institute

U.S. Department of Defense

U.S. Department of Veteran Affairs



* Includes external grants and strategic partner support.

** Supplemental grants from the Regenstrief Foundation are split over three years (2007-2009).

B. Sources and Uses of Funding

