

6-2013

RCHE Semi-Annual Report June 2013

Regenstrief Center for Healthcare Engineering

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Dear Board Members,

The Regenstrief Center for Healthcare Engineering (RCHE) advanced significant progress in attaining impact from research this year. This report highlights information about our activities, our accomplishments, and future direction for RCHE's research.

Achieving impact through research continues to be the center's primary objective. This focus can be seen in the scope of projects shown in the research tree (page 3) and in the significant center projects on page 9. The research-to-impact process, shown on page 10, has been enhanced with the addition of translational healthcare engineer positions. These positions will help build bridges between academic research and practical application. Benjavan (Den) Upatising has accepted an offer for one of these positions and will join RCHE this August after the completion of

her fellowship in healthcare engineering at the Mayo Clinic (page 8).

Another approach we are using to improving research impact is to involve physicians more directly in healthcare engineering research. This year we have collaborated with primary care residents (PG-3) as they fulfill their research requirements to improve care delivery. This relationship provided immediate impact and is presented on page 11. We are expanding this program in July 2013.

Success in applying our research continues through the utilization of our internet hub CatalyzeCare. This year we extended development of provider decision-support tools on CatalyzeCare based upon our research. An example of this approach pertains to hospital post-discharge care planning and is described on pages 6 and 7. This and other examples of provider accessible decision-support tools will be a major future research direction with great promise for achieving impact.

Other center research engages payers, providers, and communities, and reflects the variety of participants in the healthcare system. RCHE has developed provider and purchaser research teams this year in development and testing of population health models. This research is a continuation of our population healthcare utilization modeling and improves cost-effective care delivery. Direct involvement of providers and communities enable health plans to be developed around local exigencies. RCHE will research when key stakeholders supported with data analyses yield effective population health plans and evaluate their impact. Two additional community projects are being planned.

Our research activity and success has been achieved with the support of our partners, Purdue faculty and students, and certainly the continued support of you, the Regenstrief Foundation Board. We again thank you for financial assistance and encouragement.

Sincerely,

A stylized, handwritten signature in black ink that reads "Steve".

Steve Witz



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THE REGENSTRIEF CENTER FOR HEALTHCARE ENGINEERING WILL PURSUE A TRANSFORMED HEALTHCARE DELIVERY SYSTEM BY CONDUCTING **IMPACTFUL RESEARCH** GUIDED BY NATIONAL PRIORITIES AND LEVERAGING **COLLABORATIVE PARTNERSHIPS**.

Eight years ago, RCHE was launched with the mission of transforming healthcare delivery. Situated in Purdue's Discovery Park, home of the university's interdisciplinary research focusing on grand challenges, RCHE is unique in its approach to truly impactful and transformative healthcare research through the application of academic knowledge.

IN PURSUIT OF THE MISSION

This report marks both the end of one Foundation funding period (2008–13) and the beginning of another (2013–18). In the last five years, RCHE has made great strides in its pursuit of its mission. These accomplishments, elaborated upon in the 2011 Renewal document and in this report, include:

- Developing a **cohesive research focus strategy** that is inclusive of national priorities, partner priorities, and faculty priorities;
- Launching two research **focus areas**;
- Growing faculty and researcher **expertise** at Purdue and through partnerships;
- Adding **research and dissemination partners**, and reformulating a research partner engagement strategy with the research-to-impact model; and
- **Exceeding** its original commitment of a 2.5 leverage factor of Foundation core funds.

RCHE will build upon these accomplishments in the fulfillment of our vision:

- RCHE will be a **nationally cited center** for healthcare delivery research;
- RCHE will be an **interdisciplinary center** with a systems research foundation, with emphasis on developing and applying science to improve healthcare delivery, and taking risks to pursue stretch initiatives that will drive national impact;
- RCHE's **research-to-impact model** will be a recognized approach for the translation of healthcare engineering research into practice with feedback for continuous improvement and impact, and will be adopted by other universities and national organizations for describing this type of research;
- RCHE will have **pioneered and demonstrated innovations** to advance knowledge development, collaborative research, and rapid cycle dissemination through technologies like CatalyzeCare;

- RCHE will contribute to the establishment of **healthcare engineering as the foundation for the science of healthcare delivery** by producing the healthcare engineers of the future, integrating healthcare engineering in the curriculum of healthcare professions training programs, and integrating healthcare engineers in organizations leading healthcare delivery; and
- RCHE's research will be drawn upon to **influence national healthcare priorities**.

The center is pleased to report these recent activities as additional accomplishments indicating continued progress in pursuing the mission and achieving bold goals:

- Shanghai Jaio Tong University in China selected RCHE as one of three U.S. healthcare engineering centers and programs to visit and **to model after** when they create their own healthcare engineering center this year.
- RCHE has been **invited to present** plenary talks at national meetings. Ken Musselman presented at the American Society for Quality 2013 World Conference on Quality and Improvement in May.
- A \$1.5 million NSF grant will expand RCHE's partnership with the Actuarial Sciences program and **introduce more student actuaries to healthcare**.
- The School of Industrial and System Engineering at Georgia Institute of Technology invited Ken Musselman to join their **Academic Program Review Committee** to specifically focus on their healthcare engineering initiatives.
- RCHE is adding researchers to the center to improve its ability to **extend its research into practice and achieve impact**.

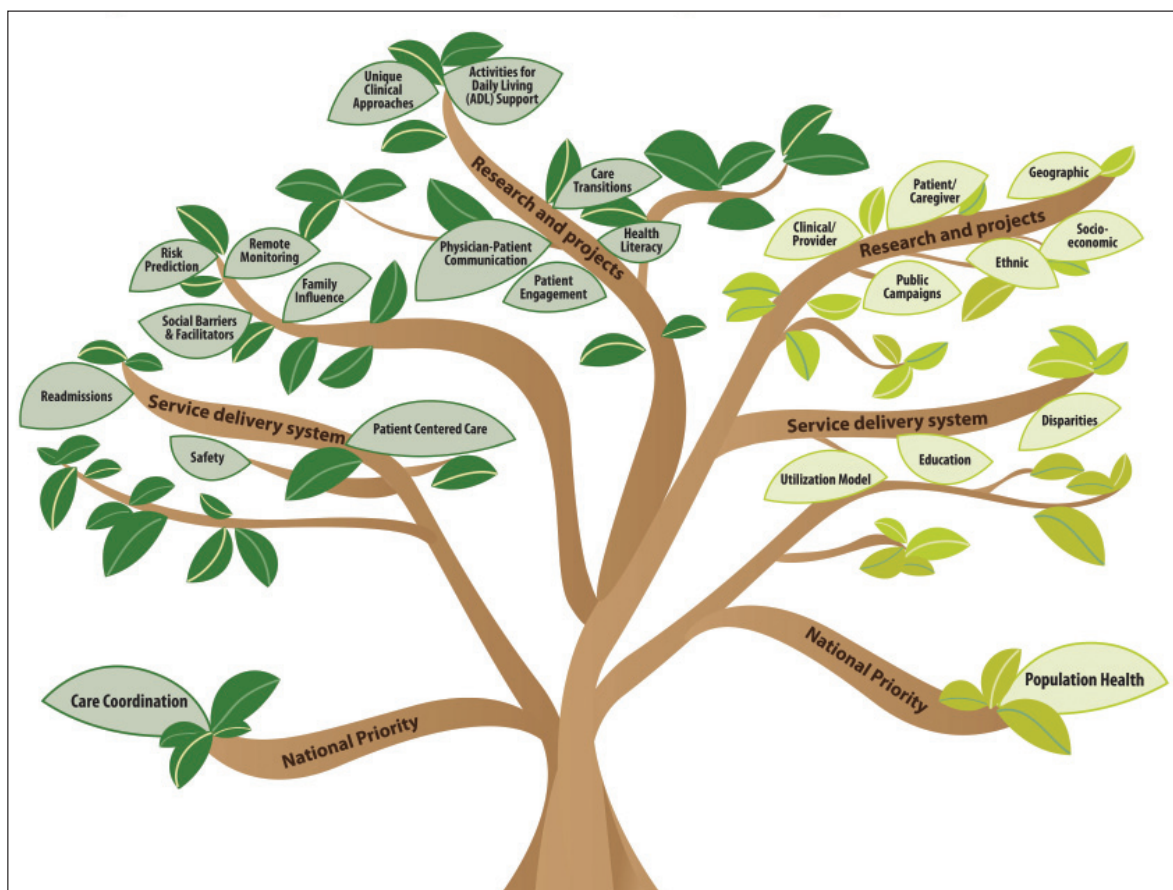


Figure 1. RCHE Research Tree.

THE RESEARCH TREE

RCHE's Research Tree illustrates how the center's seemingly broad research topics grow together and derive from common roots.

The initial basis for the research are two national priorities — care coordination and population health. Formalized by the National Partnership for Priorities, these have also been cited by others, including former CMS director Donald Berwick as part of his Triple Aim. The second level builds upon these priorities and illustrate elements of the healthcare service delivery system as identified by RCHE partners. These are areas in which research-based improvements are needed.

The top-most leaves represent research projects and areas of faculty expertise that are developed to target the service delivery elements. Developing this pathway from priority, through the system, and finally to projects ensures two things:

- The research has a clinical feedback mechanism and advocate in the partner. Partners who have identified the need are first offered the opportunity to partner on research project.
- It ensures projects undertaken are useful to the system, implementable by a partner, and benefitting from the best faculty strengths. RCHE considers that all three of these are necessary to develop research that contributes to the academic fields as well as to the healthcare delivery system.

IMPACTFUL RESEARCH

THE REGENSTRIEF CENTER FOR HEALTHCARE ENGINEERING WILL PURSUE A TRANSFORMED HEALTHCARE DELIVERY SYSTEM BY CONDUCTING **IMPACTFUL RESEARCH** GUIDED BY NATIONAL PRIORITIES AND LEVERAGING **COLLABORATIVE PARTNERSHIPS**.

A VISION FOR CREATING IMPACT

RCHE's research vision is to catalyze healthcare delivery improvement through systems analyses and the provision of performance feedback for continuous population health improvement. As represented on page 3, this vision is applied to population health and increasing care coordination. An initial step is creating alignment of interests among patients, healthcare providers, and purchasers so they are able to see their interests in relation to each other and develop consensus for improved population health through engineered delivery systems.

The emphasis on population health includes the analyses of healthcare utilization and provision of decision-support for developing population health management plans. Current research focuses on adherence to evidence-based care guidelines, and provider, patient, and public strategies to increase adherence. This research focus also includes healthcare delivery strategies addressing specific needs of sub-populations.

Increasing coordination among healthcare professionals and for patients over extended time periods is RCHE's second research emphasis. RCHE is contributing to coordination of care envisions that areas of contribution will include the reduction of avoidable care, improved engagement of patients in their care and elimination of safety errors. The use of patient risk prediction, improved information flow to patients and providers, and engineering care for specific patient needs are core elements of RCHE contribution to care coordination.

EVALUATING THE IMPACT OF RESEARCH

Publications are common when research contributes basic knowledge to a field (see Appendix D); however, publications for dissemination projects where the greatest potential for impact lies are much less common. Therefore, beyond academic citations, RCHE also looks to the following as objective evaluations of research:

- Feedback from project partners and a desire to continue partnering on projects;
- Interest from current or new partners in joining new projects; and
- Acknowledgement from experts and special-knowledge organizations in the field.

This report demonstrates these types of evaluations as well as listing publications in Appendix D.

DIVERSE FACULTY EXPERTISE

More than 70 faculty members from most of Purdue's academic colleges choose to be affiliated with RCHE. As seen in the chart below, the faculty represent a diverse range of interests and expertise.

In addition to these faculty, researchers from administrative areas such as information technology and human resources also lend their expertise to center projects.

RCHE AFFILIATED FACULTY (MAY 2013)

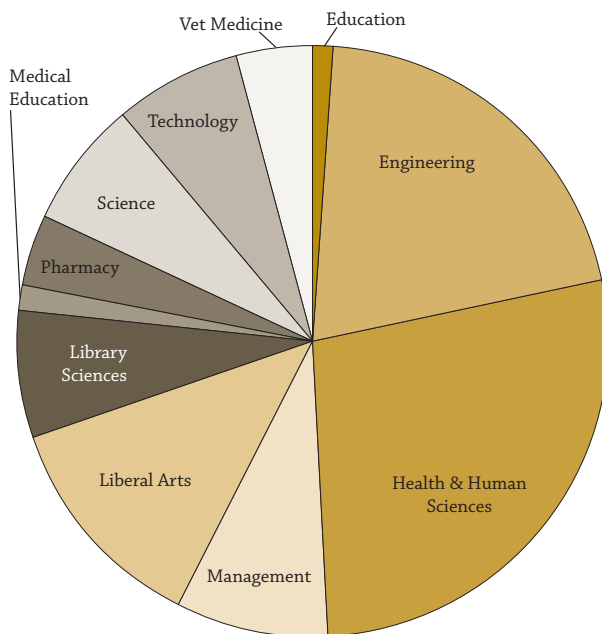


Figure 2. Affiliated Faculty.

CLEVELAND SHIELDS

HUMAN DEVELOPMENT & FAMILY STUDIES

Cleveland Shields' entry into healthcare research was a little unexpected.

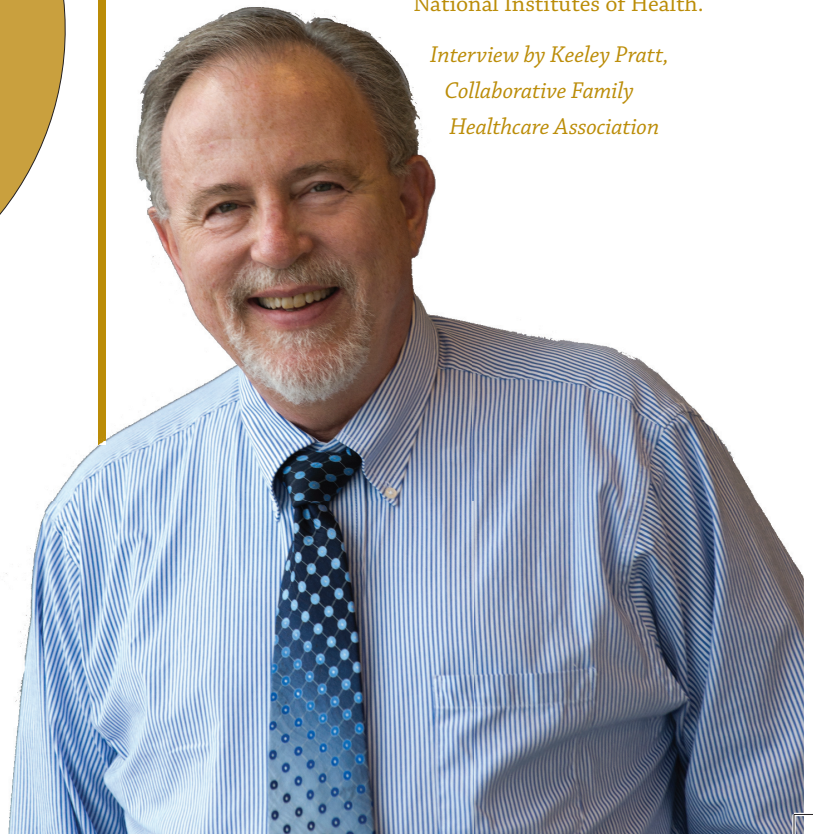
"I was a [marriage and family therapist for 12 years at the University of Rochester Medical Center] but my patients wanted to talk about their diabetes, why they didn't like their medication, their cancer, or whatever disease/illness they had. So, I suddenly had to learn about health," he says.

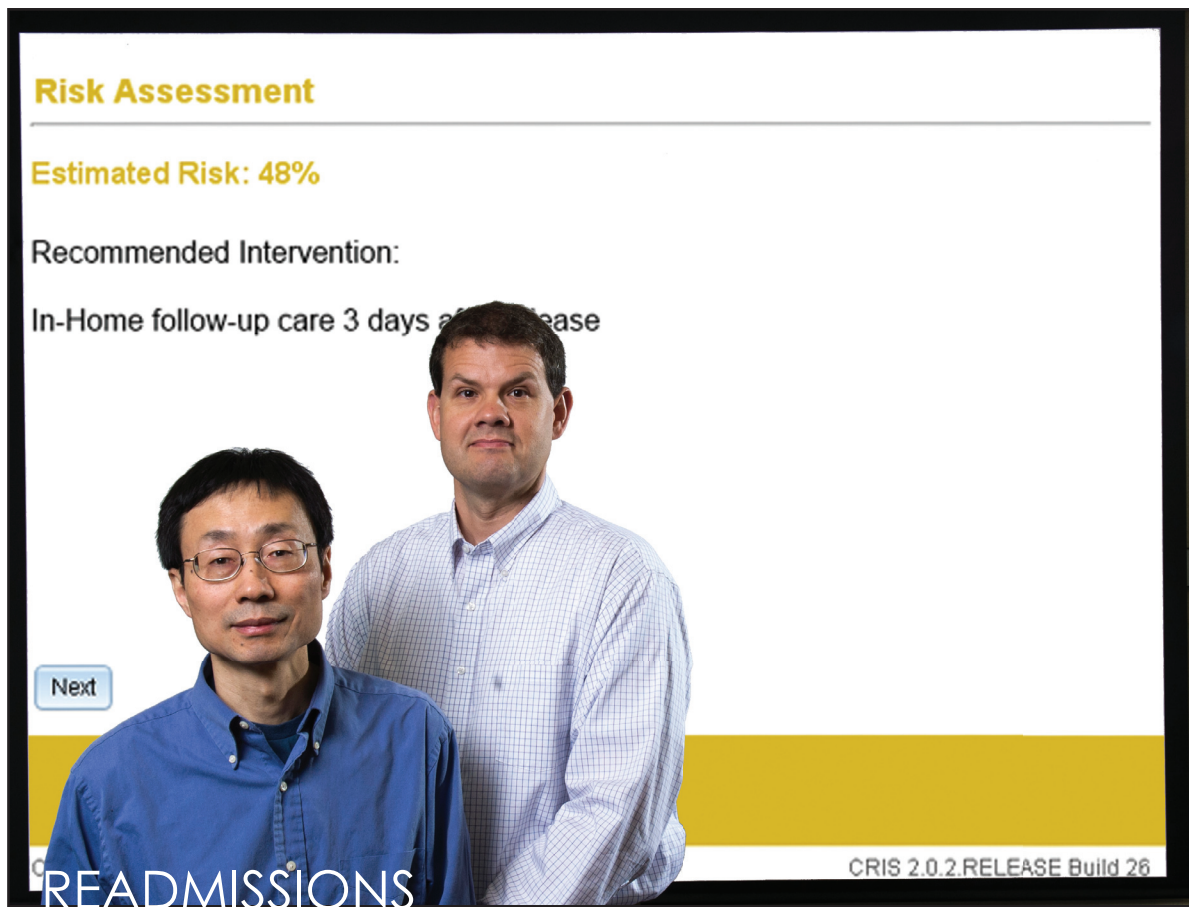
Shields describes himself as, "a family therapist who studies the role of clinical communication in the management of chronic illness and the role of clinical communication in healthcare disparities." He researches family interventions in health and patient-centered care, among other areas.

"It is important to establish when to involve family members and when it's not. We need to know how to help family members provide needed support."

Shields is also the director of the Center on Poverty and Health Inequities (COPHI), located within RCHE. He and a collaborator at the University of Rochester are currently working on physician-patient communication research funded by a \$2.7 million grant from the National Institutes of Health.

*Interview by Keeley Pratt,
Collaborative Family
Healthcare Association*





IMPACTFUL PREDICTION POWER

Developing an algorithm for predicting readmissions was only the start for RCHE. Now, with feedback from hospital partners, the center is collaborating with the Purdue Cyber Center to create an application for physicians and nurses. The application was conceived to address partners' usability concerns — how, with an already busy schedule, could this be applied to improve patient care?

Jia Xu and Peter Baker, above, are developing the application that runs the RCHE algorithm to assess readmissions risk but displays the results in a user-friendly graphical interface. The application also draws on clinical recommendations from the research partner hospital to display recommended interventions.

The readmissions risk model developed by the research team is at least as strong as the best reported research. Follow-up research will enhance the application while also allowing the research team to explore improvements in the predictive algorithm and the creation of a dynamic decision support model. Both of these areas of research hold great potential for healthcare system impact through partner involvement and dissemination, but can also contribute to the field of healthcare engineering as follow-up studies in these areas are rare.

Patient Information	
Patient Id	1
AdmissionNumber	4
Hospital	SJH
DischargeDisposition	XFR/DSHSPECIALTYHOSPITA
DaysSinceLastDisch	14
DiseaseSeverityIndex	4
PayerClass	MEDICAID
Age	55
LengthOfStay	5
Race	WHITE
AdmissionType	EMERGENCY
Charlson	4
MaritalStatus	LEGALLYSEPARATED
Gender	M
PrincipalDiagnosisCC	1.1Bacterialinfection
PrincipalProcedureCC	11.6OtherORtherapeuticprocedures;ma
NonSubBehavior	1
SubBehavior	1
<input type="button" value="Next"/>	

Above, this early draft of the inputs for the application shows the key patient characteristics demonstrated by analysis as most highly predictive of readmission risk. These include:

- Days since last discharge
- Disease severity
- Payer class
- Age
- Marital status
- Gender

BRANDON POPE

INDUSTRIAL ENGINEERING

Brandon Pope transitioned from mathematics to engineering as a graduate student in part because of the “allure of modeling real-world systems,” he says. Since joining RCHE in 2011, Pope has contributed his expertise to a variety of projects in readmissions, modeling patient centeredness, and quality and efficiency in healthcare.

“Healthcare is a service system, but one in which the outcome is greatly affected by the consumer. This is a challenging reality given the need to not only facilitate better outcomes, but also to isolate and measure the contribution of healthcare services to those outcomes,” says Pope. His other areas of research interest include uncertainty/risk, and information ability and outsourcing. He also pursues projects in healthcare incentives.

“I would like to see my work become validated, implemented tools that support decision making.”

Pope holds a PhD and ME from Texas A&M University in Industrial and Systems Engineering. He has submitted two papers on his readmissions research at RCHE, and has presented his work at

numerous national conferences.





BENJAVAN UPATISING

As a consumer and mother of four, Benjavan “Den” Upatising has experienced many of the same frustrations most encounter with healthcare providers. As an industrial engineer, she also is uniquely positioned to bring improvements to the system.

Den recently completed a four-year Mayo Clinic Healthcare Engineering Fellowship with the Regenstrief Center for Healthcare Engineering. She is part of a team of researchers analyzing data and developing predictive models from a controlled trial that involved 205 patients at four Mayo Clinic outpatient practice locations. Her research is funded by the \$12 million Southeastern Minnesota Beacon Community grant.

“Are there factors that can be used to predict when home telemonitoring, provided by the primary care practice, can reduce hospitalizations, emergency department visits and total health care cost for older adult patients with multiple chronic illnesses, high risk of worsening functional and medical status, and hospitalization?” she says. “If so, then how can we use the knowledge to develop a decision-support tool that can assist physicians in deciding the appropriate level of care?”

Den continues to enjoy a positive prognosis for her career as well as for the possible applications of her research. “I’m excited about the role that engineering, specifically industrial engineering, can play in improving this nation’s health care system,” she says.

Den has co-authored two papers about her research and has recently submitted a third.

Written by Purdue Marketing & Media for the Purdue web feature “5 Students Who are Health Makers.”

SIGNIFICANT CENTER PROJECTS

While space precludes a complete synopsis of each project underway at RCHE, here is a brief description of work being conducted by RCHE faculty that is not featured in this report:

Preventable Readmissions: See pages 6–7 for an update of current readmissions project work.

Care Transitions and Diabetics: Building upon her previous work on marriage relationships and health behaviors (see publications in Appendix D), Melissa Franks (Human Development & Family Studies) is partnering with St. Vincent Health to investigate the role of the supporting partner (parent, spouse, child, etc.) in a diabetic patient's transition to home after hospitalization. The goal is to identify interventions in which the supporting partner could participate that would help to reduce rehospitalizations. This work is being funded by RCHE.

Social and Behavioral Influences on Clinical Communication and Pain Management: Examining various aspects of physician-patient interactions and their effect on positive health outcomes for cancer patients. This series of projects is funded by the National Institutes of Health and is being conducted by Cleveland Shields (Human Development & Family Studies). One paper has been published; others are under review or pending submission.

I-ADAPT Health Disparities Hub: Funded by AHRQ and conducted by Mohan Dutta and Bart Collins (Communications), this project is a partnership between Purdue University, the Indiana Minority Health Coalition, and black health leaders in Lake County. It is investigating and testing the impact of a community-led set of educational materials on improving heart disease risk behaviors.

Critical Access Hospital Readmissions: This research examines readmissions in critical access hospitals, which serve many rural parts of the U.S. and operate with a different structure from acute care hospitals. Researchers at RCHE are examining whether the number of handoffs, which are typically greater in critical access hospitals, affects the rate of readmission. If so, it could suggest that transition issues that affect acute care hospitals are also affecting critical access hospitals. This research is being funded by RCHE.

Infusion Pump Alerts Thresholds and Guidance: The amount of alert data gathered through the Infusion Pump Informatics system is now large enough for research to be conducted with it. This project applies knowledge about alert fatigue in the airline industry to infusion pump alert fatigue. This work is funded by RCHE and conducted by Steve Landry (Industrial Engineering).

COLLABORATIVE PARTNERSHIPS

THE REGENSTRIEF CENTER FOR HEALTHCARE ENGINEERING WILL PURSUE A TRANSFORMED HEALTHCARE DELIVERY SYSTEM BY CONDUCTING **IMPACTFUL RESEARCH** GUIDED BY NATIONAL PRIORITIES AND LEVERAGING **COLLABORATIVE PARTNERSHIPS**.

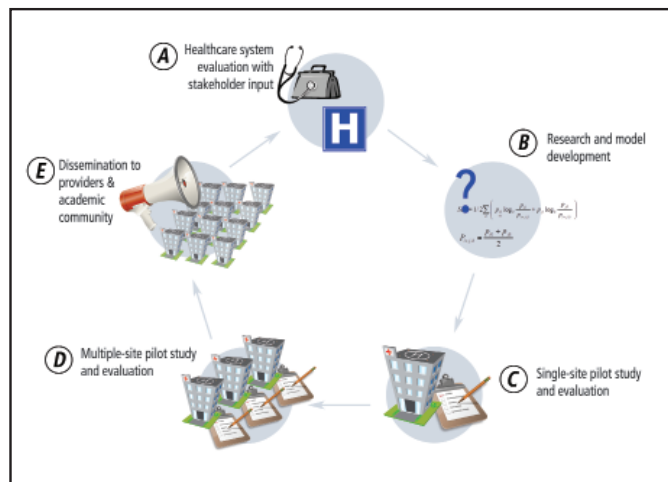
A VISION FOR CREATING IMPACT

RCHE manages a portfolio of basic and applied systems research that is practice-based and directed in part by the evaluation of healthcare delivery with stakeholder input. RCHE develops these models with healthcare providers serving as pilot sites. This work is represented in the first three steps of the research-to-impact process (A-C) depicted above.

Pilot site findings are validated in multiple-site evaluation to avoid a premature treatment of the pilot site innovation as a “best practice” (step D). This step provides information guiding effective broad-scale dissemination for healthcare delivery improvement. The implementation of innovation from practice informed research returns essential feedback from the field of practice to drive a rapid cycle, closed-loop applied research process (steps E and A).

To assist in guiding research projects from research, through pilot and evaluation, and to impact, RCHE has developed three translational scientists positions. These positions will work with faculty and partners on the application of research findings in the clinical environment.

Essential to this research-to-impact process is collaboration with healthcare providers to establish research direction, conduct applied research in a pilot site, validate at multiple sites, and disseminate on a broad scale. RCHE and its healthcare partners are actively demonstrating the value of the research-to-impact process.





PARTNERS IN PATIENT CENTEREDNESS

RCHE and the St.Vincent Health's Residency Program have partnered to develop research to understand patient and provider perceptions that contribute to patient centeredness.

According to the Institute of Medicine, patient centered care “is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.” This study asked resident physicians and their patients to identify their needs and wants, pre- and post-visit, and sought to find out if these perceptions were aligned and if they changed during the visit. Closer alignment between patient and provider needs/wants are considered to be indicative of greater patient centeredness.

“In our study, patients with chronic diseases had larger disparities between their needs and wants for the visit,” says RCHC research associate Brandon Pope. “Patients become used to hearing about their chronic disease but they may not ‘feel the effects.’ Providing a therapeutic alliance with them is very important,” said family medicine resident and project collaborator Josh McKinnion, MD.

Follow up research is being developed to extend the project by adding objective measures of health outcomes. This will allow the researchers to determine elements of perception and patient-centeredness that are most highly correlated with specific, desired outcomes. Providers wanting to improve certain health outcomes (e.g. adherence) would then know which elements of patient centeredness to focus on to best help their patients.

This pilot project was supported by RCHC. Funding applications for the follow-up study are being submitted.

SUPPORTING COMMUNITIES OF PRACTICE

Supporting communities of practice — groups of individuals and organizations with similar interests — is an important facet of RCHE partnership development. These groups include healthcare providers, researchers, faculty members, and students.

The center hosts speakers and conferences with the goal of encouraging collaboration and introducing new perspectives on common challenges within and across knowledge communities. RCHE sponsored the following events in 2012–13:

- Infusion Pump Informatics (IPI) Conference
 - 35 Pharmacists and nurses from health systems around the Midwest attended
- Health Communication & Family Dynamics: Beyond the Patient-Provider Relationship
 - Kathleen Galvin, PhD, Northwestern University
 - Daena Goldsmith, PhD, Lewis & Clark College
 - Shannon K. Oates, MD, IU Health Arnett
 - Chris Segrin, PhD, University of Arizona
- Pioneer Speakers:
 - Alan Vaida, PharmD, FASHP, Executive Vice President, Institute for Safe Medication Practices
 - Dave Kindig, MD, PhD, University of Wisconsin
- Research Speaker Series:
 - Azza Ahmed, Nursing
 - Bart Collins, Communication
 - Ruchith Fernando, Computer Science
 - Melissa Franks, Human Development and Family Studies
 - Uri Kartoun, Industrial Engineering
 - Theresa Knotts, Purdue Healthcare Advisors
 - Mark Lawley, Biomedical Engineering
 - Pratik Parikh, Industrial and Human Factors Engineering, Wright State University
 - Brandon Pope, Industrial Engineering
 - Lingsong Zhang, Statistics

INFUSION PUMP INFORMATICS



IPI CONFERENCE

October 24, 2012

Purposes:

- To support community building and knowledge sharing among the group.
- To identify areas of mutual interest for future research collaborations.

Outcomes:

- Established new joint area of interest in high alert medications.
- Initiated data collection in compliance, which will allow additional research to be conducted.



RESEARCH SPEAKER SERIES

Purposes:

- To encourage and support interdisciplinary and collaborative research.
- To develop interdisciplinary teams based on similar interests in healthcare delivery improvement.

Outcomes:

- Developed connections with new faculty in Communications and Management.

CENTER PARTNERS

RCHE partners provide clinical feedback on research projects, access to primary data, and dissemination avenues for completed work. The center's continuous partner development ensures that its research can remain robust, relevant, and positioned to have greatest impact upon improving healthcare delivery.

RESEARCH PARTNERS



Community Health Network — A leading non-profit health system with five hospitals and more than 70 sites of care in central Indiana.



Indiana State Department of Health — Promoting, protecting, and providing for the health of Hoosiers in their communities.



IU Medical Group — A practice of more than 135 physicians at 17 clinics.



IU School of Medicine — The provider of medical education in Indiana with more than 1,000 MD and PhD students.



Mayo Clinic — The first and largest integrated, non-profit group practice in the world.



Regenstrief Foundation — A private foundation that focuses its activities and financial support on the improvement of healthcare through medical research and process improvement.



Regenstrief Institute — A national leader in health services research, located at the Indiana University School of Medicine in Indianapolis.



St. Vincent Health — The state's largest healthcare employer with more than 3,000 physicians.



U.S. Department of Veterans Affairs — Including the Roudebush Veterans' Administration Medical Center, designed to enhance the VA's capacity to implement and sustain evidence-based practice.

DISSEMINATION PARTNERS



American College of Physicians — The largest medical-specialty organization and second-largest physician group in the United States.



American Hospital Association — The national organization that represents and serves all types of hospitals, health care networks, and their patients and communities.



Ascension Health — The nation's largest non-profit health system.



Indiana Hospital Association — The professional trade association for 167 Hoosier hospitals and health systems.

COLORING IN THE GREY AREAS

Once thought to be exclusive to insurance companies, actuaries are helping provide clarity in an increasingly fuzzy healthcare landscape.

“There are still a lot of ‘grey’ areas [in healthcare] and actuaries have the expertise to provide some color,” says Jeff Beckley, professional actuary in residence at Purdue. Beckley provides professional consulting to the program and the RCHE-Actuarial Science partnership.

Actuaries have traditionally worked in insurance because their skills are primarily focused on calculating risk in the face of a variety of circumstances; however, the healthcare industry is increasingly finding their talents to be useful.

“The role of the healthcare actuary has changed substantially over the last 10 years and continues to evolve,” says Beckley. “At one time, almost all healthcare actuaries worked for health insurance companies or for consulting firms whose primary clientele were insurance companies. Now many actuaries are employed or engaged by many other entities such as healthcare providers, corporations, or pharmaceutical companies.”

The RCHE-Actuarial Science partnership supports Actuarial Science student and faculty involvement with RCHE and its healthcare datasets. This partnership will continue to grow thanks to a new \$1.5 million grant from the National Science Foundation. The grant will fund the continued development of a selective summer internship program in which three actuarial science students join RCHE and conduct research on center data.

“The internship provided me with an opportunity to put everything that I’ve learned from Purdue to the test [with] a real world example,” said student Ravi Rajesvaran.

Rajesvaran has continued to intern with RCHE during 2012–13, and his poster of his work with the center won the Undergraduate Poster Award at the 2013 Purdue Computational Science and Engineering Student Conference.

XUANYAO HE STATISTICS

Xuanyao He joined RCHE in the fall of 2012 to help integrate actuarial science research and students with center projects.

“We can, for example, analyze the insurance and payer information to see the effect of different insurance plans and tiers on out-of-pocket payments and on patients’ health conditions,” she says.

Actuaries have been heavily involved in the implementation of the Affordable Care Act. “The need for actuaries in all kind of healthcare analysis is changing and growing very fast today.”

He completed her PhD in Statistics at the University of North Carolina at Chapel Hill. She is interested in the relationships among healthcare delivery pricing, efficiency, and health outcomes.

“How to use payer incentives to improve healthcare delivery is one of my interests.”

He has been working on a risk adjustment methodology that can be applied to other center research, such as the utilization model. Her method

will allow datasets to be compared by adjusting for risk factor differences in the groups, such as age, health status, etc.



CENTER FINANCIALS

FUNDING STRATEGY

As part of its commitment to being good stewards of the Regenstrief Foundation funding, RCHE develops external sources of research funding. These sources include:

- Healthcare partners
- Other foundations
- Government research grants

FUNDING ORGANIZATIONS

During this funding period, RCHE has received grants from many prestigious organizations, including:

- Agency for Healthcare Research and Quality
- Center for Disease Control
- Department of Defense
- Department of Health and Human Services
- National Institutes of Health
- National Science Foundation
- Office of the National Coordinator for Health Information Technology

LEVERAGING FOUNDATION FUNDING

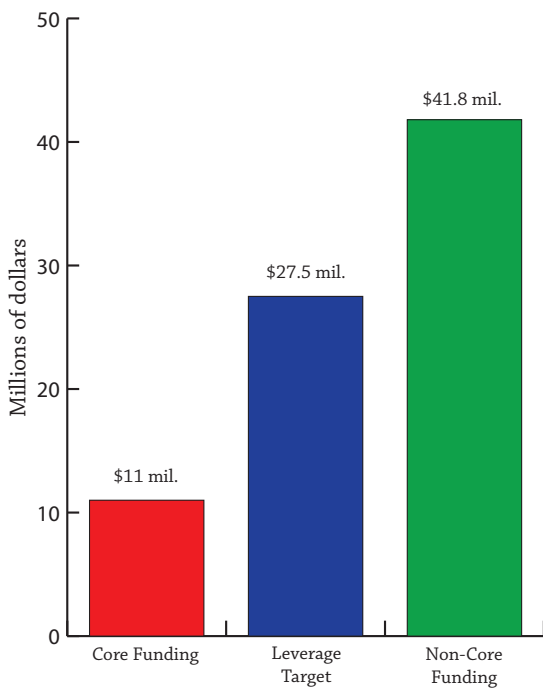
As reflected in the graph at the bottom of page 17.

	2008 (6 mo.)	2008-09	2009-10	2010-11	2011-12	2012-13	Total
Core Funding	\$1,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$11,000,000
Non-Core Funding	\$10,270,110	\$3,351,517	\$18,032,161	\$7,155,617	\$1,512,354	\$1,520,996	\$41,842,755

FUNDING LEVERAGE, 2008–13 FUNDING PERIOD

RCHE Leverage of Foundation Funding

Cumulative, Funding Period 2008–2013



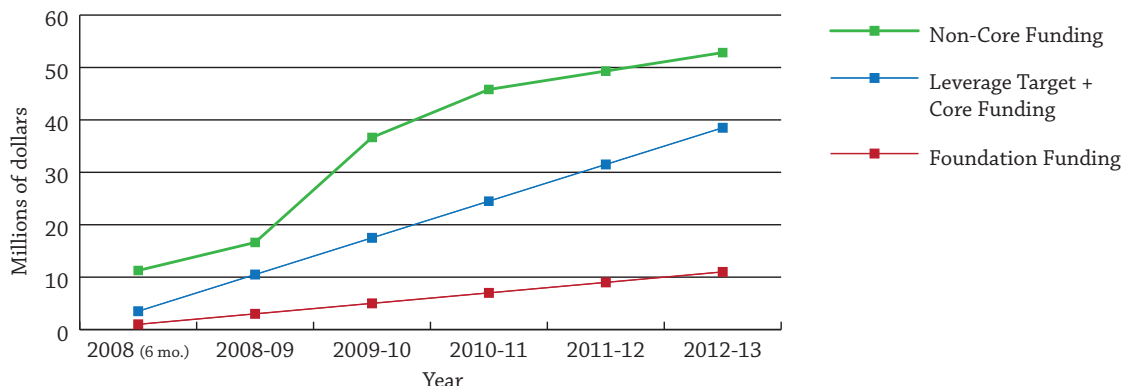
Five years ago, RCHE committed to a leverage factor of 2.5 for the five-year funding period — raising \$2.50 in external funding for every \$1.00 provided by the Regenstrief Foundation Core Funding. The center's progress over the course of its full funding period is displayed below.

The final tally of the center's leverage compared with the required leverage amount (2.5 x core funding) is displayed at left.

The result: RCHE exceeded its original leverage goal, surpassing it by more than \$14 million.

RCHE Leverage of Foundation Funding

Cumulative, Funding Period 2008–2013





APPENDICES

Appendix A: Metrics Achievement, 2008–2013

Appendix B: Guest speakers, 2008–2013

Appendix C: Center Projects, 2008–2013

Appendix D: Publications, 2008–2013

Appendix E: Presentations, 2008–2013

APPENDICES

METRIC ACHIEVEMENT, 2008–2013

RESEARCH EFFECTIVENESS

Metric	Achievement
RCHE will add two new value-chain partners.	<i>Metric achieved.</i> Partnership with the American College of Physicians established in 2008; Partnership with Mayo Clinic established in 2010.
RCHE will secure research funding from major national funding sources awarding competitive grant applications.	<i>Metric achieved.</i> Grants have been received from: Center for Disease Control, U.S. Department of Health and Human Services, Department of Defense, Indiana Family and Social Services Administration, National Institutes of Health, Office of the National Coordinator for Health Information Technology, Agency for Healthcare Research and Quality.
RCHE will publish research findings and reports in peer reviewed journals.	<i>Metric achieved.</i> See Appendix D for list of publications.
Research partners will provide an evaluation of RCHE.	<i>Metric achieved.</i> Partner evaluation statements provided in the Renewal Document, presented to the Foundation in June 2011.
Research findings will be evaluated to assess impact on improving healthcare delivery.	<i>Metric achieved.</i> Examples of impact provided in the Renewal Document, presented to the Foundation in June 2011.
Establish a multi-university, healthcare engineering research alliance.	<i>Metric achieved.</i> Healthcare Systems Engineering Alliance (HSEA) was established in 2007. It was expanded to multi-national membership in 2012 and now has more than 40 member universities
Hold at least one joint HSEA conference.	<i>Metric achieved.</i> Conferences held in 2008, 2009, and 2010. Sponsored a track at INFORMS Healthcare 2013.

OPERATIONS

Metric	Achievement
Identify and perform a gap analysis against two other healthcare research centers.	<i>Metric achieved.</i> Benchmarked against Tennenbaum Institute in 2009; Health Systems Institute at Georgia Institute of Technology in 2009.

LEARNING & INNOVATION

Metric	Achievement
A data support capacity will be added to RCHE.	<i>Metric achieved.</i> A secure server was established in 2008. A second server was established in 2010. A database server was established in 2009. A HIPAA-compliant server was established in 2012. A data analyst was hired in 2008.
RCHE will hold at least two conferences annually.	<i>Metric achieved.</i> Spring and fall conferences held each year since 2008.
RCHE will host at least three nationally prominent speakers per year.	<i>Metric achieved.</i> See appendix B for list of speakers

FINANCIAL MANAGEMENT

Metric	Achievement
RCHE will develop and submit an annual operating budget.	<i>Metric achieved.</i> Completed for 2008, 2008–09, 2009–10, 2010–11.
RCHE will document financial management of Foundation funds and supply monthly financial reports.	<i>Metric achieved.</i> Ongoing. Monthly and annual reports provided to the foundation and program boards.
Attain a core leverage ratio* greater than 2.5.	<i>Metric achieved.</i>

*Overall RCHE funding exclusive of the Foundation core grant divided by the Foundation core grant.



GUEST SPEAKERS, 2008–2013

Each year, RCHE hosts several Pioneer Speakers. These speakers are often hosted in conjunction with a conference or other forum to encourage discussion with them and of their ideas.

2008–09

Harvey Fineberg, Institute of Medicine

David Meyers, Agency for Healthcare Research and Quality

Steve Mayfield, American Hospital Association

2009–10

Mark Braunstein, Georgia Institute of Technology

William Cast, NoMoreClipboard.com

Glen Mays, University of Arkansas for Medical Sciences

Vinod Sahney, Blue Cross Blue Shield of Massachusetts

2010–11

Nilay Shah, Mayo Clinic

Bob Lubitz, St. Vincent Health

Brandon Pope, Department of Industrial and Systems Engineering, Texas A&M University

2011–12

Gregory Kreps, George Mason University

Rob Logan, National Library of Medicine

William Coleman, National Institute on Minority Health and Health Disparities

2012–13

Allen Vaida, Institute for Safe Medication Practices

David Kindig, University of Wisconsin

Steve Rough, University of Wisconsin, UHC



CENTER PROJECTS, 2008–2013

FY	Project Title	PI	PI College	Sponsor
2008 (first half)	Creation of a VR Healthcare Facility Design Hub	Arns	Technology	RCHE
2008 (first half)	Various	Sloan	Technical Assistance Program	Various
2008 (first half)	Framework for Improving Adoption Rate and Value Realization of Computer Physician Order entry Systems	Duffy	Engineering	WellPoint
2008 (first half)	Life Long Analysis of Bladder Cancer Development and Patient Care: Dog as Proxy/Surrogate to Human	Orcun	Discovery Park	Discovery Park
2008 (first half)	A Randomized Pilot of Breast Cancer Survivor Patient Activation Intervention	Shields	Health and Human Sciences	RCHE
2008 (first half)	Combined Fluoroscopy/High-Resolution Manometry Data Collection and Visualization	Peine	Engineering	Sierra Scientific Instruments
2008 (first half)	Health literacy in underserved pre-diabetic populations	Jensen	Liberal Arts	RCHE
2008 (first half)	Health Care e-Learning Hub	Schaffer	Education	RCHE
2008 (first half)	Self-care and health literacy and traditional home health patients with heart failure	Yehle	Health and Human Sciences	RCHE
2008 (first half)	Rural Telehealth Needs Assessment	Collins	Liberal Arts	ISDH
2008 (first half)	Measuring and reporting quality performance and medication safety in community pharmacy	Yehle	Health and Human Sciences	RCHE
2008 (first half)	Modeling supply chains for healthcare products	Schwarz	Krannert	RCHE
2008 (first half)	Optimal long-term care resource allocation for older adults enrolled in medicaid	Kong	Engineering	RCHE
2008 (first half)	Impact of insufficient community based long term care on medicare expenditures	Sands	Health and Human Sciences	RCHE
2008 (first half)	Remote Power Transmission Feasibility	Peine	Engineering	Ethicon EndoSurgery
2008 (first half)	Year 2 Pandemic Exercise Preparedness Program Drills and Tabletop Exercises for Local Public Health departments Development and Planning	McGlothlin	Health and Human Sciences	Center for Disease Control
2008 (first half)	Health Literacy, Medication Burden, and Self Care Behaviors in Patients with Heart Failure Across Multiple Settings	Plake	Pharmacy	RCHE
2008 (first half)	Modeling and Control of Cable Actuated Mechanisms for Surgical Robotic Systems	Peine	Engineering	Meere

FY	Project Title	PI	PI College	Sponsor
2008 (first half)	Drive for Life Campaign and Evaluation; impact of just-in-time information, public education, and DMV clerk training on donor registrations and family notifications	Morgan	Liberal Arts	US Dept. of Health & Human Services
2008 (first half)	New Jersey Workplace Partnership for Life	Morgan	Liberal Arts	New Jersey Sharing Network
2008 (first half)	Show us your heart media campaign	Harrison	Liberal Arts	US Dept. of Health & Human Services
2008 (first half)	Rural Healthcare -- Kewanna	Witz	RCHE	
2008 (first half)	Point of care audit and feedback tools to improve patient safety	Hopp	Statewide campus	RCHE
2008-09	Libraries' work on CATHub	Carlson	Libraries	RCHE
2008-09	Consulting (6-day LEAN project)	Birk	Technical Assistance Program	Not identified
2008-09	Show US Your Heart: Secretary of State/ DMV Point-of-Decision, Grassroots, and Media Campaign.	Harrison	Liberal Arts	U.S. Department of Health and Human Services
2008-09	Women's Oncological Research and Development (WORD)	Collins	Liberal Arts	WORD
2008-09	Using Narrative Persuasion to Increase Colon Cancer Detection in High-Risk Individuals: A Worksite Intervention	Jensen	Liberal Arts	RCHE
2008-09	Therapeutic Dose Optimization using a Bayesian Pharmacometric Approach to Personalized Medicine	Orcun	Discovery Park	RCHE
2008-09	VHA Blueprint Evaluation	Schaffer	Education	RCHE
2008-09	Racial Differences in Physician-Patient Communication for Cancer Pain Management	Shields	Health and Human Sciences	PHS-NIH National Cancer Institute; Regenstrief Center
2008-09	Following Doctor's Orders: Does Patient and Spouse Communication with Healthcare Providers Improve Dietary Adherence Among Patients with Diabetes?	Franks	Health and Human Sciences	RCHE
2008-09	Proximity to Uninsured Populations and Hospital Services	Chen	Health and Human Sciences	University of Kentucky Research Foundation

FY	Project Title	PI	PI College	Sponsor
2008-09	Consulting (2-day quality workshop)	Birk	Technical Assistance Program	Not identified
2008-09	Empowering Nursing Leaders Through Healthcare Engineering Partnership Education	Novak	Health and Human Sciences	Helen Fuld Health Trust
2008-09	Alaris Smart Pump Safety	Catlin	ITaP	Cardinal Health; RCHE
2008-09	Integrated Data and Trauma Care Outcomes	Thomas	Pharmacy	RCHE
2008-09	Modeling the Supply Chains for Healthcare Products	Schwarz	Krannert	RCHE
2008-09	The Drive for Life Campaign and Evaluation: The Impact of Just-in-time Information, Public Education	Morgan	Liberal Arts	U.S. Department of Health and Human Services
2008-09	Work Process Design Strategy to Reduce Barcode Medication Administration (BCMA) Workarounds for Improved Patient Safety	Duffy	Engineering	ASHP Foundation Medication Safety Team Grant
2008-09	Effects of Gain Vs. Loss Frame Sun Protection Messages on Rural Indiana Adolescents	Cho	Liberal Arts	PHS-NIH National Cancer Institute
2008-09	Tri-State Telehealth Resource Grant	Collins	Liberal Arts	Marquette General Hospital
2008-09	Retrospective Analysis of Older Adults Undergoing Surgery	Sands	Health and Human Sciences	RCHE
2008-09	The Impact of No-Show Behavior on Diabetes Management	Sands	Health and Human Sciences	RCHE
2008-09	CHN	Collins	Liberal Arts	RCHE
2008-09	Optimization Model for Financing Medical Home Activities in Primary Care	Lawley	Engineering	RCHE
2008-09	CHN nursing study advice	Edwards	Health and Human Sciences	RCHE
2008-09	Work Process Design Strategy to Reduce Barcode Medication Administration (BCMA) Workarounds for Improved Patient Safety	Duffy	Engineering	Lilly Seed Grant Program
2009-10	Testing an Interactive Web-Based Nutrition Tool in Patients Enrolled in Cardiac Rehabilitation	Yi	Engineering	RCHE
2009-10	H1N1 Campaign Evaluation	Jensen	Liberal Arts	Indiana State Department of Health

FY	Project Title	PI	PI College	Sponsor
2009-10	Pathophysiology of Postoperative Delirium in Older Patients	Sands	Health and Human Sciences	University of California at San Francisco (UCSF)
2009-10	SafetyNet -- AgEcon	Hunte	Agriculture	RCHE
2009-10	CCE Supplement	Pekny	Engineering	RCHE
2009-10	Using Narrative Persuasion to Increase Colon Cancer Detection in High-Risk Individuals: A Worksite Intervention	Jensen	Liberal Arts	RCHE
2009-10	Tailored health communication and interactive technology: Developing a computer-based algorithm to encourage utilization of breast cancer diagnostics	Jensen	Liberal Arts	NIH
2009-10	(MAYO) Chronic Disease Monitoring of Patients at Home (IE Fellowship)	Yih	Engineering	Mayo Clinic
2009-10	ACP II (Utilization Model Tool)	Witz	RCHE	RCHE
2009-10	CAT Continuance	Duerstock	Vet Med	RCHE
2009-10	Ping on project	Lawley	Engineering	RCHE
2009-10	Libraries' work on CatalyzeCare	Carlson	Libraries	RCHE
2009-10	Advancing Smart Pump Informatics System (IPI 2.0)	Catlin	ITaP	RCHE
2009-10	Ergonomics	McGlothlin	Health and Human Sciences	Airgas Central Accounting Group
2009-10	Stimulus grant to help providers implement HIT	McKinnis	Technical Assistance Program	Office of the National Coordinator
2009-10	Walther Oncology Physical Sciences & Engineering Research Embedding Program	Harrison	Discovery Park	Walther Cancer Foundation
2009-10	Evaluation of a home monitoring solution for diabetes patients	Collins	Liberal Arts	Core; St. Vincent Health
2009-10	Modeling the Supply Chains for Healthcare Products	Schwarz	Krannert	RCHE
2009-10	Effective Implementation of Evidence-based Practice: Investigating innovation spread across healthcare institutions	Schaffer	Education	RCHE
2009-10	Simulation-based planning model for mental health care services	Turkcan	Engineering	Roudebush VA Medical Center
2009-10	VERC (Roudebush)	Witz	RCHE	VAMC
2009-10	Implementation of North Central Nursing Clinics Electronic Health Record.	Aaltonen	Health and Human Sciences	PHS-HRSA National Center for Health Services Res

FY	Project Title	PI	PI College	Sponsor
2009-10	Tailored health communication and interactive technology: Developing a computer-based algorithm to encourage utilization of breast cancer diagnostics	Jensen	Liberal Arts	American Cancer Society
2009-10	Health Literacy, Medication Hassles, and Self-Care in Heart Failure: A Longitudinal Study.	Yehle	Health and Human Sciences	The Kinley Trust
2009-10	Royal on Dunston seed	Royal	Health and Human Sciences	RCHE
2009-10	Cancer Care Infrastructure	Harrison	Discovery Park	Walther Cancer Institute Foundation Inc.
2009-10	Improving Assessment of Patient Preferences in Localized Prostate Cancer	Sands	Health and Human Sciences	VAMC/San Francisco
2009-10	Prognostic Significance of Insufficient ADL Help on Health Outcomes/Utilization	Sands	Health and Human Sciences	National Institutes of Health
2009-10	HTAP 2009-10 Contracts, Grants, etc	Sloan	Technical Assistance Program	Various
2009-10	Outcomes and perceived needs among individuals with TBI and SCI in Indiana	Thomas	Pharmacy	Indiana Spine and Brain Injury Research Fund
2010-11	Readmissions I -- STAT	Zhang	Science	
2010-11	Proactive Planning and Scheduling Intervention for Diabetic Care	Lawley	Engineering	RCHE
2010-11	Prognostic Significance of Insufficient Activity of Daily Living (ADL) Help on Health Outcomes/Utilization	Sands	Health and Human Sciences	PHS-NIH National Institute on Aging
2010-11	MATTR	Collins	Liberal Arts	
2010-11	Infuser pump alert thresholds and guidance	Landry	Engineering	RCHE
2010-11	Institute for Accessible Science (IAS): Advancing Inclusion of Persons with Disabilities in Biomedical Laboratory Research	Duerstock	Vet Med	National Institutes of Health
2010-11	Health Literacy and Medication Hassles in Informal Caregivers of Patients with Heart Failure	Yehle	Health and Human Sciences	American Association of Heart Failure Nurses Inc.
2010-11	Health Outcomes Research	Thomas	Pharmacy	Pfizer Inc.
2010-11	Hand gesture recognition using contextual information	Wachs	Engineering	AHRQ

FY	Project Title	PI	PI College	Sponsor
2010-11	Application of Bayesian computational/statistical techniques to extract data from colonoscopy procedure reports in the electronic medical record	Lehto	Engineering	RCHE
2010-11	Social and Behavioral Influences on Clinical Communication and Pain Management	Shields	Health and Human Sciences	National Institutes of Health (NIH)
2010-11	Improving medication adherence through practitioner and patient health literacy education	Plake	Pharmacy	Pfizer, RCHE
2010-11	Infusion Pump Informatics, 3.0	Catlin	ITaP	RCHE
2010-11	Pathophysiology of Postoperative Delirium in Older Patients - Amendment 1	Sands	Health and Human Sciences	University of California - San Francisco
2010-11	Improving Assessment of Patient Preferences in Localized Prostate Cancer	Sands	Health and Human Sciences	VAMC/San Francisco
2010-11	Health Literacy, Medication Hassles, and Self-Care in Heart Failure: A Longitudinal Study	Yehle	Health and Human Sciences	Sigma Theta Tau International
2010-11	Readmissions Critical Access	Witz	RCHE	RCHE
2010-11	Retrospective Chart Review for Patients at Risk of Postoperative Cognitive Decline	DeCrane	Health and Human Sciences	RCHE
2010-11	I-ADAPT health disparities hub	Dutta	Liberal Arts	AHRQ
2010-11	Improving Patient Care Outcomes and Reducing Health Expenses	Glozbach	Technology	RCHE
2010-11	Identifying social barriers and facilitators to assistive device use among older adult veterans	Ferraro	Liberal Arts	RCHE
2010-11	Efficacy of Monitoring Devices in Reducing Damaging Sound Levels in Neonatal Intensive Care Units	Walton	Technology	RCHE
2010-11	Patient Simulator in a Virtual Built Environment	Dunston	Engineering	RCHE
2011-12	Care transitions & diabetics	Franks	Health and Human Sciences	RCHE
2011-12	Readmissions Critical Access -- Rosen Center	Zentner	ITaP	RCHE
2011-12	Health Outcomes Research	Thomas	Pharmacy	Pfizer Inc
2011-12	Pathophysiology of Postoperative delirium in older patients	Sands	Health and Human Sciences	University Of California - San Francisco

FY	Project Title	PI	PI College	Sponsor
2011-12	Culture-Centered Heart Health Promotion among African American Youth in Marion County	Dutta	Liberal Arts	NIH -- Community Health Engagement Program (CHEP)
2011-12	Prognostic Significance of Insufficient ADL Help on Health Outcomes/ Utilization	Sands	Health and Human Sciences	Phs-Nih National Institute On Aging
2011-12	Brandon Pope support	Pope	Engineering	RCHE
2011-12	Supplement II -- Safety Net	Witz	RCHE	RCHE
2011-12	Supplement II -- PCMH Utilization Model	Witz	RCHE	RCHE
2011-12	Supplement II -- IPI	Witz	RCHE	RCHE
2011-12	Research and Evaluation Support for the Black Mens Health Study Conducted by the Racial and Ethnic Minority Epidemiological Center	Hunte	Health and Human Sciences	Indiana Minority Health Coalition
2011-12	Optimizing Operating Room Efficiency	Lawley	Engineering	Advanced Process Combinatorics
2012-13	A robotic assistant for the operating room	Wachs	Engineering	CTSI
2012-13	Conceptualization of the Social and Innovation Opportunities of Data Analysis	Zentner	ITaP	National Science Foundation
2012-13	Navion	Zentner	ITaP	RCHE
2012-13	CMS Bundled Payment	Zentner	ITaP	RCHE
2012-13	Patient-Centered Care	Collins	Liberal Arts	RCHE
2012-13	Health Care Resource Use and Expenditures	Thomas	Pharmacy	Pfizer Inc.
2012-13	Readmissions -- RCHE	Witz	RCHE	RCHE
2012-13	OurHealth	Witz	RCHE	RCHE



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Shields, C. G., Ziner, Kim W., Bourff, Sara A., Schilling, K., Zhao, Q., Monahan, P., Sledge, G., Champion, V., (In Press). An Intervention to Improve Communication between Breast Cancer Survivors and their Physicians. *Journal of Psychosocial Oncology*.

Shippee, Tetyana Pylypiv, **Kenneth F. Ferraro**, and Roland J. Thorpe, Jr. 2011. “Racial Disparity in Access to Cardiac Intensive Care over 20 Years.” *Ethnicity and Health* 16:145-165.

Shippee, Tetyana Pylypiv, Markus H. Schafer, and **Kenneth F. Ferraro**. 2012. “Beyond the Barriers: Racial Discrimination and Use of Complementary and Alternative Medicine among Black Americans.” *Social Science and Medicine* 74: 1155-1162.

Stephens, M. A. P., **Franks, M. M.**, Rook, K. S., Iida, M., Hemphill, R., & Salem, J. K. Spouses’ attempts to regulate day-to-day dietary adherence among patients with type 2 diabetes. *Health Psychology*. 2012.

Thomas, J., Iyer, N. **Collins, W.**, & **Schaffer, S.P.** (2010). Illness representations and medication non-adherence among individuals with diabetes. *Proceedings of the American Pharmacists Association Annual Meeting*, Washington, D.C.

Turkcan, A., DeLaurentis, P., Nuti, L., **Tian, Z.**, **Zhang, L.**, **Lawley, M.**, **Sands, L.** “No-show Modeling in Ambulatory Care”. *Healthcare Operations Management*, Springer, Ed. Brian Denton. 2013.

Turkcan, A., Lynn Nuti, Po-Ching DeLaurentis, **Zhiyi Tian**, **Joanne Daggy**, **Lingsong Zhang**, **Mark Lawley**, **Laura Sands**. “No-Show Modeling for Adult Ambulatory Clinics.” Handbook of Healthcare Operations Management. *International Series in Operations Research & Management Science*. 184. 251–288. 2013.

Turkcan, A., Zeng, B., **Lawley, M.**, “Chemotherapy Operations Planning and Scheduling” *IIE Transactions on Healthcare Systems Engineering*, 2(1), 31-49, 2012.

Turkcan, A., Zeng, B., **Lawley, M.**, “Chemotherapy Operations Planning and Scheduling” *IIE Transactions on Healthcare Systems Engineering*, 2(1), 31–49, 2012.

Turkcan, A., Zeng, B., Muthuraman, K., **Lawley, M.**, “Sequential Clinical Scheduling with Service Criteria” *European Journal of Operational Research*.

Upatising, Benjavan, Gregory J Hanson, Young L Kim, Stephen S Cha, Yuehwern Yih, Paul Y Takahashi. Effects of home telemonitoring on transitions between frailty states and death for older adults: A randomized controlled trial. *International Journal of General Medicine*, 6(1). 145–151. 2013.

Wang L. and **N. Kong**, “Security Constrained Economic Dispatch: A Markov Decision Process Approach with Embedded Stochastic Programming,” 2010. *International Journal of Operations Research and Information Systems*. Vol. 1, No. 2, pp. 1 –16.

Wu, S., Lehto, M., **Yih, Y.**, Saleem, J.J. and Doeblbeling, B.N. “On improving provider decision making with enhanced computerized clinical reminders.” *Lecture Notes in Computer Science*. Springer-Verlag, 2009.

Xu H, Covinsky KE, Stallard E, **Thomas III J, Sands LP**. Insufficient Help for ADL Disabilities and Risk for all-cause Hospitalization, *Journal of the American Geriatrics Society*, 60;927–933, 2012.

Xu H., Weiner M., Paul S., **Thomas III J.**, Craig B. A., Rosenman M., Carney Doeblbeling C., **Sands L. P.** (2010). Volume of home- and community-based Medicaid Waiver services and risk of hospital admissions. *Journal of the American Geriatrics Society*, 58(1):109-115.

Yehle K., Sands L., Rhynders P, & Newton, G.(2009). “The effect of shared medical appointments on knowledge and self-care in patients with heart failure: A pilot study.” *Heart & Lung*. 38(1) 25-33.

Yehle, K., & Plake, K. (2010). Self-efficacy and educational interventions in heart failure: A review of the literature. *Journal of Cardiovascular Nursing*, 25(3), 175-188.

Yehle, KS, AMH Chen, **KS Plake, JS Yi**, AR Mobley. A Qualitative Analysis of Coronary Heart Disease Patient Views of Dietary Adherence and Web-Based and Mobile-Based Nutrition Tools. *Journal of Cardiopulmonary Rehabilitation and Prevention*. 32 (4), 203–209. July 2012.

Yih, Y. (editor) *Handbook of Healthcare Delivery Systems*, CRC Press, 2010.

Young J, Slebodnik M, **Sands L**. Bar code technology and medication administration error. *Journal of Patient Safety*, in press.

Zeng, B., Turkcan, A., Lin, J., **Lawley, M.**, “Clinic Scheduling Models with Overbooking for Patients with Heterogeneous No-show Probabilities” *Annals of Operations Research*, Special Issue on Operations Research in Health Care Delivery. 178(1), 121–144. 2010.

Zeng, B., Zhao, H., **Lawley, M.**, “Clinic Overbooking and Patient Response: A Game Theoretic Approach”, *IIE Annual Conference Proceedings*. 2009.



PRESENTATIONS, 2008–2013

Bodie, G. D., Collins, W. B., Jensen, J. D., Davis, L. A., Guntzviller, L. M., & King, A. J. (2010, November). Thinking about health: Development and initial validity evidence for the health-unhealthy other instrument (HUHOI).

Paper to be presented at the 96th annual meeting of the National Communication Association, San Francisco, CA.

Brandon Pope. Prediction, Non-Clinical Factors and Intervention in Unnecessary Hospital Readmissions. INFORMS, October 2012.

Brandon Pope. Prediction, Non-Clinical Factors and Intervention in Unnecessary Hospital Readmissions. BME Seminar Series. Wednesday, August 22, 2012. MJIS 1001. The seminar will be teleconferenced to SL-220 at IUPUI.

Bute, J. J., & Jensen, R. E. (2009, May). Underserved women describe fertility-related expectations: Descriptive norms, injunctive norms, and behavior. Competitively selected paper presented in the Health Communication Division at the International Communication Association, Chicago, IL.

Chakraborty S. "Sequential Scheduling under General Service Time for Outpatient Clinics," INFORMS Annual Meeting, October 2008.

Chakraborty S. "Stochastic Sequential Scheduling without Fixed Appointment Slot for Outpatient Clinics" INFORMS Annual Meeting, October 2008.

Chakraborty, S. IIE Annual Conference, April 2008.

Chakraborty, S. RCHE Operations Meeting, March 2008.

Chakraborty, S., Muthuraman, K., Lawley, M. "Sequential Appointment Scheduling with No-show for Continuous Consultation Periods" Proceedings of the National Science Foundation Awardees Conference, June 2009, Honolulu Hawaii.

Chang, K., & Yehle, K. "Benefits and Barriers in Implementing an Online Heart Failure Module for Undergraduate Nursing Students". National Conference on Professional Nursing Education and Development, Rochester, MN. October 2009

Chen X, Brian I, Kong N. "Temporal Prediction Models for Mortality Risk among Patients Awaiting Liver Transplantation." 3rd Annual INFORMS Workshop on Data Mining and Health Informatics. Washington, DC, October 11, 2008.

Daggy, J. K., Craig, B. A., Thomas, J.T. "Joint modeling of zero-inflated data using copulas" JSM 2009 Meeting; Washington, DC, Health Statistics Track.

Daggy, J., RCHE Operations Meeting, March 2008.

Daggy, J., RCHE Symposium, April 2008.

Davis, L. A., Jensen, J. D., King, A. J., & Guntzviller, L. M. "Self efficacy, health literacy, and health behavior: Predicting diet and physical activity in low-income, Spanish-speaking adults." Paper to be presented at the 96th annual meeting of the National Communication Association, San Francisco, CA. November 2010.

DeLaurentis, P. IIE Annual Conference, April 2008.

Elman A, Kong N, Bartlett E, Otto K. "Analysis of Sensory Transformations in Response to Complex Sensory Stimuli in the Auditory Pathway." 3rd Annual INFORMS Workshop on Data Mining and Health Informatics. Washington, DC. October 11, 2008.

Guntzviller, L. M., Jensen, J. D., King, A. J., & Davis, L. A. (2010, November). The foreign language anxiety in medical office scale (FLAMOS): Developing and validating a measurement tool for Spanish-speaking individuals. Paper to be presented at the 96th annual meeting of the National Communication Association, San Francisco, CA.

Hess, A., Plake, K., Yehle, K., Murawski, M., & Mason, H. (March 2010). "Health Literacy and Self-Care of Patients with Heart Failure". American Pharmacists Association, Washington, D.C.

Jensen, J. D. "Skill and access in low-income Indiana adults: Realities, opportunities, and challenges." Invited lecture for Regenstrief Center for Healthcare Engineering Brown Bag Lecture Series. September 2009.

Jensen, J. D. "Collaboration between researchers and community partners: Translating research into action." Invited lecture for Community Health Engagement Program (CHEP) Conference in Indianapolis, IN. March 2010.

Jensen, J. D. "Health communication and interactive technology: Increasing mammography utilization to 70%." Invited lecture for the Breast Cancer Prevention 2020 Lecture Series. November 2009.

Jensen, J. D., King, A. J., Guntzviller, L. M., & Davis, L. A. "Patient-provider communication and low-income adults: Age, race, literacy, and optimism predict communication satisfaction." Paper presented at the Health Literacy Annual Research Conference hosted by the Institute of Medicine Roundtable on Health Literacy, Washington, DC. October 2009.

Jensen, R. E., & Bute, J. J. (2009, November). Fertility and sexuality-related perceptions and behaviors among low-income women: Injunctive norms, sanctions, and the assumption of choice. Competitively selected paper to be presented in the Health Communication Division at the National Communication Association, Chicago, IL. November 2009.

Jensen, R. E., & Bute, J. J. "Narrative sense-making and time lapse: Interviews with low-income women about sex education." Presented in the Health Communication Division at the annual convention of the National Communication Association, San Francisco, CA. November 2010.

Kim, H., Schaffer, S. P., & Reyes, L. "Learning Design Strategies for Building an Online Patient Self-Care System." Society for Applied Learning Technology (SALT) Conference, Orlando, FL. 2009.

Kim, H., Schaffer, S.P., & Reyes Paulino, L. (2009). Self-Regulated Learning Supports in an eHealth System, Conference of the Association for Educational Communications Technology (AECT), Louisville, KY. 2009.

Kim, H., Schaffer, S.P., & Reyes, L. "Design of a web-based patient self-management system grounded in patient activation theory." American Educational Research Association Annual Meeting, Denver, CO. 2010.

King, A. J., Jensen, J. D., Davis, L. A., & Guntzviller, L. M. "Ethnic newspapers and low-income Spanish-speaking adults: Influence of news consumption and health motivation on cancer prevention behaviors." Paper to be

presented at the 96th annual meeting of the National Communication Association, San Francisco, CA. November 2010.

King, A. J., Jensen, J. D., Morgan, S. E., & Panell, A. "Health communication campaigns and interventions promoting colon cancer screening: A systematic review." Paper to be presented at the annual meeting of the American Society of Preventive Oncology, Bethesda, MD. March 2010.

Lawley, M. A. "Emerging Research in Healthcare Engineering," University of Michigan, November 12, 2008.

Lawley, M. A. "Healthcare Engineering" ChemE 421, Purdue Chemical Engineering, November 20, 2008.

Lawley, M. A. "Research in Clinical Scheduling," American College of Physicians, November 31, 2008.

Lawley, M. A. Production & Operations Management Society, May 2007.

Lawley, M. A. Regenstrief Institute, October 2007.

Lawley, M. A., IIE Annual Conference, April 2008.

Lawley, M. A., NC State Health Care Alliance Meeting, April 2008.

Lawley, M. A., RCHE Advisory Board Meeting, April 2008.

Lawley, M. A., RCHE Symposium, April 2008.

Lawley, M. A., University of Illinois Chicago, November 2007.

Lin, J. "Non-myopic Optimal Policy and Its Approximation for Sequential Clinical Scheduling with No-show," INFORMS Annual Meeting, October 2008.

Musselman, K. "Panel: Collaboration of Healthcare Systems Academic Programs Through a New Alliance," INFORMS Healthcare, Montreal, Canada, June 20, 2011.

Musselman, K. "Healthcare Systems Engineering," Keynote Speaker, 10th Anniversary of Ingenieria Industrial at Universidad Noacional de Colombia, Bogota, Columnbia, August 25, 2011.

Musselman, K. "IE Frontiers: Research Needs for Healthcare," IIE Annual IE Conference & Expo 2012. Orlando, FL, May 22, 2012.

Musselman, K. "A Hub Infrastructure to Reduce Infusion Pump Medication Errors in Hospitals." INFORMS, October 2012.

Musselman, K. "Discover the PossibilitIEs," Keynote Speaker, IIE Great Lakes Region Conference, Purdue University, West Lafayette, IN, February 20, 2010.

Musselman, K. "Global Engineering: Key Factors to Achieve Competitiveness." Tecnologico de Monterrey, San Luis Potosi, Mexico, April 1, 2009.

Musselman, K. "Health Care Engineering: Applying Engineering Principles and Techniques to Healthcare Challenges," Safety Across High-Consequence Industries Conference, St. Louis University, St. Louis, MO, September 12, 2008.

- Musselman, K. "IE Frontiers in Healthcare," IIE Annual Conference, Cancun, Mexico, June, 2010.
- Musselman, K. "Industrial Engineering in Healthcare Services," Tecnologico de Monterrey, San Luis Potosi, Mexico, April 1, 2009.
- Musselman, K. "Industrial Engineering," Tecnologico de Monterrey High School, San Luis Potosi, Mexico, April 2, 2009.
- Musselman, K. "International IIE: Strategies and Tendencies," Convencion Nacional del Institute of Industrial Engineers, Region Mexico, San Luis Potosi, Mexico, March 31, 2009.
- Musselman, K. "Multidisciplinary Research in Healthcare Delivery," Tecnologico de Monterrey, San Luis Potosi, Mexico, April 2, 2009.
- Musselman, K. "Research to Reality: Empowering Mission-Driven Action," Keynote Speaker, Society for Health Systems Conference and Expo 2011, Orlando, FL, February 19, 2011.
- Musselman, K. "Reshaping Healthcare Delivery through Industrial Engineering," Keynote Address at the Convencion Nacional del Institute of Industrial Engineers, Region Mexico, San Luis Potosi, Mexico, April 3, 2009.
- Musselman, K. "Sustaining the Medical Home: A Game Theoretic Approach," IIE Annual Conference, Cancun, Mexico, June, 2010.
- Musselman, K. "Systems Engineering at RCHE," Invited Speaker, Council of Engineering Systems Universities (CESUN), University of Illinois, Urbana-Champaign, IL, April 22, 2010.
- Musselman, K. "Transforming Healthcare Delivery," Invited Speaker, Logistics and Distribution Institute, University of Louisville, Louisville, KY, September 10, 2010.
- Musselman, Ken, Cody Mullen, and Zhiyi Tian. "Care Coordination and Hospital Readmissions." Annual IE Conference and Expo, 2012. Orlando, FL. May 2012.
- Muthuraman, K., University of Michigan, March 2008.
- Pope, Brandon. Hospital efficiency. June 6-9, 2012.
- Sandino, R., RCHE Operations Meeting, March 3, 2008.
- Sands L. P. , Daggy J, Campbell W, Flynn M, Lemon A. "Obesity and need for long-term care services." Journal of the American Geriatrics Society, 56(4), 2008. Presented at the 2008 meeting of the American Geriatrics Society, Washington DC.
- Sands L. P. , Xu H, Paul S, Weiner M, Doebelling C, Hancock E, Thomas J. "Amount of Attendant Care is Associated with Risk of Hospitalization among Medicaid Waiver Recipients with Dementia." Presented at the 61th annual meeting of the Gerontological Society of America, National Harbor, MD.
- Sands L. P. "Adult Day Health Care: Benefits for Participants. Presented to: Best Practices In The Continuum of Care: Innovative Models of Care for Older Adults." Little Rock, AR, April 21, 2010.

- Sands L. P. "Psychometric Evaluation of a Patient Preferences Index." Presented during the preconference workshop: "Understanding Patient Preferences for Prevention and treatment" to the 31st Annual Society of Behavioral Medicine, Seattle. *Annals of Behavioral Medicine* V39, S2. 2010.
- Sands, L. P., Xu, H., Paul, S., Weiner, M., Doebbeling, C., Hancock, E., Thomas, J. "Amount of Attendant Care is Associated with Risk of Hospitalization among Medicaid Waiver Recipients with Dementia." *Gerontological Society of America's 61st Annual Scientific Meeting*. November 2008.
- Schaffer, S. P. "Evaluation of knowledge development in a healthcare setting." *Second International ICST Conference on Electronic Healthcare for the 21st Century*. Istanbul, Turkey. 2009.
- Schaffer, S. P. "Knowledge and Performance Microsystems (teams): A case study." 2010.
- Schaffer, S. P. "Knowledge and performance micro-systems (teams): A case study." April 2010 International Society for Performance Improvement Conference. San Francisco, CA. 2010.
- Schaffer, S. P., & Reyes Paulino, L., & Kim, H. "SHOWCASE: LIT E-Learning Portal: Innovative Learning and Communication Technologies in Support of Patient Self-Care," *Conference of the Association for Educational Communications Technology (AECT)*, Louisville, KY. 2009.
- Schaffer, S. P., Kim, H., Reyes, L., & Collins, B. "Team performance meets Web 2.0: Supporting Collaborative E-learning Development." *International Society for Performance Improvement Conference*, San Francisco, CA. 2010.
- Schaffer, S. P., Reyes, L. & Kim, H., & Collins, B. "High Performing Patients." *International Society for Performance Improvement Conference*, San Francisco, CA. 2010.
- Schaffer, S. P., Reyes, L., & Kim, H. "Design and Validation of a Performance Support System in a Healthcare Setting." April 2010 International Society for Performance Improvement Conference. San Francisco, CA. 2010.
- Schaffer, S. P., Reyes, L., & Kim, H. "Using Activity Theory to Understand Learning Design Requirements of Patient Self-Management Environments." *American Educational Research Association Annual Meeting*, Denver, CO. 2010.
- Schaffer, S. P., Reyes, L., & Kim, H. "Web-based Support for Patient Self-Management." *American Educational Research Association Annual Meeting*, Denver, CO. 2010.
- Schaffer, S. P., Reyes, L., Kim, H., & Collins, B. "Design and Validation of a Performance Support System in a Healthcare Setting." *International Society for Performance Improvement Conference*, San Francisco, CA. 2010.
- Shields, C. "Interdisciplinary Research between Purdue & IU School of Nursing Psycho-Oncology Intervention: Breast Cancer Survivor Activation Study." *American Academy on Communication in Healthcare Conference*. 10/17 – 10/19/08.
- Shields, C. "Using Standard Patients to Measure Discrimination in Health Care Delivery." *National Cancer Institute Technical Workshop – Methodological and Conceptual Issues in Conducting Research on Racial/Ethnic Discrimination in Health Care Delivery*. 9/29/08.

- Susan DeCrane. Area Agency on Aging, Lafayette, Indiana (invited podium) “Mental Health Issues Among Older Adults” October, 2010.
- Susan DeCrane. Gerontological Society of America (GSA) 2009. “Twelve-Month Mortality Following Delirium Events in Long Term Care Older Adults” (Conference Poster), Atlanta, Georgia November 2009
- Susan DeCrane. Gerontological Society of America (GSA) 2011. “Strategies for Statistical Analysis of Missing Data” (Podium Presentation, Methods Section), Boston, Massachusetts, November 2011
- Susan DeCrane. Helen Johnson Leadership Conference, West Lafayette, Indiana (poster). “Twelve-Month Mortality Following Delirium Events in Long Term Care Older Adults” April, 2010.
- Susan DeCrane. Midwest Nursing Research Society (MNRS) 2010. “Hospitalization Events Among Delirium Cases in Long-Term Care Older Adults” (Conference Poster), Kansas City, Missouri, March 2010
- Susan DeCrane. Midwest Nursing Research Society (MNRS) 2011. “Fall Outcomes Following Delirium Events in Long-Term Care Older Adults” (Conference Poster), Columbus, Ohio, March 2011
- Susan DeCrane. Midwest Nursing Research Society (MNRS) 2012. “Pain Management Interventions and Delirium in Postoperative Older Adults” (Competitive Symposia) Dearborn, Michigan, April 2012
- Susan DeCrane. Post-operative Acute Confusion in Adult Hip and Knee Replacement Patients. St. Vincent Health Research Symposium. June 13 2012.
- Susan DeCrane. Purdue University Health and Human Sciences Research Day (poster) “Twelve-Month Mortality Following Delirium Events in Long Term Care Older Adults” November, 2011.
- Susan DeCrane. Sigma Theta Tau International 2012 (accepted for presentation): “Electronic Medical Record Documentation of Delirium and Injuries in Postoperative Arthroplasty Patients”. (Poster Presentation) Brisbane, Australia, July 2012
- Susan DeCrane. St. Vincent Health Research Symposium 2012 (accepted for poster): “Confusion, Injuries, and Length-of-Stay in Postoperative Arthroplasty Patients” June, 2012
- Teng Y, Kong N. “Applying Agent-based Modeling and Simulation (ABMS) to the U.S. Organ Transplantation and Allocation Network.” 3rd Annual INFORMS Workshop on Data Mining and Health Informatics. Washington, DC, October 11, 2008.
- Turkcan, A. “Clinical Scheduling of Patients with Heterogeneous No-show Probabilities,” INFORMS Annual Meeting, October 2008.
- Turkcan, A. “Patient Assignment and Scheduling in a Physicians’ Network,” IIE Annual Conference, May 18, 2008.
- Turkcan, A. INFORMS Annual Meeting, November 2007.
- Turkcan, A., RCHE Brown Bag Series, March 2008.
- Witz, Steven. “Healthcare Costs and the Mounting Federal Deficit.” The Concord Coalition. West Lafayette, IN, April 2012.

Witz, Steven. "Healthcare Reform's Impact on the Delivery Care System: Opportunities and Challenges." Aspen Institute Regional Summit. Indianapolis, IN, October 2011.

Yehle, K., & Chang, K. "Baccalaureate Students' Knowledge of Heart Failure Education Concepts". American Association of Heart Failure Nurses 5th Annual Meeting, Minneapolis, MN. June 2009.

Zeng, B. "Clinic overbooking: a game theoretical analysis," INFORMS Annual Meeting, October 2008.

Zeng, B. "Clinic overbooking: a game theoretical analysis" IIE Annual Conference, May 18, 2008.

Zeng, B. "Stochastic Overbooking Models for Patients with Heterogeneous No-show Probabilities" Mayo Clinic Conference on Healthcare, Systems Engineering and Operations Research, September 2008.

Zeng, B. IIE Annual Conference, April 2008.

Zhang, L. "Analysis of a community physician data to evaluate adherence of medical guideline by using functional data analysis methods," Presented at the 2010 Spring meeting of International Biometric Society/Eastern North American Region, New Orleans, LA, March 23, 2010.

Zhang, L. "Analysis of Adherence to Medical Guidelines by Using Functional Data Analysis Methods." Presented at the Statistics Day, Indiana University Purdue University Initiative, Indianapolis, IN, April 16, 2010.

