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,

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 Jiao 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.
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 PRIORIES 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)

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*
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.
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.

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
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 RCHE 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 RCHE. Funding applications for the follow-up study are being submitted.
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
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.
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.

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.

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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.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Funding</td>
<td>$1,000,000</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$2,000,000</td>
<td>$11,000,000</td>
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<tr>
<td>Non-Core Funding</td>
<td>$10,270,110</td>
<td>$3,351,517</td>
<td>$18,032,161</td>
<td>$7,155,617</td>
<td>$1,512,354</td>
<td>$1,520,996</td>
<td>$41,842,755</td>
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</table>
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.
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
# METRIC ACHIEVEMENT, 2008–2013

## RESEARCH EFFECTIVENESS

<table>
<thead>
<tr>
<th>Metric</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCHE will add two new value-chain partners.</td>
<td><em>Metric achieved.</em> Partnership with the American College of Physicians established in 2008; Partnership with Mayo Clinic established in 2010.</td>
</tr>
<tr>
<td>RCHE will secure research funding from major national funding sources awarding competitive grant applications.</td>
<td><em>Metric achieved.</em> 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.</td>
</tr>
<tr>
<td>RCHE will publish research findings and reports in peer reviewed journals.</td>
<td><em>Metric achieved.</em> See Appendix D for list of publications.</td>
</tr>
<tr>
<td>Research partners will provide an evaluation of RCHE.</td>
<td><em>Metric achieved.</em> Partner evaluation statements provided in the Renewal Document, presented to the Foundation in June 2011.</td>
</tr>
<tr>
<td>Research findings will be evaluated to assess impact on improving healthcare delivery.</td>
<td><em>Metric achieved.</em> Examples of impact provided in the Renewal Document, presented to the Foundation in June 2011.</td>
</tr>
<tr>
<td>Establish a multi-university, healthcare engineering research alliance.</td>
<td><em>Metric achieved.</em> 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</td>
</tr>
</tbody>
</table>
### OPERATIONS

**Metric** | **Achievement**
---|---
Identify and perform a gap analysis against two other healthcare research centers. | Metric achieved. 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. | Metric achieved. 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. | Metric achieved. Spring and fall conferences held each year since 2008.

RCHE will host at least three nationally prominent speakers per year. | Metric achieved. See appendix B for list of speakers

### FINANCIAL MANAGEMENT

**Metric** | **Achievement**
---|---

RCHE will document financial management of Foundation funds and supply monthly financial reports. | Metric achieved. Ongoing. Monthly and annual reports provided to the foundation and program boards.

Attain a core leverage ratio* greater than 2.5. | Metric achieved.

---

*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

<table>
<thead>
<tr>
<th>FY (first half)</th>
<th>Project Title</th>
<th>PI</th>
<th>PI College</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Creation of a VR Healthcare Facility Design Hub</td>
<td>Arns</td>
<td>Technology RCHE</td>
<td></td>
</tr>
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<td>2008</td>
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<td>Drive for Life Campaign and Evaluation; impact of just-in-time information, public education, and DMV clerk training on donor registrations and family notifications</td>
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<td>Point of care audit and feedback tools to improve patient safety</td>
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<td>Racial Differences in Physician-Patient Communication for Cancer Pain Management</td>
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<td>Effects of Gain Vs. Loss Frame Sun Protection Messages on Rural Indiana</td>
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PUBLICATIONS, 2008–2013

RCHE affiliated faculty are indicated in bold.


Beever, J. and Nicolae Morar (eds). *Perspectives in Bioethics, Science, and Public Policy*. Purdue University Press. 2012. (Note: RCHE co-sponsored this lecture series)


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.


**APPENDIX D**


Turkcan, A., Zeng, B., Muthuraman, K., **Lawley, M.,** “Sequential Clinical Scheduling with Service Criteria” *European Journal of Operational Research*. 38


PRESENTATIONS, 2008–2013


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.


Chakraborty, S. IIE Annual Conference, April 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


Daggy, J., RCHE Symposium, April 2008.

APPENDIX E


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.


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


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


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

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


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. “Systems Engineering at RCHE,” Invited Speaker, Council of Engineering Systems Universities (CESUN), University of Illinois, Urbana-Champaign, IL, April 22, 2010.


Muthuraman, K., University of Michigan, March 2008.


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.


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.

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. 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. 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


Zeng, B. IIE Annual Conference, April 2008.

