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The Regenstrief Center for Healthcare Engineering

Introduction

As the Regenstrief Center for Healthcare Engineering (RCHE) continues to define the next steps in its evolution, the leadership of Purdue University remains strongly committed to the Center and its success. Under the new leadership of Tomás Díaz de la Rubia, Discovery Park’s Chief Scientist and Executive Director, Discovery Park has identified two major areas of focus, health and sustainability. RCHE with its current regional and national footprint serves as the foundation for the health initiative. In addition to its prominent role in Discovery Park, realizing RCHE’s potential and impact remains a high priority for the Executive Vice President for Research and Partnerships as well as the President of Purdue University.

With one exception, the short term goals RCHE set in June 2015 have been reached or are on track to meet their completion dates.
Regenstrief Distinguished Fellow – Robert Kaplan

Recognizing that effective and enthusiastic leadership is vital to the success of any organization, Purdue is prepared to devote significant resources to attract recognized scholars to lead RCHE initiatives. A national search for a new director was renewed in May of 2016. The search committee is led by Marietta Harrison, RCHE’s interim director and aided by Meyer Consulting, a professional search firm with expertise in recruiting senior level faculty in healthcare outside of medicine. A list of search committee members appears in APPENDIX A. We are highly optimistic regarding the success of this search with the addition of Robert Kaplan as a member of the RCHE leadership team. Kaplan joined RCHE as a Regenstrief Distinguished Fellow in May of 2016. His expertise and role at RCHE is described in detail below. Kaplan is highly networked in the national healthcare field. He currently lives in Washington, DC and will represent and promote RCHE at various Washington policy forums and at meetings of the National Academy of Medicine. He is working diligently on RCHE’s behalf to identify appropriate RCHE director candidates and will be personally involved in the recruiting process.

Kaplan is well qualified for this role. He has had a distinguished career in healthcare serving as the former Chief Scientific Officer of AHRQ (Agency for Healthcare Research and Quality) in the Department of Health and Human Services and as former Associate Director of the National Institutes of Health. A brief biography is contained in APPENDIX B. Kaplan presented the first 2016 RCHE Distinguished Lecture “Do We Need a New Paradigm for Biomedical Research?” on February 22. After spending time visiting RCHE and its faculty he became interested in associating with RCHE as it enters the next phase of its evolution. As mentioned, he accepted the position of Regenstrief Distinguished Fellow in May and visited RCHE soon afterwards. He met with various faculty, department heads and deans who are invested in RCHE’s success. Kaplan’s major responsibilities include: providing a critical assessment of RCHE’s capabilities and potential; identifying areas of unique strength and areas for growth and improvement; representing RCHE at Washington Policy Forums and at meetings of the National Academy of Medicine; identifying and connecting RCHE with various external funding opportunities as appropriate; identifying and recruiting candidates for the RCHE Director position; assisting RCHE in building a strong partnership with the Regenstrief Institute; engaging with the Regenstrief Foundation; and raising the national profile of RCHE through identifying opportunities for faculty membership on national boards and committees. Kaplan is a welcome addition to the RCHE Leadership Team and has been broadly embraced by RCHE’s major academic stakeholders.
Associate Director RCHE – Yuehwern Yih

RCHE created the position of Associate Director in May 2016 to focus faculty research efforts within defined research programs. Yuehwern Yih, PhD, Professor of Industrial Engineering will serve in this capacity. Yih has been an active member of the RCHE Faculty Leadership Team. Her research interests and expertise are in the area of healthcare delivery process improvement. Along with Kaplan she is a welcome addition to the Leadership Team. A short biography appears below.

Yih received her Ph.D. in Industrial Engineering from the University of Wisconsin-Madison in 1988. Her expertise resides in system and process design, monitor, and control to improve quality and efficiency. Her research work has been focused on dynamic control, workflow design and analysis, system modeling and simulation, decision making and optimization for operations in complex systems such as healthcare delivery systems, manufacturing systems, and supply chains.

Yih published over 150 scientific articles and book chapters, four edited books, and a patent on system engineering and management. Her contributions in this area have been recognized by a National Science Foundation Young Investigator Award (NYI), a Dell K. Allen Outstanding Young Manufacturing Engineer Award, GE Faculty Fellow, NEC Faculty Fellow, Institute for Industrial (and Systems) Engineers (IIE) Fellow, Purdue Engagement Faculty Fellow Award, and Executive Leadership in Academic Technology and Engineering (ELATE) Fellow.

Yih provides strong leadership in applying IE principals in the healthcare engineering area. She worked with healthcare organizations and industries to develop better and safer healthcare delivery systems. Her research, in addition to being published in scientific journals, resulted in changes in hospital’s operations and process design to improve patient access, patient safety, and patient care quality via Healthcare Technical Assistant Program. Yih was named the Regenstrief Center of Healthcare Engineering Faculty Scholar in 2005. Her graduate students won several Student Poster Competition prizes in the Regenstrief Center Annual Conferences. In 2009, her Ph.D. student also received the Best Track Paper Award in Health & Service Systems at the national IIE Conference. Applications of Dr. Yih’s research include quality assurance in clinical laboratories, preventive care for colorectal cancer, open access for outpatient clinics, care transition between hospitals and long-term care facilities, usability of EMR and information technology, telemedicine impact on older adults’ health, surgical scheduling, workflow redesign for check-in process, process improvement in ER and admission to ICU, discharge strategies, pharmacy operations and error prevention, bed assignment, etc.
Yih serves as the Associate Editor of *IIE Transactions on Healthcare Systems Engineering*, and serves on the Editorial Boards of *International Journal of Enterprise Network Management* and *European Journal of Industrial Engineering*. Her *Handbook of Healthcare Delivery Systems* is the first handbook covering the wide arrays of sectors in healthcare delivery systems to provide a holistic view of healthcare delivery as an integrated system. Yih is one of the contributing experts to “Order from Chaos – Accelerating Care Integration,” a report of the Lucian Leape Institute Roundtable in 2012.

In 2013, Yih received the highest honor at Purdue in engagement, the Faculty Engagement Fellow Award, based on her work at AMPATH that designs and implements a nutrition information system and a food distribution system for HIV patients in western Kenya. In addition to paper publications in top journals in medical and health informatics area, this integrated nutrition system was deployed in 2005 and provided food for over 38,000 HIV patients and their families each year. Her work was also featured in *Industrial Engineer Magazine* cover article in January 2014.

Selected publications can be found in APPENDIX C.
Overview of the National Healthcare Landscape and RCHE’s Potential Impact

The United States enjoys the world’s largest Gross Domestic Product (GDP). The biggest sector in this large economy is healthcare, which will consume nearly $3 trillion, or 18% of the GDP, in 2016. In contrast, most of the US major economic competitors devote less than 11% of their GDP to healthcare. And these economic rivals are achieving better results. A recent study from the Institute of Medicine suggests that health outcomes in the United States have been falling behind other wealthy countries for the last 30 years. RCHE’s emphasis on building multidisciplinary research teams to bring new approaches to improvements in healthcare delivery will clearly fall on fertile ground with a potential for major impact. For example, RCHE has deep expertise in developing advanced decision support tools to help provider groups identify and reduce healthcare services that have little or no effect on health outcomes, while increasing implementation of other evidence-based services that may have the potential to extend life expectancy and to improve the quality of life. Although the US spends enormous amounts of money paying for health services, insufficient attention has been devoted to assuring these services are received by people who need them. National estimates suggest that only about half of today’s patients receive the best evidence-based primary care services. Recent studies show that preventable medical errors are the third leading cause of premature death in the US, causing between 210,000 and 400,000 deaths each year. RCHE’s investment in infusion pump and medical device alert informatics clearly has the potential to reduce a major subset of these preventable events. Re-engineering hospital care should continue to be a major focus for RCHE as it has the potential to substantially reduce unnecessary deaths. There is considerable room for new engineering approaches to improve safety and streamline healthcare delivery. For example, one relatively small national effort to improve safety in hospitals, led by the Agency for Healthcare Research and Quality, may have saved 87,000 lives in the interval between 2010 and 2014. This effort resulted in a 17% decline in deaths associated with hospital-acquired conditions.

The landscape is rapidly changing and the time is right to bring new engineering and multi-collaborator approaches to healthcare delivery. Over the last few years most healthcare providers have moved from smaller private practices to being employees of large healthcare systems. The Affordable Care Act has ushered in a new era where characteristics of most medical encounters are captured in electronic health records, and advanced decision support tools are continually evolving. Most importantly, the amount of data on
healthcare encounters and outcomes of care has exploded and the healthcare system is overwhelmed with information. RCHE brings exceptional capacity to analyze enormous amounts of information, to develop new approaches to medical data, and to turn the masses of data into dependable knowledge.
Current National Impact

**REMEDE Central**

The expansion of the Infusion Pump Informatics (IPI) project to REMEDI Central continues to move forward rapidly. Under the capable direction of Mike Zentner and Rich Zink, the underlying technology platform as well as the recruitment and interactions with clinicians, hospitals and vendors have made significant progress. Since the original inception of the IPI project, which began with 10 Indiana hospitals in 2010, REMEDI Central has expanded to its current level of 166 hospitals in eighteen states. The hospitals not only input data into REMIDI Central, but most importantly generate reports that directly impact clinical practice. These hospitals along with strategic partners currently serve as RCHE’s clinical living laboratories.

**REMEDE Central National Footprint**

The next two phases of REMEDI Central are being rolled out simultaneously. REMEDI will expand to include alerts from physiological monitors and link the alarm data to electronic medical records (EMR). With the help and encouragement of the Association for the Advancement of Medical Instrumentation (AAMI), five physiological monitor vendors have participated in ongoing discussions with RCHE and key default values for
instruments from three of these vendors have been obtained. To accommodate the 1000+ hospitals RCHE will host in REMEDI Central, a new technical platform was required. The design phase of the new platform was completed and the technology is now operational. To date the system contains 23 million alert records, summarizes 77 million infusions and the 176 registered users (clinicians and researchers) have generated 40 thousand reports. A new functionality requested by the clinical users, the Drug Limit Library tool, was launched and demonstrated at the 2016 REMEDI Central conference in April and was met with great enthusiasm.

Progress on the difficult, but not impossible task of linking alert data to EMRs included the identification of the location and responsible parties for the databases that hold IU Health Arnett (RCHE’s pilot site) infusion pump alert data and the corresponding EMRs. Discussions with IU Health were quite productive and we currently are waiting approval to access the EMR data from IU Health legal staff. Parallel discussions with the Regenstrief Institute indicated an interest on the Institute’s part to capture medical device data and partner with RCHE to undertake outcome analyses enabled by linking device data to appropriate EMRs.

RCHE’s and its national organization partner’s vision is to utilize the wealth of data and the clinical and research networks that REMEDI Central continues to expand to establish much needed national drug limit standards and best practice guidelines. A summary of REMEDI Central progress and metrics is contained in APPENDIX D.

National Healthcare Summit
In September, RCHE will host a national healthcare summit to identify the most important issues facing the US healthcare system. A group of distinguished experts will be brought together to identify problems that are likely to benefit from RCHE’s unique capabilities. Summit participants will include experts in medicine, nursing, healthcare delivery, social sciences, health services research, and engineering. Approximately half of the participants will be from other institutions and about half will be faculty leaders from the Purdue campus. Representatives from federal and state agencies and from private foundations and corporations will be included. Over the course of the two-day meeting, the group will produce a prioritized list of problems that could be uniquely addressed by RCHE’s current and future faculty. Following the summit, a series of meetings of RCHE Leadership and other Purdue stakeholders will use the prioritized list to identify strategic research programs that will coalesce and further focus RCHE’s research going forward. Following the appointment of faculty leaders for each of these research programs, RCHE will issue requests for proposals from each program as a basis for resourcing the programs as they move to acquire external funding.
Current Regional Impact

Purdue Healthcare Advisors (PHA) continues to have a strong regional impact primarily through its collaborations on federally funded projects with two schools of medicine: the Regenstrief Institute - IU School of Medicine and the Northwestern University Feinberg School of Medicine. These projects represent key components of healthcare transformation in Indiana and surrounding states and include efforts to facilitate the transition to value-based care for over 3,000 PHA-recruited clinicians in the Centers for Medicaid and Medicare Services’ Transforming Clinical Practice Initiative. In collaboration with Northwestern, PHA engaged over 50 clinical practices in an AHRQ-funded program focused on improving care for patients with, or at risk for heart disease. These significant opportunities were built on successful projects including the Regional Extension Center program, which assisted over 3,000 clinicians and over 60 hospitals reach Meaningful Use of Electronic Health Records. This included providing expertise to over 400 practices in mitigating data security risk assessments, and participating in the Hospital Engagement Network program, which provided process and quality improvement expertise to over 100 of Indiana’s hospitals.

PHA continues to work with key state partners including: the Family and Social Service Administration to provide expertise to Medicaid providers in the area of health IT systems security; the Indiana State Office of Rural Health to build and improve processes and quality measures in Critical Access Hospitals; and the Indiana State Department of Health providing analysis for process improvement and rapid improvement events. PHA also continues to advance key healthcare provider offerings in quality and process improvement, practice transformation, and health IT security in a manner consistent with the PHA strategy of partnering with faculty to disseminate innovative practices and assisting small and under-resourced providers. A summary of PHA’s impact is contained in APPENDIX E.

Interactions with the Regenstrief Institute

The interim leadership of both the Regenstrief Institute and the Regenstrief Center for Healthcare Engineering has a strong desire to build a robust relationship between the two organizations. RCHE hosted a day long visit by Chris Callahan, interim President and CEO, Regenstrief Institute on March 24, 2016. Chris met with members of the RCHE Faculty Leadership Team as well as with the Executive Vice President for Research and Partnerships and key department heads and deans all of whom have a vested interest in RCHE’s success. This was followed by a meeting hosted at the Institute on May 3, 2016 for the purpose of introducing Bob Kaplan to the Institute
leadership. Unfortunately, Bob was temporarily taken ill on his visit and did not attend. However, both the Interim Director of RCHE, Marietta Harrison and the Strategic Collaboration Director of RCHE, Ken Musselman, attended. It was decided that for the initial event to bring the two organizations closer together, the Institute would host a small group of RCHE faculty in mid-August for a focused session with key Institute faculty. The goal is to identify initial “high affinity binding sites” where mutually beneficial collaborations could be established that would yield short term successes.

In addition to these deliberate efforts, PHA continues its highly successful collaborations with the Institute and with Dr. Malaz Boustani in particular. We expect these to continue to grow as the need to engage clinical practices throughout the region increases. Dr. Boustani is the Principal Investigator for the Great Lakes Practice Transformation Network, a $46 million CMS award to transform the practices of over 15,000 clinicians in Illinois, Indiana, Kentucky, and Michigan. PHA leads the Indiana activities under this award, including working with the State Medicaid Office and over 3,000 providers throughout the state.

Projects

APPENDIX F provides a high level summary of current projects.

Challenges and Opportunities

RCHE’s current challenge as well as its major opportunity is the recruitment of a permanent director to lead the next phase of RCHE’s growth. As noted above, we have appointed a search committee and retained a professional search firm to move this effort rapidly forward. The desire, optimism, and pent-up energy across campus for a dynamic and thriving RCHE remains palpable. Almost all members of the original search committee readily agreed to continue to serve. Meyers Consulting search firm will be on campus in June to meet with the committee and accelerate the identification of potential candidates, which has already begun. As mentioned, Bob Kaplan has discussed RCHE and its opportunities and potential with several of his contacts to generate interest in the position and he will be a valuable asset as we move through the process.

The second major challenge is identifying focused areas of research strength to serve as nuclei to coalesce the RCHE faculty given their diverse expertise and interests, which range from the development of sophisticated algorithms to advance the information that can be extracted from electrocardiograms to uncovering the root organizational causes of sub-
optimal performance of healthcare providers. Great opportunity lies in the availability of RCHE-dedicated tenure faculty hiring lines in the College of Engineering and the new emphasis on healthcare research in the Krannert School of Management. Both colleges are well represented on the RCHE Director Search Committee. As mentioned, the goal of the September RCHE hosted National Healthcare Summit is to prioritize research problems that could be uniquely addressed with the expertise and multi-disciplinary team capabilities of RCHE.

RCHE continues to aspire to increase its national impact through and beyond REMEDI Central. The establishment of the inaugural RCHE National Healthcare Conference, the creation of focused faculty-driven high impact research programs, the recruitment of a nationally recognized director, are the launching efforts to realize RCHE’s considerable potential to impact healthcare delivery.

References
Appendices
Appendix A

Search Committee Members
Regenstrief Center for Healthcare Engineering
Director Search Committee – May 2016

Marietta L. Harrison, PhD, Chair
Interim Director, Regenstrief Center for Healthcare Engineering
Professor, Medicinal Chemistry and Molecular Pharmacology
Purdue University

Christopher M. Callahan, MD
Interim President and CEO, Regenstrief Institute, Inc.
Cornelius and Yvonne Pettinga Professor
Director, IU Center for Aging Research
Scientist, Regenstrief Institute, Inc.

Melba Crawford, PhD
Associate Dean of Engineering for Research, College of Engineering
Purdue University

Abhijit Deshmukh, PhD
James J. Solberg Head and Professor, School of Industrial Engineering, College of Engineering
Purdue University

David Hummels, PhD
Dean, Krannert School of Management
Professor, School of Economics
Purdue University

Martin Jischke, PhD
President Emeritus
Purdue University

Robert Kaplan, PhD
Regenstrief Distinguished Fellow – Regenstrief Center for Healthcare Engineering
Professor Emeritus UCLA

David McKinnis, PhD
Special Adviser - Office of Corporate and Global Partnerships
Purdue University

Ken Musselman, PhD
Director, Strategic Collaboration - Regenstrief Center for Healthcare Engineering
Purdue University
Nan Kong, PhD
Associate Professor of Biomedical Engineering
Weldon School of Biomedical Engineering, College of Engineering
Purdue University

Joseph Pekny, PhD
Director, Deliberate Innovation – Burton D. Morgan Center for Entrepreneurship
Professor of Chemical Engineering
Purdue University

Cleveland Shields, PhD
Director, Center on Poverty and Health Inequities - Regenstrief Center for Healthcare Engineering
Professor of Human Development and Family Studies
College of Health and Human Sciences
Purdue University
Appendix B

Robert Kaplan
Brief Biography
Robert Kaplan Brief Biography

In May of 2016, Robert M. Kaplan, Ph.D. became Regenstrief Distinguished Fellow at the Purdue Campus. During the 2015-2016 academic year, he was a Visiting Scholar at Stanford University where he worked with the Clinical Excellence Research Center and the Center for the Advanced Study in the Behavioral Sciences. He was the Chief Science Officer in the US Department of Health and Human Services Agency for Health Care Research and Quality (AHRQ) from 2014-2016. Kaplan came to Washington in 2011 to serve in the National Institutes of Health (NIH) Office of the Director as the NIH Associate Director of for Behavioral and Social Sciences and Director of the Office of Behavioral and Social Sciences Research (OBSSR). Prior to working for government, Kaplan spent 37 years as a professor and administrator in AAU universities. He was Distinguished Professor of Health Services at UCLA and Distinguished Professor of Medicine at the UCLA David Geffen School of Medicine, where he was PI of the California Comparative Effectiveness and Outcomes Improvement Center. He led the UCLA/RAND AHRQ health services training program and the UCLA/RAND CDC Prevention Research Center. He was Chair of the Department of Health Services from 2004 to 2009. From 1997 to 2004 he was Professor and Chair of the Department of Family and Preventive Medicine, at the University of California, San Diego. He is a past President of several organizations, including the American Psychological Association Division of Health Psychology, Section J of the American Association for the Advancement of Science (Pacific), the International Society for Quality of Life Research, the Society for Behavioral Medicine, and the Academy of Behavioral Medicine Research. He is a Past Chair of the Behavioral Science Council of the American Thoracic Society. Kaplan is a former Editor-in-Chief of two different academic journals: Health Psychology and the Annals of Behavioral Medicine. He is the author, co-author or editor of more than 20 books and over 500 articles or chapters. His work has been cited in nearly 30,000 papers and the ISI includes him in the listing of the most cited authors in his field (defined as above the 99.5th percentile). In 2005 he was elected to the Institute of Medicine of the National Academies of Sciences (recently renamed as the National Academy of Medicine).

Other selected honors include APA Division of Health Psychology Annual Award for Outstanding Scientific Contribution (for junior scholar in 1987 and again for a senior scholar in 2001), Health Net Distinguished Lecturer (1991), University of California 125 Anniversary Award for Most Distinguished Alumnus, University of California, Riverside (1992), APA Distinguished Lecturer, Distinguished Scientific Contribution Award from the American Association of Medical Schools (1996), National Leadership Award from the SBM (2003), President’s Award for Career Achievement from the ISOQOL (2004), and Distinguished Research Mentor Award from the SBM (2006), American Sociological Association Policy Scientist of the Year (2012), and Presidential Citation from the American Psychological Association.
National health care leader joins Purdue's Regenstrief Center for Healthcare Engineering

May 16, 2016

Robert M. Kaplan, former chief science officer at the U.S. Agency for Healthcare Research and Quality and associate director of the National Institutes of Health has joined Purdue's Regenstrief Center for Healthcare Engineering as the Regenstrief Distinguished Fellow. Kaplan assumed the role on May 2.

"I am excited about working with RCHE to move health care in some creative new directions. RCHE and Purdue University are uniquely positioned to help improve health outcomes by applying established principles of systems engineering and management science," Kaplan says.

As the Regenstrief Distinguished Fellow, Kaplan will promote the activities of the Regenstrief Center for Healthcare Engineering, assess Purdue strengths in health care engineering, and assist with enhanced opportunities for growth.

Before Kaplan's service with the AHRQ and as associate director of NIH, where he led the behavioral and social sciences programs, he was a distinguished professor of health services and medicine at the University of California, Los Angeles, where he led the UCLA/RAND AHRQ health services training program and the UCLA/RAND CDC Prevention Research Center. He was chair of the Department of Health Services from 2004 to 2009. From 1997 to 2004, Kaplan was professor and chair of the Department of Family and Preventive Medicine at the University of California, San Diego.

Kaplan is a past president of several organizations, including the American Psychological Association Division of Health Psychology, Section J of the American Association for the Advancement of Science (Pacific), the International Society for Quality of Life Research, the Society for Behavioral Medicine, and the Academy of Behavioral Medicine Research. Kaplan is a former editor-in-chief of Health Psychology and of the Annals of Behavioral Medicine. His 18 books and over 500 articles or chapters have been cited more than 28,000 times. Kaplan is a member of the National Academy of Medicine (formerly the Institute of Medicine).

RCHE also announced that Yuehwem Yih, professor of industrial engineering and the director of the Smart Systems and Operations Laboratory, has been appointed as an associate director for RCHE. Yih brings expertise in systems process improvement through design and control.

RCHE is designated Patient Safety Organization and is housed in Discovery Park, Purdue's complex for major interdisciplinary research activities,
Appendix C

Yuehwern Yih
Selected Publications
Yuehwern Yih Selected Publications

Appendix D

Summary of REMEDI Central Progress and Metrics
2016 ACTIVITIES

Infusion Pump Informatics re-branded

As the evidence-based community of practice now focuses on more medical devices than just infusion pumps, a decision was made to expand the Infusion Pump Informatics (IPI) system to Regenstrief National Center for Medical Device Informatics (REMECI) Central (see logo left) to include additional medical devices and electronic health records (EHR). Purdue purchased the rights to www.REMEDIcentral.org and www.REMEDICentral.com.

Platform upgraded

The original IPI platform did not have the ability to scale up to the level of data and performance demanded by REMEDI's expansion to multiple medical devices and EHR. Therefore, a new, online platform was designed to handle the increased number of users and quantity of data. The development team built an administration utility that, while not user-facing, is critical to the migration to the new platform as it provides administrators of REMEDI Central the ability to manage users, hospitals, facilities, applications and permissions. REMEDI's Drug Limit Library tool was the first new application launched on this platform (see story left).

REMECI Central membership expanded

Membership in the collaborative increased this past year with the signing of 12 new hospital/hospital system contracts representing 37 facilities. Now REMEDI Central:

- is used by hospitals in 18 states;
- lists 176 registered users (clinicians, researchers, and administrators);
- contains 23 million alert records;
- summarizes 77 million infusions; and
- has generated 37.9 thousand reports.

2016 Infusion Pump Conference

At the annual RCHE-hosted 2016 Infusion Pump Conference at the Big Ten Conference Center in Rosemont, IL, topics included the continuous monitoring of patients on opioids, which is timely because more than 50% of medication-related deaths are due to opioids and more than 600,000 patients will experience opioid-related respiratory depression, and of those, only 20% will survive. Medical devices discussed were physiological monitors for measuring respiration rate, and capnographs for measuring the amount of carbon dioxide in respiratory gases. The agenda reinforced strategic relationships with the Advancement of Medical Instrumentation (AAMI); the American Society of Health-System Pharmacists (ASHP); the Institute for Safe Medication Practices (ISMP); and the ECRI Institute among others. Infusion pump vendors present included Becton Dickinson, Baxter, and Pfizer.

ANTICIPATED NEW APPLICATIONS AND TOOLS

The REMEDI Central development team plans to offer these new applications:

- Infusion pump compliance
- Automated dispensing cabinets
- Physiological monitors

Other activities being addressed or developed are:

- Drug-drug and drug-allergy applications
- Incorporation of EHR
- Integration of an alarm threshold setting tool
- Management of healthcare image data
- Display of various Patient Safety Organization reports (e.g., incident, near miss, unsafe condition)
Regenstrief National Center for Medical Device Informatics (REME) 

2009 Medication errors related to infusion therapy top the list for adverse events occurring in hospitals. To promote and improve patient safety, Regenstrief Center for Healthcare Engineering at Purdue University founded Infusion Pump Informatics as an evidence-based community of practice.

2009 Begins tracking alarms generated when medical personnel program “smart pumps” (i.e., infusion pumps programmed with Drug Error Reduction Software) outside allowable limits.

2013 Begins tracking the activation of “smart pump” technology on infusion pumps. Do clinicians turn it on?

2015 Expands scope to form informatics-based communities of practice around additional medical devices.

2016 Forms REMEDI Central, an online site for medical device data, benchmarking, analysis and research results.

2016 Creates a Drug Limit Library, which acts as a repository for concentrations and soft/hard maximums/minimums for infused drugs; and introduces a standard profile and drug mapping for easier comparisons.

Compliance: 77,047,711 infusions, 81.5% avg.

Alarms: 22,856,059 during programming.

Libraries: 15 hospitals, 89 comparisons, 32,000 entries, 1,772 distinct drug names.

2009 1 state → 2016 18 states.
Appendix E

Summary of PHA’s Impact
PURDUE HEALTHCARE ADVISORS
June 2016 Update

MISSION
To work with healthcare organizations to build their capacity for change.

VISION
We envision a healthcare system that supports people living the healthiest lives possible by emphasizing wellness and providing affordable quality care for all in need.

KEY STRATEGIES
Applied Research
Strong PHA-Purdue faculty relationships to assist with dissemination of innovative practices.

Small is Big
A focus on assisting small and under-resourced providers underserved by other advisory firms.

You all are doing amazing work with these hospitals, and it’s being extremely well-received. – INSORH

FAST STARTS TO 2016

Team Firsts
- Launched new mission/vision and strategic priorities to align PHA strategy to RCHE.
- Began second medical school partnership with the IU School of Medicine. Previous award partnered PHA with Northwestern University Feinberg School of Medicine.
- Achieved Indiana recruitment goal of 3,000 providers ahead of other key partners and three months ahead of proposed schedule, for three-state Great Lakes Practice Transformation Network (GLPTN) collaborative (CMS-funded and IU-led).
- As of June 2016, achieved 80% of Indiana participant enrollment for AHRQ-funded and Northwestern-led Healthy Hearts in the Heartland (H3) research program, leading H3 Illinois- and Wisconsin-based partners in recruitment.
- Rapidly over-subscribed clients in first year of a three year Indiana State Office of Rural Health (INSORH) grant to provide lean transformation for Critical Access Hospitals.

Project Updates
- Launched Lean First, a revised Lean curriculum that includes a novel approach to behavior change and balanced work via Rapid Improvement Events (RIEs).
- Launched interventions for H3 in 12 Indiana small practices.
- Continued work with FSSA to assist small/rural providers with ongoing Meaningful Use process and security assistance (125 provider clients in 2015).
- Continued work with security-expert researchers regarding firewall rule analyzer software.
- Added new security service offerings, including phishing and remote, ongoing vulnerability assessments.
- Began providing change-management coaching and lean services for the IU School of Medicine accreditation process.

New Talent
- Bringing to PHA significant clinical and operational experience, Melanie Cline (picture shown) joined PHA’s Process Improvement service line and RCHE’s REMEDI project.
- Bringing to PHA significant office-practice and quality-improvement experience, Kelley Gillespie and Derek Kendrick were hired on as GLPTN Quality Improvement Advisors.

SUCCESSFUL ENDING
Completed objectives of the Purdue Regional Extension Center (PurdueREC), a CMS/ONC Initiative that funded more than $14M to Purdue to help 2,200 Indiana providers and 30 Critical Access Hospitals achieve EHR Meaningful Use standards (exceeded objectives by assisting more than 3,000 providers and 60 hospitals).

ON THE HORIZON
- Contracted process improvement work for the Indiana State Department of Health (ISDH), which includes Lean First, RIEs, and process improvement strategy, will begin in Q3.
- In tandem with a final rule expected to be announced in Q3/4, PHA will provide expert assistance on the Merit-Based Incentive Payment System (MIPS).
- Late in Q3, the Process Improvement service line will launch an online, competency-based training course called Lean Daily Improvement, which will be the first of its kind nationally.
- Continue to work with various RCHE faculty members to determine mutual interests around applied research and key industry issues.
- Advanced Lean Practitioner training to launch in Q4.
Appendix F

Project Summaries
# Project Matrix

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<th>Medical Device Informatics</th>
<th>Research-to-Impact Phase</th>
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<td>Valuing the Impact of Adopting the REMEDI Central Database System – REMEDI Central</td>
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<td>Drug Limit Library Database and Research – REMEDI Central</td>
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<td>Drug Limit Library Update Process – REMEDI Central</td>
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<td>Development of Physiological Monitor Databases – REMEDI Central</td>
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<td>The Impact of Burnout Contagion on Staff job Performance in Hospital Departments</td>
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<td>Workaround Culture in Hospital Organizations</td>
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<td>Deskilling of Infusions in US Healthcare Facilities – REMEDI Central</td>
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<td>Lean Transformation and Organizational Change</td>
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<td>Medical Delivery Systems Analysis</td>
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<td>See-What-I-Do: Remote Surgery Consultation</td>
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<td>Rating Healthcare (completed)</td>
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<td>Accountable Care Delivery (Pilot: OurHealth)</td>
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<td>Interventions to Improve Type 2 Diabetes (T2DM) Adherence &amp; Outcome in Rural Indiana: A Randomized Controlled Trial</td>
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<td>Health Management – Purdue Claims Data</td>
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<td>State-Level Collaboration to Impact Polypharmacy in Indiana Nursing Homes</td>
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