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# Program Committee Report December 2017

Regenstrief Center for Healthcare Engineering

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# **Regenstrief Center** for **Healthcare Engineering**

## **Program Committee Summary Report**

**December 2017**



## Summary Report

The Regenstrief Center for Healthcare Engineering (Regenstrief Center) strives to conduct nationally recognized research that ultimately leads to improved quality, accessibility, equity and affordability of healthcare delivery. Our research focuses on the generation, diffusion and adoption of evidence to better inform healthcare policy and practice. The past year has been a time of significant change. In this annual summary report, we describe the changes, activities and resulting impact that Regenstrief Center accomplished in research, outreach and education, and the current progress that we have made in implementing our one-year action plan. Further details for each of the sections may be found in the December 2017 Program Committee Supplement Report.

### *Management Changes*

Over the last year, the Regenstrief Center experienced two changes in management: 1) Paul Griffin, who also holds faculty positions in the Purdue Schools of Industrial Engineering and Biomedical Engineering became **Director of the Regenstrief Center** in January 2017; and 2) **Strategic Collaboration Director** Ken Musselman, who has been with Regenstrief Center since 2006, retired from Purdue in October.

We went through a strategic planning process in the spring of 2017, and developed a six-year roadmap including a one-year action plan. The report “**A Strategic 6-Year Roadmap for the Regenstrief Center for Healthcare Engineering (2017-2023)**” was presented to the Regenstrief Foundation in June 2017. A table showing the specific activities and metrics of our one-year action plan (2017-2018) is provided in Appendix A. Of the 29 metrics developed, we are on track to achieve 27 by the second quarter of 2018. The two metrics in which we will be deficient are 1) the development of a Regenstrief Center Scholar’s program, and 2) the involvement of student interns from MS program with Purdue Healthcare Advisors. We were overly optimistic in our estimate of the time it would take to set up the funding mechanism for the scholar’s program, and we now estimate it will be at least December 2018 before this will be in place. For the MS interns, this will not be possible until we recruit for the new MS program described later in this report, but we estimate that this metric will be achieved by June 2019.

As per the plan, an **External Advisory Board (EAB)** was established and held its first meeting on the Purdue campus in October. The EAB is made up of well-established leaders from healthcare providers and community organizations. In addition to providing feedback on strategy, the EAB will also help to establish connections for funding opportunities. The composition of the EAB is:

- D. Craig Brater, MD, President of Programs, Regenstrief Foundation, and Vice President of Programs, Walther Cancer Foundation
- Joanne Burns, RN, Chief Strategy Officer, Cerner
- Robert Dittus, MD, MPH, Albert and Bernard Werthan Professor of Medicine, Executive VP for Public Health and Health Care, Senior Associate Dean for Population Health Sciences, Director of the Institute for Medicine and Public Health, Vanderbilt University Medical Center

- Al Gatmaitan, DSc, FACHE, Executive Vice President and Chief Operating Officer, IU Heath
- Sherron Rogers, MS, Vice President, System Evolution, Eskenazi Health
- Tim Vanderveen, PharmD, MS, Consultant, BD (Becton, Dickinson and Co)
- Jennifer Walthall, MD, MPH, Secretary, Indiana Family and Social Services Administration

The **Regenstrief Center Strategic Leadership Team**, established in October, includes a Faculty Leadership Team and key personnel from Purdue Healthcare Advisors and the Regenstrief Center staff. The first meeting of the team was held on December 11 (after the completion of the wiring of this report). The purpose of the team is twofold: review the progress of Regenstrief Center based on metrics from the one-year action plan and input from the EAB and 2) identify gaps and opportunities and update the action plan and strategic roadmap accordingly.

As specified in the strategic action plan, we established a process for the designation of “**Regenstrief Center faculty and clinical affiliate**” for those faculty and clinicians who are meaningfully engaged with us. We have recruited 24 affiliates to date. This includes faculty from the Colleges of Business, Engineering, Health and Human Sciences, Nursing, Pharmacy, and Science.

### ***Sponsored Events***

In our efforts to increase Purdue faculty and student engagement with the Regenstrief Center, we held several events in 2017:

- Sponsorship of four seminars at Purdue including the **Discovery Park Distinguished Lecture Speaker**, given by Jim McClelland, Indiana Executive Director for Drug Prevention, Treatment, and Enforcement for the State of Indiana.
- Sponsorship of the **Women’s Health Symposium** held at Purdue on Oct 4 and 5, where CDC Foundation President Judith Monroe was the keynote speaker.
- An inaugural **Graduate Student Seminar Series** for students doing work in healthcare delivery.
- A **Faculty Networking Event** series in the fall. Two events were held, which started with a set of faculty discussing a healthcare topic (e.g., Improving Population Health), followed by a social time to network. We use this as a way to introduce and engage faculty with the Regenstrief Center. Hereon, we will hold five networking events each year going forward.

## *Purdue Healthcare Advisors*

Purdue Healthcare Advisors (PHA) is Regenstrief Center's not-for-profit outreach initiative for the healthcare industry. A staff of more than 30 specialists consults, coaches, and trains healthcare professionals in various capacities in both hospitals/health systems and physician practices. PHA's three service lines are: 1) health information technology security, 2) process improvement, and 3) quality services, including Medicare payment reform.

**PURDUE**  
HEALTHCARE ADVISORS  
**1<sup>st</sup> to accept  
CMS Challenge**



In 2017, PHA **served 376 healthcare organizations** across 80 Indiana counties, trained 874 workshop attendees, assisted over 5,000 physicians, completed security risk assessments at over 100 unique organizations, and trained 237 participants through their lean collaboration portal. PHA also received

funding from 52 sources, including the Centers for Medicare & Medicaid Services (CMS), Indiana's Family and Social Services Administration (FSSA), and the Indiana State Department of Health (ISDH). In early 2017, PHA received a five-year CMS award (subcontract) to assist small and underserved providers with the new Medicare Quality Payment Program, which is the CMS value-based program for ambulatory providers.

Two examples of the impact that PHA has achieved this year include:

1. Guiding almost every clinician in Indiana through QPP reporting
  - With PHA's pledge to CMS to guide 90% of Indiana clinicians through QPP reporting, -, Indiana became the first state in the nation willing to commit to guide that level of Indiana's program-eligible clinicians to successful participation in QPP for 2017. The federal program, which alters the way clinicians are reimbursed for their Medicare Part B encounters, involves a negative payment adjustment for clinicians who are eligible to report to the QPP's Merit-based Incentive Payment Program (MIPS), but who fail to participate.
2. Building continuous improvement capacity in Indiana Critical Access Hospitals
  - PHA's introduction of value stream analysis into its lean training for 14 rural and critical access hospitals is producing good outcomes in year two in revenue cycle as well as inpatient and outpatient services. This includes a 50% reduction in denials due to pre-authorization, reduced length of stay in urgent care by 14%, improved patient understanding of medications from 83% to 100%, and a decrease in readmissions from 8% to 1.65%.

PHA is also expanding its reach by launching a **microlearning approach** to soft-skill development and behavior change and a new **online learning platform**. PHA's approach to microlearning uses an evidence-based, competency model to improve individuals' people-centric performance, allowing them to build new habits as they build new soft skills. Soft-skill development is critical in helping PHA's clients make lasting personal and organizational

change, particularly in the area of building continuous improvement capacity. The online platform will support lean and process improvement training, remote coaching, and a virtual community of practice. It will allow PHA to significantly extend and scale Lean First and other PHA online offerings to healthcare providers both nationally and globally.

The Regenstrief Center is beginning to develop a **blended model of research** between academic faculty and PHA staff, which includes the important areas of implementation science and dissemination components. An example is work that has been initiated with St. Vincent Health to help the organization achieve its vision of a care coordination command center (C4). C4 is the “digital brain and nervous system” for the organization designed to improve care by coordinating resources, demand, and access to essential services across all patient groups. A complex and bold undertaking, it will bring the organization’s demand-capacity management and patient flow capabilities to the highest levels, and is, therefore, a natural starting point for a collaboration that involves Regenstrief Center, its PHA staff, an faculty from Industrial Engineering and Biomedical Engineering.

## ***REMEDI***

The Regenstrief National Center for Medical Device Informatics (REMEDI) is an evidence-based community of practice that uses a collaborative HUB to collect data that has been captured and stored on medical devices such as smart infusion pumps. REMEDI enables vendor-neutral analytics and reporting to improve patient safety. As of April 2016, 149 hospitals across the nation deposited data from smart pumps delivering IV drugs into REMEDI. Comparative reports summarizing a hospital’s performance relative to that of other participating hospitals can be generated by REMEDI users. By October of 2017, the number of participating hospitals had **grown to 292 hospitals** in 23 states.

This year, new functionality was added to the REMEDI platform. Specifically, hospitals are now able to upload data and generate benchmarks for: 1)

**physiological monitor defaults**, which provides benchmarking tools to see where other hospitals initially set their alarm thresholds for heart rate, peripheral capillary oxygen saturation, systolic and diastolic blood pressures, end-tidal carbon dioxide, and other alarm conditions, and 2) **ventilator settings**, which allows respiratory technicians and other clinicians the ability to examine the variation in the default settings hospitals use for key ventilator alarms including positive end-expiratory pressure, peak inspiratory pressure, tidal volume, minute volume, respiratory rate, apnea, and disconnect priority.

The data from REMEDI was used by several Regenstrief Center researchers. Examples include:



- Updating drug libraries in smart infusion pumps
  - Regenstrief Center researchers used data from the infusion alert database contributed by 49 hospital members in 12 hospital systems of the REMEDI community of practice in 2015 and 2016. They found significant delays in smart infusion pump drug library updates were widespread across the group of hospitals; in 22 of the 49 hospitals the delay was over a year. A prolonged drug library update period can translate into potential patient harm due to an incorrect drug limit setting on the pump and, thus, had led to several efforts to reduce these delays.
- A machine learning approach to detecting infusion programming errors in smart infusion pumps during standardizing IV medication concentration
  - It was found that the wrong volume per hour was given 5%-10% of the time for specific medications in infusion pumps. Regenstrief Center researchers developed a machine-learning approach to detect when an incorrect volume was programmed for administration, and to warn the infusion nurse to change to the correct settings.
- Organizational, Cultural, and Psychological Determinants of Smart Infusion Pump Work Arounds: A Study of 3 U.S. Health Systems
  - Of 1,029 open-ended responses to the question “why do smart pump work arounds occur?” approximately 44% of the causes were technology related, 47% were organization related, and 9% were related to individual factors. Hospitals may significantly improve adherence to smart pump safety features by addressing the nontechnical causes of work arounds and by providing more leadership and formalized training for resolving smart pump–related problems.

The REMEDI team, led by Managing Director of REMEDI Operations Rich Zink, was recognized for its national impact on improving patient safety by winning **two national awards**: 1) the AAMI Foundation Clinical Solution Award, and 2) the Institute for Safe Medication Practices Cheers Award for the prevention of medication errors and adverse events. REMEDI held its **national conference** in Chicago in April as well as four virtual conferences throughout the year.



## ***Research Activities and Impact***

In order to best leverage the resources available with the specific strengths of Regenstrief Center-affiliated staff, scientists and faculty, we used our strategic planning sessions to define **strategic areas**, which are expected to evolve as we hire new faculty and, therefore, described in somewhat broad terms. The three strategic areas are:

1. *Supplementing evidence-based practice with evidence obtained from linking observations process data to outcomes*
2. *Supporting an adaptive healthcare continuum by effectively matching resources with demand*
3. *Improving health and wellness in the rural community*



Our support of research efforts also has become more strategic. First, we have worked to develop a few key **strategic partners** with whom we have a strong synergy and can find much potential research in common from a strategic perspective. We have focused on three new relationships this year: Geisinger Health System, Stanford Medicine, and St. Vincent Health. Geisinger, which is a large hospital network in Pennsylvania that is both a provider and “payer” through the Geisinger Health Plan (GHP), we established a broad agency agreement and data use agreement to: i) develop a set of impactful investigator-based research efforts with targeted funding sources, and ii) develop a center-level relationship around the theme of high performance computing in data science. We have initiated research on each part of this goal. Some of the investigator-based research that has been established with Geisinger include:

- “Remote ECG monitoring for stroke prediction in patients with Atrial Fibrillation;” Geisinger: Ramin Zand, MD (Director of Clinical Stroke Operations); Regenstrief Center: Xiao Wang (Statistics), Mohammed Adibuzziman
- “Clinical forecasting and decision support for PCOS, Type II Diabetes, and Depression,” Geisinger: Vida Abedi, PhD (Biomedical & Translational Informatics); Regenstrief Center: Md Munril-Haque
- “A systems approach to improving care pathways for patients with sepsis;” Geisinger: Shravan Kethireddy, MD (Critical Care Medicine); Regenstrief Center: Paul Griffin
- “Depression diagnosis and antidepressant treatment associated with contemporary prescriptions of narcotics and benzodiazepines with worse outcomes;” Geisinger: Wendy Ingram, PhD (Department of Psychiatry); Regenstrief Center: Mohammed Adibuzziman

For the center-level relationship, the focus is on developing an open source “sand box” environment that allows Purdue researchers access to Geisinger’s data, which includes their electronic health record (EHR) system, GHP claims, tele-tracking data, biological, and lab data along with publicly available biological and drug data bases such as DrugBank and the FDA Adverse Effect Reporting System (FAERS). We will be replicating their computational

framework (e.g., Hadoop Hortonworks, HBase, and Apache Soir) on our high-performance computing (HPC) system.

We are leveraging these partnerships to **increase the level of external funding** from health agencies such as the National Institutes of Health (NIH) and Agency for Healthcare Research and Quality (AHRQ), in addition to funding from engineering/science-based agencies such as the National Science Foundation (NSF). As mentioned previously, we are working to develop a **blended model of research** between academic faculty and PHA staff that includes the components of both the implementation science and dissemination.

Our research this year continues to inform policy and practice leading to more effective and efficient healthcare delivery. A few examples of these activities and how they relate to our strategic areas include:

- Developing an integrated open access analysis platform for an EHR database (**Area 1**)
  - This involves a collaboration with scientists at the MIT and Boston-based startup Paradigm4 to accelerate the translation of big data into healthcare decision-making through a user-friendly, open-access analysis tool. The tool gives access to data for more than 60,000 critical care patients that was captured from patient monitors and hospital medical information systems at Beth Israel Deaconess Medical Center. (Regenstrief Center-affiliated faculty lead: Ananth Grama, Professor in Computer Science)
- Deriving clinical evidence from existing observational data through structural causal models. (**Area 1**)
  - The approach was validated by replicating three published randomized control trials for acute respiratory distress syndrome. A key benefit of this approach, which goes beyond the relatively simple task of prediction, is that it uses information from multiple sources and provides the clinician with reasoned recommendations for actions and policies. (Regenstrief Center-affiliated faculty lead: Elias Bareinboim, Assistant Professor in Computer Science)
- Developing an interactive tool (BREATHE) to help decision makers identify the most cost-effective interventions to control asthma in Medicaid-enrolled children. (**Area 2**)
  - To be offered through the Centers for Disease Control and Prevention (CDC) to participating programs, the tool allows state public health programs to analyze the impact of different criteria used to select groups of children who are to receive the asthma interventions. Choosing the correct selection criteria can lead to a savings of more than \$2,000 per Medicaid-enrolled child with asthma that received a home visit and more than \$1,500 for a child who received self-management education alone when compared to those children who received no intervention. (Regenstrief Center-affiliated faculty lead: Paul Griffin, Professor in Industrial Engineering)
- Developing a mobile health smart phone device that can be used to non-invasively measure anemia in pregnant women and small children, and cancer patients. (**Area 3**)
  - Using a smart phone to take an inner eyelid “selfie,” the device can analyze blood hemoglobin content for levels of anemia, which affects more than two billion people worldwide, including 50-percent of pregnant women and 69-percent of

preschool children in Kenya, and 50-percent of all cancer patients. This is particularly important for rural areas since it removes the need for the patient to come to the clinic, and is extremely cost-effective when compared to other conventional methods. (Regenstrief Center-affiliated faculty lead: Young Kim, Associate Professor in Biomedical Engineering)

### ***Educational Activities and Impact***

The Regenstrief Center is dedicated to developing and delivering innovative curriculum at both the undergraduate and graduate level through the traditional educational channels at Purdue. We also are developing student research opportunities and will be supporting special events such as hackathons, a sprint-like event in which computer programmers, designers and subject-matter-experts, collaborate intensively on software projects. In addition, we strive to provide a broad range of education and training offerings to practitioners through Purdue Healthcare Advisors.

Yuehwern Yih, Associate Director of the Regenstrief Center, led the development of the new professional **Master of Science (MS) in Healthcare Systems Engineering**, a course of study that will be offered to students through the School of Industrial Engineering (IE) starting in the fall semester of 2018, and is targeted to engineers with strong academic records who are pursuing a career in healthcare in industry. A new course in Healthcare Delivery also was developed by Dr. Yih as part of the MS program. The Regenstrief Center also provided several opportunities for undergraduate research.

### ***Regenstrief Center-Core Faculty Hiring***

The Dean of Engineering (Mung Chiang) newly committed to hiring five **Regenstrief Center-core faculty** in the College of Engineering over the next five years. A search committee, led by Nan King, Associate Professor in Biomedical Engineering, was formed and faculty position announcements have been placed in several outlets. Phone interviews began in December and will be followed by on-campus interviews beginning in January. We plan to hire up to two new faculty in 2018. The composition of the search committee is:

- Ananth Grama, Samuel Conte Professor of Computer Science
- Nan Kong, Associate Professor of Biomedical Engineering
- Jacqueline Linnes, Assistant Professor of Biomedical Engineering
- Feng (Susan) Lu, Assistant Professor of Krannert College of Management
- Thomas Talavage, Professor of Electrical and Computing Engineering
- Mario Ventresca, Assistant Professor of Industrial Engineering
- Lingsong Zhang, Associate Professor of Statistics

Regenstrief Center will play an active part in the search process and make the final hiring decisions. Regenstrief Center-core faculty will be provided dedicated space in Mann Hall in Discovery Park to facilitate research collaboration and support their activities. Regenstrief Center also will be involved in the mentoring, support, and review of these faculty, and a process will be put in place to ensure that all core faculty remain actively engaged with Regenstrief

Center. We believe this process will ensure that the world-class faculty we hire will consider Regenstrief Center as their primary home.

### *Going Forward*

This has been a year of foundation building for the Regenstrief Center. We developed our strategic plan to prioritize our research activities, and we made significant inroads in obtaining the resources necessary to achieve our research goals. First, we sponsored several events to increase Regenstrief Center's visibility among Purdue faculty and students resulting in several collaborations between Regenstrief Center research scientists and Purdue faculty, especially in the area of data science. Second, to increase the Regenstrief Center's in-house research capacity, we obtained five new faculty slots, two of which we anticipate filling in 2018. Third, based on our strategic plan, we formed strategic partnerships to gain access to subject-area expertise and data with entities outside Purdue. This includes our activities with Geisinger Health and Stanford Medicine. Finally, we rethought the role of PHA within Regenstrief Center. In particular, we will use PHA's unique expertise and relationships with clinical care providers in a blended form of research that explicitly considers implementation science.

We now have a very solid infrastructure from which we can conduct both novel and impactful research. Over the next year, driven by our action plan, we will leverage our relationships to significantly increase our external funding to support our efforts in our strategic areas; successfully launch our PHA online learning platform and new Master of Science in Healthcare Engineering degree; recruit and hire outstanding core faculty to Regenstrief Center and thoughtfully expand our faculty and clinical affiliates; and increase our national recognition.

For **PHA**, there are three key goals: 1) to significantly build the online training environment and community of practice now that the online platform has been developed and implemented; 2) to work with faculty and students to support the new Master of Science in Healthcare Engineering; and 3) to continue to develop the blended approach to research with Regenstrief Center-affiliated faculty and students.

Our efforts around **REMEDI** will be to continue to focus on improving patient safety and quality by: 1) supporting the pump community with new and improved tools, 2) growing the ventilator and physiological monitor communities as there is strong demand for learning and sharing for these device types, and 3) expanding to other devices such as computerized physician order entry (CPOE), which links data to the EHR in order to determine how changes in process impacts patient outcomes. Based on feedback from the EAB, we also will consider a business model for REMEDI that will determine market value and a corresponding commercialization plan.

Some of the **collaborative research** efforts to focus on over the next year include the implementation of our high-performance computing platform to support the open-source "sand box" environment that will provide us access to clinical data. This will allow us to expand our individual investigator relationships with Geisinger clinical researchers and to complete many of the efforts that we have already initiated. Further, we will be able to use the results of our open-source data integration research with other partners in the future. We also plan to develop our faculty affiliate areas of expertise. This includes bringing in expertise in areas such as behavioral

economics, behavioral psychology, and smart health engineering. Finally, two areas in which Purdue is making a significant investment are data science and life sciences through collaborations with the major Purdue research centers, industry partners worldwide, and our renowned faculty and graduate students. There are ample opportunities for Regenstrief Center to participate in these initiatives, and we will work to bring these to fruition.

Overall, we believe that our efforts this year helped form a foundation to significantly improve our research-to-impact process. The generous investments that the Regenstrief Foundation and Purdue have made in Regenstrief Center allow our faculty and students, together with our clinical partners, to address important issues in healthcare delivery that directly impact the health and wellness of our population. We believe we are on the path to becoming the preeminent center in healthcare engineering research — a center that will have a transformative impact on healthcare delivery and community engagement for improving healthcare and wellness outcomes.

## **APPENDICES**

**APPENDIX A:** Two-Page CV of Regenstrief Center Director Paul Griffin

**APPENDIX B:** One-Year Action Plan

## APPENDIX A: Two-Page CV for Paul Griffin

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### EARNED DEGREES

Ph.D., Industrial Engineering, Texas A&M University  
 M.S., Industrial Engineering, University of Texas at El Paso  
 B.S., Chemical Engineering, University of Texas at Austin  
 B.A., Chemistry, University of Texas at Austin

### EMPLOYMENT HISTORY

2017-present: St. Vincent Health Chair and Director, Regenstrief Center for Healthcare Engineering; Professor, School of Industrial Engineering and School of Biomedical Engineering

2015-2016: Virginia C. and Joseph C. Mello Chair and Professor, School of Industrial & Systems Engineering, Georgia Tech

2009-2015: Peter and Angela Dal Pezzo Department Head Chair, Department of Industrial and Manufacturing Engineering, Penn State University

2002-2009: Professor, School of Industrial & Systems Engineering, Georgia Tech

2002-2007: Associate Chair for Undergraduate Studies, School of Industrial & Systems Engineering, Georgia Tech

1995-2002: Associate Professor, School of Industrial & Systems Engineering, Georgia Tech

1988-1994: Assistant Professor, School of Industrial & Systems Engineering, Georgia Tech

### PUBLICATIONS

#### Books

Griffin, P.M., Nembhard, H.B., DeFlitch, C.J., Bastian, N.D., Kang, H., and Muñoz, D.A. (2016) *Healthcare Systems Engineering*, John Wiley & Sons.

#### Journal Articles (Examples from Past Year)

1. Lee, I., Griffin, P.M., Monahan, S., Serban, N., and Tomar, S.L. (2017) "Estimating the cost savings of preventive dental care services delivered to Medicaid-enrolled children in six southeastern states", *Health Services Research*, in press.
2. Cao, S., Gentili, M., Griffin, P.M., Griffin, S.O., and Serban N. (2017). "Disparities in Access to Preventive Dental Care between Publicly and Privately Insured Children in Georgia", *Preventing Chronic Disease*, to appear.
3. Cao, S., Gentili, M., Griffin, P.M., Griffin, S.O., Harati, P., Johnson, B., Serban, N. and Tomar, S. (2017). "Estimation of Demand for and Supply of Pediatric Preventive Dental Care Services for Children with Inference on Dental Shortage Areas", *Public Health Reports*, to appear.
4. Bastian, N.D., Swenson, E.R., Ma, L., Na, H.S., Griffin, P.M. (2017). "Incentive contract design for food retailers to reduce food deserts in the US." *Socio-Economics Planning Sciences*, to appear, <http://dx.doi.org/10.1016/j.seps.2017.03.003>

5. Griffin, S.O., Scherrer, C.R., Griffin, P.M., Navaal, S., and Chattapadhyay, S. (2016). "School-Based Dental Sealant Programs Prevent Cavities and Are Cost-Effective", *Health Affairs*, Vol 35, pp. 2224-2232.
6. Bastian, N.D., Kang, H., Griffin, P.M., and Fulton, L.V. (2016). "Measuring the effect of pay-for-performance financial incentives on hospital efficiency in the military health system", *IIE Transactions on Healthcare Systems Engineering*, Vol 6, pp. 33-41.
7. Kang, Y., Sawyer, A.M., Griffin, P.M., and Prabhu, V.V. (2016). "Modeling Adherence Behaviour for the Treatment of Obstructive Sleep Apnea", *European Journal of Operational Research*, Vol 249, pp. 1005-1013.
8. Bastian, N.D., Kang, H., Nembhard, H.B., Bloschichak, A., and Griffin P.M. (2016). "The Impact of Pay for Performance Program on Central Line Blood Stream Infections in Pennsylvania", *Hospital Topics*, Vol. 94, pp. 8-14.
9. Bastian, N.D., Kang, H., Swenson, E.R., Fulton, L.V., and Griffin, P.M. (2016). "Evaluating the Impact of Hospital Efficiency on Wellness in the Military Health System", *Military Medicine*, Vol 181, pp. 827-834.

#### **HONORS AND AWARDS (EXAMPLES)**

- INFORMS Koopman Prize, 2016
- Texas Industrial Engineering Lifetime Achievement Award, 2010
- Women in Engineering Outstanding Professor Award, College of Engineering, Georgia Institute of Technology, 2009
- Order of Omega Outstanding Professor Award, College of Engineering, Georgia Institute of Technology, 1998 and 2001

#### **EXAMPLE GRANTS AND CONTRACTS**

- Centers for Disease Control and Prevention, "Strengthening Health and Cost Impact Analysis for Prevention Policies"
- Military Health System, "Simulation and Modeling of the Patient Centered Medical Home"
- General Electric, "Center for Collaborative Research on Intelligent Natural Gas Supply Systems"
- Centers for Disease Control and Prevention, "Modeling the Effectiveness of TB Interventions in Resource Constrained Countries"
- National Science Foundation, "Designing an Optimal Financing Mechanism for Dental Care Among the Elderly: Reducing the Costs Associated with Information Asymmetries"
- National Science Foundation, "Auction mechanisms for solving complex resource allocation problems"

#### **TEACHING**

**EXAMPLE COURSES DEVELOPED AND TAUGHT (AT GEORGIA TECH):** ISyE 4803 - Health Systems Engineering; ISyE 4301 - Supply Chain Economics; ISyE 6230 - Economic Decision Analysis; Several executive courses for Supply Chain Logistics Institute.



## APPENDIX B: One Year Action Plan

In this Appendix, we summarize our metrics to this point for the one-year action plan. They are defined in Table 1.

*Table 1. Timing of Regenstrief Center action plan activities and goals. Green signifies that we have already achieve the goal, yellow signifies that we are on track to satisfy the goal by Q2, and red signifies that we are unlikely to achieve the metric by Q2 of 2018.*

	2017			2018		Goal	Current Metric
	Q2	Q3	Q4	Q1	Q2		
<b>Faculty Recruitment</b>							
Write specifications for Regenstrief Center faculty positions						Define positions	Ad placed
Form faculty search committees (a) and conduct searches (b)		a	b	b	b	Hire 2 faculty	Committee Formed, Search Initiated <sup>1</sup>
Define Regenstrief Center faculty affiliate requirements and recruit						12 faculty affiliates	20 faculty affiliates
Define Regenstrief Center faculty leadership guidelines/support and recruit						8 faculty	7 faculty <sup>2</sup>
<b>Student Recruitment</b>							
Develop Regenstrief Center Scholars program (a) and recruit (b)	a	b		b		5 Regenstrief Center scholars	0 scholars
Engage undergraduate capstone design with Regenstrief Center efforts						4 capstone projects	2 capstone projects
<b>REMEDI Engagement</b>							
Pilot project matching REMEDI data and EHR						1 pilot project	1 pilot project (Cameron)
Determine “value” of REMEDI and revenue model						Recommendation	Value being reviewed
Add REMEDI and PSO members						30 REMEDI, 2 PSO	
<b>PHA Engagement</b>							
Involvement of Regenstrief Center faculty in projects with PHA						3 faculty	2 faculty
Involvement of student interns from MS program with PHA						2 interns	0 interns
<b>External Advisory Board</b>							
Identify and recruit members for External Advisory Board						7 members	7 members

<sup>1</sup> The interviews will begin in January, with offers likely made in March.

<sup>2</sup> We will add a faculty member from Computer Science in the spring.

Hold first External Advisory Board meeting						Hold meeting	Meeting held
<b>Communicating Regenstrief Center Success</b>							
Webpage overhaul (a) and brochure update (b)		a	a,b	a	a	Implement changes	Changes in progress
Invite speakers for distinguished seminar series						2 speakers	1 speaker
Plan for fall Regenstrief Center Forum and establish co-sponsor partnership						Co-sponsor	Co-sponsored forum (Women's Health)
Hold fall Regenstrief Center Forum						Hold forum	Forum Held
Establish a process for press releases						Implement plan	Plan implemented
Press releases of Regenstrief Center accomplishments						3 per quarter	4 press releases
Publish Regenstrief Center e-newsletter						Monthly	e-newsletter published monthly
<b>Funding</b>							
Identify funding opportunities and submit proposals						8 proposals, \$3M	Exceed both metrics
Support large grant initiative (> \$5M)						1 proposal	Part of large grant initiative; working to take lead role
Develop pilot research opportunity with Regenstrief Institute that is externally funded						1 project	In discussion
<b>Management</b>							
Establish an Internal Advisory Board for funding review						Implement plan	Internal Board formed; plan implemented
<b>Strategic Planning</b>							
Regenstrief Center Faculty Leadership input for 2018-2019 action plan							Input received (December meeting)
Evaluate metrics and update Regenstrief Center strategic plan							Metrics evaluated and will be updated (December meeting)
Submit updated plan to Regenstrief Foundation for approval						June 2018	Metrics and update to be

							provided in June Report
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*Abbreviation key:*

MS – Professional master’s degree in Healthcare Engineering

PHA – Purdue Healthcare Advisors (<http://pha.purdue.edu>)

PSO – Patients safety organization (<https://pso.ahrq.gov>)

Regenstrief Center – Regenstrief Center for Healthcare Engineering  
(<http://www.purdue.edu/discoverypark/rche/>)

REMEDI – Regenstrief National Center for Medical Device Informatics  
(<https://catalyzecare.org/remedi>)