Panel 1: Augmenting People Through Technology

Shawna J. Perry  
Associate Professor of Emergency Medicine, University of Florida Health Science Center

Ayse P. Gurses  
Director, Armstrong Institute Center for Health Care Human Factors, Johns Hopkins University

Wanda Pratt  
Professor, Information School and adjunct in Biomedical & Health Informatics, University of Washington

Casey Overby Taylor  
Assistant Professor, Division of General Internal Medicine and Division of Health Sciences Informatics in Department of Medicine, Johns Hopkins University School of Medicine
Shawna J Perry MD,
Associate Professor, Department of Emergency Medicine, University of Florida/Jacksonville

Honorary Associate Professor, CPQI and Department of Industrial Engineering, University of Wisconsin/Madison

“Embracing the Complexity”

Prevailing mental models for the work of healthcare have not evolved to match the expected rate of improvement for this domain from many quarters. This presentation will discuss the importance of re-framing this stance to better inform development, implementation and adoption of any change(s) to the work system. Implications of this for healthcare-related technology will also be discussed.

Ayse P. Gurses
Director, Armstrong Institute Center for Health Care Human Factors, Johns Hopkins University

“Care Transitions and Teamwork in Pediatric Trauma: Implications for Health IT Design”

If designed well, health IT has the potential to improve quality and safety of care. New health IT design concepts and approaches are needed to facilitate teamwork and care coordination given today’s complex care environment. We present preliminary findings from a 5-year AHRQ-funded study aimed at (1) understanding cognitive teamwork (e.g., information requirements, decision-making) involved in care transitions of pediatric trauma patients; (2) developing and testing design requirements of future health IT solutions to support care coordination. We also describe various human factors engineering, human-centered design, and informatics methods used in the study.
Casey Overby Taylor
Assistant Professor, Division of General Internal Medicine and Division of Health Sciences Informatics in Department of Medicine, Johns Hopkins University School of Medicine

“Designing clinical decision support for precision medicine stakeholders”

Clinical decision support software applications have potential to help non-genetics clinical experts make sense of genomic results and to enable successful use those results in health care decisions. The environment where such software might be deployed, however, can be complex, high-paced, and involve multiple stakeholders. Thus, there is a need to establish software design principles that also support the current way of working. This presentation will describe a user-centered approach to gather contextual information with a diverse group of clinical stakeholders potentially impacted by the delivery of multi-gene sequencing panel (GS) reports relevant to two personalized medicine programs. Findings from that work characterized genetic testing processes and identified design principles for software applications that deliver GS reports to clinicians.
Panel 2: Augmenting People Through Technology

Gina Lynn Adrales  
Director, Division of Minimally Invasive Surgery, 
Associate Professor of Surgery, Johns Hopkins University School of Medicine

Pierre E. Dupont  
Edward P. Marram Chair and Chief, Pediatric Cardiac Bioengineering, Boston Children’s Hospital, Harvard Medical School

Jenna Wiens  
Assistant Professor, CES Department, University of Michigan

David E. Newman-Toker  
Director, Division of Neuro-Visual & Vestibular Disorders, Department of Neurology, Johns Hopkins University School of Medicine
Gina Lynn Adrales  
*Director, Division of Minimally Invasive Surgery, Associate Professor of Surgery, Johns Hopkins University School of Medicine*

**“Using Technology to Augment People: Enhancing Psychomotor Ability in the Operating Room”**

In the last 40 years, technologic advances in surgical technique have transformed surgery to minimize the physiologic impact of surgery on patients. This has resulted in less pain, shorter hospital stay, shorter recovery, and typically less infection and wound complications through minimally invasive surgery. The enhanced, magnified view of laparoscopic and robotic surgery aid the surgeon in the performance of precision surgery. Other technologic advances address the limitations, such as lack of haptic feedback, associated with these new surgical modalities.

---

Pierre E. Dupont  
*Edward P. Marram Chair and Chief, Pediatric Cardiac Bioengineering, Boston Children’s Hospital, Harvard Medical School*

**“Using Technology to Enhance Visualization and Dexterity inside the Beating Heart”**

The field of interventional cardiology has experienced spectacular success in recent years with the clinical introduction of catheter-delivered heart valves and of devices that replicate components of surgical valve repair. However, as clinical experience has increased, two major limitations of transcatheter therapy have stalled progress. These are: (1) the limited ability to detect tissue contact with an instrument and to visualize detailed anatomy at the contact site, and (2) the limited ability to stabilize, manipulate, or otherwise optimally position the target tissue for device deployment and function. This talk will describe an endoscopic imaging technology that provides detailed imaging at the catheter tip inside the blood-filled heart. It will also discuss the development of robotic catheters to enable precise tissue manipulation and automated navigation inside the beating heart.
David E. Newman-Toker  
*Director, Division of Neuro-Visual & Vestibular Disorders, Department of Neurology, Johns Hopkins University School of Medicine*

**“The Future of the “Eye ECG” to Diagnose Stroke in Acute Dizziness: Telemedicine, Tech-Based Triage, & Training”**

Strokes are often misdiagnosed when presenting symptoms are non-specific, mimicking benign disorders. Failure to promptly treat strokes presenting with acute dizziness or vertigo can result in serious patient harms. Inappropriate neuroimaging looking for stroke in patients with benign peripheral vestibular disorders leads to excess costs. Experts accurately differentiate dangerous strokes from benign ear problems by carefully examining eye movements, but experts are not routinely available. Novel use of portable video-oculography (VOG) technology for teleconsultation, tech-based triage, and training could transform care for patients by preventing hundreds of thousands of misdiagnoses and saving $1 billion per year in the US alone.
WORKSHOPS & BREAKOUT SESSIONS:

ACHIEVING PRECISION AND VALUE: THE ROLE OF PEOPLE AND TECHNOLOGY

Adam Sapirstein
Director, Division of Adult Critical Care Medicine, Johns Hopkins University School of Medicine

Alan D. Ravitz
Chief Engineer, National Health Mission Area, The Johns Hopkins University Applied Physics Laboratory

Peter A. Calabresi
Director, Division of Neuroimmunology, Professor of Neurology, Johns Hopkins University School of Medicine

Kenneth J. Pienta
Donald S. Coffey Professor of Urology, Director of Research at the Brady Urological Institute, Johns Hopkins University School of Medicine
Adam Sapirstein  
*Director, Division of Adult Critical Care Medicine, Johns Hopkins University School of Medicine*

**“Clinical Implementation of Innovations”**

A primary goal of the engineers working in health care is to create the framework for a continuous learning health system. The traditional model of medical innovation rewards consumption and utilization and is predicated on treating illness rather than promoting health. An engineered system requires a platform that allows implementation and value assessment of new technologies and processes. At Johns Hopkins Hospital we are determining if Command and Control Centers can promote implementation and measure value while assuring patient safety. We postulate that such centers can become the organizing force behind creating both Precision and Value in health care.

---

Alan D. Ravitz  
*Chief Engineer, National Health Mission Area, The Johns Hopkins University Applied Physics Laboratory*

**“Engineering Healthcare Through a Systems Approach”**

The automobile sector, aviation, power and energy, and other industries have capitalized on applying a systems approach to yield solutions that reliably deliver performance, safety, efficiency, and value. Healthcare could realize similar gains through collaborative efforts of trans-disciplinary teams of engineers, healthcare workers, administrators, patient/family advocates, and others from many other fields. APL and Johns Hopkins Medicine are teaming to apply a systems approach to address a number of challenges facing healthcare today. An overarching description of the systems approach is discussed along with representative projects and potential solutions focused on producing measurable gains related to safety, outcomes, efficiency, and value.
“Precision in Multiple Sclerosis Neuroimaging: how will it add value?”

High resolution images of the brain provide clinicians with subjective information regarding lesion site and characteristics that facilitate diagnosis and prognosis. These images are underutilized in that they contain quantitative data that is not readily provided to the practitioner. Measurements of lesion load and grey matter injury have been shown in idealized research settings to more accurately predict disease outcomes and guide judicious use of high effective but potentially dangerous therapies. An unmet need is to harmonize brain imaging datasets across heterogeneous acquisition platforms to enable real-time quantitative data to inform medical practice not only in MS but all brain neurodegenerative diseases.

“Decreasing uncertainty in the treatment of prostate cancer”

It is now clear that the term “Prostate cancer” refers to multiple subsets of disease that when lumped together lead to both overtreatment and undertreatment. We have used our longitudinal cohort of men followed at Johns Hopkins to create a nomogram for men on active surveillance (AS) for prediction of grade re-classification (GR) from low risk (active intervention not required) to high risk prostate cancer (active intervention suggested). A multivariable model was used to identify clinical and pathological parameters predictive of GR. Variables predictive of GR were earlier year of diagnosis \( \leq 2004 \text{ vs} \geq 2005 \); odds ratio (OR) 2.16, \( P < 0.001 \), older age (OR 1.05, \( P < 0.001 \)), higher prostate-specific antigen density [OR 1.19 (per 0.1 unit increase), \( P = 0.04 \)], bilateral disease (OR 2.86, \( P < 0.001 \)), risk strata (low-risk vs very-low-risk, OR 1.79, \( P < 0.001 \)), and total number of biopsies without GR (OR 0.68, \( P < 0.001 \)). The nomogram was then placed into a user-friendly interface and is currently being used at each return visit to assess the need for a surveillance biopsy.