

Strategic Health IT Advanced Research Projects (SHARP)

Area 2: Patient-Centered Cognitive Support

ONC SHARP PI Meeting

June 2-3, 2010



National Center for Cognitive Informatics and
Decision Making in Healthcare
(NCCD)

PI: Jiajie Zhang

Co-Directors: Jiajie Zhang & Vimla Patel

Overview

NCCD – Member Institutions

- The University of Texas Health Science Center at Houston
- Arizona State University
- Baylor College of Medicine/Houston VA Medical Center
- Baylor Health Care System
- Harvard University
- Intermountain Healthcare
- University of Maryland at College Park
- University of Washington
- VA Palo Alto Health Care System

- And many individuals from various institutions

NCCD - Vision

- Become a national resource providing strategic leadership in research and applications for patient-centered cognitive support in healthcare

NCCD - Mission

- Bring together a collaborative, interdisciplinary team of researchers across the nation with the highest level of expertise in patient-centered cognitive support research from
 - biomedical and health informatics, cognitive science, computer science, clinical sciences, industrial and systems engineering, and health services research
- Conduct
 - short-term research that addresses the urgent usability, workflow, and cognitive support issues of HIT
 - long-term, breakthrough research that can fundamentally remove the key cognitive barriers to HIT adoption and meaningful use
- Translate research findings to the real world through a cooperative program involving
 - researchers, patients, providers, HIT vendors, and other stakeholders
 - to maximize the benefits of HIT for care quality, efficiency, and safety

How NCCD's Six Projects Map to ONC's Research Challenges

ONC-Identified Major Research Challenges for Patient-Centered Cognitive Support

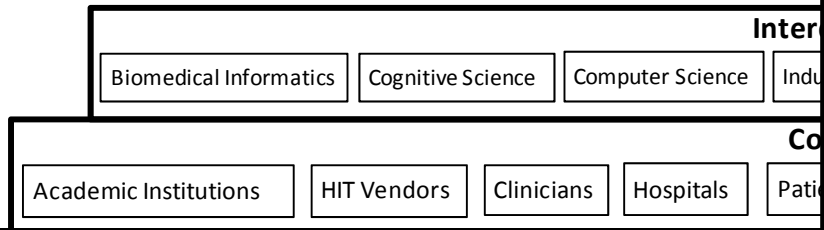
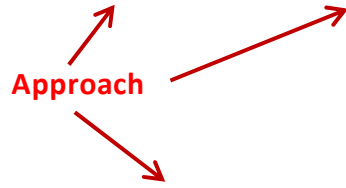
P1	P2A	P2B	P3	P4	P5	
X	X	X	X			Creating models that support dynamic abstraction of clinical information
X			X	X	X	Techniques for parsimonious information display that simplifies, while capturing essential features of a clinical decision problem
	X	X				Understanding decision making under stress and time pressure, and its implications for cognitive support
X	X	X		X	X	Communication to clinicians, addressing message content and delivery, that blends with workflow
X				X		Methods to support decisions that involve multiple stakeholders, taking into account their preferences and utilities
X				X		Methods for minimizing and simplifying, when it is necessary, manual data input by clinicians

Challenges in HIT A

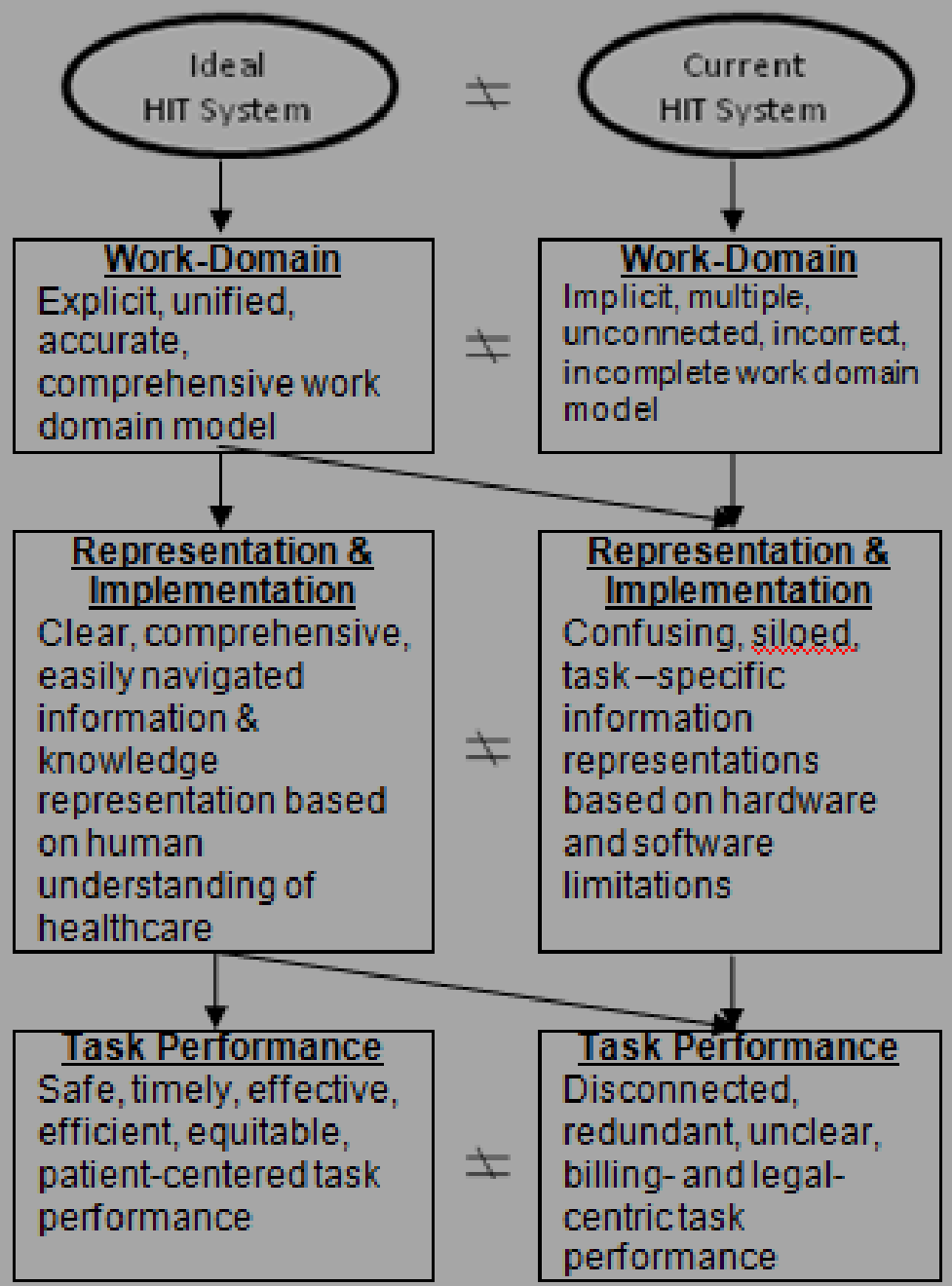


- Common Use Cases for Research, Development, & Evaluation**
- For Providers**
- Review patient history
 - Conduct patient assessment
 - Determine clinical decision
 - Develop treatment plan
 - Order additional services
 - Prescribe medications
 - Document visit
- For Patients & Providers**
- Communicate with providers
 - Manage medications
 - Manage chronic conditions
 - Understand health

How NCCD's Six Projects Map to ONC's Research Challenges						ONC-Identified for Patients
P1	P2A	P2B	P3	P4	P5	
X	X	X	X			Creating model abstraction
X			X	X	X	Techniques display that features of a
	X	X				Understanding time pressure support
X	X	X		X	X	Communicate message context workflow
X				X		Methods to multiple state preferences
X				X		Methods for it is necessary



Gaps between Ideal & Current Systems



Individual Research Projects

Individual Research Projects

Projects	Project Title	Leaders
Project 1	Work-Centered Design of Care Process Improvements in HIT	Zhang, Butler, Walji
Project 2A	Cognitive Foundations for Decision Making: Implications for Decision Support	Patel, Cohen
Project 2B	Modeling of Setting-Specific Factors to Enhance Clinical Decision Support Adaptation	Greenes
Project 3	Automated Model-based Clinical Summarization of Key Patient Data	Sittig
Project 4	Cognitive Information Design and Visualization: Enhancing Accessibility and Understanding of Patient Data	Johnson, Shneiderman, Plaisant
Project 5	Improving Communication in Distributed Environment	Patel, Singh

Project 1: Work-Centered Design of Care Process Improvements in HIT

Project Leaders: Jiajie Zhang, Keith Butler, &
Muhammad Walji

Project Advisor: Mark Haselkorn

Co-Is: Amy Franklin, Brent King, Ali Mokdad, Emeka
Okafor, Axel Roessler, Yan Xiao

Consultants: Ali Bahrami, Ellen Bass, Chris Esposito,
David Kieras, Mark Musen, David Woods

Specific Aims

	Short Term
Aim 1	Develop tools to rapidly identify and prioritize critical usability problems
Aim 2	Develop work-centered toolkit for removing usability problems in existing system and designing new systems with built-in usability
Aim 3	Methods to integrate vendor-focused solutions with social-organizational issues of acceptance and trust in healthcare environments
	Long Term
Aim 4	Model the impact of HIT on cognitive and organizational healthcare processes
Aim 5	Derive key HIT features from information usage patterns in care processes to “build-in” care improvements to HIT systems
Aim 6	Develop a work-ontology framework that builds safety and usability into HIT systems

Significance – Aims 1-2

- Validated tools and methods that can be used by vendors for improving usability, and by regional extension centers or physicians for software selection.
- Development of usability standards and guidelines that can form basis for comparison of EHR products and for certification.

Significance – Aim 3

- Increased adoption, improved processes and clinical decision-making and longer system lifespan through increased transparency, improved change management, and stronger stakeholder ownership

Significance – Aims 4-5

- Increase EHR adoption and meaningful HIT use with metrics & tools that enable care providers and managers to insert improvements directly into health care delivery systems development. These improvements will enable
 - impact analysis, prioritization, and cost-benefit analysis of HIT functions,
 - “build-in” care improvement and/or cost reduction to enterprise systems,
 - integrate work design across multiple levels with hybrid electronic and paper records, and (d) provide visibility needed to direct and monitor HIT projects.

Significance – Aim 6

- Revolutionize the reliability and usability of HIT use with model-based design. Reduce safety risk from unpredictable user behavior, and enable methods to generate optimal designs for safe, effective, efficient user interaction with HIT

Project 2A: Cognitive Foundations of Cognitive Decision: Implications for Decision Support

Project Leaders: Vimla L. Patel & Trevor Cohen

Project Advisor: Gary Klein

Co-Is: Javy Kong, Amy Franklin, Almoosa, Parsa Mirhaji, Bela Patel,
David Robinson

Consultants: Tim Buchman, John Joe, Gary Klein, Andre Kushniruk

Aims

- Aim 1: To create cognitive models of knowledge organization through information abstraction from clinical cases as “Intermediate Constructs” in critical care
- Aim 2: To develop initial prototype EHR to include these constructs using visualization and NLP tools
- Aim 3: To iteratively evaluate prototype system using both Lab and clinical-based evaluation

Structure of Knowledge in Clinical

Problem Solving

System-Level

H1

H2

UL1

UL2

UL3

Diagnostic Hypotheses

INTERMEDIATE CONSTRUCTS

IC1

IC2

IC3

IC4

IC5

Findings

LL1

LL2

LL3

LL4

LL5

LL6

LL7

LL8

LL9

BC1

BC2

BC3

BC4

BC5

BC6

BC7

BC8

BC9

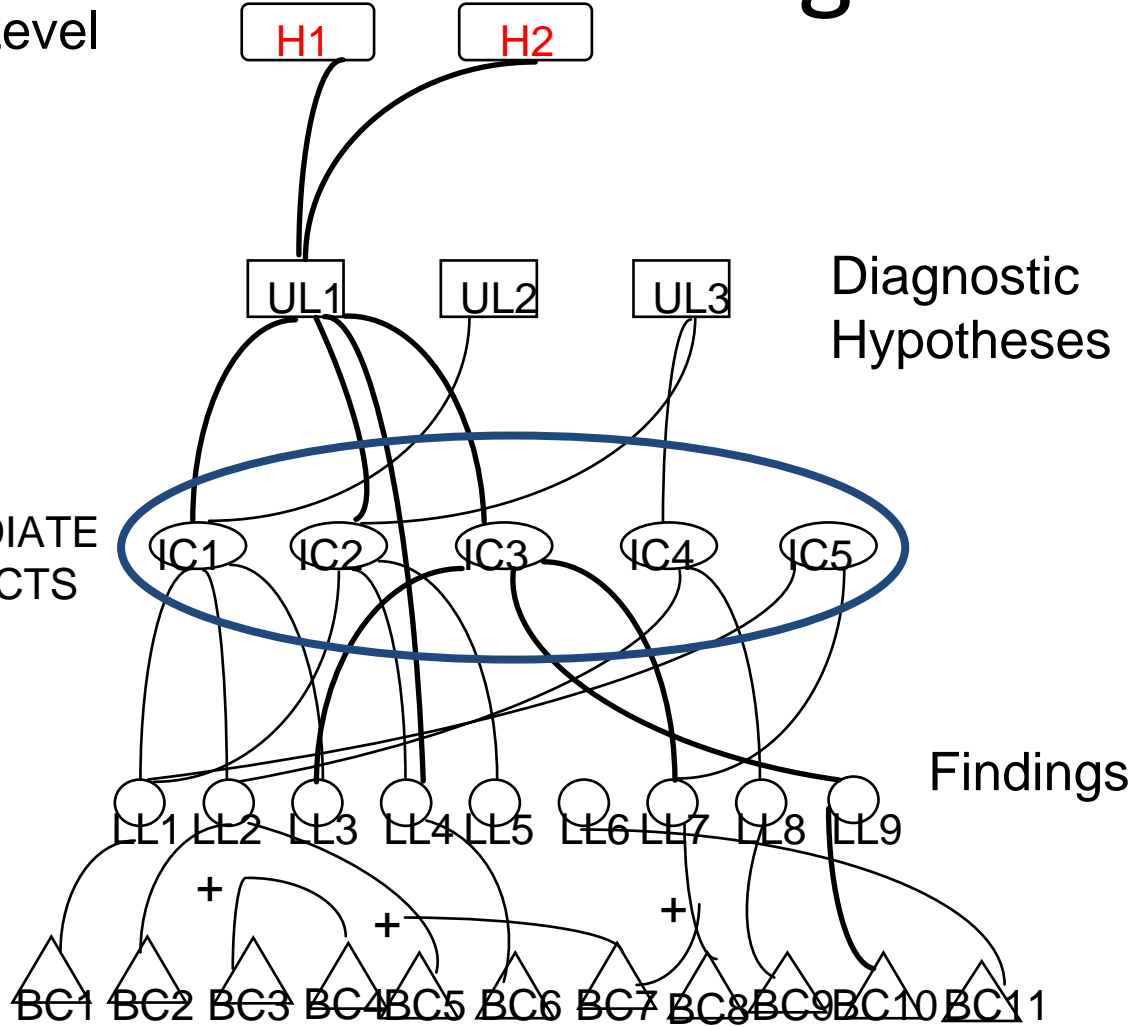
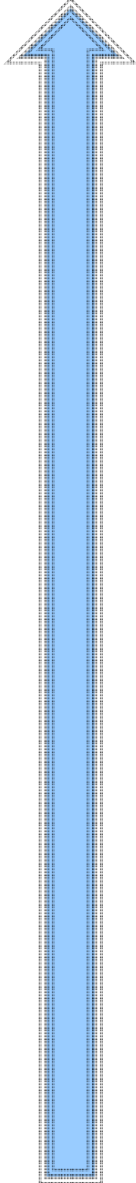
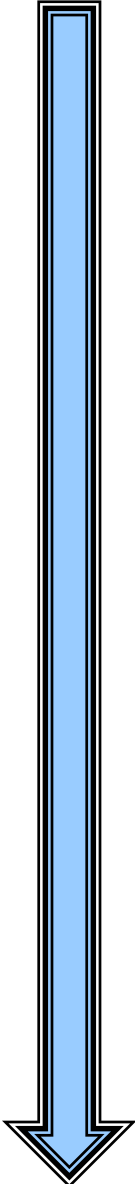
BC10

BC11

Observations

Paper Record

EHR



Significance

- Current EHRs do not represent information in a way that makes decision making efficient and effective
- New approach to cognitively driven decision support based on cognitive constructs
- Framework connecting cognitive constructs, views of patient data and decisions making
 - Methods to generate “views” that are clinically relevant
 - Prototype of cognitively-driven EHR

Project 2B: Context-Specific Factors for Clinical Decision Support

Project Leaders:

Robert A. Greenes, Arizona State University

Mary Goldstein, VA Palo Alto Health Care
System

Peter Haug, Intermountain Health

Emory Fry, Naval Health Research Center

Project Advisor:

Robert A. Jenders, UCLA

Specific Aims

Overall

1. Overcome barriers to sharing and adoption of CDS by *modeling of the role of (a) “setting-specific factors” (SSFs) and (b) “patient-specific factors” (PSFs) – in determining effective use/reuse*
2. Develop and validate methodologies to capture and organize these attributes to more effectively tailor CDS to particular SSFs and PSFs

Specific Aims

Short-Term Aims (2 years): Immediate Impact on CDS Adoption and Use

1. Characterize a range of implemented CDS, rules-based knowledge in terms of the core logic and SSFs in diabetes and hypertension, and in a set of prevention and screening recommendations
2. Develop a taxonomy of SSFs and tools for adaptation to different environments
3. Work with the Lab Core to test usability of the systems

Long-Term (4 years): Breakthroughs Leading to Next Generation CDS

4. Develop and refine a state-based model for chronic disease, with focus on diabetes and hypertension
5. Develop a taxonomy of patient-specific factors (PSFs) as derived from state model, and expand the knowledge base for these states from existing guidelines, literature, experts, and data mining
6. Work with the Lab Core to develop clinical encounter prototypes incorporating the expanded knowledge for clinical documentation and plan/order generation and assess their usability

Significance

Aims 1-2

- provide a methodology for characterizing the SSFs to be incorporated into actual deployments of CDS
- can enhance the ability for CDS to be more easily adapted to different environments and more effectively shared and reused

Aim 3

- address the tasks of converting the conceptual model and knowledge base into actual payload format that can be used by an implementer
- assess model and KB value as a way to semi-automate the adaptation of shared CDS knowledge to particular settings

Aims 4-5

- address a breakthrough conceptual approach to constructing the clinical encounter for chronic disease so as to capture PSFs
- use PSFs to tailor (a) the data assembly pertinent to a patient's state, and (b) provide integrated guidance/ workflow enhancement for the assessments, and the plans/actions to be carried out

Aim 6

- create and evaluate novel and potentially significant user interfaces (including interactive visualizations) for the clinical encounter

Project 3: Automated Model-Based Clinical Summarization of Key Patient Data

Project Leaders: Dean F. Sittig, Eric Thomas,
Adam Wright

Project Advisors: Hardeep Singh, Joan Ash

Specific Aims

- Identify data and methods required to model interactions and summarize complex, chronically-ill patients' history and create appropriate, evidence-based actions to improve clinicians' decisions under information overload and time pressure.
- Design automated methods of creating accurate, succinct, condition-dependent and independent computer-generated summaries of complex, chronically-ill patients to improve patient safety, clinician efficiency and satisfaction, and reduce the cost of care.

Significance - must develop automated methods of using patient-centered knowledge to summarize and display information

- In “early EHR adopter” organizations patients have over 10 years of EHR data covering all aspects of their care
- Readily accessible, perfectly legible archives of clinical notes, laboratory results, images, and provider correspondence challenge time-pressured clinicians
- As EHRs and HIEs capable of exchanging patient-level data increases, the quantity of data that clinicians must review for safe and effective care increases exponentially
- Clinicians must integrate data with their existing knowledge and literature
- Solutions require explicit, unified, accurate, and comprehensive patient-centered models that reflect the true work domain ontology

Project 4: Cognitive Information Design and Visualization: Enhancing Accessibility and Understanding of Patient Data

Project Leaders: Todd R. Johnson (UTHealth), Ben
Shneiderman (UMD), Catherine Plaisant (UMD)

Project Advisor: David Woods

Co-Is: Elmer Bernstam, Jorge Herskovic, Javy Kong

Specific Aims

- **Short term (2 years): Immediate impact on clinician understanding of patient data.** Focus on *individual clinicians* and the *benefits of specific visualization* tools for test cases selected based on national priorities.
 - **Aim 1:** Develop a clinical data by task taxonomy of visualization opportunities, and guidelines for use.
 - **Aim 2:** Design a visualization framework - develop and validate prototype tools to enable patient-centered cognitive support for selected use cases.
- **Long term (4 years): Breakthroughs leading to visualizations that support enhanced team-based coordinated care and a variety of clinical situations**
 - **Aim 3:** Design and develop techniques for customization of the visualizations based on care team roles
 - **Aim 4:** Generalize the visualization framework and tools to support team-based care and management, and a variety of clinical situations.

Significance

- In current EMRs Clinicians are data hunter-gatherers
 - data required for a clinical understanding of a patient is scattered across dozens or even hundreds of screens and notes
- Interactive visualizations can compactly represent and facilitate understanding of large amounts of clinical data

Project 5 - Improving Communication in a Distributed Environment

Project Leaders: Hardeep Singh &
Vimla Patel

Advisors: Dean Sittig, Gary Klein

Consultants: Andre Kushniruk

Specific Aims

- Aim 1: Design a state-of-the art prototype system for communication of key clinical information (e.g., abnormal test results) between individual providers
- Aim 2: Identify best practices to increase individual clinician's situational awareness by overcoming failures of perception of electronically communicated information

Significance

- Reducing communication breakdown is the centerpiece of achieving patient safety.
 - Missed and delayed diagnoses, often a result of missed test results, are among the most common safety concerns in the outpatient setting and persist in EHRs.
 - They lead to substantial harm and cost and are a frequent reason for outpatient malpractice claims

Synergy across Projects

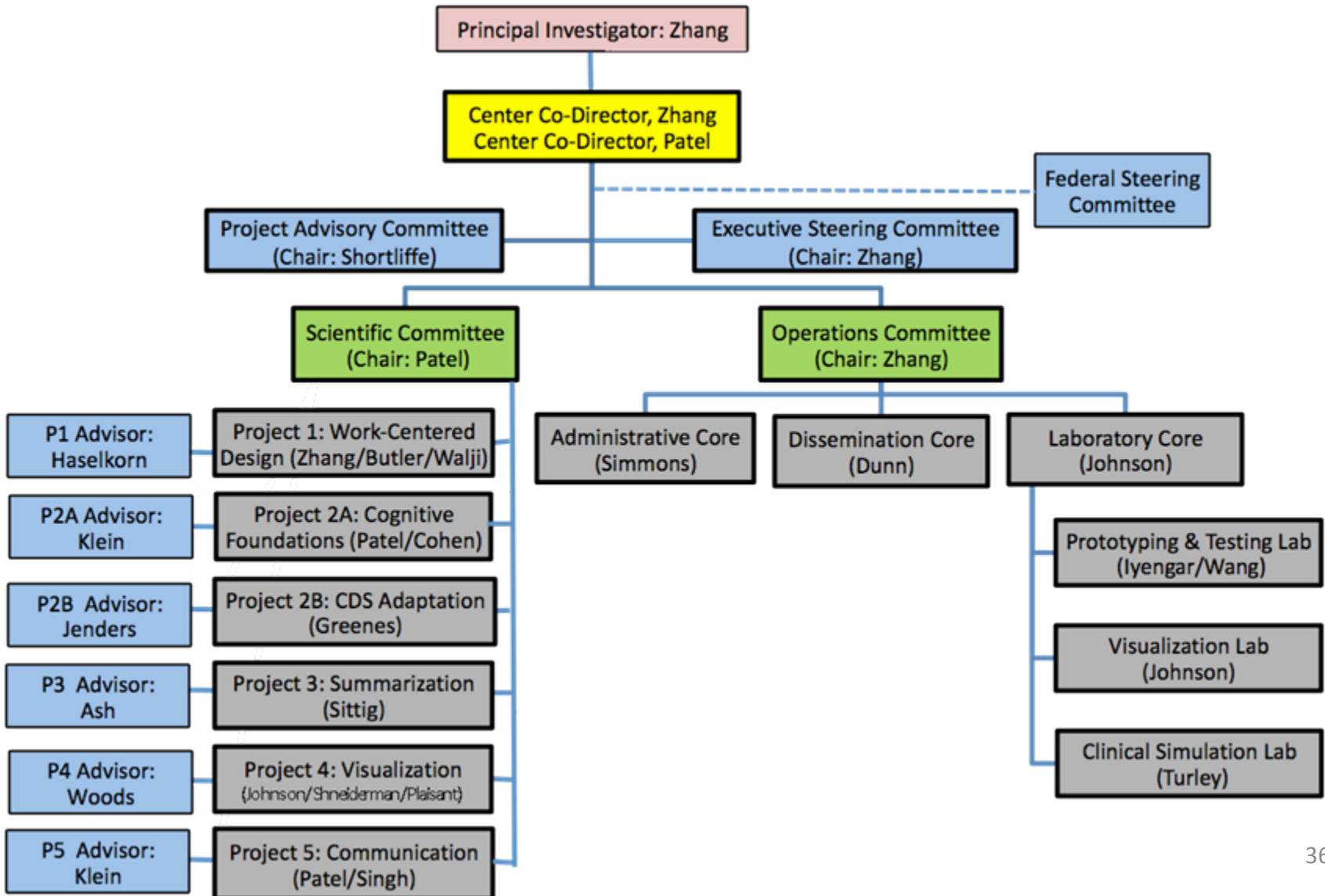
	P1	P2A	P2b	P3	P4	P5
P1		Usability, design	Usability	Usability, WDO	Usability, design	usability
P2A	New design		Model, method	Model, method		Model, method
P2B		CDS		Patient state		SSF
P3	New design	Intermediate construct	Patient model		Visualization	
P4	Visualization	Visualization		Visualization		Visualization
P5	Team design	Team decision making	CDS		Team visualization	



contributions

Project Management

Organizational Chart



Personnel

- 40 investigators
- 17 consultants
- 20 advisory committee members
- Other personnel
 - Postdocs
 - Students
 - Developers
 - Others

Project Advisory Committee

Project Advisory Committee (PAC)

Roles	Names, Titles, and Institutions
Chair	Edward H. Shortliffe , MD, PhD; President and CEO of AMIA; Professor, UTH Health Information Sciences
ONC Liaison	Charles Friedman , PhD, Chief Scientific Officer, ONC
Academic Institutions	Donald A. Norman , PhD, member of NRC Committee for Report “Computational Technology for Effective Health Care”; Professor of Design, EE, Computer Science, Psychology, & Cognitive Science, Northwestern University
	Jack W. Smith , MD, PhD, Dean and Professor, UTH Health Information Sciences
	David Woods , PhD, Professor, Dept. of Integrated Systems Engineering and Director, Center for Complexity in Natural, Social and Engineered Systems, Ohio State University; Past President, Human Factors & Ergonomics Society
	Thomas Payne , MD, Medical Director, Information Technology Services, University of Washington Medical Center
Vendors	James Ingram , MD, Chief Medical Officer, Greenway Medical Technologies
	David McCallie, Jr. , MD, Vice President for Medical Informatics, Director of Cerner Medical Informatics Institute
	James Spohrer , PhD, Director, IBM Almaden Services Research
	Sameer Bhat , Co-Founder, Vice President, eClinicalWorks
	Jacob Reider , M.D., Chief Medical Informatics Officer, Allscripts
	Eric Horvitz , PhD, Principal Researcher, Microsoft Research; Past President of AAAI
	W. Paul Nichol , MD, National Director of Medical Informatics, Patient Care Services, Veterans Health Administration
Professional Associations	Patricia B. Wise , RN, MS, MS, FHISS, Vice President, HIMSS
	Michael Speer , MD, Representative for Texas Medical Association, Baylor College of Medicine
	John Joe , MD, President, Harris County Academy of Family Physicians
Patient Groups	Laura Batz Townsend , Founder & Director, Louise H. Batz Hospital Awareness Fund
	Mellanie True Hills , CEO, StopAfib.org & American Foundation for Women's Health; Author, Award-Winning A Woman's Guide to Saving Her Own Life
Hospitals/ Providers	Michael Shabot , MD, Senior Vice President & System Chief Medical Officer, Memorial Hermann Healthcare System
	Ralph Farr , Vice President for Information Services, University of Texas Medical Branch at Galveston
	Charlotte Weaver , RN, PhD, Senior Vice President and Chief Clinical Officer, Gentiva Health Services

Dissemination

Dissemination

- Website: <http://sharpc.org>
- Collaboration with Vendors and RECs
- Workshops at HIMSS and AMIA
- Webinars and eBlasts
- Project Advisory Committee
- Intellectual Property Management
 - Open source
 - Licensing
 - Free download

National Center for Cognitive Informatics and Decision Making in Healthcare

Home
About Us
Org Chart
Projects
Key Personnel
Project Advisory Committee
Office of the National Coordinator for Health Information Technology and Other SHARP's
SHARP C Wiki

Home

The National Center for Cognitive Informatics and Decision Making in Healthcare (NCCD) is funded by the [Office of the National Coordinator](#) for Health IT under the Strategic Health IT Advanced Research Projects (SHARP) Program, which seeks to support improvements in the quality, safety and efficiency of health care through advanced information technology. NCCD is a consortium of nine institutions led by The University of Texas Health Science Center at Houston.

The award was one of four presented by the Office of the National Coordinator for Health Information Technology (ONC) through the American Recovery and Reinvestment Act of 2009 to address key barriers to health information technology. NCCD's research focus area is Patient-Centered Cognitive Support. [Dr. Jiajie Zhang](#) is the Principal Investigator of this award and [Dr. Jiajie Zhang](#) and [Dr. Vimla L. Patel](#) are the Co-Directors of NCCD.

Participating Institutions

- [The University of Texas Health Science Center at Houston](#) (lead institution)
- [Arizona State University](#)
- [Baylor College of Medicine](#)
- [Baylor Health Care System](#)
- [Harvard University](#)
- [Intermountain Healthcare](#)
- [University of Maryland at College Park](#)
- [University of Washington](#)
- [VA Palo Alto Health Care System](#)

Video of the SHARPC Kickoff Teleconference, May 14, 2010

SHARPC Wiki > Video of the SHARPC Kickoff Teleconference, May 14, 2010

Wiki

Discussion

History

Video of the SHARPC Kickoff Teleconference, May 14, 2010

WikiScrnShotLong



The following links are MP4 files. These files play well on both Macintosh and PC computers.

The links below split the teleconference into sections, for ease of playback.

[Introduction](#)

[Project 1: Work-Centered Design of Care Process Improvements in HIT](#)

[Project 2A: Cognitive Foundations of Cognitive Decision: Implications for Decision Support](#)

Evaluation

Evaluation of Center

- Formative and summative
- Evaluation will focus on
 - Execution of project plans
 - Functioning of PAC
 - Roles of multi-stakeholder network
 - Dissemination
 - Collaboration with other SHARP projects

Evaluation of Center

- Yearly Evaluation
 - 2-year plan to be developed in collaboration with FSC (after June 2-3 meeting with FSC at ONC)
 - Evaluation at 12th, 24th, and 36th month
 - A formative review by PAC at the annual meeting
- Quarterly Evaluation
 - Reviewed by PAC at its quarterly meetings
 - Covers plans as well as performance

Evaluation of Individual Projects

- Reviewed by the Scientific Committee
- Yearly Plan and Review
 - 1-2 page yearly summary plan
 - milestones, activities, and outcomes
- Quarterly Plan and Review
 - 1-2 page quarterly detailed plan
 - research, development and dissemination plans

More Evaluation Plans

- Continue Matrix project management
- Expect Crystalline growth of projects
 - Baldrige assessment of domains
- Develop responsive agility to accelerated technology
- Apply continuous quality improvement
 - PDCA, metrics development and evaluation

Meeting Schedules

- Annual Meetings (face-to-face)
 - In Houston
 - First one: March or April, 2011
 - Participants: PAC, ONC, Project Leaders, selected project team members
- Quarterly Meetings (WebEx)
 - PAC, Scientific Committee
- Monthly Meetings (Teleconference or WebEx)
 - Scientific Committee
- Other scheduled or ad hoc meetings
 - As needed

Thank you