Designing Healthcare of the Future - Transdisciplinary Thinking

David Cowan, Jennifer Coppola, Christie Hunt
To solve complex problems we need to address them at a higher level than the level where they were created...

Einstein – paraphrase
Goals

• Describe *Design Process*, Design Thinking

• *Transdisciplinary* Problem Solving

• *Ideas* for better Team based Problem Solving

• *Recruiting* the next generation of great thinkers to Healthcare
Healthcare Design of the Future, 2015
Georgia Tech, SimTigrate Design Lab, HCDF

HCDF 2015 Resources Class Pictures Group Projects Open House

Class Exercises Students Prototype Review

https://hcdf2015simtigrategatech.wordpress.com
Designing Healthcare of the Future

A class to

expose students to healthcare,

explore the design process, and to

consider transdisciplinary thinking
Many Design Challenges

These are some of the topics we have addressed

• Preparing a Community Hospital for an Infectious Epidemic
• Streamlining a Pediatric Cancer Treatment Clinic
• Improving Teamwork in treating Sepsis
Patient Biocontainment Units: Optimizing the Environment of Care
Quick Assist - a wall mounted communication system
Collaborative Work Area
Co-Presenters

• **Jennifer Coppola, MSHS,**
  – A student in the class
  – Now meaningfully employed

• **Christie Hunt, RN**
  – Adjunct Faculty for the Class
  – Nurse Educator at Piedmont Hospital
  – And a Trans Disciplinary Thinker
Preparing Engineers to Lead Design

• Different than Process Improvement
• Diverse Team
• As we all know Healthcare is Complex, even more so in design

• Need to grow to become Trans Disciplinary
Florence Nightingale - Transdisciplinary Thinker

- Clinician
- Statistician
- Designer
- Women’s Advocate
- Leader
- International Education/Experience
Diagram of the Causes of Mortality in the Army in the East.

The areas of the blue, red, & black wedges are each measured from the centre as the common vertex.
The blue wedges measured from the centre of the circle represent areas for area, the deaths from Preventible or Mitigable Zymotic disease, the red wedges measured from the centre, the deaths from wounds, & the black wedges measured from the centre the deaths from all other causes.
The black line across the red triangle in Nov 1854 marks the boundary of the deaths from all other causes during the month.
In October 1854 & April 1855, the black area corresponded with the red, in January & February 1855 the blue corresponded with the black
The entire areas may be compared by following the blue, the red & the black lines successively.
Solving Healthcare Problems
Building a Context

• Understanding and defining Problems
• Recognizing the many perspectives
  – Patients
  – Doctors
  – Nurses
  – Designers
  – Engineers
  – Builders
  – Financiers
Building a Context

• Wicked Problems

• Complex Adaptive Systems

• SEIPS
DEALING WITH WICKED PROBLEMS...

- Anything you do will change
- But grand expectations are possible to achieve...

LEARN about the PROBLEM...
SHAPE/NUDGE
KEEP WATCHING the SYSTEM

"I see what you see?"

You’re NOT HELPLESS...
BUT you’re NOT in CONTROL.

be AMBITIOUS, but also SKILLED
in how you USE the SYSTEM & EDUCATE STAKEHOLDERS.
Characteristics of Wicked Problems

• No agreement about what the problem is or what solutions are possible
• Creating solutions changes the problem
• Outcomes are “better” or “worse” Not right or wrong.
• Crucial role for stakeholders who hold different definitions of the “real” problem, its causes and potential solutions
Technology Innovation

Increased Efficiency

Increased Effectiveness

Decreased Risk

Decreased Cost/Use

Increased Use

Increased Expenditures

Improved Care

Longer Life

01/18/2018
SHS Webinar, DC, CH, JC
Complex (Adaptive Systems)

- They are **nonlinear, dynamic** and do not inherently reach fixed equilibrium points. The resulting system behaviors may appear to be random or chaotic.

- They are composed of **independent agents** whose behavior can be described as based on physical, psychological, or social rules, rather than being completely dictated by the dynamics of the system.

- Agents' needs or desires, reflected in their rules, are not homogeneous and, therefore, their **goals and behaviors are likely to conflict** -- these conflicts or competitions tend to lead agents to adapt to each other's behaviors.

- Agents are **intelligent, learn** as they experiment and gain experience, and change behaviors accordingly. Thus, overall systems behavior inherently changes over time.

- Adaptation and learning tends to result in **self-organizing** and patterns of behavior that emerge rather than being designed into the system. The nature of such emergent behaviors may range from valuable innovations to unfortunate accidents.

- There is **no single point(s) of control** – systems behaviors are often unpredictable and uncontrollable, and no one is "in charge." Consequently, the behaviors of complex adaptive systems usually can be influenced more than they can be controlled.

Rouse
SEIPS Model
SYSTEMS ENGINEERING INITIATIVE FOR PATIENT SAFETY

WORK SYSTEM
- Tools & Technology
- Organization
- Person(s)
- Tasks
- External Environment

PROCESSES
- Physical
- Cognitive
- Social/behavioral

OUTCOMES
- Desirable
- Distal
- Proximal
- Undesirable

ADAPTATION
- Anticipated or unanticipated
- Short- or long-lasting
- Intermittent or regular

Professional Work
Collaborative Professional-Patient Work
Patient Work

Patient Professional Organizational
Organize the existing ICU rooms to improve safety, efficiency and satisfaction

### Physicians
- Pediatric cardiologist
- Pediatric cardiac surgeons
- Respiratory therapists

### Support personnel/staff
- Biomedical engineers
- ECG technicians
- Radiographers
- Emergency specialists

### Nurses
- Bedside nurse
- Critical care nurse
- Nurse-in-charge

### Family
- Parents
- Involved Family Members and Friends

### Tools and Technology
- Patient monitoring equipment
- ECMO
- ECG machines
- Diagnosing tools
- Communicating tools

### Room environment
- Lighting
- Windows and Views
- Bedside Facilities
- Private Vs Multi-Beds
- Materials and temperature

### Process
1. Altering safety Protocols
2. Optimize patient sleep
3. Organize and Schedule family waiting & Visit
4. Facilitate communication system

### Outcomes
- Patient Safety
- Decreasing length of Stay
- Reduce Medical Errors
- Staff Satisfaction
- Management satisfaction
Building a Context

• Wicked Problems
  – Implementing Solutions Change the Problem
  – Multiple Systems

• Complex Adaptive Systems
  – No Clear Leadership
  – Dynamic

• SEIPS
  – Inter relationships
  – Causal Model
The Design Process

• **Defining** the Problem/Opportunity

• Developing **Goals** – Establishing Criteria for Success

• **Research:** Discovery, Human Centered Design, Experiment,

• Propose **Solutions**

• **Prototype** and Refine, Develop Specifications

• **Build**
Teams

• Team Formation
  – Get the Skills / Experience Needed, Multidisciplinary

• Process for Team Development
  – Forming, Storming, Norming and Performing

• Support with Subject Matter Experts

Team Development

Forming > Storming > Norming > Performing
Team Transdisciplinary
Pivot the Room
Pivot the Room

- Describe the problem from the **various perspectives**
- Build a **unified model**
- **Iteration** – constantly improving the understanding of the problem and the solutions developed
Other Perspectives

• Adjunct Faculty - Christie Hunt, RN, Nurse Educator at Piedmont Healthcare in Atlanta, was an IT specialist before returning the Nursing School

• Student, Jennifer Coppola, MSHS, recent graduate, IE student in a design class.
Subject Matter Experts

- Nurses
- Physicians
- Architects
- Engineers
Build Understanding

• What is the environment?
• Who are the players?
• What are the goals?
• What is the paradigm?
• How do they interface?
Build Understanding

• What are the problems?
• What will we break?
Interdisciplinary Thinking

• Requires Empathy
• Must be able to put yourself in someone else’s shoes.
• Wicked problems require it.
Examples

• OR to ICU Handoff
• Increasing Functionality in Aging OR
Developing Trans Disciplinary Thinking

• Encourage a questioning attitude. “I wonder why?”
• Teach active listening. “What did you hear? What needs clarifying?”
• Support empathy. “How are the goals different in that team?”
• Praise the progress and then take it to the next step. “I like your thinking. I wonder…”
Initial Perspective

- Structural Thinking/Factual reasoning
- Skepticism
- Continuous Optimization
Class Experience

• Challenged my way of thinking
  – Spahettii workshop > saw how design students think
  – Project Abiguity
    • BME and Design Students Thrived
    • I was the one to ask the Questions
      – What do customers want
      – Is this feasible
  – Learned to really value role each plays
Results

• Gives a better picture of the real world, what to expect

• Although not a design thinker yet – it led to:
  – a higher level of understanding and
  – improved communication skills

• Learned a lot of real world skills beyond the textbook
Remembering Our Goals

• **Interest in Healthcare** – we need more great thinkers to help us solve our problems

• **Transdisciplinary Thinking** - solving problems at a higher level than where they were created

• **Framing our Problems** – Wicked, Complex, Adaptive, SEIPS

• **Defining the Challenge**

• **Team Development**
How do we attack them...

• **Transdisciplinary Thinking**
  – Seeking solutions at the intersection of Facility, Devices, Process and Culture
  – And at the intersection of Doctors, Nurses, patients, Hospitals, Technology, Society, etc.

• **With Great Courage (and Risk)**
  – Investment
  – Potential Harm – unintended consequences.

• **And with all the skills and tools we have**
Discussion
Building a Context

- Wicked Problems
- Complex Adaptive Systems
- SEIPS
Team Transdisciplinary
Thank you so much for participating

Hope to see you at the Conference in February, here in Atlanta.

Who will be coming?

Come back to my session, I will have some additional information to share with you.

David, Christie, & Jennifer