Patient Room of the Future
Transforming Patient Care & Nursing Practice using Innovative Technology & Human-Centered Design

Michelle Y. Williams, RN, MSN
Nursing Practice Leader, Innovation & Advanced Technology
Kaiser Permanente

Summer Institute in Nursing Informatics
University of Maryland School of Nursing
July 20-23, 2011
Overview

To transform care at the bedside, it is essential to design the patient-and-family-centered *Hospital Patient Room of the Future* for safety, quality care, and clinical workflow efficiency. The focus of this presentation is to share with you our experiences exploring innovative health care technologies for the hospital and the use of:

- ethnographic research
- agent-based modeling, and
- human-centered design

...to improve nursing workflow, decision support, and patient care.
Objectives

1. Describing the benefits of using ethnographic research to improve clinical workflow,

2. Defining agent-based modeling and giving examples of its use in decision support, and

3. Identifying the benefits of using human-centered design elements to improve patient care at the bedside.
Patient Room of the Future: Overview

- Improve Nursing Workflows
- Integrate Clinical Devices with the Electronic Medical Record (EMR)
- Improve Patient Safety
- Improve Patient Satisfaction
- Improve Clinical Efficiency
- Consolidate Nursing Tools

Kaiser Permanente
Ethnographic Research is the study of human behavior in its natural context, involving observation of behavior and physical setting.

Advantages/Benefits: The biggest advantages of ethnographic research include direct access to real-life places, people, and situations. For example, the researcher can see people in their natural settings and environments, including their homes, hospital nursing units, ambulatory clinics, and pharmacies, etc.
Approach

**Ethnographic Research:** Interviews, focus groups, and video journalism were used to gain insights from Kaiser Permanente frontline clinical staff, patients/members, and ancillary staff about the hospital work environment and patient care. In addition to the data gathering during the field research, several stakeholder groups (IC, IAT, ILABS, IT, EA, NFS, Garfield, PointForward) participated in a series of information gathering sessions and workshops, in addition to the research data synthesis and use case development processes—for this project.

**Detailed Ethnographic Field Research Plan**

<table>
<thead>
<tr>
<th>Task</th>
<th>Details</th>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline workshop</td>
<td>Approx 4 hr. session, to bring out the existing collective knowledge regarding patient rooms, based on previous projects</td>
<td>Rough outline of field guide and field activities</td>
</tr>
<tr>
<td>Fieldwork at KP Modesto, Santa Clara Medical Centers</td>
<td>5 full days of interviews, observations and exercises with nurses</td>
<td>Photos, notes, video footage</td>
</tr>
<tr>
<td>Analysis and Synthesis</td>
<td>Needs and models, key opportunity areas for improving nurses' and patients’ experience through technology</td>
<td>Presentation on findings</td>
</tr>
<tr>
<td>Nurse Managers’ Workshop</td>
<td>Present initial insights to nurse managers and facilitate initial design session to test synthesis and stories</td>
<td>Video clips of nurses interaction with initial synthesis</td>
</tr>
<tr>
<td>Video Editing</td>
<td>Selecting video clips and photos to make a documentary-style video</td>
<td>10-15 minute video/DVD</td>
</tr>
</tbody>
</table>
Observation & Ethnography 101

See the world with fresh eyes.

Give yourself the opportunity to experience what we cleverly call “vuja de”...seeing something familiar as if it were the first time.
Ethnography at the Point of Need

Most companies start with the solution, not the problem—and that’s the problem. Ethnography opens up new problem spaces. Incubation generates the solutions for those new spaces.

**Ethnography**

The tools of ethnography are relatively simple: interviews, observation and participating. The practice, however, is highly complex, requiring experienced researchers who know how to dig for things when it’s not always clear what they are.

The results are new perspectives on customers.

- Customer models
- Compelling video
- New defining characteristics
- Previously unknown needs

**Incubation**

Incubation turns customer insights into strategic assets. Companies often spend too much time brainstorming inside the same old frameworks. Point Forward is data-driven, using generative new imperatives.

These new frameworks produce differentiated product opportunities:

- New product and service concepts
- New value propositions
- New ideas for messaging
- New segmentation

http://www.pointforward.com/services.htm, PointForward, 2011
Findings of Ethnographic Research: Nurses

Guiding principles for the Patient Room of the Future (nurse’s perspective)

Simplify my paths
“Give me the shortest path with the fewest obstacles.”

Shorter, quicker paths:
- to medications and supporting supplies
- to ADL (activities of daily living) supplies for patients i.e. chapstick, socks, water, etc
- to find back-up functioning equipment when something fails
- to people who can provide help when I need it
- to places/ways to chart when I don’t want to disturb the patient or I need privacy
- to disseminating information throughout the unit. (“...is broken...”)

Easier access to:
- Medication rooms
- Medication drawers
- Computer systems
- Emergency alert systems
- Clocking in/clocking out

Support me with Knowledge
“Support me with more information. Let me pull it easily and efficiently when I want it. Push relevant information out to me sensitively because I’ve got a lot going on. Keep me from feeling in the dark.”

Knowledge I need on three levels:
1) About my specific patient
   - Background/history/preferences
   - Recent/current clinical data
   - How the patient is “feeling”
2) About my other patients while I’m with this one.
3) About the unit/system information
   - Locations of stuff (where’s the poop bucket?)
   - Codes, passwords, protocols
   - Unit processes (e.g., this is how we do shift change on this unit)

Reduce my “gatekeeping” tasks
“Take some of the non-nursing stuff off my plate. Allow self-service for others.”

Coordinating caregivers
- Tests/Procedures/Discharges involving clinicians, transport, family, patients, coordinators

Timing, schedule, reminders
For patients and visitors:
- “When is the doctor coming?”
- “What happens next?”
- “How many more times do I need to do ___? How many have I done already?”

Patient training and education
- Clinical “how-to’s”, home instructions
- How the hospital works, what to expect

“Concierge services”
- Food, water, ice for patients and visitors
- ADL (activities of daily living) supplies for patients i.e. chapstick, books, toothpaste, etc.
- Wayfinding for visitors
Findings of Ethnographic Research: Patients

Objectives: To ensure the patient and family member perspectives are understood and used to inform Interactive Patient Care technology (IPC) prototypes, simulations, usability testing and activities at the Garfield Center (also to inform future pilots).

Summary of Thematic Findings:

One Size Does NOT Fit All

“It’s the Little Things that Matter”

Just Call Out My Name

Keep it Simple

Keep me “In the Know”

Calgon, Take me Away!
Minimize the role of RN as a “Gatekeeper”
Offload non-nurse tasks to the system and support self-service

Scenarios 9 & 10
Transparency in Patient & Hospital Schedule View
Meeting Basic Needs of Patient / Family

9:30 AM Jack just had “X” surgery and is being moved to his post surgery in-patient room, where his nurse, Ellen welcomes him, suggests he get settled in and relax, until she returns to check in on him and take his vitals. BDIC (Capsule, etc.) integration with EMR (Working Code), dashboard (EPIC, etc.)

After getting comfortable in his bed, Jack turns the TV on and finds a schedule that reads “Jack Smith’s Agenda for today”. The info presented allows Jack to know exactly what was happening, what to expect and when to expect it. The agenda lets him know that his vitals will be checked at 10:15 AM. Jack has time to relax & further explore and notices that he also has access to modify his meal menu and request basic necessities. Since his wife, Lauren is staying overnight to keep him company, the self-service capability is very helpful to Jack, as he orders extra pillows and blankets for Lauren. He also has control of the temperature and lighting in his room.

Infotainment, IPC, Integration dietary, care board, education, EVS, integration with stocking [supply chain] capability, leverage In-Patient Scheduling project. Automate the care board to Infotainment System (examples: Get Well Network, LogNet), touch screen (Smart Phone, WOW, etc.)

Jack can also see that if his healing goes well, he should be discharged in 2 days and will receive more information (e.g. timeline agenda and/or checklist) on what to expect at discharge as the day approaches. Jack can access pertinent information about his hospital plan of care, including his post operative care focus (coughing, deep breathing, ambulating), and post discharge needs to continue the healing process at home (wound checks, etc.), supplies he will likely need when he is discharged, and how to schedule his outpatient appointments. Integration with ADT.

Nurse Ellen knocks & walks in to take Jack’s vitals. The vitals are updated and available for Jack and his healthcare team to view. Everything is great and Ellen left to check on her other patients. Lunch arrives at 11:30 am, which gives Jack plenty of time to take a walk around his floor. He receives reminders twice a day to take a walk to get some exercise. Jack’s lunch was delicious and exactly what he specified. He has time for a short nap before his scheduled blood test early afternoon. Jack plays his favorite genre of music and falls asleep. BDIC (Capsule, etc.)

While Jack takes advantage of KP’s self-service system, Nurse Ellen had time for her other patients and time to catch up on charting without any interruptions. Today was as great day for Jack & Ellen.

Reduction in Never Events, Patient Safety Risks. (Infection Prevention, Hygiene, Falls Prevention, Pressure Ulcer Prevention)
Agent-Based Modeling: (ABM) is a class of computational models for simulating the actions and interactions of autonomous agents with a view to assessing their effects on the system as a whole. ABM combines elements of game theory, complex systems, emergence, computational sociology, multi-agent systems, and evolutionary programming. The models simulate the simultaneous operations and interactions of multiple agents, in an attempt to re-create and predict the appearance of complex phenomena.

**Uses:** Agent-based models have been used since the mid-1990s to solve a variety of business and technology problems. Examples of applications include supply chain optimization and logistics. ABMs have also been used to analyze traffic congestion. In these and other applications, the system of interest is simulated by capturing the behavior of individual agents and their interconnections. Agent-based modeling tools can be used to test how changes in individual behaviors will affect the system's emerging overall behavior for decision support.

With Agent-Based Modeling, a **Digital Nurse**, which is an *intelligent personal assistant* that can support nursing and patient care technician (PCT) functions in hospitals, can be designed to manage the nurse’s daily tasks of finding and recording patient information, and taking care of patient care coordination across settings and with other colleagues and providers.

- The **Digital Nurse** gets its intelligence from its knowledge about the daily practices of nurses and patient care technicians in hospitals.
- The **Digital Nurse** knows what the nurse/PCT is doing, where he or she is, which patient is being taken care of, etc.
- The **Digital Nurse** is integrated with the patient room’s clinical devices and the hospital's EMR and medicine dispensing systems, as well as with intelligent planning and scheduling systems, to have an up to date understanding of the context and situation.
- The **Digital Nurse** runs on a hospital’s existing computer infrastructure, both on mobile and cloud-based computing solutions.

**Benefits:**

The **Digital Nurse** helps hospital RNs and PCTs be more accurate, more efficient, and more patient focused, and able to spend more time on patient care activities.

The **Digital Nurse** can also be used as a scenario driven training tool.
Agent-Based Modeling: Personal Digital-Nurse Agents

**Personal Agent:**
A software agent that acts as your “personal assistant” or acts as your proxy, based on your work practice knowledge.

**Tiered System**
Tier 1: Data entry
Tier 2: Simple rule based
Tier 3: Complex problem solving

Support Nursing Workflow

Agent-Based Modeling Automates Nursing Workflow
“The Digital Nurse”
Support RN’s in their clinical practice, improves efficiency, automates workflow

System to systems engineering: Agent as an approach for integrating systems
Agent-Based Modeling Performance Improvement Goals for Nursing

Provide Support with Multi-level Knowledge

- Support creating patient documentation
  **Objective:** \( \downarrow 35.3\% \) documentation

- Support in getting the right patient information at the right time (patient awareness)
  **Objective:** \( \uparrow 19.3\% \) patient care activities

Simplify the Path

- Support coordination within and between floors
  **Objective:** \( \downarrow 20.6\% \) care coordination

- Support scheduling (patient discharge, RN patient workload)
  **Objective:** \( \uparrow 19.3\% \) patient care activities; \( \downarrow 20.6\% \) care coordination

Device Integration

- Support medicine finding and ordering
  **Objective:** \( \downarrow 17.2\% \) medication administration

- Patient health monitoring
  **Objective:** \( \downarrow 7.2\% \) assessment/vitals

Human-Centered Design

Human-Centered Design (HCD) is a process and a set of techniques used to create new solutions for the world. Solutions include products, services, environments, organizations, and modes of interaction.

The reason this process is called “human-centered” is because it starts with the people we are designing for. The HCD process begins by examining the needs, dreams, and behaviors of the people we want to affect with our solutions.

- We seek to listen to and understand what they want.
- We call this the Desirability lens.
- We view the world through this lens throughout the design process.

Once the range of what is Desirable is identified, we begin to view potential solutions through the lenses of Feasibility and Viability. These lenses are brought in during the later phases of the process.

HCD Experience-Based Decision Making

People drive all stages of the design process.

Experience-based decision making – move beyond abstract data to direct experiences.
HCD Process

- Observations & storytelling
- Synthesis
- Brainstorming
- Prototyping
- Field-test
- Pilot & measure

Laying the foundation
Imagining the possibilities
Building the future
# HCD Sample Training Guide

<table>
<thead>
<tr>
<th>Session</th>
<th>Course</th>
<th>Description</th>
<th>Objectives</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Human-Centered Design</td>
<td>&quot;What is it? Why is important? How will it affect my work? What's in it for me?&quot;</td>
<td>Participants value HCD and are motivated to engage in the rest of the curriculum.</td>
<td>2 hours</td>
</tr>
<tr>
<td>2</td>
<td>Ethnography</td>
<td>&quot;Why is ethnography important? What's in it for me? How do I do it? When and how should I get help?&quot;</td>
<td>Participants can prepare and conduct basic contextual inquiry and can analyze the results.</td>
<td>2 hours</td>
</tr>
<tr>
<td>3</td>
<td>Introduction to Personas</td>
<td>&quot;What's a persona? How are they used? How do I make one?&quot;</td>
<td>Participants can create personas for simple projects and can effectively use personas created by others.</td>
<td>2 hours</td>
</tr>
<tr>
<td>4</td>
<td>Scenarios</td>
<td>&quot;How do I convert a business requirement or use case into a scenario? How do I use scenarios in my projects?&quot;</td>
<td>Participants can create scenarios and use them to generate high-level software requirements.</td>
<td>2 hours</td>
</tr>
<tr>
<td>5</td>
<td>Prototyping</td>
<td>&quot;What are best practices for prototyping software? Where does prototyping fit in a human-centered design process?&quot;</td>
<td>Participants can apply prototyping best practices in the context of a software design &amp; development project</td>
<td>2 hours</td>
</tr>
</tbody>
</table>
Human-Centered Design: Single-Bed NICU
Plans for the Kaiser Permanente: Patient Room of the Future

2007 to 2010 – Laying the Foundation

- **Technology Research** – Point of Care & Interactive Patient Care (IPC) Technologies.
- **Ethnographic Research** – Frontline staff & KP Patients/Members.

2011 – Imagining the Possibilities

- **Brainstorming** – Ideas, Ideas, Ideas!
- **Prototyping** – Scoping, Designing, & Planning Patient Room Models.

2011 to 2012 & beyond – Building the Future

- **Field Testing** – IPC & Nursing Communications Tools.
- **Pilot & Measure** – Garfield Innovation Center & Medical Center.
1. Build three separate patient room prototypes and one nurses’ station.

2. All rooms will be equipped with baseline Kaiser hospital room template configurations: equipment, technology, and furniture.

3. The rooms will have varied iterative designs, technology upgrades, and fidelity levels.

4. One room will be built as a state-of-the-art patient room design.

5. The final PRF prototype template will be piloted in a medical center, following clinical workflow and technology redesign activities, simulation deep-dive learning sessions, and pilots at the Garfield Center.
Thank You!

Michelle Y. Williams, MSN, RN
michelle.y.williams@kp.org
925-924-6603