

Patient Engaged Human Factors: The Work of Medication Management in Older Heart Failure Patients

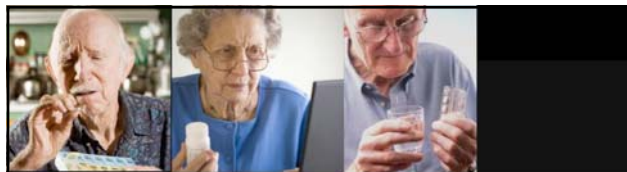
Robin Mickelson MS, RN



Vanderbilt University School of Nursing



Center for Research in Systems Safety



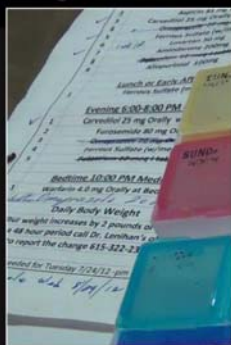
“Clinicians are not the only actors in health care; patients also play an important role in their own care... the patient’s work must be examined in our efforts to reduce errors.”

(Unruh & Pratt, 2007, p.236)

Why Examine Patient Health Work?

Improve Patient Performance and well-being

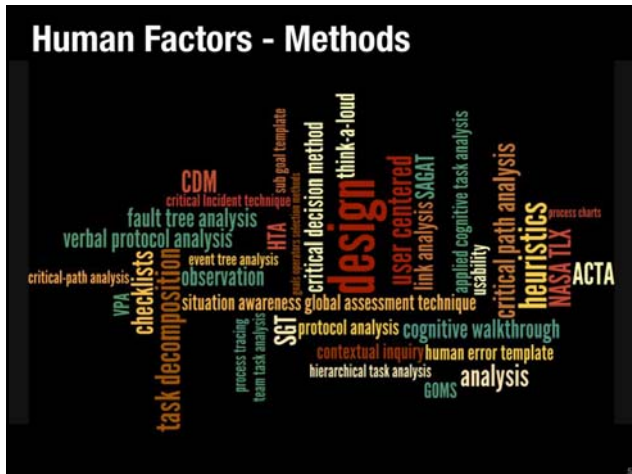
- ▶ Performance problems
- ▶ Dissimilar to professionals
- ▶ Different sociotechnical systems
- ▶ Improve the performance and well being of patients



How to Examine Patient Health Work

Human Factors Approach

- ▶ “Human factors is the theoretical and fundamental understanding of human behavior and performance in purposeful activity, interacting with sociotechnical systems, and the application of that understanding to design in real settings” (Wilson, 2000)
- ▶ Systems approach
- ▶ Design Driven
- ▶ Outcomes: performance and well-being (Dul et al., 2012)



Human Factors Contributions

- ▶ Human factors has improved safety and performance in aviation and nuclear power
- ▶ Design of better systems and technology

A photograph showing two technicians in yellow safety vests working on a complex piece of machinery, likely an aircraft engine or a nuclear reactor component. They are looking at a document and pointing at the equipment.

Human Factors: Clinicians

Human factors has improved the safety and performance of clinicians (MDs, RNs, pharmacists etc.)

Three panels showing a clinician interacting with a patient, a mannequin, and a child. The first panel shows a clinician talking to a patient. The second panel shows a clinician talking to a mannequin. The third panel shows a clinician talking to a child.

Design of better systems and technology

Human Factors: Patients

Human factors can contribute to patients, families what it has done for professionals (pilots, MDs, RNs, etc.)

Three panels showing a patient interacting with a mannequin, a clinician, and a child. The first panel shows a patient talking to a mannequin. The second panel shows a patient talking to a clinician. The third panel shows a patient talking to a child.

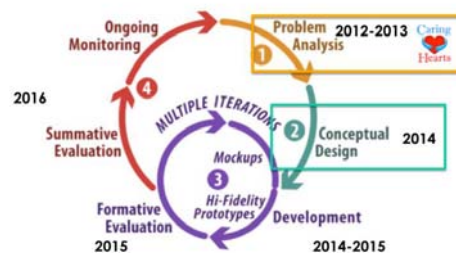
Design of better systems and technology

Patient Engaged Human Factors

“The application of human factors theories and principles, methods and tools, analyses, and interventions to study and improve work done by patients and families, alone or in concert with healthcare professionals.”

(Holden & Mickelson, 2013; Holden et al., 2013)

A Human Factors Approach to Support Older Chronically Ill Patients' Home Care



NIA/NIH K01AG04439 & VICTR Scholars Award
Principle Investigator: Richard J. Holden PhD

Medication Adherence Problem Space

Performance problems affecting patient well-being

- ▶ **Chronic disease increasing in prevalence**
 - ▶ Aging population, longer life span
 - ▶ Multiple comorbidities
- ▶ **Medication non-adherence rates estimated 20% to 50% in older adults with chronic disease**
- ▶ **Results in:**
 - ▶ Unnecessary disease progression
 - ▶ Lower QOL
 - ▶ Preventable deaths
 - ▶ Avoidable medical spending

Medication Adherence Problem Space

Previous Research

- ▶ **Focus on individual level risk factors and prevalence**
- ▶ **Clinician driven interventions low long-term effectiveness and high cost**
- ▶ **Medication self administration is complex with a multitude of factors at many levels of analysis**



Heart Failure Problem Space

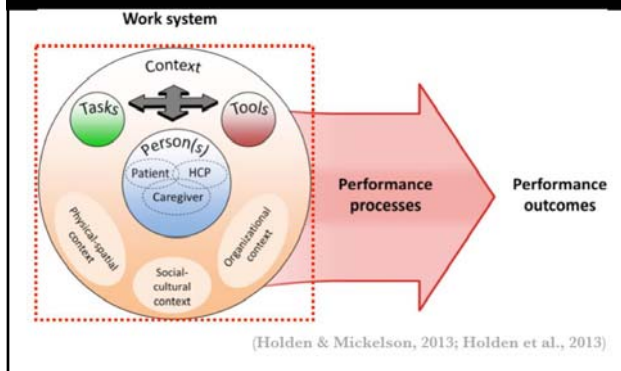
Previous Research

- ▶ Chronic disease dependent on the life long administration of complex medication regimens
- ▶ 5.1 million Americans aged ≥ 20 have heart failure, projected to increase 25% by 2030
- ▶ Leading and fastest growing cause of death in the US among all cardiovascular diseases



Patient Medication Work System

Focus on work system structure



Purpose

The purpose of this study was to describe the nature and prevalence of barriers to medication management and adherence performance in older adults with heart failure using a patient engaged HFE work system model.

Method

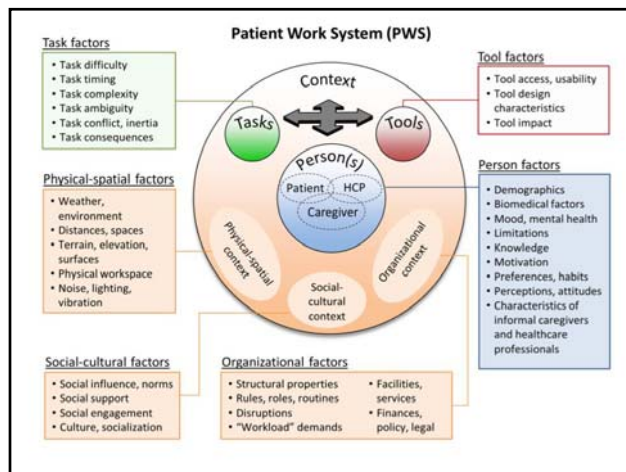
Triangulation of data collection methods

- ▶ Multi-method longitudinal data collection
- ▶ Clinic visit observations
- ▶ In-clinic interviews
- ▶ Standardized surveys
- ▶ In-home observation
- ▶ In-home interview
- ▶ Medical record review



Method

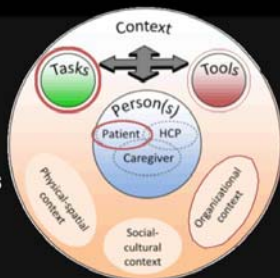
- ▶ Patients (N=30) and caregivers (N=13) from outpatient cardiology clinic in an academic medical center
- ▶ Time since HF diagnosis, 1 month to > 5 to 10 years
- ▶ NYHA Class II (65%) and Class III (35%)
- ▶ Age, M=73.8 years, SD=6.6 (range: 65-86 years)
- ▶ Male 58%, Married, 62%
- ▶ HS education 33% (30% < HS), most retired
- ▶ Annual household income ≤ \$25k 61%
- ▶ Number prescribed medications M=15.1 (range, 3-28)



Results

811 references mentioned by ≥ 5 participants

- ▶ **55% Task barriers**
- ▶ **28% Person barriers**
- ▶ **15% Organizational barriers**
- ▶ **2% Tool barriers**



Task Difficulty

209 references, 100% of participants

- ▶ **Number of pieces or subtasks**
(75% of participants, 74 references)



"I got confused one time. They gave me a prescription for one size and the drugstore didn't have that size so they changed it to something else. Instead of taking one 4mg, is it 4? I had to take two 2mg twice a day and I got confused by that."

Task Difficulty

► Conditionality (x contingent on y)

(47% of participants, 39 references)



"... like it was 247, I take 2-, like if it's 249 in the morning I take one of those pills. And if it's like five pounds in two days I'll take two of them, I believe is what they tell me.... And if he gets up anymore we, we call "

21

Task Difficulty

► Task ambiguity

(50% of participants, 31 references)



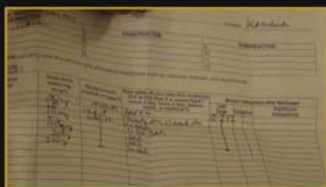
"You get two at night and one during the morning. Maybe that makes you weak and short of breath. I don't know. I I mean, mom doesn't complain anyway. So, we're just going by what we see...."

21

Task Difficulty

► Task changes

(47% of participants, 28 references)



"And if it's too high then they'll tell me lower the dosage and how long to stay on it and go back to my regular dosage and if it's too low they tell me to take a certain amount for so many days and then go back and go back and when to go back and get my blood drawn...."

21

Task Consequences

93% of participants, 114 references

► Effect on life and personal routine

53% of participants, 33 references



"I told (my doctor) you know my getting up so many times at night and so she suggested (I take my diuretic in the morning), but I started taking it in the morning and it got to where I was afraid to leave the house... I just stayed home, you know. There was no control at all."

21

Task Consequences

► Effect on body, health, and mind

87% of participants, 58 references

"The doctor, he's a great doctor, I love him to death, but all the medications that he's put me on, it makes me sick. The last one ... I took it for 3 days ... but I got sicker each day and do you know it took me 10 days to get over that?"



Patient Barriers

100% of participants, 226 references

Lack of knowledge

43% of participants, 65 references

Limitations - Aging and Medical Condition

43% of participants, 60 references



"I don't know what to take them for.... when I get up I take most of them in the morning, now the Furosemide I take some in the morning and some at night."

"Quite honestly, just standing there getting the pills out of the bottle is hard."

Organizational Barriers

63% of participants, 114 references

Medical and bodily routines

30% of participants, 19 references

Medication services & delivery

40% of participants, 31 references

"Well remember when you left the hospital your medicines were kind of messed up because they changed things and you know and then you have such a long list..."

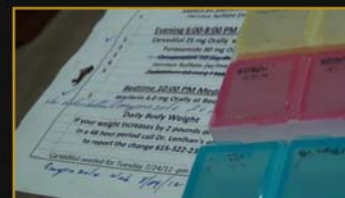
".... they gave her her old prescription instead of giving her the prescription that he (MD) called in. so they didn't check, they're not checking."

Tool Barriers

Design characteristics - Accuracy, up to date

13% of participants, 7 references

"These are them except for a couple I've got to talk to him about that's, uh that doesn't have the doubled-up dose on the Fur-, Furosemide." (talking about medication list)



Conclusions

- ▶ Medication management tasks were particularly difficult, demanding, and complex for older adult with heart failure.
- ▶ Patient limitations, the organizational structure of medication delivery, and lack of well designed tools further impaired medication management performance.
- ▶ Further research is needed to study the work done by patients and their caregivers in order to design effective tools to decrease task demand and overcome limitations in the patient medication work system.

**Thank You!
Questions?**

Robin Mickelson

robin.s.mickelson@vanderbilt.edu

Our R&D Team



Chris Schubert,
PhD



PI Rich Holden,
PhD



Tony Threatt,
PhD



Courtney
Thomas,
MA



Amanda
McDougald
Scott, MS



Russ Beebe,
MA