APPLICATION OF HUMAN FACTORS/SYSTEMS ENGINEERING TO HAND HYGIENE PROMOTION

MARTIN MUSUUZA, MBBS, MPH, PI, RESEARCHER
MARY JO KNOBLOCH, PHD, MPH, PI, RESEARCHER
ROSIE BARTEL, PATIENT ADVISOR AND ADVOCATE
DIVISION OF INFECTIOUS DISEASES, DEPARTMENT OF MEDICINE
UNIVERSITY OF WISCONSIN SCHOOL OF MEDICINE AND PUBLIC HEALTH

DISCLOSURES
• None

OBJECTIVES
• To describe what human factors means in the context of health care
• To describe the role of human factors engineering (HFE) methods in designing hand hygiene (HH) initiatives
• To present a patient perspective about HH
• To provide practical tools that can support HH initiatives and improve compliance
HUMAN FACTORS: CONSIDERING THE ENTIRE SYSTEM

PATIENT SAFETY AND HH: TWO IOM REPORTS

- 1999: To Err is Human: Building a Safer Health Care System
  - Over 100,000 Americans dying due to medical errors each year

- 2001: Crossing the Quality Chasm: Health Care in the 21st Century
  - Safe: “First, do no harm” How to avoid injuries from care intended to help
    - Hand hygiene
  - Effective: match science, with neither underuse nor overuse
  - Patient-centered: “Nothing about me without me”
  - Timely: Unintended waiting
  - Efficient: Constantly seeking to reduce the waste
  - Equitable: Quality care regardless of race, ethnicity, gender, income

PATIENT SAFETY AND HH

- "Crossing the Quality Chasm" emphasized the need to improve the design of health care systems and processes for patient safety
- Information provision alone does not improve HM compliance: need for multimodal approaches
- Human behavior and infection prevention are tightly linked
  - HH is the most important single behavior that healthcare workers (HCWs) can engage in to protect patients from infection
- Focus beyond individuals, rather design/redesign work areas to facilitate HH
WHAT IS HUMAN FACTORS ENGINEERING (HFE)?

- The study of how humans interact physically and cognitively with the world around them, including environments, tools, processes, and procedures. It is “matching” the work system to the “person”
- HFE seeks to optimize the interactions among humans and other system elements

HFE HAS LONG BEEN RECOGNIZED IN OTHER FIELDS

- Aerospace systems
- The nuclear industry
- Ground transportation

WHY DO WE NEED HFE IN THE HEALTH CARE INDUSTRY?

- HFE provides principles, tools, and techniques for:
  - Systematically identifying important factors within the system
  - Analyzing and evaluating how these factors interact to influence risk of healthcare-associated infections (HAIs)
  - Identifying and implementing effective preventive measures
- HFE helps make HH intuitive, efficient, and sustainable
  - Healthcare institutions need organizational structures that support necessary collaboration between HCWs and HFE experts
Limited use and application of formal HFE tools and methods in HH studies

- Only a few HH studies formally assess all components in a system
- Addressing the latent and deep-rooted human factors problems requires assessment of the interaction of critical system components

CONCEPTUAL APPROACHES TO PATIENT SAFETY

- In the past there has been emphasis on individual responsibility
  - provide high-quality patient care
  - avoid adverse events through error-free practice
  - Assumes infallibility of HCWs—unrealistic and unsafe
- Systems emphasis has shown success
- Latent conditions (blunt end): “resident pathogens” within the system
  - arise from decisions made by managers, engineers, designers and others
- Active failures (sharp end)—direct actions/behaviors resulting in failure
  - violations or workarounds (e.g., deliberate failure to perform HH)

CONCEPTUAL APPROACHES TO PATIENT SAFETY

- Swiss cheese model
- Systems Engineering Initiative for Patient Safety (SEIPS) model
  - 5 elements of the work system: Tools & Technologies, Organization, Process Tasks, Environment
  - Non-linear & integrates many aspects of other models
THE SEIPS MODEL

SIMPLE PROCEDURE IN A COMPLEX ENVIRONMENT
APPLICATION OF SEIPS TO HH

THE PATIENT JOURNEY: HUMAN FACTORS FROM A PATIENT PERSPECTIVE

Rosie Bartel, Patient Advisor and Advocate
bartel1949@gmail.com
REVIEW OF EVIDENCE: EXAMPLES OF HOW HFE PROMOTED HH COMPLIANCE

OBJECTIVE AND METHODS

Objective: Evaluate the relationship between sink location and compliance with handwashing among HCWs and visitors

Setting: Surgical transplant unit

Methods:
- Readily visible accessible sink identified as a major barrier during initial assessment
- 2 additional sinks were placed in highly visible locations on the unit
- Foot pedals and adequate supplies
- Optimal location of sinks selected through collaboration between engineering, facilities planning, infection control, and unit staff
- Covert observers

Brief report
Impact of sink location on hand hygiene compliance for Clostridium difficile infection

Caroline Zielke, Rebekah Blaney RN, Sarah Van Hael BSN, RN, Nuna Sallae MD, PhD

*Division of Infectious Diseases, Department of Medicine, University of Wisconsin, Madison, WI
**Division of Hepatobiliary Surgery, Department of Surgery, University of Wisconsin, Madison, WI

American Journal of Infection Control
Journal homepage: www.ajicjournal.org
RESULTS: IMPACT OF SINK LOCATION ON HH

<table>
<thead>
<tr>
<th>Compliance</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No HH before</td>
<td>72.5 (58/80)</td>
<td>51.6 (22/42)</td>
<td>0.0104</td>
</tr>
<tr>
<td>No HH after</td>
<td>54.6 (42/77)</td>
<td>37.1 (23/62)</td>
<td>0.0404</td>
</tr>
<tr>
<td>Soap and water after</td>
<td>33.8 (24/77)</td>
<td>51.6 (22/42)</td>
<td>0.0339</td>
</tr>
<tr>
<td>Alcohol gel before</td>
<td>27.5 (22/80)</td>
<td>48.4 (20/42)</td>
<td>0.0104</td>
</tr>
</tbody>
</table>

“Staff reported that the 2 new visible sinks enhanced the likelihood of completing proper hand hygiene.”

INTERVENTION

- Multimodal HH intervention
- Strategically-displayed & collaboratively-designed posters (Visibility)
- Performance feedback (Error prevention)
- Distribution of individual hand sanitizer (Flexibility & Efficiency)
- Alcohol hand-rub dispensers mounted to patient beds (Accessibility & Consistency)
- Institutional support (Context)
RESULTS

• Overall HH compliance improved significantly over a 3-year period from 47.6% to 66.2% (p<0.001)

• Prevalence of HAIs decreased from 16.9% to 9.9% (p=0.04)

• Overall incidence of MRSA decreased from 2.16 to 0.93 episodes per 10,000 patient days (p<0.001) over a 4 year period

CONCLUSIONS

• Improving HCW compliance to a complex behavioral intervention, such as HH requires a systems assessment and designing of interventions that reduce systems barriers to HH

• Being intentional about applying HFE principles to designing HH interventions improves patient outcomes

REFERENCES


THANK YOU FOR LISTENING TO ME

Jackson Musuza, MBBS, MPH, PhD
musuza@wisc.edu

SUSTAINING EVIDENCE-BASED HAND HYGIENE PRACTICES

PRACTICAL TOOLS YOU CAN USE

IT'S TIME TO MIND THE GAP!

- Evidence-based guidelines
- Educational Tools
  - Centers for Disease Control and Prevention (CDC)
    - HH 101: Core Concepts of Hand Hygiene Clean Hands or Health Care Personnel
    - HH 102: Hand Hygiene: Education, Monitoring and Feedback
    - HH 103: Identifying Motivators for Hand Hygiene: External and Internal Factors
    - WHO Guidelines on Hand Hygiene in Health Care, WHO 2009
LEADERSHIP ROUNDS
ONE TOOL YOU CAN USE!

HAI LEADERSHIP ROUNDS (WALK ROUNDS)
• Leadership Rounds
  • A quality improvement tool that connects leaders with frontline staff
  • Leaders meet with staff – where the work is done
  • Leadership understands the value stream; tapping into experience of frontline employees to solve problems
  • Institute for Healthcare Improvement (IHI)
    ▪ Managing by walking around (Gemba Walks)
    ▪ Stresses in-person communication


STUDY OF LEADERSHIP ROUNDS (HAI)

COMMUNICATION
• Much interaction between staff and leaders
• Staff talked freely about mistakes
• Staff and leader’s problem-solved often

STRUCTURE
• Conducted on 19 units in cycles
• Every 3 months
• Time of day is flexible
• 30 minutes in duration
• Flexible location
• Flexible agendas – and modified as needed
KEY THEMES

- Learning Climate
  - An environment that enhances psychological safety (reflection and evaluation time)
  - Staff feel they are respected and knowledgeable partners, can test new ideas or methods

- Psychological Safety
  - Staff feel they are respected and knowledgeable partners, can test new ideas or methods

WHAT DO WE KNOW?

- Leaders can influence learning climate which, in turn, can influence psychological safety
- Psychological safety can lead to workers speaking up
- Evidence supports the link between psychological safety and quality improvement
- Evidence supports Leadership Rounds as a successful tool for patient safety

A. Edmondson, 2014 Aranzamendez, James, & Toms, 2015; A. Edmondson, 1999; Aarons, Ehrhart, Farahnak, Sklar, & Horowitz, 2015; Lindstrom, 2013; McCormack et al., 2002; McFadden, Stock, & Gowen, 2014; Saint, Kowalski, et al., 2010, A. Frankel et al., 2003; A. Frankel et al., 2005; A. Frankel et al., 2008

SUCCESS FACTORS FOR LEADERSHIP ROUNDS IN A HEALTHCARE SETTING

<table>
<thead>
<tr>
<th>Leadership Round Structural Factors</th>
<th>Leader Characteristics and Communication Behaviors</th>
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<tbody>
<tr>
<td>Clinician ownership in the rounds</td>
<td>Leader perceived as being trustworthy</td>
</tr>
<tr>
<td>Articulation and clear documentation</td>
<td>Leader perceived as a good listener</td>
</tr>
<tr>
<td>Enhanced learning environment</td>
<td>Leader perceived to have clinical knowledge</td>
</tr>
<tr>
<td>Key learning points discussed in rounds</td>
<td>Leader shares pertinent learning points to team members</td>
</tr>
<tr>
<td>Providing role models</td>
<td>Leader allows time and space for reflection and learning</td>
</tr>
<tr>
<td>Development of climate of safety</td>
<td>Leader values and appreciates contributions from staff</td>
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LEADERSHIP ROUNDS FOR HAND HYGIENE

Challenge:
How can leadership rounds work to increase Hand Hygiene compliance at your facility?
Do you have leaders who are willing to spend time rounding – specifically for hand hygiene?
Do you have leaders with good communication skills – this is key!

TOOLS YOU CAN USE TO “MIND THE GAP”

KAMISHIBAI CARDS (K CARDS)
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• The word Kamishibai means "paper drama".

• Kamishibai Cards (K Cards) have been used in other fields:
  • manufacturing environments (e.g. Toyota Production System) as a management tool.
  • In healthcare, K cards have been used in daily rounding to improve HAI bundle compliance
    • Spectrum Health Helen DeVos Children’s Hospital (Michigan)
    • American Family Children’s Hospital
    • UW Hospitals and Clinics

K CARDS

K CARDS IN PRACTICE
K CARDS IN PRACTICE

Translating evidence into routine practice challenging.
• Sustaining new practices is even more difficult.

Sustaining best practices appears to be non-linear!

Sustainability is an integrative process of uptake, adaptation, communication, and learning.

OUR STUDY

Examined K Cards as a tool to encourage compliance interactions between leaders and staff.
• Interactions observed (n=14)
• Interviews recorded and coded (n=22)
KEY THEMES

- Facilitators
  - Only takes 2-3 minutes
  - K Cards non-threatening
  - Leaders show support (positive language used)
  - Cues to Action
    - Reminders of bundle elements
    - EMR
    - Viewing the board
- Barriers
  - Afraid to fail
  - Inconsistency in who conducts K Cards

(1) "I thought it was really cool because it's really quick, it doesn't take a long time. I thought we'd be sitting here for 10 minutes, but it's really just like 2 minutes"
(2) "K Cards reinforce education. They also reinforced policy: why do we do these things?"
(3) "Our nurse manager frames it very well so that it's not that we're doing something wrong. But we're using this as an opportunity to grow..."

BENEFITS IDENTIFIED BY LEADERS AND FRONTLINE STAFF

- Facilitate patient and family education
- Improve compliance
- Reminds staff of bundle components
- Sets a unit-level learning climate
- Promotes staff engagement in problem-solving
- Serves as an audit in real time
- Promotes the importance of unit quality metrics
- Emphasizes individual roles in prevention of HAIs

BENEFITS

"I definitely think that being consistent and using the K cards makes people more aware, more compliant. Assessing the line every day, talking about the line in rounds every day, charting on what the line looks like is because of the K cards."

"It's a good teaching moment because it's an actual process..."
WHAT DO WE KNOW ABOUT K CARDS?

- K cards promote clear lines of communication about evidence-based bundles
- K cards appear to provide psychological safety that made staff feel comfortable bringing up problems and discussing solutions with their manager in real time.
- K cards can enhance a unit-level learning climate and keep evidence-based bundles fresh
- Evidence supports the link between psychological safety and quality improvement
- Evidence supports K cards as a successful tool for patient safety

USE OF K CARDS – IS SPREADING

- Expansion to all units of the American Family Children’s Hospital, with replication efforts currently under way.
  - The nurse leaders on the unit have been asked by hospital leaders to assist in the replication process across all pediatric units.
- Replication in some adult units at UW Hospital
- Nurse Scientists at VA are considering use of K Cards (pilot phase)
- Children’s Mercy Hospital, Kansas, MO
- Emory University Hospital, Atlanta (interested)
- AdvocateAuroraHealth (interested)

K CARDS FOR HAND HYGIENE COMPLIANCE

Challenge:

- How can K Cards improve HH compliance at your facility?
- Who would need to approve the use of K Cards?
- Would facility leaders need to see this in action?
- Who would champion K Cards?
THANK YOU!

CONTACT INFORMATION:

MARY JO KNOBLOCH, PHD, MPH
KNOBLOCH2@WISC.EDU