Integrating Human Factors with infection prevention and control

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#SF2H2016 #humanfactors
I have no interest to declare. **However – I should disclose:**

- It will only be possible in 20 minutes to cover the most basic aspects of human factors in an infection prevention and control (IPC) context;
- You/we will not get all of the answers we need today;
- Human factors is a scientific discipline that requires years of training.
Setting the scene: Human factors challenges in healthcare – the guidelines paradox

Junior doctors 2 years elapsed time
Human factors is about the interaction between:

- People & Environment
- People & Procedures
- People & Machines
- People & People
Human factors challenges in everyday life

How to get to room 10!

Signage in a London Hotel, January 2015
Human factors solutions in everyday life

Sieve - Flour

Colander - vegetables

York, England, UK, April 2015
Rapid summary of human factors in healthcare
SEIPS – Systems Engineering Initiative for Patient Safety

SEIPS 2.0 model.

Holden et al (2013)
Semmelweis & human factors
Semmelweis & human factors

SEIPS 2.0 model, Holden et al (2013)
Semmelweis & human factors

SEIPS 2.0 model.

Holden et al (2013)
Semmelweis & human factors

1. Person(s) – doctors versus midwives
2. Task – vaginal examination +/- autopsy
3. Internal environment – the environment enabled doctors to go straight from autopsy to examination of live women
4. Tools and technology – No means to decontaminate hands
5. Organization – power of culture and status

Holden et al (2013)
How the elements of the work system influence behaviour

<table>
<thead>
<tr>
<th>Person</th>
<th>Tasks</th>
<th>Tools and technologies</th>
<th>Physical environment</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse in intensive care unit</td>
<td>The physical, cognitive and psychosocial characteristics of the nurse</td>
<td>Administering intravenous fluids</td>
<td>Physical layout of the unit; physical characteristics of the patients room</td>
<td>Safety culture; teamwork; communication</td>
</tr>
</tbody>
</table>
Integrating IPC and Human Factors makes a lot of sense!

- IPC on the whole is still vertical rather than horizontal;
- Isolated rather than integrated
- The IPC community has only very recently woken up to the value of learning systems dedicated to implementation science
- IPC leaders often lack of authority to implement change
- We are seen more like the “police” rather than the behaviour change experts
- Others see IPC measures [e.g. hand hygiene] as a distraction or interruption to what they perceive as their actual task
“For a while, the electric thermometers we used were in short supply, and the shift started with a mad dash to nab one. We made a joke of it, but behind the laughs, I heard the clock ticking. **Infection control slows down all movement.** Hands must be washed before and after every contact with a patient, and fresh gown and gloves donned every time one enters a patient room, to be discarded when exiting. A thermometer or any other piece of equipment moved from one room to another must be cleaned too.” (Blanton 2007)
“IPC slows down all movement”

• “I can either treat patients or I can practice infection control – you choose”
  • (doctor overheard talking to a nurse, 2012, UK)
IPC – isolated or integrated?

Sepsis: pathophysiology and clinical management

*BMJ* 2016; 353 doi: http://dx.doi.org/10.1136/bmj.i1585 (Published 23 May 2016)

Cite this as: *BMJ* 2016;353:i1585

Treating sepsis: the latest evidence

- **Antibiotics**
  - Early administration

- **Fluids**
  - Several liters initially
  - Colloids
  - Crystalloid
  - Starches
  - High chloride

- **Vasopressors**
  - 1–6 hours after onset
  - Norepinephrine
  - Epinephrine
  - Vasopressin
  - Dopamine
  - Phenylephrine

- **Enteral feeding**

- **Insulin therapy**

- **Deep sedation**

- **Molecular targeted therapies**

- **Lung protective ventilation**

- **Goal oriented therapy**

- **EGDT**
  - Early goal directed therapy

- **Urinary catheter**
Sepsis: pathophysiology and clinical management

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Treating sepsis: the latest evidence

✔ Antibiotics
  Early administration

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✔ Collidioctes
  Crystallloid
  Sterile
  High chloride

✗ Goal chinese
  Therapy

✔ Vasopressors
  1–6 hours after onset

✔ Enteral feeding

✔ Insulin therapy

✗ Deep sedation

✔ Urinary catheter

Criteria for the removal of unnecessary urinary catheters have reduced nosocomial infections.
Why is IPC a challenge?
A good starting point in clarifying the “why”

Using human factors engineering to improve the effectiveness of infection prevention and control

Judith Anderson, MD; Laura Lin Gosbee, MASc; Mary Bessesen, MD; Linda Williams, RN, MSI

Human factors engineering is a discipline that studies the capabilities and limitations of humans and the design of devices and systems for improved performance. The principles of human factors engineering can be applied to infection prevention and control to study the interaction between the healthcare worker and the system that he or she is working with, including the use of devices, the built environment, and the demands and complexities of patient care. Some key challenges in infection prevention, such as delayed feedback to healthcare workers, high cognitive workload, and poor ergonomic design, are explained, as is how human factors engineering can be used for improvement and increased compliance with practices to prevent hospital-acquired infections. (Crit Care Med 2010; 38[Suppl.]:S269–S281)

Key Words: human factors engineering; infection prevention and control; delayed feedback; usability; hospital-acquired infections; simulation; hand hygiene; checklist; RCA; central catheter-associated bloodstream infection

Human factors engineering (HFE) is a discipline which, like any discipline, has its rules and principles. These interactions influence how humans behave and perform, and, as one might expect, the interactions and the effects are observable result. If an infection does occur, it is observed at a later time by
1. Delayed feedback

Cause and effect relationship unclear
2. Lack of connection with positive result

Cognitive disconnect between action & outcome
3. Complexity and inefficiency

Workarounds
4. Time pressure and high cognitive workload

And competing tasks
5. Few infection control cues

Embedding habits that endure reliably
6. Inconsistent ergonomic design practice

Placement of the tools for the job
Five strategies to enhance guideline uptake (Pronovost 2013)

1. Include an unambiguous **checklist** with interventions linked in space and time;

2. Work with **implementation scientists** to help clinicians identify and mitigate barriers and share successful implementation strategies;

3. Collaborate to integrate **guidelines for conditions that co-exist**;

4. Rely more on **systems** than the actions of individuals to ensure recommended practice;

5. Create trans-disciplinary teams and pool expertise from clinical epidemiology, implementation science and **systems engineering (human factors)** to deliver guidelines that are practice focused
Example 1: WHO Multimodal Hand Hygiene Improvement Strategy

The Five Components of the WHO multimodal hand hygiene improvement strategy

1a. System change – alcohol-based handrub at point of care

1b. System change – access to safe, continuous water supply, soap and towels

2. Training and education

3. Evaluation and feedback

4. Reminders in the workplace

5. Institutional safety climate
Example 2: The Five Moments

- Lean risk based approach
- Based on the 80/20 principle
- Addresses overuse, underuse and misuse of hand hygiene in health care
- Influenced by ergonomics and workflow, neuroscience, psychology and based on germ transmission
Example 3: outbreaks of highly transmissible disease
## Summary table: Human Factors approaches to prevent HAI

<table>
<thead>
<tr>
<th>Human factors approach</th>
<th>HAI/IPC example</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use of visual controls/ cues to action</td>
<td>• Hand hygiene</td>
</tr>
<tr>
<td>• Avoid reliance on memory – SMS/automation/Stop Orders</td>
<td>• CAUTI</td>
</tr>
<tr>
<td>• Simplification and standardization of procedures – “system change”</td>
<td>• SSI, Hand hygiene</td>
</tr>
<tr>
<td>• Use of constraints/forcing functions – nurse empowerment</td>
<td>• CLABSI</td>
</tr>
<tr>
<td>• Use of protocols/checklists</td>
<td>• CLABSI/SSI</td>
</tr>
<tr>
<td>• Reduce interruptions or distractions &amp; improve workflow</td>
<td>• CLABSI; SSI; Hand hygiene</td>
</tr>
<tr>
<td>• Instill habits</td>
<td>• Hand hygiene</td>
</tr>
<tr>
<td>• Promote effective team functioning</td>
<td>• Hand hygiene, CLABSI</td>
</tr>
</tbody>
</table>

Adapted from Savor Price (2012)
Some suggested next steps

- Refocus on IPC through a human factors lens;
- Don’t overlook excellent examples of human factors thinking e.g. hand hygiene improvement approaches;
- Develop a roadmap for action;
- Form a coalition;
- Reach out;
- Ignite research;
- Use safety culture assessments prior to implementing guidelines;
In summary

- If we get better at understanding the value of addressing human factors in IPC:
  - Life will be easier
  - Staff will be happier
  - Patients will be safer
Human factors – people to look out for

Pascale Carayon
Steven Shorrock @StevenShorrock
Shelly Jeffcott @drjeffcott
Martin Bromiley @MartinBromiley
Ken Catchpole @KenCatchpole
Ayse Gurses
Clara Alvarado
Hugo Sax @hugo_sax
Neil Wigglesworth @Neilwigg
Claire Kilpatrick @claireekt
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“We cannot change the human condition, but we can change the conditions in which humans work” (James Reason)
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Catchpole K (2013) Spreading human factors expertise in healthcare: untangling the knots in people and systems. Quality and Safety in Healthcare; 0:1-5. doi:10.1136/bmjqs-2013-002036


