

Human Factors Engineering: The science behind designing for human use

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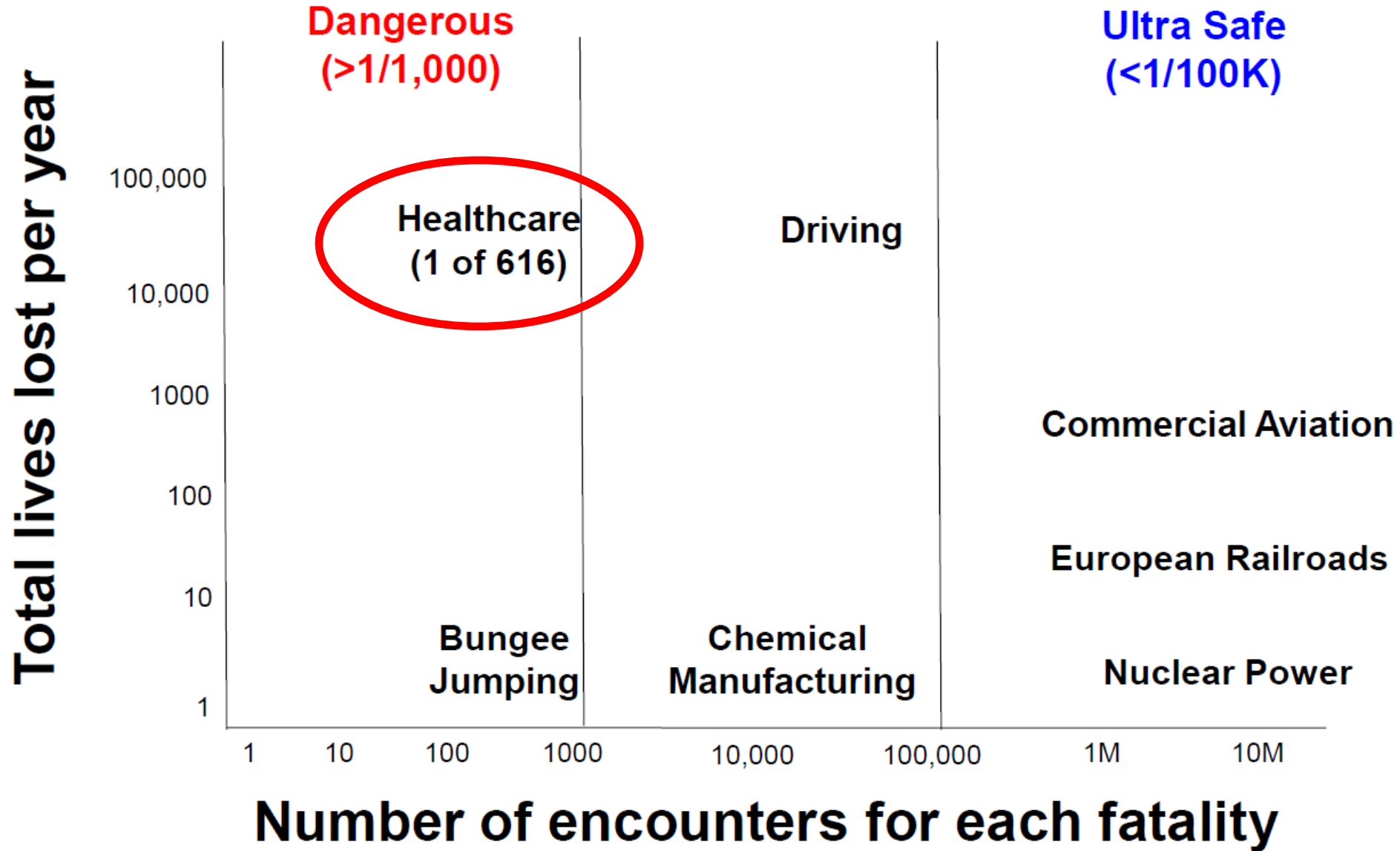
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COI Statement

- Dr. Fairbanks has no real or perceived conflicts of interest

Chart Credit: Modified from L. Leape



Designing for Safety

IOM Report in 2000

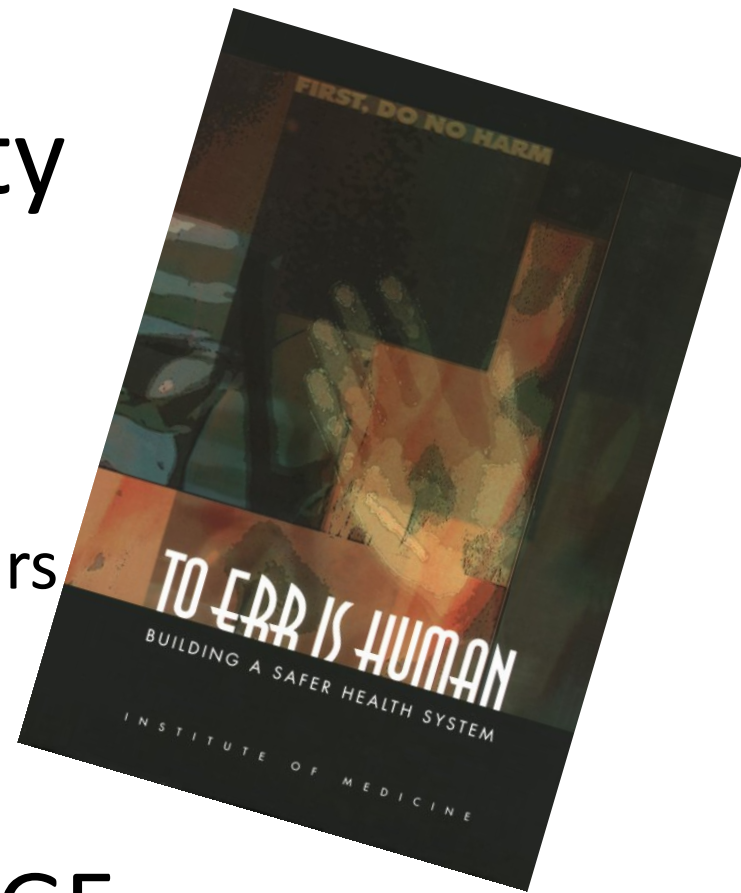
- Govt: 50% less error in 5 years
- Funding, Regs, High Focus

17 Years later....

ESSENTAILLY NO CHANGE

WHY? → Focus still on individual performance

→ Solutions inconsistent with safety science



Leape LL, Berwick DM. Five years after To Err Is Human: what have we learned? JAMA. May 18 2005;293(19)

Wachter RM. The end of the beginning: Patient Safety Five Years After 'To Err Is Human'. Health Aff. 2004(11)

Wachter RM. Patient Safety At Ten: Unmistakable Progress, Troubling Gaps. Health Aff. 2010 (29:1)

Landrigan, Parry, et al. Temporal Trends in Rates of Patient Harm Resulting from Medical Care. NEJM 363(22): 2010

Shekelle, Pronovost, et al. Advancing the science of patient safety. Ann Int Med 154(10): 2011

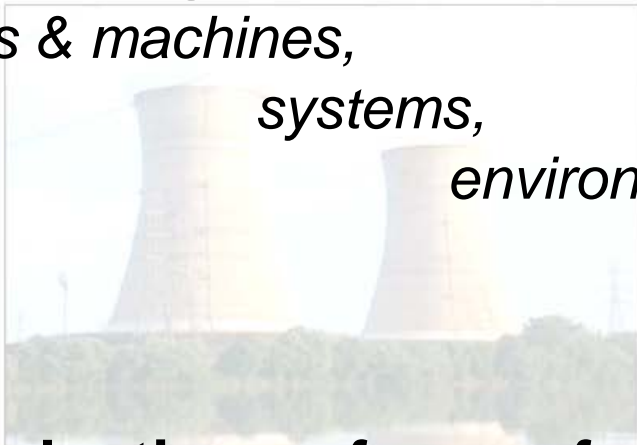
Longo, Hewett, Ge, Schubert. The long road to patient safety: a status report on patient safety systems. JAMA, 294(22): 2005.

Human Factors Engineering

...discovers and applies scientific data about human
behavior & cognition,
abilities & limitations,
physical traits,
and other characteristics



...to the design of
tools & machines,
systems,
environments,
processes,
and jobs



for productive, safe, comfortable, and effective human use.

Complex Adaptive Systems

How managers believe work is being done (rules)



GAP

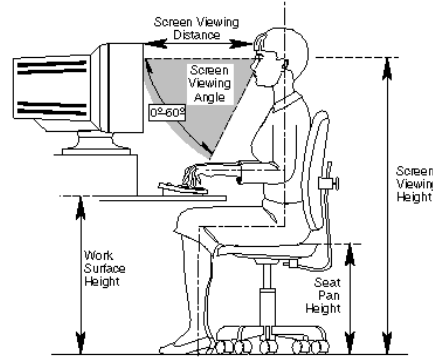
Resilience

Every-day work: How work IS being done

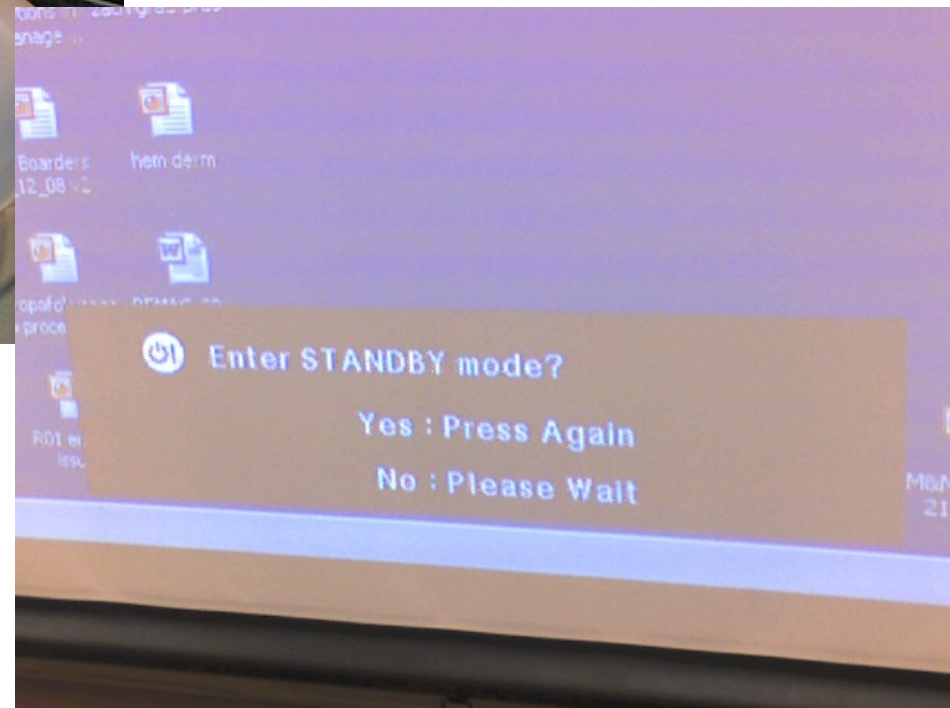
Adapted from: Ivan Pupulidy

Human Factors Engineering

“We don’t redesign humans; We redesign the system within which humans work”







Turns out... It's a “normal error”

Trend found in EMS Reporting system

Simulation study (Denmark)

- 72 physicians
- 5 of 192 defib attempts – Turned it off
- Measurable delay in shock
- Devices turn off even if charged and ready

Hoyer, Christensen, et al. Annals of Emergency Medicine 2008; 52(5): 512-514.

Fairbanks and Wears. Annals of Emergency Medicine 2008; 52(5): 519-521.

SRK: Types of Human Error

Knowledge-Based

Improvisation in unfamiliar environments
No routines or rules available to help handle

Rule-Based

Protocolized behavior
Process, Procedure

Skill-Based

Automated Routines
Require little conscious attention

Conscious

TRIAL & ERROR

1. MISAPPLY GOOD RULE
2. NOT APPLY GOOD RULE
3. APPLY BAD RULE

SLIPS & LAPSES
Automatic

Figure adapted from: Embrey D. Understanding Human Behaviour and Error, Human Reliability Associates
Based on Rasmussen's SRK Model of cognitive control, adapted to explain error by Reason (1990, 2008)

Knowledge-Based

Improvisation in unfamiliar environments
No routines or rules available to help handle

Conscious

TRIAL & ERROR

“Skills-Based Error”

= Slips and Lapses

= Automatic Mode Errors

→ HUGE OPPORTUNITY ←

Automated Routines
Require little conscious attention

Automatic

Figure adapted from: Embrey D. Understanding Human Behaviour and Error, Human Reliability Associates
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Slips and Lapses: Common

Policies, Insurance, and
Discipline



Defibrillator Response

“the preventative or
corrective action is provided
in the device labeling”

Fairbanks RJ and Wears RL. Hazards With Medical Devices: the Role of Design. Annals of Emergency Medicine Nov 2008; 52(5): 519-521.

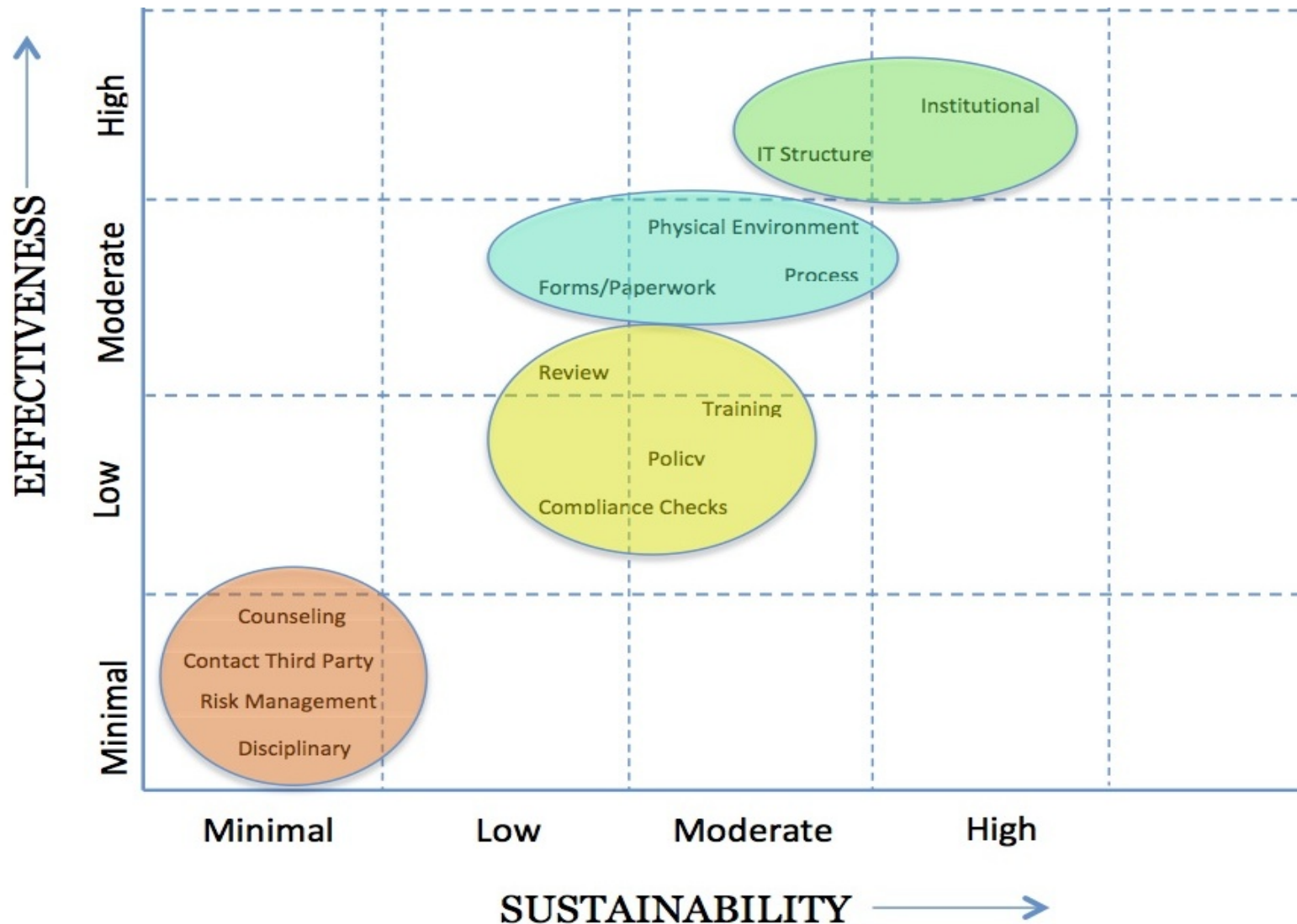




Psychological Principle: **“Affordance” AKA “Population Stereotype”**

- “What an object suggests to us”





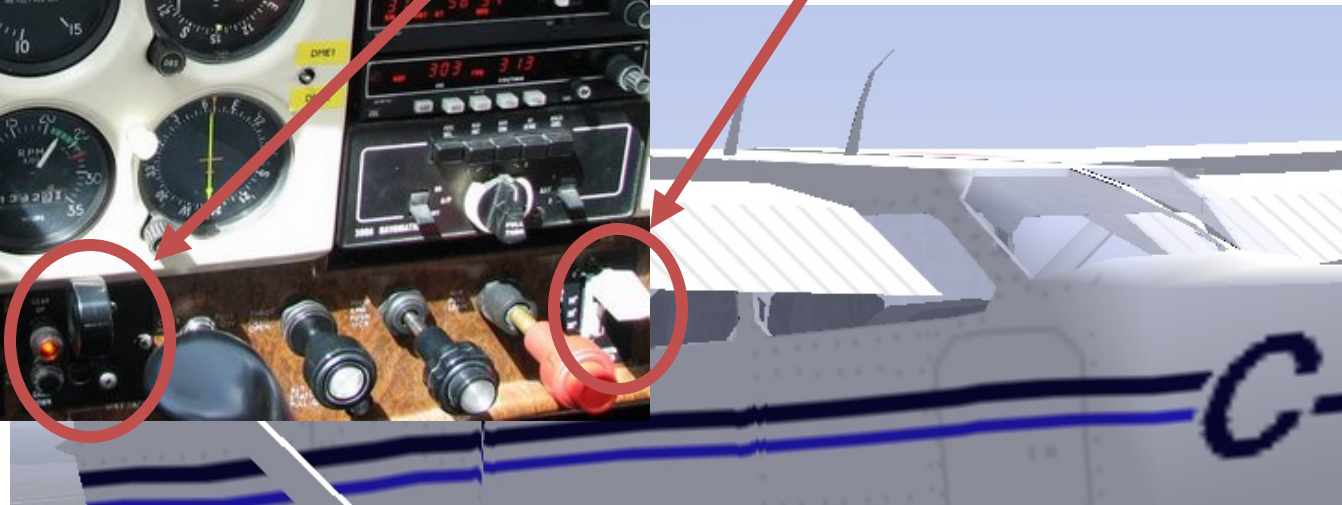
Hettinger AZ, Fairbanks RJ, et al. An evidence-based toolkit for the development of effective and sustainable root cause analysis system safety solutions. *J Healthc Risk Manag.* 2013;33(2):11-20.

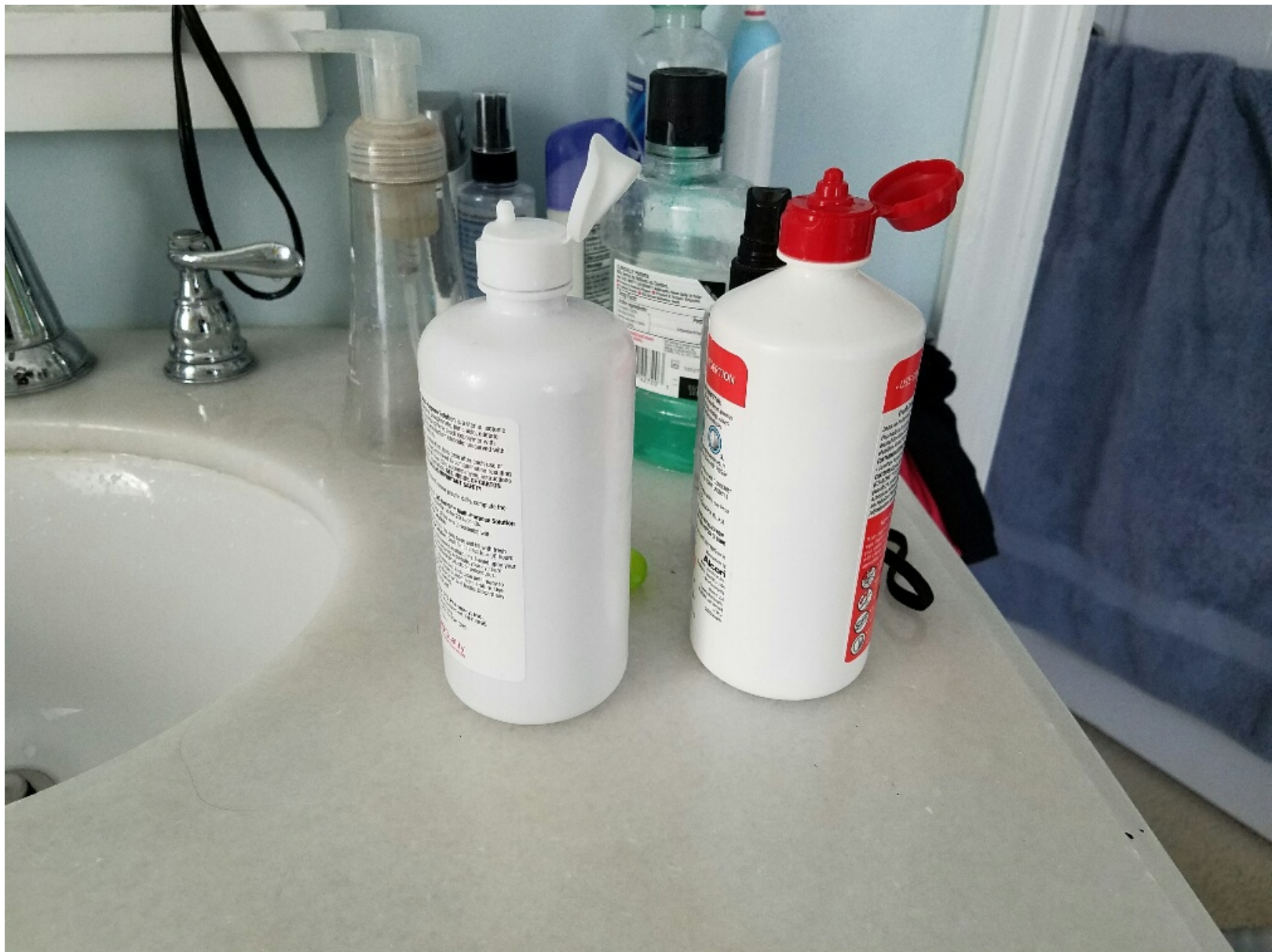
Indiana: 5 nurses





Usability Design



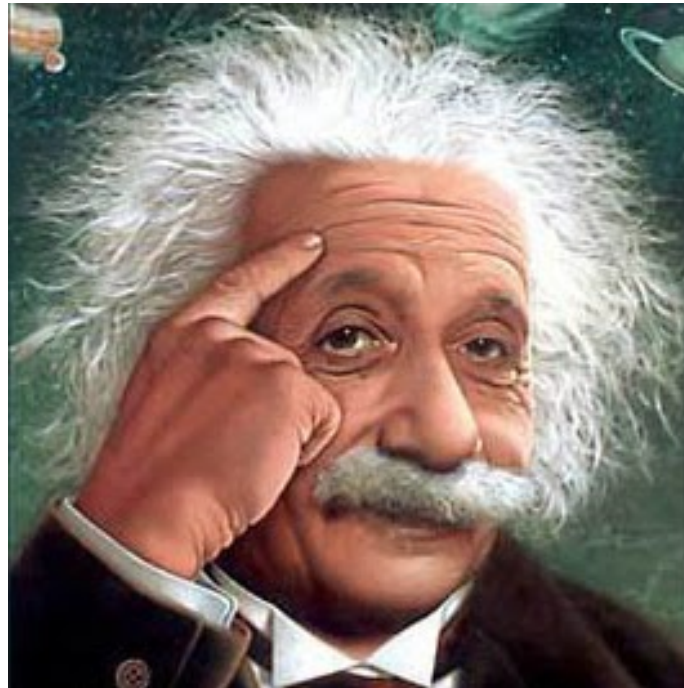


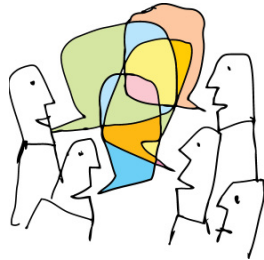


Insanity

“Continuing to do the same thing and expecting different results.”

--Einstein





DISCUSSION

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