Health IT and Diagnostic Safety: 
A Human Factors and Systems 
Engineering Perspective

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The Outcomes from the Diagnostic Process

**THE WORK SYSTEM**
- Diagnostic Team Members
- Tasks
- Technologies and Tools
- Organization
- Physical Environment
- External Environment

**OUTCOMES**
- Accurate, Timely Diagnoses
- Diagnostic Errors and Near Misses

**PATIENT OUTCOMES**
- Effects on Quality, Safety, Cost, Efficiency, Morale, Public Confidence in the Health Care System

**SYSTEM OUTCOMES**
- Learning from Diagnostic Errors, Near Misses, and Accurate, Timely Diagnoses

(Balogh et al., 2015 - Improving Diagnosis in Health Care)
SEIPS Model of Work System and Patient Safety

[SEIPS = Systems Engineering Initiative for Patient Safety]

Human Factors Engineering (HFE)
- System from the viewpoint of person
- People have physical, cognitive and psychosocial needs
- Human-centered design

Accurate and timely diagnosis
Impact on patients, healthcare professionals and HCOs

(Carayon et al., 2006, 2014)
Health IT-supported process for preventing and managing VTE
AHRQ Grant 1R01HS022086

Human-centered design

- Analysis of cognitive and team work in VTE diagnosis in the ED
  - Diagnostic team members
  - H&P, physical exam, ordering test
  - EHR, access to pt information
  - Physical environment
  - Team interactions, roles

- Primary data collection method on VTE diagnosis:
  - CDM (critical decision method) interviews (Klein et al., 1989)
  - Physicians, APP and nurses in 3 EDs
Developing Requirements of CDS for VTE Diagnosis in ED

1. Work (sociotechnical) system of VTE diagnosis
   - Role network analysis [info gathering, info integration & interpretation, working diagnosis]

2. Cues for VTE diagnosis
   - Table of cues
   - Comparative analysis of cues across 3 EDs and roles

3. Fit of cues in physician workflow, with focus on EHR (Patterson et al., 2016 – AMIA)
Health IT and Diagnostic Safety

- Diagnostic process = embedded in work system (Carayon et al., 2006, 2014; Balogh et al., 2015)
  - Health IT = one element of the work system
  - Fit of health IT within workflow and work system

- Diagnostic process = information processing (Parasuraman et al., 2000; Wickens et al., 1998; Balogh et al., 2015)

- Diagnostic process = dynamic
  - Occurs over time, multiple people-discipline-organizations
Health IT and Diagnostic Safety
Research Questions

- Health IT for whom?
  - Who are the members of the diagnostic team?
  - What is their work and work system?
  - Distributed (virtual) team
  - Health IT for engaging patients in diagnostic process [mhealth, wearables, …] – integration with clinical workflow

- Health IT for what?
  - Information gathering, information integration and interpretation, working diagnosis
  - Role of automation
  - Dynamic process

- Safety of health IT:
  - Human-centered design: usability and usefulness, cognitive workload
  - Safety = emergent phenomenon
  - Design-Implementation-Use-Design-Implementation-…