Health IT and Diagnostic Safety: *A Human Factors and Systems Engineering Perspective*
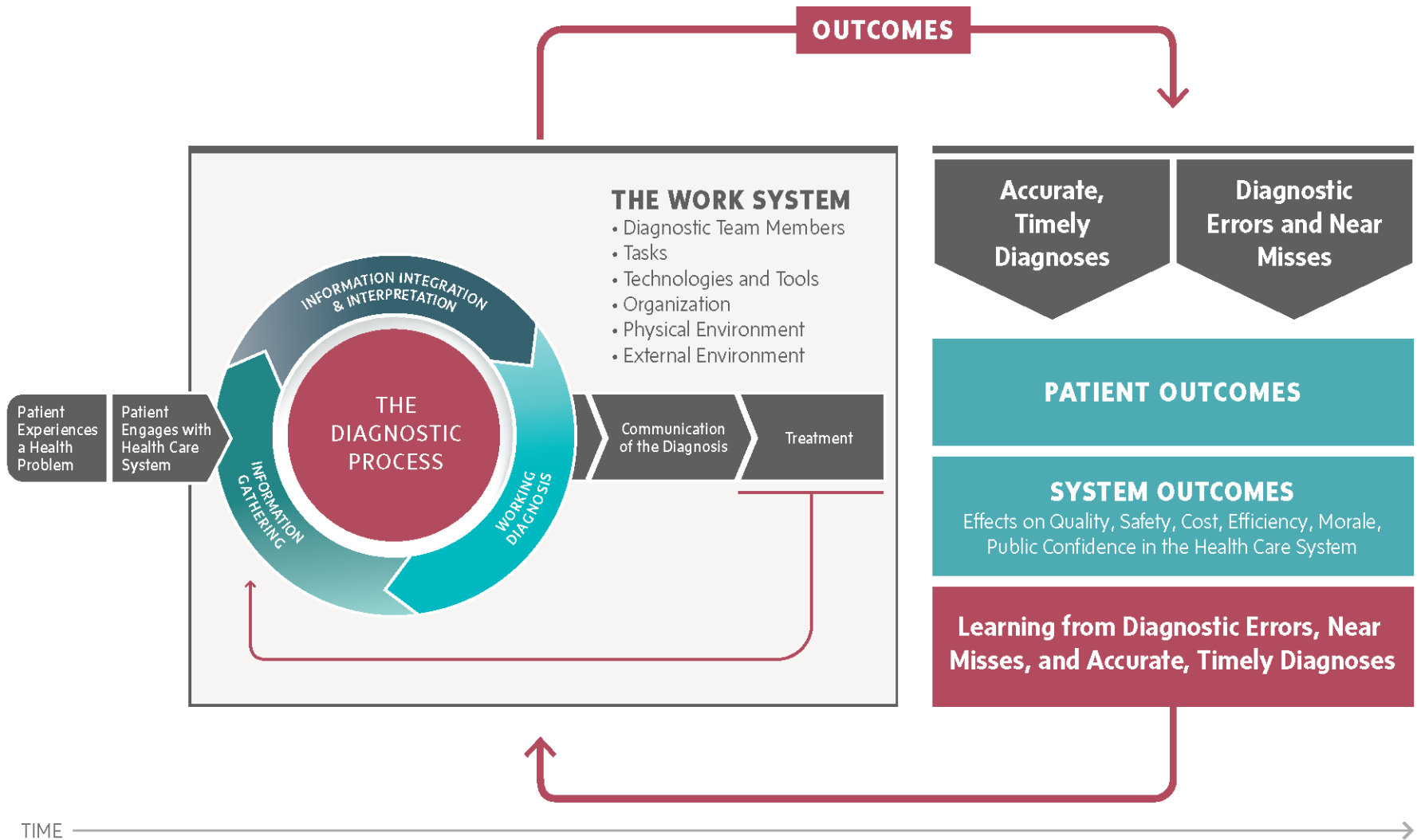
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The Outcomes from the Diagnostic Process

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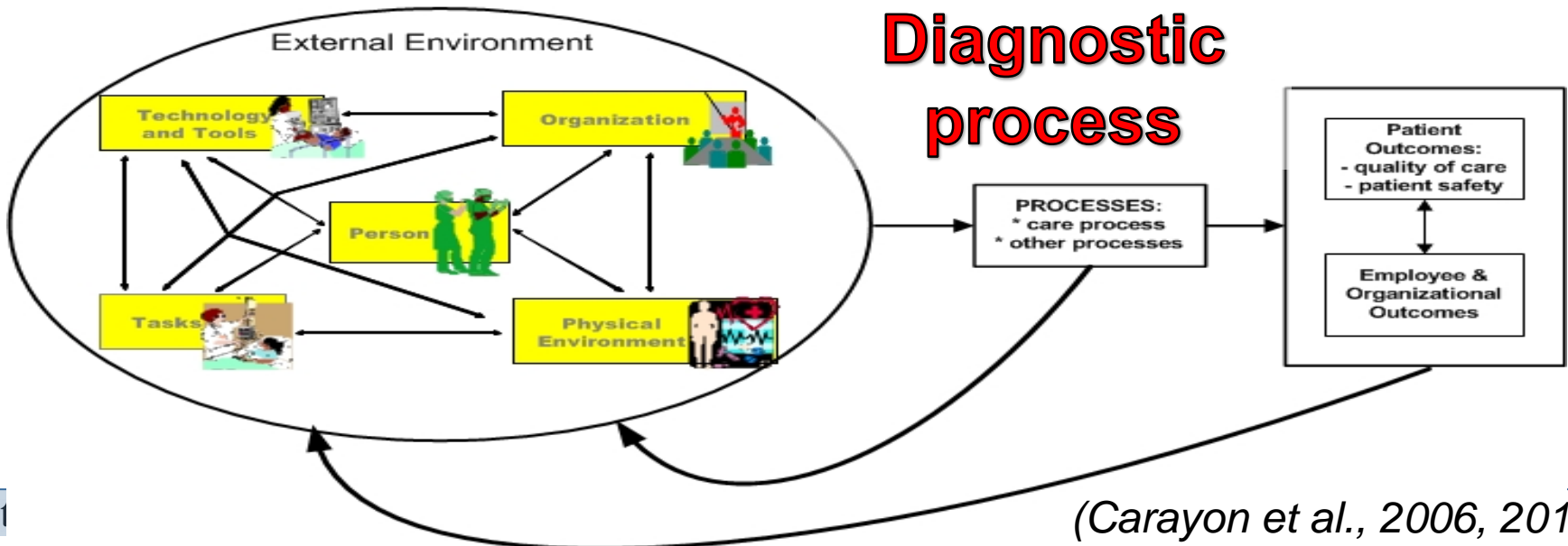
SEIPS Model of Work System and Patient Safety

[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

WORK SYSTEM → **PROCESS** → **OUTCOMES**

Diagnostic process

External Environment

Technology and Tools
Organization
Person
Tasks
Physical Environment

PROCESSES:
* care process
* other processes

Patient Outcomes:
- quality of care
- patient safety

Employee & Organizational Outcomes

(Carayon et al., 2006, 2014)

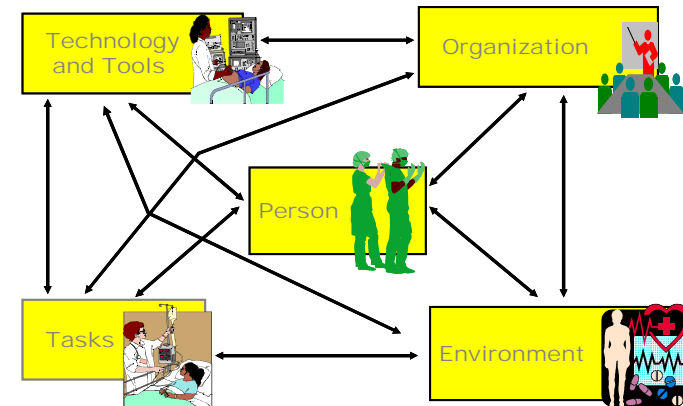# *Health IT-supported process for preventing and managing VTE*
AHRQ Grant 1R01HS022086

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 <u>and</u> usefulness, cognitive workload
  - ■ Safety = emergent phenomenon
  - ■ Design-Implementation-Use-Design-Implementation-…