



<http://www2.fpm.wisc.edu/seips/>

Ergonomics in Healthcare Delivery

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HSE at University of Wisconsin-Madison

- CHESSE:
 - Computer support system
- CHSRA:
 - Measurement of quality in long-term care
- CQPI/SEIPS:
 - Human factors engineering and systems engineering in patient safety
- Two ISyE faculty are IOM members.
- AHRQ training grant (with Population Health Sciences)
- Graduate certificate in patient safety
- Interdisciplinary HSE courses (pharmacy, population health sciences, medical physics)
- Mentoring of physicians

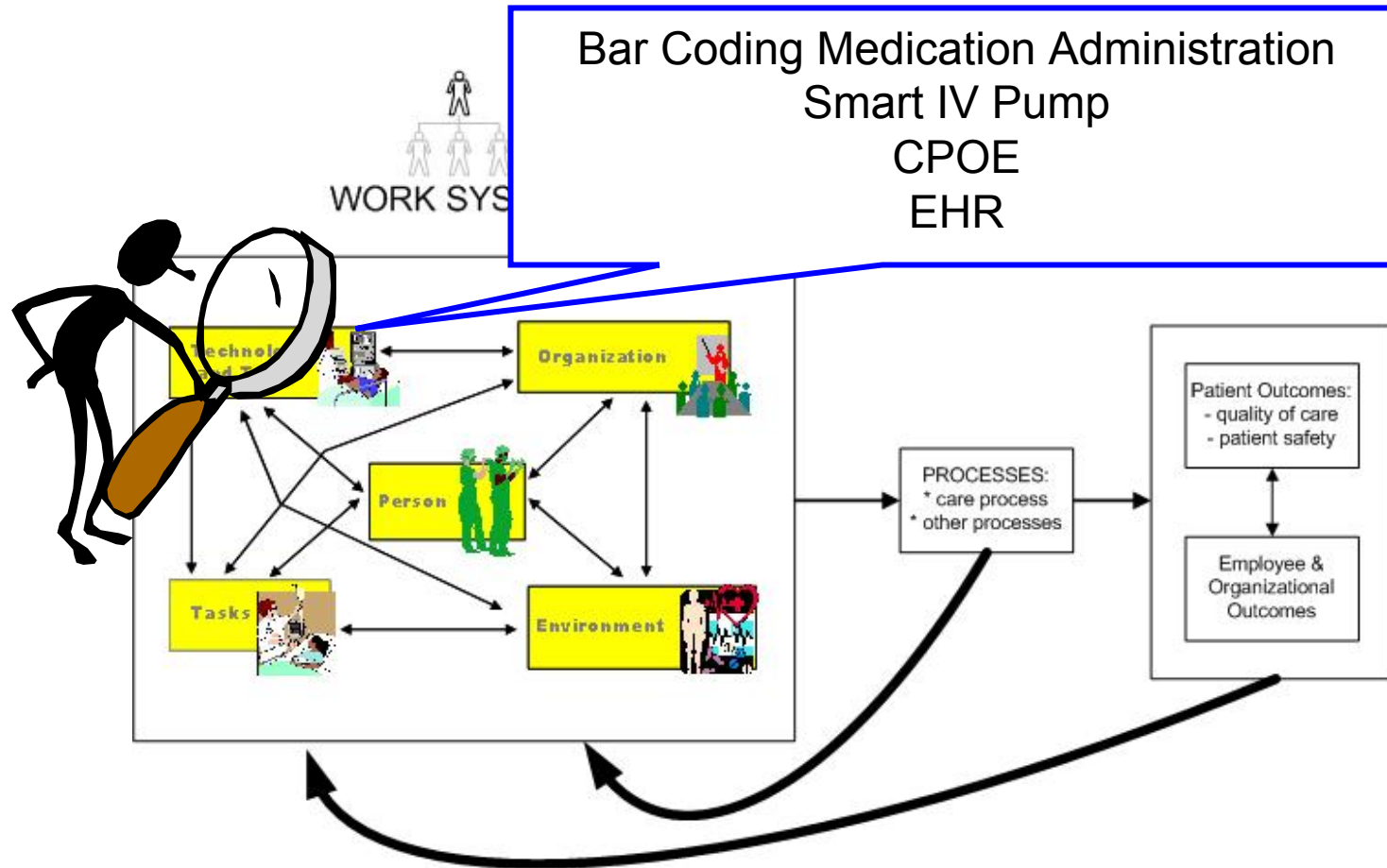
Ergonomics in Healthcare Delivery

Research needs

- Major issues facing health care and patient safety:
 - Workload of healthcare providers
 - Medical errors and adverse events: identification, management, review, recovery
 - Reliability of systems, processes and technologies
 - Patient safety in a variety of settings
 - Transitions of care
 - Medical devices and healthcare information technology

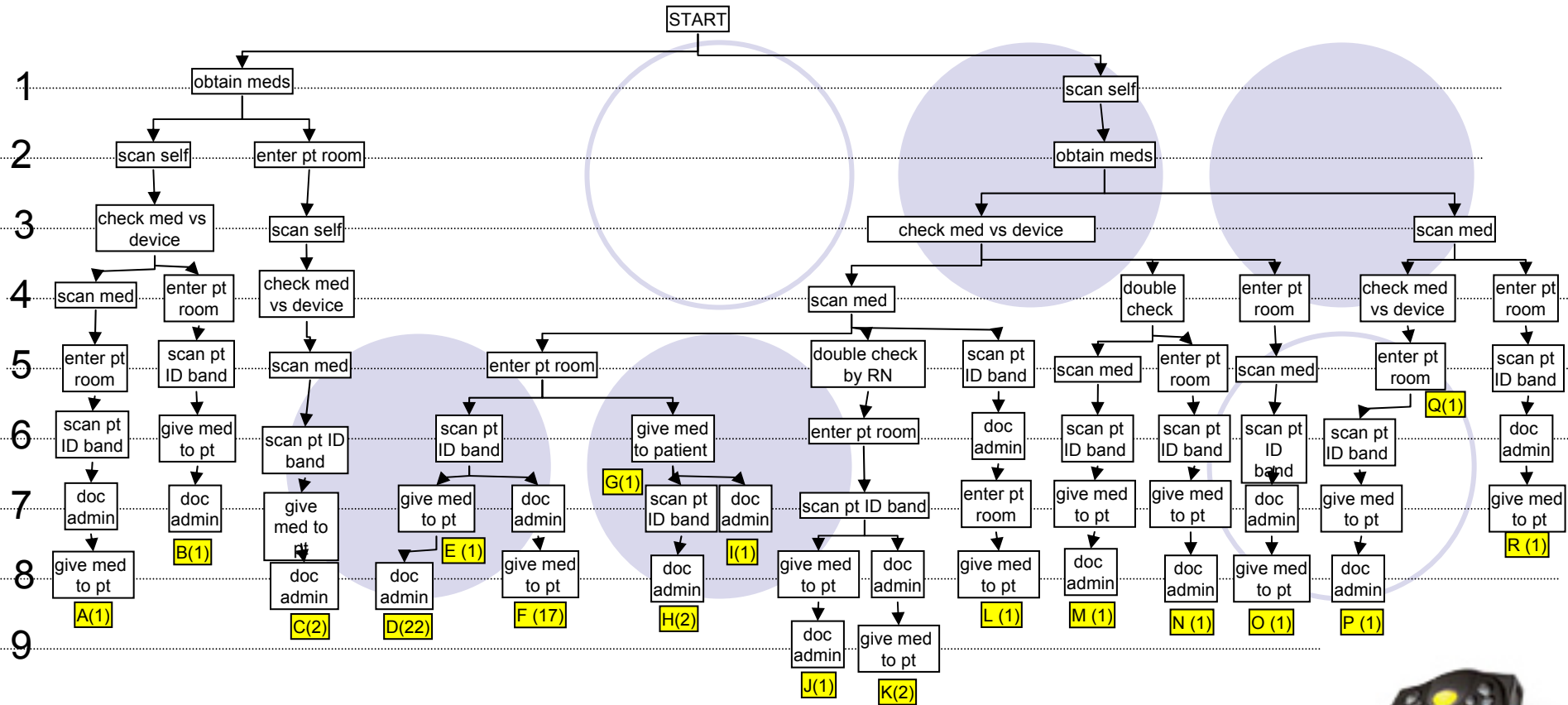
- Work system and patient safety -

SEIPS model (Carayon et al., 2003)



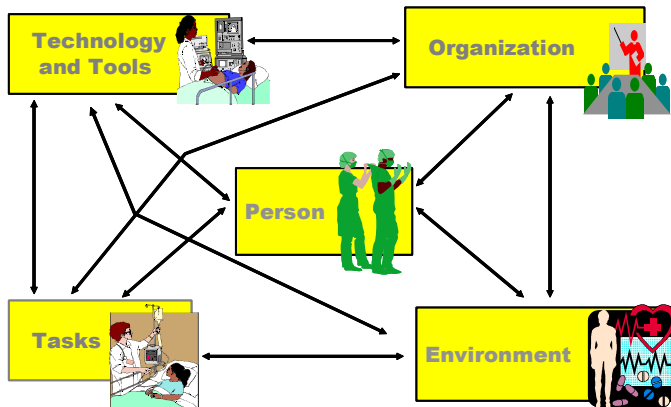
SEIPS = Systems Engineering Initiative for Patient Safety
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Task sequences observed – BCMA medication administration



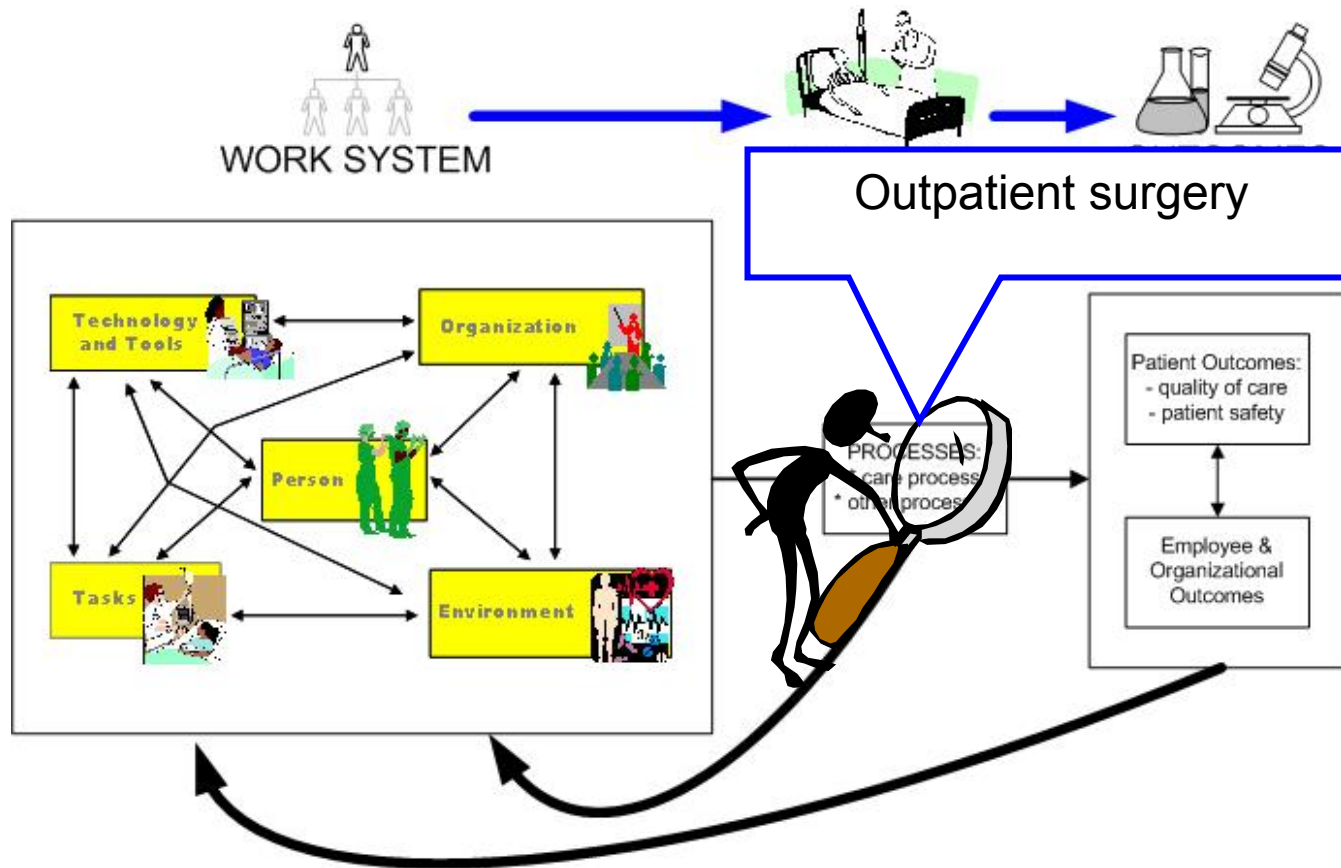
Work system factors observed in BCMA medication administration

- **Tasks:**
 - Potentially unsafe med. admin.
- **Person:**
 - Patient in isolation
- **Environment:**
 - Messy, insufficient light
- **Technology:**
 - Automation surprises, malfunctions
- **Organization:**
 - interruptions



- Work system and patient safety -

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Outpatient surgery - Preoperative process

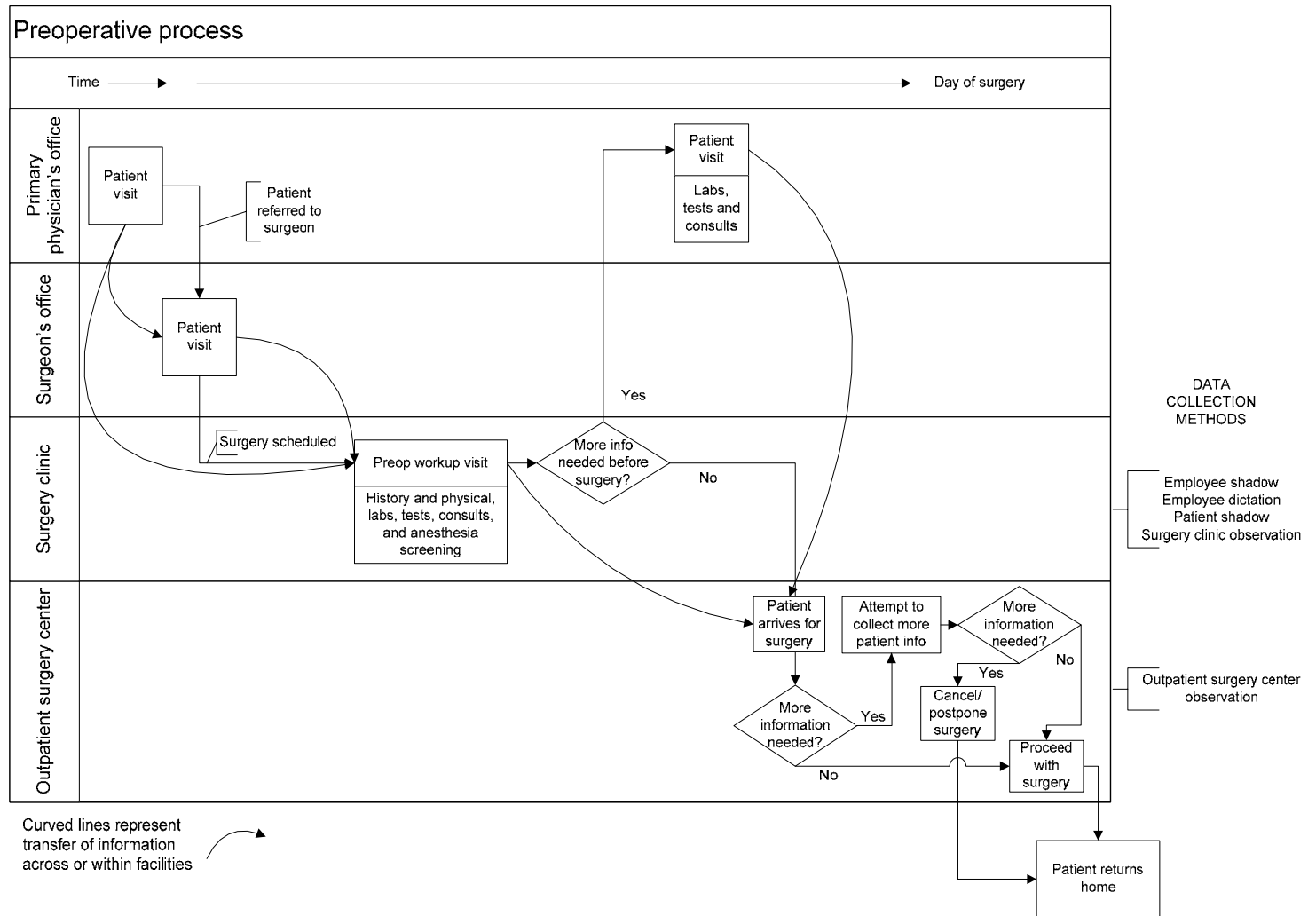


Figure 1. Simplified process map of the organization's typical outpatient surgery preoperative process and the data collection methods used.

Patient shadowing

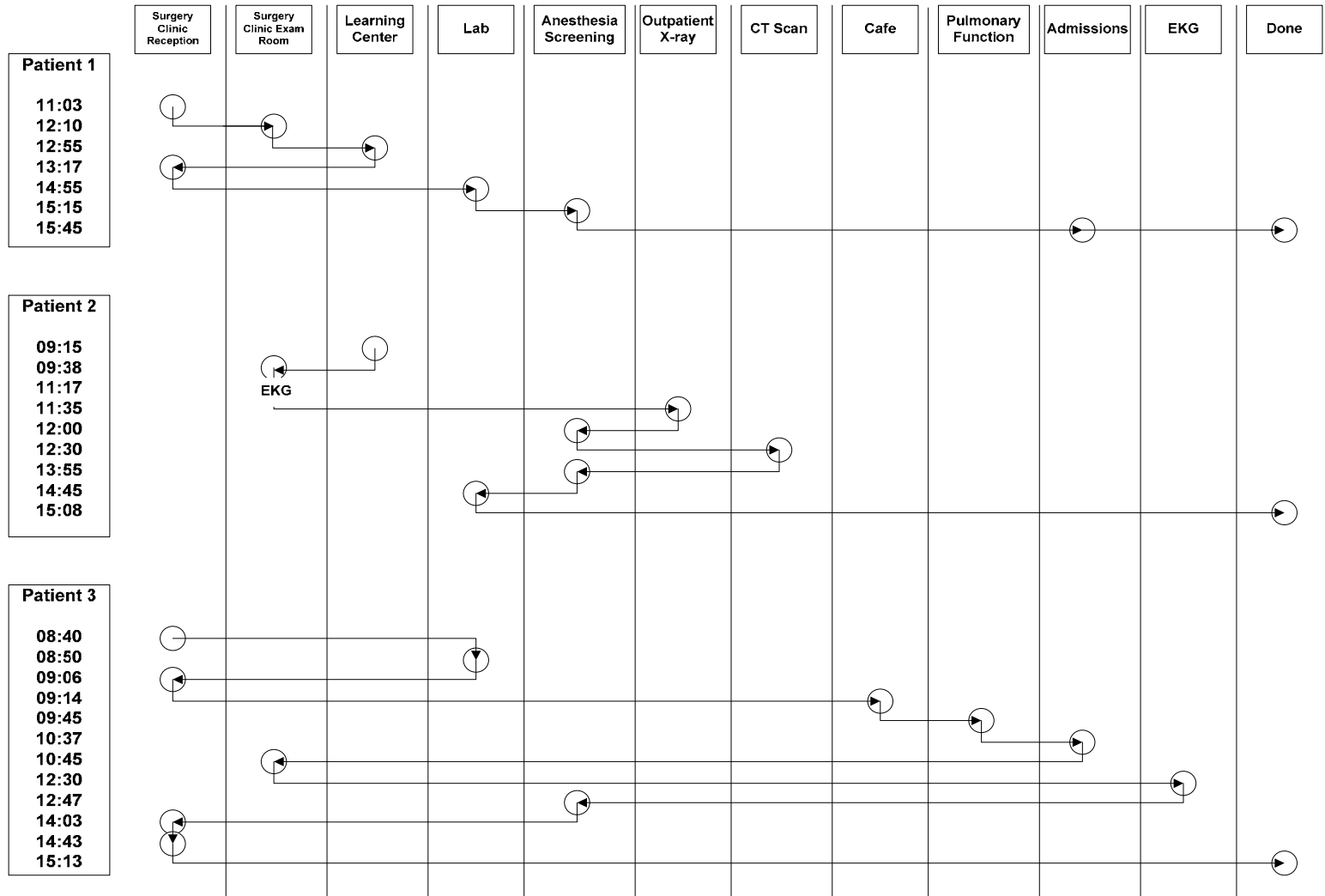
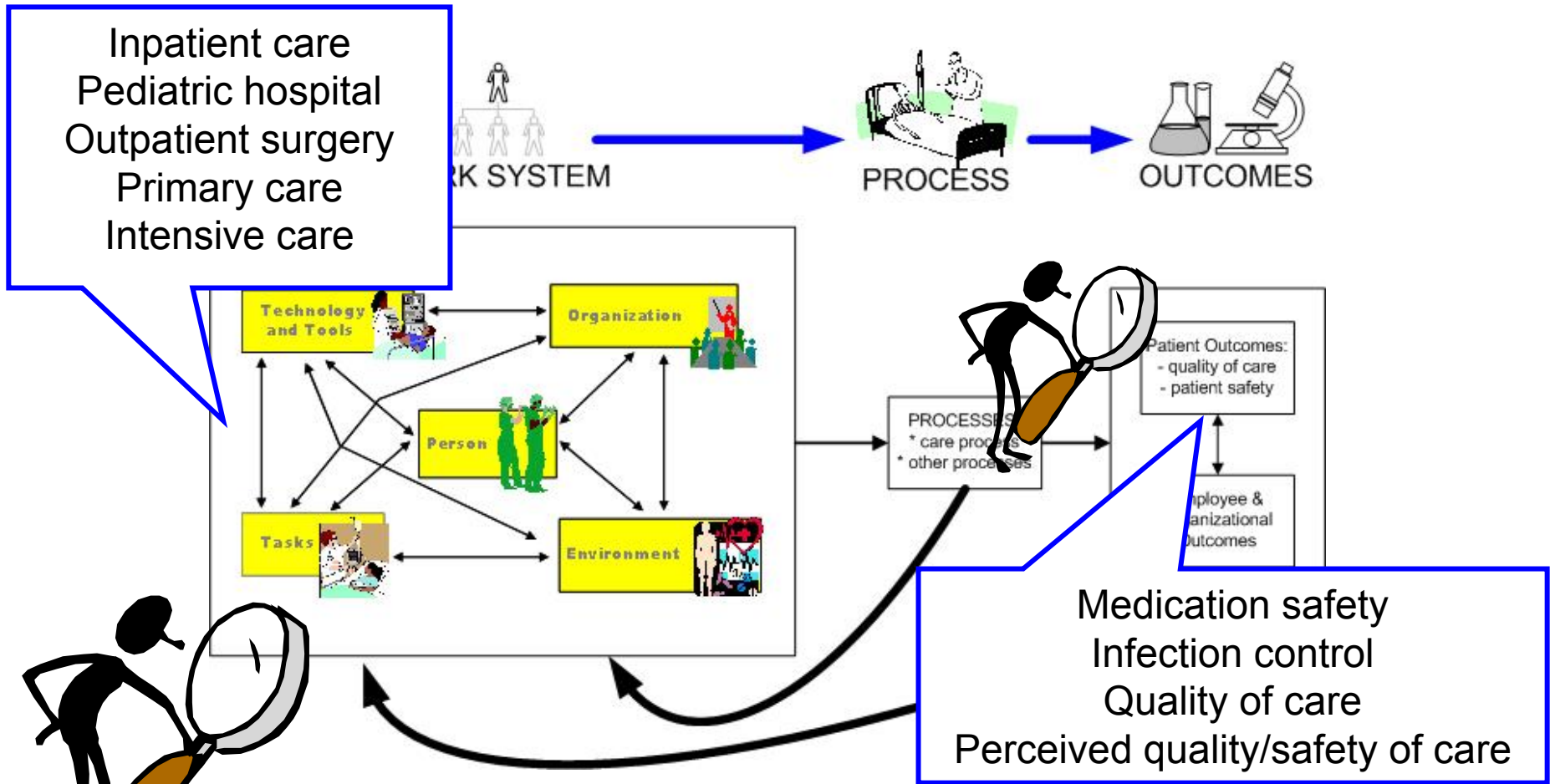


Figure 2. Diagram of observed patient flow on day of workup visit.

- Work system and patient safety -

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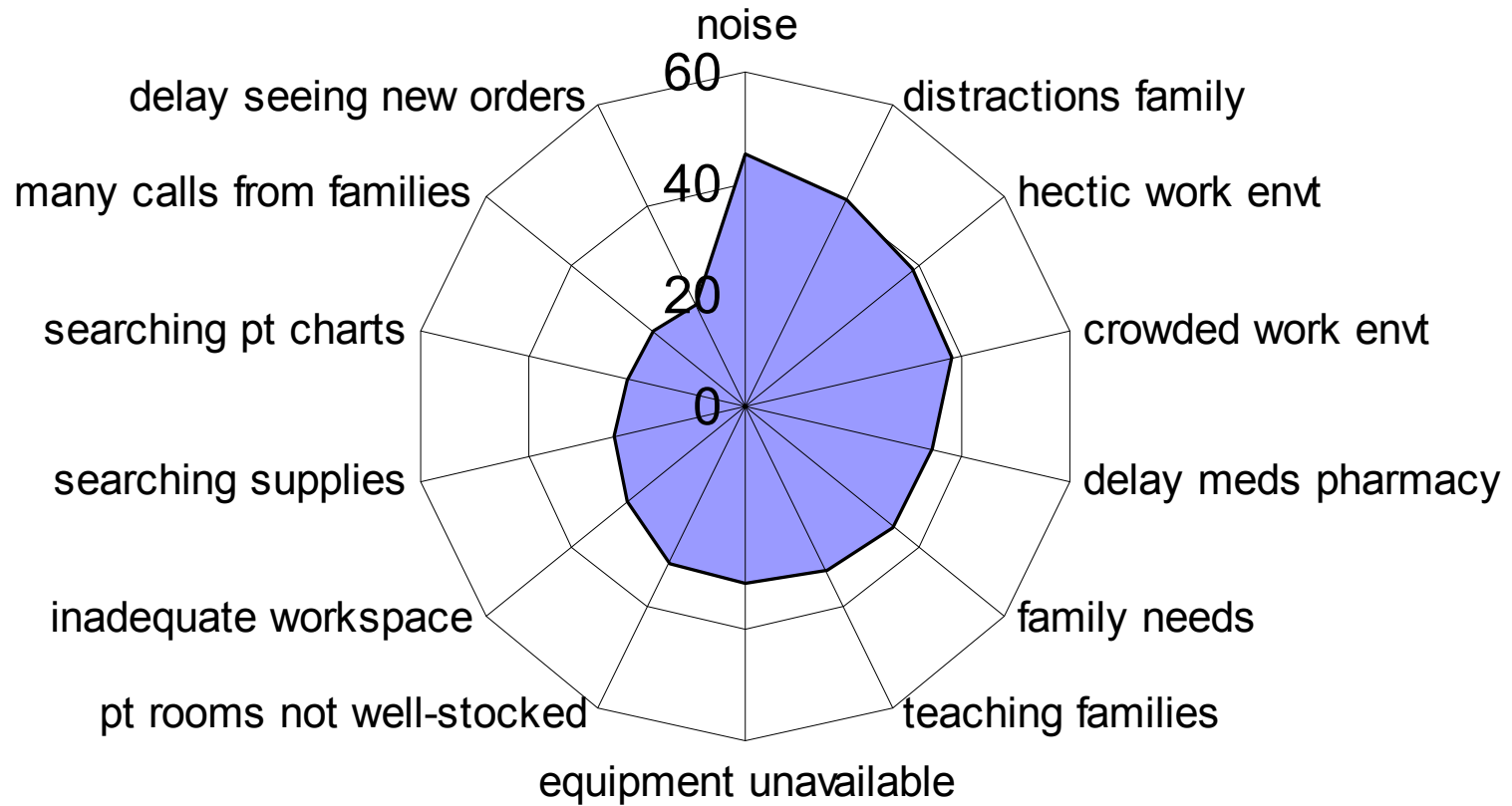
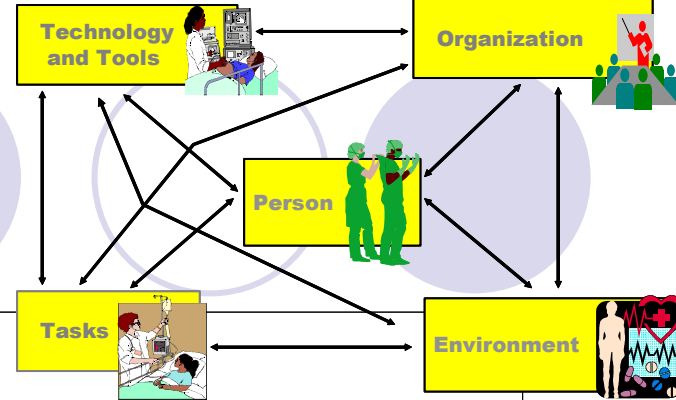
Study of ICU nurses



- 298 nurses from 17 ICUs of 7 hospitals located in Wisconsin
- Data collection between February and August 2004
- ICUs with different specialties (trauma, medical, surgical, cardiac, cardiothoracic, neurosurgery, burn, pediatric, neonatal)
- Overall response rate: 77% (ranging from 40% to 100%)

298 ICU nurses – 7 Wisconsin hospitals

Performance obstacles at end of shift



- “Given the complexity of health care and the formidable obstacles it presents to change, to overcome those barriers and create a safe culture does indeed seem to be the **ultimate challenge** for those who specialize in human factors.”

Human Factors and Ergonomics

IEA [International Ergonomics Association] definition (www.iea.cc):

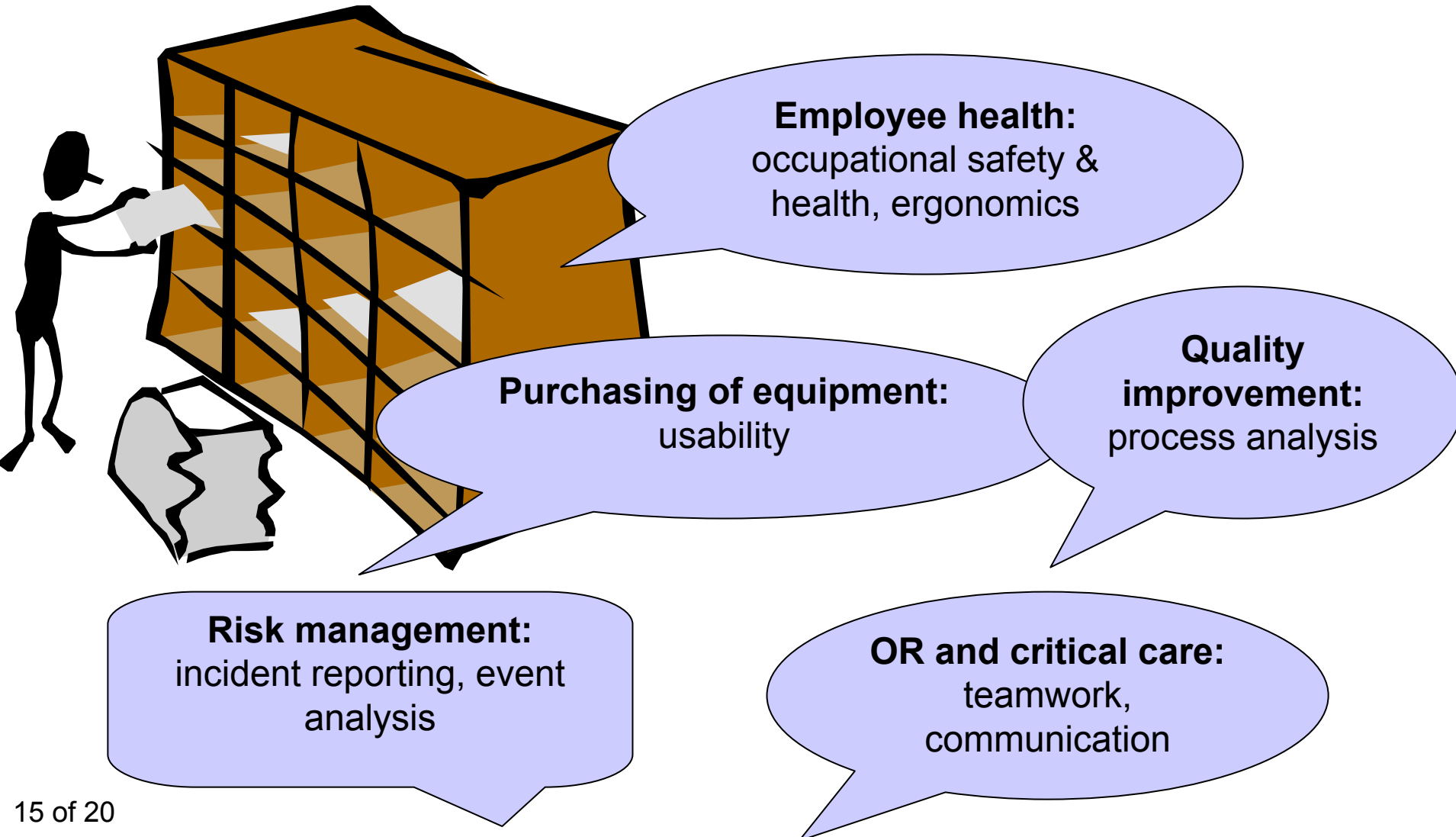
- *Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among **humans** and other elements of a **system**, and the profession that applies theory, principles, data and methods to **design** in order to optimize human well-being and overall system performance.*

Physical ergonomics

Cognitive ergonomics

Organizational ergonomics

Ergonomics expertise in healthcare organizations





Ergonomics in Healthcare Delivery

Research needs

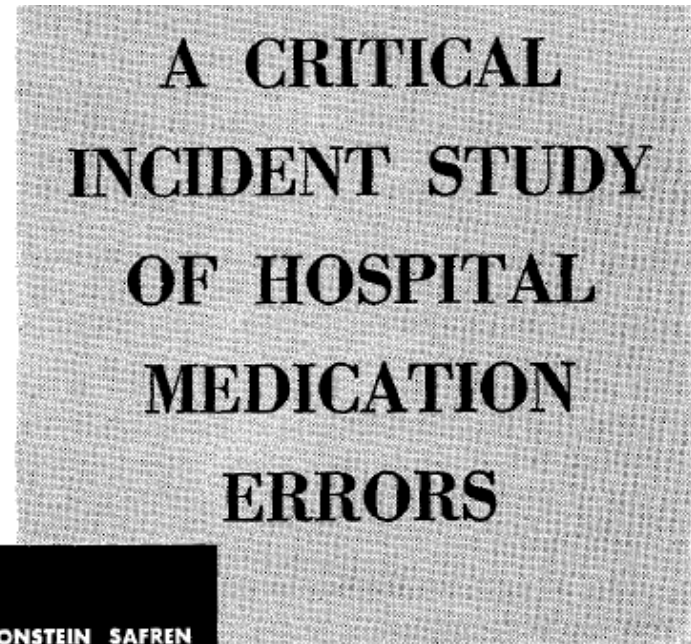
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What kind of ergonomics/HSE research?

- **Collaboration** with healthcare researchers, professionals and organizations
- Remember the **unique** characteristics of healthcare:
 - Complexity
 - Criticality
 - People-intensiveness

Probably the first (modern) study on medication errors...

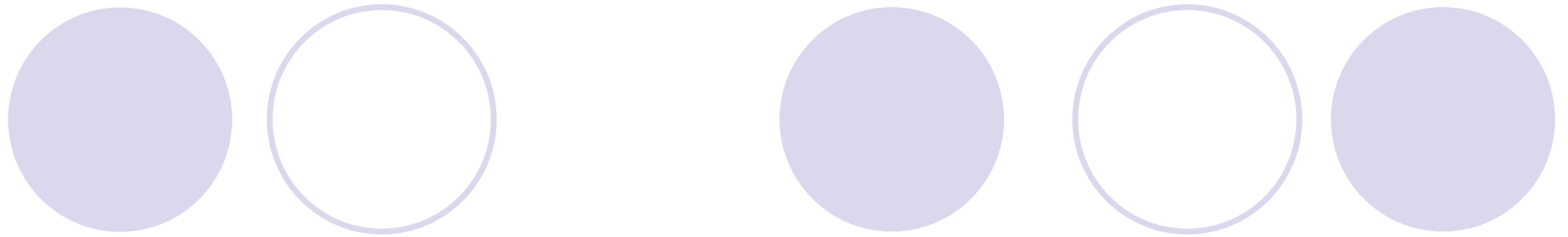
... was conducted by Alphonse Chapanis (1960).



by MIRIAM ARONSTEIN SAFREN
and ALPHONSE CHAPANIS, Ph.D.

In Part I of a two-part article, the authors report their study of 178 medication errors and near errors occurring in an 1100-bed hospital during a seven-month period. They discuss the critical incident technique as a method of studying the problem, previous research and its shortcomings and the major causes of errors unearthed by the study.

In Part II, which will appear in the next issue of this Journal, the authors will outline their recommendations, based on the study findings, to reduce medication errors and near errors in hospitals.



TYPE OF INCIDENT	NO. REPORTED
1. The <i>wrong patient</i> received or almost received a medication	36
2. A patient received or almost received a <i>wrong dose</i> of medication	36
3. A patient received or almost received an <i>extra (unordered) dose</i> of medication	36
4. A patient's medicine was <i>omitted</i> or almost omitted	31
5. A patient received or almost received the <i>wrong drug</i>	23
6. A patient received or almost received medication at the <i>wrong time</i>	14
7. A patient received or almost received the medicine through an <i>improper route</i>	2

An analysis of the reasons given for the incidents shows that 90 per cent (169 of 187) of them are contained within five categories: (1) Failure to follow required checking procedures; (2) misreading or misunderstanding written communications; (3) transcription errors; (4) medicine tickets misfiled in ticket box; and (5) calculational errors.

Need for ergonomics (intervention) research...

...that will **contribute to care** that is:

- safe
- effective
- patient-centered
- timely
- efficient
- equitable