9 Factors that Influence Prescribers' Response to Alerts at the Point-of-Care: Implications for VA Order Check Design

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My Background

- Human Factors Engineering:
  - **design** of technology, processes, and work systems so they are compatible with **human** cognitive and physical **capabilities and limitations**

Audience Question #1

What is your primary role in the VA?

a. informatics
b. patient care
c. research
d. other
e. work outside the VA

Outline

1. Overview of VA alerts
2. Results from field observations and interviews with VA prescribers
3. Framework for prescriber–alert interaction
4. Describe potential implications for VA alert design and medication safety

Computerized Medication Alerts

Background:

- 1.5 million preventable adverse drug events annually in U.S. (IOM, 2006)

Literature:

- Alert fatigue (Grizzle et al, 2007)
- Database analyses, surveys (Van der Sijs et al, 2006)

Study Aim:

Identify factors that influence how prescribers perceive and respond to alerts at the point-of-care

Medication Alerts (i.e. order checks)

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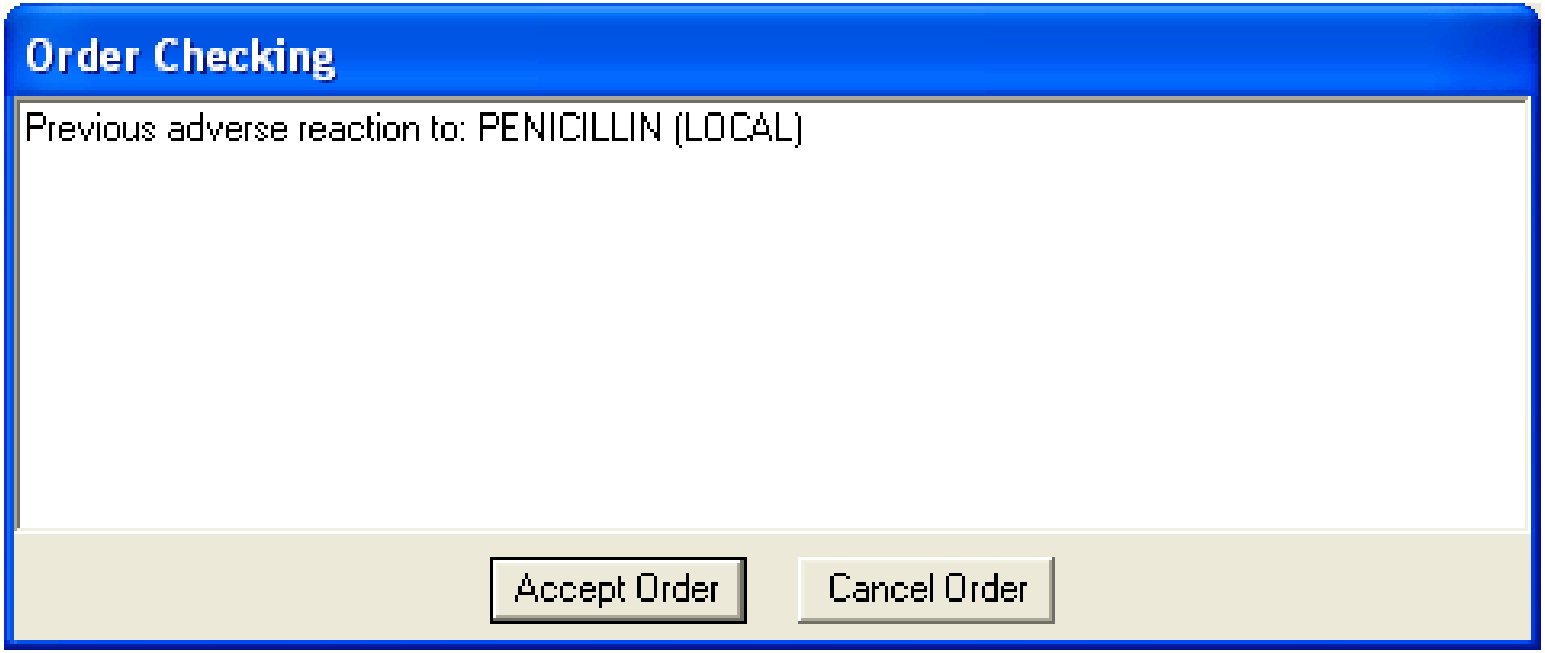

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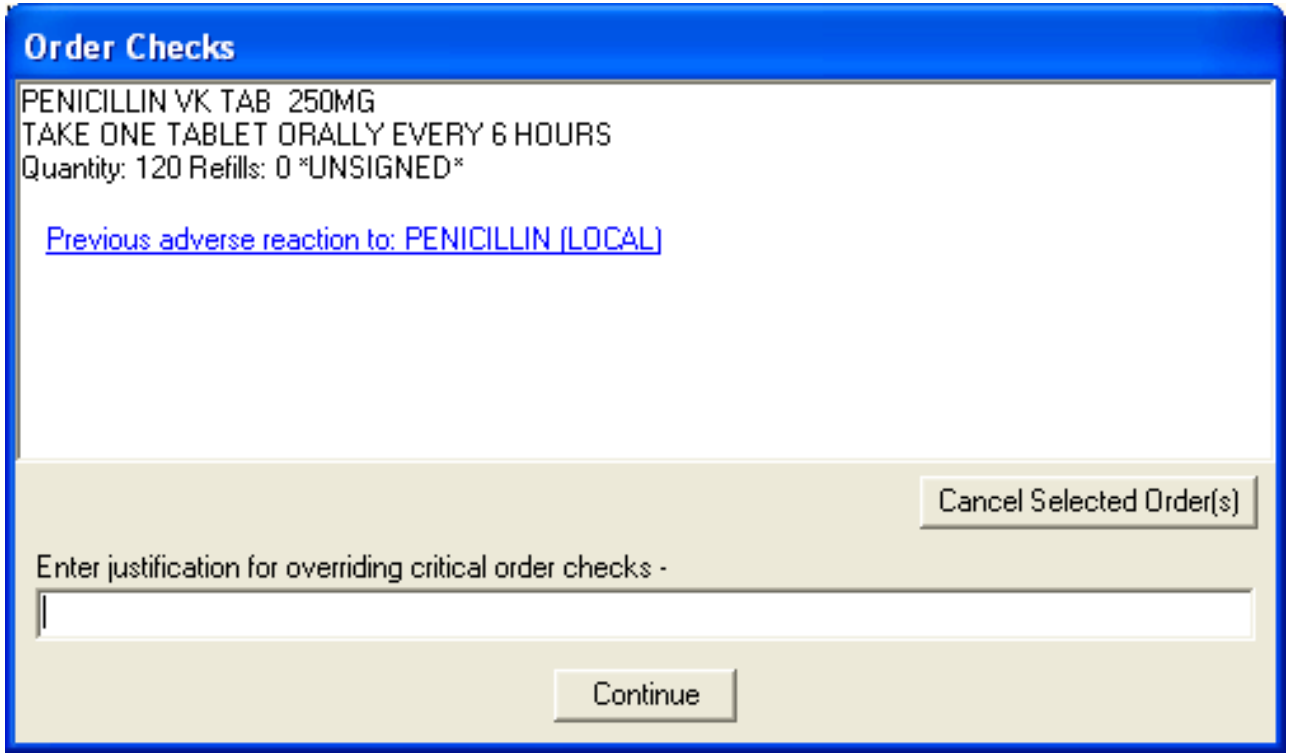
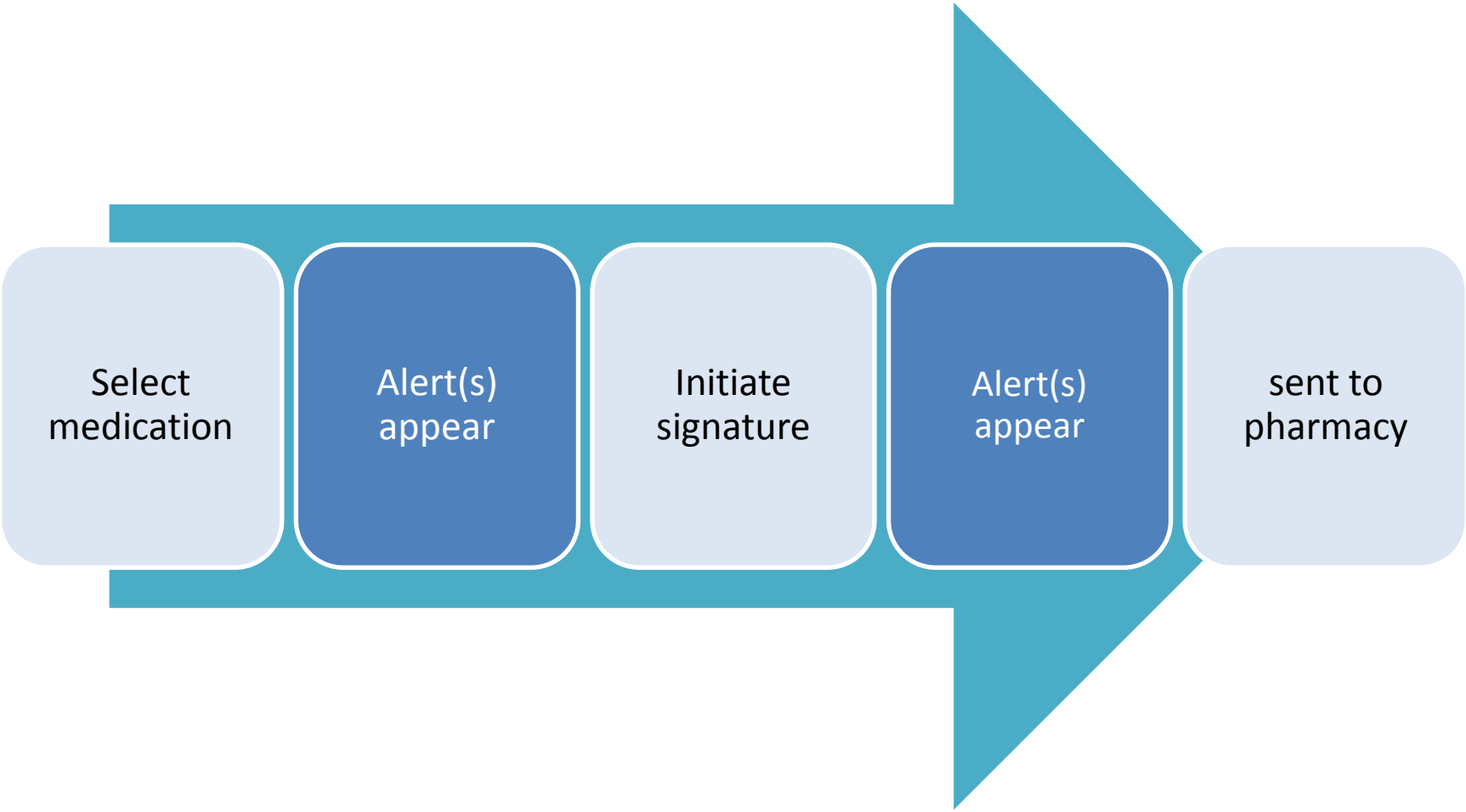


Ordering Process (simplified)



Audience Question #2:

- According to human factors science, what is the primary way that providers learn about how health IT is designed and intended to be used for patient care?

a. operations manual
b. from their peers
c. training sessions
d. software interface design
e. talk to the developers

Answer for Question #2:

- According to human factors science, what is the primary way that providers learn about how health IT is designed and intended to be used for patient care?

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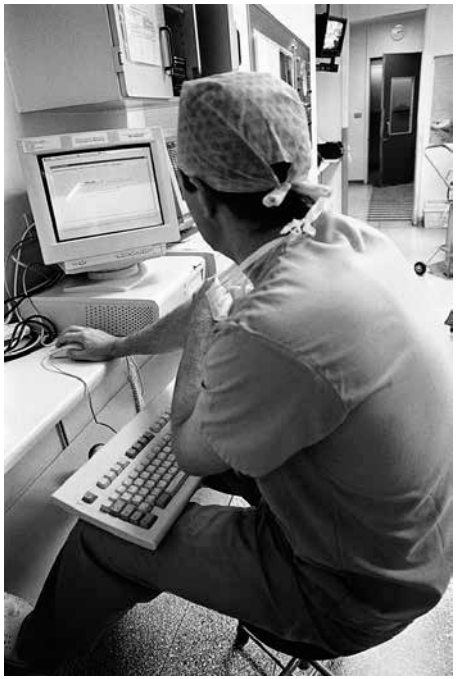


Methods

- Field observations and interviews
  - Major Midwestern VA Medical Center
  - ½ day per prescriber
    - NPs, MDs, Clinical Pharmacists
- Qualitative analysis
  - Inductive, emergent themes (Campbell 2006; Patterson 2002)
  - Team consensus
  - MAXQDA software

Data Analysis

Observations	
Total hrs	102.8 hrs
Typed Notes	351 pgs
Patients	146
Alerts	320
Qualitative Analysis	
Meetings	30 (27.5 hrs)

Jason Saleem PhD

Alan Zillich PharmD

Sue McManus PhD, NP

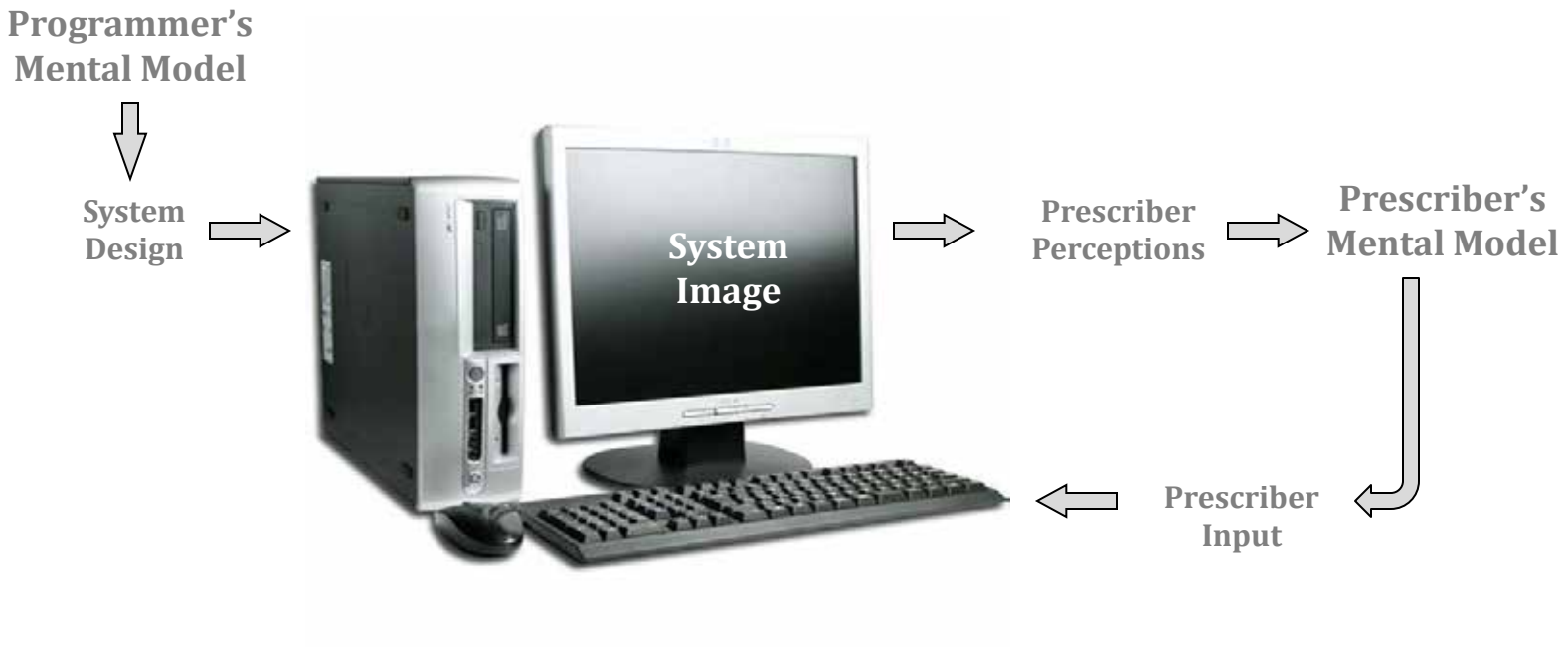
Recruiting Results

Prescribers	N=30
Primary Care (PC)	20 prescribers: 5 PC teams 4 per team
Specialty clinics	10 prescribers 8 clinics
Expertise	18 physicians 7 nurse practitioners 5 pharmacists
Age	42 (27-63) yrs
Years in VA	10 (<1-24) yrs
Gender	14M/16F

Results: prescriber-alert interaction

- 44 themes
- 9 overarching factors
- framework

Underlying Framework



From Norman 1990 and adapted by Russ et al 2012 for prescribing

Prescriber-Alert Interaction

Norman 1990
Russ et al, *IJMI* 2012

1. Alert System Logic

- External Crosschecks:
  - Compares VA meds across VAMCs
  - Compares VA meds to entered non-VA meds
  - Perceived as strength of VA alert system

- Detection (over/under detection)
  - Identified gaps; prescribers wanted more alerts for:
    - lithium
    - thyroid and liver function
    - non-steriodal anti-inflammatory drugs (NSAIDs)
    - medications that can affect psychiatry patients

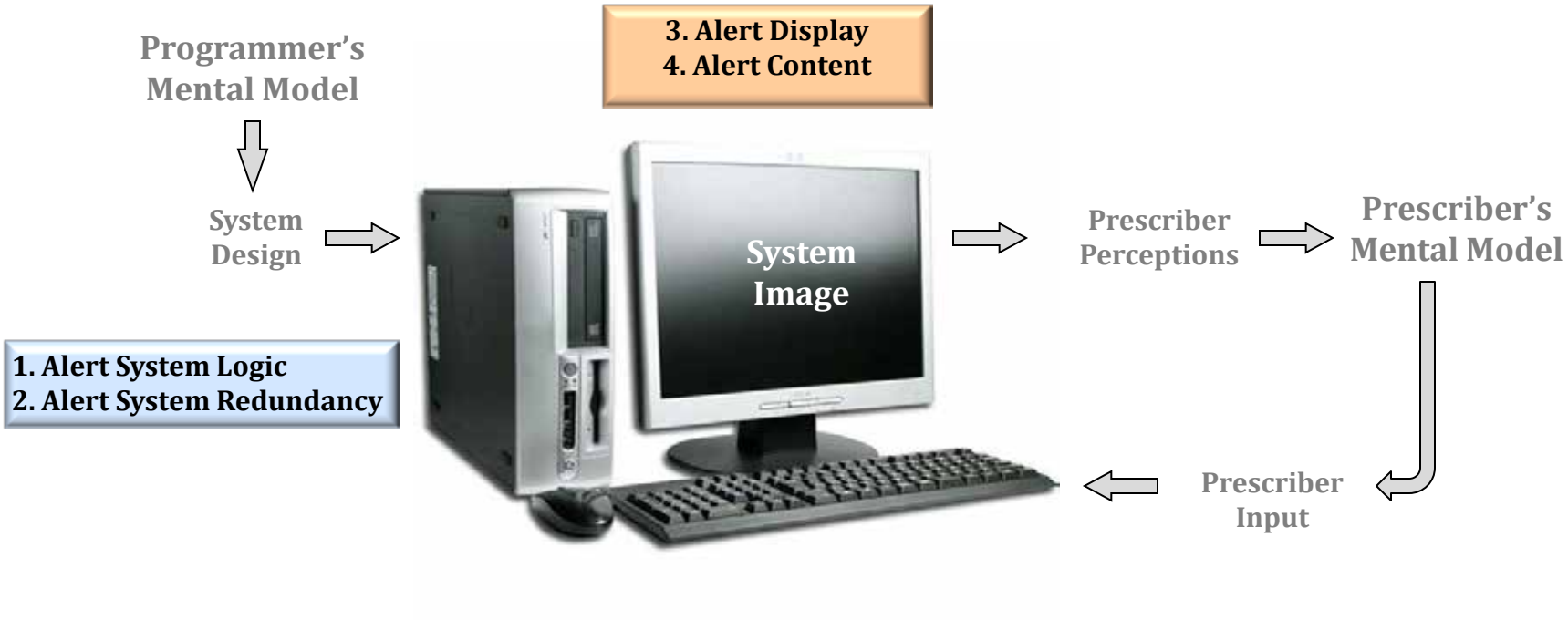
2. Alert System Redundancy

<u>Repetition within an encounter</u>

- Example:
  1: NP orders niacin; alert for niacin/pravastatin
  2: NP signs order, alert appears again
  3: NP orders pravastatin; alert for pravastatin/niacin
  4: NP signs order, alert appears again

  – Observer noted: *We have now seen the same alert 4 times in last 10 min or less.*

Prescriber-Alert Interaction



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3. Alert Display

- 5 themes included:
  - Format
  - Salience
  - Timing
  - Level of intrusiveness
  - Retrievability

- "Redesigning Medication Alerts to Support Prescriber Workflow"
  - HSR&D grant PPO #09-298
  - Coming soon to a journal near you…

4. Alert Content

Specification: *explanation of why* an alert was triggered

Order check appears:

Duplicate drug class, non- opioids [antitussives]/expectorants. Non-VA medication guiafenesin.

MD: "I don't even know what that means. It says expectorants, but it doesn't say what the other [medication] is. It says non-VA medication guiafenesin, but you're [pt 4] getting that here, right?"

Audience Question #3

Out of the 30 prescribers in the study, data from ____ prescribers indicated that there was confusion about why alerts were triggered.

a. less than 5
b. 5-9
c. 10-19
d. more than 20

Audience Question #3

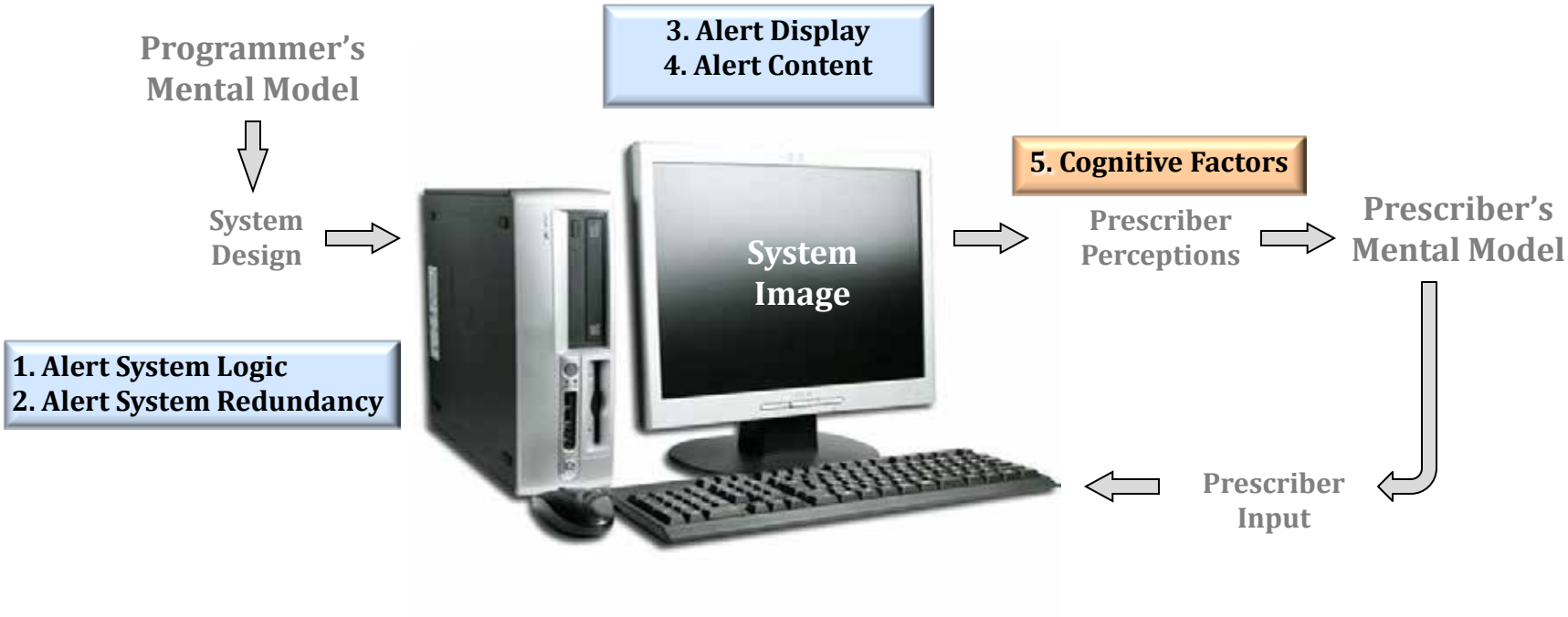
Out of the 30 prescribers in the study, data from

21 prescribers indicated that there was confusion about why alerts were triggered.

a. less than 5
b. 5-9
c. 10-19
d. more than 20

Implication: a lack of specification poses a substantial barrier to resolving alerts; additional attention is needed on the clinical content presented by alerts

Prescriber-Alert Interaction



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5. Cognitive factors

Audience Question #4:

In this study, alerts sometimes supported awareness by providing *new* information for prescribers. Prescribers found alerts particularly helpful for:

a. new patients
b. new medications
c. medications they rarely prescribed
d. allergies documented by someone else
e. all of the above

Answer for #4:

In this study, alerts sometimes supported awareness by providing *new* information for prescribers. Prescribers found alerts particularly helpful for:

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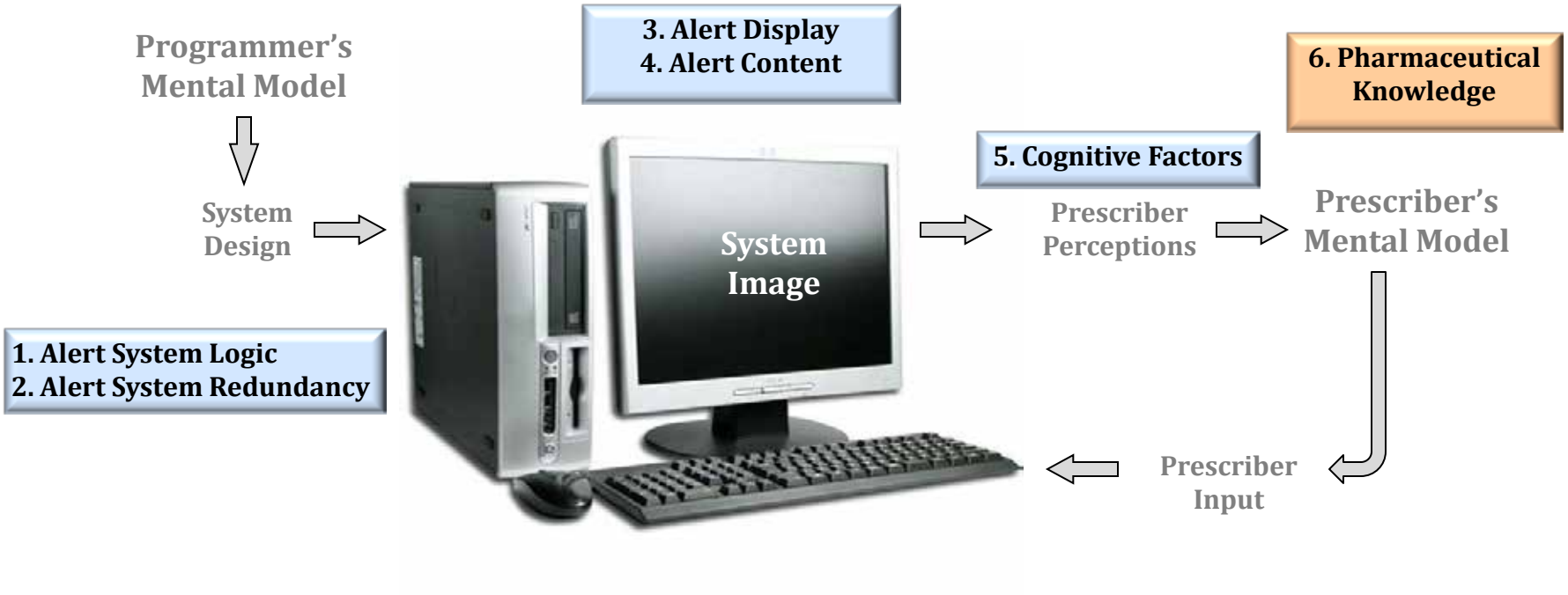
Prescriber-Alert Interaction



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6. Pharmaceutical Knowledge:

"If I'm not in the room, the doctors don't know what to do with the alert."

"I talk to the clinical pharmacist to resolve order checks. I like having the pharmacist in the room here with me."

"I'll ask the pharmacist in the clinic, 'Is this an important interaction?' ."

6. Pharmaceutical Knowledge:

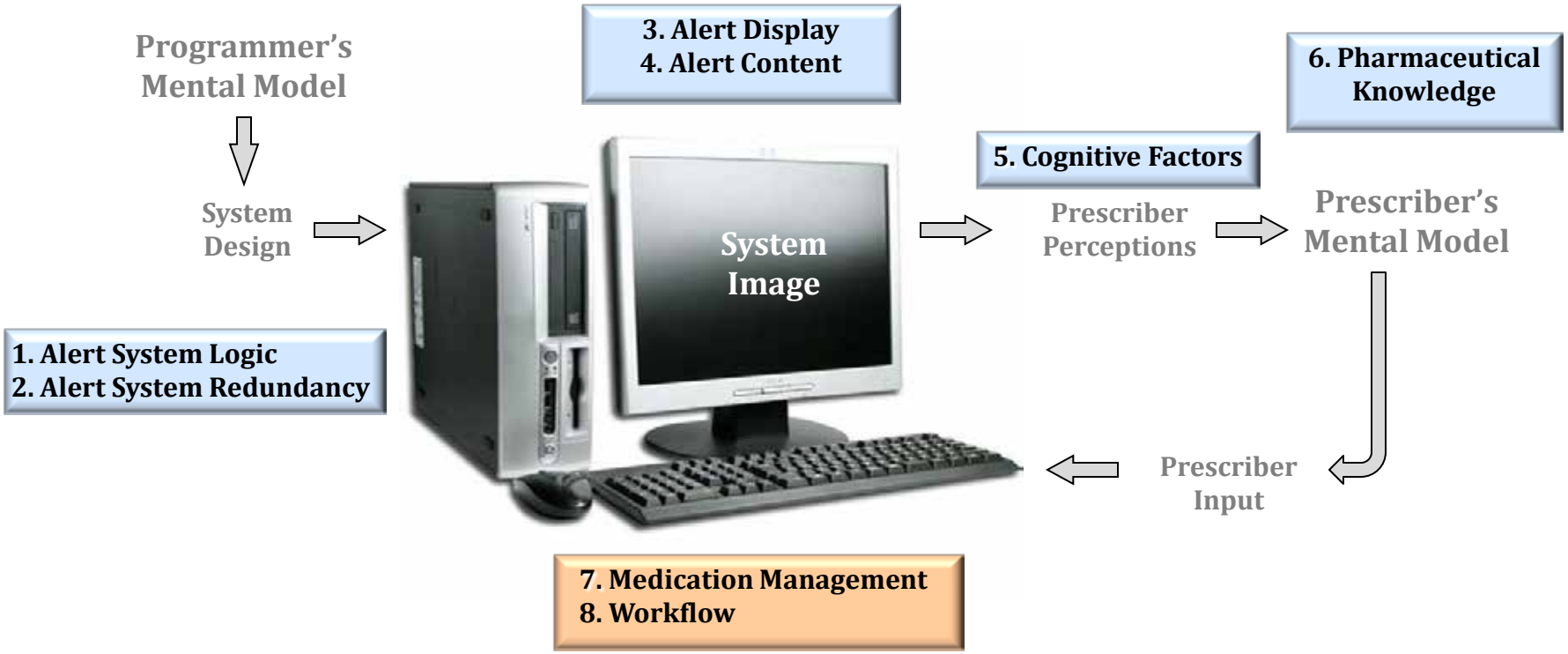
- Pharmacist consultation and proximity: pharmacists consulted in real-time to help resolve alerts

"Physicians are not trained like pharmacists. We have to learn what a significant, clinically-relevant interaction is."

- VA physician

- **Implications:**
  - Alert language, information currently inadequate
  - Universal design needed for alerts to help support prescribers with different training and levels of experience

Prescriber-Alert Interaction



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7. Medication Management

- <u>Computerized Provider Order Entry (CPOE) design</u>
  - CPOE design sometimes hindered alert resolution
  - MD orders mycophenolate
  - Duplicate drug class alert:
    mycophenolate/azathioprine
  - MD overrides alert
  - MD explains: “I couldn’t discontinue the [azathioprine] because it is coming from [another VAMC]….I can only tell the patient to stop it.”
  - **Implications:** need more advanced CPOE and alert for EHR interoperability

8. Workflow
Audience Question #5:

In this study, after computer delays reached _____, prescribers began expressing frustration.

a. 10-15 sec
b. 16-30 sec
c. 31-60 sec
d. 61-90 sec

Answer for #5:

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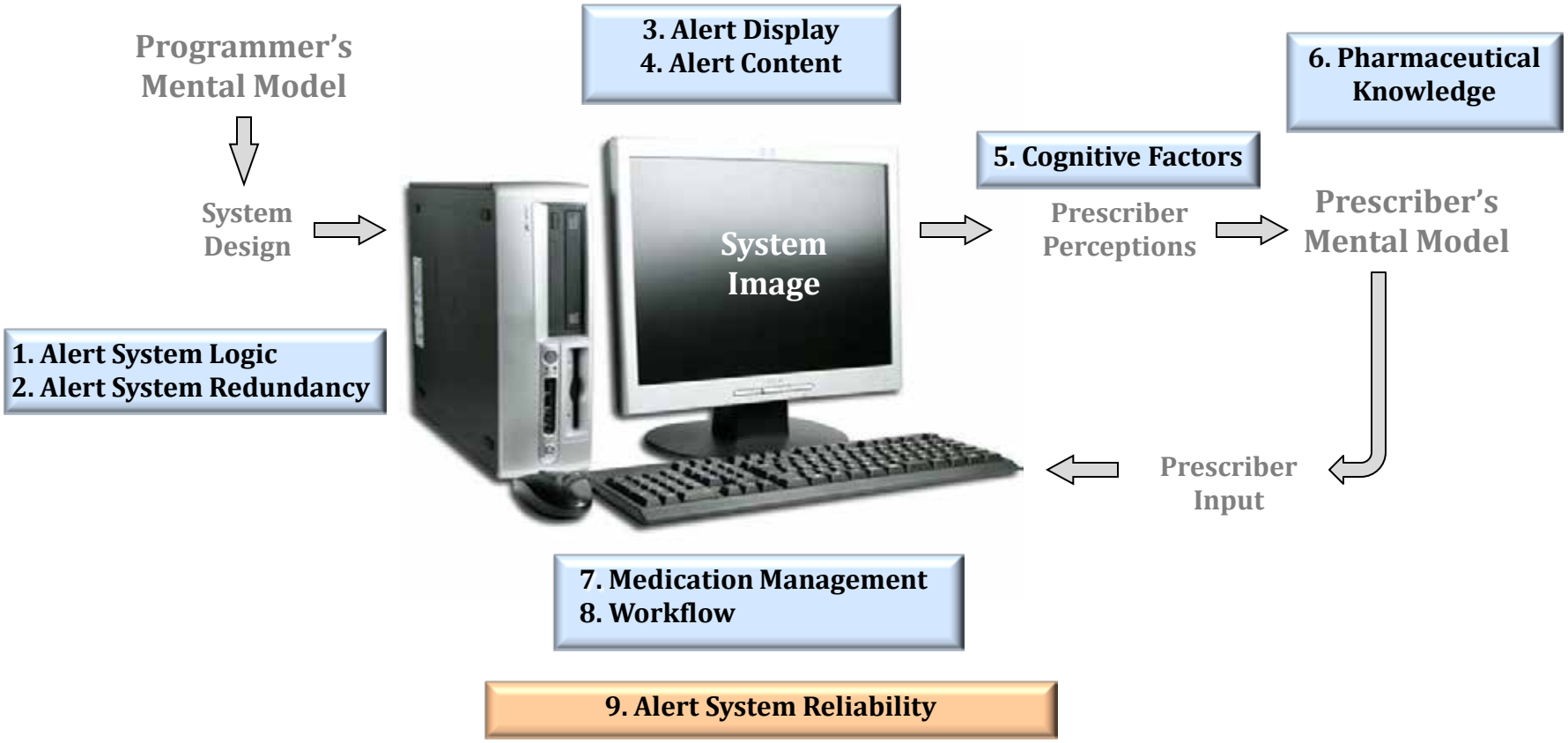
Prescriber-Alert Interaction



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9. Alert System Reliability

- Common care practices:
  - alerts inappropriately warn against practices that apply to **broad** patient populations

Alert Trigger	Prescriber Response
• NPH* insulin/regular insulin/metformin	• “There are tons of [diabetic] patients on this combination and that is safe.”
• Mometasone with albuterol [inhalers].	• “We have a lot of patients on multiple inhalers.”
• Duplicate drug class, antiretrovirals	• “Each patient is on at least 3 antiretrovirals. The cocktail is how we treat patients.”

*Neutral Protamine Hagedorn

9. Alert System Reliability

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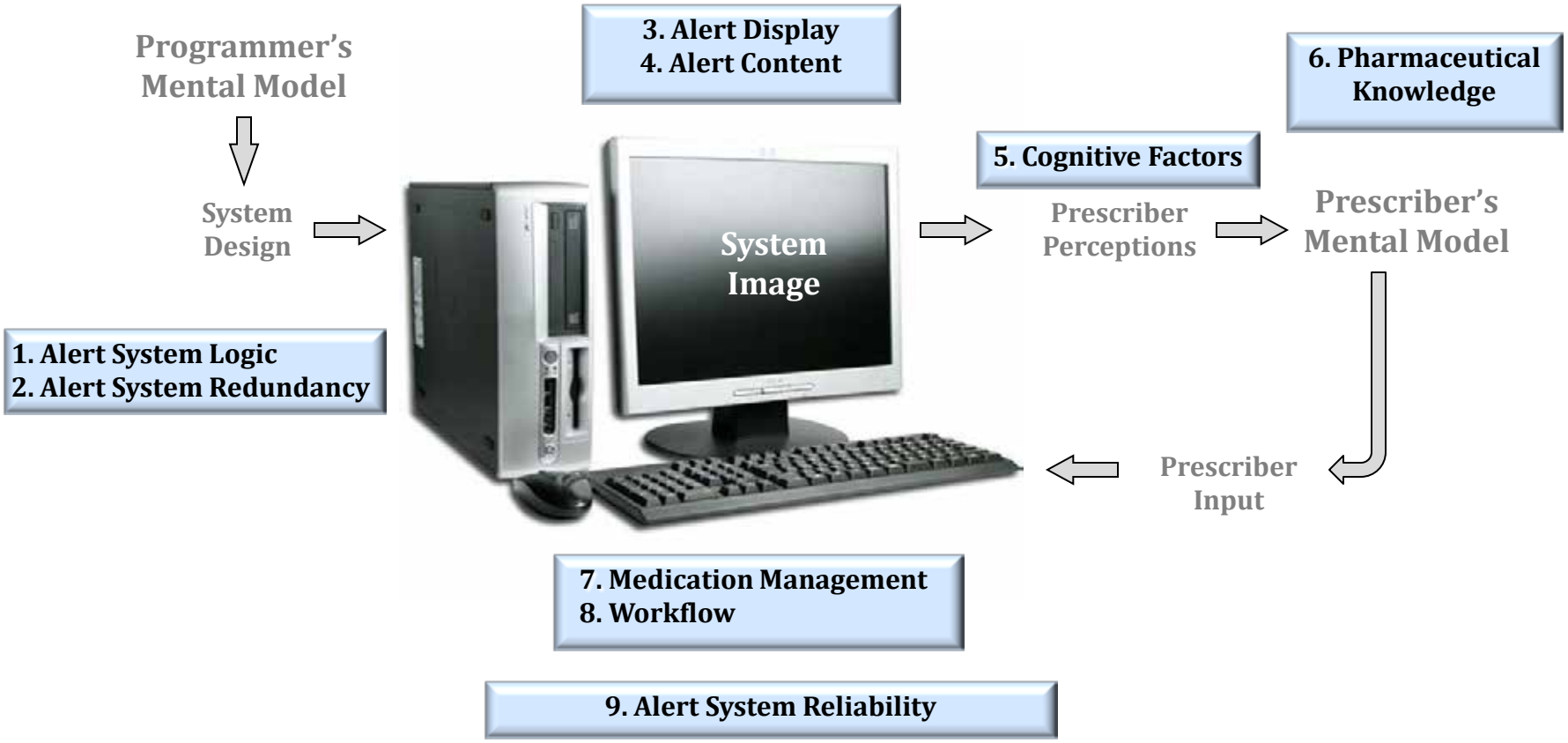
Implications:

- Reduce alerts that conflict with evidence

Prescriber-Alert Interaction



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Summary: alert design implications

- Alert interface is often a barrier for prescribers, and should be addressed along with alert fatigue
- Additional work is needed to understand how to present clinical content on alerts, so that alerts aid more prescriber types
- Need to prepare alert/CPOE systems for increased EHR interoperability

Conclusions

- One of first studies to examine alerts real-time at point-of-care
- Novel framework for prescriber-alert interaction
- Findings may inform alert redesigns to enhance patient safety

"Some are critical interactions….For example, nitrates [and] phosphodiesterase inhibitors…

It has happened before where I didn't catch this interaction, but the computer did."

- Physician

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Prescribers' interactions with medication alerts at the point of prescribing: A multi-method, *in situ* investigation of the human–computer interaction

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Thank you!

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