

# Trustworthy Information Systems in Health Care

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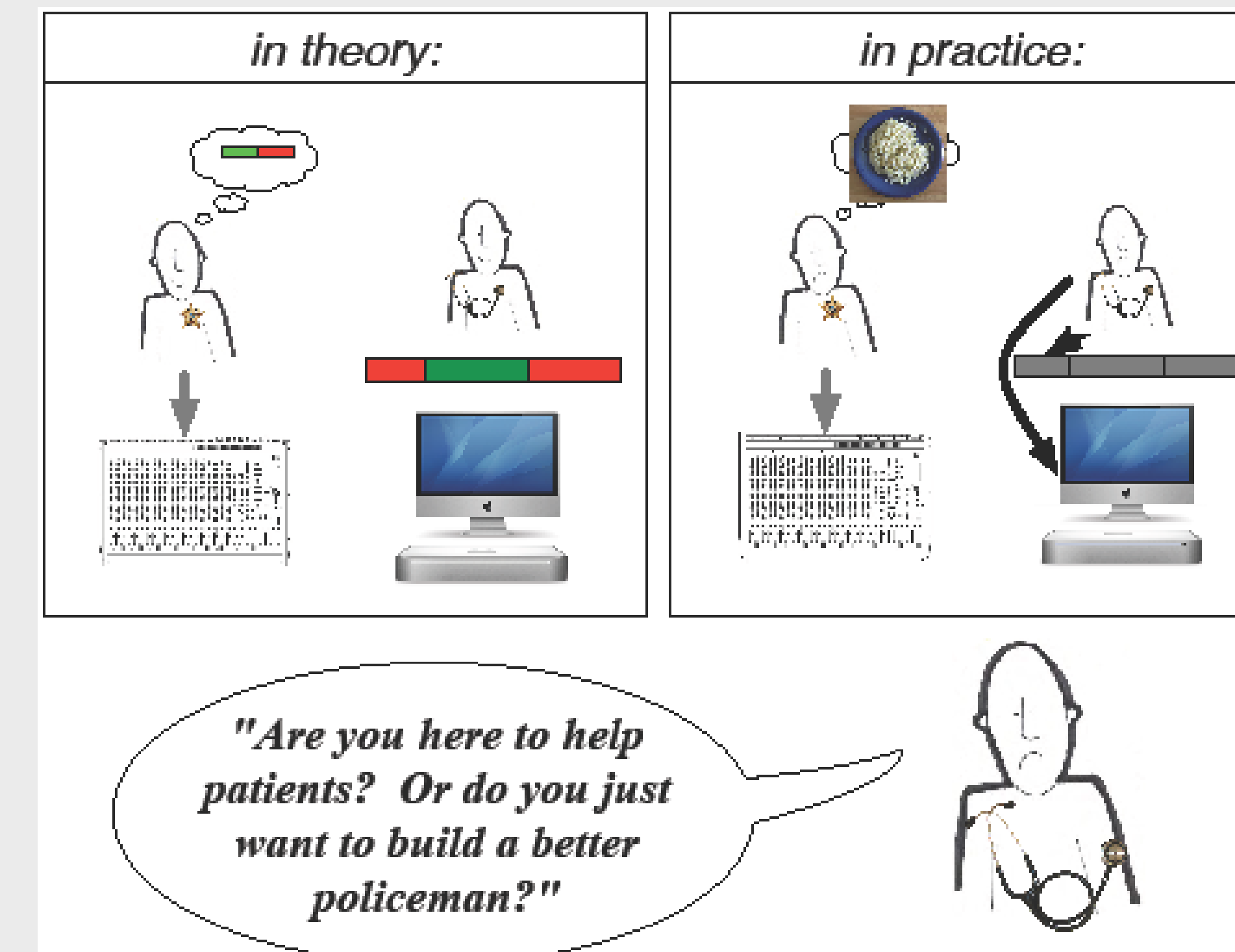
## Background

Health information technology (HIT)  
– Potential to improve quality of care  
– Potential to improve efficiency and reduce cost  
• systems must be *trustworthy*, i.e.,  
– Stakeholders confident system will do what it is designated to do  
–Correctness  
–Reliability  
–**Security**  
–**Privacy**

## Interdisciplinary research threads

1. Access control in clinical settings  
*Led by Sean Smith and Eric Johnson*
2. Mobile healthcare – security and privacy  
*Led by David Kotz*
3. Economics and risk models  
*Led by Eric Johnson and Denise Anthony*
4. Social informatics of IT in health care  
*Led by Denise Anthony*

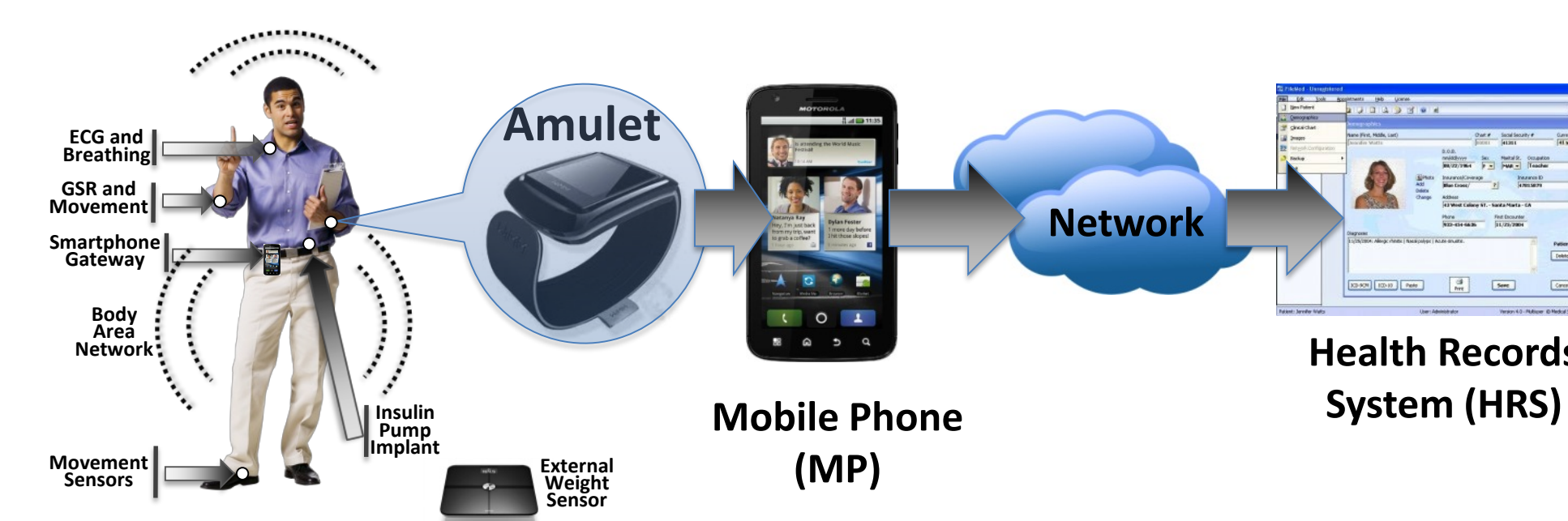
## Thread 1: Access Control Hygiene



- Access by right people, right information, right time?
- “access control” a largely solved problem?
- but no current technology (for healthcare) has all three key properties: **security, economy, usability**, that is,
  - it prevents inappropriate access and allows appropriate access,
  - it has minimal overhead for managing the system, and
  - users (both end users and administrators) can understand how to use and configure access policies

## Thread 2: mobile Health

remote patient monitoring

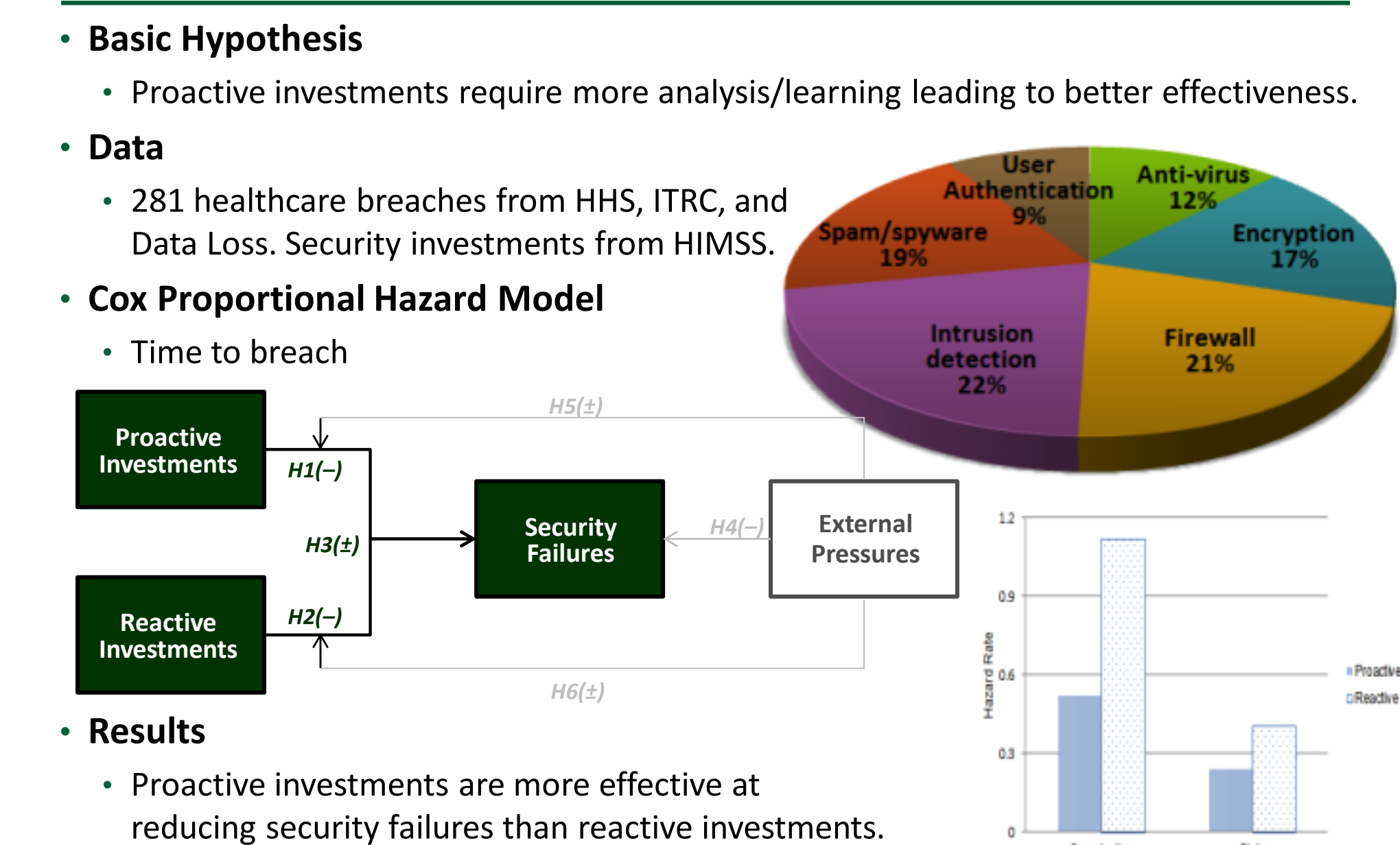


- How collect medical-quality data from wireless sensors, ensuring confidentiality and integrity?
- Develop protocols to protect integrity of sensor data
- Determine sensors are on the correct patient
  - ECG experiments
  - accelerometer experiments
- Develop usable interfaces for patient awareness and control over the information collected about them, and its distribution to others

- **Patient care risk** examines the risk to patient care from information security failures.
- **Enterprise operational risk** examines the risks related to ongoing business continuity and operating efficiency from security failures across the extended enterprise.
- **Payer financial risk** examines the risk related to misuse of protected health information and fraud.

- **Impact of HIT on quality of care**

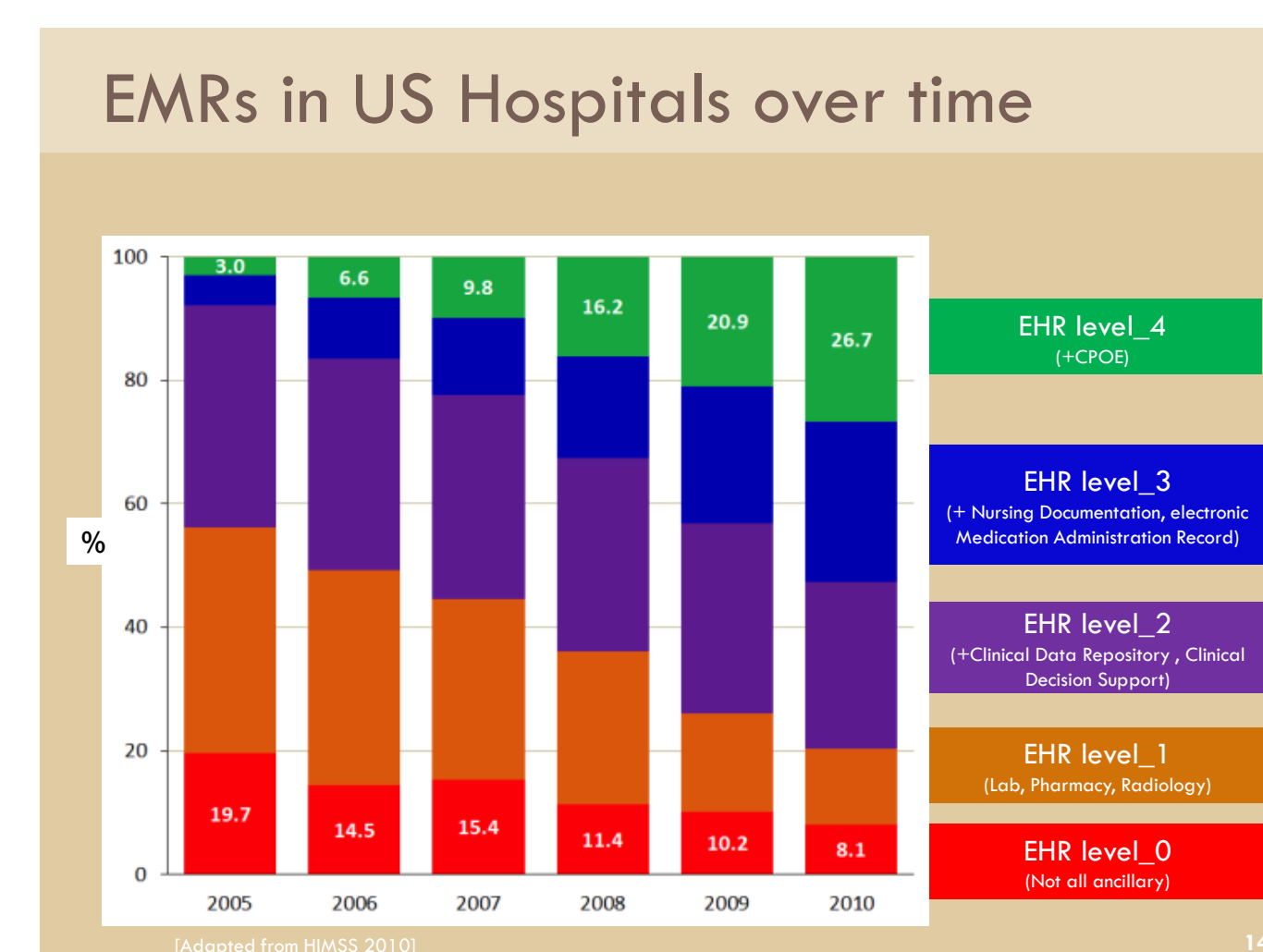
## Proactive vs. Reactive Security Investment in the Healthcare Sector



## Thread 4: Social informatics in health care

### Perceptions of privacy/security of protected health info (PHI) across healthcare delivery stakeholder groups

- What are perceptions of privacy in health care? How vary among/across stakeholders?
- How do stakeholder groups understand uses of PHI? In EMRs?
- Who is responsible for privacy/security of PHI?



### EMRs and Quality of Care

Overall, implementation of HIT systems, such as Electronic Medical Administration Record systems, surgical IT systems, or EMR systems capable of meeting federal “meaningful use” objectives, produce improved outcomes and quality of care

## Recent Papers

- “Privacy in mobile technology for personal healthcare” Sasikanth Avancha and Amit Baxi and David Kotz. *ACM Computing Surveys*, 45(1), March 2012.
- The Economics of Financial and Medical Identity Theft* (2012). Jean L. Camp and M. Eric Johnson. Springer, New York.
- “Stigma - Privacy, Information Exchanges, and the Stigmatizing Role of the Electronic Health Record.” Timothy Stablein and Denise Anthony. *2012 Eastern Sociological Society*, NY.
- “Access Control Hygiene and the Empathy Gap in Medical IT.” Y. Wang, S.W. Smith, A. Gettinger. *Dartmouth Technical Report*, April 2012.
- “Access Control Realities as Observed in a Clinical Medical Setting.” S. Sinclair, S.W. Smith. *Dartmouth Technical Report*, April 2012.
- “An Amulet for trustworthy wearable mHealth.” Jacob Sorber and Minh Shin and Ronald Peterson and Cory Cornelius and Zachary Marois and Emma Smithayer and David Kotz. In *Workshop on Mobile Computing Systems and Applications (HotMobile)*, pages 7:1-7:6, February 2012.
- “Exposing Privacy Concerns in mHealth Data Sharing.” Aarathi Prasad, *Dartmouth Technical Report*, February 2012.
- “Medication Administration Quality and Health Information Technology: A National Study of US Hospitals,” Appari, Ajit, Emily K. Carian, M. Eric Johnson, and Denise Anthony. *Journal of the American Medical Informatics Association*, Vol. 19, No. 3, 360-367.
- “Proactive vs. Reactive Investment in the healthcare sector,” Kwon, Juhee and M. Eric Johnson, *Proceedings of the 22nd Workshop on Information Systems Economics*, Shanghai, December 7-9, 2011.
- “The Impact of Security Practices on Regulatory Compliance and Security Performance,” Kwon, Juhee and M. Eric Johnson, *Proceedings of the International Conference on Information Systems*, Shanghai, December 4-8, 2011.
- “Adapt-lite: Privacy-aware, secure, and efficient mHealth sensing.” Shirang Mare and Jacob Sorber and Minh Shin and Cory Cornelius and David Kotz. In *Proceedings of the Workshop on Privacy in the Electronic Society (WPES)*, pages 137-142, October 2011.
- “Hide-n-Sense: Privacy-aware secure mHealth sensing.” Shirang Mare and Jacob Sorber and Minh Shin and Cory Cornelius and David Kotz. *Dartmouth Technical Report*, September 2011.
- Screen Capture for Sensitive Systems, J. A. Cooley, *Dartmouth Technical Report*, July 2011.
- “Recognizing whether sensors are on the same body.” Cory Cornelius and David Kotz. In *Proceedings of the International Conference on Pervasive Computing*, pages 332-349, June 2011.
- “An Organizational Learning Perspective on Proactive vs. Reactive Investment in Information Security” Juhee Kwon and M. Eric Johnson, *The Tenth Workshop on Economics of Information Security (WEIS)*, George Mason University, Fairfax, VA, June 14-15, 2011.
- “Usability Failures and Healthcare Data Hemorrhages” M. Eric Johnson and Nicholas D. Willey, in *IEEE Security and Privacy*, March/April 2011.
- “A threat taxonomy for mHealth privacy.” David Kotz. In *Proceedings of the Workshop on Networked Healthcare Technology (NetHealth)*, January 2011. IEEE Computer Society Press.
- “Practicing Privacy: Laws, Organizational Standards and Work Routines in Health Care.” Denise Anthony and Timothy Stablein. *2011 Annual meeting of the American Sociological Association*, Las Vegas, NV.