Security and Privacy in Healthcare Environments

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**Objectives and Issues**

- **Objectives**
  - Security, privacy, and safety of patients and staff
  - Security, privacy, and safety for processes and facilities in hospitals, clinics, etc.

- **Issues**
  - Vulnerabilities to malicious behavior, hostile settings, terrorism attacks, natural disasters, tampering
  - Reliability, security, and privacy issues can affect timeliness and precision of patient information

**Objectives and Issues – cont.**

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  - Collaboration over networks should be secure, private, trustworthy, reliable, consistent, correct and anonymous
  - Collaborators include physicians, nurses and staff, pharmacies, emergency personnel and law enforcement agencies, government and community leaders

**Measures**

- **Example Measures**
  - No of incidents per day, etc., in a ward, hospital, etc.
  - No of non-emergency calls due to malfunctions, failures, or intrusions
  - No of false fire alarms, smoke detections, pager activations, etc.
  - No of cases of wrong data values, lost or delayed messages, etc.
  - Timeliness, accuracy, precision

**Access Control**

- **Authorized Users**
  - Validated credentials
  - Cooperative and legitimate behavior history

- **Other Users**
  - Lack of required credentials
  - Non-cooperative or malicious behavior history

**Using Trust and Roles for Access Control**

- **Approach: “add” trust to role-based access control (RBAC**
  - Cooperates with traditional RBAC
  - Authorization based on evidence, trust, and roles (user profile analysis)

**Integrity Checking Systems**

- **Integrity Assertions (IAs)**
  - Predicates on values of database items

- **Examples** (IAs would detect errors)
  - Coordinate shift in a Korean plane shot down by U.S.S.R.
  - Human error: potassium result of 3.5 reported to ICU as 8.5

- **Types of IAs**
  - Allowable value range
  - Relationships to values of other data
  - Conditional value

**Privacy and Anonymity**

- **Privacy**
  - Protecting sensitive data from unauthorized access
  - Controlled dissemination of private data
  - Health Insurance Portability and Accountability Act (HIPAA)
  - Patients rights to request a restriction or limitation on the disclosure of protected health information (PHI)
  - Staff rights

- **Anonymity**
  - Protecting identity of data sources

**Emerging Technologies: Sensors and Wireless Communications**

- **Challenge:**
  - Develop sensors that monitor and detect violations in medical care environments before a threat to health or life occurs
  - Bio sensors to detect anthrax, viruses, toxins, bacteria
  - Ion trap mass spectrometer
  - Neutron-based detectors
  - Electronic sensors, wireless devices

**More on Our Research**

- **Collaboration**
  - Prof. Clement McDonald, M.D., Regenstrief Institute for Health Care, Indiana University School of Medicine
  - Prof. Arif Ghafoor, Electrical and Computer Engineering, Purdue
  - Prof. Mike Zoltowski, Electrical and Computer Engineering, Purdue

- **Web Site:** http://www.cs.purdue.edu/homes/bb/

- **Current support:** over one million dollars (NSF, Cisco, Motorola, DARPA)

- **Selected Publications:**