RFID in the Hospital Environment

Speaker:
Daniel Engels, Ph.D.
Director of Research
MIT Auto-ID Labs

I. Mun, Ph.D.
Director, Bio-Medical Research
Aventura Hospital & Medical Center
One million patients in hospitals daily

- 770,000 injuries caused by medication errors per year
  - 16 medication doses per patient daily
  - Estimate 2% error: 320,000 out of 16,000,000 doses daily
    - 38% (100,000): drug administration
    - 11% (35,000): drug dispensing
- 44,000 – 98,000 preventable deaths per year
- 5% of patients acquire an infection from a hospital

Staff shortage: nurse, physician, technologist
Questions

Do We Really Have Problems?

How Do We Manage The Crisis?
Action By Hospital / Government

- Optimize / Improve Workflow
- Computerize
  - Hospital Information System (HIS)
  - Picture Archiving & Communication System (PACS)
  - Electronic Medical Record (EMR)
  - Computerized Physician Order Entry (CPOE)
- Barcode
- Patient Safety Initiatives
Questions To Ask

- What Are The Sources Of Our Problems?
- What Are Our Workflows?
- What Do We NOT Know about Workflow?
Cost & Risk of Patient Care
Automatic Identification

- **Barcode?**
  - Not as good as expected.

- **RFID?**
  - Promising new technology.
Radio-Frequency IDentification

- Technology around since WWII
- Successfully re-introduced as technology for visible supply chain by AutoID Lab at MIT since 1999. For Wal-Mart, RFID may save $8 Billion per year.
- FDA & DoD are interested in RFID.
- Direct sight is not needed for read, since information is transmitted using radio-frequency
- Simultaneous reading of multiple durable tags
- More difficult to counterfeit than barcode
RFID Readers & Tags

32mm and 23mm capsule tag

Tag in mold

Tag it Smart Labels

Infusion Pump with active tag

UHF tag

RFID Patient wrist band and Handheld readers
RFID Readers & Tags
RFID Issues To Consider

• Cost
• Frequency
• Tag & Reader
• Read range
• Integration with HIS / PACS / POE /
• Standards & Support
• Pilot studies
• Regulatory Agencies
Minimum Requirements

- Cost effective
  - Better ROI than other competing technologies
  - Three to five years to pay off.

- Clinical / Operational Benefits
  - Proof-of-concept not sufficient

- Reliability / Standards
  - 99.99% uptime, service and maintenance
  - Training, Education

- Technology Upgrade Path
  - Total ownership cost

- Limited Liability
Application Types

• Standard Utilization
  - Closed System
  - Open System

• Commercial Maturity
  - Accepted System
  - Evolving System
  - Research System
Accepted Applications

• Asset Management
  ❖ Active tags (433Mhz / 915Mhz / 2Ghz
    ✓ Scan assets in a fixed / random / motion intervals
    ✓ Battery life
  ❖ 3000 items in a 300 bed hospital (10 items per bed)
  ❖ Tracking equipment & consumables
    ✓ Location / storage / inventory
    ✓ Service / repair status
    ✓ Theft prevention
    ✓ Rental equipment management
  ❖ Infant / patient tracking
  ❖ Management of room / bed : OR, ICU, CCU, ER, ….
National average utilization of mobile equipment is 45% - *Universal Hospital Services*

Hospitals can lose nearly $1 million a year in medical equipment thefts alone - *HCPro Healthcare Marketplace*

Five to fifteen percent of hospital inventory is written off each year since it can no longer be located or more importantly serviced – *Frost & Sullivan*

“Equipment moving from patient to patient without going through decontamination in between has become a significant issue to JCAHO in regard to infection control in hospitals” – *JCAHO Sentinel Alert*
Evolving Applications

- Patient wristband
  - Networked environment
    - Hospitals with HIS & PACS
    - HIPPA
    - Read-only
  - Non-network environment
    - Military
    - Disaster: hurricane, flood, earth quake
    - Read-write
  - Frequency & Read Range
    - 13.56Mhz / 433Mhz / 915Mhz
    - 2Ghz WiFi
    - Short, medium, long
Evolving Applications

• Blood product management
  - Two early sites: MGH & Georgetown
  - Reliability
  - Accuracy
  - Temperature monitoring
  - Frequency
    - 13.56Mhz
    - 433Mhz
    - 915Mhz
Evolving Applications

• Operating Room Management
  - How to optimize the OR processes
  - Active tags

• Intensive Care Unit Management
  - Improve ICU processes
  - Passive & active tags
Research Applications

- Medication delivery
  - Patient RFID wrist band
  - Interface with hospital information system (HIS), physician order entry system (POE) & inventory management system
  - Cost of item level tags and other related items
  - Change in workflow management
  - 13.56Mhz / 433Mhz / 915Mhz
  - Read-only / read-write
  - Reliability
  - Accuracy
• Pedigree for pharmaceuticals
  ▶ Legally acceptable pedigree information
  ▶ Legally acceptable document trail
  ▶ Returns
  ▶ Recalls
  ▶ 13.56Mhz / 915Mhz /
  ▶ Interface to HIS, POE, inventory management system,
  ▶ Pharmaceuticals in a hospital, pharmacy, warehouse
  ▶ Samples in physician’s office
What A Hospital Wants

• Implement RFID, if it can
  ✓ Improve patient care
  ✓ Be cost effective
  ✓ Solve real technical / clinical problems
  ✓ Reduce liabilities
Current Status

• RFID has caught the attention of hospital managers. But there are concerns about stability and cost of the technology.

• Applications for asset tracking & visible supply chain have been recognized to have a positive ROI.

• There are lots of confusing information distributed by consultants, integrators, manufactures, distributors, experts,...
Next Step for A Hospital

• Get accurate technical information from independent institutions without commercial interests to plan future steps.

• We are involved with MIT to develop accurate information through several research projects.