Wireless Internet Information System for Medical Response in Disasters
Objectives of WIISARD

- Apply scalable wireless Internet technologies to address life-threatening medical problems arising at the site of disasters and terrorist attacks
  - Focus on mature wireless technologies that could realistically be deployed in 3-5 years.
- Test systems in realistic conditions during large scale first responder training exercises
- Funding: National Library of Medicine (NIH)
Current Information Management Tools

Felt pen/whiteboard

Triage Tags

800 MHz band radios

Mobile Desks

Forms & clip board
Known Problems with Field Care of Victims of Mass Casualty Events

- Victims flee before decon causing secondary exposure (public, hospitals)
- Detection of change in status difficult (30% initial mistriage)
- Most severely ill not always transported first
- Destinations difficult to track
  - Tags lost, clinical info incomplete/missing
  - Hospital information incomplete
WIISARD Components

- Portable 802.11 location-aware mesh network
- Communications, alerting, monitoring and electronic medical records system for managing field care and regional hospital bed allocation
  - 802.11-based Intelligent Triage Tag (RFID tag)
  - Wireless pulse oximeter
  - Linux PDA’s and Windows tablets
    - Integrated barcode readers
    - Victim imaging system
  - Command center system
    - Situational awareness and geoalerts
  - Wireless mobile video
    - Virtual reality interface
Calmesh geoware networking platform

- Soekris NET 4521 133 Mhz 486
  - Linux microcomputer
  - Two 10/100 Mbit ethernet ports,
  - up to 64 Mbyte SDRAM memory
  - Compact Flash module
  - MiniPCI type III board
  - two PC-Card/Cardbus adapters

- Water resistant case,
- External antennae,
- 12V battery source provider 8-12 hours of continuous operation
- Single switch on
- External GPS
WIISARD Messaging Architecture

- Caching provides local access
- Asynchronous messaging for transmission and receipt of data
  - Make changes to local copies of objects
  - Changes sent/received when reconnected

Single team, line of sight, connected to same network node.
Forward triage and monitoring with iTAG and iMOX
iTAG WiFi RFID features

- Enter triage status
- Display triage status on LED and LCD and alerts
- Display updates from other systems
- Display ambulance for transport when assigned
- Stores medical records (512KB)
- Retrieve field care records via integrated web server
- Waterproof
- WAP and WEP security
- Commodity WiFi (parts: $200, production cost: $50)
iTag web server—field care records travel with the patient

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iMOX WiFi pulse oximeter

- Built on Nellcor OEM platform (FDA certified)
- Uses generic 802.11b
- Integrated with handhelds and midtier
- Functions as iTAG
- Waterproof
- Parts cost $460 (mass production cost of less than $150)
First tier responder handheld system
Handheld system features

- Linux PDA (HP 5555)
- Middleware for disconnected operations
- Barcode scanner
- Patient list
- PE
  - Triage, detailed physical exam
- Treatment
  - Menu and barcode
- Picture
Midtier system for field supervisors and regional hospital bed management
Role tailored software

- Triage & Treatment
- Transport
- Ambulance staging
- Regional hospital bed availability (MICN)
- Victim photo ID system
Command Team System

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Evaluation End Points:

- Triage and treatment record completeness
- Time to ambulance
- Impact on care process (ethnographic analysis)
Initial Results: Time to Transport

- No statistically significant differences in time to transport
Clinical Info Recorded vs. Time On Field (Wiisard Patients Only)

% Fields Filled vs. Field Time (minutes)*

*Calculated using timing mats (mat₂ - mat₃)

n = 37

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Qualitative Results: WIISARD Solves Critical Communication Problems

(Video clip here)
Exercise limitations introduce biases that favor paper

- Ambulance transported simulated in the exercise
  - Paper system assumed unlimited ambulance available
  - WIISARD entered ambulances on arrival schedule
- Treatment of patients not enforced by exercise controllers
  - Paper system patients were often not treated at the scene
  - WIISARD system patients often held for stabilization
- Documentation timing
  - WIISARD produced real time documentation
  - Paper system relied upon memory of first responders and was often completed in slow periods based on recall.