Rural EMS and TZD:
CrashHelp and the Role of Multimedia Information in Emergency Response

Funding:
Minnesota Medicare
Rural Hospital Flexibility Grant
2012 Minnesota Department of Transportation
Research Aims

Our research goal is to develop and test models and tools to improve technology enabled EMS systems.

Our focus:

- How can we more effectively collect, share, and visualize information?
- How can mobile technologies assist in getting useful information to the Emergency Room in advance of patient arrival?
- What are the specific information needs of MVC related traumas?
Research Activities

- **Conceptual Model – 2004-2006**
  - Development of Time-Critical Information Services Model for EMS that emphasizes end-to-end performance

- **Case Study Research – 2005-2009**
  - Two case studies to validate the model and explore best practices: San Mateo County, Mayo Clinic Trauma System

- **Prototype Development and Testing – 2009-present**
  - Review of Comparative Cases
  - Design and Testing of prototype: CrashHelp
Background: ITS and EMS

- The four “E’s” of transportation safety (USDOT, 2006)
  - Education, Engineering, Enforcement, Emergency medical services (EMS)

  “EMS is the Safety-Net of Transportation, it needs to be there when the other three E’s fail”
  - Idaho EMS Director

- ITS is needed to:
  - Support the end-to-end emergency response process
  - Provide information that can be used at the point of care, as well as to guide traffic safety analysis and improvements.
Background: MVC’s and EMS

- Almost 35,000 traffic related fatalities per year
  - Approximately 60% are on rural roads, 70% in Minnesota
- Medical and emergency service costs are roughly 15 percent of the cost of MVC’s.
- According to CDC, the cost of medical care and productivity losses from motor vehicle crash injuries as approaches $100 billion.
- **Timely** and **effective** emergency medical response to MVC’s can significantly reduce the likelihood of death, disability, and economic consequences.
Many existing and emerging technologies

- NextGeneration 911
- IP telephony
- AACN
- Mobile phones

- Computer Aided Dispatch (CAD)
- GPS/AVL/GIS
- Navigation
- Pagers, cell phones
- Interoperable 2-way radios

- e-Patient care records (PCR)
- Hospital availability/diversion systems
- Patient tracking systems
Research Findings

- Time-Critical Service
  - Incident Report (911 Call)
  - Incident Information Acquisition
  - Dispatch/Call Routing
  - Response/Coordination
  - Definitive Care

Major Gaps Information exchange from pre-hospital to hospital
CrashHelp High Level Design Principles

- Facilitates information hand-off at or before patient hand-off to ED
- Facilitates coordination across EMS organizations
- Little interference with current medical care processes and practices
- Value added context to decision makers at ED/Trauma Center
- Secure
- User friendly
- Leverages new technologies
CrashHelp System Prototype

For: EMT's / Paramedics in the field
Google Android Compatible Phone
Android Application

For: Emergency Department /
Trauma Center
Web based interface
CrashHelp System Architecture
CrashHelp Security Practices

<table>
<thead>
<tr>
<th>Mobile Device</th>
<th>Crashhelp Server</th>
<th>Web Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN Number to ID Medics</td>
<td>TLS/SSL Encryption</td>
<td>Content-Based Access</td>
</tr>
<tr>
<td>Device lock password</td>
<td>App is not Downloadable from the Market</td>
<td>Role-Based Authentication</td>
</tr>
<tr>
<td>File Encryption</td>
<td>Periodic Full Backups</td>
<td>Policy Driven User Management</td>
</tr>
<tr>
<td>Delete after sent</td>
<td></td>
<td></td>
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<tr>
<td>Remote data wipe</td>
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</tbody>
</table>
Mobile Phone Application

- Secure login
- Add new Incident
- Review existing incidents
Mobile Phone Application

- Record audio messages, Paramedic/EMT verbal snapshot:
  - Vitals
  - Origin of incident
  - Mechanism of Injury
  - Treatments given
  - Other: e.g., patient history
Mobile Phone Application

Take Pictures and Video
Mobile Phone Application

- Review, delete, encrypt, pictures, video
Mobile Phone Application

Review and add *basic* patient data

(gender, age, and name)
Mobile Phone Application

- Choose destination
- Get location
- Send phone number
- Send EMS personnel info
- Send data
- Data encrypted and stored securely on device and is “purged” after sending
- Data sends only when phone has a connection
- Text message sent to ED staff member
Web Application
Web Application
Web Application
Web Application
Pilot Test & Evaluation

- Improved information collection by on-scene EMS personnel
- Improved communication between pre-hospital transport and hospital organizations (ED / Trauma)
- Improved care decision making by hospital personnel (for some incidents)
- Improved resource utilization by hospital personnel
Minnesota Pilot Objectives:

- Enhance the functionality of CrashHelp specific to the needs of rural Minnesota emergency medical practitioners in the CENTRAC region.

- Test CrashHelp at Cuyuna Regional Medical Center (CRMC) and its EMS service.

- Plan and implement CrashHelp in 2 locations (Cuyuna, Wadena) over a 6 month period.

- Evaluate CrashHelp features for their reported and perceived impact on EMS communications, emergency medical decision making, and medical outcomes.

- Evaluate feasibility to expand CrashHelp throughout region.
# Project Evaluation Approach

<table>
<thead>
<tr>
<th>Objective 1: Test Crashhelp Usage</th>
<th>Training Cuyuna EMC Medic Crews and ED Nurses</th>
<th>Usage Evaluation</th>
<th>Valley (Trauma and Stroke)</th>
<th>Devices: Insertment</th>
<th>Evaluation</th>
<th>Crashhelp Final Comprehensive Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 2: Test Crashhelp Consistency</td>
<td>Training Tri County’s EMC Medic Crews and ED Nurses</td>
<td>Objective 3: Test Crashhelp Values Based On Use Cases</td>
<td>Use Case</td>
<td>Training and Use Case</td>
<td>Use Case</td>
<td>Use Case</td>
</tr>
</tbody>
</table>

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*Image source: CRASH HELP - A MOBILE & MULTI-MEDIA EMS APPLICATION.*

*Logos: ITS INSTITUTE, UNIVERSITY OF MINNESOTA CENTER FOR TRANSPORTATION STUDIES, CERS CENTER FOR EXCELLENCE IN RURAL SAFETY.*
Cuyuna Use: Summary Usage Stats

- Total Live Reports Sent: 88
- Total Live Reports Acknowledged: 80
- Total Audio Files Sent: 86
- Total Pictures Sent: 41
- Total Medics Used: 13
- Total Videos Sent: 0
Cuyuna Interview Themes

- **EMS communications:**
  - generally ease to use, audio preferred,
  - time consuming wireless coverage gaps,
  - close-in runs problematic

“I thought that not only was the phone was pretty self explanatory… I think it was pretty simple to use. Straightforward, had enough tools there, but not so polluted.”

“I really think that there would be some really good value in using it more to crash scenes.”

“there were times …we were so close that they, by the time the acknowledgement makes itself back through the cell service …you’re walking in the door and saying oh good, they got it”
Cuyuna Interview Themes

ED usage:
- aided in preregistration and preparation,
- increased data sharing

“It helps us to get people through faster…that was a huge asset to us as getting people registered and being able to order stuff on them, being able to pull meds out for them and stuff like that…”

“The ED physician, on seeing the image [of a deep tissue laceration], actually went ahead and, before the patient even arrived, contacted the surgeon and said, you know, I anticipate we’re gonna need your involvement based on what I’m seeing here. And it just kind of expedited getting the surgeon here.”

“I preferred to use the desktop rather than listening to the audio through the phone so then we would actually play it through a set of external speakers where the physician could hear it as well.”
Wadena: Phase 2

- Implement at Wadena through June, 2013

- Continue to refine system and use, including development of Trauma and Stroke use cases, and possible validation in real cases.

- Conduct focus groups, including regional implications (at TZD Meetings).

- Conduct qualitative interviews and quantitative analysis.
Use: Summary Usage Stats (Wadena)

- Total Live Reports Sent: 239
- Total Live Reports Acknowledged: 145
- Total Audio Files Sent: 163
- Total Pictures Sent: 54
- Total Medics Used: 11
- Total Videos Sent: 0

Last updated May 13, 2013
# Trauma Reporting (Information Matters The Most)

Please ask for the following information:
- Encourage early reporting
- Respiratory compromise/ intubation at scene
- Lowest BP
- Highest HR
- GCS/AVPU
- Mechanism of injury
- Age

## Criteria

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<tr>
<th>Criteria</th>
<th>“Must know” Information</th>
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<tr>
<td>Airway/Breathing</td>
<td>Intubated, Apneic (not breathing), oxygen, Pulse oximetry (value ~ 90%)</td>
</tr>
<tr>
<td>Circulatory</td>
<td>Lowest BP, Highest Heart Rate, EKG (for chest pain or if found unconscious)</td>
</tr>
<tr>
<td>Neurologic</td>
<td>GCS</td>
</tr>
<tr>
<td>Other Considerations</td>
<td>Mechanism of Injury, Blood Glucose</td>
</tr>
<tr>
<td>Geriatric Patients</td>
<td>Age &gt; 65 -&gt; upgrade trauma level                                                      Preganant Patient -&gt; upgrade trauma level</td>
</tr>
</tbody>
</table>
Trauma Scenario Using The CrashHelp’s Capabilities

Draft: An Enhanced Trauma Scenario

1. Medics Evaluation
   - ETA, number of incoming patients, mechanism of injury, and patient status (e.g., vital signs, interventions given, gender, and age). Anemic (not breathing), intubated, oxygen, pulse oximetry, highest HR, lowest BP, EKG, GCS, and blood glucose.

2. Medics report to ED via the CrashHelp App

3. Simultaneous notifications to ED Department, Trauma Team, and Trauma Center

4. Trauma Team Assembly

5. An EMS crew stays for Q&A
EMS Response: “Red Card” Implementation on CrashHelp

EMS Mobile Phone Screen

ED iPad Screen - General

ED iPad Screen - Details
Discussion Item: “Sustainability”

- How applicable is CrashHelp to your region?
- What challenges or restraints in your region would inhibit the implementation of CrashHelp?
Discussion & Questions

Thanks!