A PATIENT TRACKING DEMONSTRATION AND EVALUATION PROJECT FOR THE FLORIDA DEPARTMENT OF HEALTH DIVISION OF EMERGENCY MEDICAL OPERATIONS OFFICE OF EMERGENCY OPERATIONS RFP# DOH04-152

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CONFLICT OF INTEREST STATEMENT

The partners of SafeTech Solutions are not employed by nor do they have a financial interest in EMSystem LLC, Salamander Technologies, or any other entity involved in this pilot project. The resulting report submitted by SafeTech Solutions has been developed without regard to any future employment or services. The consultants hereby submit the following report with information collected as an independent third party solely for the benefit of the residents and visitors to the state of Florida.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Florida Department of Health (DOH) has been designated as the lead state agency for Comprehensive State Emergency Plan Appendix VIII Emergency Support Function 8 (ESF-8) and, in this capacity coordinates the State's health, medical and limited social service assets in the event of a major natural or man-made disaster. ESF-8 oversees the emergency management functions of preparedness, recovery, mitigation and response with all agencies and organizations that carry out health or medical services.

The FL-DOH Office of Emergency Operations (OEO) has identified the following ESF-8 issue as a high priority: "during an emergency, patients are treated, assessed and transported to medical facilities by emergency medical service providers. Some patients may also show up at treatment facilities on their own or with private assistance. Current procedures to track patients include telephone and written communications between hospitals and emergency medical service providers to establish where to send patients as well as to update situation reports for the emergency operations centers. Patient diagnostic and treatment data collected in the field typically are not available to the receiving care facility until the patient arrives."[13]

The FL-DOH OEO issued Request for Proposals (RFP) DOH04-152 "A Patient Tracking Demonstration and Evaluation Project" on June 3, 2005. EMSystem LLC of Milwaukee, Wisconsin was awarded a contract to produce a series of progress and analytical reports on the effect of a county-wide patient tracking system project between September 1, 2005 and June 30, 2006. To develop these reports, EMSystem installed a patient tracking system for testing in Orange County, Florida between September 1, 2005 and June 15, 2006.

The contract issued by OEO required the formation of a multi-disciplinary and multi-stakeholder Advisory Group. Through a series of conference calls, the Advisory Group provided EMSystem with locally focused guidance throughout the project period. The Advisory Group recommended that an independent organization be contracted to provide an evaluation of the pilot. In May 2006, EMSystem contracted SafeTech Solutions (STS) to provide an independent third party evaluation and analysis of the project.

The consultants found the first generation electronic patient tracking system providing the required and desired capabilities in Orange County. From the administrative perspective this system, with several refinements, will provide greater accountability, communications, and improve the ability to provide information to the public following a disaster. Field and hospital users appreciate the same attributes, primarily a decreased workload while improving their ability to communicate with other users.

It is important to consider the reduced costs that will be obtained with the leveraging of existing infrastructure. This project was intended to provide a complete testing opportunity and thus includes equipment and costs that may otherwise not be applicable. This final report and its annexes will provide the state of Florida a clear outline of the activities of the Orange County pilot project with recommendations to the vendors for system enhancements. While the patient tracking concept has been "proven", other solutions and vendors may ultimately be selected for implementation in Florida.

ELECTRONIC PATIENT TRACKING

As the result of Lessons Learned during Hurricane Katrina, the California Loma Prieta Earthquake, the Pentagon and World Trade Center Attacks of 9/11/01, the Oklahoma City bombing, and Mass Casualty Incidents (MCIs) that otherwise occur on a frequent basis, many public safety and Emergency Medical Service (EMS) agencies are targeting the development of electronic patient tracking systems with federal grant program funding.

Advancements in off-the-shelf technology has caught the attention of emergency managers who must track, locate, identify, and later reunify hundreds and in some cases thousands of patients and victims of mass casualty and catastrophic incidents with their families.

While the hardware and software services are now widely available, system implementation requires a rare mixture of technical expertise. Project managers must implement complex data collection and wireless communication systems that are operationally sound, cost efficient, and user friendly. These objectives must be accomplished across jurisdictional, political, and geographic boundaries to become or remain interoperable with other systems. Extensive experience with EMS and Incident Command System (ICS) operations is required to ensure that the resulting system will be functional, from both the infrastructure and end-user points of view.

PATIENT TRACKING - MANAGING EXPECTATIONS

End users have identified a variety of expectations for patient tracking systems. Some expect to simply implement computerized triage tools, or transmit casualty counts to incident managers; others expect to determine the exact location of patients on the scene of an incident and track their movement through the medical and health care system. Still others are unaware of the potential systemic impacts of each particular entry in the system. Most recognize improvements in responder deployment and “load balancing” of hospitals would occur if they had near real-time access to hospital status and scene specific information.

Emergency Departments have tracked patients for many years utilizing a whiteboard and grid, allowing managers to track and direct appropriate patient care. Recently the whiteboards been replaced by electronic patient tracking systems, allowing caregivers access to necessary information gaining efficiencies and greatly improving patient safety.

There are many variables that must be considered when developing operational or deployment models for maximizing technology purchases to leverage existing infrastructure. These variables will even vary among neighboring EMS agencies, hospitals, and other agencies. The variances have an even larger impact when one considers regional or intra-regional systems. Statewide systems must consider dozens of varying operational and deployment issues.

Some variables affecting the purchase and deployment of patient tracking systems include:

- Existing infrastructure
    - Digital data radio systems

    - Cellular phones (individual)
    - Cellular service (laptop "air cards")
    - Satellite data modems
- MCI operations/standard operating procedures
    - Mutual aid partners and their existing infrastructure
    - Field operating procedures
    - Incident command structures
- Hazard vulnerability analysis
    - Risk of specific types of incidents
    - Dispersed patients vs. casualty collection points
- Use of the system
    - Daily use
        - Hospital notification procedures
    - MCI use
        - Patient tracking procedures
        - Victim tracking procedures
        - Hospital notification procedures
    - Disaster/catastrophic incident use
        - Patient tracking procedures
        - Victim tracking procedures
        - Hospital notification procedures
        - Load balancing capabilities
        - Mutual aid coordination

Most EMS and hospital systems have some investment in an underlying infrastructure already made. Depending on that infrastructure and the intended use of the system, additional hardware and/or software may be required. Each incident will have its own Incident Action Plan, designed to mitigate the incident with the resources available. This means there will not be one single method of deployment across a region or state. Various concepts of operations, even within a single jurisdiction, can affect the role of responders, NIMS compliant incident command, and desired outcomes from the system.

ELECTRONIC HEALTHCARE RECORDS

The National Academy of Sciences Institute of Medicine (IOM) undertook a study to improve patient care records. The committee concluded that "computerization can help to improve patient records and that improved patient records and information management of heath care data are essential elements of the infrastructure of the nation's health care system."

The committee also identified five objectives for future patient record systems:

1) Future patient records should support patient care and improve its quality; and
2) They should enhance the productivity of health care professionals and reduce the administrative costs associated with health care delivery and financing; and
3) They should support clinical and health services research; and
4) They should be able to accommodate future developments in heath care technology, policy, management, and finance; and
5) They must have mechanisms in place to ensure patient data confidentiality at all times[1]

Healthcare information technology overall has been slow to integrate over the past 30 years but has recently gained momentum.[2][3] Dr. Brailer, formerly director of the Office of the National Coordinator for Health Information Technology said: "A recent study showed that clinical information is frequently unavailable in primary care, and that this missing information can be harmful to patients. That study also showed that clinical information was less likely to be missing in practices that had electronic health records. This adds to the substantial evidence that health IT – such as computer-physician order entry, ePrescribing, preventative reminders, and bar code scanning to name a few – improves care, reduces wasteful and redundant treatments, and prevents medical errors."[4]

Many factors have resulted in disparate information systems with proprietary software that performs only specific functions. "One challenge that has not yet been adequately addressed is the development of scalable, interoperable Electronic Healthcare Records. It is debatable whether the lack of emphasis on interoperable systems is more a result of vendors fragmenting the market, buyers' lack of interest, resistance from payers, perceived market advantage by provider groups or health systems by those making the investment, or fear of sharing information." [5]

Integrated resource management with access to real-time information for managers with operational and logistical responsibilities improves the care provided, patient and staff safety, and establishes accountability for liability and reimbursement while improving the post event quality management. Once fully implemented these concepts will contribute to an estimated $77.8 billion in healthcare savings![6]

LESSONS LEARNED

The After Action Reports of most large-scale disasters repeatedly indicate a need exists to improve status reporting and resource monitoring during an incident, on a real time basis. The identification of victims during the first minutes to hours of any large incident becomes problematic and difficult. Madrid, Spain physician Dr. Ortiz also provides this perspective, "*The stress put upon the families of the potential victims by not knowing the location of or whether the family members where alive or dead, had the most significance of the entire disaster*"[7].

Dr. Ortiz served as Incident Commander following the infamous Madrid train bombings for a large urban hospital. He assigned patient identification teams while a simple electronic patient tracking database was developed within three hours of the attacks so that families arriving at the hospital could be informed in the designated Family Assistance Center as soon as possible. This helped the "severe problems for family members looking for loved ones" although it had not been practiced nor planned in advance.

Pediatric victims of large incidents are particularly difficult to identify. This fact was illustrated following the South Asian Tsunami of December 26, 2004; following extensive DNA testing one infant was not identified until February 14, 2005. One Indian newspaper article reporting on a fire in a local religious temple and the resulting aftermath found "Some who *could not find their dear ones started getting frustrated*. Some of them started to ransack and burn shops and houses. Scared, the doctors and policemen fled the place."[8]

Reporting on the aftermath of the Asian Tsunami another website says, "(The death toll) numbers are expected to rise and experts fear some of the badly decomposed bodies, *many wearing only what they had on when the tsunami stuck, may never be identified*." Most victims' bodies were unrecognizable… For some, there were no photographs, only hints -- a watch, a ring, a cell phone."[9] Forensic investigators frequently use photographs for positive identification by family members. Only after the most recent disasters, publicly accessible websites have been setup for this purpose.[10]

The IOM released another report (June 2006) entitled Emergency Medical Services At the Cross Roads, which states: "The capacity shortages that are observable on a day-to-day basis in many areas of the country are magnified considerably in the event of a disaster. Given the challenges that already exist, there is substantial evidence that *the emergency and trauma care system is not well prepared for larger-scale crisis events* (Schur et al., 2004)."[11]

This IOM reported further on its findings following Hurricane Katrina, "While considerable federal resources were eventually brought to bear, these *resources were not adequately coordinated*, resulting in added confusion. Despite tremendous organizational failures that occurred at each level of government, care providers on scene did the best they could to supply adequate care. The U.S. House report on Katrina concluded that ultimately, *public health and medical support services were effectively but inefficiently delivered*.

During Katrina, air ambulance crews also played an important role, assisting in evacuating survivors from flooded areas. Overall, 27 civilian EMS helicopters were involved in evacuating Tulane Medical Center, Charity Hospital, and others (Lindstrom and Losavio, 2005). In many cases, the helicopters used the roof of the hospital parking garage as a landing zone, and patients were brought upstairs to meet them. However, despite these efforts, which took place largely without the aid of FEMA[12], *evacuations from these facilities were highly disorganized* and agonizingly slow. In many cases, hospital patients were left on their own for days without any assistance at all.

Patients who survived the evacuation were treated initially and then transported via buses and airplanes to hospitals in other cities for definitive care. However, this process *also suffered from significant disorganization and delays*. Many patients were evacuated to the airport but were left there for hours or days before being transported. Others were sent to distant cities *with little or no information about where they were going or how they could get information about the location of their families*."

POTENTIAL USES OF INTEGRATED HEALTH/MEDICAL INCIDENT TRACKING

Special needs shelter residents, Points of Dispensing resources, influenza vaccine dispensing, evacuee's, surviving patients, victims of fatal injuries, personnel, volunteers, pets of evacuees, supplies, equipment, and other resources may be individually tracked. The tracking of these would create a log identifying the item/person, the location or movement of the item/person, their status (contaminated, decontaminated, task completed, etc), the time of the entry (or start and end times) and any other detail that should be tracked.

Tracking of people serves multiple purposes. Accounting for employees, volunteers, patients and victims allows an incident commander to identify individuals who may have been exposed to dangerous chemicals, to identify how many and who are on the scene and in the case of a crime scene, who had contact with the evidence, and offers accurate real time accounting of costs. This capability allows for rapid requests for resupply, replacement and reimbursement with immediate cost capture. Inventories managed accurately and efficiently will greatly reduce the system wide impact of an incident.

The Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP) is a national effort begun in 2003 to develop a system that allows for advance credentialing of clinicians needed to augment a hospital or other medical facility to meet increased patient/victim care needs during a declared emergency. States are expected to develop their own system but follow national guidelines in order to allow for potential future integration.

Communicable disease officers would utilize the capabilities of the tracking software and equipment for managing a mass prophylaxis response, investigating epidemiological events, and other similar functions. This would allow for rapid processing of high volumes of patients through treatment areas providing documentation and tracking suitable for medical records, event logging and reimbursement requests.

By performing algorithmic monitoring of symptoms and complaints, surveillance of public health for known syndromes provides a primary protective health service for regions utilizing such services. An integrated and interoperable information tracking system would enable surveillance of every patient encounter, including 911 callers, private ambulance requests, primary care physicians, clinics, urgent care centers and emergency departments.[13]

The 2006 IOM research committee recommends "that a greater focus be placed on developing an effective *interoperable medical communications system* that works efficiently on a day-to-day basis and can be employed in the event of a major disaster. In addition to voice communication systems, the Department of Homeland Security could contribute to emergency preparedness by providing financial support for improving the nations health information technology infrastructure."

CAPABILITIES BASED SYSTEMS

Electronic patient tracking systems require the integration and interoperability of a number of disparate systems. There are three basic functions that must be accomplished in order to provide electronic patient tracking. These are 1) the EMT, Paramedic, or nurse prepares a unique patient identifier (UPI) or name if known, the initial triage category, and associate these with a location or vehicle, and 2) the information from the previous step must be transmitted to a central database, and 3) the database must be accessible to other stakeholders.

The first step, preparing a UPI, is currently automated by the preprinting of bar codes on paper triage tags that are applied to each patient during an incident. The bar code is scanned into a PDA or laptop computer. Formerly a unique number was printed on the tag, on a tear off corner to be collected on a scene. Future advancements may incorporate the

use of temporary assigned Radio Frequency Identification Device (RFID) tags or “smart chips”, magnetic strip readers to retrieve data from drivers’ licenses, and electronic health care records.

The second step, transmitting the previously collected data to a central database, can be performed by many different methods. If the data was initially collected remotely on a PDA, the method for getting the data to a central server will require wireless connectivity. The exact method is dependant on the configuration of the PDA. If equipped with cellular service, it may directly connect to the Internet; if not another wireless technology must be used connecting it to an internet access point. Additionally, if the cellular service is unavailable, another method for accessing the Internet must be provided, which may be provided by a satellite modem or radio modem.

The third step, providing an accessible database, need not be complicated but must assure users a secure and intuitive interface. Current technologies allow secure access to Internet databases through secure, SSL 128-bit encrypted, websites. This eliminates the need for specialized software, requiring only a web page designed to be intuitive for infrequent users.

GOVERNANCE AND FUNDING

The FL-DOH has been designated as the lead state agency for Comprehensive State Emergency Plan Appendix VIII ESF-8 and, in this capacity coordinates the State's health, medical and limited social service assets in the event of a major natural or man-made disaster. ESF-8 operates within the Florida Division of Emergency Management in support of county emergency management or regional Multi-Agency Coordination Groups (MACS). ESF-8 operations are in consonance with the National Incident Management System (NIMS).

To accomplish this goal ESF-8 oversees the emergency management functions of preparedness, recovery, mitigation and response with all agencies and organizations that carry out health or medical services. ESF-8 coordinates and manages overall public health response, triage, treatment and transportation of victims of a disaster; assistance in the evacuation of victims out of the disaster area after the event; immediate support to hospitals and nursing homes; provision of emergency behavioral health crisis counseling for individuals and the community and the reestablishment of all health and medical systems. Assistance in pre-event evacuation may also be provided whenever patients or clients of the state and FL-DOH are affected, or pre-established plans for any health care institution have failed.

The following ESF-8 services[14] provide the framework upon which the FL-DOH supports any emergency or disaster incident occurring in Florida:

- Assessment of health and medical needs
- Coordination of disease control/epidemiology investigation response
- Assistance to health care agencies and county special needs shelters in locating and providing health/medical care personnel
- Assistance to and coordination of EMS (pre-hospital)
- Coordination of patient evacuation
- Coordination with the Agency for Health Care Administration (AHCA) to ensure in-hospital and nursing home care is maintained
- Assurance of food and drug safety, and availability of certain food and drugs
- Coordination of critical incident stress debriefing (CISD) for all responders, health and safety
- Coordination of radiological/chemical/biological hazard surveillance and control
- Coordination of public health information
- Coordination of environmental health issues to include: vector monitoring/control, water potability, and disposal of sewage, waste water and solid waste.
- Assurance of victim identification/mortuary service

PROJECT ISSUE ANALYSIS

The OEO has identified: "during an emergency, patients are treated, assessed and transported to medical facilities by emergency medical service providers. Some patients may also show up at treatment facilities on their own or with private assistance. Current procedures to track patients include telephone and written communications between hospitals and EMS providers to establish where to send patients as well as to update situation reports for the emergency operations centers (EOCs). Patient diagnostic and

treatment data collected in the field typically are not available to the receiving care facility until the patient arrives.

Other users with needs for patient tracking information (such as emergency operations center personnel and family disaster assistance personnel) typically contact these same hospitals and EMS providers to gain patient location information. State and local epidemiologists also need tracking data for analysis of patterns.

Reliance on person–to-person communications provides only rudimentary tracking. What is needed is a county-wide, centralized process that would allow patient location updates by emergency medical service providers and information requests by users on a secure as-needed basis."[15]

REQUEST FOR PROPOSALS

The FL-DOH OEO issued Request for Proposals (RFP) DOH04-152 "A Patient Tracking Demonstration and Evaluation Project" on June 3, 2005. EMSystem LLC of Milwaukee, Wisconsin was awarded a contract to produce a series of progress and analytical reports on the effect of a county-wide patient tracking system project between September 1, 2005 and June 30, 2006. To develop these reports, EMSystem installed a patient tracking system for testing in Orange County, Florida between September 1, 2005 and June 15, 2006.

The RFP and subsequent contract requested a series of reports about a real-time system to track patients through the emergency response process from the scene of an incident through admission to a hospital or treatment facility on a county-wide basis.

The contract issued by OEO required the formation of a multi-disciplinary and multi-stakeholder Advisory Group. Through a series of conference calls, the Advisory Group provided EMSystem with locally focused guidance throughout the project period. The Advisory Group recommended that an independent organization be contracted to provide an evaluation of the pilot. In May 2006, EMSystem contracted SafeTech Solutions (STS) to provide an independent third party evaluation and analysis of the project and to produce certain reports conforming to the following requirements set forth in RFP DOH04-152:

- To provide a multidisciplinary evaluation of a countywide patient tracking system that includes patient name, race, sex, and age as well as the patient's presenting complaint and EMT/Paramedic assessment of condition.
- To report the financial considerations of the costs involved in setting up similar patient tracking systems in other counties.
- To report the potential future expansion of the patient tracking system.

PATIENT TRACKING SYSTEM REQUIREMENTS

The RFP identified minimum patient tracking system requirements to be:

- To provide basic patient demographic information in near real-time for pre-hospital patients and hospital ER walk-in patients:
    - To collect and display patient name, race, sex, and age
- To provide basic patient diagnostic information in near real-time for pre-hospital patients and hospital ER walk-in patients.

    - To collect the patient's presenting complaint and EMT/Paramedic assessment of condition.
- To identify the patient's current location
- To track the patient through the transport to the medical facility where the patient is being transported.
- To have the capability to forward information as collected to the receiving facility
- To have the capability to forward information as collected to the county level Emergency Operations Center.
- To work with a large number of hospital information systems
- To work with a large number of EMS patient information systems.
- The project was to include at least five hospitals and associated EMS providers:
    - At least one of these hospitals being a state approved trauma center.
    - At least one urban hospital should be included in the patient tracking system.
        - An urban hospital means a hospital serving census tracts the majority of which have greater than 6,000 persons per square mile.
        - The urban hospital should be in a different metropolitan area from the trauma centers.
    - At least one of these hospitals being a rural or small suburban hospital.
        - A rural hospital means a hospital serving census tracts, the majority of which have less than 2,000 persons per square mile.
    - At least one adult trauma center as defined by the DOH Bureau of Trauma.
    - At least one pediatric trauma center as defined by the DOH Bureau of Trauma.
        - The chosen pediatric trauma center may be outside the county where the patient tracking system is being tested.
    - Selected EMS entities should transport to selected hospital and should include fire and non-fire based EMS entities.
    - Other local partners will be added as agreed upon by the Department and EMSystem.

PROPOSAL TASK LIST AND OUTCOME MEASURES

The following required tasks and outcome measures were required for project completion and report acceptance:

1. EMSystem will establish the patient tracking system in the target county, Orange County, as designated in its response to the proposal.
2. Choose hospitals, EMS providers, and other local partners to establish a patient tracking system across the target county.
3. Create and chair an Advisory Committee in consultation with the Department of Health.
    a. The advisory committee should be comprised of not less than 12 nor more than 15 state-wide representatives from the following disciplines:
        - Emergency medical services agencies and personnel;
        - EMS IT providers;
        - Emergency room physicians;
        - Hospital professional staff;
        - Hospital IT providers;

- Medical records personnel;
- Hospital Infection Control;
- Epidemiology staff of the County Health Department;
- County emergency management representatives;
- State IT Personnel;
- State DOH Office of Emergency Operations personnel;
- Patient/family support groups (e.g. American Red Cross); and
- Law Enforcement personnel

b. The Advisory Committee will meet not less than three times during the system test to examine the system status and make recommendations for improvements to the system.
c. EMSystem will submit to the department copies of the minutes of all Advisory Committee minutes together with copies of any materials distributed to the committee.
d. Meetings will be compliant with Sections 286.011 and 286.0105, F.S. (Public Meetings and Records)
e. EMSystem will be responsible for the travel and ancillary expenses of the committee in the performance of its duties under this system. This will include the secretarial and clerical assistance to produce minutes and reports.

4. Develop a system demonstrating a near real-time patient tracking system that provides services for a select group of hospitals, EMS providers and the county emergency operations center in the designated county.
5. Submit a detailed work plan delineating the system activities, responsible parties and due dates necessary to achieve the patient tracking system objectives and outcomes.
6. The expected outcomes of the patient tracking system will include, but not limited to, the following:
    - A schema for the data being collected in the patient tracking system will be commensurate with the needs of the medical community as defined by the Advisory Committee;
    - A procedure for tracking Patient location and transport and sending preliminary information ahead to receiving hospitals in a timely manner;
    - A method for diverting patients to hospitals that have appropriate available facilities or trained staff when necessary;
    - A procedure to allow Emergency Operations Centers to get a current view of the extent of patient casualties in emergent situations;
    - A procedure for family members to find the location of patients without violating state and/or federal patient confidentiality protections.
7. Develop and present to the Advisory Committee the data schema and definition set for use in the patient tracking system;
8. Prepare Progress Report 1 covering the description of the data elements, the data definitions, the schema and the recommendations of the Advisory Committee.
9. Develop and present to the Advisory Committee a model patient tracking system that demonstrates the use and functionality of the recommended patient tracking system;
10. EMSystem is responsible for the purchase and maintenance of the equipment and conduct the programming required to construct and implement the patient tracking

system consistent with the needs of the hospital and EMS participants of the designated county, the Advisory Committee, and the Department of Health.

11. Demonstration includes user and technical training, and system troubleshooting training.
12. Prepare Progress Report 2 covering the progress since last report of the system development, the results of the model and the recommendations of the Advisory Committee and submit to the Department.
13. Operate and maintain the recommended patient tracking system for at least a two-month period to evaluate the sustainability of the system.
14. Prepare the Interim Report at the one month milestone covering the progress of the system demonstration, the results of the model and the observations and recommendations of the users of the system and present the report to the Advisory Committee and the Department.
15. Prepare the Final Report covering the history and progress of the system development, the financial outlays (both current and projected), and the results of the model trial and the evaluations of the users and Advisory Committee as well as the EMSystem's recommendations for future improvements.
16. In compliance with Florida Statute 119.011(1) retain all documents pertaining to the project for a period of five years after termination of the contract or longer if the contract is renewed or extended. EMSystem will furnish, when requested to do so, all documents required to be retained. Submission of such documents will be in the department's standard word processing format (currently Microsoft Word 6.0). If this standard should change, it will be at no cost incurred to the department. Data files will be provided in a format readable by the department.
17. EMSystem will maintain the confidentiality of all records, including those classified as protected health information under HIPAA, Florida law, or administrative rule. EMSystem will hold the department harmless from any claim or damage including reasonable attorney's fees and costs or from any fine or penalty imposed as a result of an improper disclosure by EMSystem of confidential records whether public record or not and promises to defend the department against the same at its expense.
18. The following outcome measures were included in the contract:
    a. EMSystem shall produce a report covering the description of the data elements, the data definitions, the schema and the recommendations of the Advisory Committee.
    b. EMSystem shall prepare a report covering the system development and design of the system with recommendations of the Advisory Committee.
    c. EMSystem shall prepare a report at the one month milestone covering the progress of the system demonstration, the results of the system and the observations and recommendations of the users of the system and Advisory Committee.
    d. EMSystem shall prepare a final report covering the process of the system development, the financial outlays both current and projected, the results of the system and the evaluations of the users and Advisory Committee as well as the EMSystem's recommendations for future improvements.

PROJECT FUNDING

Funding for RFP DOH04-152 was provided entirely by the HHS, HRSA[16] National Bioterrorism Hospital Preparedness Program (NBHPP) identified through Catalog of Federal Domestic Assistance 93.003[17] authorized by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188) amended Section 319C-1 of the Public Health Service Act (42 U.S.C. 247d-3). Funding is provided under the Consolidated Appropriations Act, 2004 (Public Law 108-199).

PROJECT GOVERNANCE

The HRSA grant program has established specific performance standards or benchmarks for states receiving HRSA grant funding. The RFP DOH04-152 project addressed the following HRSA Minimum Levels Of Readiness[18]:

1. Enhance the statewide mutual aid plan to deploy EMS units in jurisdictions/regions they do not normally cover, in response to a mass casualty incident due to terrorism.
    a. This plan must ensure the capability of providing EMS triage, transportation and patient tracking for at least 500 adult and pediatric patients per million population within 3 hours post-event.
    b. In addition, for each metropolitan area or other region of the state for which a predictable high-risk scenario has been identified during a HVA, the plan must describe a mechanism for transporting patients from an incident scene or from local hospitals to healthcare facilities in adjacent jurisdictions, to temporary healthcare facilities within or near the affected jurisdiction, and to nearby airports or rail stations for transport to more distant healthcare facilities.
    c. All scenarios documented under Critical Benchmark 2.1 should be addressed in mutual aid plans for EMS.
2. Establish a secure and redundant communications system that insures connectivity during a terrorist incident or other public health emergency between health care facilities and state and local health departments, emergency medical services, emergency management agencies, public safety agencies, neighboring jurisdictions and federal public health officials.
3. Enhance the networking capacity and training of health care professionals to be able to recognize, treat and coordinate care related to the behavioral health consequences of bioterrorism or other public health emergencies.
4. As part of the state or jurisdiction's bioterrorism hospital preparedness plan, functional exercises will be conducted during FY 2005 and should be based on the Awardee Hazard Vulnerability Analysis (HVA). These drills should involve several state agencies and implement the Incident Command Structure (ICS). To the extent possible, members of the public should be invited to participate. These exercises/drills should encompass, if possible, at least one biological agent. The inclusion of scenarios involving radiological and chemical agents as well as explosives may be included as part of the exercises/drills.
5. Establish systems that, at a minimum, can provide triage treatment and initial stabilization, above the current daily staffed bed capacity, for the following classes of adult and pediatric patients requiring hospitalization within three hours in the wake of a terrorism incident or other public health emergency:

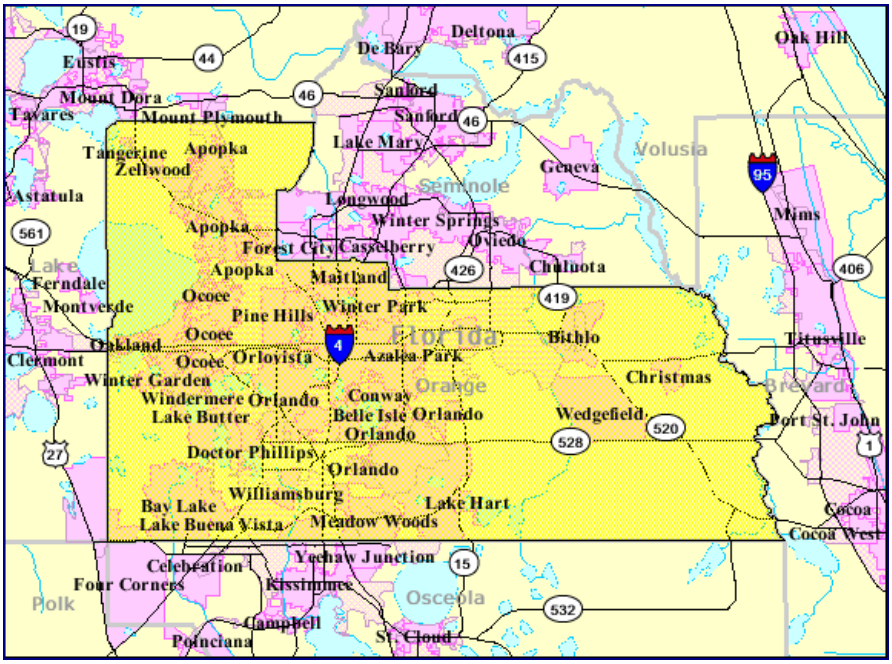
a. 500 cases per million population for patients with symptoms of acute infectious disease – especially smallpox, anthrax, plague, tularemia and influenza;
b. 50 cases per million population for patients with symptoms of acute botulinum intoxication or other acute chemical poisoning – especially that resulting from nerve agent exposure;
c. 50 cases per million population for patients suffering burn or trauma; and
d. 50 cases per million population for patients manifesting the symptoms of radiation-induced injury – especially bone marrow suppression.

ELECTRONIC PATIENT TRACKING PILOT PROJECT

TARGET COUNTY

EMSystem selected and collaborated with the Orange County Florida Emergency Medical Services Office of the Medical Director (OMD) for the installation and testing of a patient tracking system. The EMS agencies, hospitals, and communication centers have been using EMResource, an EMSystem resource management application since 2001. EMSystem's familiarity with local agencies, policies, and procedures proved to be beneficial to the project. The demographics of Orange County and of the hospitals would provide the desired test environment for the patient tracking system.

The US Census Bureau[19] estimates the Orange County population (2004) at 989,926. Orange County is 907 square miles averaging 988 persons per square mile and is within the Orlando-Kissimmee Metropolitan Statistical Area. For the purposes of this project the City of Orlando served as the urban center with a total population of 199,336 averaging 1,989 persons per square mile. The city of Apopka with a total population of 30,703 with an average 1,108 persons per square mile served as the designated rural community.



Source: US Census Bureau Geographic Information Systems

The Orange County EMS System[20] has approximately 2,000 EMS providers responding to approximately 200,000 calls and transporting 92,000 patients annually by the following EMS agencies:

- Apopka Fire Department
- Health Central Hospital District EMS
- Orange County Fire and Rescue Division
- Orlando Fire Department

- Rural Metro Ambulance
- Winter Park Fire Department

PRIMARY RESPONDER AGENCIES[21]

The Orange County EMS system has historically functioned as a "two tier" response system: with a primary responder engine company or ALS staffed and equipped fire/rescue unit (with transport capability) and advanced life support capable ambulances respond to 911 emergency medical calls throughout most of the County.

Primary Responder units with transport capability are ALS units and are staffed with at a minimum with one paramedic and one Emergency Medical Technician (EMT). Non-transport primary responder units may be staffed at a minimum with fire fighter EMTs. Emergency ambulance service is ALS and staffed with one paramedic and one Emergency Medical Technician or 2 paramedics.

Primary Responder agencies include: Apopka FD, Greater Orlando Aviation Authority (GOAA), Maitland FD, Ocoee FD, Orange County F/R, Orlando FD, Reedy Creek FD, Winter Garden FD, and Winter Park FD.

Most of the fire agencies provide one another with mutual aid or automatic aid. Such arrangements are provided under formal or informal agreements between local governments or agencies.

911 EMERGENCY TRANSPORT AGENCIES

AirCare (helicopter), Apopka FD, FireStar (OCFR helicopter), Health Central Paramedic [sic] (hospital based), Orange County Fire Rescue Department, Rural Metro Ambulance, Reedy Creek FD, Winter Park FD.[1]

If a patient is located in the cities of Apopka, Maitland and Winter Park, emergency medical response and transportation is provided by the respective fire departments of those cities. If a patient is located in Orlando, a private ambulance contractor under the existing County contract provides transportation. The Reedy Creek Fire Department (Walt Disney attractions) provides their own first responder and ambulance transport services.

Health Central Paramedic, a special hospital district in the west county, provides ALS transport to the cities of Ocoee, Winter Garden, Windermere, a portion of Orlando and a small area of unincorporated Orange County.

In the unincorporated areas of Orange County, Orange County Fire Rescue Department provides first response. ALS ambulance transportation is provided by two organizations: the

[1] Any First Responder agency with transport capabilities may transport a critical or unstable patient depending on the arrival time of an ambulance.

Orange County Fire Rescue Department in certain specific geographic areas, and a private sector provider of emergency ambulance service under contract to Orange County.

HELICOPTER AMBULANCE SERVICES

There are currently 3 dedicated medical helicopter services, "Air Care" operated by Orlando Regional Medical Center and Florida Flight, operated by Florida Hospital. The Orange County Fire Rescue Department also operates a helicopter service called "FireStar" that has medical transport capabilities.

CRITICAL CARE AND SPECIALTY TRANSPORT

Three hospitals and one private provider provide critical care and specialty transports (as for example high-risk neonatal, pediatric, obstetric patients) and interfacility (hospital campus to hospital campus).

911 PUBLIC SAFETY ANSWERING POINTS (PSAP) & EMS COMMUNICATIONS

There is no central 911 EMS Public Safety Answering Point (PSAP) in Orange County. PSAP's are located in City of Apopka, Reedy Creek Improvement District, City of Ocoee, City of Orlando, GOAA, City of Winter Park and Orange County. All 911 emergency cell phone calls are routed to Orange County Communications regardless of jurisdiction. Various municipalities and agencies provide their own EMS dispatch and communications on separate frequencies.

The following agencies provide their own communications and dispatch: City of Apopka, GOAA, Health Central, Orange County, City of Orlando, Reedy Creek Improvement District, City of Winter Park. Orange County Fire Communications dispatches for the cities of Ocoee, Maitland, and Winter Garden.

There are 12 hospitals with EMS receiving Emergency Departments in Orange County:

- Arnold Palmer Hospital for Children, Orlando.
    - Designated pediatric trauma center.
- Florida Hospital Altamonte
    - Designated suburban hospital
- Florida Hospital Apopka.
    - Designated rural hospital
- Florida Hospital East Orlando.
    - Designated suburban hospital
- Florida Hospital Orlando.
    - Designated urban hospital
- Orlando Regional Medical Center, Orlando.
    - Designated Level 1 trauma center

ADVISORY GROUP

The contract issued by OEO required the formation of a multi-disciplinary and multi-stakeholder Advisory Group. The Advisory Group members are identified in the following table. Through a series of conference calls, the Advisory Group provided EMSystem with locally focused guidance throughout the project period. The minutes for each conference call were recorded and included in the reports identified as Progress Report One, Progress Report Two, and Interim Report.

	Advisory Group Positions	Member name, Position, Organization
1	Emergency medical services agencies and personnel;	Keith Cartwright, Assistant Chief, Reedy Creek Improvement District Angel Nater, EMS Manager, Seminole Co. EMS Dave Provau, Battalion Chief, Orange County Fire Rescue Dept.
2	EMS IT providers;	Dean Valentine, IT Coordinator, Orange County Fire Rescue Dept.
3	Emergency room physicians;	Dr. George Ralls, EMS Medical Director
4	Hospital professional staff;	Donna Holton, ED Director, Fl Hospital Altamonte Bill McDeavitt, Emergency Manager, Fl. Hospital Mary Russell, Director of Research & Org. Preparedness, Boca Raton Hospital
5	Hospital IT providers;	Denise Hawley, IT Coordinator, Orlando Regional
6	Medical records personnel;	Anne Carol Castello, Fl. Hospital Asso.
7	Hospital Infection Control;	Nancy Bakewell, ED Director, Fl Hospital East
8	Epidemiology staff of the County Health Department;	Bill Toth, Epidemiologist, Orange County Health Dept.
9	County emergency management representatives;	Steve Detwiler, Planner, Orange County Emergency Management
10	State IT Personnel;	Open
11	State DOH Office of Emergency Operations personnel;	Bob Bailey, Planner, Fl Dept of Health
12	Patient/family support groups (e.g. American Red Cross);	Becky Sebren, Disaster Director, Cen. FL Red Cross
13	Law Enforcement personnel	Rob Ackinson, Emergency Manager, Orange County Sheriff Office
14	Director of Research & Org. Preparedness	Robert Maiden, FL Dept. of Health
15	State Contracts Administrator	Keith Cartwright, Assistant Chief, Reedy Creek Improvement District Angel Nater, EMS Manager, Seminole Co. EMS Dave Provau, Battalion Chief, Orange County Fire Rescue Dept.

	Pilot Project Management: Orange County EMS Office	Dave Freeman, Manager Todd Stalbaum, Quality Manager Dave Hawley, EMSystem Administrator

SYSTEM DEPLOYMENT IN ORANGE COUNTY

EMSystem collaborated with the OMD and the Advisory Group to develop the desired patient tracking system including a specific deployment model for the pilot project.

Orange County is an existing EMSystem EMResource client. EMResource is an Internet accessed resource management system. EMSystem reports EMResource is utilized by greater than 30% of the US for purposes of Emergency Department bed availability monitoring. EMTrack is a service provided by EMSystem that provides specific electronic patient tracking capabilities. For the pilot project, EMTrack will be provided to users with Internet access via laptop or desktop computers. The pilot project was limited to those under the control of the OMD and participating hospitals.

Four to five handheld PDA devices were deployed among the Orange County transporting emergency EMS agencies and the Seminole County Fire Department. To provide for maximum user input, the agencies selected were the major transporting ambulance services and one paramedic first response unit. These agencies included fire departments, hospital based and independent ambulance services, as the contract specified.

Salamander Technologies supports a wide variety of devices for use in patient tracking systems. These range from handheld devices to laptop computers, combined with a variety of methods to move data, including LAN, WAN, cellular, satellite, cradle sync, and radio. They support devices that can match a variety of environments, from standard laptops and devices suited to the hospital environment, to ruggedized full military grade and intrinsically safe devices for use in more hazardous environments.

One agency was provided a standard duty Symbol MC50 portable computer. The MC50 is a small PDA with an integrated barcode scanner and 802.11 wireless modem configured with an optional QWERTY keyboard, making it slightly larger than current off-the-shelf PDA's.

The other agencies were provided deluxe duty Symbol MC9000 portable computers with industrial scanners. The MC9000 is a much larger PDA configured with an integrated barcode scanner, an 802.11 wireless modem, and an internal cellular modem. All portable devices used the Windows Mobile 3.0 operating system.

Standard industrial grade MC70 and ruggedized laptop units were not part of the pilot. The number of deployed devices varied when they were returned to OMD or Salamander Technologies for re-configuration or repair. One satellite phone was also provided to each participating EMS agency for communications backup in case of a failure in the cellular network. Battery charging systems were installed at the home station of each participating user.

During the pilot period six MC50 devices and one wireless Internet Access Point were also deployed to three hospitals.

The portable devices were configured with medTRAX PAS Mobile 2.0 (Salamander Technologies, Traverse City, MI). medTRAX Mobile is a client side program that resides on

the PDA. All pilot project field users accessed the patient tracking system through the medTRAX software.

Submitted tracking data is transmitted to a Salamander Technologies secure server through a cellular, WiFi, or satellite Internet connection. The Salamander Technologies secure server manages the individual portable and mobile device system needs. The data is then sent to the EMSystem EMTrack secure server for compilation and display to users accessing the EMTrack web page directly. EMTrack users access the site upon successfully entering a unique username and password assigned to them. The data is displayed on a graphically pleasing and intuitive web page.

EMSystem, Salamander Technologies, and the OMD provided the initial user training. They trained 45 field providers, 23 of which participated in the pilot project.

PROJECT EVALUATION AND SURVEY DEVELOPMENT

EMSystem LLC contracted STS to design and administer a survey and to perform on-site interviews of participants in the Electronic Patient Tracking Pilot Project. The purpose of this survey and interviews was to:

1. Describe the characteristics of the Orange County EMS system and MCI and disaster response procedures.
2. Identify commonalities and differences among pilot project participants that may impact the experience of users.
3. Describe the experiences of pilot project participants.
4. Based on what is known from published research and from experts in the field; recommend where the FL-DOH, OMD, and EMSystem can best devote their efforts to improve the capability of the EMS system to meet public needs and demands and to improve the operations of disaster response operations.
5. Develop a model electronic patient tracking system for implementation in other Florida counties.

Relying on a combined 40+ years of EMS experience, serving the EMS needs of communities in many different roles, including overseeing EMS operations at the state level and national EMS policy development and research; experts composing the STS project team developed a survey around five specific areas salient to the Orange County EMS system operations and the electronic patient tracking pilot project. These specific areas include:

1) Hardware development for patient tracking;
2) Patient tracking software development;
3) Technical support for patient tracking systems;
4) End user experiences; and
5) Project participants' recommendations.

An internet survey was opened on June 13, 2006 and closed on June 20, 2006. Advisory Group members were invited by email to complete the survey on June 10 and 15, 2006. Other participants were invited by email, telephone, and in person to complete the survey during the week of June 11, 2006. There were 19 surveys completed on June 20, 2006.

The survey link provided access to three different tracks, depending on the response to a question regarding the person's role in the pilot project. Hardware and software vendors were asked questions specific to their role while all other persons were provided the same track. Survey questions were provided in multiple choice and open ended formats. It was estimated that end-users should complete the survey in approximately 15 minutes.

The consultants coordinated site visits with the OMD on June 14 & 15, 2006. In addition to the OMD staff, the consultants interviewed four paramedics employed by private and public 911 EMS agencies, Orange County Fire & Rescue Division Lieutenant (non-transport), one Orange County Fire & Rescue Division firefighter paramedic, and one Lieutenant from the Seminole County Fire Department. The interviews provided participants open-ended opportunities to provide comments, concerns, and recommendations. At the conclusion of each interview, an invitation was provided to participate in the web based survey.

CONSULTANTS INTERVIEW COMMENTS & CRITIQUES

From the paramedic perspective, the primary benefit from the system is reduced hospital radio (voice) communications resulting in greater patient care time. The automated process eliminates the need for repeating or clarifying incoming patient information, which may vary by transmission or the receiving party.

Paramedics are very concerned about not receiving feedback after activating the send function. This user feedback need not be intrusive but a confirming message is mandatory in their opinion. Common public safety radio terminology for this is “message received”. To simplify the display a simple color coded icon could be displayed for this purpose.

Most users felt that this process would reduce interpersonal conflicts that sometimes occur with radio transmissions, one user was concerned about the reduced ability to build relationships and rapport with receiving hospital staff. Users also expressed that the process would eliminate queuing on the radio system on particularly busy days, whether during normal daily use or during disaster responses.

The hospital users were most vocal about the reduction in their time-on-task for receiving incoming patient notifications. The Orange County hospitals have assigned one nurse per shift to answer radio notifications. They must do this while multi-tasking with other duties.

There were a variety of opinions regarding the form factor of the portable devices. A general consensus regarding the device exists however; users feel that for daily operations a mounted device in the rear compartment would be the most convenient. This would also reduce the personal liability that some users have for damage, loss, or theft of capital equipment.

For disaster operations concerns regarding the size and weight are minimal with users willing to accept carrying tablet PC’s or PDA sized devices. The primary concerns of the users based on their pilot experiences are related to connectivity and the user interface.

Each user reported the device did not attract attention from patients with one exception. A pediatric patient was interested in the red lights emanating from the bar code scanner.

Each user reported they received between five and fifteen minutes of training prior to use. One user felt this was insufficient, that eight hours of training should be provided. One user felt that one hour of troubleshooting training should be provided to improve the field user’s experience. Only one user understands the purpose of an electronic patient tracking process while no users recognize the system implications and potential that the process provides. Every user would be comfortable in delegating the data entry process with just-in-time training to partners or volunteers.

Field users were asked for their opinion on the cost of a device. One user felt the device would not be worth any more than $500. All other users felt the device would be a good deal if priced at $1,000 with a useful life of five years. Most users continued this opinion if the device was priced at $5,000. None felt a cost in excess of $5,000 would be justifiable.

The paramedics interviewed reported that the system decreased their workload related to relaying patient information to hospitals by 90%. 10% of the calls require medical control, or relay of specific information the device does not report. The specific information involved circumstances unique to the patient or their condition that was not on a drop down list on the device; for example, if security was needed when the patient arrived at the emergency department.

Most users expressed a desire to keep the user interface simple, for several reasons. A simple interface will reduce errors, data entry time-on-task, and necessary training. It will also minimize the opportunities for users to change settings or options which may introduce variability in the configuration and resulting data.

There are opposing opinions regarding the functionality of the device when the paramedic is alone with a critical patient. Some users felt this would increase the workload at a time when his/her attention should be focused on the patient. A radio may be operated blindly by one hand while the device requires focused attention and both hands.

Users were inconsistent in the timing of scanning and transmitting. Users scan and transmit from the scene, prior to leaving the scene, during transport, upon arrival at the hospital, and one user only used the device after dropping off the patient at the hospital. The process used during daily use will also be used during a disaster. The inconsistent patterns must be corrected, scanning and transmitting should occur when the information will provide the greatest advance notice with the greatest level of accuracy. This point may be immediately upon departure from the scene.

Users reported they could not access a record to update information once it had been “sent”. For example, if traffic delayed their transport, they could not update the record to send the travel delay message to the hospital.

Users were asked about decontamination procedures. Most users said they would decontaminate the device at the beginning of each shift and then as needed during the shift. Most users are unaware of the cleaning solution used.

All users but one reported having difficulty scanning barcodes. Most users continue to have difficulty scanning barcodes and must enter the unique patient identifier manually. Users reported they would not use the device if this problem occurred during a real disaster. The scanning process must be improved and a process for manually recording the data for later input should be developed. This may be possible with paper tracking using removable bar codes with double stick tape.

Paramedics expressed some frustration with the devices, many of which were device issues, not system issues. The Symbol 9000 device would revert to the “flight mode” each time the battery was replaced turning off the cellular service and losing the date and time settings. This may be a Microsoft operating system issue that will resolve with an operating system update. The devices were scheduled for operating system updates the week of June 18, 2006.

SURVEY RESULTS

The following survey results are identified by role of the submitter. A total of 19 surveys were returned, eight from users of the PDA device, six from Advisory Group members, and five from the vendors. Responses are provided herein verbatim[2].

RESPONSES FROM FIELD USERS - PDA

38% of respondents served in command or management roles during the pilot project. When considering the responses provided below, it is important to consider that 50% were not provided any documentation for training or pilot project planning purposes.

How is your personal workload impacted by the system?			
Increased	**No change**	**Decreased**	**Don't know**
13%	88%	0%	0%
How is the quality of your work affected by the system?			
Improved	**No Change**	**Worsened**	**Don't know**
13%	63%	25%	0%
How is your accountability during disasters affected by the system?			
Increased	**No change**	**Decreased**	**Don't know**
25%	0%	13%	63%
How is your ability to provide information to others in public health/safety affected by the system?			
Improved	**No change**	**Worsened**	**Don't know**
25%	25%	13%	38%
How is your ability to provide information to the general public affected by the system?			
Improved	**No change**	**Worsened**	**Don't know**
13%	50%	0%	38%
How is your ability to provide information to the affected patient improved or worsened by the system?			
Improved	**No change**	**Worsened**	**Don't know**
0%	63%	0%	38%
How is your ability to provide information to affected family members improved or worsened by the system?			
Improved	**No change**	**Worsened**	**Don't know**
0%	63%	0%	38%
How is your ability to provide information to un-affected family members improved or worsened by the system?			
Improved	**No change**	**Worsened**	**Don't know**
0%	63%	0%	38%

[2] The web based survey process did not provide participants with spelling or grammatical editing capabilities. The consultants have corrected the spelling of some responses. The original comments are on file.

How does the patient tracking system affect the general public?

- It doesn't.
- Unsure.
- It provides a way to give accurate information about patient counts and report on overall activities after an event.
- It delayed moving patients through triage.
- No affect.
- Does not apply to our pilot program.

How does the patient tracking system affect the involved patients and their families?

- There is no affect to either.
- Unsure.
- It improves the sharing of information among hospitals and should improve the accuracy of data and reduce redundancy.
- Saw no change.
- Does not apply to our pilot program.

How does the patient tracking system affect the command level staff?

- Unsure at this time.
- It gives them a complete and accurate accounting of counts, conditions and destinations in a timely fashion.

How does the patient tracking system affect the field responders?

- It created an additional step in the transport process. If having to do this during a critical transport it takes time away from the patient. Especially if there is only one paramedic in the back of the unit.
- As a field responder I was not given any advance notice to this new device being added to my duties until the morning I arrived for shift and was given a very brief explanation to how to enter patient info into the handheld device and how to send the data to the receiving hospital. I still am very unsure what advantage this is going to have to patients and patient care. At this time it only takes me away from patient care in order to enter the info, as the scanner usually will not read the bar codes on the wristbands, and I cannot imagine having to deal with entering this info when I have an extremely critical patient to care for (i.e. combative patients, trauma alerts, large blood loss where my hands are contaminated), to stop patient care and use that small pencil to tap type info is not going to help me, the patient, or the outcome as far as I can anticipate now.
- Improves the method of data collection and reduces radio traffic with hospitals.
- Delayed moving pts through triage due to unreliable capture of bar code. After multiple attempts, manual entry of the numbers was necessary. Too many information choices in main screen. Buttons on touch screen are too small.
- No change to overall effectiveness, outside of initial time spent training on the system.
- Doesn't as of yet

How does the patient tracking system affect policy makers?

- Unsure
- Gives accurate and timely information for decision making. It also improves the situation reporting capabilities.
- Don't know

Could you read the display in a variety of working conditions (bright sunshine, darkness, etc.)?

- 100% yes

What features do you like about the device?

- Easy to work with.
- The ability to transmit the data directly to the application.
- The size was small enough to not be uncomfortable on a belt, yet big enough to read the screen and easy to work with.
- Touch screen. Information upload capability.
- Easy to use.
- Hardened, easy to read.

Did the bar code scanner function in a variety of working conditions? (Check all that apply)

- 63% in bright sunshine
- 75% inside
- 63% at night

Did you have any difficulty scanning barcodes?

- 75% yes

If you dropped, crushed, threw, or otherwise abused the device… (if not, skip this question)

- One said “it continued working without interruption”.

What about the device drives you nuts?

- Nothing.
- Scanner does not work 98% of the time and using the little pen to tap type info in is not easily preformed in a moving vehicle.
- The ruggedized units had short battery life and when the battery was changed all the settings were lost.
- Unreliable scanning. Too much info on main screen.
- At times the device would not connect to the wireless connection.
- The touch screen - particularly the drop downs are very sensitive to touch when trying to complete the information. Found this true whether using the pen or your fingers and seemed to be more of a problem when you tried to slide the side bars to view more information.
- Communications was interrupted by always resetting to 'Flight Mode'. Had to use a pen. Could not use keys for entry.

How much time did you require before becoming comfortable in using the device?

- 5 minutes.
- Still learning.
- 15 minutes.
- After using it two to three times.
- 30 minutes.
- Couple of uses.
- Not much at all.
- One day.

How could the device be improved?

- More chief complaint options.
- Unsure.
- Improve battery life. Prevent the device from going in Airplane mode.
- For day to day use some of the chief complaint categories could be more specific and not all hospitals we transport to were in the list.
- Touch screen with bigger buttons and minimal information fields on main screen. Better reliability in scanning.
- Demonstrate what other capabilities it has.
- A mounting system for the units so that it does not get tossed aside and forgotten about by other shifts.
- Allow use of keyboard. Communications should be constant behind the scenes. For daily ok but for disaster send was too slow.

If you are familiar with other devices that might have similar capabilities, would you choose to keep this one or switch to something else and why?

- Keep this one.
- I have used PDA systems for reporting, etc. and I like this device better because of the larger screen. Easier viewing. The unit overall is good.
- PDA, Easier to use lighter to carry.

Is the website intuitive?

- 100% yes

How does the information provided on the internet affect your workload?

- 2 – decreased workload
- 4 – don't know

Do you have difficulty with viewing colors on the screen?

- 100% no

What other links to existing/future computer systems do you wish the patient tracking system had that it doesn't?

- Link to dispatch system will reduce input errors and increase data collection speed. Link to patient care report systems will reduce input errors as well.

- Ability to transfer full patient reports to our agency and hospitals.
- Link to existing CAD data and patient care reporting system. Ability to use existing laptops or MDT's (Mobile Data Terminals) for scanning and or transmitting data.

Was the pace of the patient tracking system roll-out appropriate?

- Yes.
- Not for me as of yet.
- No, a longer time frame is required to accommodate the different EMS agencies and hospital systems. Also the end users of the information need additional time for orientation.
- Yes.
- Yes.
- Yes.
- No, too rushed. Software issues put us behind by several weeks. Hospitals did not receive large screens and thus had very little input into the system. Should have asked for extension.

How long did the training take?

- 10 minutes.
- 10 minutes in the supervisor office.
- 6 hours.
- 10 minutes.
- 15 minutes.
- 1 hour.
- 1/2 hours.

Were you prepared to use the system immediately after training?

- 88% yes

What agency/facility/organization policies would improve the coordination or use of an electronic patient tracking system?

- EMS System policies.
- All sop (Standard Operation Procedures) and protocols should include the usage of such a device.
- Orange County DES.

Would the public support or oppose an electronic patient tracking system?

- 2- Oppose
- 4- Support

Do you recommend the purchase and implementation of an electronic patient tracking system to be purchased by state of Florida?

- 5 -Yes
- 3- No

Who should 'own' a patient care tracking system

- County EMS Entity
- Another Entity
- State Health Department
- EMS
- County EMS Entity
- Fire
- State EMS Agency
- EMS

RESPONSES FROM EMSYSTEM USERS – EMRESOURCE/EMTRACK

How is your personal workload impacted by the system?

- 83% no change

How is the quality of your work affected by the system?

- 17% improved
- 67% no change
- 17% don't know

How useful was the printed or online instructional or supportive documentation?

- 83% sort of useful

How is your accountability during disasters affected by the system?

- 50% increased
- 50% don't know

How is your ability to provide information to others in public health/safety affected by the system?

- 67% improved

How is your ability to provide information to the general public affected by the system?

- 33% improved
- 33% no change
- 33% don't know

How does the patient tracking system affect the general public?

- It provides a way to give accurate information about patient counts and report on overall activities after an event.
- The system allows us to keep track of the patients' and thus will allow us to respond to public inquiries regarding numbers of patient movement, types of injuries and specific locations without divulging names.
- It will provide us with more information on expected arrivals, helping the ED plan for, and allow us to alert the hospital of impact.

How does the patient tracking system affect the involved patients and their families?

- Family members may be able to locate their loved ones easier.
- It improves the sharing of information among hospitals and should improve the accuracy of data and reduce redundancy.
- The system allows us to keep track of the patients' and thus will allow us to respond to family inquiries regarding location and reunification of family members.
- More rapid acceptance of patient.

How does the patient tracking system affect the command level staff?

- Makes them more accountable and effective.
- It gives them a complete and accurate accounting of counts, conditions and destinations in a timely fashion.
- The system may provide a much more consistent way to gather basic information about who is leaving the scene as a 'patient'.
- It allows command staff to make proper decisions regarding patient flow to area hospitals. It also can generate reports for command reports.
- Allow them to make more educated decisions on how to handle personnel and resources

How does the patient tracking system affect the field responders?

- Improves the method of data collection and reduces radio traffic with hospitals.
- Takes out some of the variable interpretation we see in how information is documented.
- It helps ground personnel make proper decisions for transport destinations. It can also save time by sending information to hospitals saving communication time.
- Allow for less radio time, and expedite acceptance into the ED.

How does the patient tracking system affect policy makers?

- Gives managers a valuable resource.
- Give accurate and timely information for decision making. It also improves the situation reporting capabilities.
- One system means one set of operational guidelines. It can potentially make policy writing easier.
- The reporting process will make reports available for review; decisions and policies improving system functionality can by then be made.
- Real time information leads to more rapid decisions

Is the website intuitive?

- 100% yes

How does the information provided on the internet affect your workload?

- 50% decreased
- 50% no change

What other links to existing/future computer systems do you wish the patient tracking system had that it doesn't?

- Report writing, biomedical devices.
- Link to dispatch system will reduce input errors and increase data collection speed. Link to patient care report systems will reduce input errors as well.
- Link to existing CAD data and Paitent care reporting system. Ability to use existing laptops or MDT's for scanning and or transmitting data
- GPS with real time location of unit. Two way paging. Wand at receiving facility (ED) to insure the call is cleared and if patient went to another ED (divert, or patient condition change), the original destination would not wonder about the patient when they did not show up.

Does the system create doubts or questions for the public regarding the use or intentions of users?

- No
- No
- No
- No
- No

RESPONSES FROM PATIENT TRACKING ADVISORY GROUP

How is your personal workload impacted by the system?

- 67% no change
- 33% don't know

How is the quality of your work affected by the system?

- 17% improved quality
- 50% no change
- 33% don't know

How does the patient tracking system affect the general public?

- It provides a way to give accurate information about patient counts and report on overall activities after an event.
- The system allows us to keep track of the patient's and thus will allow us to respond to public inquiries regarding numbers of patient movement, types of injuries and specific locations without divulging names.
- It will provide us with more information on expected arrivals, helping the ED plan for, and allow us to alert the hospital of impact.
- Ideally it should enable distribution of patients to facilities so that there is less chance of overload of any one facility, at least by EMS transported patients. Also, ideally it should enable Family Notification Services.

How does the patient tracking system affect the involved patients and their families?

- Family members may be able to locate their loved ones easier.
- It improves the sharing of information among hospitals and should improve the accuracy of data and reduce redundancy.
- The system allows us to keep track of the patient's and thus will allow us to respond to family inquiries regarding location and reunification of family members.
- More rapid acceptance of patient.
- Reassurance that they are logged into the emergency medical care system, tracking of their care through the same system, and hopefully to facilitate linking up with their family members.

How does the patient tracking system affect the command level staff?

- Makes them more accountable and effective.
- It gives them a complete and accurate accounting of counts, conditions and destinations in a timely fashion.
- The system may provide a much more consistent way to gather basic information about who is leaving the scene as a 'patient'.
- It allows command staff to make proper decisions regarding patient flow to area hospitals. It also can generate reports for command reports.
- Allow them to make more educated decisions on how to handle personnel and resources.
- It should make the process of supporting care with space manpower and supplies easier by knowing the number and acuities of patients to be treated.

How does the patient tracking system affect the field responders?

- Improves the method of data collection and reduces radio traffic with hospitals.
- Takes out some of the variable interpretation we see in how information is documented.
- It helps ground personnel make proper decisions for transport destinations. It can also save time by sending information to hospitals saving communication time.
- Allow for less radio time, and expedite acceptance into the Emergency Department.
- It should improve accountability for field responders, support communication up to the EOC, and facilitate handoff to hospitals.

How does the patient tracking system affect policy makers?

- Gives managers a valuable resource.
- Give accurate and timely information for decision making. It also improves the situation reporting capabilities.
- One system means one set of operational guidelines. It can potentially make policy writing easier.
- The reporting process will make reports available for review; decisions and policies improving system functionality can by then be made.
- Real time information leads to more rapid decisions.
- Hopefully there would be ownership by policy makers to support the process of care- including communication, resources etc.

RECOMMENDATIONS

SHORT TERM RECOMMENDATIONS THAT SHOULD BE IMPLEMENTED PRIOR TO PROJECT EXPANSION

USER INTERFACE

1. Two-way service must be developed. When acknowledging message receipt in EMTrack the message should update the system and the sending user's device to indicate the message was sent and received. This should not cause a forced action on the user.
2. The device should specify sources of communications errors to assist users in troubleshooting. Currently when a connection error occurs a simple error message is displayed leaving the user unsure of the error source.
3. The "new" function should be renamed to "manual entry" on the PDA primary screen.
4. The primary screen should allow scanned or manually entered information for new patients with reduced key strokes. Currently user must press "new" to enter information manually.
5. The device should allow new patients to be entered without requiring the unique patient identifier field to be entered first.
6. The pick list for "chief complaint" should provide a selection for "other" and "unavailable". The "other" selection would be used when the appropriate condition is not preset. The "unavailable" selection would be used when the chief complaint is indefinable, such as in the case of language barriers. One user recommended that additional choices be provided.
7. The primary screen should require only the minimal information necessary and should be based on the user role. The triage user requires only age, gender, and triage category. The treatment user requires access to procedures and medications. The transport user requires the ability to select the patient, by re-scanning the barcode or manual selection, destination, and ETA. If additional information is to be provided the user should be able to select an appropriate prompt.
8. The on-screen menu format should be simplified to reduce choices and allow for larger data entry or menu selection. The current size of menus can make it difficult to select while in a moving vehicle or while the user is walking.
9. The triage category should be displayed as colored blocks to 'click' rather than requiring a dropdown pick list. The box may use a textual color designator to assist those unable to discern colors or for devices without color screens.
10. The device should allow the user to enter the age before requiring days/months/years. The current device software forces the user to select the days/months/years prior to entering the number; users do not find this intuitive.

11. The device data entry pick lists should be configurable for alphabetization and frequency of use, specifically to select provider name.
12. The system should allow users to continuously add new patients without requiring multiple screens.
13. The device software should provide an obvious “send” button to be pressed. One user identified the current software send function is easy to miss, the device stored all of the entries but only after the drill controller identified data was missing was this function discovered.

DEVICE

1. The useful battery life should be increased. In the dynamic EMS environment devices are not consistently charged in between uses.
2. The device should automatically change to the next field while providing a “back” button for the user to select if necessary. This would reduce the keystrokes or presses required to enter data.
3. The device should be configured for ‘hot keys’ to allow quick access to specific pages of the application or to open specific applications.
4. The device personalized configuration should be stored in non-volatile memory. When a battery dies or is removed the device configuration resets to default settings. These include: the timer, the device changes to flight mode, the device clock changes to Pacific Time.

EMTRACK

1. The EMTrack display should display the complete chief complaint and other important information to be displayed. The current version displays the unique patient identifier or name, the agency feels this is not necessary for the quick view during daily use.
2. The EMTrack display should provide quick and easy access to information that is useful to the hospital triage nurse. This includes the patient interventions: cardiac monitor, backboard, and IV medications. The triage nurse can then easily determine the hospital resources that will be needed immediately upon arrival.

SYSTEM

1. The use of standard bar coded paper based pick lists should be explored. A sheet of bar codes that can be scanned for one handed data entry of common words and numbers may ease the use of the device. A bar code sticker placed strategically in the ambulance would allow quick scanning of the unit identifier. This would also require integration with MCI transport sector operations planning to ensure consistency.
2. The system should allow users to scan a barcode more than one time when updating fields. The current device software does not allow the barcode to be scanned more than once, such as upon the patients arrival at a new destination.
3. The system should minimize the requirement for server access. The current configuration requires data collected by the devices to be sent to a Salamander Technologies server before being routed to the EMSystem

server. The OMD feels this unnecessarily introduces risk for failures and security breaches.
4. The system should be tested prior to roll-out. The OMD feels that many of the pilot issues would have been discovered if tested prior to being delivered to the agency.
5. The system should allow simple printing of an individual patient's complete record for inclusion in hospital reporting or the patient's medical record. This is particularly useful for patients meeting criteria for specialized care such as STEMI alerts and trauma alerts.

LONG TERM RECOMMENDATIONS THAT SHOULD BE EXPLORED IN FUTURE TRIALS

INTEGRATION

1. The data entered should be linked with electronic PCR's to automatically populate fields where possible in both directions. This capability would synchronize patient care related, billing, and demographic information. This feature would reduce data entry errors and duplication of efforts.
2. The system should obtain timestamps from the CAD system. Correlating exact times of various transactions is important for system monitoring and management. Examples include: the time of departure from the scene should match the selection of the destination, the arrival time at the hospital should match the new location, and the movement from triage to a room within the hospital should match the offload time. These definitions should be explored further.
3. The system should interface with hospital information systems. This would allow two-way data flow, of patient care related data, billing and demographic information.
4. The system should provide patient distribution or "load balancing" and management capabilities. This may require integration with Geographic Information Systems, Computer Aided Dispatch, EMResource, and EMTrack. Paramedics transporting from the scene should have automated destination selection. This requires further system and policy development but would provide maximal efficiency for the system.
5. Remote physiological monitoring systems are currently being used by the military and NASA. These wireless disposable sensors will soon be commercially available. These advancements provide a key integration point for future systems. Patients in triage or treatment areas on scene and in mass care shelters may be identified with RFID and wireless sensors. Alerting and notification will benefit of users on both "sides" of the system if prompted by devices. The PDA devices may also be used to 'program' or set the parameters of a sensor through the user interface.
6. Personnel Accountability and Security Systems (PASS) have been disparate and simple, often just a mechanical device giving an audible alarm for whoever might hear it. Technology allowing rescuers to locate an alerting PASS with directional guidance or even map based guidance are currently in development for public safety. Military contractors have

deployed autonomous vehicles which are able to communicate with, locate and extract injured soldiers. Electronic patient tracking systems and operational procedures of today will need to integrate with these devices of tomorrow.

7. System implementations should consider the needs of fixed users (i.e. hospital staff, Emergency Management Agencies, Communication Center staff, etc) by including a dedicated computer and large screen monitor. These users without dedicated systems through the course of their work will often minimize or close out the patient tracking applications.

HARDWARE SELECTION

1. The portable and mobile nature of patient tracking systems requires ad-hoc networking. The system users typically have limited expertise in computer networking. Radio modem based networking may provide a field supportable communications network. Radio modem systems allow users to operate with a single device up to 14 miles from a central hub. Some vendors provide mesh networking capabilities using radio modems. This may reduce the expense and support requirements by reducing reliance on cellular and satellite telephony subscriber based communications.
2. Vehicle mounted systems should become integrated with vehicle manufacturer supplied displays, Mobile Data Terminals, and mounted notebook computers. These systems should be integrated and interoperable.
3. Future software integration with cardiac monitors, pulse oximeters, automated external defibrillators and other electronic equipment may provide patient monitoring capabilities reducing the need for separate data recording thus improving accuracy and providing hospitals with real-time patient condition information.

CONCLUSIONS

The Florida Patient Tracking Demonstration and Evaluation Project has provided system planners, end users, and vendors with an extraordinary opportunity to evaluate a state of the art, first generation, electronic patient tracking system. Specific user needs were effectively identified through a comprehensive project evaluation, to be used by the Florida Department of Health, Orange County, EMSystem, Salamander Technologies, and the stakeholders within Orange County for system improvements.

It is important to consider the reduced costs that will be obtained with the leveraging of existing infrastructure. This project was intended to provide a complete testing opportunity and thus includes equipment and costs that may otherwise not be applicable. This final report and its annexes provide the state of Florida a clear outline of the activities of the Orange County pilot project with recommendations to the vendors for system enhancements. While the patient tracking concept has been "proven", other solutions and vendors may ultimately be selected for implementation in Florida.

After conducting a thorough system evaluation, an Internet based survey of users, site visits and telephone consultations, SafeTech Solutions finds that:

- EMSystem has fulfilled the contracted services, with the establishment of an Advisory Group and the analysis of the feasibility of establishing a patient tracking system to be used for both daily and disaster emergency responses. A patient tracking system was delivered, installed, and tested in Orange and Seminole Counties within the contract period.
- The pilot program successfully identified areas of success and areas needing further development.
- The project demonstrated value to both EMS providers and hospitals by reducing workloads, improving communications between field providers and hospitals, and accurately tracking patients through the patient care continuum.
- Internet applications function as promised, customer support and technical assistance are excellent, while some modifications would enhance the usability.
- A patient tracking system could be deployed immediately within a region, but mobile device, mobile device software, and mobile device issues based on user feedback must be addressed.
- Reduced requirements for secure server access serving both the mobile devices and the Internet products would increase the security and reliability of the system.
- Pilot programs should continue through FY07 and should explore alternative technologies and configurations and deployments.
- System users should receive an orientation to the purposes and functionality of the patient tracking system prior to user training. Supervisory staff may not provide this background information and may not fully appreciate the value to the system of appropriate use.
- Project participants were willing to tolerate technical issues, software failures, configuration issues, and other difficulties. The pilot was conducted with a limited number of users and devices. The tolerance for difficulties was likely due to the efforts of the OMD staff that provided continuous support throughout the project.

- A mechanism to provide training and direct field support of the system should be incorporated into any future implementations. OMD staff will be reassigned to their normal duties and will be unavailable for continued daily support.
- System users perceive value in a reduced workload and increased accountability.
- Continued software development, configurations, and hardware choices should be based on end user feedback. If end users do not understand the value of the system, they are likely to abandon its use at a critical moment, during a confirmed disaster.

SafeTech Solutions is confident the technical issues and configurations will be further refined based on this report, to better meet the needs of all users and stakeholders. As emerging technologies become available, patient tracking system operations will become more robust and more reliable while the system components will be "better, faster, and cheaper". The hardware purchased for this pilot project should be adaptable and scalable to future iterations of patient tracking systems.

A number of future capabilities will enhance and add value to the patient tracking system. The pilot project designers and participants are innovators in health information technologies. They understand the value of providing or obtaining the right information at the right moment in time. Some future points of interest for this group are: the capability to link Computer Aided Dispatch, patient tracking, and hospital information systems to eliminate redundant data entry and improve accuracy.

In conclusion, as other regions within Florida and other states enhance their level of preparedness, patient tracking systems will become the standard of operations management. The Orange County area will be well prepared to track patients from incidents of all sizes and to provide this information to the public, to policy makers, to affected and un-affected family members, and to Incident Commanders. SafeTech Solutions recommends based on the successes of this pilot project, a continuing investment by the Florida DOH in electronic patient tracking systems on an ongoing basis with the continued use and testing by the Orange County project participants.

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