COMCARE
EMERGENCY RESPONSE ALLIANCE

Integrated Patient Tracking Initiative

Project Approach

Development of a National Framework for the planning and implementation of Integrated Patient Tracking Systems

March 2006

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1 Introduction

The recent Gulf Coast hurricanes and other emergency events continue to confirm that the United States remains at risk of the devastating effects of manmade and natural disasters. In response to these threats, numerous efforts are underway at the federal, state, and local levels to strengthen America's emergency response infrastructure and ensure that the emergency response community is adequately prepared, resourced, and organized to overcome the unique challenges of mass casualty patient care.

One such effort is the development or acquisition of "patient tracking systems" as a means to improve emergency response and preparedness capabilities by electronically capturing and distributing patient information to various stakeholders throughout the continuum of care, such as emergency managers, EMS, and local hospitals. While versions of these systems are in various stages of development at all levels of government and from geographically diverse settings such as Kansas City and the National Capital Region, they face similar challenges. These challenges include:

- Acceptance and use: identification of a system that is useful during both day-to-day and mass casualty emergency operations.
- Interoperability: integration into the community's existing portfolio of emergency application systems.
- Federal compliance: assurance that efforts are compliant with grant requirements (Target Capabilities List) and Federal programs such as Electronic Health Records.
- Reinventing wheels: allocation of time and resources defining requirements, RFPs, and the like.
- Needs of all users: meeting the needs of all relevant agencies for such a system.
- Economics: justification of a patient tracking system investment.

To help stakeholders through the process, COMCARE launched the Integrated Patient Tracking Initiative (IPTI), bringing together a representative group of experts to develop a national framework that communities and regions can use when beginning their own patient tracking programs. This framework will include an integrated list of requirements, best practices from previous deployments, technical solutions for data exchange and collection, a framework for interoperability with other application systems, a model Request for Proposals (RFP), and a sample deployment plan based on the peer-reviewed requirements. This is a practitioner-driven process to develop requirements and an open architecture, standards-based interoperable framework in which vendors can actively compete. IPTI will not develop or select specific products.

1.1 Participating Organization Overview

The IPTI encompasses a wide cross-section of interested parties including numerous emergency agencies, related health organizations and healthcare providers as well as vendors operating within this space. The project is designed so that emergency practitioners will dominate the setting of requirements, while everyone with an interest can become involved in a number of ways. This would include active involvement from researchers, academicians, and vendor sponsors wishing early entry into the process.

The initial working group is comprised of representative experts from the fields of EMS, emergency medicine, emergency management, hospitals, public health, homeland security, law enforcement, and others. Table 1 is a representative cross-section of the organizations that have participated in IPTI.[1]

Category	Organization
Fire/EMS	• American Ambulance Association (AAA) • Association of Air Medical Services (AAMS) • Chicago Heights Fire Department • Maryland Institute for EMS Systems (MIEMSS) • National Association of EMS Physicians (NAEMSP) • National Association of State EMS Directors (NAEMSD) • Orange County (Fla) Fire - Rescue • National Association of EMTS
Emergency Medicine/Hospitals	• American College of Emergency Physicians (ACEP) • Emergency Nurses Association (ENA) • Virginia Hospital and Healthcare Association (VHHA) • University of North Carolina Hospitals Disaster Management
Emergency Management	• International Association of Emergency Managers (IAEM) • National Emergency Management Agency (NEMA)
Academic	• The George Washington University • Johns Hopkins Applied Physics Laboratory (APL) • University of Virginia (UVA)
Public Health and Medicine	• Agency for Healthcare Research and Quality (AHRQ) • Center for Biosecurity at the University of Pittsburgh Medical Center • Centers for Disease Control and Prevention (CDC) • Health Information and Management Systems Society (HIMSS) • Montgomery County (MD) Department of Health • National Association of Health Data Organizations (NAHDO) • San Francisco Department of Public Health—EMS and Emergency Operations Section • Public Health Data Standards Consortium (PHDSC)
Disaster Services/9-1-1	• National Emergency Number Association (NENA) • The American Red Cross

Table 1. Representative Organizations

The Virginia Hospital and Healthcare Association (VHHA) was the lead sponsor of Phase I of this initiative. It is an alliance of hospitals and health delivery systems that develops and advocates health care policy for the Commonwealth of Virginia. Its vision

[1] A current list of contributing organizations can be found at www.patienttracking.org.

is to achieve excellence in both health care and health. It has 62 member health systems and hospitals, representing 95 community, psychiatric and specialty hospitals throughout Virginia.

1.2 COMCARE Overview

COMCARE, a 501(c) 4 national emergency response coalition, is a non-profit alliance comprised of more than 100 member organizations representing emergency physicians and nurses, state and local public safety and emergency management officials, a variety of citizen organizations, departments of transportation, wireless companies, and technology vendors. It is the only national organization with this diversity of membership. Its mission is to improve emergency response through cooperation and new technologies, across all emergency agencies, for all hazards. In addition, COMCARE has been a leader in the promotion of life-saving communications technologies since its inception in 1998. It is led by a public/private Board of Directors.

In addition to its activities as an advocacy and educational membership organization, COMCARE works directly with communities, practitioners, organizations, and agencies to design and implement strategies to deploy modern interoperable data communications systems and information technologies, taking advantage of the wide array of emerging national, regional and local data sources. COMCARE has formed partnerships with other national organizations and government agencies to develop programs and standards to facilitate effective data exchange during emergencies. It undertakes these activities with the strong belief that individual agencies and localities should be empowered to determine how best to use these new information sources and tools in their communities, and that their individual choices can be best accommodated through the use of national data and interface standards, and a defined set of shared core services.

COMCARE and its members have been addressing various aspects of patient tracking and victim information collection and exchange for several years in daily and mass casualty contexts. The IPTI plan is based on those experiences, and on several focus group discussions with emergency professionals over the last year.

2 Background

Traditionally, the emergency response community measured the value of new technologies by cost reductions or improvements to the quality of care delivered during routine, day to day emergencies, such as car accidents. The terrorist attacks of September 11th changed this reality.

The emergency response community has reached two conclusions as a result of the events of the last few years. First, other disasters, whether natural or manmade will occur in the future. Second, the existing communications and information technology capabilities for managing emergency response on a daily basis need significant improvement, but do not begin to be capable of efficiently managing a large-scale emergency.

One new mechanism that has been devised to respond to these situations is an electronic patient tracking system specifically designed for a Mass Casualty Incident (MCI). Many of these systems are being developed throughout the country, with actual deployments in communities like St. Louis, Kansas City, and the US Military.

The overall design of most mass casualty based patient tracking systems is similar. In the event of an MCI, first responders and Emergency Medical Services (EMS) professionals arrive on the scene and give each patient a unique identifier, such as a identification tag, a bar-code or radio frequency ID tag. This identifier is then scanned by an interrogator device, where a responder records some amount of patient triage information. The amount of information collected varies between systems.

The information is then transmitted from the device to an Emergency Operations Center (EOC), field commander or hospital where emergency managers make appropriate transport decisions based on data they are receiving from various sources such as hospitals, shelters, and public health officials. The patient's identifier is scanned again as they leave the scene and finally when they arrive at their final destination (hospital, shelter, morgue, etc).

After collection, the information is transmitted either directly from the interrogator device or through a local routing device to different agencies and provider organizations in the region. These include Emergency Operations Centers (EOCs), hospitals, EMS administrators, shelters, public health departments and others.

In many cases, these systems are designed for, and only used for, mass casualty incidents (MCIs). While the technology and design of these systems will be beneficial as a key reference point moving forward, there is a general belief that any patient tracking system designed and used only for MCIs will fail. The best medical, public health, and emergency management science confirms that systems that perform the best during a crisis are ones that are used or practiced every day[2]. Experts agree that a "break glass

[2] Barbera J.A., Macintyre A.G. (October 2002). Medical and Health Incident Management (MaHIM) System: A Comprehensive Functional System Description for Mass Casualty Medical and Health Incident Management. Institute for Crisis, Disaster, and Risk Management, The George Washington University. Washington, D.C. Supported by a grant from the Alfred P. Sloan Foundation.

in case of big emergency" design creates equipment and training challenges during the disaster itself.

The emphasis on a dual use system - MCI and day-to-day - conveniently matches two parallel developments in emergency care: the development of an increasing number of data sources and tools relevant to the treatment of a patient in a pre-hospital setting (e.g. information obtained by a 9-1-1 center and/or EMT), and a major national focus on developing electronic health records.

Some of the conclusions from preliminary discussions are that patient tracking systems must be designed to accommodate all these functions and address the different needs of the whole emergency response community—not just individual segments, and not just for single jurisdictions. Systems need to be interoperable with each other and with other emergency software applications across jurisdictional, professional, and organizational boundaries. The following is a preliminary summary of requirements that are shared by all agencies, and then specific requirements of individual emergency response professions.

- **General Consensus Requirements:**
    - Serve all possible emergency agency requirements that arise in day to day events and MCIs in order to enhance use, increase amount and value of information in the system, and lower per agency and per user costs.
    - Security - protection of patient privacy and critical systems
    - Able to use shared identity rights management, authentication and other Core Services[3]
    - Enter data only once
    - Acquire data from multiple sources
    - Publish data to multiple destinations and types of users
    - Allow input and output using a full range of devices and techniques; not bundled with one or a handful of specific, proprietary devices
    - Accommodate data storage in various ways
    - Accommodate all forms of electronic transport (wireless, wire line)
    - Accommodate absence of electronic transport for periods of time (share data when transport becomes available)
    - Be interoperable with other emergency systems and software applications of all kinds if they also use standardized interfaces; open architecture
    - Use standardized data sets

- **Emergency Management** needs patient tracking to provide an accurate, near real-time account of the location and condition of casualties in the event of a disaster. Emergency managers need this data in a standardized, electronic format that is interoperable with their legacy incident management tools and

[3] Core Services are common shared tools, services, and resources offered through a collective effort of the emergency response community. See Appendix A for a detailed description.

protocols. In addition, they need a system that will not only enhance their ability to manage an event as it is occurring but will allow them to keep an accurate record of the event for review at a later time.

- **Hospitals** have multiple requirements for patient tracking systems. First, hospitals need to receive near real-time patient information about patients potentially and actually being transported to their hospital. They need this information to adequately prepare for patient arrival as well as to offer treatment recommendations to providers in the field. In the event of a mass casualty incident, hospitals need this information from the field so they can make decisions about response, and post their availability and diversion status. In addition, mutual aid agreements may require them to access this information from areas usually not within their jurisdiction or coverage area. Hospitals need a patient tracking system operating in the field to be interoperable with their internal tracking and health records management systems, for accuracy and efficiency. And in MCIs they need one so they can inform relatives and others of the status of patients: admitted, discharged or transferred.
- **Emergency Medical Services** need a patient tracking system that gives them the ability to collect patient information, including care provided, using any number of sources including: input from other systems, speech to text, text, and monitoring devices (e.g. a wireless link from a heart monitor). The system needs to be interoperable with the documentation required for run reports and billing. EMS also needs a patient tracking system that gives them the ability to transfer patient information from other sources while they are en route to the scene, and the ability to transfer information to hospitals before arrival, allowing the hospitals to offer treatment guidance, and other recommendations. In the event of a mass casualty incident EMS needs a system that supports the rapid triage and transport of numerous patients to the appropriate destination. This requires interoperability between patient tracking and other resource applications, including decision support tools to help make responsible transport decisions.
- **Public Health** needs near real-time access to be able to review clinical data collected by response agencies (9-1-1, EMS, hospitals), such as where the patient was found and their chief complaint. This is invaluable raw data for analysis by existing public health applications designed to monitor disease and injury trends. Public Health especially needs this functionality to assist in homeland security activities such as biosurveillance, and in preventing the spread of epidemics.
- **9-1-1** needs a patient tracking system that helps inform dispatch decisions, and then shares that information with other responders. It needs to be able to accept data from external public and private sources, as well as information obtained from the 9-1-1 caller. This information will help 9-1-1 offer appropriate advice to callers and emergency dispatchers. Additionally, in many cases, this relevant patient information can be transferred electronically to emergency staff that is responding to the incident.
- **Disaster Services,** such as the American Red Cross, need a patient tracking system that allows them to track the location of patients to help facilitate reunification efforts and the coordination of volunteers.

- **Academics and researchers** need a patient tracking system that allows study of actions, timing and outcomes (from the beginning of an emergency to discharge - not just parts of the process) so emergency response can be improved.

2.1 Patient Tracking Implementations

2.1.1 *St. Louis*[4]

The St. Louis Emergency Patient Tracking System (EPTS) was initially developed by Raytheon, and later updated by a consortium led by IBM. The project began soon after September 11th and the first version went live on May 8, 2003. The EPTS is used by the St. Louis Fire Department's EMS group to process patients being transported to hospitals in the St. Louis Metropolitan area during a Mass Casualty Incident (MCI). The EPTS is part of the larger St. Louis Metropolitan Medical Response System (MMRS), which is a coalition of emergency management, law enforcement, and health officials from fifteen counties neighboring St. Louis. There are 35 hospitals participating in the MMRS, originally run by Jeffery Lowell, MD, at the time,a transplant surgeon at St. Louis Children's Hospital. He later went on to become the medical advisor to the Department of Homeland Security. After a period of trail and error, the system is currently undergoing a significant revision after evaluating the original implementation.

2.1.1.1 How it Works

While the revised system is still a work in progress, the original system is a good example of the basic elements required by a patient tracking system. In the event of an MCI, all information is routed through MedComm, a regional incident command center housed on St. Louis University Hospital's campus. MedComm's role is to gather information from hospitals, public health, law enforcement, and other organizations and to use that information to relay the appropriate transportation decisions to the field.

First responders at the scene give each patient and casualty a bar-coded bracelet. This bracelet is then scanned with a handheld wireless phone equipped with a bar-code scanner. The responder enters into the device the patient's triage code and the hospital to they will be transported. The hospital's emergency department is then notified that they have a patent en route with a certain triage code.

In addition to being relayed to the hospital, the tracking information is sent to MedComm, which monitors hospital diversion data as well as resources deployed in the field. MedComm uses this information to instruct responders on the scene as to where the patient should be transported. The patient's bar-code is scanned when leaving the scene of the MCI and again upon their arrival at a hospital. All information is transmitted either by voice over radio or the dataset through the commercial wireless network.

[4] A slideshow of the EPTS Project can be found at: http://www.ndms.chepinc.org/data/files/3/56.pps

Recognizing the need to have a solution that works on a day-to-day basis as well as mass casualty incidents, on May 1, 2003 St. Louis began a pilot program to attempt to enter every patient transported by the St. Louis EMS into the EPTS.

2.1.2 *Kansas City*[5]

Kansas City's patient tracking system was developed with Urban Area Security Initiative grants awarded for 2003 and 2004, and 2005. The Kansas City system is not a stand alone tool, but rather a functional part of a larger emergency communications project called the Metropolitan Emergency Information System (MEIS). MEIS is operated by the Mid-America Regional Council (MARC), an organizational body composed of 165 organizations within the Kansas City metropolitan area. There are 8 counties, 116 municipalities, and over 2 million people within the MARC in both Kansas and Missouri.

The Kansas City patient tracking system, as well as MEIS, is not yet fully operational. They have completed the necessary infrastructure by deploying a wireless network within the MARC's jurisdiction. In some parts of the deployment area, hospitals and primary dispatch centers are on-line and it is expected that field users will have full access during 2006.

The patient tracking system software is being provided by EMSystem, with all data being exchanged in XML format. They will be using bar-coded wristbands, personal digital assistants (PDA's) with barcode readers and Toughbook™ laptops. All patient data will be transferred and accessible (with appropriate access clearance) in a central web-based database allowing appropriate agencies and organizations such as the Red Cross, hospitals, public health, and law enforcement access to patient tracking data. Additionally, the system incorporates hospital emergency department diversion programs and other functionality from EMSystem. This project has an emphasis on developing a central data repository, including specific regional views within the jurisdiction of the Mid-America Regional Council.

2.1.2.1 How it Works

Once it is determined that an event constitutes a mass casualty incident, the MCI protocol begins and wristbands carried by first responders are distributed. Each patient (alive or deceased) is given a bar-coded bracelet, which is then scanned into a PDA. This generates the patient's number, which will follow them through the course of the incident. Along with the bar-code the responder enters the patient's triage information such as age, sex, condition and possibly a photo for identification.

The PDAs transmit this information via a local area wireless connection to a field commander who is on scene with a Toughbook™ laptop computer. The commander's laptop is connected to the internet via a cellular card or satellite link. S/he will monitor area resources (such as diversion data from the hospitals' EMSystem) and will use this data to make transport decisions about individual patients. The commander then

[5] A slideshow of the MEIS project can be found at: http://www.marc.org/emergency/MEISdescription.pdf

transmits this decision to a secure website where many agencies have access, including hospitals, EOC, public health, and other organizations within MARC. The patient's bar-code is scanned at every step along the way.

2.1.3 *TacMedCS(Tactical Medical Coordination System)*[6]

TacMedCS began as a patient tracking prototype developed at the Pacific Northwest National Laboratory (PNNL) for the Navy. The project was undertaken in collaboration with the Naval Aerospace Medical Research Laboratory (NAMRAL) of Pensacola, Florida. Originally, the Navy contracted with PNNL to design a Radio Frequency Identification (RFID) tag containing a soldier's complete medical chart—including condition, blood type and allergies. The tag was similar to a standard dog tag. This prototype was deployed in two urban warfare scenarios.

In 2002, due to the war in Iraq, the Navy chose to purchase off the shelf readable/writable RFID wristbands and interrogators (scanners). These devices have been deployed in Iraq by Field Hospital 3, a 116-bed expeditionary medical facility that treats wounded coalition personnel, prisoners of war, and civilians.

2.1.3.1 How it Works

A casualty receiving corpsman (responder) scans the patient's wristband with a portable interrogator. The interrogator then displays the patient's medical history, including blood type, allergies, and past interventions and care. The corpsman inputs the patient's present condition, which is transferred to the patient's RFID wristband, updating their medical record. For the military, writable RFID offers significant advantages over bar-codes. For example, all of the patient interaction data can stay with the patient. It also can be electronically transferred. In the absence of wireless electronic channels or communications capabilities, critical information can still be retained on the patient.

From the field the patient is transported to a hospital. The patient's RFID record is scanned as they arrive. Movement through the hospital is recorded as well, including real time updates of the patient's record. When the patient leaves the hospital their final disposition is written to the wristband.

Throughout this process all patient information from the field is also relayed to a central command center where it is updated in a central database and monitored by operational commanders. This redundancy achieves two goals. First, it allows commanding officers to provide better consequence management (i.e., how many soldiers have I lost and how many reinforcements do I need) as well as get a more robust picture of the field situation. Second, having the patient data in a central database, as well as on the individual ensures that the data will not be lost if the individual loses their wristband or the central command center is destroyed.

[6] Visit http://www.namrl.navy.mil/clinical/projects/tacmedcs.htm.

2.1.4 *Other Examples*[7]

There are a variety of other efforts underway across the country and within the military to develop ways of tracking and sharing patient information. Chicago Fire and EMS is now exporting data from its 9-1-1 computer aided dispatch system via commercial wireless data (Verizon EV-DO) to ambulances so EMTs can be better prepared. Experiments of this kind are occurring in various other communities.

The Department of Defense has launched several programs that relate to patient tracking in addition to TacMedCS. Some of these projects include the Army's Telemedicine and Advanced Technology Research Center's Battlefield Medical Information System – Tactical (BMIST)[8] and the Force Health Protection and Readiness Joint Patient Tracking Application (JPTA)[9] from the Office of the Secretary of the Department of Defense.

A wide variety of software systems to capture patient injury and EMS treatment data using laptop computers, tablet PCs or PDAs have been developed for use by EMTs and other field personnel around the country. These are generally designed to download data into standalone or networked computers at hospitals, and ease the preparation of required run reports, but they are increasingly linked wirelessly to computer networks and data systems and available in near real-time.

Public health experts have developed syndromic surveillance systems with business rules that raise red flags when unusual trends are spotted. One example, Essence II developed by Johns Hopkins and deployed in the National Capital Region. At the same time, major efforts are being undertaken to develop electronic health record systems for patient records from hospitals and physician offices. With new sources of electronic data comes a new opportunity to use it to better manage outcomes.

And finally, a variety of private sector services are developing products that offer near real-time data on patients: from services like MedicAlert that store allergies, medical conditions/instructions and the like, to those such as OnStar and ATX that will provide incident information on vehicular emergencies, and even databases such as ChemTrec's that provide details on every chemical and how to treat exposure are also becoming available online.

2.2 A Unified Approach

As can be seen from these examples, there are a variety of ways in which a patient tracking system can be designed and implemented. It also seems clear that a national consensus on suggested requirements and implementation processes would allow communities to save time and select systems that satisfy both short and long term goals, focusing on their special needs. A national patient tracking framework will help communities to obtain the most value from their patient tracking investments.

[7] Other examples see http://www.patienttracking.org
[8] BMIST website http://www.tatrc.org
[9] JPTA website https://jpta.fhp.osd.mil

3 Project Objectives and Overview

The Integrated Patient Tracking Initiative is a multi-phase project. The first phase was designed to rapidly develop national consensus requirements from all emergency professions that can be used when selecting a patient tracking system. The second phase develops a patient tracking toolkit and launches a process to identify and fill in gaps in the data standards arena. The third and final phase "test drives" and refines the framework with field trials and by following a few communities through their procurement and implementation processes. This experience will allow the project team to refine the framework for others to use.

3.1 Objectives

The primary objective of this project is to provide practitioners with tools they need to make decisions about patient tracking systems for their respective communities, and to do so in ways that enhance overall emergency data communications and interoperability. To that end, the project will consider the following:

- All relevant prior requirements efforts and models for patient tracking systems at federal, state and local levels.
- Processes used by practitioners when responding to emergencies and then treating patients during emergency events -- whether they are mass casualty incidents or everyday emergency events such as car crashes.
- Systems and software tools used for developing and recording patient information, and how patient tracking solutions would integrate with them.
- Systems and software tools used for handling emergencies (e.g. EOC software; 9-1-1 computer aided dispatch), and how patient information from these systems would integrate with a patient tracking system (both publish and subscribe).
- Best practices and lessons learned from previous patient tracking initiatives.
- National efforts to deploy the widespread use of health information technology, electronic health records, and the development of a "national health information network".
- Information technology and communications capabilities of agencies that would use patient tracking systems.
- Challenges presented by jurisdictional and geographic differences in communications (e.g. wireless dead zones in rural areas), budget (e.g. limited funds in smaller communities), and other relevant capabilities.
- Data standards, including needed data elements, message standards, and message profiles, after considering those standards already developed that can be used for these purposes whether or not they have been created specifically for this use.
- Economic value and budgetary impact of such new systems.

Analysis will be performed for the current state of technology as well as an envisioned future state. The project team will use emergency event scenarios with practitioner working groups and solicit comments and feedback from the broader emergency response and vendor communities.

The requirements process will be comprised of a combination of working group meetings, conference calls, aggressive outreach and communications, and a national summit. After merging the results of the working group meetings and incorporating initial feedback, the Draft Requirements Report served as a basis for requirements

discussions at the day-long National Patient Tracking Summit which allowed interested agencies, organizations and vendors to offer comments and feedback. In addition to the requirements walkthrough, the Summit also included panel presentations addressing the technology, implementation issues, and lessons learned from the field. Suggested changes have been incorporated into the Requirements Report which will remain open for comment.

4 Project Structure

4.1 Scope and Methodology

COMCARE has extensive experience and capabilities in the functional, technical, and project management aspects of emergency response, solution design, development and delivery. This background and its operational philosophy result in a deeply ingrained practice of project-based activities. With experience in project management, interoperability architecture, standards development, and infrastructure design, the COMCARE team has developed a three-phase approach for completing the Integrated Patient Tracking Initiative.

4.1.1 *Phase I – Requirements Definition*

Phase I established a broad based practitioner Participant Group (see 1.1 above) to develop consensus for national requirements. The Participant Group was divided into working groups which took multi-dimensional views of practices following a patient care perspective, an emergency management and hospital planning perspective, and a disaster services and public health perspective. The working groups participated in facilitated workshops where participants walked through a number of scenarios to define current and future processes used when treating patients during a variety of emergency events, from mass casualty incidents (MCIs) to everyday emergencies.

The full Participant Group then reviewed this work product, integrated the three efforts, and issued as a draft consensus set of requirements. The requirements were distributed to a broader audience for public comment and peer review. The result was a consensus requirements report to use in later phases of the project.

Phase 1 included:

- Establishment of the Participant Group.
- Establishment of the three working groups.
- Assessment of current processes and protocols.
- Assessment of current technology environments including systems and network capabilities.
- Visioning discussions and/or workshops to determine needs that are not satisfied by the current environment.
- Research of future trends and emerging national requirements.
- Documentation of policies and protocols that affect the patient tracking process.
- Drafting of consensus national requirements.
- Identification of barriers to achieving them.
- Consultations with technology experts and vendor community.
- Circulation of draft requirements to broader practitioner, vendor and public audiences.
- Convening a national conference.
- Incorporation of feedback from conference into draft requirements.
- Planning for Phase II.

4.1.2 *Phase II – Patient Tracking Toolkit*

Phase II includes the identification and development of additional components needed to support communities in implementing integrated patient tracking systems. During this phase the activities of the Participant Group will include

- Survey of practitioner and vendor communities to identify current or planned implementations.
- Survey of current and planned solutions in relation to requirements.
- Establish practitioner and vendor working group to identify, develop, and/or adopt data standards to exchange information between various legacy and new systems in the patient tracking process.
- Identification of a model deployment path.
- Development of policy templates to use as guidelines during implementation.
- Planning and hosting a technology vendor showcase.
- Preparing a Patient Tracking Implementation Toolkit.
- Launch of a patient tracking website to highlight best practices and lessons learned as well as provide open access to the Toolkit.
- Planning for Phase III.

4.1.3 *Phase III – Demonstrations and Deployments*

Phase III is designed to "test drive" and refine the framework completed in Phase II. The project team will work with communities that have recently procured or implemented patient tracking systems to review their processes using the framework. We hope to be able to work with at least one area interested in acquiring a patient tracking system and using the framework in a real world setting. In addition, members of the Participant Group will work with vendors to develop demonstrations that show the requirements in action, and will work with communities to demonstrate the value of patient tracking systems and how they can be integrated with other emergency response systems using standard data sets and common core services. Early adopter vendors and communities will be showcased to help refine the implementation blueprint for others to follow. This phase includes:

- Planning and organizing patient tracking demonstrations. Showcasing vendors that have developed systems that are compliant with the requirements.
- Selection of communities; at least two that have already procured and/or implemented patient tracking systems, at least one that is planning to start the process.
- Validation of the framework to achieve interoperability across federal, state, and local systems.
- Refinement of the patient tracking functional and technical requirements, and the overall framework.

4.2 Tasks and Deliverables

The table below outlines the activities in each phase of the project, the anticipated deliverables and target completion dates. The final deliverable contents will be established during the initial stages of each project phase.

Phase/Activity	Deliverables
Phase I: Requirements Definition	
Outreach and Communications • Recruit Participant Group and working group members and chairs • Coordinate with participating organizations • Complete marketplace research on Patient Tracking solutions • Present initiative at appropriate conferences • Prepare descriptive and other outreach materials	• Participating organizations • Communications materials
Participant Group and Working Groups Organization • Begin overall Participant Group meetings • Confirm and assemble working group members • Create collaboration work space • Identify appropriate scenarios for walkthroughs • Organize meeting formats	• Populated working groups • Collaboration work space • Scenarios
Working Group Meetings • Work with chairs to prepare agendas • Clarify project expectations • Identify cultural and organizational challenges • Define critical success factors and measures of success • Document and post meeting minutes • Walk through scenarios to identify functional requirements • Assess and document current processes • Identify future needs	• Meeting guidelines and goals • Meeting agendas, minutes, and work product
Requirements Report • Draft functional requirements from working groups • Draft technical requirements • Coordinate output from working groups with technical writer • Have overall Participant Group review and agree on functional and technical papers • Circulate requirements and gain feedback • Prepare Consensus Requirements Report	• Model functional requirements paper • Model technical requirements paper • Final consensus version • Standards requirements
Sponsorship • Prepare sponsorship materials • Recruit financial sponsors for conference and subsequent phases of the project • Recruit organizational sponsors	• 0rganizational sponsors • Sponsorship materials

Phase/Activity	Deliverables
Patient Tracking Requirements Summit • Find venue and prepare for event logistics • Secure sponsors and exhibitors • Secure presenters and panelists • Finalize agenda • Hold event	• Patient Tracking Event
Phase II Planning • Compile conference feedback to prepare Phase II project plan	• Draft Project Plan for Phase II
Phase II: Patient Tracking Toolkit	
Outreach and Communications • Present Initiative at appropriate conferences • Prepare Initiative marketing materials • Submit articles and abstracts for publication • Coordinate with participating organizations	• Communications Materials
Research Current/Planned PT Solutions • Develop list of other needed components from Working Groups and COMCARE • Survey practitioner and vendor communities to identify current or planned implementations • Survey current and planned solutions and conduct comparison of solutions to requirements	• Analysis of recent/planned implementations
Patient Tracking Data Standards Development • Research existing data standards that support or affect Patient Tracking • Develop proposal for standards effort • Identify and document potential standards for integrating patient tracking systems with other emergency response systems • Identify participants for standards effort • Seek federal support • Recruit vendors to rapid prototype standards.	• Draft of potential patient tracking data set standards • Rapid prototyping and demonstrations of use of draft standards
Research Technical Solutions • Update marketplace research on Patient Tracking solutions • Identify information needed for the technology directory • Establish Technical Committee • Plan and Conduct Vendor Showcase	• Vendor Showcase
Compile PT Implementation Toolkit Components • Finalize list of components • Identify working groups required to complete each component • Convene working groups • Prepare Model RFP • Establish Advisory Group for policy issues • Develop policy templates to use as guidelines during	• PT Implementation Toolkit

Phase/Activity	Deliverables
implementation • Document results for publication	
Launch Patient Tracking Website • Design PT Website • Develop content • Seek members of the Technology Directory • Recruit sponsors for the Website • Post toolkit components and launch PT Technology Directory • Schedule Website review session with key stakeholders • Launch site	• PT Website • PT Technology Directory
Plan for Phase III • Develop project plan for Phase III	• Draft project plan for Phase III
Phase III: Demonstrations and Deployments	
Outreach and Communications • Coordinate with participating organizations • Present Initiative at appropriate conferences • Prepare Initiative marketing materials	• Communications Materials
Plan and Conduct PT Demonstrations • Design scenarios for demonstrations • Prepare demonstration guide • Recruit vendor and stakeholder participants • Coordinate demonstrations • Document results	• Patient Tracking Demonstrations
Conduct Framework Walkthroughs • Prepare materials for process walkthroughs • Prepare invitations for communities to participate • Solicit communities for tabletop walkthroughs • Hold tabletop walkthroughs • Document results and revise framework	• Refined Framework
Guide Actual PT Implementation • Research and solicit community for actual exercise • Train community staff on use of the framework • Select representative for project team • Document use of framework throughout the process • Incorporate feedback into framework	• Refined Framework • Implementation Report
Close Project • Prepare and present final reports and findings • Publish reports on PT website	• Final report and findings

5 Project Assumptions

This proposal is based on and contingent upon the following assumptions and goals:

5.1 General Assumptions[10] and Goals

- Systems that perform the best during a crisis are ones that are used every day.
- "Patient tracking" does not just mean tracking the physical location of the patient. Rather, it means a system which tracks the location of a patient or victim and allows for the association of some limited additional level of information regarding the condition of that individual and care given, e.g. chief complaint, disposition, medications administered, etc.
- It also means creating electronic identifying mechanisms that, beyond a simple tracking application or cross cutting data collection system, can link all sources of data about a patient in a dynamic, end-to-end continuum, crossing multiple independent databases and agency applications, from 9-1-1 through hospital discharge, and a variety of enriching data bases, protocols and algorithms along the way.
- Standardization of response parameters (vocabulary, equipment, and communications) lowers costs and improves choices.
- Political support and regular interagency interactions promote improved response and preparedness.
- Patients enter and leave the emergency system in different ways.
- Because healthcare has developed as an industry of independent practitioners, facilities and systems that have minimal need for coordination during day-to-day use, the traditional command structure utilized by the fire service, EMS and other emergency responders may not function well in a broader healthcare setting. Healthcare entities may have to be managed differently from other players in the emergency response field; however one goal of this program is to ensure that during a major incident, all such parties are willing and effective participants in an Incident Management System.
- Emergency management has developed to address all types of emergencies and disasters. The all-hazards approach of emergency management primarily denotes the use of a single set of management and response systems for all hazards (the same systems for communication, notification, management methods, etc.).

[10] Assumptions have been validated in, and are largely from:

Barbera J.A., Macintyre A.G. (October 2002). Medical and Health Incident Management (MaHIM) System: A Comprehensive Functional System Description for Mass Casualty Medical and Health Incident Management. Institute for Crisis, Disaster, and Risk Management, The George Washington University. Washington, D.C. Research supported by a grant from the Alfred P. Sloan Foundation.

- Each political jurisdiction has primary legal and political responsibility to its own citizenry such that it cannot abrogate or subrogate that responsibility to other jurisdictions, to a "region," or to a federal response agency.

- There is a lack of incentives for interoperability and sharing. To succeed, we must be able to demonstrate a clear value to each professional category of emergency practitioner, to lay people, and to elected officials.

- A growing set of electronic data that could be helpful in patient response resides in a large number of unrelated places.

- A fully federated patient tracking system links all the parties and their information sources in the current or potential system of response.

- The system should be active and enable two-directional communications.

5.2 Project Assumptions

- The need for this initiative is established and verified. No other national initiative is addressing the issues raised herein in a comprehensive and inclusive manner. All agencies involved with patient tracking contacted thus far have reacted positively to the launch of this project.

- Funding/sponsorship for the summit and other parts of the project will be acquired.

- The COMCARE Board of Directors has authorized this project. COMCARE has the staff available to support this project.

- Other needed experts with the appropriate knowledge will be available to participate on the project.

6 Project Funding

Most of Phase I, up to the development of standards and the Consensus Requirements white paper, was funded by the Virginia Hospital and Healthcare Association (VHHA).

Funding needs to be identified for other aspects of the project, including the Patient Tracking Requirements Summit as well as Phases II and III.

Appendices

7.1 Appendix A: Interoperability Architectural Framework

Shared, real-time voice and data information is essential to emergency response. Regionally interoperable first responder **voice** communications has received a good deal of attention at all levels of government. Interoperable, shared **data** among local and state agencies and other external entities, for public safety, criminal justice, and emergency response is the next challenge.

Architectural Layers

There are several architectural layers that must be in place to achieve effective **data** interoperability in a locality, state or region. Some of these layers are shared resources while others are components that will be unique to individual agencies. (See Figure 1, which reflects the components identified in the Federal Communications Commission's NRIC VII draft report on the Future of Emergency Communications.) These needed layers include data *transport*, shared emergency response *standard data sets***,** shared *core services*, individual (or group) agency *applications*, and the *policies and protocols* that govern the use of the system when data interoperability is achieved. Interoperability will not come from building a single new network, and forcing the tens of thousands of US emergency agencies to junk their legacy systems. Instead, we believe it will come about by using standards, core services and policies to create an "internetwork". It will connect the wide variety of wireline and wireless networks, and applications that use them. These are controlled by thousands of separate entities.

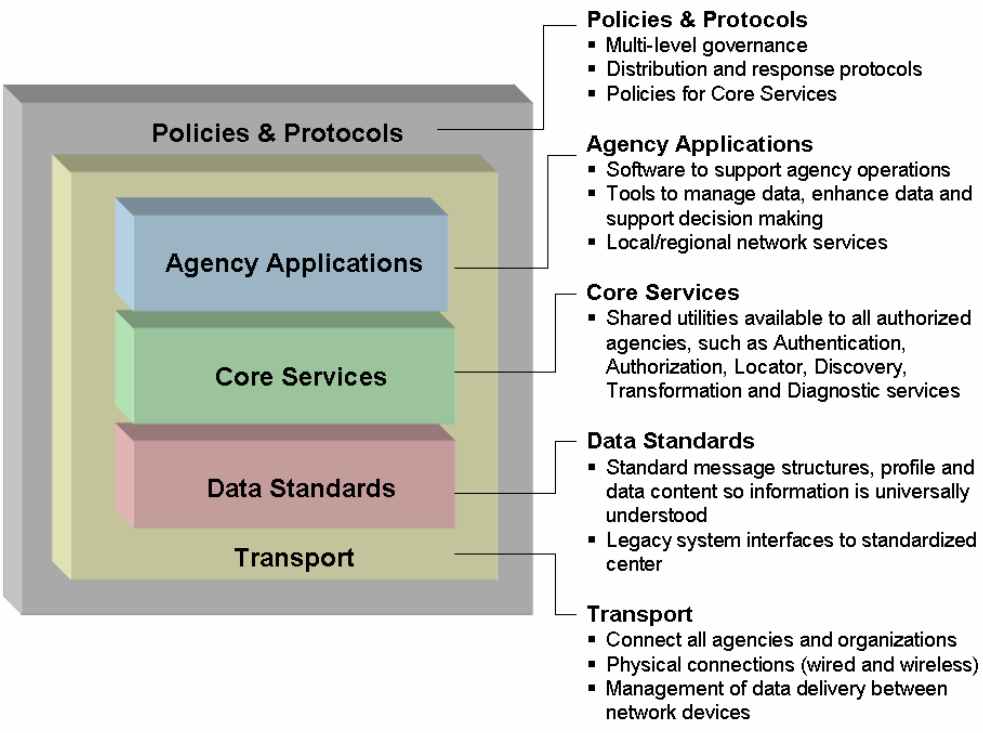

Figure 1. Architectural Layers for Achieving Interoperability

Transport

The transport layer is comprised of the physical networks over which voice and data travel. This can be private public safety radio systems and telephone for voice. Data interoperability requires reliable and secure broadband data connections using Internet protocol. This can be the public Internet; that has the advantage of being available to almost any agency immediately, and for very low cost. However, many localities and states have developed their own private IP networks that have the advantage of providing better performance. The transport layer also manages the end-to-end delivery of messages and determines how data are transferred between network devices. It manages user sessions and dialogues, and controls the establishment and termination of logic links between users.

Standards

Standards create a common language that enables data sharing between the thousands of individual agency proprietary systems being used today. It is often suggested that a solution to interoperability is to require all agencies to use the same software tools. While that can allow multiple agencies to see the same information, it is not interoperability. Most agencies will not be willing to let someone else make their application selection decisions for them, nor will they be comfortable or efficient using tools that they don't use on a daily basis – "just another screen". The costly alternatives are to develop individual interfaces for each source of data, or to acquire complicated and expensive systems that sit between agencies and claim to be able to translate each agency's data language into the others.

Common standards allow data communication among the disparate systems that are already in use, along with new applications as they are introduced into the system, by essentially having the owner of each system building a single interface for all such purposes at the point where that system "meets the outside world".

Standards have to be national. National standards mean local and state technology choices will expand and prices should improve, following the experience of the private sector with the commercial computer industry. It is equally important that representatives from the full range of emergency response professions are at the table during the national standards development process.

The need for data interoperability using common standards has been identified as a key issue by the Department of Homeland Security (DHS) through OMB's Disaster Management eGov Initiative. DHS, with COMCARE's help, is facilitating a process bringing together leaders of all the emergency professions that need to share data during emergency response operations. These practitioners develop detailed requirements for specific emergency message standards, using standardized content developed by other standards efforts focused on specific professional domains, such as the extensive work by the Global Justice project, NEMSIS, HL7, DEEDS, IEEE 1512, and others, particularly the new National Information Exchange Model (NIEM) project. Vendors field test these common sets of emergency message standards and then they are submitted to formal international standards bodies. The DM project's goal is to

develop a common set of emergency message standards called the Emergency Data Exchange Language (EDXL).

Over the last few years, a similar process has resulted in other XML (eXtensible Markup Language) standards. These include the Common Alerting Protocol[11] (CAP) and the Vehicular Emergency Data Set[12] (VEDS).

In addition to data standards, there needs to be an effort to standardize server interfaces and common transactions. This will allow far more rapid and efficient adoption of data standards.

Core Services

Core Services are common shared tools, services, and resources offered through a collective effort of the emergency response community. They enable interoperability and are available for use by authorized emergency entities. These services include, but are not limited to, security, diagnostics, routing directory, identity management, access control, digital rights management and authentication. By using these shared core services, agencies do not have to spend their limited funds creating and maintaining these functions on their own (and convincing corresponding agencies to trust their functions)

Data cannot be routed without a directory of agencies and their electronic addresses. Each user or vendor can have its own, which almost by definition ensures less quality, less comprehensiveness, and less accuracy. Rather than the inefficient profusion of single purpose directories that is growing today, there should be a shared utility, owned and managed by the emergency response professions. Operated as a secure registry, authorized agencies would enter their name, contact information, professional function, level of government, incident interests (and the geographical area of both jurisdiction and interest for each type of incident), and emergency data delivery address(es). Once agencies are registered, authorized systems of any kind can query the directory to determine to which agencies they need to send information.

Identity management and authorization functions are critical as well. There must be a trusted way to credential agencies and individuals, allow them access to and use of the network, and provide them with appropriate authorizations, such as granting them permission to send and/or receive data. Linking networks will require system(s) that will

[11] The Common Alerting Protocol (CAP) standard is an open, non-proprietary OASIS (Organization for the Advancement of Structured Information Standards) standard for the exchange of emergency alerts and public warnings over data networks and computer-controlled warning systems.

[12] The Vehicular Emergency Data Set (VEDS) is an XML standard for the transmission of telematics data to emergency agencies. Initially designed to transmit automatic crash notification data to an emergency agency, VEDS also serves as a data receptacle, collecting important bits of information as the response effort unfolds. The data set can contain data transmitted directly from the vehicle like vehicle speed, airbag deployment, direction of force and rollover as well as information from the telematics provider about the vehicle and its owner. Questions asked by a 9-1-1 operator about the age and gender of the occupants and data from responders and witnesses at the scene can also be added.

assure that only authorized parties may participate, assign them appropriate rights and roles, and authenticate communications from them.

Core services require both electronic tools *and* new institutional processes (see "Policies and Protocols" below) to develop the rules and policies needed to govern information sharing enabled by this framework.

Agency Applications

There are numerous emergency applications in use today, including complex Computer Aided Dispatch Systems (CAD), web-based emergency management tools, local and statewide GIS systems, hospital capacity reporting systems, and other applications. Some are owned by single agencies; some are network elements owned by a collection of agencies (e.g. the law enforcement network NLETS). Each of these systems has their own unique functionality; agencies should be encouraged to purchase the tools that are best suited for them. However, it is critical that these applications all have the ability to send and receive XML messages to other applications in standardized formats at the interface point where they connect to outside systems. As agencies look to the future, they need to require vendors to provide this capability. It should not matter to a 9-1-1 CAD system that it is receiving data from an emergency management tool about a flood, a telematics message from OnStar, a bioterrorism alert from CDC, or data about a 9-1-1 call from a wireless company. The same data interface should be used. Vendors will benefit because they will not have to create multiple one-off interfaces.

Another set of applications and services are those that compete to deliver information between these agency-based applications. These can range from traditional ones that provide telephone, radio, or data connections between disparate parties (such as NLETS), to more sophisticated shared systems which enrich incident messages with associated data from multiple sources (e.g. "chlorine spill? Here are the treatment instructions." "Wind blowing northwest at 25 mph? Here is the plume model."). The same interface rules need to apply to them.

Policies and Protocols

It is important to separate technical capabilities from policy rules governing their use. Technically, we need a system that connects any agency to every other agency. And, indeed, "agency" needs to include many private sector entities. But that doesn't mean that any agency should be allowed to send or receive any message or have access to all data.

While achieving data interoperability technically, it is also important to develop the policies and protocols that determine the rights and roles of agencies in the system, and management rules for it. Does a hospital have the same privileges as the county DOT, the 9-1-1 center, the police, or the towing company? Who has access to what data and who is allowed to send what messages? Some of these policies (and the decision making bodies) are already in place today, whether they are officially written policies or not. The local, state and federal law enforcement communities are most advanced in this regard. Most other emergency agencies are not because sharing emergency information between them has not been done before. All of these policies and protocols will need to be addressed in terms of electronic communication.

Summary

The Interoperability Architectural Framework enables the integration of data providers to data collectors. Data from devices in cars and trucks, incident data or personal medical data can immediately be sent to those registered and authorized to receive this type of information. The framework provides one approach for all-hazards emergency messaging, whether messages are about mass emergencies or single events, about patient tracking or resource management, and whether an agency needs to contact other agencies, private entities or the public. It is adaptable for use by a wide range of organizations and improves operational efficiency so the focus is on emergency response, not on the administrative tasks of data entry, looking up contact information or filing paper records.

Through this framework, agency systems as well as other discipline-specific systems can be integrated across the entire emergency response spectrum. Real time data can be collected for all types of hazards, improving the ability to detect trends and threats. Agencies will know immediately when an emergency event occurs. Responders will receive timely information allowing them to provide more effective response — and to reduce injuries and save lives in the process.