Integrated Patient Health Information Systems to Improve Traffic Crash Emergency Response and Treatment

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Abstract

This research explores how a wide range of automobile crash, emergency responder, hospital, and trauma information could be useful to emergency medical practitioners for making decisions about automobile crash victims. We use a framework from prior research to consider, devise and examine emergency medical practitioner use of information systems for improving emergency response services and outcomes. This paper first provides an overview of clinical decision support systems focused on car crash emergency and trauma response. Concepts are grounded in a case study investigation conducted in Minnesota at the State and local level (Mayo Clinic). Operational data from 911 communications, ambulance response, and trauma data systems were linked together to demonstrate a data integration "proof of concept" to emergency medical practitioners. Interviews and focus groups discussions were then conducted to discuss the current and potential value of integrating inter-organizational data for real-time decision support. Analysis across these various methods provided a multi-layered understanding which led to a descriptive architecture for a crash trauma information system.

1. Introduction

Automobile crashes result in over 40,000 deaths per year in the United States [1, 2]. Research has shown that timely emergency medical response to these crashes can significantly reduce the likelihood of death and disability consequences [3, 4]. The literature has also posited the potential role of health information technology (HIT) in reducing emergency medical response times [5, 6] and improving the level and type of care provided to a crash victim at varying points across the inter-organizational continuum of emergency care [7-9]. Prior research by the authors indicated that one key aspect of improving clinical decision making for car crash victims would be to provide a complete view of information about the patient, including the events surrounding a crash incident, and the care provided to that patient from the time of 911 call, through paramedic response, through the receiving trauma center, and patient rehabilitation. However, in the United States, such a complete and unified approach is not currently accessible and “viewable” across the range of care providers involved [10]. Little is known, from a consumer standpoint (i.e., emergency medical practitioners), the requirements for such a system, the information that should be included, or how to achieve such a vision. This research aims to explore the concept of an integrated crash trauma information system from a consumer health standpoint, focusing on metrics surrounding the entire “end-to-end” treatment of a crash victim. This paper reviews literature and best practices on the technical architectural components needed for a unified patient view to enable more real-time information for clinical use. It then grounds the concepts through a case study analysis on multi-organizational information sharing in the Minnesota Mayo Clinic trauma system from both local Mayo Clinic practitioner perspectives and State level trauma system perspectives. From this user driven approach, the authors construct a high-level descriptive architecture of an integrated crash trauma information system.

2. Background

Emergency response information consumers need access to accurate, timely and comprehensible information [11, 12]. For automobile crash trauma incidents, patient and incident information is used at various points in time by telematics service providers (e.g., OnStar), 911 dispatchers, first responders, ambulance providers, emergency department...
personnel, trauma physicians, crash analysts, and a range of medical specialists. However, information from these various practitioner organizations typically remains in “silo” data systems and are not shared across the incident response and care continuum [10]. For example, patient care information is often collected by paramedics at the scene of an automobile crash, but not always passed forward to an emergency room doctor upon patient arrival to the hospital [13]. As the patient makes his/her way to the hospital, critical data that could aid in saving his/her life is often misplaced, forgotten, or otherwise not reported to care givers [14-16].

This article presents research that extends previous work on time-critical information services conducted by the research team [17]. In our prior work, we developed a conceptual model for analyzing organizational, operational, and governance dimensions of performance information sharing across multiple cooperating emergency medical services (EMS) organizations [17]. The framework was applied within a comparative case study in San Mateo County, CA and with the Mayo Clinic in Southeast MN [18]. A key finding of the case study work was the need for more focused attention on the information needs of consumers across the entire experience of the crash victim, in terms of the clinical information requirements of emergency care practitioners, information about resources for providing care, and end-to-end performance of the trauma emergency care process. We use a process oriented view to begin our analysis.

2. 1. Trauma Information Systems for Clinical Decision Support

Clinical decision support has been defined as “the act of providing clinicians, staff, patients, or other individuals with knowledge and/or person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care” [19]. This goal has been met with mixed success, in large part due to the challenges of entering, accessing, and visualizing information from across a range of information owners [19-21]. For example, in a recent survey, 85% of emergency physicians reported that it is difficult or very difficult to obtain external patient data, taking an average of 66 minutes [7]. Many emergency care practitioners believe that access to patient and incident information will help improve care efficiency, reduce errors and costs, and benefit the patient [5, 7]. But the information sharing challenge remains a significant one to overcome.

For automobile crash emergencies, much advancement has been made in the use of a variety of information systems towards a more integrated data system. For example, one significant technology is Automatic Crash Notification (ACN) systems, or an array of sensors, wireless technologies, and software systems that notify a telematics service provider (e.g., OnStar) when an automobile has suffered an impact, roll-over, or airbag deployment. The automated “push” of this data has allowed for decreasing the amount of time that occurs between the onset of a crash and the time that it is reported to 911 dispatch or other emergency services [5, 22, 23]. This technology has been useful for assisting 911 operators to know how many and what type of resources (ground or air ambulance) to send to a crash incident. What is less understood is if and how such data could help emergency department and trauma center practitioners prepare for the arrival of a crash victim [5, 24]. Further supporting the critical need for effective response are findings suggesting that crash survivability is increased for those cases where EMS is promptly notified and dispatched [25].

Next Generation 911 systems have also been identified as an essential component that enables decision support for an integrated “voice and data” emergency communications system [26]. Toward this end the Hatfield Report [27] provided recommendations toward upgrading 911 infrastructures that can sufficiently address improvements and opportunities made available by Internet Protocol (IP) networking standards, voice over IP (VOIP) communications, location identification techniques and public safety answering point (PSAP) processes and resources [28]. ACN and NG911 systems working together would provide a foundation by which to pass forward essential patient and incident information to emergency medical personnel to increase a crash victim’s chance of survival [26, 29, 30].

Computer-aided 911 dispatch systems and electronic patient care record (PCR) systems used by paramedics in the field are also essential components for patient data sharing. Recently, the National EMS Information System (NEMSIS), an XML data standard for transfer of inter-organizational EMS data in the “pre-hospital” setting, was released. As of October 18th, 2007, 50 states in the US had signed on to adopt the standard, the benefit being that standardized protocols have been created for local, state, and national level information transfer for more real-time data routing as well as “pre-hospital” research and analysis [8, 31].

While NEMSIS is important and essential for enabling real-time information sharing, little is known how a patient’s health data will be used in a clinical environment such as an emergency
department or trauma center setting due to the few implementations to date. It is also unclear how NEMSIS-enabled systems will integrate with hospital and trauma center data systems. Trauma centers themselves have long had issues with information sharing and integration. For example, Mann, et. al [32] note that there is a high degree of variability in terms of data representation and structure across trauma data registry software products.

To address this issue, the National Trauma Data Standard (NTDS) initiative has focused on developing an XML data standard to be used by all trauma registry systems, which will include the ability to link data with NEMSIS. It has been planned for the NTDS to be completed and ready for implementation in 2009 [33].

Although these studies have identified a need for integrating data across the spectrum of EMS and trauma services, there have been no empirically established efforts related to data integration across these domains [34]. While many other information systems could be noted herein, including patient tracking systems, hospital availability systems, electronic health records, and others, it is important to note previous findings by the authors that indicated the need for an integrated consumer oriented effort to assimilate and utilize data across many disparate health information systems, particularly to support the needs of automobile crash trauma emergency responders.

3. Research Approach

Our prior research identified inter-organizational gaps in regards to data access and integration across organizations involved in the emergency medical response process. This process oriented analysis allowed us to discover issues, challenges, and opportunities for inter-organizational information sharing [34]. The research presented herein is aimed at exploring practitioner perspectives on the performance value and use of shared information. Figure 1 provides a way to frame the review through considering the end-to-end EMS process, from medical onset through definitive care as displayed below [17].

An important goal of this research is to uncover how pre and post EMS information could affect EMS process improvements and related health outcomes. Our approach was to study the use of information systems to improve emergency response services and outcomes. Based on findings from prior research phases, and recognizing the need for “on the ground” investigation of how research concepts are instantiated in practice, a state and local case study investigation was conducted. The local case study was conducted first at the Mayo Clinic in Rochester, MN. The State level analysis was conducted afterwards, which served to validate the local findings. Case study analysis led to a descriptive enterprise architecture for a crash trauma information system. These phases are discussed below.

4. Local Case Study Analysis: Mayo Clinic Rochester, MN

Researchers conducted a case study of the local Rochester Minnesota Mayo Clinic trauma information system in Olmsted County, Minnesota between March 2007 and January 2008. The Mayo Clinic service area is largely rural, covering a land mass that includes portions of three states: southeastern Minnesota, western Wisconsin, and northeastern Iowa and the population of the communities served range in size from under 1000 to more than 60,000.1 The Mayo Clinic is located in Rochester, Minnesota, which has a population of 94,950. The data collected and context discussed herein focused on emergency responses in the southeastern Minnesota region.

Building on prior research collaboration with the Mayo Clinic, the aim of the case study was to explore, from an end-user perspective, challenges and benefits associated with the implementation and use of end-to-end information systems across the inter-organizational emergency medical response process (see Figure 1). Researchers used an EMS process framework developed through prior work (in Figure 1) to investigate patient information handoffs. Researchers collected data sets used across the process, merged and analyzed the data, and then held a series of focus group discussions with emergency medical practitioners to understand the benefits and challenges of using that data and how information technology could be better utilized to support decision making.

4.1. Local Case Study Data Analysis

As discussed above, a first step in this research process was to obtain data that linked patient data across the emergency medical process as a “proof of concept” to demonstrate to emergency medical practitioners who would participate in the qualitative phase of this study. De-identified data was obtained from the Mayo Clinic for the year 2006 to investigate the range and types of data that exist for automobile crash emergency responses, how well the data integrates across organizational units, and to what extent the data might be useful to practitioners if the data were to be integrated and used for decision making.

Two data sets were obtained: one for “prehospital” EMS information and a second one for Hospital Trauma information. The goal was to link all EMS responses for automobile crash trauma patients that 1) occurred in the Mayo Clinic Trauma Region, 2) were responded to by Mayo Clinic 911 operators and ambulances, and 3) were transported to St. Mary’s hospital (Mayo Clinic). The EMS Data Set was sorted to locate only those incidents that were identified as “motor vehicle accidents (MVA)”.

Once the MVA-related data was obtained, connection with the Hospital Trauma Data was then made. To enhance the probability of data matches, there were several data fields used to construct a match. These included: date, time, age, sex/gender. In sum, the research team successfully linked 179 records of a possible 193.

4.1.1. Data Analysis

After data linkages were made, a general descriptive statistical analysis was conducted on 1) EMS response times, and 2) trauma outcomes (see Figures 2-4 below).

In terms of EMS response, or Travel Time starting from 911 call until arrival to a Trauma center, we found that 25% took less than 30 Minutes (46) while 75% of them took greater than 30 minutes (133). This is significant to note since automobile crash trauma patients are 5-7 times more likely to survive when arrival to a trauma center is less than 30 minutes [4].

However, it is not a surprising statistic given the rural population served by the Mayo Clinic. As described later in this article, participants are keenly interested in decision support capabilities to help support the provision of quality care prior to arrival at a trauma center in part due to the nature of long distance trauma transports.
could be extracted profiling the entire health consumer/patient experience and outcome.

Figure 4. Trauma TBI Outcome Scores

As such, the data analysis began to investigate relationships between pre-hospital performance and trauma outcomes. Additional data has been requested from Mayo Clinic to conduct a more in-depth multi-year analysis. The above analysis was presented to emergency care practitioners that participated in the next phase of qualitative research. Interviews and focus group discussions were held to better understand emergency practitioner perspectives on “end-to-end” information sharing and integration. The following sections present findings from focus group discussions with end users.

4.2. Local Case Study Focus Groups

Three focus group sessions were conducted at Saint Mary’s Hospital (part of the Mayo Clinic) in Rochester, Minnesota. The 14 participants represented organizations across both pre-hospital and hospital domains as shown in Table 1.

Focus group questions focused on challenges and benefits to using inter-organizational information and the requirements for system and process improvement. The data analysis process involved transcription of audio recordings of focus group sessions. After the transcription, the text data was organized along operational, organizational, and governance dimensions as prescribed in Horan and Schooley [17], who developed a framework for analyzing inter-organizational emergency response systems. Findings were then resolved into a set of architecture qualities for an integrated crash trauma information system (see section 5 below). The qualitative analysis resulted in eight themes, or characteristics, that the case study participants desired from the next-generation crash trauma information system. A summary of these findings is described below.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Position</th>
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<tbody>
<tr>
<td>Mayo Clinic Emergency Communications Center</td>
<td>Manager</td>
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<tr>
<td></td>
<td>Program Coordinator</td>
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<tr>
<td></td>
<td>Supervisor</td>
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<tr>
<td>Mayo Medical Transport (air and ground ambulance services)</td>
<td>Administrator</td>
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<tr>
<td></td>
<td>Chief Financial Officer</td>
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<td></td>
<td>Chair of RescueNet Committee</td>
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<td></td>
<td>Director of Air Operations, Mayo MedAir</td>
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<tr>
<td></td>
<td>Regional Process Coach</td>
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<tr>
<td>Mayo Clinic Corporate Communications</td>
<td>Director</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Director/Lead Analyst/Programmer</td>
</tr>
<tr>
<td>Department of Emergency Medicine</td>
<td>Physician, Co-Medical Director – Air</td>
</tr>
<tr>
<td></td>
<td>Physician, Co-Medical Director – Ground</td>
</tr>
<tr>
<td>Department of Trauma</td>
<td>Surgeon, Co-Medical Director – Air</td>
</tr>
<tr>
<td>Total Participants:</td>
<td>14</td>
</tr>
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</table>

Table 1. Mayo Clinic Focus Group Participants

4.2.1. Operational Level Findings

Unified Patient Records – While integrated medical records and associated software to capture patient information are used by the Mayo Clinic hospitals, the pre-hospital sector (i.e., first responders, ambulance provider, 911 communications center) is not integral part. The implication is that the care providers that arrive to an automobile crash incident are not able to utilize pre-existing patient information. Nor is that information forwarded on to a receiving emergency department or trauma center. Participants noted how having such information could significantly reduce data collection time on scene and also provide much needed information (e.g., medications, pre-existing medical conditions, allergies, blood type, emergency contact information, etc.) to help reduce medical errors and increase quality of care provision across the emergency response continuum of care. Participants noted that an integrated system should allow for identification and “pulling” and “pushing” of patient information from and to each authorized care provider.

Pre-hospital to hospital performance information analysis gap – The ability to easily share data between both pre-hospital and hospital domains inhibits a complete end-to-end patient perspective on performance. Often, different elements of crash, EMS, and trauma information for the same crash incident exist in different databases in different organizations. Participants discussed how the ability to integrate data across these “silos” would enable clinical and operational analysis and decision making at select points of care across the end to end process,
and for post incident research and analysis. For example, participants noted the difficulty of assessing the relationship between ambulance response times (a pre-hospital measure) and patient outcomes (hospital measures). Conducting such an analysis today would be very time consuming and error prone. Participants noted that the “next generation” system should facilitate performance reporting across emergency response and hospital organizations.

Clinical Usability – Participants discussed needed improvements to software systems that they are required to use on a daily basis. Improvements included enhanced interfaces that enable automated data capture as opposed to manual data entry and that “fit” with their emergency care processes as opposed to “getting in the way” of their time-critical work. However, many challenges are associated with adopting new technology and integrating it with existing data systems. Participants noted that open, standardized, and interoperable software systems are key to allowing for continuous enhancements for more user friendly features.

Data Communications and Standards – Participants are acutely aware of the national movement towards data interoperability and standards development. Several participants noted their involvement in many national conferences and policy groups working to reconcile data communications and standards issues. A number of participants discussed the essential need to adopt standards to allow for enhanced levels of information integration across organizational boundaries.

4.2.2. Organizational Level Findings

End-to-end Awareness – Participants discussed performance and quality improvement activities within each organizational unit (hospital, ambulance, 911 communications, etc…) and noted the lack of a stronger business case for cross-organizational (end-to-end) information sharing initiatives. While an advisory board exists that includes members across organizational units, participants noted that the entire multi-organizational system could benefit by devoting more attention on end user level discussion with consumers from one organization conversing with another. Participants felt that conversing in such a manner would act as a training experience on the importance of “end-to-end” information integration and performance, thus forwarding the system wide thinking and culture to allow for integrated information systems.

Stakeholder Involvement – Mayo Clinic personnel discussed the benefits of working with legislative groups at all levels of government in order to find innovative ways to progress trauma care in their region. Participants agreed that taking upon themselves the role of “facilitator” to involve a wide range of stakeholders had been important for Mayo’s cultural focus on continuous improvement. In particular, taking a “bottom up” approach to allowing interested practitioners to get involved had helped to gain additional stakeholder involvement.

4.2.3. Governance Level Findings

Use of Contracts – Within the Rochester, MN area, the Mayo Clinic controls almost the entire end-to-end provision of service, from 911 medical phone calls, to air or ground ambulance response, to trauma care. Outside of the Rochester area there is mixed control including first responders as well as sub-contracted and volunteer ambulance providers. As such, the larger, regional emergency medical services (EMS) system is similar to many other EMS systems throughout the United States, constructed of many different, loosely coupled, and sometimes competing organizations. When outside the boundaries of control, the Mayo Clinic is faced with the financial and technical aspects related to inter-organizational information sharing and the need for contracts to enforce service performance levels. End user participants discussed the importance of these contracts for ensuring information exchange across provider organizations.

Non-contract information sharing – Networks of cooperating and collaborating organizations outside of the Mayo system have been established for the purpose of infusing the Mayo Clinic’s philosophy of high quality patient care. Information sharing and service cooperation often takes place without formal binding contracts in place. This is often at the expense of the Mayo Clinic. But the organizational philosophy is that care provision at the Clinic will be enhanced if inter-connected care providers work like they do – with a focus on quality patient care.

4.3. State Level Stakeholder Focus Group and Evaluation

While the local level case study provided valuable insight, researchers also sought to understand practitioner perspectives from the State level including how crash, EMS, and trauma information is currently being integrated and utilized in the State of Minnesota and challenges and benefits to further integration. Moreover, the discussion focused on how to conceptualize the “next-generation” system that would not only facilitate the analysis of large archival data sets, but also allow for more real-time analysis
from a clinical standpoint. A series of 2 focus group discussions and 3 follow-on interviews were conducted with 16 state level Agency decision makers. Participants represented the following organizations: Emergency Medical Services Regulatory Board (EMSRB), the Health Department (State Trauma System and State Trauma Advisory Council), Department of Transportation (Intelligent Transportation Systems Program and Office of Traffic Safety), and Department of Public Safety (Traffic Safety).

4.3.1 Summary of State Level Focus Group and Interview Findings

Participants discussed that in order for a complete end-to-end view of patient and incident information to provide value to a wide range of consumers, there would need to be data assimilated from a wide range of existing organizations and information systems. These data sources would include: telematics providers (data from automatic crash notification systems), 911 dispatch centers, first responders, ambulance providers, emergency departments, trauma centers, public health (e.g., rehabilitation databases), public safety (e.g., crash analysis reporting systems), and department of transportation (e.g., traffic management systems). These are illustrated in Figure 6.

Participants discussed operational challenges to achieving this vision, including several data collection issues. For example, there is a lack of state level information collection policies. Paramedics also experience difficulty inputting data due to their need to focus on patient care in time-critical situations. The lack of wireless infrastructure can often poses system connectivity problems as well. As such, and to the dissatisfaction of physicians, the electronic incident report from the paramedic is typically received well after a patient has arrived to the ED.

While many obstacles were discussed, participants agreed that there exists substantial motivation to progress towards a more open, standardized, integrated, yet secure and private, information sharing environment. Potential benefits discussed included reducing emergency response times, improving decision making capacities, improving patient care, reducing crashes, improving emergency response management capabilities, and reducing disability consequences, fatalities, and associated costs across the State.

For the purpose of research, participants agreed to share data for the advancement of a “proof of concept” project. Furthermore, participants supported a research oriented and multi-phased approach, understanding the magnitude of such an undertaking and long-term vision of integrated data sharing across the State. Participants noted the research approach should include stakeholders from across the full spectrum of crash and emergency response organizations, integrate with existing state policy programs, such as the “Toward Zero Deaths” program (a statewide cooperative to reduce annual traffic fatalities to zero), involve state trauma board of physicians to provide a “clinical” perspective on data sharing, and take a multi-phased approach to development beginning with architecture development, prototype creation and testing, and demonstration of a “proof of concept” as an example of the eventual larger implementation.

In sum, focus group participants validated case study findings in terms of issues, challenges and potential solutions for constructing a patient focused end-to-end trauma information system.

5. The Need for an Integrated Crash Trauma Information Network (ICTIN)

Taking the literature review and Minnesota case study work together, findings indicated the need for a more integrated, clinician focused enterprise model for information system design and data sharing. Figures 5 and 6 illustrate an overview of the Integrated Crash Trauma Information Network (ICTIN) as conceptualized by researchers; taking into account key features that would be included in the system design. This concept is discussed below.

1. At the top level of Figure 5, there are a number of end-to-end operational process considerations to provide emergency medical care as seen through the eyes and experience of a patient. The top level of this diagram represents a linear work flow of a patient from emergency notification (e.g., ACN, 911 phone call), through dispatch, emergency medical care provision, and arrival and definitive care provision at an emergency department and/or trauma center. Based on findings, emergency responder processes may be viewed as dynamic or sequential. But the sequential representation is meant to take into account the patient experience, an important system design characteristic as described by Schooley and Horan [18].

2. As shown in the second level (from the top) of Figure 5, a multi-organizational view of the system architecture is an essential consideration for the ICTIN concept. As described throughout this paper, and illustrated in Figure 6, many organizations are involved in emergency response activities, from emergency notification through care provision. Many other practitioners and organizations are involved in
crash analysis, public health research, patient outcome research, and other analyses. Therefore, the architecture needs to accommodate the information and data needs of a wide variety of organizations, including authorized access to information, while maintaining the privacy and security of patient information. Fortunately, the technology exists to enable these software quality attributes. How to implement such attributes in a complex large-scale environment is a challenge yet to be resolved.

3. Dynamic information sharing considerations are represented on the third and fourth levels of Figure 5. From this analysis, and prior research, a number of information types, or taxonomies, are captured, analyzed, and distributed across EMS organizational actors and hardware and software systems. The view represented here is one that would allow for information to be fully utilized by authorized emergency responders (and information systems) at “downstream” points of an emergency response episode. For example, rather than waiting for a paramedic to click the “submit report” button of an electronic patient care record, patient information would be dynamically (and incrementally) sent to physicians at a receiving ED or trauma center. To enable such open systems, web services and related information architecture standards would need to be implemented across organizations and information systems so that both “push” and “pull” functionality could exist for any and all authorized users.

4. End-to-end performance reporting capabilities across organizations and information systems are also enabled through such an architecture. The ability to pull any number of data elements not only benefits real-time clinical decision making, but would also allow for the creation of customized reports for real-time monitoring (e.g., dashboards) or retrospective research and analysis. The idea here is that performance analysis becomes a system design consideration at the outset, as opposed to taking the traditional approach of constructing performance reports after the system has been built. As shown in Figure 6, reporting and analytics would be a key component of the ICTIN.

5. Additional enterprise architecture characteristics are illustrated in Figure 6. Though alluded to in the above discussion, these include:

a. Security/Privacy: A standard suite of network, software, and data security measures would be implemented to ensure safe transport of patient information in accordance with State and National privacy guidelines and laws.
b. Patient tracking system: In order to accurately identify data from one system to another, there must be a common data identifier that could associate data with a patient, including vehicle, incident, medical information, care provision, receiving hospital, medications administered, dispatched emergency resources, time of phone call, etc. The data would all be linked back to the patient for real-time and retrospective analysis. A patient tracking system would facilitate this core function of the ICTIN.

c. Directory and Access Services: This would be one or several secure databases that include a listing of all authorized organizations and individuals allowed to access ICTIN information. Individuals would register, be approved by the managing organization, and then allowed access to certain information based on the information access policies prescribed by the managing body. The directory is controlled by a managing entity to be determined by the network stakeholders.

5.1. Directions for Subsequent Phases

While there exists a need for an integrated crash trauma information network (CTIN), there also exists a paucity of guidance, literature, and directions on how to achieve such a complex system implementation. As confirmed by the local and state focus group discussions in Minnesota, further exploration into the potential and feasibility of developing an integrated crash trauma information network would provide an innovative advancement from both a research and practice perspective. More specific recommendations for taking a phased and incremental research approach to move the concept forward are discussed below.

In our phased approach, several methods are being employed. A first task would be to validate the Minnesota case studies by conducting a comparative case study review in another state. Findings from a cross-case comparison would be used to outline the parameters for an initial prototype of the integrated crash information system. The prototype would be a simplified “sample” system to provide a “proof of concept” and illustrate how crash information could be shared from the moment of impact, through emergency dispatch and response, and then into the emergency room and health treatment services. A key component of this prototype will be the integration of data around the patient. Our straw man system (“CrashHelp”) will be defined through an iterative series of interviews and focus groups with significant stakeholders in the process, including departments of transportation, public safety, 911, emergency services, and healthcare. Small data sets from crash, EMS, health information systems would be collected and used to develop and populate the prototype to demonstrate its utility for safety decision support and planning purposes. Feedback analysis from policy-makers, planners, public health, EMS, safety engineers, emergency planners and citizens will focus on operational, organizational, and policy deployment challenges surrounding an enhanced EMS system, including possible benefits from its utilization.

Figure 6. Organizations and Integrated Crash Trauma Information Network Services

6. Expected Benefits & Conclusion

The Trauma network would organize the information around the patient, providing a user/consumer centric approach to information design and use. In doing so, the trauma network would extend current EMS systems to include a greater range of information, including information that has been requested by emergency room physicians but often not available. This information is expected to improve not only the timeliness, but also the quality of the emergency response and improve patient care. An end-to-end trauma network would allow for more holistic data analysis that can be both visualized and conducted in real-time. Just as private sector operations have achieved benefits through integrated customer systems (e.g., CRM) similar principles can apply to the victim of a trauma. In this case, the issue is not just better customer service but fundamental issues of life and death.

8. References


