Inland Counties Emergency Medical Agency

Serving San Bernardino, Inyo, and Mono Counties

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2014 NACo Achievement Award for ICEMA Health Information Network

The Inland Counties Emergency Medical Agency (ICEMA) developed a new and unique way to manage health information. The ICEMA Health Information Network (HIN) was designed to integrate emergency medical services patient care reports into a network designed to improve patient care. The ICEMA HIN officially started on November 11, 2011, with the approval of contracts by the ICEMA Governing Board (San Bernardino County Board of Supervisors). The primary purpose of the project was to improve healthcare services to residents and visitors in San Bernardino County by providing a centralized system for the collection of patient health information, systemic review of the care provided and continuous quality improvement. The ICEMA HIN is positioned to evolve as enhancements are made to national EMS data standards and full integration with health information exchange.

Abstract of the Program

Emergency Medical Services (EMS) play an important role in the healthcare of the community by providing an emergency safety net that extends to the acutely ill and injured who are otherwise unable to reach medical care on their own. Of the almost 1,000,000 emergency patient visits that occur each year at emergency departments throughout San Bernardino County, approximately 25 percent are assisted through the services provided by EMS. The EMS healthcare services provided to residents and visitors of San Bernardino County are often the difference between life and death or the initial step in recovery from illness or injury.

Operating under the authority of State regulations and the California Emergency Medical Services Authority (EMSA), a key responsibility of ICEMA is to provide overall system management, evaluation, and improvement of the EMS system throughout San Bernardino County. A major component of these responsibilities is the development of processes, guidelines, and tools for the collection of data, oversight of EMS care provided, and sharing of health information between otherwise disparate providers such as hospitals, pharmacies, and primary care physicians.

To satisfy these requirements, the ICEMA HIN was created to collect and share information between healthcare agencies and organizations. The purpose of the network was to provide a centralized access and collection point for the accumulation of prehospital and specialty care documentation, ensure data consistency and interoperability between EMS providers, and analyze and improve prehospital care provided in San Bernardino County.

The Problem/Need for the Program

EMS is a coordinated system that provides emergency medical care outside hospitals, clinics, and long-term care facilities. The primary focus of EMS is to respond to the scene of serious illness or injury, provide initial medical care and ambulance transportation to facilities where other trained medical

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professionals are able to provide definitive care. EMS is available every day and for all kinds of emergencies that require emergency medical treatment and transport to a hospital. EMS providers consist of highly trained medical personnel, such as paramedics, emergency medical technicians, first responders, nurses, and physicians, working in an out-of-hospital or prehospital setting. ICEMA's responsibility is to coordinate their effort and monitor the care they provide.

The passage of the Emergency Medical Services System Act of 1973 by the US Congress and subsequent regulations in California created an organized system of personnel, facilities, and equipment to deliver emergency medical services. In the 40 plus years since passage, the development of an expanded scope of practice and an extensive patient care delivery system occurred. While rapid response, appropriate care, and efficient transport remained the required standards, challenges due to lack of data consistency and interoperability between EMS providers, impeded system management, and process improvement.

The framework necessary for standardized data collection included consistent elements and uniform definitions. The National Emergency Medical Services Information System (NEMSIS) was created in 2003 to provide this structure. In the years since, the exchange, integration, sharing, and retrieval of health information between different agencies and healthcare organizations became possible.

The development of the ICEMA HIN was more than a simple replacement of an antiquated process. The system in place at the time allowed for the collection of data from both electronic and paper formats and transferring data from a variety of disparate systems. It did not include standards for elements or field values that were necessary to ensure system compatibility and interoperability of data. The data was often incomplete or of such low quality that it was unusable. Electronic data was often collected through software provided by third party vendors and required extensive mapping or data transformation to be usable. Data reliability, quality, and validity were questionable. Additionally, there was no reliable mechanism to disseminate information to other EMS providers within the continuum of care and the value of the care that was provided prior to arrival at the hospital was often lost in translation or discarded all together. Managing the system by setting tangible goals for improvement was not possible given the issues with the process.

Description of the Program

In 2010, ICEMA undertook a project to purchase a suite of EMS specific data collection tools and implement a system to collect and share health information between disparate agencies and organizations such as EMS providers and hospitals. The resulting records management system standardized the collection of prehospital and specialty care documentation and allowed ICEMA to ensure data consistency and interoperability between participating EMS providers. This allowed the healthcare provided patients to be analyzed and benchmarked using nationally accepted standards. The project is called the *ICEMA Health Information Network* and consists of the following core elements:

EMS Data System: The core of the ICEMA HIN is the ICEMA EMS Data System. This is a group of integrated modules designed to facilitate the exchange of EMS data among EMS providers and hospitals. It includes modules that integrate staffing, dispatch and scene times, and a state of the art real-time electronic patient care record (ePCR). Reporting components are available for system monitoring and quality improvement.

In 2013, the ICEMA EMS Data System was made available to four additional Local Emergency Medical System Agencies (LEMSA) representing 21 of the 58 counties in California. These services were made available to these LEMSAs without the additional expense of hardware necessary for managing their own centralized system. ICEMA is currently active in developing the services that will allow these counties to extend the same data collection and enhancement services offered in San Bernardino County to their EMS providers and to collect and report their data to state and federal agencies for patient care benchmarking.

Health Information Exchange (HIE): ICEMA is currently implementing a process that facilitates the exchange of health information between stakeholders and extends it across many organizations throughout the ICEMA region. HIE combines the data from the ICEMA EMS Data System with data from other healthcare resources, such as physician's offices, clinics, pharmacies, and hospitals, into a master patient record. Data regarding patient care, collected at the scene of injury may be transferred between other EMS providers, joined with outcome data from hospitals and shared seamlessly with state and federal partners for system improvement and benchmarking. Eventually, with improvements and maturity of the data collection system, the exchange of information from the very first contact in the field to discharge at the hospital and beyond, for all patients, will enhance EMS and provide continuity of care and process improvement in collaboration with multiple disciplines that have traditionally been disconnected.

HIE provides the framework required for health information sharing and will allow hospitals and physicians to view patient reports compiled by EMS providers. It establishes the framework necessary for continuity of care and is essential in determining other factors that may influence patient care such as prior care received, medications used, progression of a disease and possible comorbidity.

Specialty Care Registry: The ICEMA Hospital Patient Registry System is currently a core element in the exchange and integration of patient care information between EMS and hospitals. A part of the regional care for trauma, stroke, and heart attack patients, the Specialty Care Registry combines EMS and hospital care information for system benchmarking and process improvement. The registries currently provide outcome information for measuring the effectiveness of EMS patient care.

Syndromic Surveillance: The ICEMA HIN provides a first line system for identification of potential disease outbreaks or biological and chemical terrorism. It provides EMS/ 9-1-1 syndromic surveillance system to monitor strategic healthcare events in near real-time and benchmarks the information against national standards for identification and early notification.

Patient Tracking and Patients at Risk: The ICEMA EMS Data System facilitates the tracking of patients transferred during widespread emergencies and disasters. A future component of the ICEMA EMS Data System will catalogue the names of patients and destinations for repatriation. The system will also identify the locations of patients at risk in skilled nursing facilities and residences for follow up by the San Bernardino County Department of Public Health during disasters. This will assure that the appropriate resources and equipment necessary for care can be deployed into areas prior to or immediately after a disaster or widespread emergency.

Data Exchange for Reporting and Billing: The ICEMA HIN provides mechanisms for the exchange of information for data reporting and billing. Depending on need, the ICEMA EMS Data System includes exports to the National Fire Incident Reporting System (NFIRS), California EMS Information System

(CEMSIS) and the National EMS Information System (NEMSIS). The system also provides standardized exports for billing and cost recovery.

Base Hospital Electronic Patient Care Report: A recent addition to the ICEMA HIN is currently being evaluated for implementation. This allows base hospitals that provide medical control to EMS providers, to receive advance notification of the care being provided by EMS providers and append the record with physician orders for additional treatment, medications, and destination.

Hospital Dashboard: A dashboard is available as an advanced notification to hospitals prior to receiving patients. The hospital is able to view and print the ePCR from the field so resources are available for the patient's care when they arrive. The hospital is also able to search and print past patient arrivals for inclusion in the patient's hospital medical record. Future enhancements in the data structure and HIE will provide a portal allowing EMS providers to obtain pertinent patient outcome information to further improve patient care.

California Data Repository: The ICEMA HIN is available for LEMSAs, representing all counties in California, to deposit patient care information into the CEMSIS. This repository provides reporting capabilities for EMSA policy makers and transmission of data to NEMSIS. ICEMA is currently administering the system. The California Data Repository, which contains over 1,250,000 patient reports, is well on the way to becoming one of the largest in the nation.

EMS Data Reporting: Report writing is accomplished using both transactional and analytical reporting. Reports may be scheduled and emailed to participants or created ad hoc. Reporting functions allow data and quality improvement managers to process information on a daily basis and view it to better understand meaning and analyze trends. ICEMA is also using web services to send billing data to private EMS providers for billing.

Responding to Economic Downturn

There is no economic impact to the County budget in establishing this program.

Use of Technology

Several data structures exist for the organized storage of data. In designing the most appropriate structure, ICEMA considered requirements necessary to achieve the goals. The desired system had to account for the environment in which patient care was provided and allow for access by a variety of portable platforms. The system needed to provide for continuity of data collection by all EMS providers and allow for the reporting of both local and regional data. Finally, the system needed to include a process to transfer care in the field and hospital notification of incoming patients. Of utmost importance was the centralized monitoring of the system for medical control and the improvement of patient care throughout San Bernardino County. The ICEMA HIN meets these requirements.

A fully integrated records management system comprised of an enterprise solution and a secure web-based electronic patient care reporting (ePCR) system, now known as the ICEMA EMS Data System was selected. This, coupled with centralized services for storage and disaster recovery, ensured the best solution for data integrity and information security. Additionally, the system allows for a single point of

governance and control over data element integrity. The ICEMA HIN is fully compliant with regulations for patient health information security.

The use of technology in the ICEMA HIN is extensive. All centralized equipment is securely located in a 24/7 data center. Traffic is routed through a network load balancer to ensure each remote user has the fastest connection possible. The application servers handle requests for data stored in a Microsoft SQL Database Cluster. There is currently two terabytes of Network Attached Storage (NAS) Tier 1 storage. The databases are backed up continuously and sent daily off-site for added security. A Disaster Recovery (DR) site provides fail-over in the event the primary site fails. Data sent to the main site is replicated to the DR site so traffic can be re-routed in the event of outages with limited downtime to users.

ICEMA developed a secure Wi-Fi network of approximately 150 mobile hotspots. These hotspots are located in private transport ambulances in San Bernardino County and provide access to the centralized server by all EMS field personnel. This allows EMS field personnel to access the ICEMA HIN and transfer patient care information to other EMS providers and hospitals while mobile.

The Cost of the Program

ICEMA issued a Request for Proposal (RFP) and the ICEMA Governing Board subsequently approved the purchase of software and hardware in November 2011. In late 2012, ICEMA purchased additional modules to the ImageTrend Patient Care Registry that included additional nationally accepted data elements and in 2013 purchased additional modules to complete the initial phases of the ICEMA HIN by expanding the system to include the base hospital components.

The three-year project cost for the ICEMA HIN is close to $1,000,000. The funding for the project came in part from fees assessed against the contract EMS providers for delays in response as a part of their performance base contracts and fees paid to support specialty programs. The initial three-year cost to establish the data system and infrastructure was approximately $750,000. Additional costs, added since implementation, included inventory management, patient tracking, fire informatics, and several components required for specialty care registries. There was no direct cost to taxpayers.

The Results/Success of the Program

ICEMA recognized the need for a centralized system that allowed collection of data from EMS field personnel. ICEMA sought the combined expertise of internal staff and the collective input from EMS providers, throughout the region, in planning and implementing the program. ICEMA also worked with other County departments to design a scalable and redundant system that included real or near-real time documentation, transfer in the field, and timely hospital notification. The resulting system provided the backbone necessary to collect meaningful and reliable data that could be used to analyze patient care and drive improvement.

Core Measures: System management and patient care improvement are primary requisites in EMS. The collection of data from all EMS field personnel is required to fully analyze the overall effectiveness of patient care and the accumulation of data that encompasses wide regions is necessary to benchmark findings against other similar systems. ICEMA participated in the California EMS System Core Quality

Measures and is using these measures to benchmark key values such as response times, patient assessment, and treatment standards against other similar EMS systems.

California EMS Information System: In 2013, ICEMA entered into a contract with the EMSA to house the statewide CEMSIS data. This provides a statewide data repository that can be used to accumulate data from LEMSAs throughout California and provides a platform for identified core measures for EMS providers and patient improvement. There are currently over 1,250,000 reports in the California EMS Data Repository.

National EMS Information System: NEMSIS is a national project to collect data from local and state agencies from across the nation. The purpose is to define EMS and prehospital care on a national scale for improving patient care and EMS curriculum and to define a standard on which to measure care. In November 2013, the first data was uploaded from the ICEMA HIN for EMSA on behalf of California. This was the first time that California data has ever been included in NEMSIS reporting since the inception of NEMSIS in 2006.

Cost Savings: The savings to participants comes from consolidating the costs that would have been required of individual EMS providers, hospitals, and other county departments had a non centralized system been selected. The direct impact to EMS providers and other counties in the ICEMA region is difficult to determine since all the elements of the ICEMA HIN would be difficult to replicate individually. However, the component cost for software and infrastructure are estimated between $250,000 to $500,000 per EMS provider or county depending on the components selected. A change in the system to accommodate a reverse flow or data synchronization process could easily cost an additional $3,000,000 and several years to implement. Overall, costs to the taxpayer could have exceeded $10,000,000 to $15,000,000 to establish a process similar to that being provided by ICEMA. An undeterminable amount is saved by individuals, health providers, and insurance companies through long-term improvements in patient care. Even then, providing the components and governance necessary to ensure data consistency and interoperability would not have been possible without the direct oversight provided through ICEMA.

A hospital dashboard was provided to hospitals showing information for patients that were in route to the hospital. The dashboard allowed hospitals to review incoming calls, print reports as needed, and reference historical information. It replaced the ICEMA supported printers at hospitals that cost approximately $100,000 per year in maintenance, repair, and disposables costs.

The ICEMA EMS Data System is the core of EMS patient improvement in San Bernardino County. Since beginning in 2012, ICEMA has collected nearly 250,000 reports for EMS care provided in San Bernardino County to patients experiencing trauma, stroke, heart, and medical conditions requiring emergency medical care.

Worthiness of an Award

The ICEMA HIN is a key element in support of the role that EMS plays in providing emergency services to the residents of San Bernardino County. It helps to improve patient care to residents and visitors by providing a centralized system for the collection of data. An additional benefit is the monitoring and improvement of the care that is provided to the acutely ill and injured throughout San Bernardino County and the other 21 counties throughout California. It enhances the value of the EMS

safety net by providing a link to other EMS stakeholders and healthcare providers over a wide geographic region. Finally, the ICEMA HIN improves patient care by fostering collaboration and cooperation among EMS providers and maintains local, state, and national reporting for quality improvement and system enhancements.

When considering optimal patient care and improvement it is apparent that the need for EMS data systems that centralize the collection and standardization of data, enhance patient care by fostering interoperability between stakeholders, and allow benchmarking for process improvement with other regional and national EMS providers is required. The ICEMA HIN satisfies these requirements and are the reason why this program is worthy of a National Association of Counties 2014 Achievement Award.

ICEMA Mission Statement: To ensure an effective system of quality patient care and coordinated emergency medical response by planning, implementing and evaluating an effective emergency medical services system including fire department and public ambulances, prehospital providers and hospitals, including specialty care hospitals, such as trauma and cardiac care hospitals.