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San Diego's eRAP System Redirects Frequent Flyers



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The San Diego Resource Access Program (RAP) is an EMS-based surveillance and case management system. Conceived in 2008 by the San Diego Fire-Rescue Department (SDFD) and Rural/Metro Ambulance, this paramedic-coordinated project was designed to help individuals who repeatedly accessed 9-1-1. Since its inception, RAP has evolved from a gumshoe case management approach into a health information technology (HIT)-enabled program supported by real-time EMS and computer-aided device surveillance. The features of the electronic component of RAP (eRAP) illustrate an EMS application capable of assisting communities to achieve better care and improved health at lower cost.

Program Background

Chronic 9-1-1 use is often an indication of a health or social vulnerability. Frequent users

typically suffer from combinations of chronic medical diseases, psychiatric disorders, drug and alcohol dependence, in-home difficulties and homelessness. For this population, repetitive transport to emergency departments (EDs) is a particularly ineffective and wasteful use of 9-1-1 resources. The underlying need often remains unaddressed and EMS dependence persists. RAP identifies such patients, investigates the underlying circumstances and seeks to reduce dependence on acute care services by linking these individuals with resources more appropriate to their situations.

RAP primarily focuses on the most dynamic and unstable of frequent users in the system. Many of these vulnerable individuals have a profoundly deleterious impact on multiple branches of the public safety net. Current case management methods for this population are based on San Diego's experience addressing chronic public inebriates: effective management of these patients require partnerships with key stakeholders including law enforcement, courts, behavioral and homeless outreach teams, social workers, case managers, housing providers, etc.(1) During the first two years of using this case management method, RAP demonstrated significant improvements for 51 clients, reducing the number of ambulance transports (736 to 459), task time (263 hours), miles (1939) and charges (\$314,306).(2)

Given the tendency of many frequent users to access multiple facilities for care, the collective connectedness of EMS with hospitals and other providers affords a unique opportunity to detect abnormal patterns of activity. Additionally, EMS information systems can serve as regional health networks, and when linked with CAD data provide a rich healthcare geo-database that can be mined. This position allows EMS to detect not only frequent 9-1-1 users, but also equally vulnerable yet less noticeable individuals. The eRAP development has leveraged existing technologies to more quickly identify, rank, alert and intervene on individuals with the greatest need.

Technology Gap

Early RAP efforts attempted to identify and prioritize chronic 9-1-1 users by manual investigation of patient care records. However, it quickly became apparent that accurate analysis of the overall EMS system was impossible; painstaking chart reviews and queries consumed valuable case management time. This left little choice but to prioritize cases based on field responder complaints. Furthermore, existing case management platforms didn't meet the needs of RAP. Information technology development was necessary to create a software system tailored to RAP goals.

Fortunately, in 2010 the San Diego region was the recipient of a \$15 million Beacon Community grant from the Office of the National Coordinator.³ San Diego was the only one of the 16 Beacon communities that proposed to demonstrate the value of bidirectional information exchange between EMS and hospitals. Beacon funding enabled software developers, including Infotech Systems Management Inc., ImageTrend Inc. and FirstWatch, to explore the potential of EMS information exchange. Infotech developed the Beacon EMS Hub to serve as the gateway into the health information exchange (HIE) and independently created novel applications with RAP, illustrating the value and potential of EMS data.

What is eRAP Technology?

The eRAP technology is best described as an electronic surveillance and case management platform that

continuously monitors incoming electronic patient care report (ePCR) and computer-aided dispatch (CAD) data traffic. The user interface was designed specifically for use on an iPad, but because it's a web-based tool, it's agnostic to operating systems and can be accessed from any Internet-connected device with appropriate security. (Flip to p. 42 for more on how EMS providers are using iPads and tablets in the field.) The goal of eRAP is to display the real-time, comprehensive status of repeated 9-1-1 activity, including the affects of individual patients on operations and resources over time (e.g., the past week or past year). This tool allows the RAP coordinator to prioritize and strategically deploy resources for more effective interventions.

1. Electronic ranking to ID most active callers: A major component of eRAP surveillance involves the application of programmatic algorithms to electronically identify frequent users and sort them by impact to the EMS system. By data mining multiple repositories, eRAP recognizes a distinct person across multiple incidents, uses a patient-association technique to collect all records connected to a unique patient and converts them into an auto-populated, patient-centric case management system. The eRAP patient-association mechanism matches patients in spite of errors or missing information. Patients are then electronically ranked according to their number of 9-1-1 encounters and displayed on active dashboards.

Remarkably, during the process of developing this technology, eRAP identified three individuals among the city's 10 most affective patients who had never been referred or previously identified, including the number one EMS user in the city. We attribute the conventional method's inability to identify this patient to two principal factors: 1) the vast geographical range from which this individual called 9-1-1, and 2) the aggressive rate at which he suddenly began calling the 9-1-1 system without previous frequent use.

>> **Case 1:** RAP Client 1 is an energetic 60-year-old male with underlying schizoaffective disorder. A resident of a neighboring city, he used to use a senior citizen discount to enthusiastically tour San Diego via public transportation. When routes were inconvenient, he called 9-1-1 and strategically requested a hospital close to his desired destination. On arrival at a hospital, he typically eloped and reactivated 9-1-1 several blocks away.

By the time this patient's behavior was identified and referred to RAP, the client had accumulated 96 ambulance transports in three months. The geographical spread of his calling location was so vast (see map above), and his interactions with fire engine and paramedic crews so diverse that he went unrecognized in the system. Based on eRAP's electronic patient ranking data, RAP was able to intervene and assist in developing a comprehensive case plan.

Unfortunately patients with this level of affect frequently have inadequately treated psychiatric disease and require a multitude of resources to be stabilized. When Client 1 began exhibiting violent behavior toward first responders and reached more than 200 calls in a brief period, he was arrested and charged with 9-1-1 abuse, false reporting and assaults on ambulance personnel. Once in custody, RAP advocated for the patient's redirection into the behavioral health court system, which typically results in supervised medication management and psychiatric care. Unfortunately, the court therapeutic team determined the patient did not have the ability to comply with treatment requirements, and the patient received 90 days of custody plus three years of probation. After serving 90 days, the patient was released from jail. He promptly activated the 9-1-1 system from across the street in less than five minutes of his release. RAP is still currently working to find appropriate resources for Client 1.

2. Electronic discovery of the vulnerable: Perhaps the most groundbreaking function of eRAP is its ability to electronically identify vulnerable people in San Diego who have come in contact with EMS. All incoming ePCR and CAD incidents are put through vulnerability filters, where eRAP searches the report for indications of vulnerabilities, such as substance abuse, psychiatric and behavioral emergencies, in-home falls and hoarding behavior. Individuals associated with these incident types are identified, aggregated and ranked using custom recognition algorithms. Vulnerability flags are automatically added to the patient's profile page; other data aggregated within the profile page include patterns in 9-1-1 activity, such as calling location, time of day and hospital destinations, to help subsequent RAP case management strategies.

The eRAP "in-home vulnerability" algorithm identifies addresses where residents appear to be experiencing specific difficulties. The search algorithm is triggered when a series of calls suggests mobility issues or when responding crews repeatedly determine calls are "not of a medical nature." The location is electronically flagged; resources, referrals and interventions follow. The following example illustrates the usefulness of this algorithm.

>> Case 2: Crews began responding to RAP Client 2, a 76-year-old woman suffering from dementia who lived in a recreational vehicle (RV) with her husband. The RV had been permanently parked at a local campsite facility, and the patient had been recently discharged with the diagnosis of bilateral cellulitis, which affected her already deteriorating mobility. Without the provision of additional resources, the patient adopted the 9-1-1 system (calling up to three times per day) with requests to change diapers, reposition herself in bed, change her urine-soaked clothing and linens, sort her laundry, reach her equipment, and review medical and prescription paperwork.

In spite of retirement income with full benefits, the couple refused relocation assistance. In a coordinated on-scene response involving the Adult Protective Services (APS) department, RAP and law enforcement, the couple was removed against their will and placed in an appropriate facility. And although APS officials didn't have grounds to remove the couple against their will, law enforcement readily determined this need based on scene assessment and the eRAP data displayed on-scene by the RAP coordinator.

Prior to eRAP, it was difficult to track calls that were non-medical in nature. The in-home vulnerability algorithm combines dispatch records (without personal health identifiers) with ePCR records to track the entire 9-1-1 effect of any patient. In locations with multiple residents, eRAP can recognize and indicate them separately.

3. Patient associative CAD View: The eRAP program monitors and displays all incoming 9-1-1 calls on its iPad interface via a patient associative live "CAD View" screen. When engine or ambulance crews enter patient information into a handheld ePCR device and click "save," CAD View creates a link to that current patient data. This allows RAP to identify patients within minutes of a 9-1-1 call, even while crews are still on scene. Additionally, an icon indicates if the patient fulfills vulnerability criteria or is a "top 50" client and tapping it will take the provider to the patient-specific management page.

>> Case 3: RAP Client 3 is a 56-year-old homeless male who often called 9-1-1 up to three times per day from the same payphone. His chief complaints were anxiety and shortness of breath after a bad dream; his symptoms typically resolved after being awake for several minutes. All 9-1-1 calls would occur during the daytime, with estimated costs to EMS and first responders of nearly \$25,000 per month. RAP provided case management

services with its sister program, the San Diego Police Department (SDPD) Homeless Outreach Team (HOT).

Despite efforts to direct the patient into a more stable situation, the patient continued this behavior. One day, after being released from jail after 9-1-1 abuse charges had been dropped by attorneys, the patient walked to his usual payphone and called 9-1-1. HOT and RAP confirmed the incoming call via CAD View, arrived at the scene and cancelled responding units. Since the patient didn't have what they considered to be a legitimate complaint, the teams escorted the patient to a clinic and introduced him to the clinic staff. During the clinic's offer of assistance the patient discretely slipped outside and called 9-1-1 from the payphone. RAP again identified the incoming 9-1-1 call via CAD View and intervened again.

The HOT sergeant immediately requested the city shut down this particular payphone. Remarkably, one day later Client 3 attempted to call 9-1-1 again, but encountered the dead phone. He walked to the clinic to inform staff and inquired if he could use their phone. Instead, the clinic staff instructed the patient to sit until he felt better. The patient took their advice and began watching television. Client 2 has stopped calling 9-1-1, preferring to watch television in the clinic. HOT visits him regularly while arranging for benefits and placement in a care facility. He has had only one EMS encounter in the past four months—a projected EMS and fire savings of \$75,000–100,000.

4. Alerting: The eRAP program allows responders and assigned case managers to subscribe to time-sensitive 9-1-1 information alerts relevant to current case management workflow. Alerts can be delivered as e-mails, text messages and pages.

>> **Case 4:** RAP Client 4 is a 59-year-old chronically inebriated male who had enrolled in the SDPD San Diego Serial Inebriate Program. In one year, the patient had generated more than 70 alcohol-related ambulance transports and four admissions to the Level 1 trauma center. Three months after achieving sobriety, the patient relapsed and was encountered again by EMS. The eRAP alerting system sent a text message immediately to a SIP officer, who responded to the emergency department with a treatment counselor. Within one hour, the patient had been placed back into his treatment program with an admonishment that further behavior would result in re-incarceration.

Between the Lines

San Diego's most dynamic and demanding EMS patients have a profound and complicated effect on the community. Its most chronic 9-1-1 users have frequent encounters with law enforcement, psychiatric services, jail services, homeless services and the court system. In these cases, habitual EMS use is one effect of a severely troubled and afflicted individual. Although EMS can usually identify the vulnerable, EMS doesn't necessarily have the expertise to provide total case management. These patients need referral to coordinated multi-pronged services because isolated case management focused exclusively on health may offer no benefit.

Once RAP navigates an individual out of the EMS system, EMS use can be dramatically reduced. However, elimination of 9-1-1 calls doesn't necessarily indicate overall success. As a case in point, while Client 4 dramatically reduced his 9-1-1 calls, SIP counselors became taxed as he began exhibiting increasing and extreme attention-seeking behavior. Thus, RAP simply shifted a burden to another provider, as is often the case. EMS is likely

to reencounter patients like this during periods of recidivism. Subsequent 9-1-1 encounters require immediate intervention and navigation back into their treatment programs to discourage a return to his or her former 9-1-1 dependence, and reinforce treatment thus far. For this reason, RAP actively supports efforts to keep clients in their respective treatment programs, partly by extension of eRAP technology to case management partners.

The Future of eRAP

San Diego EMS is currently engaged in the expansion of eRAP technology to case management partners. RAP hopes that this extension will help provide the necessary connections for coordinated and responsible community care. Monthly meetings with stakeholders, including the city attorney, are allowing RAP to design appropriate electronic sharing practices. A goal of the RAP is to create a “spoke-and-hub” bidirectional data sharing with all stakeholders and ultimately link to the Beacon HIE. This will require the development of suitable HIPAA-compliant consent protocols similar to those employed by SIP, as well as adaptable programming methods.

With such a system in place, EMS sees the role of eRAP extending beyond its most chronic users, soon helping to assist others in the community with disproportionate health burdens. For example, eRAP could facilitate case management of select high-needs beneficiaries (e.g., dual eligibles) who are engaged by managed care programs. In addition, eRAP technology can provide a means to significantly assist in injury and disease prevention.

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