2 August 2012

EMS Assessment Report

Yolo County
Woodland, CA

FITCH & ASSOCIATES, LLC
2901 Williamsburg Terrace #G ▪ Platte City ▪ Missouri ▪ 64079
816.431.2600 ▪ www.fitchassoc.com

CONSULTANT REPORT

Yolo County California
EMS Assessment Report

Table of Contents

Executive Summary

Yolo County with support from its cities, Tribe and the university engaged Fitch & Associates (Fitch) to review the county's Emergency Medical Services (EMS) system. The activities of the project include:

- Assess the current system to identify the services being delivered and at what performance levels.
- Incorporate extensive stakeholder input into defining expectations.
- Communicate and educate decision makers on the existing system and the desired future state.

The overarching theme of our analysis is based upon:

1. Fiscal responsibility to ensure that the patients and constituents of Yolo County receive good value for the services provided by EMS.
2. That the actions of the agencies and individuals involved in Yolo County EMS are directed towards clinical efficacy where demonstrable improved patient outcomes is the ultimate goal.
3. The EMS system needs to be prepared to respond to healthcare changes, some of which were recently validated by the Supreme Court's decision to let the healthcare reform statues remain in effect. Some of the characteristics and changes in healthcare have to do with value-based purchasing which is going to require healthcare providers to be able to demonstrate quality by identifying and measuring statistical indicators and demonstrating positive outcomes of their efforts. The healthcare changes both reflected in reform as well as the natural changes in healthcare delivery systems will be more closely focusing on the matching of patients needs with the appropriate resources and reducing unnecessary high costs patient interactions.
4. All health systems are reenergizing efforts towards prevention, particularly for chronic diseases and injuries.

All of these external influencers can be leveraged to improve EMS within Yolo County. In effect, the definition of EMS is broadened to include responsibilities and functions in the area of public education, prevention efforts, and development of systems of care that include all of relevant agencies performing at high levels in order to achieve positive patient outcomes. The following paragraphs identify the major recommendations that are seen as essential to allow the Yolo County EMS system to prepare for the future.

1. *Implement emergency medical dispatch (EMD) with priority determination.*
   The effective implementation of comprehensive emergency medical dispatching (EMD) processes is essential in order to achieve a number of benefits within Yolo County EMS. These include:

   - Cost savings to the ambulance service by allowing longer response times to non-urgent events and allowing more efficient deployment and use of resources.
   - Cost savings to first responder agencies by not having these agencies respond to all 9-1-1 calls but to a reduced number of calls where the patients are likely to benefit from first response.
   - Being able to identify calls based upon acuity or criticality allows the ambulance service and first responders to achieve shorter response times to the critical calls. These better response times can have a meaningful impact on a small subset of 9-1-1 call events if the first responders can arrive within a very short period of time followed by a reasonable response of the ambulance service.
   - Implementing comprehensive EMD and the quality improvement processes associated with the program is prerequisite to implementing triage of 9-1-1 callers to alternative support systems such as advice lines or alternative providers.
   - Implementation of EMD is also a prerequisite to implementing alternative destination policies for the EMS system in the future.

2. *Develop and Implement Comprehensive Quality Management Programs System Wide.*
   A healthcare delivery system such as EMS must be supported by continued scrutiny on clinical performance and outcomes. These types of activities can only be effectively monitored and managed when there are system-wide quality management programs in place. The implementation of a county-wide quality management program includes:

   - The collection of agreed upon data elements to monitor statistical indicators.
   - Is inclusive of first responders, ambulance services, receiving facilities and treating facilities.
   - Is the only way to demonstrate effectiveness of EMS programs
   - Is a prerequisite for achieving enhanced reimbursement through value based purchasing arrangements.
   - Requires constant innovation to improve quality of care and results.

3. *Amend ambulance contractor's agreement.*
   A significant missing piece in the Yolo County EMS system is modern provisions to ensure accountability and transparency. The only effective means to establish the accountability and to be able to monitor the effectiveness of ambulance response within the system is to incorporate these requirements in the definitive agreement between the ambulance contractor and the LEMSA. The revised EMS agreement should include:

   - Clear definitions of responsibilities of the contractor to expand into more direct community education, training, and prevention program development and delivery.
   - Consequences for non-compliance with performance standards identified in the amended agreement.
   - Provisions for regulating the ambulance rates charged by the ambulance service.
   - Specificity regarding what data and activities must be reported on a regular basis and how these reports should be provided.
   - Increased requirements for the contractor to improve collaboration and communication with all the stakeholder entities within the County.

4. *Amend ambulance ordinance, designate County liaison, and restructure committees.*
   The operation and governance of the Yolo County EMS system can be improved by amending the county ambulance ordinance to address critical care transports, committee oversight, and county liaison/oversight responsibilities with the LEMSA.

   Additionally, the LEMSA and the County should reevaluate fee structures and what services are reimbursed by the ambulance contractor to allow for the increased efforts required by the recommendations of this report. The ambulance contractor should be expected to reimburse for medical direction, contract administration, and quality improvement program requirements. Additionally, the ambulance permits and inspection fees should be adequate to compensate the LEMSA for its ordinance administration activities.

   The recommendations of the report include the elimination of the current EMCC as required by county ordinance and its replacement with an emergency medical advisory group made up of system stakeholders. This allows more flexibility for addressing issues and implementing changes. It will also improve transparency and communications among those involved in the EMS system.

Implementing the changes recommended in this report will prepare the Yolo County EMS System for the future and provide agility to respond to the healthcare delivery changes occurring as this report is being written.

Section 1: Today's EMS Systems

Yolo County with support from its cities, Tribe and the university engaged Fitch & Associates (Fitch) to review the county's Emergency Medical Services (EMS) system. The activities of the project include:

- Assess the current system to identify the services being delivered and at what performance levels.
- Incorporate extensive stakeholder input into defining expectations.
- Communicate and educate decision makers on the existing system and the desired future state.

The catalyst for the review was not based upon serious EMS system problems or crisis situations. The purpose expressed in the Request for Proposal for this project was to recognize how the system is performing today and to make recommendations to better facilitate the system's improvement over time. The recommendations included in this report are designed to improve flexibility, communication, operational efficiency, and long-term financial stability as the Yolo County EMS system evolves.

The structured process proposed for this project was to expressly question the status quo: including services in the manner they are delivered, performance requirements, roles, goals, and visions for the future. This allowed all options to be available for consideration as well as preparing the county's EMS system for fundamental changes in funding, structure, and service deliveries.

This evaluation process has two overriding objectives: 1) To recommend actions and decisions based benefits to patients and the community, and 2) To recommend roles and activities based on value – cost versus benefit. Yolo County's current EMS system design has evolved over time with most of the agreements, processes, and performance objectives established prior to 2006. In fact, many of system design elements have been in place for decades.

A number of objectives were established for the Yolo County Emergency Medical Services review. These include:

- Identify improvements to the EMS system that will insure constituents will receive high quality, appropriate, and up-to-date emergency medical services.
- Delineate EMS system changes that may be needed to deliver equitable coverage and care throughout the County.

- Establish actions steps that modernize the governance, structure, oversight, and fundamental agreements to provide confidence in the EMS system.
- Create discrete measures to monitor and report on the EMS system's performance.
- Prepare a foundation for the collaboration of the many stakeholders and service providers operating in the EMS system to optimize integration of the providers to enhance patient experience and outcomes.
- Construct recommendations to balance the quality of services with costs to insure sustainability of the EMS system.

In order to achieve these objectives, a comprehensive work plan was developed. Specific activities included the collection of significant amounts of data and information from the system stakeholder agencies within the County including the Public Safety Answering Points (PSAP), ambulance contractor, fire agencies, the local EMS agency, Sierra-Sacramento Valley Emergency Medical Services Agency (S-SV), and the County.

Additional activities included multiple site visits and telephone conferences by the consulting team to interview stakeholder representatives. Those interviewed included:

- County elected officials
- Health Department representatives
- Emergency Operations representatives
- The ambulance contractor leadership
- PSAP representatives
- Dispatch center managers
- UC Davis representatives
- Fire Chiefs
- City Managers
- Hospital representatives
- And a number of other individuals in the County

A separate activity accomplished during the process was to acquire a download of actual call information from the county's ambulance service contractor's (AMR) computer aided dispatch (CAD) system to indentify demand levels of emergency medical responses within the County, to quantify current response time performance levels, and to analyze that data in order to recommend appropriate response time performance levels and zones based upon demand and location of emergency medical events.

The focus areas for the scope of work for the project included eleven specific components. These are:

1. Governance and oversight
2. Evaluation of EMS delivery system structure
3. Evaluation of data system development
4. Assessment of training and education needs
5. Evaluation of financial issues
6. Assessment of ambulance zone and response time requirements and performance
7. Assessment of EMS system components
8. Evaluation of quality management activities
9. Assessment of cooperation among system participants
10. Review disaster preparedness components
11. Consider external environmental factors in development of the recommendations

The format of this report will be to first describe the external influences on EMS system design. These influences include: The current economic environment, healthcare reform, and evidence based EMS medicine. We will discuss and review these components in order to provide recommendations for the Yolo County EMS system to be able to adapt and respond to changes over time. Many of the recommendations found in this report are not anticipated to be implemented immediately, but are sequential in nature preparing the system to be able to adapt as the healthcare changes are implemented, EMS authority rules and regulations are adopted to allow further evolution of EMS, and to build a system that will become more effective and efficient in the areas that positively impact patient outcomes.

After discussion of the external influencers, we will provide an overall assessment of the existing EMS system and compare it to established benchmarks. It is important to keep in mind that these benchmarks found in many high-performing EMS systems are a reflection of the system design and the comprehensiveness of its fundamental policies, procedures, rules, regulations, performance requirements and expectations that are based in the system's fundamental agreements.

Following the summary of Yolo County's comparison with national benchmarks, we delve into individual areas outlined in our proposal. For each area, we will describe the existing activities in the Yolo County EMS system, we will identify where the system should strive to go, and make specific recommendations with supporting rationale.

The Evolution of EMS

For nearly thirty years, the common thinking was that advanced life support (ALS) was of primary importance and that patients benefit from shortened response times. This has driven the development of high-cost EMS systems to achieve shortened response times and expansion of paramedics functioning within these systems. These efforts were, unfortunately, not based on evidence, but rather assumption by providers. New studies and industry guidance have been published which expand the role of EMS and which focus EMS system development based on evidence of benefits to patients.

Two foundational documents have been released, "Emergency Medical Services – Agenda for the Future"[1] and "Rural and Frontier Emergency Medical Services Agenda for the Future: A Service Chief's Guide to Create Community Support of Excellence in EMS."[2] The first was released by the National Highway Traffic Safety Administration (NHTSA) and the second by the Health Resources and Services Administration (HRSA). Both documents expand the traditional concept of EMS and are based on 14 EMS attributes:

1. Integration of health services
2. EMS research
3. Legislation and regulations
4. System finance
5. Human resources
6. Medical direction
7. Education system
8. Public education
9. Prevention
10. Public access
11. Communication systems
12. Clinical care
13. Information systems
14. Evaluation

These attributes of an EMS system extend beyond the common perception of EMS consisting of emergency ambulance and first responder services. Both documents clearly express that the future of EMS includes its integration with other healthcare providers and depends on

[1] NHTSA, Emergency Medical Services – Agenda for the Future, 2010.

[2] HRSA, rural and Frontier Emergency Medical Services Agenda for the Future: a Service Chief's Guide to Create Community support of Excellence in EMS, 2004.

expanded community education and involvement. The former of Administrator of NHTSA states: "As we look to the future it is clear that EMS must be integrated with other services and systems that are intended to maintain and improve community health and insure its safety."[3]

This challenge is consistent with research findings and is being embraced within a few EMS systems in the country. The EMS Agenda for the future clearly expresses the need for an expanded definition of EMS and focuses on more than responses to emergency medical events. The vision statement for EMS incorporates prevention, education, care, follow-up, and community health monitoring.

> *"Emergency medical services (EMS) of the future will be community based health management that is fully integrated with the overall healthcare system. It will have the ability to identify and modify illness and injury risk, provide acute illness and injury care and follow-up, and contribute to treatment of chronic conditions and community health monitoring. This new entity will be developed from redistribution of existing healthcare resources and will integrate with other healthcare providers and public health and public safety agencies. It will improve community health and result in more appropriate use of acute healthcare resources. EMS will remain the public's emergency medical safety net."*

This vision statement suggests that these challenges would occur from "the redistribution of existing healthcare resources and will be integrated with other healthcare providers and public health and public safety agencies."

Clearly, EMS systems encompass broad-based community education involvement, education centers for EMS providers, public health, community healthcare systems, medical direction, system coordination and oversight, public safety, first responders, and ambulance services. An array of system participants must work collaboratively to develop systems and centers of care based on evidence.

Summary

EMS systems are rapidly evolving into complex systems of care that are much more far-reaching than the traditional perceptions. The broad-based community care systems are designed to not only respond and treat acute events, but are established to improve health in the community and to provide a consistent continuum of care for those in need. The characteristics of modern EMS include:

[3] EMS Agenda for the Future, pg i.

- Pervasive community education to modify illness and injury risk and to rapidly identify and respond to situations in need of intervention.
- Partnering with community healthcare providers and public safety agencies to establish and define systems and centers of care for specific health events.
- Coordination of the continuum of care based on specific needs of the community and individuals.
- Monitoring and responding to community health issues.
- Customizing strategies and plans to meet individual and group healthcare needs.
- Match patient health and social needs to the most appropriate source of care and support.

These are not unrealistic or unachievable, rather they are necessary steps required to integrate EMS into the changing healthcare environment.

Section 2: Evidence Based EMS Systems

The Medicine

Recent research has shifted the emphasis of EMS systems from focusing on discreet performance activities to adopting a systems approach to specific patient conditions. It is recognized that the overall goal of improved patient outcome is dependent upon the coordinated efforts of multiple caregivers, not just the first responders and the ambulance personnel. Significant advancements have been made in the treatment of acute myocardial infarctions through the ST-Segment Elevation Myocardial Infarction (STEMI) programs that have embraced early recognition by pre-hospital personnel and a rapid coordinated treatment at designated hospitals. Similar systems approaches have been credited with improved outcome for trauma patients and are envisioned for patients suffering from strokes. A number of other advancements have been made that positively impact the patient and include pain mitigation, continuous positive airway pressure (CPAP), decreasing intrathoracic pressure with CPR,[4] hypothermia treatment, and other promising interventions and technologies.

The efficacy of short response times and early advanced life support (ALS) has been deemphasized as a result of research which questions the value of these measures for positive patient outcomes. Rather, EMS systems have increased efforts to expand system-wide public access defibrillation and bystander CPR which have demonstrated positive patient outcome results.

It has been recognized that EMS systems have the infrastructure, competence, and capability to fulfill a more important role than solely the provision of emergency medical response, treatment and transport. Prevention efforts, early identification of symptoms, and community education programs have effectively reduced the incidence of some of the acute emergency medical events. A wide variety of programs have demonstrated positive results including programs for asthma patients, fall prevention, car seat training, encouraging use of helmets, and early recognition of signs of heart attack or stroke.

The direction of EMS is clearly pointed towards a comprehensive systems approach to deal with the ill and injured. To be effective, the continuum of service providers must be involved, coordinated, and effective in the delivery of the patient focused care and treatment required to save lives and improve patient quality of life.

[4] Bobrowa BJ, Ewy GA, Gordon A. Ewy. Ventilation during resuscitation efforts for out-of-hospital primary cardiac arrest. Current Opinion in Critical Care 2009; 15:228–233.

The Challenges

EMS systems that focus on utilizing evidenced based protocols, policies and procedures are having demonstrable positive effects on patient outcomes. But, these systems are severely challenged by old limiting designs, too few resources, turf battles, politics, and rapid changes in the healthcare delivery systems in America. As a former administrator of NHTSA states, "It is important, however, not to be held hostage to the past, but to look freely to the future."

EMS and out of hospital care activities are funded primarily by user fees and public tax support. Each of these funding sources is being challenged. Primary payors of user fees are government healthcare programs (Medicare and MediCal) and insurance companies. Government payors only pay for the patient transportation component and then only to select destinations (i.e., hospitals). California ambulance providers have seen continuous decreases in Medicare reimbursement since the implementation of the Medicare Ambulance Fee Schedule in 2002 and now only realize limited increases that fail to cover the cost increases or even keep up with inflation.

The financial crisis in California has decreased MediCal reimbursement and is expected to further cut funding for ambulance services.

On average, neither Medicare nor MediCal is reimbursing the cost of providing ambulance services provided to beneficiaries and recipients.

Health insurance companies are increasing pressure to reduce their payments for ambulance services, particularly in California where the average ambulance rates are higher than most other areas of the country exceeding $1,500 per transport.

Fundamental changes in healthcare delivery are occurring. The passage of healthcare reform has introduced changes in the means and methods that healthcare will be provided and compensated. The push towards accountable care organizations (ACO), the creation of insurance exchanges, and the continued efforts of government healthcare payors to expand value-based purchasing will dramatically change healthcare services and the way EMS are delivered and paid for.

These issues and others will be considered in light of the severe financial pressures on Federal, State, and local jurisdictions. Communities have decreased public safety funding resulting to cuts to fire and police personnel. Lack of funding limits progress and many jurisdictions have had to cut the services provided to their constituents.

Section 3: How does Yolo County EMS system compare?

The Yolo County EMS system has never been specifically designed but has evolved over decades responding to changes in rules, regulations and expectations. For that reason, many of the benchmarks used to compare EMS systems are not concretely defined or required within the Yolo County EMS, but in many instances have been established by the individual provider agencies including the ambulance contractor, county health department, fire first responding agencies and the local EMS agency.

Table 1 lists 74 separate criteria that Fitch has used to compare performance among EMS systems throughout North America. Some of these criteria deserve additional discussion as they pertain to Yolo County. Guidance to Yolo County for addressing the criteria is included in column 3.

Table 1. System Comparison Metrics

Criteria	Yolo County	Guidance
Accreditation		
1. NAED Accredited Center of Excellence (ACE)	AMR Dispatch Center in Sacramento is ACE accredited, other centers	Important for County Center to achieve within 2-3 years
2. CAAS Accredited	No	Should be required in amended contract with provider to occur within 2 years
3. CAMTS Accredited	No	Not applicable
4. Other Accreditations	No	Not applicable
Public Education		
5. Provides training related to safety, injury prevention, or public health/medical intervention	Limited-not required	High importance and should be initiated immediately with execution of amended provider contract
Communications		
6. Public Access via 911	Yes	
7. Protocol-Based Dispatch	Inconsistent	Essential and should be implemented within 6 months

Criteria	Yolo County	Guidance
Communications Continued		
8. EMD Certification	Inconsistent (YECA & AMR have EMDs)	Essential for all 911 answering points to provide or outsource
9. Bio-surveillance monitoring/reporting	No	Highly desirable-should be considered within 2-3 years
Response Time Reliability		
10. Measure response times	Yes	Compliant now
11. Response time clock begins at T2 or T3 & ends at T7	Clock starts when AMR receives call from PSAP	PSAP intervals should be measured and combined with ambulance service times to monitor system response time performance
12. Response time measured in Fractile/Percentile	Yes	Compliant now
13. Emergency Fractile Compliance Achieved	Yes	Compliant now
14. Response Time Compliance Regularly Reported	Yes, but not widely communicated	Improve format and distribute on a wider basis (Immediately)
15. Response Time Compliance Regularly Reported - Externally	No	See # 14
16. Response Time Compliance Regularly Reported – Publically Available	No	See # 14
17. Ambulances Deployed Fully or as Hybrid to match Demand	Yes	Compliant now
18. CAD based demand prediction systems used.	Yes, by AMR	Compliant now
19. Regular process to review late calls for special causes	Tracked by S-SV	Compliant now, but need to report results on wider basis
Medical First Response		
20. BLS level (or higher) with AED	Yes	Compliant now
21. Dispatched to Life Threatening Emergencies & Select Special Cause Calls	Dispatched to all 911 calls for medical assistance	Essential to implement call prioritization to allow first responders to be dispatched to only calls needing level of assistance. Implement within 6 months

Criteria	Yolo County	Guidance
Medical First Response Continued		
22. Track and Report Medical First Responder Response Times	Internally	
Clinical Care		
23. Electronic Patient Care Record	Yes	Compliant now
24. Measure ROSC (return of spontaneous circulation)	Limited	Essential - Comprehensive measurement and reporting after data collection system is finalized –Within 6 months
25. Measure Defibrillator to Patient Side	Limited	See Guidance for # 24
26. Measure 911 to PCI in STEMI	Partial, arrive at hospital to PCI is not collected and this important measure is missed in many systems	See Guidance for # 24
27. Measure PE/CHF receiving NTG	Not on consistent basis	See Guidance for # 24
28. Measure PE/CHF provided NIPPV	Not on consistent basis	See Guidance for # 24
29. Measure percentage of ACS defined traumas transported to trauma center	Yes	Compliant now
30. Measure ACS trauma cycle time from 911 to trauma center arrival	Yes	Compliant now
31. Measure ACS trauma, 10 minute or less scene times	Yes	Compliant now
32. Inspect defined sample of medical records for protocol compliance	Provider required to have QI approved by LEMSA	Essential-system-wide QI program should be implemented within 1 ½ to 2 years
33. Participate in Research	Yes	Compliant now
34. Physician Medical Director 3 or more NAEMSP recommended qualifications	Yes	Compliant now
Customer Focus		
35. Customer Service Measured	Not Required	Beneficial-should be required in amended provider contract
36. Customer feedback reported Organization-wide	Not Required	See Guidance for # 35
37. Customer feedback reported externally	Not Required	See Guidance for # 35
38. Customer feedback loop with employee	Not Required	See Guidance for # 35

Criteria	Yolo County	Guidance
Safety		
39. Safety Officer Responsibilities Delineated	Not Required	Contractor issue
40. Safety Officer Training	Not Required	Contractor issue
41. Formal Safety Committee	Not Required	Contractor issue
42. Emergency Driver Training Program	Required as part of EMT certification	Compliant now
43. Required emergency driver refresher training	Not Required	See Guidance for # 35
44. Occupational Safety Training Program	Not Required	See Guidance for # 35
45. Required safety refresher training	Not Required	Contractor issue
46. Use driver monitoring device	Not Required, but AMR has	Should be required in amended contract
Workforce Focus		
47. Supervisor to Employee Ratio	Not Specified	Contractor Issue
48. EMD Mean Salary Comparators	Not Specified	Contractor Issue
49. EMT Mean Salary Comparators	Not Specified	Contractor Issue
50. EMT-I Mean Salary Comparators	Not Specified	Contractor Issue
51. EMT-P Mean Salary Comparators	Not Specified	Contractor Issue
52. EMS Attrition Rate Identifiers	Not Specified	Contractor Issue
53. Employee Feedback Routinely Solicited - Internally	Not Required	Contractor Issue
54. Employee Feedback Routinely Solicited - Externally	Not Required	Contractor Issue
55. National Registry Certification	Required as part of EMT-certification	Compliant now
Leadership		
56. Accountable to governing/advisory board	Yes	Compliant now
57. Leadership preparation/credentials	Not Specified	Contractor issue
58. Use run & control charts for data analysis	Not Specified	Beneficial for including in recommended system-wide QI program to be implemented within 6 months.
59. Trained/Certified process improvement advisor	Not Specified	Beneficial, but not essential for !I

Criteria	Yolo County	Guidance
Operations		
60. ALS Unit Response criteria	Yes	Compliant now
61. Non-emergency transfer call criteria	Not Specified	Not applicable
Fleet		
62. Fleet size to peak	Not Specified	Should be specified in amended contract
63. Vehicle Collisions per 100,000 miles reported	Information collected	Compliant now
64. Vehicle Failures per 100,000 miles reported	Information collected	Compliant now
65. Fleet tracked with GPS/AVL	Yes	Compliant now
Finance & Reimbursement		
66. Total System Expenditures Includes All Costs	Not Required	Not applicable
67. Per Capita Cost	Not Collected – No subsidy	Not applicable
68. Unit hour cost	Not Required	Not applicable
69. Transport cost	Not Required	Not applicable
70. Cost per response	Not Required	Not applicable
71. Independent Financial Statements are performed AND Required	Available to LEMSA	Compliant now
72. Percent of user fees to subsidy	Not Required	Not applicable
73. Annual external Medicare billing audits	Not Required	Contractor issue
74. Fees set and regulated externally	No	Essential-rate regulation process should be developed and followed

Accreditation:

Opportunities exist for various agencies in EMS systems to be accredited by a national organization. Primarily for Yolo County, Fitch would look at the accreditation of the dispatch centers as well as the ambulance provider. For Yolo County, American Medical Response's dispatch center in Sacramento is accredited by the National Association of Emergency Dispatch (NAED). AMR's specific ambulance operations for Yolo County are not accredited, yet a number of its operations within California have achieved CAAS accreditation. The County and its LEMSA do not require accreditation.

Public Education:

As indicated previously in this report, EMS systems are expanding their role in public safety training, injury prevention, and introduction of other public health/medical interventions. Public education is an essential role. It is not required of any of the agencies within Yolo County EMS, although a number of the fire departments provide public education events and AMR provides CPR training and other public informational activities on a limited basis.

Communications:

Communications and dispatch are essential components of an effective EMS system. The criteria identified in the benchmark comparison include access via 9-1-1 which is present throughout Yolo County. But, the other criteria for the utilization of protocol based dispatched, emergency medical dispatch (EMD) certification and bio surveillance monitoring and reporting are present on an inconsistent basis or absent as in the case of the bio surveillance monitoring.

Response Time Reliability:

The system measures response times, particularly of the ambulance contractor. They are reported to S-SV and they are measured from the time that the call is received at AMR's dispatch center until arrival on-scene. The times are measured on a fractile or percentile basis and there are response time performance requirements identified for Yolo County by the S-SV in its policies and procedures. AMR indicates and is supported by the LEMSA that there is consistent compliance with these requirements.

The time interval from when the 911 call is answered and the information is relayed to AMR is not measured and reported on a consistent basis. This interval should be measured and benchmarks established. The elapsed time should not exceed 60 seconds, 90% of the time.

One of the weaknesses of the current activities regarding response times is the lack of system-wide communication of performance levels among the various stakeholders and municipalities and County personnel. This lack of communication or regular reporting is problematic. There is very little external reporting or communication with the public regarding response time performance within the system.

Medical First Responders:

Yolo County is fortunate to have very active First Responders from its fire agencies that respond on medical calls with personnel trained at the basic life support (BLS) level or higher with automatic external defibrillators (AED). These First Responder agencies respond to all 9-1-1

medical calls and requests are not differentiated to allow for a more focused response by First Responders on only calls likely to need early intervention or First Responder assessment.

Clinical Care:

S-SV has developed and requires the use of comprehensive clinical protocols for EMS personnel. The system has incorporated electronic collection of patient care data at the scene, which will allow extensive quality management activities to measure results of clinical care actions and patient outcomes. Some of the key indicators used by sophisticated EMS systems are not being measured, monitored, and reported on a regular basis. It was indicated that the limited resources of the LEMSA and the pending implementation of electronic data collection have not allowed for the full measuring and monitoring of key clinical indicators that should be expected.

Quality Measurement:

S-SV requires providers to submit a quality improvement plan for its approval. Many of the stakeholder agencies including AMR and some of the fire departments have submitted QI programs for approval to S-SV. What the system lacks is a coordinated consolidation of quality management activities in order to measure system performance versus individual or individual agency performance.

Customer Focus:

EMS systems often measure patient and customer service perceptions. In fact, the consumer experience is a major measure required for value-based purchasing by federal programs reimbursing hospitals and physicians. No specific activities are required to collect customer feedback. That is not to say that individual agencies do not have systems in place to do so.

The remaining categories in the benchmark table identify items such as safety, workforce focus, leadership, operations, fleet, finance and reimbursement. There are limited requirements of Yolo County agencies with regard to these criteria. There is defined oversight provided by S-SV and the EMCC and MCC committees. There are specific requirements for ALS unit responses. The ambulance fleet does include automatic vehicle locating devices (AVL). The assessment of these criteria does not indicate that many of them are not in place, only that they are not specifically required in policies, procedures or governing documents and agreements.

Summary

In summary, there are many missing components in the structure of the Yolo County EMS system that defines expectations, roles, and performance levels. While this system, as observed and reviewed, is performing adequately, it is concerning that some of the baseline standard criteria measured and present in other systems are not required or specified within Yolo County. Recommendations that Fitch provides later in this report will specifically address these shortcomings.

Section 4: Optimizing Yolo EMS Components

This section will focus on the roles of participating agencies within Yolo County. The optimal or desired performance expectations from each component will be defined. The status quo will be identified and discussed. Recommendations for changes in future EMS system performance will be identified.

There are a number of ways that the information collected in this project can be reported. We feel that it is best that we look at the various components, identify which should be present as far as roles and performance expectations, establish where Yolo County is at this time, and provide direction on how the County should change roles, activities and performance levels in order to respond to the influencers discussed previously.

PSAP's and Medical Dispatch

Optimal Attributes

- Immediate answering of 9-1-1 calls.
- Emergency Medical Dispatch processing to identify priorities of requests based on structured protocols.
- Direct, immediate, and simultaneous dispatch of response resources.
- Physician oversight and quality processes to measure compliance with dispatch protocols.
- Measurement and reporting of all time intervals and compliance measures.

Description of Yolo County PSAP's and Dispatch Activities

Yolo County has three public safety answering points (PSAP) within the County. These are located at the Davis Police Department, University of California at Davis, and at Yolo Emergency Communications Agency (YECA). AMR provides the medical dispatch of ambulances and receives notification of requests to respond from the various PSAP's via direct telephone communications.

The three PSAP's and AMR utilize different technology to manage their dispatch information. These computer aided-dispatch (CAD) programs are not compatible with each other and interface is difficult. YECA is in the process of replacing its CAD system.

The various agencies have the capabilities to communicate with each other through the radios using fire frequencies or landline contacting an agency one at a time. The primary means of

communication between the PSAP's and AMR are drop-down lines established expressly for this purpose.

Emergency medical dispatch (EMD) is a standardized process that is utilized in the majority of major dispatch centers throughout North America. There are two purposes of EMD. First is to specifically identify the nature and acuity level of the call to determine appropriate response resources. For example, many EMD capable centers identify which calls are likely to benefit from First Response. Secondly, the EMD process allows for the provision of pre-arrival instructions to bystanders or family members who can initiate treatment of the patient prior to the arrival of the First Responders or the ambulance.

Modern EMS systems require sophisticated EMD in order to progress and take advantage of opportunities that will be forthcoming. The National Association of EMS Physicians published a Position Paper in 1989 supporting and encouraging the use of EMS. Major advantages of comprehensive EMD include cost savings and risk avoidance by not requiring fire first responders to respond on 100% of 9-1-1 medical aid calls. There are specific sets of circumstances and calls where first responders are extremely beneficial to the patient and the focus should be responding first responders to those calls where their services will have the greatest impact on patient outcome

By prioritizing calls and determining which ones need first responder services and which ones are unlikely to benefit from those services, a first responder agency will be better able to respond more quickly to those calls to where time is of the essence. At the same time they will be able to save significant amounts of money by not having the department respond on calls where their services are not necessary.

Identifying the acuity levels of the calls and the priority for a response also allows the system to impose higher response time performance standards on the ambulance service for life-threatening emergencies while allowing somewhat longer response times for incidents that are not life-threatening. This enables the provider to be more efficient in the use of its resources while providing higher levels of service to the life-threatening calls and appropriate response to the non-life-threatening events.

In summary, all 9-1-1 requests for ambulance services within Yolo County are responded at the same level. First responders are dispatched and respond on all 9-1-1 medical calls and AMR responds with the same level of urgency to all calls regardless of the circumstances. The only exception to AMR's response may be a downgrading of its response after first responders get

on-site and evaluate the situation and let the AMR dispatch know that it is not a life-threatening emergency.

All emergency medical requests within Yolo County that do not directly go through AMR's dispatch via a seven digit telephone number used by various facilities are received at the individual PSAP's, information is collected regarding the call and location, and then this information is telephoned to AMR's dispatch for dispatching of ambulances. The first responders are notified either to respond either slightly before or slightly after AMR dispatch notification.

Bystanders or family members that could possibly benefit from instruction on delivering pre-arrival interventions to assist or stabilize the patient may receive these pre-arrival instructions if the 9-1-1 call is answered at YECA or occasionally at UC-Davis. If pre-arrival instructions are indicated at UC-Davis, the call is then transferred to AMR to deliver those instructions.

Discussion

Yolo's existing PSAP and medical communication system is not prepared to capture the opportunities presenting themselves to modern EMS systems. Processes are cumbersome, repetitive, manual, and inconsistent. Expectations for modern EMS systems include optional services that are identified at the dispatch or call receiving level. A number of medical dispatch centers are incorporating options for referring callers that don't have truly urgent events to other resources such as physician or nurse advice lines or social services.

Modern EMS systems need to be able to match the patient's needs with the resources for response. Those patients that urgently need life saving interventions should receive the quickest possible response from first responding agencies and the ambulance service. Those patients with less urgent needs (typically comprising more than half of all 9-1-1 requests) may require no response from first responder agencies and a slightly longer response from the ambulance service.

Effective EMS, PSAP, and medical dispatch includes comprehensive monitoring of all time intervals and compliance with protocols in order to ensure that the patients are receiving the services and the responses appropriate for their specific situation. By categorizing calls in such a manner the biggest advantages include the savings to the first responder agencies by not having a 100% response requirement on 9-1-1 medical aid calls and the resultant reduction of risk to the responders and the public.

Also, categorization of calls allows for better utilization and efficiency for the ambulance provider's perspective where life-threatening calls get quicker responses and those that there would be no harm to the patient would receive a slightly longer responses. This results in savings in the deployment expenses of the contractor and also allows for a more consistent, reliable response to truly emergent events.

The manual systems for communicating information are fraught with delays and prone to errors. Regardless of the ultimate recommendation identified and implemented by Yolo County, there should be a direct electronic interface between key computer aided dispatch (CAD) systems associated with the PSAP's and with the ambulance provider. This would allow accurate electronic transfer of information regarding the location and the specifics about the call as well as the simultaneous dispatch of first responders and the responding ambulance service.

Recommendations

1. Require that all EMS calls originating from 9-1-1 receive comprehensive EMD evaluations to identify the priority levels of the call, the appropriate response resources, and specific information regarding the patient's condition necessary for filing for reimbursement for the patient transport. There are multiple options by which this can be accomplished and these include:
    1. All callers requesting medical aid through 9-1-1 should be routed through a central center such as YECA, where EMD processes can be followed on each and every call.
    2. Another option would be for each of the PSAP's to institute and comply with EMD practices.
    3. A final option would be to route the callers from those centers that do not have EMD capabilities to the ambulance contractor for EMD processing.
2. Option number one is seen as the best option for Yolo County for a number of reasons. First, YECA has EMD trained personnel at this time and is planning on expanding its practices to include prioritization by using the specific determinants identified through the EMD process. YECA is also in process of installing a new CAD system which should be capable directly interfacing and downloading information to the ambulance contractor's CAD system. The final reason that this option is recommended is that the EMD capability and the call processing capability will be retained in the public domain of the County system.
3. Require the ambulance contractor to install electronic interfaces with the major PSAP CADs. This direct electronic interface will allow the immediate transmission of patient location and other information determined through the interrogation process.

4. Ensure that there is appropriate physician medical direction of the protocols used in the EMD system and that compliance with those protocols is monitored on a routine basis through advanced quality improvement processes.
5. Collect and evaluate and report on time increments involved in the receipt and the dispatch of calls to emergency medical events.

First Responders

Optimal Characteristics

- Immediate notification to respond to medical events.
- Opportunity to respond to only those events that are identified to likely benefit from immediate first response.
- Ensure clinical capabilities are available to appropriately treat emergency patients and at a minimum this should be an EMT with AED equipment and training.
- Include clinical activities of first responders in a County-wide quality management program.
- Conduct regular training events that include first responders, ambulance personnel, and other caregivers such as hospital personnel.

Current Status

Yolo County residents benefit from widespread participation of fire agencies in medical first response. Fire first responder involvement in EMS has been embraced by the volunteer and paid fire agencies. In the vast majority of situations, these first responders have, at a minimum, training at the level of EMT and have AED capability on their response units. Furthermore, Yocha Dehe provides medical first response with paramedic personnel at an ALS level.

Discussion

Medical first response is an essential component of an EMS system. For a relatively small subset of 9-1-1 calls, quick response by first responders can make a difference in the patients' survival. This is particularly true for cardiac arrest patients where arrival of first responders in five minutes has been demonstrated to improve survival. In fact, without bystander CPR and quick arrival of first responders with AED capabilities, an eight minute ambulance response is immaterial to the patient's outcome.

Over the last couple of decades, there have been efforts by fire agencies to staff first responder units with paramedics. This is particularly true in California. The evidence does not support the benefit of this high cost service level. The immediate response is critical in certain situations but

it is not dependent upon the ability of first responders to provide ALS services. The Yolo County first responders are trained to the EMT level and carry AED's. These are the critical factors for patient outcome improvement.

Yocha Dehe paramedics, on the other hand, do provide a valuable capability of ALS patient intervention due to the extended response times for the ALS ambulance to arrive at the casino.

Due to the financial pressures on many municipalities, fire services are being challenged and in many instances their ranks are being depleted due to budgetary cuts. In fact, some communities are considering eliminating medical first response from the fire services' role. A recent consultant report for the City of San Jose asked that fundamental question as to whether or not the city is required to provide medical first response or whether that is part of the fire service's mission should be reevaluated.

As indicated earlier, we believe that medical first response is essential to EMS and efforts should be made to use these first response resources as efficiently as possible. Modern techniques allow for the differentiation of those calls that are likely to need first responders or benefit from their clinical care capabilities from the less urgent or acute calls that would not impact patient outcome if first responders did not participate. This is an important characteristic for implementation to EMS systems throughout the US in order to maximize beneficial patient outcomes while reducing the financial and operational stresses that high call volume and responses to unnecessary calls create. Examples of call that first responders are needed include:

- Motor vehicle crashes
- Chest pain
- Cardiac arrest
- Breathing difficulties
- Severe trauma

Conversely, first responders are not likely to be needed for:

- Sick person
- Abdominal pain
- Intoxication
- Minor trauma

From our interviews, it is clear that there is strong collaboration among the fire agencies within the County and a commitment to provide medical first response in a coordinated and effective manner. The critical component is the automatic aid where the closest unit responds regardless of the specific jurisdiction.

It was also made clear through the interviews that joint training between first responders and ambulance contractor personnel and other Yolo County healthcare professionals is limited and sporadic at best. Some services indicated that they had no joint training opportunities with AMR, while others identified limited or periodic training events.

Recommendations

6. Allow and encourage first responders to respond to only those calls where the patients are likely to benefit from the quick response of the first responders or in instances where there is going to be a delayed response from the ambulance contractor.
7. Continue to provide medical first response at the EMT level with AED capabilities and evaluate the initiation of expanded scope capabilities for certain drugs or interventions.
8. Develop and conduct regular joint training events among the first responders and ambulance contractor personnel and other County healthcare providers.
9. Standardize data collection and include first responder activities in a system wide quality improvement process. While first responder agencies have their own internal quality improvement practices, we could find no evidence of standardization of the data elements collected and the compilation of this information to be able to establish a quality management system to ensure ongoing improvement in the delivery of healthcare services to the patients of Yolo County.

Emergency Ambulance Service Provider

Optimal Characteristics

- Single 9-1-1 provider in defined exclusive operating area (EOA) with adequate volume to financially support operations.
- Provision of ALS to all emergency 9-1-1 requests for service.
- Clearly defined expectations incorporated into a comprehensive performance based contract.
- Ambulance provider serves as a leader in providing public education, prevention programs, and training for system participants.
- Contractor's performance is intensively monitored and reported on a regular basis.

Current Status

Yolo County has a single ambulance service provider to respond to emergency 9-1-1 requests for services within the County. The contract for ambulance services is between S-SV and American Medical Response. AMR and its successor ambulance services have been providing emergency ambulance service in Yolo County since prior to the January 1, 1981 date which legislatively allows the continuation of the organization providing the services without a competitive procurement requirement. Recently, the California EMS authority (EMSA) has ruled that the City of Winters is not an exclusive operating area. This decision would require S-SV to conduct a competitive process to secure ambulance services for 9-1-1 emergency responses within the city of Winters in order to establish an exclusive provider. This issue will be discussed in greater detail further in the report.

During our multiple site interviews with various stakeholders, there was no indication of issues with the clinical care capability of AMR's ambulance crews. There were a number of stakeholders that indicated that they were concerned about the lack of communication between AMR and the various stakeholder agencies and the perceived lack of accountability.

Other issues were expressed regarding a perceived close relationship between AMR and S-SV, the County's LEMSA. The LEMSA is responsible for administering AMR's contract, monitoring performance and insuring that personnel are compliant with S-SV's protocols and policies.

While AMR is the sole ambulance service provider that is allowed to respond to 9-1-1 emergencies within Yolo County, with the exception of specific circumstances of mutual aid, other ambulance providers have agreements with Yolo County hospitals to provide BLS and inter-facility transport.

AMR's regional headquarters is located in Sacramento and that is also the site of its medical dispatch center serving Yolo County.

Discussion

There are two major issues regarding the contracted ambulance service provider for Yolo County. First, the agreement between S-SV and AMR is not consistent with comprehensive performance based contracting. It can be best described as a level of effort contract without consequences for non-performance. There are no provisions in the contract to allow for fines, penalties or other consequences if the contractor does not comply with all aspects of the agreement. The only avenue to address non-compliance is to declare a breach of the

agreement, which would require significant resources in order for a new ambulance provider to be selected to serve the County.

The current agreement makes achieving accountability difficult due to the lack of specific performance requirements and consequences for non compliance. The weakness of the agreement has fostered perceptions that the ambulance service is not being held to the highest level of accountability it should. It also brings up the question of the level of monitoring that S-SV conducts on AMR's operational performance.

The second issue that surfaced during this project is the lack of communication between AMR and its client, the County of Yolo, and the EMS system stakeholders.

Over time, AMR has focused most of its communication between its contracting agency (S-SV) rather than spending time and efforts maintaining high levels of communication with agencies and governmental entities within Yolo County. All of the city managers that we interviewed, as well as County staff, expressed a lack of regular and effective communication from AMR management.

Part of the reason for this low level of communication, which is not frequently seen in a lot of emergency ambulance service operations, is that the long relationship between the existing contract provider and the LEMSA has resulted in complacency. Since no real crises have been identified in recent times that would bring to light the performance of the ambulance contractor and no strong initiatives to initiate change within the EMS system; both S-SV and AMR have become relaxed in communicating their service levels to the communities and stakeholder agencies within the County.

One city manager expressed his frustration with the information or lack of information flow by stating that he "gets more detailed reports from animal control than he does from his EMS agency." These communication issues were shared with S-SV and AMR during the interview process in order to allow them to address the concerns.

During our interviews with management at AMR, one question that was asked was whether or not AMR would consider amending their existing contract to include more specificity about performance requirements, obligations, and consequences for failure to comply in a performance based agreement. While there was some reservation, it was indicated they would be willing to discuss an amendment to the contact to include these types of provisions.

The current contract between AMR and Napa County can be used as a template for a high performance agreement. The contract includes specific fines and penalties for non-compliance. The provisions and amounts would be appropriate in the Yolo County EMS System.

Recommendations

10. Draft an amendment to the existing contract to include clear definition of roles, responsibilities and expectations and to establish defined performance requirements with consequences for non-compliance. These provisions should address the contractor's required activities for public education, prevention programs, joint training, communication, and regular reporting requirements to the County and municipalities and stakeholder agencies.
11. AMR should intensify its efforts to directly communicate at managerial levels with the client (i.e., Yolo County) and municipalities and stakeholder agencies within Yolo County. Heightened communication can improve not only AMR's ambulance operations but relationships with system participants and will aid in constant improvement of system delivery activities.

Receiving Facilities

Optimal Characteristics

- Hospital representatives and healthcare providers are actively involved in the EMS system and participate on committees developing policies, procedures and quality management activities.
- Hospitals are capable and designated to receive patients based on the patient illness or injury.
- Hospitals provide patient outcome data to quality management processes so EMS system can measure clinical performance and initiate improvement activities.
- Hospitals have access to transportation resources for urgent patient transfers to higher level or specialized medical centers.

Current Status

There are two hospitals located in Yolo County, Woodland Healthcare and Sutter-Davis Hospital. These hospitals are best described as community hospitals and provide a wide range of services for the patients. Both hospitals are designated as modified base hospitals by S-SV for the EMS system and provide direction and assistance to the crews in the field. S-SV has designated the capabilities of both hospitals and each has equivalent capabilities for receiving most patients requesting EMS. Some specialized services are not available at these hospitals

and patients must be delivered or transferred to other medical centers. Patients requiring specialized services such as a STEMI, burn, or trauma center are delivered to the designated facilities in Sacramento or Solano counties.

Interviews with hospital personnel revealed some frustrations with the EMS system and its administration. It was expressed that unique issues of Yolo County aren't specifically addressed by S-SV because of S-SV's effort to standardize policies and procedures throughout its ten-county service area. It was also indicated that the Medical Care Committee (MCC) structure caused similar issues in that it tried to address issues across the entire area of responsibility of S-SV with limited input or actions addressed to specific counties or service areas.

Other issues that are not directly related to EMS but involve the broader perspective of getting patients to the right locations to be able to treat their conditions arose during these discussions. Representatives from both hospitals indicated that, at times, it was very difficult to get a critical care transport unit to transport a patient from their facilities to tertiary care centers in the Sacramento area. It was indicated that often it would be a number of hours before a critical care transport unit would become available. This exceeded the time that the physicians thought that the patients needed to be able to receive a higher level of care. In those circumstances, the hospitals would sometimes call 9-1-1 to get an AMR unit and then staff the unit with one of their nurses to provide a higher level care to get the patient to the specialty care facility that is capable of treating their particular condition.

As a direct response of state cutbacks to support mental health and social services, it was identified that at times hospital emergency departments could be overwhelmed with patients suffering from a mental health crisis. There are limited beds available for admission, both within the County and the region. This is a significant problem particularly for Woodland Healthcare.

These are the types of issues that should be addressed with the assistance of S-SV and other system participants to find solutions or programs that would mitigate some of the challenges that these issues represent.

Discussion

Research on EMS and out of hospital care is revealing the importance of a well defined organized and competent continuum of care. This starts with the education of the public increasing CPR capabilities and public access defibrillation, first responders with AED's, ambulance response within a timely basis, and getting the patient to appropriate facility. This systems approach has proven very effective in the treatment of heart attack patients, trauma

patients, and cardiac arrest patients. It is also believed that similar positive outcomes are going to be seen in the treatment of stroke patients. Ultimately, the EMS system should be designed to identify patient's needs quickly and to transport those patients to the right facility that can treat the specific illness or injury. This will often cause ambulances to bypass closer facilities in order to shorten the length of time between the incident and definitive care.

Yolo County EMS has incorporated a systems approach to STEMI, trauma, and stroke patients. The system, in conjunction with its hospitals, should continue to identify the most appropriate destination for treatment of patient conditions regardless of where those facilities may be. Also, systems need to be in place for hospitals to recognize that a patient needs a higher level or specialty care service not available at its facility and rapidly access transportation resources to get the patient moved to a center capable of treating the patient's condition in an efficient and timely manner.

Recommendations

12. Insure meaningful hospital input into EMS system decisions that may impact their facilities or for actions in which they will be involved in the delivery of care.
13. Establish a work group representing S-SV, the County, the hospitals, and transport providers in order to create a formalized plan for accessing urgent transportation of patients from Yolo County hospitals to higher levels of care.

Local EMS Agency

Optimal Characteristics

- EMS agency is responsive to its clients (i.e., Counties) needs and requests.
- The LEMSA fulfills all its obligations as required by laws, regulations, and agreements.
- The EMS agency coordinates, supports, and provides guidance to all the stakeholders participating in the EMS system.
- The LEMSA implements and manages a comprehensive quality management program to enhance system clinical performance.
- Leadership of the LEMSA should be thought leaders in the industry and promote advancement within the EMS system to improve its flexibility and its ability to respond to healthcare changes.

Current Status

Yolo County designated Sierra-Sacramento Valley Emergency Medical Services Agency (S-SV) as its local EMS agency. S-SV functions as the local EMS agency for 10 counties in California and was established as a joint powers authority (JPA) among these counties. The board of directors of S-SV consists of a supervisor representative from each of the counties. A summary of Yolo County's LEMSA History and a description of LEMSA activities are included in Attachment A. The responsibilities of the LEMSA are defined in Table 2 below.

Table 2. Responsibilities of a LEMSA

Responsibilities of a LEMSA
Medical Director Appointment
Planning, Implementing and Evaluating the EMS System
Implementation of ALS/LALS systems. Monitoring Training Programs
Training Program Approval
Certification of Personnel
Establish Certification Fees
Additional Training/Qualifications
Authorizing ALS/LALS Programs
Medical Control Policies and Procedures
Trial Studies
Development and Submission of EMS System Plan
Coordinate and Facilitate EMS System Development
Review of EMS Grants
Submittal of Trauma Plan
Medical Control
Base Hospital Policies and Procedures
Alternative Base Stations
Designation of Base Hospitals/Alternative Bases
Rural Base Hospitals and Receiving Facilities
Approval of Alternative Base Station
Regional Trauma Systems
Triage and Transfer Protocols
Transfer Agreement Guidelines and Standards

Responsibilities of a LEMSA
Certificate Review Process
Local EMS Agency evaluation and recommendation for disciplinary action against an EMT-P
Suspension of an EMT-P License
Violations of Transfer Guidelines, Protocols or Agreements
The Local EMS Agency may revoke, suspend, or place on probation the approval of a training program

These functions are set forth in California Safety Code, Division 2.5, Section 1797 et seq. In addition to these responsibilities, as required by the Health and Safety Code, the JPA agreement indicates that S-SV should perform the following.

1. Agency may develop a schedule of fees for testing and certification in amounts sufficient to actually cover the costs the certification process.
2. The agency shall provide an organizational and committee structure which fosters interagency coordination and maintains an effective working relationship between individuals and groups.
3. The agency shall provide a liaison with county emergency medical care committees and providers to plan effective program variations which meet specific county, provider, and patient needs.
4. The agency shall periodically reassess the facilities to ensure that listed treatment capabilities are current and modifications of triage and treatment guidelines reflect current medical practice.
5. The agency shall perform legislative actions on behalf of the member counties at the state and local levels.
6. The agency shall research availability of funds, institute applications where appropriate, and manage budgets in accordance with the regional policies and specific requirements of funding sources.
7. The agency shall facilitate intercounty and interregional response and transport of patients.
8. The agency shall comply with all other relevant requirements as stated in the act.
9. The agency may contract with organizations to provide any relevant service or function of the act.
10. The agency may have other powers and responsibilities authorized by the counties.

One of the fundamental responsibilities required by the California health and safety code is the submission of an annual EMS plan for the area served by the LEMSA. S-SV is fulfilling this requirement for Yolo County, although, county representatives identified a number of errors in

the plan submitted for Yolo County. During this project, S-SV submitted its new plan to county representatives prior to submission to the state in order to eliminate errors.

There are a number of actions that can be taken by S-SV to become more effective and responsive as Yolo County's LEMSA. Improved communications between S-SV and county representatives and stakeholders is desired. Some of the specific responsibilities incorporated in the JPA agreement should receive more focus from S-SV leadership. Particularly item #2 where the agency should provide an organizational committee structure which fosters interagency coordination and maintains an effective working relationship between individuals and groups. And item #3 where the agency is required to provide a liaison with County emergency medical care committees and providers to plan effective program variations which meets specific county, provider, and patient needs.

Discussion

The EMS agency has inadequately satisfied one of its authority members, Yolo County, desires and needs for reports and information describing the performance and functioning of the EMS system. While this information may be collected and monitored at the LEMSA level, it is not disseminated or shared consistently with governmental officials and stakeholder agencies at an adequate level to make them feel comfortable that the system is performing appropriately.

One reason S-SV has difficulty sharing this information is due to the makeup of the County EMCC and, frankly, the poor attendance of some of its members. While information may be shared at that level, it is not getting back to the various organizations and governmental officials in a format that they can generate confidence in the system's performance. When quantitative and specific information is not provided, then inferences and doubts start arising regarding various aspects of system performance. If the information isn't supplied adequately, then the anecdotes that percolate through the system become the defined performance levels.

The EMCC membership is defined by the state's health and safety code. A much more responsive and flexible committee structure could be established by eliminating the EMCC and replacing it with an emergency medical services advisory group. This group could be made up largely of system stakeholders and participants with appropriate municipal and county representation and could be more effective at identifying local issues, suggesting actions for resolution and implementing changes among the provider organizations.

State legislation allows for the county health officer and LEMSA administrator to act jointly as the medical health operational area coordinator (MHOAC). This duplication of roles has led to confusion among stakeholders on who is in charge and who to contact. It will be imperative for

S-SV's administrator to communicate and collaborate with the county health officer's designee to coordinate MHOAC responsibilities to ensure immediate access and consistent response to medical disasters.

Recommendations in this report will have cost implications. It is appropriate that some of these costs be recouped by the emergency ambulance service provider and other ambulance services operating within the County. The cost of contract administration, inspections, permitting, medical direction, and quality improvement activities should be partially recouped from the ambulance services.

A significant piece that has not been fully implemented at S-SV is a comprehensive quality management program that includes specific data collected in the form of agreed upon indicators from first responders, ambulance providers, and receiving facilities. S-SV is in the process of implementing a data collection system that could facilitate improvements and expansion of its quality improvement efforts. S-SV should place a high priority on accomplishing this by identifying key indicators, collecting data, reporting the results, and developing processes to improve areas of weakness identified in this process.

In the evolving systems of healthcare delivery, value based purchasing is spreading throughout, particularly for government payers. A key to being paid based upon the value of the services you provide is the ability to demonstrate the provision of quality services. The first step in this process is to share performance on key statistical indicators with the government and the government will establish the benchmarks that will need to be achieved for enhanced reimbursement. Without a good quality management system in Yolo County, future reimbursement of its providers, particularly the ambulance service, may be negatively impacted.

Recommendations

14. Improve communication, collaboration, and involvement by S-SV representatives to address the unique issues within the county.
15. Establish a comprehensive template report on relevant performance measures for Yolo County EMS and produce and disseminate performance information at least on a quarterly basis to the municipalities, the stakeholder agencies and the county representatives.
16. Work with the County to reconstitute the EMCC with predominant membership to include representatives from all stakeholder groups and to establish standing sub-committees to address day-to-day operational issues and work groups to collaborate in implementing recommendations included in this report.

17. Collaborate with County representatives to clearly define MHOAC responsibilities and implement procedures to provide consistent contact and response procedures.
18. Develop and implement a comprehensive quality management system within Yolo County that includes the collection of agreed upon data points from first responders, the ambulance providers, and the receiving facilities. The results of the quality management performance system should be managed through the quality improvement committees of S-SV but also disseminated to the larger group of stakeholders and governmental officials.
19. Evaluate costs of administering emergency ambulance contract, medical direction, quality improvement processes, permitting, and inspections in order to recoup appropriate amounts from the emergency ambulance contractor by imposing additional fees in the amended contract and from other ambulance services through permitting and inspections fees.

Yolo County and its Department of Public Health

Optimal Characteristics

- Health department is a fully engaged stakeholder agency in the EMS system.
- Health department functions as County's EMS monitor and primary interface with its LEMSA.
- Health department has primary responsibility for emergency preparedness and coordinates and contributes to the LEMSA's mandated responsibilities for disaster preparedness.
- Health department advocates and implements expanded role of EMS in evolving healthcare system changes.

Current Status

The Health Department provides the county's direct interface with its LEMSA but, the Board has not expressly designated this responsibility. Yolo County is a member of the joint powers authority created to function as its Local EMS Agency. What this entails is that the mandated requirements and obligations of the local EMS agency inclusive of planning, reporting, oversight, coordination, etc, have been delegated by the County to S-SV. Even so, it is necessary for the County to monitor this external agency's performance to insure that the county's obligations are ultimately fulfilled.

The primary representative from the County to interface S-SV is the Emergency Preparedness Coordinator. There have been recent changes in the health department including personnel cutbacks and changes within key positions. A positive result of these changes has been the

increased scrutiny placed on the EMS system as new health department leaders increase their understanding of the Yolo County programs. This fresh look at EMS has revealed a system that has been functioning adequately but has not been prodded to incorporate modern EMS system design functions and innovations.

Personnel changes within the Health Department have resulted on focusing on EMS with a fresh set of eyes and this is probably a significant catalyst as to why this project was initiated. It is anticipated that the results of this system review with recommendations for changes will result in a more flexible, collaborative, and accountable EMS system better prepared to respond to the fiscal realities of developing a sustainable system over the long term.

This report will focus on the patients and what specific programs or activities should be incorporated in EMS to educate the public, provide early recognition of acute injury and illness events, engage in expanding CPR and public access to fibrillation programs, and developing systems of care that provide a continuum that includes the public, the patients, the first responders, the ambulance services, the health department, and the receiving facilities in order to improve patient outcomes.

Yolo County is a leader in the region and in the State's emergency preparedness initiatives. The LEMSA also has mandated disaster preparedness responsibilities. These dual mandates sometimes replicate activities and are occasionally conflicting. Regardless, this only represents one single function of the EMS system and it is important that the Health Department and its representatives focus on the broad picture, particularly the future system changes.

The Yolo County ambulance ordinance permits ambulance services, establishes the emergency medical care committee (EMCC) and allows for the imposition of fees to recover costs of permitting and inspections. In addition, the County pays to S-SV an annual amount of $10,000 to administer the ordinance.

Discussion

It is going to be important that the Health Department take a lead in advocating for and implementing system changes to broaden the reach of EMS and the programs and activities encompassed by the system. The State of California has some significant legislative obstacles to implementing EMS activities consistent with the National EMS Agenda for the Future, specifically; EMS legislation in the state does not allow emergency 9-1-1 ambulances to transport patients to any place other than acute care hospital emergency departments. The rules and regulations do not allow for EMS systems to incorporate treat and release protocols where the patients who do not need to go to the hospital can be treated and referred to other

more appropriate resources. EMS rules and regulations, based on the legislation, also limit the scope of EMTs and paramedics and do not allow for the options envisioned by the community paramedic model.

The state EMS Authority is aware of the trend of counties wanting to explore implementing, and have expressed interest in the community paramedic model. The Authority is beginning discussions around policy changes to be made at the state level in order to incorporate some of the desired features.

The County has an ambulance ordinance that establishes processes for permitting ambulance services (ALS and BLS) that operate within the County. This ordinance also establishes the emergency medical care committee (EMCC). The ordinance does not address critical care transport as discussed in the receiving hospital section.

The Health Department, along with S-SV, should strongly advocate at the State level to increase the flexibility of EMS systems to more appropriately respond to requests for services and to be able to deliver services needed by the patients and communities.

A key role of public health is to monitor the S-SV's performance and fulfillment of its responsibilities as the County would monitor any other contracted vendor. More importantly, public health's interface with S-SV should be able to report on a regular basis to Health Department leadership and elected officials on the overall performance of its EMS system, its advancements, its issues, and its plans for the future.

Recommendations

20. The Health Department should increase communication and participation in a broad range of LEMSA activities.
21. In collaboration with S-SV, the Health Department should develop reporting processes to insure S-SV's fulfillment of its responsibilities and to share EMS system performance measures and activities.
22. The Board of Supervisors should specifically delegate to the Health Officer the responsibility to liaise with, assist, and monitor S-SV performance and compliance with the JPA agreement. The Health Officer should be allowed to designate another individual to perform these functions.
23. The Board of Supervisors should amend the ambulance ordinance to create permitting and performance requirements for CCT and to ensure that appropriate fees are in place to perform required permitting, administration, monitoring, and inspection.

24. Collaborate with S-SSV representatives to clearly define MHOAC responsibilities and implement procedures to provide consistent contact and response procedures.
25. The Health Department should enlist supporters and advocate at the state level for policy changes or legislative initiatives to broaden EMS options for the future. These include:
    - Alternative destinations
    - Treatment and release protocols
    - Community paramedicine
    - 9-1-1 triage to alternative advice lines or care providers

Section 5: Miscellaneous EMS issues

There are a few issues that have not been fully addressed in previous sections of this report. This section will address each of the specific issues and suggest recommendations for subsequent action by the County or S-SV.

The City of Winters Exclusivity

A recent decision was made by the California EMS Authority that Winters is not part of the County's exclusive operating area. It was the State's determination that there was not continuous provision of ambulance service by the current provider in the same scope and manner since January 1, 1981. Further documentation is being provided to the State to clarify the boundaries of these decisions – City of Winters or Winters Fire District. What this specifically means is that the Winters cannot have an exclusive 9-1-1 ambulance provider without a competitive process to select the provider. The challenge is further demonstrated in that the City itself cannot conduct the procurement for ambulance services as that is a specific delegated responsibility to Yolo County's local EMS agency. The current EOA contractor, AMR, has exclusivity for all areas surrounding the City of Winters just not within the city limits. The call volume within Winters is inadequate to support a full time ambulance; therefore it is going to have to be dependent upon coverage from the Yolo County EOA provider or potentially coverage from the provider in Solano County.

This ruling by the State leaves S-SV with two options. The first option would be to do nothing and the City of Winters would remain a non-exclusive ambulance service area and dependent upon the 9-1-1 PSAP to notify ambulances to respond and depend upon the ambulance services willingness to respond to Winters. Frankly, this results in an untenable position for the City and its residents, because without the establishment of an exclusive operating area it is difficult for the local EMS agency to impose performance criteria and delivery of services is left largely to the whims of the ambulance providers.

The second option is to conduct a competitive process to award exclusivity for ambulance services within the city of Winters. This limited service area would likely not result in multiple ambulance services vying to provide 9-1-1 response. Potentially, Yolo County's provider would be willing to compete in such a competitive process as well as the Solano provider.

Winters is on the western edge of Yolo County abutting Solano County. The distance from the City of Davis to Winters is approximately the same as the distance from city of Vacaville,

although travel time from Vacaville to Winters is likely five to seven minutes quicker because of the road structure.

Recommendations

26. S-SV should collaborate with Winters and the County of Yolo to establish an exclusive operating area for the Winters and conduct a competitive procurement for ambulance services to respond to 9-1-1 emergencies.

AMR Contract

S-SV's contract with the current Yolo County provider, AMR, does not meet current contracting standards for emergency ambulance services provided to exclusive operating areas. The contract lacks adequate detail of expectations and performance requirements. In addition, there are no consequences to the provider for failure to perform other than the threat of loss of the entire contract. Breaching an ambulance service contract with the volume of services provided in Yolo County is a very expensive and resource intensive.

An amended contract between S-SV and AMR should:

- More clearly define roles and responsibilities
- Include comprehensive performance requirements
- Include consequences for non-compliance
- Improve reporting requirements

The overall goal of modifying the contract should be to increase the contractor's accountability and transparency in the provision of services in the Yolo County EMS system.

Recommendations

27. Amend the current AMR contract with S-SV to include clarification of roles and responsibilities and comprehensive performance requirements. A template that could be used to identify the needed changes is the contract between AMR and the County of Napa. This contract was the result of a recently completed procurement process and was accepted by AMR as the successful bidder. Not all provisions are relevant to Yolo County but this would provide a foundation for S-SV to identify potential provisions to include in a new contract. If AMR does not agree to amend the contract, S-SV should consider a competitive procurement for the County's EOA provider.

Data Systems

It is essential that modern EMS systems have comprehensive technology in place to collect, manage, and distribute data. Yolo County is rapidly implementing various components through the EMS stakeholder agencies. The following paragraphs briefly describe the essential data systems required for information management and distribution.

Computer Aided Dispatch (CAD)

The CAD systems interface directly with 9-1-1 at the PSAP's. This allows for rapid identification of the patient's telephone number and address as well as a geographic location for many of the cellular calls. Sophisticated CAD systems take this information and identify the closest source for response and provide the quickest routes to the responders. These systems also allow for simultaneous notification of different responding agencies such as first responders and the ambulance service.

As indicated earlier, each of the three PSAP's has different technology platforms on which they receive, collect and document information from 9-1-1 calls. YECA is in the process of acquiring a new, modern CAD which will facilitate interfacing with other system data collection components.

AMR has a sophisticated CAD which allows for it to dispatch the closest appropriate unit and to accumulate and maintain data regarding the location of all requests for service, destinations, time intervals, etc.

It is important that the independent systems in the PSAP's and the entities that dispatch the ambulance service be connected electronically to reduce potential for errors in the re-communication of information via telephone and to speed the dispatching process.

Another important aspect of the modern CAD system is integration with priority dispatching software which allows computerization of emergency medical dispatching and the identification of priority call levels along with determination of the patients' specific conditions.

Electronic Patient Care Report (ePCR)

The ePCR is a point of care data entry solution for EMS crews. The information about the patient's condition, assessment and interventions is documented at the patient's side through a hand-held device. This information is electronically linked with the dispatch information to develop a record of the entire event. The ambulance contractor in Yolo County is utilizing ePCR capabilities. The ePCR data is downloaded nightly to the system and is available to the LEMSA.

A desired feature for future implementation would be to broaden the ePCR to be able to include the information collected and documented by first responders during medical events in real time (immediately after completion of a call).

Quality Management Data Collection

The compilation of data that is collected and entered into electronic systems from dispatch, the PSAP, and the field ultimately should be accessible by S-SV in order to analyze the system's performance. S-SV is currently implementing a system to facilitate clinical quality management by identifying key data elements or indicators to monitor and measure and report on performance and outcomes.

This component is essential for an EMS system to be able to determine its effectiveness in all aspects. The system is anticipated to be fully operational mid-July 2012 and should be able to fill a glaring gap in S-SV's ability to implement and manage a comprehensive quality improvement program system-wide.

Bio-Surveillance Monitoring and Reporting

Modern EMS systems have acquired data mining software in order to extract data from multiple databases to provide real-time monitoring of system performance and to objectively measure performance levels for both clinical and operational activities. Data mining software can be connected to multiple types of databases at various locations in order to extract desired elements to analyze, interpret, and to define trends.

Interfaces

It is unrealistic to expect that there would be one platform used by all first responding agencies, PSAPs, ambulance contractors, hospitals, and S-SV. Therefore, it is necessary to develop and install interfaces to connect and electronically transfer information rapidly and efficiently among the various components. For example, many systems have developed electronic interfaces where the patient care report, instead of being hand written and handed to the receiving facility, is electronically transmitted to the receiving facility's information management systems or fax machines. Other interfaces that are critical include the interface between the PSAP and the medical dispatch center which was discussed previously in this report. Interfaces in place include the ability of medical control or medical direction to be able to rapidly access patient care reports to investigate any issues that occur on an immediate basis.

Recommendations

28. Support YECA's acquisition and implementation of a modern CAD system and ensure that the system is capable of computerizing EMD activities and interfacing with the ambulance contractor's CAD.
29. S-SV should consider acquiring bio-surveillance monitoring and reporting software to be able to mine the data in multiple databases for quality management and system performance monitoring purposes.
30. Receiving facilities should implement mechanisms to electronically transfer information to S-SV regarding patient outcome for designated patient types.
31. The ambulance service should be required to electronically transfer patient care report information to the receiving facilities in a format that can be incorporated in the patient's electronic health record at the facility.

Ambulance Rates

Attachment B includes the current rates for American Medical Response. The contract between AMR and S-SV allows for rate regulation. Although, currently, rates are not regulated by S-SV or the County and AMR is only required to submit their rates to S-SV.

With the award of an exclusive operating area it is the fiduciary responsibility of the awarding entity to ensure rate control. By establishing a monopoly it is important to ensure that rates are inordinately increased. The rates reviewed for AMR are consistent with the rates charged in other Northern California counties and in our opinion are not excessive. Even so, there should be a mechanism to ensure public confidence in the rates they are being charged.

Recommendation

32. We recommend that S-SV institute a rate regulation process that allows the contractor to annually increase rates to match the cost of living increases and to apply for additional rate increases in the event something occurs with reductions in reimbursement or increases in costs that are beyond the contractor's control.

Ambulance Response Times, Requirements and Zones

Throughout America, response time performance has been the primary measure of EMS systems, both for its first responders and its ambulance providers. For nearly 50 years, EMS systems have been trying to shorten ambulance response times thinking that it would have a direct impact on patient outcomes. Recent studies contradict this belief. The outcome for patients is not directly improved by shortening of ambulance response times.

Initial studies on cardiac arrest indicated that ambulance response time should be eight minutes or less. These old studies identifying an eight minute ambulance response time or an eight minute ALS response time have largely been debunked. EMS systems have been designed focusing on responses to cardiac arrest. By focusing on this two to four percent of the 9-1-1 calls, we have created systems that placed unrealistic value on the quickness of the ambulance service. In fact, huge advancements have been made in improving the outcome for cardiac arrest patients, but this is based upon bystanders initiating CPR, rapid access to defibrillation through public access defibrillation or first responders, and less reliance on ALS interventions.

The state of California has recommended guidelines to identify reasonable response times based upon the population density. Population density was used as a proxy for ambulance service demand and provided a mechanism to identify areas where short ambulance responses should be expected and areas of the service area where longer ambulance response times are going to occur due to their remoteness or lack of access.

S-SV identifies response time performance levels for each of its service areas. Table 3 includes the response time standards for Yolo County.

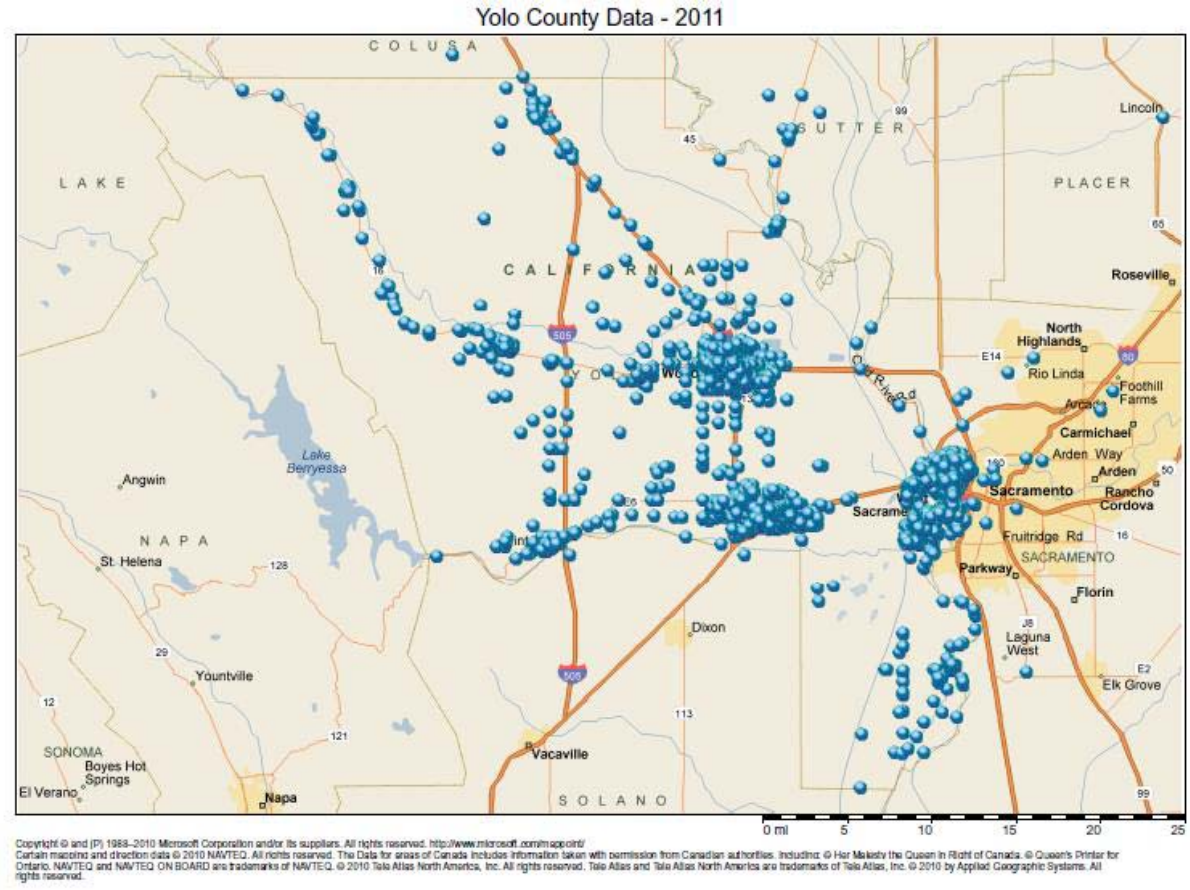
Table 3. Response Time Standards for Yolo County

Caller Type	n	Min RT	Max RT	Average RT (sec)	St Dev RT	90th Percentile
DAVIS P.D.-911	2744	6	2819	300.0331633	171.4672522	08:40
UC DAVIS P.D.-911	306	29	1326	277.369281	164.8832997	08:09
WEST SAC-911	4981	5	3960	259.2756475	144.0325394	07:24
WINTERS FIRE	229	116	1997	859.3187773	210.4800458	18:49
WOODLAND-911	3105	6	1860	280.5188406	166.8899291	08:14
YOLO CO WILDERNESS	48	188	2696	1461.1875	573.7367124	36:36
YOLO MUTUAL AID	43	435	2545	1222.162791	520.9304373	31:30
YOLO RURAL- 911 15	358	8	2819	540.9832402	272.5974135	14:50
Yolo Rural- 911 20	5	641	1608	1129.2	349.1155969	26:17
YOLO RURAL- 911 25	167	164	2163	1197.245509	330.9235064	27:01
YOLO RURAL-911 20	338	21	6541	921.9556213	445.2910972	24:53

The response areas or the identified largely based upon jurisdictional boundaries such as the city limits or fire districts. Part of the specific activities undertaken in this project is to look at the actual ambulance demand within Yolo County and to recommend changes to zones that more closely reflect ambulance demand, and to recommend response times consistent with what could be achieved in these zones.

Figure 1 shows the demand pattern for 9-1-1 ambulance requests during the year 2011.

Figure 1. Demand Pattern for 9-1-1 Ambulance Requests - Year 2011



As expected, the demand is largely centered around the various communities within the county and along traffic ways.

Instead of the traditional designation of urban, rural and wilderness areas, modern EMS systems are implementing their coverage requirements based upon the actual demand for ambulance services. A process identifying those areas that represent high density call demand, what previously might have been considered urban, is to measure the actual frequency of 9-1-1 calls within defined geographic areas. The high demand or urban designation process we use in

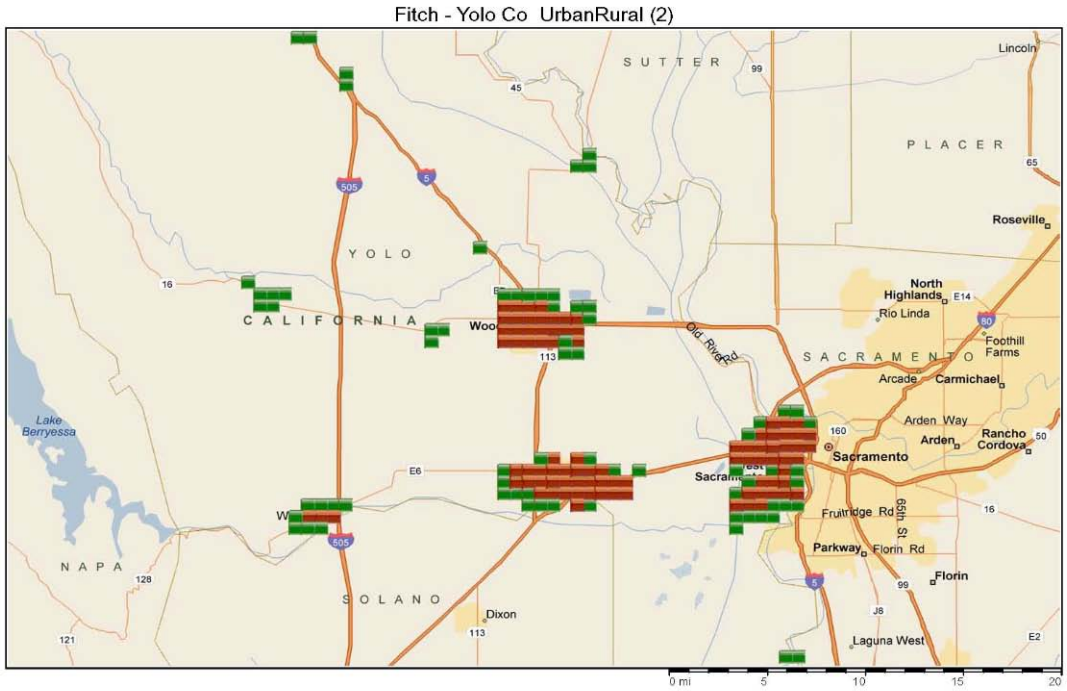
this report was created in Canada and has been implemented in a number of counties and locations throughout the United States, particularly in California (i.e. Alameda, Napa)

The algorithm to determine the high density area is one that measures call requests within a square kilometer. If an average of two or more ambulance calls originate within a square kilometer per month and half of the adjacent square kilometers produces an average of two or more ambulance calls per month, then this is considered high density (or urban).

In order to identify other areas of medium density call demand, we looked at all calls that generate on average more than .25 calls per month (one call every four months) but less than two calls per month. And finally, the low density areas are those that generate on average less than one call per square kilometer every four months.

Looking at Figure 2 the red squares represent high density call volume which is where the most stringent response time standards should be implemented consistent with the prior designations of urban. The green squares represent those areas where there will be more than one call every four months but less than two calls per month. These would be recognized as the medium density areas.

Figure 2. Call Density Areas



In establishing response time requirements, we take the density areas in consideration as well as the overall demand patterns for the system. When developing overall requirements for an EMS system's response times, it is important to erase jurisdictional lines. Just because a city limit stops on one side of the street does not mean that there is not considerable demand for ambulance services on the other side of the street. Therefore, the ultimate definition of response time zones should be based upon call demand patterns as well as the infrastructure of roadways.

Figure 3 includes a depiction of the high and medium demand areas along with drive times from urban areas and other locations for potential ambulance deployment. The figure is looking at eight minute drive times represented by the red line designations and 12 minute drive times represented by the blue lines. This is not an expression of the recommended response times but is a process developed in order to realistically assess potential system coverage and to make decisions regarding response times.

Figure 3. Demand Areas and Drive Times

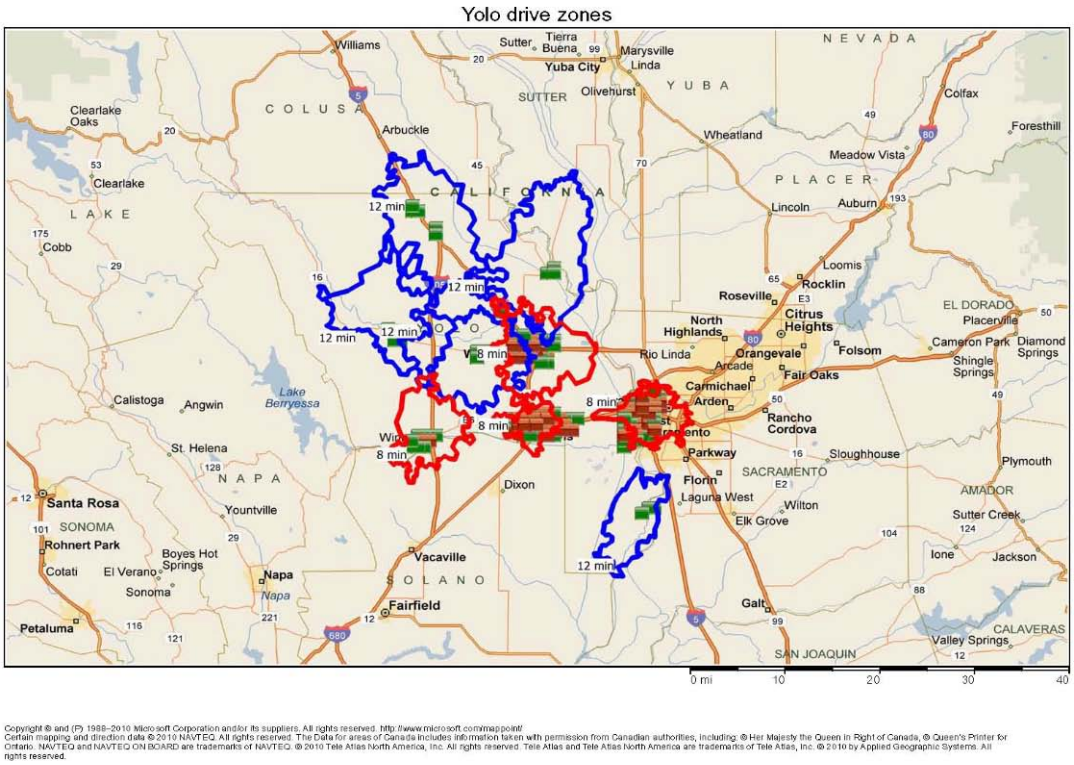
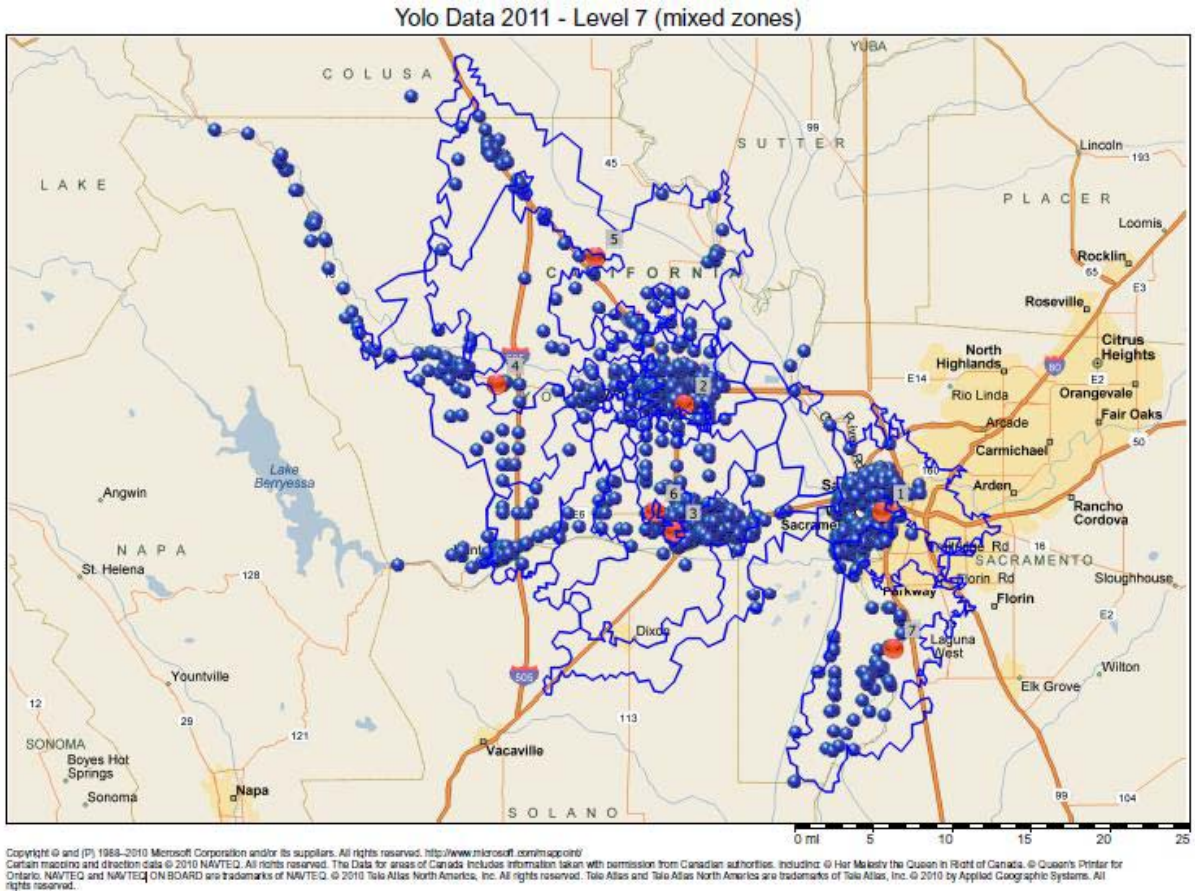


Figure 4 included mixed drive time outlines of 10 minutes and 15 minutes from 7 locations within the County. It demonstrates the coverage of the demand and should be considered as the basis for establishing the high and medium density response zones.

Figure 4. Demand Areas with 10 and 15 Minute Drive Times



The actual delineation of borders for response time requirements should be based upon the demand levels (low, medium, high), the road infrastructure, and realistic response time capabilities. While this describes the engineering behind developing a deployment plan, it must be recognized that the system must react to the clinical implications of its response time requirements.

The process for ultimately defining the response time zones will be geospatial designation of services areas based upon road structure and longitude and latitude of the areas encapsulated by the response time zones. They will not be based upon the actual jurisdictional boundaries within the system.

The boundaries represented in Figure 3 should be the initial starting point for the definition of zones for emergency ambulance response within Yolo County. As can be seen by comparing Figure1 with Figure 3, these zones cover the vast majority of ambulance demand within the County. They are an effective starting place for the delineation of emergency response zones.

The County should also look at response times from its first responders in conjunction with its ambulance response. There are a number of circumstances why this is important. We have recommended previously that first responders do not respond to all calls, only to those likely to benefit from first response. There are rural areas within the county where there is going to be an extended ambulance response time where the current practice of responding to all medical aide calls by first responders will remain essential. In addition, there will be times when an ambulance is not available or delayed and that should trigger the first responders to respond even on those calls identified as not likely needing first responder resources. So for each of the designated zone types; high, medium and low density, there should be goals established for the first responders response times. These should be accompanied by performance standards required of the ambulance service provider.

It is more important that response times maintain a high degree of reliability rather than focusing on the shortness of responses. Therefore, as we recommend minimum standards for response time performance in the low, medium and high demand areas, we will initially propose a 90% compliance standard but ideally that 90% reliability can be increased slightly as the system transitions performance requirements.

The current response time standards include six levels of performance; from eight minutes to as soon as possible. We recommend that these be consolidated into three discreet performance areas to match the low, medium and high density zones. We recommend that the high density zones have a 10 minute ambulance response, 90% of the time. The medium density zones should have a 15 minute response, 90% of the time. The low density zones should have a 30 minute response, 90% of the time. Penalties for non-compliance with response times should be established for each of the three zones (high, medium, and low density). The response times should be measured monthly.

Similarly, goals for the first responders should include five (5) minutes in the high density areas, 90% of the time, 10 minutes in the medium density areas, 90% of the time and 20 minutes in the low density area 90% of the time.

In summary, we have proposed a process that shifts the establishment of response time zones from jurisdictional lines to lines based upon the road infrastructure and call density levels. We have lengthened response times in higher density areas but have established finite response times for the low density areas and established realistic response times that can be achieved based upon road infrastructure for the medium density areas.

There may be individuals that are concerned about lengthen response times, but based upon current studies, the establishment of the continuum of care and the definitive treatment systems centers are much more relevant to the patient's outcome. Recent studies show that it is the presence of an effective trauma system and the ability to get a patient to a trauma center is much more important than a shorter response times. The same is true for heart attack and stroke victims. For these reasons, we can comfortably extend response times in the high density areas and be confident that there is not going to negatively impact patient outcome.

Focusing on cardiac arrest, we recognize that the only meaningful way to positively impact patient outcomes is to have bystanders initiate CPR and ensure rapid access to defibrillation. This is why we have focused on getting response times by first responders to a finite and a short period of time because realistically these are the individuals that can realistically have an impact on cardiac arrest patients' outcomes. Whether the ambulance response time is eight or ten minutes will not impact the outcomes on cardiac arrest patients.

As discussed earlier, we recommend that there be consequences for the ambulance service not meeting response time performance requirements.

As a part of this process, we downloaded directly from AMR's CAD the 9-1-1 responses for the year 2011. We made no efforts to clean the data or identify exceptions or anomalies during this process. We wanted to take the hard data and identify the ranges of performance currently existent within the system. Table 4 includes the response time performance levels at the 90th percentile from various call sources. These times are based upon the time the call was answered at AMR's dispatch center until the ambulance arrives on scene.

The 90th percentile response time ranges from seven minutes and twenty-four seconds (7:24) for calls originating from West Sacramento 9-1-1 to thirty-six minutes and thirty-six seconds (36:36) for those calls identified as originating from Yolo County Wilderness defined areas. Davis and UC-Davis have 90th percentiles at the eight minute and forty second (8:40) and eight minute and nine second (8:09), respectively and Winters' 90th percentile performance is at the eighteen minute and forty-nine second level (18:49).

The presentation of these response times is not intended to determine whether AMR is in compliance with its contract, because our analysis includes all emergency calls and makes no consideration for anomalies where there have been data entry errors or exceptions that might have been granted due to unusual events. The purpose of this analysis was to determine and to help corroborate what reasonable response times in the service area could and should be for future compliance requirements.

Recommendation

33. We recommend the creation of three discreet performance areas designated as low, medium and high density zones. We recommend that the high density zones have a 10 minute ambulance response, 90% of the time. The medium density zones have a 15 minute response, 90% of the time. The low density zones should have a 30 minute response, 90% of the time. Penalties for non-compliance with response times should be established for each of the three zones (high, medium, and low density). The response times should be measured monthly.

Table 4. Response Time Performance Levels

SIERRA-SACRAMENTO VALLEY EMS AGENCY
PROGRAM POLICY

REFERENCE NO. 415-B

SUBJECT: 9-1-1 RESPONSE TIME CRITERIA –YOLO COUNTY

RESPONSE TIME STANDARDS	
YOLO COUNTY	
AMERICAN MEDICAL RESPONSE (AMR)	
City of Davis, UC Davis	8 minutes 90% of the time
Woodland	8 minutes 90% of the time
West Sacramento	8 minutes 90% of the time
West Plainfield, Willow Oak Fire, and Yolo Fire	15 minutes 90% of the time
Winters	18 minutes 90% of the time
Elkhorn Fire, Knights Landing, Madison, Zamora Fire, Esparto Fire, Dunnigan Fire, and Clarksburg Fire	20 Minutes 90% of the time
Capay Fire, and Yocha Dehe Fire	25 minutes 90% of the time
Yolo County – Wilderness	As soon as possible

Effective Date: 06/01/2012
Next Review Date: 10/2012
Approved:

Date last Reviewed / Revised: 06/12
Page 1 of 1

SIGNATURE ON FILE
S-SV EMS Medical Director

SIGNATURE ON FILE
S-SV EMS Regional Executive Director

Section 6: Meeting the Challenges of the Future

Implementation of the key recommendations in this report will prepare Yolo County EMS to respond to external and internal mandates in the delivery of healthcare and emergency medical systems in the future. The County should begin action now to be able to respond to policy and regulation changes at the State level to expand the benefits provided by EMS participating agencies and individuals. Community paramedicine, treat and release protocols, alternative destinations, and strategies for diverting frequent users from the 9-1-1 system are among the opportunities that exist in future EMS system modifications that will improve the efficiency and effectiveness of EMS. A summary of the recommendations along with level of importance and projected implantation timeframes are located in Attachment C.

Attachment D includes references that were used to develop recommendations in this report and to create a vision for Yolo County EMS consistent with national direction.

All stakeholder agencies need to work together in providing emergency medical services within Yolo County and improvement in communications, reporting, and feedback will benefit all stakeholders, including, ultimately, the patients accessing EMS. As one of the city managers indicated in an interview, “there is a culture of collaboration among the Tribe, UC-Davis, the County, and the four cities” that should expand to include all aspects of the EMS system on a move-forward basis. Ultimately, clarifying roles and responsibilities, increasing accountability, and enhancing transparency can lead only in a positive direction for the EMS system. This type of ongoing attention will result in the residents and patients of Yolo County receiving the best value for the resources expended and will provide a level of confidence to decision-makers in the county that they truly have established and provided a high quality emergency medical service system that is flexible and will be responsive to future changes.

ATTACHMENT A

LEMSA History/Activities

FITCH
& ASSOCIATES

Attachment A: LEMSA History/Activities

What Does a Local Emergency Medical Service Agency (LEMSA) Do?

California's EMS Act authorizes each county to develop an EMS program and to designate a local EMS agency (LEMSA) that oversees the delivery of EMS within that geographic area. Essential functions that are performed by local EMS agencies include:

- Serving as an advocate for patients.
- Planning, implementing, evaluating, liaison to EMCC, and continually improving local EMS systems including pre-hospital services and relevant hospital services such as trauma and pediatrics.
- Collaborating with other health officials to ensure a unified, coordinated approach in the delivery of health care.
- Carrying out regulations relative to EMS systems (the State EMSA promulgates regulations but LEMSAs carry out those regulations).
- Certifying, accrediting, and authorizing EMS field personnel
- Authorizing and approving local EMS training programs
- Developing/approving medical treatment protocols and policies for local EMS service providers (EMTs, paramedics, dispatchers) and periodically reassess facilities.
- Perform legislative activities at the State and local levels.
- Establishing and maintaining local EMS communication systems
- In collaboration with public health, developing local medical and health disaster plans and coordinating medical and health response to disasters (natural and man-made)
- Designating trauma centers and other specialty care centers
- Determining ambulance patient destinations based upon hospital resources
- Establishing policies for emergency department diversion and implementing mitigation strategies where diversion is excessive
- Coordinating activities and communications between various agencies that provide EMS system services so that care appears seamless to the patient (e.g., emergency medical dispatch, first responders, ground and air ambulance, receiving hospitals, trauma centers)
- Coordinating community education programs, such as: injury prevention, CPR, public access defibrillation.
- Collecting, analyzing, and reporting on EMS data and providing that data to EMSA electronically for statewide system evaluation
- Responsible for all of Yolo County Ambulance and Medical transportation ordinance as well as providing ongoing monitoring of the ordinance.
- Establishing exclusive operating areas for emergency ambulance service as appropriate, and then contracting for those services
- Providing oversight for EMS quality improvement and quality assurance activities
- Providing technical assistance to EMSA
- Mediating conflicts between various EMS stakeholders (e.g., ambulance, fire, hospitals, physicians)
- Resolving consumer complaints
- Providing information to public officials
- Advocating for sufficient and stable funding for emergency medical services
- Monitors and establishes procedures for Medical Control
- Coordinating and possibly facilitating arrangements necessary to develop the EMS System
- Recertification of EMT's and submission of change of status regarding an EMT's disciplinary action taken by the medical director
- All of CA Health & Safety Code , Division 2.5

Yolo County LEMSA History

Background

1975 Sierra Sacramento Valley EMS Agency Established

1992 Joint Powers Authority Agreement Signed by Nevada, Placer, Sutter, Yolo and Yuba counties

2002 Proposed Agreement between American Medical Response (AMR) and Sierra-Sacramento Valley EMS for Advanced life support ambulance in Yolo County.

2006 JPA contract amended to task SSV-EMS with Yolo County Ambulance and Medical Transportation Ordinance

2010/2011 Butte, Colusa, Shasta, Siskiyou and Tehama counties joined S-SV EMS

2011 Reapproved SSV-EMS JPA agreement

Joint Powers Agreement

The Sierra-Sacramento Valley Emergency Medical Services Agency (S-SV EMS Agency) is a Joint Powers Agency (JPA). The Governing Board of Directors for the JPA consists of a County Supervisor from each member county. S-SV EMS is designated as the Local EMS Agency (LEMSA) for each of the member counties under the authority of the Government Code, State of California (Section 6500, et seq.)

Regional EMS Agency

The S-SV EMS Agency was founded in 1975, and serves as the regional EMS agency for the ten counties of Placer, Yuba, Yolo, Nevada, Sutter, Butte, Colusa, Shasta, Tehama and Siskiyou. The ten counties have a combined resident population of approximately 1,460,200.

ATTACHMENT B

AMR Ambulance Rates

FITCH
& ASSOCIATES

ATTACHMENT B: AMR Ambulance Rates

AMERICAN MEDICAL RESPONSE TRANSPORT RATES												
Yolo County												
1/4/2012												
					ALS/BLSEmergent/Non-Emergent			$1,489.48				
					BLS Base Non-Emergency			$829.29				
					ALS / BLS Mileage			$33.83				
					Emergency Multi Patient			$22.33				
					Non Medical Transport Fee			$240.91				
					Non Medical Mileage			$8.51				
					Non Medical Billing Fee			$39.75				
					Night Charge			$135.53				
Activated Charcoal			$24.79		Disposable Linen			$21.58		Morphine		$20.82
Adenosine			$209.25		Dopamine Drip			$56.51		Narcan		$25.98
Albuterol Nebulizer			$13.31		Dressing - Major			$42.35		Needle chest decompression		$141.45
Amiodarone			$43.92		Dressing - Minor			$20.62		Nitrospray		$6.31
Aspirin			$10.32		EKG Monitor			$112.93		O2 Supplies / Nebulizer		$21.15
Atropine			$17.42		Epinephrine			$19.62		OB Pack		$40.16
Bag Valve Mask			$76.10		Glucagon			$264.95		Oxygen		$145.64
Benadryl			$14.69		Glucometer Use			$107.01		Personal Care Supply		$10.32
CO2 Detection Supply			$52.56		Glucose			$16.18		Pulse Oximetry		$69.03
Calcium Chloride			$28.20		Intraosseus Needle			$311.68		Sodium Bicarb		$47.46
Capnograph			$23.61		Intubation Supplies			$135.54		Spinal Immobilization		$60.43
CPAP Procedure			$321.47		Isolation / Decontamination			$35.31		Splint External Disposable		$14.63
D5W IV Solution 100			$53.40		IV Drip Supplies			$80.12		Suctioning		$32.20
Defib Electrodes			$72.68		Lasix			$14.69		Versed 10 mg		$53.51
Dextrose 25%			$53.40		Lidocaine Preload			$28.43		Zofran/Ondansetron		$34.43

ATTACHMENT C

Summary of Recommendations

FITCH
& ASSOCIATES

ATTACHMENT C: Summary of Recommendations

Each recommendation is followed by a color-coded categorization of its importance as High, Medium, and Low. A recommended timeframe for implementation of the recommendation is also identified as less than 1 year, 1 to 3 years, or greater than 3 years.

Priority	Timeframe
Low	< 1 Year
Medium	1 – 3 Years
High	> 3 Years

PSAP's and Medical Dispatch

1. Require that all EMS calls originating from 9-1-1 receive comprehensive EMD evaluations to identify the priority levels of the call, the appropriate response resources, and specific information regarding the patient's condition necessary for filing for reimbursement for the patient transport. There are multiple options by which this can be accomplished and these include:
   1) All callers requesting medical aid through 9-1-1 should be routed through a central center such as YECA, where EMD processes can be followed on each and every call.
   2) Another option would be for each of the PSAP's to institute and comply with EMD practices.
   3) A final option would be to route the callers from those centers that do not have EMD capabilities to the ambulance contractor for EMD processing.
2. Option number one is seen as the best option for Yolo County for a number of reasons. First, YECA has EMD trained personnel at this time and is planning on expanding its practices to include prioritization by using the specific determinants identified through the EMD process. YECA is also in process of installing a new CAD system which should be capable directly interfacing and downloading information to the ambulance contractor's CAD system. The final reason that this option is recommended is that the EMD capability and the call processing capability will be retained in the public domain of the County system.

Priority	Timeframe
High	1 – 3 Years

3. Require the ambulance contractor to install electronic interfaces with the major PSAP CADs. This direct electronic interface will allow the immediate transmission of patient location and other information determined through the interrogation process.

Priority	Timeframe
High	**1 – 3 Years**

4. Ensure that there is appropriate physician medical direction of the protocols used in the EMD system and that compliance with those protocols is monitored on a routine basis through advanced quality improvement processes.

Priority	Timeframe
High	**1 – 3 Years**

5. Collect and evaluate and report on time increments involved in the receipt and the dispatch of calls to emergency medical events.

Priority	Timeframe
Medium	**1 – 3 Years**

First Responders

6. Allow and encourage first responders to respond to only those calls where the patients are likely to benefit from the quick response of the first responders or in instances where there is going to be a delayed response from the ambulance contractor.

Priority	Timeframe
High	**1 – 3 Years**

7. Continue to provide medical first response at the EMT level with AED capabilities and evaluate the initiation of expanded scope capabilities for certain drugs or interventions.

Priority	Timeframe
High	**Ongoing**

8. Develop and conduct regular joint training events among the first responders and ambulance contractor personnel and other County healthcare providers.

Priority	Timeframe
High	**< 1 Year**

9. Standardize data collection and include first responder activities in a system wide quality improvement process. While first responder agencies have their own internal quality improvement practices, we could find no evidence of standardization of the data elements collected and the compilation of this information to be able to establish a quality management system to ensure ongoing improvement in the delivery of healthcare services to the patients of Yolo County.

Priority	Timeframe
Medium	**1 – 3 Years**

Emergency Ambulance Service Provider

10. Draft an amendment to the existing contract to include clear definition of roles, responsibilities and expectations and to establish defined performance requirements with consequences for non-compliance. These provisions should address the contractor's required activities for public education, prevention programs, joint training, communication, and regular reporting requirements to the County and municipalities and stakeholder agencies.

Priority	Timeframe
High	**< 1 Year**

11. AMR should intensify its efforts to directly communicate at managerial levels with the client (i.e., Yolo County) and municipalities and stakeholder agencies within Yolo County. Heightened communication can improve not only AMR's ambulance operations but relationships with system participants and will aid in constant improvement of system delivery activities.

Priority	Timeframe
High	**< 1 Year**

Receiving Facilities

12. Insure meaningful hospital input into EMS system decisions that may impact their facilities or for actions in which they will be involved in the delivery of care.

Priority	Timeframe
Medium	**1 – 3 Years**

13. Establish a work group representing S-SV, the County, the hospitals, and transport providers in order to create a formalized plan for accessing urgent transportation of patients from Yolo County hospitals to higher levels of care.

Priority	Timeframe
Medium	**1 – 3 Years**

Local EMS Agency

14. Improve communication, collaboration, and involvement by S-SV representatives to address the unique issues within the county.

Priority	Timeframe
High	**< 1 Year**

15. Establish a comprehensive template report on relevant performance measures for Yolo County EMS and produce and disseminate performance information at least on a quarterly basis to the municipalities, the stakeholder agencies and the county representatives.

Priority	Timeframe
Medium	**1 – 3 Years**

16. Work with the County to reconstitute the EMCC with predominant membership to include representatives from all stakeholder groups and to establish standing sub-committees to address day-to-day operational issues and work groups to collaborate in implementing recommendations included in this report.

Priority	Timeframe
High	**1 – 3 Years**

17. Collaborate with County representatives to clearly define MHOAC responsibilities and implement procedures to provide consistent contact and response procedures.

Priority	Timeframe
Medium	**1 – 3 Years**

18. Develop and implement a comprehensive quality management system within Yolo County that includes the collection of agreed upon data points from first responders, the ambulance providers, and the receiving facilities. The results of the quality management performance system should be managed through the quality improvement committees of S-SV but also disseminated to the larger group of stakeholders and governmental officials.

Priority	Timeframe
High	**1 – 3 Years**

19. Evaluate costs of administering emergency ambulance contract, medical direction, quality improvement processes, permitting, and inspections in order to recoup appropriate amounts from the emergency ambulance contractor by imposing additional fees in the amended contract and from other ambulance services through permitting and inspections fees.

Priority	Timeframe
Medium	**< 1 Year**

Yolo County and its Department of Public Health

20. The Health Department should increase communication and participation in a broad range of LEMSA activities.

Priority	Timeframe
High	**< 1 Year**

21. In collaboration with S-SV, the Health Department should develop reporting processes to insure S-SV's fulfillment of its responsibilities and to share EMS system performance measures and activities.

Priority	Timeframe
Medium	< 1 Year

22. The Board of Supervisors should specifically delegate to the Health Officer the responsibility to liaise with, assist, and monitor S-SV performance and compliance with the JPA agreement. The Health Officer should be allowed to designate another individual to perform these functions.

Priority	Timeframe
High	< 1 Year

23. The Board of Supervisors should amend the ambulance ordinance to create permitting and performance requirements for CCT and to ensure that appropriate fees are in place to perform required permitting, administration, monitoring, and inspection.

Priority	Timeframe
High	< 1 Year

24. Collaborate with S-SSV representatives to clearly define MHOAC responsibilities and implement procedures to provide consistent contact and response procedures.

Priority	Timeframe
High	< 1 Year

25. The Health Department should enlist supporters and advocate at the state level for policy changes or legislative initiatives to broaden EMS options for the future. These include:

    - Alternative destinations
    - Treatment and release protocols
    - Community paramedicine
    - 9-1-1 triage to alternative advice lines or care providers

Priority	Timeframe
High	**> 3 Years**

The City of Winters Exclusivity

26. S-SV should collaborate with Winters and the County of Yolo to establish an exclusive operating area for the Winters and conduct a competitive procurement for ambulance services to respond to 9-1-1 emergencies.

Priority	Timeframe
Medium	**1 – 3 Years**

AMR Contract

27. Amend the current AMR contract with S-SV to include clarification of roles and responsibilities and comprehensive performance requirements. A template that could be used to identify the needed changes is the contract between AMR and the County of Napa. This contract was the result of a recently completed procurement process and was accepted by AMR as the successful bidder. Not all provisions are relevant to Yolo County but this would provide a foundation for S-SV to identify potential provisions to include in a new contract. If AMR does not agree to amend the contract, S-SV should consider a competitive procurement for the County's EOA provider.

Priority	Timeframe
High	**< 1 year**

Data Systems

28. Support YECA's acquisition and implementation of a modern CAD system and ensure that the system is capable of computerizing EMD activities and interfacing with the ambulance contractor's CAD.

Priority	Timeframe
Medium	**1 – 3 Years**

29. S-SV should consider acquiring bio-surveillance monitoring and reporting software to be able to mine the data in multiple databases for quality management and system performance monitoring purposes.

Priority	Timeframe
Medium	**> 3 Years**

30. Receiving facilities should implement mechanisms to electronically transfer information to S-SV regarding patient outcome for designated patient types.

Priority	Timeframe
High	**1 – 3 Years**

31. The ambulance service should be required to electronically transfer patient care report information to the receiving facilities in a format that can be incorporated in the patient's electronic health record at the facility.

Priority	Timeframe
Medium	**1 – 3 Years**

Ambulance Rates

32. We recommend that S-SV institute a rate regulation process that allows the contractor to annually increase rates to match the cost of living increases and to apply for additional rate increases in the event something occurs with reductions in reimbursement or increases in costs that are beyond the contractor's control.

Priority	Timeframe
Medium	**1 – 3 Years**

Ambulance Response Times, Requirements and Zones

33. We recommend the creation of three discreet performance areas designated as low, medium and high density zones. We recommend that the high density zones have a 10 minute ambulance response, 90% of the time. The medium density zones have a 15 minute response, 90% of the time. The low density zones should have a 30 minute response, 90% of the time. Penalties for non-compliance with response times should be established for each of the three zones (high, medium, and low density). The response times should be measured monthly.

Priority	Timeframe
High	**< 1 year**

ATTACHMENT D

References Used to Develop Recommendations

FITCH
& ASSOCIATES

Attachment D: Reference Information and Websites

Fitch & Associates, LLC, Consultant Report Prepared for: Contra Costa County EMS Agency, September, 2003

NHTSA, Emergency Medical Services – Agenda for the Future, 2010

HRSA, rural and Frontier Emergency Medical Services Agenda for the Future: a Service Chief's Guide to Create Community support of Excellence in EMS, 2004

Western Eagle County Health Services District, Community Paramedic™ Program Handbook, Fall 2011

EMS1 News, Case study: How and EMS agency tackled frequent fliers, 2/07/2012

LAWS of MINNESOTA for 2011 CHAPTER 12–S.F.No. 119

Bobrowa BJ, Ewy GA, Gordon A. Ewy. Ventilation during resuscitation efforts for out-of-hospital primary cardiac arrest. Current Opinion in Critical Care 2009; 15:228–233

Zavadasky M. Response Time Realities: The Scientific Evidence, EMS Insider, Feb 2012, 39(2):4-5

Eisenberg MS, Bergner L, Hallstrom A, Cardiac Resuscitation in the Community: Importance of Rapid Provision and Implications for Program Planning, JAMA. 1979; 241(18):1905-1907

Newgard CD, Schmicker RH, Hedges JR, et. al. Emergency Medical Services Intervals and Survival in Trauma: Assessment of the "Golden Hour" in a North American Prospective Cohort, Annls of Emerg Med, 2010:55:3:235-246.

Lerner EB, Moscati RM. The Golden Hour: Scientific Fact or Medical "Urban Legend"? Academic Emergency Medicine, July 2001, 8(7): a759-760

Blackwell TH, Kline JA, Willis JJ, Hicks GM. Lack of Association Between Prehospital Response Times and Patient Outcomes. Prehosp Emerg Care 2009:13(4): 444-450.

Stiell IG, Nesbitt LP, Pickett W, et. al. The OPALS Major Trauma Study: impact of advanced life-support on survival and morbidity, CMAJ, 2008:178(9):1141-1152

Stiel IG, Wells GA, Field B, et. al. Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest, N ENGL J MED 2004:351;7: 647-656.

Stiell IG, Spaite DW, Field B, et. al. Advanced Life Support for Out-of-Hospital Respiratory Distress, N ENGL J Med 2007, 346;21: 2156-2164.

Sampalis JS, Denis R, Lavoie A, et al. Trauma care regionalization: a process-outcome evaluation. J Trauma. 1999; 46:565-581.

MacKenzie EJ, Rivara FP, Jurkovich GJ, et al. A national evaluation of the effect of trauma-center care on mortality. N Engl J Med. 2006;354:366-378

Mullins RJ, Veum-Stone J, Helfand M, et al. Outcome of hospitalized injured patients after institution of a trauma system in an urban area. JAMA. 1994;271:1919-1924.

Mullins RJ, Veum-Stone J, Hedges JR, et al. Influence of a statewide trauma system on location of hospitalization and outcome of injured patients. J Trauma. 1996;40:536-545.

Mullins RJ, Mann NC, Hedges JR, et al. Preferential benefit of implementation of a statewide trauma system in one of two adjacent states. J Trauma. 1998;44:609-617.

Demetriades D, Martin M, Salim A, et al. The effect of trauma center designation and trauma volume on outcome in specific severe injuries. Ann Surg. 2005;242:512-519.

Stiel IG, et. al. Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest

Gonzales L, Langlois J, Parker C, Yost D. Combined Interventions May Improve Success When Treating Sudden Cardiac Arrest. PREHOS EMERG CARE 2010;14:22-228

De Luca G, Suryapranata H, Ottervanger JP, Antman EM. Time Delay to Treatment and Mortality in Primary Angioplasty for Acute Myocardial Infarction: Every Minute of Delay Counts, Circulation. 2004:109:1223-1225.

Hacke W, Kaste M, Bluhmki E. et. al. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke. N ENGL J MED 359;13; 1317-1329.

Napa County Emergency Ambulance Service Agreement with AMR (2011)

http://www.emergencydispatch.org/articles/ArticleMPDS(Cady).html
THE MEDICAL PRIORITY DISPATCH SYSTEM-A SYSTEM AND PRODUCT OVERVIEW by Geoff Cady, Consultant and EMT-P
http://www.emergencydispatch.org/articles/positionpaper1.htm Prehospital and Disaster Medicine, Vol. 4, No. 2, October-December 1989 Jeff J. Clawson, MDPosition Paper: Emergency Medical Dispatching, National Association of Emergency Medical Services Physicians
http://www.emergencydispatch.org General EMD Information


FITCH
& ASSOCIATES