

Prepared for
California Emergency Medical Services Authority

Project Report

Health Information Exchange Readiness Assessment/Survey

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1.0 BACKGROUND

The Emergency Medical Services Authority (EMSA) describes its mission as: “The mission of the California Emergency Medical Services Authority is to ensure quality patient care by administering an effective, statewide system of coordinated emergency medical care, injury preventions, and disaster medical response.” One of the factors in ensuring a statewide system of coordinated care is understanding the current landscape of health information exchange (HIE) in the State of California for all EMS providers. EMSA’s goal is to ensure that data systems are positioned for electronic capture of patient data and transmission to the hospital on a “real-time” basis.

The State of California has 33 Local Emergency Medical Services Agencies (LEMSA) across the counties. Within those agencies, there are many subcontracts issued to different EMS providers such as ambulance, fire and helicopter. All are using some version of a patient care record (PCR) and some have started or finished the process of implementing an electronic patient care record (ePCR). The PCR or ePCR is completed when treating a patient who has requested emergency medical assistance or ambulance transport. The paper PCR is often not included in the hospital patient record and the ePCRs typically do not get transmitted electronically to the hospital in a timely manner.

In order to address this “disconnect” between documentation of the emergency services provided and receipt of that information by the subsequent healthcare provider (e.g., hospital), EMSA conducted a survey to obtain information about the current readiness of appropriate stakeholders to electronically document, transmit and/or receive appropriate records of provided emergency services. The project explored the readiness of local agencies, providers, and California hospitals to begin to exchange pre-hospital EMS information with hospitals. It is also aimed at identifying gaps in readiness for HIE. This information can be used to inform stakeholders about strategic directions necessary to achieve health information exchange.

2.0 METHODOLOGY

In order to properly assess the progress with health information technology (HIT) and health information exchange (HIE), a survey was developed and 33 local agencies were identified. The survey included questions to determine an initial baseline evaluation of the agency. Additional questions included a description of current EMS workflow, health information technology usage and exchange processes between the local agency, the field provider, and hospitals. The ePCR readiness assessment included questions for the local agencies and their associated providers (such as Advanced Life Support (ALS) Non-Transport Responders, Emergency Ambulance

Service Providers, and Hospitals) regarding the current status, plans for phased implementation, and expected gaps in:

- EMS Data Systems that are both State EMS Information System compatible and, planned for National EMS Information System (NEMSIS).
- ePCR implementation at the provider level through use of a Field Bridge for “real-time” data collection and transmission.
- Actual Transmission of data to the hospital through a Hospital Dashboard.
- Integration of electronic patient care record (ePCR) data into the hospital EMR/Electronic Health Record.
- Bidirectional HIE exchange from field to hospital.

The first step was to identify and categorize the information needed and questions that would provide opportunity for discussion around barriers, gap and best practices. EMSA provided the following US EMS ePCR Adoption Model as the baseline.

Table 1: ePCR and HIE Adoption Model

Stages	Definition
Stage 7	HIE functional, bidirectional sharing of data between the ePCR and hospital based EHR, business and clinical intelligence.
Stage 6	HIE capable, Transfer of data from the ePCR to hospital based EHR.
Stage 5	HIE capable, Advanced clinical decision support (on-line medical direction) through hospital Dashboard, proactive care management, and structured messaging.
Stage 4	ePCR transmission to Hospital Dashboard, including EKG, available at the hospital, receiving unidirectional information from the field “real-time”.
Stage 3	ePCR entry, computers have replaced the paper chart for “real-time” data entry, clinical documentation and clinical decision support (pre-hospital protocols).
Stage 2	Beginning of a computerized data record (CDR), computers may be at point-of-care.
Stage 1	Desktop access to PCR information entered after the call, multiple data sources.
Stage 0	Paper chart based

From this information, questions were developed to cover the following areas (see Appendix A):

Baseline assessment – using the information in the US EMS ePCR Adoption Model questions were developed to expand on the stage of adoption.

- Use Case: a use case describing the high level process for intake was developed. This was read to the survey participants and several questions were asked about the various steps of documentation.
- ePCR progress: this section covered progress the agencies have made with ePCR.
- Integration of ePCR data into hospital electronic health record (EHR): this section covered the types of data IF integration was in place.
- Bidirectional HIE exchange from field to hospital: patient identifiers, data elements, error reports etc. were discussed with the survey participants.
- Best practices: survey participants were encouraged to share success stories about their implementation as well as information about improvements in quality of care.
- Cost considerations: survey participants discussed budgets and costs associated with ePCRs and HIE.
- Barriers and gaps: survey participants were given several scenarios to convey any gaps or barriers they may have had.

All survey questions were either yes/no, multiple choice, number or type. Many questions were open ended in order to encourage sharing of detailed information that couldn't be conveyed in a yes/no answer.

The first phase of questions was tested at 6 agencies including Los Angeles, Contra Costa, Inland County, Kern, Monterey and San Francisco. Once the testing was complete the survey team regrouped and discussed any necessary changes to the questions.

Findings from the test survey included changing the questions pertaining to the seven stages of ePCR and HIE adoption. The US EMS ePCR Adoption Model status was the first question for participants and it was discovered that each agency had multiple providers and each was at a different stage. The survey was adjusted to include multiple answers so that each provider would be represented. For instance, an agency could have some providers on paper, and some that were transmitting data to a hospital dashboard. That agency could then answer "0" and "4."

When asking the question "Is EMS or trauma data transmitted to CEMSIS (California EMS Information System)?" it was apparent that none of the agencies were able to transmit data to CEMSIS. The question was revised to ask two questions: First, "have you submitted data to CEMSIS in the past?" and second, "are you able to submit to the new version of CEMSIS when available?"

The Use Case questions covered the initial emergency phone call through a patient arriving at the hospital in an emergency situation. These questions created some interesting discussion. Many of the questions were initially phrased in ways such as “Is the patient data transmitted to the hospital prior to arrival?” with “yes” or “no” being the options given. However, the test surveys revealed that most agencies wanted to answer “yes” *and* “no” because some of their providers transmitted data to the hospital prior to arrival and some did not. Also, the agencies had multiple providers where each transmitted in different manners. This set of questions was revised to include multiple answers as well as a comment box.

The initial survey design asked the agency if an ePCR was implemented. The question was posed as a “yes” or “no” with logic in place so if the agency answered “yes” they saw a series of questions about their ePCR and its usage. If they answered “no” they saw a series of questions about whether or not they planned to implement an ePCR. During the testing it was apparent that most agencies wanted to answer “yes” and “no,” given the fact that some of their providers were on an ePCR and some were not. The question was restructured to include comment boxes for each question so that the survey respondents could answer “yes” and “no” and give a description of current progress for each of their ePCR and non-ePCR providers.

One question initially asked the providers to simply state how many providers were currently using an ePCR, but found after the test survey that this omitted how many providers were using paper. A question to cover those providers using paper was added to the final survey.

The initial questions devised for the bi-directional HIE between the hospital and agencies were simple “yes” or “no” answers. Again, the test surveys revealed that most agencies wanted to answer “yes” *and* “no” since they had different providers at different stages of readiness.

Finally, the question of having the ability to transmit data to the hospital was revised to include what type of process an agency would like in place for transmission to the hospital. This allowed the survey to cover those who already transmit and those who do not. Once all of these changes were made to the survey, an email was sent to the remaining agencies letting them know they would receive a phone call to conduct the survey at their convenience.

3.0 FINDINGS

The findings from the survey have been categorized into 9 sections as follows:

Table 2: EMSA Survey Questions for agencies

Report Section	Survey Questions
<p>ePCR Implementation Progress</p>	<p>Describe what level your agency is at based on the 7 levels of EMS ePCR and HIE Adoption Model (more than one option may apply)</p> <p>What is the number of pre-hospital 911 providers using ePCR?</p> <p>What is the number of pre-hospital 911 providers using paper PCR?</p> <p>How many providers are using ePCR out of the total number of providers within your system?</p> <p>Approximately what percent of responses are covered by an ePCR? (the percentage that you are transmitting machine readable data)?</p> <p>Is ePCR implementation in progress?</p> <p>If you do not have an ePCR system, do you have a budget for one?</p> <p>If you do not have a budget for an ePCR, why not?</p>
<p>EMS Data System Compatibility and Gaps</p>	<p>Which softwares are used?</p> <p>Have you submitted data to CEMSIS in the past?</p> <p>Are you currently able to submit data to the new CEMSIS version?</p> <p>Where is your information stored? Cloud based, regional or vendor based?</p> <p>What is the system compatibility between first responders, transport providers, EMS aircraft, other system participants, CEMSIS?</p>
<p>Actual Data Transmission to Hospitals</p>	<p>What type of information is recorded in PCR (ex. EKG, Automatic blood pressures, etc?)</p> <p>Is patient care data transmitted to hospital?</p> <p>If Yes, how is the data transmitted to the hospital? Is it faxed, emailed, submitted directly to the patient record?</p> <p>If No, are you planning on establishing this?</p> <p>If Yes, do you have a time frame for establishing this?</p> <p>If Yes, what is the time frame? (0-12 months, 1-2 years, 3-5 years, >5 years?)</p> <p>Where does PCR go within hospital (i.e.: emergency room, medical records department, etc)?</p> <p>List the number of base or receiving hospitals that the LEMSA (local EMS agency) or provider agency works with:</p> <p>How is pre-hospital emergency request for service received? (9-1-1, 10 digit emergency number, etc.)</p> <p>When the 911 call comes in, how is that information inserted into the PCR? Computer aided dispatch (CAD), paper, etc?</p>

	<p>What equipment is used for PCR documentation (tablet, computer, PDA, other - please list specific device)</p> <p>Is the patient care information transmitted to the hospital prior to arrival?</p> <p>Is the PCR is transmitted, electronically or by fax?</p> <p>Is report completed in field, at the hospital or after completion of the response?</p> <p>Is the PCR included in the hospital medical report at the time patient is turned over to emergency department personnel?</p> <p>As data or picture image?</p>
Integration of ePCR Data into Hospital EHR	<p>Are you integrating ePCR data into hospital EHR system?</p> <p>Type of data now integrated into hospital system</p> <p>Type of data planned on being integrated into hospital system</p>
Bidirectional HIE Exchange from Field to Hospital	<p>Does ePCR interface to Hospital EHRs?</p> <p>Does Hospital data interface to the field?</p> <p>What data elements need to be interfaced?</p> <p>What is/should the process be for the data to interface (i.e. does a program run automatically, is it a manual push that has to be initiated by the field personnel, etc.)?</p> <p>Are standard error reports produced?</p> <p>What is the process for tracking patients (unique identifier)?</p>
Best Practices	<p>Have you seen an increase in productivity since implementing an ePCR?</p> <p>Have you seen an increase in the accuracy of data?</p> <p>Have you seen improved outcomes since implementing an ePCR?</p> <p>Did you have a positive experience with your ePCR implementation?</p> <p>What were some of the positives of the implementation process?</p> <p>What were some of the negatives of the implementation process?</p>
Barriers	<p>Was the training of responders a barrier?</p> <p>Was Change Management a barrier?</p> <p>Were Funding issues a barrier?</p> <p>Was Implementation timeframe a barrier?</p>
Gaps	<p>Is there increased scene or transport time due to documentation completion?</p> <p>Were there other barriers / gaps you would like to discuss?</p>
Cost Considerations	<p>What was the initial cost of the ePCR software?</p> <p>What were the implementation costs?</p> <p>What are the maintenance costs?</p>

Detail data can be found in Appendix B for each county surveyed.

3.1 EPCR IMPLEMENTATION PROGRESS

This section covers survey findings with regards to current ePCR implementation progress for the agencies surveyed. The questions posed to agencies ranged from indicating progress from a list of seven levels of ePCR adoption, capturing numbers for associated agency providers using ePCR or paper, as well as plans for future implementation.

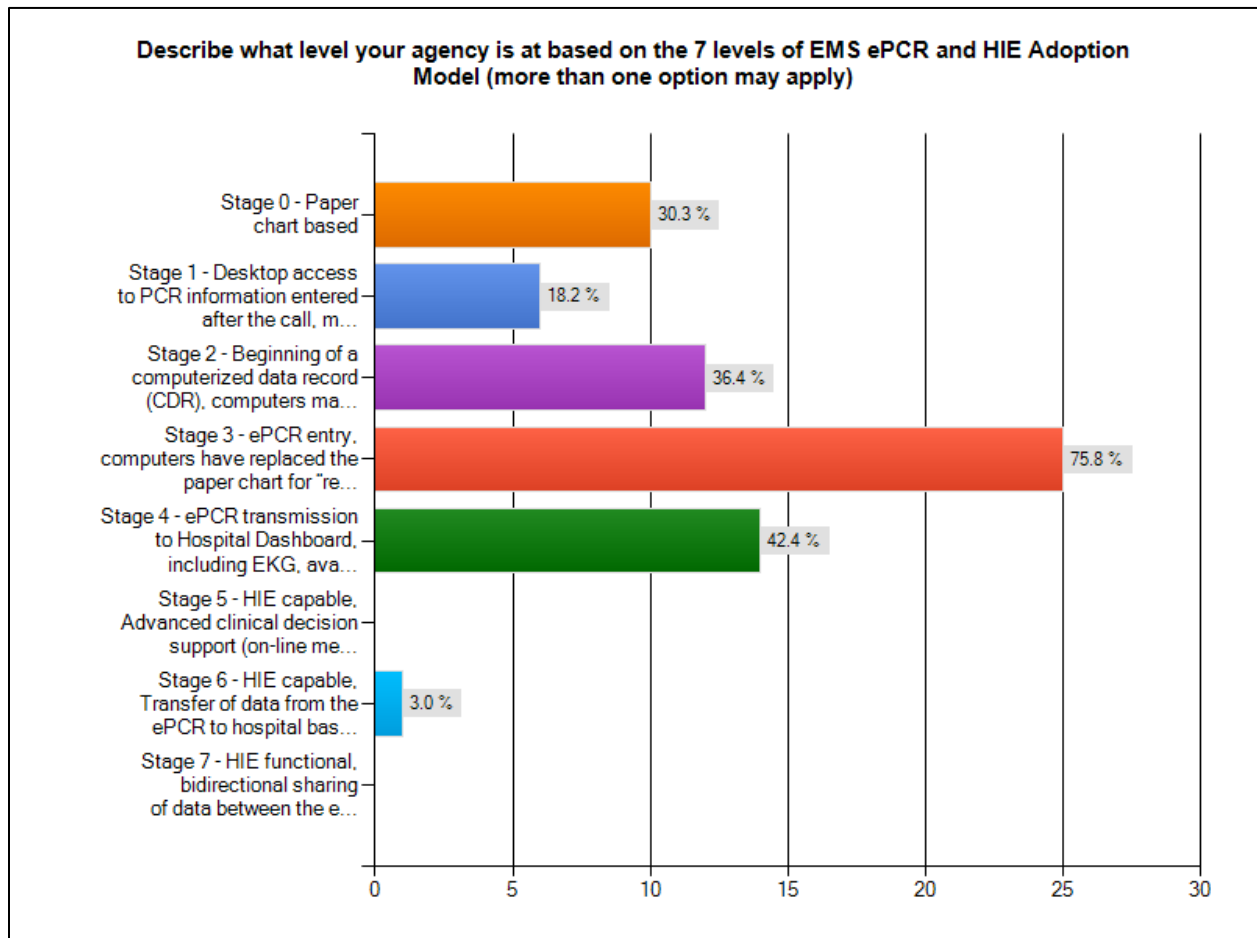


Table 3: ePCR and HIE Adoption Model by County

US EMS ePCR Adoption Model		
Stages	Definition	Current Counties
Stage 7	HIE functional, bidirectional sharing of data between the ePCR and hospital based EHR, business and clinical intelligence.	
Stage 6	HIE capable, Transfer of data from the ePCR to hospital based EHR.	Merced County
Stage 5	HIE capable, Advanced clinical decision support (on-line medical direction) through hospital Dashboard, proactive care management, and structured messaging.	
Stage 4	ePCR transmission to Hospital Dashboard, including EKG, available at the hospital, receiving unidirectional information from the field “real-time”.	Ventura County, El Dorado County, San Joaquin County, Santa Clara County, Solano County, Mountain Valley, Santa Cruz County, Inland Counties, Santa Barbara County, Orange County, Yolo County, San Mateo, Los Angeles County, Kern County
Stage 3	ePCR entry, computers have replaced the paper chart for “real-time” data entry, clinical documentation and clinical decision support (pre-hospital protocols).	Imperial County, North Coast, Contra Costa County, Tuolumne County, El Dorado County, Sacramento County, Coastal Valley, San Benito County, San Diego County, Solano County, Mountain Valley, Santa Cruz County, Sierra-Sacramento Valley, Napa County, Santa Barbara County, Riverside County, Marin County, Northern California, Alameda County, San Francisco, San Luis Obispo, Central California, Monterey County, Los Angeles County, Kern County
Stage 2	Beginning of a computerized data record (CDR), computers may be at point-of-care.	Imperial County, Contra Costa County, Tuolumne County, Coastal Valley, San Joaquin County, Solano County, Mountain Valley, Sierra-Sacramento Valley, Santa Barbara County, Northern California, San Francisco, Los Angeles County

Stage 1	Desktop access to PCR information entered after the call, multiple data sources.	Imperial County, Mountain Valley, Sierra-Sacramento Valley, Santa Barbara County, Yolo County, Los Angeles County
Stage 0	Paper chart based	Imperial County, Contra Costa County, Sacramento County, San Diego County, Mountain Valley, Napa County, Yolo County, San Francisco, San Luis Obispo, Los Angeles County

The agencies were asked which of the seven levels of the ePCR and HIE adoption model (see Table 3) was most appropriate for their current implementation status.

An overwhelming number of agency providers (75.8%) are currently at Stage 3 of implementation, indicating the ePCR is fully implemented but data transmission to the hospital dashboard has not been established. The number of providers at Stage 4 (42.4%) have established data transmission to the hospital dashboard, but are not HIE capable. The group of providers at Stage 2 (36.4%) has started implementing an ePCR but computers have not replaced paper at the response point of care. A number of providers at Stage 0 (30.3%) indicated that they were entirely on paper, and the providers at Stage 1 (18.2%) had access to PCR information entered after the call. Lastly, only one provider (3%) indicated they were at Stage 6, HIE capable with a transfer of data from providers in the field to the hospital.

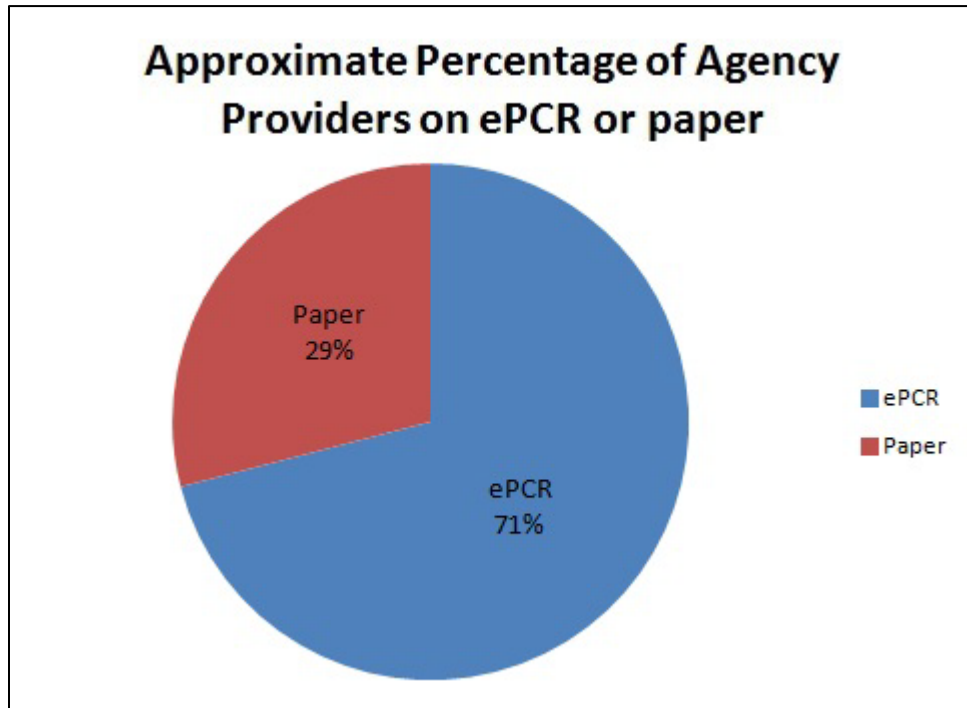


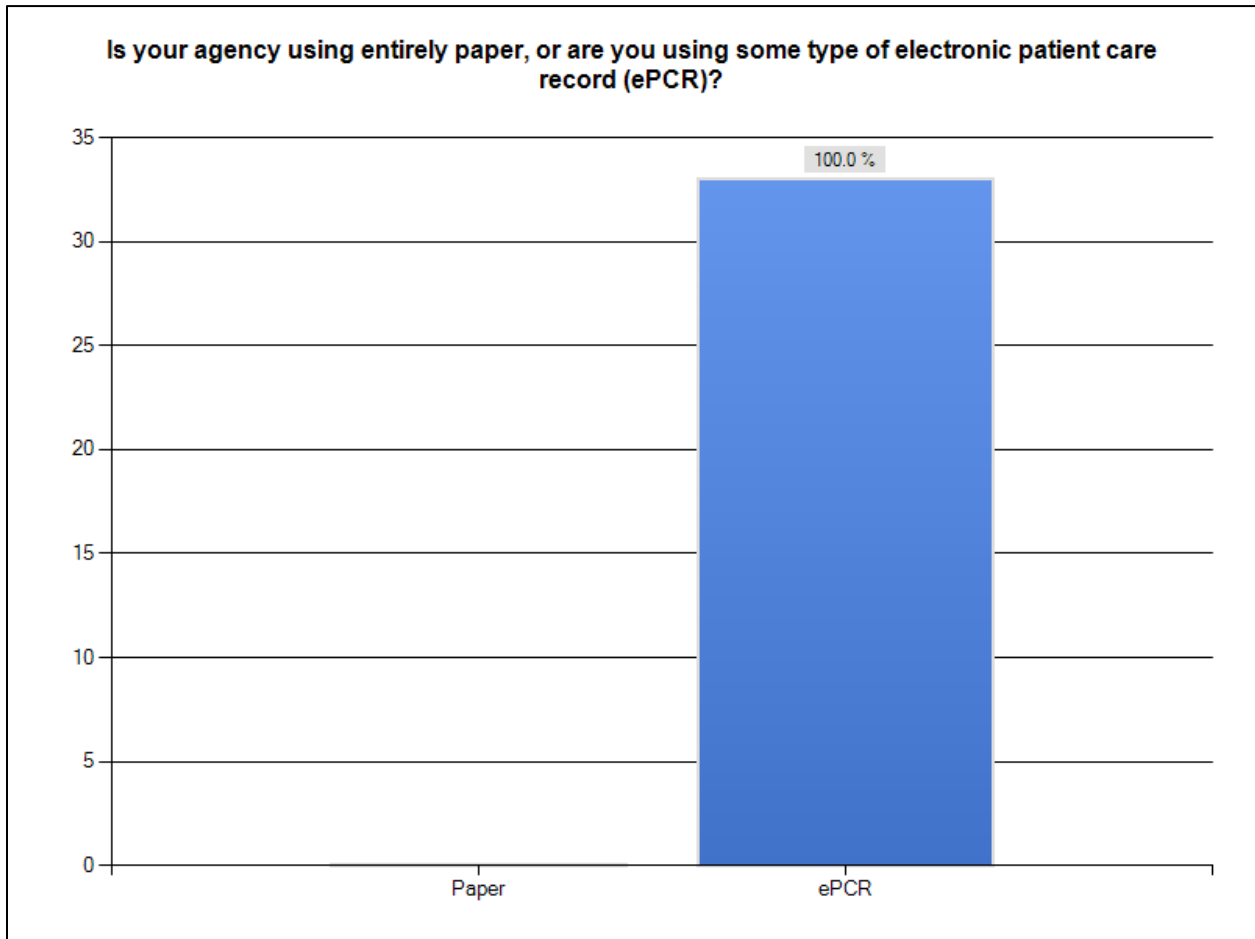
Table 4: Number of EMS Providers on ePCR or Paper by County

County	Number of Providers on ePCR	Number of Providers on Paper
Alameda County	10	0
Central California	15	1
Coastal Valley	17	1
Contra Costa County	7	2
El Dorado County	2	0
Imperial County	4	5
Inland Counties	26	10
Kern County	6	4
Los Angeles County	8	22
Marin County	10	0
Merced County	2	4
Monterey County	9	26
Mountain Valley	13	13
Napa County	6	5
North Coast	10	0
Northern California	17	0
Orange County	14	28
Riverside County	8	0

Sacramento County	4	1
San Benito County	50	0
San Diego County	75	6
San Francisco	3	0
San Joaquin County	8	0
San Luis Obispo	2	12
San Mateo	16	0
Santa Barbara County	6	0
Santa Clara County	12	10
Santa Cruz County	8	0
Sierra-Sacramento Valley	20	3
Solano County	5	4
Tuolumne County	1	0
Ventura County	13	0
Yolo County	1	10

The agencies were also asked how many of their pre-hospital providers were currently live on an ePCR, as well as how many providers were still using paper. Of the 575 pre-hospital providers described by agencies, a large number (408 - 71%) were using an ePCR in some capacity, and the rest (167 - 29%) were still on paper. Agencies such as Merced, Sacramento and Orange County indicated their fire providers were using paper.

When asked what percent of their 911 responses were covered by an ePCR, (the percentage of them are transmitting machine readable data) the combined average response for all agencies was 93%. This would indicate while there is an average of 71% of providers using ePCR in some capacity, a majority of the 911 responses is covered by an ePCR system.



It's also worthy to note that of the 33 counties surveyed, all of the agencies (100%) had at least one provider who had an ePCR implemented. Santa Clara County indicated they had plans to implement an ePCR system for 8-10 more of their associated ambulance providers, although they did not give a budget or timeline for these providers.

3.2 EMS DATA SYSTEM COMPATIBILITY AND GAPS

This section covers survey findings with regards to current ePCR data system compatibility and gaps for the agencies surveyed. In order to capture this information, the survey contained questions to agencies asking for the name of the ePCR software systems, describing how their data is stored, defining their ability to submit data to CEMSIS as well as detailing the system compatibility between agency providers. This data gives the current ePCR systems most commonly used across California and compatibility gaps.

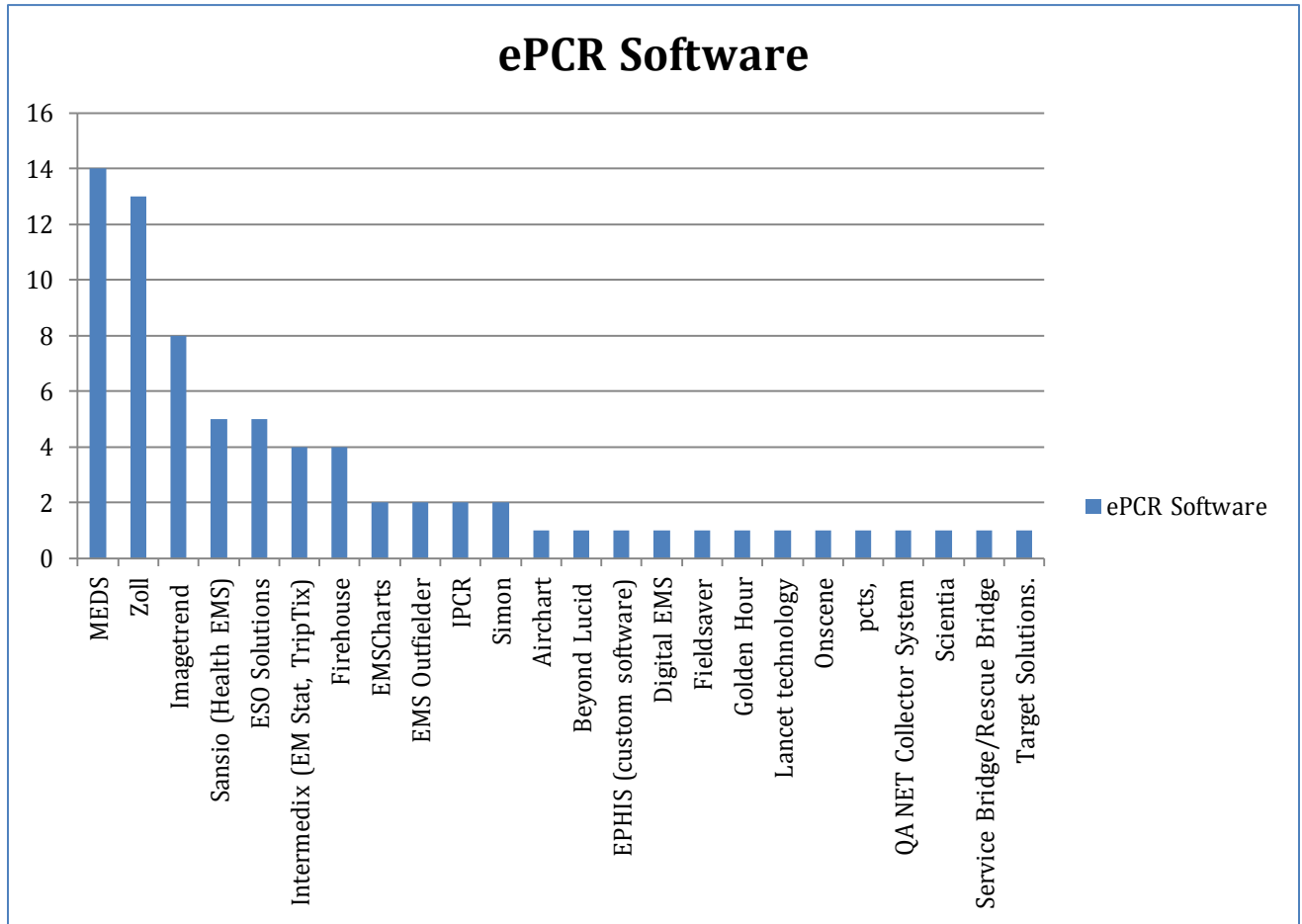


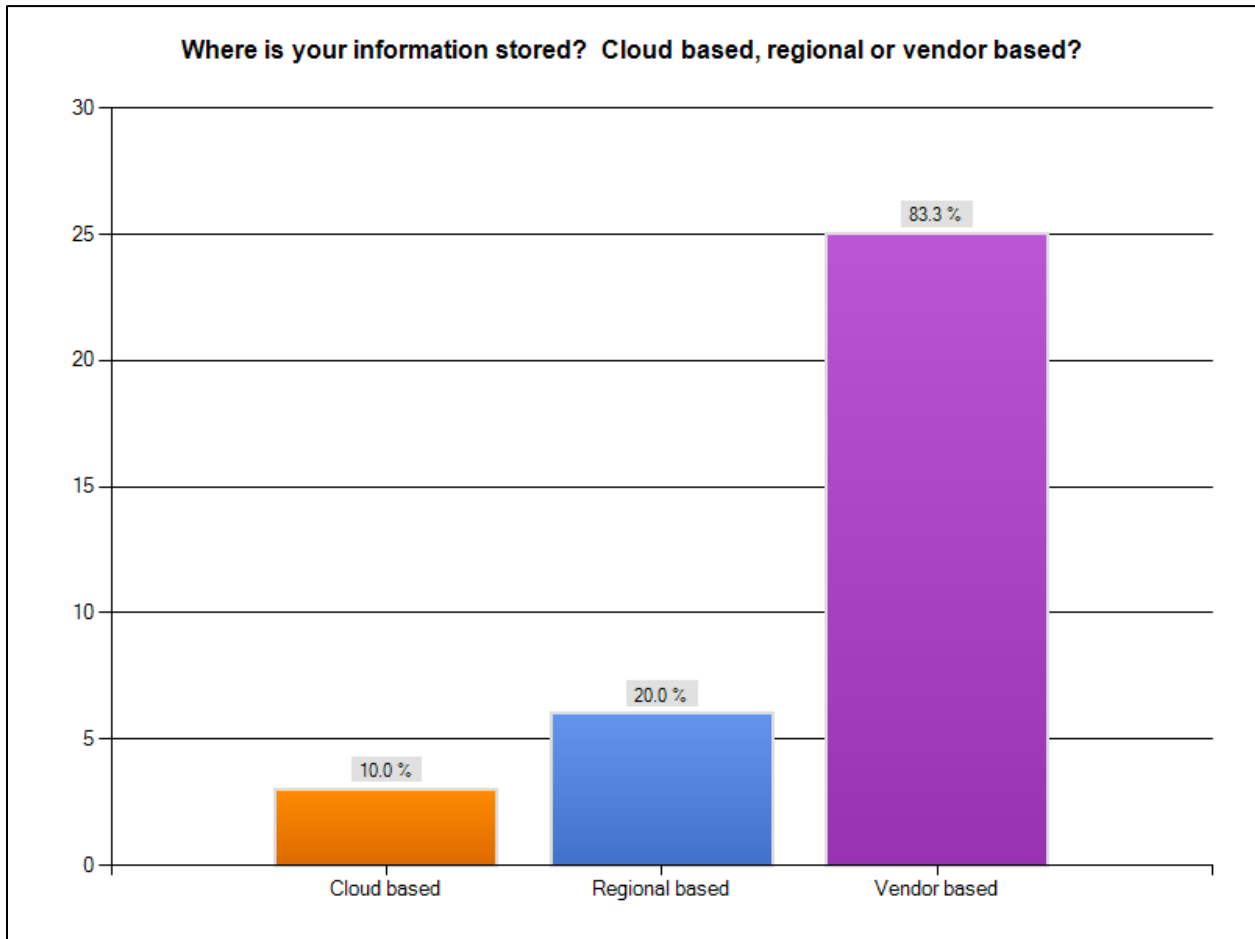
Table 5: ePCR Software Used by County

County	ePCR Software Used
Alameda County	Zoll
Central California EMS Agency	MEDS, Simon, Zoll
Coastal Valley	MEDS, Zoll, Firehouse, Intermedix EM Stat
Contra Costa County	Zoll, MEDS
El Dorado County	IPCR
Imperial County	Intermedix
Inland Counties	ImageTrend
Kern County	Zoll, EMS Charts
Los Angeles County	Sansio Health EMS, Digital EMS, ESO Solutions, Lancet Technology
Marin County	ESO Solutions
Merced County	Sansio Health EMS

Monterey County	MEDS, ESO Solutions
Mountain Valley	MEDS, Zoll, EMS Outfielder, Golden hour, Beyond Lucid, Sansio Health EMS
Napa County	MEDS
North Coast	EPHIS (custom software)
Northern California	ImageTrend, Service Bridge/Rescue Bridge, IPCR, ESO Solutions, Intermedix TripTix
Orange County	Imagetrend, Zoll, Scientia
Riverside County	Sansio Health EMS, MEDS
Sacramento County	Sansio Health EMS, MEDS, Zoll
San Benito County	MEDS
San Diego County	QA NET Collector System, Imagetrend, MEDS, Airchart, Zoll, Fieldsaver, Onscene
San Francisco	MEDS, Zoll
San Joaquin County	MEDS, Firehouse
San Luis Obispo	Simon
San Mateo	MEDS
Santa Barbara County	MEDS
Santa Clara County	ImageTrend, Zoll
Santa Cruz County	ImageTrend
Sierra-Sacramento Valley	ImageTrend, ESO Solutions, Zoll
Solano County	Firehouse, Intermedix EM Stats, Zoll
Tuolumne County	EMS Outfielder
Ventura County	ImageTrend
Yolo County	Fire House, Target Solutions

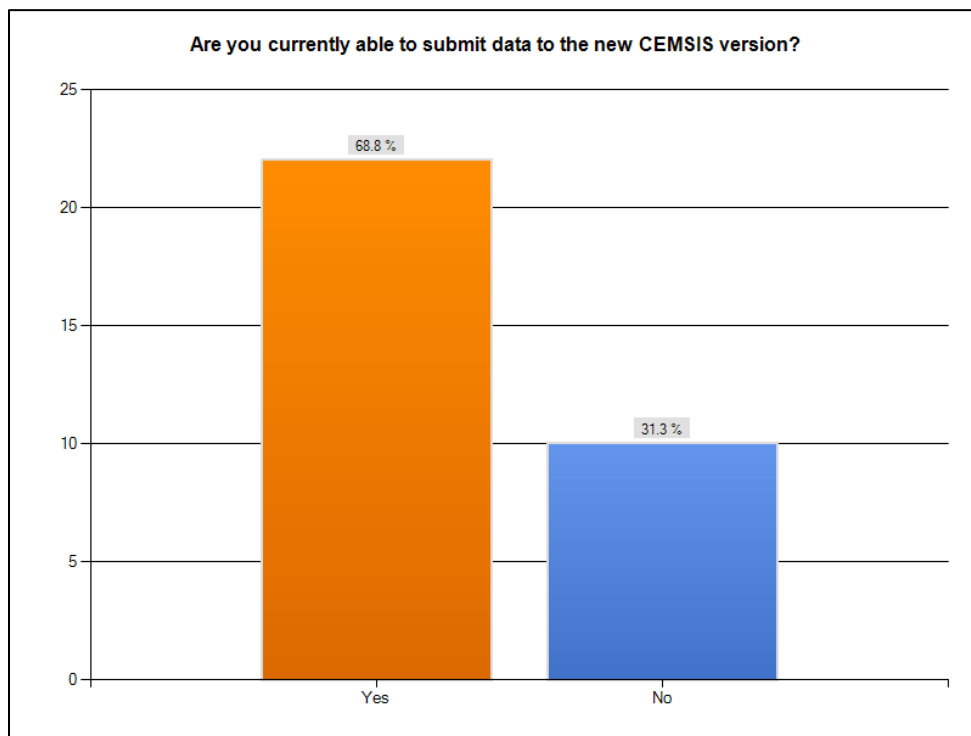
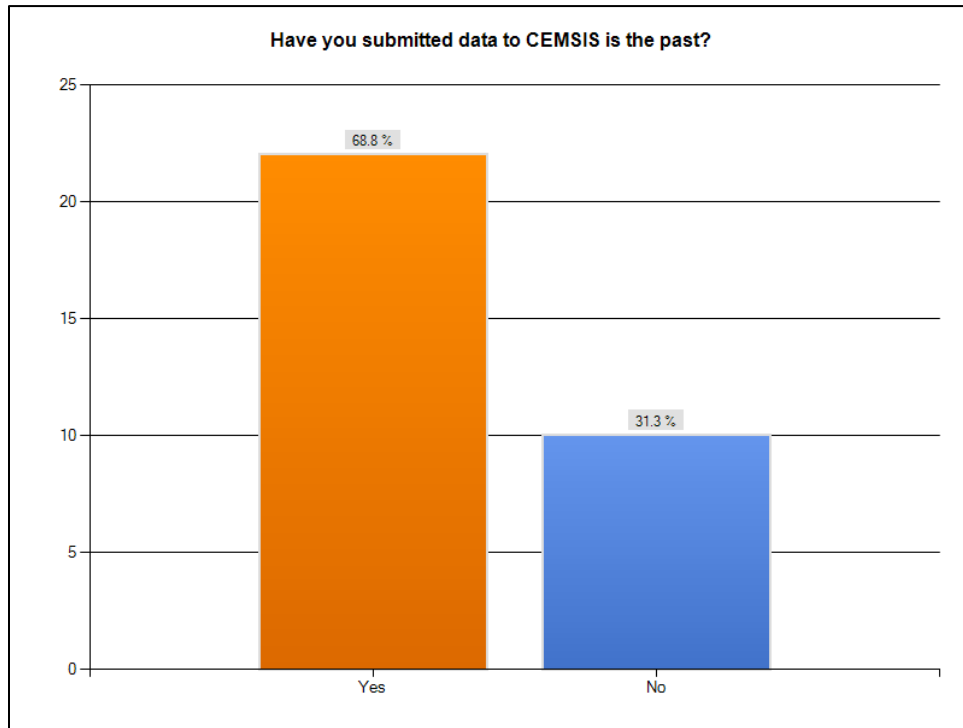
According to the survey, the most common response from agencies was that providers are using the MEDS and Zoll software systems. Other commonly listed software included Imagetrend, Sansio (Health EMS), ESO Solutions, Intermedix (EM Stat, TripTix) and Firehouse. The chart above illustrates the number of times that agencies indicated a software system was used in their county.

A number of agency providers used custom designed systems developed internally such as EPHIS for North Coast County and the QA Collector System for San Diego County. In some cases one agency could be dealing with several different ePCRs across multiple providers. For instance, the survey found that in Sacramento County, one fire provider is using Sansio Health EMS; another is using Zoll while the ambulance provider is using MEDS. In the case of Santa Clara County all providers are on the same system, Imagetrend.



When asked how their data was stored, a large number of respondents indicated data storage was vendor based (83%). The remaining responses indicated storage was regional based (10%) or cloud based (10%). The majority of agencies have data stored by the software vendor.

Agencies also responded with multiple options, indicating that providers in their county used different means of data storage. For instance, Contra Costa county providers using Zoll stored data regionally, MEDS providers stored data at the vendor level and fire providers store data at a single center. A few of the agencies such as San Joaquin County responded that data is housed internally on servers. San Diego County responded that cloud based storage was not an option due to HIPAA concerns. Santa Barbara County indicated that though the data was stored by the vendor, it was replicated on a server within the county.



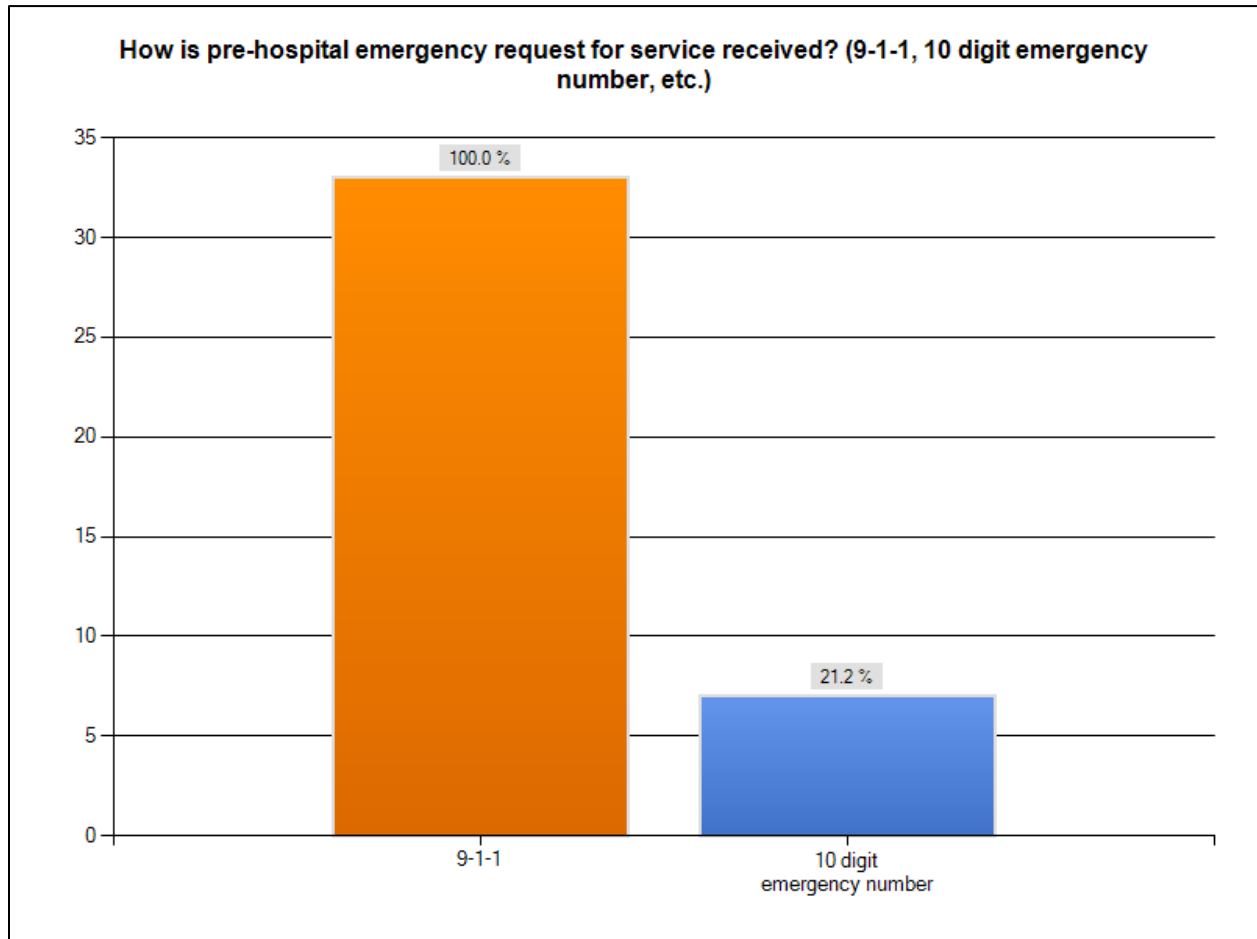
In terms of CEMSIS compatibility, the agencies were asked if they had submitted data to CEMSIS in the past and if they would submit data to CEMSIS in the future. The results for both of these questions came back with the same number of survey respondents (68.8%) indicating they submitted data to CEMSIS and they would be able to submit in the future. Sacramento County responded that a number of their providers are on paper, with only one of their part time ambulance providers submitting to CEMSIS giving a skewed data response for that county.

A number of agencies (31.2%) replied they had not submitted data to CEMSIS in the past and would not be able to submit data to the new CEMSIS version. When asked for reasons they are not able to transmit, agencies such as San Francisco responded that one of their pre-hospital providers is able to submit data to CEMSIS, but it has not been implemented. They are waiting until after the state workshop to plan the implementation. Other agencies such as Santa Barbara responded that they can't transmit at this time, but can once the providers have upgraded their system. Sierra-Sacramento Valley agency said they have not tried to submit data, but they will be able to. Finally, San Diego County indicated they are currently working on any issues that would keep them from being able to transmit to CEMSIS.

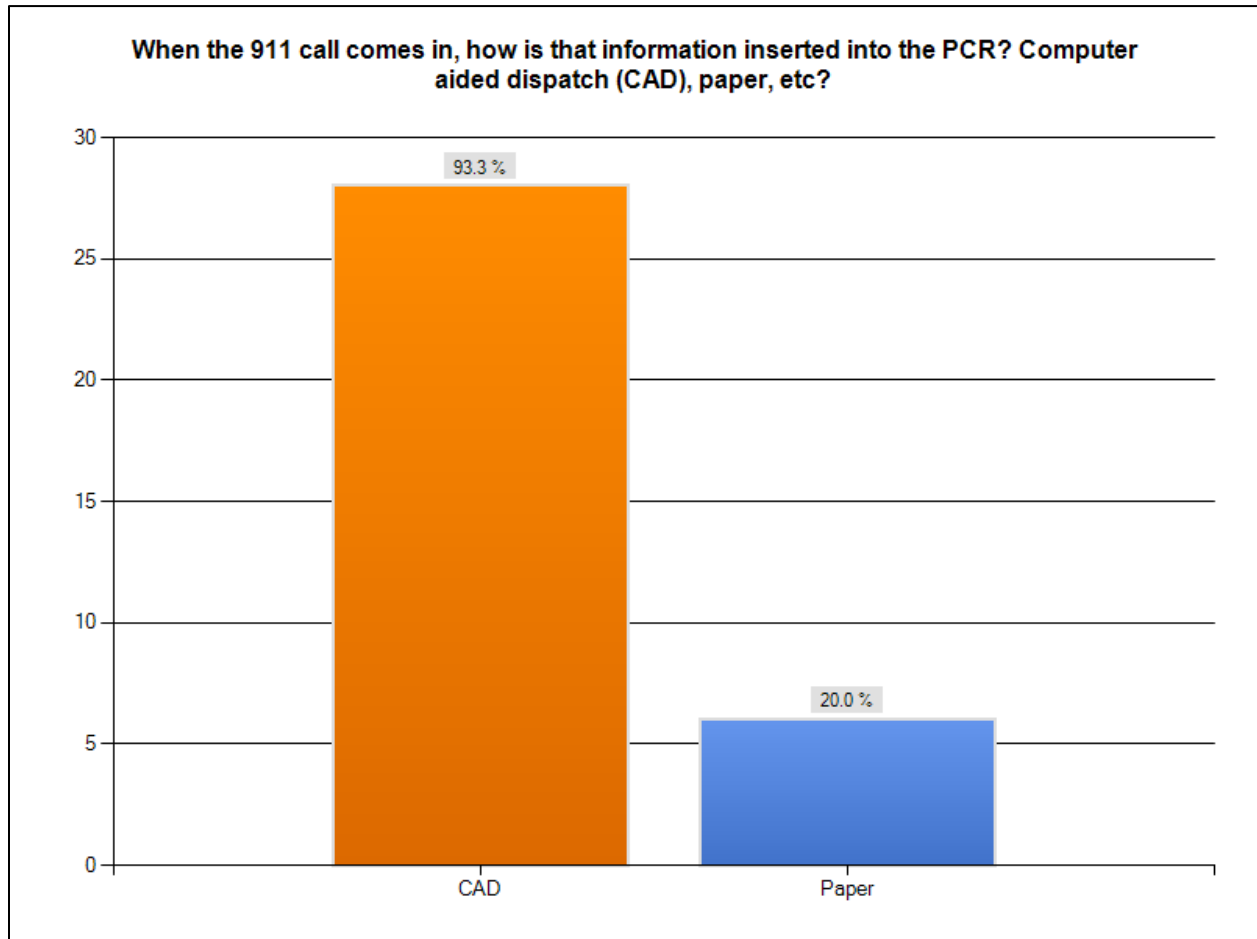
In terms of system compatibility between providers, a majority of survey respondents (60%) indicated they currently have none or limited system compatibility between providers. Most agencies, such as Santa Barbara County cited the reason is a breakdown in communication and most providers use different systems that are unable to communicate. A number of agencies (21%) such as Orange County indicated they were able to mitigate the challenge of system compatibility by having the providers use the same system. Some agencies such as Alameda County indicated that their solution was to have providers upload data to one central database location where reports could be downloaded by other providers in the county. Ventura County indicated that reports could be transferred from one provider to another because the data was cloud based.

3.3 ACTUAL DATA TRANSMISSION TO HOSPITALS

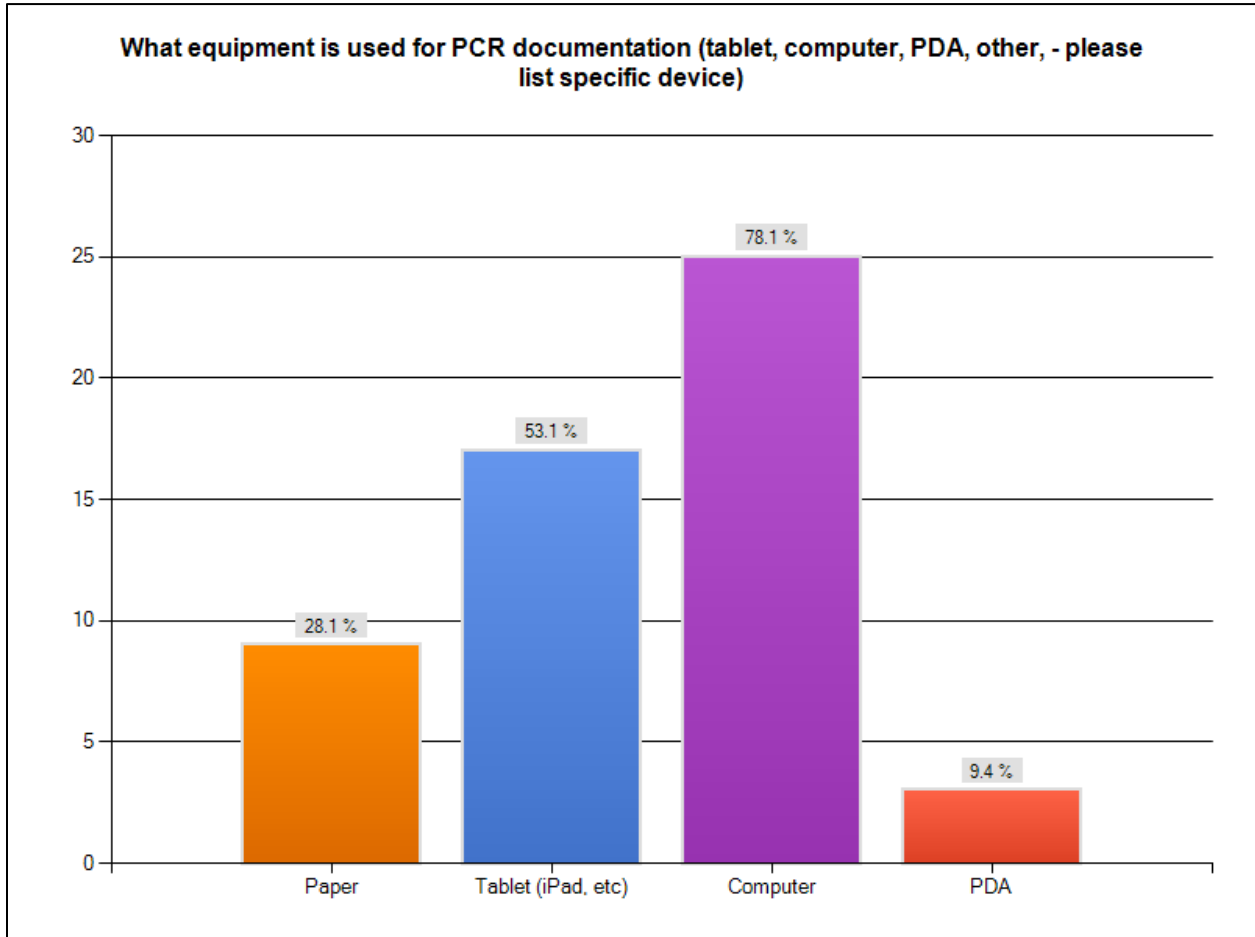
This section covers survey findings with regards to current capabilities for data transmission to hospitals. In order to report on this information, the survey contained questions that captured a typical use case for an agency – starting from how the 911 information is captured, what sort of information is captured, and finally how is that information transmitted to base and receiving hospitals. These survey responses show the current processes in place for data transmissions between agency providers and associated hospitals.



When asked about how the initial request for service is received, all of the responding agencies (100%) indicated it was through a 911 call. 21.2% indicated the request could also be received through a 10-digit number. Santa Clara County responded they had a direct line to PSAP and 911, with a cellular transfer that tracks location as well.



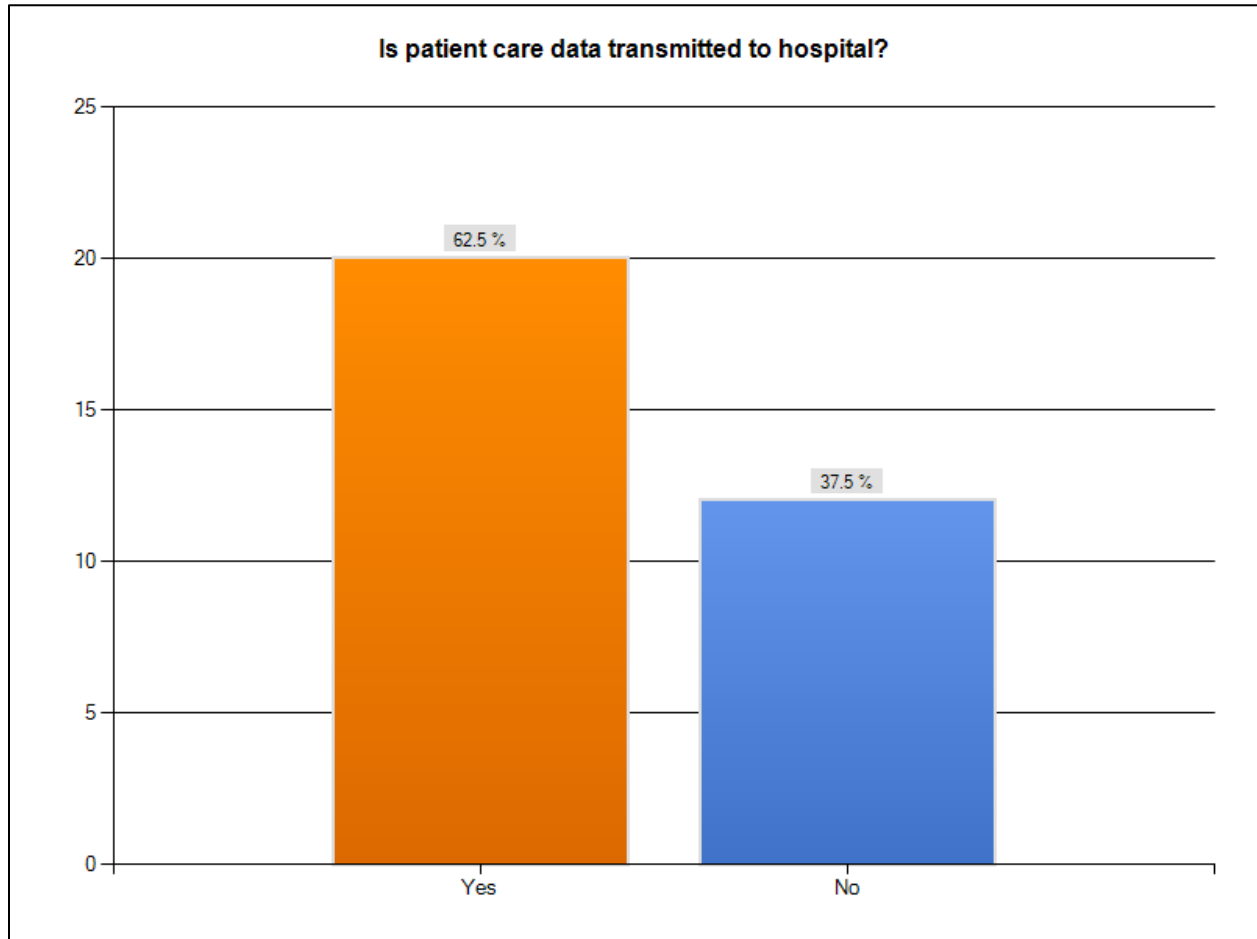
The majority of survey respondents (93.3%) insert the request information into the ePCR through a Computer Aided Dispatch (CAD) system. A number of agencies (20%) state the information could also be captured manually. Ventura County responded that when the call comes into CAD, the information is pushed to Imagetrend. A number of agencies such as Mountain Valley, Sacramento and Los Angeles indicated that within their county some providers use CAD and some use paper.



The agencies were asked what method is typically used for capturing information for response documentation. A majority (78.1%) responded that a computer (desktop or laptop) was used. The second most common device used (53.1%) was a tablet such as iPad. 28.1% capture PCR information on paper and 9.4% use a PDA for data capture. Riverside County indicates that Panasonic Toughbooks are used, while some departments enter information after response in a desktop computer.

When asked about the type of information is captured in a typical ePCR or paper PCR, 93% of survey respondents cited EKGs, Vitals and Automatic Blood Pressures. Agencies additionally capture information such as paramedic impression, chief complaint, treatment procedures rendered, response to treatment, location, times, patient narrative, patient billing information, demographic information and medications used. Of interest, Tuolumne County indicated that at their agency the EKG is not electronically recorded, but entered with a code. Santa Cruz County indicated they do not capture EKGs or race information. In addition to commonly captured data, Riverside County also captures a code summary if a patient has a full cardiac

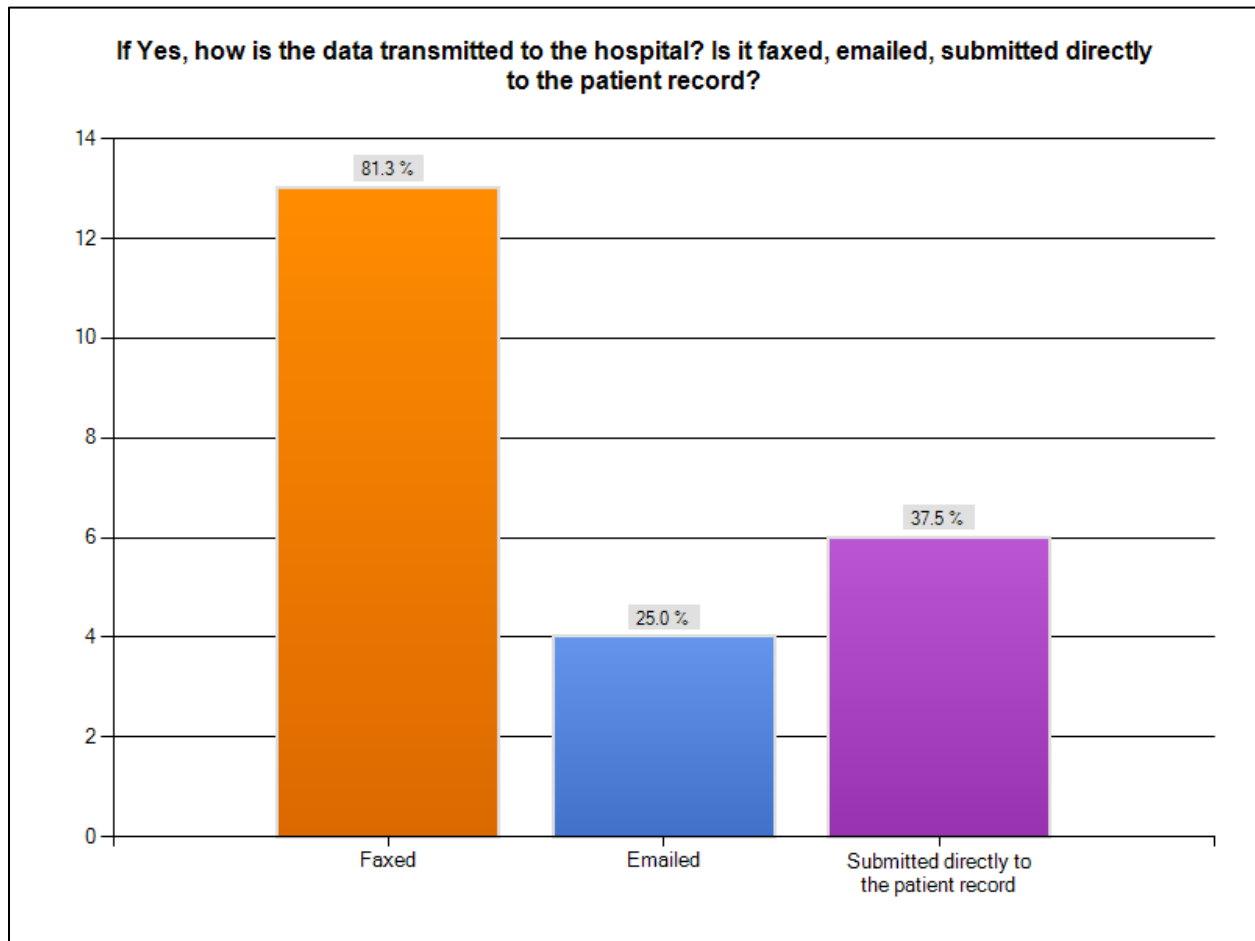
arrest, waveform capnography (CO2 expired from patient), and transmits this data to hospital as well in real time.



A majority (62.5%) of the agencies indicated the patient care data was transmitted to the hospital. The remaining agencies (37.5%) indicated that patient care data was not transmitted to the hospital directly. Most agencies that indicated they did not transmit data to the hospital, such as Imperial County or Mountain Valley stated that the paper report was sent by fax or handed off to the practitioner by hand. Contra Costa County responded that they have a separate system for transmitting EKGs only to the hospital emergency room. Agencies such as Santa Cruz and Orange County indicate that the hospital can login to an online server and download the patient care data themselves.

When the agencies that did not transmit patient care data were asked if they planned to establish a data transmitting system, an overwhelming number (90%) said that they did. When these agencies were asked if they had a timeline in place for this implementation, a large

number (81.8%) indicated they did not. Agencies such as Imperial County and Coastal Valley indicated that while interest is there, cost is prohibitive and once the funding was available they would establish a timeframe. Central California EMS indicated that while they would like to establish a system, the roadblock is the hospital concern about HIPAA compliance. Orange County has established a timeframe with a five phase implementation plan over three to five years. The final step will be HIE. Sierra-Sacramento and Merced County have an implementation timeframe of one to two years.

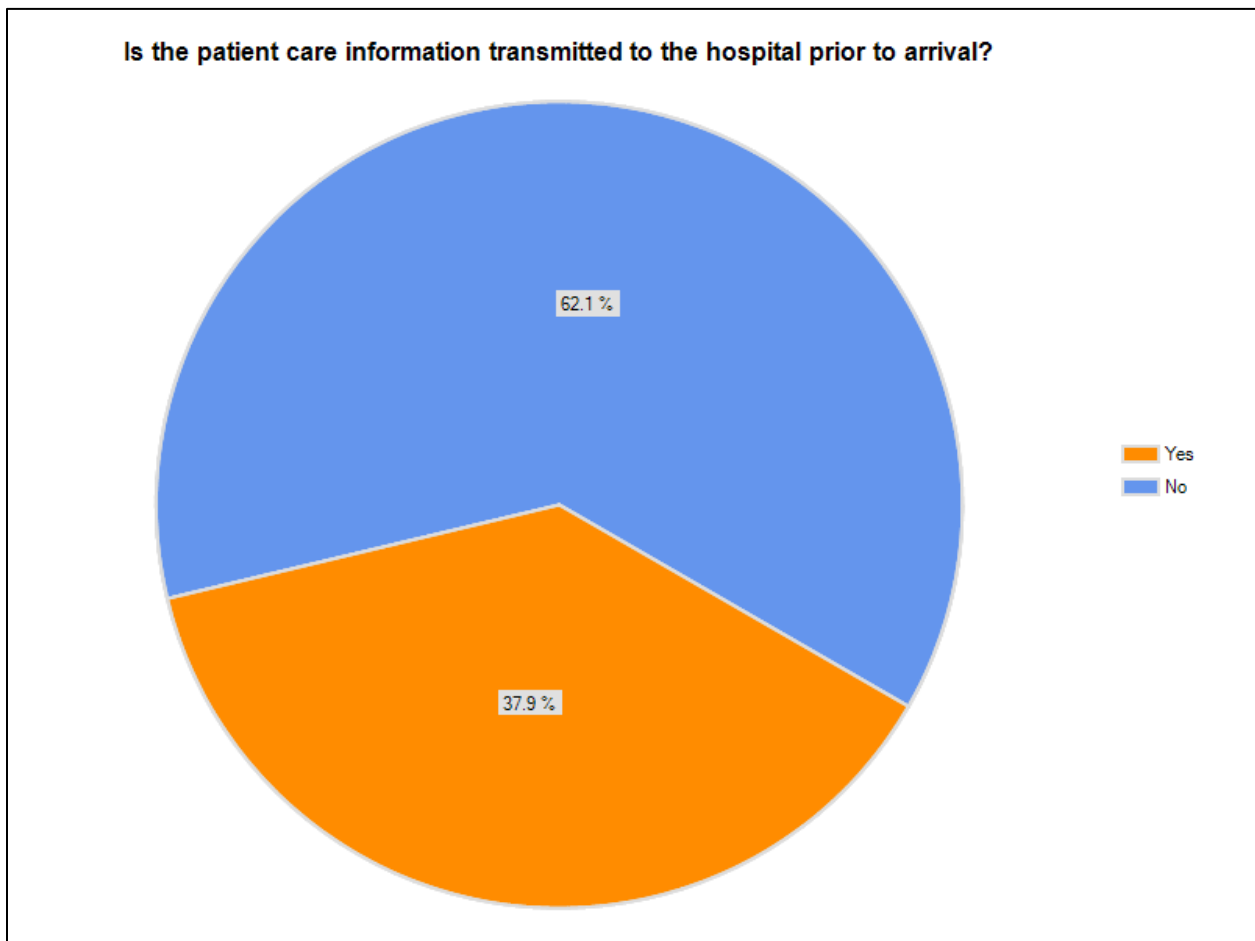


For the providers who can submit patient data to the hospital, 81.3% indicated it was faxed, 25% responded it was emailed and 37.5% said it was submitted directly into the patient record. A number of agencies gave alternate methods for submission. Napa, San Francisco and Sacramento responded the patient care record is hand delivered to the emergency department. Ventura, El Dorado, San Benito, San Diego, Santa Cruz, San Mateo Los Angeles and Riverside Counties indicate the hospital can login to an online server and download the report as needed.

Contra Costa County responded that the patient care data goes to the emergency room via a cellular transmission through a separate program that runs directly to the hospital.

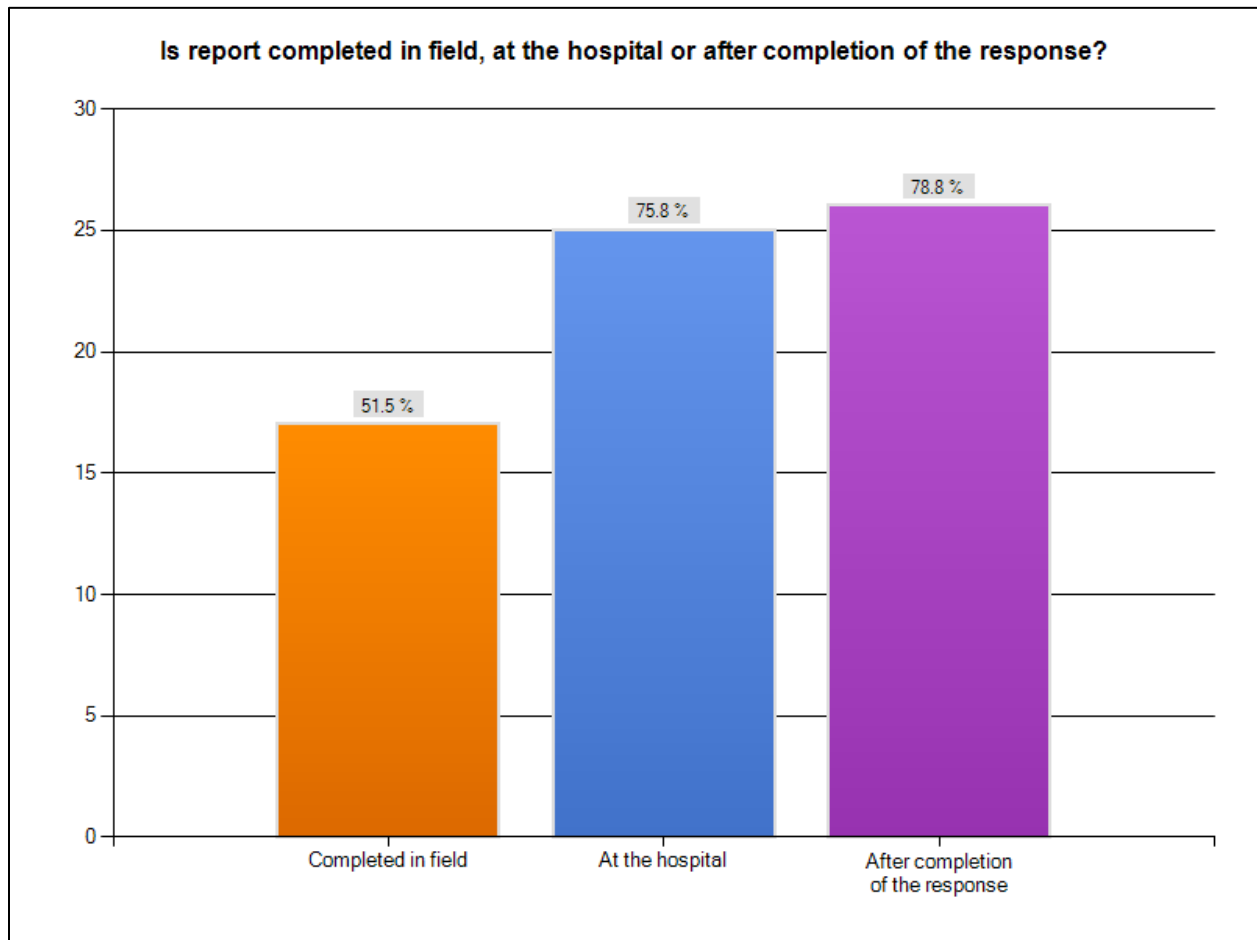
When asked where the patient care record goes within the hospital, all survey respondents (100%) indicated the emergency room. In addition, 27.8% of agencies state the report goes to the medical records department as well. A number of agencies such as Contra Costa, Napa responded that a report copy was printed out at the hospital and left at the emergency room.

The agencies were asked to indicate the number of base and receiving hospitals they work with. After examining the captured data, it appears that agencies work with an average of 3 base hospitals and 11 receiving hospitals. Often, in cases such as Yolo County, the agency works with one base hospital in county with six other receiving hospitals located out of county.



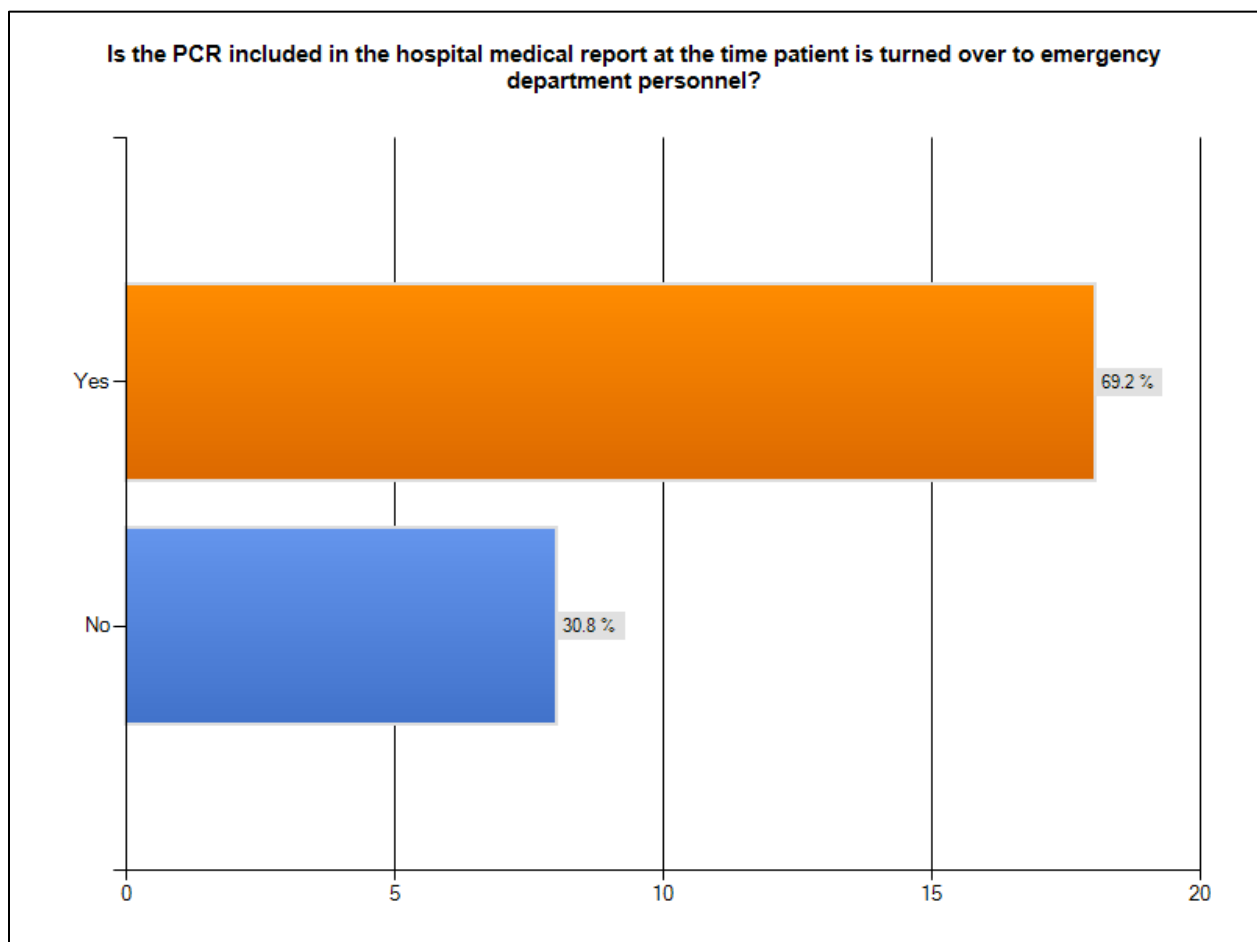
The survey asked the agencies if patient care information was transmitted to the hospital prior to arrival. A majority (62.1%) responded data records were not sent prior to arrival. 37.9% of

agencies indicated they had capability to transfer data prior to arrival. When asked how the patient care information is transmitted to the hospital, all agencies responded that it was sent electronically. 28.6% indicate the report could also be sent by fax. San Diego County indicates that for all base contacts, a radio is always used. Northern California responded that phone or radio is used to send information prior to arrival. Santa Clara County indicated once the current solution is completed, the data will be automatically transmitted to the hospital. San Mateo and Solano County transmits just the EKG prior to arrival. For Santa Cruz, the documentation is available to the hospital on the internet as soon as it is inserted. Riverside County responded that the capability is there but point of care devices for the field has to be distributed. This system is currently being beta tested at one hospital.



The agencies were asked if the patient care report was completed in the field, at the hospital or after the completion of the response. The response was divided evenly, indicating that the report is still in process of being completed throughout a typical response. There was a slight

majority (78.8%) to those stating the report was completed after the response. 75.8% claimed it was completed at the hospital and 51.5% stated it was done while still in the field. Santa Clara County stated one phase was done at the patient side and the final report was completed at the hospital. They also state that fire providers often finish the report after the call. Mountain Valley indicates that their agency policy is to have the report finished within two hours of the response. For Alameda County, the transport provider is fined if the report is not left at the hospital so the report is completed throughout the transport process.



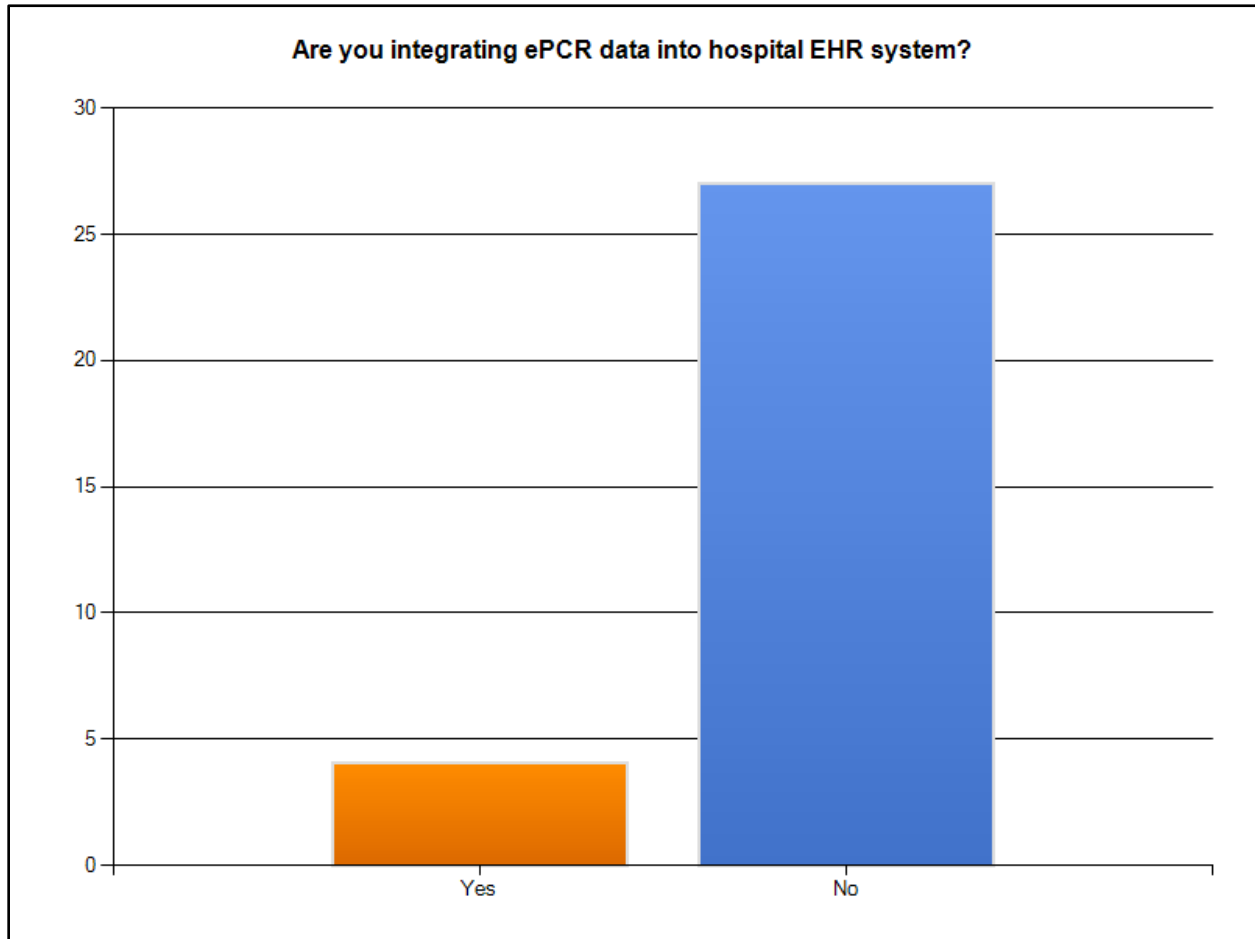
When asked if the ePCR or paper PCR report was included in the hospital medical report at the time the patient is turned over to the emergency department personnel, a majority of agencies (69.2%) responded that it was included. 30.8% indicated the ePCR or paper PCR was not included with the hospital report. Santa Clara, Contra Costa and Marin County responded the current practice is to complete the ePCR, print out a paper draft copy and include it when patient is delivered. The hospital puts the report copy in the patient record at this point.

Tuolumne and Monterey County state an interim report is delivered, with the final report given to the hospital when the provider gets back to the station. There are often time restraints imposed on the delivery of the patient record to the hospital. In San Benito County, the report is delivered within 24 hours. In San Diego, the report is expected to be included when patient arrives or minutes after. Napa County states that often the report is delivered with when patient turned over, but it is not the completed report – the ePCR exported from MEDS is often not seen as “doctor friendly” and the hospitals prefer the paper worksheets that are printed from the ePCR system.

The agencies were also asked what report format is given to the hospital at the time of patient delivery. A majority of survey respondents (66.7%) indicated the report was given as a picture image. 33.3% state the report is sent to the hospital as data. Several agencies such as Contra Costa, Tuolumne Sacramento, Merced, Napa, Alameda, San Francisco and Central California EMS County state that the report is given as a paper copy. Los Angeles, Orange, Marin, Monterey, Santa Cruz and Santa Clara Counties indicate the report is given as a PDF.

3.4 INTEGRATION OF EPCR DATA INTO HOSPITAL EHR

This section covers survey findings regarding the integration of data between the agency ePCR and the hospital EHR system. In order to report on this information, the survey contained questions that captured the current agency status for data integration, the type of data currently integrated, as well as any planned data integration. These survey responses give an overview for the current progress of data integration between hospitals and agencies.



Agencies were asked if they were currently integrating ePCR data into the hospital ePCR system. The majority of survey respondents (87%) indicated they do not integrate ePCR data into the hospital EHR system. Of those that do not, three agencies including San Diego County are currently working on implementing a system; three agencies including Solano and Santa Barbara are partially integrating data; and four agencies including Imperial and Merced County have the data integration process in their future plans. Mountain Valley commented that up to this point the hospitals have been unwilling to let the agency link in to their system. Santa Clara County said that while they are working towards HIE, the hospital system is using Epic which is a difficult system to interface with.

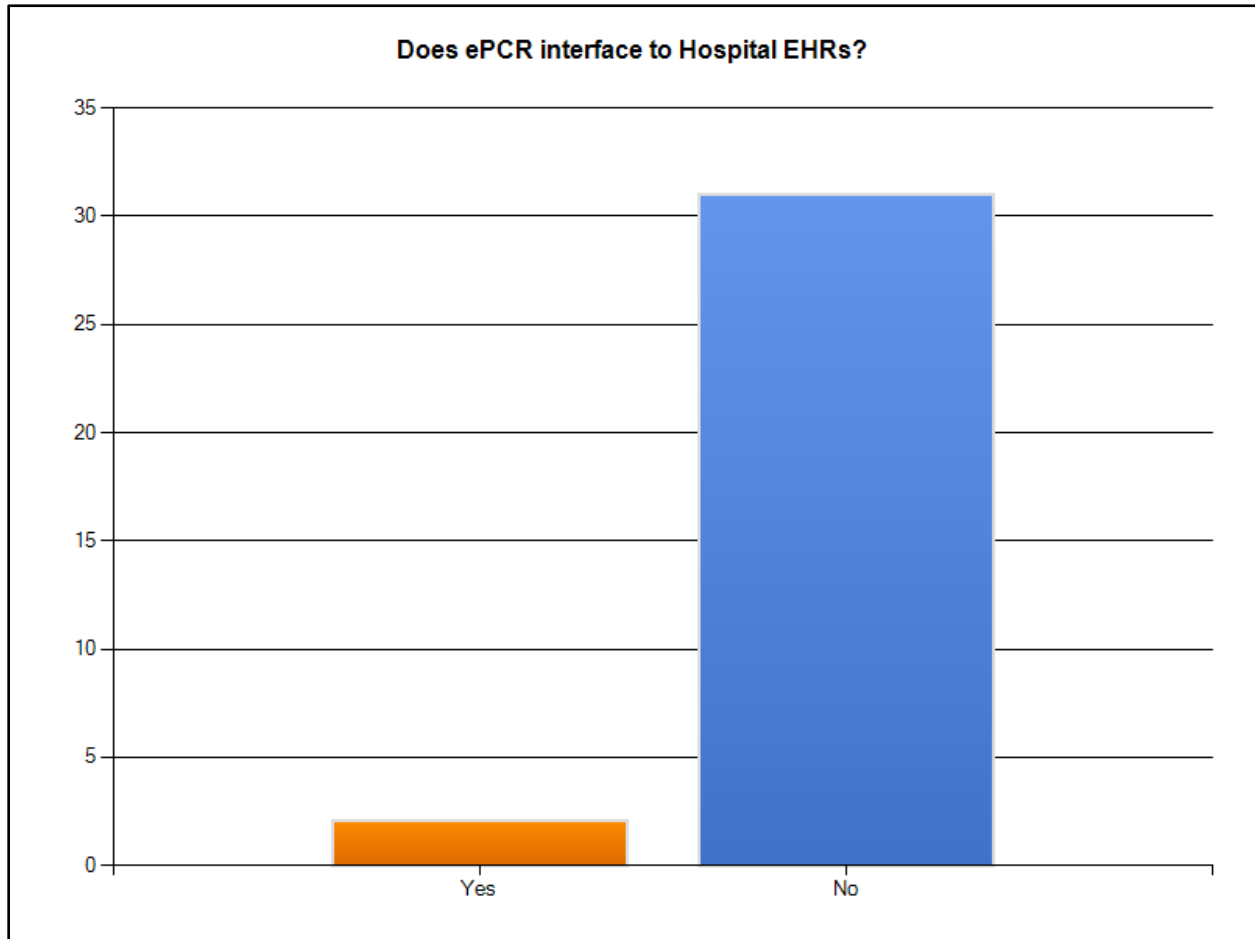
Agencies who are integrating their ePCR data into the hospital EHR system were asked which types of data are included in the current integration. Agency responses included NEMESIS trauma data, EKG, patient demographics, STEMI, stroke, trauma and response time

information. Santa Barbara County replied that the full patient care record is attached as a trailing document to the hospital EHR.

The agencies that do not integrate ePCR data into the hospital EHR system were asked what sort of data they plan on integrating. The majority of these agencies (12) indicated they would like the entire ePCR data transmitted and integrated with the hospital system. Several agencies such as Marin County said conceptual discussions are ongoing, while North Coast EMS indicated that they are waiting for the State of California to tell them what type of data should be integrated.

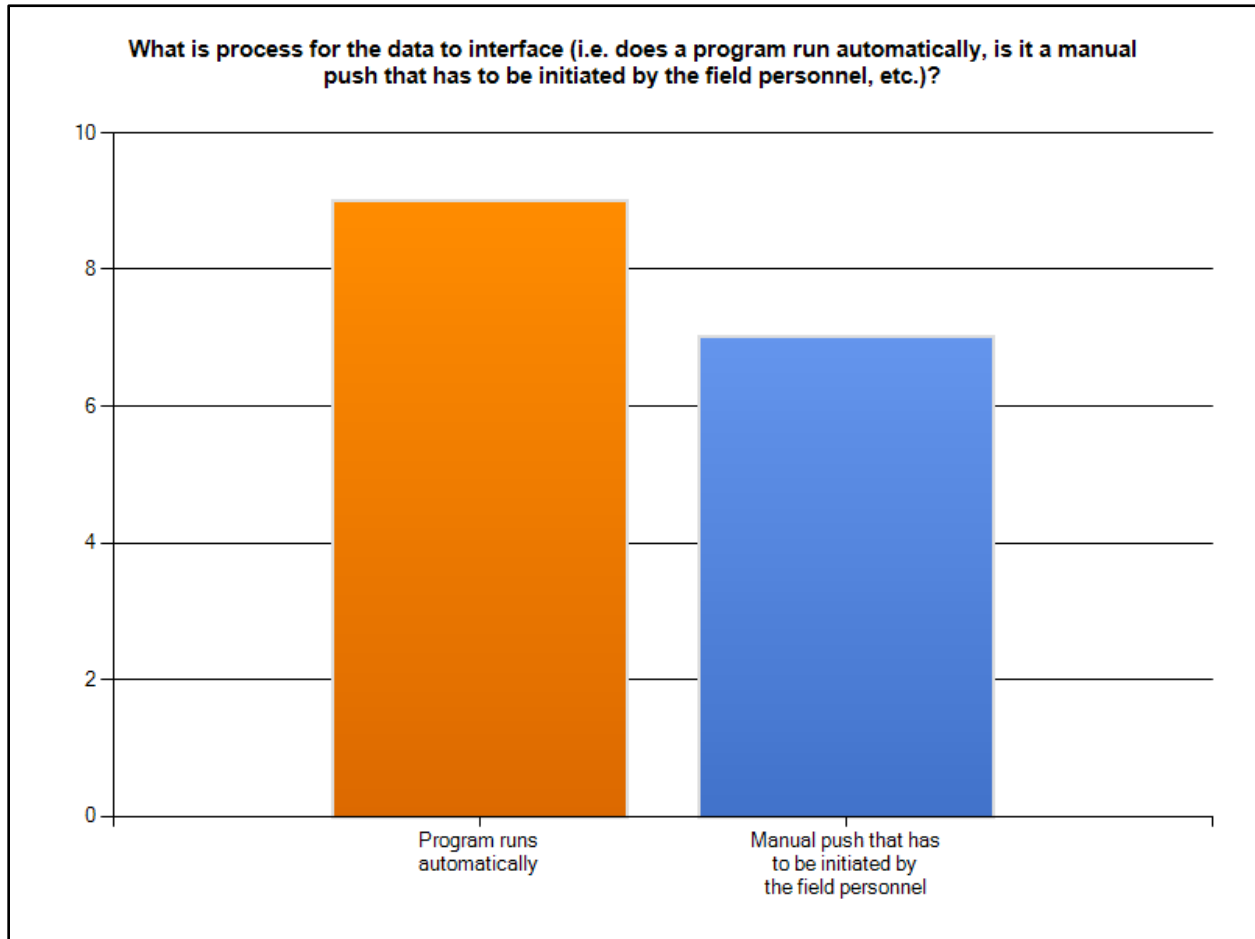
3.5 BIDIRECTIONAL HIE EXCHANGE FROM FIELD TO HOSPITAL

This section contains survey findings for the current progress for a bidirectional HIE exchange between agency providers in the field and their associated hospitals. In order to report on this information, the survey contained questions that captured the current status for the ePCR interfacing to the hospital, the status for the hospital data interfacing to the field, the type of data integration and interface processes that agencies would like to see in place, the current process in place for standard error reports as well as the current unique patient identifier in use by agency providers. These survey responses show the current progress for a bidirectional HIE exchange between hospitals and agencies.

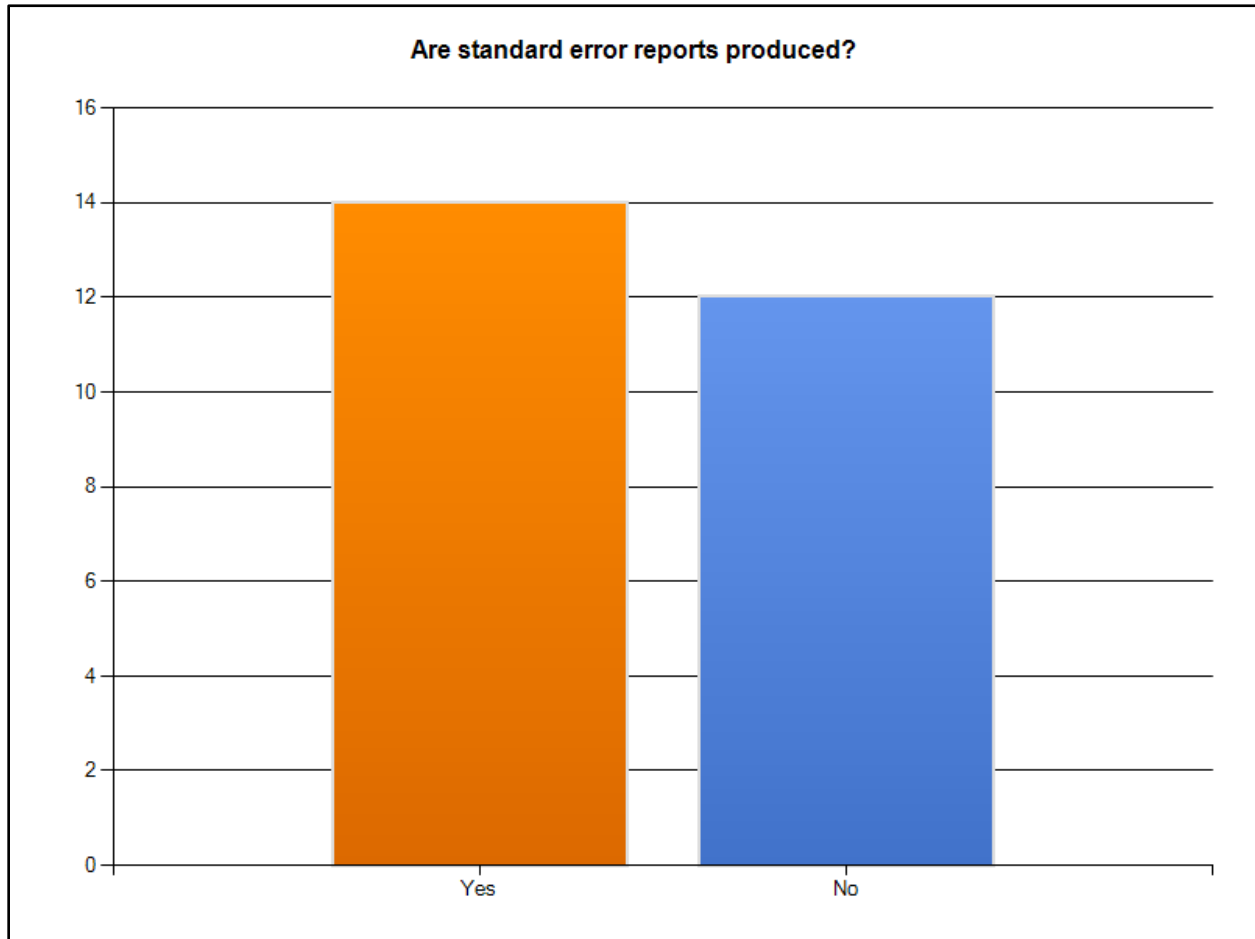


The agencies were asked if their ePCR currently interfaces to Hospital EHRs. A majority of agencies (94%) indicated that the ePCR does not currently interface with hospital systems. When asked if the hospital EHR data interfaces to providers in the field, all agencies (100%) replied that they did not receive data from the hospitals.

When asked what data elements needed to be interfaced between the ePCR and the hospital EHR, the most common response was that patient outcomes and discharge data were needed. Other agencies such as Monterey County would like demographic information, vital signs and patient history including medications. Los Angeles and Merced Counties responded that the entire ePCR record including all data points should be integrated. San Mateo indicated that there should be enough data integration to ensure unique patient identification. Santa Barbara County said that data integration should include time sensitive data related to service for specialty care.



Agencies were asked when the data is integrated between the hospital and the ePCR, should this interface occur automatically or should it be initiated by a manual push from the field personnel. Slightly more than half (56.25%) of the survey respondents answered they would like a program that runs automatically. Sacramento County indicated that it would depend on whether or not the report is done right; only closed patient care reports should be available to hospital so that drafts wouldn't be seen by hospitals. Conversely, Santa Clara County responded it should be automatic since there is a need to take the human element out of the process. Napa County indicated the process should be manual because they don't want the report sent until the respondent is ready to send. Orange County answered that the process should be done manually by field personnel because reports are completed over the course of care for the patient and could change during treatment. For example, the provider could have a John Doe and learn the name during treatment. San Francisco was concerned that the process should be HIPAA compliant and protected and the process shouldn't be automatic in order to protect data.



Slightly more than half (54%) responded that error reports were produced from the current ePCR. Sacramento County indicated two error reports were created by their system; Invalid entry in field (validation reports), as well as invalid relationship between values within separate fields. Two different errors are tracked by their system and both kinds of validations are performed on aggregated data out of Inspironix. San Benito County indicated they have trouble getting reports from the hospital due to IT security. Orange County has 100 different validation rules in place to determine whether or not a report has been completed accurately. For Alameda County, fines are in place for leaving data points incomplete in a report.

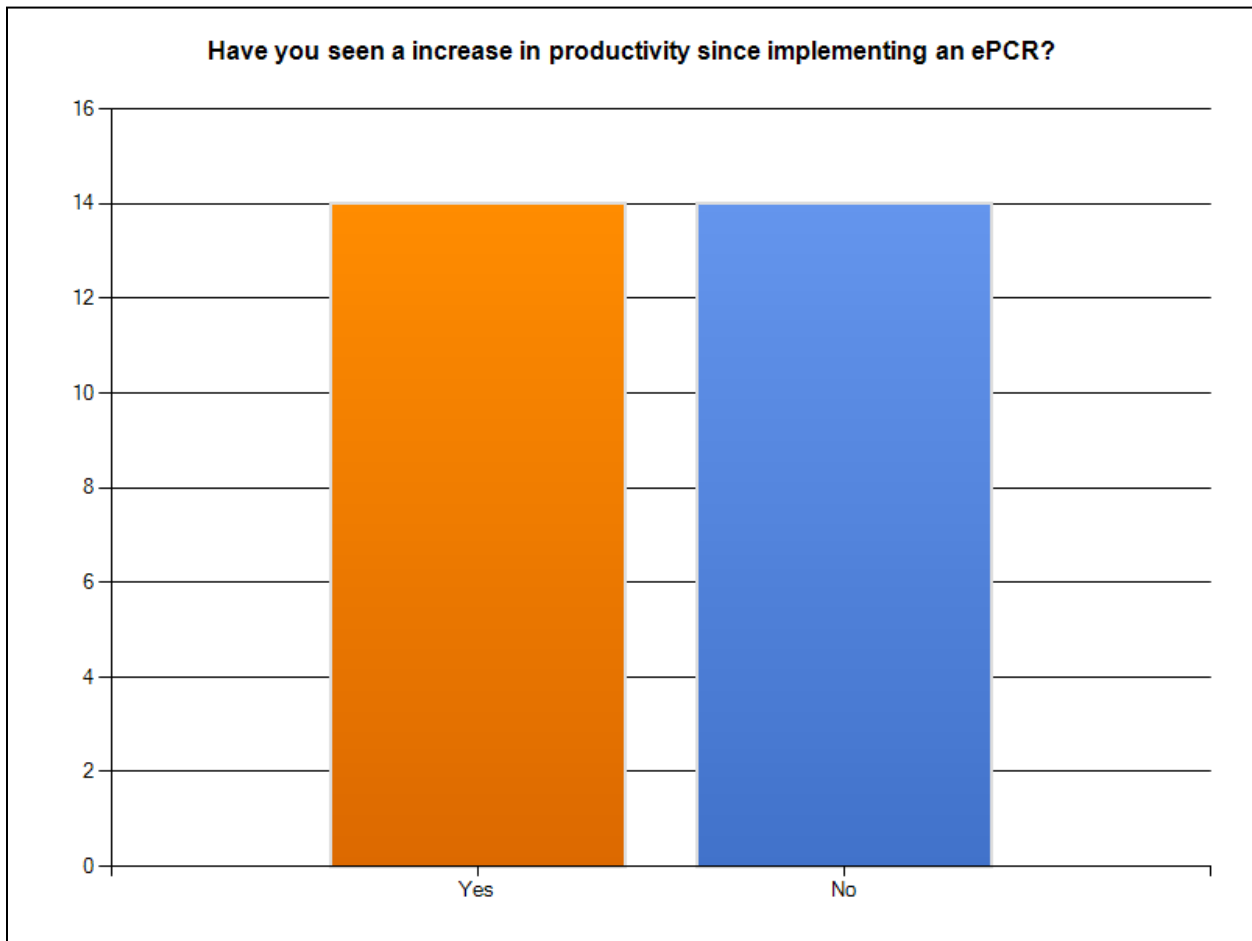
Regarding the establishment of a unique patient identifier for tracking patients, the most common response was that the ePCR system generated a unique number for tracking and identification. Counties such as El Dorado, San Luis Obispo and Los Angeles indicate that they track patients using an EMS Sequence Number Identifier or Run Number. Other agencies such as Merced, Santa Cruz, Santa Clara and Alameda Counties used information such as patient

name, date of birth and social security number for tracking identification. Some counties such as San Joaquin and Monterey do not have a system for tracking patients at this time. Central California has a tracking number used within their associated provider agencies, but not used with the agency itself.

One reoccurring concern involves multi-casualty responses and the difficulty in tracking multiple patients. Many agencies such as San Francisco County responded that sometimes a call involves more than one person and this information may not appear in tracking. Marin County answered that when a single incident has four patients for example, it is unclear how each patient gets unique identifier since they would all have same incident number. In the Marin County system, the unique identifier related to the call number is automatically generated by CAD with individual identifiers created for patients within the response call but this process isn't always accurate.

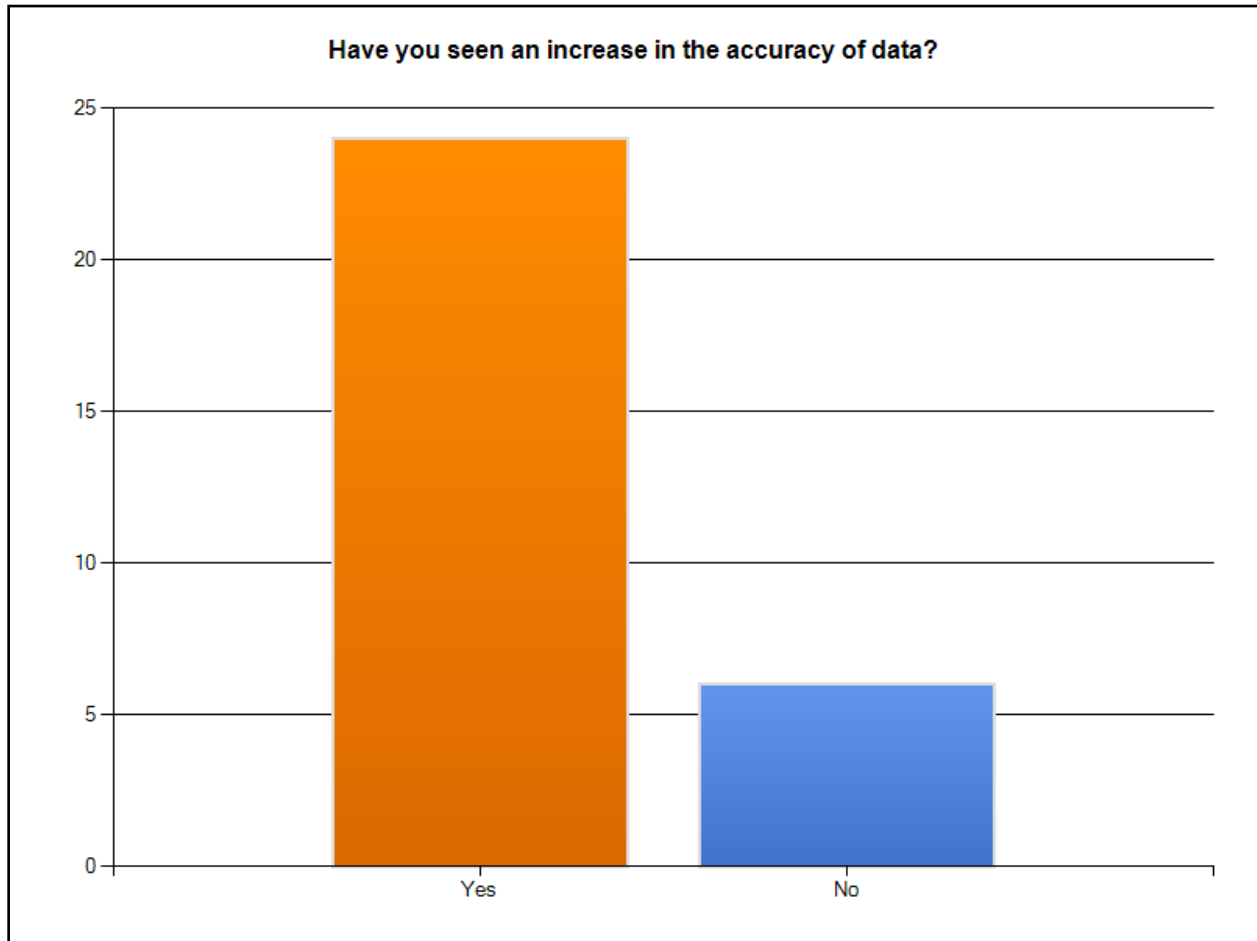
3.6 BEST PRACTICES

This section contains survey findings for the current best practices in place for agencies. In order to report on this information, the survey contained questions that captured whether the agency had seen an increase in productivity, accuracy of data, improved patient outcomes and overall experience during implementation. These survey responses give an overview for the current best practices in place as well as improvements seen as a result of ePCR implementation.

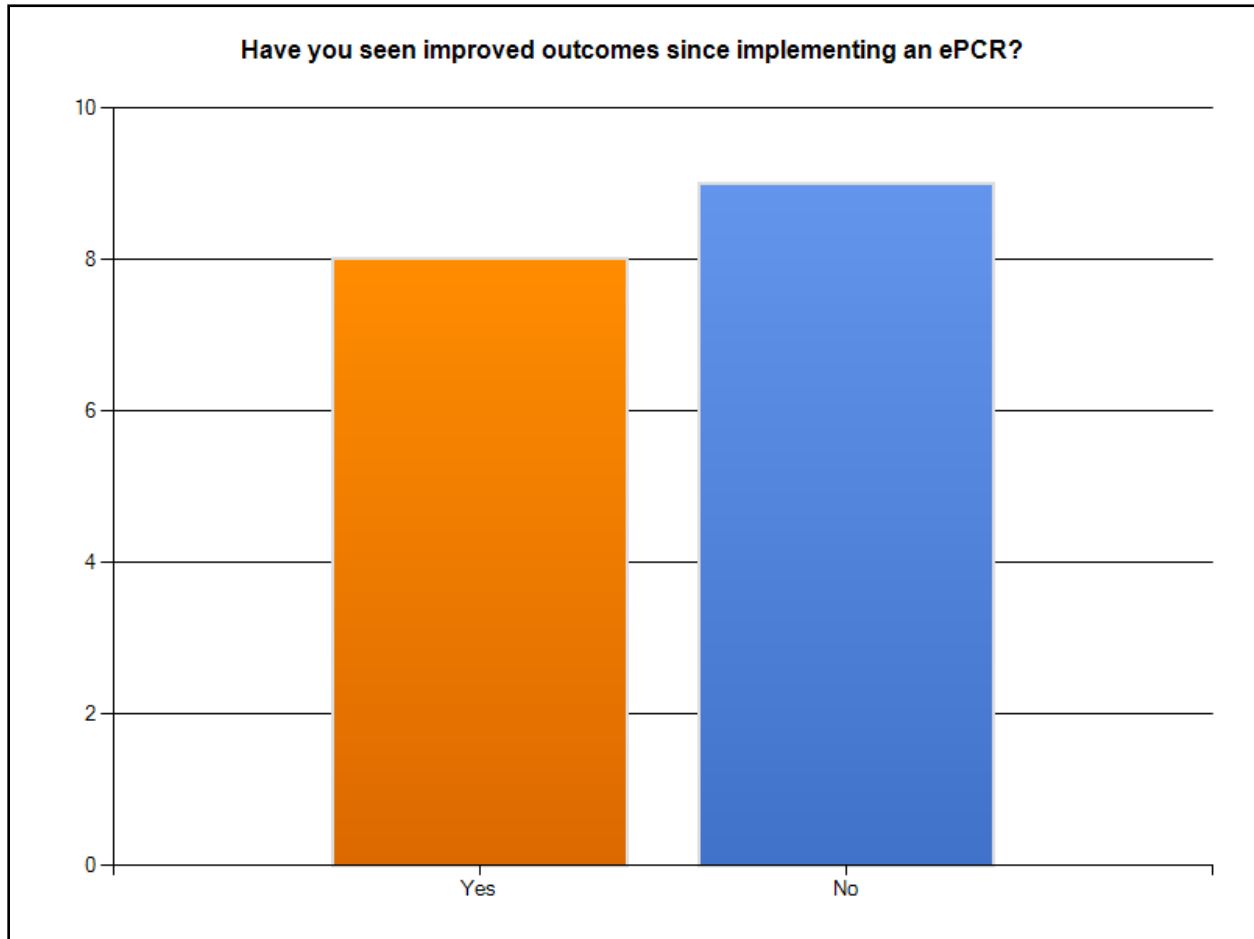


In regards to best practice, agencies were asked whether or not they had seen an increase in productivity since implementing an ePCR. Agencies responded evenly, with half of the survey respondents replying that they'd seen an increase in productivity and half indicating they had not. Some agencies, (Imperial, Contra Costa and Sacramento) responded they were unable to measure productivity increases. A common response from agencies including Santa Barbara

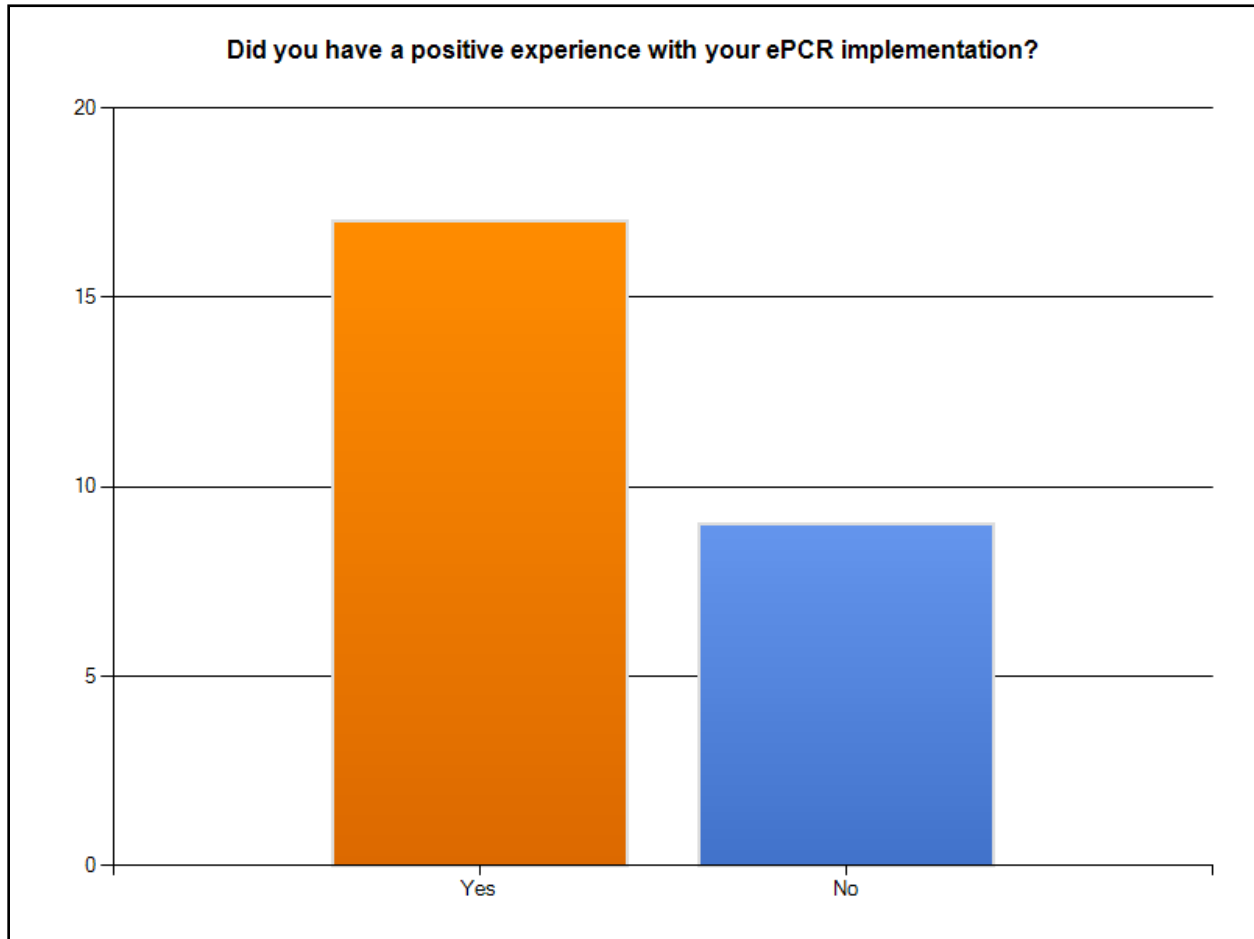
and San Francisco was that the system had been implemented before the respondent started working there. In these cases, it was hard for the agency representative to gauge if there had been an increase in productivity. Santa Clara replied that there is normally a decrease in productivity when an ePCR is first implemented but it does increase later.



Agencies were asked if they had seen an increase in the accuracy of data after implementing an ePCR. A majority of survey respondents, (80%) answered that they have seen an increase in the accuracy of data. Napa County commented that they now saw less anecdotal data and more accuracy; for instance, they could now scrutinize cardiac arrests on evidence based principals. Santa Barbara County responded that they have the data issues as before, but now electronically. San Mateo replied that they had only been there five years and were unaware of how the system was prior to being implemented. Alameda County indicated that ePCR made data mining easier.



More than half of the agencies responded they have not seen improved outcomes as a result of implementing an ePCR. This is mainly due to the inability of providers to receive data from the hospitals. Marin County added that there needs to be a quantifiable definition of improved outcomes. Others such as San Mateo County replied that they have improved monitoring of patient outcomes as a result of ePCR implementation which informs the training of provider respondents within the area. Orange County responded that it was too soon to tell if there will be a measureable improvement. Napa County has seen a huge improvement in cardiac arrest saves for example, due to accurate data and best practices. The Tuolumne County representative has seen better outcomes and accuracy since joining the agency.



Agencies were also asked if they had a positive experience during their ePCR implementation. Of those responding, nearly two-thirds (65%) said they had a positive experience. An additional five agencies including San Mateo, Merced and Napa County mentioned the system had been implemented before they joined the agency and had no knowledge about the implementation experience. San Diego County felt the experience had its positives and negatives with so many different vendors involved. They also said that in a perfect world, everyone would all be on one system. As each provider goes to a third party vendor, that new system has to work with the agency in order to interact. There were additional challenges with using an external vendor for data collection. In addition, providers using the same ePCR vendor might have different versions creating challenges in data sharing. It was also reported that the data and interface requirements were a challenge. Mountain Valley added that the implementation was a financial challenge. Orange County replied that it was definitely a challenge due to technology and political issues, but it was a rewarding experience overall.

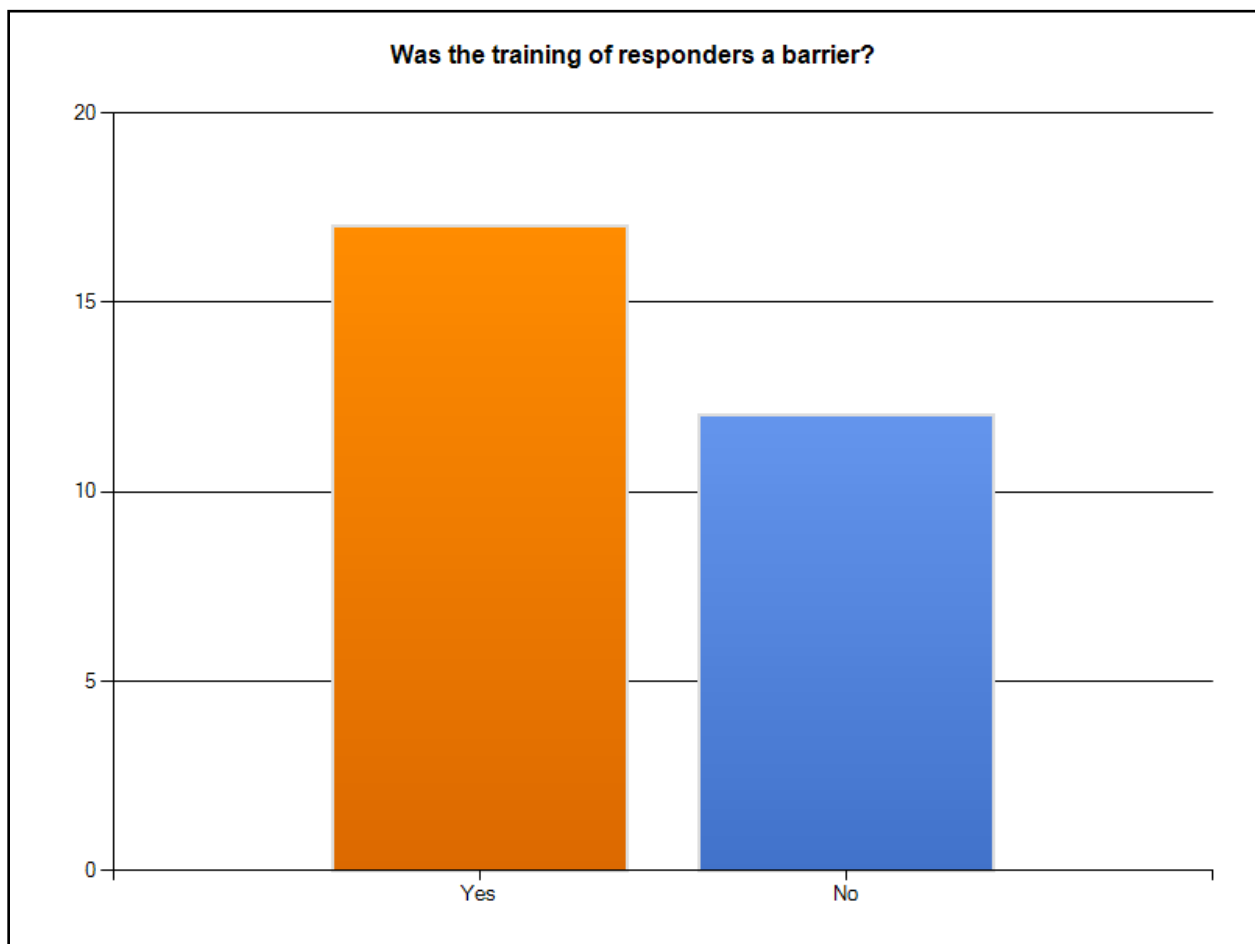
When asked about the positives of the ePCR implementation process, a majority of agencies responded that the ePCR system made their processes easier in general. Positive comments included that it was easier to study and trend data, to collect data, easier to search, data records were more complete, and records are easier to read and interpret. Several agencies such as Contra Costa, San Benito, San Francisco, Central California and Coastal Valley mentioned that with the use of ePCRs, there were no longer issues in reading illegible handwriting. Monterey County replied that the data was cleaner and more searchable. Central California added that you can now enter unlimited information; you are no longer limited by the space on a form. San Francisco and Sierra-Sacramento Valley added that the reports have more comprehensive data now since providers must complete elements that show a level of care. Los Angeles indicated that a positive for the agency was ultimately being able to get data in a timelier manner. Kern County added that the ability to analyze system-wide data now exists where it did not before and that they now have the ability to do bio-surveillance. Riverside County replied that the implementation was a positive experience because the agency came together as a team and worked toward system advancement. Through an educational process, providers saw the value of data and how it can be used for quality improvement. Overall, it was a positive cultural transformation for Riverside County.

Agencies were also asked to define the negatives of the ePCR implementation process. The majority of survey respondents indicated the high learning curve as the main complaint. Imperial County added data transfer and conversion was the main negative. Cost was also a common complaint cited by agencies including Riverside, San Joaquin and Solano County. Mountain Valley cited difficulties in training.

Several agencies such as San Francisco, Contra Costa, and Coastal Valley replied that they faced difficulties with employee resistance in getting the field personnel to comply. San Diego and Santa Clara indicate getting the technology to work across the county with multiple vendors was very difficult. North Coast and Mountain Valley had difficulty in receiving technical support because many providers are using the system at 2 AM when there is no support readily available. Santa Barbara listed difficulties in getting providers to enter good documentation as a challenge, with the system having issues of limited electronic access. Orange County had difficulty navigating through the software. They had to become technically savvy very quickly in order to become an intermediary between the software company and providers. Further, they learned not to depend on the software company to manage the system for them.

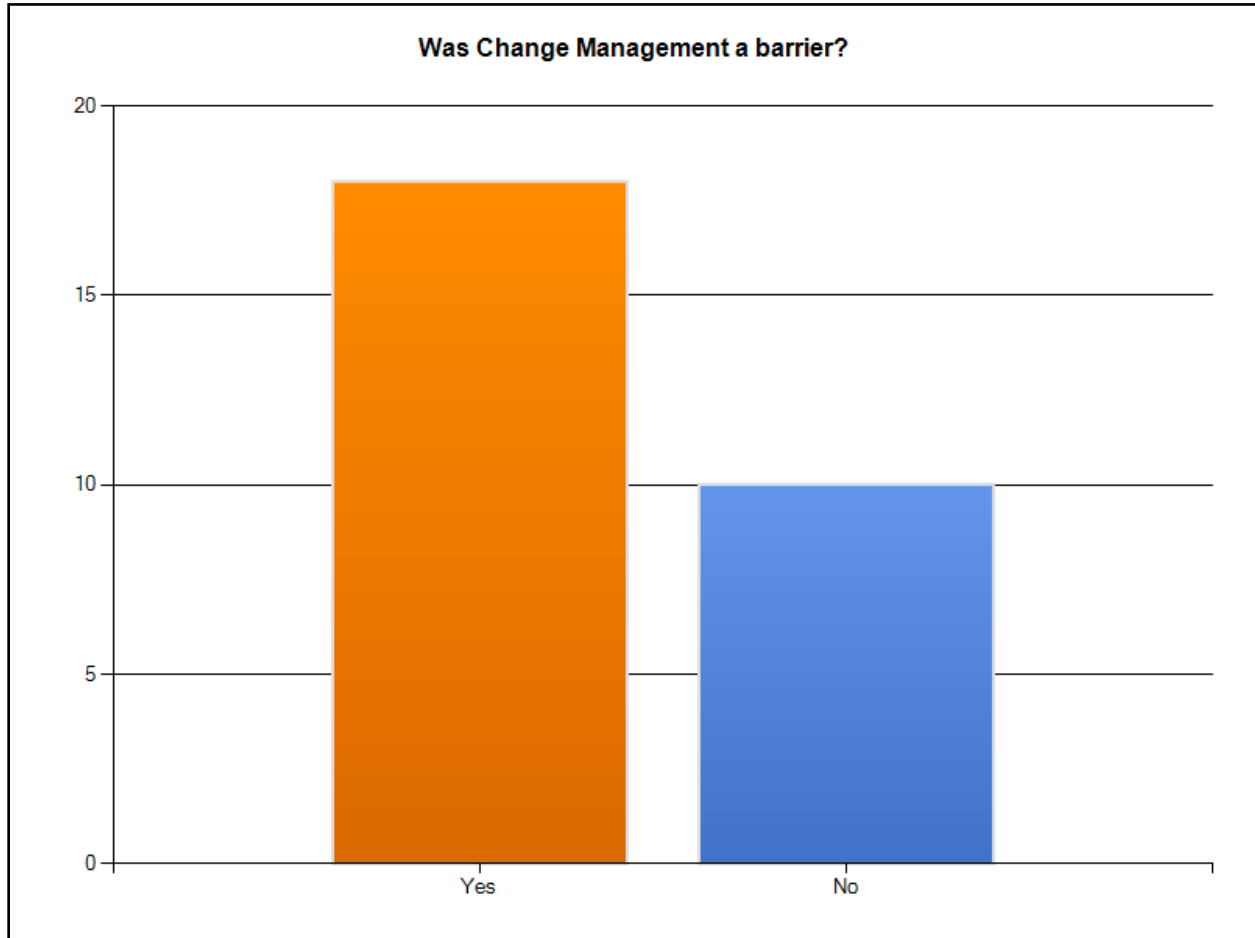
3.7 BARRIERS

This section contains survey findings for the current barriers and challenges seen by agencies. In order to report on this information, the survey contained questions that captured whether the agency had experienced barrier issues with training, change management, funding or the implementation timeframe. These survey responses show the current barriers faced by agencies.

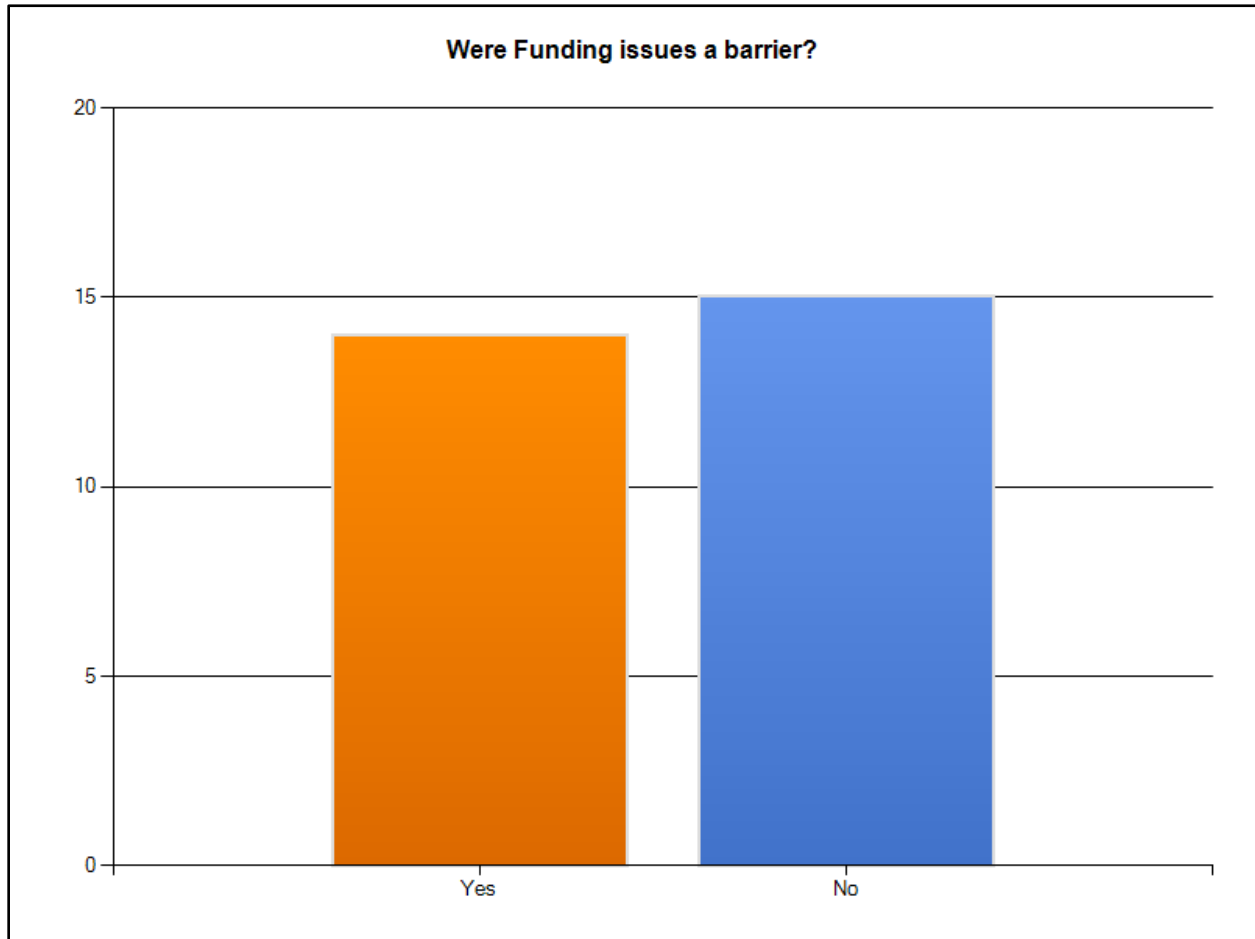


A strong majority of agencies (58.6%) indicated that training was a barrier. Several agencies such as San Benito and Central California commented that it was a challenge for older people to switch to the electronic system. Santa Clara County mentioned getting providers to take a training class was a barrier. El Dorado and San Francisco County responded that the training of providers is an ongoing issue. Orange County responded that it had been a barrier, but they

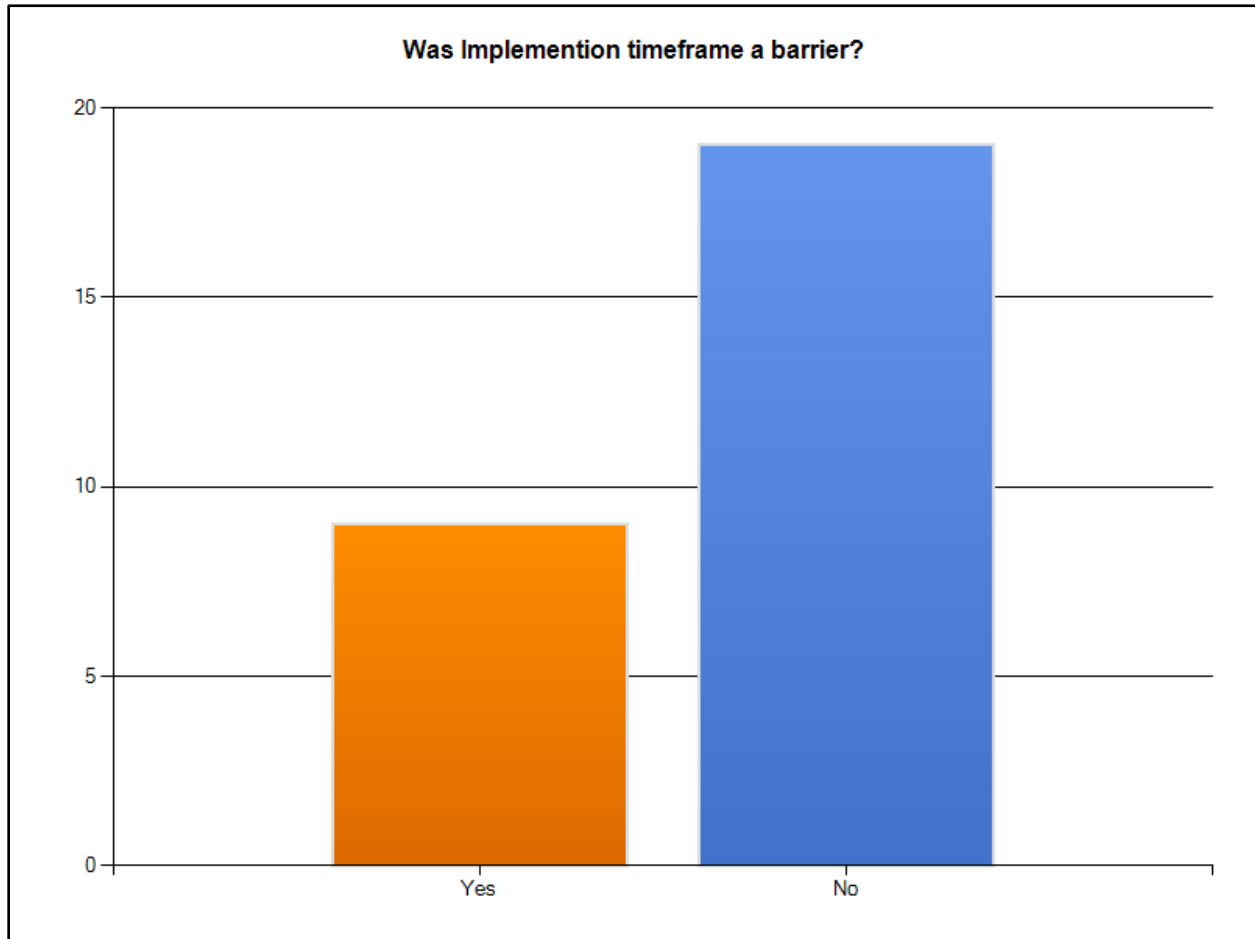
hired the retired EMS manager at the fire department to do the training. The manager had been a supporter of the ePCR system and they now have a train-the-trainer process.



Agencies were asked if change management had been a barrier to ePCR implementation. A majority of those surveyed (64%) responded that change management had been a barrier. A number of agencies such as Riverside, Contra Costa, El Dorado, San Diego, Santa Cruz and Marin responded that change was an uphill challenge with resistance at first, but things were overall more positive now. Orange County replied that the difficulty in change was managed by creating a monthly newsletter, a steering committee, multiple workgroups, and a task force. Everyone at the agency felt like they had a “say”. There was a constant push for positive information, with all questions and concerns answered quickly. Four of the agency representatives including Alameda and Merced County were not at the agency at the time the system was implemented and unable to answer the question.



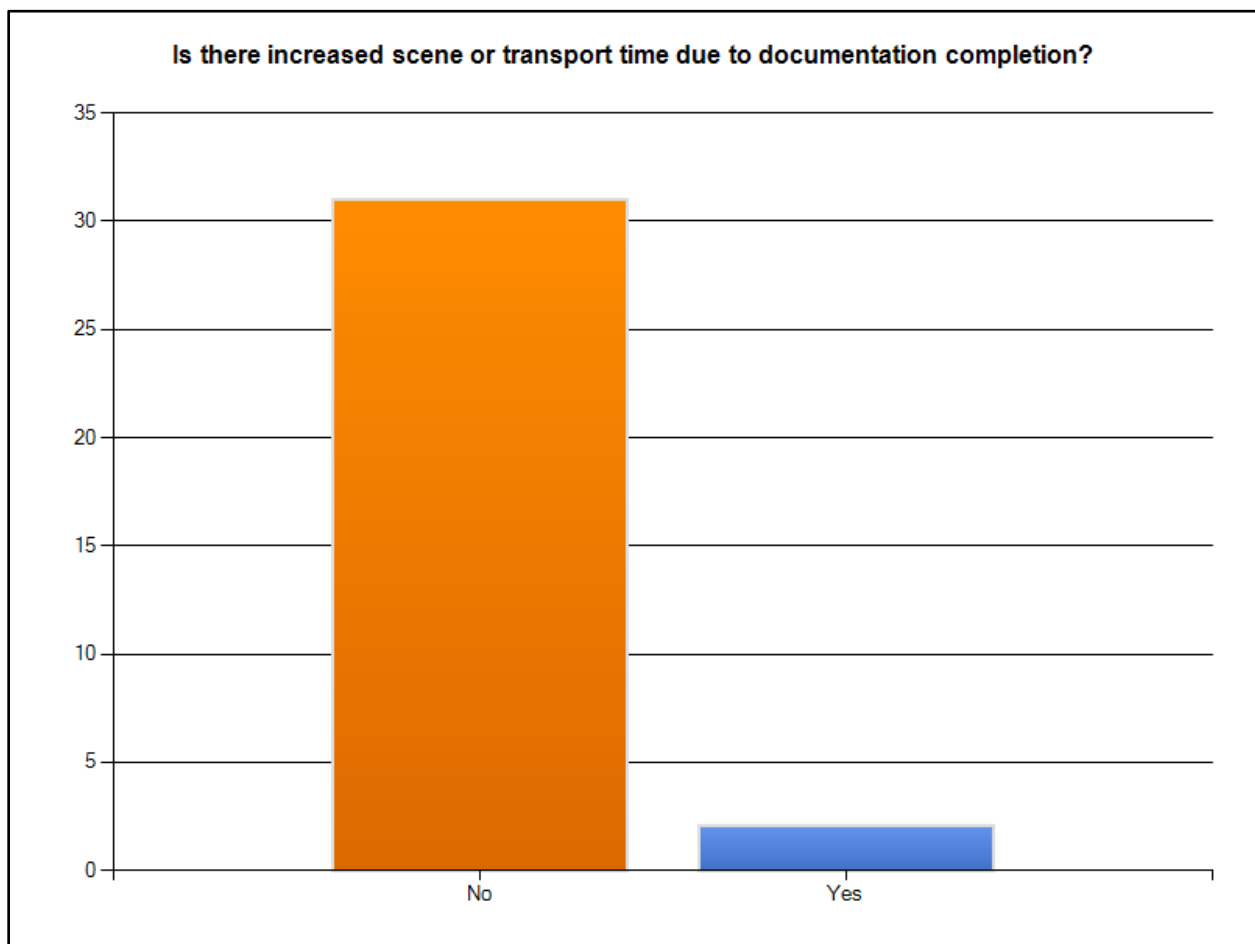
Agencies response to the issue of funding was divided evenly with half saying funding had been an issue and half saying it had not. Santa Cruz County cited that it had not been a barrier because they had a fund setup for the implementation in advance. For Coastal Valley, funding had not been a barrier because they had received a grant. They added funding might be an issue in the future. Riverside County replied that funding issues had not been a barrier for purchasing the software, but the issue continues to be a challenge for the hardware side. A number of agencies such as Imperial and Merced County stated that it was not a barrier because the cost had been passed down to the providers. Sacramento indicated that funding had been a major issue for Sacramento Fire, one of their providers.



When asked whether or not ePCR implementation timeframe had been a barrier, a majority of survey respondents (68%) indicated that it had not been a barrier. Santa Barbara County replied that timeframe had not been the barrier as much as resistance to support change. Riverside County answered they had not kept to their initial timeline. Northern California replied that the implementation stretched on longer than they had anticipated it would have. They had to keep reminding the providers of the importance of transitioning to an electronic system in order to keep on track. For San Diego, timeframe was only a barrier when the process was grant related. They have received numerous IT grants through the years for ePCR implementation. Most IT grants are for one year or 18 months, but actual implementation timeframe could take three years.

3.8 GAPS

This section contains survey findings for the current gaps in service seen by agencies. In order to report on this information, the survey contained questions that captured whether the agency had experienced increased scene or transport time due to ePCR implementation, as well as any other gaps seen by the agency. These survey responses give an overview for the current gaps experienced by agencies.



Agencies were asked whether there was an increase in scene or transport time due to document completion. An overwhelming number of people (93.9%) said there was no increase due to ePCR implementation.

Napa County cited that there was an increase in the time for returning to service. The providers are at the hospital longer than they would like to be finishing paperwork. The agency does not

have an issue with “wall time” (i.e. the waiting time to move a patient to the hospital gurney from the ambulance gurney) but providers have a longer time at the hospital due to completing the ePCR. Napa adds that ePCR implementation has created complicated response time issues because the patient care record is never completed before arrival at the hospital when it had been in the past. San Francisco responded that in some cases documentation does delay response time. For instance, in the case of a diabetic patient who doesn’t want to leave (patient refusal); the field provider has to complete additional documentation to protect the agency. This documentation is done on scene and delays response time. Sacramento County replied that the ePCR might be impacting turnaround times, but not any more than any other EMS system. Orange County indicated that there had been a slower response time due to a learning curve, but this had been corrected.

Agencies were asked to list any additional barriers or gaps that they had faced. Agencies such as Solano County described disagreement on what software to use as a major issue. San Francisco commented that the main barrier or gap was having multiple ePCR vendors in a system or state. The use of multiple ePCR systems becomes a barrier to consistent evaluation and identifying needs for improvement. If there was a standardized system, you could see gaps more easily. Several agencies cited cost and budget as an additional barrier. North Coast commented they are limited in the options for an ePCR system by cost.

Northern California replied that providers would like to use the ePCR in the field but it is costly for mobile devices. The cost of these devices was the biggest barrier to getting the system into the field for more real-time data capture.

Ventura County mentioned the biggest gap is the link between pre-hospital and the hospital systems. El Dorado County added that not every hospital is interested in establishing integration. It would not be possible to move to an HIE if the hospitals are unwilling. Sierra Sacramento Valley also stated that a major gap were the IT issues with hospitals. San Joaquin and Coastal Valley cited internal resistance to change as a major barrier.

Santa Barbara listed dual entry into the fire responder record management system as a barrier due to the time involved. A data bridge was built on the agency side, but the fire department didn't want to build a bridge on their side to receive the data. For Tuolumne County, a major barrier would be the inability to connect wirelessly since the providers operate in a rural, mountainous region.

3.9 COST CONSIDERATIONS

This section contains survey findings for the cost considerations experienced by agencies. In order to report on this information, the survey contained questions that captured initial ePCR software costs, implementation costs and yearly maintenance costs. These survey responses give an overview for the current cost considerations faced by agencies.

Agencies were asked what the initial cost of their ePCR software was. More than 50% of the agencies interviewed did not know the answer to this question, or were unsure of the initial cost of the ePCR software. This was mostly due to fact that the agency representatives surveyed were not being part of the provider organization where the system was implemented, or that the costs were incurred by the provider agencies directly.

For those who could estimate the initial costs of the software, seven of the agencies said the cost was \$90,000 or less, including one who said the cost was only \$7000 because they were offered an accelerating range of software upgrades. Nine agencies said the costs were over \$100,000, including one estimate for Inland County for just under \$1 million. Kern County stated the cost for ambulance provider implementation was over \$1 million. For the low range (\$7000 to \$90,000) the average was around \$60,000. For the upper range (\$120,000 to \$1,000,000+) the average was over \$400,000. For several agencies in the upper range the costs included software and implementation, or software and hosting for the first year.

The agencies were also surveyed regarding their ePCR implementation costs. Over 60% of agencies did not know the answer to this question. Six agencies including Monterey, Inland and Coastal Valley indicated the implementation costs were rolled into the initial contract costs of the ePCR software. For the other responses, the answers ranged from \$7500 for Imperial County, \$20,000 for North Coast, over \$1,000,000 for Ventura, \$50,000 for Mountain Valley to purchase and implement the ePCR, \$250,000 for Kern County and close to \$1,000,000 for Northern California. Orange County did not have a final total, as they were still implementing the system.

When asked about maintenance costs for their ePCR systems, nearly half (45%) did not know the costs. Five agencies including Coastal Valley indicated they were rolled into the implementation costs, although Inland County stated this cost was only included for the first three years, after which it would be about \$150,000 a year. For the other agencies, the answers were: \$6000 for Northern California EMS; \$10,000 for North Coast; \$12,000 annually for Imperial County; \$20-50,000 (plus an unknown cost for the providers) for Kern County; \$30,000 for Santa Cruz; \$65,000 for Ventura; \$117,000 for Orange County in maintenance and hosting per year; \$120,000 for Santa Clara and \$225,000 for San Diego for maintenance on their QCS

system; any changes to the system would be above and beyond that. Tuolumne County cited maintenance costs as a minimal expense, with the exception of the upgrade they are undergoing. Mountain Valley responded maintenance costs were generally 10-15% of the initial implementation cost annually. Santa Barbara responded that maintenance costs are not built into budgets, causing issues with the system since providers are not upgrading and maintaining their systems.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The agencies were very cooperative in taking this survey and understood the importance of developing a baseline for future HIE between all agencies and providers. The landscape is complicated with 33 agencies each working with many different providers. Throughout the survey cost, training and privacy issues were discussed as well as change management issues. However, there was an overwhelming agreement of the need for systems to improve patient care by improving response times and accuracy of data.

A majority (roughly three-quarters) of the agencies in the State of California have reached a level of ePCR implementation where an ePCR has replaced paper charts for data entry. Although roughly half of the agencies contacted have established a hospital dashboard for ePCR transmission, almost none of the agencies are at a point where they are HIE capable.

The most commonly used software systems statewide were MEDS, Zoll and Imagetrend. A majority of the agencies store their ePCR data at the software vendor. Some agencies cited that cloud based solutions were not an option due to HIPAA concerns. Roughly two-thirds of the state agencies are able to submit their data to CEMSIS. A majority of agency providers have no system compatibility to communicate with each other. One of the only solutions suggested resolving this issue was the usage of the same system county wide.

A majority of agencies have the ePCR data populated by CAD, and captured at the response site using a computer (laptop or desktop). Data is typically not transmitted to the hospital prior to arrival, but submitted by fax or by printing out a copy that is given when the patient is delivered to the hospital emergency room. A number of agencies have an online system established where the hospital can login and download the report as needed. Reports are typically completed throughout the response, but most commonly at the hospital or after the response is completed.

For the most part, agencies are not currently interfacing their data into the hospital EHR system. Agencies cited that in some cases, there is unwillingness on the part of the hospitals to

interface with their system because of regarding privacy and security. They also cited that the hospital EHR can be a difficult system to interface with.

With regards to bidirectional HIE data interfacing, there is very limited data transferred from the ePCR to the hospital and no data transferring from the hospital to the field. Slightly more than half of the agencies would like to see a bidirectional interface that operates automatically, although some agencies voiced concerns that the process should be HIPAA compliant, and that the process shouldn't be automatic in order to protect data. Other agencies felt the process should be done manually by field personnel because reports are completed over the course of care for the patient and could change during treatment. There were a great deal of differences between agencies with regards to unique patient identifiers used and this process should be streamlined and standardized to avoid confusion with patient identification.

While agencies were divided when asked whether or not they had seen an increase in productivity with an ePCR, the majority felt they had seen an increase in the accuracy of data. Most agencies could not respond when asked if they had seen improved outcomes with an ePCR because they do not have access to hospital outcomes. Overall, agencies felt access to patient outcomes and records was extremely important in order to improve patient outcomes. A majority of agencies responded that training of providers and resistance to using the system had been a barrier to implementation. Orange County overcame this barrier through a train-the-trainer approach. Most agencies also saw change management as a major barrier. As another example, Orange County established a steering committee so all stakeholders had input in the ePCR process. Agencies were divided evenly as to whether or not funding was a barrier. Agencies overwhelmingly responded that completion of ePCR documentation had not increased scene or transport time. Varying responses were received regarding gaps faced in the ePCR process. For Tuolumne County, a major gap was the inability to connect wirelessly since providers operate in a rural, mountainous region. A number of agencies cited the biggest gap as the link between pre-hospital and the hospital systems. El Dorado County added that not every hospital is interested in establishing integration. It would not be possible to move to an HIE if the hospitals are unwilling. Some agencies such as San Francisco mentioned the largest gap was the use of varying systems within the same county which are unable to communicate.

Most agency representatives did not have access to the information for the ePCR software cost, or implementation costs. Typically, this was because the cost was paid by the providers associated with the agency. For those who knew the software cost information, the average low end cost was \$60,000 with the average upper end cost being around \$400,000. Over half of the agencies knew their yearly maintenance fees, which ranged from \$6,000 to \$225,000 a year.

In moving forward with a statewide solution to HIE for all counties that concludes with the appropriate interface to the State Emergency Medical Services Authority and bi-directional HIE with hospitals, further work will need to be completed to standardize processes, data and systems. Workgroups could be established made up of representatives from the 33 agencies to cover the barriers and gaps discussed in this report. The 33 agencies could assign a different person to each group who would be responsible for working with the providers on issues concerning their use of ePCRs and HIE.

Areas to be covered by workgroups:

- Workflow should be standardized as much as possible; this can be completed by mapping the process each agency is using and finding the common points as well as best practices.
- Data standards should be agreed upon for entering into the ePCR and for transmitting data to the hospitals and other providers. What data is important and who needs what data? Does the data need to be bi-directional?
- Assign a team to work with the various hospital systems to establish the relationship and agreement regarding HIE. Have the same team work with CAHIE to determine how to interface to the community HIE.
- HIPAA requirements should be evaluated further to see what barriers truly exist in sharing of data between the providers, agencies and hospitals. Standard use agreements should be put in place as well as standard security policy.
- Review current systems in place and determine if they are viable systems. Understand the future of the ePCR company and if they have been part of any HIE. This will help determine how difficult it may be to interface these systems.
- Review in detail implementation practices at those agencies that have been successful and are furthest along in the process. 73% of all agencies are at Stage 3 with the ePCR in use. These agencies could work together to determine best practices for implementation as well as lessons learned. A “coach” from those agencies who have had great success in implementation could be assigned to those counties further behind in the process.
- Develop measurable results for success around patient outcomes and response times
- Create a change management team to help agencies and providers understand the need for HIE and the positive impact it can have.

The ePCR and HIE progress throughout California has made great progress. Key to future success will be more standardization around data, processes, coordination with hospitals and measurable patient outcomes. Response times should also be measured in detail to verify improvement through use of electronic systems to track data and communicate with hospitals.

The forming and established HIE's throughout California should be relied on to make the transition to bi-directional interface a reality.

Report Date: _____

Report Submitted by: _____

Signature: _____