Running Head: ELECTRONIC PRE-HOSPITAL CARE REPORT IMPLEMENTATION

Planning for Success – Developing an Electronic Pre-Hospital Care Report Implementation Plan for the Laguna Beach Fire Department

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed:_____

Abstract

The problem was the Laguna Beach Fire Department was beginning to develop an electronic pre-hospital care report (ePCR) but did not have a written implementation plan to guide the project from development to implementation. The purpose of this project was to develop an ePCR implementation plan for the Laguna Beach Fire Department. This is an action research project which utilized surveys, questionnaires, and literature review to answer four research questions. The research questions focused on identifying ePCR program goals, hardware and software solutions, training requirements, and an appropriate implementation timeline. The results of the research provided answers to all of the research questions and provided guidance for the project recommendations which includes utilizing the implementation plan.

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Planning for Success – Developing an Electronic Pre-Hospital Care Report Implementation Plan for the Laguna Beach Fire Department

The problem is the Laguna Beach Fire Department is beginning to develop an electronic pre-hospital care report (ePCR) but does not have a written implementation plan to guide the project from development to implementation. The purpose of this research project is to develop an ePCR implementation plan for the Laguna Beach Fire Department. This action research project will include a comprehensive review of available literature as well as produce original research through the analysis of surveys, questionnaires, studies, and reports. The following questions shall be answered utilizing the research techniques described:

1). What goals does the Laguna Beach Fire Department desire to achieve with the implementation of an electronic pre-hospital care report?

2). What is the best software and hardware solution for Laguna Beach Fire Department's ePCR?

3). What kind of training and how much of it will be necessary to implement an ePCR at the Laguna Beach Fire Department?

4). What is a realistic implementation timeline for an ePCR at the Laguna Beach Fire Department?

Background and Significance

The City of Laguna Beach is a 9.1 square mile community on the Southern California Coast with a resident population of 23,727 that swells upward of 100,000 during peak tourism periods. Known for having a rich tradition in art while possessing some of the most picturesque beaches and open space in the world; Laguna Beach attracts approximately 3 million visitors per year (City of Laguna Beach [CLB], 2006). Thousands of acres of dedicated open space and park

land surround the northern and eastern boundaries of the city and provide a rustic backdrop to the quaint seaside village. Laguna Beach is an affluent community with a median household income of $122,966 and an average median home price of $1,889,154 (Cable News Network, 2007).

The Laguna Beach Fire Department (LBFD) is divided into two divisions consisting of Operations and Fire Prevention. A fire chief, three chief officers, and one administrative assistant manage the department and provide chief officer coverage for emergency incidents. The Laguna Beach Fire Department staffs 4 stations with 12 on-duty firefighters and employs 40 sworn and 2 non-sworn personnel. Each station houses a Type 1 Engine which is staffed with a Captain, Engineer, and Firefighter. Stations one and four are paramedic engines providing Advanced Life Support (ALS) level care and stations two and three provide Basic Life Support (BLS) level care. The Laguna Beach Fire Department also cross staffs a city purchased Type 3 wildland engine and a Type 1 engine from the Governor's Office of Emergency Services (OES). LBFD has strong mutual aid and automatic aid agreements which assist with providing services. Services provided include: EMS, fire suppression, rescue, Haz-Mat, fire prevention, and public education. In 2008 2613 calls for service were answered as follows: 280 fire alarm, 13 fire code, 1,859 EMS, 132 fire, 30 physical rescue, 132 hazardous condition, 59 smoke investigation, and 108 service calls.

The California Emergency Medical Services Authority (Cal EMSA) oversees 31 Local Emergency Medical Services Agencies (LEMSA) throughout the state of California. Cal EMSA's mission is to "ensure quality patient care by administering an effective, statewide system of coordinated emergency medical care, injury prevention, and disaster medical response" (EMSA, 2009). The Orange County Health Care Agency (OCHCA) is the LEMSA responsible for overseeing all healthcare service provider agencies within Orange County,

California. Each ALS service provider agency is assigned to one of five base hospitals geographically dispersed throughout the county. Base hospitals coordinate medical care with ALS units in the field and assist with determining and coordinating appropriate paramedic receiving centers. The Laguna Beach Fire Department is assigned to Hoag Hospital.

The National Fire Academy's Executive Leadership course encourages managers to identify innovative and courageous ways to enhance emergency services and support the United States Fire Administration's mission by helping to "provide national leadership to foster a solid foundation for local fire and emergency services for prevention, preparedness, and response" (United States Fire Administration [USFA], 2009). It will be the responsibility of Laguna Beach Fire Department (LBFD) staff to analyze the benefits of utilizing an ePCR implementation plan to guide the development and implementation of a an ePCR.

Literature Review

An organizational change such as implementing an ePCR program should be taken very seriously and the primary justification for change should have a nexus to improving patient care. However, a process improvement should have multiple benefits and outcomes. The success of organizational change depends largely on a group's desire to change, thus there must be a perceived benefit and plan to increase the likelihood of success (FEMA, 2004). There are so many examples across the nation of failed attempts at ePCR implementation that the very notion can conjure negative emotions (Huisenga, 1999). Taigman (2003), states "technology must improve patient care or make employees' lives better." Thus the focus of implementing an ePCR at the Laguna Beach Fire Department should remain on improving patient care by improving processes and employee working conditions.

What goals does the Laguna Beach Fire Department desire to achieve with the implementation of an electronic pre-hospital care report?

The literature review revealed vast amounts of information on this topic and found some common reoccurring themes as well as anecdotal observations and lessons learned. Perhaps Huisenga (1999) states it most succinctly:

> Systems can recognize numerous potential benefits by migrating to electronic data collection, including enhanced productivity, reduced costs, optimized billing, identification of trends, improved protocol compliance, and a dramatic reduction in the inefficiencies of managing information with paper. But to obtain these benefits, a system must demonstrate a benefit to the end-users – the field providers; it must be more useable than the previous system.

While Huisenga's list outlines many of the benefits of an ePCR it should not be considered exhaustive and it is fraught with the subjectivity that every organization is faced with when contemplating the advantages of implementing an ePCR program. Organizations are well advised to develop Specific, Measurable, Attainable, Reasonable, and Timely (SMART) objectives (March of Dimes, 2004) prior to implementing an ePCR program to assist with ascertaining the success and failures of the program.

The literature review also revealed the ugly side of failed ePCR programs as technological black holes that have drained many organizations of precious resources. Taigman (2003) suggests analyzing what went wrong with other organizations attempts to implement an ePCR in order to avoid their costly mistakes. This seems like prudent advice particularly since the cost of human capital in the form of lost confidence in technology or a perceived decline in working conditions can result in employee dissatisfaction and high turnover rates which can be

more expensive than the shelved hardware and software programs. Kerney (2007) attributes many of the failures to launch successful ePCR programs to inadequate or complicated software programs and fragile hardware platforms.

The ePCR program should be designed to be as simple to use as possible. One of the reasons for San Diego Fire-Rescue Department's success with their ePCR program is that it will function at the BLS or first responder level and transition seamlessly to the ALS level users during transfer of patient care (Ott, 2004). A study conducted by the Arizona Emergency Medicine Research Center found that the ideal ePCR should have the ability to display real time data collection and quickly and seamlessly transfer data to other EMS professionals, base hospitals, and receiving hospitals (Meislin, 1999).

A study of Alberta Canada's ePCR system (Singleton, 2003) found the primary responses to success for an e-PCR system as follows: "user friendliness for paramedics and EMTs, scalable and customizable to the service that purchased the ePCR, ability to interface with existing software, ability to submit to Alberta Health and Wellness, and data security." User friendliness was mentioned often in the literature review and Kerney (2007) suggests that ePCR software should take limited time and training to implement. Zygowicz (2007) and Kerney (2007) identified scalability and customization as another primary consideration when implementing an ePCR system. This was a consistent theme in the literature review identifying the need for ePCR software programs to adapt to current systems already in place and the ability to be customized.

Improving the productivity of personnel in the field is a sure way to justify the appropriation of resources for an ePCR program. Erich (2008) states that the City of San Diego Fire Department added an estimated 16,500 of unit hours back into the field annually.

What is the best software and hardware solution for Laguna Beach Fire Department's ePCR?

Middleton (2002) describes the implementation process for an ePCR system like "putting a puzzle together." There are a lot of factors to consider when deciding which system is best for your organization. Saint Paul, Minnesota Fire Department identified some broad ePCR needs when shopping for a system; it needed to be "real-time useable; as fast as or faster than paper, a tool that does more than collect data; reliable; flexible; intuitive; and easy to use (Huisenga, 1999)." Ott (2004) states "when adopting any data system not your own you must adapt your processes to those of the data products, and typically you have to make compromises on data points that may or may not be collected." Ludwig (2006) argues this point and suggests that organizations not alter their needs to fit a specific solution but rather "make the solution fit your needs."

Zygowicz (2007) suggests that the first basic feature of an ePCR software program should be its ability to comply with state and federally required data sets and its ability to be upgraded for future compliance. Compliance with the Healthcare Insurance Privacy and Portability Act (HIPPA) should also be a consideration when shopping ePCR software (Taigman, 2003). Additionally, fire based EMS systems will want an ePCR software program that is compliant and can work within the current and future National Fire Incident Reporting System (NFIRS) data sets (Zygowicz, 2007). Finally, there should be powerful data tools that enable the study of the data captured in the field for Continuous Quality Improvement purposes (Tollefson, n.d.).

Zygowicz (2007) suggests the following ePCR system features: auto fill of patient data for repeat customers, ability to construct organizational templates that require certain data collection for various types of incidents, real-time error checking with a medical and standard

dictionary, the ability to attach picture and or sound files, witness statements, EKG strips, and additional documents. A study utilizing iRevive ePCR software identified the inability to save a partially completed PCR and the failure to alter a PCR once saved as significant stumbling blocks toward the successful implementation of the software (Tollefson, n.d.). Other considerations include the ability to capture a patient signature for refusal of care or billing and nurse signatures at the receiving hospital (Ludwig, 2006). Taigman (2003) suggests finding vendors with a Graphical User Interface (GUI) that is simple to use and learn.

Hardware choices can be narrowed down once the software component of the ePCR is decided and conversely if a particular hardware platform is favored then the choices of software programs will be reduced. Since collecting data at the bedside in the mobile environment increase information accuracy, lowers reporting errors, and reduces data-input redundancy then a mobile computing platform such as a notebook PC, Personal Digital Assistant (PDA) or tablet PC is the best choice (Zygowicz, 2007). The pre-hospital care setting can be a harsh environment; computing hardware should be ruggedized to meet the demands of the pre-hospital care surroundings in order to avoid equipment breakage and user frustration (Zygowicz, 2007). The advantages of a PDA are its lower cost and substantially smaller size but it may not be a match for an organization's preferred ePCR software choice. A ruggedized laptop has a large screen for viewing more of the form at once and all the computing power necessary to operate the most sophisticated ePCR programs. The downside of a ruggedized laptop is weight, bulk, and cost. The final hardware platform option is a ruggedized tablet PC. Ruggedized tablet PCs are available in assorted screen sizes, are lighter and typically less expensive than a ruggedized lap top, and are powerful enough to operate most all ePCR software programs.

Of primary concern when selecting an ePCR system is its compatibility with current technology systems already in place (Zygowicz, 2007). Close consultation with the organizations Information Technology (IT) professionals is a must before making any purchase decisions. The back end of the system must be able to dependably store, retrieve, and send data rapidly and be capable of interfacing with the Computer Aided Dispatch (CAD) and Fire RMS Systems. A fully integrated ePCR system should be able to receive information from the 911 dispatcher, capture accurate information into the ePCR in the field and transmit the information to the receiving center before the patient arrives (Shenvi, 2007). The described workflow relies on connectivity such as cellular broadband and wireless technology to facilitate the rapid movement of data.

What kind of training and how much of it will be necessary to implement an ePCR at the Laguna Beach Fire Department?

The literature reinforced the need to train personnel before, during, and after the implementation of an ePCR. Organizations must begin with an honest self assessment of their computer literacy and determine if training is necessary for basic computer operation (Middleton, 2002). Designing a training program that takes into account all of the various levels of computer skills in an organization can be very challenging and there must be sufficient time to provide hands-on training and remediation prior to going live (Zygowicz, 2007). The ePCR implementation team should anticipate varying times in which people become competent with the hardware and software platforms and factor this into their training plan (Ott, 2004). The training plan should be based on predetermined benchmarks that measure progress and competency (Ludwig, 2006). Once the basic functionality of the software and hardware is taught personnel should practice entering data from mock paper PCR forms (Ludwig, 2006). Meislin's

(1999) study found that user apprehension of the ePCR dropped as their familiarity with the program increased.

Most ePCR vendors will provide the initial training which is usually component of the product cost (Zygowicz, 2007). Ultimately there should be a number of individuals with advanced training and understanding of the ePCR system and they should be available throughout the organization to assist with questions and technical difficulties during the training and implementation phase. Regular meetings of this group can help identify end user difficulties and provide input on possible GUI improvements (Meislin, 1999) as well provide feedback on the progress of the training plan. Organizations must not cut corners in the area of training and provide adequate resources to ensure all personnel are competent and comfortable with the ePCR prior to implementation.

What is a realistic implementation timeline for an ePCR at the Laguna Beach Fire Department?

There are many factors that must be considered when trying to determine an implementation timeline. A gap analysis can assist with determining what technological and organizational hurdles exist. It may be at this point in the exercise that organizations will determine that there is inadequate IT infrastructure or insurmountable organizational issues that stand in the way of implementing an ePCR program. Assuming that the proper IT infrastructure is in place, the ePCR software and hardware decisions have been made, and the training plan has been developed there are just a few more variables to consider before deciding on an implementation timeline. Is the funding in place and immediately available? Will the legal department need time to review the contracts? Have all of the necessary approvals been obtained from managers and the governing body? Will the ePCR software program be “off the shelf” or a custom product? How much lead time is required to order and take delivery of the hardware and

software? When is the ePCR software trainer(s) available to come on site? When is the hardware installer(s) available to come on site? These are some of the questions to consider when developing an implementation time line.

Without the proper commitment of resources the implementation can become delayed or stalled altogether. Taigman (2003) suggests "managing the implementation" by "committing time and energy to actively managing the project." What this means to managers is that the success of the implementation process depends on the amount of time and resources they are willing to commit to the process. Singleton (2003) states that one of the reasons in Alberta for a loss of enthusiasm in implementing a regional ePCR system is "the high rate of purchased but not implemented systems." Zygowicz (2007) warns those considering the implementation of an ePCR to expect "a few bumps in the road" as they transition from their current paper system. Taigman (2003) suggests that organizations be "flexible and have realistic expectations around product requirements and timelines." Perhaps San Diego's implementation of their Tap Chart ePCR is good example of organizational flexibility with 400 hours of initial software development time and 5 years of ongoing refinements since deployment (Ott, 2004).

Procedures

This research project was first conceptualized by the author while attending the National Fire Academy's Executive Leadership course during the spring of 2009. While on the National Fire Academy campus a topic search at the Learning Resources Center (LRC) identified sufficient information to support the development of an ePCR implementation plan. The author utilized the following search terms and key words at the National Fire Academy's Learning Resource Center: emergency medical services, reports, electronics, computers, patient records, pre-hospital emergency care, and pre-hospital care report. The author also utilized the following

terms for an internet search utilizing Yahoo and Google search engines: electronic pre-hospital care report, ePCR, e-PCR, and electronic documentation of pre-hospital care reports.

The author developed two survey instruments and two questionnaires to gather the necessary data to answer the research questions. Each Laguna Beach Fire Department end user and manager was asked to participate in a survey that requested feedback on the development of an ePCR program. A copy of the Laguna Beach Fire Department ePCR survey cover letter is located in Appendix A, the survey can be found in Appendix B and the data collection tool is located in Appendix C. A survey of EMS managers was developed and a request for survey participant feedback was placed on the Cal Chief's website with a link to a survey feedback collection website. The EMS Manager Survey asked for feedback from organizations currently utilizing an ePCR and the Survey Monkey website was used to develop and collect the responses. A copy of the EMS manager survey cover message can be found in Appendix D, a copy of the survey in Appendix E, and the data collection tool is located in Appendix F. A LEMSA Stakeholder Questionnaire was sent to the Orange County Health Care Agency (OCHCA) and a coordinated response from the Emergency Medical Services Program Manager, Medical Director, Paramedic Program Coordinator, and CQI Coordinator was received (Appendix G). Finally, a Technical Expert Questionnaire was provided to the City of Laguna Beach public safety IT contractor with results contained in Appendix H.

The Laguna Beach Fire Department ePCR survey was developed to solicit feedback from Laguna Beach Fire Department end users and managers to determine their perception of a well designed ePCR program and the resources necessary to achieve the best results. All of the surveys were identical but each was coded to match one of four unique groups that all end users and managers were divided into. The survey participants were unaware of the survey coding to

eliminate the possibility of intentionally manipulating the survey responses. End users and managers were divided into the following groups: managers, paramedics, captains, and Emergency Medical Technicians (EMT). On May 26th, 2009, 39 surveys were distributed utilizing the interdepartmental mail with a cover letter (see appendix A) explaining the intent of the survey. Survey recipients were asked to complete the survey and return it to the author via interdepartmental mail by June 12, 2009.

The EMS Manager Survey was developed to solicit feedback from EMS Managers throughout the state of California currently utilizing an ePCR. The survey was designed to help identify the motivation or need to implement an e PCR program, current hardware and software platforms being utilized, and training and implementation timelines.

The LEMSA Stakeholder Questionnaire was designed to assist the Laguna Beach Fire Department with understanding the OCHCA's perspective on ePCR's. The questionnaire should provide information which will assist with the design of an ePCR program that has the capability to meet the LEMSA's needs. The questionnaire should also provide a more global perspective on ePCR usage, its advantages, and potential challenges to utilizing such a system.

The Technical Expert Questionnaire was designed to allow an IT expert familiar with the Laguna Beach Fire Department's CAD hardware and software, Fire RMS, mobile data computers (MDC), and connectivity infrastructure to comment on the feasibility of implementing an ePCR program. The questionnaire should also provide an IT professional's perspective on the amount of training necessary for end users and a realistic implementation time line estimate.

Limitations

One limitation of this research project is that the EMS Manager survey is limited to members of the California Fire Chiefs' Association (CFCA) that receive notifications via the

CFCA list server. Approximately 350 fire chiefs received the CFCA list sever notification of the ePCR survey and only those that are currently using an ePCR were asked to participate. The survey population was not under the control of the author and thus the results are not based on a particular confidence level or confidence interval (Creative Research Systems, 2009).

Assumptions

The first assumption of this research project is that the literature review represents an exhaustive search of available literature on electronic pre-hospital care reports. Literature searches were conducted utilizing the National Fire Academy's Learning Resource Center and internet searches utilizing Yahoo and Google search engines.

The second assumption of this research project is that the EMS Manager survey participants represent a legitimate sample of current ePCR users throughout the state of California. As previously stated in the limitations section the survey sample was not based on a pre-determined confidence level or confidence interval (Creative Research Systems, 2009) however the author made the assumption that the survey results are representative of current ePCR users within the state of California.

The third assumption is that the respondents of the ePCR end user survey did not intentionally manipulate their individual responses. Similarly, there is no indication to believe that the survey respondents would collaborate to intentionally skew or invalidate the data collected.

The fourth assumption is that the IT professional possesses sufficient knowledge and experience to accurately assess the needs of the Laguna Beach Fire Department.

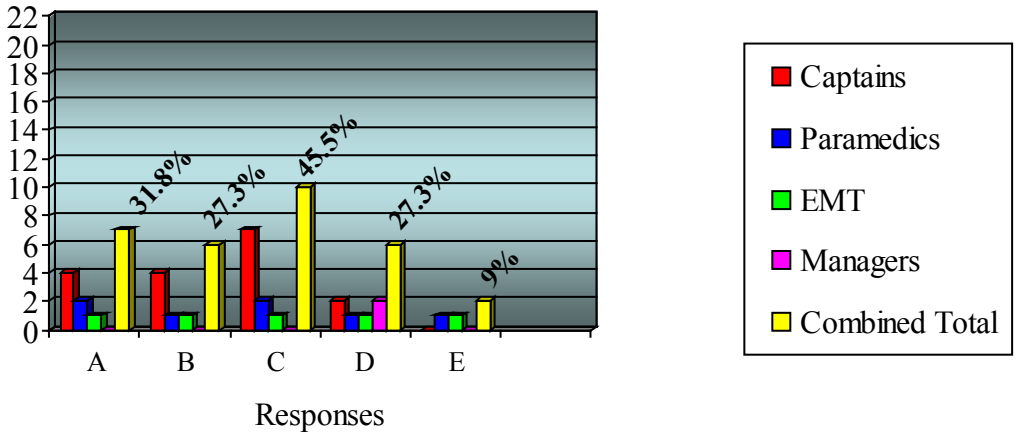
Results

The results of the action research conducted for this project will provide the information to produce an ePCR implementation plan for the Laguna Beach Fire Department (see Appendix I). The data and information collected from the LBFD ePCR end user survey, EMS Manager ePCR Implementation Survey, LEMSA Questionnaire, and IT Technical Expert Questionnaire provided the necessary information to answer each of the four research questions. The results for the distribution and return rate of the LBFD ePCR end user survey (Appendix C) is as follows: 39 total distributed with 22 returned for a 56% overall return rate, 12 distributed to captains with 8 returned for a 66.6% return rate, 15 distributed to paramedics with 7 returned for a 46.6% return rate, 9 distributed to EMTs with 5 returned for a 55.5% return rate, and 3 distributed to managers with 2 returned for a 66.6% return rate.

What goals does the Laguna Beach Fire Department desire to achieve with the implementation of an electronic pre-hospital care report?

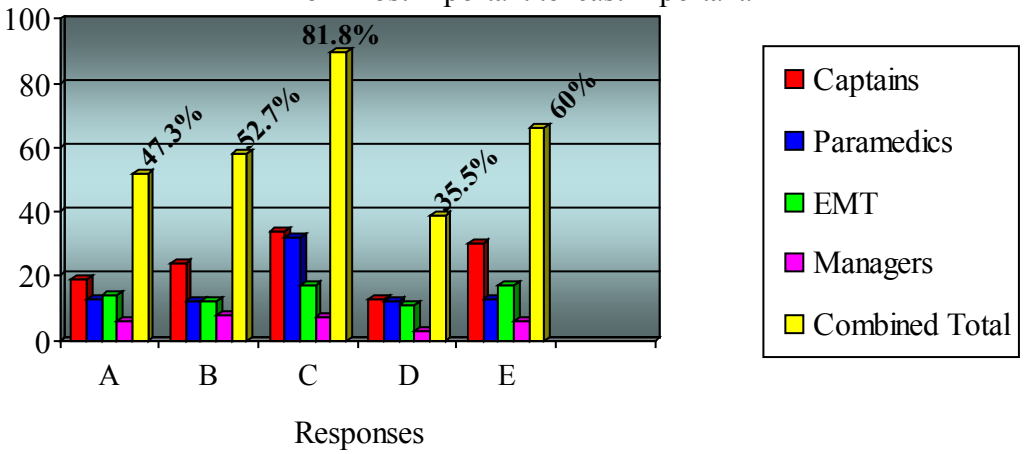
Questions 1, 2, 3, 4, 5, and 6 of the LBFD ePCR Survey, question 1 of the EMS Manager ePCR Implementation Survey, and questions 1 and 2 of the LEMSA Stakeholder Questionnaire answered this research question. The following are the results of questions 1, 2, 3, 4, 5, and 6 of the LBFD ePCR Survey. Question 1 (Figure 1) found that respondents ranked simplification of the completion of incident reports in Firehouse RMS (response C) as the most important function of an ePCR with 45.5%. Respondents ranked the reduction of the pre-hospital care report completion time (response A) the next most important function of an ePCR with 31.8%, followed by improving the accuracy of pre-hospital care reports (response B) and improving the continuous quality improvement process (response D) tied at 27.3%. Only 9% of the respondents identified a function that was not listed by selecting “other” (response E).

Figure 1
LBFD ePCR Survey, Question 1: In your opinion what is the most important function of an electronic pre-hospital care report?



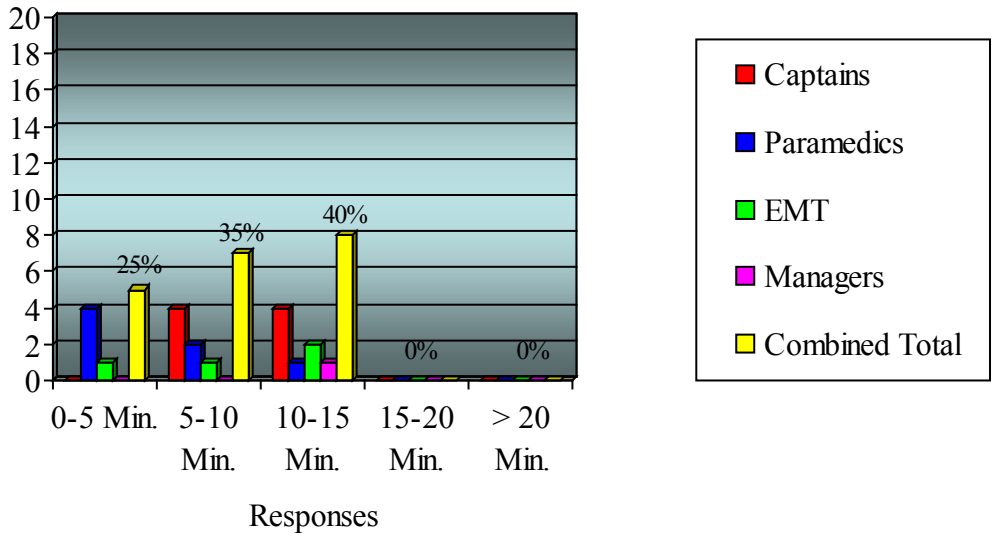
Question 2 (Figure 2) found that respondents ranked the ability to auto fill incident data from computer aided dispatch system into the ePCR (response C) as the most important feature that an ePCR should have by 81.8%. The next important feature was the automation of ePCR data downloading into Firehouse RMS (response E) by 60%, followed by drop down and pick list (response B) at 52.7%, handwriting recognition (response A) at 47.3%, and auto download of 12 lead data into the ePCR (response D) with 35.5%.

Figure 2
LBFD ePCR Survey, Question 2: Rank the following ePCR features from most important to least important.



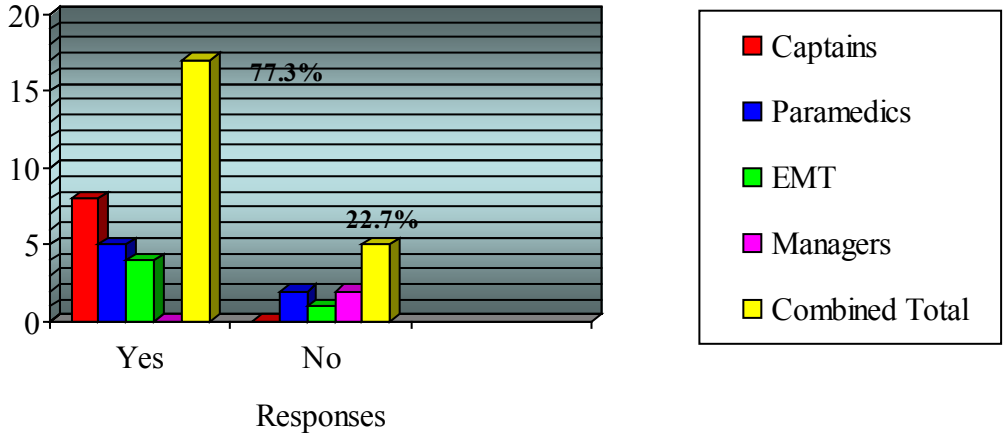
Question 3 (Figure 3) found that 40% of the respondents require 10 to 15 minutes to complete a paper pre-hospital care report, 35% require 5 to 10 minutes, and 25% require 5 minutes or less. The results indicate that 75% of the LBFD ePCR survey respondents require 5 to 15 minutes to complete the paper pre-hospital care report.

Figure 3
LBFD ePCR Survey, Question 3: What is the average amount of time you spend completing the current paper pre-hospital care report from start to finish?



Question 4 (Figure 4) found that 77.3% of the survey respondents stated yes, in order for an ePCR system to be considered successful it should take less time to complete than a paper pre-hospital care report.

Figure 4
LBFD ePCR Survey, Question 4: In order to be considered successful, should an ePCR take less time to complete than a paper pre-hospital care report?



Question 5 (Figure 5) asked respondents what the goal should be for the total length of time it should take to complete an ePCR; 63.6% responded 5 minutes or less and 31.8% responded between 5 and 10 minutes.

Figure 5
LBFD ePCR Survey, Question 5: What should be the goal for the total length of time to complete an ePCR?

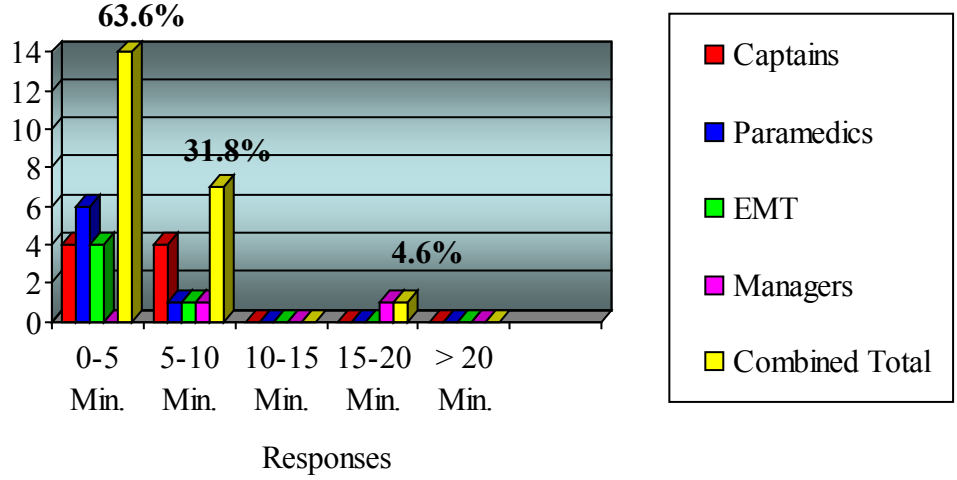


Table 1 shows the results of cross tabulating LBFD ePCR end user survey questions 3 and 5. 15% of the respondents that currently take 10 to 15 minutes to complete a paper pre-hospital care reports (PCR) expect a 10 minute reduction in completion time down to 0 to 5 minutes. 25% of respondents that currently spend 5 to 10 minutes completing a PCR expect to reduce the completion time 0 to 5 minutes. 20% of the respondents spend 0 to 5 minutes to complete a PCR and expect it to continue to take 0 to 5 minutes. 20% of the respondents that take 10 to 15 minutes to complete a PCR expect to reduce the completion time to 5 – 10 minutes. 10% of the respondents that take 5 – 10 minutes to complete a PCR expect it to continue to take the same amount of time. 5% of the respondents that currently take 0 to 5 minutes expect the PCR completion time to increase to 5 to 10 minutes. 5% of the respondents currently take 10 to 15 minutes to complete a PCR and expect the time to increase to 15 to 20 minutes with the

implementation of an ePCR. 60% of the respondents expect at least a 5 minute reduction in the average completion times of a paper PCR by switching to an ePCR. 30% of respondents expect no change in the amount of time it takes to complete a PCR by switching to an ePCR. 10% expect the time it takes to complete a PCR to increase 5 minutes by implementing an ePCR.

Table 1

LBFD ePCR Survey, Question 3 and 5 Cross Tabulation

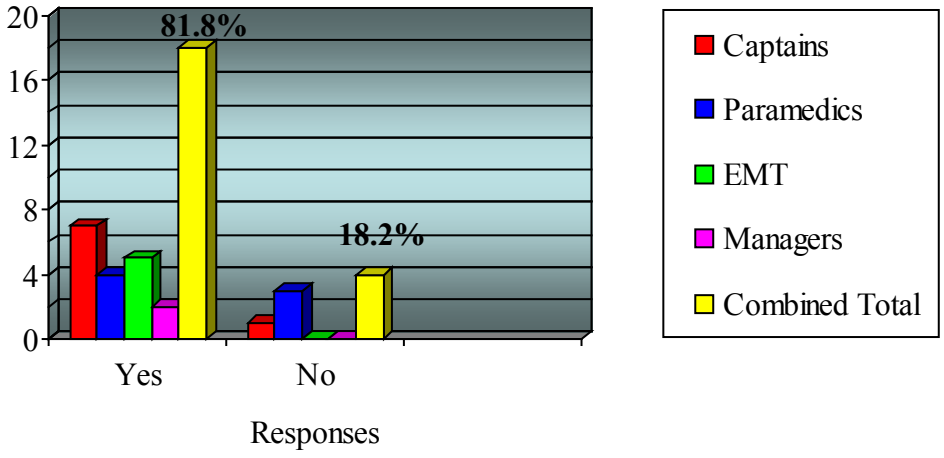
Question 3. What is the average amount of time you spend completing the current paper pre-hospital care report from start to finish?

	Question 5. What should be the goal for the total length of time to complete an electronic pre-hospital care report?					
Answer Options	0 - 5 Min.	5 - 10 Min.	10 - 15 Min.	15 - 20 Min.	> 20 Min.	Response Totals
0 - 5 Min.	20%	5%	0%	0%	0%	25%
5 - 10 Min.	25%	10%	0%	0%	0%	35%
10 - 15 Min.	15%	20%	0%	5%	0%	40%
15 - 20 Min.	0%	0%	0%	0%	0%	0%
> 20 Min.	0%	0%	0%	0%	0%	0%
Totals	60%	35%	0%	5%	0%	100%

Question 6 (Figure 6) determined that 81.8% of the respondents felt that an ePCR system should improve the quality of pre-hospital care report documentation of EMT and EMT-P personnel.

Figure 6

LBFD ePCR Survey, Question 6: Should one of the functions of an ePCR be to improve the quality of documentation by Laguna Beach Fire Department EMT and EMT-P personnel?



Question 1 of the EMS Manager ePCR Implementation Survey (Appendix E) asked the survey respondents "what goals did their organization hope to achieve by implementing an ePCR?" Improving the continuous quality improvement process received the greatest amount of responses with 96.3% (response D). Improving the accuracy of the pre-hospital care report received an 81.5% response (response B), improving billing collection rates received 51.9% (response E), reducing the pre-hospital care report completion time received 44.4% (response A), and simplifying the completion of incident reports in the RMS received 40.7% (response C).

Question 1 of the LEMSA Stakeholder Questionnaire (Appendix G) asked "what are the components of a well designed and fully implemented ePCR program?" The Orange County Health Care Agency responded with five components: a standardized database structure, user friendly interface, data storage and security, web based data transfer methodology, and data mining capability. Question 2 of the LEMSA Stakeholder Questionnaire asked what goals should EMS providers have in mind when designing an ePCR system. The OCHCA responded with: system structure, funding sources, implementation strategy, training schedule, and a commitment to on-going maintenance.

What is the best software and hardware solution for Laguna Beach Fire Department's ePCR?

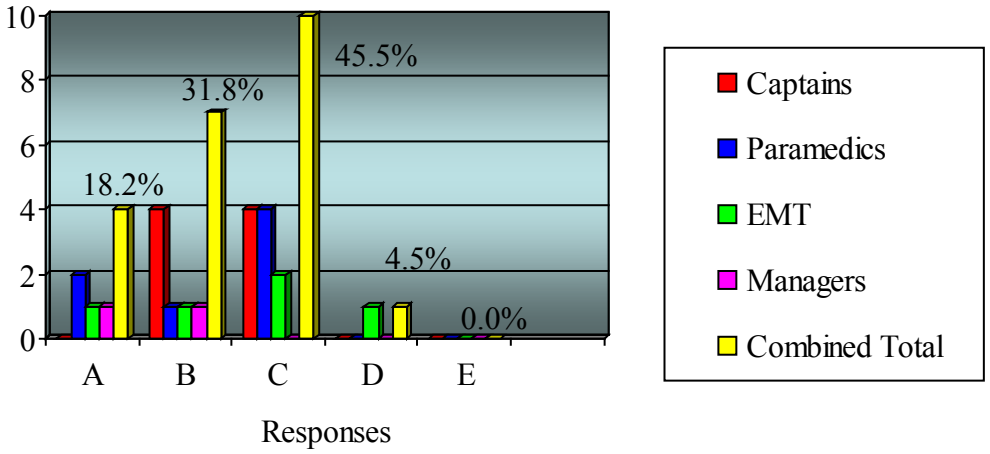
Questions 1, 2, 8, and 9 of the LBFD ePCR Survey and question 1 of the Technical Expert Questionnaire addressed this research question. End users identified through question 1 of the LBFD ePCR survey their desires for ePCR program functionality and capabilities (Figure 1). End user percentages of total responses are: the simplification of completing incident reports in the RMS (45.5%), reducing the pre-hospital care report completion time (31.6%), improving the accuracy of pre-hospital care reports (27.3%), and improving the continuous quality improvement process (27.3%).

End users identified through question 2 of the LBFD ePCR survey the desired ePCR program functionality and features (Figure 2). The percentage of total end user responses are: auto fill of incident data from computer aided dispatch system 81.8% (response C), automated download of ePCR data into Firehouse RMS 60% (response E), drop down/pick lists 52.7% (response B), handwriting recognition 47.3% (response A), automated download of 12 lead data into ePCR 39.35% (response D).

End users identified through question 8 of the LBFD ePCR Survey (Figure 7) preferred ePCR hardware platforms as follows: Personal Digital Assistant 18.2% (response A), 8.4" ruggedized tablet computer 31.8% (response B), 10.4" ruggedized tablet computer 45.5% (response C), 12.4" ruggedized laptop computer 4.5% (response D), and other 0% (response E).

Figure 7

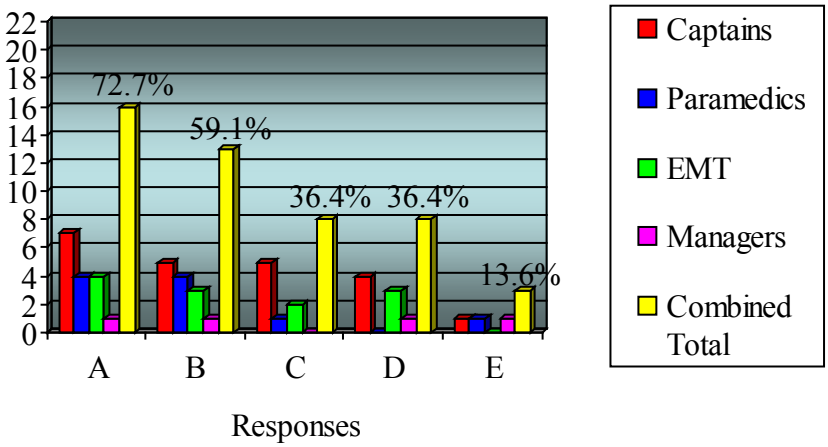
LBFD ePCR Survey, Question 8: An ePCR can be run on many hardware platforms and each has distinct advantages. Which of the following options appeals to you most?



Over 77% of the survey respondents preferred a tablet platform over all other options. While the Captains were divided at 50% each for the 8.4" and 10.4" ruggedized tablets respectively, a majority of the paramedics (80%) preferred the 10.4" over the 8.4" screen size.

End users identified through question 9 of the LBFD ePCR Survey (Figure 8) additional hardware and software features that would be beneficial: magnetic strip card reader 72.7% (response A), internet capability 59.1%, (response B), Microsoft Office Suite 36.4% (response C), GPS capability 36.4% (response D), and other (camera) 13.6% (response E).

Figure 8
LBFD ePCR Survey, Question 9: What additional hardware and software features would be beneficial? Please circle all that apply.



Question 1 of the Technical Expert Questionnaire (Appendix H) identified a 10.4" ruggedized tablet with an Intel processor running Windows Tablet as the optimum hardware platform with a SQL server on the back end. Data transfer and connectivity are addressed with a broadband wireless connection or a secure wireless router located on the fire apparatus.

What kind of training and how much of it will be necessary to implement an ePCR at the Laguna Beach Fire Department?

Question 4 and 5 of the EMS Manager ePCR Implementation Survey, and question 2 from the ePCR Technical Expert Questionnaire answers this question. When questions 4 and 5 of the EMS Manager ePCR Implementation Survey are cross tabulated (Table 2) a comparison of the size of the agency and the number of required training hours can be made. 71.4% of the

surveyed agencies with 11 – 20 daily ePCR end users required 2 – 5 hours of training to adequately prepare end users. The Technical Expert Questionnaire suggests 2 hours of end user ePCR training.

Table 2

Question 4. How much training (avg. hours per employee) was necessary to adequately train your personnel on the use of the e-PCR?

	Question 5. How many end users (ALS and BLS combined) does your organization have that utilize your e-PCR on a daily basis?						
Answer Options	1 - 10	11 - 20	21 - 50	51 - 100	Greater than 100	Response Percent	Response Count
Less than 2 hours	1	0	0	1	0	7.4%	2
2 - 5 hours	0	5	4	2	2	48.1%	13
5 - 10 hours	0	1	3	2	0	22.2%	6
Greater than 10 hours	0	1	0	2	3	22.2%	6

What is a realistic implementation timeline for an ePCR at the Laguna Beach Fire Department?

Question 7 of the LBFD ePCR survey, question 3 of the EMS Manager ePCR Implementation Survey, and question 3 and 5 of the Technical Expert Questionnaire answers this question. The results of the LBFD ePCR survey are as follows: 1 month 13.6% (response A), 3 months 31.8% (response B), 6 months 18.2% (response C), greater than 6 months 36.4% (response D). When the EMS Manager ePCR Implementation Survey results of questions 3 and 5 are cross tabulated (Table 3) 43% of organizations with 11 – 20 end users were able to fully implement their ePCR program within 6 months and over 71% were able to implement their programs within 12 months. The Technical Expert Questionnaire (Appendix H) identifies a 6 month implementation time line as appropriate for the Laguna Beach Fire Department.

Table 3

Question 3. How long did it take to fully implement your e-PCR program from start to finish?

	Question 5. How many end users (ALS and BLS combined) does your organization have that utilize your e-PCR on a daily basis?						
Answer Options	1 - 10	11 - 20	21 - 50	51 - 100	Greater than 100	Response Percent	Response Count
Less than 3 months	1	2	2	0	0	18.5%	5
3 - 6 months	0	1	1	1	0	11.1%	3
6 - 12 months	0	2	2	4	1	33.3%	9
greater than 1 year	0	2	2	2	4	37.0%	10

Discussion

The literature review and survey results provided a significant amount of information and data to answer each of the research questions and help guide the development of an ePCR implementation plan for the Laguna Beach Fire Department.

The results of the surveys provide insight on end user expectations and the goals that current ePCR users had prior to implementing their ePCR program. The LBFD ePCR end user survey rated simplifying the completion of incident reports in the RMS as the most important function of the ePCR (45.5%) and the auto fill of incident data from computer aided dispatch as the most important ePCR feature (81.8%). Huisenga (1999) suggests that in order to obtain goals such as improving the continuous quality improvement process or managing information there must be a demonstrated benefit to the end user. The LBFD ePCR end user survey clearly identifies the simplification of completing the pre-hospital care reports and incident reports as the primary benefit desired by end users. Kerney (2007) attributes many ePCR program implementation failures to inadequate software programs. The LEMSA questionnaire supports this notion by stating that the user interface must be “user friendly.” This level of ePCR

functionality or "user friendliness" will require a software program that can interface with the current CAD and RMS and is discussed later in this section. Based on the data collected it is very likely that LBFD end users will perceive any ePCR program to be inadequate if it does not incorporate the sharing of CAD and RMS data.

Over 96% of EMS Managers rated the organizational goal of improving the continuous quality improvement process as the most important goal of an ePCR program. This finding is supported by 100% the Laguna Beach Fire Department managers that rated improving the continuous quality improvement process as the most important function of an ePCR. The LEMSA questionnaire supports the need to improve the continuous quality improvement process by indicating that standardized database structure and data mining capabilities are components of a well designed ePCR program. Zygowicz (2007) states that the first basic feature of any ePCR should be its ability to meet required state and national data set standards. The LEMSA further states that a well designed ePCR program must also be compliant with the local data set requirements. Since the local data set is different from state and national data sets, any ePCR software program purchased by an Orange County EMS provider must be customizable to meet the local data set requirements. Singleton (2003) found in his research that one of the keys to successful ePCR programs is its ability to be scalable and customizable.

Additional goals were identified through the LBFD ePCR end user survey that are worthy of incorporating into an ePCR program. End users identified the reduction of the time necessary to complete the pre-hospital care report as a high priority. Huisenga (1999) states that one of the potential benefits of an ePCR program is increased productivity. The LBFD ePCR survey found that over 95% of the end users feel that an ePCR should take 10 minutes or less to complete with 40% of the respondents indicating that it currently requires greater than 10 minutes to complete

the paper pre-hospital care report. The survey indicates that 70% of the end users will consider the implementation of an ePCR to be successful if the pre-hospital care report completion time is reduced by at least 5 minutes. This finding was supported when the LBFD ePCR survey found that 77.3% of the end user indicated that in order for an ePCR program to be considered successful it should take less time to complete than a paper PCR. The survey results also indicate that some end users may have an unrealistic expectation of the amount of time that will be saved by implementing an ePCR program with 15% believing that the completion time will be reduced by at least 10 minutes.

Another goal identified by the LBFD ePCR survey is the desire to improve documentation of pre-hospital care reports. Over 81% of the LBFD respondents feel that an ePCR should improve the quality of documentation by EMT and Paramedic personnel. Improvement of the accuracy for pre-hospital care documentation and improving the continuous quality improvement process combined for a total of 54.6% of the end user responses when asked what is the most important function of an ePCR. The LEMSA questionnaire suggests that organizations can benefit in these areas as a result of implementing an ePCR. Singleton (2003) and Kerney (2007) suggest that an ePCR's user friendliness can be maintained while improving the quality and accuracy of documentation and the continuous quality improvement process.

The literature review identified specific guidelines that should be considered before purchasing an ePCR software program. Ludwig (2006) suggests that an EMS provider should require the ePCR vendor to provide a solution that fits their needs. Singleton (2003) maintains that an ePCR program must be scalable and customizable. Zygowcz (2007) suggests that any ePCR software being considered for purchase should at least meet the necessary data sets to meet compliance. Ott (2004) cautions that adopting a data set that is not your own Orange County

Medical Emergency Data System (OC-MEDS) will often require compromises on the data points collected. The LEMSA questionnaire makes it clear that all Orange County EMS providers must be compliant with the Orange County data system standards.

Zygowicz (2007) identifies many ePCR system features that should be considered including: auto fill of patient data, real-time error checking with a medical and standard dictionary, and ability to attach various files and documents. Taigman (2003) suggests buying a software program with graphical user interface that is easy to use and learn. The ability to capture nurse signatures or refusal of treatment/transport signatures should also be a consideration (Ludwig, 2006). Perhaps the most important feature of all is the need for the ePCR to be compatible with technology systems already in place (Zygowicz, 2007). This need is further highlighted by the LBFD ePCR survey findings which indicate that end users desire an ePCR that is fully integrated with the CAD and Fire RMS currently being used by the Laguna Beach Fire Department.

There are currently no ePCR software options that meet the OC-MEDS data set and are capable of integrating with Laguna Beach Fire Department's CAD and RMS. In light of this the information from the ePCR Technical Expert Questionnaire recommends a custom ePCR software program that is scalable and customizable running on a SQL server.

Zygowicz (2007) states a bedside data collection platform lowers reporting errors and reduces data input redundancy. The focus of the research was on a mobile data collection platform that would be primarily utilized for field data collection. Thus the hardware platform choices provided to end users through the LBFD ePCR survey were limited to mobile computing devices only. The LBFD ePCR end use survey identified a 10.4" ruggedized tablet PC as the hardware platform of preference. The ePCR Technical Expert Questionnaire identified a 10.4"

ruggedized tablet PC with an Intel processor running Windows Tablet. This hardware platform fits the mobile computer criteria and has the capability to handle additional computing requirements for future expansion.

LBFD ePCR Survey respondents identified additional hardware features for consideration with 72.7% desiring a magnetic strip card reader, 59% desiring internet capability, and 36.4% with GPS capability. Approximately 40% of LBFD ePCR respondents identified the ability to download 12 lead data into the ePCR, this capability requires Bluetooth connectivity to be added to the current EKG monitors. Other computer hardware considerations are: wireless connectivity, built in camera, and touch screen capable. Shenvi (2007) describes a fully integrated ePCR system as being capable of receiving CAD data, capturing accurate information, and transmitting data to the receiving center before the patient arrives. This capability requires additional hardware to be added to Laguna Beach's current mobile computing infrastructure. The Laguna Beach Fire Department already utilizes a wireless broadband connection to transmit CAD data to and from mobile data computers. The additional hardware needed is a wireless router on each apparatus or a wireless data card for each tablet PC to connect to and send/receive CAD, ePCR, and RMS data.

Middleton (2002) suggests that organizations contemplating the training component of implementing an ePCR begin with an honest self assessment of their organization's computer literacy. The Laguna Beach Fire Department recently deployed a new fire RMS and CAD on a mobile data computer platform. The organizations computer literacy increased significantly as a result of this deployment. Although the organization's overall computer literacy has risen, there are still varying levels of computer competency throughout the organization. Ott (2004)

recommends that ePCR implementers develop a training plan capable of meeting the need for various computer competencies.

The EMS Manager survey found that 71.4% of the organizations that match Laguna Beach Fire Department's end user demographics trained their personnel between 2 and 5 hours prior to implementation of their ePCR. The ePCR Technical Expert questionnaire suggests that a 2 hour class of ePCR orientation will sufficiently prepare LBFD personnel prior to going live. The technical expert has extensive knowledge of the organization's computer literacy so there is reason to believe his estimation for ePCR orientation is likely to be accurate. The cost of the initial training is typically included in the ePCR contract price (Zygowicz, 2007). Once the basic functionality of the ePCR software is taught it is suggested that personnel practice entering mock paper PCR forms (Ludwig, 2006). The Laguna Beach Fire Department trained field personnel to assist during the deployment of the new mobile computing platform and CAD/RMS deployment. This deployment model placed personnel out in the field to establish a support network for individuals that had questions or difficulties with aspects of the new mobile computer data environment. It is advisable that the support network model also be utilized during the deployment of the ePCR.

The training phase of the implementation plan must be closely monitored and regular meetings of the implementation and training teams can identify user interface problems and additional training needs (Meislin, 1999). Additionally, pre-identified benchmarks should be developed to measure progress and competency (Ludwig, 2006). Finally, the implementation plan should factor in sufficient time for remedial training if required (Zygowicz, 2007).

The length of time required to implement an ePCR program for the Laguna Beach Fire Department is the last consideration of this research paper. The LBFD ePCR survey found that

63.6 % of end users feel that an ePCR can be implemented in 6 months or less. The EMS Manager survey found that only 42.9% of agencies with similar end user demographics as LBFD were able to implement their ePCR program in 6 months or less. Many variables can prolong such a technologically dependent program and a research project could be done on this topic alone. However, ePCR implementers must take into account that approximately 70% of all agencies in the EMS Manager survey took longer than 6 months to fully implement their ePCR program.

The ePCR Technical Expert Questionnaire identified a 6 month implementation time from beginning of product development to deployment. The literature review did bring some interesting points of view to light. First, agencies should be flexible and expect set backs (Zygowicz, 2007). Secondly, the implementation must be managed and implementers must be willing to commit time and energy to the effort (Taigman, 2003). The EMS Manager survey asked respondents if they have realized all of their ePCR goals; 55.6% stated that they have not. The reasons for this finding are outside the scope of this research but perhaps the San Diego City ePCR software deployment offers an explanation.

The City of San Diego developed and implemented their own ePCR software 9 years ago. The development of this software has been a process of continual improvement with over $500,000 spent as of November, 2004 (Ott, 2004). The City of San Diego Fire Department figures this is a reasonable investment given the size of their organization (Ott, 2004). Their ePCR is a constantly evolving program and they are always identifying ways to improve the software. The fire service is forced to continually invent better ways of doing business in order to maximize their resources.

Recommendations

It is recommended that the Laguna Beach Fire Department utilize the ePCR implementation plan to guide their ePCR project through development to deployment. Considerations for effectively utilizing this and future implementation plans are also provided.

- Continue to build support and consensus among all stakeholders.
- Include implementation team members that are critical of the program to provide a different perspective and help identify potential issues before implementation.
- Look for opportunities to secure program funding through public/private and public/public partnerships that could benefit from sharing certain ePCR data.
- Pursue grant opportunities to help support/improve the ePCR Program.
- Consider contract employment of a CQI nurse to produce and evaluate quality improvement reports.
- Utilize the CQI reports to identify opportunities to develop and deliver performance driven training.
- Once the ePCR program is implemented create a culture of "continual improvement" to the program.
- Consider developing current department forms with similar electronic and data base reporting capabilities.

Future readers of this applied research project should not become overwhelmed or slowed down with the need to develop a formal implementation plan for every project. The need for an implementation plan should be driven by such factors as organizational readiness, capabilities, project sophistication, and organizational needs. Managers and project coordinators must remember that the mere presence of an implementation plan does not ensure that a new program

is being implemented effectively. Finally, a significant amount of time and effort must be committed to the management of the implementation process.

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MEMORANDUM
FIRE DEPARTMENT

DATE: **May 26, 2009**

TO: **Survey Recipients**

FROM: **Kris Head, Division Chief**

SUBJECT: **Electronic Pre-Hospital Care Report Survey**

The Laguna Beach Fire Department is in the beginning stages of developing an electronic pre-hospital care report or e-PCR. Attached you will find a short survey asking for your opinion on a number of issues concerning e-PCR's. This confidential survey will only take 5 to 10 minutes to complete and your feedback is greatly appreciated. Your input will help to tailor the design of the software and hardware platforms. Please complete the survey and return in the inter-departmental mail to me by June 12th, 2009 and feel free to contact me if you have any questions or comments.

Appendix B
Laguna Beach Fire Department
Electronic Pre-Hospital Care report Survey

1). In your opinion what is the most important function of an electronic pre-hospital care report (e-PCR)?

A. Reduce the pre-hospital care report completion time.
B. Improve the accuracy of pre-hospital care reports.
C. Simplify the completion of incident reports in Firehouse.
D. Improve the continuous quality improvement process.

2). Rank the following e-PCR features in order of importance from most important to least important. 1 represents most important and 5 represents the least important.

____ Handwriting recognition
____ Drop down/pick lists
____ Auto fill of incident data from computer aided dispatch system
____ Automated download of 12 lead data into e-PCR
____ Automated download of e-PCR data into Firehouse RMS.

3). What is the average amount of time you spend completing the current paper pre hospital care report from start to finish?

A. 0 - 5 minutes
B. 5-10 minutes
C. 10 - 15 minutes
D. 15 – 20 minutes
E. Greater than 20 minutes

4). In order to be considered successful, should an e-PCR take less time to complete than a paper pre-hospital care report?

A. Yes
B. No

5). What should be the goal for the total length of time to complete an e-PCR?

A. 0 - 5 minutes
B. 5-10 minutes
C. 10 - 15 minutes
D. 15 – 20 minutes
E. Greater than 20 minutes

6). Should an e-PCR improve the quality of documentation by Laguna Beach Fire Department EMT and EMT-P personnel?

A. Yes
B. No

7). In your opinion what is a realistic timeline to fully to implement an e-PCR at the Laguna Beach Fire Department?

A. 1 month
B. 3 months
C. 6 months
D. Greater than 6 months

8). An e-PCR can be run on many hardware platforms and each has distinct advantages. Which of the following options appeals most to you?

A. Personal Digital Assistant (ex. Palm Pilot). Convenient and lightweight but a small screen and limited computing power, unable to run other programs.
B. 8.4" screen, ruggedized tablet computer. Ample computing power to run additional programs (fire safety inspection program, apparatus daily check, daily narcotics inventory, etc.). Weighs about 3 to 4 lbs. and has a touch screen large enough to visualize about 1/3 of the pre-hospital care report at a time.
C. 10.4" screen, ruggedized tablet computer. Ample computing power to run additional programs (fire safety inspection program, apparatus daily check, daily narcotics inventory, etc.). Weighs about 3.5 to 5 lbs. and has a touch screen large enough to visualize about 1/2 of the pre-hospital care report at a time.
D. 12.4" screen, ruggedized laptop computer. Ample computing power to run additional programs (fire safety inspection program, apparatus daily check, daily narcotics inventory, etc.). Weighs about 5 to 7 lbs. and has a touch screen large enough to visualize about 2/3 of the pre-hospital care report at a time.

9). What additional hardware and software features would be beneficial? Please circle all that apply.

A. Magnetic strip card reader that can read information from a drivers license and import it into e-PCR
B. Internet capability
C. Microsoft Office software suite
D. Built in GPS
E. Other _____

Appendix C
Laguna Beach Fire Department
Electronic Pre-Hospital Care Report Survey Data Collection Tool

Question 1	A		B		C		D		E (Other)	
Responses	4, 2, 1		4, 1, 1		7, 2, 1		2,1, 2, 1		1, 1	
Totals	7	31.8%	6	27.3%	10	45.5%	6	27.3%	2	9.1%

Question 2	Handwriting Recognition				Drop Down/Pick List		Auto Fill from CAD		Auto Download of 12 Lead		Auto Load ePCR data into Fire RMS	
Responses	19, 13, 6,		14		24, 12, 8, 14		34, 32, 7,	17	13, 12, 3,	11	30,13,6,17	
Totals	52	47.3%			58	52.7%	90	81.8%	39	35.5%	66	60.0%

Question 3	0 - 5 Min.		5 - 10 Min.		10 - 15 Min.		15 - 20 Min.		> 20 Min.	
Responses	4, 1		4, 2, 1		4, 1,1, 2					
Totals	5	25.0%	7	35.0%	8	40.0%	0	0.0%	0	0.0%

Question 4	Yes		No	
Responses	8, 5, 4		2, 2, 1	
Totals	17	77.3%	5	22.7%

Question 5	0 - 5 Min.		5 - 10 Min.		10 - 15 Min.		15 - 20 Min.		> 20 Min.	
Responses	4,6, 4		4, 1, 1, 1				1			

Question 6	Yes		No	
Responses	7, 4, 2,5		1, 3	
Totals	18	81.8%	4	18.2%

Question 7	1 Month		3 Months		6 Months		> 6 Months	
Responses	2, 1		3, 2, 2		2, 2		1, 3, 2, 2	
Totals	3	13.6%	7	31.8%	4	18.2%	8	36.4%

Question 8	A		B		C		D		E (Other)	
Responses	2, 1, 1		4, 1, 1, 1		4, 4, 2		1			
Totals	4	18.2%	7	31.8%	10	45.5%	1	4.5%	0	0.0%

Question 9	A		B		C		D		E (Other)	
Responses	7, 4, 1, 4		5, 4, 1, 3		5, 1, 2		4, 1, 3		1, 1, 1	
Totals	16	72.7%	13	59.1%	8	36.4%	8	36.4%	3	13.6%

Captain Responses in Red	8
Paramedic Responses in Blue	7
EMT Responses in Green	5
Manager Responses in Purple	2
Total Responses	22

Appendix D
EMS Manager e-PCR Implementation Survey
Cover Message

Fellow EMS Professionals:

The Laguna Beach Fire Department is pursuing the implementation of an e-PCR program. We would like to incorporate the feedback from current e-PCR users into our implementation plan. The link below will direct you to a brief survey which will be used to collect your responses. Please feel free to contact me directly if you would like me to share the results of this survey with you and thank you in advance for taking the time out of your busy schedule to assist us with this project.

http://www.surveymonkey.com/s.aspx?sm=Bxt6mMBzyrD24GjOesx1Jw_3d_3d

Sincerely,

Kris Head
Division Chief
Laguna Beach Fire Department
505 Forest Avenue
Laguna Beach, CA 92651
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Cell (949) 922-8764
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EMS Manager e-PCR Implementation Survey

1). What goals did your organization hope to achieve by implementing an e-PCR? Please check all that apply.
□ Reduce the pre-hospital care report completion time
□ Improve the accuracy of pre-hospital care reports
□ Simplify the completion of incident reports in your RMS
□ Improve the continuous quality improvement process
□ Improve billing collection rates
□ Other (please specify) _____
_____

2). Has your organization realized all of its e-PCR program goals?
□ Yes
□ No

3). How long did it take to fully implement your e-PCR program from start to finish?
□ Less than 3 months
□ 3 - 6 months
□ 6 - 12 months
□ greater than 1 year

4). How much training (avg. hours per employee) was necessary to adequately train your personnel on the use of the e-PCR?
□ Less than 2 hours
□ 2 - 5 hours
□ 5 - 10 hours
□ Greater than 10 hours

5). How many end users (ALS and BLS combined) does your organization have that utilize your e-PCR on a daily basis?
□ 1 - 10
□ 11 - 20
□ 21 – 50
□ 51 – 100
□ Greater than 100

6). Please indicate which e-PCR software program you are using.
_____
_____

7). Why did you purchase this e-PCR program? Please check all that apply.
□ Price
□ Compatibility with your CAD and Fire RMS software
□ Ability to add user defined features
□ A regional decision with multiple agencies and end users
□ Ease of use
□ Other (please specify)_____
_____

8). Please indicate which hardware platform your field personnel are using to run the e-PCR.

_____
_____

9). Why did you choose the hardware platform that you are currently using? Please check all that apply.

□ Price
□ Computing power and ability to operate multiple or complex software programs
□ Size, weight, and portability
□ Ability to add user defined features such as voice recognition, magnetic strip reader, GPS, etc.
□ Ease of use
□ Other (please specify)_____
_____

Appendix F
Laguna Beach Fire Department
EMS Manager ePCR Implementation Survey Data Collection Tool

Q1. What goals did your organization hope to achieve by implementing an e-PCR? Please check all that apply.

Answer Options	Response Percent	Response Count
Reduce the pre-hospital care report completion time	44.4%	12
Improve the accuracy of pre-hospital care reports	81.5%	22
Simplify the completion of incident reports in your RMS	40.7%	11
Improve the continuous quality improvement process	96.3%	26
Improve billing collection rates	51.9%	14
Comments		3

Q2. Has your organization realized all of its e-PCR program goals?

Answer Options	Response Percent	Response Count
Yes	44.4%	12
No	55.6%	15

Q3. How long did it take to fully implement your e-PCR program from start to finish?

Answer Options	Response Percent	Response Count
Less than 3 months	18.5%	5
3 - 6 months	11.1%	3
6 - 12 months	33.3%	9
greater than 1 year	37.0%	10

Q4. How much training (avg. hours per employee) was necessary to adequately train your personnel on the use of ePCR?

Answer Options	Response Percent	Response Count
Less than 2 hours	7.4%	2
2 - 5 hours	48.1%	13
5 - 10 hours	22.2%	6
Greater than 10 hours	22.2%	6

Q5. How many end users (ALS and BLS combined) does your organization have that utilize your ePCR on a daily basis?

Answer Options	Response Percent	Response Count
1 - 10	3.7%	1
11 - 20	25.9%	7
21 - 50	25.9%	7
51 - 100	25.9%	7
Greater than 100	18.5%	5

Q6. Please indicate which e-PCR software program you are using.

Q7. Why did you purchase this e-PCR program? Please check all that apply

Answer Options	Response Percent	Response Count
Price	25.9%	7
compatibility with your CAD and Fire RMS software	37.0%	10
Ability to add user defined features	33.3%	9
A regional decision with multiple agencies and end users	37.0%	10
Ease of use	33.3%	9
Comments		11

Q8. Please indicate which hardware platform your field personnel are using to run the e-PCR.

Q9. Why did you choose the hardware platform that you are currently using? Please check all that apply.

Answer Options	Response Percent	Response Count
Price	25.9%	7
Computing power and ability to operate multiple or complex software programs	22.2%	6
Size, weight, and portability	48.1%	13
Ability to add user defined features such as voice recognition, magnetic strip reader, GPS, etc.	0.0%	0
Ease of use	37.0%	10
Comments		16

In your opinion what are the components of a well designed and fully implemented e-PCR program?

A well designed and fully implemented ePCR system should include the following components:

- **Standardize Database Structure** – a provider based electronic prehospital care report (ePCR) solution must be compliant with Local, State, and National EMS Data System standards.

    - National: The National EMS Information System (NEMSIS) Standards must be utilized and any prospective vendor must have been certified as a NEMSIS Gold or Silver compliant. The NEMSIS model includes the minimum data set to be submitted by states into the NEMSIS database. Go to: www.nemsis.org for more information.

    - State: The California State EMS Information System (CEMSIS) is based on the NEMSIS model and includes some California Specific data elements. California Local EMS Agencies (LEMSA's) must comply with the CEMSIS model as a minimum data set to be submitted to the state into the CEMSIS database. Go to: http://www.emsa.ca.gov/systems/default.asp#Data for more information.

    - Local: The Orange County Medical Emergency Data System (OC-MEDS) is based on the NEMSIS and CEMSIS models and includes some Orange County specific data elements. Orange County EMS provider agencies must comply with the OC-MEDS model. The OC-MEDS model includes required and optional data elements. Go to: http://ochealthinfo.com/medical/ems/oc-meds.htm for more information.

- **User Friendly Interface** – A "user friendly" user interface is a vital component of any ePCR solution. The component should not be taken lightly as this is the area that providers themselves (paramedics) will use. If the user interface is cumbersome and/or difficult to use, then it may not gain needed acceptance by the individual user. *Data is only as good as the user who is entering it.*

- **Data Storage and Security** – any ePCR solution must include data storage and security methods that are consistent with HIPAA. The US Department of Health and Human Services (HHS) has issued National Interim Guidance pursuant to the Health Information Technology for Economic and Clinical Health Act or the (HITECH Act) of the American Recovery and Reinvestment Act of 2009 (ARRA) regarding how best to secure protected health information (PHI). Go to: http://www.hhs.gov/ocr/privacy/hipaa/understanding/coveredentities/hitechrfi.pdf for more information.

- **Web-Based Data Transfer Methodology** – The provider ePCR solution must have the capability for web-based (XML) data transfer from portable devices to a central provider or vendor hosted server or data storage center. The system must also have the capability of transmitting data upon request or regularly (pursuant to a signed data usage agreement) to the LEMSA via secure encrypted File Transfer Protocol (FTP) site or other suitable web-based data transfer method.

- **Data Mining Capability** – The ePCR solution must also possess robust data mining and reporting capabilities. An ePCR system is pointless without a strong reporting and data mining structure.

What goals should EMS providers have in mind when designing an e-PCR program?

Implementing an ePCR program is a very time consuming and labor intensive process that will require significant commitment on the part of the provider agency. My suggestion is for the provider agency to set clear and achievable goals with a specific time line in which to accomplish them. A system should not be purchased and/or implemented until the provider agency has identified:

- System Structure
- Funding Sources
- Implementation Strategy
- Training Schedule
- On-Going Maintenance

What are the primary benefits of an EMS provider having an e-PCR program?

An ePCR program affords the provide agency a unique and rewarding opportunity to gain extremely valuable insight into the efficacy of the emergency medical services that they provide to the citizens that they serve. An ePCR system is an organizational enrichment tool that if used appropriately; can aid the provider agency by:

- Providing data to support evidence based and performance driven quality assurance / quality improvement programs
- Providing system insight for identifying average response times, peek use times, syndromic surveillance, etc.
- Aiding cost recovery efforts either through direct billing or through system utilization assessments.

How does a LEMSA benefit from EMS providers utilizing an e-PCR?

The primary role of a LEMSA in California is to plan, coordinate, implement, and continuously evaluate the EMS System in the County or region in which they serve. As the Local EMS Agency, Orange County EMS (OCEMS) has developed cooperative business relationships with EMS provider agencies and hospital throughout the county. OCEMS will benefit from data submitted through provider based ePCR in the following ways:

- Evidence based policy and procedures updates
- Evidence based treatment guidelines updates
- Performance driven training
- Improved Quality Assurance / Quality Improvement
- System-wide and system-to-system comparative analysis (i.e city to city, county to county, etc)
- Syndromic Surveillance
- EMS Research
- Data to support grant applications, cost recovery, or any other form of monetary assistance to aid the continued growth efficacy of the OC EMS System

Appendix H
Laguna Beach Fire Department
ePCR Technical Expert Questionnaire

1). What is the best software and hardware platform for the Laguna Beach Fire Department e-PCR?

SQL backend, 10.4" max. tablet with Intel processor running Windows Tablet. Custom ePCR software, Secure wireless router on engines.

2). What kind of training and how much of it will be necessary to implement an e-PCR at the Laguna Beach Fire Department?

2 hour class for ePCR software orientation.

3). What is a realistic implementation time line for an e-PCR at the Laguna Beach Fire Department?

If you are asking for a deployment date then I would state August 1. This should give us enough time to work out any issues/enhancements the user find, test Tablets, and implement the Intergraph interface and Bluetooth.

Laguna Beach Fire Department
ePCR Implementation Plan

Table of Contents

Introduction

The following plan is intended to assist Laguna Beach Fire Department personnel with the implementation of an electronic pre-hospital care report (ePCR). This plan is a component of a research project submitted to the National Fire Academy to meet the requirements of the Executive Fire Officer Program. The recommendations within this plan have been developed with the input of LBFD personnel, LBFD Information Technology support personnel, the Orange County Health Care Agency, and Emergency Medical Services Managers throughout the State of California. A significant amount of information for developing this plan was also gathered from available literature such as trade magazines, studies, and reports.

Background

This plan is intended to be adaptable with the primary focus being the deployment of an ePCR that meets the Laguna Beach Fire Department's needs. The only decision made prior to the development of this plan is which ePCR software program is going to be utilized. This decision was driven by the organizational need to have an ePCR that meets the Orange County Medical Emergency Data System (OC-MEDS) requirements, interfaces with CAD and Fire RMS, is scalable, customizable, and able to support CQI needs. Since no current ePCR software vendors met all of these requirements the decision was made to develop a custom ePCR program that could meet all of the organization's needs.

A software developer was chosen based on their extensive knowledge of the Laguna Beach Fire Department's IT infrastructure and proven ability to deploy custom forms and data bases for other public safety agencies. Authorization to proceed with the project was secured from the City Manager and Fire Chief and funding was secured with money budgeted for EMS CQI but not being utilized effectively due to an antiquated CQI program.

Development of the ePCR began in March of 2009 with a target date to release the ePCR to the end user workgroup by July 1, 2009. The end user workgroup is made up of all ranks, EMT's and EMT-P's with average to far above average computer technical abilities. The end user work group will be responsible for working with the software programmer to assist with the development of the Graphic User Interface (GUI). The end user group will also be responsible for trialing the ePCR software and making suggestions for product refinement prior to deploying to the entire organization. Product refinement will primarily focus on incorporating and refining features that will assist with improving the accuracy and speed in which the form can be successfully completed. End users will be tasked with providing feedback on various tablet PC platforms and work flow suggestions.

On May 26th, 2009 every member of the Laguna Beach Fire Department was given a survey and asked to provide feedback on their preferred hardware platform for an ePCR. The 10.4" ruggedized tablet PC received the majority of responses and this platform was also identified by the IT technical expert as being the best option. The members of the Laguna Beach Fire Department also identified the following additional hardware and software options as being helpful for field use: magnetic card reader, internet, Microsoft Office Suite, GPS, camera, and handwriting recognition.

ePCR Program Goal Discussion

The Laguna Beach Fire Department hopes to realize several goals as a result of implementing an ePCR. From management's perspective the catalyst and primary driving force behind implementing an ePCR is to establish a compliant continuous quality improvement (CQI) program. The next management goal is to improve the quality of pre-hospital care

documentation of Laguna Beach Fire Department personnel. The final management goal is to increase the productivity of personnel.

The Laguna Beach Fire Department end user survey identified several goals for the ePCR program. The most important function of an ePCR as identified by the Laguna Beach Fire Department end users is to simplify the completion of incident reports in Firehouse. LBFD end users ranked the ability to auto fill incident data from CAD as the most important ePCR feature. Another end user desire is to reduce the ePCR completion time. All three of these end user requests will improve the productivity of fire department personnel.

An overwhelming majority of end users stated that one of the functions of an ePCR should be to improve the quality of documentation by Laguna Beach Fire Department personnel. This statement supports management's goal of improving the pre-hospital care report documentation and establishing a useful CQI program. While the motives behind the desire for an ePCR program may differ between end users and management, there is a synergy that will help to achieve the overall program goals. All of the program goals relate to improving patient care and the working conditions of LBFD personnel.

Goals and Objectives

Goal - Establish a compliant CQI program.

Objective – Electronically and securely transmit 100% of the data captured in the field, transmit to, and store on a secure server

Objective - Develop standard reports for CQI review including: skills, response times, treatment/transport times, standing order compliance, and demographics

Objective - Verify 100% HIPPA compliance

Goal – Improve the quality of pre-hospital care report documentation

Objective - Deploy a bedside data capture platform utilizing tablet PC's

Objective - Design ePCR with mandatory fields that satisfy all OC-MEDS data sets

Objective - Design ePCR with forced menu selections for all appropriate fields

Objective - Incorporate a standard and medical dictionary for spell check

Objective - Design ePCR program that can be upgraded for future compliance

Goal - Increase the productivity of personnel

Objective - Deploy a Ruggedized tablet PC with minimum 10.4" touch screen weighing less than 4lbs. and running Windows Tablet operating software.

Objective - Develop ePCR that will take CAD data and import it into appropriate fields.

Objective - Develop an ePCR that will download all pertinent data into the Firehouse RMS incident reports

Objective - Upgrade Philips EKG monitors with Bluetooth capability

Objective - Develop ePCR software with ability to take 12 lead EKG data from Philips monitor

Objective - Develop ePCR with auto sense functions and handwriting recognition on all text fields

Objective - Develop ePCR to take file attachments such as pictures, videos, and documents

Objective - Incorporate magnetic strip reader for driver's license information

Objective - Incorporate ability to capture signatures for receiving hospitals and Refusal of treatment

Objective - Incorporate ability to transfer data to paramedic receiving centers from the field prior to hospital arrival.

Goal – Develop a sustainable ePCR program

Objective - Develop an ePCR that is scalable and customizable

Objective - Identify and secure a funding stream to maintain the ePCR program

Objective - Assume a leadership role with other fire departments and OCEMS and assist where possible with a countywide implementation of an ePCR program

Project Task Timeline

Date	Responsible Party	Task
June 21, 2009	KH	Schedule Bluetooth installation on Philips EKG monitors.
June 25, 2009	KH, IT	Meet with IT professional to discuss end user preferences for hardware specifications for tablet PC and place order.
July 1, 2009	IT	Release the first version of the ePCR software to the end users. Deploy on MDC computers until demo tablet PC's arrives.
July 7, 2009	KH	Installation of Bluetooth on Philips Monitors.
July 8, 2009	ALL	ePCR workgroup meeting
July 8, 2009	IT	Begin programming of ePCR software to accept 12 lead data from Philips monitor via Bluetooth.
July 8, 2009	IT	Program user defined changes in ePCR software.

July 9, 2009	KH, IT	Order wireless router, portable printer, mounting hardware and cables.
July 10, 2009	ALL	Test data transfer from CAD to ePCR
July 13, 2009	IT	Configure operating software on tablet PC, test wireless connections, install ePCR software
July 14, 2009	KH, IT	Test tablet PC and verify functionality prior to issuing to end users.
July 14, 2009	IT	Finalize data transfer from CAD to ePCR
July 15, 2009	KH, IT	Issue tablet PC to end users for field trials.
July 15, 2009	ALL	ePCR workgroup meeting
July 15, 2009	WG, IT	Test download of 12 lead data into ePCR via Bluetooth
July 15, 2009	ALL	Configure ePCR data base mapping for OC-MEDS.
July 16, 2009	IT	Install wireless router and portable printer on Engine 1.
July 17, 2009	ALL	Test printing of ePCR data for field transfer of patient care
July 22, 2009	IT	ePCR workgroup meeting
July 22, 2009	IT	Program user defined changes in ePCR software.
July 22, 2009	ALL	Begin development of patient release form
July 22, 2009	WG, IT	Test data transfer from ePCR to Firehouse RMS
July 29, 2009	ALL	ePCR workgroup meeting
July 29, 2009	ALL	Begin development of training program for end users
July 29, 2009	ALL	Test data transfers from data base to receiving hospitals, base hospitals, and Orange County Health utilizing wireless router connection.

July 29, 2009	ALL	Test data transfers from tablet PC to receiving hospitals and base hospitals utilizing Bluetooth connection to paramedic cellular phone.
July 29, 2009	KH, IT	Order additional hardware (additional tablet PC's, wireless routers, portable printers, mounting hardware, and cables)
August 5, 2009	ALL	ePCR workgroup meeting
August 5, 2009	IT	Finalize ePCR data mapping for OC-MEDS.
August 5, 2009	IT	Finalize data transfer from ePCR to Firehouse RMS
August 12, 2009	ALL	ePCR workgroup meeting
August 12, 2009	IT	Install hardware (tablet PC docking station, wireless routers, and printers) on apparatus
August 12, 2009	IT	Confirm HIPPA compliance and data base security
August 19, 2009	ALL	Deliver training to personnel. Begin company based ePCR completion drills.
August 26, 2009	ALL	ePCR workgroup meeting
September 9, 2009	ALL	Go live with ePCR.
September 9 – 16	ALL	Closely monitor implementation issues and make necessary changes
September 16, 2009	ALL	ePCR workgroup meeting
September 16, 2009	ALL	Closely monitor implementation issues and make necessary changes
September 17 – 24	ALL	Develop CQI reports

September 17 – 24	ALL	Closely monitor implementation issues and make necessary changes
September 25 –	ALL	Provide follow-up ePCR training for personnel

*WG = End User Workgroup, IT = IT Consultant, KH = Kris Head, ALL = IT, KH, and WG

Summary

It is critical to have developed a fully functional ePCR program prior to implementing in the field. To do otherwise may lead to a loss of end user confidence and an unnecessary stigma for future versions of the ePCR. Therefore, the dates within the timeline should be considered flexible based on the project's pace and progress to date. It will be the project manager's responsibility to determine the difference between project delays and project development and to actively manage the project through completion. Once the project is fully implemented it will be the responsibility of the EMS Manager to periodically review the ePCR program for opportunities for improvement. The EMS Manager will also be responsible for ensuring that adequate funds and staff support are available to sustain the ePCR program.