An Introduction to Continuous Quality Improvement for EMS Systems

Developed by the Emergency Medical Practice Advisory Council and the Colorado Department of Public Health and Environment

Colorado Department of Public Health and Environment

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Glossary

A list of terms and definitions used throughout this document.

“6 CCR 1015-3, Chapter Two – Rules Pertaining to EMS Practice and Medical Director Oversight” – Defines the qualifications and duties of medical directors to EMS agencies as well as the scope of practice for EMS Providers. See www.coems.info

“Adverse event” – An injury caused by medical management rather than the underlying condition of the patient.

“Agency Administrator” – The designated executive, chief, director, etc. of an EMS Service Agency with final policy making authority over the provision of EMS services for that agency.

“Continuous Quality Improvement (CQI) Program” – The continuous monitoring of the system performance as a whole to identify opportunities for improving operational policies, treatment protocols and processes.

“Department” – The Colorado Department of Public Health and Environment.

“Emergency Medical Practice Advisory Council (EMPAC)” – the council established pursuant to Section 25-3.5-206, C.R.S., that is responsible for advising the Department regarding the appropriate scope of practice for EMS Providers and for the criteria for physicians to serve as EMS medical directors

“EMS Clinical Coordinator” – The designated official of an EMS Service Agency responsible for EMS clinical matters and/or liaison with the Medical Director. In some EMS service agencies this may be combined with the Agency Administrator or other position.

“EMS Provider” – refers to all levels of emergency medical technician certification issued by the Department including Emergency Medical Technician, Advanced Emergency Medical Technician, Emergency Medical Technician-Intermediate and Paramedic. Also referred to as “field provider” in this document.

“EMS Service Agency” - Any organized agency including but not limited to a “rescue unit” as defined in Section 25-3.5-103(11) C.R.S., using certified EMS Providers to render initial emergency medical care to a patient prior to or during transport. This definition is inclusive of ambulance services and rescue units. Also referred to as “agency” in this document.

“Medical Director” - A physician licensed in good standing who authorizes and directs, through established protocols and standing orders, the performance of certified EMS Providers or students in-training who perform medical acts, and who is specifically identified

as being responsible to assure the performance competency of those authorized individuals as described in the physician's medical continuous quality improvement program.

“National EMS Information System (NEMSIS)” – The national EMS database established by multiple federal agencies and the states to define data elements and to serve as a repository for EMS patient care data nationwide.

“Online Medical Control” – A system in which EMS Providers have access to consult with physicians on the treatment and diagnosis of patients in the field.

“Organizational Policies” – The administrative and/or operational policies, procedures and guidelines implemented by the EMS Service Agency related to non-clinical matters such as administration, operations, human resources, etc.

“Patient Care Report (PCR)” - An electronic and/or written medical record of an encounter between any patient and a provider of medical care.

“Regional Medical Direction (RMD)” – A multi-county system established to coordinate activities between Medical Directors and assist with EMS Quality Improvement. RMD systems may or may not designate one or more physicians or other staff to coordinate these functions.

“Quality Assurance (QA)” – The process by which the performance of individual EMS Providers will be continuously monitored to ensure compliance with treatment protocols and operational policies.

“Sentinel Event” – An unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof.

“SMARTER” – A mnemonic used in business which can assist in the development and evaluation of goals set by an organization. Stands for Specific, Measurable, Achievable, Relevant, Timely, Evaluate and Revise

“Standing Orders” – Authority given under treatment protocols to perform an act during patient care that does not necessitate contacting online medical control.

“Treatment Protocol” - Written standards for patient assessment and management approved by an EMS medical director.

Introduction

This document, ***An Introduction to Continuous Quality Improvement for EMS Systems***, was developed by the Colorado Department of Public Health and Environment and the Emergency Medical Practice Advisory Council (EMPAC) to provide EMS medical directors and EMS leaders with the basic information to develop and maintain an EMS service agency continuous quality improvement (CQI) program. The information and tools in this primer should be of value to all medical directors, regardless of the individual's experience level or the type of CQI program already in effect at the agency.

This document will be the first in a series of resources to be part of a "toolkit." Other topics will be released in the future to further develop a clinical excellence within the Colorado EMS community. This document is designed to be an overview and does not address all of the medical director's responsibilities.

The medical director is responsible for the medical oversight of an EMS agency's performance. Included in this responsibility is the assurance that the performance of the EMS providers who operate under a medical director's supervision and authority meets acceptable standards of care and minimal competency. As such, there is a need to establish a quality management program that will allow for the collection, analysis and usage of data to make changes that ultimately will help to improve the care provided by an agency.

The medical director's responsibility to provide a medical oversight program is set forth in both Colorado Statute and Department rules.

The **Emergency Medical and Trauma Services Act**, (Colorado Revised Statutes § 25-3.5-203) states:

> (5) For the purposes of this article, unless the context otherwise requires, "medical direction" includes, but is not limited to, the following:
>
> (a) Approval of the medical components of treatment protocols and appropriate pre-arrival instructions;
>
> (b) Routine review of program performance and maintenance of active involvement in quality improvement activities, including access to dispatch tapes as necessary for the evaluation of procedures;
>
> (c) Authority to recommend appropriate changes to protocols for the improvement of patient care; and
>
> (d) Provide oversight for the ongoing education, training, and quality assurance for providers of emergency care.

The responsibility of the medical director to establish and maintain a program of medical oversight for each agency he/she supervises should not be confused with the statutes and rules regarding a statewide CQI system. A statewide CQI system does, however, rely on the medical oversight of individual agencies/providers already being in place. Both regional and statewide continuous quality improvement programs are designed to augment agency CQI by focusing on EMS system issues from both a regional and statewide perspective.

No matter the design, EMS medical oversight programs share several common components:

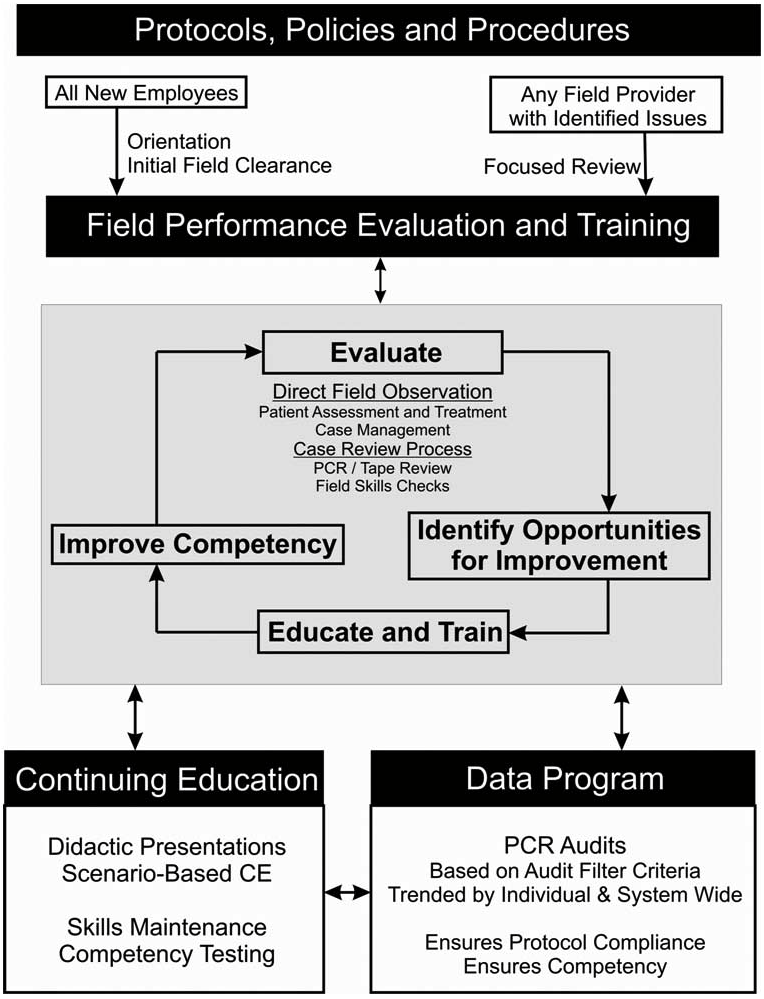
1. Protocols, Policies and Procedures Manual (the target goals to be met)
2. Quality Assurance Program (to ensure the basic competencies of individual providers)
3. Continuous Quality Improvement Program (an ongoing system of evaluation and training that encourages individual and system performance improvement)
4. Data Program (a system for auditing medical records and preparing reports used in QA and CQI process to identify individual and system strengths and opportunities for improvement)
5. Medical Education Program (a primary tool for responding to the areas for improvement that have been identified)

These components must be fully integrated for a medical oversight program to be truly successful.

The first requirement for a quality oversight program is to set a target goal. Through establishment of protocols, policies and procedures, all field providers should clearly be able to understand what they are expected to do to meet the agency-defined “standard of care.” Protocols, policies and procedures are used to identify the expected level of performance for the agency.

However, the purpose of medical oversight is not only to achieve a defined performance level, but to achieve improved care through the collection and analysis of data.

This is accomplished through a process called the Cycle of Continuous Quality Improvement, which involves a continuous cycle of evaluation, identification of strengths and opportunities for improvement, education and training in areas needing improvement and then re-evaluation to determine whether improvement has been achieved (see figure below). This Cycle of CQI is the core of an overall quality management program and will be discussed throughout the document.



This introductory resource can be used by any medical director, regardless of experience. While some may use it as the blueprint for their system, others might only use portions to bolster an existing system. Although there are common components to any quality management program, it is important to recognize that "one size does not fit all." Systems vary by call volume, geography, resources and many other factors. But despite these differences, to achieve success in quality improvement, we recommend you build a solid foundation based on the principles and practices outlined in the sections that follow.

Lastly, the different needs of EMS agencies throughout the state should be recognized. Agencies will differ based on call volume, staffing, geography and many other factors. The items in this document should be considered best practice suggestions and should be modified to serve the needs of the medical director and the agency with the foremost thought being quality patient care and service. The rest of this document will attempt to provide a framework of how a system might be developed from basic steps to more advanced concepts. This document is, however, only a primer. There are multiple other

resources from the manufacturing and health care industries on QA and CQI. One of the best for EMS is the National Association of EMS Physicians (NAEMSP), *Emergency Medical Services: Clinical Practice and Systems Oversight – Volumes 1-4,* which can be found online at www.naemsp.org.

SECTION 1

The Role of the Medical Director in EMS Agency Medical Oversight

Perhaps no role of the medical director is more important than taking a lead in quality improvement for an EMS service agency. In addition to being a regulatory requirement that every medical director conduct QA/CQI, effective oversight and ongoing improvement begins with the expectations set by the medical director.

The Department rules in 6 CCR 1015-3, Chapter Two (Rules Pertaining to EMS Practice and Medical Director Oversight) describe the requirements for medical directors who oversee EMS service agencies and EMS providers as follows:

> 4.2.4 Establish a medical continuous quality improvement (CQI) program for each EMS Service Agency being supervised. The medical CQI program shall assure the continuing competency of the performance of that agency's EMS Providers. This medical CQI program shall include, but not be limited to, appropriate protocols and standing orders and provision for medical care audits, observation, critiques, continuing medical education and direct supervisory communications.
>
> 4.2.5 Submit to the Department an affidavit that attests to the development and use of a medical CQI program for all EMS Service Agencies supervised by the Medical Director. As set forth below in section 4.3, the Department may review the records of a Medical Director to determine compliance with the CQI requirements in these rules.
>
> 4.2.6 Provide monitoring and supervision of the medical field performance of each supervised EMS Service Agency's EMS Providers. This responsibility may be delegated to other physicians or other qualified health care professionals designated by the Medical Director. However, the Medical Director shall retain ultimate authority and responsibility for the monitoring and supervision, for establishing protocols and standing orders and for the competency of the performance of authorized medical acts.

Most medical directors do not build an oversight program from scratch; rather a program is inherited that has been in service for some time. Under the best of circumstances, the previous medical director implemented a well functioning process for system improvement. However, even with the best case scenario, the process of quality management must reflect the medical director's vision and direction for the agency. This often requires changes to current processes or the establishment of new processes. Implementing change is frequently the most difficult aspect in establishing a quality management program.

An important initial step is for the medical director to define QA and CQI. While these two processes are separate, they are intertwined and operate in parallel. The biggest challenge is "selling" these ideas, philosophies and practices to the agencies and providers. Many agencies and directors start this process by developing mission, vision

and value statements to help define where the organization is going and how it will get there. This can form the basis for presenting the platform for QA/CQI to the agencies and providers.

The following are ways in which one might approach an understanding of these two concepts. Quality Assurance (QA) may be defined as:

> The process by which the performance of individual EMS providers will be continuously monitored to ensure compliance with treatment protocols and operational policies.

In many instances the QA process is applied organization-wide; however, the process may be individualized to also address specific issues or EMS providers (i.e. new members.) The QA program looks to answer the question: "Did the care/performance/service fulfill a specific set of requirements?" For example, did the EMT check, and properly chart, a blood glucose measurement in the case of a seizure patient? QA is "firm" and usually requires a yes or no answer. As such, the criteria to which the agency or EMS provider will be held needs to be clear and unambiguous. Charts should be reviewed for protocol deviations in a timely fashion and deviations from the standard should be explained sufficiently in the chart. If applicable, failure to meet expectations should be remediated by the medical director and/or the agency. Considering that a review of every chart by any medical director is often impractical, a system must be in place to alert the medical director of specific items needing review through the use of filters or flags.

It should also be understood that pre-hospital care is delivered in a challenging environment where patients are often seriously ill or injured before EMS arrives. QA program expectations, therefore, should not be tied to individual case outcomes since a bad outcome may occur despite the fact that best possible care was provided in compliance to the protocol. In addition, the pre-hospital environment makes performing many assessments, treatments and interventions more difficult. The medical director, in establishing expectations, must be mindful of the overall context of the patient encounter being reviewed and continually refine and improve expectations to make sure the "customers" are getting the best care that can be provided.

This leads to the next concept, Continuous Quality Improvement (CQI), which may then be defined as:

> "The continuous monitoring of the system performance as a whole for opportunities of operational policy, treatment protocol and process improvement."

The National Association of EMS Physicians defines CQI as:

> The concept of a continual cycle of evaluation and improvement based on the findings of quality assurance.

Simply put, the spirit behind CQI is that most problems result from processes, not individual errors. CQI does not seek to blame, but to understand and improve the system. The goal of a CQI system is not to discipline a specific provider or agency. Shortcomings in patient care are the medical director's responsibility to address and should cause a closer look at the education, training and/or protocols and processes that are in place. The published CQI literature suggests this requires:

- A long-term, senior-level commitment
- Extensive training
- Adoption of CQI philosophies at all management levels
- Cultural changes within the organization
- Behavioral changes within the organization

Keep in mind, however, that in many small agencies only one or two people may be responsible for performing the above-mentioned CQI functions and implementing change management. In many cases, cultural change may be needed to implement improvements. Regardless, leadership by the medical director will be required. Both the medical director and agency administrator must also be mindful to:

- Anticipate that change is coming
- Educate and empower EMS Clinical Coordinators and other mid-level staff on the rationale and importance of changes
- Insist that quality is equally an agency and individual provider responsibility
- Design protocols and policies that give the medical director and agency leadership the ability to measure and enforce CQI commitments.

It should be obvious how these two processes, QA and CQI, are intertwined. However, many QA issues may actually be process issues in disguise. For example, a medication administration error may have occurred because all the medications have similar labels. Mistakes that are made during the course of a single call need to be analyzed to determine their likelihood to occur on any call in order to prevent the same mistakes from being made by others. This sort of analysis requires a robust, open, honest and non-punitive reporting of mistakes by the providers with the knowledge that quality is everyone's responsibility. Development of an atmosphere of mutual trust concerning reporting is essential. While poor medical care can be dealt with appropriately through the QA process, mistakes should always be analyzed in the spirit of overall system improvement.

The question may arise, “Does the medical director have authority beyond medical issues?” This question usually stems from deciding which part of an EMS service agency is “operations” and which part is “clinical care.” While most medical directors do not have much interest in placing ambulance tire pressures in treatment protocols, it must be remembered that how medical care is delivered to the patient begins with ambulance operations. Ignoring the operations side, especially communications, will make it harder to design appropriate treatment protocols which are usable, and hence, enforceable. For example, treatment protocols requiring Intermediates to call into online medical control for drug orders are predicated on having a suitable communications system, calling from an area with access to that system, and having persons knowledgeable of EMS provider levels and treatment protocols answering the calls to give orders. Many times, rural areas lack one or more of the above and therefore communications failure must be expected and a plan in place for when it occurs. How far into the operations side a medical director wishes to venture is system dependent, and often an individual choice Medical Director involvement in operations can be very political, especially if it is not welcomed by agency leadership. Conversely, it can be argued that anything that may affect patient care delivery falls under the purview of the medical director.

State and Federal regulations require maintenance of medical records for prescribed periods of time for legal review. It is in the best interest of the medical director to understand what those periods are and make recommendations for ongoing handling of records and protocols. Effective risk management practices dictate that if a lawsuit arises, the medical director be able to determine and produce the version/set of the treatment protocols were in place at that time so proper evaluation of care may be done. In addition, paper trails of all QA activities, especially of any remediation or discipline of providers should be kept in accordance with applicable organizational policies to assure that protection of the public and quality of care are documented. These processes should be pre-determined and clearly stated in organizational policies to ensure handling of these issues is fair and consistent.

While this information may be intimidating, it is important to recognize the importance of properly setting up the program and knowing what are available as resources to the medical director. In the next section, the creation of a CQI program will be presented.

SECTION 2

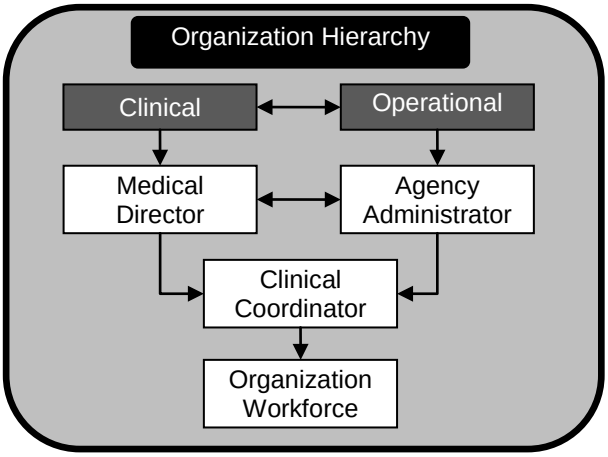
Steps in Implementing a Continuous Quality Improvement Program

Which is the best CQI program for my organization?

There is no such thing as a "one size fits all" program. By acknowledging EMS agencies vary in many different ways, a program can be developed that allows for these differences and can obtain useful information.

Organizational Hierarchy

The administration of an agency can be divided into 2 areas: Clinical and Operational. While the two areas may seem exclusive of each other, they must work in concert. It is important that the agency administrator and the medical director have an open relationship for the betterment of patient care.



Where to Start

Before delving into CQI, it is beneficial to understand the agency in context. By looking into the agency and its ideals, one can begin to identify its strengths and weaknesses. Some of these basic elements are:

1. The organization's scope and services
2. The mission, vision and values statements
3. The organizational goals, objectives for attaining these goals, and key performance indicators for measuring success

There are many books and resources available that can assist with the development of these elements if they are not already in place.

Medical Director's Oversight Program

As mentioned, state regulations (6 CCR 1015-3, Chapter Two, Section 4.2.4) require a medical director to have a CQI program. That program may include the following:

- Protocols and standing orders
- Provision for medical care audits
- Observation

- Critiques – providing feedback
- Continuing medical education
- Direct supervisory communications

Protocols and Standing Orders

According to NAEMSP in *Evaluating and Improving Quality in EMS*, treatment protocols are "written procedures providing pre-hospital personnel with a standardized approach to commonly encountered patient problems, thus providing a pathway to the rendering of consistent care." Treatment protocols include procedures relating to assessment and treatment of patients, as well as other pertinent information.

During the development of protocols, it is important to determine what is allowed in the scope of practice under Department rules. These rules define which clinical skills and acts are allowed at each provider level and, where applicable, if online medical control contact is necessary prior to performing them. An agency's treatment protocols must comply with the EMS Practice Rules. A medical director who feels there is an established need that is not met under the rules may apply for a waiver to the scope of practice. Information on the scope of practice waiver process can be found in 6 CCR 1015-3, Chapter Two, Section 11.

Determining what procedures or medications require online medical control contact, as opposed to a standing order, may be a difficult decision. The medical director must have a comfort level that EMS providers have sufficient breadth and depth of understanding of the treatment or medication in question order to administer it under standing orders. In most cases, standing orders work well for common treatments and medications under typical conditions. By contrast, online medical control contact works well in rare or ambiguous situations. Furthermore, there also needs to be adequate training and ongoing assessment in place to ensure the competency of the providers with various medications and treatments. The QA and CQI processes can also be helpful in validating skills performed either by standing order or subsequent to online medical control contact.

Another common concern is the rigidness of treatment protocols. Some may consider protocols to be guidelines while others would suggest they do not allow for modification. While no set of guidelines can account for every situation, a medical director needs to establish a baseline of expectations in accordance with established standards of care. Consider developing protocols that define when a medical treatment must be provided or should be considered. For example, during review of a seizure protocol, the medical director may determine every seizure patient must have a blood glucose check based on the established standard of care. Key words in the treatment protocols should identify when a medical skill or act is required. If the skill is indicated, consider using words like "must" or "shall." If there are factors the provider should take into account, use words such as "should"

or “may.” In this instance, the language in the protocol may be updated to read “Must perform a blood glucose check.” Treatment protocols that are used in an EMS agency can be recommendations or absolute, and that distinction should be clearly understood by EMS providers.

Provision for Medical Care Audits – Patient Care Report Review

The purpose of patient care report auditing is to provide a retrospective review of how the care delivered by an EMS service agency can improve. It is also a method to ensure quality on the individual level. Reviewing patient care reports is a key component to QA. Chart review provides insight on both individual care and the care delivered by the agency as a whole. The goal should be to balance improvement of the entire organization with remediation for an individual when necessary. This can be difficult at times but as the process matures, efficiencies in the process should be seen as refinements are made.

Where practical, it is better to perform patient care audits close to when the call actually occurred. Over time EMS providers may forget details about specific incidents and it is more effective to provide feedback to individuals while the details are still fresh in their minds.

As mentioned earlier, it may be impractical to review every patient care report. Audit filters can be developed to define what types of calls the medical director reviews and in what timeframe. What should be included in an audit filter? This is unique to each agency but a few examples of audit filters can be found in Appendix B. One recommendation is to have all adverse or sentinel events reviewed by the medical director due to the nature of the event. Adverse event reporting and investigation need to be a part of all QA/CQI programs.

Observation

Another tool for improvement is observation of how agencies and individuals perform to accomplish specific tasks. Observation can occur during actual patient care or during simulation. Observation during actual patient care, also known as direct observation, does not have to be done by the medical director. An agency may designate other staff, such as the clinical coordinator, supervisors or EMS educators, to observe and report their findings according to guidelines set by the agency and agency administrator.

Because it might be impractical to observe all skills by all providers in the field setting, the medical director should consider coordinating a skills review or simulation sessions with the clinical coordinator and EMS educators. This can be combined with educational opportunities and would allow individuals the opportunity to review skills that are infrequently used.

Continuing Medical Education

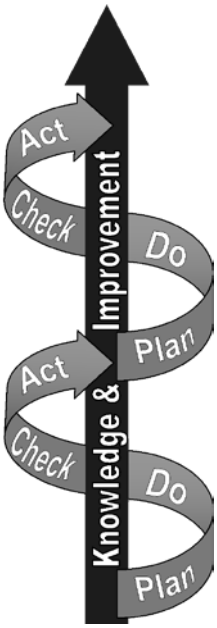
Continuing medical education should be driven in part by quality improvement. When looking at ways to improve an agency, EMS educators and field trainers need to be an integral part of the CQI process. Trainings provide a way for feedback to be given to the entire agency. Trainings also serve as a conduit to the medical director when educators identify issues or concerns such that expectations can be related back to field crews. Remember to include EMS educators in the CQI process as they may often be the formal or informal contact person when protocol or system issues arise.

Direct Supervisory Communications

The medical director should also have processes in place for disseminating information about treatment protocols or any other clinical items to all members of the agency. Additionally, the medical director should have the ability to speak with individual EMS providers directly as part of the QA or CQI process. Access to EMS providers is an important review and feedback tool for any medical director. Equally important to the process is for the EMS provider to have access to the medical director, whether directly or through an agency representative. This communication process should be clearly defined in the CQI program.

Organizational Quality Improvement – Going Beyond the State Requirements

"The aim of the system must be clear to everyone in the system. The aim must include plans for the future. The aim is a value judgment." – W. Edwards Deming



Quality improvement is not limited to the components of Colorado regulations. There are many tools available for quality improvement not only in healthcare, but also in general business management. One tool is the PDCA cycle, also known as the Deming or Shewhart cycle. The PDCA cycle was developed by quality improvement pioneer W. Edwards Deming utilizing, in part, the philosophies of quality control statistician Walter Shewhart.

PDCA stands for "Plan – Do – Check – Act." According to *A Leadership Guide to Quality Improvement for EMS Systems* one can "Plan" to implement something to improve quality or decrease the cost of the service provided. Once developed, the plan is implemented in the "Do" phase. Next, "Check" to see if the plan is working. The last step is to "Act" based on the results that have been collected. If the check determines the outcome of the plan is favorable, act to keep the successful parts of the plan in place and use the knowledge obtained to develop additional improvement plans. If the check determines the desired improvement was not reached, determine what went wrong and use the knowledge obtained in the process to develop a subsequent plan.

The PDCA cycle is usually represented as a continuous circle. Another way to look at it is like a coil of spring. With each PDCA cycle new knowledge is gained. With this knowledge, improvement can be recognized, even if the outcome is not what was expected or desired. Just like a spring, an agency will become stronger and stronger with each PDCA cycle added.

Goals, Objectives and Key Performance Indicators

What is the difference between goals and objectives?

- A goal is where an agency aims to be. It is what is needed to improve.
- Objectives are how the goal is reached. They are the battle plan for meeting the goal. There can be many objectives for reaching a goal.

Key performance indicators (KPIs) are used to measure the success of an objective which ultimately measures whether or not the goal was accomplished. KPIs must be:

- Indicative of the agency's goal
- Key for reaching the goal
- Measureable (quantifiable)

A good tool for developing a goal and defining objectives is using the mnemonic "SMARTER"

- Specific
- Measureable
- Achievable
- Relevant
- Timely
- Evaluate
- Revise

Example: It was determined through the QA/CQI process that agency-wide blood glucose checks are not being performed consistently on seizure patients. Using the SMARTER mnemonic, a goal is developed and defined as:

> "To provide better care and service to our patients with a primary complaint of 'seizure' by increasing EMS provider use of blood glucose checks to determine if the seizure itself, any altered mental status following the seizure, or any subsequent seizures are due to hypoglycemia."

In order to accomplish this goal, the first objective is to make everyone aware of the goal and educate EMS providers about hypoglycemia and seizures. After completion of the first objective, the second objective is a 10% improvement in blood glucose checks over

the next 6 months. At the end of 6 months, *Evaluation* of the progress reveals blood glucose checks have only increased by 2%.

When using the *Revise* portion of the SMARTER method, it is noted that the glucometers used have a large number of errors when checks are performed. After determining the equipment may be at fault, the process can begin again with an updated goal:

> "To provide better care and service to our patients with a primary complaint of 'seizure' *by providing field providers with fast, easy to use glucometers* to consistently check blood glucose and determine if the seizure itself, any altered mental status following the seizure, or any subsequent seizures are due to hypoglycemia."

Start simple with goal development and document the steps throughout the process for review and reference when creating new goals.

Incident Reporting

Incident reporting can be used as a general tool to identify issues that may need review. It is a route by which issues, concerns, accidents, commendations and quality improvement referrals from other agencies and stakeholders can be directed to the agency's QA/CQI program. In some agencies, incident reporting is also encouraged by members within the agency.

Know the Program – Defining Process, Roles, Expectations and Outcomes

Any QA/CQI program should clearly define the process, roles, expectations and outcomes of the program. Processes need to be defined so members of the agency understand how to be active participants in the program. Agency member roles need to be clear so everyone knows what part they play, who to go to with questions regarding the program, and who is responsible for completing specific tasks in the program. Expectations and outcomes of the process need to be well-defined so members of the agency know what to expect. The CQI program also provides a basis for fairness in the process. Provide this information to every member of the agency and educate them on the program.

Section 3

Data Management

Data Collection

> Quality improvement methodologies rely on the collection, analysis and interpretation of electronic data in order to understand, modify and improve processes

Electronic recordkeeping of EMS runs, as well as submission of these records to the Department, is required for all licensed transport agencies (air and ground) by 6 CCR 1015-3, Chapter Three. Electronic patient care reports are currently in widespread use throughout Colorado in EMS service agencies of all sizes. EMS, in general, has also adopted electronic record management systems at a pace equivalent to, or ahead of, most other areas of health care.

Quality improvement methodologies rely on the collection, analysis and interpretation of electronic data in order to understand, modify and improve processes. Without valid and reliable data, quality improvement activities are reduced to speculation and trial and error. With a large, accurate and consistent data set at the agency level, any number of processes can be understood and improved. If data elements are common between agencies, then multi-agency, regional and national comparisons are also possible. Casting a "wide net" in terms of data collection also sets the groundwork for being able to answer questions that may arise in the future without having to modify or rebuild data collection systems. Quality improvement is achieved when the data collected shows sustained improvement.

The most difficult form of data to use for the CQI process are written records or narrative fields in electronic reporting systems. Use of these types of data requires significant time and effort to compile and will likely preclude meaningful analysis of all but the most critical and important systems questions. While many EMS providers are accustomed to "telling a story" in a narrative format, it must be stressed that meaningful data analysis requires EMS providers select answers from a list and/or check the boxes on the screen where appropriate. Recording information only in a narrative format, or selecting the field labeled "other" may make it impossible to include certain records in an analysis. EMS providers should be trained regarding the importance of standardized electronic data collection and agencies should provide feedback regarding the quality of data entered. It is only when an agency is able to consistently collect reliable data that opportunities for real improvement can begin.

The national standard for EMS data collection is the National EMS Information System (NEMSIS) and Colorado is a participant in this project. As this document is being written, Version 3 of the NEMSIS data set is currently under development and is scheduled for implementation through 2014. Currently, the NEMSIS standard includes over 400 data elements. Most commercially available electronic patient care reporting systems conform to the latest NEMSIS standard. In addition to standardization across EMS, Version 3 and subsequent NEMSIS versions will be built to interface with hospital electronic medical records further enhancing the ability to analyze pre-hospital care and patient outcomes across the spectrum of emergency care. It is recommended that agencies collect data that conforms to the NEMSIS standard and avoid changing existing data elements at the agency level as that may prevent the ability to compare and analyze information between agencies. If additional information is needed, it is better to add customized fields rather than changing existing ones.

After working on the data collection process, it is important to validate the quality of the incoming data. In most cases, it is valuable to generate standard reports and involve multiple members of the agency in verifying that the information received is accurate. In many instances, agencies can run specific operational and clinical reports on a regular basis to monitor how the agency is performing and what, if anything, is changing that may require attention.

As electronic EMS records and data analysis become more commonplace in EMS, it is increasingly the expectation that changes in clinical care or operations be based on evidence. This is a change from the historic situation where EMS practice was based on mostly reasonable assumptions and expert opinion. However, this transition to evidence-based EMS practice will provide an excellent foundation for quality improvement methodology.

Assessing Data Integrity

Once it is determined what type of patient care reporting system, and therefore data collection system, will be used, a determination regarding compliance with the system reporting requirements needs to be made. The old adage of data review and reporting "garbage in will result in garbage out" forms the basis of the importance of this section.

For example, treatment protocols require that every person who has a seizure must have a blood glucose level determined. Data analysis finds that only 59% of patients with a provider impression of "seizure" have a blood glucose determination done. Before a medical director can implement a structured education program to teach the importance of this check, it should be determined if this procedure is not reflected in the data collected for other reasons such as:

- Did the providers not check it?
- Did they document why it was not checked?
- Did they check it but fail to document it?
- Did they check it but fail to document it properly? This may occur more in electronic medical records where the "box" was not checked but the blood glucose value was documented in the narrative where it will not transfer to automatic data mining.

When implementing new systems, treatment protocols, or operational procedures, an initial period of chart review for compliance of appropriate documentation should be built in. Before acting on the data that has been obtained for actual medical care oversight, there will be a need to ensure it is appropriate and reliable. Data should be obtained and presented with the caveat that reliability is being reviewed in regard to the data quality. Education will initially be focused on improving data integrity prior to improving care. Setting a level of documentation compliance (percentage of charts done correctly) that is needed before data are considered accurate is most common. Once consistency and reliability are achieved, EMS providers should be informed that improper or missing documentation is no longer acceptable and may be treated as part of the disciplinary process.

Data Integrity needs to be reviewed and repeated from time to time to ensure compliance even in well functioning systems. New providers come on line all the time and even the best practices of documentation can become lax over time.

Data Analysis

Now that the patient care system has been designed and the parameters for its use are in place, analysis can begin. In this section, basic analysis will be discussed. The term "analyst" is also used with the understanding that a defined position with this title may not be available in every situation or agency. As mentioned earlier in this document, multiple roles may be combined based on the structure of the agency and this term does not imply the need to hire another position.

Loosely defined, data analysis is the process, both art and science, of converting data into usable information. A primary step in analyzing the data is to revisit the question the data were collected to answer. The information gleaned from these methods form empirical evidence for decisions made in agencies. As such, it is important to fundamentally understand what the data says, and perhaps, what the data does not say about the item being examined. While delving deeply into statistictical theory and practice is beyond the scope of this document, a basic statistics or biostatistics reference may be useful in the CQI process.

One of the fundamental elements of data analysis is measures of central tendency. For example, assume seizure patients seen by a service are aged 20, 20, 31, 35 and 40.

Mean: Also known as the average. This is the sum of observations divided by the total number of observations. The sum, 146, is divided by the total number of patients, 5, to get an average age of 29.2 years.

Median: The middle number in a range or set of numbers ordered from lowest to highest as shown above. In the above example, 31 is the median. The median is also known as the 50^{th} percentile.

Mode: The most frequently occurring number in a set. In the above example, the number 20 appears twice making it the mode of that particular set.

As analysis is undertaken, often the answer to one question will begin the process of formulating others, or drilling deeper into the data. At the initial phase of the analysis step, however, the focus should be on whether or not the data can be converted into useful information to answer the original question.

Thus, how does one formulate the research question that the analysis will attempt to answer? This may be one of the most challenging aspects to the process. Considerations for this question include, but are not limited to:

- Is there access to the data? e.g., PCR software may already have a report for the question.
- How easy is it to compile the data?
- Is the question formatted in such a way that it is answerable?
- Does the question truly ask what the analyst is trying to answer?

Presentation of data facilitates the process of converting numbers into useful information. Some examples of CQI may involve questions about the frequency of an event or procedure. For example, an agency may be interested in the number of seizure patients evaluated. A sample question could be: “How many seizure patients were seen last year?” Because of the broad nature of this question, there is limited information that can be derived. There is a potential to further stratify the data and create useful information based on how the question is formulated. Assuming the first revision to the question was “How many seizure patients under 18 years of age did the agency treat last year?” Then the number returned tells the analyst exactly what was asked, holding that all other parameters before the data analysis were evaluated and judged satisfactory. The raw data could be further stratified yielding more detailed information. For example, the analyst could stratify the patient age groups as follows: (0-2), (3-5), (6-8), (9-11), (12-14), (15-17). The key to obtaining quality information depends both on the form of the question and the presentation of data.

Some questions are better answered when presented as a percentage. Simply put, a percentage is a part, or fraction, of the whole. Consider the question: "What percentage of diabetic patients under 18 years of age received a blood glucose check?" This question is actually asking two things with data that can be algebraically manipulated to gain a third bit of information. The analyst needs to know two things: first, how many diabetic patients under 18 years of age were seen over the time period in question; and second, how many of those diabetic patients received a blood glucose check? To convert to a percent, simply take the number of diabetic patients that received a blood glucose check, for the purposes of this example assume it is 78 and divide it by the total number of diabetic patients, 100. The result of 78/100 is 0.78. To convert this to a percentage, simply multiply 0.78 by 100 (0.78 x 100 = 78 or 78%). Thus, 78% of these patients received a blood glucose check. The third piece of information that is easily calculated is the percentage of patients who did not receive a blood glucose check (100% - 78% = 22%). These results may help identify if this is an agency trend or an individual remediation issue based on the standards the medical director has set in the treatment protocol and training.

If the question involves several variables, a range and percentile may be an adequate method of analyzing and presenting the data. For example, an analyst wishes to examine the ages of patients evaluated with an impression of seizure. The first step is to sort each of the records by patient's age from lowest to highest. After this, the 90th percentile could be calculated yielding the information that 90% of the ages are less than the calculated value. Say, when ordered low to high, the 90th value out of 100 is 56 and it is the only value of 56. This tells the analyst that only 10% of patients with an impression of seizure are older than 56 years and 90% would be less than or equal to 56 years. Additionally, a low and high percentile could be computed to indicate a range of values. If finding the range of 90% of the values was the goal, then finding the 5th and 95th percentiles would accomplish this. The use of a statistical reference may be useful for this type of analysis.

Benchmarking is another method of analysis that may need interpretation. The biggest caution in benchmarking is ensuring the benchmark is appropriate for what is being measured. Some benchmarks are easily obtained while others require historical data or consensus on best practice. As an example of an established benchmark, the 7th Edition of *PHTLS* on page 427 recommends that EMS providers initiate transport of critically injured trauma patients to the closest appropriate facility within 10 minutes of making patient contact.

The potential pitfall in utilizing this benchmark lies in defining critically injured trauma patients. While intended to illustrate the concept, assume there are criteria in place defining "critical trauma." An analysis of the raw data can then be benchmarked against

the 10 minute time for all “critical trauma” patients. Descriptive statistics, including the mean, median and mode may also be of value when benchmarking. Consultation with other medical directors and the department may be of value when determining benchmarks for key performance indicators (KPIs).

Baseline analysis may be of use when analyzing data trends. The baseline, simply stated, is where a particular system measurement is today; a de facto benchmark to measure against when a change in process is implemented. This differs from benchmarking in that no standard has yet been set.

As system data is analyzed on a statewide basis, appropriate clinical benchmarks may become more apparent. The KPIs may provide evidence that a system may be out of tolerance and in need of further analysis. If the benchmark states that 95% of seizure patients will have their glucose checked, trend analysis, on an agency or individual level depending on the data being analyzed, would be performed. Assume an analyst compiles data examining glucose checks in seizure patients and notes that over 6 months, the agency has improved glucose checks in these patients from a baseline (initial level) of 56% to 78%. The trend is heading toward the end goal (95%) in a positive direction. Further assume that one provider simply does not comply with the mandate. While the agency trend seems to be favorable, the individual’s trend is out of compliance. After additional investigation, education and training may likely be required for this provider via an individualized learning program.

Extracting data to analyze is a function of an agency’s collection and volume. Many ePCR programs have standardized reports that may be a great entry point for the data analyst. Once familiarity with the process is attained, these ePCR software programs often contain the ability to create custom reports. As a part of strategic planning, agencies should consider the value of electronic record keeping and review both the State of Colorado and other company’s products to determine how best to meet their needs.

Section 4

Closing the Loop

Now that the data has been collected and analyzed, it is time to act on it. This is an important part of the process as it allows the EMS medical director, and the entire EMS leadership team, the opportunity to evaluate clinical performance and the processes that are in place to support quality care.

A powerful tool to enable improvement is a CQI committee. Ideally, the committee should be open so that members of the agency understand its role in identifying issues and enhancing organizational effectiveness. If possible, using members of an EMS agency with different roles to make up the committee will make it more well-rounded and effective. Based on the size and needs of the agency, the committee may include, but not be limited to:

- EMS Medical Director
- Agency Administrator
- Clinical Coordinator
- Field Supervisor(s)
- Field/EMS Training Instructor
- Field Providers

While in some smaller agencies, some of these roles may be shared, or perhaps not even in place, it is still important that agencies have different perspectives so as to ensure that any issues are analyzed from multiple viewpoints. It is also important to mandate that top clinical and agency leadership participate in the process.

The CQI committee has the ability to accomplish great things and should be empowered to make recommendations that not only benefit the agency, but patient care as a whole. The committee can not only look retrospectively at protocols and procedures but also guide future treatment protocol development and trainings to strengthen EMS services to the community.

Data Reporting and Analysis

The medical director should work with the agency administrator to determine a regular schedule for the review of data. Data may be divided into a number of subcategories including:

- Regularly reported performance data (e.g. response times)
- Established audit filters (e.g. all cardiac arrests)

- Random or regular patient care report reviews
- Specific care issues selected for special analysis

Even though CQI/QA activities are ongoing, committee meetings should be designed to analyze overall performance. This is an opportunity to discuss past performance as well as which areas will be studied moving forward. Among the items that can be evaluated are items such as protocol compliance and adverse/sentinel events. As mentioned earlier, blood glucose checks in the context of seizure patients would be an example. By having different perspectives at the table with open dialogue, it is possible to ascertain if the issue in question is a documentation problem, protocol design issue, performance problem or another isolated or general concern.

Critical to the process is agreement between the medical director and the agency administrator that minutes will be kept, particularly relating to future action steps. The benefits to keeping minutes also include the ability to share them with the agency, as well as having a historical reference of issues and how they were resolved. Agencies should seek advice from their legal counsel as to discoverability and other risk management concerns in order to understand what should and shouldn't be included. Another concern that will need to be addressed is the need for confidentiality in certain situations. The good intentions of the CQI committee can be severely undermined by singling out of providers or organizations, even if doing so was unintentional.

Compliance with Protocols

One of the key issues to analyzing worthwhile data is if the data is not reconciling properly or showing anticipated progress, there may be a variety of factors that are at the cause. It is important for the medical director and the agency administrator to step back and ask "Why are we not meeting our goals as expected?" Reasons for poor compliance may include:

- Improperly asked question(s)
- Improper data collection/analysis
- Outdated protocols
- Inadequate training
- Ambiguous direction/expectations
- External issues
- Software/hardware issues

Organizational Feedback and Reconciliation

Once a concern has been identified, it is now important to classify it as an agency or individual issue. Following this classification, listed below are some methods that may assist in addressing those concerns.

Bad Data

First narrow down the specific problem. If the concern arises due to a poorly designed or worded question, look at what information is trying to be gathered and how you can re-design your research question to analyze the data. If the research question is appropriate, then look at what data is being collected. There may be many reasons why the data are inadequate. This can range from software issues to provider compliance. The former can be dealt with on a technical level. The latter may require reeducation or a restatement of expectations to field providers.

Barriers to Compliance with Protocols

While one may like to think that many issues can be solved internally and quickly, it is important to also recognize that there may be factors that act as barriers to improvement. To use an example from a previous section, medication errors may be made due to the simple problem of packaging. This can be solved a number of different ways, but the key is to recognize the problem. Another factor may be an agency policy that is in conflict with a treatment protocol. For example, if a protocol clearly states that a blood glucose check is to be done, agency and administrative policies need to exist to support this rather than create a potential barrier. Lastly, there may be external factors that are out of the control of the EMS providers. If there is a requirement that crews transport a patient within a designated time frame, oversight must take into consideration policies from other agencies that may hinder or delay transport.

Follow-up/Reconciliation

Prompt and appropriate feedback is necessary to see a positive change. The medical director will need to work with the agency leaders to determine where the issue lies and if there are appropriate corrections that can be made. For example, there may be a need to not only address protocols but also to work with the agency administrator to ensure that a conflicting agency policy supports the change rather than makes an EMS provider's work more difficult.

Another option that may be appropriate is additional training. Trainings should be specific to the issue, explain the background of the issue and include the rationale for the proposed solution. For example, if a checkbox is not being appropriately marked within the PCR software, the medical director and the EMS educator may show not only the statistics of how often the box is missed, but how it impacts research and CQI.

As mentioned throughout this document, it is important not only to analyze and correct, but to reassess. Simply issuing a memo or scheduling a class will not ensure change.

Collecting data from the point of change and comparing it to the previous analysis period will properly show if the changes have been effective.

Provider Feedback and Reconciliation

There may be times when the issue lies solely with a provider. When an issue is identified specific to a provider, there are different methods in which it can be handled. In any instance, it is important that there is consistency in order to maintain integrity and trust in the process. After identifying an individual performance issue remediation methods may include but are not limited to:

- Informal counseling
- Formal counseling
- Additional training, either in a classroom or in a skill lab

While the medical director does not need to be the point person in these situations, it is strongly recommended that any corrective action plan be reviewed by the medical director prior to implementation.

A key component in any remediation is documenting the issue, the plan for correcting the issue, expected outcomes and timelines for reassessment and validation. While some may feel that documentation is an unnecessary burden, it is essential for legal and administrative purposes. This documentation needs to be consistent and legally defensible. Furthermore, the medical director should work with the agency to ensure that agency policies support the CQI efforts and any associated remediation.

In short, the medical director and the agency need to be able to differentiate problems to see if they are process based, clinical errors or due to lack of understanding/education or performance on the individual level.

Reevaluation

Upon concluding an evaluation, it is important to realize that this is merely the first step. Analysis does not stop simply because an issue was looked at once. Reevaluation is an important part of the process and should give you the opportunity to look at the changes that were made and whether they have made an impact. This should be done whether it is on the individual level or the organizational level. As mentioned throughout this document, CQI and QA are a cyclical process and simply reaching the end of one step does not mean the progression has ended. Rather, it should give the medical director drive to further look at how to continually meet goals as well as identify new areas as well as identify new areas for analysis and evaluation.

Appendix A

Using Risk Assessment to Determine CQI Priorities

The major activities of a continuous quality improvement program should be determined based on a risk assessment of EMS activities. In general, significant effort should be focused on high consequence and high frequency activities (e.g. patient refusals). Efforts should also be directed at low frequency and high consequence activities that may not be routinely performed by EMS providers but require active monitoring (e.g. cricothyrotomy). Minimal efforts should be expended on rare activities with little consequence (e.g. correct atropine dosing for organophosphate poisoning). Below is a typical tool used to evaluate the overall risk of a proposed activity:

Risk Matrix

	Likelihood				
Consequence	1 - Rare	2 - Unlikely	3 - Possible	4 - Likely	5- Almost Certain
1 - Negligible	1	2	3	4	5
2 - Minor	2	4	6	8	10
3 - Moderate	3	6	9	12	15
4 - Major	4	8	12	16	20
5 - Catastrophic	5	10	15	20	25

1 - 3	Low Risk
4 - 6	Moderate Risk
8 - 12	High Risk
15 - 25	Extreme Risk

The categorization of both consequence and frequency can be done generally, or may be defined more specifically in terms of probability of occurrence or degree of potential harm across multiple domains such as clinical care, provider safety or regulatory compliance. In most cases, however, a simple risk analysis using the tool above is sufficient to determine the relative priority or importance of a CQI activity.

The following document on risk assessment and patient safety from the UK NHS Patient Safety Agency provides additional detail on this topic at:
http://www.npsa.nhs.uk/nrls/improvingpatientsafety/patient-safety-tools-and-guidance/risk-assessment-guides/risk-matrix-for-risk-managers/

Appendix B

Listed below are several example items for audit, QA and CQI. A sample form has also been provided as an example of how to organize concise CQI information for reviewing.

Items in the list have been divided into two tiers of importance. Tier 1 items represent core items of importance. These are examples of items that agencies should at minimum audit if there are limited time and resources. Tier 2 items represent a much more expanded list of potential review items. These items by no means represent an exhaustive list and must be tailored to each agency's size, capabilities and patient population.

Review/Audit Filters for Medical Director Review

Tier 1

a. Lights and sirens returns
    i. Critical patient(s)
    ii. Appropriate usage
b. Level one trauma/injuries (defined by State trauma triage criteria*)
c. Airway
    i. Advanced airway procedures
    ii. Needle decompression
    iii. Cricothyrotomy
d. Cardiac arrests
e. Sentinel events

Tier 2

a. Shock of any type/unstable hemodynamics
b. GCS <8
c. Altered mental status of unknown etiology
d. Critical actions missed in suspected AMI
    i. Oxygen
    ii. Aspirin
    iii. Nitroglycerin
    iv. 12 lead EKG/cardiac monitoring
    v. IV
e. Patients meeting immobilization criteria but not immobilized
f. Patients meeting intubation criteria but not intubated
g. Patient requiring chemical restraints
h. Incorrect medication administration/dosing
i. Treatment omissions
j. Patient released AMA

k. Patient refusal
l. Inappropriate level of care/response (BLS vs ALS)
m. Documentation deficiency/error
n. Other protocol non-compliance

QA Items

Tier 1

a. Advanced procedures (airway and needle decompressions)
    i. Assessment reasons
    ii. How managed; what device; verification
    iii. How many attempts
b. Cardiac arrest assessment
    i. Protocol followed
    ii. Field outcome
c. Level One Trauma (defined by State trauma triage criteria*)
    i. Scene time greater than 15 minutes
    ii. Facility destination appropriateness

Tier 2

a. Infrequently used medications with potential harmful affects
b. Chest pain
c. Pulmonary edema
d. Stroke patients
    i. Facility destination
    ii. Transport mode
e. Altered mental status
    i. GCS <8
    ii. Glucose check
    iii. Narcan

CQI Items/Benchmarking

Tier 1

a. Cardiac arrest averages
b. Advanced airway management
c. Response times

Tier 2

a. Protocol evaluation/improvement
b. Training improvement

SAMPLE CONTINUOUS QUALITY IMPROVEMENT (CQI) FORM

PCR # _____ PCR Date: _____ Skill Level: ___ BLS ___ALS

Reviewed by: _____

Medical Director Review: ___ Yes ___ No EMS Administrator Review: ___ Yes ___ No

Reason For Review

TIER ONE	
□ Lights and sirens return	□ Cardiac arrest
□ Level One trauma / injuries (as defined by state trauma triage criteria listed below)	□ Sentinel event / Death
□ Advanced airway / procedure **	□ Other:_____
TIER TWO	
□ Unconscious of unknown etiology	□ Incorrect medication administration/dosing
□ Shock of any type / unstable hemodynamics	□ Treatment omissions
□ GCS < 8	□ Patient release AMA
□ Patient requiring chemical restraint	□ Patient refusal
□ Critical actions missed in suspected MI ***	□ Inappropriate level of care/response (ALS vs BLS)
□ Patient meets immobilization criteria but not immobilized	□ Documentation deficiency/error
□ Patient meeting intubation criteria but not intubated	□ Other protocol non-compliance
□ Seizure	□ Other:_____

ARE THE FOLLOWING DOCUMENTED ON THE PCR?				
	Yes	*No*	*N/A*	*Comments:*
Age, Sex, Weight				
Demographics				
Chief Complaint				
Presenting Problem/MOI				
Past Medical Hx				
Medications				
Allergies				
LOC/APGAR or GCS				
Pulse, Rate and Quality				
Blood Pressure (min. of 2)				
Vital Signs q 5 or 15 min				
Pupils				
Skin Temp, Color, Condition				
Pertinent Negatives				
Response to treatment				
Written narrative (spelling/legibility)				
ECG attached				
Scene time: _____ min				
If excessive time, reason documented				
Response time > 10 minutes				

□ Documentation was complete □ Documentation could be improved by: _____

_____

_____

□ Care provided was appropriate □ Care provided could be improved by: _____

_____

_____

□ If applicable: What actions will be taken to prevent reoccurrence:

_____

* - Taken from the State trauma/injury triage guidelines

A. Blunt Trauma – Significant blunt trauma with physiological compromise as evidenced by:
   1. Systolic BP <90
   2. Pulse >120
   3. Respiratory rate <10 or >29
   4. Endotracheal intubation or assisted ventilations
   5. GCS ≤ 5

B. Penetrating Trauma – Any penetrating trauma to:
   1. Head, neck, torso, pelvis or extremities above the elbow or knee

C. Injuries
   1. Flail chest
   2. Two or more proximal long bone fractures (humerus and/or femur)
   3. Suspected unstable pelvic fractures
   4. Paralysis or evidence of spinal cord injury
   5. Burns >15% or face/airway involvement
   6. Amputations above wrist or ankle
   7. Crushed, degloved or mangled extremity
   8. Open or depressed skull fracture

D. Mechanism of Injury
   1. Falls > 20 feet
   2. High risk auto crash, with such components as:
      a. Intrusion of vehicle of ≥ 12 inches in occupant compartment; > 18 inches any site
      b. Ejection (partial or complete from compartment
      c. Death in same passenger compartment
   3. Auto vs. pedestrian/bicyclist thrown, run over, or with significant impact
   4. Motorcycle crash > 20 mph
   5. Events involving high energy dissipation
      a. Ejection from motorcycle, ATV, animal, etc.
      b. Striking a fixed object with momentum
      c. Blast or explosion
   6. High energy electrical injury

** - Advanced Airway/Procedures:

1. Intubation
2. Needle decompression
3. Cricothyrotomy

*** - Critical actions in AMI:

1. Oxygen
2. Cardiac Monitoring
3. Aspirin
4. Nitroglycerin

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