

Arizona Department of Health Services
Bureau of EMS and Trauma System
Guidance Document: An Introduction to EMS
Agency Performance Improvement



Approved by TEPI: July 17, 2014

Approved by STAB, MDC, and EMS council: September 25, 2014

We would like to acknowledge the efforts of the following individuals who were responsible for preparing this resource:

| | |
|---|---|
| <u>Chair:</u> Mary McDonald, RN, BSN | Tucson Fire Department |
| Brian Smith, EMT-P | Flagstaff Medical Center |
| Franco Castro-Marin, MD, FACEP | Scottsdale Fire Department Scottsdale Lincoln Health Network |
| Glenn Kasprzyk | Life Line Ambulance |
| Jill McAdoo, RN | Life Line Ambulance |
| Josh Gaither, MD | University of Arizona Medical Center |
| Kevin Burkhart | Southwest Rural/Metro |
| Paul Dabrowski, MD | Banner Good Samaritan Hospital |
| Robert Corbell | Northwest Fire/Rescue District |
| Sandra Nygaard, EMT-P | Banner Ironwood Medical Center Banner Goldfield Medical Center |
| Sean Culliney, MPH, CEP | Northwest Fire/Rescue District |

With staff support from:
Rogelio Martinez, MPH
Data and Quality Assurance Section Chief

Bureau of EMS and Trauma System

INDEX

| Section | Page |
|---|-------------|
| Acknowledgements | 2 |
| Index | 3 |
| Purpose | 4 |
| EMS Performance Improvement (PI) Plan | 4 |
| Performance Improvement Objectives | 4 |
| Definitions | 4 |
| Beginning an EMS Performance Improvement Plan | 5 |
| Data Collection | 5 |
| Data Analysis | 6 |
| Individuals Involved | 6 |
| Role of the Organizational Leadership | 6 |
| Role of the EMS Medical Director | 7 |
| Role of the Quality Assurance Team/Individual | 7 |
| Role of EMS Educator | 7 |
| Role of EMCTs | 7 |
| Implementation of a PI Program | 7 |
| Filters for PI | 10 |
| Closing the PI Loop | 11 |
| Sample Case Studies | 12 |
| Additional Resources | 14 |
| Sample PI plan | 15 |
| Appendix A- EMS Integration Across All Phases of Care | 17 |
| Appendix B- Definitions of Common Data Measurements | 18 |
| Appendix C- Hierarchy of review levels in an EMS program | 19 |
| Appendix D- Using Risk Assessment to Determine Continuous Quality Improvement | 20 |
| Quality Closing | 21 |

Purpose

The purpose of this EMS Performance Improvement (PI) manual is to assist agencies in identifying improvements in care; implementing loop closure for Quality Improvements (QI); improving patient outcomes through an achievable system of support and education for agencies and providers.

EMS Performance Improvement Plan

The *Guidance Document: An Introduction to EMS Agency Performance Improvement* will drive the performance of providers in the prehospital environment. It will be used in the EMS community to implement and monitor best practices, allow for collaboration with stakeholders, and lead to high functioning care in every patient contact occurring in the state of Arizona.

The goal of this plan is to provide effective, safe, cost-beneficial, patient-focused, pre-hospital medical and trauma services to those presenting to the EMS System. Programs should focus on quality improvement, education, training, effective healthcare delivery systems, public education, prevention, and the development of strong working relationships with other community partners. A presentation of the EMS continuum of care in a patient interaction is presented in Appendix A.

Examples of Performance Improvement Objectives

- Improve prehospital care in my agency for patients with Out-of Hospital Cardiac Arrest,
- Improve prehospital care in my agency for patients with stroke,
- Improve prehospital care in my agency for patients with major trauma,
- Improve prehospital care in my agency for patients with ST-segment Elevation Myocardial Infarction (STEMI).

Definitions

- Performance Improvement - A system that improves the execution or accomplishment of its intended purpose,
- Process Improvement - A measurement technique that analyzes a series of actions to improve its effectiveness or efficiency,
- Quality Improvement (QI) - A system that improves the overall quality of a product or service,
 - Prospective QI - Primary selection, initial training, and certification of EMS personnel; continuing education; periodic skill evaluation; training programs,
 - Concurrent QI - Direct observation of EMS personnel performance at the time of service delivery,

- Retrospective - Case review and chart audits to check for completeness and accuracy in order to determine the level of compliance with established policies and protocols.
- Quality Assurance (QA) - A system that ensures a desired level of quality in the development, production, or delivery of products and/or services,
- Loop Closure - Demonstrating that a corrective action has the desired effect as determined by continuous evaluation. Although some process loops may never be completely closed, all initiatives should demonstrate the continuous pursuit of performance improvement and patient safety.

Beginning a Performance Improvement Plan

Ideally, an agency should identify the goals of their agency PI plan prior to any data collection, analysis, or implementation. The process should begin with an identification of evidenced based criteria, standardization in data collection, proper selection of analytical methods, and most importantly, timely loop closure of any proposed changes.

For agencies that are unable to purchase their own ePCR software, the [Arizona Pre-Hospital Information & EMS Registry System](#) offers FREE software and assistance in the implementation of this process.

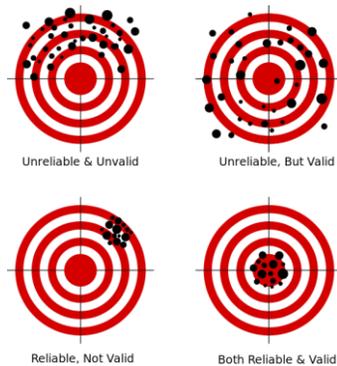
Data Collection

The data collection process should be part of daily operations in EMS care. Data collection is done by providers in the field, reviewed by managers, and used by organizational leadership to drive decisions. Information that is gathered should be done in a purposeful, reliable, and standard format, preferably with an electronic patient care reporting (ePCR) system. It is essential to note that a PI program should not be a punitive process. A proactive, multi-disciplinary effort will improve patient care significantly.

Everyone, whether it is one individual or a set of assigned EMS personnel, should be interpreting the documentation on the electronic Patient Care Report (ePCR) in a similar fashion using a QA tool that has definitions for each criteria being audited. Interpretation of data gathering should not be dependent on individual discretion. An elaborate web-based system will not be of use, if incoming data is flawed. Collection of data should be weighted (scored) and consistent across patient encounters.

There are three distinct concepts in the data collection process; validity, reliability, and accuracy. Additional data definitions are presented in Appendix B.

Figure 1: Data concepts



Validity- the extent to which a measurement captures what it is supposed to measure. Example: Does an EKG interpretation identify a STEMI?

Reliability- the extent to which a measurement tool can be repeated and yield repeatable results. Example: Does an automated blood pressure device provide measurements that are consistent?

Accuracy- the extent to which the measurement represents the true value. Example: The comparison of a field blood glucose monitor to a lab value obtained at a hospital.

Data Analysis

The process of data analysis can take many different forms. Agencies can work with their Medical Direction authority, base hospital and/or quality assurance officers to establish their protocols and procedures for criteria audit filters, trends, performance, and other useful information in your agency. Agencies should strive to benchmark their services and outcomes against others to understand how they compare against similar organizations. In Arizona, benchmarks are set with the [Premier EMS Agency Program \(PEAP\)](#). This program requires that 100% of STEMI, Stroke, Out of Hospital Cardiac Arrest (OHCA), and major trauma calls are reviewed. Regular, [quarterly reports](#) are sent to agencies that participate in AZ-PIERS on these four measures.

PI Implementation

The remainder of this manual identifies the PI implementation process. The individuals internal to the agency are identified along with the processes and examples. **This is the most difficult part of any system and requires constant attention; done correctly this will allow for agencies to determine best practices for their individual agencies.**

Individuals Involved

Role of Organizational Leadership

PI requires absolute commitment from Organization Leadership in order to succeed. These individuals could be the Chief Executive Officer, Fire Chief, Medical and Operations District Management Teams or President of an organization. Organization Leadership, which includes the Medical Director, should provide the authority and direction to their personnel to have an honest, non-punitive approach to identify and resolve issues with processes.

Role of Medical Director

A Medical Director provides clinical guidance, leadership, and oversight over all aspects of prehospital care. An EMCT in the field serves as an extension of the Medical Director within an EMS agency. Medical Directors MUST be engaged with the design and execution of retrospective, concurrent, and prospective quality improvement initiatives for an EMS agency to optimize clinical outcomes. These initiatives require that methods, criteria, and desired outcomes be clearly defined, along with assignment of roles for the individuals involved (Q/A team/Educator/Training). The agency should provide the resources and personnel needed to achieve the desired results.

Role of Quality Assurance Team/Manager

The QA team/manager are designated with the role and responsibility for PI. This individual(s) is a person in direct and constant communication with the designated liason for medical direction. This role should ensure that there is timely loop closure and see themselves as directly supporting the providers in their day-to-day role. Lastly, this role should work with receiving facilities to obtain patient outcomes in a timely fashion that ultimately drive care.

Role of EMS Educator

EMS Educators should work with the Medical Director to identify and implement best practices within all aspects of the agency's training program. These individuals must be able to gather and identify community and organizational resources that lead to improvement in care. EMS educators should work with the QA team to reinforce evidence-based education or training. The topics should be selected and prioritized based on the weaknesses identified through a data-driven process improvement plan.

Role of Emergency Medical Care Technician (EMCT)

The role of the EMCT includes providing excellent care and documentation for their patients using best practices. EMCTs should proactively look for feedback from their agencies to improve the care they provide in the field. EMCTs are essential to implementing changes as guided by their agency's PI plan. Additionally, EMCTs in an organization need to be aware of the goals and mission of the agency to ensure success of the program.

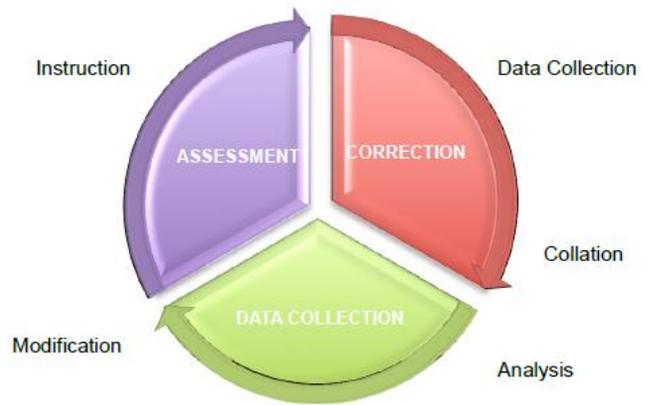
Implementation of a PI Program

A PI plan consists of a foundation in data collection, identification of potential issues, and continuous surveillance of processes. Figure 2 and 3 are two examples of the merger in these principles.

Figure 2: Systems Management in Public Health



Figure 3: ACS Performance Improvement



Once the organizational leadership commits to optimizing patient care above all else, the PI can begin. The leadership will need to identify individuals that are passionate, determined, and persistent to solve arising issues. A major importance to a PI program is the constructive and mutually supportive relationship that must occur between the QA individual(s) and the Medical Director. Figure 4 below identifies a sample implementation process for PI.

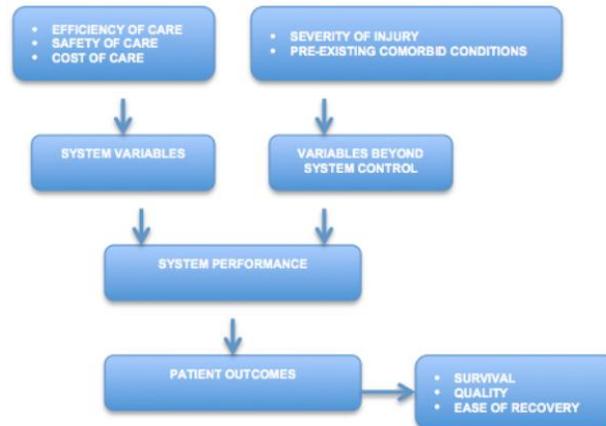
Figure 4: Implementation of a PI program



Filters for PI

Filters can be used to flag issues that require the attention of the QA team. In certain cases, these situations may be appropriate but further exploration is required. Although these filters are not all encompassing, they are a good place to start. Agencies can look at developing their own filters for acceptable thresholds (90% is common), documentation, clinical excellence, research projects, and protocol adherence.

Figure 5: Categorization of Influential Variables



- Trauma cases with:
 - Scene times > 20 min,
 - No documentation of patient destination (when transported),
 - Endotracheal Intubation (ETI),
 - Number of cases with ETI,
 - Number of cases with rapid sequence intubation,
 - Number of attempts per case prior to success,
 - Number of cases with use alternative rescue airways.
- STEMI cases with:
 - Missing an ECG,
 - No administration of aspirin,
 - No administration of oxygen,
 - Failure to transport to a cardiac receiving center.
- Stroke cases with:
 - Performing a stroke assessment,
 - Not obtaining a blood glucose value,
 - Failure to pre-notify hospital.
- Out of Hospital Cardiac Arrest cases with:
 - No documentation of chest compressions,
 - No documentation of defibrillation time,
 - No documentation of date/time at which resuscitative measures are withdrawn.

Closing the PI loop

In EMS there are two types of categories of variables impacting the outcome of a patient; the internal (system) variables and external (beyond system control) variables. The internal-variables for a patient who suffered a Traumatic Brain Injury would be time of response of unit after receiving notification, adherence to [EPIC protocols](#), and timely transportation to a designated trauma center. The external agency variables would be factors such as weather, injury severity, and age of patients.

Agencies with a PI plan will have to decide the degree of response each issue will require. Appendix C provides a schematic on a typical response to an issue. Issues of improvement can be classified as a **first level** (minor), **second level** (moderate), or **third level** (major issue). A first level review could typically require only the response of the QA team (delay in submission of an ePCR). A second level review could require a response from the QA team and the Medical Director and can be used as a teaching moment (improper protocol adherence, medication mix-up, complex case). A third level is a systemic failure that could require the attention of the QA manager, Medical Director, and a peer review committee (STEMI patients failing to meet door to balloon times, trauma patients failing to receive pain medication). Appendix D provides a schematic for prioritizing issues that occur within an agency.

Additional resources and theories have been established to identify opportunities for improvements and solutions. These include an Ishikawa diagram (fishbone/root cause analysis), Lean, Six Sigma, System Managements in Public Health, and others (*see Additional Resources for further information*).

After opportunities for improvement and solutions have been established with success, it is important to train and educate within the agency on these new findings. Education programs can use successful cases to train providers through real life scenarios. An excellent education program will challenge providers to understand potential pitfalls, challenges, and solutions. Agency progress should be integrated and reinforced into the training, course material, and staff. Education programs can consider using guest speakers who experienced the problem first hand and found solutions.

It is important to note that sentinel events, errors, and areas of improvement should follow the EMS agency's PI program. Appropriate personnel from the department(s) that will be affected should attend. The Medical Director, or the equivalent, should be involved in the process.

EMS agencies should strive to resolve issues in three months. In some complex cases the inquiry might extend further, however, timely resolution is essential to a PI program.

Sample Case Studies

Case Study 1

An EMS agency has decided to investigate the administration of its narcotics in patients undergoing musculoskeletal injuries. The EMS agency decides to evaluate the effectiveness of pain management in patients through the EMCTs' documentation of a pain score and the appropriateness of the administration of narcotics.

[First Level Review]

The EMS agency analyzes 100% of musculoskeletal injuries for one month. Each musculoskeletal injury is broken into two specific categories, pain scale assessment performed and narcotic administration. The QA Manager identifies that 10% of the charts did not document a pain scale and 45% of all patients did not receive pain medication.

[Second Level Review]

The QA Manager surveys the field providers on reasons for the lack of pain management and use of a pain scale. After analyzing the results, the QA Manager finds that many providers were unaware that a pain scale was on the ePCR. The QA Manager contacts the vendor to have the pain scale tool placed within the vital signs field. A department in-service is done on proper documentation of a pain scale assessment and includes a closed call rule that forces providers to answer the assessment field.

The QA Manager brings the results of the survey to the Organization Leadership that many providers felt that management pressed field providers to get into service too quickly and that the hospital prioritized replacing an EMCT's controlled substances as unimportant to operations. The Medical Director contacts the hospital pharmacy group to request a faster and more streamlined process for medication replacement.

[Third Level Review]

After a few weeks of inquiry, the QA Manager identified the lack of a field implementation of a pediatric pain scale. The EMS agency identifies community stakeholders to determine the implementation of best practices into a pediatric pain assessment. A small workgroup is assigned to re-educate, monitor, track progress, and find solutions to the issue. They are tasked with presenting their policies to the EMS agency. The committee decides to follow up with monthly and quarterly reports. Additionally, the committee embeds audit filters to determine if any improvements are occurring within the department.

After a year of continuous monitoring, the group finds a department wide compliance of 95% for pain assessments and 65% for the distribution of narcotics. The workgroup disbands and the QA Manager begins to monitor the issue every quarter.

Case Study 2

A rural EMS agency receives an AZ-PIERS quarterly report on STEMI outcomes from ADHS. After reviewing their performance against the aggregate, the QA Manager determines that they would like to find ways to improve their patient's outcomes.

[First Level Review]

In the AZ-PIERS STEMI report, the EMS agency learns that they had 70 patients who were treated at a hospital for a STEMI in the past three months. Of those cases, only 21 patients went to a cardiac receiving/referral center. Additionally, all cases failed to document an ECG assessment. The QA Manager believes that these results led to more patients being discharged to hospice or a long-term skilled nursing facility. The QA Manager identifies this as an issue and recruits the Medical Director to increase the percentage of patients who get discharged home.

[Second Level Review]

The QA Manager discovers that the cardiac monitors are outdated and require replacement in order to reliably interact with their ePCR. Due to recent funding cuts, the board has been unable to approve the purchase of new monitors. As a community with a large demographic of older adults, the Medical Director urges the significance of having more reliable cardiac monitors. The fire district board approves the Medical Director's plan of replacing the cardiac monitor, transporting patients to cardiac receiving/referral centers, and monthly STEMI chart reviews.

[Third Level Review]

The fire district board members, QA Manager, and Medical Director begin looking for funds to replace the monitors. They ask for assistance from their closest cardiac receiving/referral center, regional council, professional EMS organization, and other nearby fire districts. After some months the department finds a small rural specific grant that allows for the purchase of three refurbished cardiac monitors. The fire district board, Medical Director, and QA Manager monitor their surveillance of STEMIs in their community for the next year.

Additional Resources

Arizona Trauma and EMS Performance Improvement toolkit:

- <http://www.azdhs.gov/bems/documents/data/users/stemi.pdf>
- <http://www.azdhs.gov/bems/documents/data/users/cardiac-arrests.pdf>
- <http://www.azdhs.gov/bems/documents/data/users/major-trauma.pdf>
- <http://www.azdhs.gov/bems/documents/data/users/stroke.pdf>

American College of Surgeons “Resources for Optimal Care of The Injured Patient” 2006.

BMGI Videos and Topics: *Search for topics*

- Introduction to Lean
- Introduction to Lean Six Sigma
- The Five Principles of Lean
- The Eight Types of Waste
- Visual Management
- Current State Value Stream Maps
- Creating a Pareto Charts
- Data Collection

Center for Disease Control and Prevention:

- <http://www.cdc.gov/stltpublichealth/performance/>

National Association of EMS Physicians. (2009). Emergency Medical Services: Clinical practice and systems oversight. Kendall Hunt Publishing Company.

Emergency Medical Services System Quality Improvement Program Model Guidelines:

- <http://emsa.ca.gov/media/default/pdf/emsa166.pdf>

Handbook for EMS Medical Directors: March 2012

- http://www.usfa.fema.gov/downloads/pdf/publications/handbook_for_ems_medical_directors.pdf

Joint Commission: Accreditation, Health Care, Certification

- http://www.jointcommission.org/Sentinel_Event_Policy_and_Procedures/

National Public Health Performance Standards Program:

- <http://www.cdc.gov/NPHPSP/PDF/UserGuide.pdf>

Public Health Quality Improvement Exchange:

- <https://www.phqix.org/>

Sample PI Plan

Purpose: The *EMS Agency* shall follow the comprehensive Performance Improvement Program that addresses policies to continuously improve clinical quality.

Performance Improvement Plan: The *EMS Agency* shall include prospective, concurrent, and retrospective initiatives designed to improve the care delivered by the agency's providers (whether ALS or BLS levels of care).

- All aspects of the Clinical Performance Improvement Program shall be developed in conjunction with Medical Administration and receive approval from the Medical Director.
- The *EMS Agency's* Operations Division will identify and develop the avenue for the implementation of the Performance Improvement Plan.

Objectives: The *EMS Agency* shall have measurable clinical indicators that are regularly assessed for compliance with established thresholds. These indicators shall include, at a minimum, the following:

- Accurate patient assessment
- Medical interventions delivered in accordance with established Administrative Orders;
- Success of skills;
- Clinical documentation quality, and
- Outcome data.

Note: If the agency Medical Director allows Permissive Skill(s), the EMS Agency shall also conduct appropriate review of these services.

Closing the PI Loop: The *EMS Agency* shall have a process for identifying and addressing instances where measurable indicators are not in compliance with established thresholds. This process shall include individual exceptions and department trends. Both circumstances should be addressed with on-going education.

The *EMS Agency* shall define reporting process for Performance Improvement activities and issues. This shall include, at a minimum: documenting & reporting individual issues; following through with the respective individuals to resolve the problem, documenting and reporting data to the Organizational Leadership, Operations, Medical Director, and others as needed. Areas of the program determined to be in need of improvement will be identified, changed, reassessed, and reported on every quarter.

Identified improvements in the standard of care will be initiated by Medical Director and follow through the *EMS Agency's* chain of command.

Intended for Quality Assurance Purposes Only

Sample PI Plan

Filters:

Stroke:

- Documentation of a patient's last well known time
- Documentation of stroke assessment and results
- Contact date/time hospital was contacted
- Documentation of a blood glucose
- Transport to a Stroke Center

STEMI:

- Obtain an ECG as soon as unit arrives on scene
- Notify the hospital on the ECG (results/transmit)
- Documentation of aspirin administration (unless contraindicated)
- Documentation of oxygen administration (unless contraindicated)
- Transport to a Cardiac Center

Out of Hospital Cardiac Arrest:

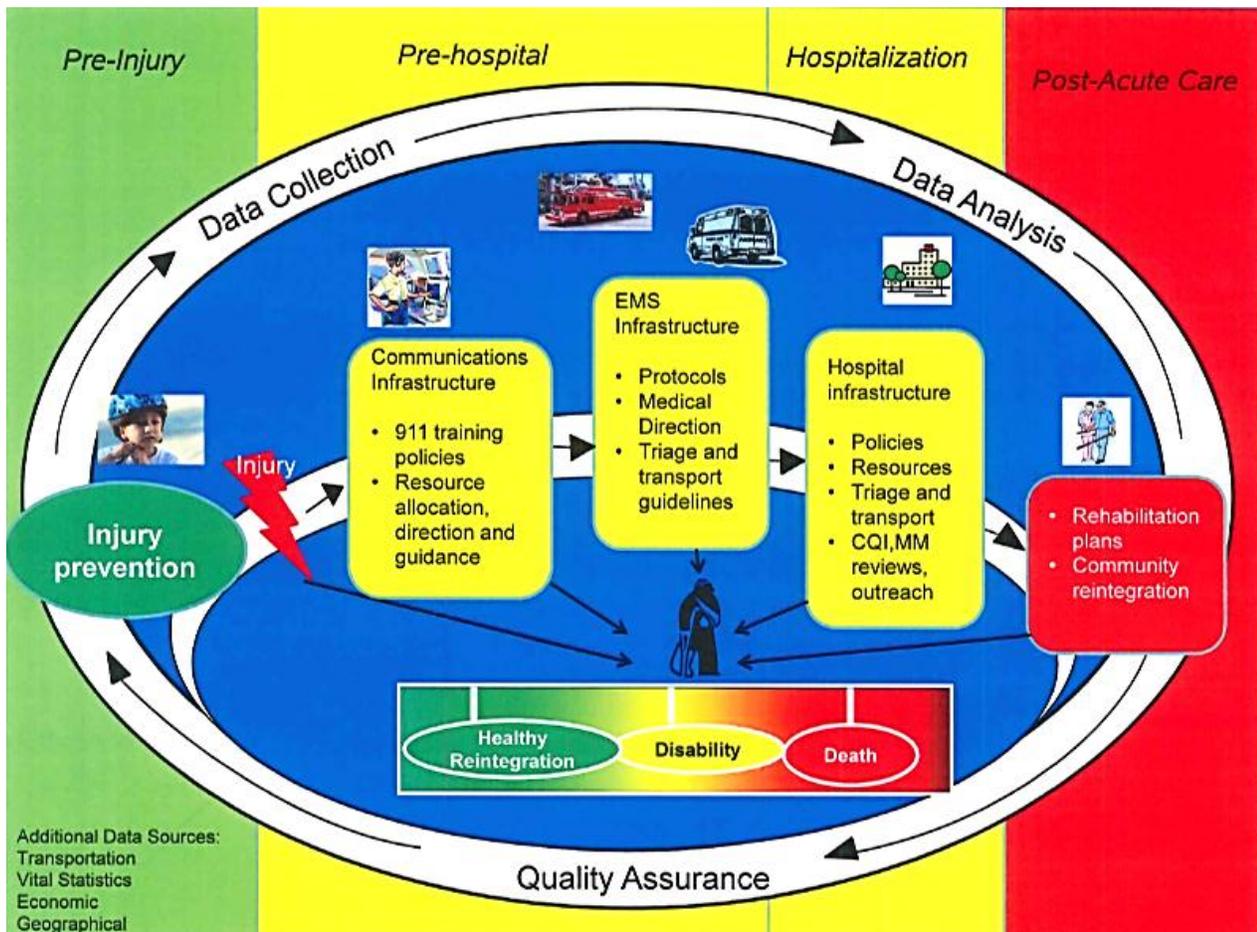
- Document whether bystander CPR was performed
- Document whether cardiac arrest was witnessed
- Document initial cardiac rhythm
- Document spontaneous circulation
- Document termination of resuscitation
- Reduce time to first compression upon unit arrival on scene
- Reduce time to defibrillation upon unit arrival on scene
- Transport to a Cardiac Center

Major Trauma:

- Reduce on scene time
- Document trauma triage criteria
- Document time and date of measurements for systolic blood pressure, respiratory rate, total GCS
- Document any transfers of patients
- Document intubations attempts and successes
- For TBI patients over the age of 18, maintain ETCO₂ between 35% and 45%, systolic blood pressure above 90 mmHg, and pulse oximetry above 90%
- For TBI patients under the age of 18, maintain ETCO₂ between 35% and 45%, systolic blood pressure (70 + 2 x age), and pulse oximetry above 90%
- Transport to a designated Trauma Center

Intended for Quality Assurance Purposes Only

Appendix A: EMS Integration Across All Phases of Care



An EMS data collection model should look at all potential legs of care from the patient perspective. Data sources include injury prevention activities, 911 dispatch/communication, pre-hospital, hospital, and rehabilitation. The focus of the system should be treating the patient and preventing death/disability in order to maximize the health reintegration of the patient into society.

The goal of every EMS system is to minimize the amount of mortality and morbidity occurring in their communities.

Appendix B: Definitions of Common Data Measurements

I. Statistical

A. Measures of Central Tendency: These are data measurements which show how the data is the same or; where most of the people, places or things tend to score or behave. These measurements are in the middle of what has often been called the “bell shaped curve”.

1. Mean (average) – The sum of all measured, or counted, data divided by the total number of data points; for example in the below data, if all the data values added together equal = 223 is divided by the total number of data points which are 15, then the product would be 14.8. Thus, the mean value of the data is 14.8.

2. Mode – the value repeated most often in raw data. For example in the data below the value 12 is repeated the most. Thus the mode value is 12

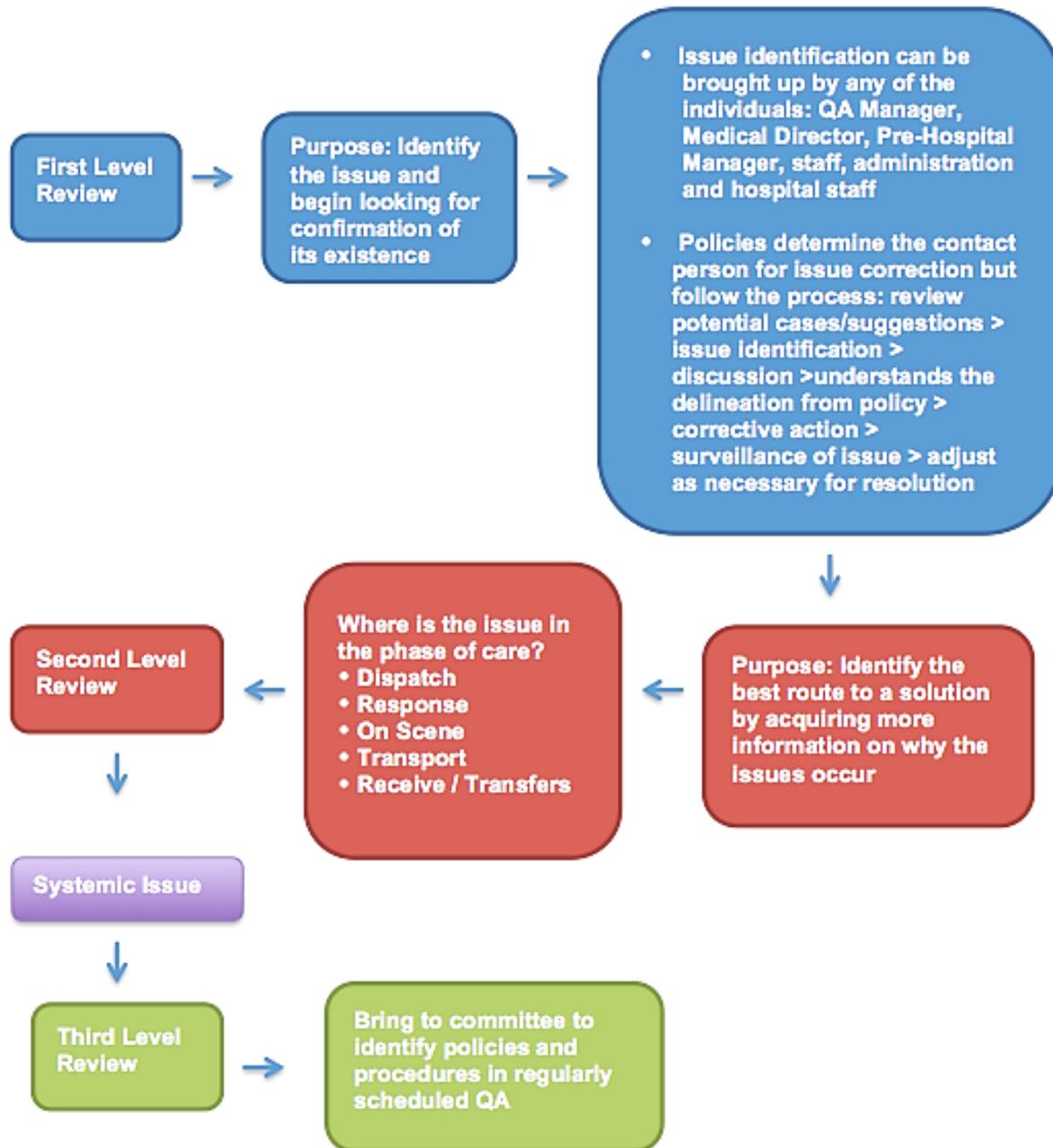
3. Median – the middle of all the measured or counted data points. For example, in the data below, all values are placed in numerical order and then the middle value is found by dividing by 2 and counting the ordered values until the middle value is identified. Thus, 12 is the middle of the ranked data points. Sample data: 8, 8, 9, 10, 10, 12, 12, 12, 14, 16, 16, 18, 20, 28, 30

B. Measures of Dispersion: These are data measurements which show how the data is different or; where most of the people, places or things are different. These measurements are on the outside of what has often been called the “bell shaped curve”.

1. Range – the maximum value minus the minimum data value.

2. Standard Deviation – A measurement which shows how widely spread (dispersed) any set of data is from the mean (average) of an entire data distribution. The standard deviation takes into account all the data points.

Appendix C: Hierarchy of Review Levels in an EMS Program



Appendix D: Using Risk Assessment to Determine Continuous Quality Improvement

| | 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 consequence and frequency may consider multiple divisions in an agency. Some examples are clinical care, provider safety, and/or regulatory compliance. In most cases, the tool above may help determine the importance of a beginning a quality improvement initiative.

Closing

The Arizona Department of Health Services and Bureau of EMS & Trauma System would like to thank the EMS providers in the state for their innumerable counts of service, bravery, and sacrifice to the people in Arizona. The intention of this manual is to serve as a resource for individuals on the front lines striving to improve the care they provide to EMS patients at their time of greatest need. Special thanks are extended to the Trauma and EMS Performance Improvement standing committee and the EMS PI Plan workgroup responsible for this most valuable resource.

Further information and technical assistance can be accessed online at <http://www.azdhs.gov/bems/data/index.htm> or by contacting the DQA section chief directly at 602-542-2246.