

During 2004 a comprehensive overall plan for improvements in Out of Hospital Cardiac Arrest (OHCA) was developed under the medical vision of Dr. Ben Bobrow and a design-model from Bob Ramsey to build a type of positive bandwagon to implement popular support. Bringing together state and local government departments, leaders and their staff champions with health professional associations, local EMS providers including fire departments and private ambulance companies, local medical directors, training agencies, emergency room departments and hospital systems under a Arizona Department of Health Services (ADHS) working umbrella.

The initial strategy was to develop a series of voluntary participating programs by health providers, fire departments, ambulance companies and the public to establish studies using real-time measurements in distinct timeframes with active management and measurement information technologies for practicing evidence-based medicine via standardized data collection and analysis. Our outreach objective uses a new paradigm of Active Measurement Intervention (AMI).

THE IMPLEMENTATION MODEL:

- 1. New “Cardiac Arrest Program,” the new CPR procedures that were not yet embraced nationally or internationally in the EMS field.**
- 2. Key local project innovators and leaders from fire, police, ambulance and EMS training centers**
- 3. Establish voluntary participating fire departments and ambulance providers.**
- 4. A statewide system for the submission of electronic data of patient care from paramedics for studies.**
- 5. Public education through media.**
- 6. AED access in public buildings and other facilities.**
- 7. Support of enhanced Bystander Response, “hands-only CPR”.**
- 8. A statewide web based AED Registry to measure outcomes, location and status.**
- 9. The publication, nationally and internationally of the studies’ outcomes.**
- 10. Public press and celebration of participating provider successes along the way.**

Our state regulator, the Arizona Department of Health Services (ADHS), their Director Will Humble, and State EMS Medical Director Ben Bobrow, constituted policies of working together through volunteer participation and sharing successes with the participating state’s pre-hospital providers, municipal first responders and private ambulance providers promoting evidence- based treatment and continue to improve survival rates from Out of Hospital Cardiac Arrest, (OHCA).

Will Humble and Dr. Bobrow along with Terry Mullins, Bureau Chief of EMS & Trauma System, begin implementation of the Save Hearts in Arizona Registry and Education

(SHARE) Program in the state of Arizona, including a public web service for registry and measurement analysis.

Since 2004, SHARE provides services and resources to assist 911 centers in implementing and measuring the effectiveness of the latest pre-arrival CPR guidelines. SHARE has partnered with more than 115 Arizona EMS agencies to collect, analyze, and create standardized data reporting for the incidence and outcomes of OHCA. For example, the SHARE Program measures public CPR training, AED (automated external defibrillator) placement and use, as well as EMS and hospital care.

Right Hospital in the Right Time Frame

Getting the right patient to the right hospital in the right time frame means a patient triaged with a specific medical emergency is transported with the appropriate level and practice of medical care to the appropriate hospital to treat the emergency. The results helped improve mean time between 911 contact and initial defibrillation by pre-hospital personnel enhancing the level of pre-hospital personnel adherence to new resuscitation protocol, expanding the delivery of Out of Hospital Cardiac Arrest (OHCA) patients to a Cardiac Arrest Center when feasible. Arizona improved survival rates of out-of-hospital overall cardiac arrests and ventricular fibrillation (VF) cardiac arrests.

In 2011, Arizona was the first state to introduce a CPR Dispatch Academy program for professional emergency medical dispatchers at public and private agencies. The program teaches specific dispatch-assisted CPR protocols and pre-arrival instructions for Out of Hospital Cardiac Arrest (OHCA).

As an example of the effectiveness of this intervention, in just a couple of months, data from the City of Mesa, Maricopa County (population approximately half-million) dispatch center shows bystander CPR has increased 27% and time to first compression has been reduced by 37%. A review of hospital records shows these actions have saved the lives of at least 13 people in the first months. Additionally in 2011, Bob Ramsey and Professional Medical Transport, along with the SHARE Program, published a study demonstrating that laypersons exposed to very short hands-only CPR videos are more likely to attempt CPR and show superior CPR skills than untrained laypersons and equals the affect of classroom training.

The SHARE Program conducted a 5-year state-wide campaign endorsing hands-only CPR and measured a significant increase in the overall incidence of bystander CPR from 28.2% to 39.9% as a result of the program. The proportion of CPR “hands-only” increased from 19.6% to 75.9%. And most importantly, overall survival increased from 3.7% to 9.8%. Rates of survival were 5.2% for the no bystander CPR group, 7.8% for conventional CPR, and 13.3% for hand-only CPR.

Cardiac save rates for OHCA in Cities such as Scottsdale, Tempe, Glendale and Mesa within Maricopa County improved during 2009 through today for emergency responses from a national average of 3.5% to more than 40% within the first years of project integration. This is the centerpiece of what we are talking about in this paper, and a historic change.

Patient care design standards are further set forth for each of the four defined public health emergencies, as follows:

SUDDEN CARDIAC ARREST- Initiation of therapeutic hypothermia imposed as soon as possible following a return of spontaneous circulation, and transport to a Regional Cardiac Arrest Center when feasible.

STEMI- Receive patient care intervention (PCI) within 90 minutes of symptom onset.

ACUTE STROKE- Receive pre-hospital stroke assessment and transport to a Primary Stroke Center for thrombolysis within three hours of the symptom onset.

TRAUMATIC INJURY- Receive pre-hospital assessment and transport to the closest available Level I trauma center within 60 minutes of injury onset, whether initially transported to a Level IV trauma center or other non-trauma center for stabilization via emergency medicine physician with or without Tele-Trauma assistance prior to transport to a Level I trauma center.

Starwest Tech Innovations

In 2006, Bob Ramsey's Starwest Tech and IT Director Marc Chambers began the development and implementation of an enhanced field ePCR network, "The Active Management System" for electronic data collection for PMT Ambulance and other providers, using Bob Ramsey's advanced theories for technologies of real-time management through measurement interventions, and sharing of real-time data both for internal and external use. Distinct integrated IT processes are uniquely communicated and managed in concurrent real-time and retrospective workflows. Early results quickly showed improvement on operational behaviors and emergency response times for pre-hospital providers and individual caregivers, including dramatic improvements in clinical outcomes. The premier quality and quantity of the electronic data helped support Arizona Department of Health Service (ADHS) clinical studies for evidence-based, measureable improvements in emergency patient outcomes, and standardized patient care.

Contributions to provider operations:

- Improved Response Times in 911 (8:59. 92+%)
- Better Data for Reimbursement and Compliant Standards
- Increased Unit Hour Utilization (UHU)

- Cost Effective Reduction in Unscheduled Over-Time
- Greater Availability of Ambulances and Resources
- Dramatic Measurements in Clinical Standards
- Medical Direction Management of Quality Improvement and Continuous Ongoing Training
- Implementing quick protocol and operational procedures to compliance

Blueprint for Premier EMS Agencies

Formation of the Premier EMS Agency Program (PEAP) by ADHS introduced a systematic and standardized approach to integrate EMS and trauma care delivery, protocols and treatment guidelines through formal commitments of EMS agencies and healthcare institutions to develop standardized data collection and submission processes, quality assurance processes and ongoing training and development for improving patient care and outcomes. EMS agencies and health care institutions participation in PEAP is strictly voluntary. The participation in the PEAP Program included the vast majority of providers.

PEAP goals are twofold. First, the program facilitates ongoing, statewide, measurable improvements in emergency patient outcomes using evidence-based and standardized patient care for major trauma, cardiac arrest, STEMI and acute stroke.

Secondly, PEAP was implemented to ensure patients in Arizona who experience any of these public health emergencies will receive state-of-the-art, standardized pre-hospital care and transport to a healthcare institution equipped and staffed to render definitive intervention for that specific emergency.

Key to PEAP success is a foundation of regionalization, coordination and standardization within two categories: Systems Design and Patient Care Design.

System design coordination is an integral component of a successful regionalized system of care. Arizona's PEAP has:

- Identified pre-hospital and hospital-based agencies, institutions and other agency resources;
- Developed short-term and long-term performance measurements with analysis and evaluation tools by EMS region;
- Established the PEAP Advisory Board;
- Developed a strategic plan and operating budget with short-term and long-term objectives;
- Developed public information and education strategies;
- Developed HIPAA-compliant data sharing mechanisms.

Patient care coordination includes pre-hospital on-line and off-line medical direction; pre-hospital patient alerts to appropriate facility; and initial receiving hospital alert activation, patient assessment and transfer protocols.

PEAP system design standards require NEMSIS (National EMS Information System) data elements, data submission standards, notification standards and performance measure standards.

Pre-hospital Care for Traumatic Brain Injuries

In 2012, based on their successful CPR work, EMS agencies, the University of Arizona, and the ADHS, in collaboration with the Ramsey Community Service Foundation initiated the Excellence in Pre-hospital Injury Care (EPIC) Project, a statewide effort to improve survival and neurologic outcome for another leading cause of death: traumatic brain injury (TBI). Arizona was selected, in an extremely competitive process, for the EPIC Project by the National Institutes of Health (NIH). It is the first and only statewide project of its kind.

Over five years, the EPIC Project will work with EMS agencies across the state to implement and evaluate the latest TBI guidelines. This will happen through the linkage of pre-hospital data and the Arizona State Trauma Registry (ASTR) also using the latest medical devices for pre-hospital EMS care donated by the Ramsey Foundation. To date, more than 85% of Arizona's EMS agencies are participating and are in the process of being trained in EPIC.

Interventions in the "EPIC Protocol" include optimizing the management of hemodynamics, oxygenation, and ventilation in the field in major TBI victims, with special emphasis on patients who are intubated. There is growing evidence that the care provided in the first few minutes after major TBI may be *more* important than what happens later. In fact, the success of subsequent critical care and surgical interventions is probably dramatically enhanced by optimal pre-hospital care.

Key Success

A successful track record of clinical excellence in emergency medical care is the priority of measurement as an intervention and active management of the links in the chain of survival in time sensitive illnesses. Key performance indicators are set forth for the EMS teams and care givers from the public to pre-hospital providers in the field, medical directors and hospitals. Each group factors strongly in the equation for successful implementation of programs that positively impact overall public health in the areas of major trauma, cardiac arrest, STEMI and stroke by transmitting data to the state that is used to measure patient outcome performance.

Conclusion

Today, Arizona EMS leaders are taking the lead in assuring delivery of premier EMS services throughout the state and promoting improvements in the state's EMS trauma system through research and education for continuous quality improvement; intersecting emergent patients' needs with the appropriate pre-hospital treatment, transport, and health care institution

Arizona's commitment to innovative pre-hospital patient care and reporting standards has set forth a national and world-wide template for best practices in public health. Agencies, providers or facilities that commit to program improvement add tremendous value to the patient and to the community by reducing the impact of illness and injury.

Through programs such as AZ-PIERS, PEAP, SHARE, and EPIC, the community partners have created a systematic and standardized approach to measuring and implementing emergency medical care. Ongoing training for improved patient outcome, quality assurance programs and standardized data collection processes continue to enhance patient survival rates.

Innovation in the development of real-time and retrospective measurement interventions of data will produce better outcomes and facilitate regionalized systems of care committed to clinical excellence by partnering with public and private healthcare providers and IT developers. Through this approach of clinical collaboration and measurement intervention a community can economically optimize, in a short time period, the rates of survival for cardiac arrest, STEMI, stroke and traumatic brain injury (TBI).