Cardiac Arrest

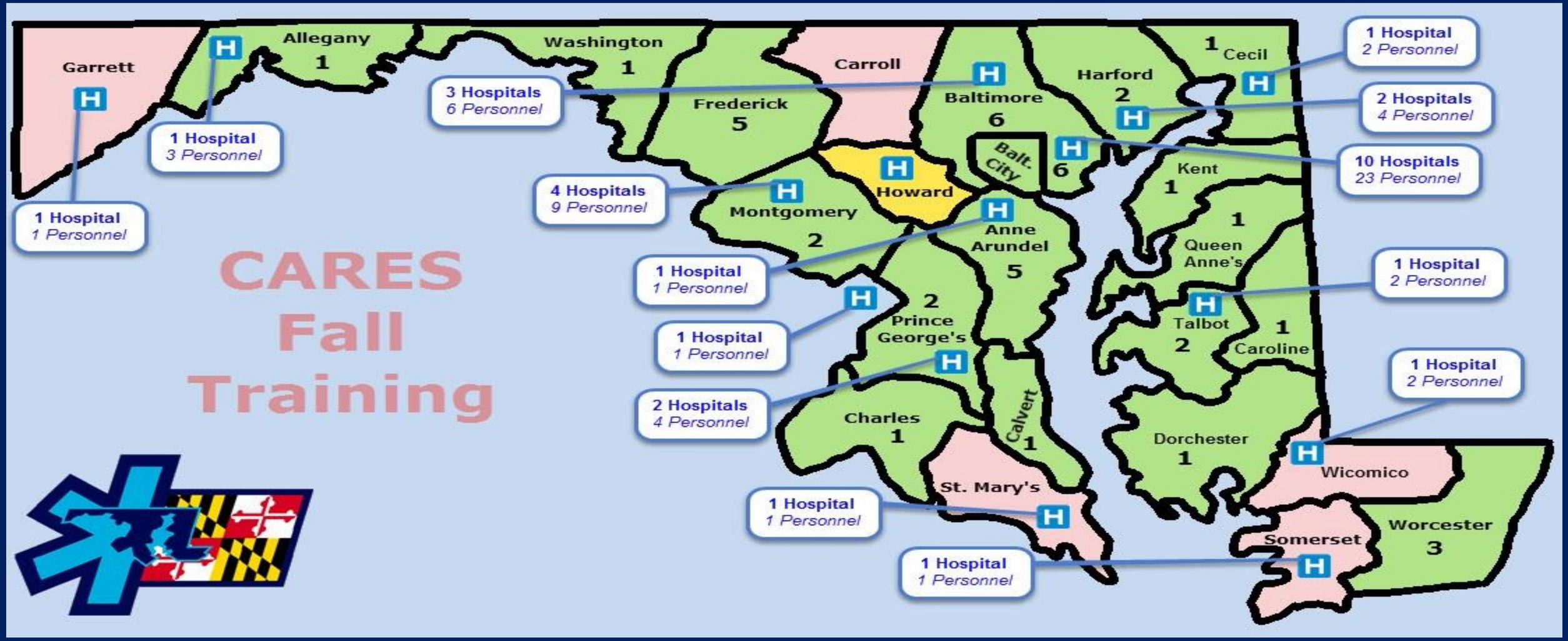
Maximize Survival in Maryland

Kevin G. Seaman, MD, FACEP
Maryland Institute for EMS Systems

Outline

- **Define the challenge**
- **Where we are currently**
- **What we need from your partnership**

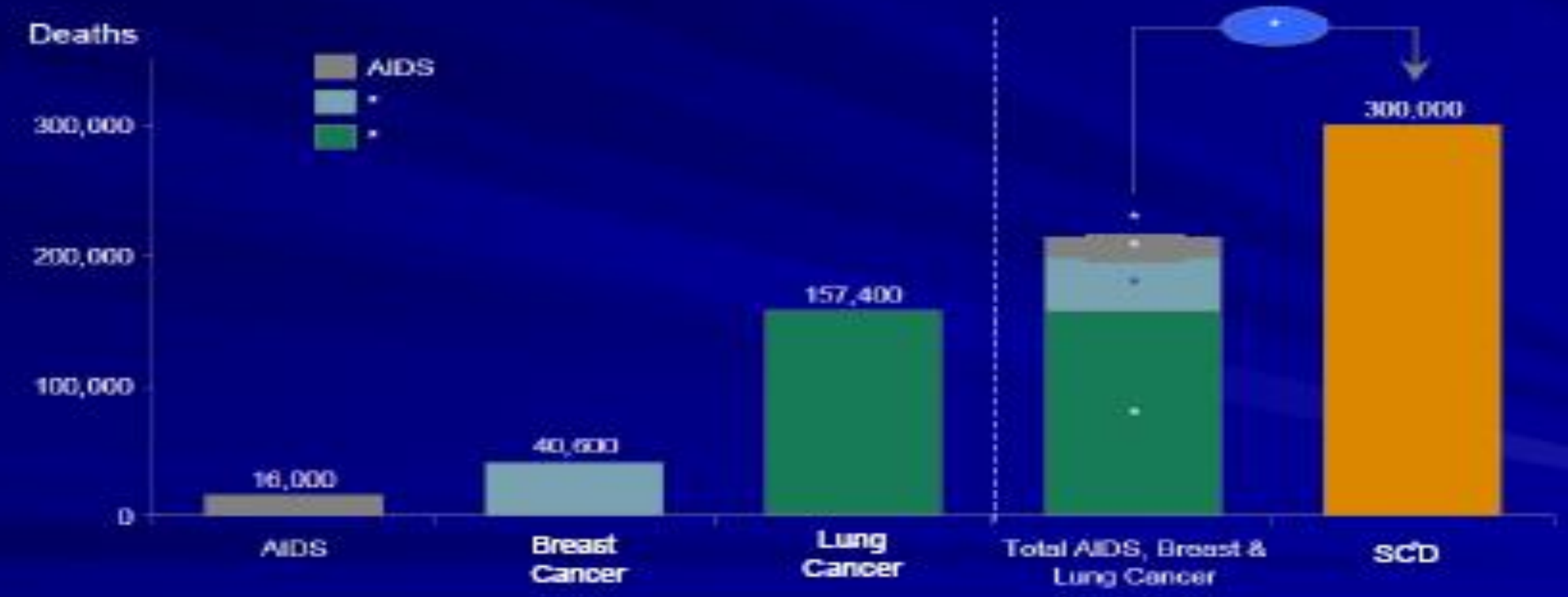
CARES Conference



Cardiac Arrest is a leading cause of death in the United States

More deaths result from SCD than AIDS, breast cancer and lung cancer combined

SCD compared to other diseases



Demographics of Out-of-Hospital SCAs in Maryland

Total Arrests: N =10096

Rate: 61.7 per 100,000 population per year

Witnessed Arrests with Medical Cardiac Nature : N = 3514

Rate: 21.5 per 100,000 population per year

OOH EMS SCA Transports

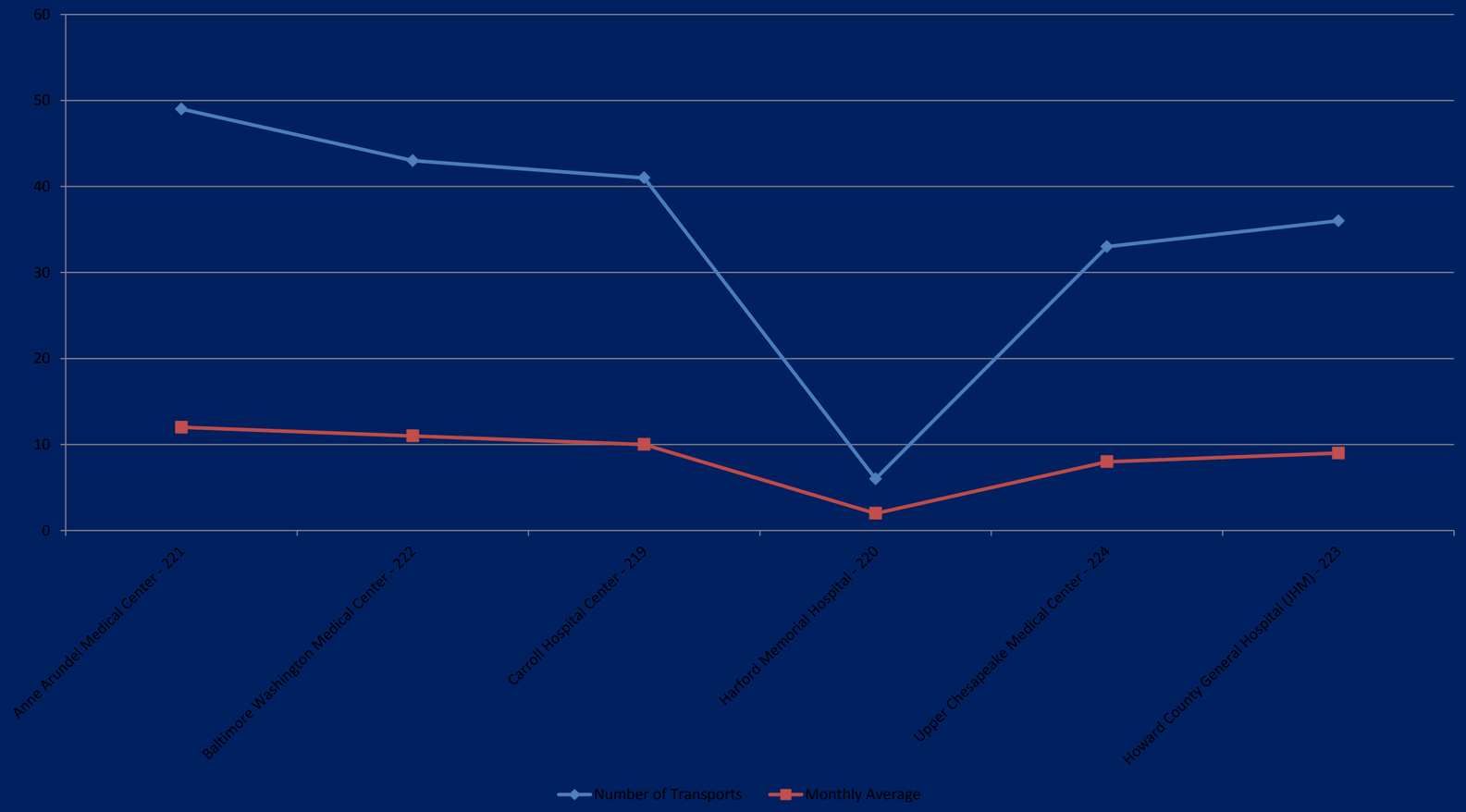
EMS Out-of-Hospital Sudden Cardiac Arrest Transports
May, 1, 2015 to August 31, 2015
Source: eMEDS®, All Cardiac Arrest Etiologies

REGION 3A

OOH EMS SCA Transports

EMS Out-of-Hospital Sudden Cardiac Arrest Transports
May, 1, 2015 to August 31, 2015
Source: eMEDS®, All Cardiac Arrest Etiologies

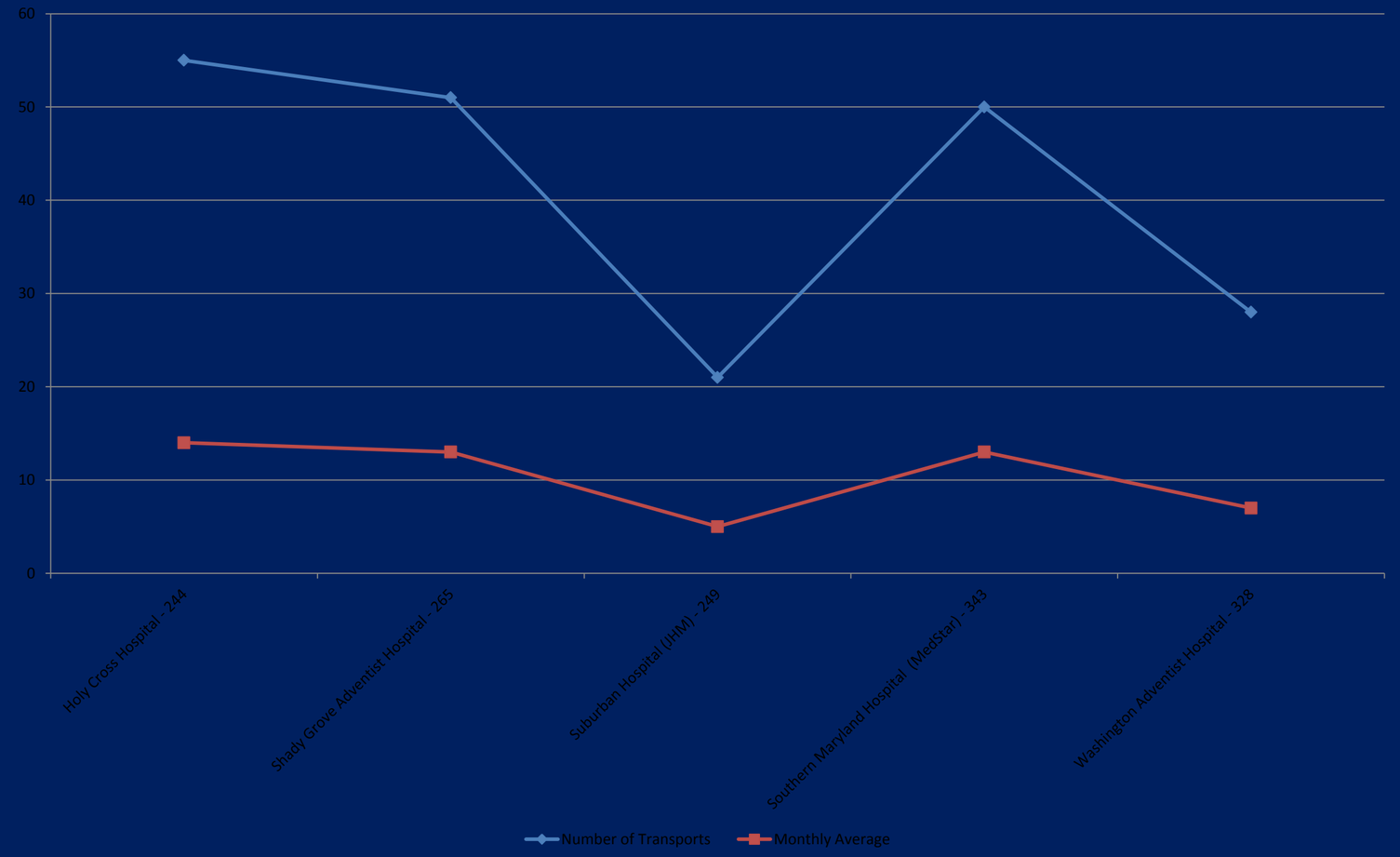
REGION 3B



OOH EMS SCA Transports

REGION 5

EMS Out-of-Hospital Sudden Cardiac Arrest Transports
May, 1, 2015 to August 31, 2015
Source: eMEDS®, All Cardiac Arrest Etiologies



OOH EMS SCA Transports

EMS Out-of-Hospital Sudden Cardiac Arrest Transports
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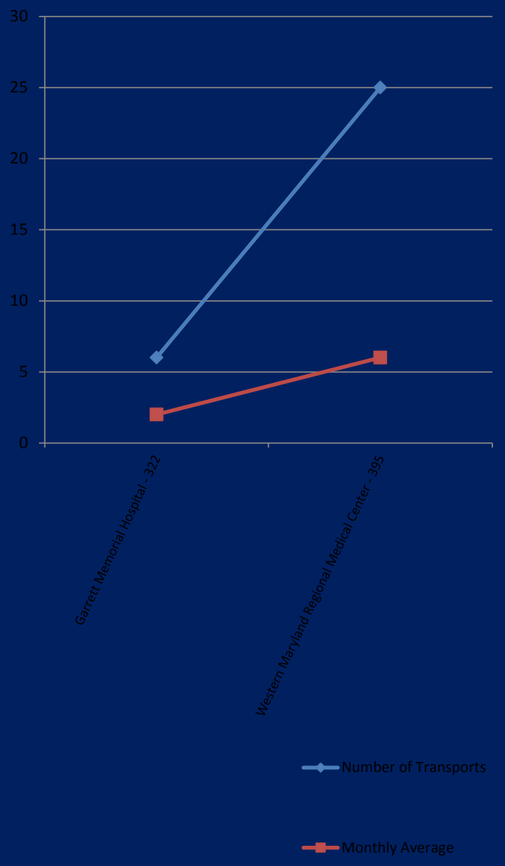
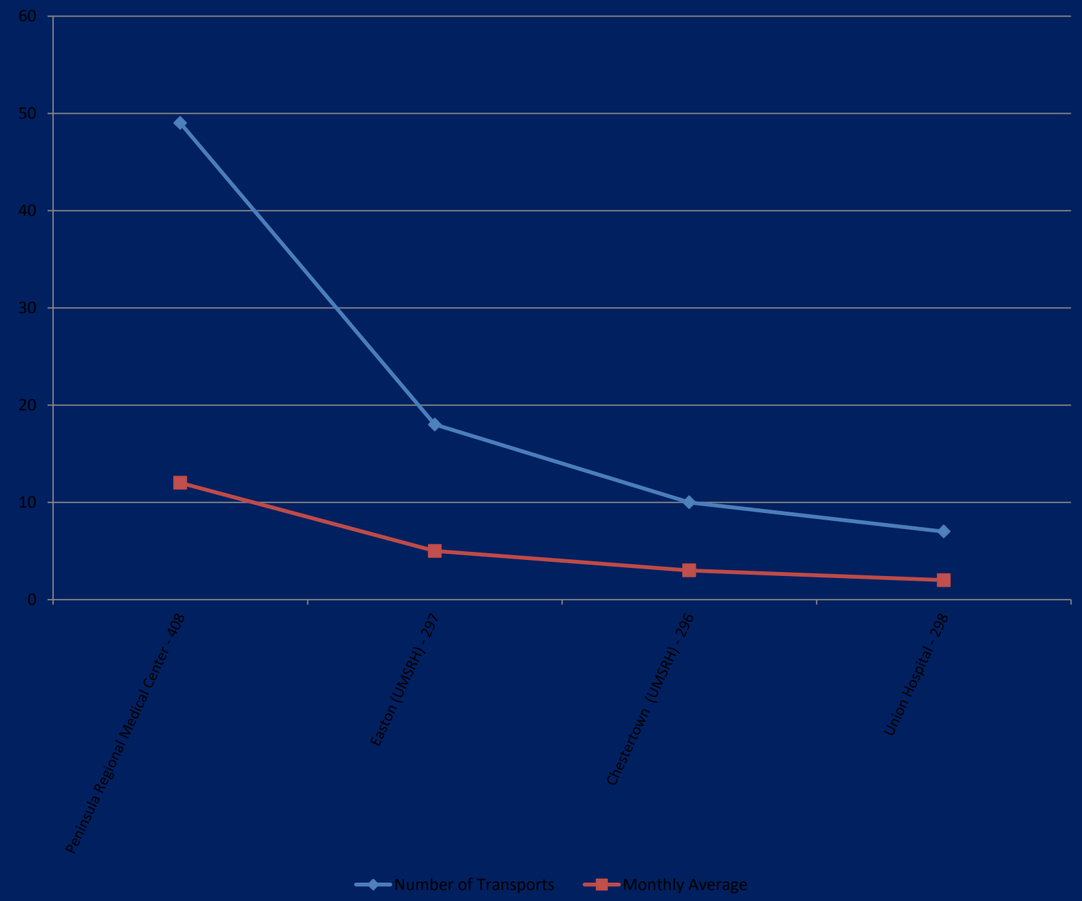
Source: eMEDS®, All Cardiac Arrest Etiologies

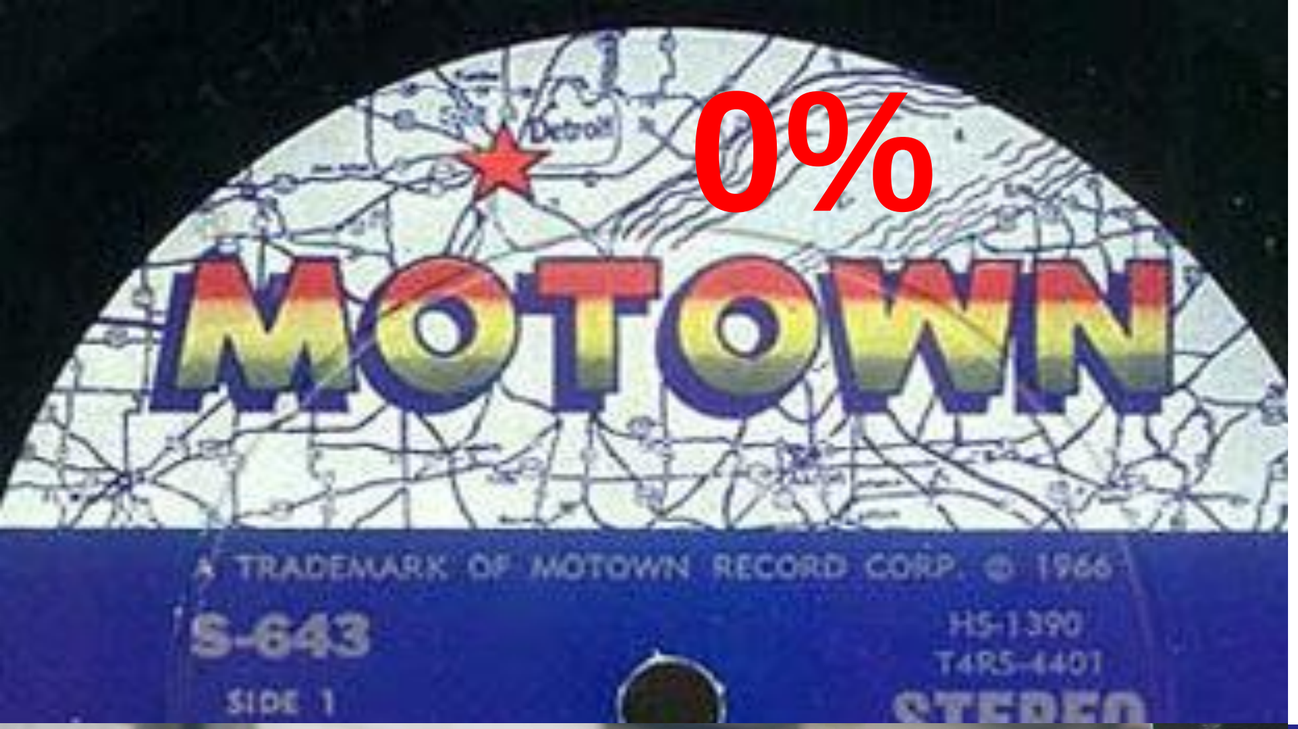
REGIONS 1 & 2



REGION 4



The **disparity**



0%

CHICAGO BULLS

3%

5%

50%

Regional Variation

Regional Variation in Out-of-Hospital Cardiac Arrest Incidence and Outcome

Graham Nichol, MD, MPH
Elizabeth Thomas, MSc
Clifton W. Callaway, MD, PhD
Jerris Hedges, MD, MS
Judy L. Powell, BSN
Tom P. Aufderheide, MD
Tom Rea, MD
Robert Lowe, MD, MPH
Todd Brown, MD
John Dreyer, MD
Dan Davis, MD
Ahamed Idris, MD
Ian Stiell, MD, MSc

Context The health and policy implications of regional variation in incidence and outcome of out-of-hospital cardiac arrest remain to be determined.

Objective To evaluate whether cardiac arrest incidence and outcome differ across geographic regions.

Design, Setting, and Patients Prospective observational study (the Resuscitation Outcomes Consortium) of all out-of-hospital cardiac arrests in 10 North American sites (8 US and 2 Canadian) from May 1, 2006, to April 30, 2007, followed up to hospital discharge, and including data available as of June 28, 2008. Cases (aged 0-108 years) were assessed by organized emergency medical services (EMS) personnel, did not have traumatic injury, and received attempts at external defibrillation or chest compressions or resuscitation was not attempted. Census data were used to determine rates adjusted for age and sex.

Main Outcome Measures Incidence rate, mortality rate, case-fatality rate, and survival to discharge for patients assessed or treated by EMS personnel or with an initial rhythm of ventricular fibrillation.

Results Among the 10 sites, the total catchment population was 21.4 million, and there were 20 520 cardiac arrests. A total of 11 898 (58.0%) had resuscitation attempted; 2729 (22.9% of treated) had initial rhythm of ventricular fibrillation or ventricular tachycardia or rhythms that were shockable by an automated external defibrillator; and 964 (4.6% of total) were discharged alive. The median incidence of EMS-treated cardiac arrest across sites was 52.1 (interquartile range [IQR], 48.0-70.1) per 100 000 population; survival ranged from 3.0% to 16.3%, with a median of 8.4% (IQR, 5.4%-10.4%). Median ventricular fibrillation incidence was 12.6 (IQR, 10.6-5.2) per 100 000 population; survival ranged from 7.7% to 39.9%, with a median of 22.0% (IQR, 15.0%-24.4%), with significant differences across sites for incidence and survival ($P<.001$).

Conclusion In this study involving 10 geographic regions in North America, there were significant and important regional differences in out-of-hospital cardiac arrest incidence and outcome.

JAMA. 2008;300(12):1423-1431 www.jama.com

IT REMAINS TO BE DETERMINED HOW often out-of-hospital cardiac arrest (OHCA) occurs. Recent sources indicate that about 166 000 to 310 000 Americans per year experience an OHCA,[1] although resuscitation is not attempted in many of these cases. The reported incidence of OHCA[2] and reported survival to discharge after OHCA are highly variable.[3]

Accurate estimation of the burden of OHCA is essential to evaluate progress toward improving public health by reducing cardiovascular disease. Clinical trials often exclude patients at higher risk of poor outcomes, so estimation of the burden of illness based only on those enrolled in trials is subject to bias. Knowledge of regional variation in outcomes after cardiac arrest could guide identification of effective interventions that are used in some communities but have not been implemented in others. Potential interventions include culturally appropriate public health initiatives, community support, and equitable access to high-quality prehospital emergency care. We hypothesized that there would be significant regional variation in the incidence and outcome of OHCA.

See also pp 1432 and 1462.

METHODS

Design and Setting

The Resuscitation Outcomes Consortium (ROC) is a clinical research network conducting research in the areas of cardiopulmonary arrest and severe

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Corresponding Author: Graham Nichol, MD, MPH, University of Washington-Harborview Center for Prehospital Emergency Care, Box 359727, 325 Ninth Ave, Seattle, WA 98104 (nicholdlife.washington.edu).

- **In this 2006 JAMA study, 10 ROC regional outcomes from a v-fib arrest ranged from 7.7% to 39.9%**
- **2/3 did not get bystander CPR**

First Reported Out of Hospital Save

January 6, 1960 - Baltimore, Maryland

Dr. C. Park and Dr. Peter Safar, Dept. of Anesthesia, Baltimore City Hospital and Capt. Martin McMahon, Chief, Baltimore Fire Department Ambulance Service

ANNALS OF
INTERNAL MEDICINE

Volume 71 September 1969 Number 3

The Development of the Defibrillator

WILLIAM B. KOUWENHOVEN, M.D., *Baltimore, Maryland*

SUMMARY: I was fortunate in [illegible] in being chosen a member of a team to study the effects of electric shocks on human beings. In 1930 we were asked to investigate the statement of Prevost and Battelli (1) that they had been able to defibrillate the ventricular fibrillating dog's heart by applying an electric countershock directly to the myocardium. They had used direct cardiac massage to circulate oxygenated blood. We confirmed their statement and developed an open-chest defibrillator. Their method became a standard operating room procedure in fibrillation cases.

We also found that the human heart could be defibrillated by placing the electrode on the surface of the chest and applying timed electric energy. This procedure eliminated the need for thoracotomy.

We continued our studies and have developed the Hopkins AC, monophasic and biphasic DC capacitor-type defibrillators, and external cardiac massage.

THE DEVELOPMENT OF the defibrillator was initiated by Dr. J. W. Lieb, President of the Consolidated Edison Co. of New York. In 1925 he became disturbed by the increasing number of electric shock accidents and deaths. Dr. Lieb called on Dr. Simon Flexner of the Rockefeller Institute, New York, for advice. Conferences were held and five committees were formed with the following chairmen: Physiology, Dr. W. H. Howell (The Johns Hopkins University); Pathology, Dr. W. B. MacCallum (The Johns Hopkins University); Engineering, Dr. Philip Drinker (Harvard University); Electrocution, Dr. H. B. Williams (Columbia University); Cytology, Dr. W. J. Gies (Rockefeller Institute). Funds were made available by the power company.

At Johns Hopkins I was fortunate in being chosen as one of three faculty members to carry on the experimental studies under the direction of Dr. Howell and Dr. MacCallum. The other two were Dr. R. D. Hooker, Professor of Physiology, and Dr. O. R. Langworthy, Associate Professor of Neurology.

Ventricular fibrillation was known to be one of the effects of electric shock, and in May of 1928 Dr. Hooker began an experimental study on the treatment of fibrillation with drugs.

Langworthy and I were to study other effects. Dr. Lieb invited us to visit him in New York so that we could learn at first hand the types of electric shock accidents (2) that occurred in industry and homes. He

Received April 8, 1969; accepted April 17, 1969.
From The Johns Hopkins Hospital, Baltimore, Md.

Requests for reprints should be addressed to W. B. Kouwenhoven, M.D., 3205 Blalock Bldg., The Johns Hopkins Hospital, 601 N. Broadway, Baltimore, MD. 21205

Outline

- Definition of the problem
- Where we are currently
- What we need from your partnership

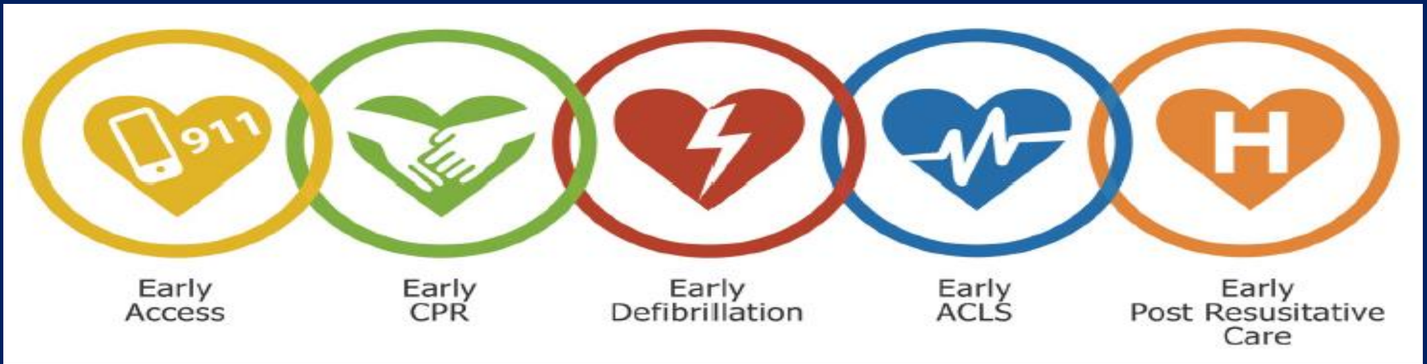
CARDIAC ARREST SURVIVAL:
A TIME TO ACT

It is our national responsibility to improve the likelihood of survival without disability after **cardiac arrest.**

Read the new report from the Institute of Medicine

www.iom.edu/cardiacarrest

THE CARDIAC ARREST CHAIN OF SURVIVAL



Resuscitation Academy, 2014

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IMMEDIATE PROVISION OF CARE IN COMMUNITY SETTINGS

- Time to first compressions and defibrillation are crucial and the best way to improve outcomes
- Any CPR or defibrillation delivered by the public is better than no care
- Bystanders and family members are needed to activate emergency medical services and provide care.
- EMS systems can facilitate bystander response through dispatcher-assisted CPR (aka telecommunicator CPR).

WHAT CAN MARYLAND DO ?

- ❑ EDUCATE THE PUBLIC
- ❑ PARTNER WITH THE PUBLIC

WHAT CAN MARYLAND DO ?

- CARES REGISTRY
- MULTIDISCIPLINARY GROUP
  - TO CHAMPION
  - PROVIDE ACCOUNTABILITY
- LINK TO EXCELLENCE

HIGH QUALITY CARE FROM EMERGENCY AND HOSPITAL PROFESSIONALS CAN SAVE LIVES

- High-performing communities provide examples of how functional public health infrastructures and well-organized health system responses can facilitate timely and effective treatment.
- Continuous quality improvement programs can encourage data collection across all sites of care, enable comparisons within and between EMS and health care systems, and lead to new treatments and best practices that improve population health and patient outcomes.

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RECOMMENDATION 3.
ENHANCE THE CAPABILITIES AND PERFORMANCE OF EMS SYSTEMS

As the informal agency for EMS, NHTSA should coordinate with other federal agencies and representatives from private industry, states, professional organizations, first responders, EMS systems, and non-profit organizations

- to develop standardized dispatcher-assisted CPR protocols and national educational standards for use by all public safety answering points.
- to establish a standardized definition and training curriculum for high-performance CPR to be used in basic emergency medical technician training and certification.

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WHAT CAN MARYLAND DO ?

- ❑ EMS EXCELLENCE, UNIFORMLY SO
- ❑ STANDARDIZED PROTOCOLS

RECOMMENDATION 4.

SET NATIONAL ACCREDITATION STANDARDS RELATED TO CARDIAC ARREST FOR HOSPITALS AND HEALTH CARE SYSTEMS

The Joint Commission—in collaboration with the American Red Cross, the American Heart Association, hospital systems, hospitals, professional organizations, and patient advocacy groups—should develop and implement an accreditation standard for health care facilities specific to cardiac arrest care for adult and pediatric populations.

RECOMMENDATION 5.

ADOPT CONTINUOUS QUALITY IMPROVEMENT PROGRAMS

EMS systems, health care systems, and hospitals should adopt formal, continuous quality improvement programs for cardiac arrest response that

- Assign responsibility, authority, and accountability within each organization or agency for specific cardiac arrest measures;
- Implement core technical and non-technical training, simulation, and debriefing protocols to ensure that EMS and hospital personnel can respond competently to both adult and pediatric cardiac arrests; and
- Actively collaborate and share data to facilitate national, state, and local benchmarking for quality improvement.

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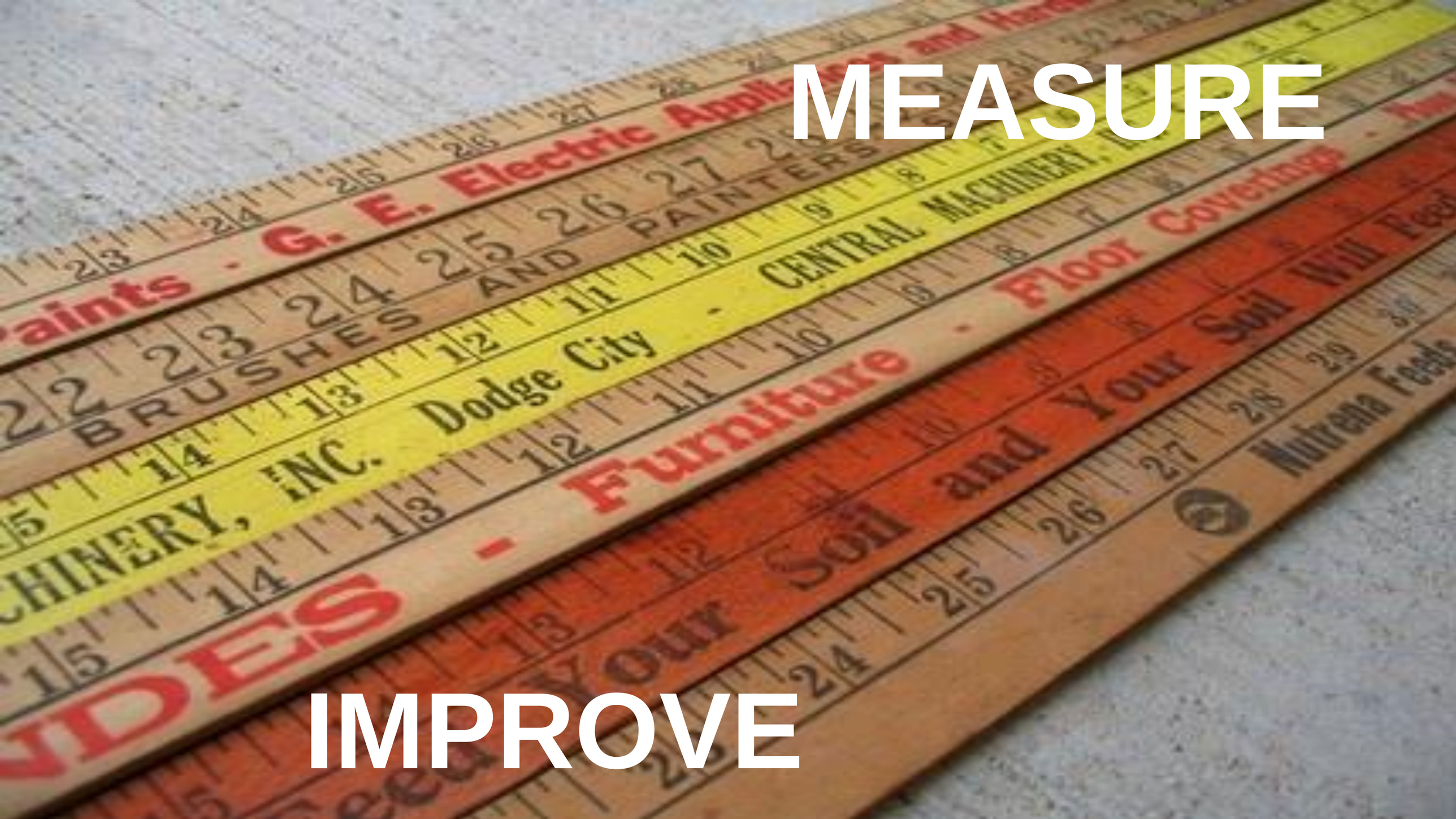
THE NEED FOR RENEWED LEADERSHIP, ACCOUNTABILITY, AND STAKEHOLDER ADVOCACY

- Sustained federal, state, and local leadership are necessary to improve outcomes from cardiac arrest across the United States.
- The public should expect accountability from their leaders through public reporting of data related to cardiac arrest in their communities.
- To generate appropriate leadership and multiple levels of accountability, the resuscitation field needs to coordinate its advocacy efforts and establish unified goals.

WHAT WILL MARYLAND DO ?

- Time to ACT is now
- Accountability
- Partnerships

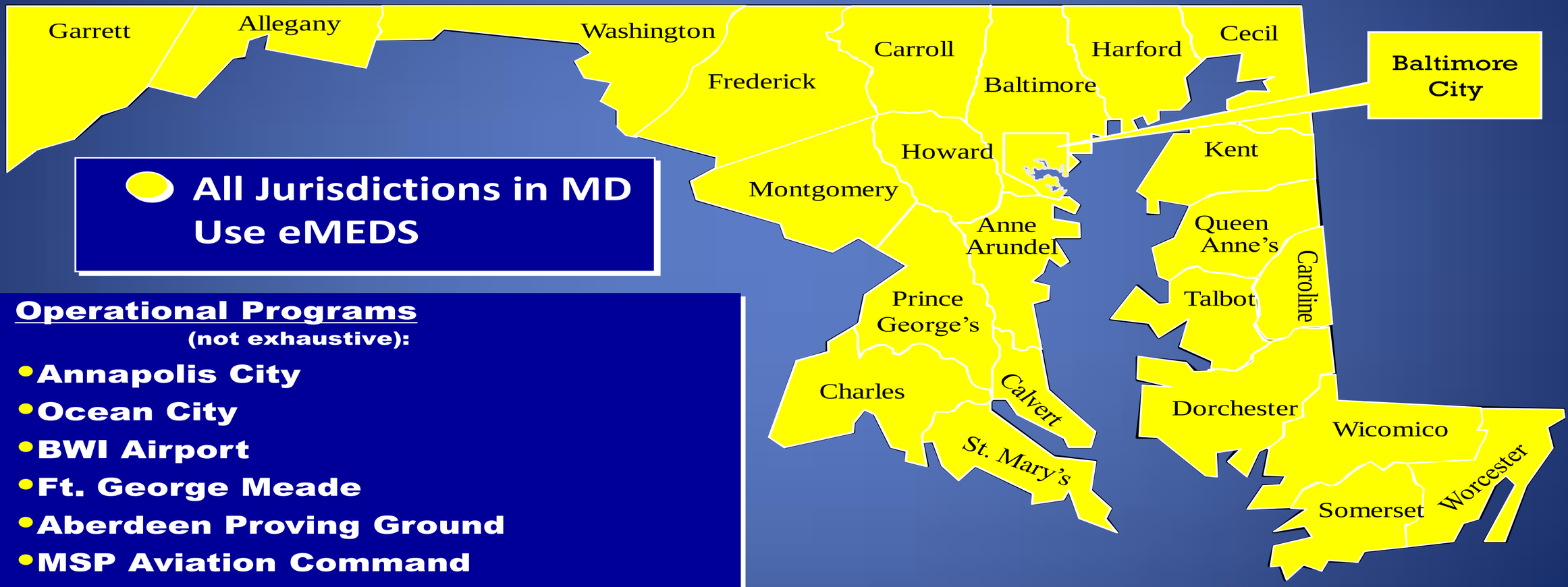

MEASURE
IMPROVE

"Most cities don't measure their performance effectively, if at all. They don't know how many lives they are losing, so they can't determine ways to increase survival rates."

– Bob Davis, "Six Minutes to Live" *USA Today*, 2003

Maryland eMEDS

Electronic Patient Care Reporting System



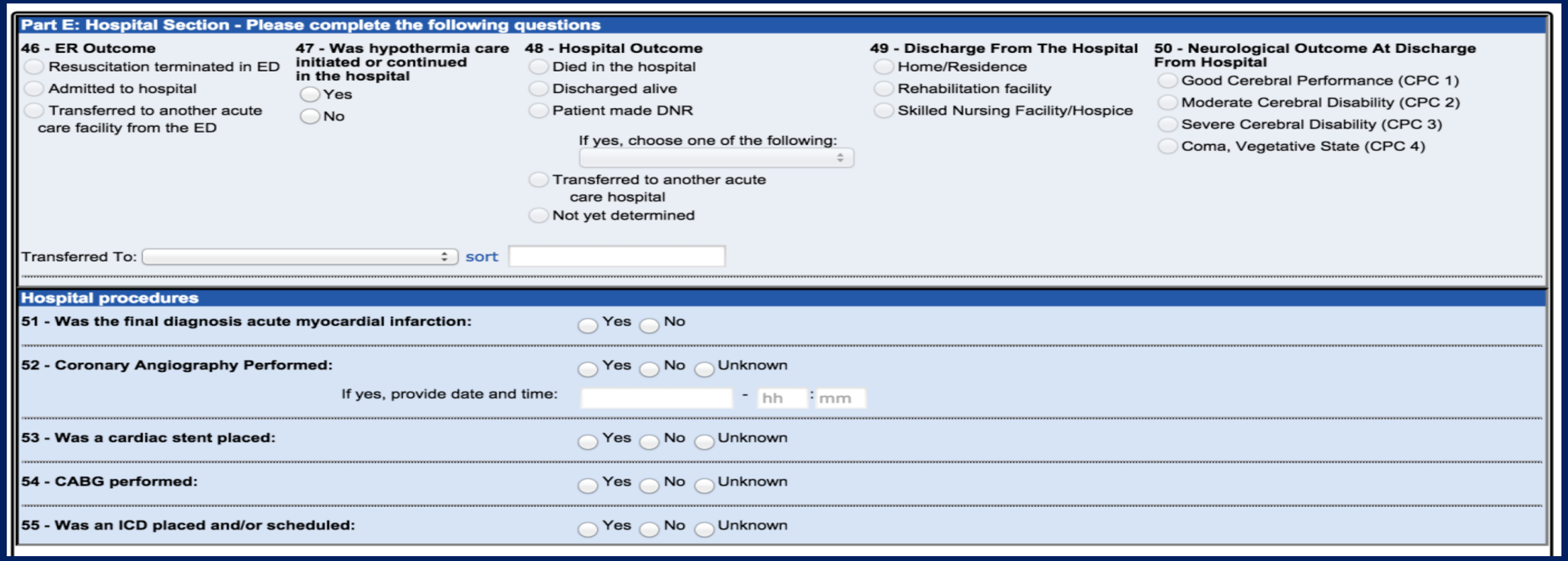
All Jurisdictions in MD Use eMEDS

Operational Programs

(not exhaustive):

- Annapolis City
- Ocean City
- BWI Airport
- Ft. George Meade
- Aberdeen Proving Ground
- MSP Aviation Command
- NSA Bethesda
- US Naval Academy EMS
- 25+ Commercial Services

CARES Hospital Fields



Part E: Hospital Section - Please complete the following questions

46 - ER Outcome
- Resuscitation terminated in ED
- Admitted to hospital
- Transferred to another acute care facility from the ED

47 - Was hypothermia care initiated or continued in the hospital
- Yes
- No

48 - Hospital Outcome
- Died in the hospital
- Discharged alive
- Patient made DNR

If yes, choose one of the following:

- Transferred to another acute care hospital
- Not yet determined

Transferred To: sort

49 - Discharge From The Hospital
- Home/Residence
- Rehabilitation facility
- Skilled Nursing Facility/Hospice

50 - Neurological Outcome At Discharge From Hospital
- Good Cerebral Performance (CPC 1)
- Moderate Cerebral Disability (CPC 2)
- Severe Cerebral Disability (CPC 3)
- Coma, Vegetative State (CPC 4)

Hospital procedures

51 - Was the final diagnosis acute myocardial infarction: Yes No

52 - Coronary Angiography Performed: Yes No Unknown

If yes, provide date and time: - hh : mm

53 - Was a cardiac stent placed: Yes No Unknown

54 - CABG performed: Yes No Unknown

55 - Was an ICD placed and/or scheduled: Yes No Unknown

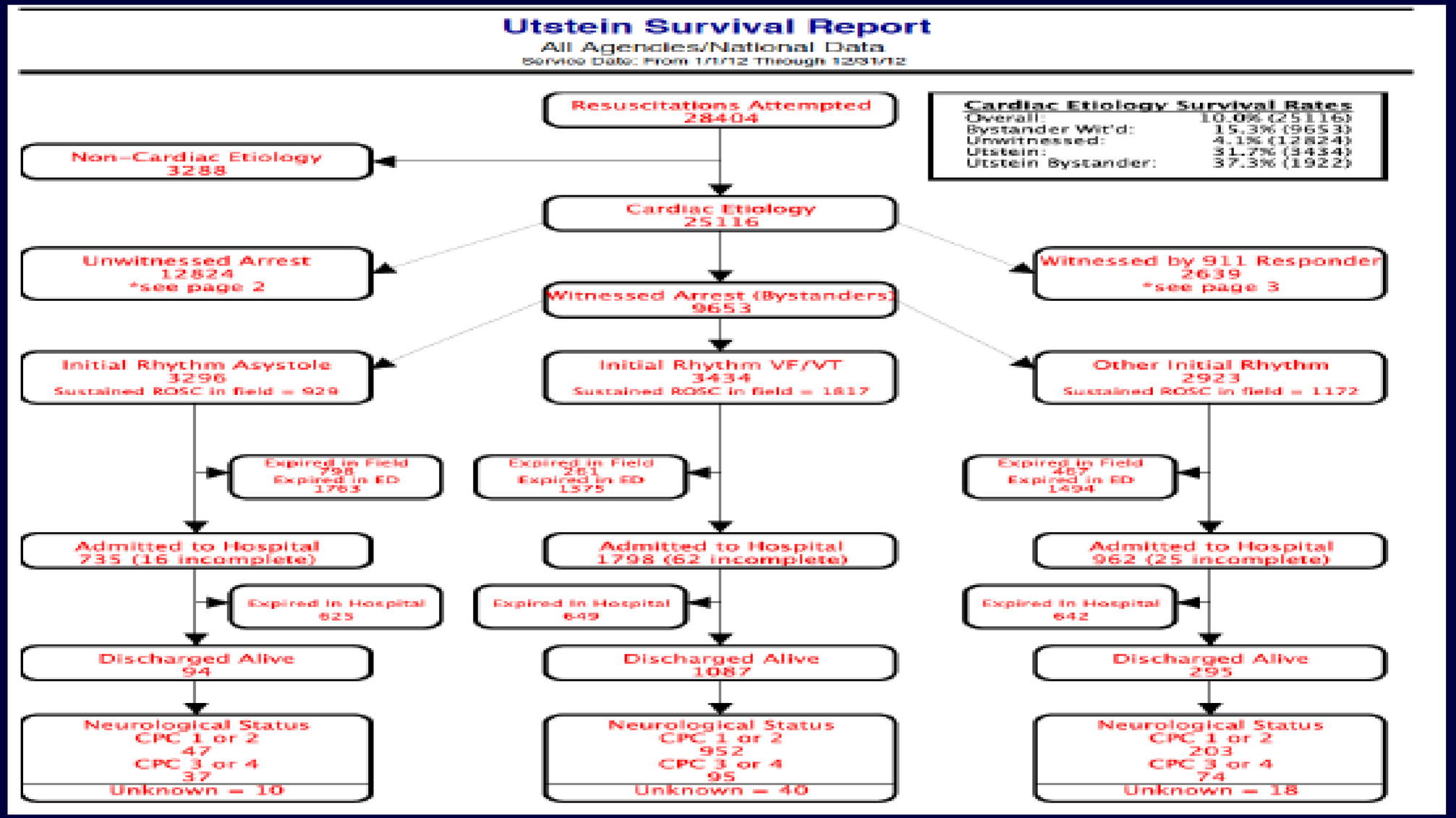
How Many Patients?

- **How many patients need outcome follow-up?**
  - **CARES Data from Pilot**
    - **Period 21 weeks (2/9/15 – 6/30/15)**
      - **Total CARES calls: 64**
      - **Ongoing ED Care: 25 (~ 1 case/week)**
      - **Admitted: 19**
      - **Discharged Alive: 6**
    - **Projection for 1 year:**
      - **47 Admitted**

How Many Fields?

- CARES Hospital Contact have to fill out?
- 1 – 10 fields; Depending on patient outcome and the level of care provided
    - Example: Patient with ROSC in field, died in ED
        - Hospital rep would fill out one field
    - Example: Patient with field ROSC, admitted to ED, PCI in cath lab, admitted to hospital
        - Hospital rep would fill out 10 fields
    - Example: Patient with field ROSC, admitted to ED, transferred to CIC Hospital
        - Hospital rep would fill out ~ 3 fields; CIC 7 fields

CARES Utstein Survival Report



CARES

- Allows communities to determine OHCA outcomes & identify high risk groups and neighborhoods
- Enables clinical benchmarking to identify opportunities for improvement and track the diffusion of new therapies
- Promotes accountability to improve the quality and impact of prehospital care
- Observational data for effectiveness research

Where we want to be

- **eMEDS**
  - **All jurisdictions submitting data through eMEDS**
- **CARES**
  - **Successful pilot**
  - **All jurisdictions participating**
  - **Mandatory cardiac arrest data fields**

citation Acad ×

ramaryland.org

Home | Program Overview | EMS Provider | Dispatcher | Public

MARYLAND RESUSCITATION ACADEMY

Goal:

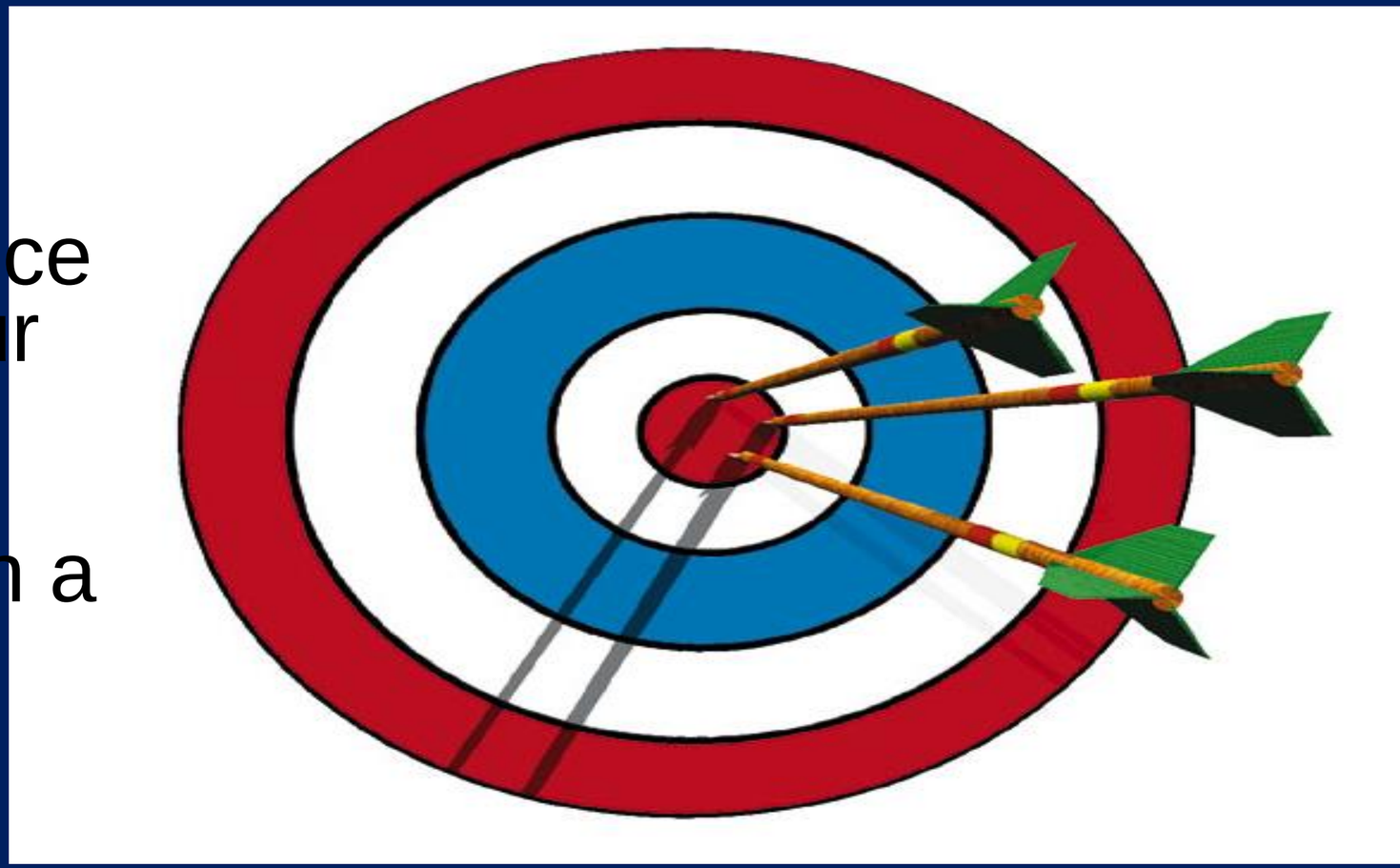
Measure the effect of the plan of action on cardiac survival.

Welcome to Maryland Resuscitation Academy. Improving survival from cardiac arrest.

We help EMS supervisors, dispatchers, and EMS field personnel improve cardiac arrest survival in the communities they serve. Join the leaders Maryland's EMS community for a course that will transform the way your EMS system manages cardiac arrests.

Goals

- Improve cardiac arrest survival rate in your community
- Establish and/or enhance cardiac arrest QI in your community
- Measure: Participate in a cardiac arrest registry
- Improve: Make programmatic changes

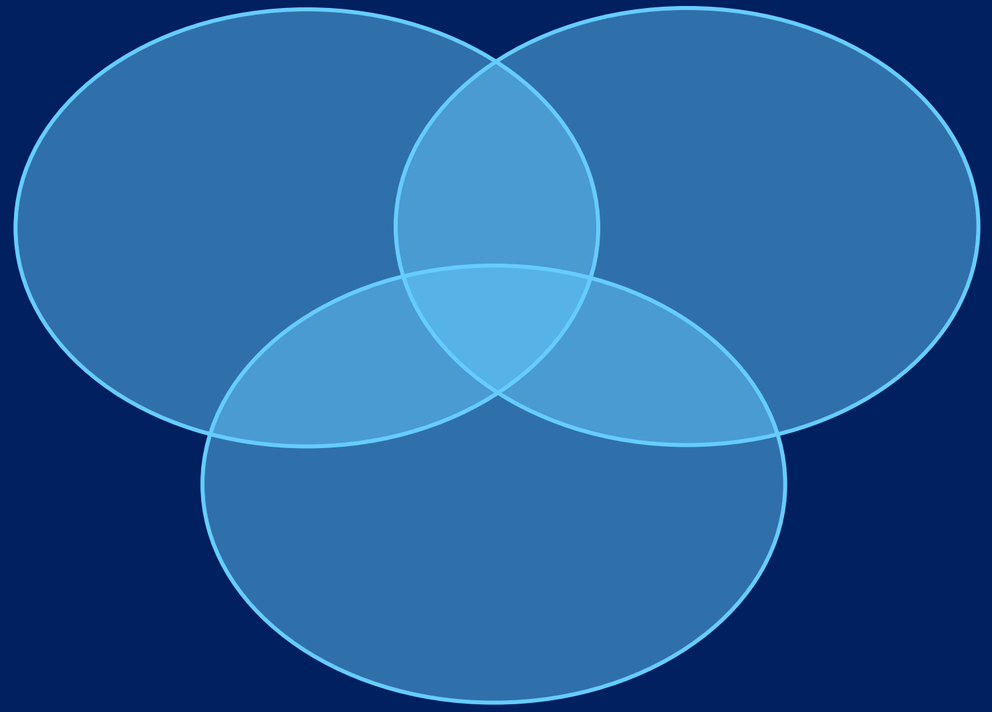


Maryland Resuscitation Academy

- **Resuscitation Academy**
- **Number of personnel/first responders trained through the Maryland Resuscitation Academy:**
  - **2012 65**
  - **2013 140**
  - **2014 350**

Factors Which Determine Survival

Following Cardiac Arrest

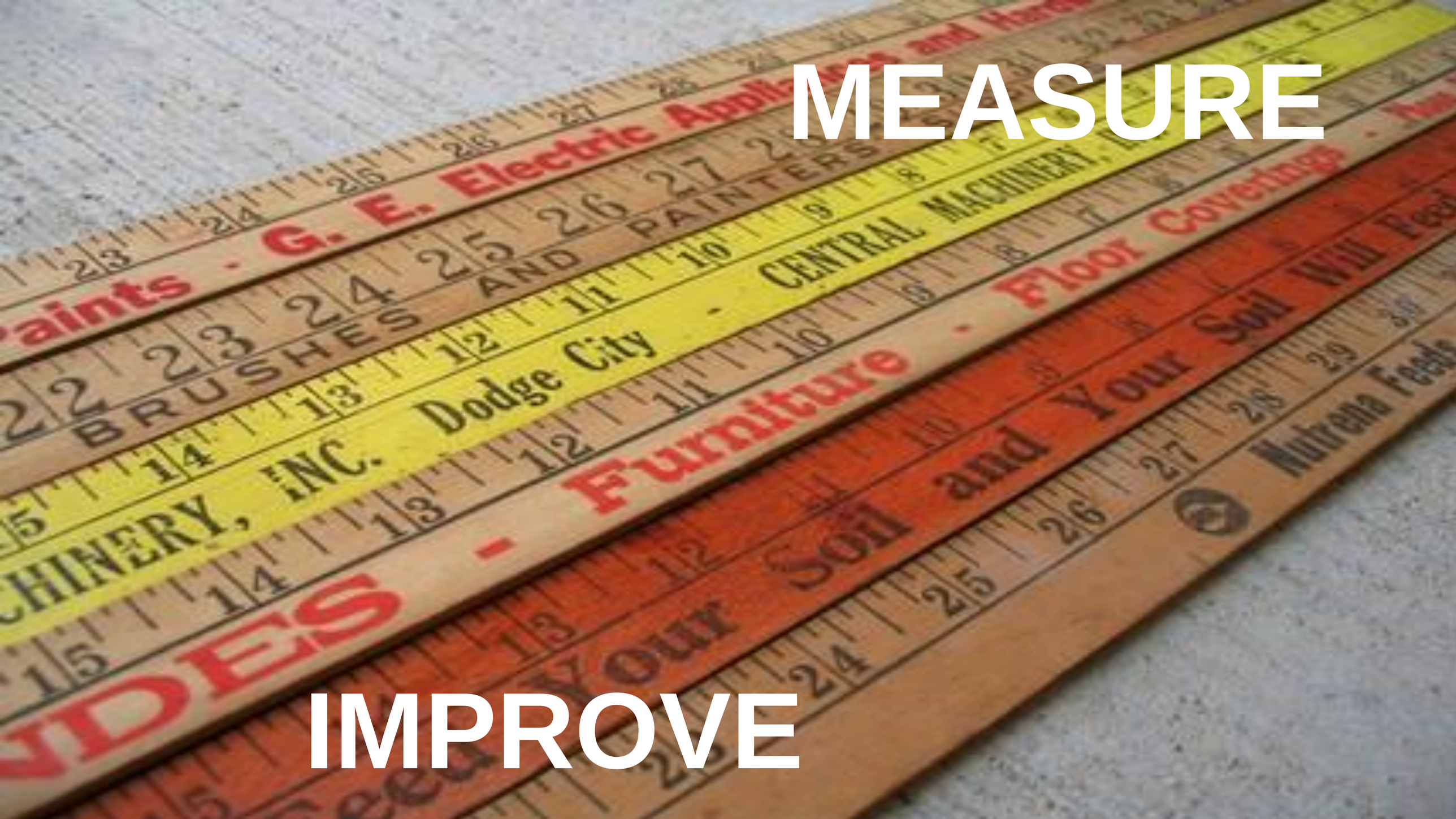


Determinants of a successful resuscitation

Successful Resus

- Patient and event factors are important but cannot be changed by the EMS system

- System factors can be changed - most are time related


MEASURE
IMPROVE

Maryland Data

Howard County

Year	Survival
2013	50%
2012	44%
2011	42%

Baseline 2002-3 Data 19%ROSC to ED Arrival

Outline

- Definition of the problem
- Where we are currently
- What we need from your partnership

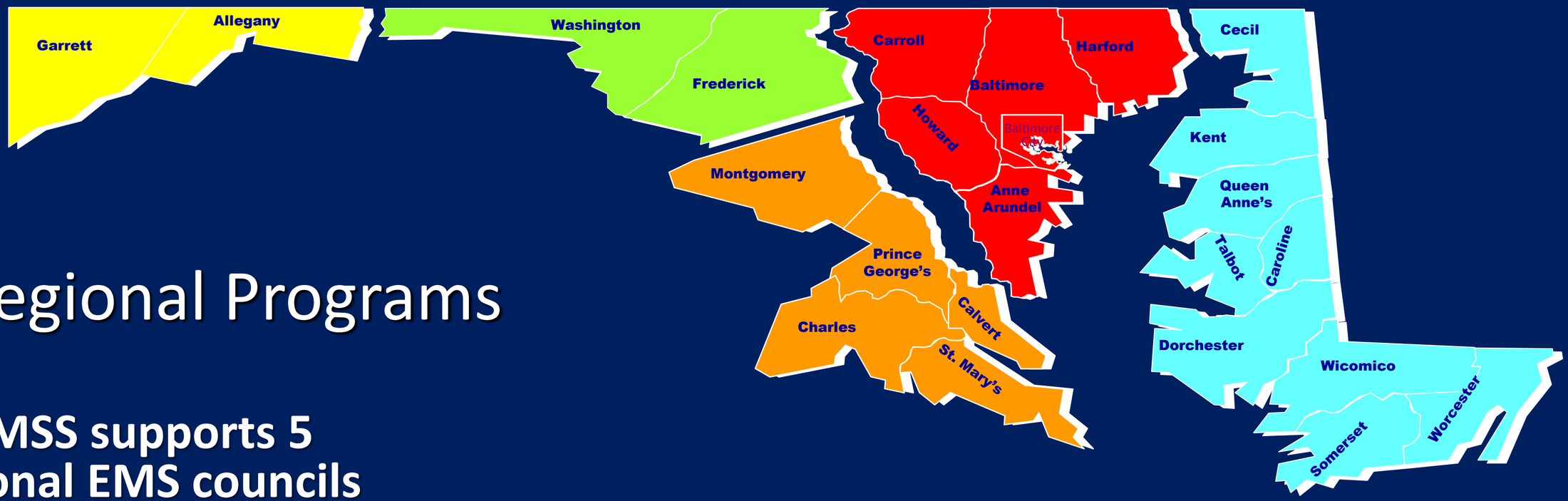
Your Partnership

- **Support**
- **CASC Key Goal: To enhance the response to and care of patients with sudden out of hospital cardiac arrest in a way that will improve outcomes from sudden out-of-hospital cardiac arrest in all communities and populations in Maryland.**
  - ***Mission of the Maryland Resuscitation Academy*** **: Improve survival from sudden cardiac arrest throughout the State of**

CARES Roll Out

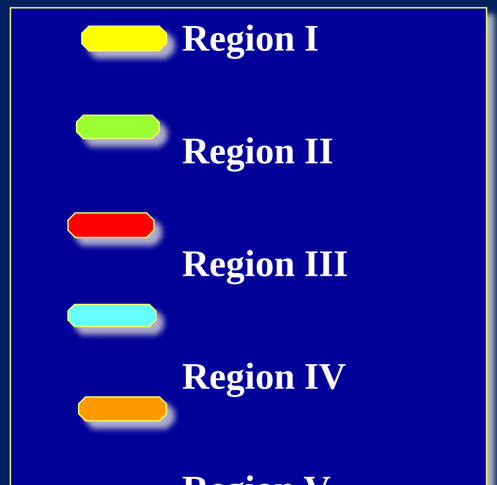
- EMS Jurisdictions
- Hospitals serving the jurisdiction
  - Easy if one hospital in the jurisdiction
- For Metro areas
  - EMS first
  - Add hospitals and healthcare systems

MIEMSS - Principal Roles



Regional Programs

- MIEMSS supports 5 regional EMS councils
- Addresses inter-jurisdictional and regional issues of importance
- Includes EMS providers, hospitals, 9-1-1 centers and public health agencies




Everybody in
VF survives


It takes a
SYSTEM
to save a victim

Low Hanging Fruit

Dispatcher-assisted CPR*

High-performance CPR*

Rapid dispatch

A vision of the future

75% bystander CPR

AED applied < 4 min. 50% of the time

60% survival from VF for all communities