

"Evidence-Based Care after Cardiac Arrest: Improving Outcomes!"

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DEPARTMENT OF
Emergency Medicine



UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE



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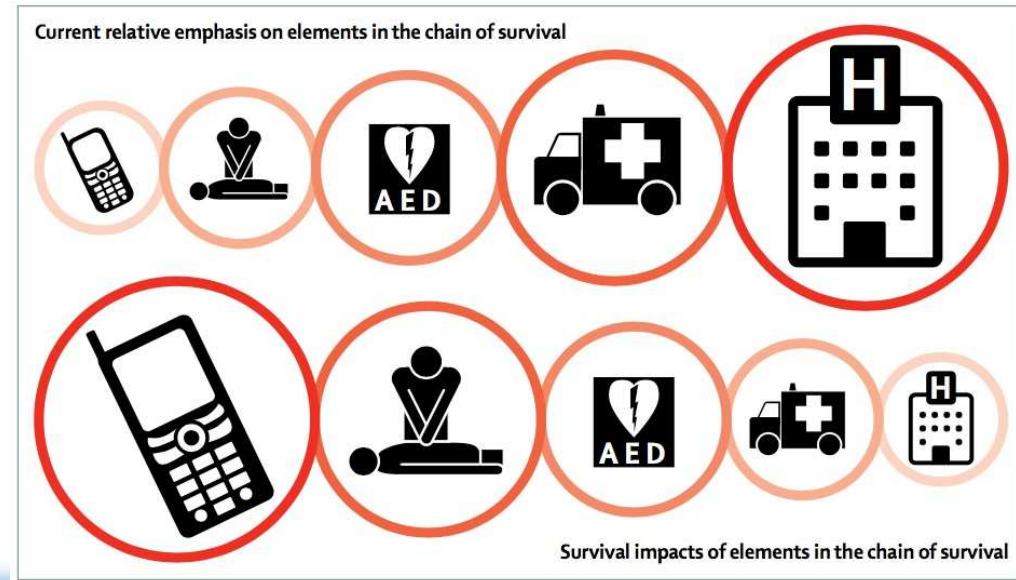
Systems of Care



A comprehensive, structured, multidisciplinary system of care should be implemented in a consistent manner for the treatment of post-cardiac arrest patients (Class I, LOE B).

Ong Lancet 2018

AHA Guidelines 2010



Learning objectives

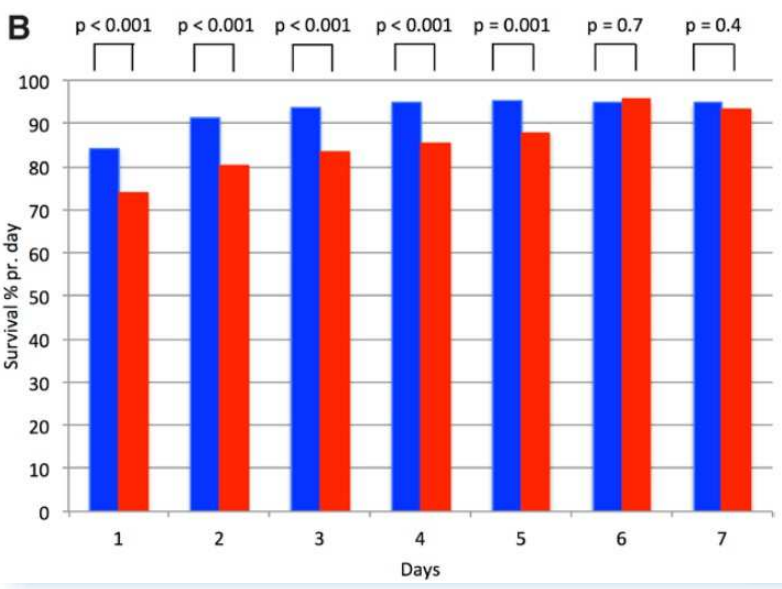
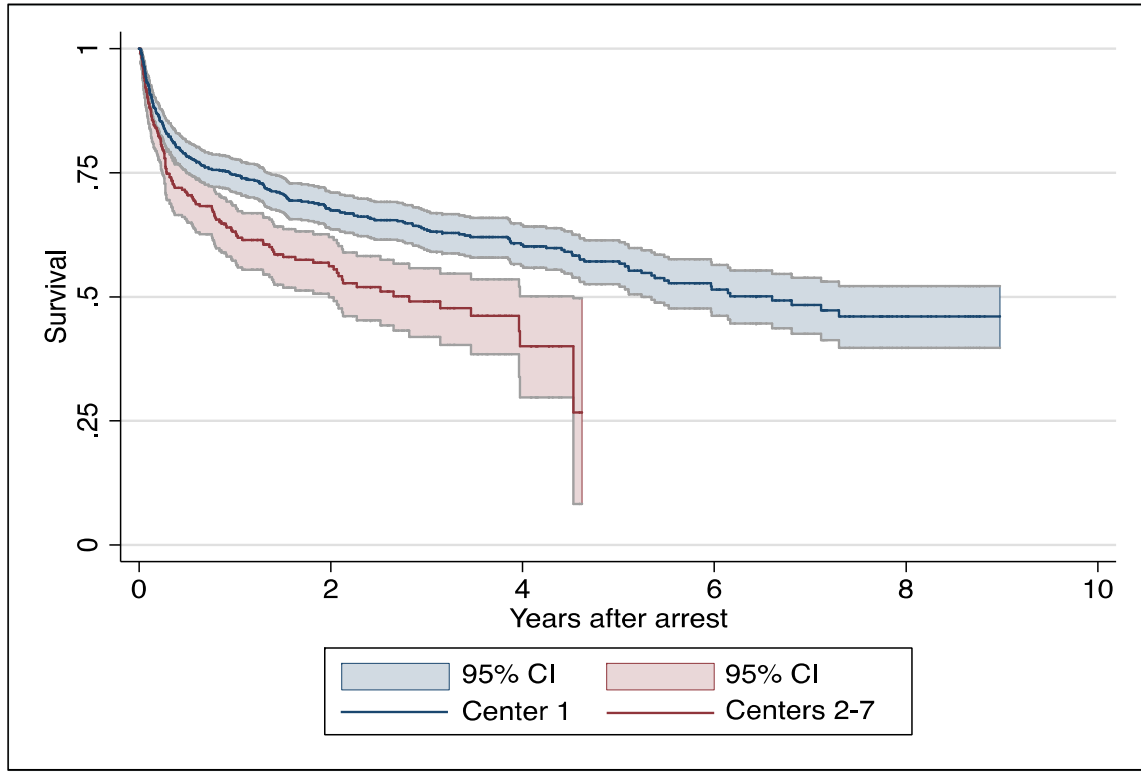
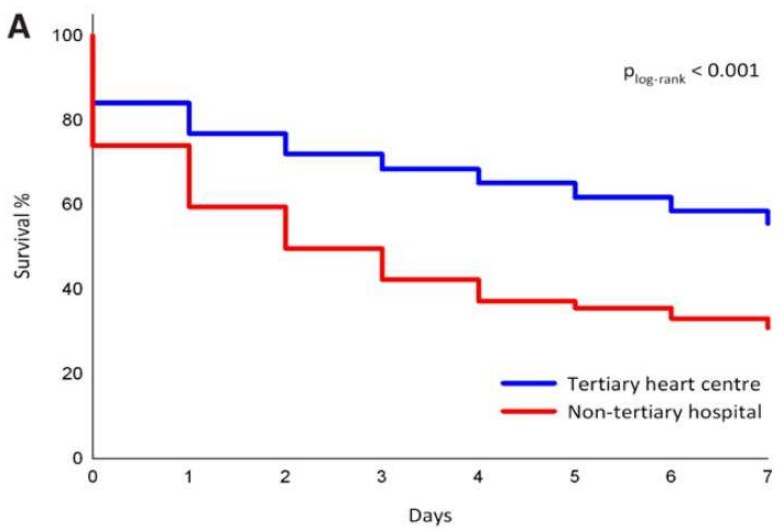
Review survival rates/outcomes after cardiac arrest

Discuss patient variables after cardiac arrest that affect outcomes

Describe systems changes that can help improve post arrest patients' outcomes



Some centers affect early survival



Søholm CCQO 2015

Elmer UNPUBLISHED



Western PA data

Table 3. Multivariable survival models for both overall and limited to nontransferred patients transported directly from the out-of-hospital cardiac arrest scene to the treating hospital.

Characteristic	Overall Cohort (n=5,217), Adjusted HR (95% CI)	Nontransfers Only (n=4,827), Adjusted HR (95% CI)
Transferred to CARC	0.31 (0.20-0.48)	—*
Final treating hospital CARC	0.84 (0.74-0.94)	0.84 (0.75-0.94)

Elmer AnnalsEM 2018

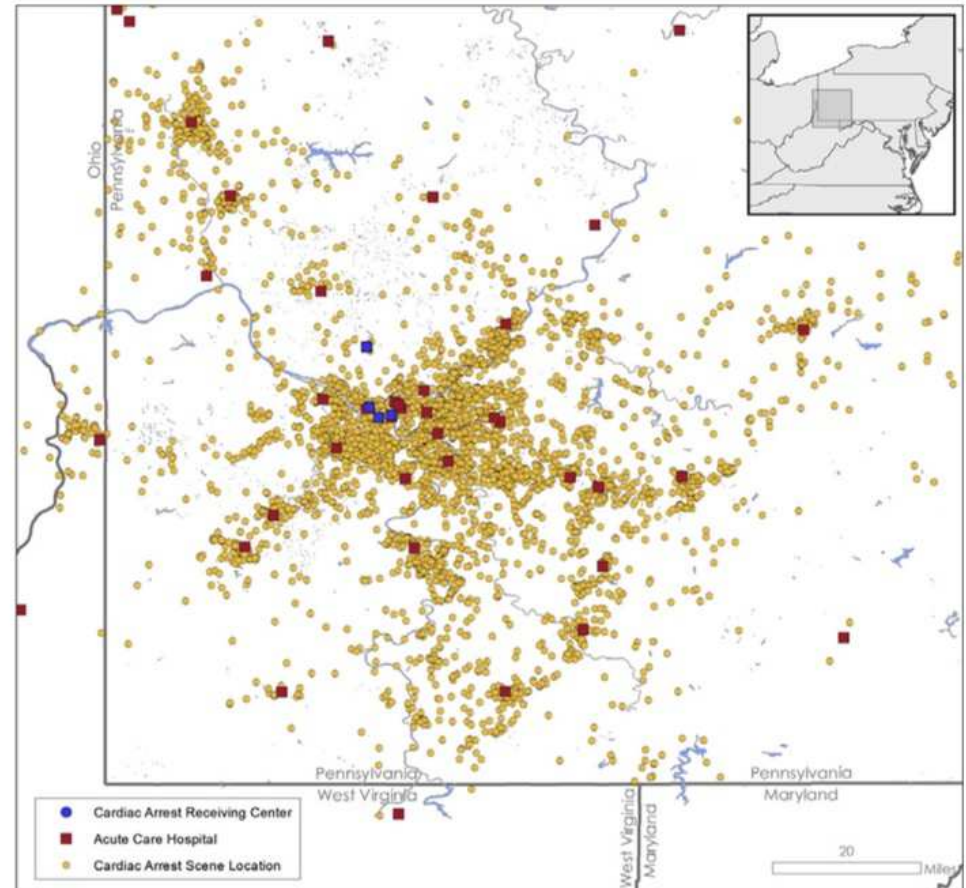


Figure 1. Cardiac arrest scene locations and included acute care hospitals in southwestern Pennsylvania and surrounding Ohio, West Virginia, and Maryland.

What do better performing centers do?

Identify patient variations

Fix what can be fixed

Neuroresuscitation

Delay neuroprognostication

Post ICU care

Measure care and track outcomes

A LOT!

**MUCH IS NOT
EASY**



3 systems changes

Identify patient variations

Delay neuroprognostication

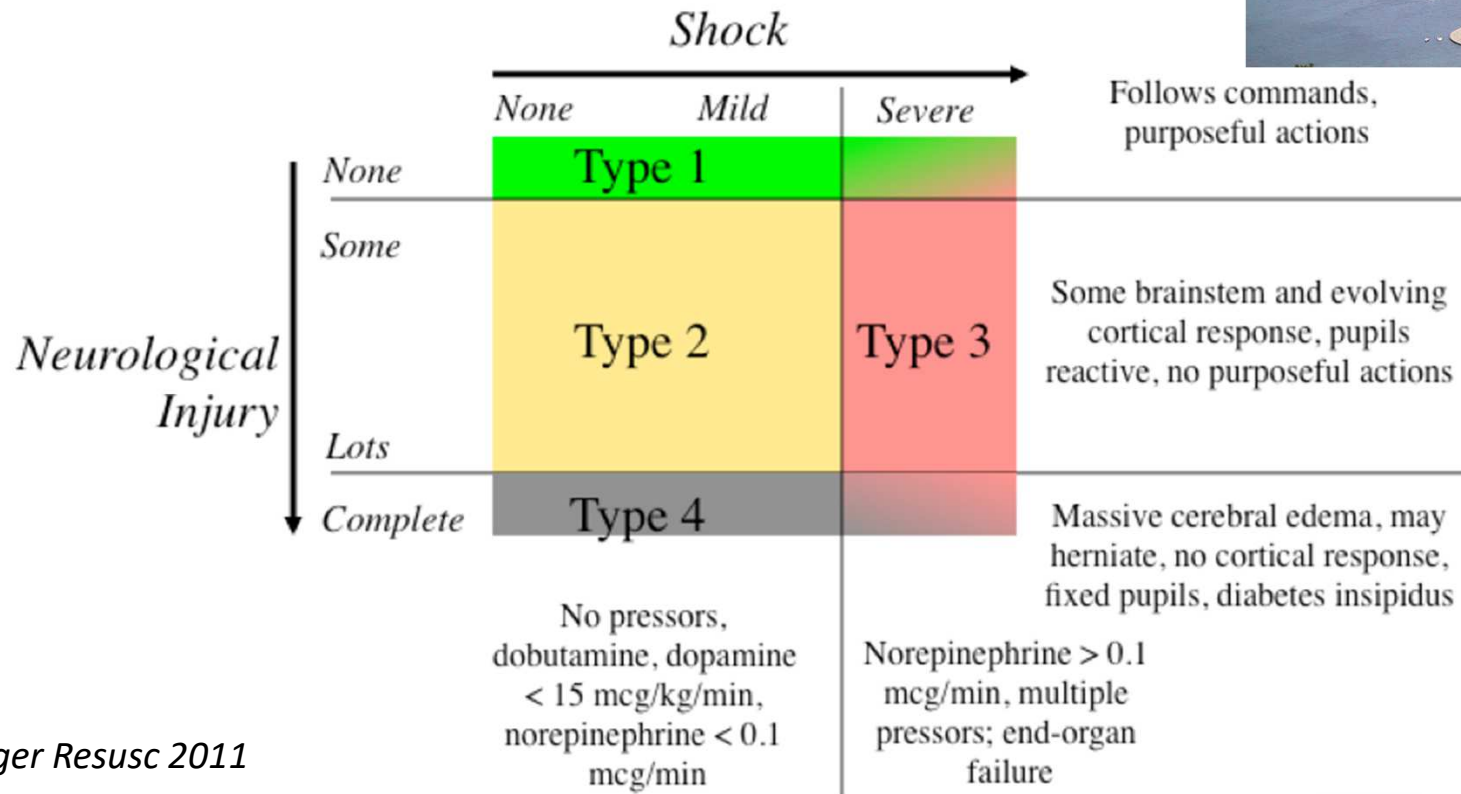
Measure care and track outcomes



Step 1 – identify patient variations



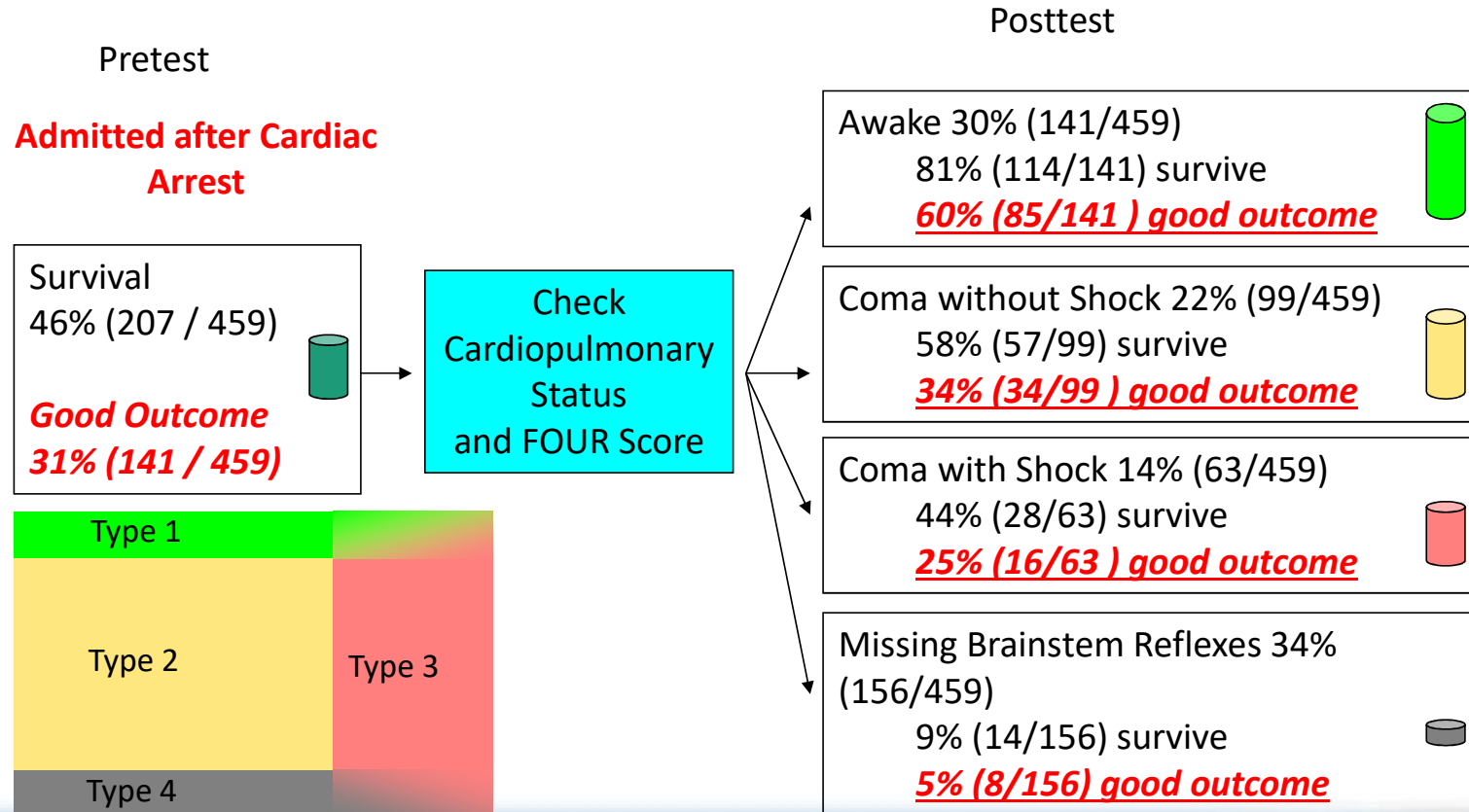
Initial severity of patients vary



Rittenberger Resusc 2011



Initial illness severity and outcome



How does this help?

Some patients we play to win

Young

Healthy

PCAC I-III

Some patients will NOT have good outcome

Older

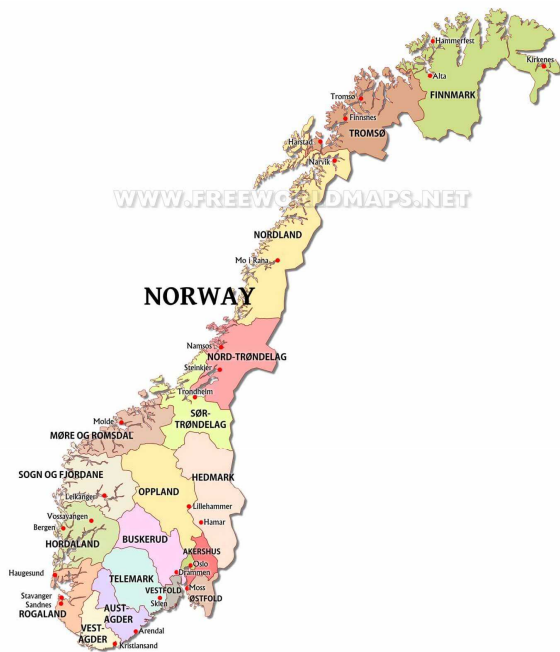
Co-morbid

PCAC IV

Cerebral edema / myoclonic status early

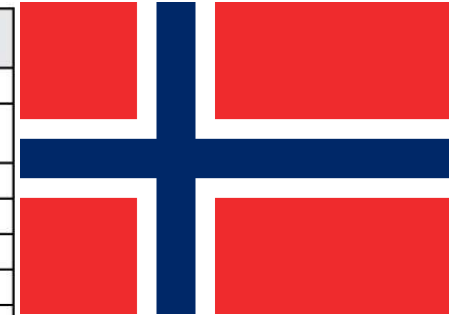


Etiologies of CA patients vary



Nolan Semin Neurol 2017

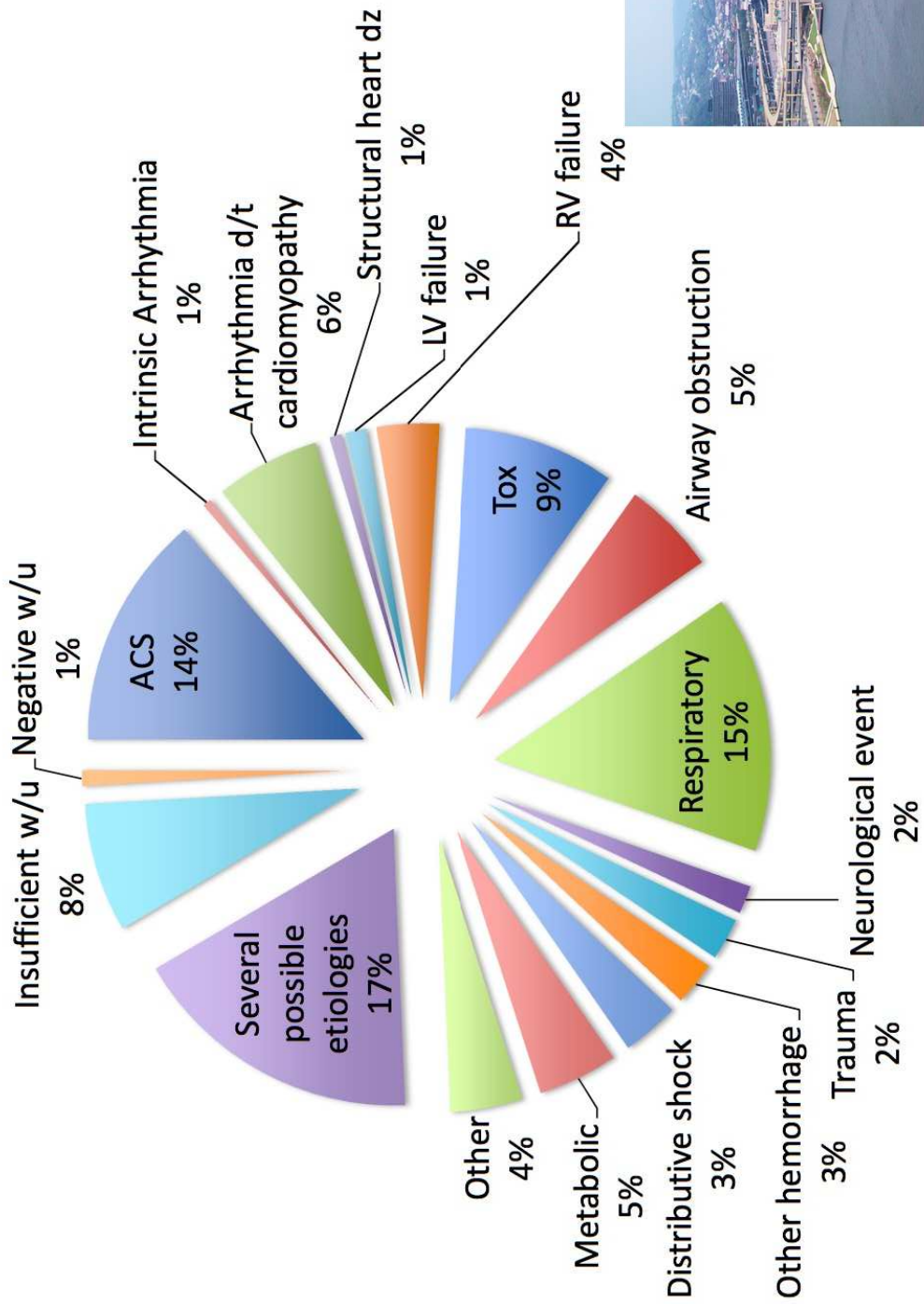
Variable	Number of patients	%
Cause determined reliably	258	85
Recognized correctly by emergency team during ALS	198	66
Cardiac	156	60
Myocardial infarction	100	39
Heart failure	21	8
Arrhythmia	16	6
Myocardial ischemia	15	6
Cardiac tamponade	11	4
Aortic stenosis	5	2
Ventricle wall rupture	8	3
4 Hs and 4 Ts	108	42
Hypoxia	51	20



Cardiac	156	60
Myocardial infarction	100	39

Tamponade cardiac	16	6
Tension pneumothorax	1	0.4
Toxins	2	1
Other	40	16
Sepsis	13	5
Cerebral bleeding/infarction	6	2
Aortic dissection	6	2
Aortic aneurysm with rupture	4	2
Cerebral seizure	4	2
Esophageal variceal bleeding	1	0.4
Other causes	8	3
Unknown	44	15





How does this help?

Mobilize resources

Cath lab

CCM

Trauma services

GI team

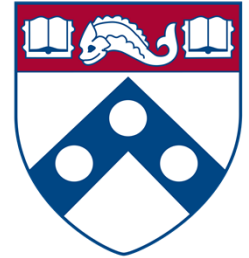
Pulmonary / vascular teams



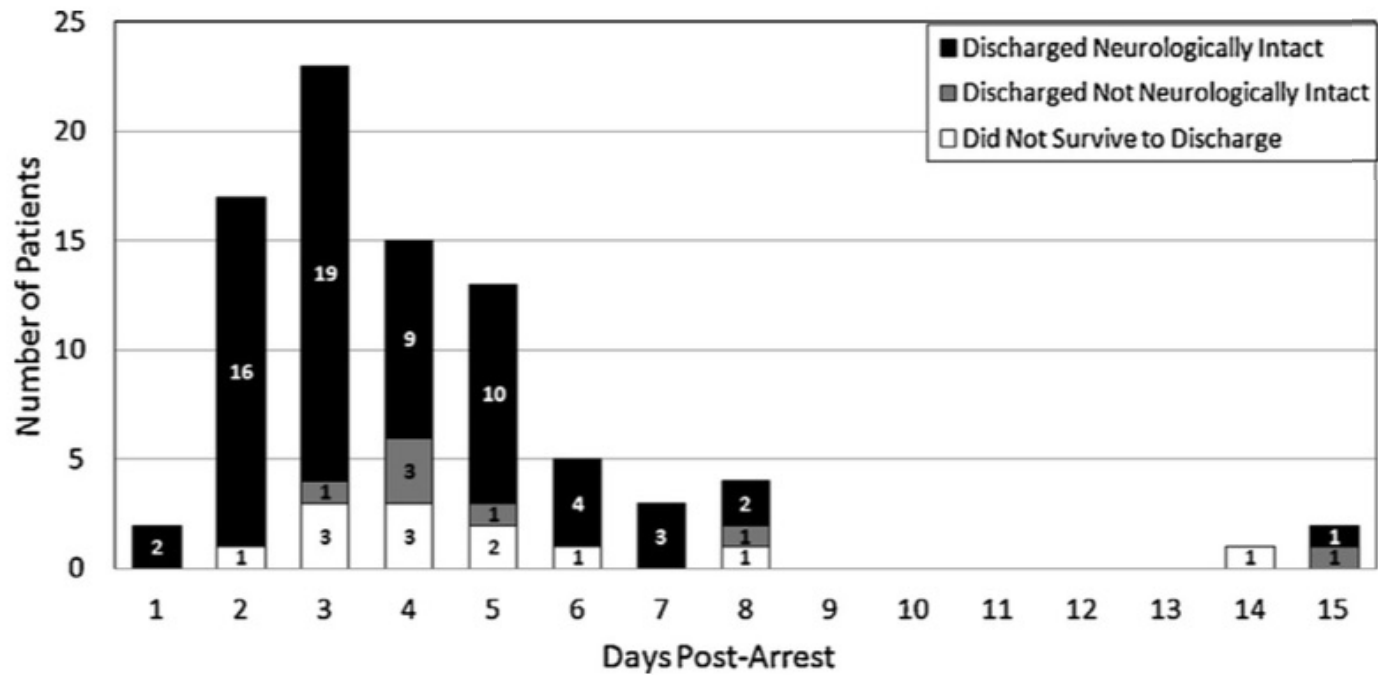
Step 2 – delay neuroprognostication



Patients awoken late



Perelman
School of Medicine
UNIVERSITY of PENNSYLVANIA



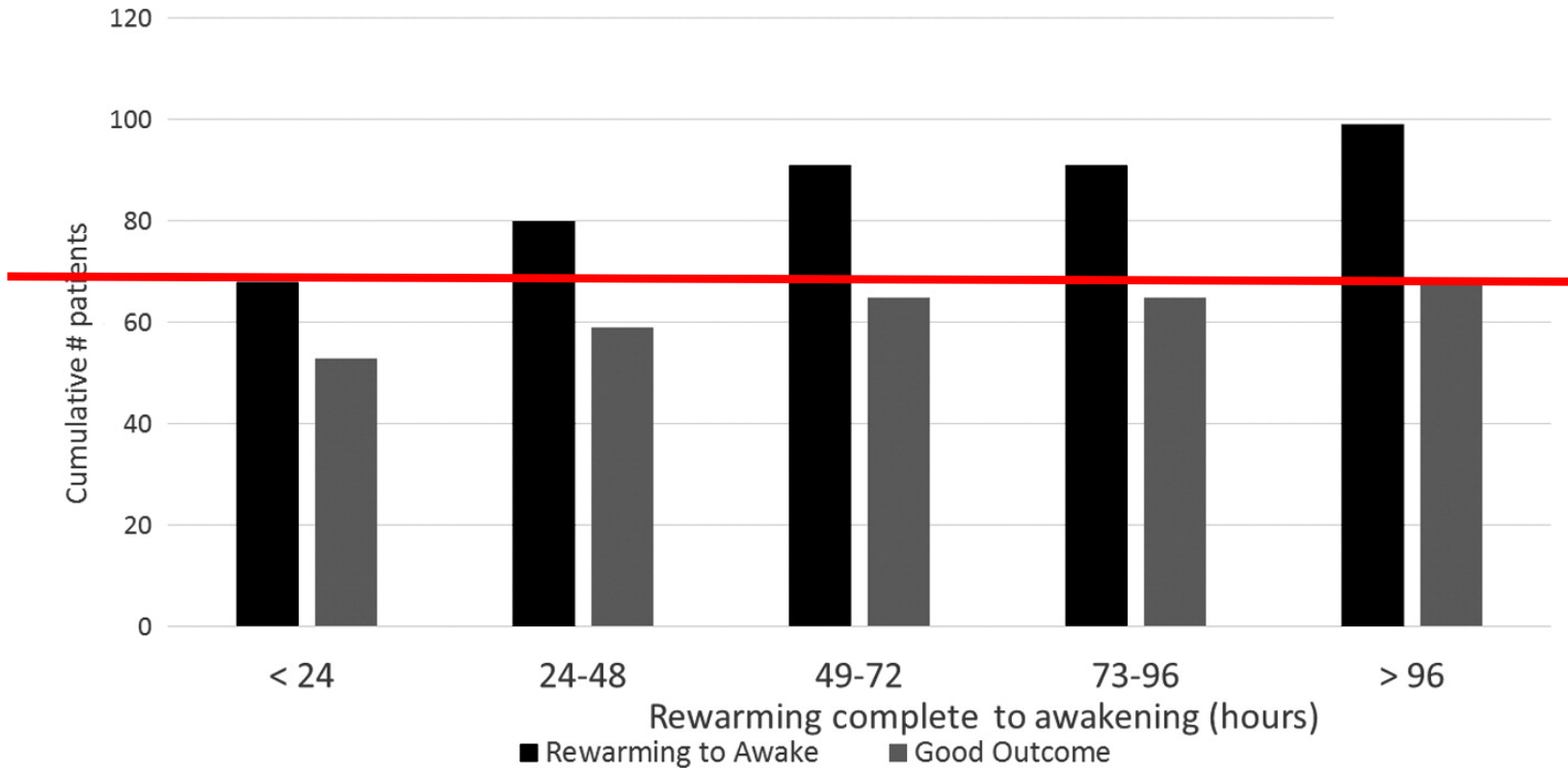
Grossestreuer Resusc 2013

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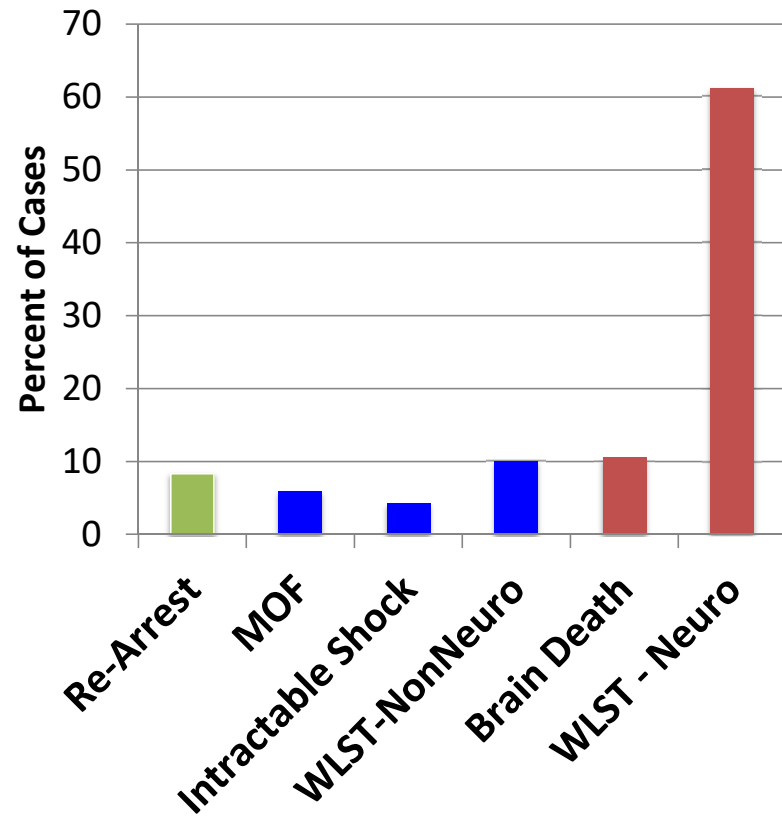
Zanyk-McLean Ther Hypothermia Temp Manage 2007



Most patients die b/c of withdrawal of care

2,137 non-survivors after OHCA

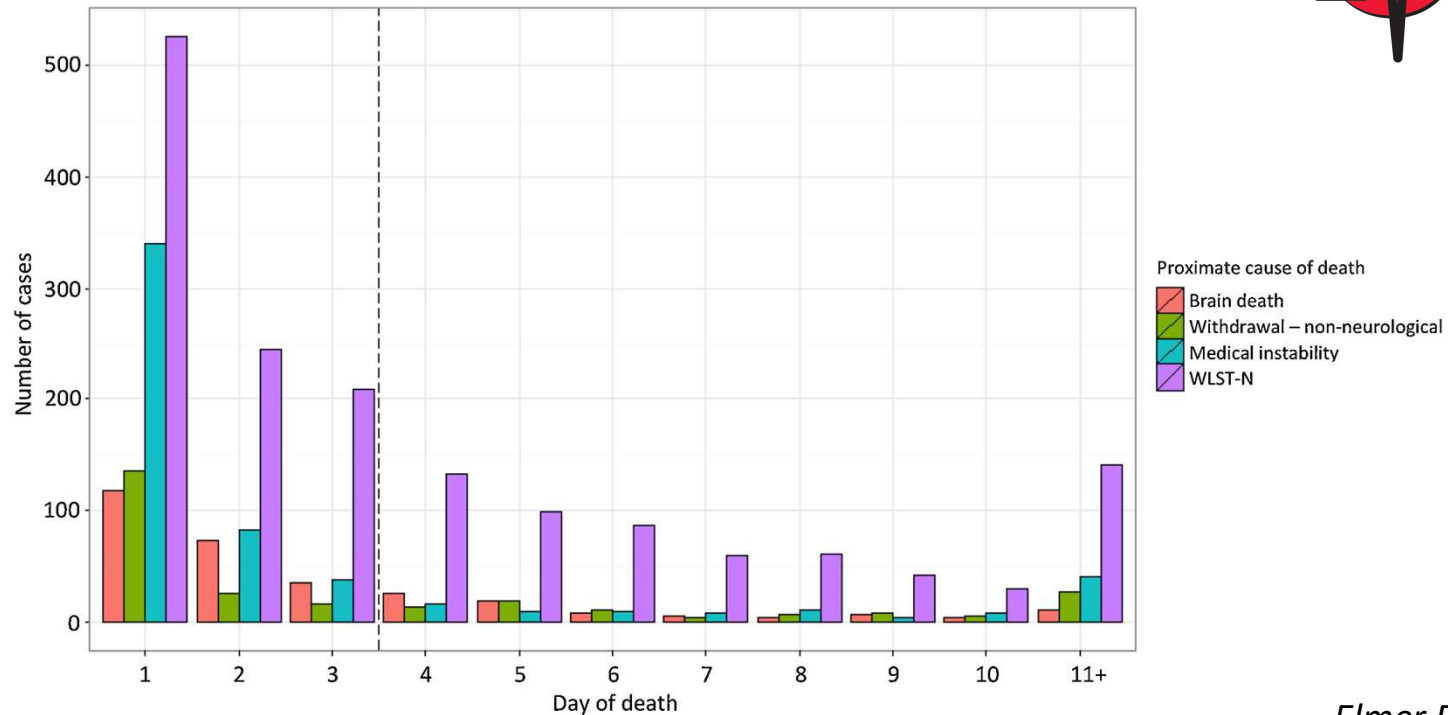
Largest cause of in-hospital death was WLST for “neurological” reasons (61.2%)



Callaway Resusc 2014



Most neurologic withdrawal is early



Elmer Resusc 2016





Impact of delaying withdrawal

Increase survival by 5.5%

Increase # of survivors nationally by 2300

You only get one chance to do this!

Elmer Resusc 2016



Step 3 – measure care and track outcomes



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How does this help?

Hawthorne effect

Benchmarking

Goal setting

Accountability



Caveat – good reporting

Focusing on low hanging fruit – but not clinically important

Rewarding overtesting/overmedication

Surrogate (performance) markers not patient centered outcomes

Does not account for staff time / opportunity cost

Does not look for benefit AND harm

Lack of transparency

Saver PLOS Med 2015



Good quality metrics

Table 2. Comparison of typical performance measures and author recommendations.

Current Approaches	Recommended Approaches
Binary (cut-point) thresholds of risk	Continuous measures of risk
Surrogate outcomes	Patient-centered outcomes
No accounting of staff effort required to impact performance measure	Accounting of staff effort
Lack of emphasis on shared decision-making and eliciting patient preferences	Individualization and shared decision-making as a default expectation
No articulation of NNT, NNH, NNS	Transparency and referencing of NNT, NNH, NNS
Measures focused on individual risk factors	Aggregate risk measures
Isolated morbidities	Recognition that multimorbidity may modify or invalidate some measures in individuals
No accounting for social determinants of health	Inclusion of social determinants of health
Multiple metric sources with varying biases and transparency	Single, independent, transparent, unbiased source

* NNT: number needed to treat; NNH: number needed to harm; NNS: number needed to screen

doi:10.1371/journal.pmed.1001902.t002

Saver PLOS Med 2015



Maintain survival rate of cardiac events above 50 percent

Maintain highest-in-the-nation level of cardiac event survival [Explore the data](#)

56 percent surviving
Final Result from Jun 2017

50 percent surviving
Dec 2017 Target

Achieved Goal
Goal Period ended December 2017



Why is this goal important?

Seattle is one of the best places to survive a heart attack. Due to the internationally renowned Medic One Program, cardiac patient survival rates are the gold standard for emergency medical care in the United States. The resuscitation rate for witnessed, shockable sudden cardiac arrest in Seattle and King County is 62 percent—more than twice that of most cities.

Through extensive medical studies, we learned that the quality of care Firefighter/EMTs and Firefighter/Paramedics are able to provide in the first six minutes of a cardiac event can mean the difference between life and death.



Summary

Step 1 – identify patient variations

Step 4 – delay withdrawal of care

Step 5 – track outcomes

Things your center can do

Assess individual patients
Tailor treatments

Delay neuroprognostication > 72 post
TTM

Join a registry
Report IMPORTANT outcomes



Recap

We can increase survival after cardiac arrest

Etiologies of arrest differ – and so do treatments

Patients wake up later than you think - and wake up well!

If you can't measure it, it didn't happen BUT measure good things





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