Evidence-Based Performance Measures: Beyond Defibrillation and Speed

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“Nothing succeeds like the Appearance of success”

-- Christopher Lasch

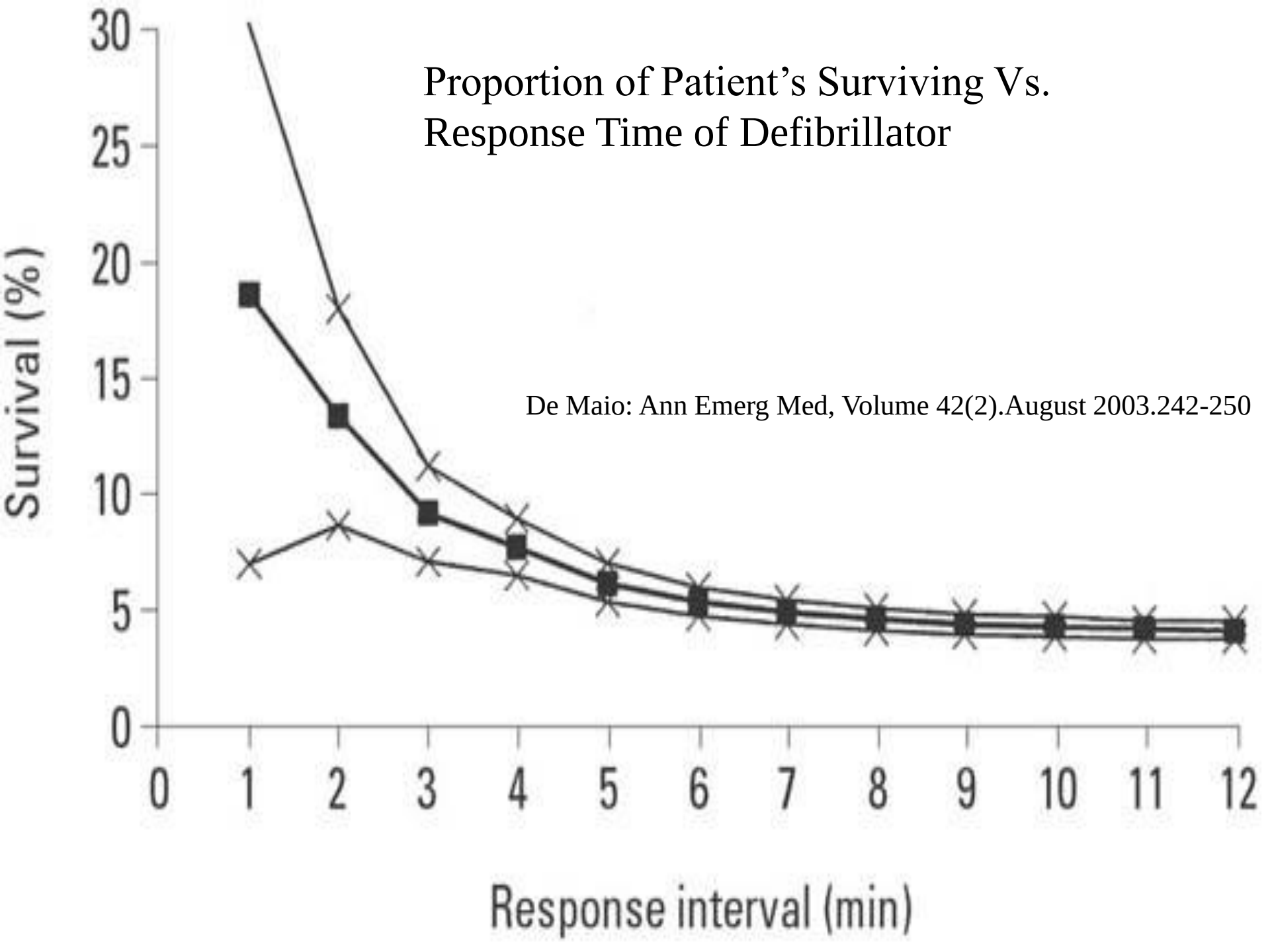
Traditional Performance Measures

- Response time intervals
- Cardiac arrest resuscitation rates
- Perhaps patient safety issues
  - Intubation/airway complications
  - Vehicle crashes

Response Time Intervals

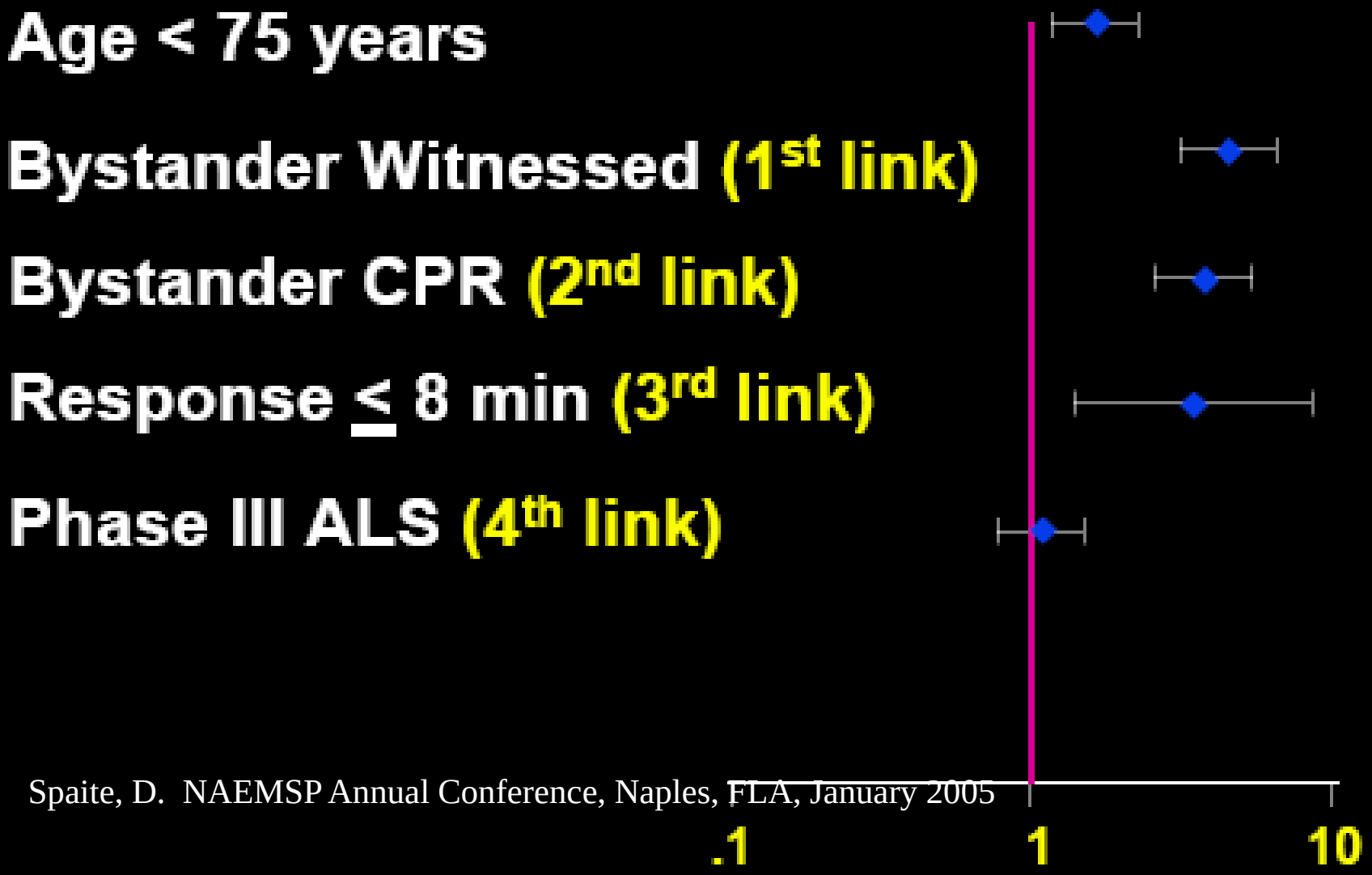
- Very little (if any) evidence suggests improved patient outcomes with rapid ALS response
- Strong evidence suggests improved outcomes for cardiac arrest with defibrillator response <5 minutes
- Improving ALS response time intervals may have undesirable consequences

Proportion of Patient's Surviving Vs. Response Time of Defibrillator



De Maio: Ann Emerg Med, Volume 42(2).August 2003.242-250

Adjusted Odds Ratios for Survival to Hospital Discharge



Spaite, D. NAEMSP Annual Conference, Naples, FLA, January 2005

Cardiac Arrest Survival

- ~1 % of patient volume
- Survival requires coordination with receiving hospitals
- Important but not sufficient measure of performance

So What Have We Done?

- Reviewed the evidence regarding EMS interventions for a larger group of patients
- Utilized the Number Needed to Treat (NNT) concept to estimate the magnitude of this benefit
- Wrote a manuscript

Types of Patients

- ST Segment Elevation MI
- Pulmonary Edema
- Asthma
- Seizure
- Trauma
- Cardiac Arrest

Number Needed To Treat

- Does not require graduation from MIT (Texas A and M will work just fine)
- Gives a magnitude of the benefit of a particular treatment
- Formula = 1/Absolute reduction in risk

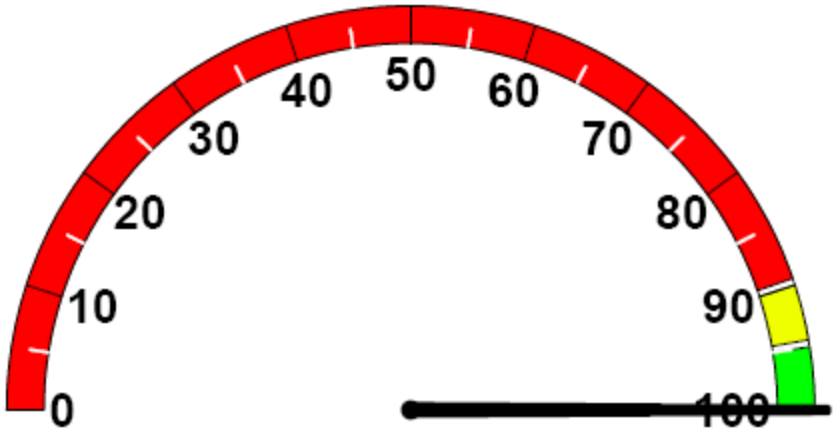
STEMI

- Elements of treatment bundle:
  - ASA
  - 12 lead with pre-arrival activation of the interventional cardiology team
  - Direct EMS transport to PCI for EKG-to-PCI interval <90 minutes
- NNT to avoid death, 2nd MI, or stroke:
  - 15

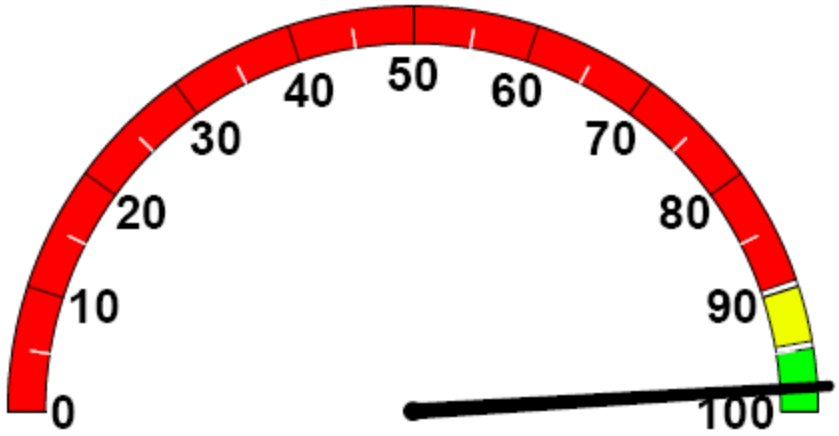
If all patients received the full treatment bundle, there was the potential to avoid 2nd MI stroke, or death for: 14.0 patients

This benefit was realized by: 10.0 patients

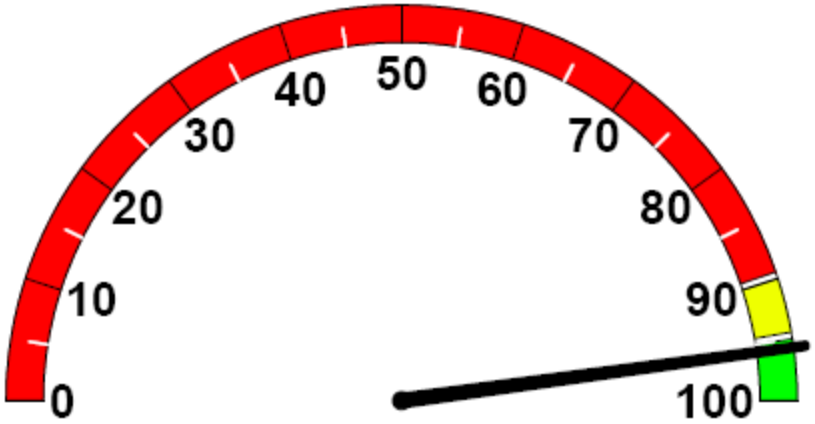
Scene Time <15 Minutes or Justified



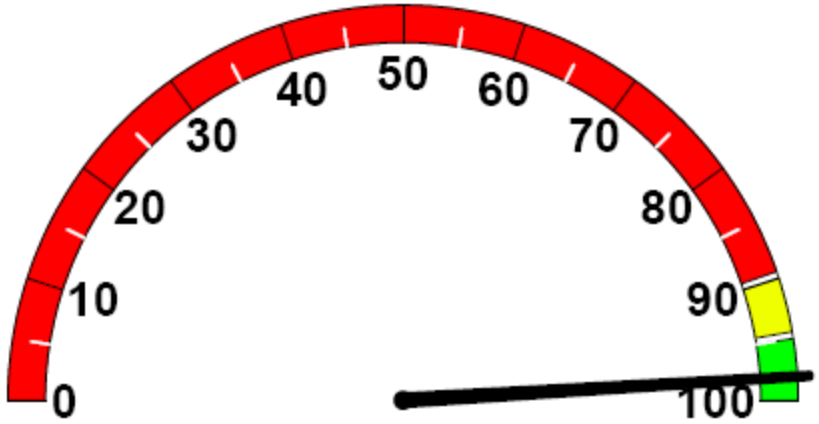
Prehospital 12-Lead Acquisition



ASA Administration Since Pain Began or Documented Contraindication

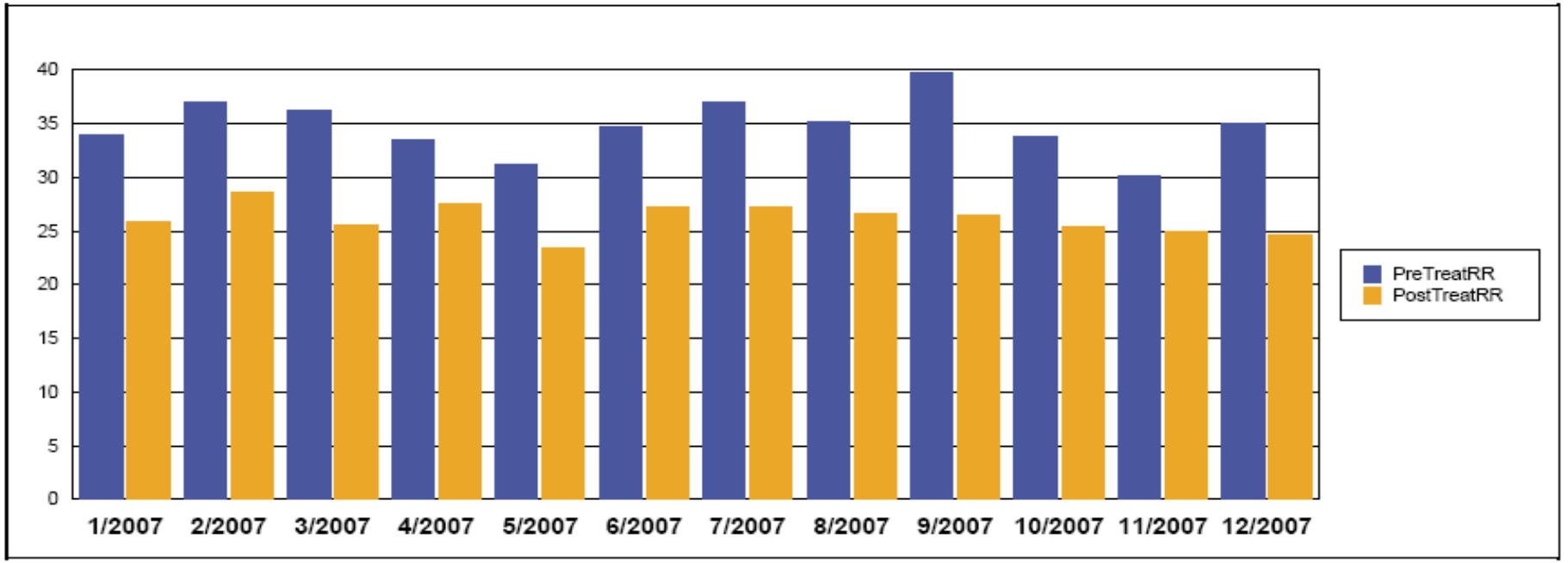


Primary PCI Center Selected for Hospital Destination



Pulmonary Edema

- Elements of treatment bundle:
  - Nitroglycerin in the absence of contraindications
  - Non-invasive positive pressure ventilation (NIPPV)
- NNT with NIPPV to avoid intubation:
  - 6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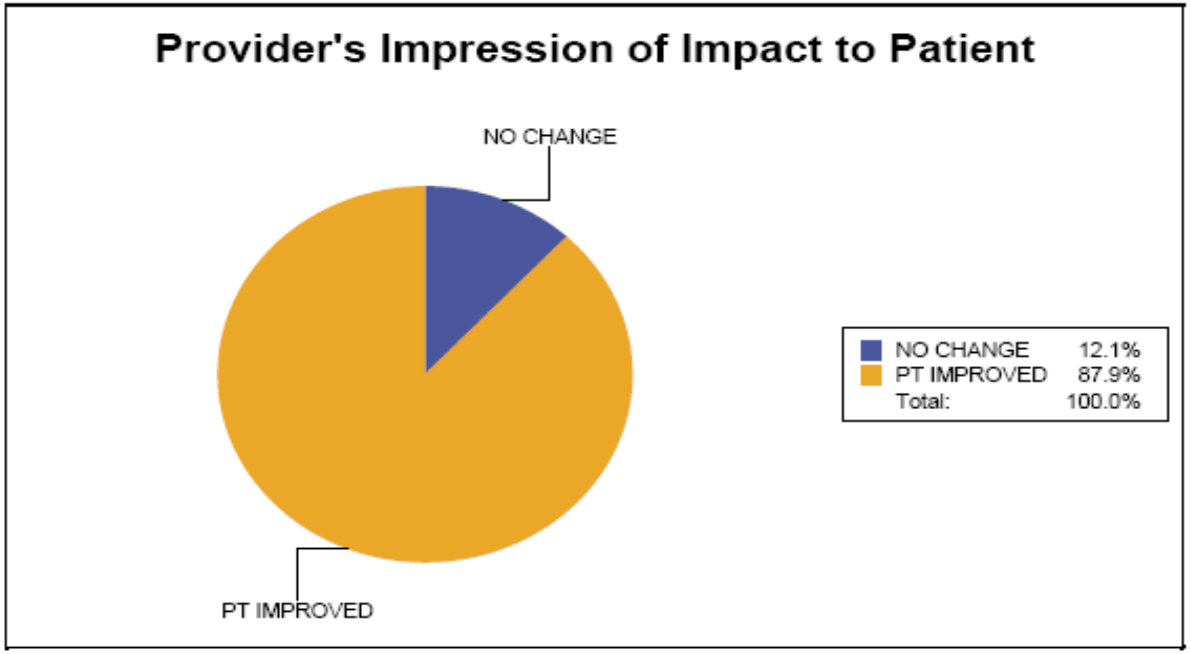

Provider's Impression of Impact to Patient
NO CHANGE
PT IMPROVED
NO CHANGE 12.1%
PT IMPROVED 87.9%
Total: 100.0%

Seizure

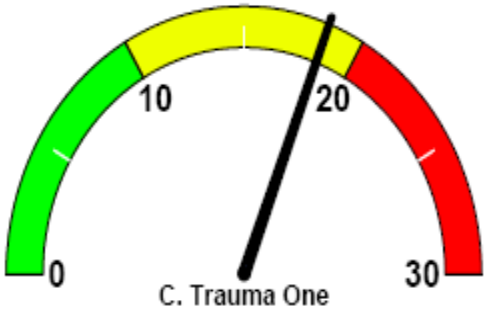
- Elements of treatment of bundle:
  - Blood glucose measurement
  - Provision of benzodiazepine for status epilepticus
- NNT with benzodiazepines to terminate seizure that would have otherwise continued
  - 4

Trauma

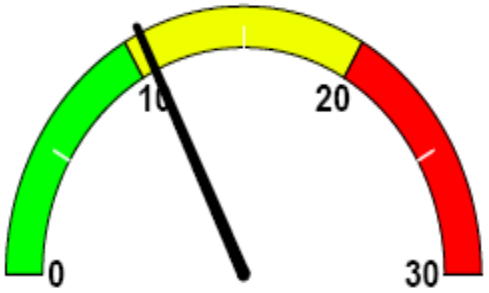
- Elements of treatment bundle:
  - Limit scene time to 10 minutes
  - Direct transport to trauma center for those meeting ACS trauma criteria
  - Appropriate air medical policy
- NNT with ISS > 15 to avoid death
  - 11
- NNT over 65 with ISS >21 to avoid death
  - 3

C. Trauma One		Scene Alert	Scene Time	911 to ED Time	
N =	256	N= 243	11	29	Average
		%= 95	19	44	90th Percentile

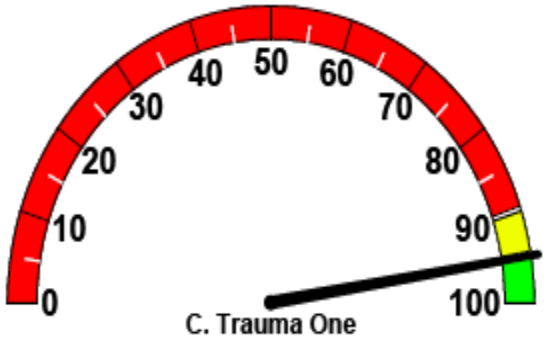
90th Percentile Scene Time in Minutes



Average Scene Time in Minutes



Scene Alert Given



Cardiac Arrest

- Element of treatment bundle
  - Response time interval for defibrillator equipped resource < 5 minutes
- NNT for patients in VF/pulseless VT if defibrillator arrives in <5 minutes rather than <8 minutes to avoid death:
  - 8

Asthma

- Element of treatment bundle:
  - Administration of beta-agonist
- Evidence demonstrates this medication can be safely administered by BLS personnel

Summary

- Response time intervals and cardiac arrest survival remain important measures of EMS System performance

- We now have evidence to measure performance for a broader array of clinical encounters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