

OUTCOMES AFTER CARDIAC ARREST

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Learning Objectives

- ▣ Compare the outcomes of inpatient versus outpatient cardiac arrest patients
- ▣ Describe the long term consequences experienced by survivors of cardiac arrest

Outline

- ▣ How data is collected
 - Utstein definitions
 - National registries
- ▣ Outcome according to etiology
- ▣ Out-of-hospital vs in-hospital arrests
- ▣ Predictors of neurologically-intact survival
- ▣ Long-term outcomes
- ▣ Other post-resuscitation measures
- ▣ Summary

Utstein Definitions

- ▣ Nomenclature of cardiac arrest patients represented a problem in semantics
- ▣ Consensus definitions were created
 - 29 core data elements were identified and clearly defined
- ▣ Hospitals began using templates for standardized data collection

Circulation. 2004;110:3385-3397

Out of Hospital Arrests

- ▣ Affect ~ 450,000 Americans annually
- ▣ 80% occur at home
- ▣ Overall 10 % survival rate
 - More than 50% have permanent neurological disability

Out of Hospital Survival

- ▣ No significant difference in survival over time
 - 1977-1981 survival to hospital discharge 17.5%
 - 1998-2001 survival to hospital discharge 15.7%
- ▣ Long-term neurological outcomes are improving among patients who survive until discharge
 - Baseline improved from 1.6-2.8% of all patients with COH arrest and "favorable neurological status"
 - From 2.1-4.3% for bystander witnessed arrest
 - From 9.8-20.6% for witnessed arrest with initial VF

Explanations

- ▣ Some aspects have improved
 - Bystander CPR
 - Decreased time to defibrillation
- ▣ Other features are more challenging
 - Increasing age
 - Decreased proportion of VF as initial rhythm
 - Response times slower
 - ? Population growth/urbanization

Outcomes According to Rhythm

OUT OF HOSPITAL

IN HOSPITAL (N > 50,000)

Etiology	% surviving to admission	% surviving to discharge	Etiology	% surviving to discharge
Asystole	10	0-2	Asystole	11
PEA	23	11	PEA	12
VT/VF		25-40	VT/VF	37

Outcomes from Noncardiac Causes

EXAMPLES

OUTCOMES

- ▣ Hemorrhage
- ▣ Intoxication
- ▣ Trauma
- ▣ Pulmonary embolism
- ▣ Near drowning

Survived to admission	40%
Survived to discharge	11%
Neurologically functional	6%

Predictors of Poor Neurological Outcomes

OUT OF HOSPITAL

IN HOSPITAL

- ▣ Later initiation of CPR
 - CPR > 5 minutes
 - ▣ Asystole or PEA
 - ▣ Absence of vital signs
 - ▣ Sepsis
 - ▣ CVA
 - ▣ Cancer
 - ▣ Dementia
 - ▣ Comorbidities
- ▣ Persistent coma after CPR
 - ▣ Renal failure
 - ▣ Hypotension
 - Need for vasopressors
 - ▣ Pneumonia
 - ▣ Mechanical ventilation
 - ▣ Hx of CHF class III or IV
 - ▣ Older age
 - ▣ Duration of CPR
 - ▣ Multiple episodes of CPR

GO-FAR Score

- ▣ Based on massive registry in US hospitals
 - 366 hospitals participating
- ▣ Initially validated with > 50,000 patients with in-hospital arrest (2007-2009)
- ▣ Utilized 13 clinical variables in a scoring system
- ▣ Predicts likelihood of survival with good neurological function following arrest
 - Cerebral Performance Category score (CPC) of 1

JAMA Intern Med. 2013;173(20)

GO-FAR Clinical Variables

- ▣ Neurologically intact -15
- ▣ Major trauma 10
- ▣ Acute stroke 8
- ▣ Metastatic or hematologic cancer 7
- ▣ Sepsicemia 7
- ▣ Medical noncardiac diagnosis 7
- ▣ Hepatic insufficiency 6
- ▣ Admit from SNF 6
- ▣ Hypotension 5
- ▣ Renal insufficiency 4
- ▣ Respiratory insufficiency 4
- ▣ Pneumonia (active) 1
- ▣ Age
 - 70-74 2
 - 75-79 5
 - 80-84 6
 - ≥85 11

GO-FAR Outcomes

Group	Score range	% with CPC of 1
Very low	≥24	0.8
Low	14-23	2
Average	-5 to 13	9.2
Above average	-15 to -6	27.8

Glasgow Outcome Scale

Score	Definition
1	Dead
2	Vegetative state, no interaction with environment
3	Severe disability, cannot live independently
4	Moderate disability, participates in ADLs, but work/social life compromised
5	Good recovery; able to return to work

Learning Assessment Question

- Long term consequences of cardiac arrest include which of the following:
 - A. Decreased quality of life
 - B. Impaired functional status
 - C. Decreased cognitive function
 - D. All of the above

Post Resuscitation Challenges

- Severe, global ischemia/reperfusion injury
 - Oxidative damage
 - Systemic inflammation
 - Myocardial stunning
 - Adrenal suppression
- Dysfunctional cerebral autoregulation

Post Resuscitation BP Management

- Recent publication in CCM found MAP > 70 was associated with good neurological outcome
 - More driven by association between hypotension and poor outcome
 - Higher MAP thresholds not associated with more favorable neurological outcomes

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Avoid Hyperoxia

- Hyperoxia - defined as PaO₂ ≥ 300
- Hyperoxia - post-arrest group had higher in-hospital mortality (63%)
- Normoxia group had 45% mortality
 - Hypoxia mortality 57% (PaO₂ < 60)

Body Temperature

- Increase in body temperature is associated with unfavorable neurological outcome
 - May exacerbate neural injury
 - Basis for therapeutic hypothermia
- Mild to moderate hypothermia (32-34°C)

What Next?

- If patient is comatose > 24 hours after cardiac arrest or hypothermia, the AAN guidelines can be used to assess prognosis:
 - Absence of brainstem reflexes – brain death testing
 - Myoclonic status epilepticus – poor prognosis
 - Serum NSE (neuron-specific enolase) > 33 – poor prognosis
 - Absence of pupil/corneal reflexes or absence of motor response > flexor – poor outcome

Summary

- Outcomes after cardiac arrest depend upon certain timely critical interventions
 - Early defibrillation when appropriate
 - Effective CPR
- Quality improvement efforts should be data driven
 - Large registries, updated guidelines
 - Outcomes remain poor
- Utilize tools to predict “favorable neurological outcomes” to help families make informed decisions