The Congenital Heart Collaborative

University Hospitals
Rainbow Babies & Children's
Nationwide Children's Hospital

Syncope and Sudden Death: How Do We Identify and Prevent It?

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Rainbow Babies & Children's

Nationwide Children's

When your child needs a hospital, everything matters.℠

Definition

Syncope

Transient loss of consciousness

No response to

- Voice
- Pain

Decreased muscle tone

Poor cerebral perfusion

Impact

Frequent occurrence in pediatric patients

True incidence is impossible to obtain

Prior to adulthood 15-25% of pediatric patients experience syncopal episode

Rarely life threatening

Impact

Study by **Gordon et al.**

Medical evaluation of syncope is expensive

Excessive testing performed due to limited understanding of pediatric syncope

- Mean of 6 tests per patient
- 40% of patients hospitalized
- $3000 per patient
- Pathology found in << 10%

Etiology

Cardiovascular

- Arrhythmia
- Structural disease
- Vasovagal

Neurologic

- Migraines
- Seizure disorder
- Stroke
- Vestibular syndrome

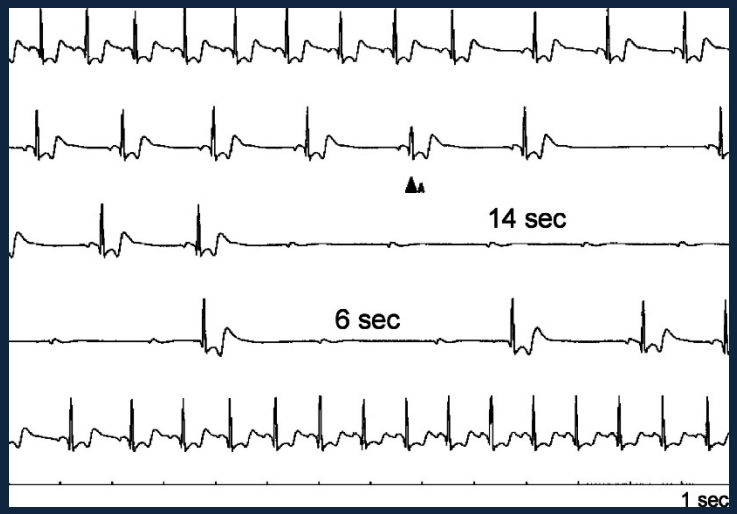
Mechanism

Response to upright posture

- Increased heart rate
- Decrease in systemic vascular resistance

Symptoms

- Abrupt hypotension
- Bradycardia
- Syncope



Syncope Types

Common forms of situational syncope

- Noxious stimuli
- Hyperventilation
- Emotional
- Hair combing
- Micturition
- Shower
- Breath holding
- Stretch
- Cough

Evaluation History

Circumstances prior to event

Prodrome

Loss of consciousness

How long was patient out

Loss of bowel or bladder control

Movements

What did they feel like after?

Evaluation History

Circumstances prior to event

- Were they running?
- At church?
- Hot day?
- Eaten?
- Drank?

Evaluation History

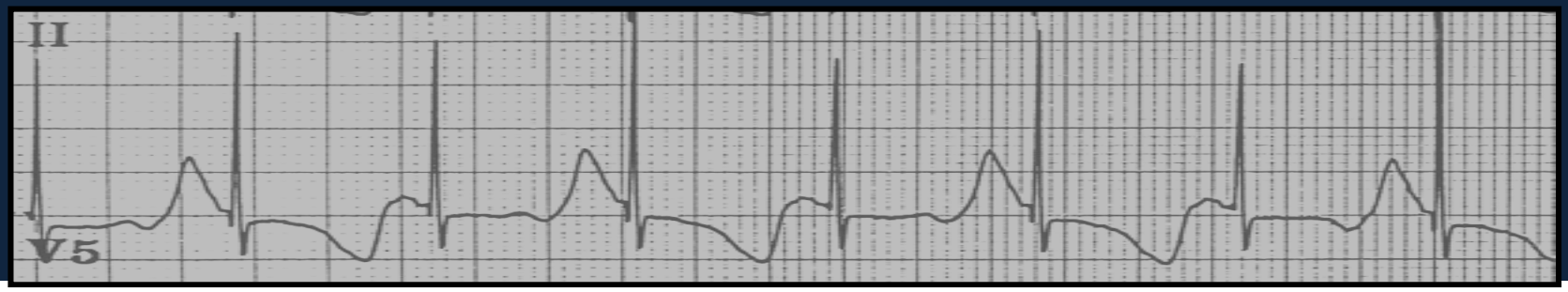
- Family history
  - Syncope
  - Drowning
  - Deafness
  - Seizures
  - Sudden unexplained death

Evaluation (Physical)

- Routine physical examination
  - Vital signs
  - Cardiac examination
  - Skin
  - Neurologic

Evaluation ECG

- Structural cardiac disorders
- Primary electrical disorders
  - Long QT syndrome
  - Brugada's syndrome
  - Wolff-Parkinson-White
  - Complete AV block



Clinical Impact

Given the magnitude of *Sudden Cardiac Death* in Pediatrics, and the fact that there is an identifiable subsets of young patients at risk, it is imperative for clinicians to be aware of these diseases and their features that allow for the early of these patients

PREVENTION

Sudden Cardiac Death

Children & Adolescents

- 5-7,000 annual deaths in USA
- 5% of all deaths in children
- 1-8/100,000 patient years
- Rarely associated with myocardial ischemia
- Participation in sports increases risk irrespective of cardiac diagnosis

@ Driscoll DJ, Edwards WD, J Am Coll Cardiol 1985;5:118b-121b.

Causes

Arrthythmias

- Primary
  - WPW, VT,VF
- Congenital
  - CAVB
- Familial
  - SND, AV block
- Associated with CHD
  - Ebstein's, L-TGA
- Post-operative
  VT, SVT, SAVB, SND
- Pacemaker
  - Non-capture, over-sensing, battery depletion
- Genetic
  - Lngqtc, Brugada, ARVD, CPVT
- Unknown
  - Commotio cordis

Structural

- Hypertrophic cardiomyopathy
- Aortic valve stenosis
- Pulmonic stenosis
- Tetralogy of Fallot
- Dilated cardiomyopathy
- Restrictive cardiomyopathy
- Pulmonary hypertension
- Pericardial effusion
- Constrictive pericarditis
- Atrial myxoma
- Coronary artery anomaly
- Kawasaki
- Pulmonary embolus
- Congenital absence of pericardium
- Mitral valve prolapse
- Marfans

Etiology

Previously unrecognized cardiac disease

•Structural disease

- •Hypertrophic cardiomyopathy*
- •Left ventricular hypertrophy
- •Coronary artery anomalies
- •Right ventricular dysplasia*
- •Marfan syndrome
- •Mitral valve prolapse
- •Absence of pericardium*

•No structural disease

- Long QTc*
- WPW*
- Complete AV block*
- Ventricular tachycardia*
- Ventricular fibrillation*
- Brugada syndrome*
- Pulmonary hypertension*
- Myocarditis*
- Commotio cordis

* May cause sudden death without exertion

Family History

Unexplained sudden death 1^0 family members

Birth history

- Born deaf
- Multiple spontaneous abortions

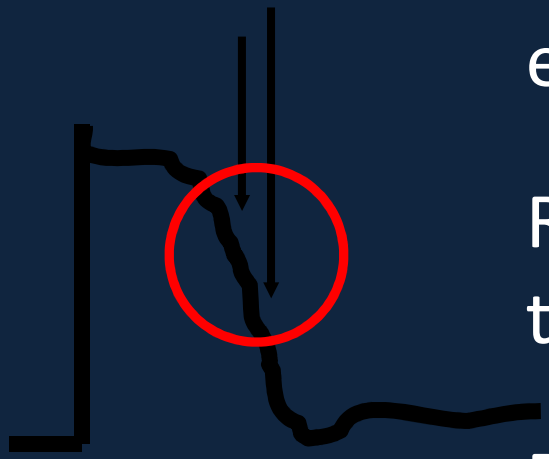
Unexpected episode

- Swimming and drown
- Fall out of tree and died
- Crash car or plane

Anyone in family with defibrillator / pacemaker?

Unrecognized Cardiac Disease

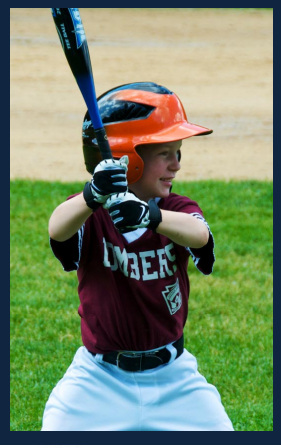
Commotio Cordis



Blunt blow to the chest during electrically vulnerable period

Results in ventricular tachycardia or fibrillation

Baseball and Hockey highest risk sports



Sudden Cardiac Death

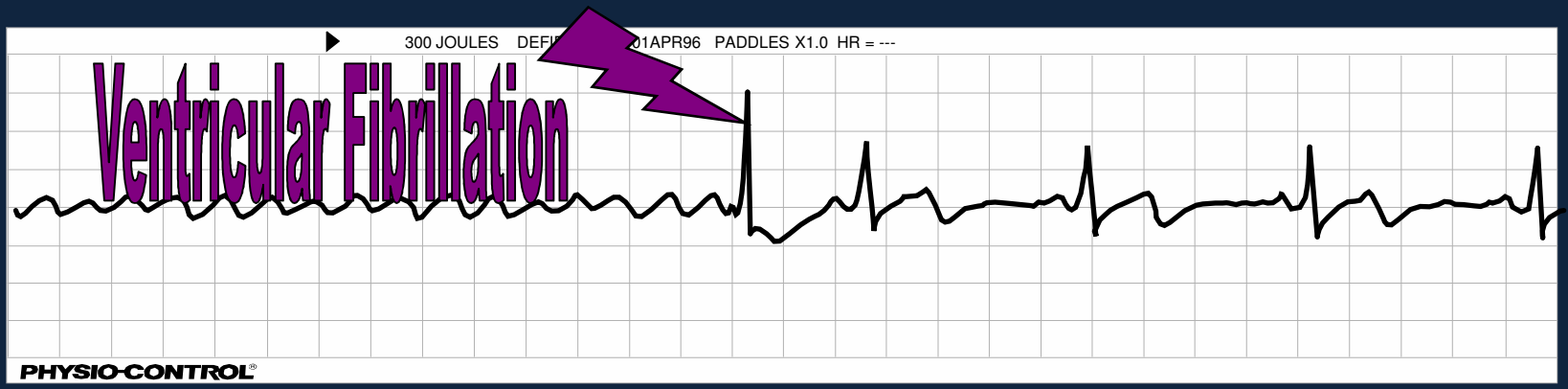
Goals

- Primary prevention
- Early intervention
  - "Return to sinus rhythm"
    - CPR
    - AEDs
- Improved therapy for survivors
  - Anti-arrhythmics
  - ICDs

Sudden Cardiac Death

Future

Impact of


300 JOULES
01APR96 PADDLES X1.0 HR = ---
Ventricular Fibrillation
PHYSIO-CONTROL®

“Chain of Survival”

- Early access
- Early CPR
- Early defibrillation
- Early advanced life support

EARLY DEFIBRILLATION

- Automatically analyzes the patient's heart rhythm
- Determines if shock is necessary
- Uses voice and screen prompts to guide the rescuer

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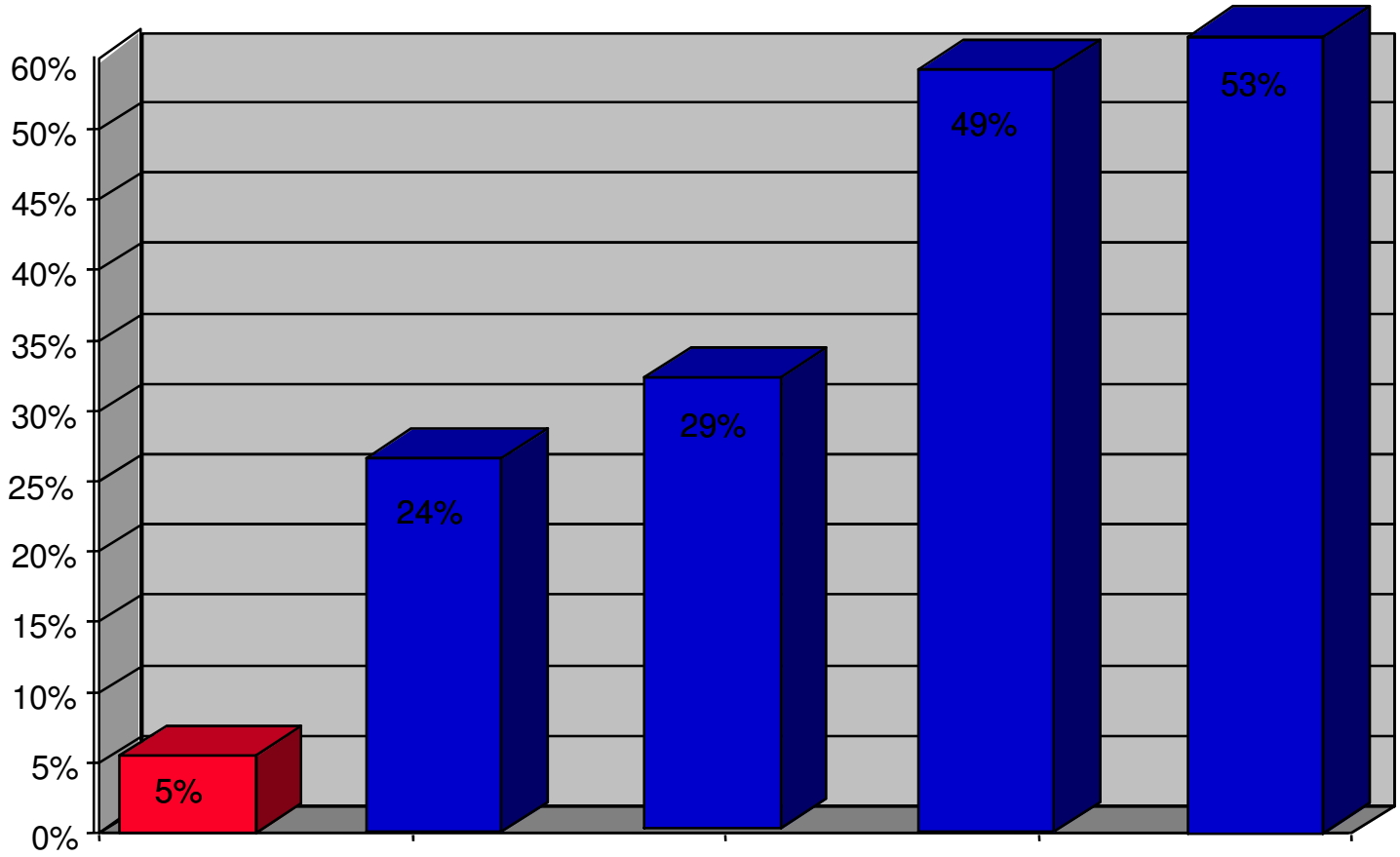
AEDs Improve Survival



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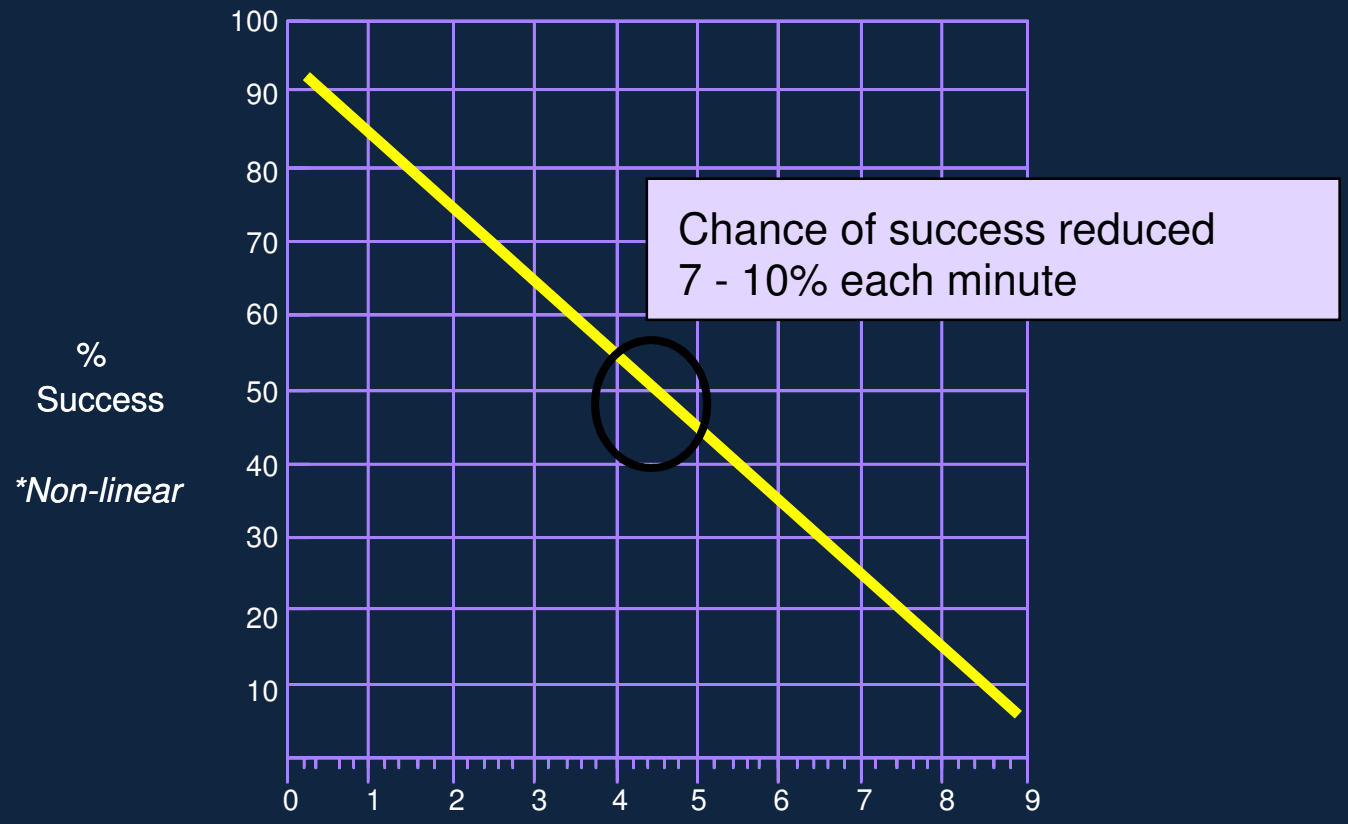
Smith SC. Circ. 97;13:1321-1324.
Cobb LA. Circ. 92;85:I98-102.
Valenzuela TD. N Engl J Med. 2000;343:1206-1209.

Treatment Options for SCA

Defibrillation is only effective treatment for the majority of SCAs

The majority of SCA are caused by either VT, VF or bradycardia

Resuscitation Success vs. Time*



Adapted from text: Cummins RO,
Annals Emerg Med. 1989, 18:1269-1275.

EMS Can’t Always Get There Fast Enough!