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of MEDICINE  
University of Iowa Health Care

## Cardiac Arrest: Life after Death

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Assistant Professor of Medicine  
University of Iowa Carver College of Medicine

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## Outline

- Normal circulatory system
- What is cardiac arrest
- Types of cardiac arrest
- Causes of cardiac arrest
- Why is it important to study cardiac arrest
- Research agenda

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## Normal circulatory system

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- <https://www.youtube.com/watch?v=JA0Wb3gc4mE>

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## What is cardiac arrest

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## Cardiac arrest

Sudden loss of pumping ability of the heart

- No pulse
- No breathing
- No response

Death will occur within in minutes, if untreated

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## Types of cardiac arrest

- Shockable
  - Ventricular fibrillation
  - Ventricular tachycardia
- Non-shockable
  - Asystole
  - Pulseless electrical activity


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## Cardiac Arrest is not a Heart Attack

DO YOU KNOW WHAT TO DO WHEN SOMEONE GOES INTO Sudden Cardiac Arrest???

Do you know what sudden cardiac arrest (SCA) is?

**What it's NOT**


SCA is **NOT** a heart attack — it's worse. A heart attack occurs when blood supply to the heart muscle is blocked, but the heart keeps beating.



**What it IS**

SCA occurs when the heart's **electrical system goes haywire** (ventricular fibrillation) and stops blood flow from the heart.

→ VENTRICULAR FIBRILLATION



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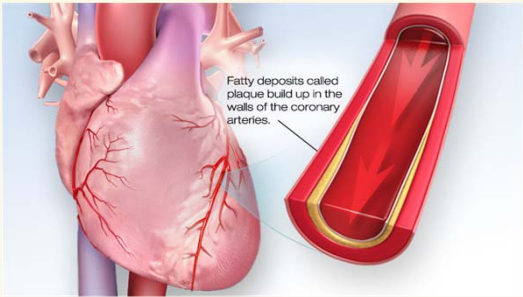
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## Heart attack



Fatty deposits called plaque build up in the walls of the coronary arteries.

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- [https://www.youtube.com/watch?v=zdemKH\\_v\\_al](https://www.youtube.com/watch?v=zdemKH_v_al)

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### Causes of cardiac arrest

- Heart attack
- Weak heart muscle
- Salt imbalance in the blood
- Severe medical illness (e.g., sepsis)
- Side effect of drugs
- Hereditary conditions

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### Treatment

Immediate treatment

- CPR
- Defibrillation (for shockable rhythms)
- Drugs (epinephrine)

Treatment after initial resuscitation

- Hypothermia
- Protocol based care

Time is Brain

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## Cardiac Arrest can occur anywhere

- Out-of-hospital arrest
- In-hospital cardiac arrest

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## Why study cardiac arrest

- Out-of-hospital cardiac arrest affects 420,000 patients every year
  - Survival is ~10%
- In-hospital cardiac arrest affects 200,000 patients every year
  - Survival is ~ 25%

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## Research Focus

- Understand new ways to improve cardiac arrest survival

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**Get With the Guidelines-Resuscitation:**  
In-hospital cardiac arrest registry  
200,000 patients with IHCA in ~ 600 hospitals

**CARES Registry:**  
Out-of-hospital cardiac arrest  
180,000 patients with OHCA in 25 states

**FOCUS ON IMPROVING QUALITY OF CARE**

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**Has in-hospital cardiac arrest survival improved**

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**ORIGINAL ARTICLE**

**Trends in Survival after In-Hospital Cardiac Arrest**

Saket Girotra, M.D., Brahmajee K. Nallamothu, M.D., M.P.H., John A. Spertus, M.D., M.P.H., Yan Li, Ph.D., Harlan M. Krumholz, M.D., and Paul S. Chan, M.D., for the American Heart Association Get with the Guidelines-Resuscitation Investigators

- N=84652 patients at 374 hospitals in the GWTG-Resuscitation
- Examined survival rates over a 10-year period

**Girotra et al NEJM 2012**

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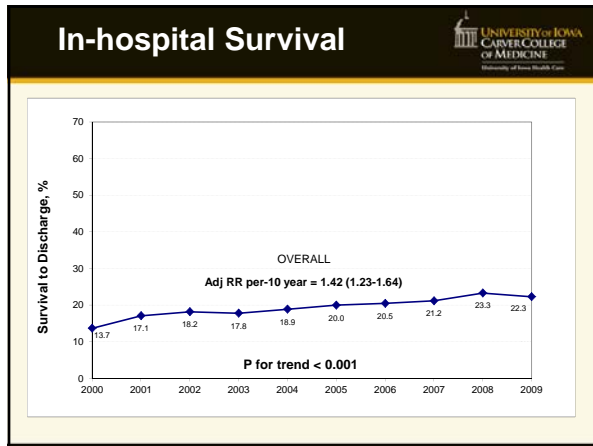
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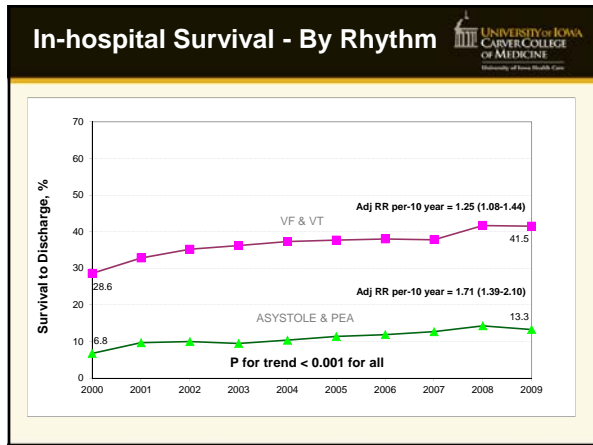
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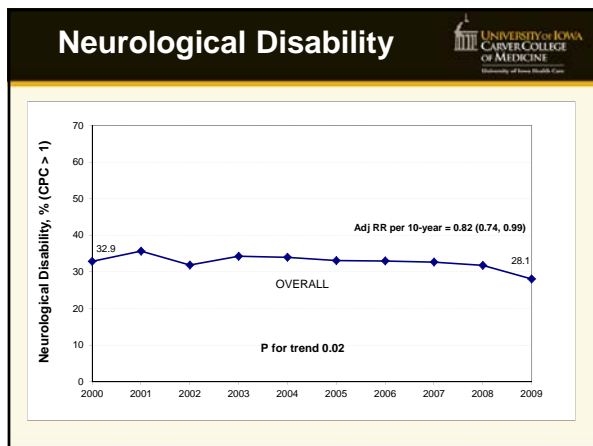
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## IMPLICATIONS



- Assuming a stable incidence 200,000 cardiac arrests / year

	2000	2009	Net Gain
Survival to discharge	27,400	44,600	17,200
No significant neurological disability	18,385	32,067	13,682

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## What is Driving the Improvement in Survival?




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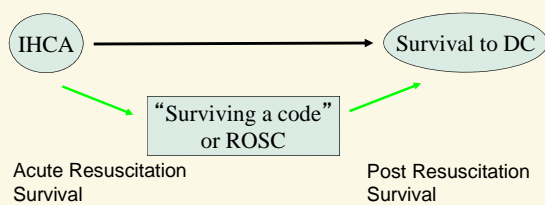
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## Conceptual Model




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Has improvement in survival been uniform, or have some hospitals improved more than others

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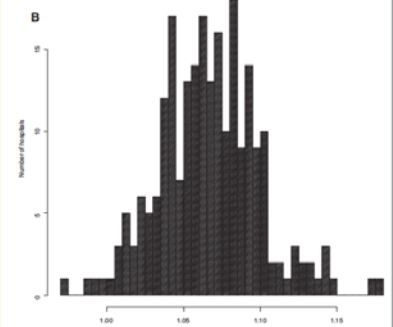
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**Hospital Variation in Survival Trends for In-hospital Cardiac Arrest**

Saket Girotra, MD, SM; Peter Cram, MD, MBA; John A. Spertus, MD, MPH; Brahmajee K. Nallamothu, MD, MPH; Yan Li, PhD; Philip G. Jones, MS; Paul S. Chan, MD, MSc; The American Heart Association's Get With the Guidelines®-Resuscitation Investigators



Girotra et al JAMA 2014

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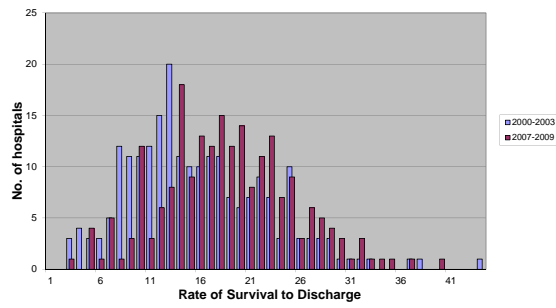
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**Hospital-Level Rates of Survival to Discharge**



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## Why do survival rates differ between hospitals

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## Future Direction

- Identify hospitals with best outcomes
- Obtain information regarding their resuscitation care practice
  - Survey
  - In-depth interviews
- Share best practices with all hospitals so that care can improve across the board

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## ACKNOWLEDGEMENTS

- National Institutes of Health

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**Thank you**

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