Success and Survival Factors of Cardiopulmonary Resuscitation in Naresuan University Hospital

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Introduction

- Cardiac arrest is a situation that requires a sudden treatment that we called cardiopulmonary resuscitation (CPR)
- In America, people died from cardiac arrest in every two minutes.
- 15 percent of American population died because of this cause
- In Thailand, the incidence occurs to 0.5-1.5/100,000 people each year.
- The successful rate in survival is different among many studies.

(Peter AM, et al. Circulation 2013;128:417-435)

(Zhi-Jie Zheng, et al. Circulation 2001;104:2158-2163)

(ธวัช ชาญชญานนท์, และคณะ สงขลานครินทร์เวชสาร 2554:39-49)

(Sittichanbuncha Y, Prachanukool T, Sawanyawisuth K.
A 6-year experience of CPR outcomes in an emergency department in Thailand.
Therapeutics and Clinical Risk Management 2013:9 377–381)

Successful CPR

ROSC ≥ 20 minutes

- **Return of spontaneous circulation (ROSC)**
  - Pulse can be palpated or BP can be measured
  - Pulse can be palpated > 20 seconds or End Tidal CO2 > 40 mmHg
  - BP can be measured from arterial line

(Ian Jacobs & Vinay Nadkarni ,2004) ,(Jan-Thorsten, Patrick, Rolf, et al. 2011)
(American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2010)

Survivors

- Patients who survive at post CPR 24 hours.

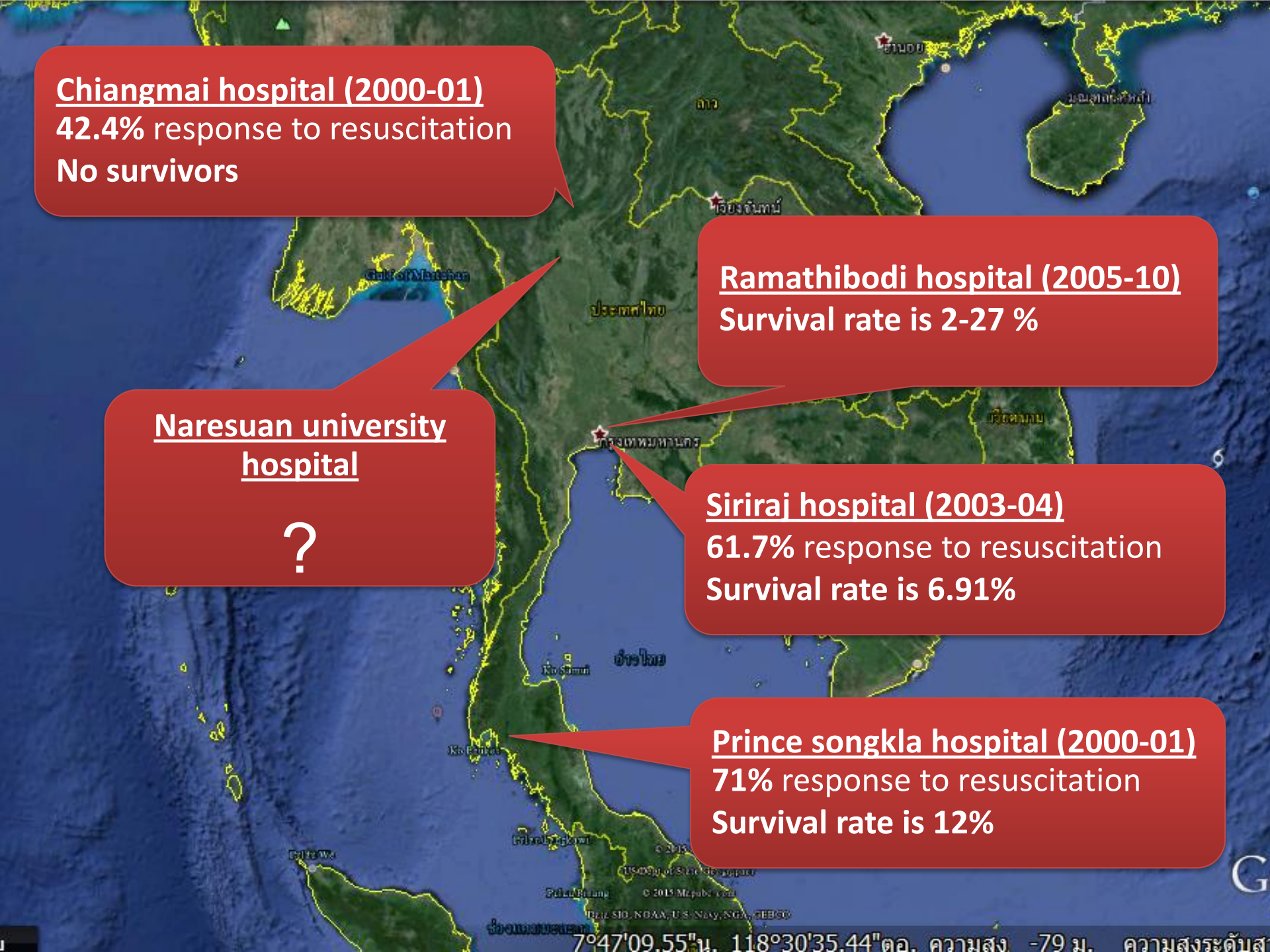
In the world

The incidence of cardiac arrest is 20-140/100,000 people

Survival rate is 2 -11%.


Cardiac arrest occurs
every 90 seconds.
(> 350,000 people per year).

Incidence is about
0.5 – 1.5 people
per 1,000 population.


Chiangmai hospital (2000-01)
42.4% response to resuscitation
No survivors
Ramathibodi hospital (2005-10)
Survival rate is 2-27 %
Naresuan university hospital
?
Siriraj hospital (2003-04)
61.7% response to resuscitation
Survival rate is 6.91%
Prince songkla hospital (2000-01)
71% response to resuscitation
Survival rate is 12%

Research Question

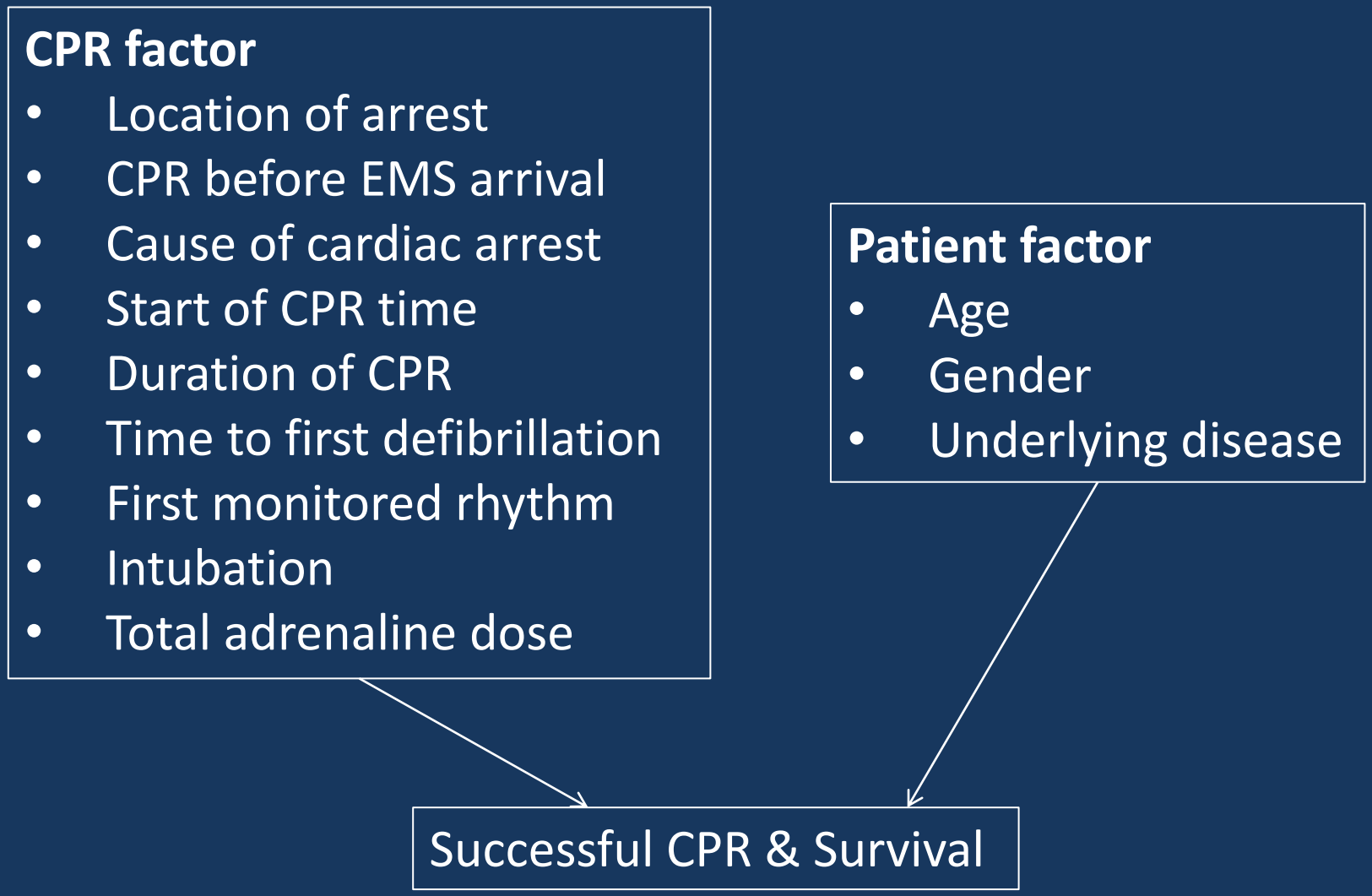
- **Main question**

  What are successful and surviving factors of resuscitation ?

- **Secondary question**

  What is the result of resuscitation in Naresuan university hospital ?

Conceptual Framework



Material and Method

- Descriptive study
  - Retrospective collection of data

Material and Method

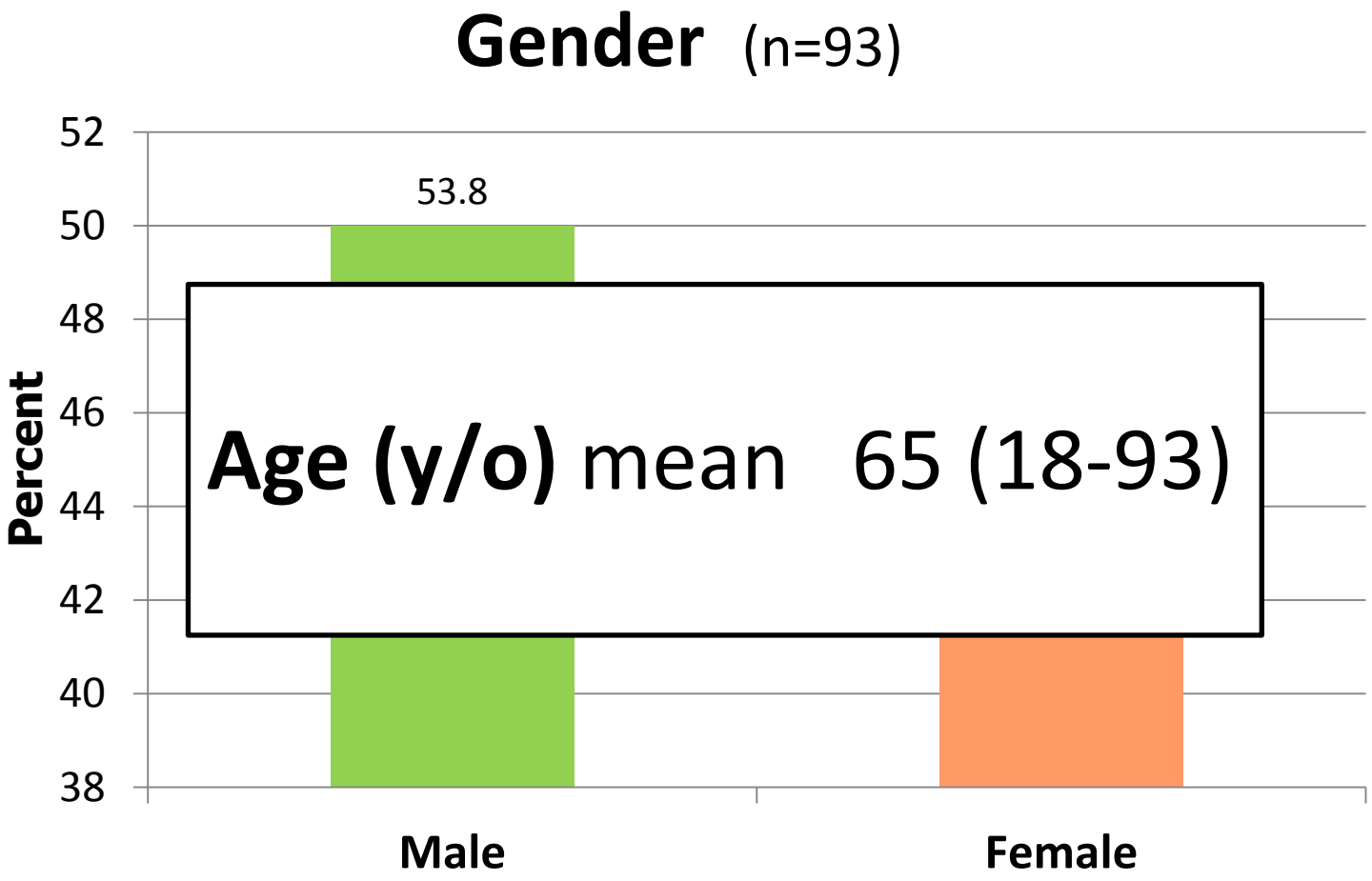
- **Population**
  - **Inclusion**
    - Patients who are older than 18 years old with sudden cardiac arrest and received resuscitation by CPR team of Naresuan University Hospital
  - Exclusion
    - Pregnancy
    - patients who had agreed in DNA (Do not attempt to resuscitation)
- Data was collected between November 2011 to November 2013

Material and Method

- **Data analysis**
  - Chi-squares
    - To determine the factors associated with successful resuscitation.
  - Logistic regression
    - To compare odds ratio of the factors that contribute to the success of resuscitation.
    - 95% confidence interval at 0.05 significance level

Result

- There were 93 patients participated in the study


Gender (n=93)
52
50
48
46
44
42
40
38
Percent
53.8
Age (y/o) mean 65 (18-93)
Male
Female

Outcome

Survival rate is
33.33 %

31 patients survive at post CPR 24 hrs.

Factors	p-value (ROSC>=20min)	p-value (Post CPR 24hr)
Gender	0.392	0.104
Age(y/o)	0.195	0.634
Location of arrest		
Out-of-hospital	0.336	0.261
In-hospital	0.450	0.421
Prehospital resuscitation	0.966	0.696
CPR before EMS arrival	0.912	0.855
Cause of cardiac arrest	0.749	0.835
CPR duration	**<0.01**	**<0.01**
First defibrillation	0.357	0.863
First monitored rhythm	0.483	0.344
Intubation	0.432	0.133
Total adrenaline use	**<0.01**	**<0.01**

Odd ratio (OR) and 95%Confidence interval (95%CI) of the CPR duration and the successful CPR

CPR duration	ROSC ≥ 20	ROSC < 20	OR	95% CI	p-value
≤ 15 min	32 (61.5)	10 (24.4)	4.96	2.005-12.269	0.001
> 15 min	20 (38.5)	31 (75.6)	*		

*reference group

Associated literature

- APACHE II scores as predictors of cardio pulmonary resuscitation outcome: Evidence from a tertiary care institute in a low-income country

  Muhammad Junaid Patel

- A 6-year experience of CPR outcomes in an emergency department in Thailand

  Yuwares Sittichanbuncha

- การศึกษาการผายปอดนวดหัวใจกู้ชีวิต ณ ห้องฉุกเฉิน รพ.ภูมิพลอดุลยเดช

  เกษศิรินทร์ พุฒิโชติ และคณะ

Odd ratio (OR) and 95%Confidence interval (95%CI) of the adrenaline use and the successful CPR

Total adrenaline use (mg)	ROSC ≥ 20	ROSC < 20	OR	95% CI	p-value
0-5	37 (72.5)	14 (27.5)	*		
6-10	9 (60.0)	6 (40.0)	0.568	0.170-1.889	0.356
11-20	5 (22.7)	17 (77.3)	0.111	0.034-0.359	< 0.01
> 20	1 (20.0)	4 (80.0)	0.095	1.429-4.888	0.04

*reference group

Associated literature

- Outcome of In-Hospital Cardiopulmonary Resuscitation and Factors Affecting the Outcome at Songklanagarind Hospital

Thavat Chanchayanon และคณะ

CPR before EMS arrival

Although this study didn't show the significant relation between the CPR before and the outcome. It shows that in the out-patient cardiac arrest, there was only 20 percent had got the CPR before EMS team arrival.

Associated literature

- Effect of Location of Out-of-Hospital Cardiac Arrest on Survival Outcomes

  E Shaun Goh และคณะ

- การศึกษาการผายปอดนวดหัวใจกู้ชีวิต ณ ห้องฉุกเฉิน รพ.ภูมิพลอดุลยเดช

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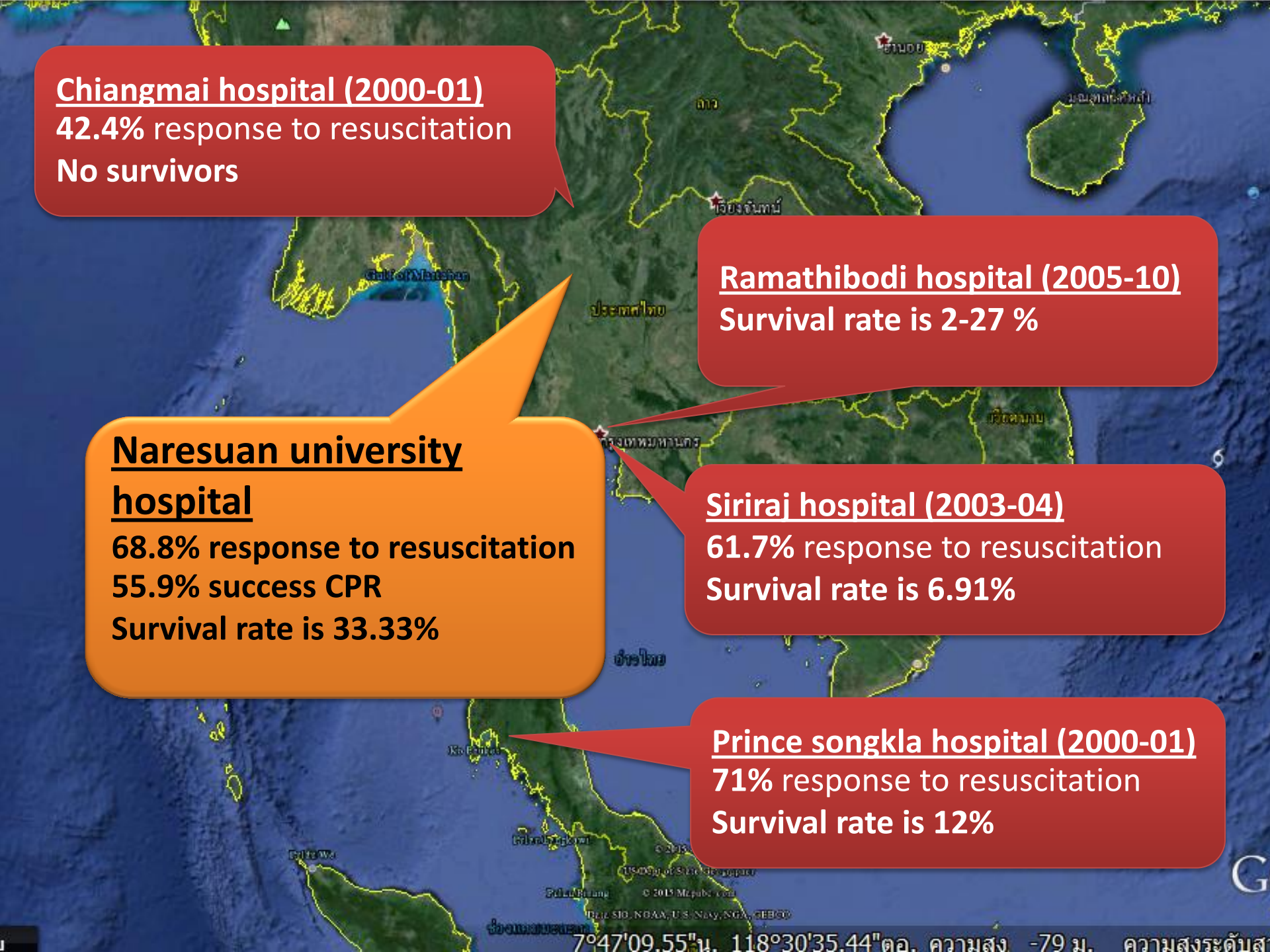
Conclusion

The success and survival factors of cardiopulmonary resuscitation in this study are

- **CPR duration <= 15 minutes**
- **Total adrenaline use <= 5 mg**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55.9% success CPR
Survival rate is 33.33%
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Application

- Prediction the outcome of the CPR
- First 15 minutes “Golden period”
- The CPR method is important not only for a health care officer, but also other people

Suggestion

- Use the prospective research after giving the knowledge to other people
  - Evaluate the result
  - Study other factors
    - the maximum time for the CPR
    - Survival rate after discharge
    - Potential of the nervous system after CPR
    - Other factors in this study that isn't significant
- Study in many center for more reliability

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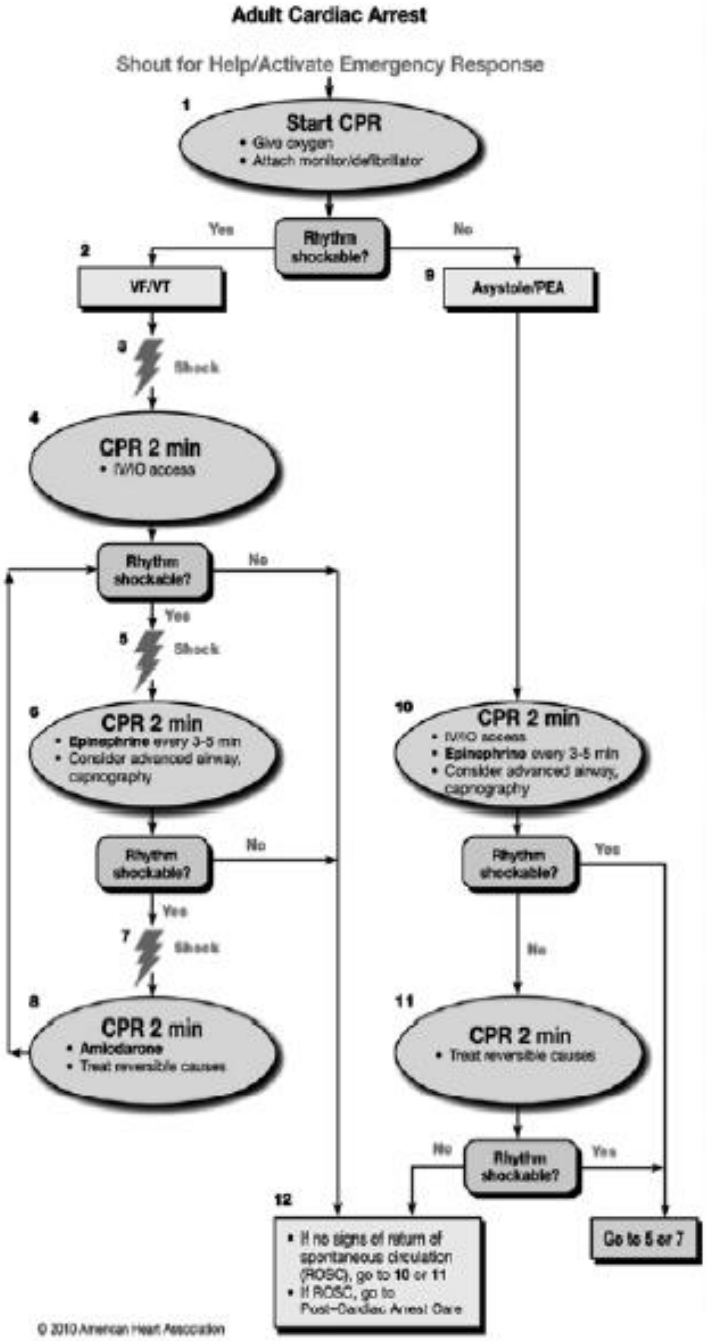
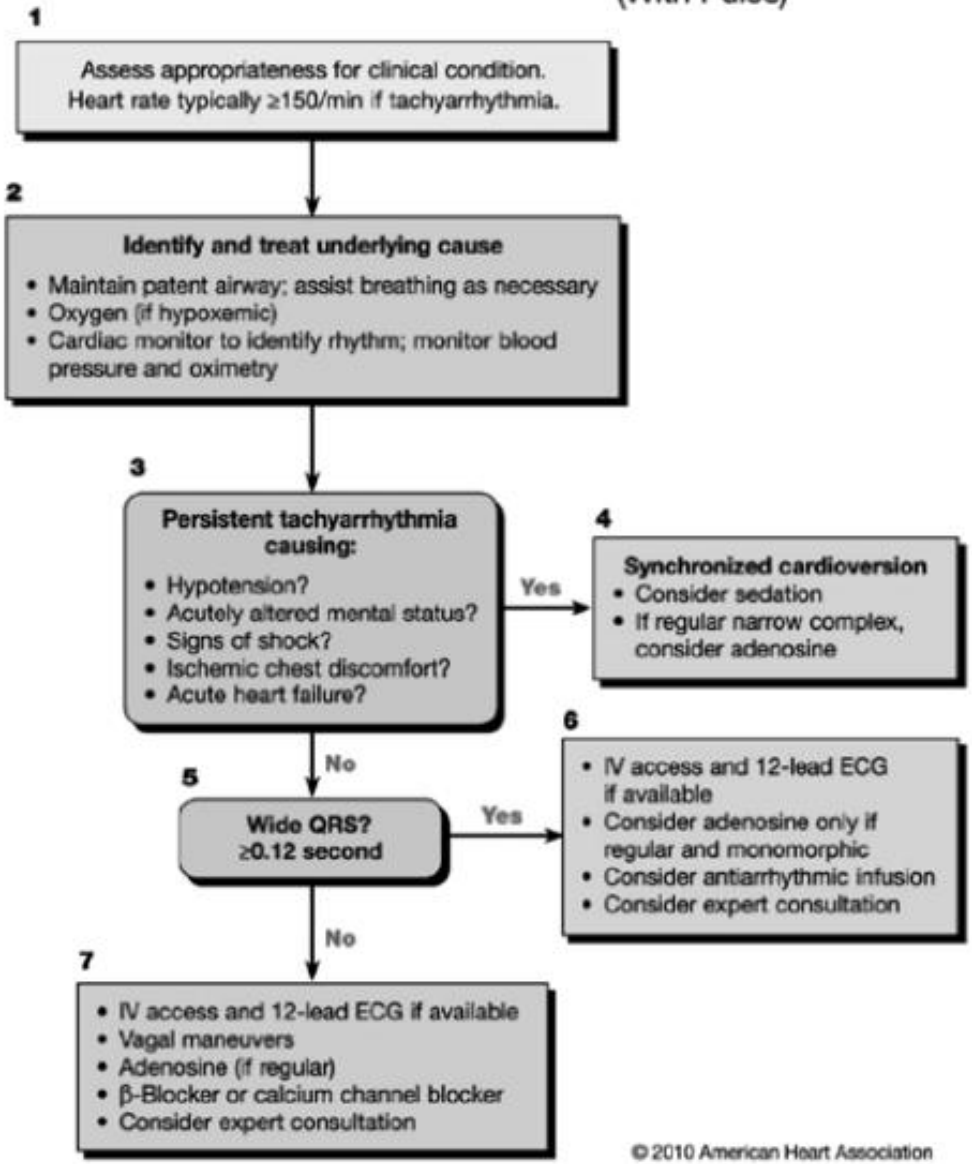
Appendix


Adult Cardiac Arrest
Shout for Help/Activate Emergency Response
1
Start CPR
• Give oxygen
• Attach monitor/defibrillator
Rhythm shockable?
Yes
No
2
VF/VT
9
Asystole/PEA
3
Shock
4
CPR 2 min
• IV/IO access
Rhythm shockable?
No
Yes
5
Shock
6
CPR 2 min
• Epinephrine every 3-5 min
• Consider advanced airway, capnography
Rhythm shockable?
No
Yes
7
Shock
8
CPR 2 min
• Amiodarone
• Treat reversible causes
10
CPR 2 min
• IV/IO access
• Epinephrine every 3-5 min
• Consider advanced airway, capnography
Rhythm shockable?
Yes
No
11
CPR 2 min
• Treat reversible causes
No
Rhythm shockable?
Yes
12
• If no signs of return of spontaneous circulation (ROSC), go to 10 or 11
• If ROSC, go to Post-Cardiac Arrest Care
Go to 5 or 7
© 2010 American Heart Association
CPR Quality
• Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
• Minimize interruptions in compressions
• Avoid excessive ventilation
• Rotate compressor every 2 minutes
• If no advanced airway, 30:2 compression-ventilation ratio
• Quantitative waveform capnography
– If PETCO2 <10 mm Hg, attempt to improve CPR quality
• Intra-arterial pressure
– If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality
Return of Spontaneous Circulation (ROSC)
• Pulse and blood pressure
• Abrupt sustained increase in PETCO2 (typically ≥40 mm Hg)
• Spontaneous arterial pressure waves with intra-arterial monitoring
Shock Energy
• Biphasic: Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
• Monophasic: 360 J
Drug Therapy
• Epinephrine IV/IO Dose: 1 mg every 3-5 minutes
• Vasopressin IV/IO Dose: 40 units can replace first or second dose of epinephrine
• Amiodarone IV/IO Dose: First dose: 300 mg bolus. Second dose: 150 mg.
Advanced Airway
• Supraglottic advanced airway or endotracheal intubation
• Waveform capnography to confirm and monitor ET tube placement
• 8-10 breaths per minute with continuous chest compressions
Reversible Causes
– Hypovolemia
– Hypoxia
– Hydrogen ion (acidosis)
– Hypo-/hyperkalemia
– Hypothermia
– Tension pneumothorax
– Tamponade, cardiac
– Toxins
– Thrombosis, pulmonary
– Thrombosis, coronary

Adult Tachycardia
(With Pulse)



Doses/Details

Synchronized Cardioversion
Initial recommended doses:
- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (NOT synchronized)

Adenosine IV Dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

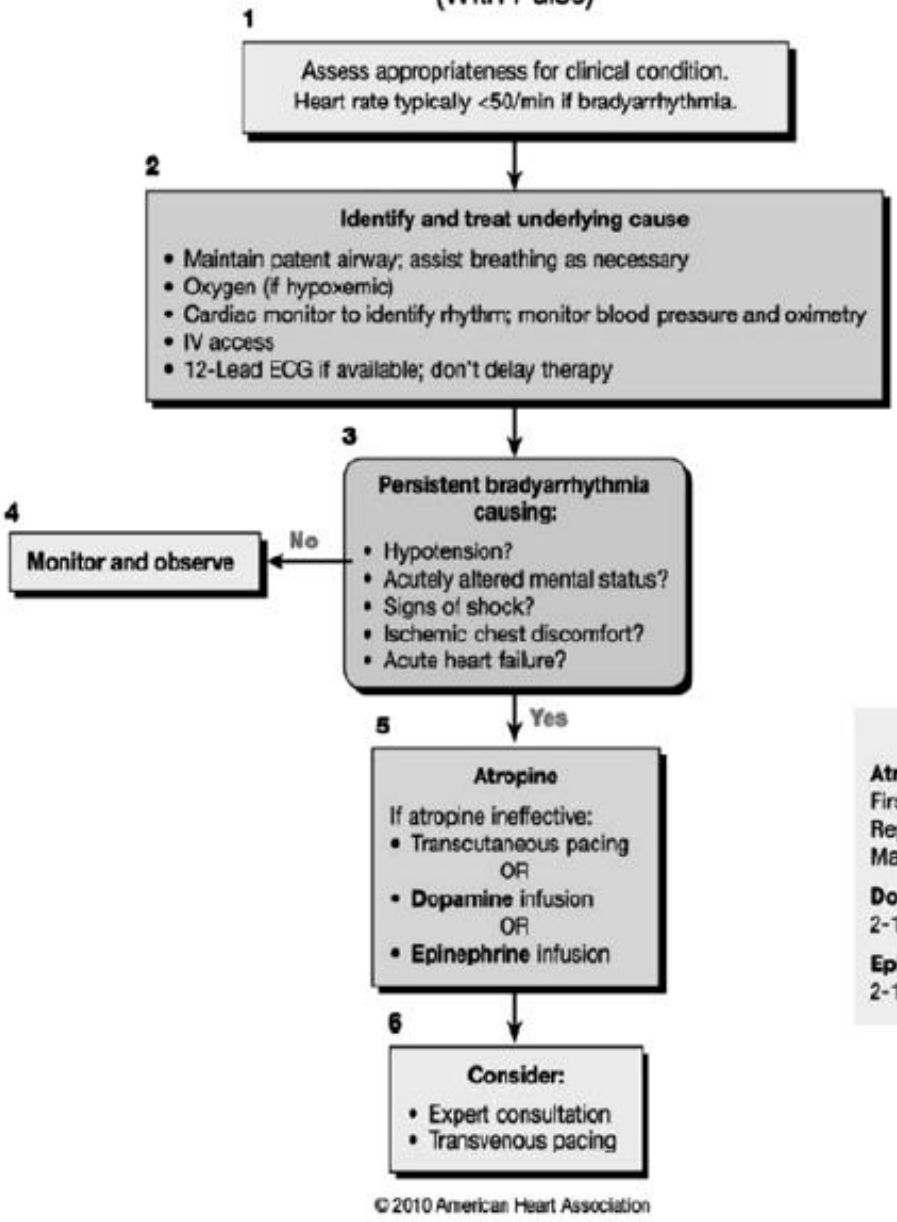
Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV Dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given.
Maintenance infusion: 1-4 mg/min.
Avoid if prolonged QT or CHF.

Amiodarone IV Dose:
First dose: 150 mg over 10 minutes.
Repeat as needed if VT recurs.
Follow by maintenance infusion of 1 mg/min for first 6 hours.

Sotalol IV Dose:
100 mg (1.5 mg/kg) over 5 minutes.
Avoid if prolonged QT.

Adult Bradycardia
(With Pulse)

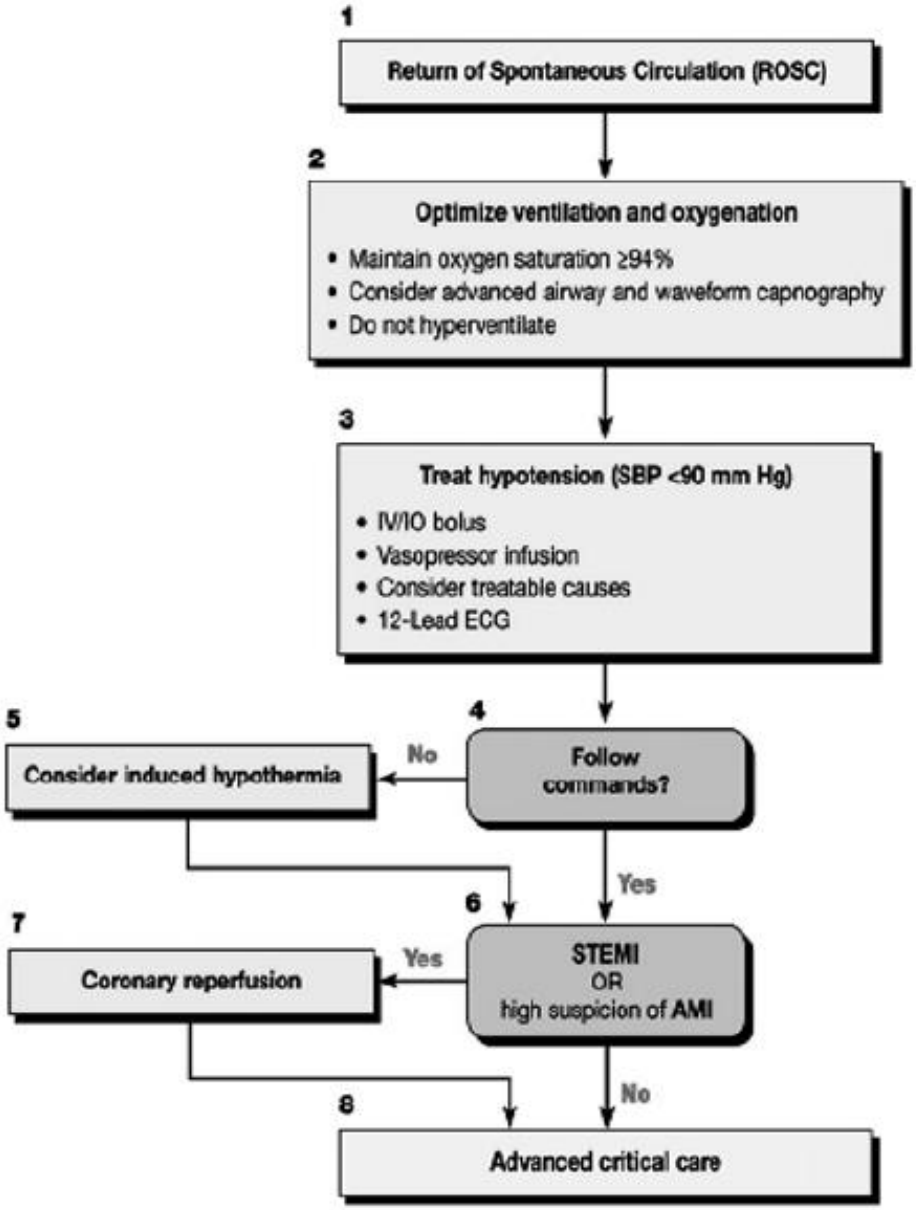


Doses/Details

Atropine IV Dose:
First dose: 0.5 mg bolus
Repeat every 3-5 minutes
Maximum: 3 mg

Dopamine IV Infusion:
2-10 mcg/kg per minute

Epinephrine IV Infusion:
2-10 mcg per minute



Doses/Details

Ventilation/Oxygenation
Avoid excessive ventilation. Start at 10-12 breaths/min and titrate to target P_{ETCO_2} of 35-40 mm Hg. When feasible, titrate F_{IO_2} to minimum necessary to achieve S_{pO_2} ≥94%.

IV Bolus
1-2 L normal saline or lactated Ringer's. If inducing hypothermia, may use 4°C fluid.

Epinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV Infusion:
5-10 mcg/kg per minute

Norepinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Reversible Causes
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

แบบบันทึก ปัจจัยที่มีผลต่อความสำเร็จในการช่วยฟื้นคืนชีพ

เดือน ..... ปี พ.ศ. .....

จำนวน ..... คน

			Patient factor	**CPR factor**											
									Time						
หมายเลข	เพศ	อายุ	Underlying disease	Location	Witness arrest	Prehospital resuscitation	CPR before EMS arrival	Cause of cardiac arrest	First start CPR	Duraton	First defibrillaion	First monitored rhythm	Intubation	Adrenaline use (amp)	**ROSC >20min**
001															
002															
003															
...															