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報告者:R2 吳志華
指導者:VS 吳柏衡

CARDIAC MOVEMENT IDENTIFIED ON PREHOSPITAL ECHOCARDIOGRAPHY PREDICTS OUTCOME IN CARDIAC ARREST PATIENTS

Gernot Aichinger*, MD, Peter Michael Zechner*, MD, Gerhard Prause, MD, Florian Sacherer,GernotWildner, MD, Craig L. Anderson, MPH, PhD, Mirjam Pocivalnik, MD, UlrikeWiesspeiner, MD, John Christian Fox, MD

Introduction

‣ The prognostic value of emergency echocardiography (EE) in the management of cardiac arrest patients has previously been studied in an in-hospital setting.

‣ Portable handheld battery-operated ultrasound systems--prehospital ultrasound

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Introduction

‣ In most European countries, cardiac arrest patients are normally treated by emergency medical services (EMS) teams on scene.

Objective

‣ To evaluate the ability of EE to predict outcome in cardiac arrest patients when it is performed by ultrasound-inexperienced emergency physicians on scene.

Methods

‣ Prospective ,observational study of nonconsecutive, nontrauma, adult cardiac arrest patients who were treated by physician-staffed urban EMS teams on scene.
‣ Participating emergency physicians (EPs) received a two-hour course in EE during CPR.
‣ EE was performed during a rhythm and pulse check.
‣ single subxiphoid, four chamber view

Methods

▸ Sonographic evidence of cardiac kinetic activity as any detected motion of the myocardium.

▸ CPR had to be continued for at least 15 minutes after the initial echocardiography

▸ No clinical decisions were made based on the results of EE.

Results

▸ We enrolled 42 patients in the study from March 1, 2009, to April 1, 2010.
▸ 20 patients: one echocardiography
▸ 22 patients: had multiple examinations
▸ mean time of CPR to the first echocardiography was 17.4 minutes

Results

▸ All 18 patients who underwent bystander CPR died at the scene, whereas five of 19 patients (20.8%) without bystander CPR survived to hospital admission (p = 0.06).

Results

TABLE 1.   Demographics of the Patients

	All Patients	Survivors	Nonsurvivors
Age–mean	70.3 (SE = 2.4)	66.3 (SE = 8.2)	70.9 (SE = 2.5)
Gender			
Male	30	2	28
Female	12	3	9

Survivors = patients who survived to hospital admission; nonsurvivors = patients with no return of spontaneous circulation in the field.
SE = standard error.

Results

	survivors	nonsurvivors
mean downtime prior to CPR	9.8 minutes	12.1 minutes
mean initial ETCO2	32.2 mmHg	31.2 mmHg
No movement(First EE)	3.1%	
Movement(First EE)	40%	
Cardiac standstill on initial EE resulted in a positive predictive value of 96.9% for death at the scene and a negative predictive value of 40%.		

Results

TABLE 2.   Survival Rates in the Movement and No-Movement Groups Including Only the First Echocardiography

	No Movement			Movement		
	Asystole	PEA	VF/VT	Asystole	PEA	VF/VT
Survived	1	0	0	1	1	2
	1			4		
Died	18	7	6	0	3	3
	31			6		

Movement = myocardial motion in the first echocardiography; no movement = cardiac standstill in the first echocardiography.
ECG = electrocardiogram; PEA = pulseless electrical activity; VF/VT = ventricular fibrillation/ventricular tachycardia.

TABLE 3. Survival Rates in the Movement and No-Movement Groups Including All Performed Echocardiographies

	No Movement			Movement		
	Asystole	PEA	VF/VT	Asystole	PEA	VF/VT
Survived	1	0	0	1	1	2
	1			4		
Died	18	8	8	0	2	1
	34			3		

Movement = myocardial motion in every echocardiography; no movement = cardiac standstill in at least one echocardiography.
ECG = electrocardiogram; PEA = pulseless electrical activity; VF/VT = ventricular fibrillation/ventricular tachycardia.

Results

- Ten patients (23.8%) had cardiac movement on the first EE and seven patients (16.7%) had cardiac movement on every EE

Results

- Four out of seven patients (57.1%) with cardiac movement on every EE versus one out of 35 patients (2.9%) with cardiac standstill on any EE survived to hospital admission (p = 0.001)

DISCUSSION

- Only cardiac movement was associated with survival, and cardiac standstill at any time during CPR resulted in a positive predictive value of 97.1% for death at the scene.

LIMITATIONS

- Relativ
- No videotape the ultrasound scanely small sample size.

CONCLUSIONS

- Employing an easy-to-use device as a highly reproducible predictor of survival in cardiac arrest patients would be of high value for the EP deciding whether to continue resuscitative efforts.

The Association Between Length of Emergency Department Boarding and Mortality

Adam J. Singer, MD, Henry C. Thode Jr., PhD, Peter Viccellio, MD,
and Jesse M. Pines, MD, MBA, MSCE
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Objectives

- Emergency department (ED) boarding
  ◦ several negative patientoriented outcomes, from worse satisfaction to higher inpatient mortality rates
  ◦ EX:delays in important medications and higher complication rates after ED evaluation, including an increase in mortality.

Objectives

- Boarders do not receive the same level of care that they would in inpatient beds.
  ◦ Safety issues

- Prolonged ED boarding of admitted patients
  ◦ 探討是否病人長時間留觀,會不會有較高mortality rates或較長的hospital lengths of stay (LOS).

Methods

- Retrospective cohort study
- Suburban academic ED, annual 90,000 visits
- 從ED住院,且在October 2005 and September 2008期間出院的患者.
- Boarding was defined as ED LOS 2 hours
- Hospital LOS, subsequent transfer to an intensive care unit (ICU), and mortality controlling for comorbidities.

Methods

- The ED disposition (discharge, admit to floor, admit to hallway), ED and hospital LOS, and inhospital mortality were extracted.
- (2-5,6-11, 12-24, >24 hours) for length of ED boarding.
- Primary outcome was in-hospital mortality.
- Secondary outcomes were the rate of transfer or upgrade of patients to an ICU setting and total hospital LOS.

Methods--Measures of Disease/Injury Severity.

- The All Patient Refined Diagnosis-Related Groups (APR-DRG) severity of illness and mortality risk scales (Likert scales from 1 = minor to 4 = extreme) were used as general descriptors of the severity of patient conditions.

RESULTS

- 41,256 cases used in the analysis.
  - 42,149 patients admitted from the ED
  - 893 (2.1%) of these were excluded for missing data

Table 1
Baseline Characteristics of Patients

Characteristic	All Patients	Boarding Categories (Hours)				
		<2	2-6	6-12	12-24	24+
Number of patients	41,256*	20,527	15,145	3,121	2,086	377
Mean (±SD) age, yr	53.1 (24.6)	49.6 (26.2)	55.4 (23.0)	58.5 (20.1)	61.4 (19.4)	62.9 (18.7)
65 years of age and older, %	36.8	33.0	39.3	41.8	46.7	50.9
Male, %	52.1	52.2	51.2	53.9	54.6	58.1
Race, %						
White	80.0	79.1	80.4	80.7	84.5	82.8
Black or African American	6.7	6.7	6.8	7.0	5.6	7.2
Hispanic	9.1	9.7	8.8	8.0	6.4	6.4
Boarding time 6+ hours, %	13.5	0	0	100	100	100
Illness severity, % (n = 42,092)						
Minor	29.1	32.4	27.7	23.0	19.3	18.0
Moderate	35.5	35.8	35.3	36.1	33.8	32.9
Major	25.6	23.0	27.4	28.3	32.5	31.0
Extreme	9.8	8.8	9.6	12.6	14.4	18.0
Risk of mortality, % (n = 42,092)						
Minor	50.5	55.1	48.3	43.3	34.9	32.9
Moderate	26.5	24.7	27.8	28.5	31.9	29.2
Major	15.8	13.8	16.6	18.6	22.9	24.4
Extreme	7.2	6.3	7.2	9.7	10.4	13.5
Weekend visit, %	24.9	27.1	23.2	21.4	20.9	32.6
Shift, %						
Evening (4 PM-midnight)	38.3	43.2	29.5	33.9	62.8	25.5
Night (midnight-8 AM)	12.4	10.8	12.2	25.1	9.7	13.0
Comorbidities, %†						
Congestive heart failure	8.1	7.1	8.6	9.2	11.4	11.1
Valvular disease	5.0	4.5	5.3	5.8	6.7	6.4
Peripheral vascular disease	5.6	4.9	5.9	6.6	8.2	8.8
Hypertension	41.5	38.3	43.7	45.9	49.3	47.5
Other neurologic disorders	6.9	6.5	7.3	7.1	7.5	9.0
Chronic pulmonary disease	15.2	14.0	15.7	18.1	18.3	18.8

Table 1
Baseline Characteristics of Patients

Characteristic	All Patients	Boarding Categories (Hours)				
		<2	2-6	6-12	12-24	24+
Diabetes mellitus						
No complications	16.0	14.4	17.1	18.0	20.2	19.6
With complications	3.9	3.4	4.2	4.9	4.4	5.3
Hypothyroidism	9.2	8.4	9.9	10.4	10.3	12.2
Renal failure	9.3	8.1	9.9	11.8	12.2	13.8
Coagulation deficiency	3.3	3.1	3.3	3.8	4.3	3.4
Obesity	8.0	7.2	8.7	9.4	8.8	10.6
Weight loss	4.3	3.9	4.5	5.4	5.2	6.9
Fluid and electrolyte disorders	24.8	22.8	25.9	28.0	30.6	32.9
Deficiency anemias	15.2	13.9	15.8	17.4	18.3	20.2
Alcohol abuse	4.2	4.0	4.0	5.0	6.1	4.5
Drug abuse	3.7	3.4	3.8	4.0	4.4	5.0
Psychoses	3.6	3.4	3.7	3.6	4.7	5.3
Depression	10.7	10.0	11.5	11.2	12.5	8.8
Outcomes						
Median hospital LOS, days (IQR)	3 (2-6)	3 (2-6)	3 (2-7)	4 (2-7)	4 (3-8)	5 (3-9)
In-hospital mortality, %	2.8	2.5	2.7	3.9	4.5	4.5
Admitted to ICU, %	12.1	12.4	10.8	14.5	14.6	15.9

*Sixty-four cases were excluded because illness severity and risk of mortality could not be determined based on diagnoses of these cases.
†Excludes comorbidity categories affecting <3% of the sample (pulmonary circulation disorders, paralysis, liver disease, chronic peptic ulcer, HIV/AIDS, lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis, blood loss anemias).
ICU = intensive care unit; LOS = length of stay.

Table 2
In-hospital Mortality by Length of ED Boarding Time

ED Boarding Time, hours	In-hospital Mortality %	Multivariate Odds Ratio (95% CI)	ICU admission %	Multivariate Odds Ratio (95% CI)	Mean LOS (±SD)	Multivariate LOS Mean Increase in Days (95% CI)
<2	2.5	Reference	12.4	Reference	5.6 (11.4)	Reference
2-6	2.7	0.91 (0.80-1.05)	10.8	0.85 (0.79-0.91)	6.1 (11.9)	0.23 (0.00-0.46)
6-12	3.9	1.24 (1.00-1.54)	14.5	1.14 (1.01-1.29)	6.8 (11.4)	0.49 (0.08-0.90)
12-24	4.5	1.43 (1.13-1.82)	14.6	1.18 (1.02-1.35)	7.3 (11.8)	0.74 (0.25-1.23)
24+	4.5	1.23 (0.73-2.09)	15.9	1.19 (0.88-1.61)	8.7 (16.3)	1.93 (0.79-3.06)

Multivariate results are adjusted for age, sex, race, weekend, shift, and Elixhauser comorbidity variables.
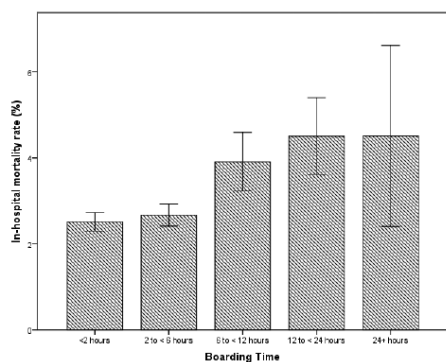

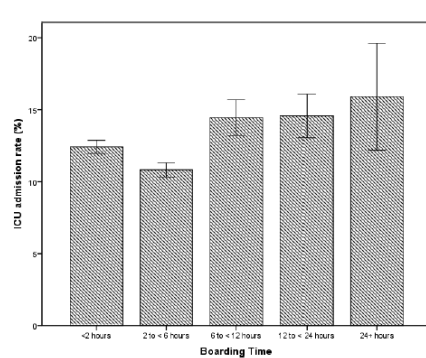**Figure 1.** In-hospital mortality rate by length of boarding time.

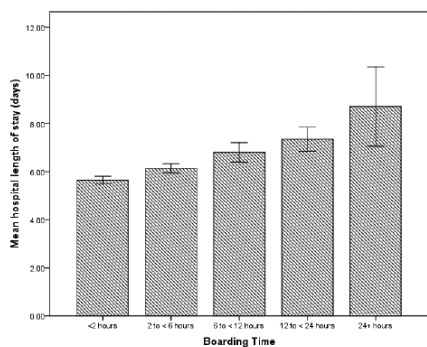**Figure 2.** ICU admission rate by length of boarding time. ICU = intensive care unit.

Figure 3. Mean hospital LOS by length of boarding time. LOS = length of stay.

LIMITATIONS

▸ Retrospective review

CONCLUSIONS

▸ Emergency department boarding was associated with higher inpatient mortality rates and longer hospital length of stay in this hospital. Efforts to reduce boarding may improve outcomes for ED patients who are admitted to the hospital.