

Survival from Out-of-Hospital Cardiac Arrest in New York City: 10 Years Later

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Background

- New York City (NYC) is a large urban area comprised of five geographically distinct boroughs. It has a culturally and economically diverse population, many of whom live and work in densely populated and/or high traffic environments.
- New York City has a population of 8 million people, with 121,703 individuals age 85 years or older¹.
- NYC 911 Emergency Medical Services (EMS) is a three-tier system consisting of Advanced Life Support (ALS), Basic Life Support (BLS), and firefighter/certified first responder (CFR) units, all of which are CPR and defibrillator capable.
- Municipal and voluntary hospital emergency response units are dispatched and operate under the authority of the NYC Fire Department (FDNY).
- In 1991-1992, the Prehospital Arrest Survival Evaluation (PHASE), a six-month prospective study, demonstrated (a) an overall survival rate of 1.4% from out-of-hospital cardiac arrests (OOHCA) occurring prior to EMS arrival; (b) median 911 EMS system response time to OOHCA of 9.9 minutes².
- Over the past decade the population of NYC has been growing and aging, and a number of enhancements have been introduced to the 911 EMS system.

Study Aims

- To reassess OOHCA survival in NYC following (a) implementation of a first responder program (210 firefighter / first responder units with CPR and defibrillation capability added) and (b) introduction of additional 911 ambulance resources (2x-3x increase in 8-hour tours), all of which are defibrillator equipped.
- To compare results to the 1991-1992 PHASE study

Methods

- Design: One year prospective-observational study of consecutive patients with OOHCA.
- Dates: April 1, 2002 - March 31, 2003
- Data collected from prehospital providers using a previously validated telephone interview process.
- Utstein core measures and critical time intervals measured.
- Patient demographics and system performance measures merged with outcome/ survival data obtained through the FDNY Office of Medical Affairs Quality Assurance program.
- Data collected on 6,973 adult patients with OOHCA; 4,653 (66.7%) of whom were of presumed primary cardiac etiology.

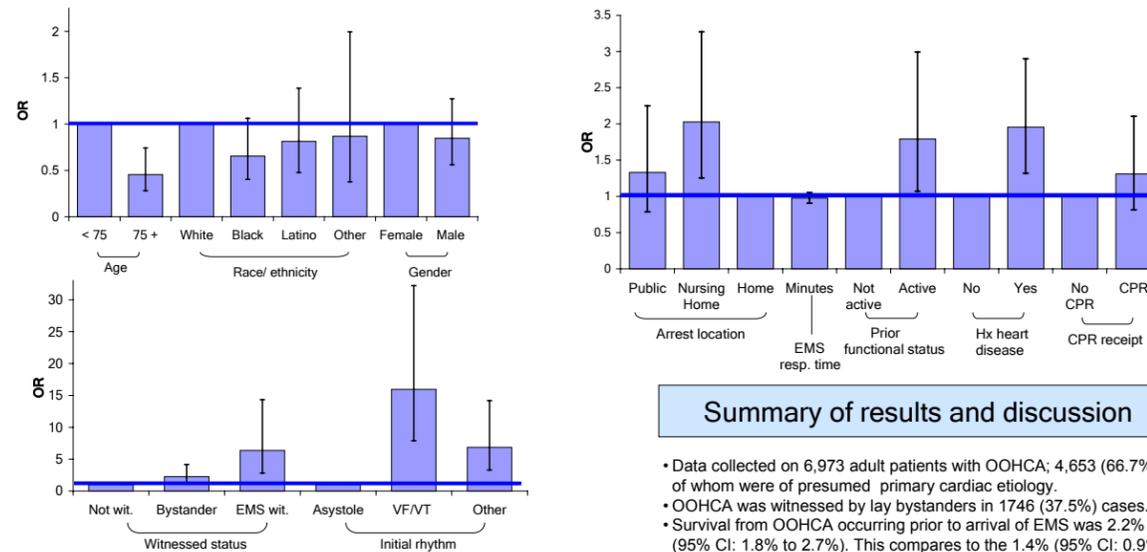
Sample characteristics and bivariate associations with survival

Characteristic	n	%	Survival to discharge, lived > 30 days	n	%	p-value
Survival to discharge, lived > 30 days						
No	4519	97.1				
Yes	134	2.9				
Age						
74 and under	2635	56.6	104	3.95	<.0001	
75 and over	2018	43.4	30	1.49		
Patient's race						
Black	1446	31.2	30	2.07	0.1404	
Latino	759	16.4	23	3.03		
White	2147	46.3	73	3.40		
Other	283	6.1	8	2.83		
Gender						
Male	2539	54.6	83	3.27	0.0834	
Female	2111	45.4	51	2.42		
Witnessed						
Not witnessed	2102	45.2	16	0.76	<.0001	
Witnessed by bystander	1746	37.5	62	3.55		
Witnessed by EMS	311	6.7	38	12.22		
CPR						
Yes	1526	32.8	69	4.52	<.0001	
No	2824	60.69	56	1.98		
Initial rhythm						
Asystole	2852	61.3	10	0.35	<.0001	
VF/VT	742	16.0	76	10.24		
Other	977	21.0	43	4.40		
Hx heart condition						
No	2562	55.1	60	2.34	0.0152	
Yes	2091	44.9	74	3.54		
Prior functional status						
Active	2347	50.4	98	4.18	<.0001	
Not Active	2016	43.3	28	1.39		
Response time						
Incident Location						
Residence	2875	62.4	65	2.26	<.0001	
Nursing Home	1233	26.8	34	2.76		
Public location	497	10.8	32	6.44		

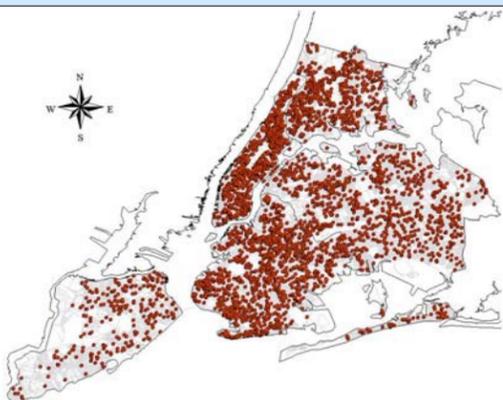
Study comparisons

Outcome	PHENYCS (2002-2003)	PHASE (1990-1991)
Survival- overall	2.9% (95% CI: 2.4-3.4)	2.2% (95% CI: 1.7-2.9)
Survival- OOHCA prior to EMS arrival	2.2% (95% CI: 1.8-2.7)	1.4% (95% CI: 1.0-2.1)
Survival- OOHCA prior to EMS arrival, PHENYCS adjusted to 1990's age, sex, race population structure	2.5% (95% CI: 2.0-3.0)	
Survival- EMS witnessed arrest	12.2% (95% CI: 8.6-16.8)	8.5% (95% CI: 5.3-12.9)
Survival- bystander witnessed	3.6% (95% CI: 2.7-4.6)	2.1% (95% CI: 1.4-3.1)
Survival- bystander witnessed VF	9.6% (95% CI: 6.9-13.1)	5.3% (95% CI: 3.3-8.0)
Hospital admission- bystander witnessed	13.4% (95% CI: 11.8-15.1)	15.5% (95% CI: 13.5-17.7)
ROSC- bystander witnessed	20.2% (95% CI: 18.3-22.1)	28.2% (95% CI: 25.7-30.8)
VF- bystander witnessed	24.3% (95% CI: 22.3-26.4)	33.5% (95% CI: 30.9-36.3)

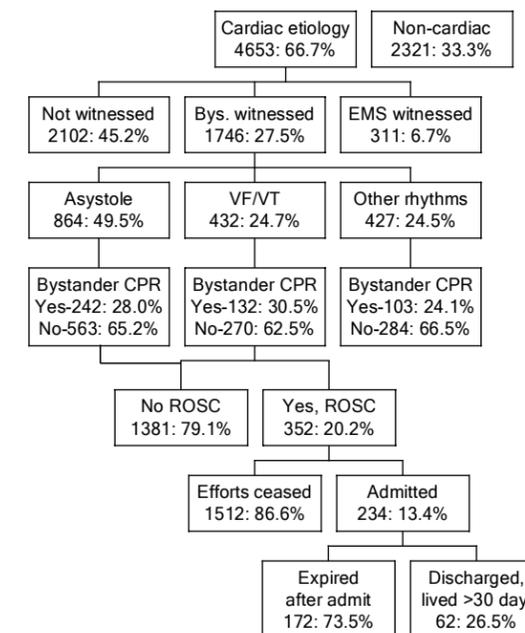
Variables predicting survival in multivariable logistic modeling (n = 4573)



Location of arrests



Utstein criteria



Summary of results and discussion

- Data collected on 6,973 adult patients with OOHCA; 4,653 (66.7%) of whom were of presumed primary cardiac etiology.
- OOHCA was witnessed by lay bystanders in 1746 (37.5%) cases.
- Survival from OOHCA occurring prior to arrival of EMS was 2.2% (95% CI: 1.8% to 2.7%). This compares to the 1.4% (95% CI: 0.9% to 2.0%) survival demonstrated by the PHASE study.
- Overall survival from OOHCA was 2.9%. This includes patients who arrested in the presence of EMS and compares to an overall survival rate of 2.2% over ten years ago.
- Mean response time for arrests occurring prior to EMS arrival was 4.7 minutes (95% CI: 4.6 - 4.8 minutes), and compares to the 9.3 minute response time for OOHCA previously demonstrated.
- In a multivariate adjusted model, variables associated with survival were age less than 75 years, bystander witnessed arrest, initial rhythm VF/VT, prior history of cardiac disease, active life style prior to arrest, and cardiac arrest in a skilled or extended term care nursing facility.
- Following the implementation of a first responder/defibrillator program and the introduction of additional ambulance resources, response times to OOHCA in the NYC 911 system decreased substantially over the past decade.
- Survival from OOHCA due to witnessed VF/VT increased in the face of an aging population, and despite a declining incidence of VF/VT that has been recognized in other EMS systems^{3,4}.
- Overall survival from OOHCA in NYC is consistent with that found in several other large urban centers⁵.

References

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