Elderly Out-of-hospital Cardiac Arrest

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a Population-wide Analysis of Prehospital Registry Data

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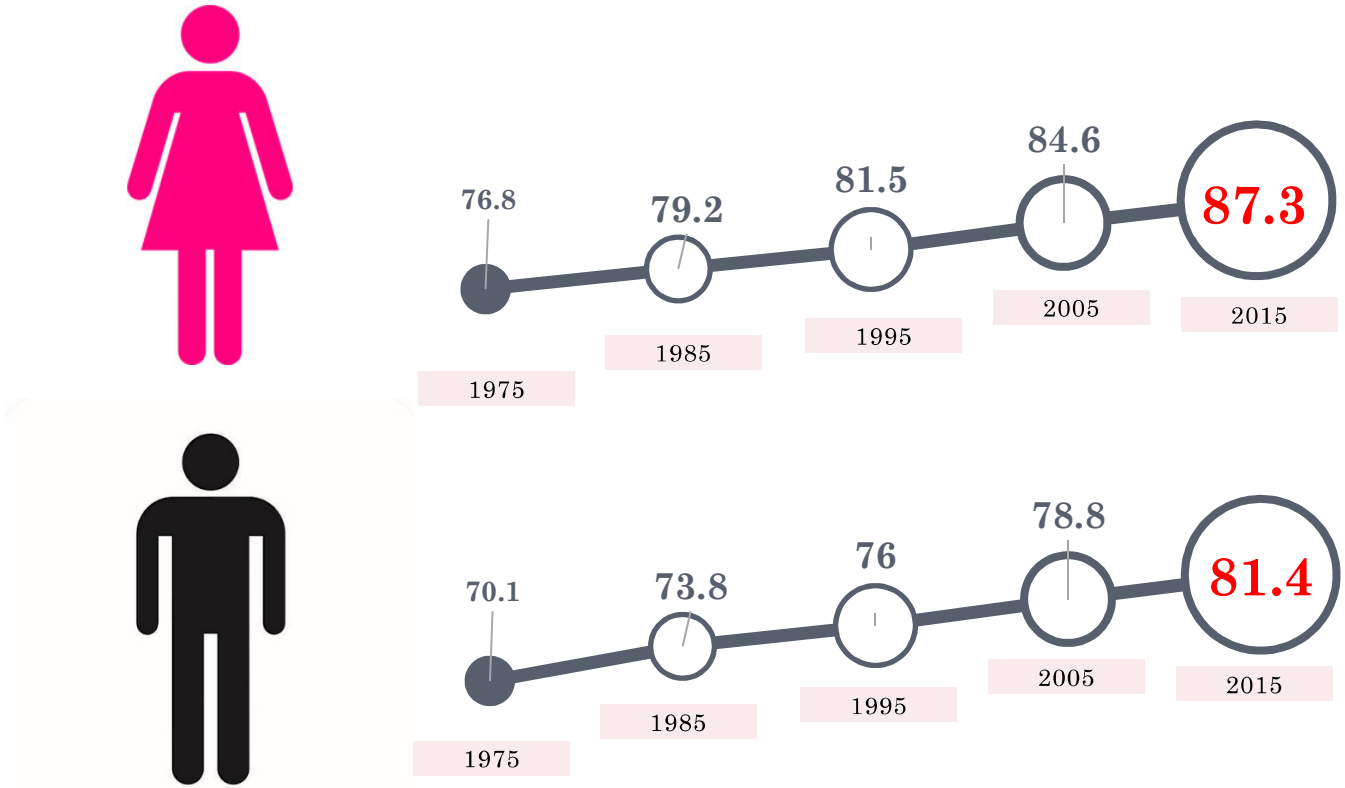
DISCLOSURES

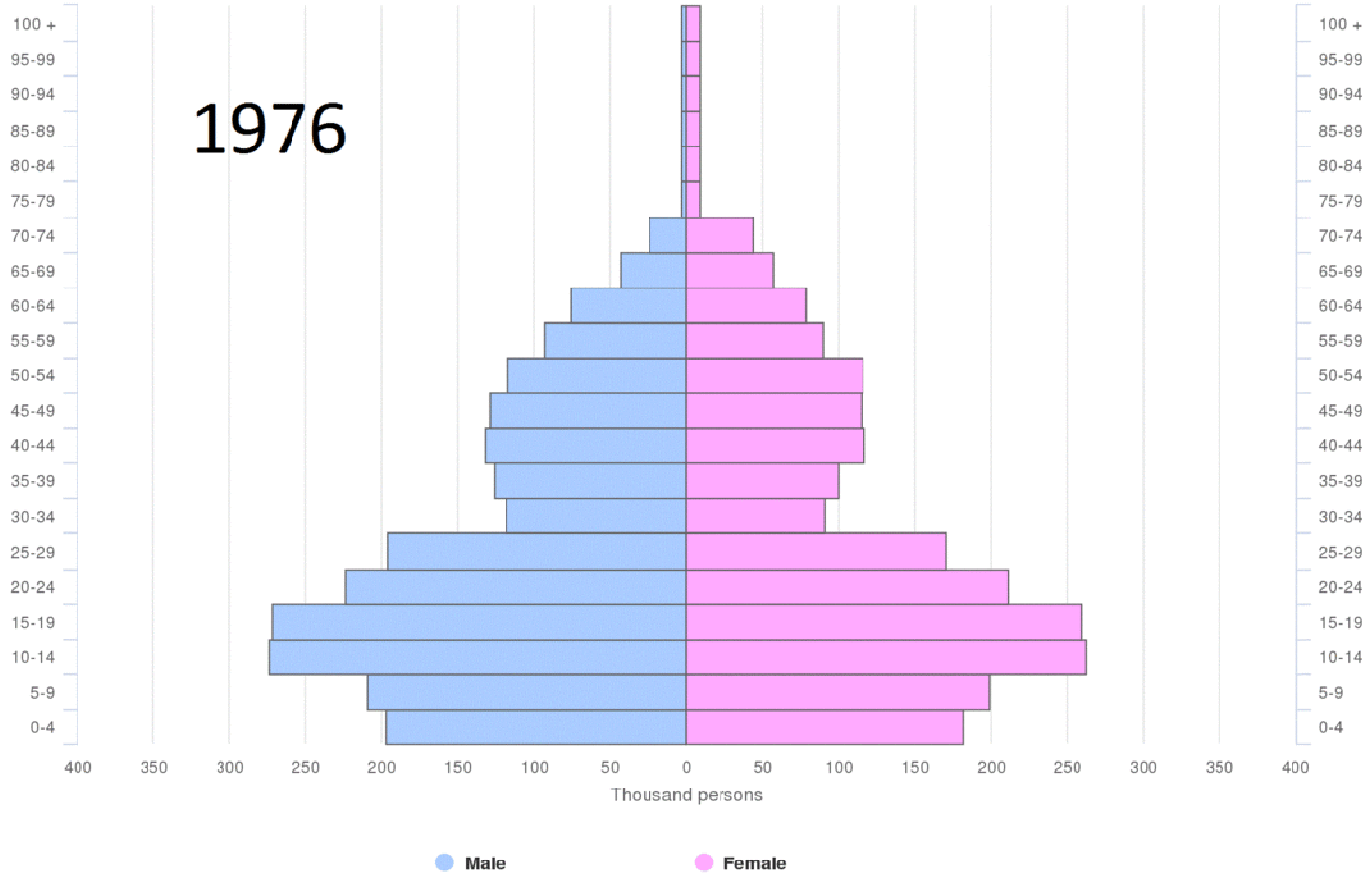
- No conflicts of interest

Hong Kong:
Increasing life expectancy at birth



Source: Department of Health

Hong Kong: Aging population

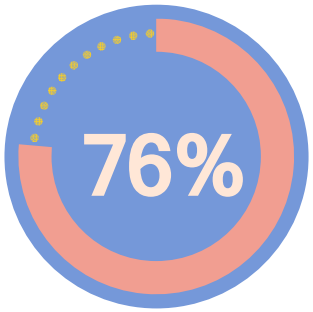


Source: By-census 2016

Global incidence of OHCA

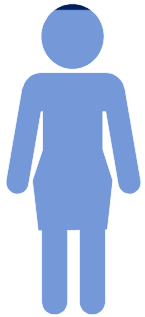
Incidence of OHCA in Hong Kong

0.07%



OHCA SURVIVAL-TO-DISCHARGE IN GENERAL

2%



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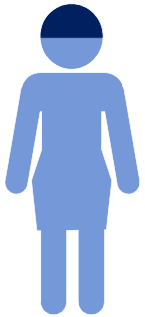
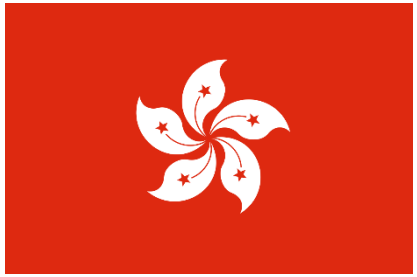
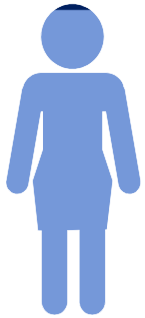


11%



2.3%



Objectives

To describe epidemiology, outcomes, and predictors of survival from OHCA in geriatric population using territory-wide prehospital data

METHODS

- Retrospective cross-sectional study
- Consecutive OHCA patients ≥ 65 yo
- Emergency FSD ground ambulance service
- 1st August 2012 - 31st July 2013
- Primary outcome: 30-day survival
- Secondary outcome: neurological recovery

Methods

- Descriptions of
  - Demographic data
  - Site of arrest
  - Presence of witness
  - Initial cardiac rhythm
  - Bystander CPR and defibrillation
  - Resuscitation in emergency department
  - Prehospital time variables

Methods

- Survivors and non-survivors were compared
  - Continuous: Mann-Whitney U test
  - Categorical: Chi-squared test

- Associations among independent variables and study outcomes
  - Uni-variable logistic regression

Results

	Aged 65 or above (n= 3919)
Demographics factors	
Age Median age (IQR)- years	84 (77-89)
Age group 65-74 75-84 85-94 95 or above	 632 (16.1) 1509 (38.5) 1409 (36) 369(9.4)
Gender Male Female	 1958 (50) 1960 (50)
Pre-hospital factors	
Arrest Location Home Public Street HFA En-Route Others	 1971 (50.3) 207 (5.3) 77 (2.0) 1506 (38.4) 156 (4) 1 (0.025)
Witnessed Arrest Unwitnessed EMS (ambulance) HFA staff Other Bystanders	 2378 (60.7) 300 (7.7) 613 (15.7) 620 (15.8)
Bystander CPR No Yes HFA Staff First Responder Relatives Police Others	 2731 (69.7) 1187 (30.3) 623 (15.9) 471 (12) 55 (1.4) 17 (0.4) 21 (0.5)
Bystander AED No Yes	 3884 (99.1) 34 (0.9)
Ambulance shock No Yes	 3560 (90.8) 359 (9.2)
Initial ECG rhythm VF or VT Asystole PEA Other or unknown	 241 (6.1) 3270 (83.4) 400 (10.2) 8 (0.2)

- 3919 cases
- 416 arrests per 100,000 person-years
  - (72 in general population)

TIME RELATED FACTORS AND OUTCOME

	Median response time (min), (IQR)
Recognition-activation	0 (0-3.0)
Call-patient's side	9 (8-11)
Call-A&E arrival	26 (22-30)
Call- bystander CPR (n=1133)	6 (0-9)
Call- PAD (n=31)	8 (2-11)
Call- EMS CPR	10 (8-12)
Call-ROSC (n=105)	19 (15-25)
Call- First Defibrillation (n=358)	14 (10-20)

- Related to survival
  - Time to call
  - Time to patient side
  - Ambulance CPR
  - Time to ROSC

	Aged 65 or above (n= 3919)
Outcome (%)	
Resuscitation in A&E	1395 (35.6)
ROSC before A&E arrival	106 (2.7)
Survival to hospital admission	537 (13.7)
Survival at 30 days	58 (1.5)
Good neurological status on discharge (CPC 1-2)	33 (0.8)

Characteristics	30d-Survivors (N=58)	30d-Non-survivors (N=3861)	p-value
Age (years)			
65-74	28 (48.3)	604 (15.6)	<0.001
75-84	20 (34.5)	1489 (38.6)	
85-94	10 (17.2)	1399 (36.2)	
95 or above	0 (0)	369 (9.6)	
Gender			
Male	40 (69)	1918 (49.7)	0.004
Female	18 (31)	1942 (50.3)	
Location of OHCA			
Home	17 (29.3)	1954 (50.6)	<0.001
Public places (excluding streets)	17 (29.3)	190 (4.9)	
Street	3 (5.2)	74 (1.9)	
HFA	5 (8.6)	1501 (38.9)	
En-route to hospital	16 (27.6)	140 (3.6)	
Others	0 (0)	1 (0)	
Witness status			
Witnessed	36 (62.1)	1505 (39)	<0.001
Unwitnessed	22 (37.9)	2356 (61)	
Bystander CPR			
Yes	15 (25.9)	1172 (30.4)	>0.05 (0.459)
No	43 (74.1)	2688 (69.6)	
Bystander AED			
Yes	5 (8.6)	29 (0.8)	<0.001
No	53 (91.4)	3832 (99.2)	
Initial ECG rhythm			
VF/VT	31 (53.4)	210 (5.4)	<0.001
Asystole	9 (15.5)	3261 (84.5)	
PEA	16 (27.6)	384 (9.9)	
Other or unknown	2 (3.4)	6 (0.2)	
Time factors (Median) (min), (IQR))			
Recognition-activation interval	0 (0, 0.25)	0 (0, 3)	0.002
Call-patient's side interval	9 (7, 10)	9 (8, 11)	0.009
Call-ED arrival interval	25 (22, 30)	26 (22, 30)	>0.05
Call- bystander CPR interval	n=14, 5 (5, 6.25)	n=1119, 2 (0, 8)	>0.05
Call- EMS CPR interval	n=57, 11 (7.5, 17.5)	n=3861,10 (8, 12)	>0.05
Call- first defibrillation interval	n=33, 10 (7.5, 16)	n=343,13 (10, 20)	0.003

UNIVARIABLE LOGISTIC REGRESSION

	Aged 65 or above (n= 3919)	p-value, OR (95% CI)
Demographics factors		
Age		<0.001, OR=0.895 (0.865-0.926)
Mean (years) ± SD, range	83.2±8.5 (65-109)	
Median age (IQR)- years	84 (77-89)	
Gender		0.005, OR=2.25 (1.285-3.938)
Female	1960 (50)	
Male	1958 (50)	
Pre-hospital factors		
Arrest Location		<0.001
Home	1971 (50.3)	Home (reference)
Public	207 (5.3)	<0.001, OR=10.284 (5.2-20.5)
Street	77 (2.0)	0.016, OR=4.66 (1.336-16.25)
Elderly home	1506 (38.4)	0.06, OR=0.383 (0.141- 1.040)
En-Route	156 (4)	<0.001, OR=13.14 (6.50-26.6)
Others	1 (0.025)	
Witnessed Arrest		<0.001
Unwitnessed	2378 (60.7)	Ref (below OR compare to this)
EMS (ambulance)	300 (7.7)	<0.001, OR=10.6 (5.9-18.8)
HFA staff	613 (15.7)	>0.05
Other Bystanders	620 (15.8)	>0.05
Bystander CPR		<0.001
No	2731 (69.7)	Reference
Yes	1187 (30.3)	
HFA Staff	623 (15.9)	>0.05
First Responder	471 (12)	>0.05
Relatives	55 (1.4)	>0.05
Police	17 (0.4)	<0.001, OR=13.4 (3.7-48.3)
Others	21 (0.5)	>0.05
Bystander AED		0.001, OR=12.5 (4.6-33.4)
No	3884 (99.1)	
Yes	34 (0.9)	
Initial ECG rhythm		<0.001
VF or VT	241 (6.1)	Reference
Asystole	3270 (83.4)	<0.001, OR=0.019(0.009-0.4)
PEA	400 (10.2)	<0.001, OR=0.282 (0.151-0.528)
Other or unknown	8 (0.2)	>0.05, OR=2.258 (0.44-11.69)
Initial ECG rhythm		<0.001, OR=0.05 (0.029-0.085)
Shockable (ref)	241 (6.1)	
Non-Shockable	3678 (93.9)	
Ambulance shock		<0.001, OR=1.88 (1.59-2.23)
No	3560 (90.8)	
Yes	359 (9.2)	

UNIVARIABLE LOGISTIC REGRESSION

	Aged 65 or above (n= 3919) [a]	p-value [c]
EMS process		
Decision (Recognition-activation) time		0.002, OR=0.878
Mean (mins) ± SD, range	3.4±9.2 (0-151)	(0.787-0.979)
Median (mins), (IQR)	0 (0-3.0)	
Call- bystander CPR time	n=1133	>0.05
Mean (mins) ± SD, range	5.4±4.6 (0-31)	
Median (mins), (IQR)	6 (0-9)	
Call-patient's side time		0.04, OR=0.862
Mean (mins) ± SD, range	9.8±3.7 (2-69)	(0.780-0.953)
Median (mins), (IQR)	9 (8-11)	
Call- First Defibrillation Time		>0.05
n, Mean (mins) ± SD, range	n=358, 16.0±7.5 (4-52)	
Median (mins), (IQR)	14 (10-20)	
Call- PAD Time		>0.05
n, Mean (mins) ± SD, range	n=31, 7.3±4.8 (0-19)	
Median (mins), (IQR)	8 (2-11)	
Call- ambulance CPR time		0.007, OR=1.045
Mean (mins) ± SD, range	10.9±5.1 (0-69)	(1.1012, 1.079)
Median (mins), (IQR)	10 (8-12)	
Call-ROSC time		0.046, OR=0.943
n, Mean (mins) ± SD, range	n=105,20.3±7.9 (7-42)	(0.891-0.999)
Median (mins) , (IQR)	19 (15-25)	
Call-A&E arrival time		>0.05
Mean (mins) ± SD, range	26.8±6.8 (10-104)	
Median (mins), (IQR)	26 (22-30)	
Process time (Patient side- AE arrival time)		>0.05
Mean (mins) ± SD, range	17.0±5.2 (3-74)	
Median (mins), (IQR)	16 (14-20)	

LOGISTIC PREDICTIVE MODEL AFTER BACKWARD SELECTION

	P-value	OR	95% C.I. Lower	95% C.I. Upper
Age	<0.001	0.934	0.899	0.969
Arrest Site (Home as ref)	<0.001			
Arrest Site(1) Public	<0.001	4.251	2.005	9.009
Arrest Site(2) Street	0.977	1.020	0.269	3.868
Arrest Site(3) Elderly home	0.350	.608	0.214	1.728
Arrest Site(4) En-Route	<0.001	10.983	5.168	23.341
Arrest Site(5) Others	1.000	0	0	0
Shockable rhythm	<0.001	8.782	4.810	16.034
Patient side time-TOC(mins)	0.015	.876	0.787	0.975
Constant	0.017	40.884		

Discussion

- Odds of 30-day survival dropped 11% with each year of age increase
- Survival of nursing home residents: 0.39%
  - ? Withold resuscitation
- Survival deteriorated with delays of activation of emergency medical service, ambulance arrival, and first defibrillation

Discussion

- Witnessed arrest on ambulances
  - 10x higher survival
- Bystander CPR by police
  - 13x higher survival
- Public access defibrillation (PAD)
  - 12x higher survival
- Initial VF and pulseless VT carried better prognosis
  - Adjusted OR = 8.78, CI = 4.81 – 16.03, $p < 0.001$

Limitations

- Short study period
- Missing cases not transferred by FSD ground ambulance
- Lack of post-resuscitation care data
- Limitation of predictors derived from parameters with too few samples
  - Esp. time related parameters

Conclusion

- Incidence of elderly OHCA was high
- Survival remained low
- Chain of survival needs to be reinforced
- Structured training to shorten delays to CPR, defibrillation and ambulance
  - Police officers
  - Nursing home staff
  - Home carers
  - Public

Thank you!

Questions and comments?