Wik L, Olsen JA, Persse D, et al.

Manual vs. integrated automatic load-distributing band CPR with equal survival after out of hospital cardiac arrest. The randomized CIRC trial.

Resuscitation. 2014;85(6):741-8.

背景

- ILCOR 強調高品質 CPR
- LDB (load distributing band)
- LDB vs. manual 結果不一

- randomized Circulation Improving Resuscitation Care (CIRC)

研究目的

- 比較患者之出院存活率
  - iA-CPR(integrated automated load distributing band CPR)
  - 高品質 M-CPR (manual CPR)

方法

- 隨機、非盲、有對照組、senquential trial
  - 2009-03-05~2011-01-11
  - 美國 3 處、歐洲 2 處
  - 假定心因性 OHCA 成人

- EMS M-CPR → iA-CPR 或 M-CPR → 追蹤至患者活著出院或死亡

- 主要結果：出院存活率
  - 校正共變項：年齡、目擊、初始心律、地點
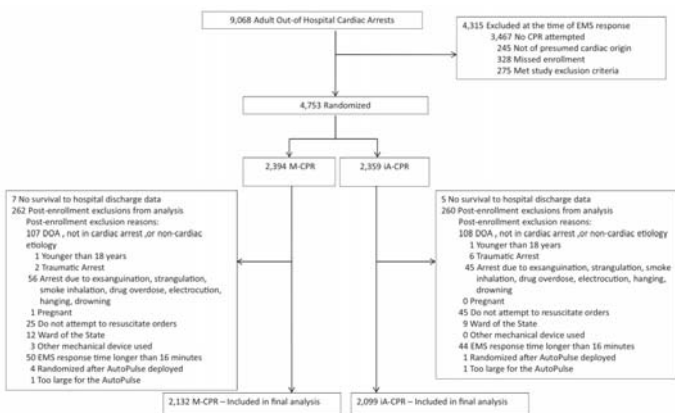 - interim analysis

- 電腦記錄 CPR fraction

Fig. 1. Distribution of potential study patients. *DOA – Dead on Arrival (Note: this occurred when a first responder enrolled the patient and a later arriving unit determined the patient was not viable).

Table 2
Evaluation of potential covariates for survival to hospital discharge by treatment arms.

結果

Table 3
Comparison of outcome by treatment arm.

Outcomes	M-CPR (n = 2132)	iA-CPR (n = 2099)	Covariate adjusted odds ratio (95% CI)	Covariate and interim analyses adjusted odds ratio (95% CI)[a]
Survival to Hospital Discharge	233 (11.0%) (7 cases unknown)	196 (9.4%) (5 cases unknown)	0.89 (0.72-1.10)	1.06 (0.83-1.37)[a]
Survival to 24 h	532 (25.0%) v	456 (21.8%) (10 cases unknown)	0.86 (0.74-0.998)[b]	
Sustained ROSC	689 (32.3%)	600 (28.6%)	0.84 (0.73-0.96)[b]	
Discharge mRS	(n = 233)	(n = 196)		
Score of 0-3	112 (48.1%)	87 (44.4%)	0.80 (0.47-1.37)[b]	
Score of 4-5	61 (26.2%)	50 (25.5%)		
Unknown score	60 (25.8%)	59 (30.1%)		

[a] Adjusted for covariates and interim analyses.
[b] Secondary outcomes can only be adjusted for the covariates, not the interim analyses.

- 4753 名患者 → 排除 522 位（ 11.0% ）
- IA-CPR (2099 [49.6%]) vs. M-CPR (2132 [50.4%])
  - 持續 ROSC（至 ED 時）： 600 (28.6%) vs. 689 (32.3%)
  - 24h survival ： 456 (21.8%) vs. 532 (25.0%)
  - hospital discharge (12 例未知)： 196 (9.4%) vs. 233 (11.0%)
  - 出院存活率之校正勝算比： 1.06 (95% CI 0.83-1.37)
  - 20min CPR fraction ： 80.4% vs. 80.2%

結論

- iA-CPR 之出院存活率與高品質 M-CPR 相當。

討論（ CIRC vs. others ）

- 監測 CPR 品質 (80% vs. 48~60%)
- 消失的 neurologic outcome
  - 26~30% vs. 14~25%
    - 千錯萬錯都是同意書的錯
- CPR 致傷究竟是誰的錯？
- ↑VF/VT ？！

討論（研究缺陷）

- 非盲
- 復甦後照顧鐵定不同
- 只觀察到出院，無長期追蹤
- 壓胸深度是個謎

Table 4
Injuries sustained by patients during the trial.

Injury[a]	M-CPR Arm n = 2132	iA-CPR Arm n = 2099
Number of patients with a reported injury	225 (11%)	242 (12%)
Injuries reported		
Flail chest[b]	1	0
Hemothorax	1	1
Large vessel injury[b]	0	0
Liver injury	0	1
Mediastinal injuries	1	1
Myocardial laceration[b]	1	0
Pneumothorax	20	33
Pulmonary edema	176	159
Rib Fractures	31	69
Spine fracture	2	4
Spleen injury	0	0
Sternum fracture	4	1
Subcutaneous emphysema	6	21
Tympanic membrane rupture	0	0

[a] Listed injuries are not mutually exclusive (one patient can have multiple injuries) and neither diagnostic exams nor autopsy were required as part of the protocol. Injuries were identified using clinical record review.
[b] Required to be submitted to the medical monitor for review.

Rea T, Prince D, Morrison L, et al.

Association Between Survival and Early Versus Later Rhythm Analysis
in Out-of-Hospital Cardiac Arrest:
Do Agency-Level Factors Influence Outcomes?.
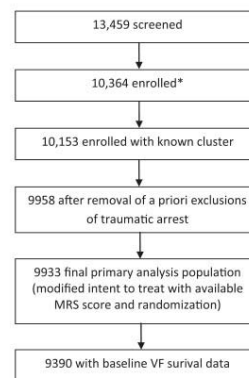Ann Emerg Med. 2014;64(1):1-8.

背景

- 復甦策略是否有效因族群而異。
- OHCA 患者是否先分析心律研究結果不一。
- 大型隨機試驗結果無顯著差異。

研究目的

- 若 VF 存活率低，
  EMS 先分析心律有助於提高存活率？
- 若 VF 存活率高，
  EMS 先 CPR 有助於提高存活率？

方法

- OHCA 隨機試驗 → Secondary, post hoc study
  - 是否先分析心律
  - EMS 分隊之 VF 存活率 (<20% vs. >20%)
- mixed-effects model → 出院時神經功能較佳？

Figure 1. Analyze early versus analyze late study population.
MRS, Modified Rankin Scale.

Table 1. Characteristics according to baseline bystander-witnessed ventricular fibrillation survival and analyze early versus analyze late status.

| | Baseline Survival ≤20% | | Baseline Survival >20% | |
Characteristic, Treatment Strategy	Analyze Early, N=2,291	Analyze Late, N=1,903	Analyze Early, N=2,673	Analyze Late, N=2,523
EMS response interval, mean (SD), min*	6.1 (2.7)	6.0 (2.7)	6.0 (2.8)	6.0 (2.6)
Arrest witnessed, %[†] (n)	45.9 (1,030)	45.8 (855)	44.4 (1,152)	44.7 (1,085)
Bystander CPR, %[†] (n)	34.6 (799)	35.0 (666)	42.5 (1,135)	44.8 (1,135)
Age, mean (SD), y	67.9 (16.3)	68.0 (15.7)	66.0 (16.8)	66.1 (17.1)
Male, %[†] (n)	65.4 (1,499)	64.7 (1,232)	64.1 (1,713)	63.5 (1,601)
Public location, % (n)	13.7 (315)	14.3 (273)	14.2 (381)	14.5 (365)
Presumed cardiac cause, %[†] (n)	97.9 (2,242)	98.0 (1,864)	97.9 (2,616)	97.6 (2,462)
Service level of first vehicle to arrive				
BLS, %[†] (n)	3.2 (74)	74.1 (77)	0.6 (16)	0.1 (2)
BLS-D, %[†] (n)	38.7 (886)	39.9 (758)	65.5 (1,751)	66.1 (1,667)
BLS+, %[†] (n)	15.6 (357)	15.9 (302)	11.0 (295)	11.4 (288)
ALS, %[†] (n)	42.5 (973)	40.2 (765)	22.9 (611)	22.4 (566)
Perishock pause, mean (SD), s	30.6 (16.7)	31.7 (15.9)	21.7 (12.4)	22.0 (12.8)
EMS initial rhythm				
VF, %[†] (n)	26.0 (594)	25.6 (484)	23.3 (617)	25.1 (627)
PEA, %[†] (n)	19.1 (437)	18.8 (355)	19.5 (516)	19.0 (474)
Asystole, %[†] (n)	46.8 (1,069)	48.0 (908)	46.4 (1,226)	45.3 (1,131)
Perfusing, %[†] (n)	0.1 (3)	0.3 (5)	0.1 (2)	0.3 (7)
No shock and no strip, %[†] (n)	8.0 (182)	7.4 (140)	10.7 (284)	10.4 (259)

BLS, Basic life support; BLS-D, basic life support defibrillation; BLS+, BLS providers with limited ALS scope of practice (for example, some BLS+ providers can place an intravenous access or supraglottic airways); ALS, advanced life support; VF, ventricular fibrillation; PEA, pulseless electrical activity.
*EMS interval was the time from call receipt by emergency dispatch center to the time EMS arrived at the scene of the arrest. Baseline survival was for bystander-witnessed VF not attributed to an obvious noncardiac cause. BLS-D providers were equipped with defibrillation capability (automated external defibrillators). Perfusing rhythm patients were noted to have a pulse on the first EMS rhythm analysis.
[†]Percentage of known.

Table 2. Outcomes according to baseline bystander-witnessed ventricular fibrillation survival and analyze early versus analyze late status.

| | Baseline VF Survival ≤20% | | Baseline VF Survival >20% | |
Treatment Strategy	Analyze Early, N=2,291	Analyze Late, N=1,903	Analyze Early, N=2,673	Analyze Late, N=2,523
ROSC at ED arrival, % (n)	19.8 (453)	19.8 (377)	30.2 (806)	31.1 (783)
Survived to hospital discharge, % (n)	6.8 (155)	5.1 (97)	9.4 (251)	10.1 (255)
Favorable functional survival % (n)	5.5 (127)	3.8 (72)	6.2 (167)	7.5 (189)
OR of favorable survival (95% CI)*	1 (reference)	0.67 (0.50, 0.90)	1.14 (0.90, 1.44)	1.38 (1.09, 1.74)

VF, Ventricular fibrillation; ROSC, return of spontaneous circulation; CI, confidence interval.
*For the comparison of analyze late versus analyze early for the strata with baseline VF survival greater than 20%, the OR=1.22 (0.98, 1.51). Favorable neurologic survival was defined as survival to hospital discharge with a modified Rankin Scale score less than or equal to 3.

Table 3. Primary logistic regression model of odds of favorable functional survival.

| | OR (95% CI) | |
Predictor Variable	Primary Model	Model With Perishock Pause*
Analyze early	1 (reference)	1 (reference)
Analyze late	0.75 (0.59–0.96)	0.83 (0.59–1.18)
Epistry survival rate for a +10% difference	1.26 (1.05–1.52)	1.26 (1.03–1.53)
Interaction between analyze late and baseline survival, for a +10% difference	1.34 (1.07–1.66)	1.28 (0.97–1.70)
Perishock pause, median from the first 3 shocks	—	
<20 s	—	1 (reference)
≥20 s, <40 s	—	0.69 (0.51–0.92)
≥40 s	—	0.64 (0.38–1.10)
Covariates		
Bystander CPR	1.25 (1.02–1.54)	1.15 (0.86–1.52)
Witnessed arrest	2.49 (1.95–3.19)	2.89 (2.02–4.14)
Age, for 1-y increase	0.96 (0.95–0.97)	0.96 (0.96–0.97)
Public location	1.82 (1.47–2.25)	1.65 (1.24–2.20)
EMS arrival ≤10 min	2.11 (1.23–3.62)	2.09 (0.99–4.41)
No obvious cause	1.35 (0.52–3.54)	—
Male	1.01 (0.80–1.28)	0.96 (0.69–1.35)
EMS initial rhythm		
VF/VT	1 (reference)	—
PEA	0.19 (0.14–0.26)	—
Asystole	0.03 (0.02–0.05)	—
Perfusing	5.17 (1.74–15.34)	—
AED, no shock, no strip	0.14 (0.08–0.23)	—

*Model with perishock pause is restricted to patients presenting with an initial shockable rhythm. Restricted to those with an initial rhythm of ventricular fibrillation.

結果

- 後分析（ 4426 ） vs. 先分析（ 4964 ）
  - 患者特性相彷
  - 出院時神經功能較佳的機率＆ (odds ratio [95% CI])
    - VF 存活率 <20% ： 3.8% vs. 5.5% (OR 0.67 [0.50~0.90])
    - VF 存活率 >20% ： 7.5% vs. 6.1% (OR 1.22 [0.98~1.52])
    - 多變數校正：
      VF 存活率↑ 10% ，
      odds ↑34% (OR 1.34 [1.07~1.66])

結論

- 系統層面的特性可能影響復甦結果。

討論 (研究缺陷)

- 非前瞻性研究
  - 機制？
  - CPR 品質？
  - 施救者經驗？
- EMS 系統 vs. EMS 分隊
- Epistry (epidemiologic registry) 排除 6% (543/9933)

討論

- 復甦策略沒有最好，只有最合適
- CPR 品質？ (品質面面觀)
- Individual vs. system