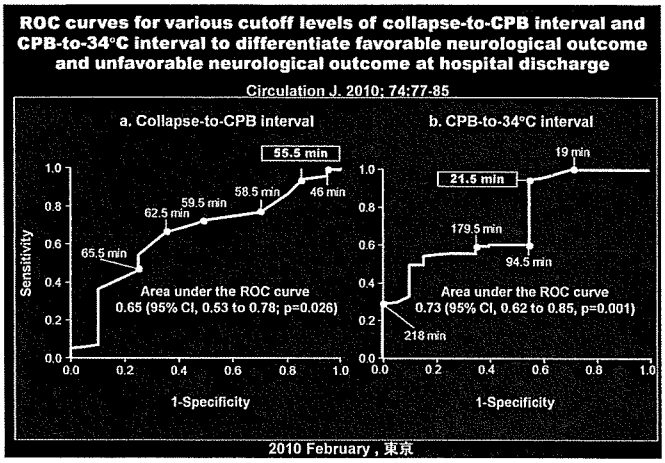
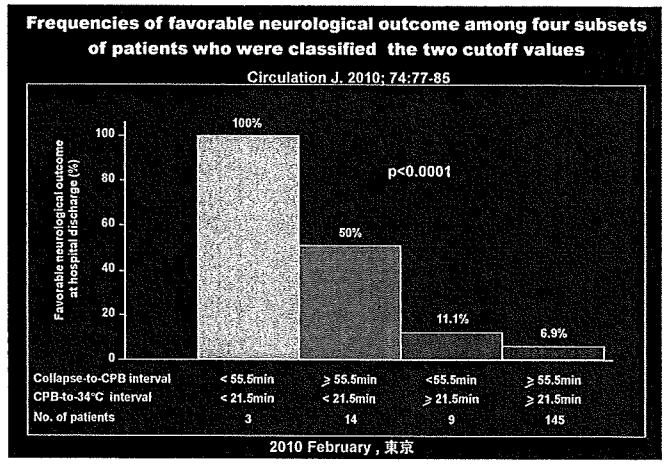

ROC curves for various cutoff levels of collapse-to-CPB interval and CPB-to-34°C interval to differentiate favorable neurological outcome and unfavorable neurological outcome at hospital discharge
Circulation J. 2010; 74:77-85
a. Collapse-to-CPB interval
b. CPB-to-34°C interval
Sensitivity
1-Specificity
55.5 min
65.5 min
62.5 min
59.5 min
58.5 min
46 min
Area under the ROC curve
0.65 (95% CI, 0.53 to 0.78; p=0.026)
21.5 min
19 min
179.5 min
94.5 min
218 min
Area under the ROC curve
0.73 (95% CI, 0.62 to 0.85, p=0.001)
2010 February , 東京


Frequencies of favorable neurological outcome among four subsets of patients who were classified the two cutoff values
Circulation J. 2010; 74:77-85
Favorable neurological outcome at hospital discharge (%)
100%
p<0.0001
50%
11.1%
6.9%
Collapse-to-CPB interval
CPB-to-34°C interval
No. of patients
< 55.5min
< 21.5min
3
≥ 55.5min
< 21.5min
14
<55.5min
≥ 21.5min
9
≥ 55.5min
≥ 21.5min
145
2010 February , 東京


Study of Advanced life support for Ventricular fibrillation with Extracorporeal circulation in Japan
UMIN000001403
SAVE J
2010 February , 東京


心停止患者に対する低体温療法は、ACLSの主要治療戦略である。
2010 February , 東京

J-PULSE-Hypo registry: Mild Hypothermia Therapy for Acute Coronary Syndrome

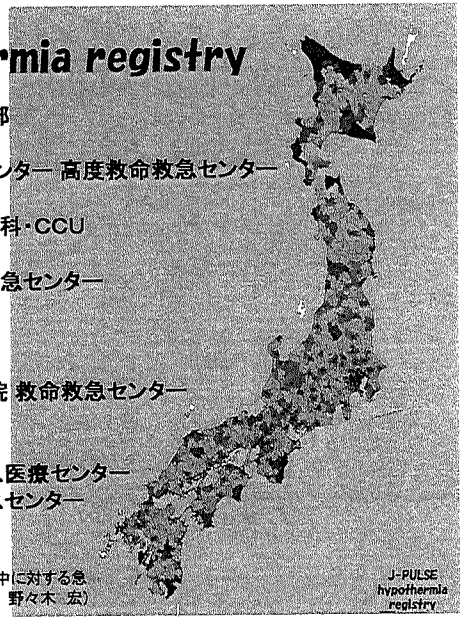
Shinichi Shirai [1], M.D., Ken Nagao [2], M.D., Hiroshi Nonogi [3], M.D., Naohiro Yonemoto [3], M.D., Hiroyuki Yokoyama [3], M.D., Mamoru Hase [4], M.D., Yoshio Tahara [5], M.D., Kazunori Kashiwase [6], M.D., Yuji Yasuga [7], M.D., Hideki Arimoto [8], M.D., Soma Kazui [9], M.D., Hirotaka Sawano [10], M.D., Hiroshi Hazui [11], M.D., Takuro Hayashi [12], M.D.,Tatsuya Maruhashi [13], M.D., Yasuhiro Kuroda [14], M.D., Yuichi Motomura [15], M.D.

and for the J-PULSE Hypo registry Investigators.

[1] Division of Cardiology, Kokura Memorial Hospital, [2] Division of Cardiology, Nihon University Surugadai Hospital, [3] Division of Cardiology National Cardiovascular Center, [4] Emergency and Critical Care Center, Sapporo City University Hospital, [5] Emergency and Critical Care Center, Yokohama City Hospital, [6] Division of Cardiology, Osaka Police Hospital, [7] Department of Cardiology, Sumitomo hospital, [8] Emergency and Critical Care Center, Osaka City Medical Center, [9] Emergency and Critical Care Center, Kitazato University Hospital, [10] Emergency and Critical Care Center, Saiseikai Senri Hospital, 11 Osaka Mishima Emergency Critical Care Center, [12] Emergency and Critical Care Center Kobe City Medical Center General Hospital, [13] Department of Cardiology, Hiroshima Municipal Hospital, [14] Emergency and Critical Care Center, Kagawa Univeristy Hospital, [15] Emergency and Critical Care Center, Saga University Hospital.

J-PULSE hypothermia registry

札幌医大付属病院 救急集中治療部
駿河台日本大学病院 循環器科
横浜市立大学付属市民総合医療センター 高度救命救急センター
北里大学病院 救急救命センター
国立循環器病センター 心臓血管内科・CCU
大阪府三島救命救急センター
大阪市立総合医療センター 救命救急センター
大阪警察病院
大阪府済生会千里病院
住友病院 循環器内科
神戸市立医療センター中央市民病院 救命救急センター
広島市民病院 循環器科
香川大学医学部付属病院
山口大学医学部付属病院 先進救急医療センター
佐賀大学医学部附属病院 救命救急センター
小倉記念病院循環器科



厚生労働省；H19-心筋-03 急性心筋梗塞と脳卒中に対する急性期診療体制の構築に関する研究（主任研究者 野々木 宏）

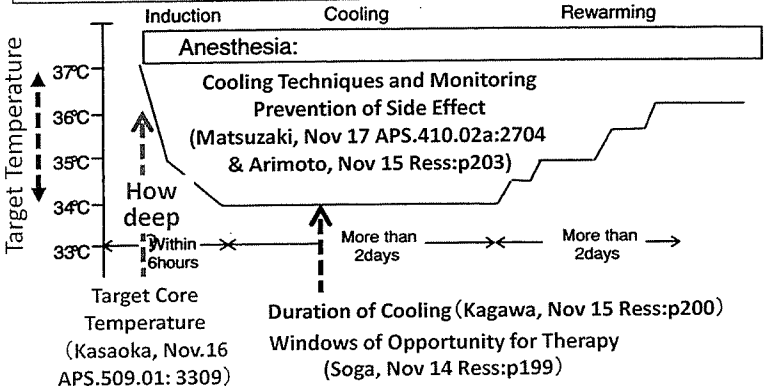
8 Clinical Questions from J-PULSE-Hypo in 2009

Patients characteristic

Initial Patients Evaluation (blood exam.) (Kashiwase, Nov 15 Ress:p202)

Impact of AMI/ACS (Shirai Nov 14 Ress: p94)

PCPS with Hemodynamic Compromised State (Kokubu, Nov 14 Ress:p95)



Courtesy of Hiroyuki Yokoyama

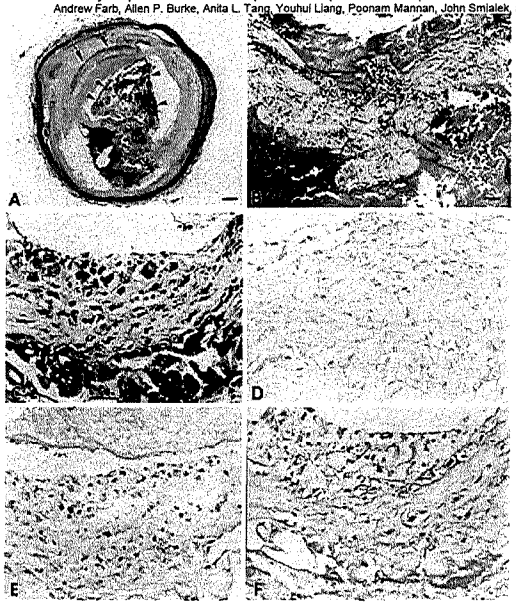
Introduction

Resuscitated patients from sudden cardiac death (SCD) had a poor prognosis because of not only high mortality but also severe neurologic disability (1)

Ischemic heart disease was reported to be the main causes of SCD. Myocardial infarction was the main causes of SCD (2,3), therefore, emergency revascularization therapy might be the most effective for improving the mortality for the patients with cardiac arrest due to acute ischemic coronary artery disease, even without ST segment elevation in ECG (3).

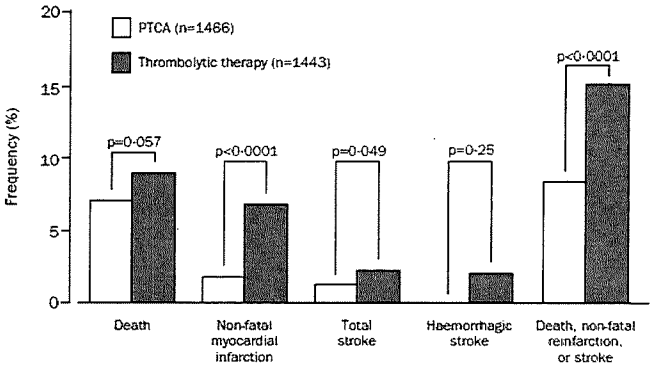
For the patients with post cardiac arrest syndrome (PCAS), 'bundled' therapy was recommended, that is ,early coronary revascularization (3-5), temperature control (6,7) was mandatory treatment strategy (8). Percutaneous coronary intervention (PCI) with mild hypothermia therapy (MHT) was effective for the cardiac arrest patients with ST elevation MI (9).

Coronary Plaque Erosion Without Rupture Into a Lipid Core : A Frequent Cause of Coronary Thrombosis In Sudden Coronary Death
Andrew Farb, Allen P. Burke, Anita L. Tang, Youhui Liang, Poonam Mannan, John Smialek, and Renu Virmani. *Circulation*. 1996;93:1354-1363



Acute thrombosis of the left anterior descending coronary artery was found in this 54-year-old man with witnessed cardiac arrest and death 2.5 hours after the onset of chest pain. A, Concentric plaque with a large hemorrhagic lipid core (L) and focal calcification (arrows) is seen at low power; an occlusive thrombus (arrowheads) is present. B, The platelet-rich thrombus (T) is adjacent to the rupture of the fibrous cap (high power). Immunohistochemical staining demonstrates abundant macrophages (in C), an absence of smooth muscle cells (in D), and scattered T cells (in E) with HLA-DR–positive macrophages and T cells (in F).

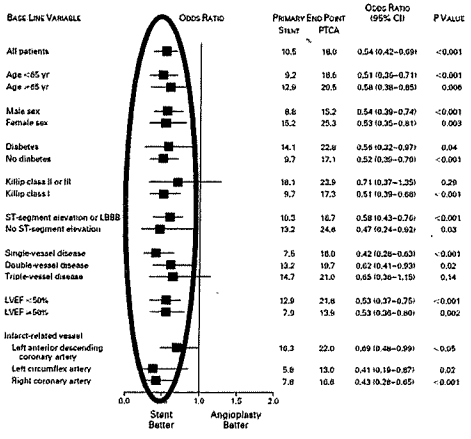
PCI was the main stream for the treatment of STEMI.



Short-term clinical outcomes in individuals treated with on-site thrombolysis or after emergent transfer for primary PTCA

Lancet 2003;361:13-20.

COMPARISON OF ANGIOPLASTY WITH STENTING, WITH OR WITHOUT ABCIXIMAB, IN ACUTE MYOCARDIAL INFARCTION



N Engl J Med 2002;346:957-66.

Acute coronary angiographic findings in survivors of out-of-hospital cardiac arrest

Characteristic	No significant CAD (n = 26)	Significant CAD (n = 46)	P	Total (n = 72)
Electrographic patterns on admission*				
ST-segment elevation	2 (7.7)	21 (45.7)	.0009	23 (31.9)
ST-segment depression	6 (230.)	15 (32.6)	.4	21 (29.2)
Left bundle branch block	4 (15.4)	8 (17.4)	1.0	12 (16.7)
Unspecific ST or T changes	8 (30.7)	4 (8.7)	.02	12 (16.7)
Normal	6 (23)	5 (10.9)	.2	11 (15.3)

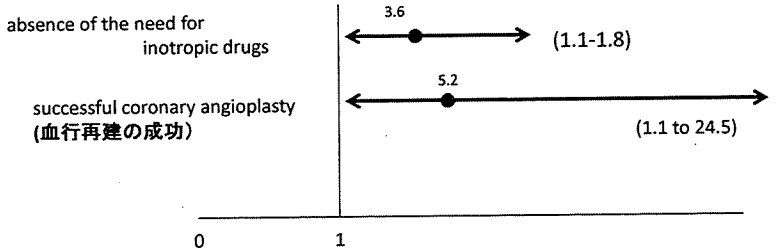
Pattern of ECG change immediately after ROSC.

ECG did not reflect the severity of coronary lesion.: in some cases, no significant change or normal pattern was found in the case of coronary block. Therefore, no ECG change immediately after ROSC could not conclude that the reason of cardiac arrest was due to the coronary ischemia.

⇒Emergency coronary angiography immediately after ROSC should be performed to establish the adequate diagnosis and treatment in order to improve the prognosis

Am Heart J 2009;157:312-8.

IMMEDIATE CORONARY ANGIOGRAPHY IN SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST

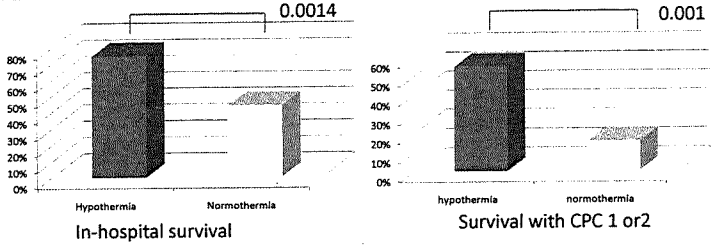


A longer time between the onset of cardiac arrest and the return of spontaneous circulation was associated with a lower rate of survival, with an odds ratio for mortality of 1.1 per minute of delay (95 percent confidence interval, 1.02 to 1.12; P=0.003).

心肺停止患者において生存の条件は血行再建の成功であるといわれている。

N Engl J Med 1997;336:1629-33.

Primary percutaneous coronary intervention and mild induced hypothermia in comatose survivors of ventricular fibrillation with ST-elevation acute myocardial infarction



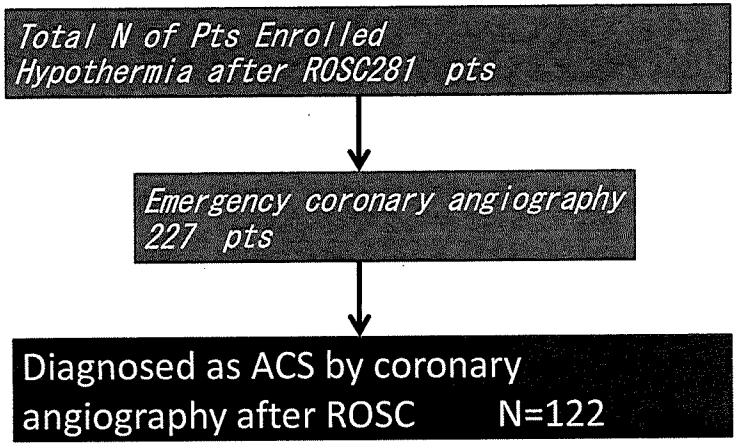
(Conclusion)

Our preliminary experience indicates that primary PCI and MIH are feasible and may be combined safely in comatose survivors of ventricular fibrillation with signs of STEMI. Such a strategy may improve survival with good neurological recovery.

Vfによる心肺停止を発症したST上昇型心筋梗塞患者に対してPCIおよび低体温療法を施行することは生存率およびCPC1,2という神経学的予後の改善をもたらすことが可能である。

Resuscitation (2007) **74, 227—234**

Results



From 2005 to 2008, two hundred eighty one patients were enrolled with fulfillment of the inclusion criteria. Of those 281 patients, emergency coronary angiography was attempted in 227 patients. For this current analysis of this sub-study of J-PULSE Hypo registry, one hundred twenty two patients were evaluated for the efficacy of hypothermia with emergency percutaneous coronary intervention (PCI).

Baseline Characteristics (1)

Man (%)	95.1
Age	60+/−11
Bystander CPR (%)	54.1
Shockable Rhythm (%)	82.8
Mean no flow time (min)	3.0
OMI (%)	2.5
History of Heart Failure (%)	4.9
Stroke (%)	5.7
Hypertension (%)	35.0
Diabetes (%)	15.6
Mean GCS	3.8
ROSC before ER (%)	55.7
Hb (mean g/dl)	14.0+/−1.6
Serum K (mEq/l)	4.1+/−0.9
Cre>1.5 (%)	12.3

Baseline Characterstics (2)

mean B.E	−12.9
mean CA-ROSC	30 +/− 24
Cold saline use (%)	52.7
Surface cooling (%)	56.0
Over cooling during Tx (%)	28.6
cooling start to target temperature (min)	239.8+/− 211.4
Mean cooling time (hrs)	32.6+/−14.0
Rewarming	
24 hours>= (%)	24.6
24–48 hours (%)	30.3
48–72 hours (%)	33.6
72 hours<	9.0
Multivessel disease (%)	41.0
Anterior MI (%)	63.1
Left main culprit (%)	4.0
IABP use (%)	61.5
PCPS use (%)	29.5

Clinical Outcomes

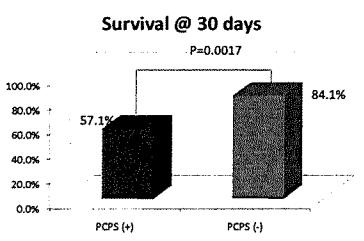
Alive @ 30days 77.0%

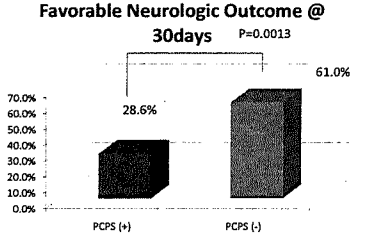
Favorable Neurologic Outcome @ 30days 52.0%

Including cardiogenic shock required PCPS

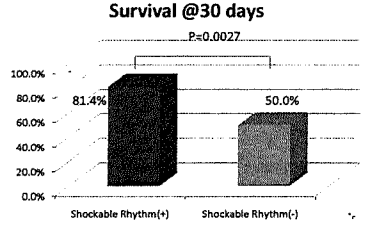
Clinical Outcomes (2)

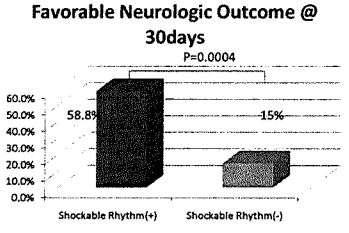
PCPS use





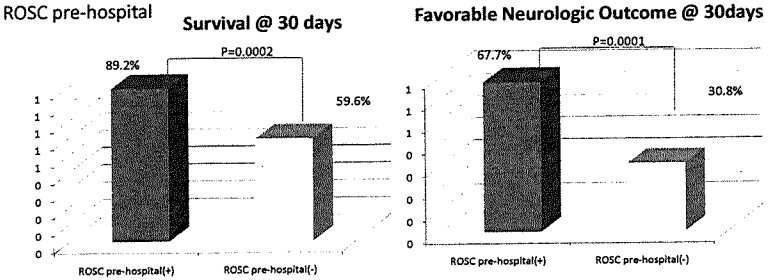
Shockable Rhythm



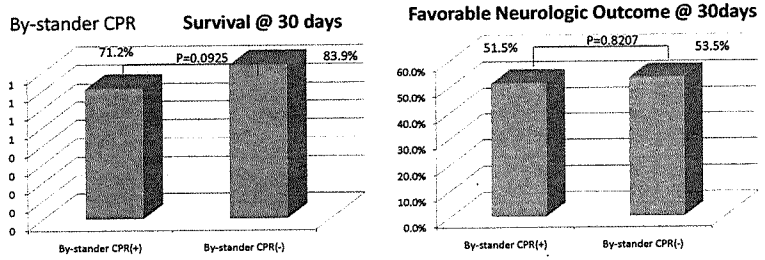


Clinical Outcomes (2)

ROSC pre-hospital



By-stander CPR

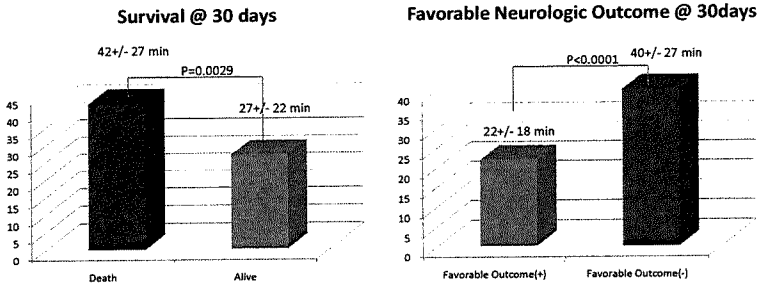


Which is better: PCI first or Hypothermia first?

- Merits of early PCI for the cardiac arrest patients with acute coronary events were improving mortality. On the other hand, these procedure needed anticoagulation and anti-platelet therapy, therefore, increased risk for bleeding.
- Early induction of hypothermia was recommended (10,11), however, it remained unknown which procedure should be initiate, PCI or MHT in case of acute ischemic coronary event that was indication for emergency revascularization therapy.
- Our study examined clinical outcomes and efficacies of early induction of MHT prior to PCI group (Early induction group: Group E) compared with late induction of MHT after PCI (Late Induction group: Group L).

Clinical Outcomes (3)

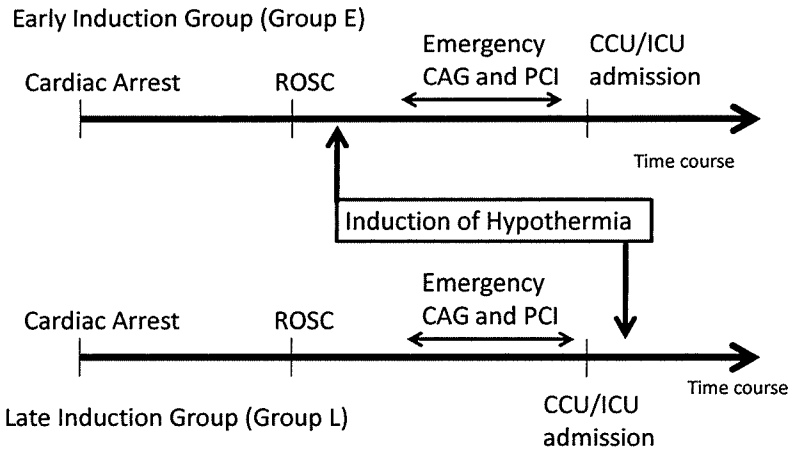
Correlation Between Collapse to ROSC time and Clinical Outcomes



Complication	Normothermia	Hypothermia
	no./total no. (%)	
Bleeding of any severity†	26/138 (19)	35/135 (26)
Need for platelet transfusion	0/138	2/135 (1)
Pneumonia	40/137 (29)	50/135 (37)
Sepsis	9/138 (7)	17/135 (13)
Pancreatitis	2/138 (1)	1/135 (1)
Renal failure	14/138 (10)	13/135 (10)
Hemodialysis	6/138 (4)	6/135 (4)
Pulmonary edema	5/133 (4)	9/136 (7)
Seizures	11/133 (8)	10/136 (7)
Lethal or long-lasting arrhythmia	44/138 (32)	49/135 (36)
Pressure sores	0/133	0/136

N Engl J Med 2002;346:549-56.

Figure-2



	Late Induction (L) (N=70)	Early Induction (E) (N=42)	p-value
Age	61+/−1	58+/−2	0.0788
Man (%)	94.3	95.2	0.8284
Witness (%)	90.0	88.1	0.7524
By-stander CPR (%)	54.2	50.0	0.6601
Shockable Rhythm (%)	82.9	83.3	0.9482
No flow time (min)	2.8+/−0.8	4.6+/−1.1	0.2025
Prior MI (%)	3.2	2.5	0.8427
History of heart failure (%)	6.3	5.0	0.7757
History of Stroke (%)	6.3	5.0	0.7757
Hypertension (%)	27.0	35.0	0.3874
Diabetes	19.0	15.0	0.5981
Hemoglobin (g/dl)	13.7+/−2.0	14.2+/−2.0	0.1546
Serum creatinine (mg/dl)	1.47+/−0.25	1.74+/−0.32	0.5312
Serum potassium (mEq/l)	4.0+/−0.1	4.0+/−0.1	0.9101
Serum glucose (mg/dl)	286+/−12	277+/−15	0.6558
Collapse to ROSC (min)	31.3+/−2.9	28.2+/−4.0	0.5312
Hemodynamic compromise (%)	15.1	22.9	0.3356

Table-1 Baseline patient characteristics. CPR: cardiopulmonary resuscitation, MI: myocardial infarction. ROSC: recovery of spontaneous circulation.

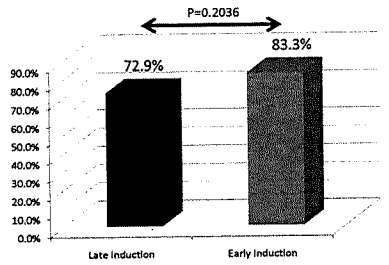
	Late Induction (L) (N=70)	Early Induction (E) (N=42)	p-value
Target temperature (%)			
33 Celsius degree	25.7	0.0	<0.0001
34 Celsius degree	72.8	90.5	
35 Celsius degree	1.4	9.5	
Cold fluid infusion at Initiation of MHT (%)	32.4	82.6	<0.0001
Blood cooling methods for maintenance of hypothermia (%)	30.0	66.6	<0.0001
Collapse to Initiation of hypothermia (min)	168+/−9	52+/−13	<0.0001
Collapse to target temperature (min)	422+/−28	230+/−38	<0.0001
Initiation to target temperature (min)	278+/−25	173+/−32	0.0106
Cooling duration (hours)	33.3+/−1.8	31.3+/−2.4	0.5107
Rewarming time (%)			
24hours>=	25.0	26.8	0.0125
25-48	32.4	22.0	
49-72	27.9	51.2	
72=<	14.7	0.0	
Excessive cooling (%)	37.1	11.9	0.0039

Table-2 hypothermia data. MHT: Mild Hypothermia Therapy

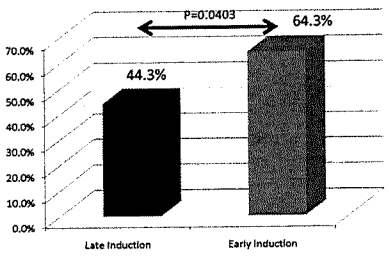
	Late Induction (L) (N=70)	Early Induction (E) (N=42)	p-value
Anterior Myocardial infarction (%)	57.1	78.6	0.0212
Multi-vessel disease (%)	38.6	42.9	0.6542
Use of IABP (%)	60.0	61.9	0.8416
Use of PCPS (%)	25.7	33.3	0.3875
Pre TIMI (n)			
0	45	22	0.6174
1	10	7	
2	7	4	
3	8	8	
Post TIMI			
0	0	1	0.1947
1	0	0	
2	4	5	
3	66	35	
Stent use (%)	92.3	93.0	0.9001

Table-3 Angiographic and Intervention data.

Figure-3



A. Survival at 30 days



B. Favorable Neurologic Outcome at 30 days

Odds ratio, 2.26, 95% CI, 1.03 to 4.98, p=0.0403

	Late Induction (GroupL)	Early Induction (Group E)	p-value
Blood Transfusion (%)	10.3	25.0	0.0629
DIC	5.1	6.9	0.7071
Infection	15.4	20.8	0.4841

Table-4 During hypothermia complication data.

Conclusion

1) Mild Hypothermia therapy with coronary intervention for ACS patients complicated by cardiac arrest was safe and effective for improving mortality and neurological outcomes compared with previous reports even in this high-risk cohorts.
2) Very high-risk patients with profound shock requiring PCPS was high-mortality and less favorable-outcome, however, for almost one-third of the shock patients, MHT with PCI was effective to achieve favorable outcome.
3) Early ROSC was one of the contributor for intact neurologic survival, therefore, early establishment of circulation might be effective by using extracorporeal circulation assist device.
4) Mild hypothermia induction prior to coronary intervention did not only increase complication rates even using anticoagulation with anti-platelet therapy but had an efficacy to achieve neurological recovery compared with coronary intervention before cooling.

Discussion

We reported the safety and efficacy of early induction of mild therapeutic hypothermia (MHT) prior to coronary intervention.

In previous reports (#3,5,6-8), the efficacy of MHT with PCI was limited for the cardiac arrest pts with STEMI. This was the first report of the efficacy and safety of the early induction of hypothermia prior to PCI for the patients with angiographically confirmed severe coronary block immediately after ROSC without limitation of ST elevation in ECG. In our study cohorts, more than 80 percent of all this MHT patients received coronary angiography, as a results, almost half of the resuscitated pts were treated in PCI.

In previous reports, the patients with cardiac arrest (CA) had a coronary artery disease (CAD), and CAD was the leading cause of sudden cardiac arrest (SCD)(#1). Furthermore, acute plaque change was found in 40-86% of resuscitated patients from CA and 15-64% of autopsy cases (#2). Percutaneous coronary intervention (PCI) was reported to be feasible and effective for the STEMI patients with CA, even for unconscious pts immediately after ROSC (#3-10). Success of revascularization was associate with the improvement of survival rate after ROSC (#4). Therefore, emergency coronary angiography and PCI for the culprit lesion was thought to be the standard care for the post cardiac arrest syndrome (PCAS) in patients with out-of –hospital cardiac arrest with ROSC to protect myocardium (#11).

MHT was reported to be associated with bleeding complication (#17). Furthermore, the procedure of coronary intervention increased bleeding complication because of administration of aspirin, thienopyridines and heparin before and during PCI to prevent stent thrombosis. Therefore, the beneficial effect of MHT prior to PCI to improve neurologic outcome was not fully elucidated because of bleeding risk of the procedures. Our results reported that in early hypothermia induction group, the complication rate of blood transfusion was lower than late induction group. This finding revealed the safety of early MHT induction prior to PCI as to bleeding complication. Same as previous reports (#18), usage of 4 degree cold saline infusion in order to start MHT was not only safe for the patients underwent PCI, but also effective to shorten the time to reach target temperature.

This result confirmed that the combination therapy of MHT with PCI was the effective and mandatory therapy to achieve favorable neurologic outcome to treat PCAS patients who suffered from acute coronary event, and elucidate that the therapeutic time window of the MHT was narrower than that of PCI, therefore, MHT should be started as soon as possible.

Early induction of hypothermia using cold saline should be applied for any etiology of cardiac arrest even in ischemic origin necessary to perform coronary intervention to achieve favorable neurologic outcome.

Bundled therapy, together with following interventions; Early coronary reperfusion, control of ventilation, blood glucose control, temperature control, treatment of seizures, was recommended for the patients with PCAS. In terms of this theory, PCI itself improved the mortality of the pts, however, PCI without hypothermia could not achieve the improvement of neurologic outcome (#12). Therefore, it was necessary to undergo MHT with PCI in order to have neurolgical benefit. The early induction of hypothermia was reported to be neurologically beneficial as soon as possible in animal model (#14) and human (#15, 16)

①心肺停止患者においては、ほとんどの症例において冠動脈疾患を有しているばかりではなく心臓性突然死の大きな原因であることも報告されている(#1)。さらに心肺蘇生後生存患者においては40-86%、剖検症例からは15-64%の頻度で、冠動脈プラークの急性変化が認められると報告されている(#2)。

②心肺停止に至ったSTEMIを含む急性冠動脈eventにたいしてはPCIを施行することで、たとえ意識障害が遷延している患者においてもメリットを有していることも報告されている(#3-#10)。そして、生存のためにはPCIの成功が必要条件であることも報告されている(#4)。心肺停止患者に対して緊急冠動脈造影検査を施行すること、そして責任病変に対してPCIを施行することは、standard-careの一つとすべきと考えられる(#11)。

②また、蘇生後症候群の患者管理に対してはBundled therapy, together with following interventions; Early coronary reperfusion, control of ventilation, blood glucose control, temperature control, treatment of seizures was recommended. (#11)、であり、PCI単独では神経学的予後の改善も得られないと報告されている(#12)。therefore, 冠動脈eventを原因とする心肺停止患者においてPCIと低体温療法をcombinationで施行することは、予後の改善につながると報告されている(#13)。

③心肺停止に対する低体温療法は早ければ早いほど神経学的予後を改善すると報告されており、実際Intra-arrest coolingを施行することで神経学的予後が改善する証明として動物実験(#14)、そして人でも(#15)evidenceが得られてきている。

⑤ 今回の我々の報告では、低体温先行群に比べ、PCI先行群で輸血を必要とする出血性合併症が少なかったが、これに関して、その原因は明らかではない。しかし、以前の報告と同様(#18)、4℃の冷却水をPCI施行前に低体温のinductionとして使用することは、出血性合併症が増加するということはなく、安全に投与可能であるだけでなく、目標温度への到達時間を短縮させることが可能であり、有用であることも明らかであった。

今回の結果はPCAS治療において冠動脈InterventionとMHTは良好な神経学的予後を得る為に必要不可欠な治療であるが再認識されたこと、さらにMHTはPCIに比べ治療を開始する際のtime-windowが重要であり、PCIよりも早期に開始することが重要であると考えられる。

⑥ その点からは、心肺停止という状況に対して早期からの低体温を施行する際にはCPAの原因となった疾患の違いは問題がないことも認められた。

⑦ このことから、将来、pre-hospitalからの低体温の開始がなされる際、インターベンション施行に有無にかかわらず、全例で開始輸液を低体温で施行することが推奨されるものと予測される。

⑥ 過去の報告は、心肺停止を合併したSTEMI症例(#3,5,6-8)であるが我々の報告はlimitationを加えずに心肺停止蘇生後状態の患者のうち約80%以上の患者に対して、原因究明のための緊急冠動脈造影検査が施行されている。さらに、動脈硬化に起因する責任病変に対してPCIを施行するだけでなく脳保護目的で施行し最初の報告と考えられる。

In previous reports (#3,5,6-8), the efficacy of MHT with PCI was limited for the cardiac arrest pts with STEMI. In this report, more than 80 percent of all this MHT registry patients received coronary angiography immediately after ROSC, furthermore, the pts with significant stenosis or coronary block was treated in PCI subsequently performed coronary angiography.

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Study Limitation

1) RESISTRYのデータであり、ランダム化されていないこと
2) 低体温を先行したは経過のうち比較的晩期に施行されていること
3) 比較的症例数が少ないこと
4) 冠動脈eventとしてはplaque ruptureを原因とするACSが疾患群以外にも冠れん縮による突然死も対象となる場合があるが、今回のinclusionとしてはその群は入っていない。

であるが、そうした条件ではあっても、インターベンションを施行する患者群においても低体温を早期から施行することは生存率、とくに心機能に影響を与えず、神経学的予後を良好なものとしたことは優位性をもって認められた結果であると考えられた。

	Late Induction (L) (N=70)	Early Induction (E) (N=42)	p-value
Age	61+/−1	58+/−2	0.0788
Man (%)	94.3	95.2	0.8284
Witness (%)	90.0	88.1	0.7524
By-stander CPR (%)	54.2	50.0	0.6601
Shockable Rhythm (%)	82.9	83.3	0.9482
No flow time (min)	2.8+/−0.8	4.6+/−1.1	0.2025
Prior MI (%)	3.2	2.5	0.8427
History of heart failure (%)	6.3	5.0	0.7757
History of Stroke (%)	6.3	5.0	0.7757
Hypertension (%)	27.0	35.0	0.3874
Diabetes	19.0	15.0	0.5981
ROSC before hospital arrival (%)	42.9	64.2	0.1842
Hemoglobin (g/dl)	13.7+/−2.0	14.2+/−2.0	0.1546
Serum creatinine (mg/dl)	1.47+/−0.25	1.74+/−0.32	0.5312
Serum potassium (mEq/l)	4.0+/−0.1	4.0+/−0.1	0.9101
Serum glucose (mg/dl)	286+/−12	277+/−15	0.6558
Collapse to ROSC (min)	31.3+/−2.9	28.2+/−4.0	0.5312
Hemodynamic compromise (%)	15.1	22.9	0.3356

Table-1 Baseline patient characteristics. CPR: cardiopulmonary resuscitation, MI: myocardial infarction. ROSC: recovery of spontaneous circulation.

J-PULSE. SAVE-J　合同公開報告会

病院内での取り組み:院内心停止登録から

国立病院機構 独立行政法人

鹿児島医療センター

循環器科　　田中 秀樹　薗田 正浩

医療安全係長　東 幸代

H18年度からわが国における院内心停止の実態の解明のため、政策医療ネットワーク共同研究(院内心停止例の実態と対策)の研究が始められ、院内ウツタイン様式に準じた効率的かつ統一した登録が検討された。

⬇

H19年度からは急変および心肺停止症例を集積し、データ集積ソフトに入力し、登録における問題点を解析した。

⬇

H20年度は登録票の記載と回収率の充実、それを構築するための院内救急体制と情報収集体制を構築することを主眼とした。

問題点

①急変症例の情報収集について

専門科、各病棟、各医師間において院内急変時の登録用紙にかなりのばらつきがある。また急変時は処置に追われ、人手が少なく、時間経過の記載が不十分であったり、記録漏れが多く見受けられる。

②急変症例への対応について

専門科、各病棟、各個人間において心肺蘇生法にばらつきがある。

解決策

①急変症例の情報収集について

院内急変発生時に医療安全係長(看護師長)にも緊急コールし、発生状況や蘇生経過についてリアルタイムに把握する。登録用紙を漏れなく記載し、後からWeb登録する。

②急変症例への対応について

各病棟、部門別に急変時の対応のBLSトレーニングを8回開催し、職員全員が統一した救急体制を取れることを目指した。このBLSトレーニングはH22年度も引き続き継続して開催している。また、鹿児島トレーニングサイトの協力の元、BLS/ACLS資格取得の研修を当院で開催し、新たに45名の資格者が実現できた。

今後の展開と目標

院内にとどまらず、J-RCPRの集積データをもとに情報のフィードバックをすすめ、質の高い救急処置を目指していく。

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JRCPR

Japanese Registry of CPR for Inhospital Cardiac Arrest

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本邦においての院内心停止に関するデータは少ない。

JRCPRに参加した11施設において2008年1月～12月の1年間に発生した院内心停止の状況を診療録から後ろ向きに登録し、非連結匿名化したデータを収集統合した。

本研究は倫理委員会により登録方法に関して承認されている。

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登録基準

病院施設中のすべての患者、訪問者、従業員、スタッフに生じた院内心停止症例を対象。

脈なし、または組織灌流が不十分なために胸骨圧迫を実施または無脈性VTやVFに対する除細動による心肺蘇生法を施行された、20歳以上の成人心肺停止例。

一般入院病棟のみならず、集中治療部門や救急外来で応答したすべての病院事例を対象とした。

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除外基準

①救急搬送途中に生じた心停止を含めた院外心停止事例

②病院到着時に心肺蘇生術が継続された事例

③病院到着後20分間以上の心拍再開が維持せずに蘇生が再開された事例

④胸骨圧迫または除細動を必要としない事例

⑤DNR/DNAR事例

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院内心停止の急性期予後について

（心停止発見時の心拍リズム間での検討）

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背景と目的

心停止時のリズムは無脈性VT, VF, PEA, asystoleの4パターンが知られている。

NRCPR等の欧米の文献では院内心停止発見時の心拍リズム間で生存退院率に差があるとし、PEAやasystoleに比較してDCショックが有効なVTやVF症例の生存退院率が高いことが示されている。

本邦においての院内心停止に関するデータは少なく、よって心停止発見時の心拍リズム間での予後の差についても分かっていない。

本研究の目的は本邦での院内心停止 の状況の把握、理解とともに発見時の心拍リズム間での急性期予後の差異を検討するものである。

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（対象）

JRCPRに2008年1月から12月までに登録された、成人院内心停止251例を対象とした。主要調査項目は

①患者背景

②基礎疾患

③心停止発生イベントデータ

④アウトカムデータ

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心肺停止発見時の初期調律

VT: 29人 (12%)

VF: 40人 (16%)

PEA: 100人 (40%)

Asystole: 76人 (31%)

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
Age(y)	61.5±23.7	62.8±20.7	73.5±14.6	80.0±25.3	p<0.01
	n (%)	n (%)	n (%)	n (%)	
Sex(male)	14 (48)	29 (72)	59 (59)	54 (71)	NS
Event-location					
ICU(including operating-room, catheter-lab)	11(39)	18(46)	27(27)	15(19)	p<0.01
Inpatient ward	9(32)	15(38)	57(57)	55(72)	p<0.01
Others	8(29)	6(15)	15(15)	5(6)	

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
ILLness Category	n (%)	n (%)	n (%)	n (%)	
Arrhythmia	8 (28)	7 (18)	13 (13)	7(9)	NS
ACS	6 (21)	13 (33)	17 (17)	5 (7)	p<0.001
Cardiomyopathy	6 (21)	6 (15)	10 (10)	3 (4)	NS
Valvular disease	5 (17)	7 (18)	4 (4)	4 (5)	NS
PTE	0 (0)	0 (0)	0 (0)	1 (1)	NS

ACS: Acute coronary syndrome
PTE: Pulmonary thromboembolism

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
ILLness Category	n (%)	n (%)	n (%)	n (%)	
CVD	5 (17)	3 (8)	12 (12)	7 (9)	NS
DAA	1 (3)	1 (3)	4 (4)	2 (3)	NS
TAA/AAA	1 (3)	1 (3)	9 (9)	3 (4)	NS
Pulmonary disease	0 (0)	2 (5)	10 (10)	15 (20)	p<0.001
Renal dysfunction	1 (3)	3 (8)	10 (10)	9 (12)	NS

CVD: Cerebrovascular disease
DAA: Dissecting aortic aneurysm
TAA: Thoracic aortic aneurysm
AAA: Abdominal aortic aneurysm

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
Discovery status at time of event	n (%)	n (%)	n (%)	n (%)	
Witnessed	28 (97)	38 (95)	79 (80)	45 (60)	p<0.0001
Electrocardiogram -monitored	24 (88)	34 (92)	69 (88)	36 (78)	NS

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
Immediate factors related to event	n (%)	n (%)	n (%)	n (%)	
ACS	3 (10)	6 (15)	12 (12)	2 (3)	NS
Hypotension	3 (10)	0 (0)	28 (28)	17 (22)	p<0.001
Acute respiratory insufficiency	1 (3)	1 (3)	32 (32)	23 (30)	p<0.001
Metabolic/ Electrolyte disturbance	1 (3)	0 (0)	10 (10)	6 (8)	NS
Unknown	1 (3)	1 (3)	7 (7)	9 (12)	NS

ACS: Acute coronary syndrome

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Patient demographics and event characteristics

	VT n=29	VF n=40	PEA n=100	Asystole n=76	
Interval to initiation of CPR (min)	2.2±4.4	0.93±0.98	2.3±4.9	1.3±3.3	NS
Interval to first epinephrine (min)	7.5±5.8	11.6±12.7	10.4±15.1	8.8±8.34	NS
Duration of CPR (min)	20.6±22.1	27.4±29.5	41.0±48.7	38.7±32.8	p<0.05

CPR: Cardiopulmonary resuscitation

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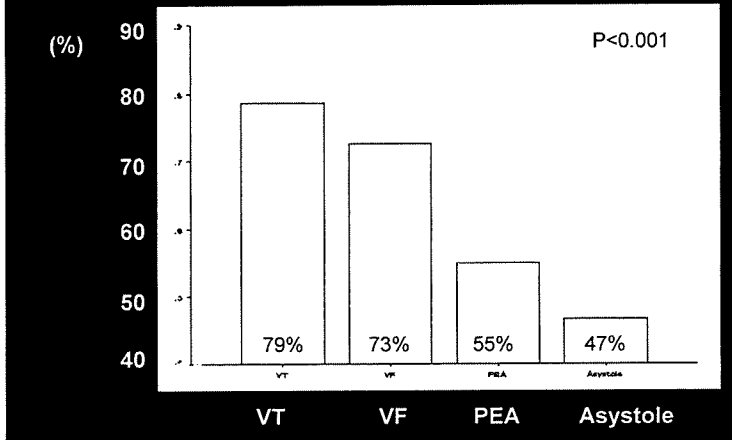
ROSC after each first documented rhythm



ROSC: Return of spontaneous circulation

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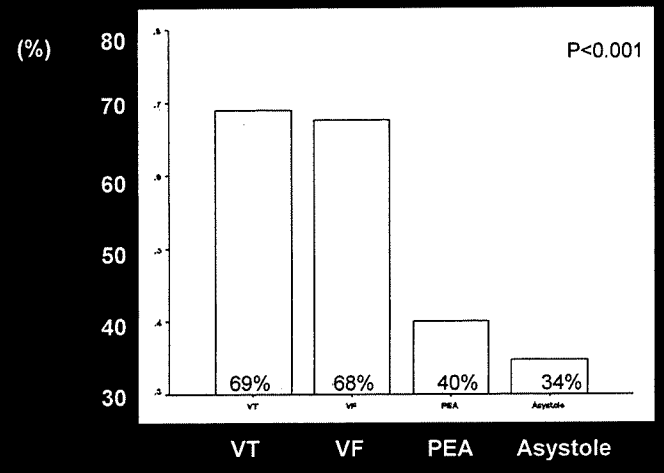
Survival at 24hrs after each first documented rhythm



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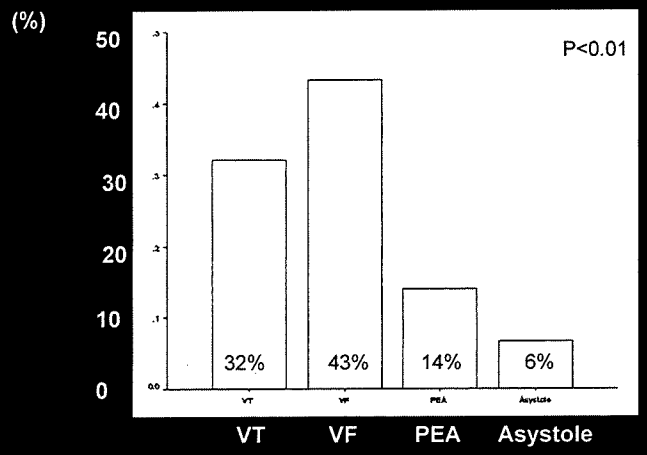
Survival to hospital discharge after each first documented rhythm



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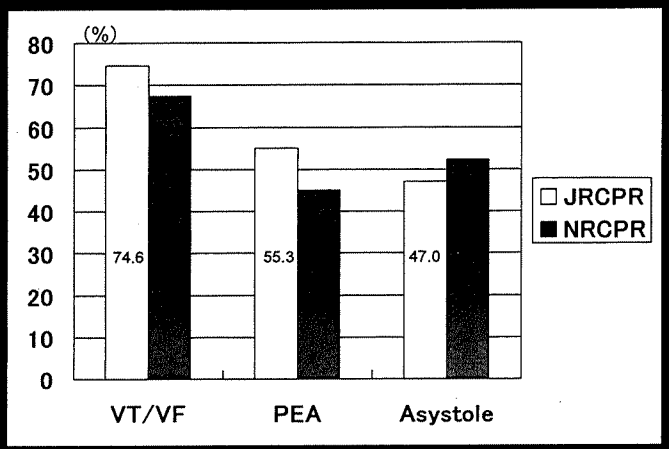
ROSC after each first documented rhythm



ROSC: Return of spontaneous circulation

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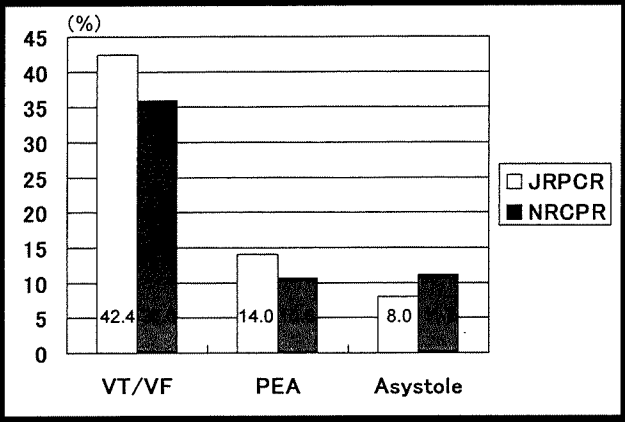
Survival to hospital discharge after each first documented rhythm



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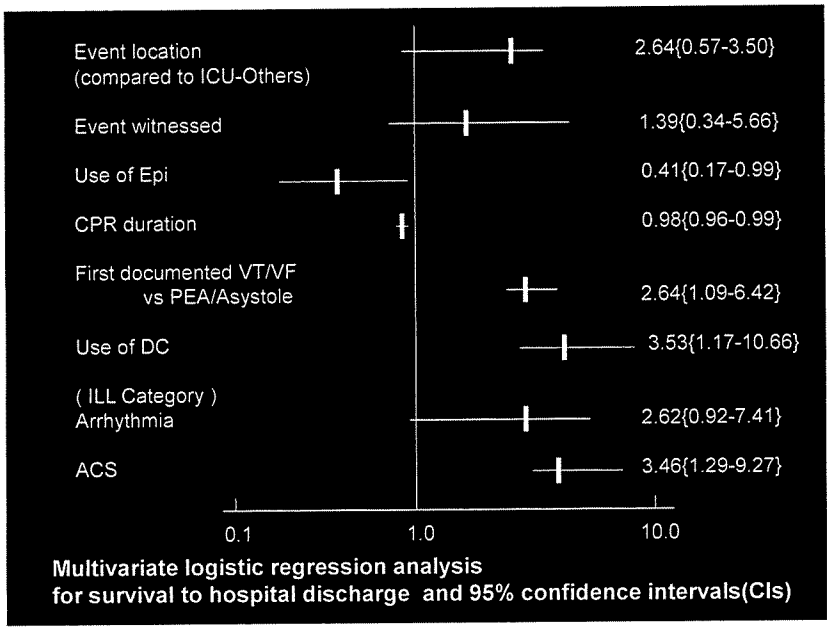

Multivariate logistic regression analysis for survival to hospital discharge and 95% confidence intervals(CIs)

（まとめと考案）

①基礎疾患（入院時診断）がACSの場合は、心停止時のリズムはVT/VFが多く、基礎疾患（入院時診断）が呼吸器疾患の場合は、心停止時のリズムはPEA/Asystoleが多い。

②心停止発見時のリズム間で比較すると、手術室やカテラボを含むICUではVT/VFが多く、一般病棟ではPEA/Asystoleが多い。

③急変のトリガーが血圧低下や呼吸不全である場合は、心停止のリズムはPEA/ Asystoleが多い。

④心肺蘇生時間はVT/VFに比較してPEA/Asystoleでより長い。

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（まとめ）

⑤急性期アウトカムであるROSC率、24時間生存率、生存退院率はいずれもVT/VFでより高く、NRCPでの結果とほぼ同等である。

⑥生存退院率にプラスに寄与する因子についての多変量解析では、手術室やカテラボを含むICUでのイベント発生や、基礎疾患が不整脈疾患やACSであることと共に発見時の心拍リズムがVT/VFであることやDCが使用されることが有意な独立因子であることが示された。

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The Japanese Registry of CPR for In-hospital Cardiac Arrest (J-RCPR)

国立循環器病センター 心臓血管内科 緊急治療科
横山広行・野々木宏・米本直裕

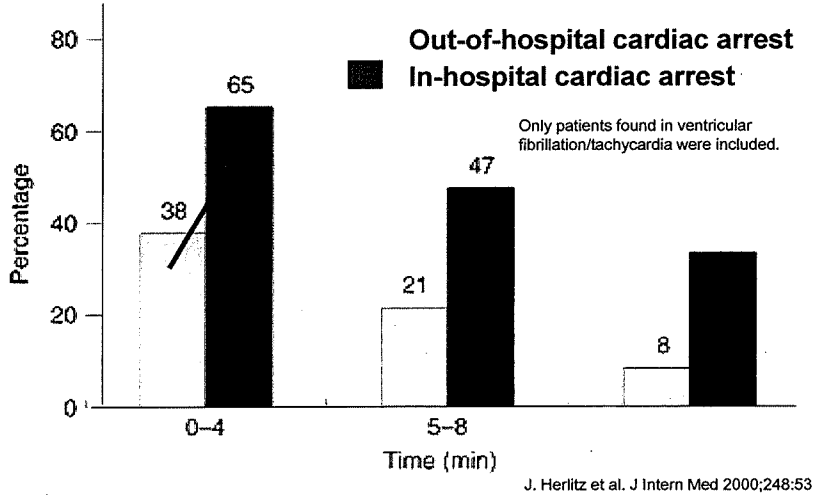
背景

- 院外心停止は科学的根拠に基づいたガイドラインの普及により、その蘇生率は徐々に向上している。
- 一方、院内心停止においては、原因や対策に関する研究は十分ではない。
- 院内心停止に対する方策立案には、院内心停止に関する多施設登録に基づく実態調査が必要である。
- 米国ではAHAがスポンサーとなり2000年から院内心停止のデータを収集、評価するためにthe National Registry of Cardiopulmonary Resuscitation（NRCPR）の登録が開始された。

院内心停止のクリニカル・クエッション

1. 院内心停止の蘇生率・生存退院率
2. 院内心停止の直接原因・誘因
3. 入院の原因疾患と院内心停止の関係・対策
4. 院内心停止の初期心調律の影響
5. 院内心停止に対する急性期対策
6. 院内心停止の対応は院外心停止と同一か
7. 院内心停止の予防策
8. 院内講習会は院内心停止の生存率を改善するか
9. 院内心停止の国内外の比較検討
10. 成人と小児で院内心停止の特徴は異なるのか

Survival in relation to time to first defibrillation



J. Herlitz et al. J Intern Med 2000;248:53

NRCPR

全米における
院内心停止登録; 1999
AHA ECC Programs established a task force to develop the NRCPR

参加施設に登録用ソフト配布
講習会開催
2000年登録開始

JCAHO requirements for monitoring in-hospital resuscitation events

NRCPRの使命は「効率的に継続的データを収集、解析し、必要な設備、資源、訓練を評価することにより、より多くの人命を救うこと」が掲げられている。

First Documented Rhythm and Clinical Outcome From In-Hospital Cardiac Arrest Among Children and Adults

VM. Nadkarni, GL Larkin, MA Peberdy, Scott M. CW Kaye, ME. Mancini, G Nichol, T Lane-Truitt, J Potts, JP. Ornato, RA. Berg, for the National Registry of Cardiopulmonary Resuscitation Investigators *JAMA.* 2006;295:50-57.

Results The rate of survival to hospital discharge following pulseless cardiac arrest was higher in children than adults (27% [236/880] vs 18% [6485/36 902]; adjusted odds ratio [OR], 2.29; 95% confidence interval [CI], 1.95-2.68). Of these survivors, 65% (154/236) of children and 73% (4737/6485) of adults had good neurological outcome. The prevalence of VF or pulseless VT as the adu chil pre 0.7 at ti

院内心停止；発症時心電図
Children vs Adult

VT, intensive care unit location of arrest, and duration of cardiopulmonary resuscitation, only first documented pulseless arrest rhythm remained significantly associated with differential survival to discharge (24% [135/563] in children vs 11% [2719/24 987] in adults with asystole and PEA; adjusted OR, 2.73; 95% CI, 2.23-3.32).

Survival From In-Hospital Cardiac Arrest During Nights and Weekends

MA. Peberdy, JP. Ornato, GL. Larkin, RS. Braithwaite, et al.
JAMA, 2008; 299:785-792.

Results A total of 58 593 cases of in-hospital cardiac arrest occurred during day/evening hours (including 43 483 on weekdays and 15 110 on weekends), and 28 155 cases occurred during night hours (including 20 365 on weekdays and 7790 on weekends). Rates of survival to discharge (14.7% [95% CI, 14.3%-15.1%] vs 19.8% [95% CI, 19.5%-20.1%], return of spontaneous circulation for longer than 20 minutes (44.7% [95% CI, 44.1%-45.3%] vs 51.1% [95% CI, 50.7%-51.5%]), survival at 24 hours (28.9% [95% CI, 28.4%-29.4%] vs 35.4% [95% CI, 35.0%-35. CI, val CI, fibt

院内心停止；生存退院率
During Nights vs During Weekends

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hospital cardiac arrests occurring during day/evening hours, survival was higher on weekdays (20.6% [95% CI, 20.3%-21%]) than on weekends (17.4% [95% CI, 16.8%-18%]; odds ratio, 1.15 [95% CI, 1.09-1.22]), whereas among in-hospital cardiac arrests occurring during night hours, survival to discharge was similar on weekdays (14.6% [95% CI, 14.1%-15.2%]) and on weekends (14.8% [95% CI, 14.1%-15.2%]; odds ratio, 1.02 [95% CI, 0.94-1.11]).

目的

- 院内心停止の原因と病態、心肺蘇生活動の状況、治療効果に関する情報を正確に解析することにより、院内心停止のなかで可避死に対する対策を立案する。
- 国際比較が可能な登録システムを構築。
- 2008年から多施設共同前向き登録調査を開始した（現在11施設が参加）。

Japanese Registry of CardioPulmonary Resuscitation (J-RCPR).