

# Why the Cath Lab for the Cardiac Arrest Patient?

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Review and presentation of current literature

Dr. Nainesh Patel, Lehigh Valley Health System, PA

1. What are the rhythms and ECG indicators to go to cath lab?
2. What medications are given in cath lab and potential concerns?
3. Do you cool before or after cath and why?
4. What % of your patients go to cath and with what characteristics



## Questions for Panel

5. Who do you NOT take to cath lab and why?
6. How often do you see Cardiogenic Shock and how do you treat it?
7. Any insights to culprit artery and “door to balloon” challenges
8. How often are you seeing Cardiomyopathy



**Writing a White Paper to ACC  
Dr. Paul McMullan, Ochsner**

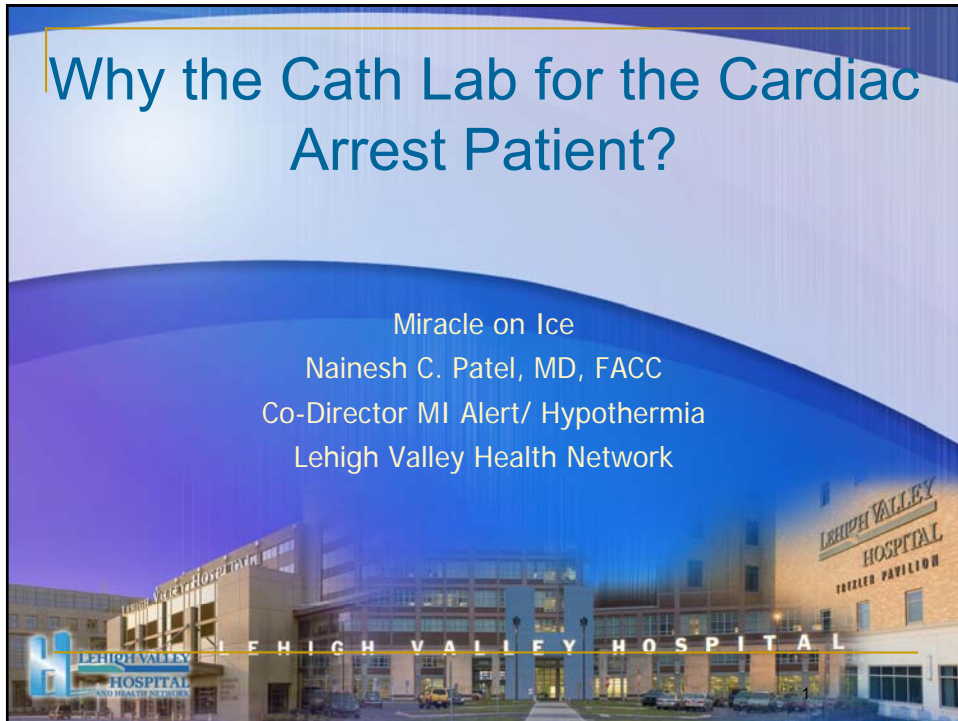
# Why the Cath Lab for the Cardiac Arrest Patient?

Miracle on Ice

Nainesh C. Patel, MD, FACC

Co-Director MI Alert/ Hypothermia

Lehigh Valley Health Network



LEHIGH VALLEY HEALTH NETWORK

## Disclosure of Financial Interest

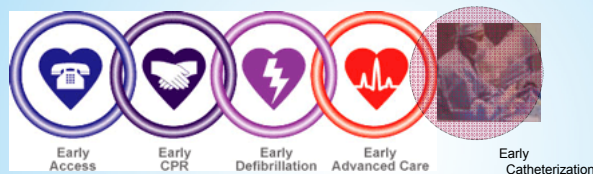
- None

## Cardiac Arrest Survival Rate



- Dismal--survival to admission 25%
- 1/3 deaths from neurologic damage
- 1/3 deaths from myocardial injury
- 1/3 deaths from multiorgan failure

## Chain of Survival



## Why isn't angiography performed early?

- Reluctance
- Unknown neurologic prognosis
- It's not a ST Elevation MI (STEMI)
- No ECG changes
- Not enough evidence
- In-hospital cardiac arrest
- Scorecard medicine: If I do PCI and patient does not survive, death counted against operator and hospital

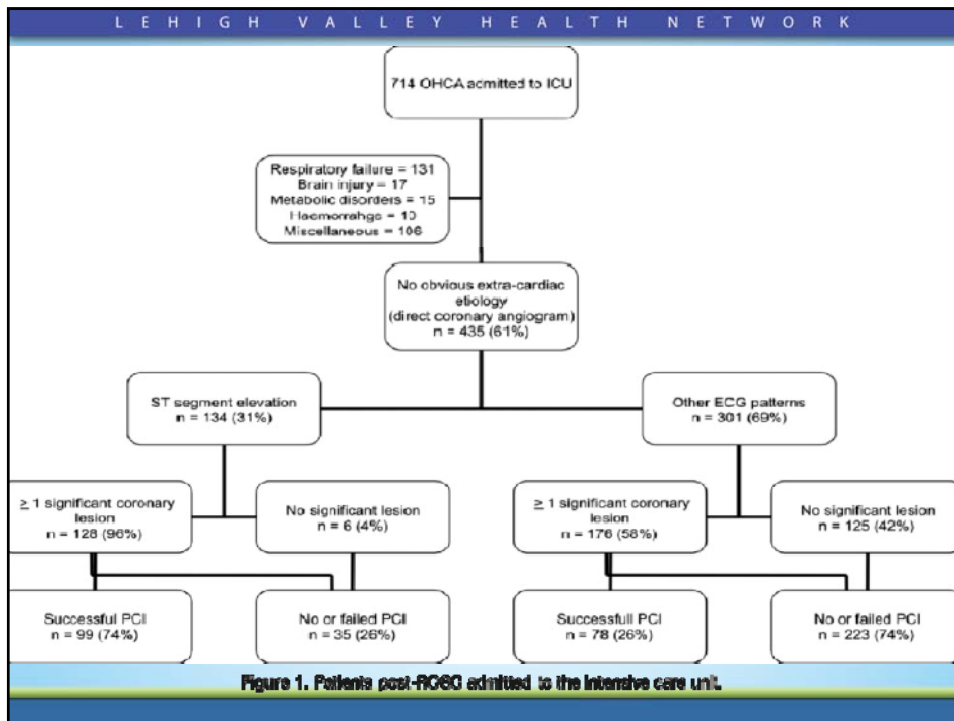
## Prognostication

Booth, JAMA 2004 291:870-879	ILCOR Statement 2008
Absent corneal reflex at 24 hrs	Absent corneal reflex at 72 hrs
Absent pupillary reflex	Absent pupillary reflex at 72 hrs
Absent withdrawal response to pain at 24 hr	Absent withdrawal response at 72 hrs
No motor response at 24 hours	No motor response at 72 hrs
No motor response at 72 hrs	

**Immediate Percutaneous Coronary Intervention Is Associated With Better Survival After Out-of-Hospital Cardiac Arrest**

Insights From the PROCAT (Parisian Region Out of Hospital Cardiac Arrest) Registry

- 435 Out-of-Hospital Cardiac Arrest patients without obvious extracardiac etiology...all underwent immediate cardiac cath
- 31% with STEMI..96% with obstructive lesion identified (74% successful PCI)
- 69% without STEMI..58% with obstructive lesion with only 26% successful PCI



## Immediate PCI in survivors of Cardiac Arrest

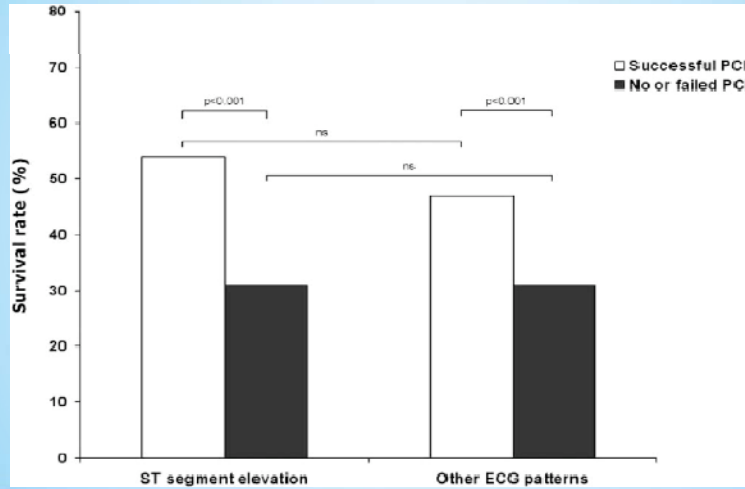


Figure 8. Survival rates according to the achievement and failure of PCI in individual patients.

Dumas et al., *Circulation Interventions*, June 2010

## PROCAT Study Limitations

- Experienced physician in ambulance--  
May help better identify cardiac causes
- Exceptional care--But no better than  
what we do everyday!
- Most treated with hypothermia ( HOW  
MANY???????)

The New England Journal of Medicine  
 IMMEDIATE CORONARY ANGIOGRAPHY IN SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST

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

CHRISTOPHER M. SPULDING, M.D., LISA M. JONES, M.D., JAMES R. SPINDLER, M.D., EDWARD M. SPINDLER, M.D.,  
 BRUCE R. WILSON, M.D., JOHN FRANCIS A. DEWINTER, M.B., F.R.C., and FRANK GARDY, M.D.

- 84 patients successfully resuscitated
- early angiography +/- PCI
- 71% had significant CAD
- 50% had total occlusion
- 11% had totally occluded artery without ECG changes or symptoms prior to arrest

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

Survival Postcardiac Arrest After early PCI

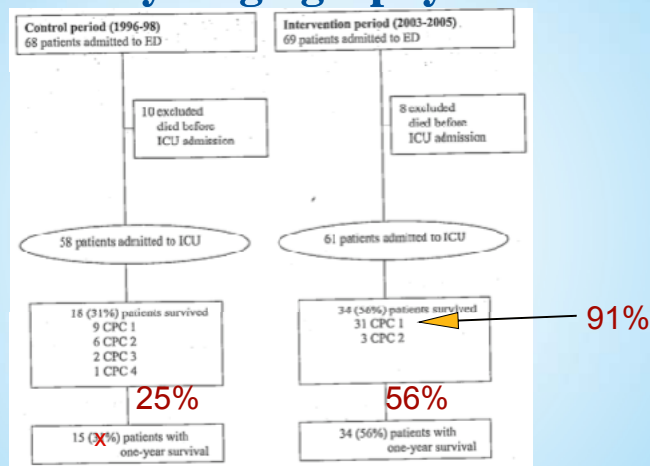
Author/year	Survival to DC	Good Neuro among Survivors
Kahn et al.,1995	6/11	4/6
Spaulding et al.,1997	32/84	30/32
Lin et al.,1998 LIN	9/10	NA
Bulut et al., 2000	4/10	NA
Borger van der Berg et al.,2003	39/42	NA
Keelan et al., 2003	11/15	9/11
Bendz et al., 2004	29/40	NA
Qintero-Moran et al., 2006	18/27	NA
Gorjup et al., 2007	90/135	72/90
Garot et al., 2007	102/186	88/102
Richling et al., 2007	24/46	22/24
Markusohn et al., 2007	19/25	17/19
Werling et al., 2007	9/13	NA
Pleskot et al., 2008	14/20	11/14
Hosmane et al., 2009	63/98	58/63

Konofal, Rehm, Cohn and Co. Card Inter 75:616-624

## 17 Reports Survival Postcardiac Arrest After Early PCI

Survival to discharge	Good neurological outcome
556/930 =60%	344/396=87%

## Feasibility and Success of Early Coronary Angiography and PCI



Sunde et al. Resuscitation 2007;73:29-39

## PCI Combined with Therapeutic Hypothermia for STEMI After Resuscitation

Author/year	n	Survival to hospital DC	Survivors with intact CNS
Hovdenes et al. 2007	50	41/50(82%)	34/41(83%)
Knafelj et al. 2007	40	30/40(75%)	22/30(73%)
Wolfrum et al. 2008	16	12/16(75%)	11/12(92%)
Peels et al. 2008	44	22/44(50%)	NA
<b>Total</b>	<b>150</b>	<b>105/150(70%)</b>	<b>67/83(81%)</b>

Kern K, Rahman O, Cath and Cardio Interv. 75:616-624 (2010)

## No delay in Door to Balloon time

	MTI (n = 38)	Control (n = 17)	p Value
Door-to-balloon time (minutes)	95 (72-99)	95 (92-122)	.21
Infarct related artery			
LAD	8 (80%)	8 (47%)	.163
LCA	3 (79%)	3 (89%)	.63
RCA	5 (81%)	4 (89%)	.71
Midial vessel disease	11 (89%)	9 (89%)	.66
Left main affected	1 (8%)	0 (0%)	.163
Bifurcation fracture (%)	47 (45-49)	47 (45-49)	.87
Midial vessel intervention	5 (81%)	4 (89%)	.71
Institution of drug eluting stents	4 (89%)	3 (89%)	.89
TDR flow of <=2 in the infarct related artery before PCI	13 (89%)	14 (89%)	.163
TDR flow 0 or 1 in the infarct related artery after PCI	18 (89%)	17 (89%)	.163
Use of GP IIb/IIIa receptor antagonists	18 (89%)	18 (89%)	.17
Use of an intra-venous contrast/painkiller	5 (81%)	7 (89%)	.163
Treatment with clopidogrel	18 (89%)	17 (89%)	.163
Symptomatic time over 48 hrs (any)	5 (13-20)	3 (17-43)	.82
Duration of mechanical ventilation (hrs)	1.98 (1.98-2.99)	3.1 (2.1-10.4)	.63
Peak troponin (mcg/L)	0.9 (0.8-1.0)	0.9 (0.5-1.1)	.163
Peak lactate level (mmol/L)	1.9 (1.7-2.1)	2.0 (1.5-2.9)	.29
Peak C-reactive protein (mg/L)	1.0 (1.0-1.9)	1.0 (1.0-2.9)	.11
Creatinine on admission (µmol/L)	87 (87-114)	1.0 (91-106)	.63
Creatinine 48 hrs after admission (µmol/L)	91 (91-113)	1.0 (97-106)	.64
Troponin T on admission (ng/mL)	1.0 (1-2)	1.0 (1-3)	.66
CR on admission (mg)	2.0 (1.1-4.7)	2.0 (1.0-2.4)	.63
CR 48 hrs on admission (mg)	2.0 (1-3.0)	2.0 (2-3)	.63
Maximum of infarct related CR (mg)	5.3 (5-5.9)	5.3 (4.1-6.7)	.66
Maximum of infarct related CR 48 hrs (mg)	4.0 (3.0-5.0)	5.1 (4.1-6.1)	.72

Sebastian Wolfrum, MD; Christian Pierau, Peter W. Radke, MD; Herbert Schunkert, MD;

## Cardiac Cath underutilized after in-hospital cardiac arrest

- 110 patients with **in-hospital** VF arrest survivors
- 30/110 (27%) cath performed within 1 day
- 17/30 (57%) had PCI
- 13/30 (43%) STEMI or new LBBB
- 17/30 had angiography in the absence of ECG data suggesting acute MI
- Patients who received cath were more likely to survive than those who did not 80% vs. 54%,  $p < .05$

## ILCOR Consensus Statement 2008 Circulation 118;2452-2483

- In summary, patients resuscitated from cardiac arrest who have electrocardiographic criteria for **ST-elevation myocardial infarction** should undergo **immediate coronary angiography**, with subsequent PCI if indicated. Furthermore, **given the high incidence of ACS in patients with out-of-hospital cardiac arrest and limitations of electrocardiography-based diagnosis**, it is appropriate to **consider immediate coronary angiography** in all post-cardiac arrest patients in whom ACS is suspected.

## Is there data to support cath in any patient with ST depression?

- Pride YB, Tung P, Mohanavelu S, et al. Angiographic and clinical outcomes among patients with acute coronary syndromes presenting with isolated anterior ST-segment depression: A TRITON-TIMI 38 (Trial To Assess Improvement In Therapeutic Outcomes By Optimizing Platelet Inhibition With Prasugrel-Thrombolysis In Myocardial Infarction 38) substudy. *J Am Coll Cardiol Interv.* 2010;3:806-811.
- 13,608 ACS Patients
- 1,198 with isolated anterior ST depression in V1-V4 (8.8%)
- 1 in 4 patients had an occluded artery (26.2%) with ECG to PCI=29.2 hrs
- Increased Mortality Risk

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## Why angiography should be performed early?

- Neurologic testing is unreliable within first 24-48 hours
- Growing evidence
- Chest pain and ECG were poor predictors of acute coronary occlusion
- Successful immediate coronary angioplasty was associated with improved hospital survival in pts with or without ST segment elevation.

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## Is there data to support immediate cath in patients with cardiac arrest?

- Randomized trials incredibly difficult to perform in cardiac arrest patients
- We know a certain percentage of these patients will have occluded/severely obstructed arteries
- Immediate PCI may provide benefit and improve mortality in some patients with cardiac arrest--we don't want to deny care to those that may benefit

# Questions?

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