Evolution of coronary bypass in New York State over 22 years of the mandatory cardiac surgery reporting system (1990-2012)

Darryl Hoffman MD, FRCS, FCS(SA)
Beth Israel Medical Center
New York NY USA

The Israel Society of Cardiothoracic Surgery
22-23 April 2013. Jerusalem

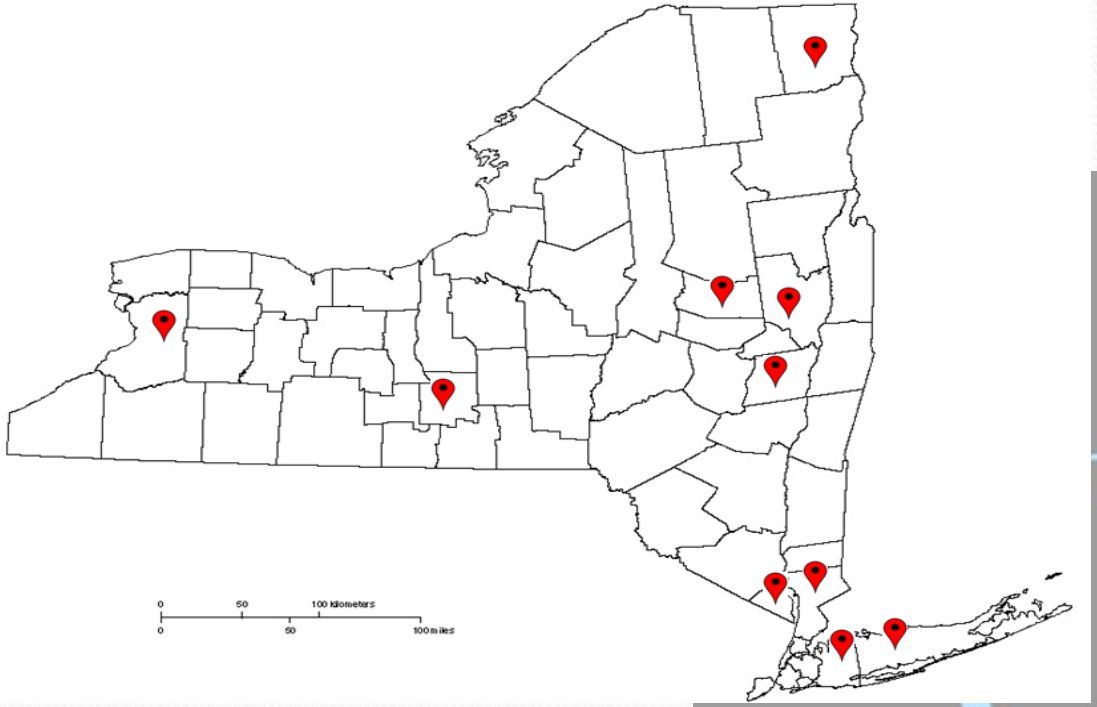

DISCLOSURES
NONE

NEW YORK STATE REPORTING SYSTEM

- 1988 CABG mortality+ complication rates vary widely
  - State DOH creates clinical database
    - Compare institutional outcomes adjusted for differences in patient acuity
- 1990 JAMA publication
  - Observed, Expected, Risk-Adjusted Mortality Rates
    all 28 NY hospitals (numbered but not named)
  - Same day: commissioner released hospital names + RAMR to NY Times

mortality 1990 Jan-June ↓ 14% (from 1989)

New York Cardiac Surgery Sites



Montefiore – Moses
Montefiore – Weiler

Long Island Jewish
NY Hospital Queens

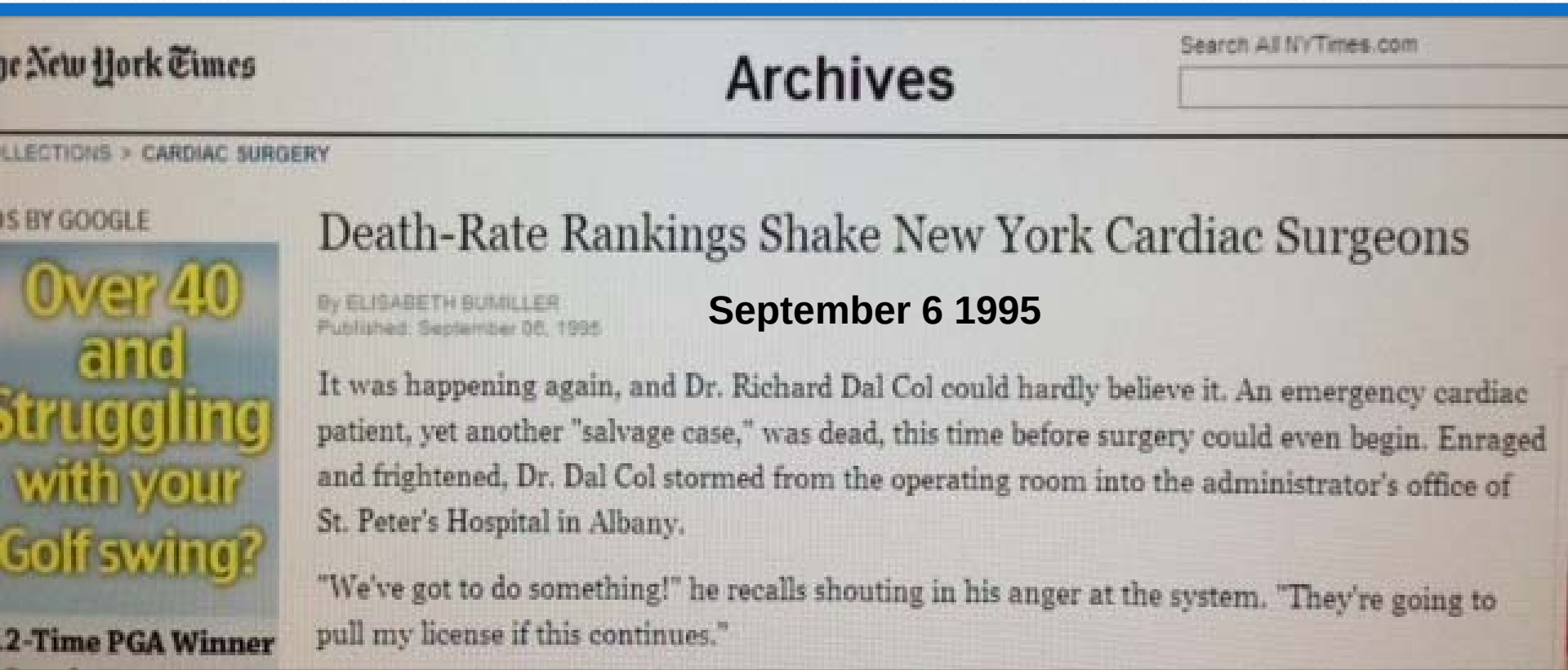
Beth Israel Medical Center
Bellevue Hospital Center
Lennox Hill Hospital
Mount Sinai Hospital
NY Methodist Hospital
NYP Columbia Presbyterian
NYP Weill Cornell
NYU Hospitals Center
St. Lukes Hospital

Staten Island Univ. Hospital

University Hospital Brooklyn
Maimonides Medical Center

FURTHER DEVELOPMENTS

- 1992 LAWSUIT
  - Surgeon specific data
    - rolling 3-year data
      - all surgeons with >1 procedure in each of the 3 years
- 1992-7 PCI… VALVE CABG



The New York Times

Archives

Search All NYTimes.com

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S BY GOOGLE

Over 40 and Struggling with your Golf swing?

2-Time PGA Winner

Death-Rate Rankings Shake New York Cardiac Surgeons

By ELISABETH BUMILLER
Published: September 06, 1995

September 6 1995

It was happening again, and Dr. Richard Dal Col could hardly believe it. An emergency cardiac patient, yet another "salvage case," was dead, this time before surgery could even begin. Enraged and frightened, Dr. Dal Col stormed from the operating room into the administrator's office of St. Peter's Hospital in Albany.

"We've got to do something!" he recalls shouting in his anger at the system. "They're going to pull my license if this continues."

DATA ACCURACY

- Cleaning
- Auditing
- Statistical Analysis
  - logistic regression model
  - backward stepwise elimination
    - with training and validation samples to cross-validate the models

Expected Mortality(every patient) calculated (based on all patients in NY) …

probabilities of mortality averaged across **all** patients for each provider

For every provider: ratio Expected : Observed mortality

x the statewide mortality rate

= Risk-Adjusted Mortality Rate (RAMR)

Figure 1: In-Hospital/30-Day Risk-Adjusted Mortality Rates for Isolated CABG in New York State, 2010 Discharges

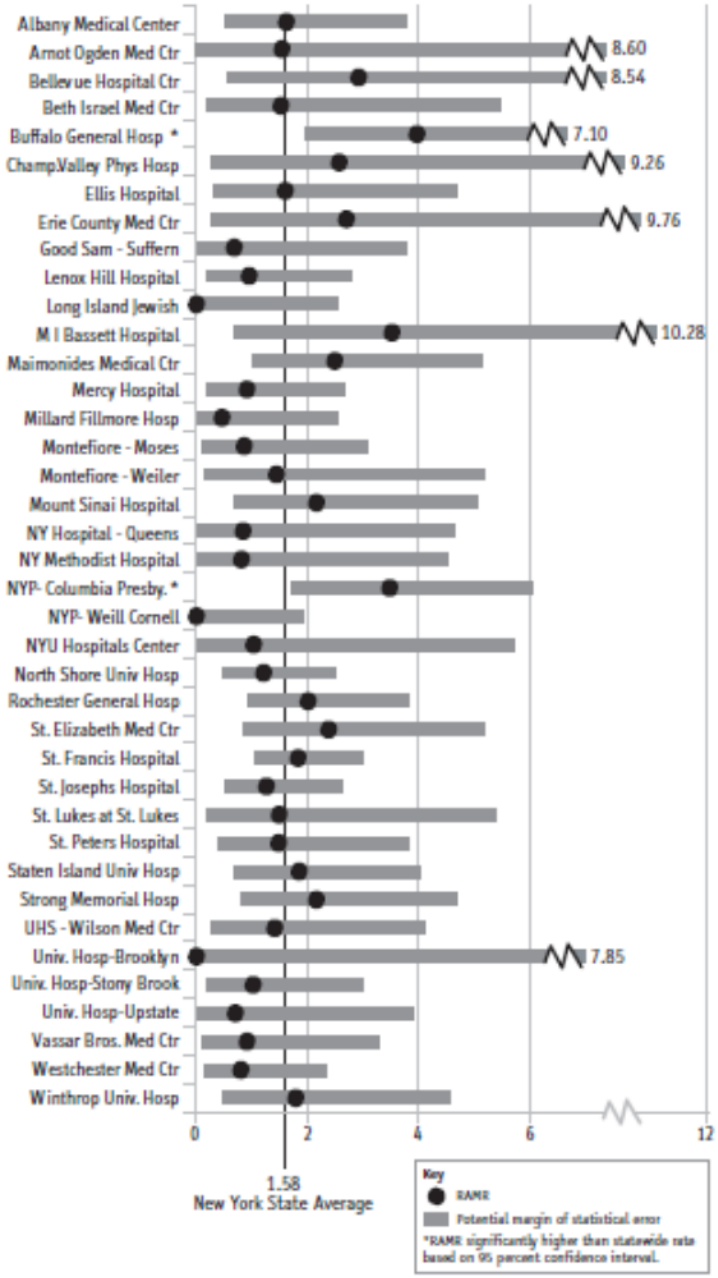
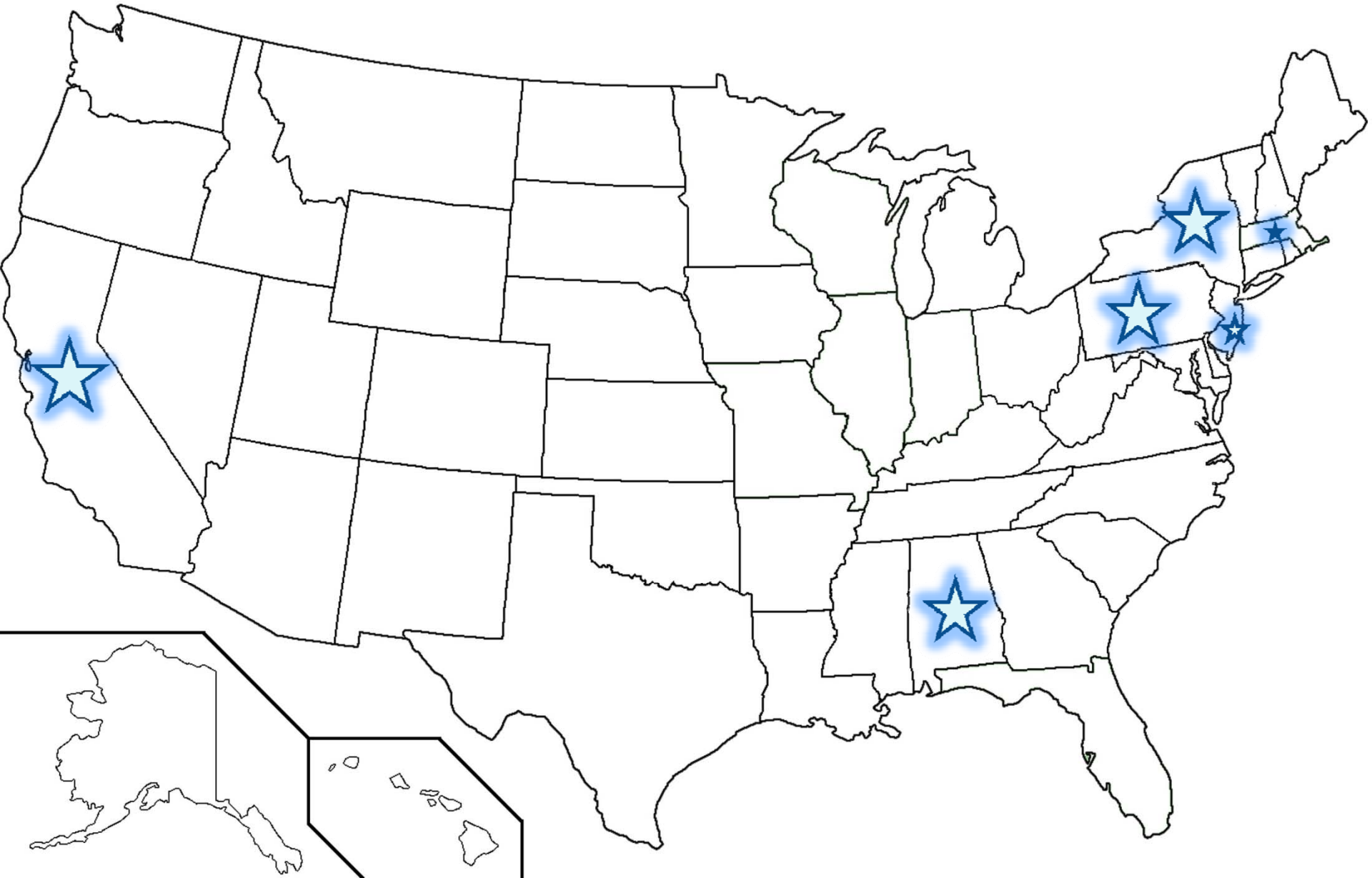


Table 5 continued

	Isolated CABG					
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR
Beth Israel Med Ctr						
Geller C M	113	0	0.00	1.26	0.00	(0.00, 4.46)
Hoffman D	200	3	1.50	1.04	2.51	(0.50, 7.33)
##Ko W	8	0	0.00	0.66	0.00	(0.00,100.0)
Tranbaugh R	321	4	1.25	1.27	1.71	(0.46, 4.37)
All Others	3	0	0.00	0.36	0.00	(0.00,100.0)
Total	**645**	**7**	**1.09**	**1.18**	**1.59**	**(0.64, 3.28)**
Buffalo General Hosp						
#Ashraf M	2	0	0.00	2.49	0.00	(0.00,100.0)
Grosner G	694	14	2.02	1.48	2.36	(1.29, 3.96)
#Lewin A	165	9	5.45	1.64	5.76 *	(2.63,10.94)
##Picone A	214	11	5.14	1.94	4.59 *	(2.29, 8.22)
Total	**1075**	**34**	**3.16**	**1.60**	**3.43 ***	**(2.37, 4.79)**
Champ.Valley Phys Hosp						
Abbott A E	210	3	1.43	1.41	1.76	(0.35, 5.13)
#Canavan T	5	0	0.00	1.19	0.00	(0.00,100.0)
#Reich H	.	.	.	.	.	(. , .)
#Saifi J	1	0	0.00	1.45	0.00	(0.00,100.0)
#Singh C	47	1	2.13	1.48	2.50	(0.03,13.90)
All Others	41	1	2.44	1.06	3.99	(0.05,22.19)
Total	**304**	**5**	**1.64**	**1.37**	**2.08**	**(0.67, 4.86)**
Ellis Hospital						
##Depan H	185	4	2.16	2.06	1.82	(0.49, 4.67)
#Reich H	246	5	2.03	1.36	2.59	(0.84, 6.05)
#Singh C	165	0	0.00	1.41	0.00	(0.00, 2.74)
All Others	56	2	3.57	1.63	3.80	(0.43,13.72)
Total	**652**	**11**	**1.69**	**1.59**	**1.84**	**(0.92, 3.29)**
Erie County Med Ctr						
#Downing S W	258	3	1.16	1.56	1.29	(0.26, 3.77)
##Picone A	10	0	0.00	0.90	0.00	(0.00,70.93)
All Others	76	3	3.95	1.33	5.14	(1.03,15.03)
Total	**344**	**6**	**1.74**	**1.49**	**2.03**	**(0.74, 4.41)**
Good Sam - Suffern						
Lundy E F	239	2	0.84	1.79	0.81	(0.09, 2.93)
Salenger R	285	3	1.05	1.30	1.41	(0.28, 4.11)
Total	**524**	**5**	**0.95**	**1.52**	**1.09**	**(0.35, 2.54)**
LIJ Medical Center						
Graver L	179	2	1.12	1.56	1.24	(0.14, 4.48)
Manetta F	116	0	0.00	1.92	0.00	(0.00, 2.86)
Palazzo R	183	0	0.00	1.52	0.00	(0.00, 2.29)
Parnell V	.	.	.	.	.	(. , .)
Scheinerman S J	183	2	1.09	1.86	1.02	(0.11, 3.68)
#Vatsia S	.	.	.	.	.	(. , .)
Total	**661**	**4**	**0.61**	**1.69**	**0.62 ** **	**(0.17, 1.59)**

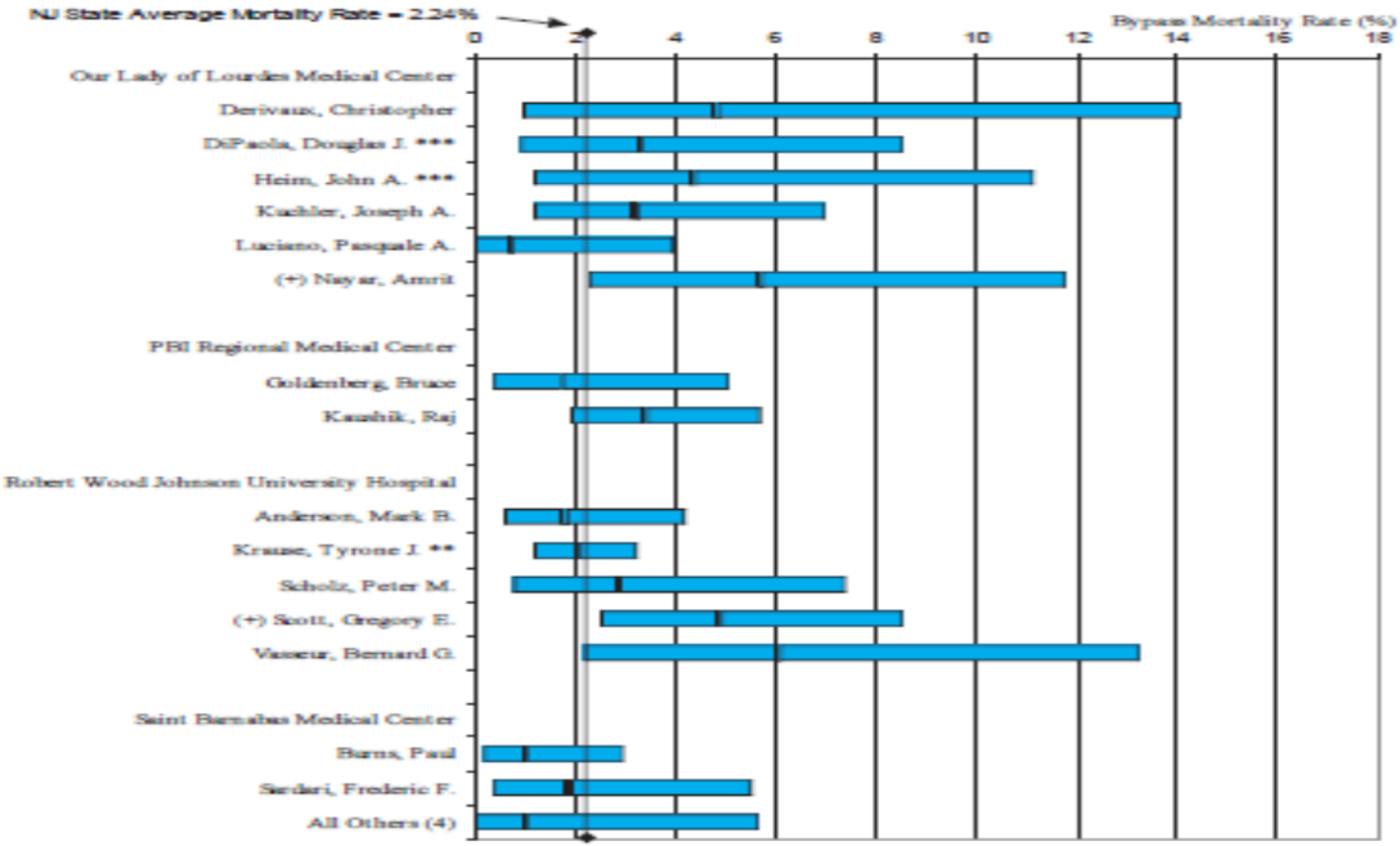
United States Cardiac Surgery Reports



NEW JERSEY REPORT 1997…

Cardiac Surgery in New Jersey 2003

Figure 3 (continued)
Surgeon Risk-Adjusted Operative Mortality* Rate (2002-2003)



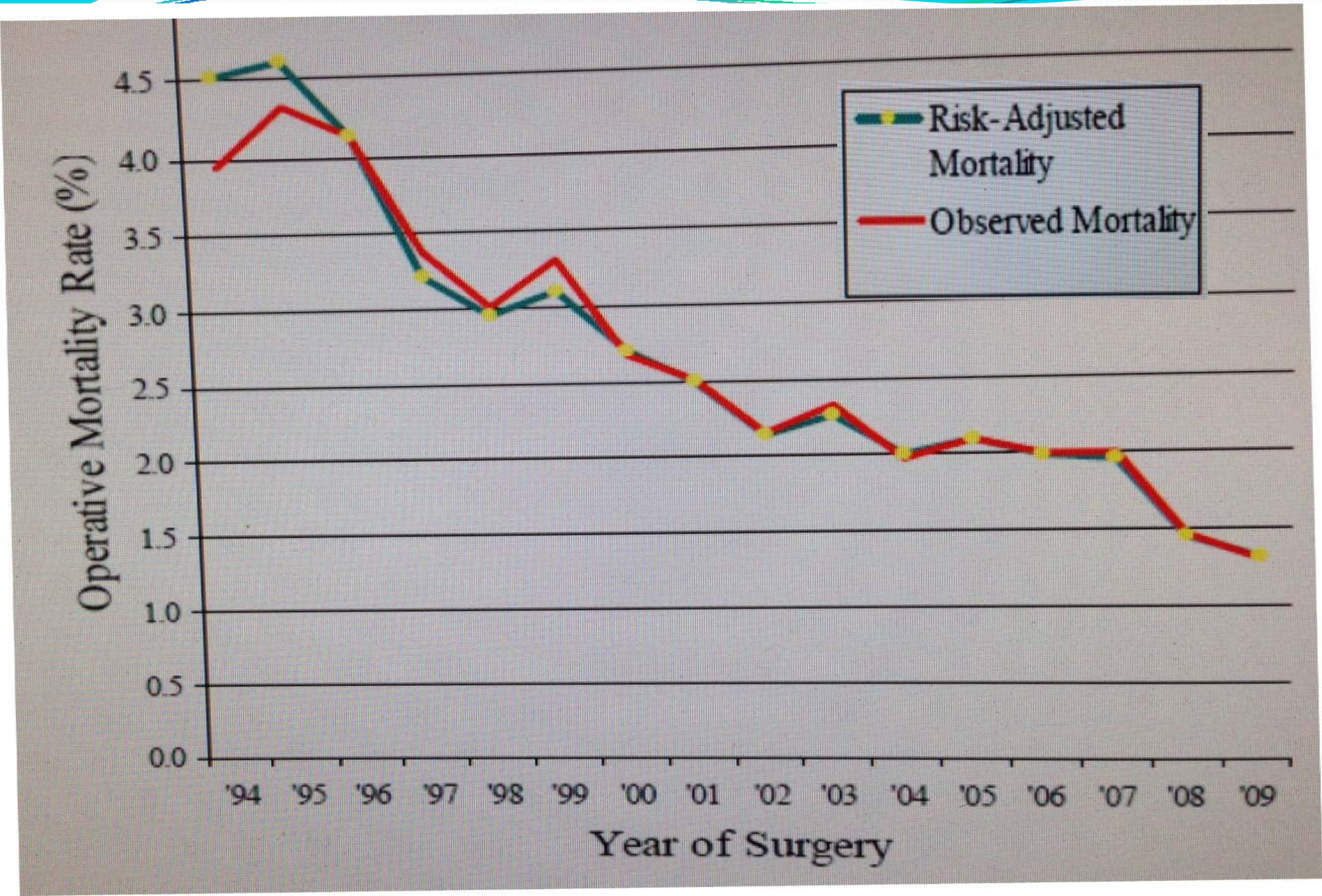
SOURCE: New Jersey Department of Health and Senior Services.

* = Operative Mortality includes: (1) all deaths occurring during the hospitalization in which the operation was performed, even after 30 days; and (2) those deaths occurring after discharge from the hospital, but within 30 days of the procedures.

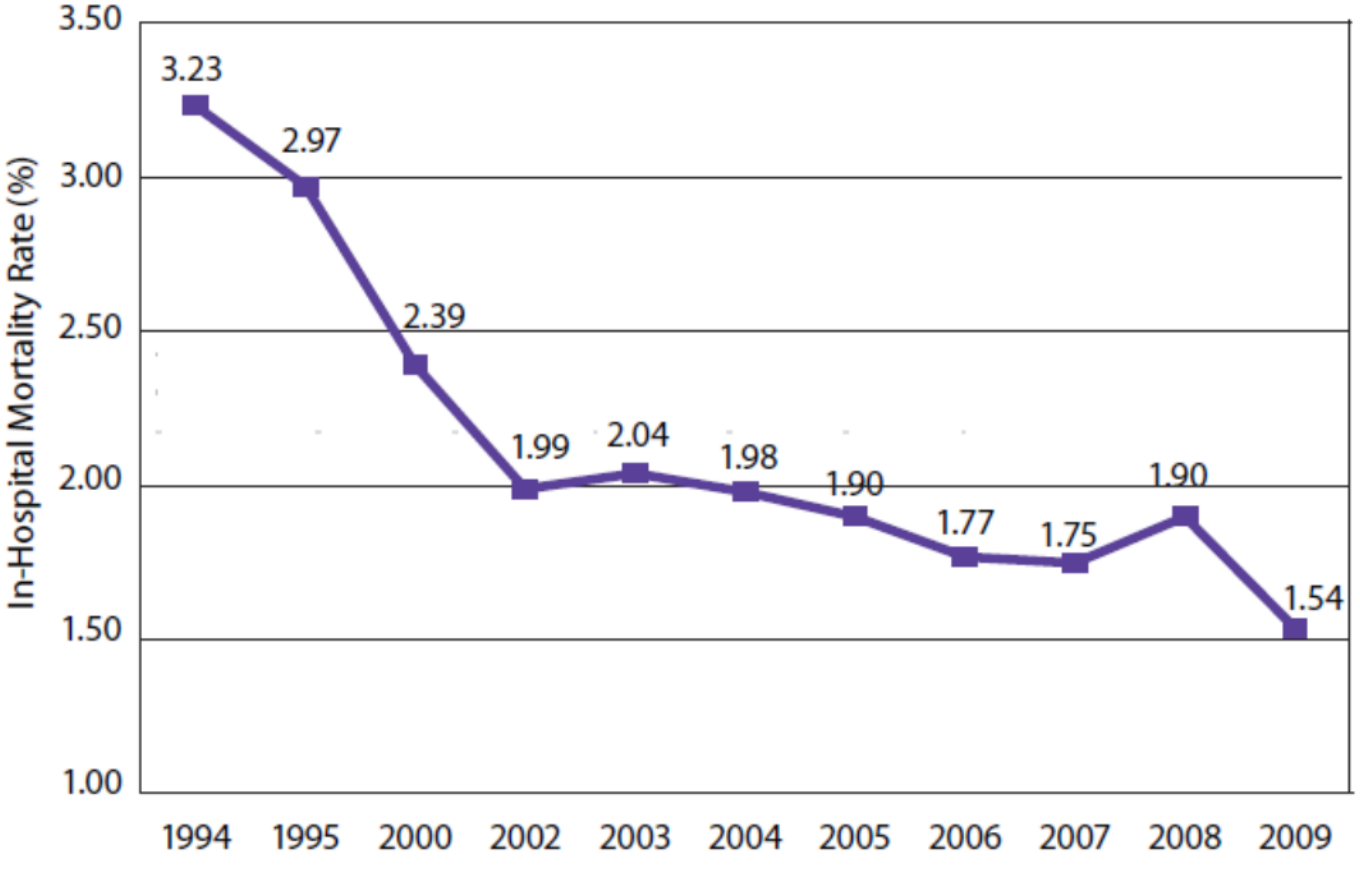
(-) = Risk-adjusted mortality rate significantly lower than the New Jersey mortality rate, based on 95 percent confidence interval.

(+) = Risk-adjusted mortality rate significantly higher than the New Jersey mortality rate, based on 95 percent confidence interval.

New Jersey: Trends CABG Mortality

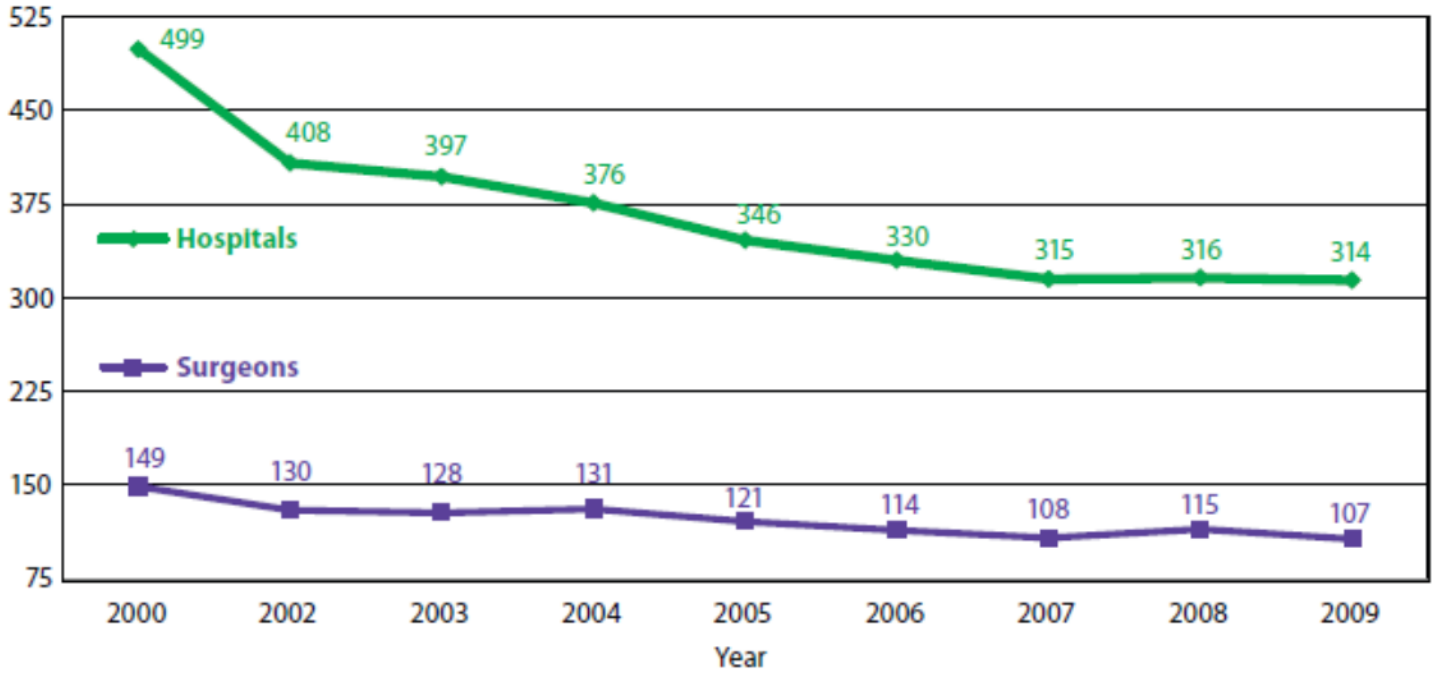


Pennsylvania: Trends in CABG Mortality



Note: This graph includes data, beginning with 1994, for each year that PHC4 published analysis for CABG procedures.

Average Number of Open Heart Procedures Performed Annually



Note: This table includes data, beginning with 2000, for each year that PHC4 published total open heart volumes.

Hospital Data

	Number of Cases			Hospital Data 2008-2009 (Two Years Combined)						2008 Average Medicare Payment
				Mortality		Readmissions		Post-Surgical Length of Stay	Average Hospital Charge	
	2008	2009	Total	In-Hospital	30-Day	7-Day	30-Day			
Statewide										
CABG without Valve	10,099	9,591	19,690	1.7%	2.2%	5.8%	13.7%	5.9	$124,093	$30,546

OTHER STATES 1990-94

No formal QI initiative or report card

- **Mass**
  - mortality decreased 42%
    - while predicted mortality increased
- **Northern New England**
  - mortality reduction like NY (1987 – 1992)

formal QI process is the key (public or confidential)

“Consumer Reports is rating surgical groups”

The New York Times

Published: September 7, 2010

“ heart bypass surgery now being rated alongside cars and toaster ovens“

Rate 1/4 surgical groups (n=221) from 42 US states

…….. all who agreed to publication

NEJM “a watershed event in health care accountability”

News | US | World | Sports | Comment | Culture | Business | Mor

News › Society › NHS

NHS to publish surgeons' survival rate league tables

Figures ranking surgeons by how many people die in their operating theatres are to be published next year

Randeep Ramesh, social affairs editor
guardian.co.uk, Tuesday 18 December 2012 04.58 EST
Jump to comments (36)

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Surgery league tables 'hitting heart patients'

by JENNY HOPE, Daily Mail

Comments (0) | Share

Seriously ill patients are being denied vital heart operations by surgeons concerned about Government performance league tables, it was revealed yesterday.

Oct 30, 2002

STATE-OF-THE-ART PAPER

The New York State Cardiac Registries

History, Contributions, Limitations, and Lessons for Future Efforts to Assess and Publicly Report Healthcare Outcomes

Edward L. Hannan, PHD,* Kimberly Cozzens, MA,* Spencer B. King III, MD,† Gary Walford, MD,‡ Nirav R. Shah, MD§

Albany, New York; Atlanta, Georgia; and Baltimore, Maryland

In 1988, the New York State Health Commissioner was confronted with hospital-level data demonstrating very large, multiple-year, interhospital variations in short-term mortality and complications for cardiac surgery. The concern with the extent to which these differences were due to variations in patients' pre-surgical severity of illness versus hospitals' quality of care led to the development of clinical registries for cardiac surgery in 1989 and for percutaneous coronary interventions in 1992 in New York. In 1990, the Department of Health released hospitals' risk-adjusted cardiac surgery mortality rates for the first time, and shortly thereafter, similar data were released for hospitals and physicians for percutaneous coronary interventions, cardiac valve surgery, and pediatric cardiac surgery (only hospital data). This practice is still ongoing. The purpose of this communication is to relate the history of this initiative, including changes or purported changes that have occurred since the public release of cardiac data. These changes include decreases in risk-adjusted mortality, cessation of cardiac surgery in New York by low-volume and high-mortality surgeons, out-of-state referral or avoidance of cardiac surgery/angioplasty for high-risk patients, alteration of contracting choices by insurance companies, and modifications in market share of cardiac hospitals. Evidence related to these impacts is reviewed and critiqued. This communication also includes a summary of numerous studies that used New York's cardiac registries to examine a variety of policy issues regarding the choice and use of cardiac procedures, the comparative effectiveness of competing treatment options, and the examination of the relationship among processes, structures, and outcomes of cardiac care. (J Am Coll Cardiol 2012;59:2309–16)

BENEFITS OF NY STATE REPORTING

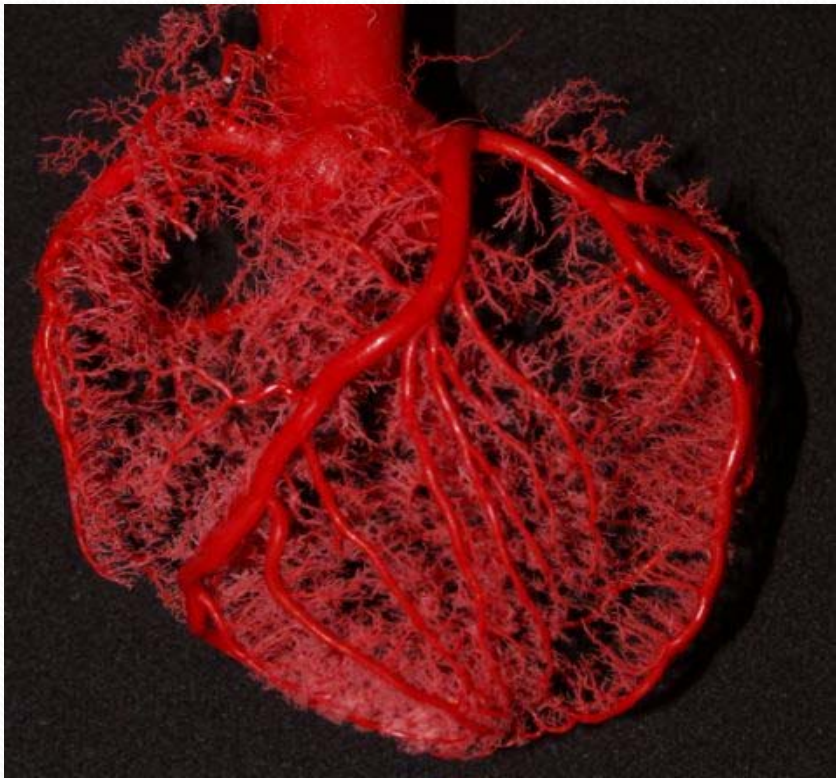
- **MORTALITY**

	1989	1992	2010
% lowered	3.52	2.78	1.58

  - **R**isk-**A**djusted
    - 1992 lowest RAMR of any state
    - *1994 -9 risk-adjusted odds mortality NY 0.66*

- **PUBLICATIONS**

- **QUALITY IMPROVEMENT**
  - St Peters 1990
  - Winthrop 1990
  - Erie 1990



exaggerated aura of scientific accuracy

- imperfect
- Interpretations vary
- ROC (C-indices) 0.76 - 0.82
  - comparable to weather prediction
- too technical for the average layman*

vs advocates enthusiasm for the public's "right to know"

nonstatisticians (consumers, administrators and surgeons) see:

mortality rates and rank order

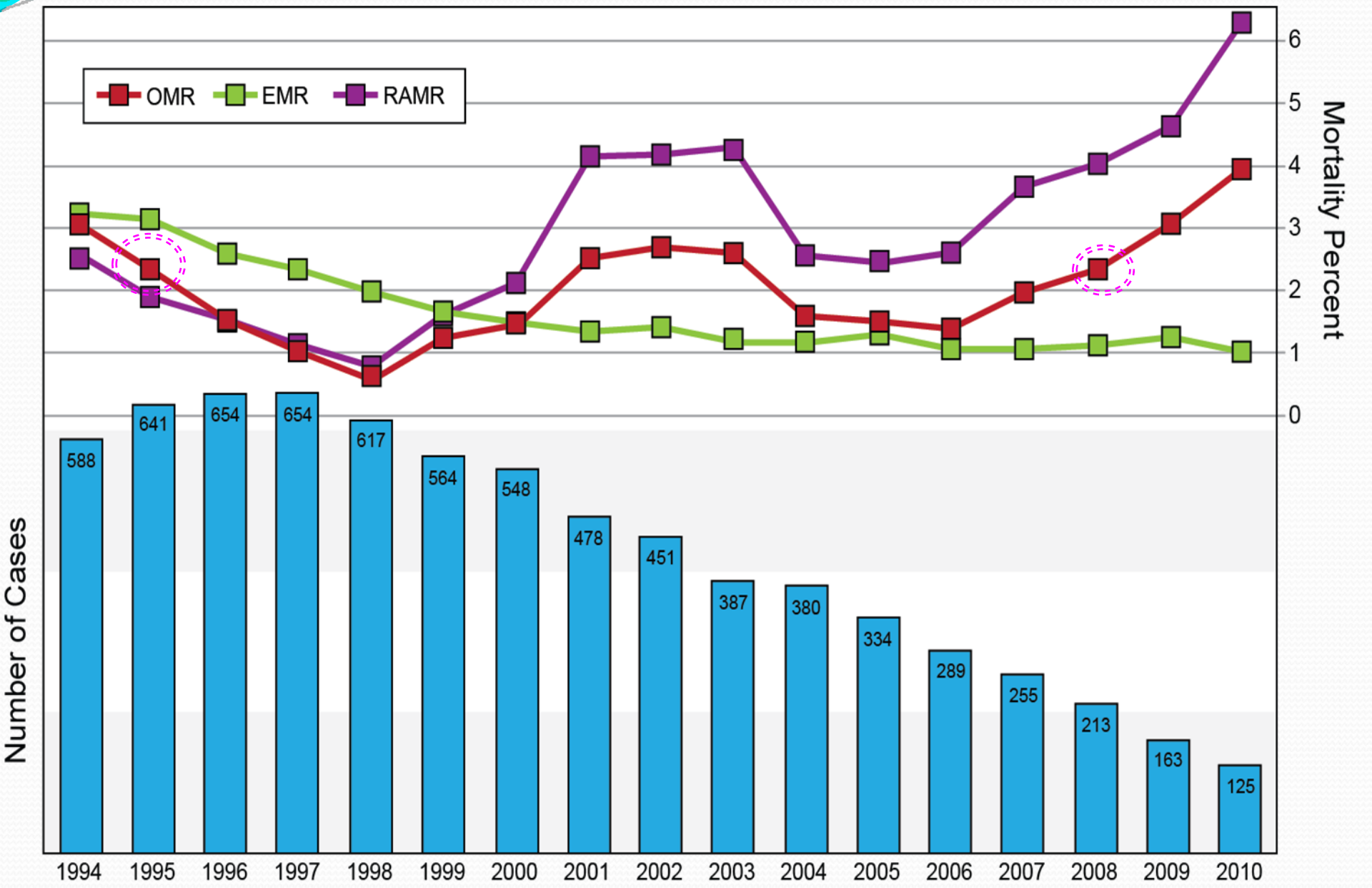
without regard to accuracy or range of statistical dispersion

Report Cards on Cardiac Surgeons — Assessing New York State's Approach

Jesse Green, Ph.D., and Neil Wintfeld, Ph.D.
N ENGL J MED 1995; 332:1229-1233

- New York **risk adjustment model** explained
  - 7.3% of variation surgeon-specific mortality
  - 8% of variation individual patients
  - 0.4% of variation hospital mortality

ONE SURGEONS RECORD



MEANING OF THE DATA?

- substantial changes in rank year – year
- rank not predictive of future performance
- *Hierarchical model: less variation, broader CI, fewer outliers*
- hospital rank shuffles without change in processes or surgeons
  - most likely explanation:

    ranks were ***not*** *significantly different*

    any observed changes are also not significant (noise)

Consumers *compare* between provider pairs
(rather than between each provider and some standard)

N ENGL J MED 1995; 332:1229-1233

Med Care 2005;43: 726–735

Relationship: Preventability of Death After CABG and RAMR

Guru V et al. Circulation 2008;117:2969-2976

Structured audit 347 deaths from 9 Institutions (Ontario 1998 – 2003)

- 32% preventable
  despite low RAMR 1.3% - 3.1%

No correlation RAMR + preventable deaths

Preventable deaths attributed to problems in:

- OR 86%
- ICU 61%
- Perioperative care 32-74%

All-cause RAMR are *convenient* measures of institutional quality of care
but not correlated with preventable mortality

detailed adverse event audits drive meaningful QI

IS MORTALITY THE CORRECT MEASURE?

other quality indicators

- risk-adjusted perioperative **morbidity**
- **cost/benefit** analysis
- **functional** improvement
- **quality of life**
- **patient satisfaction**

NEW YORK STATE RISK SCORES

Circulation

Circulation 2012 ;125:2423-2430

American Heart Association

Risk Score for Predicting Long-Term Mortality After Coronary Artery Bypass Graft Surgery

Chuntao Wu, Fabian T. Camacho, Andrew S. Wechsler, Stephen Lahey, Alfred T. Culliford, Desmond Jordan, Jeffrey P. Gold, Robert S.D. Higgins, Craig R. Smith and Edward L. Hannan

JACC

JOURNAL of the AMERICAN COLLEGE of CARDIOLOGY

J Am Coll Cardiol 2006 ;47:661– 8

Risk Stratification of In-Hospital Mortality for Coronary Artery Bypass Graft Surgery

Edward L. Hannan, PHD, FACC,* Chuntao Wu, MD, PHD,* Edward V. Bennett, MD,† Russell E. Carlson, MD,‡ Alfred T. Culliford, MD,§ Jeffrey P. Gold, MD, FACC,‖ Robert S. D. Higgins, MD,¶ O. Wayne Isom, MD, FACC,# Craig R. Smith, MD,** Robert H. Jones, MD, FACC††

	HOSPITAL N	HOSPITAL % OF CASES	HOSPITAL % MORT IN-HOSP	HOSPITAL % MORT IN/30D	NYS 2010 N	NYS 2010 % OF CASES	NYS 2010 % MORT IN-HOSP	NYS 2010 % MORT IN/30D
Pre-operative Risks, Continued								
Other Risks								
Malignant Ventricular Arrhythmia	1	0.51	0.00	0.00	72	0.76	4.17	4.17
Chronic Obstructive Pulmonary Disease	17	8.59	0.00	0.00	2262	24.01	1.95	2.34
Extensive Aortic Atherosclerosis	19	9.60	0.00	0.00	485	5.15	1.86	3.09
Diabetes Requiring Medical Therapy	88	44.44	1.14	1.14	3498	37.13	1.17	1.46
Hepatic Failure	0	0.00	0.00	0.00	1	0.01	0.00	0.00
Stent Thrombosis	0	0.00	0.00	0.00	15	0.16	0.00	0.00
Any Previous Organ Transplant	0	0.00	0.00	0.00	32	0.34	3.13	3.13
Heart Transplant Candidate	0	0.00	0.00	0.00	3	0.03	0.00	0.00
Active Endocarditis	0	0.00	0.00	0.00	1	0.01	0.00	0.00

0 ☐ None of the pre-op risk factors listed below were present

Previous Open Heart Operations

1 ☐ Previous CABG-Patent Grafts
1a ☐ Previous CABG-No Patent Grafts
2a ☐ Previous Valve Surgery
2 ☐ Any Other Previous Cardiac Surgery

Previous MI (most recent)

4 ☐ ≤6 hours
5 ☐ 6-23 hours
6 ☐☐ days *(use 21 for 21 or more)*

9 ☐ Cerebrovascular Disease
9a ☐ TIA only
10 ☐ Peripheral Vascular Disease

Hemodynamic Instability at time of procedure

12 ☐ Unstable
13 ☐ Shock

18 ☐ Congestive Heart Failure, Current
19 ☐ Congestive Heart Failure, Past
63 ☐ BNP, 3x Normal
20 ☐ Malignant Ventricular Arrhythmia
21 Chronic Lung Disease
- 1 ☐ None
- 2 ☐ Mild
- 3 ☐ Mod.
- 4 ☐ Severe

23 ☐ Extensive Aortic Atherosclerosis
24 ☐ Diabetes
- 24a Diabetes Therapy
  - 1 ☐ None
  - 2 ☐ Diet
  - 3 ☐ Oral
  - 4 ☐ Insulin
  - 5 ☐ Other

25 ☐ Hepatic Failure

27 ☐ Renal Failure, Dialysis
30 ☐ Emergency Transfer to OR after Dx Cath
31 ☐ Surgery for PCI Complication
32 ☐ Previous PCI, This Episode
33 ☐ PCI Before This Episode
38 ☐ Stent Thrombosis
39 ☐ Any Previous Organ Transplant
40 ☐ Heart Transplant Candidate
62 ☐ Active Endocarditis

NYS Significant Patient Risk Factors

	Prevalence (%)	2010 P-Value	2010 Odds	1994 P-Value	1994 Odds
Age: > 55 per year	-	<.0001	1.046	<0.0001	1.042
Body Surface Area (0.1m²)	-	0.0228	-	0.0007	0.450
Hemodynamic - Unstable	0.7	0.0020	3.797	<0.0001	3.111
Ejection Fraction <20%	1.7	0.0110	2.759	<0.0001	3.215
20-29%	5.8	0.0021	2.237	<0.0001	1.980
30-39%	10.6	0.0170	1.725		
Previous MI < 1 day	2.2	0.0002	3.695		
1-20 days	23	0.0246	1.517		
Cerebrovascular Disease	19	0.0381	1.475		
Peripheral Vascular Disease	12	<.0001	2.353		
Renal Failure Creat > 1.5mg/dl	9	0.0019	1.950	<0.0001	4.382
Dialysis	2.5	<.0001	4.021		
Chronic Obstructive Pulmonary Disease	24			0.0009	1.483
Diabetes	37			<0.0001	1.726
Extensively Calcified Ascending Aorta	5.1			<0.0001	1.810
Previous Open Heart Operations	3.3			<0.0001	2.200

Current risk factors for CABG mortality

(OR> 1.5) include only

- Age
- Ejection Fraction <40%
- Previous MI
- Peripheral Vascular Disease
- Renal Failure

- Female gender
- COPD
- diabetes
- aortic calcification
- reoperation …..

are no longer statistically important risks

Circulation

American Heart Association

Temporal Trends in the Use of Percutaneous Coronary Intervention and Coronary Artery Bypass Surgery in New York State and Ontario

Dennis T. Ko, Jack V. Tu, Zaza Samadashvili, Helen Guo, David A. Alter, Warren J. Cantor and Edward L. Hannan

Circulation. 2010;121:2635-2644

Coronary Artery Disease

Appropriateness of Coronary Revascularization for Patients Without Acute Coronary Syndromes

JACC 2012;59:1870-6

Incomplete Revascularization in the Era of Drug-Eluting Stents

Impact on Adverse Outcomes

Edward L. Hannan, PhD, FACC,* Chuntao Wu, MD, PhD,*† Gary Walford, MD, FACC,‡ David R. Holmes, MD, FACC,§ Robert H. Jones, MD, FACC,‖ Samin Sharma, MD, FACC,¶ Spencer B. King III, MD, MACC#

J Am Coll Cardiol Intv 2009;2:17–25

The NEW ENGLAND JOURNAL of MEDICINE

N Engl J Med 2008;358:331-41

Drug-Eluting Stents vs. Coronary-Artery Bypass Grafting in Multivessel Coronary Disease

Adherence of Catheterization Laboratory Cardiologists to American College of Cardiology/American Heart Association Guidelines for Percutaneous Coronary Interventions and Coronary Artery Bypass Graft Surgery

What Happens in Actual Practice?

Edward L. Hannan, PhD; Michael J. Racz, PhD; Jeffrey Gold, MD;

Circulation 2010;121:267-275

American Heart Association
Learn and Live

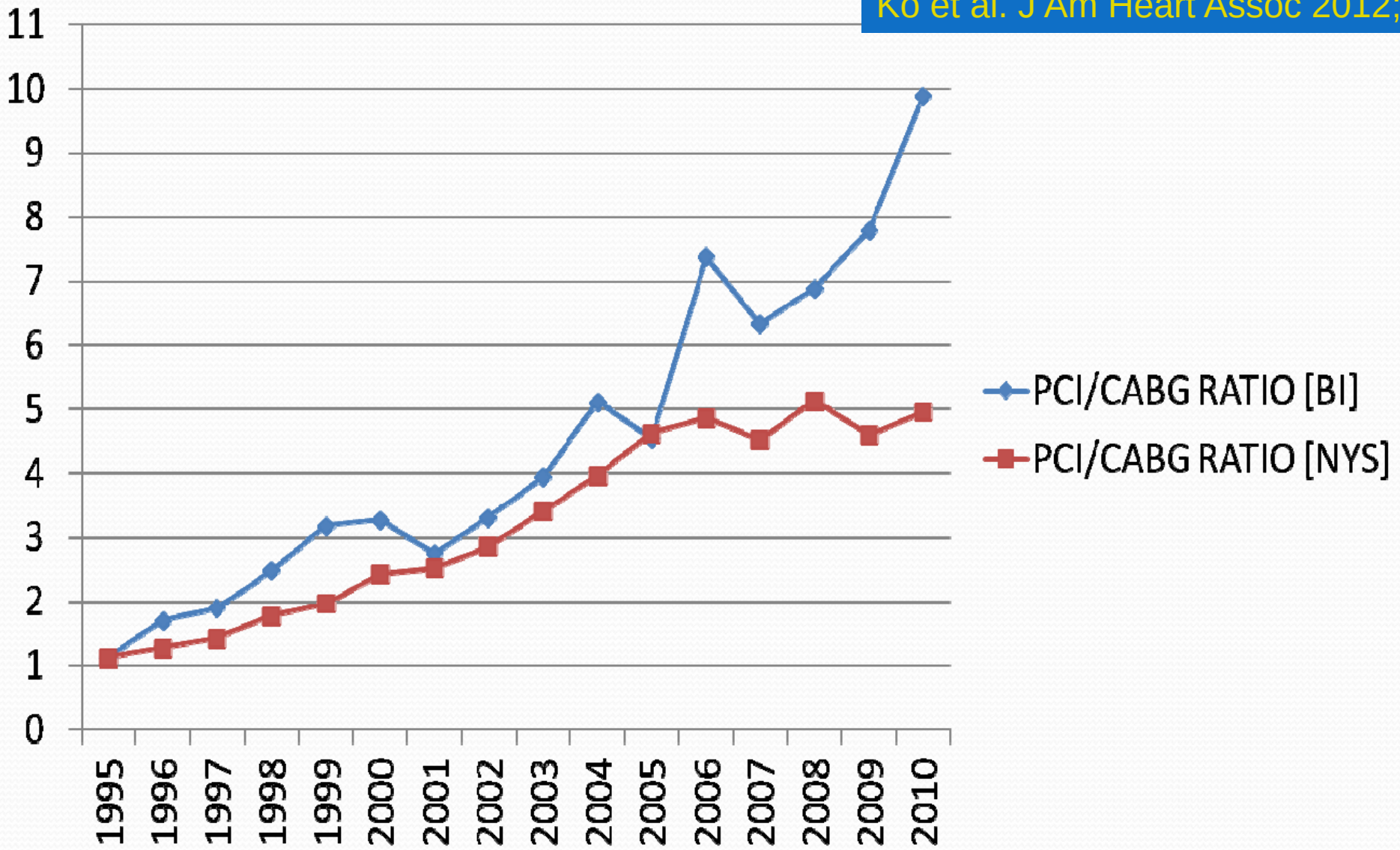
CABG indicated:	53% recommended CABG	34% PCI
PCI indicated:	94% recommended PCI	
Both indicated:	93% recommended PCI	5% CABG

	APPROPRIATE %	INAPPROPRIATE %	Uncertain %
CABG:	**90.0**	1.1	8.6
PCI:	**36.1**	**14.3**	**49.6**

J Am Coll Cardiol 2012;59:1870–6

CATH-CABG RATIO: BI vs NY State

Ko et al. J Am Heart Assoc 2012;



OFF PUMP CABG: OPCAB

25% isolated CABG 2008-2010

- **LESS**
  - stroke HR 0.70
  - respiratory failure HR 0.80
- **LOWER** mortality OR 0.81
- no difference in 7yr mortality
- MORE redo revascularization HR 1.55 (10.1 vs 6.4%)

J Am Coll Cardiol 2004;43:557– 64

Circulation. 2007;116:1145-1152

Circ Cardiovasc Qual Outcomes 2012;5:76-84

Circulation
Cardiovascular Quality and Outcomes
Journal of the American Heart Association

American Heart Association
Learn and Live

2010 CSRS BASELINE CHARACTERISTICS OF ISOLATED CABG
COMPARISON OF BETH ISRAEL MEDICAL CENTER TO NEW YORK STATE

	HOSPITAL				NYS 2010			
	N	% OF CASES	% MORT IN-HOSP	% MORT IN/30D	N	% OF CASES	% MORT IN-HOSP	% MORT IN/30D
Procedural Information								
Internal Mammary Artery Use								
IMA this OR visit	191	96.46	0.52	1.05	8894	94.41	1.16	1.48
IMA before this OR visit	0	0.00	0.00	0.00	152	1.61	1.97	1.97
IMA never used	7	3.54	0.00	0.00	375	3.98	2.93	3.73
Minimally Invasive	3	1.52	0.00	0.00	346	3.67	0.87	1.73
Converted to Standard Incision	0	0.00	0.00	0.00	13	0.14	7.69	7.69
Converted to Bypass	0	0.00	0.00	0.00	68	0.72	11.76	13.24
Entire Procedure Off Pump	19	9.60	0.00	0.00	2364	25.09	0.80	1.10
Total # Conduits								
Not Reported	0	0.00	0.00	0.00	5	0.05	0.00	0.00
1	4	2.02	0.00	0.00	655	6.95	0.61	1.22
2	18	9.09	0.00	0.00	2502	26.56	1.72	2.16
3	65	32.83	1.54	3.08	4356	46.24	1.19	1.49
4 or More	111	56.06	0.00	0.00	1903	20.20	0.95	1.16
# Arterial Conduits								
None	2	1.01	0.00	0.00	400	4.25	2.75	3.50
1	58	29.29	1.72	3.45	7423	78.79	1.24	1.59
2	84	42.42	0.00	0.00	1408	14.95	0.99	1.21
3	35	17.68	0.00	0.00	165	1.75	0	
4 or More	19	9.60	0.00	0.00	25	0.27	0	
Total # Distal Anastomoses								
Not Reported	0	0.00	0.00	0.00	8	0.08	0.00	0.00
1	4	2.02	0.00	0.00	611	6.49	0.65	1.15
2	19	9.60	0.00	0.00	1761	18.69	1.82	2.21
3	64	32.32	1.56	3.13	3572	37.92	1.23	1.60
4 or More	111	56.06	0.00	0.00	3469	36.82	1.07	1.33

- 69% >2 arterial grafts

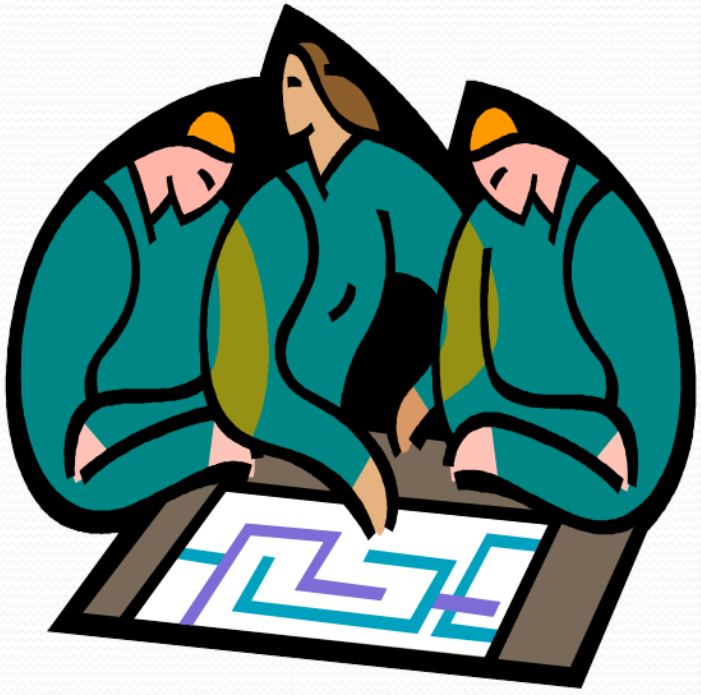
16.97%

- 56% 4 or more grafts

36.82%

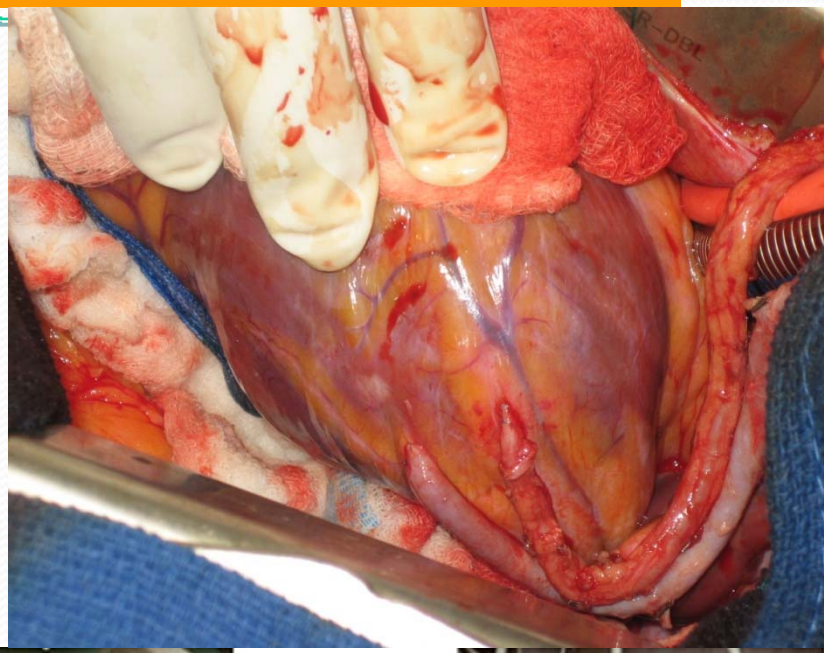
SO WHAT HAVE WE CHANGED???

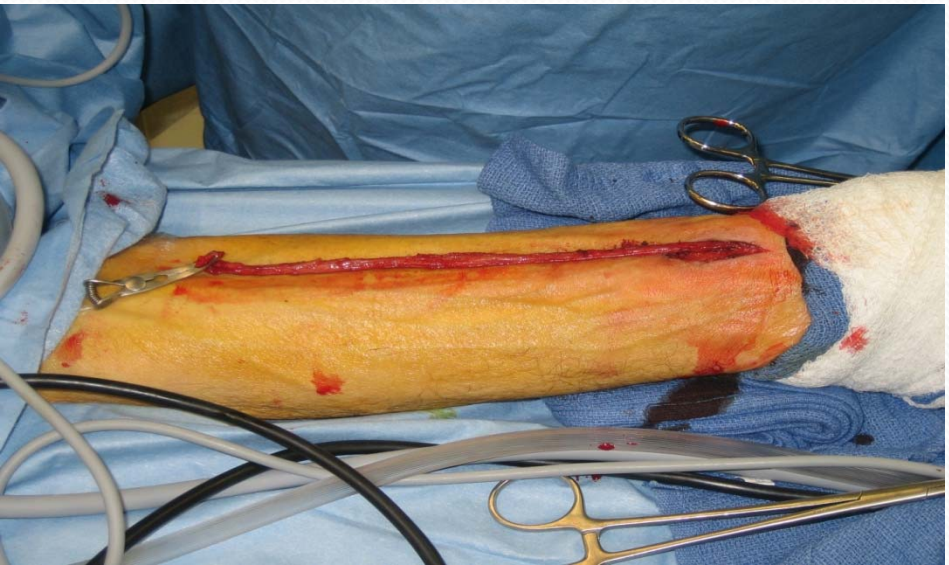
- Temperature
- Hematocrit
- Cerebral Saturation monitoring
- Selective OPCAB (10%)
  - Selective Beating Heart On Pump CABG (vs VF)
- Fewer IABP
- Wait 36 hrs after major MI
- Heart Team/Appropriateness meetings



WHAT HAVE WE NOT CHANGED

- Median Sternotomy
- Single Cross Clamp
- Blood Cardioplegia; selective retrograde
- Routine Swann Ganz, TEE
- Complete revascularization
- Radial Artery use (now 75%)
- Endoscopic conduit harvest (100%)





Traditional open vein harvest incision

Endoscopic vein harvest incision

CONCLUSIONS

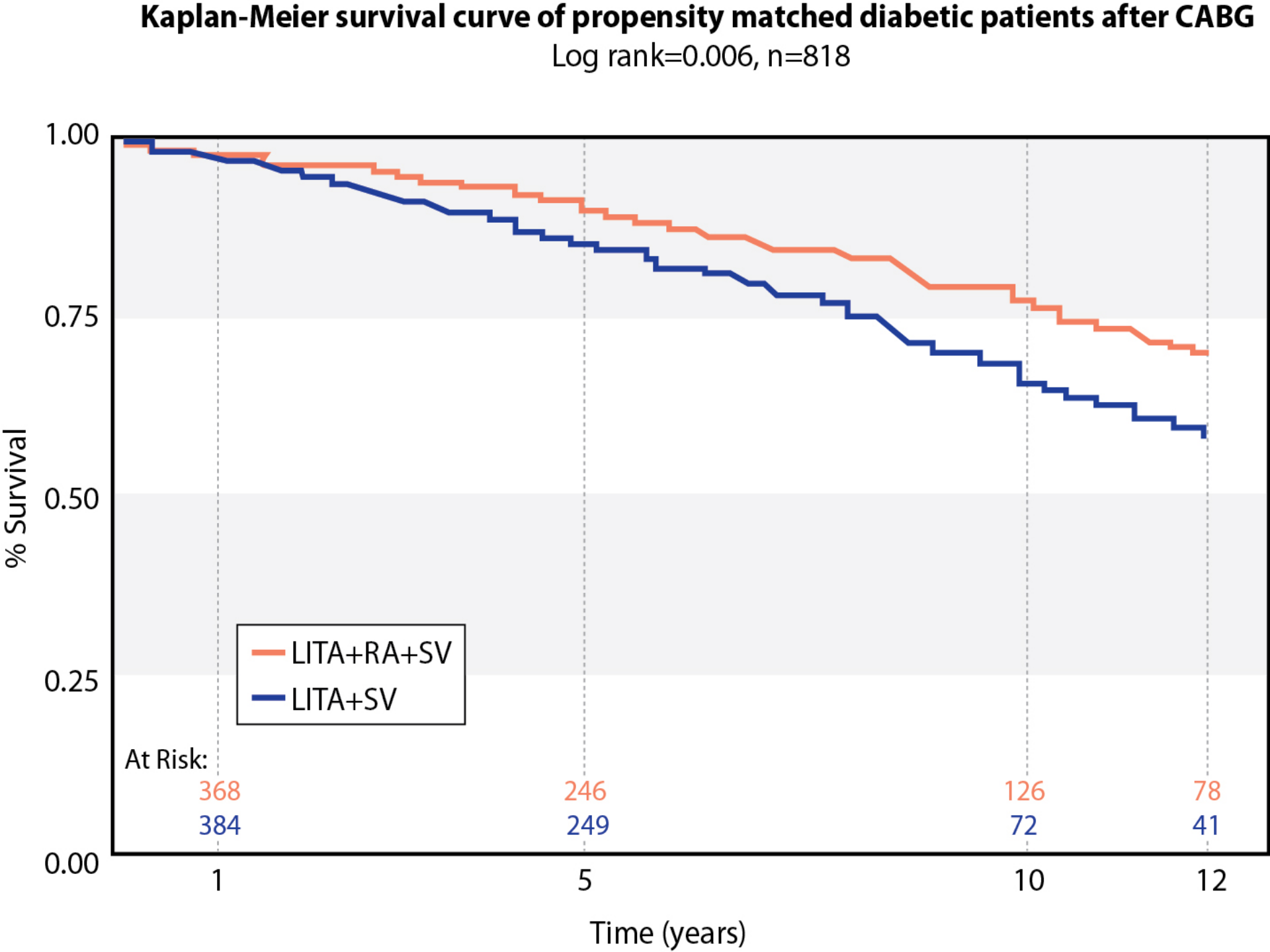
- NY trends influence others
- Benefit of public reporting remain unclear
- PCI: CABG Ratio vary excessively
- Multi- arterial grafting underused
- Mortality metric no longer adequate


THANK YOU!

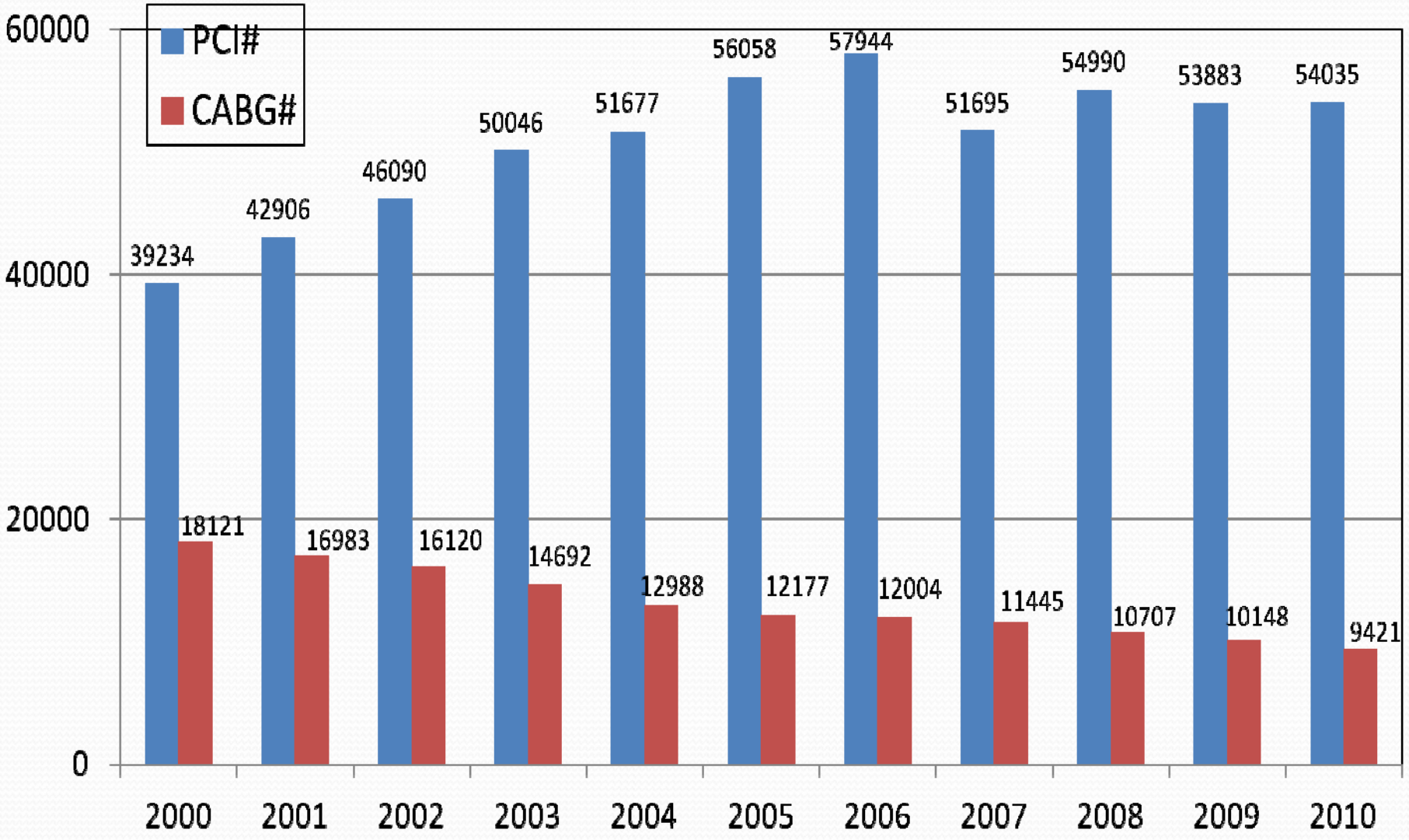
Table D1

Risk Factors Identified for Isolated CABG Surgery Operative Mortality* (2009)

Patient Risk Factors Identified	Proportion of patients(%)	Logistic Regression Results		
		Coefficient	P-Value	Odds Ratio
Demographic factors				
Age	---	0.0529	<.0001	1.054
Health factors				
Lung Disease	17.37	0.8052	0.0051	2.237
Renal Failure with Dialysis	2.54	1.5043	0.0011	4.501
Factors related to functioning of the heart				
Cardiogenic Shock	1.71	1.3059	0.0057	3.691
Ejection Fraction Less Than 30%	6.37	1.0994	0.0032	3.002
Ejection Fraction 30 - 39%	10.18	0.7811	0.0238	2.184
Myocardial Infarction 1 - 6 Hours	1.00	1.4409	0.0126	4.225
NYHA Classification - IV	16.03	0.6251	0.0479	1.868
Intercept	-8.7802			
C-Statistic	0.775			
Number of CABGs (N)	4,497			

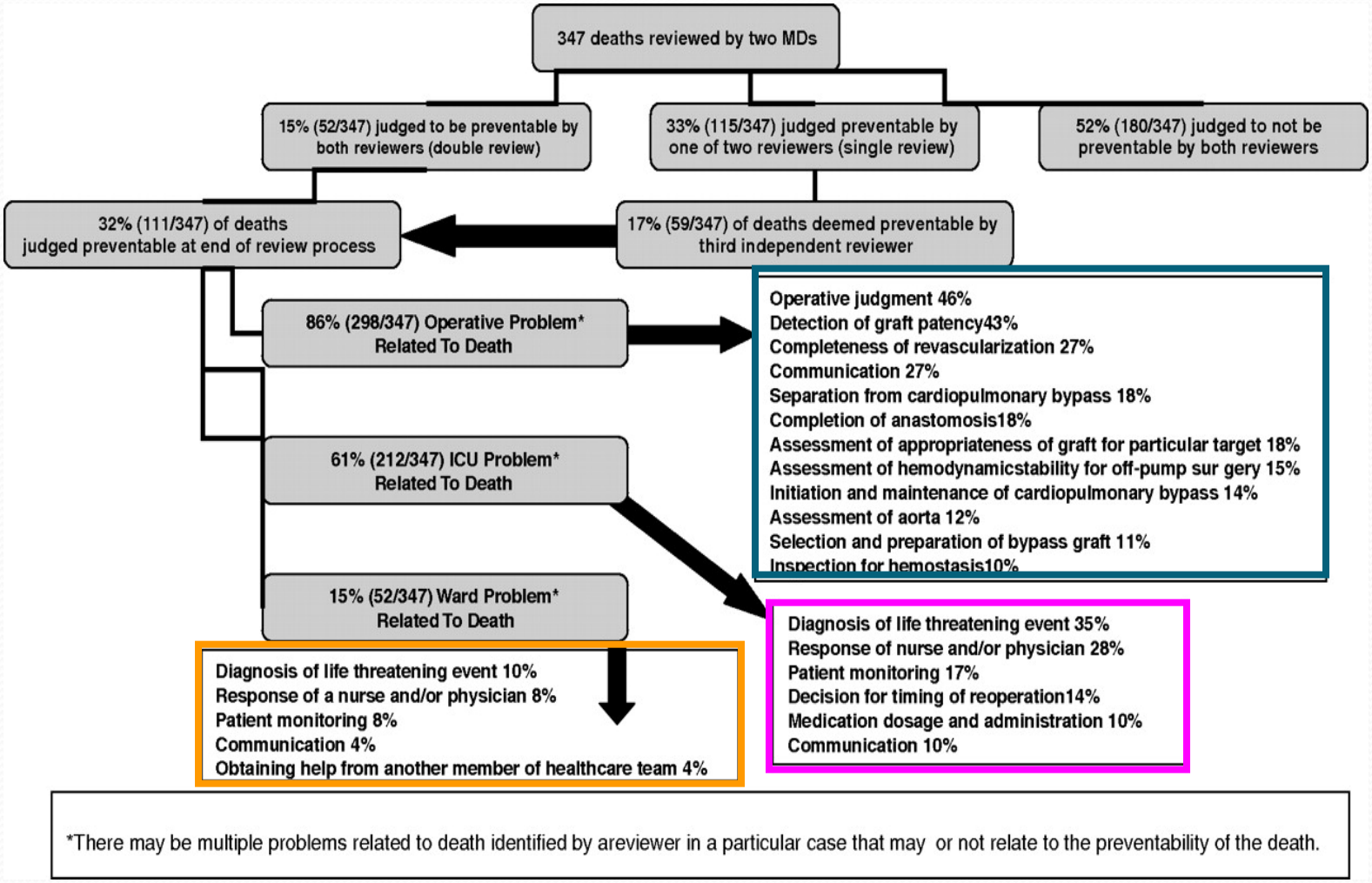

Kaplan-Meier survival curve of propensity matched diabetic patients after CABG
Log rank=0.006, n=818
1.00
0.75
0.50
0.25
0.00
% Survival
LITA+RA+SV
LITA+SV
At Risk:
368
384
246
249
126
72
78
41
1
5
10
12
Time (years)

PCI and CABG IN NEW YORK STATE



Results: review of isolated CABG deaths (n=347)

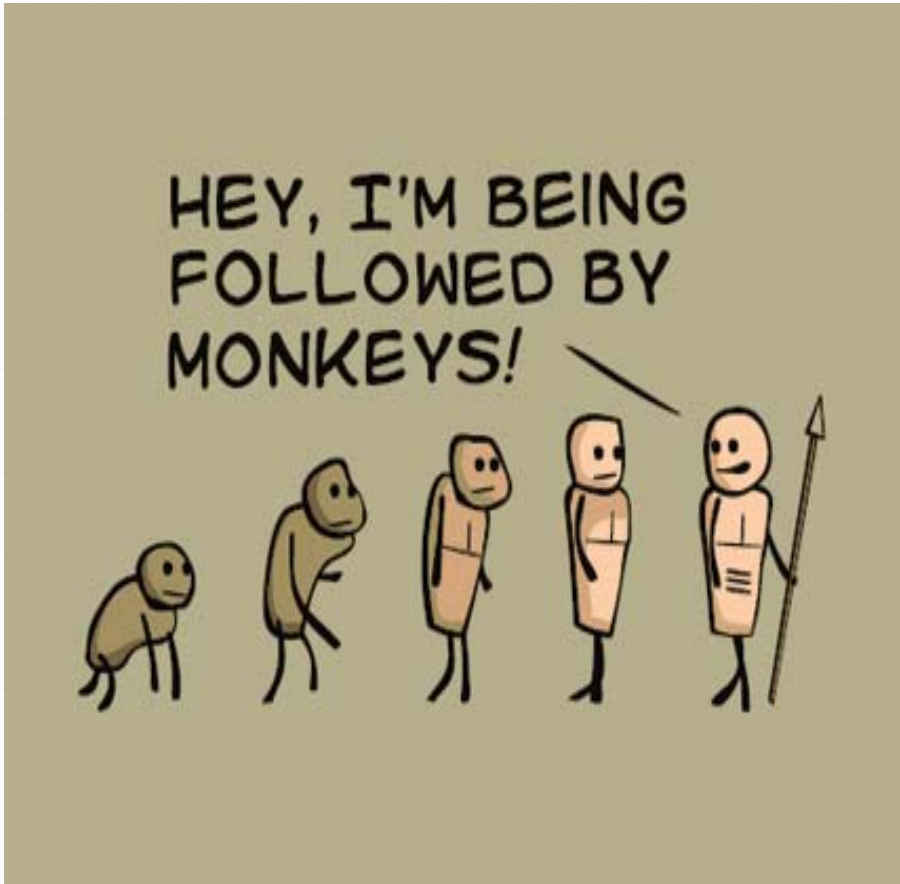
Guru V et al. Circulation 2008;117:2969-2976



2010 CSRS BASELINE CHARACTERISTICS OF ISOLATED CABG
COMPARISON OF BETH ISRAEL MEDICAL CENTER TO NEW YORK STATE

	HOSPITAL				NYS 2010			
	N	% OF CASES	% MORT IN-HOSP	% MORT IN/30D	N	% OF CASES	% MORT IN-HOSP	% MORT IN/30D
All Cases	198	100.00	0.51	1.01	9421	100.00	1.24	1.58
Patient Characteristics								
Age								
< 55	34	17.17	0.00	0.00	1523	16.17	0.66	0.98
55 - 59	31	15.66	0.00	0.00	1176	12.48	0.43	0.77
60 - 64	43	21.72	0.00	0.00	1645	17.46	0.73	0.91
65 - 69	37	18.69	0.00	0.00	1606	17.05	1.18	1.56
70 - 74	26	13.13	3.85	3.85	1390	14.75	1.51	1.87
75 - 79	17	8.59	0.00	5.88	1117	11.86	2.24	2.78
80 - 84	8	4.04	0.00	0.00	730	7.75	2.19	2.47
>= 85	2	1.01	0.00	0.00	234	2.48	3.85	4.27
Sex								
Male	161	81.31	0.62	1.24	7026	74.58	1.10	1.44
Female	37	18.69	0.00	0.00	2395	25.42	1.67	2.00
Ethnicity								
Hispanic	54	27.27	1.85	1.85	843	8.95	0.71	0.83
Non-Hispanic	144	72.73	0.00	0.69	8578	91.05	1.29	1.66
Race								
White	130	65.66	0.77	1.54	7936	84.24	1.20	1.55
Black	24	12.12	0.00	0.00	684	7.26	2.19	2.49
Native American	0	0.00	0.00	0.00	21	0.22	0.00	0.00
Asian	41	20.71	0.00	0.00	570	6.05	1.23	1.58
Pacific Islander	2	1.01	0.00	0.00	8	0.08	0.00	0.00
Other	1	0.51	0.00	0.00	202	2.14	0.00	0.00
Principal Residence								
New York State	190	95.96	0.53	1.05	9099	96.58	1.22	1.56
Outside New York	8	4.04	0.00	0.00	322	3.42	1.86	2.17
Primary Payer								
Medicare Fee for Service	57	28.79	0.00	1.75	3019	32.05	1.89	2.32
Medicare Managed Care	35	17.68	2.86	2.86	1625	17.25	1.78	2.09
Medicaid Fee for Service	13	6.57	0.00	0.00	378	4.01	1.06	1.32
Medicaid Managed Care	34	17.17	0.00	0.00	552	5.86	0.36	0.54
Blue Cross	12	6.06	0.00	0.00	1266	13.44	0.47	0.79
HMO or Managed Care	39	19.70	0.00	0.00	1516	16.09	0.53	0.99
Other Private	1	0.51	0.00	0.00	489	5.19	0.61	0.61
Self Pay	0	0.00	0.00	0.00	411	4.36	0.97	0.97
Other Source	7	3.54	0.00	0.00	165	1.75	2.42	3.03

What can we teach you about evolution?



- LIBERATE
  - CARDIAC TAMPONADE
  - CONSTRICTIVE PERICARDITIS
- RESHAPE
  - ANEURYSM
  - SAVR
  - MITRAL VALVE
- RIGHT VENTRICLE
  - PULMONARY EMBOLISM
    - ACUTE
    - CHRONIC
- ELECTRICAL THERAPY