

Why Hospital Mortality is Not a Good Quality Indicator for Stroke

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Disclosures

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COLORADO HOSPITAL REPORT CARD

Implementation Plan of House Bill 06-1278



20. Stroke

(AHRQ Risk-Adjusted Mortality Rate, Condition Measure)

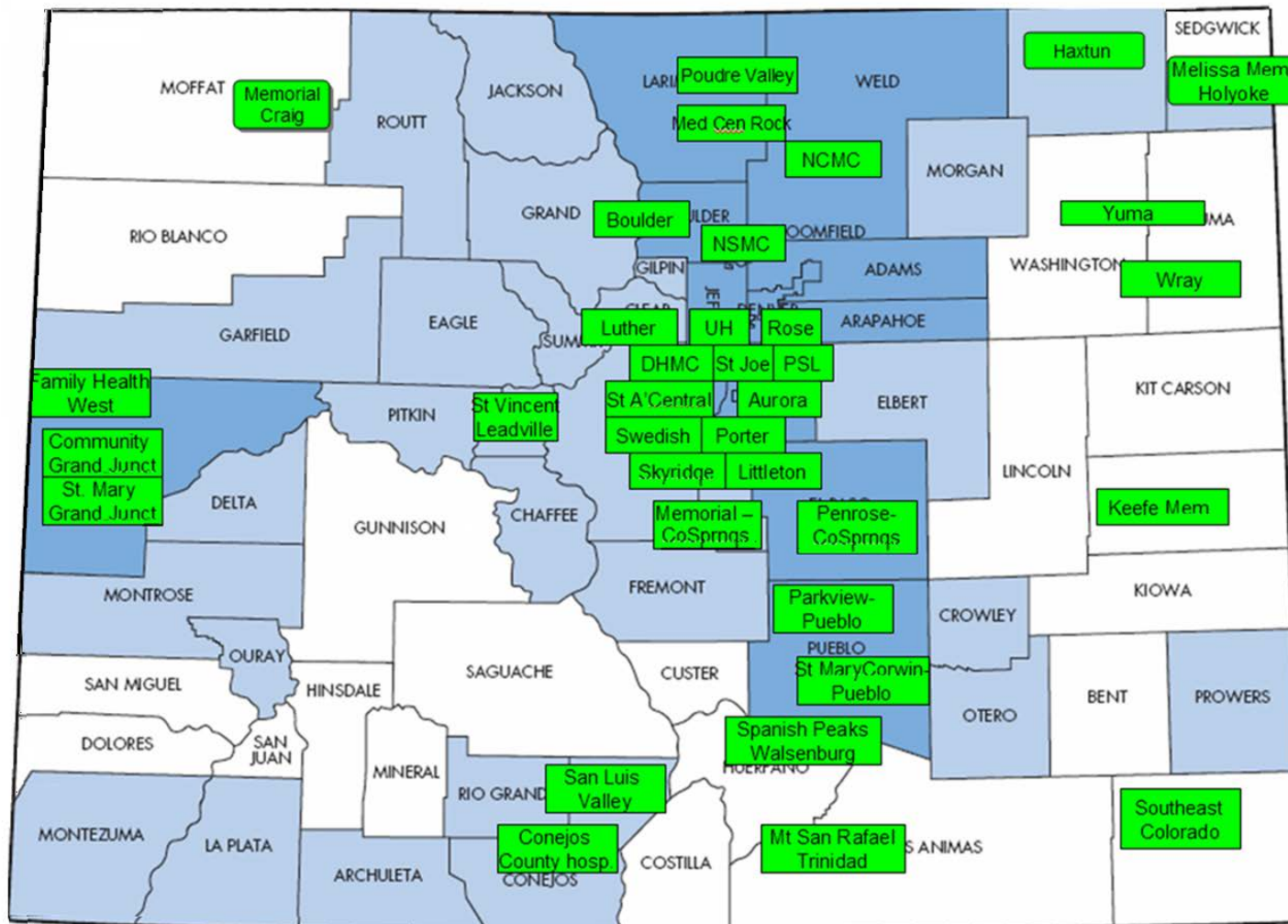
- Description - A stroke can occur when the blood supply to part of the brain is blocked or when a blood vessel in the brain bursts, causing damage to a part of the brain.
- Rate Calculation - Calculated as the number of deaths per 100 discharges for stroke.
- Justification - Quality treatment for acute stroke must be timely and efficient to prevent potentially fatal brain tissue death, and patients may not present until after the fragile window of time has passed.

Not All Strokes Are Alike



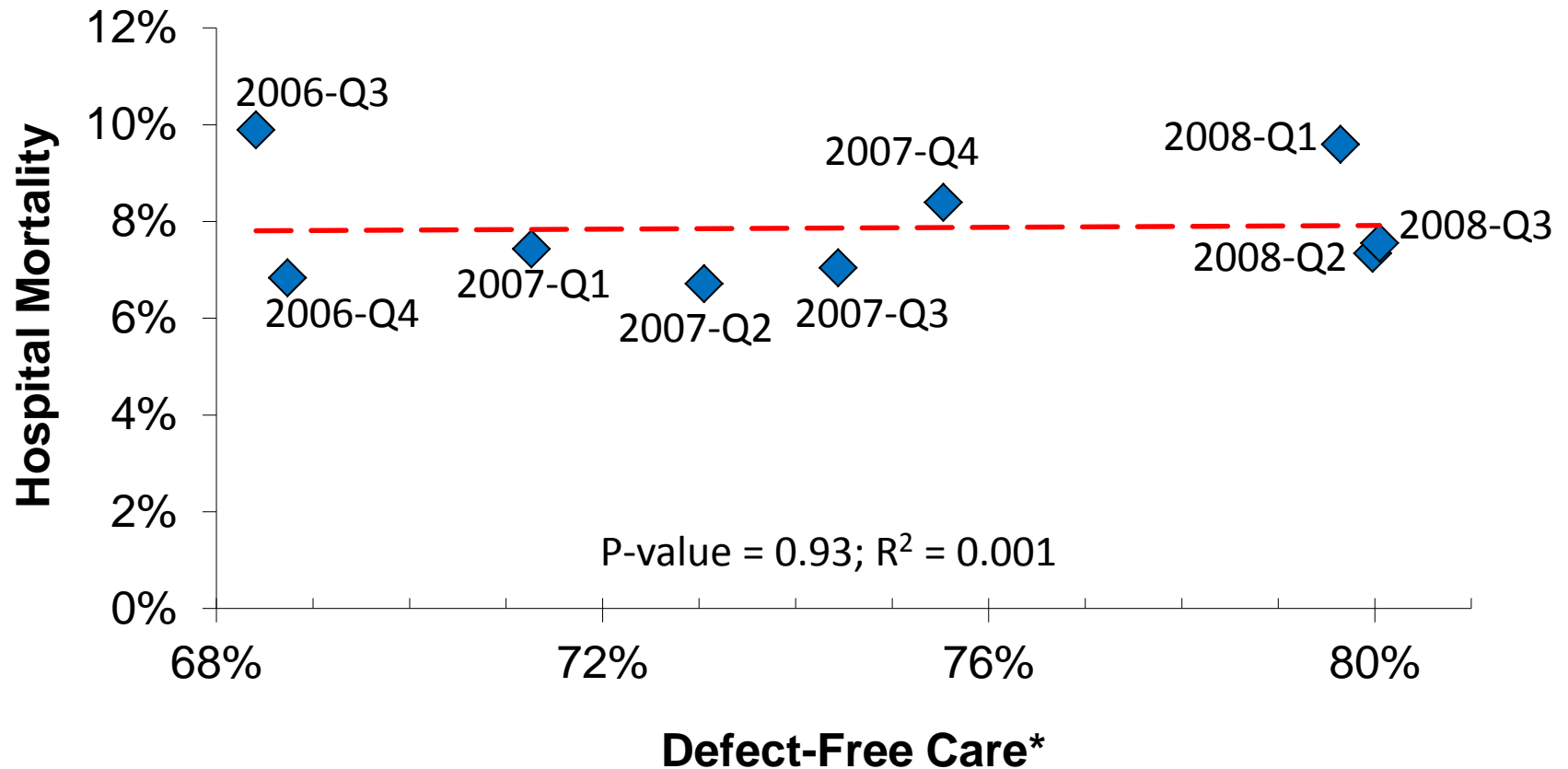


Colorado Stroke Alliance



Defect-Free Care & Mortality in CSA

Over 9 Consecutive Quarters

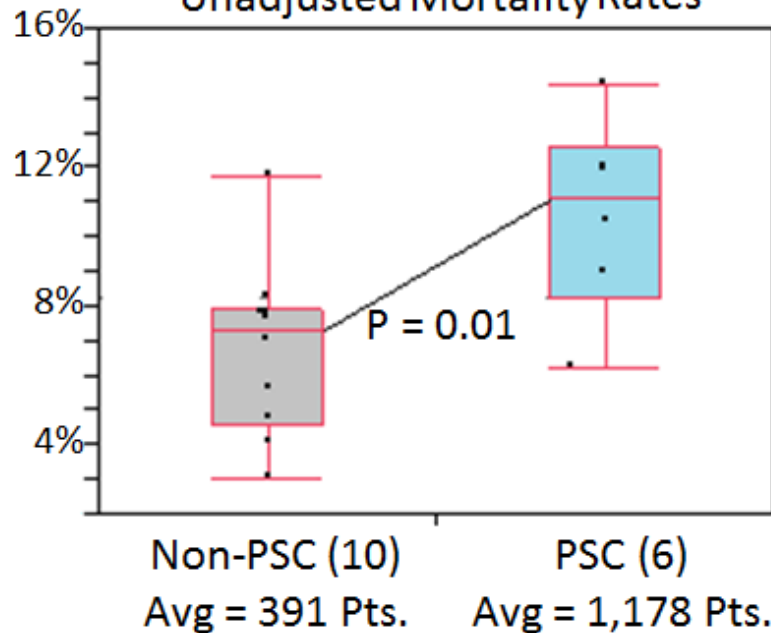


*All of the following Quality Indicators were met: anticoagulation for atrial fibrillation; antithrombotic at discharge; antithrombotic within 48 hours; DVT prophylaxis; IV rt-PA given within 1 hour; lipid lowering medication if LDL >100; smoking cessation; counseling.

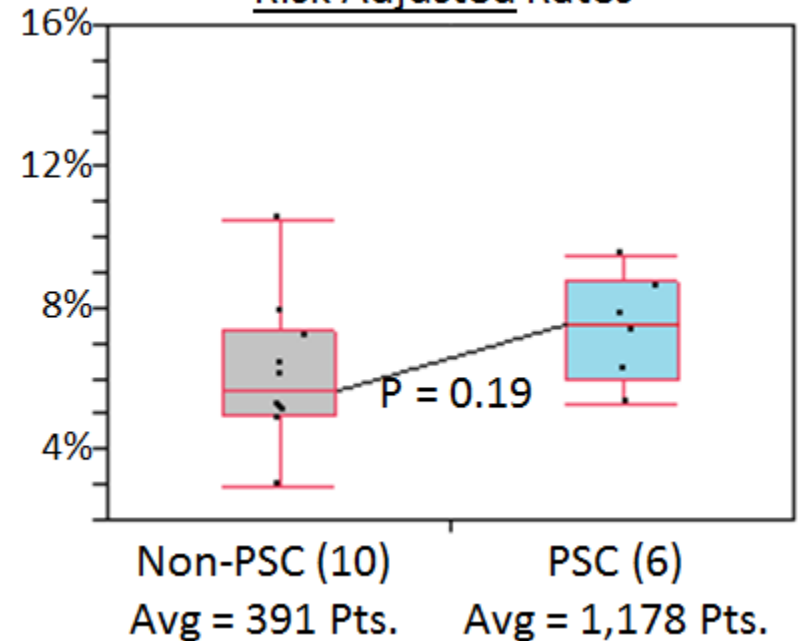
Effect of “Report Card” Risk Adjustment

Comparing PSC and Non-PSC (Data for 2005 – 2008)

Unadjusted Mortality Rates



Risk Adjusted Rates



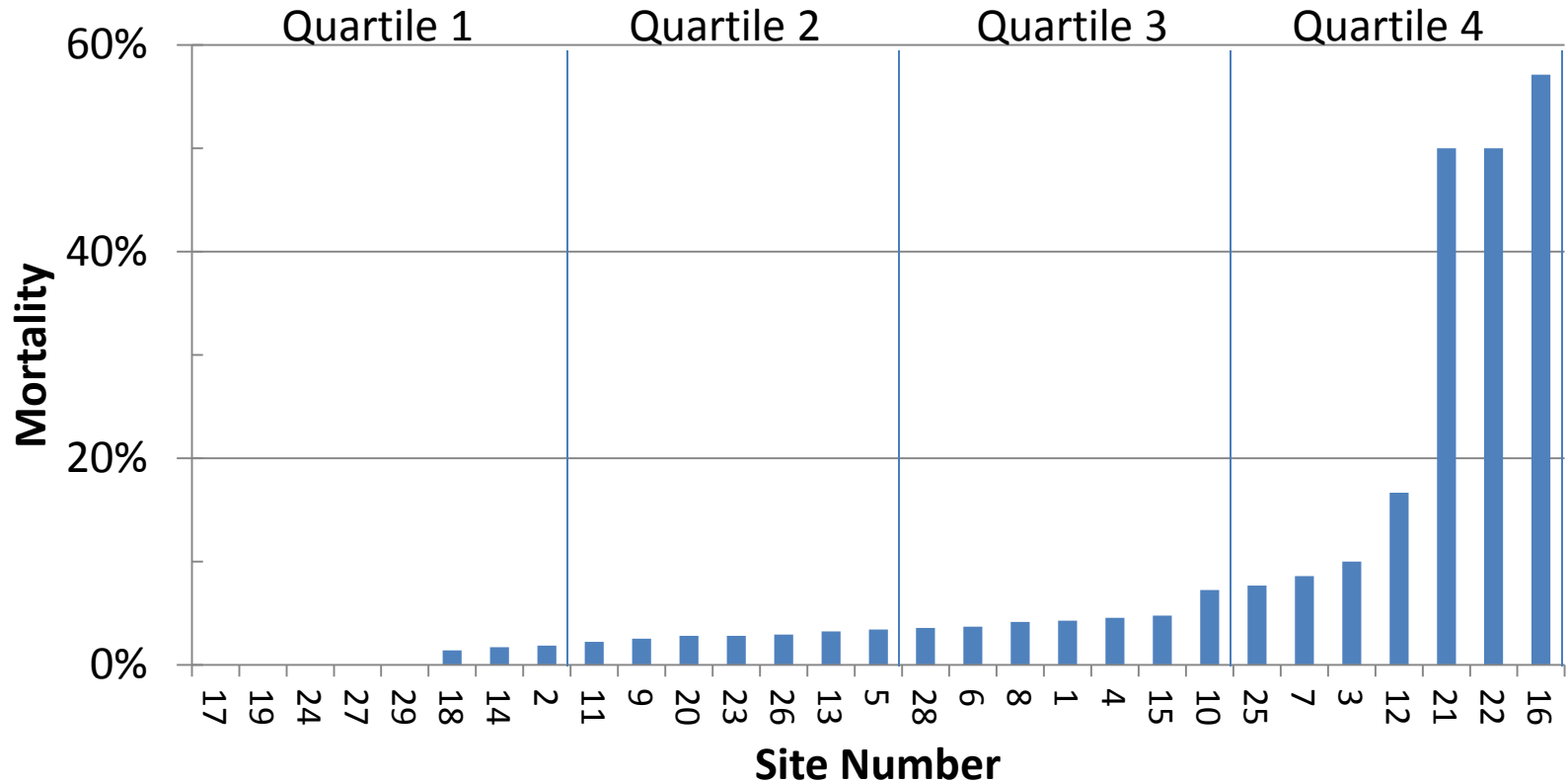
Derivation of Study Population

Data Set	Records
June 2010 download	15,625
Ischemic strokes	8,709
Complete records	7,455
Arrive via EMS or private means, from scene	6,733
Onset in community, not transferred from other hospital	5,994
Between 1/1/2006 and 5/31/2010	5,935
tPA status known	5,935
DC status known & not transferred to another hospital	5,609
Not treated with IA or experimental protocol	5,550



29 Hospitals

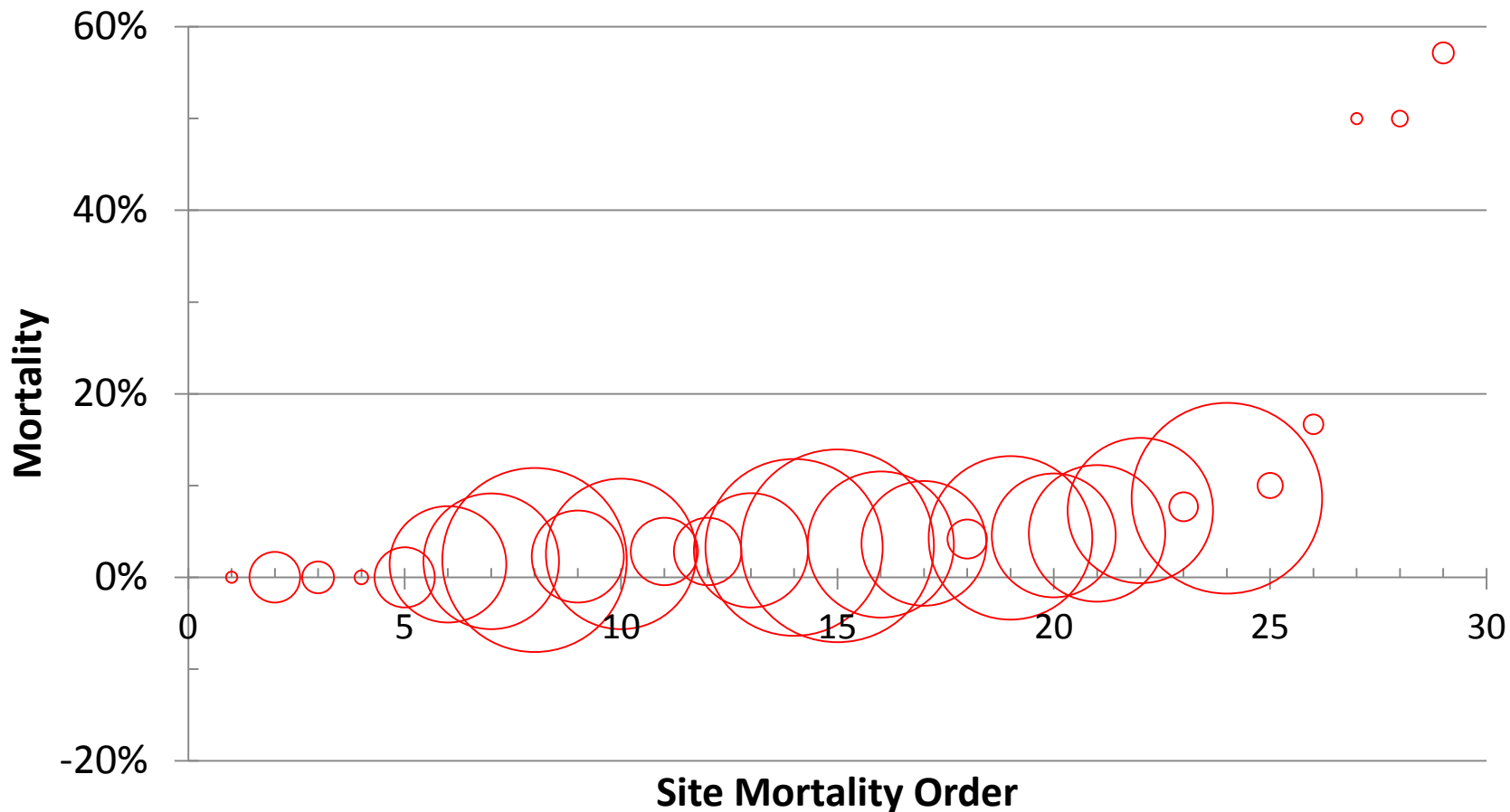
Ordered, Unadjusted Mortality Rates



Mortality Quartile	# Hospitals	Lived	Died	Odds of Death	Odds Ratio c/w 1st	Risk of Death	Risk Ratio c/w 1st
1	8	1131	18	0.016	1	1.6%	1
2	7	1848	58	0.031	1.97	3.0%	1.94
3	7	1795	89	0.050	3.12	4.7%	3.02
4	7	552	59	0.107	6.72	9.7%	6.16

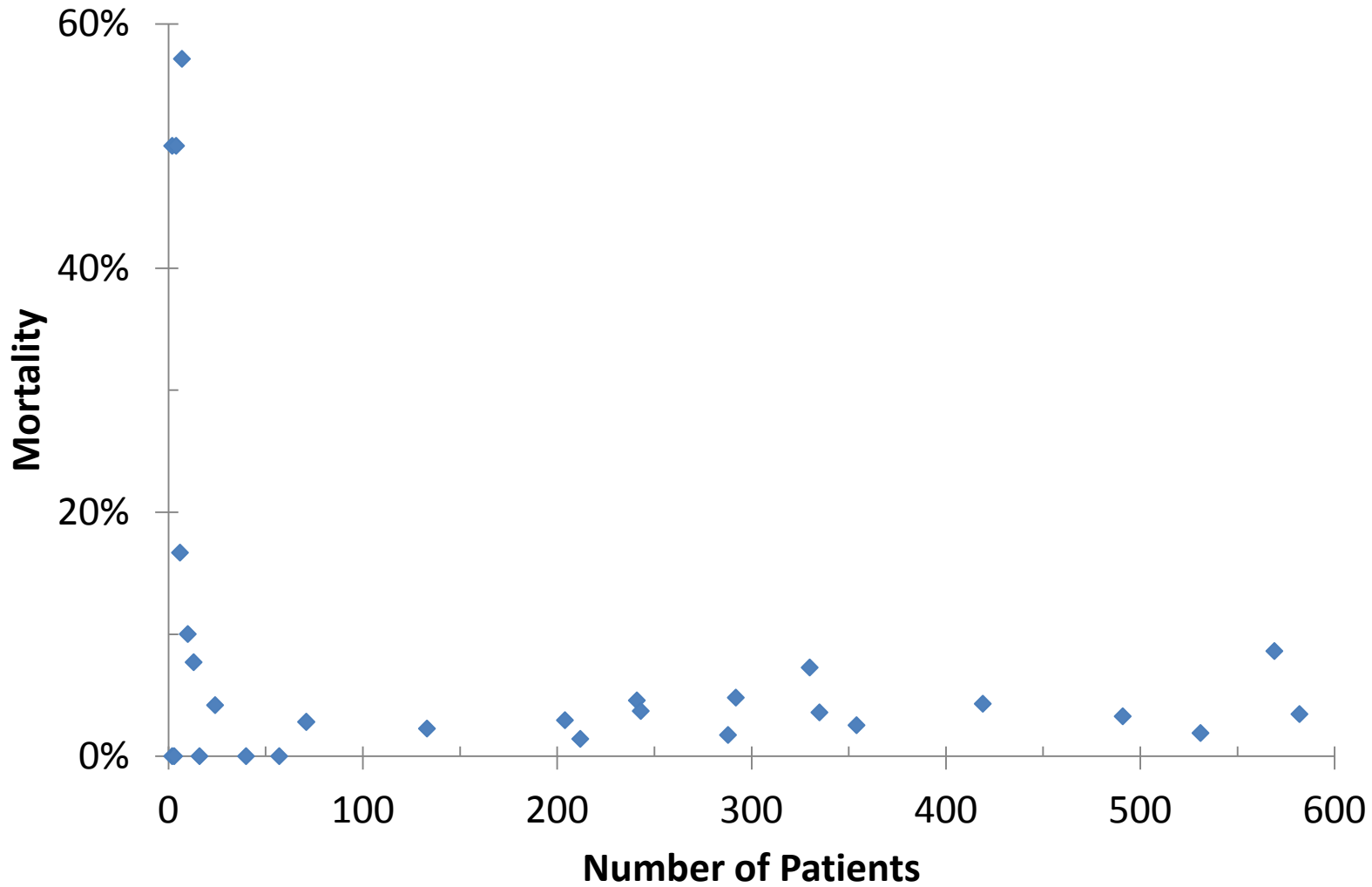
Unadjusted Mortality & Patient Volume

(Size of circles is proportional to # of patients. Center of circles marks raw mortality rates.)

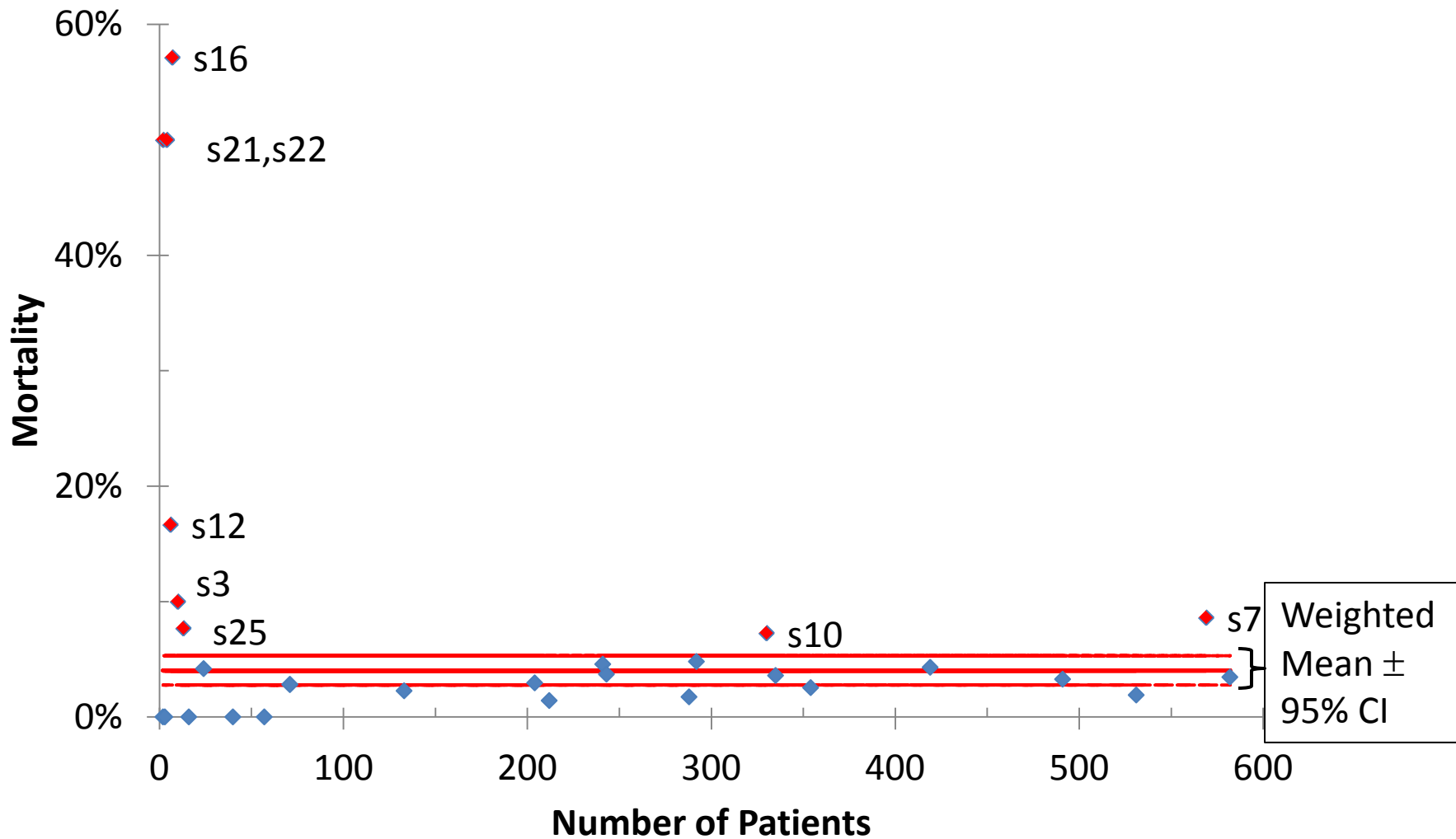


Unadjusted Mortality Rate

by Patient Volume



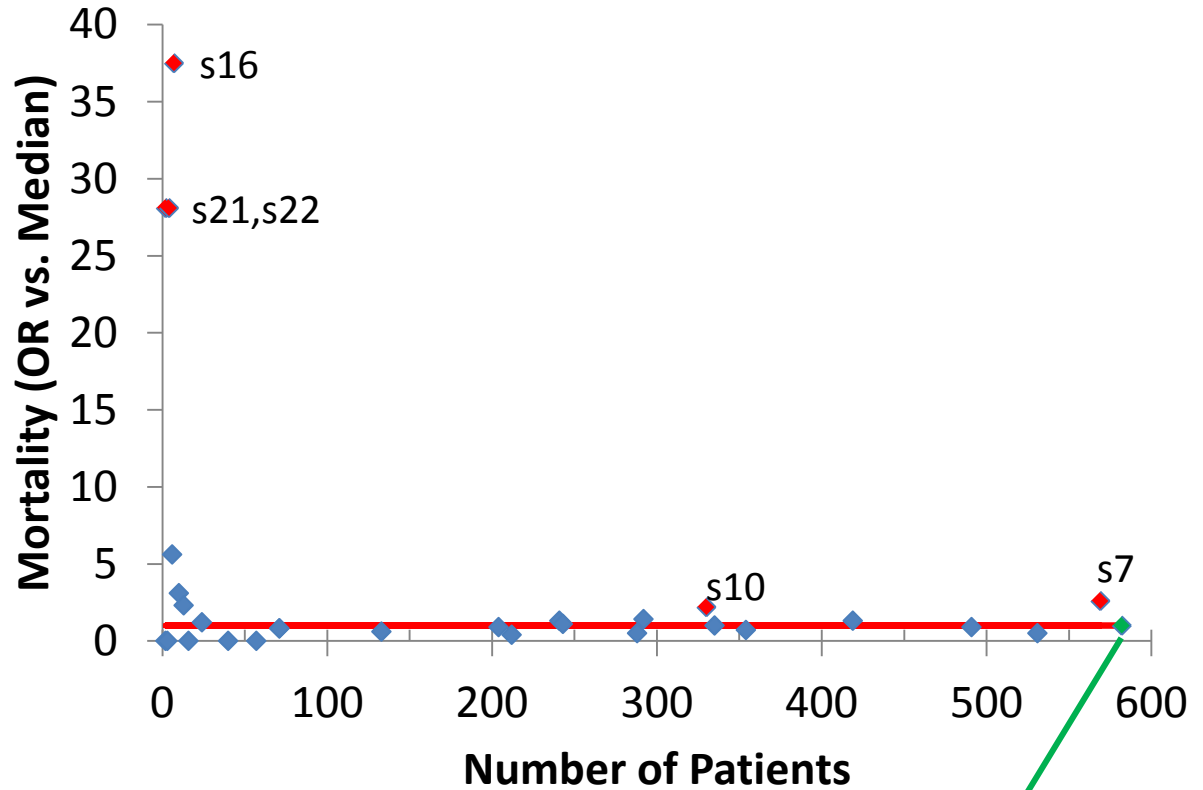
Unadjusted Mortality Rate by Patient Volume



Unadjusted Mortality Odds Ratio

Vs. Median, by Patient Volume

Site	N	OR	95% CI	
			Lower	Upper
16	7	37.5	7.9	178.7
21	2	28.1	1.7	465.6
22	4	28.1	3.8	209.7
12	6	5.6	0.6	50.4
3	10	3.1	0.4	25.8
7	569	2.6	1.6	4.5
25	13	2.3	0.3	18.9
10	330	2.2	1.2	4.1
15	292	1.4	0.7	2.8
4	241	1.3	0.6	2.8
1	419	1.3	0.7	2.4
8	24	1.2	0.2	9.5
6	243	1.1	0.5	2.4
28	335	1.0	0.5	2.2
5	582	1	median	median
13	491	0.9	0.5	1.8
26	204	0.9	0.3	2.2
20	71	0.8	0.2	3.6
23	71	0.8	0.2	3.6
9	354	0.7	0.3	1.6
11	133	0.6	0.2	2.2
2	531	0.5	0.3	1.2
14	288	0.5	0.2	1.3
18	212	0.4	0.1	1.4
17	2	0	0	0
19	40	0	0	0
24	16	0	0	0
27	3	0	0	0
29	57	0	0	0



Abstract 1580 (Scientific Sessions 2009): Prediction of In-Hospital Mortality in Ischemic Stroke Using Data From GWTG-Stroke (Circulation. 2009;120:S522)

Eric E Smith; Mathew J Reeves; Adrian F Hernandez; Jeffrey L Saver; Wenqin Pan; David Dai; DaiWai M Olson; Gregg C Fonarow; Lee H Schwamm

Introduction: There is increasing interest in mortality as a measure of quality of care in stroke. We used Get With the Guidelines-Stroke program data to derive and validate prediction models for a patient's risk of in-hospital ischemic stroke mortality.

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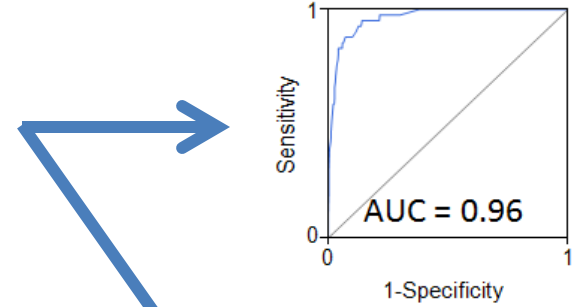
“Clearly, stroke severity is the most important predictor of outcome...
...the NIH Stroke Scale, was a very strong predictor of mortality risk. Unfortunately, this scale is only recorded about 40 percent of the time”

Eric Smith, MD --- ASA Website Information

demographics and past medical history, produce fair discrimination. **Incorporating stroke severity scores (NIHSS) substantially improved the discrimination.** Stroke severity should be considered when adjusting hospital mortality for patient case mix.

Multivariate Logistic Regression Model

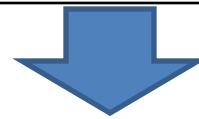
Variable	Missing Values
Any ambulation at admission	64%
Arrive by EMS	0%
NIHSS	49%
Comfort Care	0%



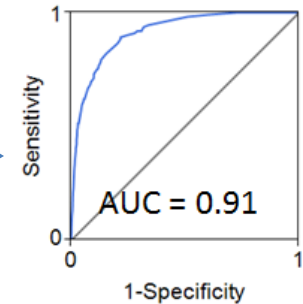
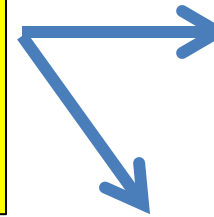
Actual	Prediction		% Correct
	Live	Die	
Lived	1285	7	99.5%
Died	26	15	36.6%
Overall, 97.5% correctly classified			

Multivariate Logistic Regression Model

Variable	Missing Values
Any ambulation at admission	64%
Arrive by EMS	0%
NIHSS	49%
Comfort Care	0%



NIHSS
Comfort Care



Actual	Prediction		% Correct
	Live	Die	
Lived	2684	18	99.3%
Died	88	23	20.7%
Overall, 96.2% correctly classified			

Summary of Models

(Identifying Sites With >Expected Mortality)

Site	Raw Rate: >U 95% CI of Weighted Mean	Univariate Logistic Analysis: P < 0.05	Multivariate Model
3	+	-	-
7	+	+	-
10	+	+	-
12	+	-	-
16	+	+	-
21	+	+	-
22	+	+	-
25	+	-	-

+ indicates possibly greater than expected mortality

NIHSS Missingness

	NIHSS Missing?		P
	No	Yes	
Age (mean, 95% CI)	71.1 (70.2-72)	70.8 (70.3-71.4)	0.37 Wilcoxon
Male (N, %)	1,315 (50.4%)	1,294 (49.6%)	
Female (N, %)	1,498 (50.9%)	1,443 (49.1%)	0.69 Chi-square

Is not related to age or gender

NIHSS Missingness

	Death in Hospital?		
NIHSS missing	No	Yes (%Yes)	Row % Total
No	2,702	111 (4%)	50.7%
Yes	2,624	113 (4.1%)	49.3%
Column % Total	96%	4%	
	P = 0.73 (chi square)		

Does not predict mortality

Summary

- Defect free care is not associated with a decrease in mortality.
- After applying the AHRQ Risk-Adjustment, stroke centers still have higher mortality rates than non-stroke centers.
- A model consisting of stroke severity (as measured by the NIHSS score) and end-of-life decision making (as reflected by assignment to comfort care) correctly classified >96% of our patients.
- Once these factors were taken into account, the site of hospital treatment did not predict stroke mortality.
- NIHSS scores were missing in nearly half our patients, but this “missingness” did not predict mortality.

Conclusion

In-hospital mortality is of questionable value as a publicly-reported indicator of the quality of hospital care, especially when the mortality rates are risk-adjusted with administrative data that lack direct measures of stroke severity or end-of-life decision making.