

# **Economic Outcomes of Percutaneous Coronary Intervention Performed at Sites With and Without On-Site Cardiac Surgery**

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# Background and Objectives

The Cardiovascular Patient Outcomes Research Team / Non-Primary Percutaneous Coronary Intervention (PCI) (CPORT-E) trial randomly assigned patients after diagnostic catheterization to undergo non-primary PCI:

- At a hospital without on-site cardiac surgery (No SOS)
- Or, to be transferred to a hospital with surgical back-up (SOS)

## Clinical Outcomes:

- No treatment-related differences in mortality at 6-weeks and major adverse cardiac events at 9 months
- SOS patients had more staged index PCI procedures but fewer subsequent revascularizations at 9 months.

**Economic Objective:** Conduct a prospective economic study to compare medical resource use and medical costs for SOS and No SOS patients.

# Economic Study Methods

**Population:** All CPORT-E patients

**Endpoints:**

- Primary: Estimated medical costs at 9 months
- Secondary: Admissions, length of stay, unadjusted medical costs

**Subgroups:** Annual PCI volume at enrolling site

- Low volume (<200 cases)
- High volume ( $\geq 200$  cases)

**Study period:** Index diagnostic catheterization through 9 months

**Costing methods:**

- Coordinators at CPORT-E sites collected inpatient bills.
- Duke EQOL coordinating center performed remote site management.
- Estimated medical costs for outpatient cardiac procedures, inpatient stays, and emergency department visits from patient bills.
- Physician costs estimated using national Medicare reimbursement.
- Ambulance transportation costs for SOS patients estimated using local Medicare reimbursements.

# Baseline Patient Characteristics

	No SOS (n=14,149)	SOS (n=4718)
<b>Demographics</b>		
Age	64.0 (55.0, 73.0)	64.0 (55.0, 73.0)
White race	11185 (79.1)	3778 (80.1)
Male sex	9046 (63.9)	2970 (63.0)
<b>Medical History</b>		
Diabetes	5485 (38.8)	1868 (39.6)
Procedure status		
Elective	10350 (73.2)	3414 (72.4)
Urgent / emergent	3784 (26.8)	1302 (27.6)
Clinical status		
STEMI / NSTEMI	3861 (27.3)	1357 (28.8)
Unstable angina	5196 (36.7)	1665 (35.3)
Stable angina	2011 (14.2)	636 (13.5)
Other	3079 (21.8)	1058 (22.4)

\* Categorical as n(%) and continuous as median (25<sup>th</sup>, 75<sup>th</sup>)

# Patient Bill Collection

Resource Type	No SOS		SOS	
	CRF Events	Percent Collect	CRF Events	Percent Collect
<b>Index Cardiac Procedures</b>				
Diagnostic catheterization	14149	95.2	4718	96.4
PCI procedure lesions	21305	97.3	6954	94.5
<b>Follow-up Period / Cardiac Procedures</b>				
Diagnostic catheterization	2404	96.8	638	95.1
PCI procedure lesions	1499	96.7	331	95.5
CABG surgery	216	95.8	107	96.3
<b>Follow-up Period Patient Bills Not on CRF</b>				
Other Acute Care		6103		2018
Emergency department		3744		1082

# Medical Resource Use (per 100 Patients)

Resource Type	No SOS (n=14,149)	SOS (n=4718)	P-value
<b>Index Procedures</b>			
Diagnostic catheterization	6.3	99.3	<.0001
PCI procedure	13.2	99.5	<.0001
PCI + diagnostic cath	93.7	0.7	<.0001
Total Index	113.2	199.5	<.0001
<b>Follow-up Period</b>			
Total revascularizations	8.1	6.7	0.001
Emergency department	26.5	22.9	0.001
Total Follow-Up	86.2	80.0	0.001
<b>Cumulative 9 Months</b>			
Total admissions	199.4	279.6	<.0001

# Average Length of Stay Days (per 100 Patients)

Stay Type	No SOS (n=14,149)	SOS (n=4718)	P-value
<b>Index Procedures</b>			
Diagnostic catheterization	11.8	225.7	<.0001
PCI procedure	19.4	148.4	<.0001
PCI + diagnostic cath	285.2	2.9	<.0001
Total Index	316.4	376.9	<.0001
<b>Follow-up Period</b>			
Total revascularizations	31.8	32.9	0.78
Emergency department	29.3	26.2	0.02
Total Follow-Up	263.0	246.1	0.11
<b>Cumulative 9 Months</b>			
Total admissions	579.4	623.1	0.002

# Estimated Medical Costs (per Patient)

Cost Type	No On-Site Cardiac Surgery	On-Site Cardiac Surgery	P-value
<b>All Subjects</b>	(n=14,149)	(n=4718)	
Index procedure	23343	20372	0.16
Follow-up period	5794	5040	0.0004
Cumulative 9 months	29136	25412	0.09

\* Adjusted for baseline characteristics and clustering of patients at sites



# Estimated Medical Costs (per Patient)

Cost Type	No On-Site Cardiac Surgery	On-Site Cardiac Surgery	P-value
<b>Low Volume Sites</b>	(n=6769)	(n=2255)	
Index procedure	26545	21807	0.25
Follow-up period	6126	4918	0.0002
Cumulative 9 months	32671	26725	0.17
<b>High Volume Sites</b>	(n=7161)	(n=2389)	
Index procedure	20319	19017	0.17
Follow-up period	5529	5211	0.18
Cumulative 9 months	25848	24228	0.13

\* Adjusted for baseline characteristics and clustering of patients at sites

# Unadjusted Index Procedure Medical Costs: Low Volume Sites

Cost Type	No SOS (n=6769)	SOS (n=2255)	P-value
<b>Low Volume Sites</b>			
Non-ICU room	939	1347	<.0001
ICU room	3762	2614	<.0001
Total rooms	4702	3961	0.002
Cardiac procedures	13793	9843	0.21
Other costs	8326	8400	0.93
Total Costs	26820	22204	0.26

\* No SOS patients required to receive post-procedural care in ICU/CCU

# Unadjusted Index Procedure Medical Costs: High Volume Sites

Cost Type	No SOS (n=7161)	SOS (n=2389)	P-value
<b>High Volume Sites</b>			
Non-ICU room	580	996	0.002
ICU room	2929	2372	0.006
Total rooms	3509	3367	0.25
Cardiac procedures	9499	8363	0.16
Other costs	7101	7231	0.68
Total Costs	20110	18962	0.22

\* No SOS patients required to receive post-procedural care in ICU/CCU

## Conclusions

- Patients assigned to PCI at sites with versus without on-site cardiac surgery had a non-significant reduction in total medical costs at 9 months.
- Index procedure medical costs at No SOS hospitals were sensitive to variations in annual PCI volume (higher volume associated with lower costs).