Introduction

This edition of PHC4's *Cardiac Surgery in Pennsylvania* report presents results of coronary artery bypass graft (CABG) surgeries and/or valve surgeries performed in 2008 and 2009 by the 60 Pennsylvania general acute care hospitals that perform these types of procedures. This report displays risk-adjusted outcomes that can be used, in part, to evaluate both hospital and surgeon performance. Reported measures include risk-adjusted in-hospital and 30-day mortality ratings, 7-day and 30-day readmission ratings, and post-surgical lengths of stay. Information on average hospital charges and average Medicare payments also are reported for hospitals.

Key Findings

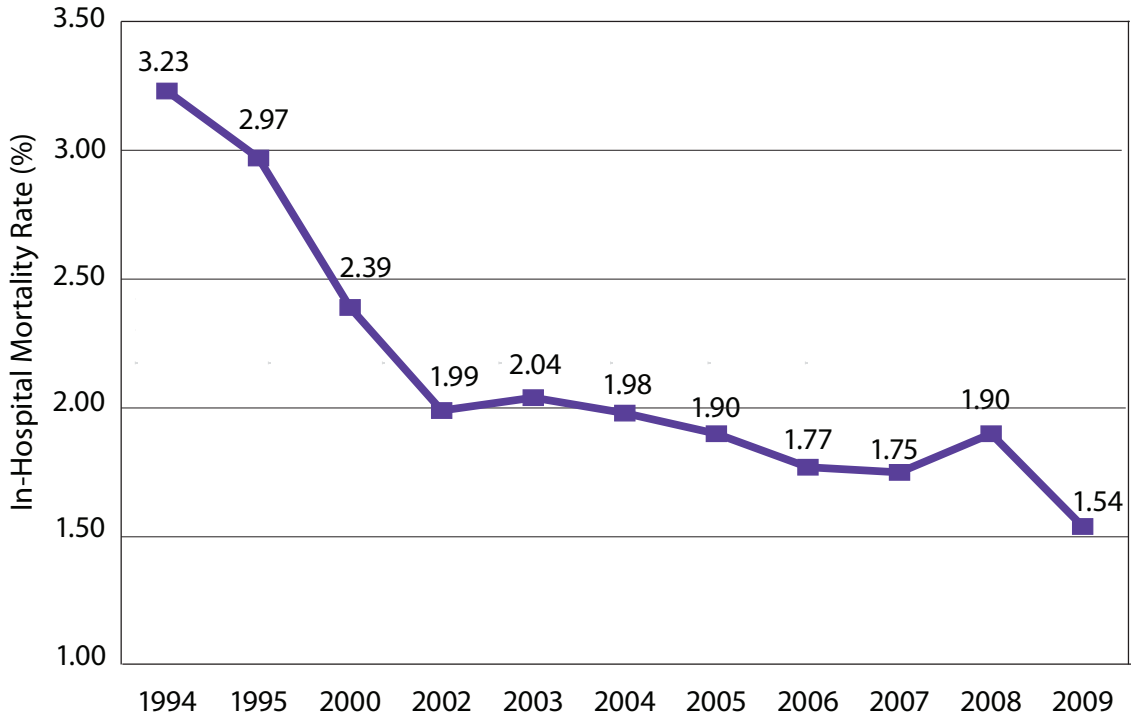
Highlights

- In-hospital mortality rates decreased 52.3 percent between 1994 and 2009 for patients who underwent CABG surgery without a valve procedure.
- For valve surgery patients, in-hospital mortality rates decreased 29.9 percent in the last five years, from 5.15 percent in 2005 to 3.61 percent in 2009.
- Readmissions within 30 days decreased 12.3 percent between 2008 and 2009, from 14.6 percent to 12.8 percent, for patients undergoing CABG surgery without a valve procedure.
- For valve surgery patients, readmissions within 30 days decreased from 19.2 percent to 19.0 percent between 2008 and 2009.
- Of the 15,325 patients who underwent CABG and/or valve surgery in 2009, 5.2 percent (792) contracted a healthcare-associated infection (HAI). The largest percent of HAIs were surgical site infections. Of the 792 patients who contracted an HAI, 291 (36.7 percent) contracted a surgical site infection.
- For Medicare fee-for-service patients, the average Medicare payment is estimated at $63,986 for cardiac surgery patients who acquired an HAI and $35,868 for cardiac surgery patients who did not acquire such an infection. Thus, the payment was 78.4 percent higher ($28,118) when patients contracted an HAI.

Mortality – CABG Surgery

- Overall, in-hospital mortality rates have decreased 52.3 percent for patients undergoing CABG procedures (without a valve procedure), from 3.23 percent in 1994 to 1.54 percent in 2009—despite patients included in this study having more chronic diseases such as diabetes and obesity, and, as asserted more generally in the scientific literature, that today's CABG patients have more complex coronary artery disease.

In-Hospital Mortality for Patients with CABG Surgery (Without a Valve Procedure)

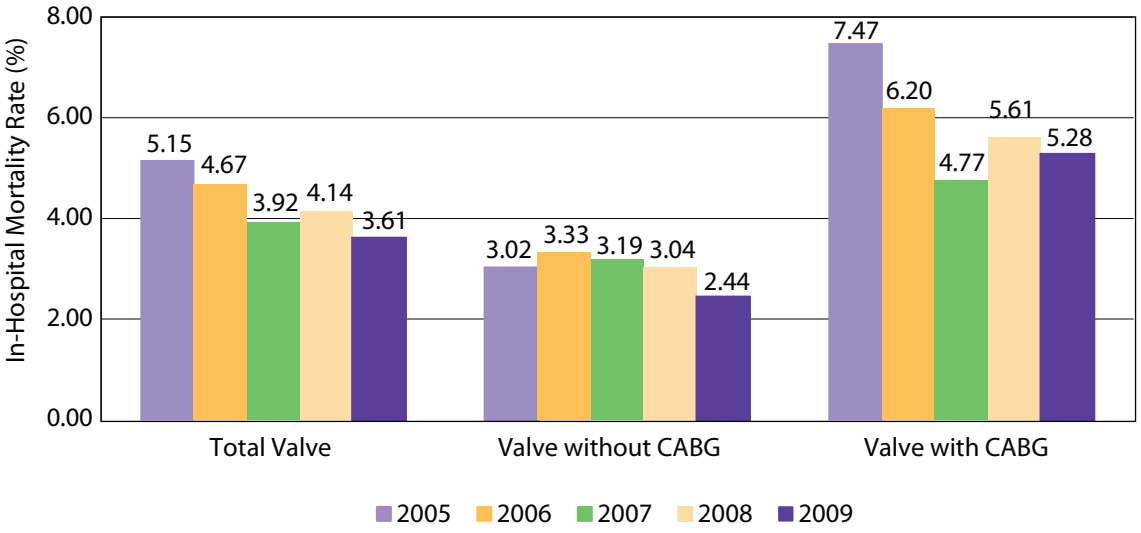


Note: This graph includes data, beginning with 1994, for each year that PHC4 published analysis for CABG procedures.

Mortality – Valve Surgery

- Overall, in-hospital mortality rates have declined for patients who underwent valve surgery either with or without CABG (i.e., the "total valve" reporting group), from 5.15 percent in 2005 when PHC4 began reporting on valve surgeries to 3.61 percent in 2009.
- For patients undergoing valve surgery without CABG surgery, the in-hospital mortality rate has declined each year since 2006, reaching a low of 2.44 percent in 2009.
- For patients undergoing valve surgery with CABG surgery, in-hospital mortality declined steadily between 2005 and 2007 with 2008 and 2009 showing higher rates than 2007. Overall, in-hospital mortality decreased 29.3 percent from 7.47 in 2005 to 5.28 in 2009.

In-Hospital Mortality for Patients with Valve Surgery



Note: This graph includes data for each year that PHC4 published analysis for valve procedures.

Readmissions

- In 2009, 2,042 patients (15.1 percent) who underwent CABG and/or valve surgery were readmitted to the hospital within 30 days of discharge for a heart-related condition or an infection or a complication. These readmissions amounted to an additional 12,542 hospital days. The top reasons for both 7-day and 30-day readmissions for CABG and/or valve surgery were heart failure and infections.
- Patients who underwent valve with CABG surgery had the highest rate of readmission (21.8 percent), were more likely to die during the readmission (5.0 percent), and were more likely to stay in the hospital longer (7.2 days) when readmitted, as compared to patients who underwent valve without CABG surgery or CABG without valve surgery.

Readmissions, 2009

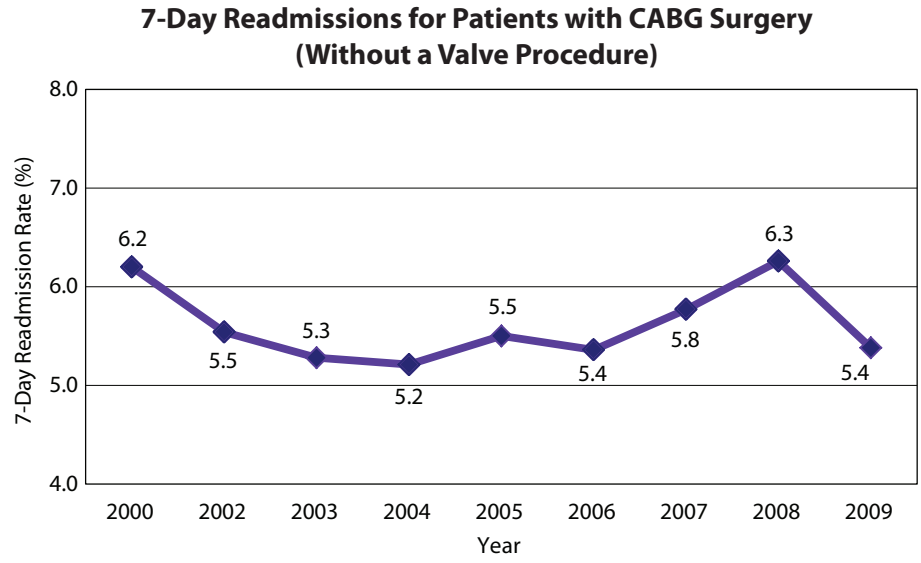
Reporting Group	Patients Readmitted within 30 Days		For patients readmitted within 30 days, the readmissions were associated with . . .					
							Estimated Medicare Payment[2]	
	Number	Percent	Mortality Percent	Average Length of Stay	Total Days	Average Hospital Charge[1]	Average	Total
Total	**2,042**	**15.1%**	**3.1%**	**6.1**	**12,542**	**$ 48,203**	**$ 9,310**	**$ 7,377,161**
CABG without Valve	1,117	12.8%	2.1%	5.7	6,402	$ 47,338	$ 8,552	$ 3,446,323
Valve without CABG	486	17.1%	3.7%	6.1	2,980	$ 44,713	$ 9,507	$ 1,853,930
Valve with CABG	439	21.8%	5.0%	7.2	3,160	$ 54,269	$ 10,651	$ 2,076,908
Total Valve	925	19.0%	4.3%	6.6	6,140	$ 49,248	$ 10,100	$ 3,930,838

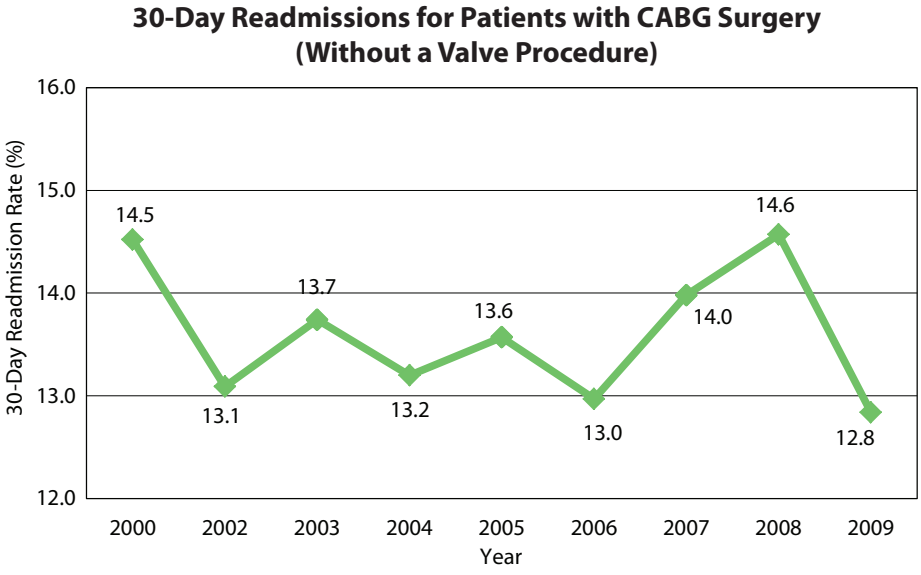
[1] In almost all cases, hospitals do not receive full reimbursement of charges; hospitals typically receive actual payments that are considerably less than the listed charge.

[2] The estimated Medicare payments were calculated by applying the 2008 fee-for-service Medicare payment data (the most recent data available to PHC4) to the fee-for-service Medicare patients who underwent a CABG and/or valve procedure in 2009 and were readmitted within 30 days.

Readmissions – CABG Surgery

- While readmission rates for CABG surgery (without a valve procedure) fluctuated since 2000 when PHC4 first began reporting readmissions for these procedures, both 7-day and 30-day readmission rates declined between 2008 and 2009: 7-day readmissions decreased by 14.3 percent, from 6.3 percent to 5.4 percent, and 30-day readmissions decreased by 12.3 percent, from 14.6 percent to 12.8 percent.

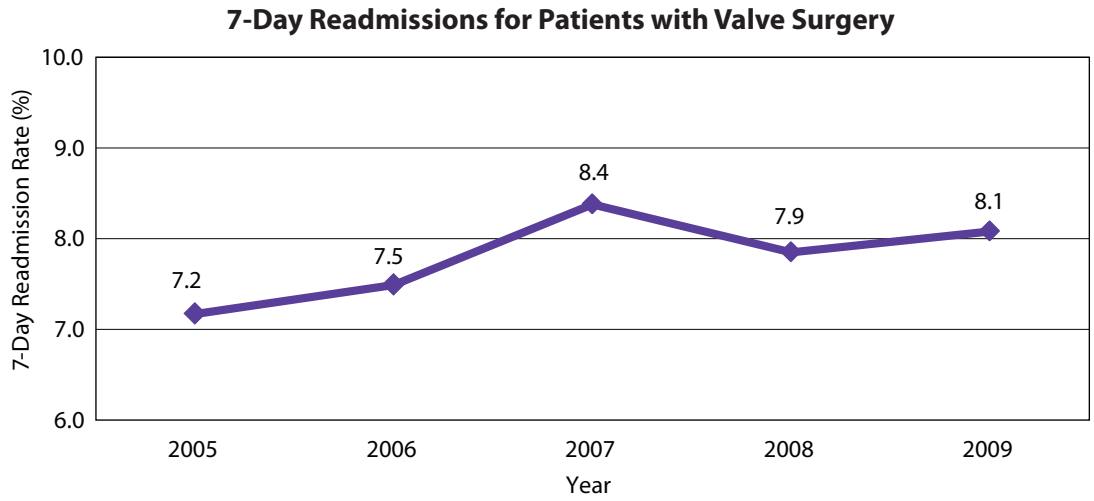


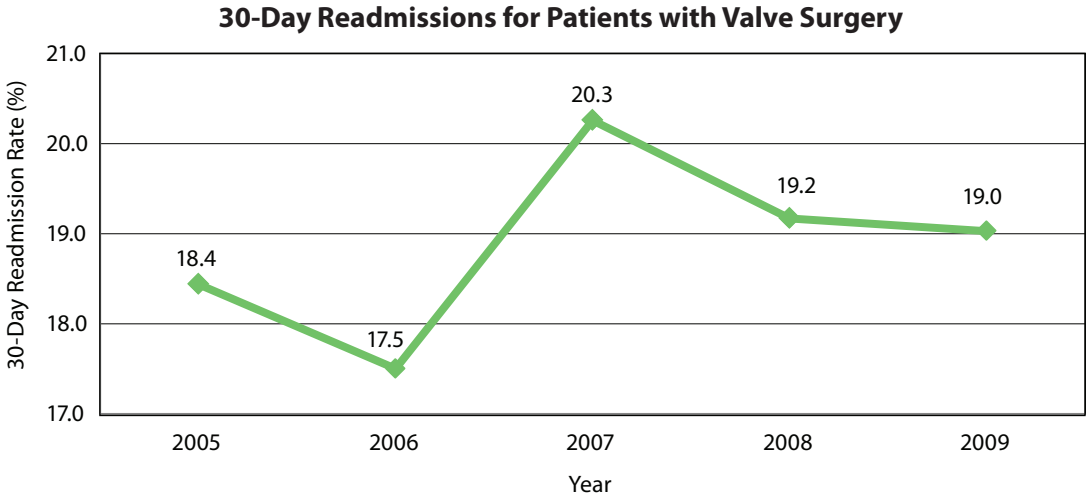


Note: The graphs above include data for each year that PHC4 published readmission rates for CABG procedures.

Readmissions – Valve Surgery

- Readmission rates for patients who underwent valve surgery (with or without CABG) have fluctuated since PHC4 began reporting on valve surgeries in 2005. Between 2008 and 2009, 7-day readmissions increased from 7.9 percent to 8.1 percent, and 30-day readmissions decreased from 19.2 percent to 19.0 percent.





Note: The graphs above include data for each year that PHC4 published analysis for valve procedures.

Medicare Payments

- The average Medicare payments for patients undergoing CABG and/or valve surgeries for 2005, 2006, 2007, and 2008 have been similar over time.

Average Medicare Payment*

Reporting Group	2005	2006	2007	2008
CABG without Valve	$29,175	$29,697	$30,448	$30,546
Valve without CABG	$42,433	$41,448	$43,801	$47,346
Valve with CABG	$44,119	$44,934	$46,001	$47,669
Total Valve	$43,343	$43,276	$44,945	$47,500

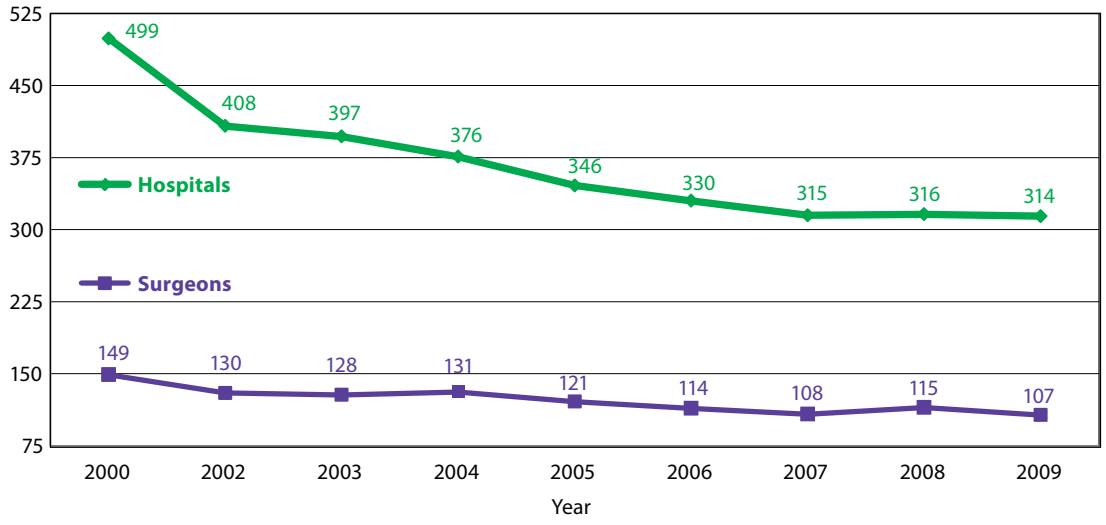
* Includes the Centers for Medicare and Medicaid Services' Medicare Part A hospital insurance fund payment (fee-for-service), but not patient liabilities, such as coinsurance and deductibles.

Note: 2008 Medicare payment data is the most recent available to PHC4 for use in this report.

Volume for Open Heart Surgery

- Overall, the average number of open heart procedures performed annually by hospitals decreased 37.1 percent from 499 cases in 2000 to 314 cases in 2009. The average number of open heart procedures performed by cardiothoracic surgeons decreased 28.2 percent from 149 cases in 2000 to 107 cases in 2009.

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.

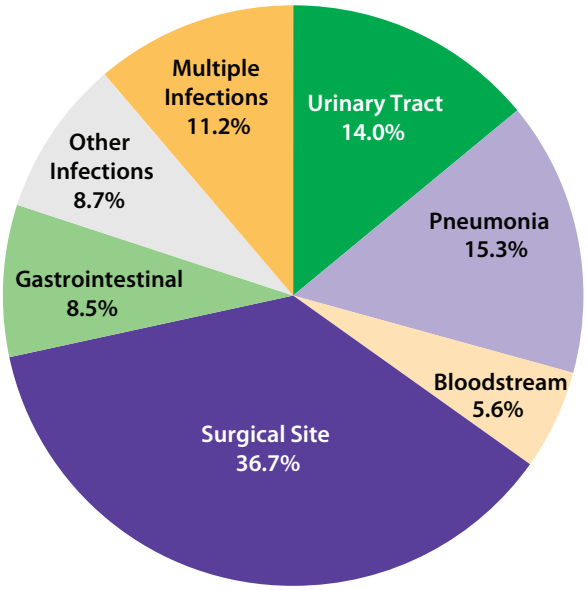
Healthcare-Associated Infections

Reducing healthcare-associated infections (HAIs) is an important focus of quality improvement initiatives. The information below provides a statewide snapshot of patients who contracted at least one HAI during their hospital stay for cardiac surgery in 2009. HAIs are not detailed at the individual hospital or surgeon level in this report.

- Of the 15,325 patients who underwent CABG and/or valve surgery in 2009, hospitals reported that 792 (5.2 percent) contracted an HAI.
- The largest percent of HAIs were surgical site infections. Of the 792 patients who contracted an HAI, 291 (36.7 percent) contracted a surgical site infection. Of the 291 patients who contracted a surgical site infection, 18.9 percent were identified during the hospitalization in which the procedure was performed and 81.1 percent were identified during post-discharge surveillance, that is, a readmission to the same or a different hospital, a follow-up visit to a physician office, or a surgeon survey via mail or phone.

792 Patients with an HAI - 5.2% of 2009 Cardiac Surgery Patients

Distribution of HAIs Across Infection Types



Key Findings

Outcomes for patients who did and those who did not contract an infection during their hospital stay are displayed in the table below. It is important to note that the outcomes reported for patients with an HAI may not have been related to the infection. Some of the differences in outcomes between patients with and without an HAI may have been influenced by other factors, including the complex medical needs of the patient that necessitated cardiac surgery.

- The in-hospital and 30-day mortality rates for CABG and/or valve surgery patients who acquired an infection were 9.0 percent and 10.7 percent, respectively. For patients who did not acquire an infection, the in-hospital and 30-day mortality rates were 2.0 percent and 2.5 percent, respectively.
- Of the patients who acquired an infection during the hospitalization in which their CABG and/or valve surgery was performed, 41.8 percent were readmitted for a heart-related condition or an infection or a complication within 30 days. For the patients who did not acquire an infection during their hospitalization, 13.7 percent were readmitted within 30 days.

Outcomes for Patients with and without HAIs, 2009

	Mortality Percent		Readmissions Percent		Average Post-Surgical Length of Stay	Average Hospital Charge[1]	Estimated Average Medicare Payment[2]
	In-Hospital	30-Day	7-Day	30-Day			
All Cardiac Surgery Patients							
With an HAI	9.0%	10.7%	14.9%	41.8%	18.0	$338,179	$63,986
Without an HAI	2.0%	2.5%	5.9%	13.7%	7.2	$154,548	$35,868
CABG without Valve Patients							
With an HAI	6.2%	7.5%	14.3%	43.6%	15.2	$268,231	$47,623
Without an HAI	1.3%	1.8%	5.0%	11.4%	6.5	$137,367	$29,677
Total Valve Patients							
With an HAI	12.8%	15.1%	16.0%	38.9%	21.9	$432,619	$76,922
Without an HAI	3.0%	3.8%	7.6%	17.9%	8.4	$183,631	$44,776

[1] In almost all cases, hospitals do not receive full reimbursement of charges; hospitals typically receive actual payments that are considerably less than the listed charge.

[2] The estimated average Medicare payments were calculated by applying the 2008 fee-for-service Medicare payment data (the most recent data available to PHC4) to the fee-for-service Medicare patients who underwent a CABG and/or valve procedure in 2009 with and without an HAI.