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Improvements in Door-to-Balloon Time in the United States, 2005 to 2010

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Background—Registry studies have suggested improvements in door-to-balloon times, but a national assessment of the trends in door-to-balloon times is lacking. Moreover, we do not know whether improvements in door-to-balloon times were shared equally among patient and hospital groups.

Methods and Results—This analysis includes all patients reported by hospitals to the Centers for Medicare & Medicaid Services for inclusion in the time to percutaneous coronary intervention (acute myocardial infarction-8) inpatient measure from January 1, 2005, through September 30, 2010. For each calendar year, we summarized the characteristics of patients reported for the measure, including the number and percentage in each group, the median time to primary percutaneous coronary intervention, and the percentage with time to primary percutaneous coronary intervention within 75 minutes and within 90 minutes. Door-to-balloon time declined from a median of 96 minutes in the year ending December 31, 2005, to a median of 64 minutes in the 3 quarters ending September 30, 2010. There were corresponding increases in the percentage of patients who had times <90 minutes (44.2% to 91.4%) and <75 minutes (27.3% to 70.4%). The declines in median times were greatest among groups that had the highest median times during the first period: patients >75 years of age (median decline, 38 minutes), women (35 minutes), and blacks (42 minutes).

Conclusion—National progress has been achieved in the timeliness of treatment of patients with ST-segment–elevation myocardial infarction who undergo primary percutaneous coronary intervention. (*Circulation*. 2011;124:1038-1045.)

Key Words: balloon dilation ■ myocardial infarction ■ angioplasty ■ reperfusion

The effectiveness of primary percutaneous coronary intervention (PCI) is highly dependent on its timeliness.^{1–4} Clinical practice guidelines and practice guidelines recommend that the time from hospital arrival to mechanical reperfusion, the door-to-balloon (D2B) time, should be as short as possible and should not exceed 90 minutes.^{5,6} In 2002, only a third of patients received primary PCI within 90 minutes, and a third underwent the procedure >2 hours after arriving at the hospital.⁷ These lackluster times led to a national response; in September 2005, the Centers for Medicare & Medicaid Services (CMS) began to report publicly the percent of patients treated within recommended times. At the same time, federally funded research identified strategies and organizational factors that were strongly

associated with shorter D2B times.^{8–11} In November 2006, the American College of Cardiology (ACC), with national partners, launched the D2B Alliance, a national campaign to improve D2B times by advocating the adoption of key strategies that had been shown to reduce delays based on a study funded by the National Heart, Lung, and Blood Institute.¹² In May 2007, the American Heart Association (AHA) launched Mission: Lifeline, another national initiative to improve systems of care for patients with ST-segment–elevation myocardial infarction.¹³

Clinical Perspective on p 1045

Although studies have reported improvements in D2B times during this period of national focus on improving the

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timeliness of primary PCI,^{14,15} these reports, which assessed performance through the first quarter of 2008, were derived from hospitals participating in registries; these hospitals represent a selected sample of the nation's hospitals. There has been no national assessment of the trends in D2B times, nor do we know whether improvements in D2B times were shared equally among patient and hospital groups.

Accordingly, we evaluated data submitted to CMS as part of its initiative to report indicators of quality for patients with an acute myocardial infarction. The latest published report from the CMS data included data up until the second quarter of 2004.¹⁶ We sought to determine how performance on this measure had changed from 2005 through 2010, with a focus on D2B times and the percent of patients who were treated in <90 minutes and in <75 minutes. We also evaluated the trends among hospitals defined by their bed size, geographic region, ownership, urban or rural location, and volume of patients with PCI that they reported for this measure. **This study represents the most contemporary, comprehensive, nationally representative investigation of the changes in D2B times in the United States.**

Methods

Patient Population

This analysis included all patients reported by hospitals to CMS for inclusion in the time to PCI (acute myocardial infarction-8) inpatient measure from January 1, 2005, through September 30, 2010. Hospitals with at least 5 acute myocardial infarction inpatient admissions during a quarter must report to CMS or face a financial penalty. Hospitals may exclude patients through sampling, depending on the number of patients eligible, and the minimum number required to be reported has changed over time. Sampling is mandated by CMS to be either simple random or sequential random, and hospitals that sample for at least 1 quarter must report that they sampled for that year; this is enforced through an additional mandate to use a measurement system certified by The Joint Commission.¹⁷ The percentage of hospitals that sampled was generally stable over the study period, with the largest number (percentage) being 252 of 4085 (6.2%) in 2005 and the smallest number being 173 of 3780 (4.6%) in 2010. The inclusion and exclusion criteria for this measure and the sampling and reporting criteria are publicly available.¹⁷ During the period of the study, there were some changes in the measure regarding exclusion criteria; the major change occurred in 2006 when patients were allowed to be excluded if there was a nonclinical reason for the delay (acute myocardial infarction-8 exclusions; see the online-only Data Supplement). To increase the likelihood that we were assessing patients receiving primary PCI, we excluded patients with times >6 hours.

Patient Variables

For each patient included in the measure, there is information about age, sex, and racial/ethnic group (white, black, other, unknown).

Hospital Variables

We classified each hospital that reported at least 25 patients during any year for the measure according to size (number of beds), Census region, ownership (government, for profit, and nonprofit), location (rural or urban), and number of patients treated with PCI, as submitted by the hospital. For 2010, we repeated the analysis with hospitals that reported at least 20 patients because we only had 3 quarters of data. Information about hospitals was taken from the Program Resource System, a national provider database maintained by CMS and the Quality Improvement Organizations.

Analysis

For each year, we summarized the characteristics of patients, including the number and percentage in each group, the median time to primary PCI, and the percentage with time to primary PCI within 75 minutes and within 90 minutes for each group.

For each year, we summarized hospital characteristics, number of patients reported, and percentage of hospitals in each group. For each year, we also calculated the median and range of hospital median time to PCI, average of hospital percentage of patients treated within 90 minutes and within 75 minutes, and the interquartile range for each of these. We graphed the summary measure of percent <90 minutes and <75 minutes over the 6-year period for all patients included in the study.

We conducted the analyses with SAS version 9.1.3 (2004; SAS Institute Inc, Cary, NC) and Stata version 11.1 (2010; Stata Corp, College Station, TX). The Human Investigation Committee at the Yale University School of Medicine approved an exemption for the authors to use CMS claims and enrollment data for research analyses and publication; informed consent was not required.

Results

During the 6-year period, the number of patients was fairly constant, ranging between 48 977 and 53 682 (Table 1), with 42 150 reported during the 3 quarters of 2010. The number of hospitals that reported at least 25 patients increased slightly from 896 to 973, with 764 reporting 25 patients for the first 3 quarters of 2010 (Table 2).

Patient Door-to-Balloon Times

Median D2B times declined 32 minutes over the 6-year period from a median of 96 minutes in the year ending December 31, 2005, to a median of 64 minutes in the year ending September 30, 2010 (Table 1). The declines in median times were greatest among groups that had the highest median times during the first period: patients >75 years of age (median decline, 38 minutes), women (35 minutes), and blacks (42 minutes). There were corresponding increases in the percentage of patients who had D2B times of <90 minutes (44.2% to 91.4%) and <75 minutes (27.3% to 70.4%; Figures 1 and 2).

Hospital Median Door-to-Balloon Times

Hospital median D2B times declined over the 6-year period from a median of 97 minutes in 2005 to a median of 64 minutes in 2010 (Table 2). The declines were greatest among groups of hospitals that had the longest times in the first year: hospitals with ≥ 500 beds (median hospital time declined 34 minutes), for-profit hospitals (declined 38 minutes), and hospitals in the East South Central and Mid Atlantic Census regions (40- and 35-minute declines, respectively). There was a corresponding increase in the hospital average percent of patient D2B times <90 minutes (from 44% to 92%) and <75 minutes (from 27% to 71%). The results from 2010 were similar if we restricted the required number of cases to 20.

Discussion

The study demonstrates the national progress in the treatment of patients with ST-segment–elevation myocardial infarction who undergo primary PCI. Median patient D2B times decreased substantially from 96 to 64 minutes, a drop of 32 minutes, over the 6 years ending in mid-2010, representing a >30% relative decline. This improvement, experienced

Table 1. Continued

	2009				2010*			
	n (%)	Median (IQR)	<90 min, %	<75 min, %	n (%)	Median (IQR)	<90 min, %	<75 min, %
Sex								
Female	14 586 (27.2)	69 (55–84)	84.8	61.3	11 531 (27.4)	67 (52–81)	89.1	66.3
Male	39 094 (72.8)	66 (51–80)	89.0	67.4	30 618 (72.6)	63 (49–77)	92.2	71.9
Unknown	2 (0.0)	75 (58–91)	50.0	50.0	1 (0.0)	55 (55–55)	100.0	100.0
Race								
Black	4153 (7.7)	71 (56–86)	82.4	57.5	3203 (7.6)	69 (55–83)	86.6	61.7
Other	1440 (2.7)	68 (53–82)	87.4	63.6	1169 (2.8)	65 (52–79)	91.4	69.9
Unknown	3209 (6.0)	66 (51–81)	88.0	67.0	2530 (6.0)	65 (51–79)	90.9	70.8
White	44 880 (83.6)	66 (52–81)	88.4	66.5	35 248 (83.6)	64 (50–78)	91.8	71.2

IQR indicates interquartile range

*For 2010, only the first 3 quarters (discharges from January through September) were available at the time of analysis.

across the country and across different types of hospitals, represents a remarkable elevation in practice that was achieved over a relatively short period of time and in the absence of financial incentive. The accomplishment is truly a tribute to interventional cardiologists, emergency medicine physicians, nurses, technologists, and other team members nationwide who were dedicated to improving D2B times.

The perspective on D2B times changed dramatically over this period. The 2004 ST-segment–elevation myocardial infarction guidelines recommended that patients be treated with primary PCI within 90±30 minutes.¹⁸ The caveat of the additional 30 minutes was included as a compromise in response to controversy about whether it was possible for hospitals to routinely treat patients with ST-segment–elevation myocardial infarction within 90 minutes. The publication of the 2004 guidelines was followed by a shift toward the 90-minute standard. Nallamothu and colleagues¹ published a study based on trials of the relationship between D2B time and the advantage of primary PCI over fibrinolytic therapy. They found that if primary PCI was delayed >1 hour beyond the time that fibrinolytic therapy could be provided, the advantage was lost. Thus, if fibrinolytic therapy was recommended to be given within 30 minutes, then the provision of primary PCI within 90 minutes was supported by evidence from the trials. In the guideline update published in 2007, the additional 30 minutes was removed, altering the recommendation for D2B time to <90 minutes.⁶ The CMS measure, which initially reported the percent of patients treated within 120 minutes, was subsequently reduced to 90 minutes in 2006 to align the performance measure with the new guideline recommendation.¹⁷

The improvement in D2B times that we observed cannot be definitively attributed to any single action; many activities likely contributed. During this period, multiple national efforts focused attention on timeliness of D2B and supported quality improvement. Published articles that revealed gaps in care and indicated strategies that were associated with faster times contributed to clinical changes in performance. A study sponsored by the National Institutes of Health used a mixed-methods approach to examine exceptional performers and then test hypotheses that de-

rived from their experience.^{7–10,19} CMS developed contracts with Quality Improvement Organizations that contributed to the increasing focus on improving various aspects of acute myocardial infarction care, including D2B times. Hospital groups and consortia focused on improving D2B times. The performance of the nation's hospitals in treating patients with ST-segment–elevation myocardial infarction was further highlighted by the release of the publicly reported D2B time measures by CMS, and the D2B Alliance and Mission: Lifeline, national campaigns by the ACC and the AHA, enlisted clinicians and hospitals in a broad-based effort to reduce delays.^{12,13}

Improvement in D2B times demonstrates how emerging science on improving care can be rapidly integrated into practice. The ACC campaign was launched simultaneously with the publication of an article in the *New England Journal of Medicine* that described strategies associated with faster times.⁹ The ACC campaign promoted the adoption of such strategies, which were shown to be underused nationally. Recent reports demonstrated the marked integration of these strategies into practice that occurred during the period of the campaign.¹⁴ Moreover, a recent qualitative study showed that the credibility of the campaign was related to the strength of the science and the clarity of the recommendations.²⁰

Despite the recent gains, additional opportunities for improvement in D2B times remain. The most outstanding institutions are now regularly achieving times under 60 minutes through strategies including coordination with Emergency Medical Services and the collection and dissemination of a prehospital ECG.^{21–23} This level of performance may become the new standard.

Another opportunity for improvement is related to the care of transfer patients. Prior studies have shown that many patients who are transferred from a hospital without PCI capability to a PCI-capable institution experience long delays in treatment.^{24–26} To address this concern, CMS is collecting a measure, with potential to be publicly reported, that assesses the time required to transfer such patients.¹⁷ More important, current research shows that these times are associated

Table 2. Continued

	2007				2008			
	n (%)	Median (IQR)	Mean (IQR)		n (%)	Median (IQR)	Mean (IQR)	
			<90 min, %	<75 min, %			<90 min, %	<75 min, %
Ownership								
Government	119 (12.7)	77 (69–86)	70 (61–84)	47 (33–61)	125 (13.1)	71 (64–77)	81 (73–93)	59 (45–73)
For profit	129 (13.8)	76 (70–86)	72 (58–85)	47 (32–61)	139 (14.5)	71 (65–79)	83 (77–93)	58 (44–70)
Nonprofit	688 (73.5)	75 (69–82)	74 (64–86)	51 (38–63)	692 (72.4)	70 (64–76)	82 (76–92)	59 (49–71)
Location								
Rural	74 (7.9)	75 (71–82)	73 (64–83)	49 (38–61)	75 (7.8)	69 (65–73)	82 (76–92)	61 (52–75)
Urban	862 (92.1)	75 (69–84)	73 (63–85)	50 (36–63)	881 (92.2)	71 (64–77)	82 (75–92)	59 (47–71)
Unknown	0 (0.0)	NA	NA	NA	0 (0.0)	NA	NA	NA
Reported cases, n								
25–35	295 (31.5)	77 (70–87)	70 (59–85)	46 (31–60)	299 (31.3)	73 (65–79)	80 (72–92)	55 (43–68)
36–50	331 (35.4)	77 (69–85)	72 (62–85)	49 (36–62)	323 (33.8)	71 (65–77)	82 (74–92)	58 (48–70)
>50	310 (33.1)	73 (67–79)	77 (68–86)	54 (43–65)	334 (34.9)	68 (63–74)	85 (80–93)	62 (52–73)
	2009				2010*			
	n (%)	Median (IQR)	Mean (IQR)		n (%)	Median (IQR)	Mean (IQR)	
			<90 min, %	<75 min, %			<90 min, %	<75 min, %
Total	973 (100.0)	67 (61–73)	88 (84–96)	66 (56–76)	764 (100.0)	64 (58–70)	92 (89–98)	71 (63–82)
Bed size, n								
<300	347 (35.7)	67 (62–72)	88 (84–96)	65 (57–76)	250 (32.7)	64 (59–70)	92 (89–98)	71 (63–81)
300–499	357 (36.7)	67 (61–73)	88 (84–96)	66 (56–76)	289 (37.8)	65 (59–70)	92 (89–98)	71 (63–81)
≥500	269 (27.6)	66 (61–72)	88 (83–95)	66 (56–77)	225 (29.5)	64 (58–69)	92 (88–98)	72 (63–82)
Census region								
East North Central	169 (17.4)	68 (62–72)	89 (85–96)	67 (57–76)	137 (17.9)	65 (58–70)	92 (89–97)	72 (64–84)
East South Central	63 (6.5)	68 (62–72)	88 (84–96)	65 (54–77)	52 (6.8)	64 (58–68)	94 (91–98)	74 (68–81)
Middle Atlantic	127 (13.1)	69 (64–75)	86 (80–92)	61 (52–71)	96 (12.6)	67 (61–72)	90 (86–95)	67 (60–76)
Mountain	85 (8.7)	69 (64–74)	87 (83–95)	62 (55–71)	63 (8.2)	63 (57–70)	92 (89–97)	71 (62–82)
New England	37 (3.8)	62 (58–71)	90 (87–96)	71 (62–81)	27 (3.5)	62 (58–66)	93 (89–97)	72 (65–79)
Pacific	131 (13.5)	66 (62–72)	88 (83–95)	67 (58–76)	100 (13.1)	64 (59–69)	93 (89–99)	72 (64–81)
South Atlantic	175 (18.0)	66 (60–72)	88 (85–97)	67 (57–78)	152 (19.9)	63 (58–68)	92 (88–99)	73 (64–82)
West North Central	75 (7.7)	63 (58–69)	92 (88–97)	73 (63–84)	54 (7.1)	60 (55–65)	93 (89–100)	76 (68–84)
West South Central	110 (11.3)	68 (63–74)	87 (81–96)	63 (54–74)	83 (10.9)	66 (61–73)	92 (88–100)	68 (59–80)
US territories	1 (0.1)	102 (102–102)	38 (38–38)	17 (17–17)	0 (0.0)	NA	NA	NA
Ownership								
Government	136 (14.0)	68 (62–74)	86 (80–94)	64 (54–76)	101 (13.2)	65 (59–70)	91 (86–97)	71 (62–82)
For profit	138 (14.2)	65 (61–72)	91 (87–98)	67 (58–78)	109 (14.3)	62 (58–69)	95 (94–100)	75 (67–85)
Nonprofit	699 (71.8)	67 (61–73)	88 (84–95)	66 (56–76)	554 (72.5)	65 (58–70)	92 (88–98)	71 (63–81)
Location								
Rural	83 (8.5)	66 (60–70)	86 (81–96)	67 (60–78)	57 (7.5)	63 (58–69)	92 (88–97)	73 (64–84)
Urban	890 (91.5)	67 (61–73)	88 (84–96)	66 (56–76)	707 (92.5)	64 (58–70)	92 (89–98)	71 (63–81)
Unknown	0 (0.0)	NA	NA	NA	0 (0.0)	NA	NA	NA
Reported cases, n								
25–35	300 (30.8)	69 (64–75)	87 (81–96)	63 (52–73)	358 (46.9)	65 (59–72)	92 (88–100)	70 (60–81)
36–50	355 (36.5)	67 (62–73)	88 (84–96)	65 (55–76)	244 (31.9)	64 (59–69)	92 (88–98)	71 (64–80)
>50	318 (32.7)	65 (59–70)	89 (85–96)	69 (61–79)	162 (21.2)	61 (55–67)	94 (91–98)	76 (68–85)

IQR indicates interquartile range.

*For 2010, only the first 3 quarters (discharges from January through September) were available at the time of analysis.

with mortality and can be reduced through greater coordination between hospitals.^{27–29}

A limitation of this assessment is the evolution of the measure over the study period, with modifications related primarily to the exclusion criteria. The most notable

change occurred in 2006 and allowed hospitals to exclude patients on the basis of the judgment that a D2B time >90 minutes was the result of a delay incurred by patient preference or clinical condition. Subsequent changes included minor alterations in the codes or slight expansions

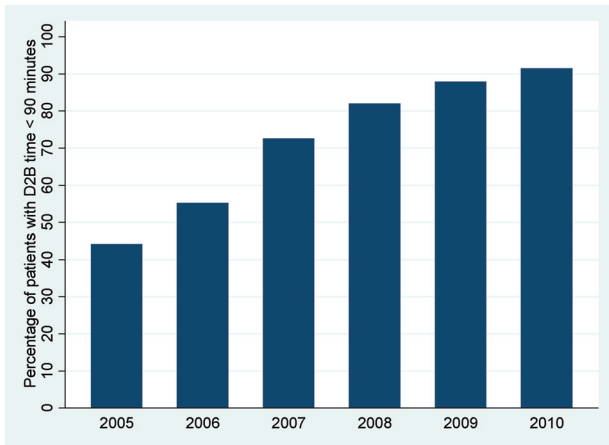


Figure 1. Trend in percentage of patients with door-to-balloon (D2B) time <90 minutes over 6 years.

in the exclusion criteria. However, the dramatic decline in D2B times that was observed over the study period is unlikely to have resulted from changes in the measure. Moreover, the greatest decline occurred between 2006 and 2007, a period corresponding to the initiation of national campaigns to improve D2B times. Finally, our results are aligned with those of registries that documented trends in D2B times and applied consistent criteria over time.

Conclusions

We document remarkable improvement in D2B times from 2005 through 2010. The improvement demonstrates the results that can be produced by collaboration among health-care professionals, hospitals, federal research agencies, and national organizations interested in patient care toward the achievement of a shared goal. The focus on improving the way in which care is delivered—improving the systems—has yielded more timely care for patients and serves as a template for similar contemporary and future efforts in areas such as readmission.

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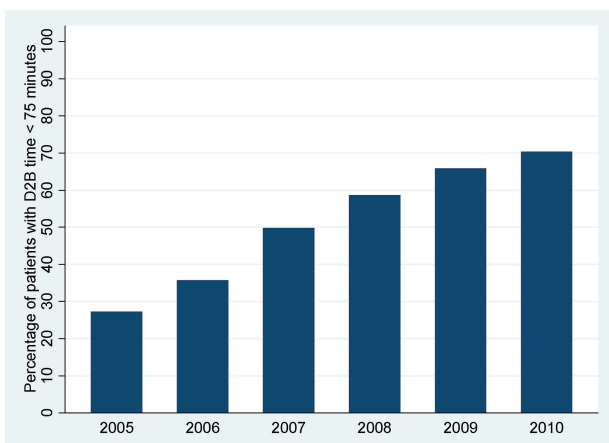


Figure 2. Trend in percentage of patients with door-to-balloon (D2B) time <75 minutes over 6 years.

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Disclosures

Dr Krumholz reports that he chairs a cardiac scientific advisory board for UnitedHealth. The other authors report no conflicts.

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CLINICAL PERSPECTIVE

In the United States, many groups, including the federal government, the American College of Cardiology, the American Heart Association, healthcare professionals, hospitals, emergency medical services, and the research community, have focused on improving door-to-balloon times for patients with ST-segment-elevation myocardial infarction who are referred for an emergency percutaneous coronary intervention. We report the national experience in door-to-balloon times based on the Centers for Medicare & Medicaid Services' measure, which includes all patients of all ages. The door-to-balloon time declined from a median of 96 minutes in the year ending December 31, 2005, to a median of 64 minutes in the 3 quarters ending September 30, 2010. There were corresponding increases in the percentage of patients who had times <90 minutes (44.2% to 91.4%) and <75 minutes (27.3% to 70.4%). This improvement, experienced across the country and across different types of hospitals, represents a remarkable elevation in practice that was achieved over a relatively short period of time and in the absence of financial incentive. The improvement demonstrates the results that can be produced by collaboration among healthcare professionals, hospitals, and national organizations toward the achievement of a shared goal.

SUPPLEMENTAL MATERIAL: AMI-8 Exclusions

AMI-8 Exclusions	Year 2005 (n=607,274)		Year 2006 (n=591,970)		Year 2007 (n=575,073)		Year 2008 (n=577,187)		Year 2009 (n=557,669)		Year 2010 (Q1-Q3) n=418,829		All data (n=3,328,002)	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Provider chose not to report the case	14,979	2.47	3,361	0.57	20,214	3.52	25,437	4.41	24,725	4.43	18,596	4.44	107,312	3.22
Birth date is missing/out of range	0	0.00	1	0.00	3	0.00	0	0.00	0	0.00	0	0.00	4	0.00
Patients with comfort measures only	n/a	n/a	11,425	1.93	21,219	3.69	15,442	2.68	9,104	1.63	n/a	n/a	57,190	1.72
Patients involved in clinical trials	n/a	n/a	n/a	n/a	985	0.17	3,553	0.62	2,966	0.53	2,061	0.49	9,565	0.29
Admission source is missing	519	0.09	306	0.05	15	0.00	0	0.00	0	0.00	0	0.00	840	0.03
Patients received in transfer from another acute care hospital (inpatient/outpatient), including another ED	168,220	27.70	165,043	27.88	153,806	26.75	151,418	26.23	145,471	26.09	109,422	26.13	893,380	26.84
Initial ECG interpretation is missing	136	0.02	134	0.02	17	0.00	0	0.00	0	0.00	0	0.00	287	0.01
Patients do not have initial ECG interpretation	305,491	50.31	304,585	51.45	284,549	49.48	290,076	50.26	286,727	51.42	220,560	52.66	1,691,988	50.84
Thrombolytic administration is missing	24	0.00	7	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	31	0.00
Patients administered thrombolytic agents	11,729	1.93	4,566	0.77	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	16,295	0.49
Fibrinolytic administration is missing	n/a	n/a	11	0.00	8	0.00	0	0.00	0	0.00	0	0.00	19	0.00
Patients administered fibrinolytic agent prior to PCI	n/a	n/a	3,503	0.59	4,550	0.79	2,918	0.51	2,097	0.38	1,300	0.31	14,368	0.43
Patients do not have a PCI	50,286	8.28	39,173	6.62	30,075	5.23	27,159	4.71	24,627	4.42	18,377	4.39	189,697	5.70
Non-primary PCI is missing	n/a	n/a	37	0.01	10	0.00	0	0.00	0	0.00	0	0.00	47	0.00
PCI described as non-primary by a physician/APN/PA	n/a	n/a	1,456	0.25	2,288	0.40	1,879	0.33	1,906	0.34	1,422	0.34	8,951	0.27
PCI date/time or arrival date/time is missing	642	0.11	377	0.06	174	0.03	97	0.02	56	0.01	19	0.00	1,365	0.04
PCI performed before hospital arrival or more than 24 hours after hospital arrival	3,796	0.63	2,591	0.44	1,571	0.27	1,537	0.27	1,380	0.25	967	0.23	11,842	0.36
Patients who did not receive PCI within 90 minutes and had a reason for delay documented by a physician/APN/PA	n/a	n/a	1,986	0.34	3,771	0.66	4,263	0.74	4,659	0.84	3,763	0.90	18,442	0.55
In denominator: PCI performed within 24 hours after hospital arrival and measure value is available	51,452	8.47	53,408	9.02	51,818	9.01	53,408	9.25	53,951	9.67	42,342	10.11	306,379	9.21

APN/PA, Advanced Practice Nurse/Physician Assistant; ED, Emergency Department, ECG, electrocardiogram; PCI, percutaneous coronary intervention

Notes:

1. *Patients with comfort measures only* was added at Q3, 2006. This exclusion criterion was removed at Q4, 2009.
2. *Patients involved in clinical trials* was added at Q4, 2007.
3. *Patients administered thrombolytic agents* was replaced with *Fibrinolytic administration* at Q3, 2006.
4. *PCI described as non-primary by a physician/APN/PA* was added at Q3, 2006.
5. *Patients who did not receive PCI within 90 minutes and had a reason for delay documented by a physician/APN/PA* was added at Q3, 2006.
6. *n/a* - the criterion was not applicable to the referenced year.

