

PROCEDURAL SETTINGS

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Summary

1. Majority of PCIs performed in Malaysia from 2013 – 2014 were performed as elective cases (n = 11,488, 74.1%). The number of PCI procedures had increased over the years; and there had been an increasing trend of PCI performed in the setting of acute coronary syndrome (STEMI/NSTEMI/UA).
2. Radial access (57%) had become the preferred percutaneous entry in the year 2013 – 2014.
3. The use of closure device had increased in 2013 – 2014 (13%) compared to only 3.9% in the year 2007–2012.
4. Aspirin and clopidogrel remained the two most common antiplatelet therapies for patients undergoing coronary angioplasty.
5. The overall use of clopidogrel had decreased in 2013 – 2014, with the introduction of newer antiplatelet agents such as ticagrelor.

This chapter discusses the procedural details and treatment received by patients who underwent PCI from 2013 to 2014.

A total of 15,514 PCI procedures were performed during this two year period in 15 centres across Malaysia. The total number of procedures reported steadily increased over the years; with an average of 4,413/year during 2007 – 2012 to 6,928 and 8,586 in 2013 and 2014, respectively. [Table 3.1]

Most of the PCIs were performed as elective cases (n = 11,488, 74.1%). About 17.1% (n = 2,654) of the total procedures were performed for acute ST-elevation myocardial infarction (STEMI) and 8.8% (n = 1,372) were for non-ST-elevation myocardial infarction/unstable angina (NSTEMI/UA). [Table 3.1]

There were decreases in the percentage of elective cases from 90.1% in 2007 – 2009 to 84.6% in 2010 – 2012 and 74.1% in 2013 – 2014. There was an increase in the number of PCIs performed during index admission with acute coronary syndrome (STEMI/NSTEMI/UA) for the year 2013 – 2014 (n = 3,397, 12.8%) compared to 2007 – 2012 registry (n = 4,026, 25.9%). [Table 3.1]

In the cohort of STEMI PCI (n = 2,654), nearly one-third was performed as primary PCI (n = 884, 33.3%), while another third was treated in the rescue PCI setting (n = 844, 31.8%). [Table 3.1]

Procedural access, guiding size and closure

Based on the previous registry (2007–2012), the preferred percutaneous entry of PCI was femoral artery access (52.3%). However, during 2013 – 2014, femoral access had decreased to 45.9% while radial percutaneous entry became the preferred choice (54.3% in 2013 and 59.2% in 2014). The most common size of guiding catheter was 6Fr (91.8%) followed by 7Fr (7.4%). [Table 3.1]

Majority of post procedural access closure was by manual compression (80.8% in 2013 – 2014). However, there was an increased in the use of closure devices from 3.9% (2007 to 2012) to 13.0% (2013 – 2014). [Table 3.1]

Extent of coronary diseases

About two-thirds of patients who went for PCI in this cohort had single vessel disease (64.4% in 2013 – 2014 vs. 46.1% in 2007 – 2012). [Table 3.1]

Only 2.9% (n = 470) of patients had left main stem involvement, however this was higher in 2013 – 2014 than in 2007 – 2012 (n = 171). [Table 3.1]

Coronary angioplasty was done in 1.3% (n = 198) of patients who have had bypass grafts . [Table 3.1]

PCI procedure

The mean fluoroscopy time was 19.3 minutes (SD 16.7), the median was 14.5 minutes. The values were similar to values in 2007 – 2012. [Table 3.1]

In terms of contrast volume, the mean for 2013 – 2014 was 162.8 ml (SD 68.9 ml) and the median was 150 ml. The mean and median contrast volume were comparable to the previous registry in 2007 – 2012 which had a mean of 177.2 ml (SD 68.9) and median of 150.0 ml. [Table 3.1]

Treatment of patients undergoing PCI

GP IIb/IIIa blocker.

Overall, the use of GP IIb/IIIa blocker remained low; even lower compared to the previous cohort (3.8% in 2013 – 2014 and 4.8% in 2007 – 2012).

Intravenous unfractionated heparin infusion and low molecular weight heparin (LMWH)

Intravenous unfractionated heparin remained the choice of anticoagulant used during PCI, which was 95.2% between 2007 – 2012 and 95.6% between 2013 – 2014. [Table 3.1]

Anti-platelets

Aspirin and clopidogrel were the two most common antiplatelet agents used in PCI in 2013 – 2014. The majority of patients received aspirin during PCI (98.9% in 2013 – 2014 and 98.6% in 2007 – 2012). [Table 3.1]

There was a decrease in clopidogrel use from 97.9% in 2007 – 2012 to 90.8% in 2013 – 2014. This was reflected in the increased use of other newer antiplatelet agents such as ticagrelor (10.5% of the patients in 2013 – 2014 and 0% in 2007–2012). [Table 3.1]

There was an increasing trend of clopidogrel use for 12 months, 55.2% in 2007 – 2012 to 76.3% in 2013 – 2014. [Table 3.1] The increase in the duration of antiplatelet therapies could possibly reflect the higher use of drug-eluting stents in 2013 – 2014. [Table 3.2]

Table 3.1 PCI status of patients who underwent procedures, NCVD-PCI Registry, 2007 – 2014

	2007 – 2012		2013		2014		2013 – 2014	
	Total no. of procedures = 26483		Total no. of procedures = 6928		Total no. of procedures = 8586		Total no. of procedures = 15514	
	No.	%	No.	%	No.	%	No.	%
PCI status, No. (%)								
Elective	23039	87.0	5072	73.2	6416	74.7	11488	74.1
NSTEMI/UA	1397	5.3	625	9.0	747	8.7	1372	8.8
STEMI	2005	7.5	1231	17.8	1423	16.6	2654	17.1
Not available	25	0.1	0	0	0	0	0	0
Missing	17	0.1	0	0	0	0	0	0
Elective, No. (%)	23039	87.0	5072	73.2	6416	74.7	11488	74.1
Staged PCI	5111	24.2	1442	20.8	2009	23.4	3451	22.2
Ad hoc	16046	75.8	3594	51.9	4362	50.8	7956	51.3
NSTEMI/UA, No. (%)	1397	5.3	625	9.0	747	8.7	1372	8.8
Urgent	824.0	60.1	218	34.9	228	30.5	446	32.5
Non-urgent	548.0	39.9	401	64.2	511	68.4	912	66.5
STEMI, No. (%)	2005	7.5	1231	17.8	1423	16.6	2654	17.1
Rescue	737	37.1	410	33.3	434	30.5	844	31.8
Primary	762	38.3	394	32.0	490	34.4	884	33.3
Facilitated	26	1.3	25	2.0	43	3.0	68	2.6
Delayed PCI	464	23.3	67	5.4	0	0	67	2.5
Delayed routine PCI			162	13.2	218	15.3	380	14.3
Delayed selective PCI			110	8.9	136	9.6	246	9.3
Pharmacoinvasive			38	3.1	93	6.5	131	4.9
#Percutaneous entry, No. (%)								
Brachial	183	0.7	67	1.0	47	0.5	114	0.7
Radial	11301	42.7	3763	54.3	5083	59.2	8846	57.0
Femoral	13857	52.3	3221	46.5	3899	45.4	7120	45.9
^s French size type, No. (%)								
Guiding catheter			8229	96.7	10518	97.3	18747	97.0
Guiding sheath			149	1.7	273	2.5	422	2.2
Not available			42	0.5	20	0.2	62	0.3
Missing			97	1.1	1	0.0	98	0.5

	2007 – 2012		2013		2014		2013 – 2014	
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	No.	%	No.	%	No.	%	No.	%
^French size (guiding catheter), No. (%)								
4			27	0.4	8	0.1	35	0.2
5	249	0.9	20	0.2	15	0.1	35	0.2
6	21667	81.8	7405	90.0	9822	93.5	17227	91.8
7	3441	13.0	728	8.8	654	6.2	1382	7.4
8	155	0.6	16	0.2	5	0.0	21	0.1
*9	2	0.0	0	0	1	0.0	1	0.0
Others	9	0.0	0	0	11	0.1	11	0.1
Not available	330	1.3	33	0.4	2	0.0	35	0.2
Missing	630	2.4	0	0	0	0	0	0
^French size (guiding sheath), No. (%)								
4			0	0	0	0	0	0
5			0	0	0	0	0	0
6			129	86.5	245	89.8	374	88.6
7			0	0	0	0	0	0
8			19	12.8	26	9.5	45	10.7
*9			1	0.7	2	0.7	3	0.7
Others			0	0	0	0	0	0
Not available			0	0	0	0	0	0
Missing			0	0	0	0	0	0
Closure device, No. (%)								
No	23702	89.5	5984	86.3	6547	76.3	12531	80.8
Seal	512	1.9	157	2.3	226	2.6	383	2.5
Suture	494	1.9	245	3.5	715	8.3	960	6.2
Exoseal			52	0.8	93	1.1	145	0.9
Others	39	0.1	80	1.2	454	5.3	534	3.4
Not available	380	1.4	89	1.3	61	0.7	150	1.0
Missing	1356	5.2	321	4.6	490	5.7	811	5.2
#^Extent of coronary disease, No. (%)								
Single vessel disease	12198	46.1	4109	59.3	5875	68.4	9984	64.4
Multiple vessel disease	12322	46.5	2382	34.4	2329	27.1	4711	30.4
Left main/LMS	171	0.6	200	2.9	270	3.1	470	2.9
Graft	292	1.1	90	1.3	108	1.3	198	1.3
Not available			147	2.1	4	0.1	151	1.0

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	No.	%	No.	%	No.	%	No.	%
Fluoroscopy time, min								
N	22773		5930		7558		13488	
Mean (SD)	20.4 (18.3)		19.2 (17.1)		19.3 (16.3)		19.3 (16.7)	
Median (min, max)	15.3 (2.0, 180.0)		14.4 (2.0, 171.0)		14.5 (2.0, 175.0)		14.5 (2.0, 175.0)	
Not available, No. (%)	2222	8.4	595	8.6	670	7.8	1265	8.2
Missing, No. (%)	1488	5.6	403	5.8	358	4.2	761	4.9
Fluoroscopy total dose, mGy								
N	11527		3113		4616		7729	
Mean (SD)	3316.3 (26882.6)		71682.5 (1635133.5)		55394.0 (408095.8)		61954.5 (1084518.4)	
Median (min, max)	187.0 (0.5, 1199417.0)		1656.0 (0.0, 90093904.0)		1900.1 (1.4, 26434900.0)		1792.0 (0.0, 90093904.0)	
Not available, No. (%)	10473	39.5	2737	39.5	2622	30.5	5359	34.5
Missing, No. (%)	4483	16.9	1078	15.6	1348	15.7	2426	15.6
Contrast type, No. (%)								
Ionic	229	0.9						
Non-ionic	24225	91.5						
Not available	1542	5.8						
Missing	487	1.8						
Contrast volume, ml								
N	23650		5937		7494		13431	
Mean (SD)	177.2 (68.9)		162.5 (69.4)		163.0 (68.5)		162.8 (68.9)	
Median (min, max)	150.0 (15.0, 500.0)		150.0 (16.0, 500.0)		150.0 (18.0, 500.0)		150.0 (16.0, 500.0)	
Not available, No. (%)	1891	7.1	529	7.6	549	6.4	1078	6.9
Missing, No. (%)	942	3.6	462	6.7	543	6.3	1005	6.5
Thrombolytics prior to PCI procedure in ACS STEMI, No. (%)								
<i>Total no. of procedures among ACS STEMI patients</i>	5722	100	1374	100	1741	100	3115	100
Yes	1258	22.0	607	44.2	706	40.6	1313	42.2
No	4458	77.9	767	55.8	1035	59.4	1802	57.8
Missing	6	0.1	0	0	0	0	0	0

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	No.	%	No.	%	No.	%	No.	%
Duration of thrombolytics given prior to PCI procedure in ACS STEMI, No. (%)								
< 3 hrs	77	6.8	51	10.8	84	14.7	135	12.9
3 – 6 hrs	132	11.6	88	18.7	114	19.9	202	19.4
6 – 12 hrs	109	9.6	82	17.4	90	15.7	172	16.5
12 – 24 hrs	146	12.8	221	46.9	284	49.7	505	48.4
> 24 hrs			29	6.2	0	0	29	2.8
1 – 7 days	450	39.5						
> 7 days	225	19.7						
Not available	26		69		56		125	
Missing	93		67		78		145	

#Patients were allowed to be in more than one type of category

\$French size type was not available in the old CRF. In the old CRF, information on French size was only collected for guiding catheter

^French size is reported by number of lesions instead of number of procedures. In the old CRF, French size was reported under Section 6 cath lab visit, no 6b, whereas in the new CRF, it was reported under Section 7 PCI proc details, no 11

* In the new CRF, French size 9 was not listed. However, there was one patient with guiding catheter and French size 9 and three patients with guiding sheath and French size 9

^Results were presented differently in 2007 – 2012 and 2013 – 2014. In 2007 – 2012, patients were allowed to be presented in different categories. In 2013 – 2014, patients were included in a unique category

Single vessel disease is for patients with single vessel disease information (old CRF)/ patients with only one information of LAD, LCx, or RCA

Multiple vessel disease is for patients with multiple vessel disease information (old CRF)/patients with more than one information of LAD, LCx or RCA

Left main stem (LMS) is for patients with information on LMS (LMS alone or combination with LAD, LCx, RCA or single vessel disease)

Graft is for patients with information on graft (graft alone or combination with LAD, LCx, RCA, single vessel disease, multiple vessel disease or LMS)

	2007 – 2012		2013		2014		2013 – 2014	
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	No.	%	No.	%	No.	%	No.	%
Iib/IIIa Blockade, No. (%)								
Yes	1275	4.8	238	3.4	347	4.0	585	3.8
No	25163	95.0	6690	96.6	8239	96.0	14929	96.2
Missing	45	0.2	0	0	0	0	0	0
Iib/IIIa Blockade given status, No. (%)								
Prior	447	37.9	64	29.2	150	50.5	214	41.5
During	629	53.3	25	11.4	20	6.7	45	8.7
After	104	8.8	130	59.4	127	42.8	257	49.8
Not available	23		0		1		1	
Missing	72		19		49		68	
Heparin, No. (%)								
Yes	25205	95.2	6576	94.9	8253	96.1	14829	95.6
No	1250	4.7	352	5.1	333	3.9	685	4.4
Missing	28	0.1	0	0	0	0	0	0
Heparin given status, No. (%)								
Prior	4863	19.7	2978	46.5	3588	44.5	6566	45.4
During	19789	80.2	5	0.1	2	0	7	0
After	35	0.1	3416	53.4	4470	55.5	7886	54.6
Not available	40		16		1		17	
Missing	478		161		192		353	
LMWH, No. (%)								
Yes	895	3.4	223	3.2	301	3.5	524	3.4
No	25520	96.4	6705	96.8	8285	96.5	14990	96.6
Missing	68	0.2	0	0	0	0	0	0
LMWH given status, No. (%)								
Prior	728	86.5	184	86.4	265	96.0	449	91.8
During	61	7.2	15	7.0	5	1.8	20	4.1
After	53	6.3	14	6.6	6	2.2	20	4.1
Not available	3		1		0		1	
Missing	50		9		25		34	

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	No.	%	No.	%	No.	%	No.	%
Ticlopidine, No. (%)								
Yes	542	2.0	93	1.3	65	0.8	158	1.0
No	25891	97.8	6835	98.7	8521	99.2	15356	99.0
Missing	50	0.2	0	0	0	0	0	0
Ticlopidine given status, No. (%)								
Prior	492	96.9	86	96.6	60	98.4	146	97.3
During	10	1.9	0	0	1	1.6	1	0.7
After	6	1.2	3	3.4	0	0	3	2.0
Not available	7		0		0		0	
Missing	27		4		4		8	
Aspirin, No. (%)								
Yes	25788	97.4	6751	97.4	8242	96.0	14993	96.6
No	668	2.5	177	2.6	344	4.0	521	3.4
Missing	27	0.1	0	0	0	0	0	0
Aspirin given status, No. (%)								
Prior	24679	98.6	6488	98.7	7950	99.2	14438	98.9
During	237	0.9	52	0.8	11	0.1	63	0.4
After	119	0.5	34	0.5	60	0.7	94	0.7
Not available	191		3		6		9	
Missing	562		174		215		389	
Clopidogrel, No. (%)								
Yes	25933	97.9	6355	91.7	7724	90.0	14079	90.8
No	531	2.0	573	8.3	862	10.0	1435	9.2
Missing	19	0.1	0	0	0	0	0	0
Clopidogrel given status, No. (%)								
Prior	24807	97.0	5862	93.3	7331	95.9	13193	94.7
During	351	1.4	28	0.4	19	0.2	47	0.3
After	404	1.6	398	6.3	301	3.9	699	5.0
Not available	178		8		6		14	
Missing	193		59		67		126	

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	No.	%	No.	%	No.	%	No.	%
Duration of clopidogrel given prior to PCI procedure, hrs, No. (%)								
< 6	5872	25.3	1593	29.5	2058	30.1	3651	29.9
6 – 24	7485	32.2	1246	23.1	1893	27.6	3139	25.6
> 24 – 72	4127	17.7	533	9.9	719	10.5	1252	10.2
> 72	5771	24.8	2021	37.5	2181	31.8	4202	34.3
Not available	677		192		92		284	
Missing	875		277		388		665	
First starting dose, mg, No. (%)								
75	11567	50.8	2725	50.4	3719	55.3	6444	53.1
300	8977	39.4	2174	40.2	2299	34.2	4473	36.9
600	2237	9.8	509	9.4	706	10.5	1215	10.0
≥ 1200	6	0.0	1	0.0	0	0	1	0.0
Not available	1187		289		199		488	
Missing	1959		657		801		1458	
*Clopidogrel dose of ACS STEMI patient, mg, No. (%)								
<i>Total no. of PCI procedures among ACS STEMI patients who were taking clopidogrel.</i>	5629	100	1183	100	1499	100	2682	100
75	2441	47.8	187	19.9	372	30.2	559	25.8
300	2165	42.5	607	64.7	705	57.4	1312	60.5
600	497	9.7	145	15.4	152	12.4	297	13.7
≥ 1200	2	0.0	0	0	0	0	0	0
Not available	211		50		25		75	
Missing	313		194		245		439	
Fondaparinox, No. (%)								
Yes	582	2.2	751	10.8	645	7.5	1396	9.0
No	14135	53.4	6128	88.5	7941	92.5	14069	90.7
Missing	11766	44.4	49	0.7	0	0	49	0.3
Fondaparinox given status, No. (%)								
Prior	482	93.6	635	86.9	576	95.2	1211	90.6
During	5	1.0	91	12.4	21	3.5	112	8.4
After	28	5.4	5	0.7	8	1.3	13	1.0
Not available	6		1		1		2	
Missing	61		19		39		58	

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	No.	%	No.	%	No.	%	No.	%
Prasugrel, No. (%)								
Yes			23	0.3	44	0.5	67	0.4
No			5517	79.6	8539	99.5	14056	90.6
Missing			1388	20.1	3	0.0	1391	9.0
Prasugrel given status, No. (%)								
Prior			19	90.5	29	74.4	48	80.0
During			2	9.5	2	5.1	4	6.7
After			0	0	8	20.5	8	13.3
Not available			0		0		0	
Missing			2		5		7	
Ticagrelor, No. (%)								
Yes			561	8.1	1071	12.5	1632	10.5
No			4979	71.9	7512	87.5	12491	80.5
Missing			1388	20.0	3	0.0	1391	9.0
Ticagrelor given status, No. (%)								
Prior			414	81.0	830	82.7	1244	82.1
During			21	4.1	24	2.4	45	3.0
After			76	14.9	150	14.9	226	14.9
Not available			1		0		1	
Missing			49		67		116	
Planned duration of clopidogrel/ticlopidine, month, No. (%)								
1	4846	18.3	714	10.3	579	6.6	1293	8.3
3	1417	5.4	287	4.1	245	2.9	532	3.4
6	1882	7.1	335	4.8	413	4.8	748	4.8
12	14619	55.2	5034	72.7	6807	79.3	11841	76.3
> 12	1774	6.7	88	1.3	65	0.8	153	1.1
Not available	1317	4.9	311	4.5	349	4.1	660	4.3
Missing	628	2.4	159	2.3	128	1.5	287	1.8

**Only applicable to STEMI patients who were taking clopidogrel*

Table 3.2 Duration of thienopyridine in patients who underwent PCI, NCVD-PCI Registry, 2007 – 2014

Year	Planned duration of clopidogrel/ticlopidine (months)	#Intracoronary devices used					
		Balloon only/POBA		Drug-eluting stent		Bare metal stent	
		No.	%	No.	%	No.	%
2007 – 2012 Total no. of lesions = 34873	1	588	23.6	299	1.5	4409	45.4
	3	142	5.7	433	2.1	867	8.9
	6	210	8.4	1317	6.5	843	8.7
	12	1100	44.2	15485	76.0	2472	25.4
	> 12	156	6.3	1790	8.8	534	5.5
	Not available	253	10.2	553	2.7	415	4.3
	Missing	41	1.6	493	2.4	176	1.8
	Total	2490	100.0	20370	100.0	9716	100.0
2013 Total no. of lesions = 8517	1	165	18.7	51	0.9	563	39.6
	3	65	7.4	47	0.8	133	9.4
	6	38	4.3	120	2.1	103	7.3
	12	527	59.6	5149	90.8	525	37.0
	> 12	16	1.8	76	1.3	9	0.6
	Not available	55	6.2	118	2.1	53	3.7
	Missing	18	2.0	116	2.0	34	2.4
	Total	884	100.0	5677	100.0	1420	100.0
2014 Total no. of lesions = 10812	1	174	10.9	129	1.7	323	31.1
	3	57	3.5	49	0.7	92	8.9
	6	94	5.8	209	2.9	66	6.4
	12	1158	72.0	6667	91.1	501	48.5
	> 12	22	1.4	53	0.7	4	0.4
	Not available	80	5.0	128	1.7	34	3.3
	Missing	23	1.4	86	1.2	14	1.4
	Total	1608	100.0	7321	100.0	1034	100.0
2013 – 2014 Total no. of lesions = 19329	1	339	13.7	180	1.4	886	36.1
	3	122	4.9	96	0.7	225	9.2
	6	132	5.3	329	2.5	169	6.9
	12	1685	67.6	11816	90.9	1026	41.8
	> 12	38	1.5	129	1.0	13	0.5
	Not available	135	5.4	246	1.9	87	3.5
	Missing	41	1.6	202	1.6	48	2.0
	Total	2492	100.0	12998	100.0	2454	100.0

*Patients were allowed to be in more than one type of category

Table 3.3 Access site of patients who underwent procedures, by PCI status, NCVD-PCI Registry, 2007 – 2014

Year	#Percutaneous entry	PCI status											
		Elective		NSTEMI/UA		AMI		Not available		Missing		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2007 – 2012 Total no. of procedures = 26483	Brachial	167	91.3	7	3.8	8	4.4	1	0.5	0	0	183	100
	Radial	10378	91.8	444	3.9	467	4.2	10	0.1	2	0.0	11301	100
	Femoral	11475	82.8	903	6.5	1463	10.6	13	0.1	3	0.0	13857	100
2013 Total no. of procedures = 6928	Brachial	51	1.0	4	0.6	12	1.0	0	0	0	0	67	1.0
	Radial	2947	57.0	333	52.3	483	38.9	0	0	0	0	3763	53.4
	Femoral	2173	42.0	300	47.1	748	60.2	0	0	0	0	3221	45.6
2014 Total no. of procedures = 8586	Brachial	27	0.4	9	1.2	11	0.8	0	0	0	0	47	0.5
	Radial	3969	58.5	449	57.4	665	45.4	0	0	0	0	5083	56.3
	Femoral	2786	41.1	324	41.4	789	53.9	0	0	0	0	3899	43.2
2013 – 2014 Total no. of procedures = 15514	Brachial	78	0.7	13	0.9	23	0.8	0	0	0	0	114	0.7
	Radial	6916	57.9	782	55.1	1148	42.4	0	0	0	0	8846	55.0
	Femoral	4959	41.5	624	44.0	1537	56.8	0	0	0	0	7120	44.3

[#]Patients were allowed to be in more than one type of category