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ANNUAL REPORT OF THE NCVD-PCI REGISTRY YEAR 2015-2016

Editor:
Dr. Wan Azman Wan Ahmad

MINISTRY OF HEALTY MALAYSIA

NATIONAL HEART ASSOCIATION OF MALAYSIA

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NATIONAL CARDIOVASCULAR DISEASE DATABASE (NCVD)

Annual Report of the Percutaneous Coronary Intervention (PCI) Registry

2015 – 2016

Editor:

Wan Azman Wan Ahmad

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We would especially like to thank the following:

- National Heart Association of Malaysia (NHAM)
- Health Informatics Centre, Ministry of Health Malaysia
- Clinical Research Centre (CRC), Ministry of Health Malaysia
- The members of various expert panels
- Our source data providers

PREFACE

The 2015-2016 PCI Registry is the fifth report since the inception of the Registry in 2007. This report provides information on not only the interventional cardiology practice in major cardiac centres in Malaysia but also the patients who underwent the interventional procedures. Such data is crucial as it represents facts rather than the usual estimates generated for the practicing healthcare professionals, private and public hospital administrators, policy makers, patients advocates, as well as the pharmaceutical and insurance industries. In addition to being an academic reference, the report can be used to improve quality of care, delivery of services, and healthcare planning.

A vast amount of data was collected, and this was only made possible with the countless hours the medical and nursing staff from individual sites throughout Malaysia spent uploading the information online. I thank them for their effort, commitment, perseverance, and enthusiasm for the last ten years; they have truly gone beyond the call of duty.

Our sincere gratitude to the writing committee headed by Prof Dr Wan Azman Wan Ahmad, which devoted many weekends pouring through the data, analysing the figures, and transforming the data into meaningful information. I thank them for the effort and commitment, which truly showcased their passion for this project. Our thanks also to the NCVD secretariat staffs in the Heart House, who quietly worked behind the scene, consistently following through and coordinating with the site investigators, the sub-investigators, the writing committee, the statisticians, etc. Without them, the registry and report would not have come together.

We strongly encourage everyone involved in the registry to fully utilise its immense data and to publish in medical journals so that the information can be shared worldwide; enabling Malaysia to truly contribute to the practice of cardiology globally. Lastly, we would like to thank the National Heart Association of Malaysia, Clinical Research Centre of the Ministry of Health Malaysia and Health Informatics Centre of the Ministry of Health Malaysia, to make this costly registry a reality. Thank you.

Dr Rosli Mohd Ali
Chairman, NCVD Governance Board

FOREWORD

Greetings and Salam!

Ten years ago, on 9th August 2006, we started this national multicentre NCVD PCI registry. Today, we are proud to see this registry grown and starting to bear fruits! The 2015-2016 report is the fifth report of the NCVD-PCI registry.

We hope the registry will provide a "real-world" database of contemporary PCI practice in Malaysia. We began this registry with the objectives to evaluate the outcomes of PCI based on selected performance measures, to determine the cost-effectiveness of PCI, to determine the level of adherence to practice guideline, to stimulate research, to facilitate quality improvement activities, to act as a reference for future studies, to facilitate research and development, and to benchmark against other national/regional PCI registries. e.g. ASPECT, ASEAN.

Much has been achieved, through the commitment and teamwork from everyone! However, there is more to do still. The way forward is to go beyond "output" to "outcome", beyond "quantity" to "quality". With the sizeable number of cases reported, we may now embark on more analysis of trends and subgroups, to determine the factors that contribute to procedural success and long-term patient-centred outcomes. To this end, we may embark to appraise our practice based on both clinical practice guidelines (CPG) and appropriateness use criteria (AUC).

Beyond the value to service improvement, our registry may provide the platform for 'registry-based randomised controlled trials", post-marketing surveillance as required by the recent governance of medical devices in the ever-changing field of interventional cardiology.

The way forward for the next decade and beyond will depend on continual commitment and support in leadership and funding from NHAM. The machinery of the NCVD registry lies with each of us. The NCVD-PCI registry will continue to be a voluntary collaborative group, with shared ownership. Participating sites will continue to have free access to their 'own' institutional database to facilitate local quality-assurance activities. We continue to uphold the 'code of honour', *Together everyone achieves more.*

We would also like to take this opportunity to thank everyone who has contributed to this registry. Happy Reading. We welcome feedback and comments.

Dr Liew Houng Bang
Chairman
NCVD-Percutaneous Coronary Intervention (PCI) Registry

NOTE FROM THE WRITING COMMITTEE CHAIRMAN

The National Cardiovascular Disease Database (NCVD): Annual report of the NCVD-Percutaneous Coronary Intervention (PCI) registry year 2015–2016 is the 5th report and publication of the data analysis for the year 2015–2016 compared to the cohort of 2013–2014. We started NCVD-PCI in the year 2007. For 2014, we had only eight source data providers (SDPs) and data of 3,938 patients entered into the registry. For the year 2016, we had 18 SDPs and data of 11,211 patients in this report. We now have 10 years of analysed data with a cumulative number of about 60,000 patients. This is a lot of data for us to perform data mining to see the trend in our practice and to stimulate further research and publication.

Highlights of the findings for this 2015–2016 report:

- Our patients who underwent PCI were young with a mean age of 57.7 years.
- Patients of Indian ethnicity had relatively higher number of PCI and were relatively younger when they had PCI compared to patients of Chinese ethnicity.
- Traditional cardiovascular risk factors, which include diabetes, hypertension, and dyslipidaemia remained highly prevalent among PCI patients. Many of them had a cluster of risk factors.
- 1.2% of patients undergoing PCI had concomitant atrial fibrillation which was much lower than the 6.2–7.9% seen in the GRACE registry and 5.3% in KAMIR registry.
- There was an increase in the number of PCIs performed in patients with acute coronary syndrome (ACS). For ST-elevation myocardial infarction (STEMI), the number of primary PCI and pharmacoinvasive PCI were also increased.
- There was an improvement in transfer time for STEMI PCI. We established the MYSTEMI network, a system of referral and clinical pathway for patients presented to a non-PCI capable centre for transfer to a PCI capable centre in 2016.
- There were further increase in PCIs performed via radial approach compared to the previous cohort (66.3%).
- There was an increase in the use of ticagrelor (25.5%) in the catheterisation laboratory compared to the 2013–2014 cohort.
- Majority of lesions treated were de novo lesions (95.0%); and complex lesions (type B2 and C) made up 59.4% of all PCI cases.
- Generally, drug eluting stents (76.9%) were the standard practice of PCI. The use of bare metal stent had decreased, however the use of drug eluting balloon (DEB) had increased.
- Most of the in-stent restenosis (ISR) lesions were treated with DEB (62.9%).
- The rate of left main stem (LMS) intervention (majority unprotected) continued to increase compared to the previous cohort with a high procedural success rate (97.5%).
- Vein grafts remained the most commonly treated in graft PCI (84.7%) with increasing left internal mammary artery (LIMA) intervention (14.9%).
- The number of chronic total occlusion (CTO) >3 months PCI constituted 7.8% of all lesions treated with a good success rate (74.8%).
- The use of coronary imaging modalities (intravascular ultrasound [IVUS] and optical coherence tomography [OCT]) as well as functional assessment tool (fractional flow reserve: FFR) were still very low.
- Post-procedural lesion complications rate remained low despite more complex PCIs being performed.
- Overall in-hospital mortality in the period of 1st Jan 2015–31st Dec 2016 was low (2.0%): 2.8% at 30 days; 4.7% at 6 months; and 6.8% at 1 year.
- The in-hospital and 30-days mortality prognostic factors were being elderly (>60 years old), ACS as presentation, status of PCI (urgent > electives), clinical presentation (Killip III/IV and low ejection fraction), previous history of myocardial infarction (MI) and patients with multi-vessel disease.

In terms of numbers, we have done well. Future effort will include focusing more on data quality and audit. We would like to see the actual number of PCI procedures entered into the NCVD-PCI registry tally with the actual number of PCI procedures performed. Congratulation to the many centres which were able to achieve more than 95% of their data entry to match the actual number of PCI procedures without missing data.

I would like to welcome new participating centres and I would like to encourage a few inactive centres to motivate their staff and send their investigators to our NCVD workshop which we conduct twice a year to share best practices and updates.

Finally, I would like to thank all the writing committee members for their contribution in producing this report. I would also like to thank all the Principal Investigators (PIs), co-PIs, study coordinators, Miss Gunavathy, Miss Noor Amirah and our statistician, Mr. Tg Mohd Ikhwan, for making this report possible.

Yours sincerely

Prof Dr Wan Azman Wan Ahmad
Chairman
NCVD Writing Committee

ABBREVIATIONS

ACE	Angiotensin Converting Enzyme
ACS	Acute Coronary Syndrome
BMI	Body Mass Index
CABG	Coronary Artery Bypass Graft
CAD	Coronary Artery Disease
CCS	Canadian Cardiovascular Score
CRC	Clinical Research Centre
CRF	Case Report Form
CTO	Chronic Total Occlusion
CV	Cardiovascular
CVD	Cardiovascular Disease
DAPT	Dual Antiplatelet Therapy
DEB	Drug Eluting Balloon
DES	Drug Eluting Stents
DTB	Door-To-Balloon
FFR	Fractional Flow Reserve
GFR	Glomerular Filtration Rate
GP	Glycoprotein
IABP	Intra-Aortic Balloon Pump
ICT	Information and Communication Technology
IJN	Institut Jantung Negara
ISR	In-Stent Restenosis
IVUS	Intravascular Ultrasound
JPN	Jabatan Pendaftaran Negara
LAD	Left Anterior Descending Coronary Artery
LDL	Low Density Lipoprotein
LIMA	Left Internal Mammary Artery
LMS	Left Main Stem
LVEF	Left Ventricular Ejection Fraction
MDRD	Modification of Diet in Renal Disease
MI	Myocardial Infarction
MOH	Ministry of Health
NCVD	National Cardiovascular Disease Database
NHAM	National Heart Association of Malaysia
NSTEMI	Non ST-Elevation Myocardial Infarction
NYHA	New York Heart Association
OCT	Optical Coherence Tomography
PCI	Percutaneous Coronary Intervention
POBA	Plain-Old Balloon Angioplasty
PPCI	Primary Percutaneous Coronary Intervention
SD	Standard Deviation
SDP	Source Data Provider
STEMI	ST-Elevation Myocardial Infarction
TIMI	Thrombolysis In Myocardial Infarction
UA	Unstable Angina

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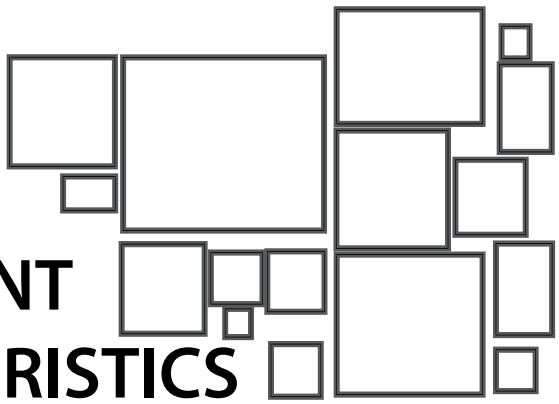

PATIENT CHARACTERISTICS

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Summary

1. There has been a steady increase in patients undergoing percutaneous coronary intervention (PCI) from 2013 to 2016.
2. Approximately 83.2% of patients were male with mean age of 57.7 years.
3. Patients of Malay ethnicity underwent the highest number of PCI (50%); however, a relatively higher number of Indians had PCI compared to Chinese.
4. There was an increase in patients with new onset angina who underwent PCI compared to the previous years.
5. Traditional cardiovascular risk factors, which included diabetes, hypertension and dyslipidaemia remained highly prevalent among the cohort of PCI patients.

In the period from 2015 to 2016, there was an increase in the number of patients undergoing PCI recorded in the NCVD-PCI Registry (n = 19,494) compared to the period from 2013 to 2014 (n = 14,136). [Table 1.1] There were 18 source data providers (SDPs) in 2015 to 2016 compared to 15 in 2013 to 2014. While this increase reflects a greater absolute number of procedures being performed and data collected, it also reflects the growing burden of coronary artery disease (CAD) in Malaysia. [Table 1.2]

The mean age of patients undergoing PCI in the period from 2015 to 2016 was approximately 57.7 years, and 83.3% were males. Approximately 23.0% of patients were under the age of 50, and this was similar to the preceding 2 years. [Table 1.1] The majority of patients (35.6%) were in the 50–60 years age group. While this remains similar among the males, the majority of females undergoing PCI were in the ages of 60–70 years. The three main ethnic groups undergoing PCI in the period from 2015 to 2016 were Malay (50.6%), Chinese (21.1%) and Indian (20.4%). [Table 1.1] Amongst males, 26.8% of Malay, 17.5% of Chinese and 24.6% of Indian patients undergoing PCI were aged less than 50 years. This was similar amongst females, in which 15.1% of Malay, 6.2% of Chinese and 14.9% of Indian patients undergoing PCI were aged less than 50 years. This was generally similar to the rates in the 2013–2014 period. [Table 1.4.2]

The prevalence of pre-morbid established cardiovascular risk factors (CVRF) were similar between the 2015 to 2016 period and the 2013 to 2014 period. Of these, 26.8% were active smokers, 14.3% had a family history of premature cardiovascular disease (CVD), 54.8% had dyslipidaemia, 68.1% had hypertension, 45.2% had diabetes, and 62.6% were obese. In addition, the prevalence of patients who had a history of myocardial infarction (MI) was 38.8%. [Table 1.1] Overall, approximately a third of patients had more than three known cardiovascular risk factors at the time of PCI. [Table 1.5.1]

We noted that there was a substantial increase in the patients who had new onset angina, from 28.7% in the period of 2013–2014, to 41.2% in the period between 2015 and 2016. [Table 1.1] On the other hand, the numbers of procedures between the two periods remained similar, with 91.1% having a single procedure in 2013–2014, and 90.7% between 2015 and 2016. [Table 1.2] This increase amongst patients with new onset angina is multifactorial and most likely a combination of increased access to PCI centres, earlier diagnosis of significant coronary disease and improved patient awareness. It was also important to note that while the majority of patients undergoing PCI had normal renal function, 21.8% of patients had a glomerular filtration rate (GFR) (by modification of diet in renal disease [MDRD] formula) of <60 ml/min. [Table 1.1]

Discussions

The National Health and Morbidity Survey (NHMS) 2015,[1] reported an estimated 73.0% of deaths in Malaysia was attributed to non-communicable diseases with the largest cohort coming from cardiovascular (CV) death. Statistics on causes of death in 2017, sourced from the Department of Statistics, Malaysia, concurred with the NHMS,[2] in which 13.2% in 2016 was related to CV death. In our neighbouring country, Singapore, CV death accounted for 17.0% of deaths in year 2016.[3] In the GRACE Registry,[4] the cumulative percentage of deaths based on diagnosis, from unstable angina to myocardial infarction, was 15.0%.

A large Swedish registry (SCAAR[5]), with data collected over the span of 20 years, showed a relatively older age population, with mean age of 67.1 years, undergoing PCI. Similarly, there was a higher percentage of male patients (approximately 71.5% in 2009 to 2010). Interestingly, the percentage of diabetes, hypertension and dyslipidaemia were 17.5%, 51.4% and 39.8% respectively. This contrasted with the higher percentage of diabetes and hypertension prevalence seen in our cohort.

Many factors contribute to the increasing burden of CVD in Malaysia, including cases of CAD treated with PCI. The combination of the rising prevalence of CVRF with perhaps psychosocial and dietary factors, compound both the earlier clinical manifestation of CAD and the severity of CAD. Therefore, addressing all these factors, as well as the socioeconomic aspect of the population as a whole, would be vital to improve both the onset and outcomes of patients with CVD. For those with established CAD and undergoing PCI, appropriate guideline-based secondary prevention strategies are also recommended.

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Table 1.1 Characteristics of patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
Demographics				
Age, Years				
N	14,136	9,428	10,066	19,494
Mean (SD)	57.7 (10.4)	57.8 (10.6)	57.6 (10.5)	57.7 (10.6)
Median (Min – Max)	57.8 (20.1 – 96.0)	58.0 (21.5 – 94.2)	57.7 (20.3 – 91.8)	57.8 (20.3 – 94.2)
Age group, No. (%)				
20 – <30	62 (0.4)	53 (0.6)	50 (0.5)	103 (0.5)
30 – <40	669 (4.7)	456 (4.8)	512 (5.1)	968 (5.0)
40 – <50	2,400 (17.0)	1,607 (17.0)	1,772 (17.6)	3,379 (17.3)
50 – <60	5,171 (36.6)	3,372 (35.8)	3,560 (35.4)	6,932 (35.6)
60 – <70	4,036 (28.6)	2,759 (29.3)	3,048 (30.3)	5,807 (29.8)
70 – <80	1,623 (11.5)	1,067 (11.3)	1,006 (10.0)	2,073 (10.6)
≥80	175 (1.2)	114 (1.2)	118 (1.2)	232 (1.2)
Gender, No. (%)				
Male	11,818 (83.6)	7,828 (83.0)	8,402 (83.5)	16,230 (83.3)
Female	2,318 (16.4)	1,600 (17.0)	1,664 (16.5)	3,264 (16.7)
Ethnic group, No. (%)				
Malay	7,018 (49.6)	4,625 (49.1)	5,234 (52.0)	9,859 (50.6)
Chinese	3,076 (21.8)	2,024 (21.5)	2,091 (20.8)	4,115 (21.1)
Indian	2,734 (19.3)	2,015 (21.4)	1,958 (19.5)	3,973 (20.4)
Orang Asli	9 (0.1)	9 (0.1)	1 (0.0)	10 (0.1)
Kadazan-Dusun	219 (1.5)	111 (1.2)	103 (1.0)	214 (1.1)
Melanau	14 (0.1)	2 (0.0)	2 (0.0)	4 (0.0)
Murut	12 (0.1)	6 (0.1)	7 (0.1)	13 (0.1)
Bajau	135 (1.0)	92 (1.0)	69 (0.7)	161 (0.8)
Bidayuh	64 (0.5)	42 (0.4)	50 (0.5)	92 (0.5)
Iban	358 (2.5)	184 (2.0)	277 (2.8)	461 (2.4)
Punjabi	79 (0.6)	60 (0.6)	41 (0.4)	101 (0.5)
Other Malaysian	289 (2.0)	187 (2.0)	158 (1.6)	345 (1.8)
Foreigner	121 (0.9)	71 (0.8)	75 (0.7)	146 (0.7)
Not available	8 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Other coronary risk factors				
Smoking, No. (%)				
Never	4,824 (34.1)	3,361 (35.6)	3,736 (37.1)	7,097 (36.4)
Former (quit > 30days)	3,079 (21.8)	2,105 (22.3)	2,272 (22.6)	4,377 (22.5)
Current (any tobacco uses within last 30days)	3,942 (27.9)	2,471 (26.2)	2,754 (27.4)	5,225 (26.8)
Not available	2,291 (16.2)	1,491 (15.8)	1,304 (13.0)	2,795 (14.3)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
Family history of premature cardiovascular disease, No. (%)				
Yes	1,494 (10.6)	1,266 (13.4)	1,521 (15.1)	2,787 (14.3)
No	9,776 (69.2)	6,464 (68.6)	7,098 (70.5)	13,562 (69.6)
Not known	2,866 (20.3)	1,698 (18.0)	1,447 (14.4)	3,145 (16.1)
Body mass index (BMI), kgm^{-2}				
N	10,658	6,801	7,840	14,641
Mean (SD)	26.6 (4.4)	26.7 (4.5)	26.8 (4.6)	26.8 (4.6)
Median (Min – Max)	26.1 (14.0 – 49.8)	26.3 (14.1 – 48.9)	26.3 (14.0 – 50.0)	26.3 (14.0 – 50.0)
Not available, No. (%)	2,056 (14.5)	1,714 (18.2)	1,477 (14.7)	3,191 (16.4)
Missing, No. (%)	1,422 (10.1)	913 (9.7)	749 (7.4)	1,662 (8.5)
BMI, kg/m^2, No. (%)				
<18.5	157 (1.5)	121 (1.8)	139 (1.8)	260 (1.8)
18.5 – 23	1,909 (17.9)	1,128 (16.6)	1,356 (17.3)	2,484 (17.0)
>23 – <25	2,079 (19.5)	1,297 (19.1)	1,416 (18.1)	2,713 (18.5)
25 – <30	4,460 (41.8)	2,908 (42.8)	3,276 (41.8)	6,184 (42.2)
30 – <35	1,589 (14.9)	1,025 (15.1)	1,222 (15.6)	2,247 (15.3)
35 – <40	358 (3.4)	250 (3.7)	331 (4.2)	581 (4.0)
≥40	106 (1.0)	72 (1.1)	100 (1.3)	172 (1.2)
Not available	2,056	1,714	1,477	3,191
Missing	1,422	913	749	1,662
Co-morbidities				
Dyslipidaemia, No. (%)				
Yes	8,390 (59.4)	5,390 (57.2)	5,292 (52.6)	10,682 (54.8)
No	4,422 (31.3)	3,273 (34.7)	3,996 (39.7)	7,269 (37.3)
Not known	1,324 (9.4)	765 (8.1)	778 (7.7)	1,543 (7.9)
Hypertension, No. (%)				
Yes	9,437 (66.8)	6,392 (67.8)	6,884 (68.4)	13,276 (68.1)
No	3,900 (27.6)	2,647 (28.1)	2,736 (27.2)	5,383 (27.6)
Not known	799 (5.7)	389 (4.1)	446 (4.4)	835 (4.3)
Diabetes, No. (%)				
Yes	6,128 (43.4)	4,267 (45.3)	4,542 (45.1)	8,809 (45.2)
No	7,059 (49.9)	4,718 (50.0)	5,007 (49.7)	9,725 (49.9)
Not known	949 (6.7)	443 (4.7)	517 (5.1)	960 (4.9)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
Type of diabetes treatment, No. (%)				
Total no. of patients who had diabetes	N = 6,128	N = 4,267	N = 4,542	N = 8,809
OHA	3,782 (65.7)	2,549 (65.9)	2,519 (62.8)	5,068 (64.3)
Insulin	973 (16.9)	670 (17.3)	721 (18.0)	1,391 (17.7)
OHA + insulin	633 (11.0)	427 (11.0)	538 (13.4)	965 (12.3)
Non-pharmacology therapy	367 (6.4)	221 (5.7)	232 (5.8)	453 (5.8)
Missing	373	400	532	932
Myocardial infarction history, No. (%)				
Yes	5,402 (38.2)	3,400 (36.1)	4,166 (41.4)	7,566 (38.8)
No	7,601 (53.8)	5,312 (56.3)	5,389 (53.5)	10,701 (54.9)
Not known	1,133 (8.0)	716 (7.6)	511 (5.1)	1,227 (6.3)
Documented coronary artery disease, No. (%)				
Yes	5,678 (40.2)	3,523 (37.4)	3,958 (39.3)	7,481 (38.4)
No	7,633 (54.0)	5,355 (56.8)	5,628 (55.9)	10,983 (56.3)
Not known	825 (5.8)	550 (5.8)	480 (4.8)	1,030 (5.3)
New onset angina (<2 weeks), No. (%)				
Yes	4,050 (28.7)	3,820 (40.5)	4,215 (41.9)	8,035 (41.2)
No	9,274 (65.6)	5,154 (54.7)	5,545 (55.1)	10,699 (54.9)
Not known	812 (5.7)	454 (4.8)	306 (3.0)	760 (3.9)
Congestive heart failure (2 weeks prior), No. (%)				
Yes	587 (4.2)	363 (3.9)	452 (4.5)	815 (4.2)
No	12,892 (91.2)	8,761 (92.9)	9,295 (92.3)	18,056 (92.6)
Not known	657 (4.6)	304 (3.2)	319 (3.2)	623 (3.2)
Cerebrovascular disease, No. (%)				
Yes	399 (2.8)	229 (2.4)	245 (2.4)	474 (2.4)
No	13,066 (92.4)	8,893 (94.3)	9,496 (94.3)	18,389 (94.3)
Not known	671 (4.7)	306 (3.2)	325 (3.2)	631 (3.2)
Peripheral vascular disease, No. (%)				
Yes	119 (0.8)	44 (0.5)	48 (0.5)	92 (0.5)
No	13,330 (94.3)	8,871 (94.1)	9,645 (95.8)	18,516 (95.0)
Not known	687 (4.9)	513 (5.4)	373 (3.7)	886 (4.5)
Chronic renal failure (>200 micromol), No. (%)				
Yes	677 (4.8)	449 (4.8)	501 (5.0)	950 (4.9)
No	12,811 (90.6)	8,487 (90.0)	9,194 (91.3)	17,681 (90.7)
Not known	648 (4.6)	492 (5.2)	371 (3.7)	863 (4.4)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
*Coronary artery disease, No. (%)				
Yes	10,210 (72.2)	6,930 (73.5)	7,885 (78.3)	14,815 (76.0)
No	3,077 (21.8)	2,007 (21.3)	1,859 (18.5)	3,866 (19.8)
Not known	849 (6.0)	491 (5.2)	322 (3.2)	813 (4.2)
Baseline investigation				
Baseline creatinine, mmol/L				
N	12,017	8,019	8,863	16,882
Mean (SD)	116.0 (117.4)	115.8 (122.2)	118.1 (127.1)	117.0 (124.8)
Median (Min – Max)	92.0 (44.0 – 1632.0)	90.0 (44.0 – 1688.0)	90.0 (44.0 – 1911.0)	90.0 (44.0 – 1911.0)
Not available, No. (%)	1,036 (7.3)	598 (6.3)	512 (5.1)	1,110 (5.7)
Missing, No. (%)	1,083 (7.7)	811 (8.6)	691 (6.9)	1,502 (7.7)
Baseline creatinine, mmol/L, No. (%)				
<100	7,408 (61.6)	5,193 (64.8)	5,740 (64.8)	10,933 (64.8)
100 – 199	3,979 (33.1)	2,410 (30.1)	2,633 (29.7)	5,043 (29.9)
≥200	630 (5.2)	416 (5.2)	490 (5.5)	906 (5.4)
Not available	1,036	598	512	1,110
Missing	1,083	811	691	1,502
*Glomerular filtration rate (GFR), MDRD				
N	11,989	8,027	8,885	16,912
Mean (SD)	75.8 (26.3)	77.2 (26.9)	76.6 (26.8)	76.9 (26.8)
Median (Min – Max)	76.2 (2.7 – 200.5)	77.8 (2.6 – 189.1)	77.7 (2.3 – 194.1)	77.8 (2.3 – 194.1)
Missing, No. (%)	2,147 (15.2)	1,401 (14.9)	1,181 (11.7)	2,582 (13.2)
*Glomerular filtration rate (GFR), MDRD, No. (%)				
<15	380 (3.2)	275 (3.4)	342 (3.8)	617 (3.6)
15 – <30	254 (2.1)	146 (1.8)	154 (1.7)	300 (1.8)
30 – <45	610 (5.1)	399 (5.0)	434 (4.9)	833 (4.9)
45 – <60	1,484 (12.4)	959 (11.9)	991 (11.2)	1,950 (11.5)
≥60	9,261 (77.2)	6,248 (77.8)	6,964 (78.4)	13,212 (78.1)
Missing	2,147	1,401	1,181	2,582
**Total cholesterol, mmol/L				
Total no. of patients who had documented coronary artery disease	N = 5,678	N = 3,523	N = 3,958	N = 7,481
N	3,301	2,181	2,223	4,404
Mean (SD)	4.4 (1.3)	4.4 (1.4)	4.4 (1.3)	4.4 (1.3)
Median (Min – Max)	4.1 (2.0 – 25.0)	4.2 (2.0 – 24.0)	4.1 (2.0 – 13.7)	4.2 (2.0 – 24.0)
Not available, No. (%)	1,589 (28.0)	924 (26.2)	1,265 (32.0)	2,189 (29.3)
Missing, No. (%)	788 (13.9)	418 (11.9)	470 (11.9)	888 (11.9)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
**LDL levels, mmol/L				
Total no. of patients who had documented coronary artery disease	N = 5,678	N = 3,523	N = 3,958	N = 7,481
N	3,223	2,107	2,129	4,236
Mean (SD)	2.5 (1.1)	2.6 (1.2)	2.5 (1.1)	2.5 (1.2)
Median (Min – Max)	2.2 (0.8 – 16.0)	2.3 (0.7 – 20.0)	2.3 (0.8 – 12.1)	2.3 (0.7 – 20.0)
Not available, No. (%)	1,662 (29.3)	1,011 (28.7)	1,340 (33.9)	2,351 (31.4)
Missing, No. (%)	793 (14.0)	405 (11.5)	489 (12.4)	894 (12.0)
Previous intervention				
Previous PCI, No. (%)				
Yes	2,281 (16.1)	1,610 (17.1)	1,790 (17.8)	3,400 (17.4)
No	11,855 (83.9)	7,818 (82.9)	8,276 (82.2)	16,094 (82.6)
Previous CABG, No. (%)				
Yes	460 (3.3)	287 (3.0)	277 (2.8)	564 (2.9)
No	13,676 (96.7)	9,141 (97.0)	9,789 (97.2)	18,930 (97.1)

**Coronary artery disease is defined as "Yes" on any of the following co-morbidities: 1) History of myocardial infarction, 2) Documented CAD >50% stenosis, 3) New onset angina (less than 2 weeks).*
**Glomerular filtration rate calculated based on MDRD formula.*
***Mean (SD) of total cholesterol, mmol/L and LDL levels, mmol/L is of the patients who had documented coronary artery disease.*
Note: Not known in coronary artery disease includes patients who do not know their co-morbidities as well as missing data.

Table 1.2 Distribution of patients by number of procedures, NCVD-PCI Registry,2013–2016

No. of procedures	Total no. of patients from 2013 – 2014	No. of patients in 2015	No. of patients in 2016	Total no. of patients from 2015 – 2016
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
1	14,136 (91.1)	9,428 (90.7)	10,066 (90.4)	19,494 (90.5)
2	1,303 (8.4)	930 (8.9)	1,008 (9.0)	1,938 (9.0)
3	67 (0.4)	37 (0.4)	64 (0.6)	101 (0.5)
4	8 (0.1)	2 (0.0)	3 (0.0)	5 (0.0)
Total	**15,514**	**10,397**	**11,141**	**21,538**

Table 1.3.1 Distribution of patients who underwent PCI, by SDP, NCVD-PCI Registry, 2013–2016

No.	Source data provider	2013 – 2014 Total no. of patients = 14,136	2015 Total no. of patients = 9,428	2016 Total no. of patients = 10,066	2015 – 2016 Total no. of patients = 19,494
		No. (%)	No. (%)	No. (%)	No. (%)
1	Pusat Perubatan Universiti Malaya, Kuala Lumpur	865 (6.1)	820 (8.7)	849 (8.4)	1,669 (8.6)
2	Institut Jantung Negara, Kuala Lumpur	5,485 (38.8)	2,988 (31.7)	3,283 (32.6)	6,271 (32.2)
3	Hospital Pulau Pinang, Pulau Pinang	912 (6.5)	459 (4.9)	428 (4.3)	887 (4.6)
4	Pusat Jantung Sarawak, Sarawak	1,352 (9.6)	710 (7.5)	988 (9.8)	1,698 (8.7)
5	Hospital Sultanah Aminah, Johor	879 (6.2)	518 (5.5)	461 (4.6)	979 (5.0)
6	Hospital Sultanah Bahiyah, Kedah	924 (6.5)	462 (4.9)	527 (5.2)	989 (5.1)
7	Hospital Serdang, Selangor	701 (5.0)	1,183 (12.5)	1,153 (11.5)	2,336 (12.0)
8	Pusat Perubatan Universiti Kebangsaan Malaysia, Kuala Lumpur		36 (0.4)	82 (0.8)	118 (0.6)
9	Hospital Sultanah Nur Zahirah, Terengganu	280 (2.0)	181 (1.9)	209 (2.1)	390 (2.0)
10	Hospital Tengku Ampuan Afzan, Pahang	458 (3.2)	218 (2.3)	342 (3.4)	560 (2.9)
11	Pusat Perubatan Subang Jaya, Selangor	210 (1.5)	203 (2.2)	33 (0.3)	236 (1.2)
12	Hospital Queen Elizabeth 2, Sabah	1,063 (7.5)	591 (6.3)	457 (4.5)	1,048 (5.4)
13	Hospital Pantai Ipoh, Perak	91 (0.6)	28 (0.3)	24 (0.2)	52 (0.3)
14	Hospital Raja Permaisuri Bainun, Perak	595 (4.2)	616 (6.5)	677 (6.7)	1,293 (6.6)
15	Hospital Raja Perempuan Zainab II, Kelantan	17 (0.1)	108 (1.1)	167 (1.7)	275 (1.4)
16	UiTM Sg Buloh, Selangor	304 (2.2)	301 (3.2)	374 (3.7)	675 (3.5)
17	Oriental Melaka Straits Medical Centre, Melaka		6 (0.1)	11 (0.1)	17 (0.1)
18	KPJ Tawakkal Specialist Hospital, Kuala Lumpur		0 (0.0)	1 (0.0)	1 (0.0)
	Total	**14,136**	**9,428**	**10,066**	**19,494**

Note: Each SDP started to contribute data at different time periods.

Table 1.3.2 Distribution of PCI procedures performed by Source Data Providers (SDPs), NCVD-PCI Registry, 2013–2016

No.	Source data provider	2013 – 2014 Total no. of procedures = 15,514	2015 Total no. of patients = 13,048	2016 Total no. of patients = 13,921	2015 – 2016 Total no. of patients = 26,969
		No. (%)	No. (%)	No. (%)	No. (%)
1	Pusat Perubatan Universiti Malaya, Kuala Lumpur	1,045 (6.7)	1,243 (9.5)	1,338 (9.6)	2,581 (9.6)
2	Institut Jantung Negara, Kuala Lumpur	6,055 (39.0)	4,584 (35.1)	4,986 (35.8)	9,570 (35.5)
3	Hospital Pulau Pinang, Pulau Pinang	1,030 (6.6)	559 (4.3)	556 (4.0)	1,115 (4.1)
4	Pusat Jantung Sarawak, Sarawak	1,463 (9.4)	843 (6.5)	1,219 (8.8)	2,062 (7.6)
5	Hospital Sultanah Aminah, Johor	947 (6.1)	708 (5.4)	592 (4.3)	1,300 (4.8)
6	Hospital Sultanah Bahiyah, Kedah	995 (6.4)	537 (4.1)	639 (4.6)	1,176 (4.4)
7	Hospital Serdang, Selangor	728 (4.7)	1,466 (11.2)	1,467 (10.5)	2,933 (10.9)
8	Pusat Perubatan Universiti Kebangsaan Malaysia, Kuala Lumpur		42 (0.3)	89 (0.6)	131 (0.5)
9	Hospital Sultanah Nur Zahirah, Terengganu	296 (1.9)	231 (1.8)	315 (2.3)	546 (2.0)
10	Hospital Tengku Ampuan Afzan, Pahang	495 (3.2)	244 (1.9)	398 (2.9)	642 (2.4)
11	Pusat Perubatan Subang Jaya, Selangor	212 (1.4)	292 (2.2)	46 (0.3)	338 (1.3)
12	Hospital Queen Elizabeth 2, Sabah	1,168 (7.5)	945 (7.2)	654 (4.7)	1,599 (5.9)
13	Hospital Pantai Ipoh, Perak	91 (0.6)	36 (0.3)	33 (0.2)	69 (0.3)
14	Hospital Raja Permaisuri Bainun, Perak	648 (4.2)	734 (5.6)	810 (5.8)	1,544 (5.7)
15	Hospital Raja Perempuan Zainab II, Kelantan	18 (0.1)	180 (1.4)	256 (1.8)	436 (1.6)
16	UiTM Sg Buloh, Selangor	323 (2.1)	396 (3.0)	509 (3.7)	905 (3.4)
17	Oriental Melaka Straits Medical Centre, Melaka		8 (0.1)	12 (0.1)	20 (0.1)
18	KPJ Tawakkal Specialist Hospital, Kuala Lumpur		0 (0.0)	2 (0.0)	2 (0.0)
	Total	**15,514**	**13,048**	**13,921**	**26,969**

Note: Each SDP started to contribute data at different time periods.

Table 1.4.1 Age-gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Age group	2013 – 2014		2015		2016		2015 – 2016	
	Total no. of patients = 14,136		Total no. of patients = 9,428		Total no. of patients = 10,066		Total no. of patients = 19,494	
	Male	Female	Male	Female	Male	Female	Male	Female
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
20 – <30	58 (0.5)	4 (0.2)	47 (0.6)	6 (0.4)	47 (0.6)	3 (0.2)	94 (0.6)	9 (0.3)
30 – <40	645 (5.5)	24 (1.0)	429 (5.5)	27 (1.7)	472 (5.6)	40 (2.4)	901 (5.6)	67 (2.1)
40 – <50	2,177 (18.4)	223 (9.6)	1,443 (18.4)	164 (10.3)	1,605 (19.1)	167 (10.0)	3,048 (18.8)	331 (10.1)
50 – <60	4,471 (37.8)	700 (30.2)	2,905 (37.1)	467 (29.2)	3,066 (36.5)	494 (29.7)	5,971 (36.8)	961 (29.4)
60 – <70	3,188 (27.0)	848 (36.6)	2,181 (27.9)	578 (36.1)	2,395 (28.5)	653 (39.2)	4,576 (28.2)	1,231 (37.7)
70 – <80	1,162 (9.8)	461 (19.9)	748 (9.6)	319 (19.9)	741 (8.8)	265 (15.9)	1,489 (9.2)	584 (17.9)
≥80	117 (1.0)	58 (2.5)	75 (1.0)	39 (2.4)	76 (0.9)	42 (2.5)	151 (0.9)	81 (2.5)
Total	**11,818 (100.0)**	**2,318 (100.0)**	**7,828 (100.0)**	**1,600 (100.0)**	**8,402 (100.0)**	**1,664 (100.0)**	**16,230 (100.0)**	**3,264 (100.0)**

Table 1.4.2 Age-gender distribution of patients who underwent PCI, by ethnic group, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015				2016			
		Total no. of patients = 9,428				Total no. of patients = 10,066			
		Malay	Chinese	Indian	*Others	Malay	Chinese	Indian	*Others
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	28 (0.7)	3 (0.2)	9 (0.6)	7 (1.1)	32 (0.7)	1 (0.1)	7 (0.5)	7 (1.0)
	30 – <40	229 (5.8)	59 (3.5)	84 (5.3)	57 (8.6)	282 (6.3)	57 (3.3)	80 (5.2)	53 (7.8)
	40 – <50	761 (19.4)	240 (14.4)	302 (19.1)	140 (21.2)	918 (20.5)	232 (13.6)	290 (18.8)	165 (24.4)
	50 – <60	1,546 (39.4)	506 (30.4)	607 (38.4)	246 (37.3)	1,687 (37.7)	549 (32.1)	592 (38.3)	238 (35.2)
	60 – <70	1,010 (25.8)	584 (35.0)	450 (28.5)	137 (20.8)	1,214 (27.2)	581 (34.0)	451 (29.2)	149 (22.0)
	70 – <80	320 (8.2)	249 (14.9)	116 (7.3)	63 (9.5)	320 (7.2)	257 (15.0)	104 (6.7)	60 (8.9)
	≥80	26 (0.7)	26 (1.6)	13 (0.8)	10 (1.5)	18 (0.4)	33 (1.9)	20 (1.3)	5 (0.7)
	Total	**3,920 (100.0)**	**1,667 (100.0)**	**1,581 (100.0)**	**660 (100.0)**	**4,471 (100.0)**	**1,710 (100.0)**	**1,544 (100.0)**	**677 (100.0)**
Female	20 – <30	5 (0.7)	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.3)	1 (0.2)	0 (0.0)
	30 – <40	18 (2.6)	2 (0.6)	4 (0.9)	3 (2.9)	20 (2.6)	7 (1.8)	10 (2.4)	3 (2.8)
	40 – <50	88 (12.5)	16 (4.5)	46 (10.6)	14 (13.5)	89 (11.7)	19 (5.0)	46 (11.1)	13 (12.3)
	50 – <60	220 (31.2)	80 (22.4)	140 (32.3)	27 (26.0)	249 (32.6)	81 (21.3)	129 (31.2)	35 (33.0)
	60 – <70	244 (34.6)	138 (38.7)	167 (38.5)	29 (27.9)	313 (41.0)	148 (38.8)	158 (38.2)	34 (32.1)
	70 – <80	124 (17.6)	102 (28.6)	68 (15.7)	25 (24.0)	84 (11.0)	104 (27.3)	58 (14.0)	19 (17.9)
	≥80	6 (0.9)	18 (5.0)	9 (2.1)	6 (5.8)	7 (0.9)	21 (5.5)	12 (2.9)	2 (1.9)
	Total	**705 (100.0)**	**357 (100.0)**	**434 (100.0)**	**104 (100.0)**	**763 (100.0)**	**381 (100.0)**	**414 (100.0)**	**106 (100.0)**

**Others include Orang Asli, Kadazan, Melanau, Murut, Bajau, Bidayuh, Iban, Punjabi, other Malaysian and Foreigner.*

Gender	Age group	2013 – 2014				2015 – 2016			
		Total no. of patients = 14,136				Total no. of patients = 19,494			
		Malay	Chinese	Indian	*Others	Malay	Chinese	Indian	*Others
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	33 (0.6)	4 (0.2)	17 (0.8)	4 (0.4)	60 (0.7)	4 (0.1)	16 (0.5)	14 (1.0)
	30 – <40	373 (6.2)	82 (3.3)	102 (4.6)	88 (7.9)	511 (6.1)	116 (3.4)	164 (5.2)	110 (8.2)
	40 – <50	1,129 (18.8)	389 (15.5)	399 (18.2)	260 (23.3)	1,679 (20.0)	472 (14.0)	592 (18.9)	305 (22.8)
	50 – <60	2,350 (39.2)	828 (33.0)	870 (39.6)	423 (37.9)	3,233 (38.5)	1,055 (31.2)	1,199 (38.4)	484 (36.2)
	60 – <70	1,562 (26.0)	801 (31.9)	590 (26.9)	235 (21.1)	2,224 (26.5)	1,165 (34.5)	901 (28.8)	286 (21.4)
	70 – <80	503 (8.4)	370 (14.8)	195 (8.9)	94 (8.4)	640 (7.6)	506 (15.0)	220 (7.0)	123 (9.2)
	≥80	48 (0.8)	34 (1.4)	24 (1.1)	11 (1.0)	44 (0.5)	59 (1.7)	33 (1.1)	15 (1.1)
	Total	**5,998 (100.0)**	**2,508 (100.0)**	**2,197 (100.0)**	**1,115 (100.0)**	**8,391 (100.0)**	**3,377 (100.0)**	**3,125 (100.0)**	**1,337 (100.0)**
Female	20 – <30	3 (0.3)	1 (0.2)	0 (0.0)	0 (0.0)	6 (0.4)	2 (0.3)	1 (0.1)	0 (0.0)
	30 – <40	14 (1.4)	3 (0.5)	5 (0.9)	2 (1.0)	38 (2.6)	9 (1.2)	14 (1.7)	6 (2.9)
	40 – <50	110 (10.8)	24 (4.2)	63 (11.7)	26 (13.5)	177 (12.1)	35 (4.7)	92 (10.8)	27 (12.9)
	50 – <60	348 (34.1)	122 (21.5)	171 (31.8)	59 (30.6)	469 (31.9)	161 (21.8)	269 (31.7)	62 (29.5)
	60 – <70	365 (35.8)	218 (38.4)	195 (36.3)	70 (36.3)	557 (37.9)	286 (38.8)	325 (38.3)	63 (30.0)
	70 – <80	170 (16.7)	170 (29.9)	88 (16.4)	33 (17.1)	208 (14.2)	206 (27.9)	126 (14.9)	44 (21.0)
	≥80	10 (1.0)	30 (5.3)	15 (2.8)	3 (1.6)	13 (0.9)	39 (5.3)	21 (2.5)	8 (3.8)
	Total	**1,020 (100.0)**	**568 (100.0)**	**537 (100.0)**	**193 (100.0)**	**1,468 (100.0)**	**738 (100.0)**	**848 (100.0)**	**210 (100.0)**

**Others include Orang Asli, Kadazan, Melanau, Murut, Bajau, Bidayuh, Iban, Punjabi, other Malaysian and Foreigner.*

Table 1.4.3 Age-gender distribution of patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015			2016		
		Total no. of patients = 9,428			Total no. of patients = 10,066		
		Pre-morbid diabetes			Pre-morbid diabetes		
		Diabetic	Non-diabetic	Not known	Diabetic	Non-diabetic	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	7 (0.2)	35 (0.8)	5 (1.3)	2 (0.1)	40 (0.9)	5 (1.1)
	30 – <40	109 (3.4)	295 (7.0)	25 (6.4)	135 (3.8)	297 (6.7)	40 (8.6)
	40 – <50	497 (15.3)	865 (20.6)	81 (20.9)	574 (16.2)	931 (21.1)	100 (21.6)
	50 – <60	1,283 (39.5)	1,478 (35.3)	144 (37.1)	1,355 (38.3)	1,538 (34.9)	173 (37.3)
	60 – <70	1,010 (31.1)	1,073 (25.6)	98 (25.3)	1,124 (31.8)	1,162 (26.4)	109 (23.5)
	70 – <80	316 (9.7)	400 (9.5)	32 (8.2)	314 (8.9)	394 (9.0)	33 (7.1)
	≥80	27 (0.8)	45 (1.1)	3 (0.8)	32 (0.9)	40 (0.9)	4 (0.9)
	Total	**3,249 (100.0)**	**4,191 (100.0)**	**388 (100.0)**	**3,536 (100.0)**	**4,402 (100.0)**	**464 (100.0)**
Female	20 – <30	0 (0.0)	6 (1.1)	0 (0.0)	1 (0.1)	2 (0.3)	0 (0.0)
	30 – <40	19 (1.9)	7 (1.3)	1 (1.8)	22 (2.2)	14 (2.3)	4 (7.5)
	40 – <50	113 (11.1)	46 (8.7)	5 (9.1)	103 (10.2)	55 (9.1)	9 (17.0)
	50 – <60	326 (32.0)	124 (23.5)	17 (30.9)	308 (30.6)	173 (28.6)	13 (24.5)
	60 – <70	357 (35.1)	204 (38.7)	17 (30.9)	407 (40.5)	230 (38.0)	16 (30.2)
	70 – <80	184 (18.1)	124 (23.5)	11 (20.0)	146 (14.5)	108 (17.9)	11 (20.8)
	≥80	19 (1.9)	16 (3.0)	4 (7.3)	19 (1.9)	23 (3.8)	0 (0.0)
	Total	**1,018 (100.0)**	**527 (100.0)**	**55 (100.0)**	**1,006 (100.0)**	**605 (100.0)**	**53 (100.0)**

Gender	Age group	2013 – 2014			2015 – 2016		
		Total no. of patients = 14,136			Total no. of patients = 19,494		
		Pre-morbid diabetes			Pre-morbid diabetes		
		Diabetic	Non-diabetic	Not known	Diabetic	Non-diabetic	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	11 (0.2)	40 (0.6)	7 (0.8)	9 (0.1)	75 (0.9)	10 (1.2)
	30 – <40	161 (3.4)	420 (6.7)	64 (7.6)	244 (3.6)	592 (6.9)	65 (7.6)
	40 – <50	716 (15.1)	1,285 (20.6)	176 (20.9)	1,071 (15.8)	1,796 (20.9)	181 (21.2)
	50 – <60	1,858 (39.1)	2,301 (37.0)	312 (37.0)	2,638 (38.9)	3,016 (35.1)	317 (37.2)
	60 – <70	1,454 (30.6)	1,523 (24.5)	211 (25.0)	2,134 (31.5)	2,235 (26.0)	207 (24.3)
	70 – <80	504 (10.6)	591 (9.5)	67 (7.9)	630 (9.3)	794 (9.2)	65 (7.6)
	≥80	47 (1.0)	63 (1.0)	7 (0.8)	59 (0.9)	85 (1.0)	7 (0.8)
	Total	**4,751 (100.0)**	**6,223 (100.0)**	**844 (100.0)**	**6,785 (100.0)**	**8,593 (100.0)**	**852 (100.0)**
Female	20 – <30	1 (0.1)	3 (0.4)	0 (0.0)	1 (0.0)	8 (0.7)	0 (0.0)
	30 – <40	14 (1.0)	7 (0.8)	3 (2.9)	41 (2.0)	21 (1.9)	5 (4.6)
	40 – <50	125 (9.1)	87 (10.4)	11 (10.5)	216 (10.7)	101 (8.9)	14 (13.0)
	50 – <60	444 (32.2)	227 (27.2)	29 (27.6)	634 (31.3)	297 (26.2)	30 (27.8)
	60 – <70	522 (37.9)	289 (34.6)	37 (35.2)	764 (37.7)	434 (38.3)	33 (30.6)
	70 – <80	243 (17.6)	199 (23.8)	19 (18.1)	330 (16.3)	232 (20.5)	22 (20.4)
	≥80	28 (2.0)	24 (2.9)	6 (5.7)	38 (1.9)	39 (3.4)	4 (3.7)
	Total	**1,377 (100.0)**	**836 (100.0)**	**105 (100.0)**	**2,024 (100.0)**	**1,132 (100.0)**	**108 (100.0)**

Table 1.4.4 Age-gender distribution of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015			2016		
		Total no. of patients = 9,428			Total no. of patients = 10,066		
		Pre-morbid hypertension			Pre-morbid hypertension		
		Hypertensive	Non-hypertensive	Not known	Hypertensive	Non-hypertensive	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	12 (0.2)	30 (1.3)	5 (1.5)	10 (0.2)	33 (1.3)	4 (1.0)
	30 – <40	178 (3.5)	222 (9.4)	29 (8.5)	193 (3.5)	240 (9.7)	39 (9.6)
	40 – <50	805 (15.7)	567 (24.1)	71 (20.8)	916 (16.6)	590 (23.8)	99 (24.4)
	50 – <60	1,911 (37.2)	862 (36.6)	132 (38.7)	2,038 (36.9)	883 (35.7)	145 (35.8)
	60 – <70	1,604 (31.2)	499 (21.2)	78 (22.9)	1,740 (31.5)	563 (22.7)	92 (22.7)
	70 – <80	568 (11.1)	156 (6.6)	24 (7.0)	566 (10.2)	153 (6.2)	22 (5.4)
	≥80	57 (1.1)	16 (0.7)	2 (0.6)	59 (1.1)	13 (0.5)	4 (1.0)
	Total	**5,135 (100.0)**	**2,352 (100.0)**	**341 (100.0)**	**5,522 (100.0)**	**2,475 (100.0)**	**405 (100.0)**
Female	20 – <30	3 (0.2)	3 (1.0)	0 (0.0)	2 (0.1)	1 (0.4)	0 (0.0)
	30 – <40	19 (1.5)	7 (2.4)	1 (2.1)	22 (1.6)	15 (5.7)	3 (7.3)
	40 – <50	117 (9.3)	41 (13.9)	6 (12.5)	129 (9.5)	31 (11.9)	7 (17.1)
	50 – <60	361 (28.7)	90 (30.5)	16 (33.3)	384 (28.2)	101 (38.7)	9 (22.0)
	60 – <70	449 (35.7)	112 (38.0)	17 (35.4)	556 (40.8)	82 (31.4)	15 (36.6)
	70 – <80	277 (22.0)	37 (12.5)	5 (10.4)	233 (17.1)	25 (9.6)	7 (17.1)
	≥80	31 (2.5)	5 (1.7)	3 (6.3)	36 (2.6)	6 (2.3)	0 (0.0)
	Total	**1,257 (100.0)**	**295 (100.0)**	**48 (100.0)**	**1,362 (100.0)**	**261 (100.0)**	**41 (100.0)**

Gender	Age group	2013 – 2014			2015 – 2016		
		Total no. of patients = 14,136			Total no. of patients = 19,494		
		Pre-morbid hypertension			Pre-morbid hypertension		
		Hypertensive	Non-hypertensive	Not known	Hypertensive	Non-hypertensive	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	14 (0.2)	35 (1.0)	9 (1.3)	22 (0.2)	63 (1.3)	9 (1.2)
	30 – <40	248 (3.3)	337 (9.5)	60 (8.4)	371 (3.5)	462 (9.6)	68 (9.1)
	40 – <50	1,124 (14.8)	881 (25.0)	172 (24.2)	1,721 (16.1)	1,157 (24.0)	170 (22.8)
	50 – <60	2,934 (38.7)	1,280 (36.3)	257 (36.1)	3,949 (37.1)	1,745 (36.2)	277 (37.1)
	60 – <70	2,279 (30.1)	749 (21.2)	160 (22.5)	3,344 (31.4)	1,062 (22.0)	170 (22.8)
	70 – <80	898 (11.9)	214 (6.1)	50 (7.0)	1,134 (10.6)	309 (6.4)	46 (6.2)
	≥80	81 (1.1)	33 (0.9)	3 (0.4)	116 (1.1)	29 (0.6)	6 (0.8)
	Total	**7,578 (100.0)**	**3,529 (100.0)**	**711 (100.0)**	**10,657 (100.0)**	**4,827 (100.0)**	**746 (100.0)**
Female	20 – <30	1 (0.1)	3 (0.8)	0 (0.0)	5 (0.2)	4 (0.7)	0 (0.0)
	30 – <40	18 (1.0)	3 (0.8)	3 (3.4)	41 (1.6)	22 (4.0)	4 (4.5)
	40 – <50	146 (7.9)	65 (17.5)	12 (13.6)	246 (9.4)	72 (12.9)	13 (14.6)
	50 – <60	534 (28.7)	144 (38.8)	22 (25.0)	745 (28.4)	191 (34.4)	25 (28.1)
	60 – <70	712 (38.3)	105 (28.3)	31 (35.2)	1,005 (38.4)	194 (34.9)	32 (36.0)
	70 – <80	401 (21.6)	44 (11.9)	16 (18.2)	510 (19.5)	62 (11.2)	12 (13.5)
	≥80	47 (2.5)	7 (1.9)	4 (4.5)	67 (2.6)	11 (2.0)	3 (3.4)
	Total	**1,859 (100.0)**	**371 (100.0)**	**88 (100.0)**	**2,619 (100.0)**	**556 (100.0)**	**89 (100.0)**

Table 1.4.5 Age-gender distribution of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2013 – 2016

Gender	Age group	2015			2016		
		Total no. of patients = 9,428			Total no. of patients = 10,066		
		Pre-morbid dyslipidaemia			Pre-morbid dyslipidaemia		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	15 (0.3)	25 (0.9)	7 (1.1)	11 (0.3)	30 (0.9)	6 (0.9)
	30 – <40	189 (4.3)	198 (7.0)	42 (6.4)	197 (4.6)	214 (6.3)	61 (8.8)
	40 – <50	711 (16.3)	595 (21.2)	137 (21.0)	744 (17.3)	691 (20.2)	170 (24.5)
	50 – <60	1,626 (37.2)	1,015 (36.1)	264 (40.4)	1,593 (37.1)	1,235 (36.1)	238 (34.3)
	60 – <70	1,323 (30.3)	701 (25.0)	157 (24.0)	1,310 (30.5)	923 (27.0)	162 (23.4)
	70 – <80	459 (10.5)	247 (8.8)	42 (6.4)	396 (9.2)	297 (8.7)	48 (6.9)
	≥80	43 (1.0)	28 (1.0)	4 (0.6)	41 (1.0)	27 (0.8)	8 (1.2)
	Total	**4,366 (100.0)**	**2,809 (100.0)**	**653 (100.0)**	**4,292 (100.0)**	**3,417 (100.0)**	**693 (100.0)**
Female	20 – <30	3 (0.3)	3 (0.6)	0 (0.0)	3 (0.3)	0 (0.0)	0 (0.0)
	30 – <40	15 (1.5)	8 (1.7)	4 (3.6)	15 (1.5)	22 (3.8)	3 (3.5)
	40 – <50	86 (8.4)	62 (13.4)	16 (14.3)	89 (8.9)	62 (10.7)	16 (18.8)
	50 – <60	293 (28.6)	137 (29.5)	37 (33.0)	286 (28.6)	188 (32.5)	20 (23.5)
	60 – <70	378 (36.9)	164 (35.3)	36 (32.1)	418 (41.8)	202 (34.9)	33 (38.8)
	70 – <80	218 (21.3)	84 (18.1)	17 (15.2)	161 (16.1)	93 (16.1)	11 (12.9)
	≥80	31 (3.0)	6 (1.3)	2 (1.8)	28 (2.8)	12 (2.1)	2 (2.4)
	Total	**1,024 (100.0)**	**464 (100.0)**	**112 (100.0)**	**1,000 (100.0)**	**579 (100.0)**	**85 (100.0)**

Gender	Age group	2013 – 2014			2015 – 2016		
		Total no. of patients = 14,136			Total no. of patients = 19,494		
		Pre-morbid dyslipidaemia			Pre-morbid dyslipidaemia		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	26 (0.4)	19 (0.5)	13 (1.1)	26 (0.3)	55 (0.9)	13 (1.0)
	30 – <40	317 (4.6)	245 (6.5)	83 (7.3)	386 (4.5)	412 (6.6)	103 (7.7)
	40 – <50	1,150 (16.6)	782 (20.8)	245 (21.4)	1,455 (16.8)	1,286 (20.7)	307 (22.8)
	50 – <60	2,653 (38.4)	1,402 (37.3)	416 (36.4)	3,219 (37.2)	2,250 (36.1)	502 (37.3)
	60 – <70	1,988 (28.7)	924 (24.6)	276 (24.1)	2,633 (30.4)	1,624 (26.1)	319 (23.7)
	70 – <80	708 (10.2)	350 (9.3)	104 (9.1)	855 (9.9)	544 (8.7)	90 (6.7)
	≥80	73 (1.1)	38 (1.0)	6 (0.5)	84 (1.0)	55 (0.9)	12 (0.9)
	Total	**6,915 (100.0)**	**3,760 (100.0)**	**1,143 (100.0)**	**8,658 (100.0)**	**6,226 (100.0)**	**1,346 (100.0)**
Female	20 – <30	0 (0.0)	4 (0.6)	0 (0.0)	6 (0.3)	3 (0.3)	0 (0.0)
	30 – <40	14 (0.9)	7 (1.1)	3 (1.7)	30 (1.5)	30 (2.9)	7 (3.6)
	40 – <50	126 (8.5)	79 (11.9)	18 (9.9)	175 (8.6)	124 (11.9)	32 (16.2)
	50 – <60	470 (31.9)	182 (27.5)	48 (26.5)	579 (28.6)	325 (31.2)	57 (28.9)
	60 – <70	535 (36.3)	243 (36.7)	70 (38.7)	796 (39.3)	366 (35.1)	69 (35.0)
	70 – <80	295 (20.0)	131 (19.8)	35 (19.3)	379 (18.7)	177 (17.0)	28 (14.2)
	≥80	35 (2.4)	16 (2.4)	7 (3.9)	59 (2.9)	18 (1.7)	4 (2.0)
	Total	**1,475 (100.0)**	**662 (100.0)**	**181 (100.0)**	**2,024 (100.0)**	**1,043 (100.0)**	**197 (100.0)**

Table 1.4.6 Age-gender distribution of patients who underwent PCI, by family history of premature cardiovascular disease, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015			2016		
		Total no. of patients = 9,428			Total no. of patients = 10,066		
		Family history of premature cardiovascular disease			Family history of premature cardiovascular disease		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	11 (1.0)	23 (0.4)	13 (0.9)	9 (0.7)	31 (0.5)	7 (0.6)
	30 – <40	80 (7.6)	282 (5.3)	67 (4.8)	112 (8.7)	289 (4.9)	71 (5.9)
	40 – <50	255 (24.1)	926 (17.3)	262 (18.6)	307 (23.9)	1,065 (18.0)	233 (19.3)
	50 – <60	382 (36.2)	1,985 (37.0)	538 (38.3)	464 (36.1)	2,163 (36.6)	439 (36.4)
	60 – <70	253 (24.0)	1,537 (28.6)	391 (27.8)	308 (24.0)	1,746 (29.5)	341 (28.3)
	70 – <80	67 (6.3)	554 (10.3)	127 (9.0)	78 (6.1)	555 (9.4)	108 (8.9)
	≥80	8 (0.8)	59 (1.1)	8 (0.6)	7 (0.5)	61 (1.0)	8 (0.7)
	Total	**1,056 (100.0)**	**5,366 (100.0)**	**1,406 (100.0)**	**1,285 (100.0)**	**5,910 (100.0)**	**1,207 (100.0)**
Female	20 – <30	3 (1.4)	2 (0.2)	1 (0.3)	2 (0.8)	1 (0.1)	0 (0.0)
	30 – <40	6 (2.9)	13 (1.2)	8 (2.7)	6 (2.5)	31 (2.6)	3 (1.3)
	40 – <50	33 (15.7)	101 (9.2)	30 (10.3)	34 (14.4)	102 (8.6)	31 (12.9)
	50 – <60	63 (30.0)	306 (27.9)	98 (33.6)	78 (33.1)	345 (29.0)	71 (29.6)
	60 – <70	65 (31.0)	413 (37.6)	100 (34.2)	84 (35.6)	471 (39.6)	98 (40.8)
	70 – <80	35 (16.7)	236 (21.5)	48 (16.4)	29 (12.3)	200 (16.8)	36 (15.0)
	≥80	5 (2.4)	27 (2.5)	7 (2.4)	3 (1.3)	38 (3.2)	1 (0.4)
	Total	**210 (100.0)**	**1,098 (100.0)**	**292 (100.0)**	**236 (100.0)**	**1,188 (100.0)**	**240 (100.0)**

Gender	Age group	2013 – 2014			2015 – 2016		
		Total no. of patients = 14,136			Total no. of patients = 19,494		
		Family history of premature cardiovascular disease			Family history of premature cardiovascular disease		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	12 (1.0)	36 (0.4)	10 (0.4)	20 (0.9)	54 (0.5)	20 (0.8)
	30 – <40	103 (8.2)	414 (5.1)	128 (5.3)	192 (8.2)	571 (5.1)	138 (5.3)
	40 – <50	290 (23.1)	1,402 (17.2)	485 (20.0)	562 (24.0)	1,991 (17.7)	495 (18.9)
	50 – <60	521 (41.4)	3,022 (37.1)	928 (38.3)	846 (36.1)	4,148 (36.8)	977 (37.4)
	60 – <70	255 (20.3)	2,312 (28.4)	621 (25.6)	561 (24.0)	3,283 (29.1)	732 (28.0)
	70 – <80	71 (5.6)	865 (10.6)	226 (9.3)	145 (6.2)	1,109 (9.8)	235 (9.0)
	≥80	6 (0.5)	87 (1.1)	24 (1.0)	15 (0.6)	120 (1.1)	16 (0.6)
	Total	**1,258 (100.0)**	**8,138 (100.0)**	**2,422 (100.0)**	**2,341 (100.0)**	**11,276 (100.0)**	**2,613 (100.0)**
Female	20 – <30	1 (0.4)	2 (0.1)	1 (0.2)	5 (1.1)	3 (0.1)	1 (0.2)
	30 – <40	3 (1.3)	13 (0.8)	8 (1.8)	12 (2.7)	44 (1.9)	11 (2.1)
	40 – <50	35 (14.8)	149 (9.1)	39 (8.8)	67 (15.0)	203 (8.9)	61 (11.5)
	50 – <60	83 (35.2)	479 (29.2)	138 (31.1)	141 (31.6)	651 (28.5)	169 (31.8)
	60 – <70	73 (30.9)	600 (36.6)	175 (39.4)	149 (33.4)	884 (38.7)	198 (37.2)
	70 – <80	38 (16.1)	348 (21.2)	75 (16.9)	64 (14.3)	436 (19.1)	84 (15.8)
	≥80	3 (1.3)	47 (2.9)	8 (1.8)	8 (1.8)	65 (2.8)	8 (1.5)
	Total	**236 (100.0)**	**1,638 (100.0)**	**444 (100.0)**	**446 (100.0)**	**2,286 (100.0)**	**532 (100.0)**

Table 1.4.7 Age-gender distribution of patients who underwent PCI, by smoking status, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015				2016			
		Total no. of patients = 9,428				Total no. of patients = 10,066			
		Never	Former	Current	Not available	Never	Former	Current	Not available
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	6 (0.3)	11 (0.5)	28 (1.2)	2 (0.2)	5 (0.2)	7 (0.3)	28 (1.0)	7 (0.6)
	30 – <40	71 (3.4)	71 (3.4)	247 (10.2)	40 (3.1)	69 (3.0)	105 (4.7)	259 (9.6)	39 (3.4)
	40 – <50	255 (12.4)	360 (17.4)	649 (26.7)	179 (14.0)	289 (12.5)	396 (17.8)	753 (27.8)	167 (14.4)
	50 – <60	736 (35.7)	756 (36.6)	951 (39.2)	462 (36.2)	822 (35.6)	780 (35.1)	1,032 (38.1)	432 (37.2)
	60 – <70	701 (34.0)	610 (29.5)	456 (18.8)	414 (32.4)	801 (34.6)	692 (31.2)	512 (18.9)	390 (33.6)
	70 – <80	267 (13.0)	235 (11.4)	87 (3.6)	159 (12.5)	290 (12.5)	222 (10.0)	116 (4.3)	113 (9.7)
	≥80	23 (1.1)	22 (1.1)	9 (0.4)	21 (1.6)	36 (1.6)	18 (0.8)	8 (0.3)	14 (1.2)
	Total	**2,059 (100.0)**	**2,065 (100.0)**	**2,427 (100.0)**	**1,277 (100.0)**	**2,312 (100.0)**	**2,220 (100.0)**	**2,708 (100.0)**	**1,162 (100.0)**
Female	20 – <30	4 (0.3)	0 (0.0)	1 (2.3)	1 (0.5)	3 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
	30 – <40	22 (1.7)	0 (0.0)	2 (4.5)	3 (1.4)	29 (2.0)	3 (5.8)	4 (8.7)	4 (2.8)
	40 – <50	134 (10.3)	2 (5.0)	8 (18.2)	20 (9.3)	141 (9.9)	4 (7.7)	9 (19.6)	13 (9.2)
	50 – <60	378 (29.0)	11 (27.5)	17 (38.6)	61 (28.5)	425 (29.8)	20 (38.5)	17 (37.0)	32 (22.5)
	60 – <70	471 (36.2)	16 (40.0)	9 (20.5)	82 (38.3)	566 (39.7)	14 (26.9)	11 (23.9)	62 (43.7)
	70 – <80	260 (20.0)	10 (25.0)	7 (15.9)	42 (19.6)	221 (15.5)	11 (21.2)	4 (8.7)	29 (20.4)
	≥80	33 (2.5)	1 (2.5)	0 (0.0)	5 (2.3)	39 (2.7)	0 (0.0)	1 (2.2)	2 (1.4)
	Total	**1,302 (100.0)**	**40 (100.0)**	**44 (100.0)**	**214 (100.0)**	**1,424 (100.0)**	**52 (100.0)**	**46 (100.0)**	**142 (100.0)**

Gender	Age group	2013 – 2014				2015 – 2016			
		Total no. of patients = 14,136				Total no. of patients = 19,494			
		Never	Former	Current	Not Available	Never	Former	Current	Not Available
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	4 (0.1)	9 (0.3)	41 (1.1)	4 (0.2)	11 (0.3)	18 (0.4)	56 (1.1)	9 (0.4)
	30 – <40	79 (2.6)	131 (4.3)	380 (9.8)	55 (2.9)	140 (3.2)	176 (4.1)	506 (9.9)	79 (3.2)
	40 – <50	409 (13.5)	539 (17.8)	985 (25.3)	244 (12.9)	544 (12.4)	756 (17.6)	1,402 (27.3)	346 (14.2)
	50 – <60	1,106 (36.6)	1,178 (39.0)	1,520 (39.1)	667 (35.4)	1,558 (35.6)	1,536 (35.8)	1,983 (38.6)	894 (36.7)
	60 – <70	989 (32.7)	835 (27.6)	749 (19.2)	615 (32.6)	1,502 (34.4)	1,302 (30.4)	968 (18.9)	804 (33.0)
	70 – <80	381 (12.6)	300 (9.9)	206 (5.3)	275 (14.6)	557 (12.7)	457 (10.7)	203 (4.0)	272 (11.2)
	≥80	52 (1.7)	30 (1.0)	10 (0.3)	25 (1.3)	59 (1.3)	40 (0.9)	17 (0.3)	35 (1.4)
	Total	**3,020 (100.0)**	**3,022 (100.0)**	**3,891 (100.0)**	**1,885 (100.0)**	**4,371 (100.0)**	**4,285 (100.0)**	**5,135 (100.0)**	**2,439 (100.0)**
Female	20 – <30	4 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	7 (0.3)	0 (0.0)	1 (1.1)	1 (0.3)
	30 – <40	15 (0.8)	2 (3.5)	2 (3.9)	5 (1.2)	51 (1.9)	3 (3.3)	6 (6.7)	7 (2.0)
	40 – <50	169 (9.4)	9 (15.8)	9 (17.6)	36 (8.9)	275 (10.1)	6 (6.5)	17 (18.9)	33 (9.3)
	50 – <60	543 (30.1)	16 (28.1)	15 (29.4)	126 (31.0)	803 (29.5)	31 (33.7)	34 (37.8)	93 (26.1)
	60 – <70	676 (37.5)	17 (29.8)	19 (37.3)	136 (33.5)	1,037 (38.0)	30 (32.6)	20 (22.2)	144 (40.4)
	70 – <80	358 (19.8)	12 (21.1)	4 (7.8)	87 (21.4)	481 (17.6)	21 (22.8)	11 (12.2)	71 (19.9)
	≥80	39 (2.2)	1 (1.8)	2 (3.9)	16 (3.9)	72 (2.6)	1 (1.1)	1 (1.1)	7 (2.0)
	Total	**1,804 (100.0)**	**57 (100.0)**	**51 (100.0)**	**406 (100.0)**	**2,726 (100.0)**	**92 (100.0)**	**90 (100.0)**	**356 (100.0)**

Table 1.4.8 Age-gender distribution of patients who underwent PCI, by new onset of angina, NCVD-PCI Registry, 2013–2016

Gender	Age group	2015			2016		
		Total no. of patients = 9,428			Total no. of patients = 10,066		
		New onset of angina			New onset of angina		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	19 (0.6)	27 (0.6)	1 (0.3)	23 (0.6)	22 (0.5)	2 (0.8)
	30 – <40	188 (5.9)	222 (5.2)	19 (4.9)	231 (6.5)	226 (4.9)	15 (6.0)
	40 – <50	588 (18.5)	782 (18.3)	73 (19.0)	684 (19.3)	870 (18.9)	51 (20.2)
	50 – <60	1,179 (37.1)	1,565 (36.7)	161 (41.9)	1,278 (36.0)	1,688 (36.7)	100 (39.7)
	60 – <70	863 (27.2)	1,218 (28.5)	100 (26.0)	977 (27.6)	1,353 (29.4)	65 (25.8)
	70 – <80	310 (9.8)	412 (9.7)	26 (6.8)	316 (8.9)	409 (8.9)	16 (6.3)
	≥80	30 (0.9)	41 (1.0)	4 (1.0)	37 (1.0)	36 (0.8)	3 (1.2)
	Total	**3,177 (100.0)**	**4,267 (100.0)**	**384 (100.0)**	**3,546 (100.0)**	**4,604 (100.0)**	**252 (100.0)**
Female	20 – <30	3 (0.5)	3 (0.3)	0 (0.0)	0 (0.0)	3 (0.3)	0 (0.0)
	30 – <40	15 (2.3)	11 (1.2)	1 (1.4)	20 (3.0)	17 (1.8)	3 (5.6)
	40 – <50	73 (11.4)	82 (9.2)	9 (12.9)	74 (11.1)	91 (9.7)	2 (3.7)
	50 – <60	180 (28.0)	267 (30.1)	20 (28.6)	203 (30.3)	273 (29.0)	18 (33.3)
	60 – <70	218 (33.9)	335 (37.8)	25 (35.7)	242 (36.2)	388 (41.2)	23 (42.6)
	70 – <80	138 (21.5)	169 (19.1)	12 (17.1)	115 (17.2)	142 (15.1)	8 (14.8)
	≥80	16 (2.5)	20 (2.3)	3 (4.3)	15 (2.2)	27 (2.9)	0 (0.0)
	Total	**643 (100.0)**	**887 (100.0)**	**70 (100.0)**	**669 (100.0)**	**941 (100.0)**	**54 (100.0)**

Gender	Age group	2013 – 2014			2015 – 2016		
		Total no. of patients = 14,136			Total no. of patients = 19,494		
		New onset of angina			New onset of angina		
		Yes	No	Not known	Yes	No	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Male	20 – <30	25 (0.7)	30 (0.4)	3 (0.4)	42 (0.6)	49 (0.6)	3 (0.5)
	30 – <40	235 (6.9)	373 (4.8)	37 (5.5)	419 (6.2)	448 (5.1)	34 (5.3)
	40 – <50	659 (19.3)	1,383 (17.9)	135 (20.2)	1,272 (18.9)	1,652 (18.6)	124 (19.5)
	50 – <60	1,260 (36.9)	2,950 (38.1)	261 (39.0)	2,457 (36.5)	3,253 (36.7)	261 (41.0)
	60 – <70	888 (26.0)	2,139 (27.6)	161 (24.1)	1,840 (27.4)	2,571 (29.0)	165 (25.9)
	70 – <80	311 (9.1)	786 (10.2)	65 (9.7)	626 (9.3)	821 (9.3)	42 (6.6)
	≥80	34 (1.0)	76 (1.0)	7 (1.0)	67 (1.0)	77 (0.9)	7 (1.1)
	Total	**3,412 (100.0)**	**7,737 (100.0)**	**669 (100.0)**	**6,723 (100.0)**	**8,871 (100.0)**	**636 (100.0)**
Female	20 – <30	1 (0.2)	3 (0.2)	0 (0.0)	3 (0.2)	6 (0.3)	0 (0.0)
	30 – <40	6 (0.9)	13 (0.8)	5 (3.5)	35 (2.7)	28 (1.5)	4 (3.2)
	40 – <50	72 (11.3)	144 (9.4)	7 (4.9)	147 (11.2)	173 (9.5)	11 (8.9)
	50 – <60	191 (29.9)	466 (30.3)	43 (30.1)	383 (29.2)	540 (29.5)	38 (30.6)
	60 – <70	214 (33.5)	577 (37.5)	57 (39.9)	460 (35.1)	723 (39.6)	48 (38.7)
	70 – <80	135 (21.2)	302 (19.6)	24 (16.8)	253 (19.3)	311 (17.0)	20 (16.1)
	≥80	19 (3.0)	32 (2.1)	7 (4.9)	31 (2.4)	47 (2.6)	3 (2.4)
	Total	**638 (100.0)**	**1,537 (100.0)**	**143 (100.0)**	**1,312 (100.0)**	**1,828 (100.0)**	**124 (100.0)**

Table 1.5.1 Presence of cumulative risk factors, NCVD-PCI Registry, 2013–2016

Presence of cumulative risk factors*	2013 – 2014 Total no. of patients = 14,136	2015 Total no. of patients = 9,428	2016 Total no. of patients = 10,066	2015 – 2016 Total no. of patients = 19,494
	No. (%)	No. (%)	No. (%)	No. (%)
None	402 (2.8)	358 (3.8)	295 (2.9)	653 (3.3)
1 risk factor	1,667 (11.8)	1,097 (11.6)	1,156 (11.5)	2,253 (11.6)
2 risk factors	3,103 (22.0)	2,012 (21.3)	2,176 (21.6)	4,188 (21.5)
3 risk factors	4,149 (29.4)	2,673 (28.4)	2,914 (28.9)	5,587 (28.7)
>3 risk factors	4,815 (34.1)	3,288 (34.9)	3,525 (35.0)	6,813 (34.9)

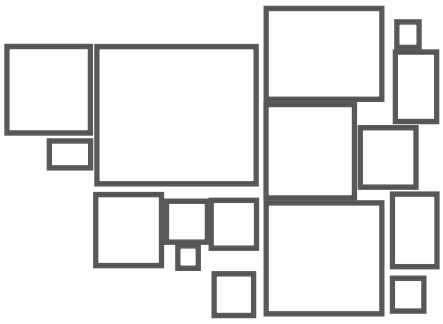
**Risk factors are defined as presence of 1) dyslipidaemia, 2) hypertension, 3) diabetes, 4) family history of premature cardiovascular disease, 5) smoking [current smokers & former smokers (quit more than 30days)] and 6) obesity (BMI ≥23.0).*

Table 1.5.2 Presence of cumulative risk factors by gender, NCVD-PCI Registry, 2013–2016

Gender	Presence of cumulative risk factors*	2013 – 2014 Total no. of patients = 14,136	2015 Total no. of patients = 9,428	2016 Total no. of patients = 10,066	2015 – 2016 Total no. of patients = 19,494
		No. (%)	No. (%)	No. (%)	No. (%)
Male	None	324 (2.7)	284 (3.6)	249 (2.9)	530 (3.3)
	1 risk factor	1,425 (12.1)	939 (12.0)	981 (11.7)	1,920 (11.8)
	2 risk factors	2,531(21.4)	1,668 (21.3)	1,803 (21.5)	3,471 (21.4)
	3 risk factors	3,370 (28.5)	2,133(27.2)	2,346 (27.9)	4,479 (27.6)
	>3 risk factors	4,168 (35.3)	2,804 (35.8)	3,026 (36.0)	5,830 (35.9)
	Total	**11,818**	**7,828**	**8,402**	**16,230**
Female	None	78 (3.4)	74 (4.6)	49 (2.9)	123 (3.8)
	1 risk factor	242 (10.4)	158 (9.9)	175 (10.5)	333 (10.2)
	2 risk factors	572 (24.7)	344 (21.5)	373 (22.4)	717 (22.0)
	3 risk factors	779 (33.6)	540 (33.8)	568 (34.1)	1,108 (33.9)
	>3 risk factors	647 (27.9)	484 (30.3)	499 (30.0)	983 (30.1)
	Total	**2,318**	**1,600**	**1,664**	**3,264**

**Risk factors are defined as presence of 1) dyslipidaemia, 2) hypertension, 3) diabetes, 4) family history of premature cardiovascular disease, 5) smoking [included current smokers & former smokers (quit more than 30days)] and 6) obesity (BMI ≥23.0).*

CLINICAL PRESENTATIONS & INVESTIGATIONS



CLINICAL PRESENTATIONS & INVESTIGATIONS

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Summary

1. Majority of patients (90.3%) had a low thrombolysis in myocardial infarction (TIMI) risk index.
2. 1.2% of patients undergoing PCI had concomitant atrial fibrillation.
3. The percentage of procedures among patients with New York Heart Association (NYHA) classes III and IV had decreased from 15.2% for the year 2013–2014 to 9.0% in 2015–2016.
4. Thirty-nine percent of PCIs were performed in patients with ACS of which 58.4%, 26.5% and 15.0% were performed in ST-elevation myocardial infarction (STEMI), non ST-elevation myocardial infarction (NSTEMI) and unstable angina (UA) respectively. Anterior STEMI (56.6%) remains the predominant presentation in the STEMI cohort.
5. The percentage of STEMI patients with Killip III and IV undergoing PCI had decreased from 19.7% to 14.8% between the 2013–2014 cohort and 2015–2016 cohort; this could be due to the increased number of NSTEMI PCI of 24.0% vs 26.5% respectively.
6. There was an improvement in transfer time (TT) for STEMI PCI for the 2015–2016 cohort compared to the 2013–2014 cohort.

This chapter discusses the clinical presentation and relevant investigations performed at the time of PCI for patients enrolled in the registry between 2015–2016. Overall, there was an increment of 38.8% total number of procedures performed in 2015–2016 (21,538 procedures) compared to 2013–2014 (15,514 procedures).

Clinical status at the time of PCI

Heart rate and blood pressure were recorded prior to the start of each procedure. The TIMI risk index (TRI) was calculated for each patient and categorised into low, intermediate, and high (<30, 30–70 and >70) risk, respectively. This index is predictive of 30-day and long-term mortality. For elective patients, assessment of functional ischaemia by either treadmill test or myocardial perfusion scan were noted. Time to treatment was documented and analysed.

The mean heart rate at presentation were 75.1 beats/min (SD 16.7 beats/min) with only 16.4% having a heart rate of ≥90 beats/min. This was similar to the 2013–2014 cohort. The mean systolic blood pressure was 138.3 mmHg (SD 26.2 mmHg) and mean diastolic pressure was 77.5 mmHg (SD 14.0 mmHg). The mean TIMI risk index was 19.1. Ninety-point three percent of this cohort had a TRI <30, almost similar to the 2013–2014 cohort (89.3%). [Table 2.1]

Majority of patients (83.0%) were in sinus rhythm. Only 1.2% were in atrial fibrillation, higher than reported in other Malaysian cardiovascular registry (REDISCOVER), which was 0.54%, but lower than the 6.2–7.9% seen in the GRACE registry and 5.3% in the KAMIR registry.[1-2, 7] [Table 2.1] With the increase of the PCI rate in atrial fibrillation, the choice of antiplatelet and anticoagulation would be an important consideration. With recent publication of PIONEER-AF (2016) and RE-DUAL PCI (2017), non-vitamin K anticoagulation (NOAC) agents are reasonable alternative to be used in combination with clopidogrel post-PCI compared to warfarin to reduce patients' bleeding risk.[3-5]

Majority of patients had a GFR ≥60 mls/min/1.73m^2 (78.1%) with only 5.5% having GFR of <30 mls/min/1.73m^2, almost similar to the 2013–2014 cohort (76.9%). Mean HbA1c was 7.4 % (similar for both cohorts).

There were fewer patients in NYHA classes III and IV who received coronary revascularisation (9.0%) compared to the 2013–2014 cohort (15.2%) and the NCDR 2014 report (13.9%).[6] This could be explained by the increase in awareness, improvement of MYSTEMI network system of referral, as well as the improvement in heart failure treatment and device therapy. In addition, more patients received early revascularisation from early referral by other health care providers. [Table 2.1]

Majority of patients were in Canadian Cardiovascular Score (CCS) class I (35.0%) and class II (28.8%) with only 11.6% in classes III and IV. Of note, was the number of asymptomatic patients who underwent PCI which increased from 18.3% (2013–2014) to 24.6% (2015–2016). This also could be due to the increase in the number of functional ischaemic testing. Even though data for ischaemic testing prior to elective PCI were available for only 6.2% of patients, almost 90% of them had a positive functional ischaemic test. [Table 2.1]

The percentage of PCIs performed for patients who presented with acute coronary syndrome (ACS) increased by 4.2% from 34.9% in 2013–2014 to 39.1% in the 2015–2016 cohort. [Table 2.1] This is in contrast to the KAMIR registry, in which the PCI rates in acute MI were 96.7% for STEMI and 82.9% for NSTEMI.[7] Of the ACS subtypes in the 2015–2016 cohort, STEMI (58.4%) PCI predominates followed by NSTEMI (26.5%) and unstable angina (15.0%), compared to the 2013–2014 cohort: STEMI (58.3%), NSTEMI (24.0%) and unstable angina (17.7%). Of all the STEMI patients, 56.6% were anterior STEMIs and this was comparable with other registries. [Table 2.1]

The percentage of STEMI patients in Killip classes III and IV decreased from 19.9% to 14.8% between the 2013–2014 and 2015–2016 cohorts and was comparable to the Korean acute MI registry (KAMIR) which was 12.9%.[7] This could be due to earlier intervention when patient is presented with NSTEMI. The decrease of percentage of STEMI patients in Killip classes III and IV also explains the decrease in the use of intra-aortic balloon pump (IABP) from 1.7% to 1.0%, respectively. [Table 2.1]

STEMI: Time to treatment analysis

The symptom-to-door time was shorter for patients presenting at the PCI capable centre compared to transferred patients (162 minutes vs 204 minutes). When we compare the data for STEMI PCI between the 2013–2014 and 2015–2016 cohorts, the median symptom-to-door time were similar (215 minutes vs 204 minutes) when presenting to a non-PCI capable centre, and 168 minutes vs 162 minutes when presenting to a PCI capable centre, respectively. [Table 2.2.1 & Table 2.2.2] As this could be due to the lack of public awareness, there is room for more health promotional exercises.

However, door-to-balloon (DTB) time when presenting to a non-PCI capable centre had improved (120 minutes vs 109 minutes) and were similar to the DTB time when presenting to a PCI capable centre (at 81.5 minutes vs 80 minutes). [Table 2.2.1 & Table 2.2.2] The shorter DTB time for patients from non-PCI capable centre could be attributed to diagnosis being already made at the referring hospital and patients being sent as soon as possible to the ICL upon arrival.

Transfer time had also improved from 95.0 minutes to 73.0 minutes respectively. This improvement could largely be attributed to the MYSTEMI network in the Klang Valley and the ACS referral network summits that were carried out by the various Ministry of Health heart centres in Johor, Penang, Ipoh, Kuching, Kota Kinabalu and Kuantan. With improvements in the critical care pathway, DTB time and TT had been shortened. This is very encouraging, although there is still room for improvement.

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Table 2.1 Patient clinical status at the time of PCI procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Clinical examination				
Heart rate at presentation, beats/minute				
N	13,617	9,106	10,210	19,316
Mean (SD)	74.8 (17.9)	75.4 (17.2)	74.7 (16.2)	75.1 (16.7)
Median (Min – Max)	72.0 (25.0 – 194.0)	73.0 (30.0 – 200.0)	72.0 (26.0 – 199.0)	73.0 (26.0 – 200.0)
Missing	1,897 (12.2)	1,291 (12.4)	931 (8.4)	2,222 (10.3)
Heart rate at presentation, beats/minute, No. (%)				
<90	11,434 (84.0)	7,560 (83.0)	8,588 (84.1)	16,148 (83.6)
≥90	2,183 (16.0)	1,546 (17.0)	1,622 (15.9)	3,168 (16.4)
Missing	1,897	1,291	931	2,222
Systolic blood pressure, mmHg				
N	13,402	8,922	9,898	18,820
Mean (SD)	136.7 (25.9)	138.1 (26.3)	138.5 (26.0)	138.3 (26.2)
Median (Min – Max)	135.0 (60.0 – 230.0)	137.0 (60.0 – 230.0)	137.0 (62.0 – 228.0)	137.0 (60.0 – 230.0)
Missing, No. (%)	2,112 (13.6)	1,475 (14.2)	1,243 (11.2)	2,718 (12.6)
Systolic blood pressure, mmHg, No. (%)				
<90	289 (2.2)	158 (1.8)	141 (1.4)	299 (1.6)
≥90	13,113 (97.8)	8,764 (98.2)	9,757 (98.6)	18,521 (98.4)
Missing	2,112	1,475	1,243	2,718
Diastolic blood pressure, mmHg				
N	13,378	8,906	9,876	18,782
Mean (SD)	76.5 (13.6)	77.6 (14.2)	77.3 (13.8)	77.5 (14.0)
Median (Min – Max)	77.0 (10.0 – 120.0)	78.0 (10.0 – 120.0)	77.0 (11.0 – 120.0)	78.0 (10.0 – 120.0)
Missing, No. (%)	2,136 (13.8)	1,491 (14.3)	1,265 (11.4)	2,756 (12.8)
TIMI risk index (TRI)				
N	13,223	8,827	9,843	18,670
Mean (SD)	19.4 (9.3)	19.3 (9.2)	18.9 (8.7)	19.1 (9.0)
Median (Min – Max)	17.5 (2.7 – 142.7)	17.8 (2.3 – 141.8)	17.4 (2.0 – 115.8)	17.6 (2.0 – 141.8)
Missing, No. (%)	2,291 (14.8)	1,570 (15.1)	1,298 (11.7)	2,868 (13.3)
TRI classification, No. (%)				
Low <30	11,802 (89.3)	7,904 (89.5)	8,954 (91.0)	16,858 (90.3)
Intermediate 30–70	1,391 (10.5)	902 (10.2)	875 (8.9)	1,777 (9.5)
High >70	30 (0.2)	21 (0.2)	14 (0.1)	35 (0.2)
Missing	2,291	1,570	1,298	2,868

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Baseline ECG, No. (%)				
Sinus rhythm	13,088 (84.4)	8,572 (82.4)	9,307 (83.5)	17,879 (83.0)
Atrial fibrillation	176 (1.1)	144 (1.4)	110 (1.0)	254 (1.2)
2nd/3rd AVB	43 (0.3)	27 (0.3)	32 (0.3)	59 (0.3)
LBBB	59 (0.4)	26 (0.3)	26 (0.2)	52 (0.2)
RBBB	39 (0.3)	28 (0.3)	25 (0.2)	53 (0.2)
HbA1c, %				
N	2,876	3,986	4,140	8,126
Mean (SD)	7.4 (2.5)	7.3 (2.1)	7.2 (2.0)	7.3 (2.0)
Median (Min – Max)	6.7 (4.0 – 32.0)	6.6 (4.0 – 18.2)	6.5 (4.1 – 29.6)	6.6 (4.0 – 29.6)
Not available, No. (%)	7,344 (47.3)	4,260 (41.0)	4,887 (43.9)	9,147 (42.5)
Missing, No. (%)	5,294 (34.1)	2,151 (20.7)	2,114 (19.0)	4,265 (19.8)
NYHA, No. (%)				
Total no. of procedures among patients with history heart failure	**N = 653**	**N = 409**	**N = 508**	**N = 917**
NYHA I	307 (50.2)	193 (48.1)	242 (48.7)	435 (48.4)
NYHA II	212 (34.6)	173 (43.1)	209 (42.1)	382 (42.5)
NYHA III	59 (9.6)	23 (5.7)	30 (6.0)	53 (5.9)
NYHA IV	34 (5.6)	12 (3.0)	16 (3.2)	28 (3.1)
Not available	31	5	8	13
Missing	10	3	3	6
Functional ischaemia, No. (%)				
Positive	1,165 (83.0)	562 (88.5)	635 (91.4)	1,197 (90.0)
Negative	95 (6.8)	20 (3.1)	18 (2.6)	38 (2.9)
Equivocal	143 (10.2)	53 (8.3)	42 (6.0)	95 (7.1)
Not applicable	6,481	2,971	2,941	5,912
Missing	7,630	6,791	7,505	14,296
Canadian Cardiovascular Score (CCS), No. (%)				
CCS 1	5,129 (39.5)	2,955 (33.5)	3,461 (36.4)	6,416 (35.0)
CCS 2	3,756 (28.9)	2,778 (31.5)	2,494 (26.2)	5,272 (28.8)
CCS 3	726 (5.6)	688 (7.8)	565 (5.9)	1,253 (6.8)
CCS 4	1,001 (7.7)	424 (4.8)	464 (4.9)	888 (4.8)
Asymptomatic	2,381 (18.3)	1,985 (22.5)	2,518 (26.5)	4,503 (24.6)
Not available	1,136	446	376	822
Missing	1,385	1,121	1,263	2,384
*Intra-aortic balloon pump (IABP), No. (%)				
Yes	251 (1.7)	130 (1.3)	89 (0.8)	219 (1.0)
No	14,919 (98.3)	10,172 (98.7)	11,021 (99.2)	21,193 (99.0)
Not applicable	344	95	31	126

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Acute coronary syndrome, No. (%)				
Yes	5,418 (34.9)	4,168 (40.1)	4,258 (38.2)	8,426 (39.1)
No	10,096 (65.1)	6,229 (59.9)	6,883 (61.8)	13,112 (60.9)
ACS type, No. (%)				
Total no. of procedures among patients with ACS	**N = 5,418**	**N = 4,168**	**N = 4,258**	**N = 8,426**
STEMI	3,115 (58.3)	2,351 (56.9)	2,537 (60.0)	4,888 (58.4)
NSTEMI	1,279 (24.0)	1,064 (25.7)	1,155 (27.3)	2,219 (26.5)
UA	946 (17.7)	719 (17.4)	538 (12.7)	1,257 (15.0)
Not available	78	34	28	62
STEMI, No. (%)				
Total no. of procedures among patients with ACS-STEMI	**N = 3,115**	**N = 2,351**	**N = 2,537**	**N = 4,888**
Anterior	1,749 (60.0)	1,297 (56.0)	1,423 (57.2)	2,720 (56.6)
Non-anterior	1,166 (40.0)	1,021 (44.0)	1,066 (42.8)	2,087 (43.4)
Not available	150	32	48	80
Missing	50	1	0	1
Ejection fraction (EF) status				
N	5,470	3,987	4,336	8,323
Mean (SD)	50.8 (12.6)	50.4 (12.8)	49.7 (12.5)	50.0 (12.6)
Median (Min – Max)	52.0 (10.0 – 80.0)	50.0 (10.0 – 80.0)	50.0 (10.0 – 80.0)	50.0 (10.0 – 80.0)
Not available, No. (%)	8,188 (52.8)	4,951 (47.6)	5,152 (46.2)	10,103 (46.9)
Missing, No. (%)	1,856 (12.0)	1,459 (14.0)	1,653 (14.8)	3,112 (14.4)
Ejection fraction (EF) status, No. (%)				
<30	279 (5.1)	220 (5.5)	245 (5.7)	465 (5.6)
30 – <45	1,320 (24.1)	956 (24.0)	1,140 (26.3)	2,096 (25.2)
45 – <55	1,379 (25.2)	1,130 (28.3)	1,239 (28.6)	2,369 (28.5)
≥55	2,492 (45.6)	1,681 (42.2)	1,712 (39.5)	3,393 (40.8)
Not available	8,188	4,951	5,152	10,103
Missing	1,856	1,459	1,653	3,112
Killip class, No. (%)				
Total no. of procedures among patients with PCI-STEMI	**N = 2,654**	**N = 1,986**	**N = 2,107**	**N = 4,093**
I	1,579 (66.6)	1,405 (74.3)	1,583 (78.1)	2,988 (76.3)
II	322 (13.6)	183 (9.7)	165 (8.1)	348 (8.9)
III	76 (3.2)	36 (1.9)	40 (2.0)	76 (1.9)
IV	395 (16.7)	266 (14.1)	239 (11.8)	505 (12.9)
Not applicable/Not available	207	86	54	140
Missing	75	10	26	36

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
^STEMI: Time-to-treatment analysis				
Total no. of procedures among patients with primary PCI	**N = 884**	**N = 793**	**N = 845**	**N = 1,638**
Symptom-to-door time, minutes				
N	517	509	590	1,099
Mean (SD)	278.0 (249.3)	275.8 (237.2)	250.2 (216.4)	262.0 (226.5)
Median (Min – Max)	200.0 (10.0 – 1440.0)	196.0 (10.0 – 1375.0)	190.0 (10.0 – 1350.0)	194.0 (10.0 – 1375.0)
Not available, No. (%)	115 (13.0)	118 (14.9)	101 (12.0)	219 (13.4)
Missing, No. (%)	252 (28.5)	166 (20.9)	154 (18.2)	320 (19.5)
Door-to-balloon time, minutes				
N	441	465	558	1,023
Mean (SD)	146.4 (133.5)	140.1 (117.4)	131.7 (103.2)	135.5 (109.9)
Median (Min – Max)	100.0 (15.0 – 705.0)	104.0 (10.0 – 720.0)	98.5 (14.0 – 679.0)	101.0 (10.0 – 720.0)
Not available, No. (%)	74 (8.4)	54 (6.8)	61 (7.2)	115 (7.0)
Missing, No. (%)	369 (41.7)	274 (34.6)	226 (26.7)	500 (30.5)
Door-to-balloon time, minutes, No. (%)				
<90	180 (40.8)	205 (44.1)	233 (41.8)	438 (42.8)
≥90	261 (59.2)	260 (55.9)	325 (58.2)	585 (57.2)
Not available, No.	74	54	61	115
Missing, No.	369	274	226	500
Transfer time				
N	155	255	312	567
Mean (SD)	177.0 (181.9)	125.3 (131.7)	103.9 (114.5)	113.5 (122.9)
Median (Min – Max)	95.0 (10.0 – 720.0)	78.0 (10.0 – 705.0)	65.0 (10.0 – 715.0)	73.0 (10.0 – 715.0)
Not available, No. (%)	261 (29.5)	250 (31.5)	238 (28.2)	488 (29.8)
Missing, No. (%)	468 (52.9)	288 (36.3)	295 (34.9)	583 (35.6)
Glomerular filtration rate (GFR), MDRD, No. (%)				
<15	419 (3.2)	306 (3.4)	391 (4.0)	697 (3.7)
15 – <30	279 (2.1)	167 (1.9)	178 (1.8)	345 (1.8)
30 – <45	681 (5.2)	433 (4.9)	479 (4.9)	912 (4.9)
45– <60	1,674 (12.7)	1,063 (11.9)	1,098 (11.1)	2,161 (11.5)
≥60	10,141 (76.9)	6,931 (77.9)	7,720 (78.2)	14,651 (78.1)
Missing	2,320	1,497	1,275	2,772

**IABP was listed in separate sections in the previous and new CRFs. In the old CRF, it was reported in Section 6 (Cath lab visit) and in the new CRF, it was reported in Section 7 (PCI procedure details).*

^New acceptable range has been used for the analysis.

Table 2.2.1 Time to treatment for STEMI, with transfer, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Total no. of procedures with primary PCI (with transfer)	**N = 630**	**N = 563**	**N = 627**	**N = 1,190**
Symptom-to-door time (minutes)				
N	364	351	453	804
Mean (SD)	300.8 (263.5)	271.8 (218.3)	255.1 (204.2)	262.4 (210.5)
Median (Min – Max)	215.0 (10.0 – 1440.0)	210.0 (10.0 – 1345.0)	203.0 (20.0 – 1350.0)	204.0 (10.0 – 1350.0)
Not available, No. (%)	34 (5.4)	51 (9.1)	30 (4.8)	81 (6.8)
Missing, No. (%)	232 (36.8)	161 (28.6)	144 (23.0)	305 (25.6)
Door-to-balloon time (minutes)				
N	279	306	413	719
Mean (SD)	173.5 (152.3)	161.4 (127.4)	133.8 (103.5)	145.5 (115.0)
Median (Min – Max)	120.0 (20.0 – 705.0)	120.0 (26.0 – 720.0)	103.0 (17.0 – 679.0)	109.0 (17.0 – 720.0)
Not available, No. (%)	1 (0.2)	2 (0.4)	4 (0.6)	6 (0.5)
Missing, No. (%)	350 (55.6)	255 (45.3)	210 (33.5)	465 (39.1)
Transfer-to-PCI centre time, (minutes)				
N	155	255	312	567
Mean (SD)	177.0 (181.9)	125.3 (131.7)	103.9 (114.5)	113.5 (122.9)
Median (Min – Max)	95.0 (10.0 – 720.0)	78.0 (10.0 – 705.0)	65.0 (10.0 – 715.0)	73.0 (10.0 – 715.0)
Not available, No. (%)	7 (1.1)	20 (3.6)	20 (3.2)	40 (3.4)
Missing, No. (%)	468 (74.3)	288 (51.2)	295 (47.0)	583 (49.0)
Symptom-to-balloon time (minutes)				
N	399	363	456	819
Mean (SD)	380.3 (269.1)	328.6 (218.2)	318.6 (210.5)	323.0 (213.9)
Median (Min – Max)	286.0 (20.0 – 1440.0)	271.0 (53.0 – 1375.0)	264.0 (47.0 – 1403.0)	269.0 (47.0 – 1403.0)
Not available, No. (%)	42 (6.7)	41 (7.3)	20 (3.2)	61 (5.1)
Missing, No. (%)	189 (30.0)	159 (28.2)	151 (24.1)	310 (26.1)

Table 2.2.2 Time to treatment for STEMI, without transfer, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Total no. of procedures with primary PCI (without transfer)	**N = 254**	**N = 230**	**N = 218**	**N = 448**
Symptom-to-door time (minutes)				
N	153	158	137	295
Mean (SD)	223.7 (202.5)	284.6 (275.1)	233.7 (252.9)	261.0 (265.8)
Median (Min – Max)	168.0 (10.0 – 1311.0)	180.0 (15.0 – 1375.0)	148.0 (10.0 – 1224.0)	162.0 (10.0 – 1375.0)
Not available, No. (%)	81 (31.9)	67 (29.1)	71 (32.6)	138 (30.8)
Missing, No. (%)	20 (7.9)	5 (2.2)	10 (4.6)	15 (3.3)
Door-to-balloon time (minutes)				
N	162	159	145	304
Mean (SD)	99.6 (72.1)	99.0 (81.0)	125.7 (102.5)	111.7 (92.7)
Median (Min – Max)	81.5 (15.0 – 578.0)	73.0 (10.0 – 508.0)	92.0 (14.0 – 639.0)	80.0 (10.0 – 639.0)
Not available, No. (%)	73 (28.7)	52 (22.6)	57 (26.1)	109 (24.3)
Missing, No. (%)	19 (7.5)	19 (8.3)	16 (7.3)	35 (7.8)
Symptom-to-balloon time (minutes)				
N	159	149	142	291
Mean (SD)	303.6 (216.4)	381.1 (277.2)	333.4 (258.9)	357.8 (269.1)
Median (Min – Max)	249.0 (11.0 – 1362.0)	280.0 (26.0 – 1350.0)	247.0 (16.0 – 1400.0)	257.0 (16.0 – 1400.0)
Not available, No. (%)	83 (32.7)	75 (32.6)	69 (31.7)	144 (32.1)
Missing, No. (%)	12 (4.7)	6 (2.6)	7 (3.2)	13 (2.9)

Table 2.3 Comparison of heart rate according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Heart rate (beats/minute)	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	<60	1,822 (18.2)	150 (12.1)	198 (8.5)
	60 – 80	5,879 (58.6)	677 (54.5)	924 (39.4)
	>80 – 100	1,947 (19.4)	326 (26.2)	794 (33.9)
	>100	384 (3.8)	89 (7.2)	427 (18.2)
	Missing	1,456	130	311
	Total	**11,488**	**1,372**	**2,654**
2015	<60	1,027 (16.0)	117 (11.7)	161 (9.4)
	60 – 80	3,761 (58.7)	537 (53.8)	699 (41.0)
	>80 – 100	1,355 (21.2)	277 (27.7)	537 (31.5)
	>100	259 (4.0)	68 (6.8)	308 (18.1)
	Missing	873	137	281
	Total	**7,275**	**1,136**	**1,986**
2016	<60	1,168 (16.0)	141 (13.5)	167 (8.9)
	60 – 80	4,260 (58.5)	578 (55.2)	811 (43.1)
	>80 – 100	1,572 (21.6)	267 (25.5)	621 (33.0)
	>100	280 (3.8)	61 (5.8)	284 (15.1)
	Missing	585	122	224
	Total	**7,865**	**1,169**	**2,107**
2015-2016	<60	2,195 (16.0)	258 (12.6)	328 (9.1)
	60 – 80	8,021 (58.6)	1,115 (54.5)	1,510 (42.1)
	>80 – 100	2,927 (21.4)	544 (26.6)	1,158 (32.3)
	>100	539 (3.9)	129 (6.3)	592 (16.5)
	Missing	1,458	259	505
	Total	**15,140**	**2,305**	**4,093**

Table 2.4 Comparison of heart rate according to ACS subtypes, NCVD-PCI Registry, 2013–2016

Year	Heart rate (beats/min)	STEMI	NSTEMI	UA	Not available
		No (%)	No (%)	No (%)	No (%)
2013-3014	<60	267 (9.7)	145 (12.6)	131 (15.8)	9 (13.8)
	60-80	1,155 (42.1)	647 (56.2)	471 (56.9)	33 (50.8)
	>80-100	877 (32.0)	283 (24.6)	195 (23.6)	19 (29.2)
	>100	444 (16.2)	77 (6.7)	31 (3.7)	4 (6.2)
	Missing	372	127	118	13
	Total	**3,115**	**1,279**	**946**	**78**
2015	<60	219 (10.8)	111 (11.7)	90 (14.0)	3 (12.0)
	60-80	918 (45.1)	534 (56.3)	381 (59.2)	11 (44.0)
	>80-100	586 (28.8)	250 (26.3)	148 (23.0)	9 (36.0)
	>100	311 (15.3)	54 (5.7)	25 (3.9)	2 (8.0)
	Missing	317	115	75	9
	Total	**2,351**	**1,064**	**719**	**34**
2016	<60	225 (9.9)	144 (13.8)	62 (13.2)	5 (23.8)
	60-80	1,058 (46.6)	598 (57.3)	274 (58.2)	12 (57.1)
	>80-100	692 (30.5)	246 (23.6)	119 (25.3)	4 (19.0)
	>100	294 (13.0)	55 (5.3)	16 (3.4)	0 (0.0)
	Missing	268	112	67	7
	Total	**2,537**	**1,155**	**538**	**28**
2015-2016	<60	444 (10.3)	255 (12.8)	152 (13.6)	8 (17.4)
	60-80	1,976 (45.9)	1,132 (56.8)	655 (58.7)	23 (50.0)
	>80-100	1,278 (29.7)	496 (24.9)	267 (23.9)	13 (28.3)
	>100	605 (14.1)	109 (5.5)	41 (3.7)	2 (4.3)
	Missing	585	227	142	16
	Total	**4,888**	**2,219**	**1,257**	**62**

Table 2.5 Comparison of systolic blood pressure according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Systolic BP (mmHg)	Elective	NSTEMI	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	<90	88 (0.9)	31 (2.5)	170 (7.4)
	≥90	9,775 (99.1)	1,200 (97.5)	2,138 (92.6)
	Missing	1,625	141	346
	Total	**11,488**	**1,372**	**2,654**
2015	<90	52 (0.8)	14 (1.5)	92 (5.5)
	≥90	6,233 (99.2)	948 (98.5)	1,583 (94.5)
	Missing	990	174	311
	Total	**7,275**	**1,136**	**1,986**
2016	<90	50 (0.7)	18 (1.8)	73 (4.0)
	≥90	7,004 (99.3)	1,007 (98.2)	1,746 (96.0)
	Missing	811	144	288
	Total	**7,865**	**1,169**	**2,107**
2015-2016	<90	102 (0.8)	32 (1.6)	165 (4.7)
	≥90	13,237 (99.2)	1,955 (98.4)	3,329 (95.3)
	Missing	1,801	318	599
	Total	**15,140**	**2,305**	**4,093**

Table 2.6 Comparison of arterial blood pressure according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Arterial blood pressure, mmHg	Elective	NSTEMI	STEMI
2013-3014	**N**	**9,829**	**1,228**	**2,294**
	Mean (SD)	97.8 (14.6)	95.3 (15.5)	91.9 (17.6)
	Median (Min – Max)	97.0 (36.0 – 152.7)	95.2 (35.7 – 150.0)	91.7 (33.3 – 150.0)
	Missing, No. (%)	1,659 (14.4)	144 (10.5)	360 (13.6)
2015	**N**	**6,274**	**958**	**1,663**
	Mean (SD)	99.0 (15.1)	97.4 (16.2)	93.4 (17.3)
	Median (Min – Max)	98.3 (34.7 – 153.3)	96.7 (44.7 – 143.3)	92.3 (42.3 – 151.3)
	Missing, No. (%)	1,001 (13.8)	178 (15.7)	323 (16.3)
2016	**N**	**7,025**	**1,019**	**1,806**
	Mean (SD)	98.5 (14.8)	97.2 (16.0)	94.7 (17.1)
	Median (Min – Max)	98.0 (40.0 – 154.3)	97.3 (48.3 – 147.0)	93.8 (47.0 – 154.3)
	Missing, No. (%)	840 (10.7)	150 (12.8)	301 (14.3)
2015-2016	**N**	**13,299**	**1,977**	**3,469**
	Mean (SD)	98.7 (14.9)	97.3 (16.1)	94.1 (17.2)
	Median (Min – Max)	98.3 (34.7 – 154.3)	97.0 (44.7 – 147.0)	93.3 (42.3 – 154.3)
	Missing, No. (%)	1,841 (12.2)	328 (14.2)	624 (15.2)

Table 2.7 Comparison of TIMI risk index according to PCI status, NCVD-PCI Registry, 2013–2016

Year	TIMI Risk Index	Elective	NSTEMI	STEMI
		No. (%)	**No. (%)**	**No. (%)**
2013-3014	Low (<30)	8,948 (91.9)	1,027 (84.7)	1,827 (80.2)
	Intermediate (30 – 70)	783 (8.0)	178 (14.7)	430 (18.9)
	High (>70)	3 (0.0)	7 (0.6)	20 (0.9)
	Missing	1,754	160	377
	Total	**11,488**	**1,372**	**2,654**
2015	Low (<30)	5,732 (92.2)	810 (84.5)	1,362 (82.5)
	Intermediate (30 – 70)	476 (7.7)	148 (15.4)	278 (16.8)
	High (>70)	10 (0.2)	1 (0.1)	10 (0.6)
	Missing	1,057	177	336
	Total	**7,275**	**1,136**	**1,986**
2016	Low (<30)	6,536 (93.0)	893 (87.6)	1,525 (84.9)
	Intermediate (30 – 70)	488 (6.9)	124 (12.2)	263 (14.6)
	High (>70)	3 (0.0)	2 (0.2)	9 (0.5)
	Missing	838	150	310
	Total	**7,865**	**1,169**	**2,107**
2015-2016	Low (<30)	12,268 (92.6)	1,703 (86.1)	2,887 (83.8)
	Intermediate (30 – 70)	964 (7.3)	272 (13.8)	541 (15.7)
	High (>70)	13 (0.1)	3 (0.2)	19 (0.6)
	Missing	1,895	327	646
	Total	**15,140**	**2,305**	**4,093**

Table 2.8 Comparison of ejection fraction according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Ejection fraction (EF)	Elective	NSTEMI	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	<30	221 (5.0)	26 (5.7)	32 (5.4)
	30 – <45	964 (21.8)	115 (25.3)	241 (40.6)
	45 – <55	1,058 (23.9)	112 (24.6)	209 (35.2)
	≥55	2,178 (49.3)	202 (44.4)	112 (18.9)
	Not available	5,669	763	1,756
	Missing	1,398	154	304
	Total	**11,488**	**1,372**	**2,654**
2015	<30	166 (5.3)	26 (7.2)	28 (5.6)
	30 – <45	674 (21.5)	83 (23.1)	199 (39.9)
	45 – <55	852 (27.2)	99 (27.6)	179 (35.9)
	≥55	1,437 (45.9)	151 (42.1)	93 (18.6)
	Not available	3,194	593	1,164
	Missing	952	184	323
	Total	**7,275**	**1,136**	**1,986**
2016	<30	196 (5.7)	17 (4.7)	32 (5.7)
	30 – <45	832 (24.4)	92 (25.5)	216 (38.6)
	45 – <55	928 (27.2)	104 (28.8)	207 (37.0)
	≥55	1,460 (42.7)	148 (41.0)	104 (18.6)
	Not available	3,419	604	1,129
	Missing	1,030	204	419
	Total	**7,865**	**1,169**	**2,107**
2015-2016	<30	362 (5.5)	43 (6.0)	60 (5.7)
	30 – <45	1,506 (23.0)	175 (24.3)	415 (39.2)
	45 – <55	1,780 (27.2)	203 (28.2)	386 (36.5)
	≥55	2,897 (44.3)	299 (41.5)	197 (18.6)
	Not available	6,613	1,197	2,293
	Missing	1,982	388	742
	Total	**15,140**	**2,305**	**4,093**

Table 2.9 Comparison of NYHA according to PCI status among patients with heart failure, NCVD-PCI Registry, 2013–2016

Year	Ejection fraction (EF)	Elective	NSTEMI	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	NYHA I	259 (54.4)	28 (34.6)	20 (36.4)
	NYHA II	173 (36.3)	31 (38.3)	8 (14.5)
	NYHA III	38 (8.0)	14 (17.3)	7 (12.7)
	NYHA IV	6 (1.3)	8 (9.9)	20 (36.4)
	Not available	24	1	6
	Missing	6	1	3
	Total	**506**	**83**	**64**
2015	NYHA I	146 (49.8)	26 (37.7)	21 (53.8)
	NYHA II	133 (45.4)	30 (43.5)	10 (25.6)
	NYHA III	10 (3.4)	11 (15.9)	2 (5.1)
	NYHA IV	4 (1.4)	2 (2.9)	6 (15.4)
	Not available	3	2	0
	Missing	3	0	0
	Total	**299**	**71**	**39**
2016	NYHA I	198 (51.2)	25 (38.5)	19 (42.2)
	NYHA II	170 (43.9)	30 (46.2)	9 (20.0)
	NYHA III	16 (4.1)	6 (9.2)	8 (17.8)
	NYHA IV	3 (0.8)	4 (6.2)	9 (20.0)
	Not available	5	3	0
	Missing	3	0	0
	Total	**395**	**68**	**45**
2015-2016	NYHA I	344 (50.6)	51 (38.1)	40 (47.6)
	NYHA II	303 (44.6)	60 (44.8)	19 (22.6)
	NYHA III	26 (3.8)	17 (12.7)	10 (11.9)
	NYHA IV	7 (1.0)	6 (4.5)	15 (17.9)
	Not available	8	5	0
	Missing	6	0	0
	Total	**694**	**139**	**84**

Table 2.10 Comparison of previous PCI according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Previous PCI	Elective	NSTEMI	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	Yes	3,005 (26.2)	285 (20.8)	197 (7.4)
	No	8,483 (73.8)	1,087 (79.2)	2,457 (92.6)
	Total	**11,488**	**1,372**	**2,654**
2015	Yes	2,071 (28.5)	270 (23.8)	135 (6.8)
	No	5,204 (71.5)	866 (76.2)	1,851 (93.2)
	Total	**7,275**	**1,136**	**1,986**
2016	Yes	2,340 (29.8)	293 (25.1)	132 (6.3)
	No	5,525 (70.2)	876 (74.9)	1,975 (93.7)
	Total	**7,865**	**1,169**	**2,107**
2015-2016	Yes	4,411 (29.1)	563 (24.4)	267 (6.5)
	No	10,729 (70.9)	1,742 (75.6)	3,826 (93.5)
	Total	**15,140**	**2,305**	**4,093**

Table 2.10.1 Comparison of previous PCI according to elective PCI status, NCVD-PCI Registry, 2013–2016

Year	Previous PCI	Staged PCI	Ad hoc	Not available
		No. (%)	No. (%)	No. (%)
2013-3014	Yes	1,586 (46.0)	1,415 (17.8)	4 (4.9)
	No	1,865 (54.0)	6,541 (82.2)	77 (95.1)
	Total	**3,451**	**7,956**	**81**
2015	Yes	1,238 (50.5)	816 (17.3)	17 (16.5)
	No	1,214 (49.5)	3,904 (82.7)	86 (83.5)
	Total	**2,452**	**4,720**	**103**
2016	Yes	1,374 (54.2)	958 (18.2)	8 (14.3)
	No	1,163 (45.8)	4,314 (81.8)	48 (85.7)
	Total	**2,537**	**5,272**	**56**
2015-2016	Yes	2,612 (52.4)	1,774 (17.8)	25 (15.7)
	No	2,377 (47.6)	8,218 (82.2)	134 (84.3)
	Total	**4,989**	**9,992**	**159**

Table 2.10.2 Comparison of previous PCI according to NSTEMI/UA PCI status, NCVD-PCI Registry, 2013–2016

Year	Previous PCI	Urgent	Non-urgent	Not available
		No. (%)	No. (%)	No. (%)
2013-3014	Yes	72 (16.1)	212 (23.2)	1 (7.1)
	No	374 (83.9)	700 (76.8)	13 (92.9)
	Total	**446**	**912**	**14**
2015	Yes	50 (17.5)	216 (25.9)	4 (25.0)
	No	236 (82.5)	618 (74.1)	12 (75.0)
	Total	**286**	**834**	**16**
2016	Yes	60 (22.1)	231 (26.0)	2 (22.2)
	No	212 (77.9)	657 (74.0)	7 (77.8)
	Total	**272**	**888**	**9**
2015-2016	Yes	110 (19.7)	447 (26.0)	6 (24.0)
	No	448 (80.3)	1,275 (74.0)	19 (76.0)
	Total	**558**	**1,722**	**25**

Table 2.10.3 Comparison of previous PCI according to STEMI PCI status, NCVD-PCI Registry, 2013–2016

Year	Previous PCI	Rescue	Primary	Facilitated	Delayed routine PCI	Delayed selective PCI	Pharmaco-invasive	Not available	Missing
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Yes	41 (4.9)	93 (10.5)	5 (7.4)	29 (6.5)	21 (8.5)	4 (3.1)	3 (12.0)	1 (11.1)
	No	803 (95.1)	791 (89.5)	63 (92.6)	418 (93.5)	225 (91.5)	127 (96.9)	22 (88.0)	8 (88.9)
	Total	**844 (100.0)**	**884 (100.0)**	**68 (100.0)**	**447 (100.0)**	**246 (100.0)**	**131 (100.0)**	**25 (100.0)**	**9 (100.0)**
2015	Yes	23 (5.3)	69 (8.7)	2 (3.1)	15 (5.5)	15 (6.3)	11 (6.6)	0 (0.0)	0 (0.0)
	No	410 (94.7)	724 (91.3)	63 (96.9)	259 (94.5)	223 (93.7)	156 (93.4)	14 (100.0)	2 (100.0)
	Total	**433 (100.0)**	**793 (100.0)**	**65 (100.0)**	**274 (100.0)**	**238 (100.0)**	**167 (100.0)**	**14 (100.0)**	**2 (100.0)**
2016	Yes	26 (7.1)	62 (7.3)	4 (3.1)	14 (4.4)	17 (7.2)	9 (4.6)	0 (0.0)	0 (0.0)
	No	341 (92.9)	783 (92.7)	123 (96.9)	305 (95.6)	220 (92.8)	185 (95.4)	18 (100.0)	0 (0.0)
	Total	**367 (100.0)**	**845 (100.0)**	**127 (100.0)**	**319 (100.0)**	**237 (100.0)**	**194 (100.0)**	**18 (100.0)**	**0 (100.0)**
2015-2016	Yes	49 (6.1)	131 (8.0)	6 (3.1)	29 (4.9)	32 (6.7)	20 (5.5)	0 (0.0)	0 (0.0)
	No	751 (93.9)	1,507 (92.0)	186 (96.9)	564 (95.1)	443 (93.3)	341 (94.5)	32 (100.0)	2 (100.0)
	Total	**800 (100.0)**	**1,638 (100.0)**	**192 (100.0)**	**593 (100.0)**	**475 (100.0)**	**361 (100.0)**	**32 (100.0)**	**2 (100.0)**

Table 2.11 Comparison of HbA1c according to PCI status, NCVD-PCI Registry, 2013–2016

Year	HbA1c (mmol/L)	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**2,490**	**157**	**229**
	Mean (SD)	7.4 (2.4)	7.6 (3.0)	7.8 (3.3)
	Median (Min – Max)	6.7 (4.0 – 32.0)	6.9 (4.2 – 31.0)	6.5 (4.4 – 32.0)
	Not available, No. (%)	5,258 (45.8)	711 (51.8)	1,375 (51.8)
	Missing, No. (%)	3,740 (32.6)	504 (36.7)	1,050 (39.6)
2015	**N**	**3,033**	**419**	**534**
	Mean (SD)	7.2 (2.0)	7.5 (2.2)	7.4 (2.4)
	Median (Min – Max)	6.6 (4.0 – 16.8)	6.9 (4.3 – 18.2)	6.4 (4.5 – 16.9)
	Not available, No. (%)	2,830 (38.9)	465 (40.9)	965 (48.6)
	Missing, No. (%)	1,412 (19.4)	252 (22.2)	487 (24.5)
2016	**N**	**3,394**	**317**	**429**
	Mean (SD)	7.2 (1.9)	7.3 (2.1)	7.7 (2.4)
	Median (Min – Max)	6.5 (4.1 – 29.6)	6.5 (4.1 – 17.0)	6.6 (4.3 – 15.6)
	Not available, No. (%)	3,187 (40.5)	566 (48.4)	1,134 (53.8)
	Missing, No. (%)	1,284 (16.3)	286 (24.5)	544 (25.8)
2015-2016	**N**	**6,427**	**736**	**963**
	Mean (SD)	7.2 (2.0)	7.4 (2.2)	7.5 (2.4)
	Median (Min – Max)	6.5 (4.0 – 29.6)	6.7 (4.1 – 18.2)	6.5 (4.3 – 16.9)
	Not available, No. (%)	6,017 (39.7)	1,031 (44.7)	2,099 (51.3)
	Missing, No. (%)	2,696 (17.8)	538 (23.3)	1,031 (25.2)

Table 2.12 Comparison of baseline creatinine according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Baseline creatinine (mmol/L)	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**10,067**	**1,181**	**1,970**
	Mean (SD)	116.2 (117.3)	127.6 (144.1)	108.9 (92.7)
	Median (Min – Max)	92.0 (44.0 – 1632.0)	92.0 (44.0 – 1606.0)	92.0 (44.0 – 1615.0)
	Not available, No. (%)	666 (5.8)	88 (6.4)	368 (13.9)
	Missing, No. (%)	755 (6.6)	103 (7.5)	316 (11.9)
2015	**N**	**6,378**	**971**	**1,540**
	Mean (SD)	116.0 (121.6)	134.0 (166.3)	103.6 (80.9)
	Median (Min – Max)	91.0 (44.0 – 1434.0)	89.0 (45.0 – 1688.0)	89.0 (44.0 – 1322.0)
	Not available, No. (%)	341 (4.7)	59 (5.2)	229 (11.5)
	Missing, No. (%)	556 (7.6)	106 (9.3)	217 (10.9)
2016	**N**	**7,183**	**1,006**	**1,651**
	Mean (SD)	120.9 (133.5)	126.9 (148.3)	104.5 (75.8)
	Median (Min – Max)	91.0 (44.0 – 1911.0)	88.0 (44.0 – 1572.0)	88.0 (44.0 – 1084.1)
	Not available, No. (%)	252 (3.2)	51 (4.4)	239 (11.3)
	Missing, No. (%)	430 (5.5)	112 (9.6)	217 (10.3)
2015-2016	**N**	**13,561**	**1,977**	**3,191**
	Mean (SD)	118.6 (128.0)	130.4 (157.4)	104.1 (78.3)
	Median (Min – Max)	91.0 (44.0 – 1911.0)	89.0 (44.0 – 1688.0)	88.0 (44.0 – 1322.0)
	Not available, No. (%)	593 (3.9)	110 (4.8)	468 (11.4)
	Missing, No. (%)	986 (6.5)	218 (9.5)	434 (10.6)

Table 2.13 Comparison of GFR according to PCI status, NCVD-PCI Registry, 2013–2016

Year	GFR	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**10,093**	**1,183**	**1,918**
	Mean (SD)	75.3 (25.7)	74.2 (29.5)	78.4 (26.9)
	Median (Min – Max)	75.8 (2.7 – 198.6)	75.0 (3.1 – 185.2)	77.8 (2.8 – 200.5)
	Missing, No. (%)	1,395 (12.1)	189 (13.8)	736 (27.7)
2015	**N**	**6,393**	**976**	**1,531**
	Mean (SD)	76.4 (26.1)	75.4 (30.6)	81.2 (27.4)
	Median (Min – Max)	77.1 (3.4 – 175.0)	77.5 (2.6 – 186.5)	80.9 (3.7 – 189.1)
	Missing, No. (%)	882 (12.1)	160 (14.1)	455 (22.9)
2016	**N**	**7,206**	**1,009**	**1,651**
	Mean (SD)	75.8 (26.4)	75.6 (29.2)	80.2 (27.6)
	Median (Min – Max)	77.2 (2.3 – 193.8)	78.8 (3.2 – 170.0)	80.4 (4.3 – 194.1)
	Missing, No. (%)	659 (8.4)	160 (13.7)	456 (21.6)
2015-2016	**N**	**13,599**	**1,985**	**3,182**
	Mean (SD)	76.1 (26.2)	75.5 (29.9)	80.7 (27.5)
	Median (Min – Max)	77.2 (2.3 – 193.8)	78.0 (2.6 – 186.5)	80.7 (3.7 – 194.1)
	Missing, No. (%)	1,541 (10.2)	320 (13.9)	911 (22.3)

Table 2.14 Comparison of TC according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Total cholesterol (mmol/L)	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**6,287**	**650**	**1,087**
	Mean (SD)	4.4 (1.3)	4.7 (1.5)	5.2 (1.5)
	Median (Min – Max)	4.1 (2.0 – 25.0)	4.4 (2.0 – 25.0)	5.1 (2.0 – 15.0)
	Not available, No. (%)	3,524 (30.7)	489 (35.6)	1,015 (38.2)
	Missing, No. (%)	1,677 (14.6)	233 (17.0)	552 (20.8)
2015	**N**	**4,288**	**623**	**840**
	Mean (SD)	4.4 (1.3)	4.7 (1.3)	5.4 (1.5)
	Median (Min – Max)	4.1 (2.0 – 24.0)	4.5 (2.0 – 12.9)	5.3 (2.0 – 13.8)
	Not available, No. (%)	1,988 (27.3)	320 (28.2)	786 (39.6)
	Missing, No. (%)	999 (13.7)	193 (17.0)	360 (18.1)
2016	**N**	**4,656**	**512**	**761**
	Mean (SD)	4.3 (1.2)	4.8 (1.5)	5.4 (1.4)
	Median (Min – Max)	4.1 (2.0 – 14.2)	4.5 (2.1 – 13.7)	5.4 (2.0 – 12.1)
	Not available, No. (%)	2,335 (29.7)	437 (37.4)	951 (45.1)
	Missing, No. (%)	874 (11.1)	220 (18.8)	395 (18.7)
2015-2016	**N**	**8,944**	**1,135**	**1,601**
	Mean (SD)	4.3 (1.3)	4.7 (1.4)	5.4 (1.4)
	Median (Min – Max)	4.1 (2.0 – 24.0)	4.5 (2.0 – 13.7)	5.4 (2.0 – 13.8)
	Not available, No. (%)	4,323 (28.6)	757 (32.8)	1,737 (42.4)
	Missing, No. (%)	1,873 (12.4)	413 (17.9)	755 (18.4)

Table 2.15 Comparison of LDL according to PCI status, NCVD-PCI Registry, 2013–2016

Year	LDL cholesterol (mmol/L)	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**6,109**	**619**	**1,029**
	Mean (SD)	2.5 (1.1)	2.8 (1.4)	3.4 (1.3)
	Median (Min – Max)	2.3 (0.8 – 20.0)	2.6 (0.8 – 18.0)	3.2 (0.8 – 13.8)
	Not available, No. (%)	3,661 (31.9)	522 (38.0)	1,061 (40.0)
	Missing, No. (%)	1,718 (15.0)	231 (16.8)	564 (21.3)
2015	**N**	**4,096**	**604**	**778**
	Mean (SD)	2.5 (1.1)	2.8 (1.2)	3.5 (1.3)
	Median (Min – Max)	2.3 (0.7 – 20.0)	2.7 (0.7 – 10.1)	3.4 (0.8 – 9.8)
	Not available, No. (%)	2,186 (30.0)	346 (30.5)	852 (42.9)
	Missing, No. (%)	993 (13.6)	186 (16.4)	356 (17.9)
2016	**N**	**4,484**	**475**	**715**
	Mean (SD)	2.5 (1.1)	2.9 (1.3)	3.5 (1.3)
	Median (Min – Max)	2.2 (0.8 – 12.1)	2.7 (0.8 – 9.9)	3.4 (0.8 – 10.8)
	Not available, No. (%)	2,474 (31.5)	473 (40.5)	1,008 (47.8)
	Missing, No. (%)	907 (11.5)	221 (18.9)	384 (18.2)
2015-2016	**N**	**8,580**	**1,079**	**1,493**
	Mean (SD)	2.5 (1.1)	2.9 (1.2)	3.5 (1.3)
	Median (Min – Max)	2.3 (0.7 – 20.0)	2.7 (0.7 – 10.1)	3.4 (0.8 – 10.8)
	Not available, No. (%)	4,660 (30.8)	819 (35.5)	1,860 (45.4)
	Missing, No. (%)	1,900 (12.5)	407 (17.7)	740 (18.1)

Table 2.16 Comparison of functional ischaemia according to PCI status, NCVD-PCI Registry, 2013–2016

Year	Functional ischaemia	Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	Positive	1,050 (85.1)	63 (68.5)	52 (67.5)
	Negative	75 (6.1)	10 (10.9)	10 (13.0)
	Equivocal	109 (8.8)	19 (20.7)	15 (19.5)
	Not available	4,710	564	1,207
	Missing	5,544	716	1,370
	Total	**11,488**	**1,372**	**2,654**
2015	Positive	508 (90.4)	35 (79.5)	19 (65.5)
	Negative	16 (2.8)	2 (4.5)	2 (6.9)
	Equivocal	38 (6.8)	7 (15.9)	8 (27.6)
	Not available	2,034	333	604
	Missing	4,679	759	1,353
	Total	**7,275**	**1,136**	**1,986**
2016	Positive	532 (91.7)	53 (88.3)	50 (90.9)
	Negative	16 (2.8)	1 (1.7)	1 (1.8)
	Equivocal	32 (5.5)	6 (10.0)	4 (7.3)
	Not available	2,179	246	516
	Missing	5,106	863	1,536
	Total	**7,865**	**1,169**	**2,107**
2015-2016	Positive	1,040 (91.1)	88 (84.6)	69 (82.1)
	Negative	32 (2.8)	3 (2.9)	3 (3.6)
	Equivocal	70 (6.1)	13 (12.5)	12 (14.3)
	Not available	4,213	579	1,120
	Missing	9,785	1,622	2,889
	Total	**15,140**	**2,305**	**4,093**

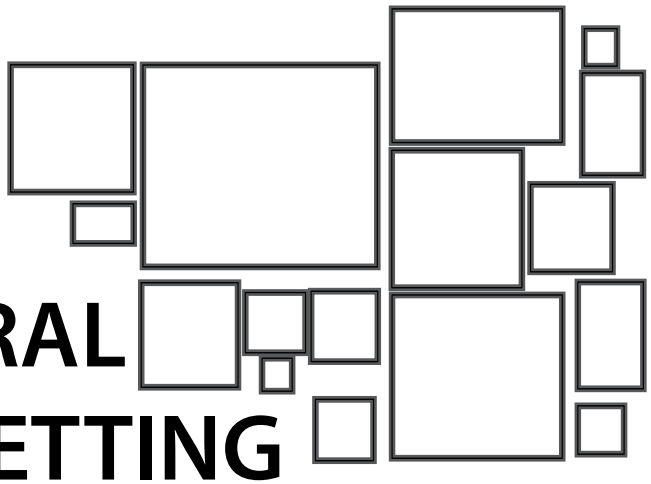
Table 2.17 Comparison of ECG according to ACS subtypes, NCVD-PCI Registry, 2013–2016

Year	Heart rate (beats/minute)	STEMI	NSTEMI	UA	Not available
		No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	**Total**	**3,115**	**1,279**	**946**	**78**
	Sinus rhythm	2,519 (46.5)	1,043 (19.3)	787 (14.5)	65 (1.2)
	Atrial fibrillation	37 (0.7)	17 (0.3)	7 (0.1)	0 (0.0)
	2nd/3rd AVB	31 (0.6)	6 (0.1)	2 (0.0)	0 (0.0)
	LBBB	23 (0.4)	6 (0.1)	4 (0.1)	0 (0.0)
	RBBB	10 (0.2)	5 (0.1)	4 (0.1)	0 (0.0)
2015	**Total**	**2,351**	**1,064**	**719**	**34**
	Sinus rhythm	1,866 (44.8)	856 (20.5)	572 (13.7)	28 (0.7)
	Atrial fibrillation	32 (0.8)	13 (0.3)	5 (0.1)	0 (0.0)
	2nd/3rd AVB	18 (0.4)	5 (0.1)	2 (0.0)	0 (0.0)
	LBBB	6 (0.1)	6 (0.1)	2 (0.0)	0 (0.0)
	RBBB	5 (0.1)	8 (0.2)	2 (0.0)	0 (0.0)
2016	**Total**	**2,537**	**1,155**	**538**	**28**
	Sinus rhythm	1,990 (46.7)	927 (21.8)	399 (9.4)	22 (0.5)
	Atrial fibrillation	18 (0.4)	14 (0.3)	4 (0.1)	0 (0.0)
	2nd/3rd AVB	24 (0.6)	3 (0.1)	0 (0.0)	0 (0.0)
	LBBB	8 (0.2)	3 (0.1)	3 (0.1)	1 (0.0)
	RBBB	8 (0.2)	5 (0.1)	2 (0.0)	0 (0.0)
2015-2016	**Total**	**4,888**	**2,219**	**1,257**	**62**
	Sinus rhythm	3,856 (45.8)	1,783 (21.2)	971 (11.5)	50 (0.6)
	Atrial fibrillation	50 (0.6)	27 (0.3)	9 (0.1)	0 (0.0)
	2nd/3rd AVB	42 (0.5)	8 (0.1)	2 (0.0)	0 (0.0)
	LBBB	14 (0.2)	9 (0.1)	5 (0.1)	1 (0.0)
	RBBB	13 (0.2)	13 (0.2)	4 (0.0)	0 (0.0)

Table 2.18 Comparison of IABP use according to ACS subtypes, NCVD-PCI Registry, 2013–2016

Year	IABP	STEMI	NSTEMI	UA	Not available
		No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Yes	161 (5.3)	31 (2.5)	7 (0.8)	0 (0.0)
	No	2,853 (94.7)	1,207 (97.5)	864 (99.2)	76 (100.0)
	Not applicable	101	41	75	2
	Total	**3,115**	**1,279**	**946**	**78**
2015	Yes	86 (3.7)	20 (1.9)	4 (0.6)	0 (0.0)
	No	2,243 (96.3)	1,025 (98.1)	701 (99.4)	31 (100.0)
	Not applicable	22	19	14	3
	Total	**2,351**	**1,064**	**719**	**34**
2016	Yes	53 (2.1)	12 (1.0)	3 (0.6)	0 (0.0)
	No	2,473 (97.9)	1,140 (99.0)	530 (99.4)	28 (100.0)
	Not applicable	11	3	5	0
	Total	**2,537**	**1,155**	**538**	**28**
2015-2016	Yes	139 (2.9)	32 (1.5)	7 (0.6)	0 (0.0)
	No	4,716 (97.1)	2,165 (98.5)	1,231 (99.4)	59 (100.0)
	Not applicable	33	22	19	3
	Total	**4,888**	**2,219**	**1,257**	**62**

**IABP was listed in separate sections in the previous and new CRFs. In the old CRF, it was reported in Section 6 (Cath lab visit) and in the new CRF, it was reported in Section 7 (PCI procedure details).*



PROCEDURAL SETTING

PROCEDURAL SETTINGS

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Summary

1. In 2015–2016, there was an increased number ofPCIs reported for STEMI/NSTEMI/ UA compared to 2013–2014.
2. For STEMI, the number of primary PCI (PPCI) and pharmacoinvasive PCI were also increased.
3. There were further increases in PCI performed via radial approach (66.3%) compared to the previous cohort.
4. There was an increase in the usage of ticagrelor (25.5%) in the catheterisation laboratory compared to 2013–2014 cohort.
5. There was an increase in radiation exposure to the patient compared to the 2013–2014 cohort. However, only 50% of data was available.

This chapter discusses the procedural details and treatment received by patients who underwent PCI from 2015–2016.

From 2015–2016, a total number of 21,538 PCI procedures were reported in 18 centres across Malaysia. The number of procedures reported increased significantly over the years with 15,514 PCIs reported during 2013–2014.

For PCI status, 70.3% were performed in elective setting and about 30% in the ACS setting. There has been an increase in the number of STEMI PCI compared to the 2013–2014 cohort. (19% vs 17.1%). [Table 3.1]

For STEMI PCI, there has been a marked increase in the number of PPCI and pharmacoinvasive PCI compared to the 2013–2014 cohort (40.4% vs 33.7% and 8.9% vs 5.0%). [Table 3.1]

Procedural access

In 2015–2016, the number of PCIs performed via radial access increased compared to the 2013–2014 cohort (66.3% vs 57.0%). [Table 3.1]

Majority of the PCIs were done with 6Fr guiding catheter (94.3%), followed by 7Fr guiding catheter (5.2%). [Table 3.1]

Closure devices were used in about 11% of procedures. However, there was an increased usage in angioseal device (4.3%) in 2015–2016 as compared to 2.6% in 2013–2014. [Table 3.1]

Extent of CAD

About two thirds of patients who went for PCI in this cohort had a single vessel disease (66.6%). This was similar to the 2013–2014 cohort (65%). [Table 3.1] 2.7% of PCIs were left main stem and 1.3% were graft PCI. [Table 3.1]

PCI procedure

The median fluoroscopy dose was higher compared to the previous cohort (2549.5 mGy vs 1792.0 mGy). About 50% of the fluoroscopy time and dose exposure were not recorded. [Table 3.1] The volume of contrast use in 2015–2016 was similar to the previous cohort at about 150 ml. [Table 3.1]

Treatment of patients undergoing PCI

There was an increase in the number of PPCI in this cohort compared to the 2013–2014 cohort. The number of patients who underwent PCI after thrombolysis were lower compared to the 2013–2014 cohort (34.0% vs 42.2%). [Table 3.1]

The usage of GP2b3a blocker remained low (2.3% vs 3.8%) compared to the 2013–2014 cohort. [Table 3.1] 96.6% of anticoagulation during PCI was IV unfractionated heparin. [Table 3.1]

Antiplatelets

About 99% of patients were given aspirin prior to PCI. There was a decreased use of clopidogrel compared to the previous cohort (80.8% vs 90.8%). This was reflected by the increased usage of ticagrelor (25.7% [2015–2016] vs 11.6% [2013–2014]). [Table 3.1]

Table 3.1 PCI status of patients who underwent procedures, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Characteristics of PCI procedures				
PCI status, No. (%)				
Elective	11,488 (74.0)	7,275 (70.0)	7,865 (70.6)	15,140 (70.3)
NSTEMI/UA	1,372 (8.8)	1,136 (10.9)	1,169 (10.5)	2,305 (10.7)
STEMI	2,654 (17.1)	1,986 (19.1)	2,107 (18.9)	4,093 (19.0)
Elective, No. (%)	**N = 11,488**	**N = 7,275**	**N = 7,865**	**N = 15,140**
Staged PCI	3,451 (30.3)	2,452 (34.2)	2,537 (32.5)	4,989 (33.3)
Ad hoc	7,956 (69.7)	4,720 (65.8)	5,272 (67.5)	9,992 (66.7)
Not available	81	103	56	159
NSTEMI/UA, No. (%)	**N = 1,372**	**N = 1,136**	**N = 1,169**	**N = 2,305**
Urgent	446 (32.8)	286 (25.5)	272 (23.4)	558 (24.5)
Non-urgent	912 (67.2)	834 (74.5)	888 (76.6)	1,722 (75.5)
Not available	14	16	9	25
STEMI, No. (%)	**N = 2,654**	**N = 1,986**	**N = 2,107**	**N = 4,093**
Rescue	844 (32.2)	433 (22.0)	367 (17.6)	800 (19.7)
Primary	884 (33.7)	793 (40.3)	845 (40.4)	1,638 (40.4)
Facilitated	68 (2.6)	65 (3.3)	127 (6.1)	192 (4.7)
Delayed routine PCI	447 (17.1)	274 (13.9)	319 (15.3)	593 (14.6)
Delayed selective PCI	246 (9.4)	238 (12.1)	237 (11.3)	475 (11.7)
Pharmacoinvasive	131 (5.0)	167 (8.5)	194 (9.3)	361 (8.9)
Not available	25	14	18	32
Missing	9	2	0	2
#Percutaneous entry, No. (%)				
Brachial	114 (0.7)	61 (0.6)	76 (0.7)	137 (0.6)
Radial	8,846 (57.0)	6,637 (63.8)	7,639 (68.6)	14,276 (66.3)
Femoral	7,120 (45.9)	4,301 (41.4)	4,044 (36.3)	8,345 (38.7)
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
$^French size type				
Guiding catheter	18,747 (97.8)	12,488 (95.8)	12,889 (92.7)	25,377 (94.2)
Guiding sheath	422 (2.2)	548 (4.2)	1,019 (7.3)	1,567 (5.8)
Not available	62	12	12	24
Missing	98	0	1	1

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
^French size (guiding catheter), No. (%)	**N = 18,747**	**N = 12,488**	**N = 12,889**	**N = 25,377**
4	35 (0.2)	12 (0.1)	18 (0.1)	30 (0.1)
5	35 (0.2)	17 (0.1)	13 (0.1)	30 (0.1)
6	17,227 (92.1)	11,650 (93.3)	12,284 (95.3)	23,934 (94.3)
7	1,382 (7.4)	780 (6.2)	543 (4.2)	1,323 (5.2)
8	21 (0.1)	15 (0.1)	29 (0.2)	44 (0.2)
Others	12 (0.1)	12 (0.1)	0 (0.0)	12 (0.0)
Not available	35	1	2	3
Missing	0	1	0	1
^French size (sheath), No. (%)	**N = 422**	**N = 548**	**N = 1,019**	**N = 1,567**
4	0 (0.0)	1 (0.2)	1 (0.1)	2 (0.1)
5	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)
6	374 (88.6)	479 (87.4)	959 (94.1)	1,438 (91.8)
7	45 (10.7)	68 (12.4)	57 (5.6)	125 (8.0)
8	3 (0.7)	0 (0.0)	1 (0.1)	1 (0.1)
Closure device, No. (%)				
No	12,531 (86.1)	7,460 (78.2)	8,824 (86.8)	16,284 (82.6)
Seal	383 (2.6)	420 (4.4)	433 (4.3)	853 (4.3)
Suture	960 (6.6)	683 (7.2)	483 (4.8)	1,166 (5.9)
Exoseal	145 (1.0)	71 (0.7)	64 (0.6)	135 (0.7)
Others	534 (3.7)	909 (9.5)	360 (3.5)	1,269 (6.4)
Not available	150	99	59	158
Missing	811	755	918	1,673
*Extent of coronary disease, No. (%)				
Single vessel disease	9,984 (65.0)	6,969 (67.0)	7,367 (66.1)	14,336 (66.6)
Multiple vessel disease	4,711 (30.7)	2,981 (28.7)	3,344 (30.0)	6,325 (29.4)
Left main/LMS	470 (3.1)	299 (2.9)	284 (2.5)	583 (2.7)
Graft	198 (1.3)	145 (1.4)	145 (1.3)	290 (1.3)
Not available	151	3	1	4
Fluoroscopy time, min				
N	13,488	9,244	10,081	19,325
Mean (SD)	19.3 (16.7)	19.1 (15.0)	20.0 (15.8)	19.6 (15.4)
Median (Min – Max)	14.5 (2.0 – 175.0)	14.9 (1.0 – 152.0)	15.5 (1.0 – 180.0)	15.2 (1.0 – 180.0)
Not available, No. (%)	1,265 (8.2)	679 (6.5)	535 (4.8)	1,214 (5.6)
Missing, No. (%)	761 (4.9)	474 (4.6)	525 (4.7)	999 (4.6)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Fluoroscopy total dose, mGy				
N	7,729	5,382	5,082	10,464
Mean (SD)	61950.7 (1084474.1)	52658.6 (221744.9)	73487.8 (230270.5)	62774.6 (226154.6)
Median (Min – Max)	1792.0 (0 – 90100000.0)	2153.5 (0 – 11607915.0)	3321.0 (0 – 9576939.0)	2549.5 (0 – 11607915.0)
Not available, No. (%)	5,359 (34.5)	3,701 (35.6)	4,223 (37.9)	7,924 (36.8)
Missing, No. (%)	2,426 (15.6)	1,314 (12.6)	1,836 (16.5)	3,150 (14.6)
Contrast volume, ml				
N	13,431	9,386	10,119	19,505
Mean (SD)	162.8 (68.9)	159.3 (66.2)	158.6 (65.6)	159.0 (65.9)
Median (Min – Max)	150.0 (16.0 – 500.0)	150.0 (20.0 – 500.0)	150.0 (15.0 – 500.0)	150.0 (15.0 – 500.0)
Not available, No. (%)	1,078 (6.9)	486 (4.7)	456 (4.1)	942 (4.4)
Missing, No. (%)	1,005 (6.5)	525 (5.0)	566 (5.1)	1,091 (5.1)
Thrombolytics prior to PCI procedure in ACS STEMI, No. (%)				
Total no. of procedures among ACS STEMI patients	**N = 3,115**	**N = 2,351**	**N = 2,537**	**N = 4,888**
Yes	1,313 (42.2)	815 (34.7)	848 (33.4)	1,663 (34.0)
No	1,802 (57.8)	1,536 (65.3)	1,689 (66.6)	3,225 (66.0)
Duration of thrombolytics given prior to PCI procedure in ACS STEMI, No. (%)	**N = 1,313**	**N = 815**	**N = 848**	**N = 1,663**
<3 hours	135 (12.9)	115 (17.9)	111 (14.9)	226 (16.3)
3 – 6 hours	202 (19.4)	137 (21.3)	148 (19.9)	285 (20.5)
6 – 12 hours	172 (16.5)	113 (17.6)	109 (14.7)	222 (16.0)
12 – 24 hours	505 (48.4)	267 (41.5)	122 (16.4)	389 (28.0)
>24 hours	29 (2.8)	11 (1.7)	254 (34.1)	265 (19.1)
Not available	125	105	25	130
Missing	145	67	79	146
Medication				
IIb/IIIa blockade, No. (%)				
Yes	585 (3.8)	271 (2.6)	234 (2.1)	505 (2.3)
No	14,929 (96.2)	10,126 (97.4)	10,907 (97.9)	21,033 (97.7)
IIb/IIIa blockade given status, No. (%)	**N = 585**	**N = 271**	**N = 234**	**N = 505**
Prior	214 (41.5)	78 (33.2)	69 (31.9)	147 (32.6)
After	45 (8.7)	26 (11.1)	22 (10.2)	48 (10.6)
During	257 (49.8)	131 (55.7)	125 (57.9)	256 (56.8)
Not available	1	0	0	0
Missing	68	36	18	54

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Heparin, No. (%)				
Yes	14,829 (95.6)	10,043 (96.6)	10,762 (96.6)	20,805 (96.6)
No	685 (4.4)	354 (3.4)	379 (3.4)	733 (3.4)
Heparin given status, No. (%)	**N = 14,829**	**N = 10,043**	**N = 10,762**	**N = 20,805**
Prior	6,566 (45.4)	3,994 (40.7)	4,906 (46.6)	8,900 (43.8)
After	7 (0.0)	2 (0.0)	3 (0.0)	5 (0.0)
During	7,886 (54.5)	5,813 (59.3)	5,620 (53.4)	11,433 (56.2)
Not available	17	10	8	18
Missing	353	224	225	449
LMWH, No. (%)				
Yes	524 (3.4)	310 (3.0)	275 (2.5)	585 (2.7)
No	14,990 (96.6)	10,087 (97.0)	10,866 (97.5)	20,953 (97.3)
LMWH given status, No. (%)	**N = 524**	**N = 310**	**N = 275**	**N = 585**
Prior	449 (91.8)	274 (94.5)	238 (91.9)	512 (93.3)
After	20 (4.1)	8 (2.8)	12 (4.6)	20 (3.6)
During	20 (4.1)	8 (2.8)	9 (3.5)	17 (3.1)
Not available	1	2	1	3
Missing	34	18	15	33
Ticlopidine, No. (%)				
Yes	158 (1.0)	49 (0.5)	50 (0.4)	99 (0.5)
No	15,356 (99.0)	10,348 (99.5)	11,091 (99.6)	21,439 (99.5)
Ticlopidine given status, No. (%)	**N = 158**	**N = 49**	**N = 50**	**N = 99**
Prior	146 (97.3)	44 (97.8)	46 (100.0)	90 (98.9)
After	1 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)
During	3 (2.0)	1 (2.2)	0 (0.0)	1 (1.1)
Not available	0	0	0	0
Missing	8	4	4	8
Aspirin, No. (%)				
Yes	14,993 (96.6)	9,732 (93.6)	10,170 (91.3)	19,902 (92.4)
No	521 (3.4)	665 (6.4)	971 (8.7)	1,636 (7.6)
Aspirin given status, No. (%)	**N = 14,993**	**N = 9,732**	**N = 10,170**	**N = 19,902**
Prior	14,438 (98.9)	9,345 (98.7)	9,637 (99.0)	18,982 (98.9)
After	63 (0.4)	54 (0.6)	31 (0.3)	85 (0.4)
During	94 (0.6)	68 (0.7)	66 (0.7)	134 (0.7)
Not available	9	5	11	16
Missing	389	260	425	685

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Clopidogrel, No. (%)				
Yes	14,079 (90.8)	8,510 (81.9)	8,895 (79.8)	17,405 (80.8)
No	1,435 (9.2)	1,887 (18.1)	2,246 (20.2)	4,133 (19.2)
Clopidogrel given status, No. (%)	**N = 14,079**	**N = 8,510**	**N = 8,895**	**N = 17,405**
Prior	13,193 (94.6)	7,955 (94.1)	8,425 (97.5)	16,380 (95.8)
After	47 (0.3)	48 (0.6)	37 (0.4)	85 (0.5)
During	699 (5.0)	453 (5.4)	175 (2.0)	628 (3.7)
Not available	14	9	12	21
Missing	126	45	246	291
Duration of clopidogrel given prior to PCI procedure, hours, No. (%)	**N = 13,193**	**N = 7,955**	**N = 8,425**	**N = 16,380**
<6	3,651 (29.8)	2,211 (30.6)	1,799 (23.1)	4,010 (26.7)
6 – 24	3,139 (25.6)	2,343 (32.4)	3,163 (40.7)	5,506 (36.7)
>24 – 72	1,252 (10.2)	1,012 (14.0)	802 (10.3)	1,814 (12.1)
>72	4,202 (34.3)	1,663 (23.0)	2,011 (25.9)	3,674 (24.5)
Not available	284	167	133	300
Missing	665	559	517	1,076
First starting dose, mg, No. (%)	**N = 14,079**	**N = 8,510**	**N = 8,895**	**N = 17,405**
75	6,444 (53.1)	4,027 (57.8)	4,544 (59.0)	8,571 (58.4)
300	4,473 (36.9)	2,319 (33.3)	2,581 (33.5)	4,900 (33.4)
600	1,215 (10.0)	617 (8.9)	578 (7.5)	1,195 (8.1)
≥1200	1 (0.0)	1 (0.0)	1 (0.0)	2 (0.0)
Not available	488	253	164	417
Missing	1,458	1,293	1,027	2,320
**Clopidogrel dose of ACS STEMI patient, mg, No. (%)				
Total no. of PCI procedures among ACS STEMI patients who are taking clopidogrel	**N = 2,682**	**N = 1,769**	**N = 1,898**	**N = 3,667**
75	559 (25.8)	425 (30.8)	400 (25.7)	825 (28.1)
300	1,312 (60.5)	779 (56.4)	1,036 (66.7)	1,815 (61.8)
600	297 (13.7)	178 (12.9)	118 (7.6)	296 (10.1)
≥1200	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	75	40	36	76
Missing	439	347	308	655

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Fondaparinox, No. (%)				
Yes	1,396 (9.0)	980 (9.4)	1,092 (9.8)	2,072 (9.6)
No	14,069 (91.0)	9,417 (90.6)	10,049 (90.2)	19,466 (90.4)
Missing	49	0	0	0
Fondaparinox given status, No. (%)	**N = 1,396**	**N = 980**	**N = 1,092**	**N = 2,072**
Prior	1,211 (90.6)	862 (93.3)	945 (94.1)	1,807 (93.7)
After	112 (8.4)	55 (6.0)	54 (5.4)	109 (5.7)
During	13 (1.0)	7 (0.8)	5 (0.5)	12 (0.6)
Not available	2	4	1	5
Missing	58	52	87	139
Prasugrel, No. (%)				
Yes	67 (0.5)	52 (0.5)	47 (0.4)	99 (0.5)
No	14,056 (99.5)	10,345 (99.5)	11,094 (99.6)	21,439 (99.5)
Missing	1,391	0	0	0
Prasugrel given status, No. (%)	**N = 67**	**N = 52**	**N = 47**	**N = 99**
Prior	48 (80.0)	38 (80.9)	28 (68.3)	66 (75.0)
After	4 (6.7)	3 (6.4)	5 (12.2)	8 (9.1)
During	8 (13.3)	6 (12.8)	8 (19.5)	14 (15.9)
Missing	7	5	6	11
Ticagrelor, No. (%)				
Yes	1,632 (11.6)	2,403 (23.1)	3,122 (28.0)	5,525 (25.7)
No	12,491 (88.4)	7,994 (76.9)	8,019 (72.0)	16,013 (74.3)
Missing	1,391	0	0	0
Ticagrelor given status, No. (%)	**N = 1,632**	**N = 2,403**	**N = 3,122**	**N = 5,525**
Prior	1,244 (82.1)	1,506 (66.6)	2,220 (74.7)	3,726 (71.2)
After	45 (3.0)	61 (2.7)	80 (2.7)	141 (2.7)
During	226 (14.9)	695 (30.7)	672 (22.6)	1,367 (26.1)
Not available	1	1	1	2
Missing	116	140	149	289

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Planned duration of clopidogrel/ticlopidine, month, No. (%)				
1	1,293 (8.9)	446 (4.7)	326 (3.2)	772 (4.0)
3	532 (3.7)	255 (2.7)	181 (1.8)	436 (2.2)
6	748 (5.1)	302 (3.2)	232 (2.3)	534 (2.7)
12	11,841 (81.3)	8,313 (88.1)	9,253 (91.8)	17,566 (90.0)
>12	153 (1.1)	124 (1.3)	88 (0.9)	212 (1.1)
Not available	660	624	639	1,263
Missing	287	333	422	755

#Patients are 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 was only collected for French size 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, no11.

**In the old CRF, patients were allowed to be presented in different categories. In the new CRF, 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 either 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 in combination with LAD, LCx, RCA or single vessel disease).

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

***Only applicable to STEMI patients who are taking clopidogrel.*

Table 3.2 Duration of thienopyridine in patients who underwent PCI, NCVD-PCI Registry, 2013–2016

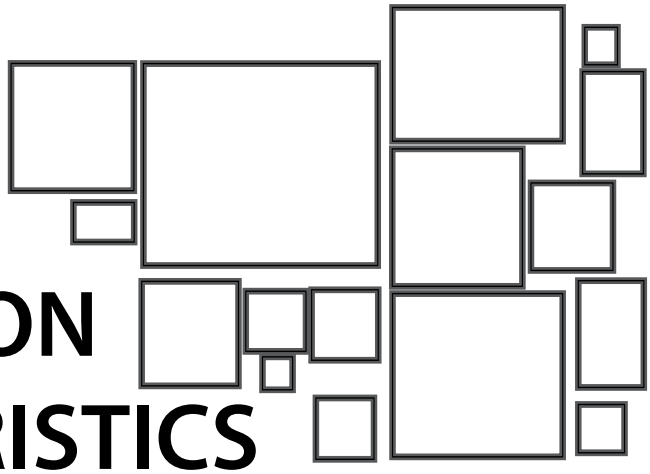
Year	Planned duration of clopidogrel/ticlopidine (months)	[#]Intracoronary devices used		
		Balloon only/POBA	Drug eluting stent	Bare metal stent
		No. (%)	No. (%)	No. (%)
2013-3014	1	339 (14.6)	180 (1.4)	884 (38.3)
	3	122 (5.3)	95 (0.8)	225 (9.7)
	6	132 (5.7)	327 (2.6)	168 (7.3)
	12	1,685 (72.8)	11,794 (94.2)	1,019 (44.1)
	>12	38 (1.6)	129 (1.0)	13 (0.6)
	Not available	135	246	87
	Missing	41	200	48
	Total	**2,492**	**12,971**	**2,444**
2015	1	168 (8.6)	151 (1.8)	240 (38.0)
	3	65 (3.3)	45 (0.5)	80 (12.7)
	6	74 (3.8)	155 (1.9)	25 (4.0)
	12	1,628 (83.3)	7,805 (94.5)	283 (44.8)
	>12	19 (1.0)	104 (1.3)	4 (0.6)
	Not available	101	385	20
	Missing	34	267	29
	Total	**2,089**	**8,912**	**681**
2016	1	112 (6.4)	98 (1.0)	125 (40.1)
	3	38 (2.2)	63 (0.7)	20 (6.4)
	6	54 (3.1)	139 (1.5)	13 (4.2)
	12	1,524 (87.7)	9,086 (96.0)	153 (49.0)
	>12	9 (0.5)	83 (0.9)	1 (0.3)
	Not available	88	388	10
	Missing	39	318	16
	Total	**1,864**	**10,175**	**338**
2015-2016	1	280 (7.6)	249 (1.4)	365 (38.7)
	3	103 (2.8)	108 (0.6)	100 (10.6)
	6	128 (3.5)	294 (1.7)	38 (4.0)
	12	3,152 (85.4)	16,891 (95.3)	436 (46.2)
	>12	28 (0.8)	187 (1.1)	5 (0.5)
	Not available	189	773	30
	Missing	73	585	45
	Total	**3,953**	**19,087**	**1,019**

[#]*Patients are 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, 2013–2016

Year	#Percutaneous entry	PCI status		
		Elective	NSTEMI/UA	STEMI
		No. (%)	No. (%)	No. (%)
2013-3014	Brachial	78 (0.7)	13 (0.9)	23 (0.8)
	Radial	6,916 (57.9)	782 (55.1)	1,148 (42.4)
	Femoral	4,959 (41.5)	624 (44.0)	1,537 (56.8)
2015	Brachial	40 (0.5)	4 (0.3)	17 (0.8)
	Radial	4,756 (61.4)	720 (61.3)	1,161 (55.7)
	Femoral	2,944 (38.0)	451 (38.4)	906 (43.5)
2016	Brachial	47 (0.6)	9 (0.7)	20 (0.9)
	Radial	5,433 (65.1)	806 (65.6)	1,400 (64.0)
	Femoral	2,862 (34.3)	413 (33.6)	769 (35.1)
2015-2016	Brachial	87 (0.5)	13 (0.5)	37 (0.9)
	Radial	10,189 (63.4)	1,526 (63.5)	2,561 (59.9)
	Femoral	5,806 (36.1)	864 (36.0)	1,675 (39.2)

#*Patients are allowed to be in more than one type of category.*



LESION CHARACTERISTICS

LESION CHARACTERISTICS

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Summary

1. The left anterior descending artery (LAD) remains the most frequently treated lesion, as previously reported.
2. Majority of lesions treated were de novo lesions (95.0%); and complex lesions (type B2 and C) made up 59.4% of all PCI cases.
3. Generally, drug eluting stents (DES) (76.9%) were the standard PCI practice. The use of bare-metal stent (BMS) had decreased, however the use of drug eluting balloon (DEB) had increased.
4. Most of the ISR lesions were treated with DEB (62.9%).
5. The rate of left main stem (LMS) intervention (majority unprotected) continued to increase compared to the previous cohort with a high procedural success rate (97.5%). Radial approach was becoming more popular even in this high-risk lesion intervention.
6. Vein grafts remained the most commonly treated in graft PCI (84.7%) with increasing left internal mammary artery (LIMA) intervention (14.9%).
7. The number of chronic total occlusion (CTO) >3 months PCI constituted 7.8% of all lesions treated with a good success rate (74.8%).
8. The use of coronary imaging modalities (intravascular ultrasound [IVUS] and optical coherence tomography [OCT]) as well as fractional flow reserve (fractional flow reserve:FFR) were still very low.
9. Post-procedural lesion complications rate remained low despite more complex PCIs being performed.

Anatomical location of lesions

Between the year of 2015 and 2016, a total of 26,969 lesions were treated via PCI. LAD remained the most common culprit artery (47.2%), followed by right coronary artery (RCA:31.8%) and left circumflex artery (LCx:16.8%). The proximal segment of each coronary artery (LAD, RCA and LCx) was the most common site being treated. Intervention to LMS increased significantly to 871 (3.2%) cases, compared to only 541 (2.8%) cases reported in the previous cohort. [Table 4.1]

Table 4.1 Summary of location of lesions treated with PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Location of lesion				
None	5 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Left main stem	**541 (2.8)**	**423 (3.2)**	**448 (3.2)**	**871 (3.2)**
Left anterior descending artery (LAD)	**9,304 (48.2)**	**6,111 (46.9)**	**6,610 (47.5)**	**12,721 (47.2)**
LAD proximal	6,477 (33.5)	4,343 (33.3)	4,726 (34.0)	9,069 (33.7)
LAD mid	2,098 (10.9)	1,332 (10.2)	1,417 (10.2)	2,749 (10.2)
LAD distal	350 (1.8)	198 (1.5)	234 (1.7)	432 (1.6)
D1	325 (1.7)	201 (1.5)	205 (1.5)	406 (1.5)
D2	46 (0.2)	32 (0.2)	24 (0.2)	56 (0.2)
D3	8 (0.0)	5 (0.0)	4 (0.0)	9 (0.0)
Right coronary artery (RCA)	**6,011 (31.1)**	**4,087 (31.4)**	**4,481 (32.2)**	**8,568 (31.8)**
RCA proximal	2,707 (14.0)	1,963 (15.1)	2,123 (15.3)	4,086 (15.2)
RCA mid	1,829 (9.5)	1,119 (8.6)	1,260 (9.1)	2,379 (8.8)
RCA distal	1,080 (5.6)	738 (5.7)	830 (6.0)	1,568 (5.8)
PDA	208 (1.1)	150 (1.2)	135 (1.0)	285 (1.1)
PLV	187 (1.0)	117 (0.9)	133 (1.0)	250 (0.9)
Left circumflex artery (LCx)	**3,287 (17.0)**	**2,276 (17.5)**	**2,262 (16.3)**	**4,538 (16.8)**
LCX proximal	1,648 (8.5)	1,178 (9.0)	1,193 (8.6)	2,371 (8.8)
LCX distal	985 (5.1)	651 (5.0)	637 (4.6)	1,288 (4.8)
OM1	528 (2.7)	356 (2.7)	368 (2.6)	724 (2.7)
OM2	100 (0.5)	75 (0.6)	52 (0.4)	127 (0.5)
OM3	26 (0.1)	16 (0.1)	12 (0.1)	28 (0.1)
Graft	**166 (0.9)**	**131 (1.0)**	**118 (0.8)**	**249 (0.9)**
Saphenous vein graft	149 (0.8)	103 (0.8)	108 (0.8)	211 (0.8)
Left internal mammary artery graft	15 (0.1)	27 (0.2)	10 (0.1)	37 (0.1)
Right internal mammary artery graft	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Radial artery graft	2 (0.0)	1 (0.0)	0 (0.0)	1 (0.0)
Missing	**15**	**20**	**2**	**22**

Lesion characteristics

The vast majority of lesions were de novo lesions (95.0%). The rates of restenosis and in-stent restenosis (ISR) were similar to the previously reported cohort. The rate of PCI due to stent thrombosis was also low at 0.5%. [Table 4.2] The very low rate of stent thrombosis was comparable to another well-established registry (SCAAR registry).[1]

Complex lesions (type B2 and C) made up half of all treated lesions (59.4%). [Table 4.3] Among the high-risk lesions treated, there was a reduction in bifurcation intervention (5.2% vs 6.5%) from the previous cohort. Interestingly, the rate of angioplasty to CTO and calcified lesions had increased (7.8% vs 6.6% and 8.4% vs 6.0% respectively). [Table 4.4] In terms of TIMI flow, 95.7% achieved TIMI III flow after angioplasty. [Table 4.5]

Types of stents and devices used

The number of coronary stents per patient was similar to the previous cohort (1.7 stent/patient). DES was used in 76.9% cases. The use of BMS had reduced from 12.5% to 3.6%. The use of dedicated bifurcation stents and covered stents were rare (0.2%). [Table 4.6]

The use of aspiration catheters had reduced to 4.7% from 5.7% as this could be due to the current evidence.[2] Interestingly, the plain-old balloon angioplasty (POBA) only strategy was still used in 14.7% of cases. DEB was gaining popularity as evidenced by its increased use (7.5% to 10.1%). With increasing number of angioplasty in calcified and CTO lesions, the use of cutting or scoring balloon and microcatheters had increased (1.4% to 2.6% and 4.6% to 5.7% respectively).

The application of functional assessment by FFR was low at 1.5%. The use of IVUS and OCT were also low at 3.1% and 1.2% respectively. These could be largely attributed to cost, reimbursement, as well as the lack of these facilities in participating hospitals. The use of rotational atherectomy and embolic protection devices were low at 1.0% and 0.1% respectively. [Table 4.8]

Lesion complication during PCI

Overall, post-procedural complication was low. Major dissection (type C and above) was at 1.3%, no-reflow was at 0.3% and perforation was at 0.4%. [Table 4.9]

Table 4.2 Characteristics of lesions treated by PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesions				
De novo	18,347 (95.3)	12,356 (95.1)	13,151 (94.9)	25,507 (95.0)
Restenosis (no prior stent)	19 (0.1)	19 (0.1)	18 (0.1)	37 (0.1)
Stent thrombosis	85 (0.4)	64 (0.5)	60 (0.4)	124 (0.5)
In-stent restenosis	804 (4.2)	549 (4.2)	628 (4.5)	1,177 (4.4)
Not available	74	60	64	124
Total	**19,329**	**13,048**	**13,921**	**26,969**

Table 4.3 Prevalence of lesions according to American College of Cardiology (ACC) classifications, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesions				
A	2,179 (11.4)	1,731 (13.5)	1,552 (11.3)	3,283 (12.3)
B1	5,491 (28.8)	3,494 (27.2)	4,018 (29.2)	7,512 (28.2)
B2	2,763 (14.5)	1,972 (15.3)	2,243 (16.3)	4,215 (15.8)
C	8,634 (45.3)	5,659 (44.0)	5,955 (43.3)	11,614 (43.6)
Not available	262	192	153	345
Total	**19,329**	**13,048**	**13,921**	**26,969**

Table 4.4 Prevalence of high-risk lesion type, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
[#]Types of lesions				
Ostial	1,435 (7.4)	1,167 (8.9)	942 (6.8)	2,109 (7.8)
Bifurcation	1,259 (6.5)	753 (5.8)	647 (4.6)	1,400 (5.2)
Total occlusion	1,140 (5.9)	863 (6.6)	778 (5.6)	1,641 (6.1)
CTO >3 months	1,285 (6.6)	1,030 (7.9)	1,073 (7.7)	2,103 (7.8)
Thrombus	1,085 (5.6)	761 (5.8)	704 (5.1)	1,465 (5.4)
Calcified lesion	1,160 (6.0)	1,129 (8.7)	1,141 (8.2)	2,270 (8.4)
LMS	425 (2.2)	331 (2.5)	337 (2.4)	668 (2.5)

[#]*Patients are allowed to be in more than one type of category.*

Table 4.5 Comparison of TIMI flow grade by pre and post procedure, NCVD-PCI Registry, 2013–2016

Year	TIMI flow grade	Pre-procedure	Post-procedure
		No. (%)	**No. (%)**
2013-3014	TIMI-0	2,595 (15.0)	344 (1.9)
	TIMI-1	1,553 (9.0)	85 (0.5)
	TIMI-2	4,746 (27.4)	326 (1.8)
	TIMI-3	8,407 (48.6)	16,907 (95.7)
	Not available	590	388
	Missing	1,438	1,279
	Total	**19,329**	**19,329**
2015	TIMI-0	1,975 (17.4)	257 (2.2)
	TIMI-1	847 (7.5)	60 (0.5)
	TIMI-2	2,212 (19.5)	178 (1.5)
	TIMI-3	6,287 (55.5)	11,166 (95.8)
	Not available	386	269
	Missing	1,341	1,118
	Total	**13,048**	**13,048**
2016	TIMI-0	2,135 (19.5)	311 (2.5)
	TIMI-1	848 (7.7)	64 (0.5)
	TIMI-2	2,012 (18.3)	175 (1.4)
	TIMI-3	5,978 (54.5)	12,048 (95.6)
	Not available	393	142
	Missing	2,555	1,181
	Total	**13,921**	**13,921**
2015-2016	TIMI-0	4,110 (18.4)	568 (2.3)
	TIMI-1	1,695 (7.6)	124 (0.5)
	TIMI-2	4,224 (18.9)	353 (1.5)
	TIMI-3	12,265 (55.0)	23,214 (95.7)
	Not available	779	411
	Missing	3,896	2,299
	Total	**26,969**	**26,969**

Table 4.6 Types of stents used, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**23,538**	**16,526**	**15,914**	**32,440**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	16,412 (73.3)	11,182 (74.4)	12,413 (79.3)	23,595 (76.9)
Bare metal stent	2,802 (12.5)	750 (5.0)	364 (2.3)	1,114 (3.6)
Bio-absorbable stent	294 (1.3)	184 (1.2)	144 (0.9)	328 (1.1)
Antibody coated stent	48 (0.2)	2 (0.0)	0 (0.0)	2 (0.0)
*Others	290 (1.3)	9 (0.1)	11 (0.1)	20 (0.1)
Drug eluting balloon	1,572 (7.0)	1,499 (10.0)	1,556 (9.9)	3,055 (10.0)
Bifurcated stent	70 (0.3)	14 (0.1)	9 (0.1)	23 (0.1)
Covered stent	23 (0.1)	42 (0.3)	24 (0.2)	66 (0.2)
Combo stent	891 (4.0)	1,351 (9.0)	1,136 (7.3)	2,487 (8.1)
Missing	1,136	1,493	257	1,750

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.7 Lesion characteristics for patients who have undergone PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Pre-procedure stenosis, %				
N	18,425	12,317	11,881	24,198
Mean (SD)	86.6 (11.7)	87.1 (11.7)	87.6 (12.2)	87.3 (12.0)
Median (Min – Max)	90.0 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)
Missing, No. (%)	904 (4.7)	731 (5.6)	2,040 (14.7)	2,771 (10.3)
Post-procedure stenosis, %				
N	18,529	12,462	12,284	24,746
Mean (SD)	4.2 (17.9)	4.5 (18.8)	5.5 (20.5)	5.0 (19.7)
Median (Min – Max)	0.0 (0 – 100.0)	0.0 (0 – 100.0)	0.0 (0 – 100.0)	0.0 (0 – 100.0)
Missing, No. (%)	800 (4.1)	586 (4.5)	1,637 (11.8)	2,223 (8.2)
Estimated lesion length, mm				
N	17,874	11,921	12,673	24,594
Mean (SD)	25.4 (15.7)	26.6 (16.4)	26.7 (16.7)	26.7 (16.6)
Median (Min – Max)	20.0 (1.0 – 131.0)	22.0 (1.0 – 133.0)	22.0 (1.0 – 150.0)	22.0 (1.0 – 150.0)
Missing, No. (%)	1,455 (7.5)	1,127 (8.6)	1,248 (9.0)	2,375 (8.8)
Lesion result, No. (%)				
Successful	18,669 (96.9)	12,486 (96.3)	13,357 (96.2)	25,843 (96.3)
Unsuccessful	600 (3.1)	485 (3.7)	521 (3.8)	1,006 (3.7)
Not available	60	77	43	120

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
*Stent length, mm				
N	17,590	11,925	12,643	24,568
Mean (SD)	30.2 (16.9)	31.2 (17.8)	31.5 (18.3)	31.4 (18.0)
Median (Min – Max)	25.0 (8.0 – 167.0)	26.0 (8.0 – 154.0)	26.0 (8.0 – 156.0)	26.0 (8.0 – 156.0)
Not available, No. (%)	1,739 (9.0)	1,123 (8.6)	1,278 (9.2)	2,401 (8.9)
**Stent diameter, mm				
N	17,562	11,885	12,601	24,486
Mean (SD)	2.9 (0.4)	2.9 (0.5)	3.0 (0.5)	2.9 (0.5)
Median (Min – Max)	3.0 (2.0 – 5.8)	3.0 (2.0 – 6.0)	3.0 (2.0 – 6.0)	3.0 (2.0 – 6.0)
Not available, No. (%)	1,767 (9.1)	1,163 (8.9)	1,320 (9.5)	2,483 (9.2)
Maximum balloon size used, mm				
N	17,758	12,094	12,757	24,851
Mean (SD)	3.0 (0.6)	3.1 (0.6)	3.1 (0.6)	3.1 (0.6)
Median (Min – Max)	3.0 (1.0 – 6.0)	3.0 (1.0 – 5.5)	3.0 (1.0 – 6.0)	3.0 (1.0 – 6.0)
Missing, No. (%)	1,571 (8.1)	954 (7.3)	1,164 (8.4)	2,118 (7.9)
Maximum stent/balloon deploy pressure, atm				
N	17,571	12,021	12,697	24,718
Mean (SD)	15.7 (4.4)	15.9 (4.5)	16.0 (4.5)	16.0 (4.5)
Median (Min – Max)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)
Missing, No. (%)	1,758 (9.1)	1,027 (7.9)	1,224 (8.8)	2,251 (8.3)
Direct stenting, No. (%)				
Yes	1,402 (7.5)	956 (7.4)	824 (6.0)	1,780 (6.7)
No	17,385 (92.5)	11,965 (92.6)	12,940 (94.0)	24,905 (93.3)
Not applicable	542	127	157	284
Other adjunctive procedure, No. (%)				
Yes	404 (2.4)	250 (2.0)	179 (1.3)	429 (1.7)
Ventilator	*132 (32.7)*	*81 (32.4)*	*58 (32.4)*	*139 (32.4)*
Temporary cardiac pacing wire	*79 (19.6)*	*57 (22.8)*	*46 (25.7)*	*103 (24.0)*
No	16,502 (97.6)	12,179 (98.0)	13,228 (98.7)	25,407 (98.3)
Not applicable	302	32	34	66
Missing	2,121	587	480	1,067

**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.8 Types of devices used during PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	1,106 (5.7)	676 (5.2)	586 (4.2)	1,262 (4.7)
Balloon only/POBA	2,492 (12.9)	2,089 (16.0)	1,864 (13.4)	3,953 (14.7)
Drug eluting balloon	1,457 (7.5)	1,315 (10.1)	1,408 (10.1)	2,723 (10.1)
Drug eluting stent	12,998 (67.2)	8,912 (68.3)	10,175 (73.1)	19,087 (70.8)
Cutting balloon/ scoring balloon	279 (1.4)	221 (1.7)	467 (3.4)	688 (2.6)
Coil	19 (0.1)	3 (0.0)	3 (0.0)	6 (0.0)
OCT	161 (0.8)	199 (1.5)	119 (0.9)	318 (1.2)
Mother and child	23 (0.1)	57 (0.4)	29 (0.2)	86 (0.3)
Microcatheter	884 (4.6)	755 (5.8)	795 (5.7)	1,550 (5.7)
Angiojet	26 (0.1)	15 (0.1)	11 (0.1)	26 (0.1)
IVUS	516 (2.7)	392 (3.0)	432 (3.1)	824 (3.1)
Flowire/FFR	232 (1.2)	193 (1.5)	218 (1.6)	411 (1.5)
Rotablator	182 (0.9)	143 (1.1)	131 (0.9)	274 (1.0)
Bare metal stent	2,454 (12.7)	681 (5.2)	338 (2.4)	1,019 (3.8)
Embolic protection	31 (0.2)	13 (0.1)	9 (0.1)	22 (0.1)
Others	1,742 (9.0)	572 (4.4)	167 (1.2)	739 (2.7)
Embolic protection status	**N = 31**	**N = 13**	**N = 9**	**N = 22**
Filter	10 (90.9)	7 (77.8)	5 (100.0)	12 (85.7)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	1 (9.1)	2 (22.2)	0 (0.0)	2 (14.3)
Missing	20	4	4	8

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

Table 4.9 Types of post-procedure complications, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications**				
Dissection	**324 (1.7)**	**186 (1.4)**	**171 (1.2)**	**357 (1.3)**
Flow limiting	42 (14.4)	11 (6.0)	14 (8.3)	25 (7.1)
Non-flow limiting	249 (85.6)	172 (94.0)	155 (91.7)	327 (92.9)
Not available	22	3	2	5
Missing	11	0	0	0
No-reflow	**120 (0.6)**	**35 (0.3)**	**36 (0.3)**	**71 (0.3)**
Transient	78 (69.6)	20 (58.8)	18 (60.0)	38 (59.4)
Persistent	34 (30.4)	14 (41.2)	12 (40.0)	26 (40.6)
Not available	8	1	6	7
Missing	0	0	0	0
Perforation	**49 (0.3)**	**52 (0.4)**	**65 (0.5)**	**117 (0.4)**

**Results are only showed for the number of patients who were reported to have the complications.*

In-stent restenosis (ISR)

In this present cohort, 4.4% of PCIs were ISR. A quarter of these patients presented with ACS. Among those who presented with ACS, 20.9% presented with STEMI and 79.1% presented with NSTEMI/UA. [Table 4.10]

62.9% of ISR were treated with DEB and 32.9% were treated with DES. The use of cutting or scoring balloon had increased from 12.6% to 16.5%. Similarly, there was also an increase in the use of coronary imaging in ISR (IVUS and OCT with 11.0% and 3.4% respectively). [Table 4.12]

Consistent with the previous cohort, the rate of lesion complication after ISR treatment was very low; there was no major dissection, no-reflow was at 0.1%, and perforation was at 0.4%. [Table 4.13]

Table 4.10 ACS status of in-stent restenosis PCI, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Acute coronary syndrome, No. (%)				
Yes	194 (24.1)	133 (24.2)	159 (25.3)	292 (24.8)
No	610 (75.9)	416 (75.8)	469 (74.7)	885 (75.2)
ACS type, No. (%)	**N = 194**	**N = 133**	**N = 159**	**N = 292**
STEMI	59 (30.9)	30 (23.1)	30 (19.1)	60 (20.9)
NSTEMI	58 (30.4)	53 (40.8)	85 (54.1)	138 (48.1)
UA	74 (38.7)	47 (36.2)	42 (26.8)	89 (31.0)
Not available	3	3	2	5
STEMI, No. (%)	**N = 59**	**N = 30**	**N = 30**	**N = 60**
Anterior	39 (70.9)	18 (60.0)	15 (50.0)	33 (55.0)
Non-anterior	16 (29.1)	12 (40.0)	15 (50.0)	27 (45.0)
Not available	4	0	0	0

Table 4.11 Types of stents used in the in-stent restenosis, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of stents used	**867**	**677**	**735**	**1,412**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	301 (35.4)	203 (32.2)	246 (33.5)	449 (32.9)
Bare metal stent	22 (2.6)	8 (1.3)	0 (0.0)	8 (0.6)
Bio-absorbable stent	1 (0.1)	1 (0.2)	2 (0.3)	3 (0.2)
Antibody coated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	4 (0.5)	0 (0.0)	1 (0.1)	1 (0.1)
Drug eluting balloon	511 (60.0)	392 (62.1)	466 (63.5)	858 (62.9)
Bifurcated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)
Combo stent	11 (1.3)	27 (4.3)	18 (2.5)	45 (3.3)
Missing	16	46	1	47
Total	**867**	**677**	**735**	**1,412**

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.12 Types of devices used in the in-stent restenosis, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	24 (3.0)	15 (2.7)	19 (3.0)	34 (2.9)
Balloon only/POBA	190 (23.6)	123 (22.4)	141 (22.5)	264 (22.4)
Drug eluting balloon	463 (57.6)	339 (61.7)	406 (64.6)	745 (63.3)
Drug eluting stent	249 (31.0)	169 (30.8)	208 (33.1)	377 (32.0)
Cutting balloon/scoring balloon	101 (12.6)	67 (12.2)	127 (20.2)	194 (16.5)
Coil	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	20 (2.5)	19 (3.5)	21 (3.3)	40 (3.4)
Mother and child	0 (0.0)	3 (0.5)	0 (0.0)	3 (0.3)
Microcatheter	54 (6.7)	35 (6.4)	60 (9.6)	95 (8.1)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	84 (10.4)	64 (11.7)	66 (10.5)	130 (11.0)
Flowire/FFR	12 (1.5)	15 (2.7)	11 (1.8)	26 (2.2)
Rotablator	3 (0.4)	1 (0.2)	3 (0.5)	4 (0.3)
Bare metal stent	20 (2.5)	6 (1.1)	0 (0.0)	6 (0.5)
Embolic protection	1 (0.1)	4 (0.7)	0 (0.0)	4 (0.3)
Others	56 (7.0)	7 (1.3)	6 (1.0)	13 (1.1)
Embolic protection status	**N = 1**	**N = 4**	**N = 0**	**N = 4**
Filter	0 (0.0)	3 (100.0)	0 (0.0)	3 (100.0)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	1	1	0	1

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

Table 4.13 Types of complications in post in-stent restenosis, NCVD-PCI Registry, 2013-2016

Year	2013 - 2014	2015	2016	2015 – 2016
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in ISR**				
Dissection	11 (1.4)	9 (1.6)	3 (0.5)	12 (1.0)
Flow limiting	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)
Non-flow limiting	10 (90.9)	9 (100.0)	3 (100.0)	12 (100.0)
No-reflow	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)
Transient	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Persistent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	1	0	0	0
Perforation	0 (0.0)	2 (0.4)	3 (0.5)	5 (0.4)

**Results are only showed for patients with the complications.*

PCI of left main stem (LMS)

A total of 871 cases of LMS interventions were performed in 2015 and 2016. Majority (94.2%) were de novo lesions, 0.3% were stent thrombosis and 5.3% were ISR. [Table 4.14]

Up to 37.5% of PCI to LMS were performed in patients presented with ACS, of which 47.8% were in STEMI and 52.2% were in NSTEMI/UA. A third of these patients had history of previous angioplasty. 93.0% of LMS PCI was de novo (increased from 87.2% to 93.0%). Among STEMI patients who received PCI to LMS, 50.9% were performed in the PPCI setting. [Table 4.15]

Consistent with the general trend,[3] LMS intervention via radial approach increased from 34.4% to 48.7% in this cohort. Femoral approach is no longer a default route in high-risk angioplasty including LMS intervention. Successful intervention was achieved in 97.5% of cases. [Table 4.15] with low rate of post-procedural complications (1.7% of dissection, 0.5% of no-reflow, and 0.6% of perforation). [Table 4.19]

Most LMS lesions were treated with DES (89.9%) followed by Combo stent (5.6%) and DEB (3.4%). [Table 4.17] Cutting or scoring balloon were used in 4.5% of cases. Interestingly, despite the increasing recommendation to use coronary imaging during LMS intervention, the use of IVUS (19.7%) and OCT (3.6%) had reduced compared to the earlier cohort. [Table 4.18]

In terms of dual antiplatelet therapy (DAPT) use, 93.2% of LMS intervention was prescribed DAPT for 12 months with only 2.8% receiving DAPT beyond 12 months. [Table 4.20]

Table 4.14 Types of lesions in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesion in left main stem procedure				
De novo	506 (93.7)	392 (92.7)	427 (95.7)	819 (94.2)
Restenosis (no prior stent)	1 (0.2)	0 (0.0)	1 (0.2)	1 (0.1)
Stent thrombosis	5 (0.9)	2 (0.5)	1 (0.2)	3 (0.3)
In-stent restenosis	28 (5.2)	29 (6.9)	17 (3.8)	46 (5.3)
Previous DES	*13 (86.7)*	*17 (100.0)*	*11 (100.0)*	*28 (100.0)*
Previous BMS	*2 (13.3)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Previous others	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Not available	*13*	*12*	*6*	*18*
Not available	1	0	2	2
Total	541	423	448	871

Table 4.15 Clinical presentation of left main stem, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Acute coronary syndrome, No. (%)				
Yes	157 (29.0)	160 (37.8)	167 (37.3)	327 (37.5)
No	384 (71.0)	263 (62.2)	281 (62.7)	544 (62.5)
ACS type, No. (%)	**N = 157**	**N = 160**	**N = 167**	**N = 327**
STEMI	72 (46.2)	69 (43.9)	85 (51.5)	154 (47.8)
NSTEMI	46 (29.5)	54 (34.4)	46 (27.9)	100 (31.1)
UA	38 (24.4)	34 (21.7)	34 (20.6)	68 (21.1)
Not available	1	3	2	5
Previous PCI, No. (%)				
Yes	185 (34.2)	124 (29.3)	149 (33.3)	273 (31.3)
No	356 (65.8)	299 (70.7)	299 (66.7)	598 (68.7)
Previous CABG, No. (%)				
Yes	69 (12.8)	29 (6.9)	32 (7.1)	61 (7.0)
No	472 (87.2)	394 (93.1)	416 (92.9)	810 (93.0)
PCI status, No. (%)				
Elective	418 (77.3)	314 (74.2)	341 (76.1)	655 (75.2)
NSTEMI/UA	64 (11.8)	57 (13.5)	45 (10.0)	102 (11.7)
STEMI	59 (10.9)	52 (12.3)	62 (13.8)	114 (13.1)
Elective, No. (%)	**N = 418**	**N = 314**	**N = 341**	**N = 655**
Staged PCI	198 (47.6)	164 (52.6)	166 (49.1)	330 (50.8)
Ad hoc	218 (52.4)	148 (47.4)	172 (50.9)	320 (49.2)
Not available	2	2	3	5
Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
NSTEMI/UA, No. (%)	**N = 64**	**N = 57**	**N = 45**	**N = 102**
Urgent	18 (28.6)	22 (39.3)	17 (37.8)	39 (38.6)
Non-urgent	45 (71.4)	34 (60.7)	28 (62.2)	62 (61.4)
Not available	1	1	0	1
STEMI, No. (%)	**N = 59**	**N = 52**	**N = 62**	**N = 114**
Rescue	23 (41.1)	14 (26.9)	16 (25.8)	30 (26.3)
Primary	26 (46.4)	23 (44.2)	35 (56.5)	58 (50.9)
Facilitated	0 (0.0)	2 (3.8)	1 (1.6)	3 (2.6)
Delayed routine PCI	3 (5.4)	4 (7.7)	4 (6.5)	8 (7.0)
Delayed selective PCI	3 (5.4)	2 (3.8)	3 (4.8)	5 (4.4)
Pharmacoinvasive	1 (1.8)	7 (13.5)	3 (4.8)	10 (8.8)
Not available	3	0	0	0

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Percutaneous entry, No. (%)				
Brachial	1 (0.2)	2 (0.5)	2 (0.4)	4 (0.5)
Radial	186 (34.4)	183 (43.3)	241 (53.8)	424 (48.7)
Femoral	381 (70.4)	272 (64.3)	238 (53.1)	510 (58.6)
Pre-procedure stenosis, %				
N	504	386	352	738
Mean (SD)	83.0 (13.2)	82.9 (13.8)	84.6 (13.9)	83.7 (13.9)
Median (Min – Max)	85.0 (0 – 100.0)	87.5 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)
Missing, No. (%)	37 (6.8)	37 (8.7)	96 (21.4)	133 (15.3)
Pre-procedure TIMI flow, No. (%)				
TIMI-0	39 (8.1)	28 (7.8)	39 (11.9)	67 (9.7)
TIMI-1	41 (8.5)	30 (8.4)	29 (8.8)	59 (8.6)
TIMI-2	186 (38.6)	81 (22.6)	76 (23.1)	157 (22.8)
TIMI-3	216 (44.8)	220 (61.3)	185 (56.2)	405 (58.9)
Not available	15	11	18	29
Missing	44	53	101	154
Post-procedure stenosis, %				
N	516	403	378	781
Mean (SD)	2.6 (13.4)	2.8 (15.2)	1.7 (9.9)	2.2 (12.9)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 90.0)	0 (0.0 – 100.0)
Missing, No. (%)	25 (4.6)	20 (4.7)	70 (15.6)	90 (10.3)
Post-procedure TIMI flow, No. (%)				
TIMI-0	2 (0.4)	4 (1.0)	1 (0.2)	5 (0.6)
TIMI-1	2 (0.4)	4 (1.0)	0 (0.0)	4 (0.5)
TIMI-2	9 (1.8)	2 (0.5)	6 (1.5)	8 (1.0)
TIMI-3	496 (97.4)	378 (97.4)	401 (98.3)	779 (97.9)
Not available	4	4	5	9
Missing	28	31	35	66
Estimated lesion length, mm				
N	512	390	417	807
Mean (SD)	28.7 (19.8)	31.2 (20.1)	34.1 (21.4)	32.7 (20.9)
Median (Min – Max)	21.0 (3.0 – 100.0)	25.0 (4.0 – 100.0)	30.0 (4.0 – 100.0)	27.0 (4.0 – 100.0)
Missing, No. (%)	29 (5.4)	33 (7.8)	31 (6.9)	64 (7.3)
Lesion result, No. (%)				
Successful	533 (98.5)	407 (96.7)	438 (98.2)	845 (97.5)
Unsuccessful	8 (1.5)	14 (3.3)	8 (1.8)	22 (2.5)
Not available	0	2	2	4

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
*Stent length, mm				
N	517	407	429	836
Mean (SD)	34.0 (20.5)	36.4 (21.1)	41.4 (24.1)	39.0 (22.8)
Median (Min – Max)	28.0 (8.0 – 107.0)	30.0 (8.0 – 115.0)	36.0 (8.0 – 128.0)	33.0 (8.0 – 128.0)
Not available, No. (%)	24 (4.4)	16 (3.8)	19 (4.2)	35 (4.0)
**Stent diameter, mm				
N	517	407	426	833
Mean (SD)	3.3 (0.4)	3.3 (0.4)	3.4 (0.4)	3.4 (0.4)
Median (Min – Max)	3.3 (2.3 – 4.5)	3.5 (2.3 – 4.5)	3.5 (2.0 – 5.0)	3.5 (2.0 – 5.0)
Not available, No. (%)	24 (4.4)	16 (3.8)	22 (4.9)	38 (4.4)
Direct stenting, No. (%)				
Yes	36 (6.8)	10 (2.4)	2 (0.4)	12 (1.4)
No	492 (93.2)	411 (97.6)	444 (99.6)	855 (98.6)
Not applicable	13	2	2	4

#Patients are allowed to be in more than one type of category.
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.16 TIMI flow prior to intervention in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
TIMI flow prior to intervention in left main stem procedure				
TIMI-0	39 (8.1)	28 (7.8)	39 (11.9)	67 (9.7)
TIMI-1	41 (8.5)	30 (8.4)	29 (8.8)	59 (8.6)
TIMI-2	186 (38.6)	81 (22.6)	76 (23.1)	157 (22.8)
TIMI-3	216 (44.8)	220 (61.3)	185 (56.2)	405 (58.9)
Not available	15	11	18	29
Missing	44	53	101	154

Table 4.17 Types of stents used in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**759**	**635**	**680**	**1,315**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	639 (85.4)	545 (89.1)	615 (90.6)	1,160 (89.9)
Bare metal stent	26 (3.5)	7 (1.1)	2 (0.3)	9 (0.7)
Bio-absorbable stent	1 (0.1)	2 (0.3)	3 (0.4)	5 (0.4)
Antibody coated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	4 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)
Drug eluting balloon	29 (3.9)	24 (3.9)	20 (2.9)	44 (3.4)
Bifurcated stent	2 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	1 (0.1)	0 (0.0)	1 (0.1)	1 (0.1)
Combo stent	45 (6.0)	34 (5.6)	38 (5.6)	72 (5.6)
Missing	11	23	1	24

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.18 Types of devices used in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	21 (3.9)	11 (2.6)	9 (2.0)	20 (2.3)
Balloon only/POBA	44 (8.1)	39 (9.2)	58 (12.9)	97 (11.1)
Drug eluting balloon	29 (5.4)	0 (0.0)	16 (3.6)	39 (4.5)
Drug eluting stent	444 (82.1)	359 (84.9)	396 (88.4)	755 (86.7)
Cutting balloon/scoring balloon	10 (1.8)	9 (2.1)	30 (6.7)	39 (4.5)
Coil	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	23 (4.3)	20 (4.7)	11 (2.5)	31 (3.6)
Mother and child	2 (0.4)	3 (0.7)	4 (0.9)	7 (0.8)
Microcatheter	36 (6.7)	27 (6.4)	27 (6.0)	54 (6.2)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	108 (20.0)	89 (21.0)	83 (18.5)	172 (19.7)
Flowire/FFR	7 (1.3)	11 (2.6)	8 (1.8)	19 (2.2)
Rotablator	30 (5.5)	21 (5.0)	21 (4.7)	42 (4.8)
Bare metal stent	22 (4.1)	6 (1.4)	2 (0.4)	8 (0.9)
Embolic protection	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Others	32 (5.9)	13 (3.1)	1 (0.2)	14 (1.6)

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

Table 4.19 Types of complications in post-left main stem, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in ISR**				
Dissection	16 (3.0)	7 (1.7)	8 (1.8)	15 (1.7)
Flow limiting	4 (28.6)	0 (0.0)	1 (12.5)	1 (6.7)
Non-flow limiting	10 (71.4)	7 (100.0)	7 (87.5)	14 (93.3)
Not available	1	0	0	0
Missing	1	0	0	0
No-reflow	5 (0.9)	1 (0.2)	3 (0.7)	4 (0.5)
Transient	1 (20.0)	0 (0.0)	1 (50.0)	1 (100.0)
Persistent	4 (80.0)	1 (100.0)	1 (50.0)	0 (0.0)
Not available	0	0	1	1
Missing	0	0	0	0
Perforation	1 (0.2)	2 (0.5)	3 (0.7)	5 (0.6)

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

Table 4.20 Planned duration of dual antiplatelet therapy in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Planned duration of dual antiplatelet therapy in left main stem procedure (months)				
1	17 (3.3)	6 (1.6)	6 (1.5)	12 (1.5)
3	6 (1.2)	7 (1.8)	3 (0.7)	10 (1.3)
6	12 (2.3)	4 (1.0)	6 (1.5)	10 (1.3)
12	457 (88.2)	352 (91.7)	386 (94.6)	738 (93.2)
>12	26 (5.0)	15 (3.9)	7 (1.7)	22 (2.8)
Not available	21	26	28	54
Missing	2	13	12	25

PCI to the grafts

During 2015–2016, there was an increase in the number of bypass grafts angioplasty (from 166 cases in the previous cohort to 249 cases reported in the current cohort). Most of the interventions were performed in de novo lesions (84.0%), followed by ISR (15.2%) and stent thrombosis (0.8%). [Table 4.21] The vein grafts were treated in 84.7% of cases while LIMA in 14.9% of cases. There was an increasing number of LIMA interventions perhaps due to the improved skills and techniques of the interventional cardiologists. Additionally, graft PCIs were successful in 97.2% of cases. [Table 4.22]

The grafts were frequently treated with DES (68.3%) followed by DEB (18.5%) and POBA only strategy (7.6%). The use of coronary imaging modalities such as IVUS and OCT in graft PCI was very low (0.4% and 0.8% respectively). Direct stenting was only performed in 5.2% of cases. The use of embolic protection device remained low at 7.6%. [Table 4.22]

Post-procedural lesion complications in graft PCI were very low. [Table 4.24] Dual antiplatelet therapy was prescribed for 12 months in 88.1% of cases, while 2.3% of DAPT cases were given beyond 12 months. [Table 4.25]

Table 4.21 Lesion types in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Lesion type in graft PCI				
De novo	148 (89.2)	112 (88.9)	92 (78.6)	204 (84.0)
Restenosis (no prior stent)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Stent thrombosis	0 (0.0)	1 (0.8)	1 (0.9)	2 (0.8)
In-stent restenosis	18 (10.8)	13 (10.3)	24 (20.5)	37 (15.2)
Not available	0	5	1	6

Table 4.22 Clinical presentation of graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Graft, No. (%)				
18 LIMA	15 (9.0)	27 (20.6)	10 (8.5)	37 (14.9)
19 RIMA	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
20 SVG1	135 (81.3)	95 (72.5)	103 (87.3)	198 (79.5)
21 SVG2	11 (6.6)	7 (5.3)	3 (2.5)	10 (4.0)
22 SVG3	3 (1.8)	1 (0.8)	2 (1.7)	3 (1.2)
23 RAD1	1 (0.6)	1 (0.8)	0 (0.0)	1 (0.4)
24 RAD2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
25 RAD3	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)
Pre-procedure stenosis, %				
N	150	118	77	195
Mean (SD)	86.2 (11.1)	86.3 (10.6)	89.9 (9.4)	87.7 (10.3)
Median (Min – Max)	90.0 (50.0 – 100.0)	90.0 (60.0 – 100.0)	90.0 (50.0 – 100.0)	90.0 (50.0 – 100.0)
Missing, No. (%)	16 (9.6)	13 (9.9)	41 (34.7)	54 (21.7)
Post-procedure stenosis, %				
N	154	125	92	217
Mean (SD)	3.9 (17.4)	1.9 (12.7)	3.7 (17.0)	2.7 (14.7)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)
Missing, No. (%)	12 (7.2)	6 (4.6)	26 (22.0)	32 (12.9)
Estimated lesion length, mm				
N	154	124	112	236
Mean (SD)	20.1 (12.7)	19.9 (13.0)	20.1 (13.6)	20.0 (13.3)
Median (Min – Max)	16.0 (5.0 – 90.0)	15.5 (4.0 – 93.0)	16.0 (4.0 – 90.0)	16.0 (4.0 – 93.0)
Missing, No. (%)	12 (7.2)	7 (5.3)	6 (5.1)	13 (5.2)
Lesion result, No. (%)				
Successful	161 (97.0)	129 (98.5)	113 (95.8)	242 (97.2)
Unsuccessful	5 (3.0)	2 (1.5)	5 (4.2)	7 (2.8)
*Stent length, mm				
N	155	126	110	236
Mean (SD)	24.5 (13.3)	24.0 (13.7)	24.8 (14.6)	24.4 (14.1)
Median (Min – Max)	20.0 (9.0 – 98.0)	18.0 (8.0 – 93.0)	20.0 (8.0 – 100.0)	19.0 (8.0 – 100.0)
Not available, No. (%)	11 (6.6)	5 (3.8)	8 (6.8)	13 (5.2)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
**Stent diameter, mm				
N	155	126	110	236
Mean (SD)	3.0 (0.6)	2.9 (0.5)	3.1 (0.6)	3.0 (0.5)
Median (Min – Max)	3.0 (2.0 – 4.5)	3.0 (2.0 – 4.5)	3.0 (2.0 – 5.0)	3.0 (2.0 – 5.0)
Not available, No. (%)	11 (6.6)	5 (3.8)	8 (6.8)	13 (5.2)
#Intracoronary devices				
Aspiration/aspiration catheter	9 (5.4)	8 (6.1)	7 (5.9)	15 (6.0)
Balloon only/POBA	10 (6.0)	9 (6.9)	10 (8.5)	19 (7.6)
Drug eluting balloon	26 (15.7)	19 (14.5)	27 (22.9)	46 (18.5)
Drug eluting stent	106 (63.9)	92 (70.2)	78 (66.1)	170 (68.3)
Cutting balloon/scoring balloon	2 (1.2)	4 (3.1)	5 (4.2)	9 (3.6)
Coil	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	1 (0.6)	2 (1.5)	0 (0.0)	2 (0.8)
Mother and child	1 (0.6)	1 (0.8)	0 (0.0)	1 (0.4)
Microcatheter	4 (2.4)	4 (3.1)	1 (0.8)	5 (2.0)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	2 (1.2)	0 (0.0)	1 (0.8)	1 (0.4)
Flowire/FFR	0 (0.0)	0 (0.0)	1 (0.8)	1 (0.4)
Rotablator	1 (0.6)	0 (0.0)	1 (0.8)	1 (0.4)
Bare metal stent	20 (12.0)	5 (3.8)	3 (2.5)	8 (3.2)
Embolic protection	14 (8.4)	12 (9.2)	7 (5.9)	19 (7.6)
Others	4 (2.4)	2 (1.5)	0 (0.0)	2 (0.8)
Embolic protection status	**N = 14**	**N = 12**	**N = 7**	**N = 19**
Filter	6 (100.0)	6 (75.0)	3 (100.0)	9 (81.8)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	2 (25.0)	0 (0.0)	2 (18.2)
Missing	8	4	4	8
Direct stenting, No. (%)				
Yes	19 (11.5)	7 (5.3)	6 (5.1)	13 (5.2)
No	146 (88.5)	124 (94.7)	111 (94.9)	235 (94.8)
Not applicable	1	0	1	1

#Patients are allowed to be in more than one type of category.
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.23 Types of stents used in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**190**	**157**	**135**	**292**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stent used in graft PCI				
Drug eluting stent	126 (66.3)	108 (73.5)	93 (68.9)	201 (71.3)
Bare metal stent	24 (12.6)	5 (3.4)	3 (2.2)	8 (2.8)
Bio-absorbable stent	1 (0.5)	1 (0.7)	0 (0.0)	1 (0.4)
Antibody coated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Drug eluting balloon	26 (13.7)	23 (15.6)	31 (23.0)	54 (19.1)
Bifurcated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	2 (1.1)	1 (0.7)	0 (0.0)	1 (0.4)
Combo stent	11 (5.8)	9 (6.1)	8 (5.9)	17 (6.0)
Missing	0	10	0	10
Total	190	157	135	292

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.24 Types of complications in post-left main stem, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in graft PCI**				
Dissection	1 (0.6)	3 (2.3)	0 (0.0)	3 (1.2)
Flow limiting	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Non-flow limiting	1 (100.0)	3 (100.0)	0 (0.0)	3 (100.0)
No-reflow	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.4)
Transient	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Persistent	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Perforation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

**Results are only showed for the number of patients who were reported to have the complications.*

Table 4.25 Planned duration of dual antiplatelet therapy in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Planned duration of dual antiplatelet therapy in graft PCI procedure (months)				
1	7 (4.3)	1 (0.8)	3 (3.0)	4 (1.8)
3	8 (4.9)	7 (5.9)	3 (3.0)	10 (4.6)
6	5 (3.1)	1 (0.8)	6 (6.0)	7 (3.2)
12	138 (85.2)	105 (89.0)	87 (87.0)	192 (88.1)
>12	4 (2.5)	4 (3.4)	1 (1.0)	5 (2.3)
Not available	3	9	16	25
Missing	1	4	2	6

PCI of CTO (>3 months)

A total of 2103 cases (7.8%) were CTO compared to 1285 (6.6%) in the previous cohort. Chronic total occlusion in LAD was the most frequently treated (43.7% of cases) followed by RCA (42.3%), and LCx (11.7%). The location of the CTO was mainly in the proximal segments compared to the distal segments. [Table 4.26]

As noted previously, most of the CTO cases (86.8%) were treated in elective settings which allow better planning and preparation. There was no difference in the preferred route of access (radial or femoral), and majority of cases were performed using 6F guide (86.6%) followed by 7F guide (13.0%).

The mean fluoroscopy time was 36.4 minutes and the mean contrast volume was 213.6 ml. The estimated lesion length was 44.3 mm, mean stent length was 51.3 mm and mean stent diameter was 2.8 mm. The success rate of CTO intervention in this cohort was 74.9%. [Table 4.27] Post-procedural lesion complications were approximately 5% of all CTO cases. 3.4% of cases were dissection (91.4% were non-flow limiting) and 0.7% were no-reflow. There was an increase in the number of perforations (from 0.9% to 1.3%). [Table 4.30]

Majority of CTO cases were treated with DES (82.6%) followed by DEB (11.3%). It is interesting to note that the use of DEB in treating CTO had increased compared to the previous cohort (11.3% vs 8.6%). [Table 4.28] Microcatheter was used in 48.4% of cases. However, the use of coronary imaging modalities such as IVUS and OCT were low (4.9% and 0.7% respectively). [Table 4.29]

In terms of DAPT use, most of the patients received standard 12 months DAPT regardless of the type of devices used. [Table 4.31]

Table 4.26 Summary of location of lesions treated with PCI and for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Location of lesion with CTO >3 months				
Left main stem	**21 (1.6)**	**18 (1.7)**	**21 (2.0)**	**39 (1.9)**
Left anterior descending artery (LAD)	**547 (42.6)**	**449 (43.6)**	**470 (43.8)**	**919 (43.7)**
LAD proximal	413 (32.1)	358 (34.8)	369 (34.4)	727 (34.6)
LAD mid	125 (9.7)	82 (8.0)	85 (7.9)	167 (7.9)
LAD distal	6 (0.5)	0 (0.0)	13 (1.2)	19 (0.9)
D1	3 (0.2)	2 (0.2)	3 (0.3)	5 (0.2)
D2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
D3	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.0)
Right coronary artery (RCA)	**522 (40.6)**	**429 (41.7)**	**461 (43.0)**	**890 (42.3)**
RCA proximal	280 (21.8)	242 (23.5)	251 (23.4)	493 (23.5)
RCA mid	162 (12.6)	134 (13.0)	142 (13.2)	276 (13.1)
RCA distal	66 (5.1)	40 (3.9)	53 (4.9)	93 (4.4)
PDA	7 (0.5)	6 (0.6)	5 (0.5)	11 (0.5)
PLV	7 (0.5)	7 (0.7)	10 (0.9)	17 (0.8)
Left circumflex artery (LCx)	**192 (14.9)**	**129 (12.5)**	**116 (10.8)**	**245 (11.7)**
LCX proximal	109 (8.5)	71 (6.9)	69 (6.4)	140 (6.7)
LCX distal	53 (4.1)	37 (3.6)	30 (2.8)	67 (3.2)
OM1	27 (2.1)	15 (1.5)	16 (1.5)	31 (1.5)
OM2	3 (0.2)	4 (0.4)	0 (0.0)	4 (0.2)
OM3	0 (0.0)	2 (0.2)	1 (0.1)	3 (0.1)
Graft	**3 (0.2)**	**4 (0.4)**	**5 (0.5)**	**9 (0.4)**
LIMA	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
RIMA	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
SVG1	3 (0.2)	2 (0.2)	3 (0.3)	5 (0.2)
SVG2	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
SVG3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD1	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	**0**	**1**	**0**	**1**

Table 4.27 Characteristics of PCI procedures performed for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
PCI status, No. (%)				
Elective	1,163 (90.5)	869 (84.4)	957 (89.2)	1,826 (86.8)
NSTEMI/UA	83 (6.5)	93 (9.0)	79 (7.4)	172 (8.2)
STEMI	39 (3.0)	68 (6.6)	37 (3.4)	105 (5.0)
Elective, No. (%)	**N = 1,163**	**N = 869**	**N = 957**	**N = 1,826**
Staged PCI	546 (47.2)	468 (54.0)	519 (54.3)	987 (54.1)
Ad hoc	612 (52.8)	399 (46.0)	437 (45.7)	836 (45.9)
Not available	5	2	1	3
NSTEMI/UA, No. (%)	**N = 83**	**N = 93**	**N = 79**	**N = 172**
Urgent	17 (20.5)	20 (21.7)	14 (18.4)	34 (20.2)
Non-urgent	66 (79.5)	72 (78.3)	62 (81.6)	134 (79.8)
Not available	0	1	3	4
STEMI, No. (%)	**N = 39**	**N = 68**	**N = 37**	**N = 105**
Rescue	12 (30.8)	12 (17.6)	5 (13.5)	17 (16.2)
Primary	19 (48.7)	31 (45.6)	16 (43.2)	47 (44.8)
Facilitated	0 (0.0)	3 (4.4)	3 (8.1)	6 (5.7)
Delayed routine PCI	4 (10.3)	14 (20.6)	4 (10.8)	18 (17.1)
Delayed selective PCI	3 (7.7)	8 (11.8)	6 (16.2)	14 (13.3)
Pharmacoinvasive	1 (2.6)	0 (0.0)	3 (8.1)	3 (2.9)
#Percutaneous entry, No. (%)				
Brachial	11 (0.9)	8 (0.8)	2 (0.2)	10 (0.5)
Radial	637 (49.6)	521 (50.6)	587 (54.7)	1,108 (52.7)
Femoral	798 (62.1)	634 (61.6)	648 (60.4)	1,282 (61.0)
$^French size type				
Guiding catheter	1,223 (96.4)	944 (91.7)	998 (93.1)	1,942 (92.4)
Guiding sheath	46 (3.6)	86 (8.3)	74 (6.9)	160 (7.6)
Not available	6	0	1	0
Missing	10	0	0	0
^French size (guiding catheter), No. (%)				
4	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
5	1 (0.1)	2 (0.2)	1 (0.1)	3 (0.2)
6	1,015 (83.2)	811 (85.9)	870 (87.2)	1,681 (86.6)
7	192 (15.7)	126 (13.3)	126 (12.6)	252 (13.0)
8	12 (1.0)	4 (0.4)	0 (0.0)	4 (0.2)
Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	3	0	0	0

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Closure device, No. (%)				
No	974 (81.2)	759 (78.2)	0 (0.0)	1,529 (77.9)
Seal	62 (5.2)	52 (5.4)	96 (43.0)	148 (7.5)
Suture	83 (6.9)	79 (8.1)	74 (33.2)	153 (7.8)
Exoseal	33 (2.8)	12 (1.2)	16 (7.2)	28 (1.4)
Others	47 (3.9)	69 (7.1)	37 (16.6)	106 (5.4)
Not available	9	6	6	12
Missing	77	53	74	127
#^^Extent of coronary disease, No. (%)				
Single vessel disease	811 (63.9)	671 (65.1)	685 (63.8)	1,356 (64.5)
Multiple vessel disease	413 (32.5)	325 (31.6)	366 (34.1)	691 (32.9)
Graft	34 (2.7)	29 (2.8)	14 (1.3)	43 (2.0)
Left main	11 (0.9)	5 (0.5)	8 (0.7)	13 (0.6)
Not available	16	0	0	0
Fluoroscopy time, min				
N	1,104	937	978	1,915
Mean (SD)	35.9 (23.6)	34.6 (20.5)	38.1 (23.3)	36.4 (22.1)
Median (Min – Max)	30.4 (2.5 – 158.0)	30.3 (1.3 – 133.6)	33.4 (1.4 – 176.2)	32.2 (1.3 – 176.2)
Not available, No. (%)	120 (9.3)	61 (5.9)	56 (5.2)	117 (5.6)
Missing, No. (%)	61 (4.7)	32 (3.1)	39 (3.6)	71 (3.4)
Fluoroscopy total dose, mGy				
N	653	474	484	958
Mean (SD)	55449.3 (134968.9)	74980.4 (159340.0)	130609.9 (289384.8)	103085.5 (235772.4)
Median (Min – Max)	2988.0 (1.6 – 082615.0)	3173.0 (0 – 1174140.0)	5650.0 (100.0 – 3634163.0)	4039.9 (0 – 3634163.0)
Not available, No. (%)	411 (32.0)	425 (41.3)	411 (38.3)	836 (39.8)
Missing, No. (%)	221 (17.2)	131 (12.7)	178 (16.6)	309 (14.7)
Contrast volume, ml				
N	1,088	935	981	1,916
Mean (SD)	215.7 (90.6)	213.9 (89.0)	213.4 (88.8)	213.6 (88.9)
Median (Min – Max)	200.0 (26.0 – 500.0)	200.0 (21.0 – 500.0)	200.0 (18.0 – 500.0)	200.0 (18.0 – 500.0)
Not available, No. (%)	121 (9.4)	50 (4.9)	49 (4.6)	99 (4.7)
Missing, No. (%)	76 (5.9)	45 (4.4)	43 (4.0)	88 (4.2)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Thrombolytics prior to PCI procedure in STEMI, No. (%)				
Total no. of procedures among STEMI patients	**N = 79**	**N = 106**	**N = 84**	**N = 190**
Yes	20 (25.3)	9 (8.5)	13 (15.5)	22 (11.6)
No	59 (74.7)	97 (91.5)	71 (84.5)	168 (88.4)
Pre-procedure stenosis, %				
N	1,248	1,016	1,032	2,048
Mean (SD)	98.5 (8.2)	98.5 (9.1)	98.2 (12.1)	98.3 (10.7)
Median (Min – Max)	100.0 (0 – 100.0)	100.0 (0 – 100.0)	100.0 (0 – 100.0)	100.0 (0 – 100.0)
Missing, No. (%)	37 (2.9)	14 (1.4)	41 (3.8)	55 (2.6)
Post-procedure stenosis, %				
N	1,217	992	973	1,965
Mean (SD)	22.7 (41.2)	24.4 (42.0)	29.2 (44.2)	26.7 (43.2)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)
Missing, No. (%)	68 (5.3)	38 (3.7)	100 (9.3)	138 (6.6)
Estimated lesion length, mm				
N	1,035	801	812	1,613
Mean (SD)	42.0 (23.6)	43.9 (23.7)	44.6 (24.7)	44.3 (24.2)
Median (Min – Max)	38.0 (4.0 – 130.0)	40.0 (8.0 – 132.0)	40.0 (4.0 – 150.0)	40.0 (4.0 – 150.0)
Missing, No. (%)	250 (19.5)	229 (22.2)	261 (24.3)	490 (23.3)
Lesion result, No. (%)				
Successful	1,003 (78.2)	783 (76.1)	788 (73.8)	1,571 (74.9)
Unsuccessful	280 (21.8)	246 (23.9)	280 (26.2)	526 (25.1)
Not available	2	1	5	0
*Stent length, mm				
N	970	766	771	1,537
Mean (SD)	48.9 (25.6)	50.8 (26.0)	51.7 (27.3)	51.3 (26.7)
Median (Min – Max)	44.0 (8.0 – 167.0)	48.0 (12.0 – 154.0)	46.0 (8.0 – 156.0)	48.0 (8.0 – 156.0)
Not available, No. (%)	315 (24.5)	264 (25.6)	302 (28.1)	566 (26.9)
**Stent diameter, mm				
N	965	762	764	1,526
Mean (SD)	2.8 (0.4)	2.8 (0.4)	2.8 (0.4)	2.8 (0.4)
Median (Min – Max)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)
Not available, No. (%)	320 (24.9)	268 (26.0)	309 (28.8)	577 (27.4)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Maximum balloon size used, mm				
N	1,005	821	811	1,632
Mean (SD)	2.9 (0.6)	2.9 (0.6)	3.0 (0.6)	3.0 (0.6)
Median (Min – Max)	3.0 (1.0 – 5.0)	3.0 (1.0 – 5.5)	3.0 (1.0 – 6.0)	3.0 (1.0 – 6.0)
Not available, No. (%)	280 (21.8)	209 (20.3)	262 (24.4)	471 (22.4)
Maximum stent/balloon deploy pressure, atm				
N	986	810	805	1,615
Mean (SD)	16.6 (4.6)	16.4 (4.8)	16.6 (4.9)	16.5 (4.8)
Median (Min – Max)	16.0 (2.0 – 34.0)	16.0 (4.0 – 40.0)	16.0 (2.0 – 40.0)	16.0 (2.0 – 40.0)
Not available, No. (%)	299 (23.3)	220 (21.4)	268 (25.0)	488 (23.2)

#Patients are 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 was only collected for French size 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, no11.
**In old CRF, patients were allowed to be presented in different categories. In new CRF, 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 either 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 in combination with LAD, LCx, RCA or single vessel disease).
Graft is for patients with information on graft (graft alone or in combination with LAD, LCx, RCA, single vessel disease, multiple vessel disease or LMS).
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.28 Types of stents used for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**1,709**	**1,346**	**1,286**	**2,632**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents for lesion with CTO >3 months				
Drug eluting stent	1,424 (83.5)	1,056 (80.4)	1,084 (84.8)	2,140 (82.6)
Bare metal stent	67 (3.9)	20 (1.5)	3 (0.2)	23 (0.9)
Bio-absorbable stent	13 (0.8)	8 (0.6)	8 (0.6)	16 (0.6)
Antibody coated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	21 (1.2)	1 (0.1)	0 (0.0)	1 (0.0)
Drug eluting balloon	147 (8.6)	160 (12.2)	132 (10.3)	292 (11.3)
Bifurcated stent	2 (0.1)	1 (0.1)	1 (0.1)	2 (0.1)
Covered stent	1 (0.1)	1 (0.1)	1 (0.1)	2 (0.1)
Combo stent	29 (1.7)	66 (5.0)	49 (3.8)	115 (4.4)
Missing	4	33	8	41

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.29 Types of devices used during PCI for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices used for lesion with CTO >3 months				
Aspiration/aspiration catheter	20 (1.6)	22 (2.1)	16 (1.5)	38 (1.8)
Balloon only/POBA	177 (13.8)	135 (13.1)	116 (10.8)	251 (11.9)
Drug eluting balloon	118 (9.2)	125 (12.1)	108 (10.1)	233 (11.1)
Drug eluting stent	845 (65.8)	634 (61.6)	681 (63.5)	1,315 (62.5)
Cutting balloon/scoring balloon	16 (1.2)	13 (1.3)	23 (2.1)	36 (1.7)
Coil	5 (0.4)	1 (0.1)	0 (0.0)	1 (0.0)
OCT	11 (0.9)	11 (1.1)	3 (0.3)	14 (0.7)
Mother and child	6 (0.5)	9 (0.9)	6 (0.6)	15 (0.7)
Microcatheter	467 (36.3)	478 (46.4)	539 (50.2)	1,017 (48.4)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	66 (5.1)	48 (4.7)	54 (5.0)	102 (4.9)
Flowire/FFR	7 (0.5)	7 (0.7)	1 (0.1)	8 (0.4)
Rotablator	19 (1.5)	18 (1.7)	9 (0.8)	27 (1.3)
Bare metal stent	59 (4.6)	16 (1.6)	3 (0.3)	19 (0.9)
Embolic protection	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Others	145 (11.3)	33 (3.2)	30 (2.8)	63 (3.0)
Embolic protection status	**N = 1**	**N = 0**	**N = 0**	**N = 0**
Filter	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	1	0	0	0

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

Table 4.30 Types of post-procedure complications for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2007–2014

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of complication for lesion with CTO >3 months**				
Dissection	55 (4.3)	39 (3.8)	33 (3.1)	72 (3.4)
Flow limiting	4 (7.7)	2 (5.3)	4 (12.1)	6 (8.5)
Non-flow limiting	48 (92.3)	36 (94.7)	29 (87.9)	65 (91.5)
Not available	2	1	0	1
Missing	1	0	0	0
No-reflow	16 (1.2)	5 (0.5)	9 (0.8)	14 (0.7)
Transient	5 (33.3)	2 (40.0)	4 (57.1)	6 (50.0)
Persistent	10 (66.7)	3 (60.0)	3 (42.9)	6 (50.0)
Not available	1	0	2	2
Perforation	12 (0.9)	14 (1.4)	13 (1.2)	27 (1.3)

**Results are only showed for the number of patients who were reported to have the complications.*

Table 4.31 Duration of thienopyridine in patients who underwent PCI and lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	Duration of clopidogrel/ ticlopidine (months)	#Intracoronary devices used		
		Balloon only/POBA	Drug eluting stent	Bare metal stent
		No. (%)	No. (%)	No. (%)
2013-3014	1	24 (16.1)	5 (0.6)	15 (27.8)
	3	7 (4.7)	6 (0.7)	1 (1.9)
	6	5 (3.4)	13 (1.6)	3 (5.6)
	12	108 (72.5)	784 (95.0)	33 (61.1)
	>12	5 (3.4)	17 (2.1)	2 (3.7)
	Not available	24	11	4
	Missing	4	9	1
	Total	**177**	**845**	**59**
2015	1	2 (1.7)	8 (1.3)	5 (35.7)
	3	9 (7.4)	2 (0.3)	2 (14.3)
	6	4 (3.3)	6 (1.0)	1 (7.1)
	12	105 (86.8)	582 (95.4)	6 (42.9)
	>12	1 (0.8)	12 (2.0)	0 (0.0)
	Not available	11	17	2
	Missing	3	7	0
	Total	**135**	**634**	**16**
2016	1	3 (2.9)	3 (0.5)	0 (0.0)
	3	0 (0.0)	6 (0.9)	1 (50.0)
	6	3 (2.9)	3 (0.5)	0 (0.0)
	12	96 (93.2)	621 (97.3)	1 (50.0)
	>12	1 (1.0)	5 (0.8)	0 (0.0)
	Not available	7	24	1
	Missing	1	19	0
	Total	**111**	**681**	**3**
2015-2016	1	5 (2.2)	11 (0.9)	5 (31.3)
	3	14 (6.1)	8 (0.6)	3 (18.8)
	6	7 (3.1)	9 (0.7)	1 (6.3)
	12	201 (87.8)	1,203 (96.4)	7 (43.8)
	>12	2 (0.9)	17 (1.4)	0 (0.0)
	Not available	18	41	3
	Missing	4	26	0
	Total	**251**	**1,315**	**19**

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

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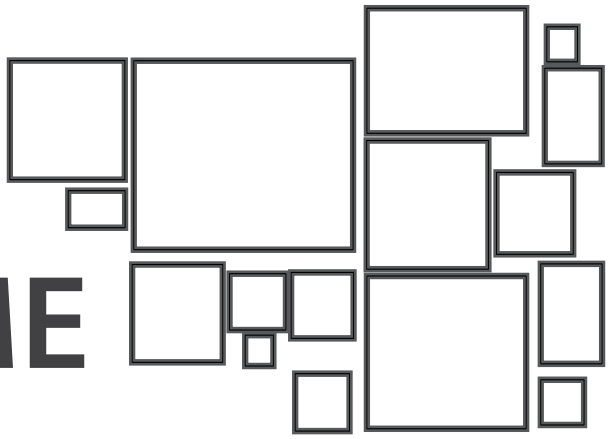
OUTCOME



OUTCOME

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Summary

1. Overall in-hospital mortality in the period of 1st Jan 2015–31st Dec 2016 was low (2.0%): at 30 days (2.8%); at 6 months (4.7%); and at 1 year (6.8%). Mortality increased at 6 months and 1 year during 2015–2016 compared to the previous cohort (2013–2014).

2. Incidences of peri-procedural complications were low (0–0.5%).

3. The in-hospital and 30-day mortality prognostic factors were being elderly (>60 years old), ACS as presentation, status of PCI (urgent > electives), clinical presentation (Killip III/IV and low ejection fraction), previous history of MI, and patient with multi-vessel disease.

There was an increase in the trend of mortality at 6 months (4.7% vs 3.2%) and 1 year (6.8% vs 3.5%) for 2015–2016 compared to the 2013–2014 cohort. This observation was seen mainly in the elderly age group (>60 years old), [Table 5.3] female gender, [Table 5.4] and those with pre-morbid condition of diabetes mellitus, [Table 5.5] hypertension [Table 5.6] and dyslipidaemia. [Table 5.7] However, the mortality trends between these two cohorts were similar for in-hospital stay and after discharge. [Table 5.2]

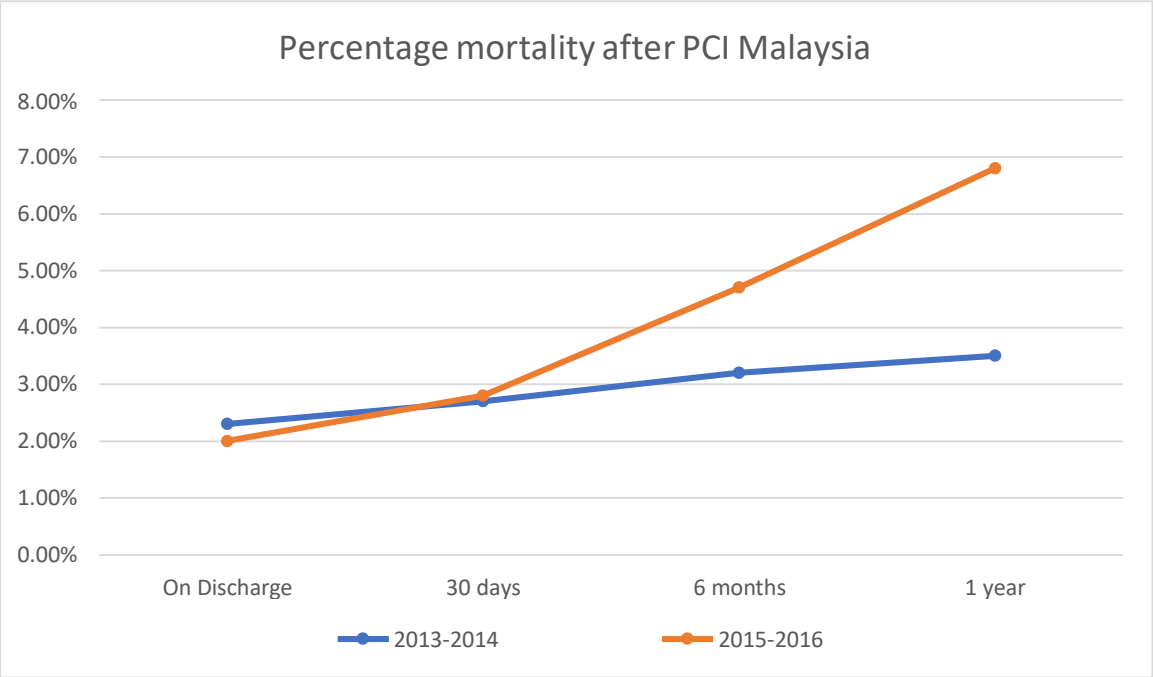


Figure 1: Comparison of mortality after PCI (in percentage) between two cohorts (2013–2014 and 2015–2016)

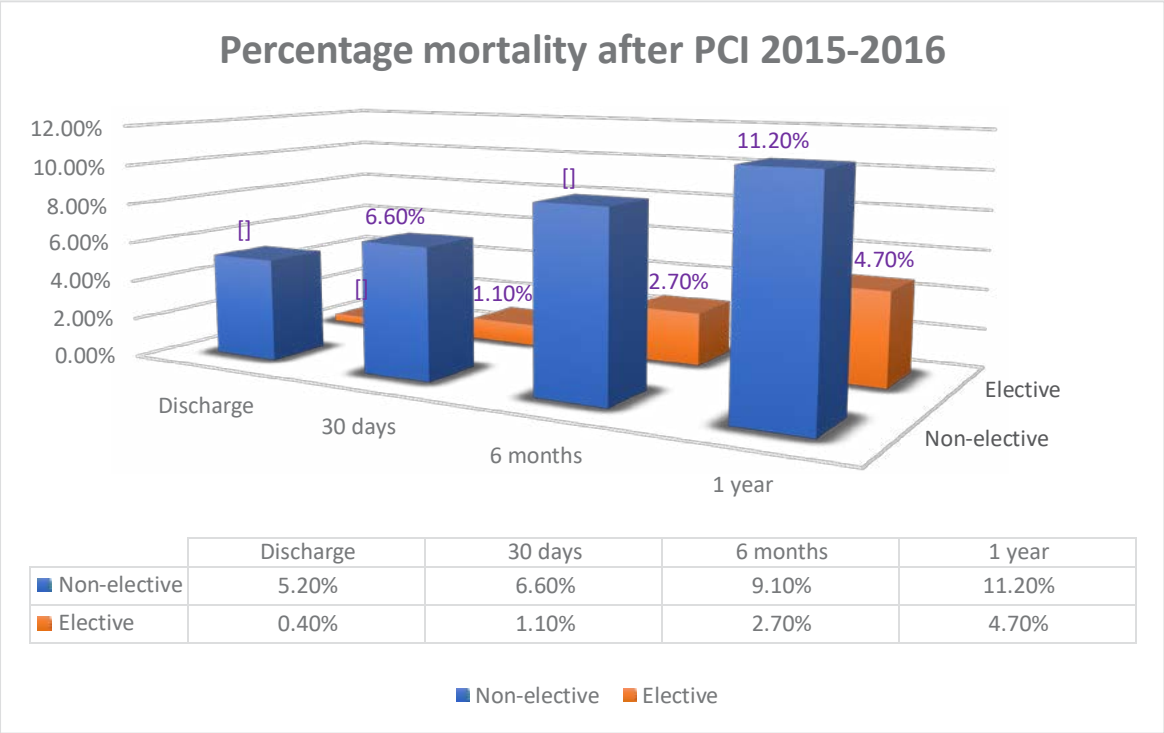
Most of the in-hospital mortality (89.2%) was cardiac-related deaths. [Table 5.11] 13.2% of deaths occurred in the catheterisation laboratory and the remaining 86.8% of deaths occurred out of catheterisation laboratory. [Table 5.12] A similar trend was observed in the previous cohort (2013–2014).

In the ACS group, mortality was higher in STEMI followed by NSTEMI and UA. In comparison to the previous cohort (2013–2014), the present cohort had lower mortality rates (STEMI: 5.7% vs 8.1%; NSTEMI: 2.3% vs 3.4%; UA: 0.6% vs 1.2%). [Table 5.9]

The incidences of post-procedural complications were low (0–0.5%): peri-procedural MI (0.4%), cardiogenic shock (0.5%), stroke (0.0%), arrhythmia (0.5%), and new renal impairment (0.4%). With increasing number of procedures via radial approach, bleeding complications and pseudoaneurysm appeared to reduce by 50%. Emergency re-intervention decreased from 0.8% to 0.3%. Bail out coronary artery bypass graft (CABG) was extremely low, with five patients in total. [Table 5.1]

For elective PCI, compared to the previous cohort (2013–2014), in-hospital mortality and mortality was similar (0.4% vs 0.5%), and 30-day mortality was 1.1% vs 0.8%; however, 6-month and 1-year mortality appeared to be higher (2.7% vs 1.3%); and (4.7% vs 1.6%) respectively.

Non-elective PCI had higher mortality compared to elective PCI (5.2% vs 0.4% in hospital; 6.6% vs 1.1% at 30 days; 9.1% vs 2.7% at 6 months and 11.2% vs 4.7% at 1 year). Compared to the previous cohort, the in-hospital and 30-day mortality was lower for both elective and non-elective PCI, however at 6 months and 1 year, the mortality was higher.



	Discharge	30 days	6 months	1 year
Non-elective	5.20%	6.60%	9.10%	11.20%
Elective	0.40%	1.10%	2.70%	4.70%

Figure 2: Comparison of mortality between elective PCI and non-elective PCI (in percentage) 2015–2016

More than 80% of patients were given aspirin or clopidogrel at discharge similar to the previous cohort. The number of patients prescribed with ticagrelor, statin, beta blocker and angiotensin converting enzyme (ACE) inhibitor increased compared to the previous cohort (2013–2014). DAPT use at 6 months and 1 year were reduced compared to the previous cohort.

Table 5.1 Summary of in-hospital outcome for patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Periprocedural MI, No. (%) (based on clinical diagnosis) /Significant periprocedural MI, No. (%)				
Yes	105 (0.7)	48 (0.5)	34 (0.3)	82 (0.4)
No	15,230 (98.9)	10,269 (99.2)	11,016 (99.4)	21,285 (99.3)
Not available	68 (0.4)	34 (0.3)	38 (0.3)	72 (0.3)
Missing	111	46	53	99
Emergency reintervention/PCI, No. (%)				
Yes	116 (0.8)	41 (0.4)	22 (0.2)	63 (0.3)
No	15,287 (99.2)	10,309 (99.6)	11,069 (99.8)	21,378 (99.7)
Missing	111	47	50	97
Bail-out CABG, No. (%)				
Yes	3 (0.0)	2 (0.0)	3 (0.0)	5 (0.0)
No	15,386 (100.0)	10,347 (100.0)	11,087 (100.0)	21,434 (100.0)
Missing	125	48	51	99
Other complications				
Cardiogenic shock (after procedure), No. (%)				
Yes	93 (0.6)	53 (0.5)	50 (0.5)	103 (0.5)
No	15,309 (99.4)	10,299 (99.5)	11,041 (99.5)	21,340 (99.5)
Missing	112	45	50	95
Arrhythmia (VT/VF/Brady), No. (%)				
Yes	119 (0.8)	62 (0.6)	46 (0.4)	108 (0.5)
No	15,283 (99.2)	10,288 (99.4)	11,045 (99.6)	21,333 (99.5)
Missing	112	47	50	97
TIA/Stroke, No. (%)				
Yes	8 (0.1)	5 (0.0)	1 (0.0)	6 (0.0)
No	15,399 (99.9)	10,347 (100.0)	11,088 (100.0)	21,435 (100.0)
Missing	107	45	52	97
Tamponade, No. (%)				
Yes	2 (0.0)	1 (0.0)	4 (0.0)	5 (0.0)
No	15,397 (100.0)	10,348 (100.0)	11,085 (100.0)	21,433 (100.0)
Missing	115	48	52	100
Contrast reaction, No. (%)				
Yes	11 (0.1)	5 (0.0)	5 (0.0)	10 (0.0)
No	15,390 (99.9)	10,342 (100.0)	11,084 (100.0)	21,426 (100.0)
Missing	113	50	52	102
New onset/worsened heart failure, No. (%)				
Yes	25 (0.2)	10 (0.1)	12 (0.1)	22 (0.1)
No	15,376 (99.8)	10,340 (99.9)	11,078 (99.9)	21,418 (99.9)
Missing	113	47	51	98

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
New renal impairment, No. (%)				
Yes	81 (0.5)	51 (0.5)	30 (0.3)	81 (0.4)
No	15,311 (99.4)	10,278 (99.3)	11,029 (99.5)	21,307 (99.4)
Not available	12 (0.1)	21 (0.2)	30 (0.3)	51 (0.2)
Missing	110	47	52	99
Vascular complications				
Bleeding, No. (%)				
Yes	28 (0.2)	20 (0.2)	8 (0.1)	28 (0.1)
No	15,373 (99.8)	10,327 (99.8)	11,082 (99.9)	21,409 (99.9)
Missing	113	50	51	101
Type of bleeding, No. (%)				
Total no. of procedures who had bleeding	N = 28	N = 20	N = 8	N = 28
Major	2 (8.0)	1 (6.3)	1 (14.3)	2 (8.7)
Minor	4 (16.0)	5 (31.3)	2 (28.6)	7 (30.4)
Minimal	19 (76.0)	10 (62.5)	4 (57.1)	14 (60.9)
Not available	2	2	0	2
Missing	1	2	1	3
Bleeding site, No. (%)				
Total no. of procedures who had bleeding	N = 28	N = 20	N = 8	N = 28
Retroperitoneal	2 (10.0)	1 (12.5)	0 (0.0)	1 (6.7)
Percutaneous entry site	15 (75.0)	2 (25.0)	3 (42.9)	5 (33.3)
Others	3 (15.0)	5 (62.5)	4 (57.1)	9 (60.0)
Not available	7	8	1	9
Missing	1	4	0	4
Access site occlusion, No. (%)				
Yes	1 (0.0)	8 (0.1)	4 (0.0)	12 (0.1)
No	15,394 (100.0)	10,345 (99.9)	11,088 (100.0)	21,433 (99.9)
Missing	119	44	49	93
Loss of radial pulse, No. (%)				
Yes	1 (0.0)	2 (0.0)	1 (0.0)	3 (0.0)
No	15,399 (100.0)	10,352 (100.0)	11,089 (100.0)	21,441 (100.0)
Missing	114	43	51	94
Dissection, No. (%)				
Yes	7 (0.0)	8 (0.1)	17 (0.2)	25 (0.1)
No	15,391 (100.0)	10,345 (99.9)	11,074 (99.8)	21,419 (99.9)
Missing	116	44	50	94
Pseudoaneurysm, No. (%)				
Yes	12 (0.1)	5 (0.0)	4 (0.0)	9 (0.0)
No	15,379 (99.9)	10,342 (100.0)	11,088 (100.0)	21,430 (100.0)
Missing	123	50	49	99

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of procedures	**15,514**	**10,397**	**11,141**	**21,538**
Management of pseudoaneurysm, No. (%)				
Total no. of procedures who had pseudoaneurysm	N = 12	N = 5	N = 4	N = 9
Ultrasound compression	4 (50.0)	2 (50.0)	0 (0.0)	2 (28.6)
Surgery	1 (12.5)	2 (50.0)	0 (0.0)	2 (28.6)
Others	3 (37.5)	0 (0.0)	3 (100.0)	3 (42.9)
Not available	3	1	1	2
Missing	1	0	0	0
Perforation, No. (%)				
Yes	1 (0.0)	3 (0.0)	5 (0.0)	8 (0.0)
No	13,813 (100.0)	10,133 (100.0)	11,047 (100.0)	21,180 (100.0)
Missing	1,700	261	89	350

Table 5.2 Overall outcome of patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge	**30-day	***6-month	****1-year
		No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	320 (2.3)	382 (2.7)	449 (3.2)	500 (3.5)
	Alive	13,816 (97.7)	13,754 (97.3)	13,687 (96.8)	13,636 (96.5)
	Missing	0	0	0	0
	Total	**14,136**	**14,136**	**14,136**	**14,136**
2015	Death	199 (2.1)	273 (2.9)	454 (4.9)	634 (6.8)
	Alive	9,228 (97.9)	9,069 (97.1)	8,888 (95.1)	8,708 (93.2)
	Missing#	1	86	86	86
	Total	**9,428**	**9,428**	**9,428**	**9,428**
2016	Death	184 (1.8)	276 (2.8)	456 (4.6)	672 (6.7)
	Alive	9,882 (98.2)	9,702 (97.2)	9,522 (95.4)	9,306 (93.3)
	Missing#	0	88	88	88
	Total	**10,066**	**10,066**	**10,066**	**10,066**
2015-2016	Death	383 (2.0)	549 (2.8)	910 (4.7)	1,306 (6.8)
	Alive	19,110 (98.0)	18,771 (97.2)	18,410 (95.3)	18,014 (93.2)
	Missing#	1	174	174	174
	Total	**19,494**	**19,494**	**19,494**	**19,494**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.3 Overall outcome for patients who underwent PCI, by age group (years), NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge			**30-day			***6-month			****1-year		
		Young	Middle-aged	Elderly	Young	Middle-aged	Elderly	Young	Middle-aged	Elderly	Young	Middle-aged	Elderly
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	9 (1.2)	126 (1.7)	185 (3.2)	11 (1.5)	148 (2.0)	223 (3.8)	12 (1.6)	169 (2.2)	268 (4.6)	16 (2.2)	189 (2.5)	295 (5.0)
	Alive	720 (98.8)	7,438 (98.3)	5,658 (96.8)	718 (98.5)	7,416 (98.0)	5,620 (96.2)	717 (98.4)	7,395 (97.8)	5,575 (95.4)	713 (97.8)	7,375 (97.5)	5,548 (95.0)
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**729**	**7,564**	**5,843**	**729**	**7,564**	**5,843**	**729**	**7,564**	**5,843**	**729**	**7,564**	**5,843**
2015	Death	7 (1.4)	78 (1.6)	114 (2.9)	10 (2.0)	105 (2.1)	158 (4.0)	16 (3.2)	178 (3.6)	260 (6.6)	23 (4.6)	248 (5.0)	363 (9.3)
	Alive	502 (98.6)	4,901 (98.4)	3,825 (97.1)	493 (98.0)	4,823 (97.9)	3,753 (96.0)	487 (96.8)	4,750 (96.4)	3,651 (93.4)	480 (95.4)	4,680 (95.0)	3,548 (90.7)
	Missing#	0	0	1	6	51	29	6	51	29	6	51	29
	Total	**509**	**4,979**	**3,940**	**509**	**4,979**	**3,940**	**509**	**4,979**	**3,940**	**509**	**4,979**	**3,940**
2016	Death	6 (1.1)	58 (1.1)	120 (2.9)	8 (1.4)	101 (1.9)	167 (4.0)	14 (2.5)	154 (2.9)	288 (6.9)	24 (4.3)	229 (4.3)	419 (10.1)
	Alive	556 (98.9)	5,274 (98.9)	4,052 (97.1)	550 (98.6)	5,167 (98.1)	3,985 (96.0)	544 (97.5)	5,114 (97.1)	3,864 (93.1)	534 (95.7)	5,039 (95.7)	3,733 (89.9)
	Missing#	0	0	0	4	64	20	4	64	20	4	64	20
	Total	**562**	**5,332**	**4,172**	**562**	**5,332**	**4,172**	**562**	**5,332**	**4,172**	**562**	**5,332**	**4,172**
2015-2016	Death	13 (1.2)	136 (1.3)	234 (2.9)	18 (1.7)	206 (2.0)	325 (4.0)	30 (2.8)	332 (3.3)	548 (6.8)	47 (4.4)	477 (4.7)	782 (9.7)
	Alive	1,058 (98.8)	10,175 (98.7)	7,877 (97.1)	1,043 (98.3)	9,990 (98.0)	7,738 (96.0)	1,031 (97.2)	9,864 (96.7)	7,515 (93.2)	1,014 (95.6)	9,719 (95.3)	7,281 (90.3)
	Missing#	0	0	1	10	115	49	10	115	49	10	115	49
	Total	**1,071**	**10,311**	**8,112**	**1,071**	**10,311**	**8,112**	**1,071**	**10,311**	**8,112**	**1,071**	**10,311**	**8,112**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patient.
Note: Young is defined as age from 20 to less than 40 years, middle-aged is defined as age between 40 and less than 60 years and elderly is defined as 60 years and above.

Table 5.4 Overall outcome for patients who underwent PCI, by gender, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge		**30-day		***6-month		****1-year	
		Male	Female	Male	Female	Male	Female	Male	Female
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	249 (2.1)	71 (3.1)	302 (2.6)	80 (3.5)	355 (3.0)	94 (4.1)	398 (3.4)	102 (4.4)
	Alive	11,569 (97.9)	2,247 (96.9)	11,516 (97.4)	2,238 (96.5)	11,463 (97.0)	2,224 (95.9)	11,420 (96.6)	2,216 (95.6)
	Missing	0	0	0	0	0	0	0	0
	Total	**11,818**	**2,318**	**11,818**	**2,318**	**11,818**	**2,318**	**11,818**	**2,318**
2015	Death	164 (2.1)	35 (2.2)	223 (2.9)	50 (3.2)	355 (4.6)	99 (6.2)	486 (6.3)	148 (9.3)
	Alive	7,664 (97.9)	1,564 (97.8)	7,533 (97.1)	1,536 (96.8)	7,401 (95.4)	1,487 (93.8)	7,270 (93.7)	1,438 (90.7)
	Missing#	0	1	72	14	72	14	72	14
	Total	**7,828**	**1,600**	**7,828**	**1,600**	**7,828**	**1,600**	**7,828**	**1,600**
2016	Death	144 (1.7)	40 (2.4)	209 (2.5)	67 (4.1)	336 (4.0)	120 (7.3)	516 (6.2)	156 (9.4)
	Alive	8,258 (98.3)	1,624 (97.6)	8,118 (97.5)	1,584 (95.9)	7,991 (96.0)	1,531 (92.7)	7,811 (93.8)	1,495 (90.6)
	Missing#	0	0	75	13	75	13	75	13
	Total	**8,402**	**1,664**	**8,402**	**1,664**	**8,402**	**1,664**	**8,402**	**1,664**
2015-2016	Death	308 (1.9)	75 (2.3)	432 (2.7)	117 (3.6)	691 (4.3)	219 (6.8)	1,002 (6.2)	304 (9.4)
	Alive	15,922 (98.1)	3,188 (97.7)	15,651 (97.3)	3,120 (96.4)	15,392 (95.7)	3,018 (93.2)	15,081 (93.8)	2,933 (90.6)
	Missing#	0	1	147	27	147	27	147	27
	Total	**16,230**	**3,264**	**16,230**	**3,264**	**16,230**	**3,264**	**16,230**	**3,264**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.5 Overall outcome for patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge			**30-day			***6-month			****1-year		
		Diabetic	Non-diabetic	Not known	Diabetic	Non-diabetic	Not known	Diabetic	Non-diabetic	Not known	Diabetic	Non-diabetic	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	152 (2.5)	111 (1.6)	57 (6.1)	181 (2.9)	140 (2.0)	61 (6.5)	216 (3.5)	169 (2.4)	64 (6.8)	243 (3.9)	192 (2.7)	65 (6.9)
	Alive	6,006 (97.5)	6,927 (98.4)	883 (93.9)	5,977 (97.1)	6,898 (98.0)	879 (93.5)	5,942 (96.5)	6,869 (97.6)	876 (93.2)	5,915 (96.1)	6,846 (97.3)	875 (93.1)
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**6,158**	**7,038**	**940**	**6,158**	**7,038**	**940**	**6,158**	**7,038**	**940**	**6,158**	**7,038**	**940**
2015	Death	105 (2.5)	70 (1.5)	24 (5.4)	152 (3.6)	94 (2.0)	27 (6.2)	266 (6.3)	155 (3.3)	33 (7.5)	383 (9.0)	212 (4.5)	39 (8.9)
	Alive	4,161 (97.5)	4,648 (98.5)	419 (94.6)	4,086 (96.4)	4,572 (98.0)	411 (93.8)	3,972 (93.7)	4,511 (96.7)	405 (92.5)	3,855 (91.0)	4,454 (95.5)	399 (91.1)
	Missing#	1	0	0	29	52	5	29	52	5	29	52	5
	Total	**4,267**	**4,718**	**443**	**4,267**	**4,718**	**443**	**4,267**	**4,718**	**443**	**4,267**	**4,718**	**443**
2016	Death	84 (1.8)	73 (1.5)	27 (5.2)	148 (3.3)	98 (2.0)	30 (5.8)	260 (5.8)	156 (3.1)	40 (7.8)	396 (8.8)	227 (4.6)	49 (9.5)
	Alive	4,458 (98.2)	4,934 (98.5)	490 (94.8)	4,358 (96.7)	4,859 (98.0)	485 (94.2)	4,246 (94.2)	4,801 (96.9)	475 (92.2)	4,110 (91.2)	4,730 (95.4)	466 (90.5)
	Missing#	0	0	0	36	50	2	36	50	2	36	50	2
	Total	**4,542**	**5,007**	**517**	**4,542**	**5,007**	**517**	**4,542**	**5,007**	**517**	**4,542**	**5,007**	**517**
2015-2016	Death	189 (2.1)	143 (1.5)	51 (5.3)	300 (3.4)	192 (2.0)	57 (6.0)	526 (6.0)	311 (3.2)	73 (7.7)	779 (8.9)	439 (4.6)	88 (9.2)
	Alive	8,619 (97.9)	9,582 (98.5)		8,444 (96.6)	9,431 (98.0)		8,218 (94.0)	9,312 (96.8)		7,965 (91.1)	9,184 (95.4)	
	Missing#	1	0	0	65	102	7	65	102	7	65	102	7
	Total	**8,809**	**9,725**	**960**	**8,809**	**9,725**	**960**	**8,809**	**9,725**	**960**	**8,809**	**9,725**	**960**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.6 Overall outcome of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge			**30-day			***6-month			****1-year		
		Hypertensive	Non-hypertensive	Not known	Hypertensive	Non-hypertensive	Not known	Hypertensive	Non-hypertensive	Not known	Hypertensive	Non-hypertensive	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	194 (2.0)	67 (1.7)	59 (7.4)	241 (2.5)	80 (2.1)	61 (7.6)	294 (3.1)	92 (2.4)	63 (7.9)	332 (3.5)	104 (2.7)	64 (8.0)
	Alive	9,285 (98.0)	3,790 (98.3)	741 (92.6)	9,238 (97.5)	3,777 (97.9)	739 (92.4)	9,185 (96.9)	3,765 (97.6)	737 (92.1)	9,147 (96.5)	3,753 (97.3)	736 (92.0)
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**9,479**	**3,857**	**800**	**9,479**	**3,857**	**800**	**9,479**	**3,857**	**800**	**9,479**	**3,857**	**800**
2015	Death	126 (2.0)	52 (2.0)	21 (5.4)	173 (2.7)	75 (2.9)	25 (6.5)	310 (4.9)	114 (4.4)	30 (7.8)	451 (7.1)	148 (5.7)	35 (9.1)
	Alive	6,265 (98.0)	2,595 (98.0)	368 (94.6)	6,170 (97.3)	2,541 (97.1)	358 (93.5)	6,033 (95.1)	2,502 (95.6)	353 (92.2)	5,892 (92.9)	2,468 (94.3)	348 (90.9)
	Missing#	1	0	0	49	31	6	49	31	6	49	31	6
	Total	**6,392**	**2,647**	**389**	**6,392**	**2,647**	**389**	**6,392**	**2,647**	**389**	**6,392**	**2,647**	**389**
2016	Death	117 (1.7)	39 (1.4)	28 (6.3)	188 (2.8)	57 (2.1)	31 (7.0)	334 (4.9)	82 (3.0)	40 (9.0)	510 (7.5)	116 (4.3)	46 (10.4)
	Alive	6,767 (98.3)	2,697 (98.6)	418 (93.7)	6,643 (97.2)	2,647 (97.9)	412 (93.0)	6,497 (95.1)	2,622 (97.0)	403 (91.0)	6,321 (92.5)	2,588 (95.7)	397 (89.6)
	Missing#	0	0	0	53	32	3	53	32	3	53	32	3
	Total	**6,884**	**2,736**	**446**	**6,884**	**2,736**	**446**	**6,884**	**2,736**	**446**	**6,884**	**2,736**	**446**
2015-2016	Death	243 (1.8)	91 (1.7)	49 (5.9)	361 (2.7)	132 (2.5)	56 (6.8)	644 (4.9)	196 (3.7)	70 (8.5)	961 (7.3)	264 (5.0)	81 (9.8)
	Alive	13,032 (98.2)	5,292 (98.3)	786 (94.1)	12,813 (97.3)	5,188 (97.5)	770 (93.2)	12,530 (95.1)	5,124 (96.3)	756 (91.5)	12,213 (92.7)	5,056 (95.0)	745 (90.2)
	Missing#	1	0	0	102	63	9	102	63	9	102	63	9
	Total	**13,276**	**5,383**	**835**	**13,276**	**5,383**	**835**	**13,276**	**5,383**	**835**	**13,276**	**5,383**	**835**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.7 Overall outcome of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge			**30-day			***6-month			****1-year		
		Dyslipidaemia	Non-dyslipidaemia	Not known	Dyslipidaemia	Non-dyslipidaemia	Not known	Dyslipidaemia	Non-dyslipidaemia	Not known	Dyslipidaemia	Non-dyslipidaemia	Not known
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	110 (1.3)	121 (2.8)	89 (6.8)	149 (1.8)	141 (3.2)	92 (7.0)	192 (2.3)	164 (3.8)	93 (7.1)	223 (2.6)	183 (4.2)	94 (7.2)
	Alive	8,364 (98.7)	4,230 (97.2)	1,222 (93.2)	8,325 (98.2)	4,210 (96.8)	1,219 (93.0)	8,282 (97.7)	4,187 (96.2)	1,218 (92.9)	8,251 (97.4)	4,168 (95.8)	1,217 (92.8)
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**8,474**	**4,351**	**1,311**	**8,474**	**4,351**	**1,311**	**8,474**	**4,351**	**1,311**	**8,474**	**4,351**	**1,311**
2015	Death	86 (1.6)	77 (2.4)	36 (4.7)	126 (2.4)	103 (3.2)	44 (5.8)	217 (4.1)	182 (5.6)	55 (7.3)	325 (6.1)	239 (7.4)	70 (9.3)
	Alive	5,303 (98.4)	3,196 (97.6)	729 (95.3)	5,218 (97.6)	3,141 (96.8)	710 (94.2)	5,127 (95.9)	3,062 (94.4)	699 (92.7)	5,019 (93.9)	3,005 (92.6)	684 (90.7)
	Missing#	1	0	0	46	29	11	46	29	11	46	29	11
	Total	**5,390**	**3,273**	**765**	**5,390**	**3,273**	**765**	**5,390**	**3,273**	**765**	**5,390**	**3,273**	**765**
2016	Death	72 (1.4)	72 (1.8)	40 (5.1)	122 (2.3)	103 (2.6)	51 (6.6)	225 (4.3)	169 (4.3)	62 (8.0)	342 (6.5)	252 (6.4)	78 (10.1)
	Alive	5,220 (98.6)	3,924 (98.2)	738 (94.9)	5,128 (97.7)	3,850 (97.4)	724 (93.4)	5,025 (95.7)	3,784 (95.7)	713 (92.0)	4,908 (93.5)	3,701 (93.6)	697 (89.9)
	Missing#	0	0	0	42	43	3	42	43	3	42	43	3
	Total	**5,292**	**3,996**	**778**	**5,292**	**3,996**	**778**	**5,292**	**3,996**	**778**	**5,292**	**3,996**	**778**
2015-2016	Death	158 (1.5)	149 (2.0)	76 (4.9)	248 (2.3)	206 (2.9)	95 (6.2)	442 (4.2)	351 (4.9)	117 (7.7)	667 (6.3)	491 (6.8)	148 (9.7)
	Alive	10,523 (98.5)	7,120 (98.0)	1,467 (95.1)	10,346 (97.7)	6,991 (97.1)	1,434 (93.8)	10,152 (95.8)	6,846 (95.1)	1,412 (92.3)	9,927 (93.7)	6,706 (93.2)	1,381 (90.3)
	Missing#	1	0	0	88	72	14	88	72	14	88	72	14
	Total	**10,682**	**7,269**	**1,543**	**10,682**	**7,269**	**1,543**	**10,682**	**7,269**	**1,543**	**10,682**	**7,269**	**1,543**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.8 Overall outcome of patients who underwent PCI, by PCI status, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge		**30-day		***6-month		****1-year	
		Elective	Non-elective	Elective	Non-elective	Elective	Non-elective	Elective	Non-elective
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	51 (0.5)	269 (7.5)	87 (0.8)	295 (8.2)	132 (1.3)	317 (8.8)	164 (1.6)	336 (9.4)
	Alive	10,503 (99.5)	3,313 (92.5)	10,467 (99.2)	3,287 (91.8)	10,422 (98.7)	3,265 (91.2)	10,390 (98.4)	3,246 (90.6)
	Missing	0	0	0	0	0	0	0	0
	Total	**10,554**	**3,582**	**10,554**	**3,582**	**10,554**	**3,582**	**10,554**	**3,582**
2015	Death	29 (0.5)	170 (5.6)	72 (1.1)	201 (6.7)	179 (2.8)	275 (9.2)	299 (4.7)	335 (11.2)
	Alive	6,383 (99.5)	2,845 (94.4)	6,274 (98.9)	2,795 (93.3)	6,167 (97.2)	2,721 (90.8)	6,047 (95.3)	2,661 (88.8)
	Missing#	1	0	67	19	67	19	67	19
	Total	**6,413**	**3,015**	**6,413**	**3,015**	**6,413**	**3,015**	**6,413**	**3,015**
2016	Death	30 (0.4)	154 (4.9)	72 (1.1)	204 (6.5)	171 (2.5)	285 (9.1)	320 (4.7)	352 (11.2)
	Alive	6,877 (99.6)	3,005 (95.1)	6,771 (98.9)	2,931 (93.5)	6,672 (97.5)	2,850 (90.9)	6,523 (95.3)	2,783 (88.8)
	Missing#	0	0	64	24	64	24	64	24
	Total	**6,907**	**3,159**	**6,907**	**3,159**	**6,907**	**3,159**	**6,907**	**3,159**
2015-2016	Death	59 (0.4)	324 (5.2)	144 (1.1)	405 (6.6)	350 (2.7)	560 (9.1)	619 (4.7)	687 (11.2)
	Alive	13,260 (99.6)	5,850 (94.8)	13,045 (98.9)	5,726 (93.4)	12,839 (97.3)	5,571 (90.9)	12,570 (95.3)	5,444 (88.8)
	Missing#	1	0	131	43	131	43	131	43
	Total	**13,320**	**6,174**	**13,320**	**6,174**	**13,320**	**6,174**	**13,320**	**6,174**

**The outcome data was derived from the National Death Register data.*
***Including patients who died in-hospital.*
****Including patients who died in-hospital and at 30 days.*
*****Including patients who died in-hospital, at 30 days, and six months.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.9 Overall outcome of patients who underwent PCI, by ACS, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Discharge				**30-day				***6-month				****1-year			
		STEMI	NSTEMI	UA	Not available	STEMI	NSTEMI	UA	Not available	STEMI	NSTEMI	UA	Not available	STEMI	NSTEMI	UA	Not available
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	226 (8.1)	39 (3.4)	10 (1.2)	1 (1.4)	246 (8.8)	47 (4.1)	16 (1.9)	1 (1.4)	262 (9.4)	55 (4.8)	22 (2.6)	1 (1.4)	281 (10.1)	57 (5.0)	25 (2.9)	1 (1.4)
	Alive	2,568 (91.9)	1,099 (96.6)	850 (98.8)	72 (98.6)	2,548 (91.2)	1,091 (95.9)	844 (98.1)	72 (98.6)	2,532 (90.6)	1,083 (95.2)	838 (97.4)	72 (98.6)	2,513 (89.9)	1,081 (95.0)	835 (97.1)	72 (98.6)
	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**2,794**	**1,138**	**860**	**73**	**2,794**	**1,138**	**860**	**73**	**2,794**	**1,138**	**860**	**73**	**2,794**	**1,138**	**860**	**73**
2015	Death	136 (6.0)	27 (2.7)	6 (0.9)	2 (6.7)	153 (6.8)	40 (4.1)	11 (1.7)	3 (10.7)	197 (8.7)	74 (7.5)	21 (3.2)	4 (14.3)	233 (10.3)	96 (9.8)	30 (4.6)	4 (14.3)
	Alive	2,144 (94.0)	960 (97.3)	660 (99.1)	28 (93.3)	2,107 (93.2)	941 (95.9)	647 (98.3)	25 (89.3)	2,063 (91.3)	907 (92.5)	637 (96.8)	24 (85.7)	2,027 (89.7)	885 (90.2)	628 (95.4)	24 (85.7)
	Missing#	0	0	1	0	20	6	9	2	20	6	9	2	20	6	9	2
	Total	**2,280**	**987**	**667**	**30**	**2,280**	**987**	**667**	**30**	**2,280**	**987**	**667**	**30**	**2,280**	**987**	**667**	**30**
2016	Death	132 (5.4)	20 (1.8)	1 (0.2)	0 (0.0)	176 (7.3)	30 (2.8)	5 (1.0)	0 (0.0)	224 (9.3)	65 (6.0)	16 (3.3)	1 (4.2)	275 (11.4)	89 (8.2)	32 (6.5)	4 (16.7)
	Alive	2,298 (94.6)	1,068 (98.2)	494 (99.8)	24 (100.0)	2,237 (92.7)	1,053 (97.2)	486 (99.0)	24 (100.0)	2,189 (90.7)	1,018 (94.0)	475 (96.7)	23 (95.8)	2,138 (88.6)	994 (91.8)	459 (93.5)	20 (83.3)
	Missing#	0	0	0	0	17	5	4	0	17	5	4	0	17	5	4	0
	Total	**2,430**	**1,088**	**495**	**24**	**2,430**	**1,088**	**495**	**24**	**2,430**	**1,088**	**495**	**24**	**2,430**	**1,088**	**495**	**24**
2015-2016	Death	268 (5.7)	47 (2.3)	7 (0.6)	2 (3.7)	329 (7.0)	70 (3.4)	16 (1.4)	3 (5.8)	421 (9.0)	139 (6.7)	37 (3.2)	5 (9.6)	508 (10.9)	185 (9.0)	62 (5.4)	8 (15.4)
	Alive	4,442 (94.3)	2,028 (97.7)	1,154 (99.4)	52 (96.3)	4,344 (93.0)	1,994 (96.6)	1,133 (98.6)	49 (94.2)	4,252 (91.0)	1,925 (93.3)	1,112 (96.8)	47 (90.4)	4,165 (89.1)	1,879 (91.0)	1,087 (94.6)	44 (84.6)
	Missing#	0	0	1	0	37	11	13	2	37	11	13	2	37	11	13	2
	Total	**4,710**	**2,075**	**1,162**	**54**	**4,710**	**2,075**	**1,162**	**54**	**4,710**	**2,075**	**1,162**	**54**	**4,710**	**2,075**	**1,162**	**54**

**The outcome data was derived from the National Death Register data.*

***Including patients who died in-hospital.*

****Including patients who died in-hospital and at 30 days.*

*****Including patients who died in-hospital, at 30 days, and six months.*

#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.

Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.10 Medication at discharge for patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#*Medication				
Aspirin	12,412 (89.8)	8,147 (88.3)	8,590 (86.9)	16,737 (87.6)
Clopidogrel	11,330 (82.0)	7,365 (79.8)	7,949 (80.4)	15,314 (80.1)
Ticlopidine	156 (1.1)	88 (1.0)	59 (0.6)	147 (0.8)
**Dual antiplatelet	12,936 (91.5)	8,899 (96.4)	9,389 (95.0)	18,288 (95.7)
Statin	11,975 (86.6)	8,455 (91.6)	8,922 (90.3)	17,377 (90.9)
Beta blocker	9,340 (67.6)	6,591 (71.4)	7,025 (71.1)	13,616 (71.2)
ACE inhibitor	6,634 (48.0)	5,148 (55.8)	5,543 (56.1)	10,691 (55.9)
ARB	1,287 (9.3)	812 (8.8)	818 (8.3)	1,630 (8.5)
Warfarin	146 (1.1)	109 (1.2)	99 (1.0)	208 (1.1)
Prasugrel	105 (0.8)	63 (0.7)	35 (0.4)	98 (0.5)
Ticagrelor	1,277 (9.2)	1,395 (15.1)	1,393 (14.1)	2,788 (14.6)
Others	7,530 (54.5)	4,927 (53.4)	5,490 (55.6)	10,417 (54.5)

**Available for those who were alive.*
***Dual antiplatelet defined as the use of a P2Y12 receptor inhibitor (clopidogrel, ticlopidine, ticagrelor or prasugrel) or aspirin.*
#Patients were allowed to be in more than one type of category.

Table 5.11 Cause of death of patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Cause of death				
Cardiac	247 (90.8)	160 (87.9)	147 (90.7)	307 (89.2)
Renal	4 (1.5)	1 (0.5)	0 (0.0)	1 (0.3)
Other	13 (4.8)	12 (6.6)	11 (6.8)	23 (6.7)
Infection	4 (1.5)	7 (3.8)	3 (1.9)	10 (2.9)
Neurological	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Vascular	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Pulmonary	4 (1.5)	2 (1.1)	1 (0.6)	3 (0.9)
Non-cardiac	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	5	3	1	4
Missing	43	14	21	35
Total	**320**	**199**	**184**	**383**

Table 5.12 Location of death of patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of patients	**14,136**	**9,428**	**10,066**	**19,494**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Location of death				
In lab	33 (12.5)	22 (12.2)	23 (14.3)	45 (13.2)
Out of lab	232 (87.5)	159 (87.8)	138 (85.7)	297 (86.8)
Not available	5	0	1	1
Missing	50	18	22	40
Total	**320**	**199**	**184**	**383**

Table 5.13 Outcome at discharge of patients who developed cardiogenic shock peri-procedure, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Cardiogenic shock peri-procedure		
		Yes	No	Missing
		No. (%)	No. (%)	No. (%)
2013-3014	Death	76 (85.4)	242 (1.7)	2 (2.0)
	Alive	13 (14.6)	13,703 (98.3)	100 (98.0)
	Missing	0	0	0
	Total	**89**	**13,945**	**102**
2015	Death	36 (72.0)	163 (1.7)	0 (0.0)
	Alive	14 (28.0)	9,174 (98.3)	40 (100.0)
	Missing#	0	0	1
	Total	**50**	**9,337**	**41**
2016	Death	38 (77.6)	145 (1.5)	1 (2.3)
	Alive	11 (22.4)	9,828 (98.5)	43 (97.7)
	Missing#	0	0	0
	Total	**49**	**9,973**	**44**
2015-2016	Death	74 (74.7)	308 (1.6)	1 (1.2)
	Alive	25 (25.3)	19,002 (98.4)	83 (98.8)
	Missing#	0	0	1
	Total	**99**	**19,310**	**85**

**The outcome data was derived from the National Death Register data.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.14 Outcome at discharge, by post-PCI TIMI flow, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Post-PCI TIMI flow					
		0	1	2	3	Not available	Missing
		No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	17 (4.9)	8 (9.4)	28 (8.6)	297 (1.8)	17 (4.4)	28 (2.2)
	Alive	327 (95.1)	77 (90.6)	298 (91.4)	16,610 (98.2)	371 (95.6)	1,251 (97.8)
	Missing	0	0	0	0	0	0
	Total	**344**	**85**	**326**	**16,907**	**388**	**1,279**
2015	Death	15 (5.8)	14 (23.3)	22 (12.4)	175 (1.6)	5 (1.9)	31 (2.8)
	Alive	242 (94.2)	46 (76.7)	156 (87.6)	10,989 (98.4)	264 (98.1)	1,087 (97.2)
	Missing#	0	0	0	2	0	0
	Total	**257**	**60**	**178**	**11,166**	**269**	**1,118**
2016	Death	15 (4.8)	7 (10.9)	20 (11.4)	146 (1.2)	8 (5.6)	26 (2.2)
	Alive	296 (95.2)	57 (89.1)	155 (88.6)	11,902 (98.8)	134 (94.4)	1,155 (97.8)
	Missing#	0	0	0	0	0	0
	Total	**311**	**64**	**175**	**12,048**	**142**	**1,181**
2015-2016	Death	30 (5.3)	21 (16.9)	42 (11.9)	321 (1.4)	13 (3.2)	57 (2.5)
	Alive	538 (94.7)	103 (83.1)	311 (88.1)	22,891 (98.6)	398 (96.8)	2,242 (97.5)
	Missing#	0	0	0	2	0	0
	Total	**568**	**124**	**353**	**23,214**	**411**	**2,299**

**The outcome data was derived from the National Death Register data.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.15 Outcome at discharge, by contrast volume used, NCVD-PCI Registry, 2013–2016

Year	*Outcome	Contrast volume, ml			
		≥300	<300	Not available	Missing
		No. (%)	No. (%)	No. (%)	No. (%)
2013-3014	Death	19 (2.7)	231 (2.0)	37 (3.9)	33 (3.7)
	Alive	676 (97.3)	11,361 (98.0)	921 (96.1)	858 (96.3)
	Missing	0	0	0	0
	Total	**695**	**11,592**	**958**	**891**
2015	Death	10 (2.5)	165 (2.0)	17 (3.8)	7 (1.5)
	Alive	390 (97.5)	7,948 (98.0)	434 (96.2)	456 (98.5)
	Missing#	0	1	0	0
	Total	**400**	**8,114**	**451**	**463**
2016	Death	9 (2.3)	149 (1.7)	10 (2.4)	16 (3.1)
	Alive	380 (97.7)	8,596 (98.3)	408 (97.6)	498 (96.9)
	Missing#	0	0	0	0
	Total	**389**	**8,745**	**418**	**514**
2015-2016	Death	19 (2.4)	314 (1.9)	27 (3.1)	23 (2.4)
	Alive	770 (97.6)	16,544 (98.1)	842 (96.9)	954 (97.6)
	Missing#	0	1	0	0
	Total	**789**	**16,859**	**869**	**977**

**The outcome data was derived from the National Death Register data.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.16 Summary of 30-day readmission status of patients who underwent PCI, NCVD-PCI Registry, 2013–2016 (N = total no. of procedures for 30-day follow-up)

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of procedures	**4,570**	**5,948**	**6,245**	**12,193**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Readmission, No. (%)				
Yes	234 (5.5)	453 (8.3)	374 (6.9)	827 (7.6)
No	4,003 (94.5)	4,988 (91.7)	5,062 (93.1)	10,050 (92.4)
Missing	333	507	809	1,316
Readmission reason, No. (%)				
Non-cardiac	26 (14.4)	58 (15.9)	24 (8.3)	82 (12.5)
CHF	9 (5.0)	12 (3.3)	5 (1.7)	17 (2.6)
Recurrent angina	18 (9.9)	35 (9.6)	23 (7.9)	58 (8.9)
Arrhythmia	0 (0.0)	2 (0.5)	2 (0.7)	4 (0.6)
ACS	16 (8.8)	25 (6.8)	24 (8.3)	49 (7.5)
STEMI	*6 (46.2)*	*2 (10.0)*	*11 (45.8)*	*13 (29.5)*
NSTEMI	*4 (30.8)*	*8 (40.0)*	*5 (20.8)*	*13 (29.5)*
UA	*3 (23.1)*	*10 (50.0)*	*8 (33.3)*	*18 (40.9)*
Not available	*2*	*2*	*0*	*2*
Missing	*1*	*3*	*0*	*3*
Staged revascularisation	112 (61.9)	233 (63.8)	212 (73.1)	445 (67.9)
PCI	*103 (97.2)*	*217 (98.6)*	*202 (98.5)*	*419 (98.6)*
CABG	*3 (2.8)*	*3 (1.4)*	*3 (1.5)*	*6 (1.4)*
Not available	*1*	*1*	*4*	*5*
Missing	*5*	*12*	*3*	*15*
Not available	31	66	69	135
Missing	22	22	15	37
Total	**234**	**453**	**374**	**827**

Table 5.17 Procedural complications and clinical outcomes, according to PCI status, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014			2015			2016			2015 – 2016		
Total no. of patients	14,136			9,428			10,066			19,494		
*Complications and clinical outcomes	Elective	NSTEMI /UA	STEMI	Elective	NSTEMI /UA	STEMI	Elective	NSTEMI /UA	STEMI	Elective	NSTEMI /UA	STEMI
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Procedural complications												
Periprocedural MI/ Significant periprocedural MI	34 (0.3)	16 (1.3)	42 (1.6)	13 (0.2)	8 (0.8)	22 (1.1)	11 (0.2)	5 (0.5)	18 (0.9)	24 (0.2)	13 (0.6)	40 (1.0)
Emergency reintervention/PCI	37 (0.4)	16 (1.3)	52 (2.0)	16 (0.3)	8 (0.8)	14 (0.7)	10 (0.1)	3 (0.3)	8 (0.4)	26 (0.2)	11 (0.5)	22 (0.6)
Stent thrombosis	6 (17.6)	1 (7.1)	5 (10.0)	4 (25.0)	5 (62.5)	4 (33.3)	5 (55.6)	0 (0.0)	2 (25.0)	9 (36.0)	5 (55.6)	6 (30.0)
Dissection	1 (3.0)	0 (0.0)	1 (2.0)	0 (0.0)	1 (14.3)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)	1 (4.8)	1 (12.5)	0 (0.0)
Cardiac perforation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.6)
Coronary perforation	1 (3.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
New ischaemia	2 (5.9)	1 (9.1)	7 (14.3)	7 (50.0)	3 (50.0)	4 (40.0)	1 (14.3)	1 (100.0)	2 (25.0)	8 (38.1)	4 (57.1)	6 (33.3)
Reinfarction	0 (0.0)	2 (16.7)	1 (2.0)	0 (0.0)	1 (14.3)	0 (0.0)	2 (28.6)	1 (50.0)	1 (12.5)	2 (9.5)	2 (22.2)	1 (5.6)
Cardiac tamponade	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Bail-out CABG	2 (0.0)	0 (0.0)	0 (0.0)	2 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.2)	1 (0.0)	2 (0.0)	2 (0.1)	1 (0.0)
Cardiogenic shock	11 (0.1)	5 (0.4)	68 (2.7)	12 (0.2)	5 (0.5)	33 (1.7)	9 (0.1)	6 (0.5)	34 (1.7)	21 (0.2)	11 (0.5)	67 (1.7)
Arrhythmia	20 (0.2)	7 (0.5)	85 (3.3)	20 (0.3)	5 (0.5)	34 (1.8)	13 (0.2)	3 (0.3)	28 (1.4)	33 (0.2)	8 (0.4)	62 (1.6)
TIA/stroke	2 (0.0)	1 (0.1)	4 (0.2)	2 (0.0)	0 (0.0)	3 (0.2)	0 (0.0)	1 (0.1)	0 (0.0)	2 (0.0)	1 (0.0)	3 (0.1)
Tamponade	0 (0.0)	0 (0.0)	2 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	2 (0.0)	2 (0.2)	0 (0.0)	2 (0.0)	3 (0.1)	0 (0.0)
Contrast reaction	9 (0.1)	2 (0.2)	0 (0.0)	3 (0.0)	1 (0.1)	1 (0.1)	3 (0.0)	1 (0.1)	0 (0.0)	6 (0.0)	2 (0.1)	1 (0.0)
New onset/worsen heart failure	3 (0.0)	1 (0.1)	19 (0.7)	2 (0.0)	0 (0.0)	8 (0.4)	1 (0.0)	4 (0.4)	7 (0.3)	3 (0.0)	4 (0.2)	15 (0.4)
New renal impairment	41 (0.4)	12 (0.9)	25 (1.0)	24 (0.4)	6 (0.6)	13 (0.7)	12 (0.2)	6 (0.5)	6 (0.3)	36 (0.3)	12 (0.6)	19 (0.5)
Bleeding	10 (0.1)	5 (0.4)	11 (0.4)	8 (0.1)	3 (0.3)	8 (0.4)	2 (0.0)	0 (0.0)	6 (0.3)	10 (0.1)	3 (0.1)	14 (0.4)
Access site occlusion	1 (0.0)	0 (0.0)	0 (0.0)	5 (0.1)	2 (0.2)	1 (0.1)	1 (0.0)	2 (0.2)	1 (0.0)	6 (0.0)	4 (0.2)	2 (0.1)
Loss of distal/radial pulse	1 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.0)	1 (0.0)	1 (0.0)
Dissection	5 (0.0)	1 (0.1)	1 (0.0)	4 (0.1)	1 (0.1)	1 (0.1)	10 (0.1)	2 (0.2)	1 (0.0)	14 (0.1)	3 (0.1)	2 (0.1)
Pseudoaneurysm	9 (0.1)	0 (0.0)	2 (0.1)	2 (0.0)	0 (0.0)	1 (0.1)	2 (0.0)	1 (0.1)	0 (0.0)	4 (0.0)	1 (0.0)	1 (0.0)
Vascular perforation	1 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	2 (0.2)	0 (0.0)	3 (0.0)	1 (0.1)	1 (0.0)	4 (0.0)	3 (0.1)	1 (0.0)

Table 5.18 Heart rate at presentation vs outcome, NCVD-PCI Registry, 2013–2016

Year	Heart rate at presentation (beats/minute)	*Outcome		
		Death	Alive	Missing#
		No. (%)	No. (%)	No. (%)
2013-3014	<90	114 (43.3)	10,328 (84.9)	0 (0.0)
	≥90	149 (56.7)	1,837 (15.1)	0 (0.0)
	Missing	57	1,651	0
	Total	**320**	**13,816**	**0**
2015	<90	60 (37.3)	6,759 (83.7)	1 (100.0)
	≥90	101 (62.7)	1,321 (16.3)	0 (0.0)
	Missing	38	1,148	0
	Total	**199**	**9,228**	**1**
2016	<90	62 (43.1)	7,666 (84.5)	0 (0.0)
	≥90	82 (56.9)	1,409 (15.5)	0 (0.0)
	Missing	40	807	0
	Total	**184**	**9,882**	**0**
2015-2016	<90	122 (40.0)	14,425 (84.1)	1 (100.0)
	≥90	183 (60.0)	2,730 (15.9)	0 (0.0)
	Missing	78	1,955	0
	Total	**383**	**19,110**	**1**

**The outcome data was derived from the National Death Register data.*
#For foreigner and incomplete identification (NRIC), mortality status cannot be matched with the National Death Register.
Note: Patients with the status "transferred to other centre" and "lost to follow-up" were categorised as "alive" patients.

Table 5.19 Heart rate at presentation vs length of stay, NCVD-PCI Registry, 2013–2016

Year	Length of stay	Heart rate at presentation (beats/minute)		
		<90	≥90	Missing
		No. (%)	No. (%)	No. (%)
2013-3014	**N**	**10,322**	**1,837**	**1,651**
	Mean (SD)	4.9 (14.8)	6.0 (16.6)	4.7 (13.7)
	Median (Min – Max)	4.0 (1.0 – 375.0)	4.0 (1.0 – 513.0)	3.0 (1.0 – 371.0)
	Missing, No. (%)	3 (0.0)	0 (0.0)	0 (0.0)
2015	**N**	**6,724**	**1,394**	**1,164**
	Mean (SD)	4.3 (4.8)	5.6 (7.1)	4.7 (5.8)
	Median (Min – Max)	3.0 (1.0 – 100.0)	4.0 (1.0 – 99.0)	3.0 (1.0 – 74.0)
	Missing, No. (%)	96 (1.4)	28 (2.0)	22 (1.9)
2016	**N**	**7,621**	**1,465**	**828**
	Mean (SD)	4.2 (4.4)	5.2 (6.8)	4.5 (5.8)
	Median (Min – Max)	3.0 (1.0 – 96.0)	4.0 (1.0 – 99.0)	3.0 (1.0 – 64.0)
	Missing, No. (%)	107 (1.4)	26 (1.7)	19 (2.2)
2015-2016	**N**	**14,345**	**2,859**	**1,992**
	Mean (SD)	4.3 (4.6)	5.4 (6.9)	4.6 (5.8)
	Median (Min – Max)	3.0 (1.0 – 100.0)	4.0 (1.0 – 99.0)	3.0 (1.0 – 74.0)
	Missing, No. (%)	203 (1.4)	54 (1.9)	41 (2.0)

Table 5.20 Prognostic factors for in-hospital mortality among patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Factor	2013 – 2014 Total no. of patients = 14,136					2015 – 2016 Total no. of patients = 19,494				
	N	Adjusted hazard ratio	95% CI		*p-value	N	Adjusted hazard ratio	95% CI		*p-value
Age						19,494	1.05	1.02	1.08	0.001
Gender										
Male (ref)	11,816	1.00								
Female	2,317	1.66	0.79	3.48	0.177					
PCI status										
Elective (ref)	10,551	1.00				13,320	1.00			
NSTEMI/UA	1,221	3.04	1.09	8.52	0.034	2,175	3.97	1.51	10.44	0.005
AMI/STEMI	2,361	4.20	1.64	10.77	0.003	3,999	3.72	1.54	8.97	0.003
****Diabetes mellitus**										
No (ref)										
Yes										
****Hypertension**										
No (ref)										
Yes										
Killip class										
I&II (ref)	5,939	1.00				10,748	1.00			
III&IV	550	2.97	1.47	6.02	0.002	703	7.59	4.05	14.22	<0.001
Smoking status										
Never (ref)										
Former smokers										
Current smokers										
Left ventricular ejection fraction										
<30	259	4.21	1.47	12.01	0.007	420	13.53	4.19	43.72	<0.001
30 – 50	2,105	1.68	0.66	4.30	0.278	3,370	4.36	1.43	13.32	<0.001
>50 (ref)	2,675	1.00				3,699	1.00			
Serum creatinine >200 µmol/L										
No (ref)	11,447	1.00								
Yes	616	3.42	1.64	7.11	0.001					

**using Cox regression with backward stepwise variable selection.*
***The "No" category in these variables included the "Not known" category.*

Table 5.21a Prognostic factors for 30-days mortality among patients who underwent PCI, NCVD-PCI Registry, 2013–2016

Factor	2013 – 2014 Total no. of patients = 14,136					2015 – 2016 Total no. of patients = 19,494				
	N	Adjusted hazard ratio	95% CI		*p-value	N	Adjusted hazard ratio	95% CI		*p-value
Age group										
20 – <40 (ref)	235	1.00				1,071	1.00			
40 – <60	2,327	0.71	0.16	3.21	0.653	10,311	1.62	0.94	2.79	0.083
≥60	1,651	1.52	0.34	6.79	0.584	8,112	3.30	1.92	5.67	0.000
Gender^										
Male (ref)										
Female										
PCI status										
Elective (ref)	3,189	1.00				13,320	1.00			
NSTEMI/UA	307	2.33	0.84	6.47	0.103	2,175	2.84	2.01	4.02	<0.001
AMI/STEMI	717	1.52	0.63	3.65	0.352	3,999	4.44	3.31	5.96	<0.001
****Myocardial infarction history**										
No (ref)	2,638	1.00				16,707	1.00			
Yes	1,575	0.44	0.18	1.05	0.066	2,787	0.59	0.41	0.84	0.003
Killip class										
I&II (ref)	2,120	1.00				10,748	1.00			
III&IV	114	4.22	1.69	10.55	0.002	703	7.78	6.34	9.55	<0.001
Heart rate^										
<40										
40 – <60										
60 – <80 (ref)										
80 – <100										
≥100										
Extent of coronary artery disease										
Single vessel disease (ref)	2,832	1.00				12,862	1.00			
Multi vessels disease	1,189	1.76	0.83	3.73	0.137	5,851	1.15	0.93	1.40	0.191
Left main/LMS	128	2.02	0.44	9.32	0.369	514	2.79	1.99	3.90	<0.001
Graft	31	20.64	2.39	178.01	0.006	263	0.53	0.07	3.82	0.531
Left ventricular ejection fraction^										
<30										
30 – 50										
>50 (ref)										

Factor	2013 – 2014 Total no. of patients = 14,136					2015 – 2016 Total no. of patients = 19,494				
	N	Adjusted hazard ratio	95% CI		*p-value	N	Adjusted hazard ratio	95% CI		*p-value
Serum creatinine >200 µmol/L^										
No (ref)										
Yes										
****Cerebrovascular disease**										
No (ref)	4,068	1.00				19,020	1.00			
Yes	145	1.14	0.25	5.10	0.865	474	1.23	0.76	1.97	0.400
Previous PCI										
No (ref)	3,238	1.00				16,094	1.00			
Yes	975	0.85	0.29	2.50	0.771	3,400	0.79	0.55	1.12	0.187

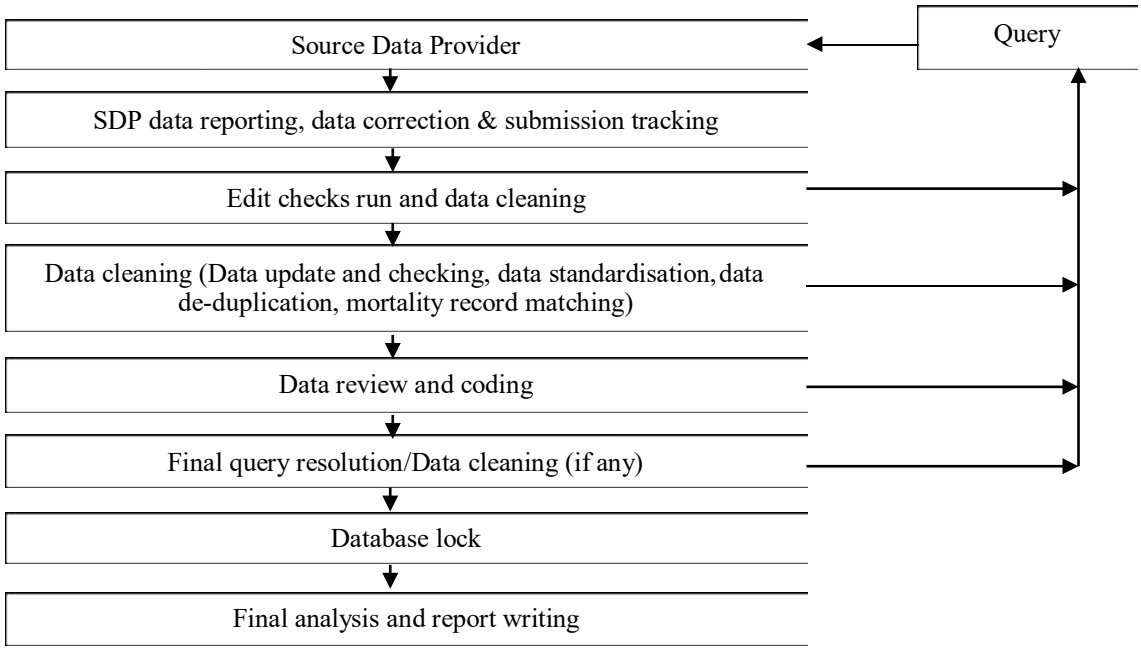
*using Cox regression with forced model analysis.
**The "No" category in these variables included the "Not known" category.
^Variables were not included in the variables selection method for the 2015–2016 analysis.

APPENDIX A: DATA MANAGEMENT

The National Cardiovascular Disease Database (NCVD) Registry maintains two different databases for cardiovascular diseases, i.e. for Acute Coronary Syndrome and Percutaneous Coronary Intervention. Data is stored in SQL Server due to the high volume of data accumulated throughout the years.

Data sources
Source Data Providers (SDPs) of NCVD-PCI registry comprises of all major hospitals who have participated in the registry, throughout Malaysia.

Data flow process
This section describes the data management flow process of the National Cardiovascular Disease Database.



SDP data reporting, data correction and submission tracking
Data reporting by SDP is done via web applications e-Case Report Forms (eCRF).

There are a number of data security features that are designed into the NCVD web application (eCRF) such as web owner authentication, two-level user authentication (user name and password authentication and a Short Messaging System (SMS) of authorisation code through mobile phone authentication), access control, data encryption, session management to automatically log off the application, audit trail and data backup and disaster recovery plan.

For PCI, SDP submits a NCVD-PCI notification form on an ad-hoc basis whenever a procedure is performed. SDP also submits follow-up data at 30-day, 6-month and 12-month post-notification date intervals. An alert page containing all the overdue submissions for follow-up at 30-day, 6-month and 12-month post-notification date is available to users to ease submissions tracking.

Prior to registering a patient record, a verification process is done by using the search functionality to search if the patient already exists in the entire registry. The application will still detect a duplicate record if the same MyKad number is keyed in, should the step of searching of a patient is left out. This step is done to avoid duplicate records. For patients whose records already exist in the database, SDP needs

only to add a new PCI notification with basic patient particulars pre-filled, based on existing patient information in the database. The PCI and ACS registries share the same patient list.

There are a few in-built functionalities at the data entry page that serve to improve data quality. One such function is auto calculation functionality to reduce human error, in calculations. There is also an inconsistency check functionality that disables certain fields and prompts the user, if the value entered is out of range.

A real time data query page is also available via the web application to enable users to check which non-compulsory data is missing, out of range and inconsistent. A link is provided on the data query page for user to click on to resolve the query for the particular patient.

Real time reports are also provided in the web application. The aggregated data reports are presented in tables and graphs. The aggregated data reports are typically presented in two manners, one as centre's own data aggregated data report and another as the registry's overall aggregated data report. In this way, the centre is able to compare itself against the overall registry's average.

Data download function is also available in the web application to allow users to download their own centre's data of all the forms entered, for their own further analyses. The data are downloadable as Text - tab delimited (.txt) format, Microsoft excel workbook (.xls) and as Comma separated value (.csv) format.

Edit checks run and data cleaning

Edit checks is performed periodically by the registry manager to identify missing compulsory data, out of range values, inconsistency of data, invalid values and errors with de-duplication. Data cleaning is then performed based on the results of edit checks. Data update and data checking of the dataset is performed when there is a query of certain fields as and when necessary. It could be due to request by user, correction of data based on checking via data query in eCRF or after receiving results for preliminary data analysis. During data standardisation, missing data are handled based on derivation from existing data. Data de-duplication is also performed to identify duplicate records in the database that might have been missed out by SDPs. Finally record matching against the National Death Register *(Jabatan Pendaftaran Negara)* database is performed to verify the mortality status of the patient.

Final query resolution/data cleaning/database lock

A final edit check run is performed to ensure that the data is clean. All queries will be resolved before the database is locked, to ensure data quality and integrity. The final dataset is subsequently locked and exported to the statistician for analysis.

Data analysis

Please refer to Statistical Analysis Method section for further details.

Data release policy

One of the primary objectives of the Registry is to make data available to the cardiovascular healthcare providers, policy makers, and researchers. The Registry would appreciate that users acknowledge the Registry for the use of the data. Any request for data that requires a computer run must be made in writing (by e-mail, fax, or registered mail) accompanied with a Data Release Application Form and signed Data Release Agreement Form. These requests need prior approval by the Advisory Board before data can be released.

Registry Information and Communication Technology (ICT) Infrastructure and Data Centre

The operation of the NCVD is supported by an extensive ICT infrastructure to ensure operational efficiency and effectiveness.

NCVD subscribes to co-location service with a high availability and highly secured Internet Data Centre at Cyberjaya in order to provide NCVD with quality assured Internet Hosting services and state-of-the-art physical and logical security features without having to invest in costly data centre setup internally. Physical security features implemented includes state-of-the-art security features such as antistatic raised flooring, fire protection with smoke and heat alarm warning system, biometric security access, video camera surveillance system, uninterrupted power supply, environmental control, etc.

Other managed security services include patch management of the servers, antivirus signature monitoring and update, firewall traffic monitoring and intrusion detection, security incidence response, data backup service done on a daily, weekly and monthly basis, data recovery simulation to verify that the backup works, which is done at least once yearly, network security scan and penetration test done on a half-yearly basis, security policy maintenance, maintenance and monitoring of audit trail of user access, etc. Managed system services such as usage and performance report, operating system maintenance and monitoring, bandwidth monitoring and systems health monitoring are also provided.

APPENDIX B: STATISTICAL METHODS

The analysis described below was conducted on data collected in the NCVD-PCI registry for 2015 and 2016. Inclusion criteria were all patients who had PCI procedures performed in 2015 or 2016 and were aged 20 years and above. In general, the unit of analysis was PCI procedures performed or treated lesions. However, for some results, a patient level analysis was conducted.

Statistical methods used mainly descriptive analysis. For discrete data, we calculated frequency and percentages; while for continuous data, the mean, standard deviation (SD), median, minimum and maximum values were calculated. The only exception to this was Cox-regression analysis performed to evaluate prognostic factors for in-hospital mortality and 30-day mortality.

Missing data was reported for both discrete and continuous data. No statistical imputation was applied to replace any missing data. Acceptable ranges for different characteristics are presented in the table below: -

Name of the field	Acceptable range
Age	≥20 years old
Height	130 – 250 cm
Weight	40 – 200 kg
Body Mass Index (BMI)	14 – 50 kgm^{-2}
Creatinine	44 – 2000 micromol/L
Glomerular Filtration Rate (GFR), MDRD	1 – 200 mL/min/1.73m^2
Total Cholesterol (TC)	2.0 – 25.0 mmol/L
Low-Density Lipoprotein (LDL)	0.7 – 20.0 mmol/L
Heart rate	25 – 200 beats/minute
Systolic blood pressure	60 – 230 mmHg
Diastolic blood pressure	10 – 120 mmHg
Ejection fraction status	10 – 80%
Mean arterial pressure	26 – 157 mmHg
TIMI risk index	1 – 145
HbA1c	4.0 – 32.0%
Symptom-to-door time	10 – 1440 minutes
Door-to-balloon time	10 – 720 minutes
Transfer time	10 – 720 minutes
Symptom-to-balloon time	10 – 1440 minutes
Fluoroscopy time	1.0 – 180.0 minutes
Contrast volume	15.0 – 500.0 mL
Pre-procedure stenosis	0 – 100%
Post-procedure stenosis	0 – 100%
Estimated lesion length	1.0 – 150.0 mm
Stent length (total)	8.0 – 160.0 mm
Stent diameter (average)	2.0 – 6.0 mm
Maximum balloon size used	1.0 – 6.0 mm
Maximum stent/balloon deploy pressure	1.0 – 40.0 mm
Length of stay	1 – 100 days

Analysis performed for each report chapter is described below:

1. Chapter 1: Patient characteristics

Patient characteristics are summarised in Chapter 1. Numbers of patients in each year were determined based on their PCI procedure year. The results presented the patients' age, gender, ethnicity, coronary risk factors, co-morbidities, lab investigations, previous interventions and other variables contained in the CRF.

2. Chapter 2: Clinical presentations & investigations

Chapter 2 included an analysis of clinical presentation, baseline investigations, cardiac status such as NYHA and Killip classes, Canadian Cardiovascular Score and IABP use at PCI procedure. An analysis of STEMI time-to-treatment was performed in which we excluded any illogical values for time-to-treatment (such as negative values for symptom-to-door and door-to-balloon time).

3. Chapter 3: Procedural setting

Chapter 3 included an analysis of the procedural details and treatment received by the patients. This chapter includes results for PCI procedure characteristics, duration of thienopyridine use, PCI and access site.

4. Chapter 4: Lesion characteristics

Lesion characteristics are summarised in Chapter 4. This chapter included location of lesion, types of lesion, types of stent, types of intracoronary devices used, stent diameter, stent length and TIMI flow. Sub-group analyses were performed for PCI to left main stem, in stent restenosis and graft lesion and CTO. In this chapter, numbers of lesions in each year were used as the denominator in the results. This was unlike other chapters where numbers of patients were the denominator.

5. Chapter 5: Outcome

The overall in-hospital mortality, all-cause mortality, post-procedural complications, medications and patient outcome at discharge and follow-up (30 days, 6 months and 1 year) are presented in Chapter 5. In order to evaluate the status of patients (whether alive or deceased), individual patients were matched against the status provided by the Malaysian National Registration Department (NRD). Patients were considered as alive at the time of follow-up if the death date was not provided in the NRD record.

NRD records only cater for national IC numbers such as Mykad number, Old IC number and police/army number. Passport number, either national or foreign, and other ID numbers are unmatchable with NRD information. Thus, mortality status was considered as unknown for unmatched record. For NCVD-PCI registry 2015–2016, 99.1% of patients' IC number can be matched with the NRD record.

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APPENDIX D: NOTE OF APPRECIATION

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Dr Akmal Hakim Arshad
Dr Teoh Chee Kiang
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Dr Ika Faizura Mohd Nor
Dr Shahrol Anuar Mohd Yasin
Dr Dhanan Umadevan
Dr Alan Koay Choon Chern
Dr Mohan Ramachandran
Dr Barveen Aisya Abu Baker
Dr Yap Lok Bin
Dr Navin Sukilan
Dr Jayakhanthan Kolanthai Velu
Dr Yap Swee Hien
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Dr Nandakumar Ramakrishnan
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Muhammad Hafiz Ab Aziz
Noor Shaika Noor Affandi

UiTM SG. BULOH CAMPUS
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Dr Zubin Othman Ibrahim
Dr Mohd Kamal Mohd Arshad
Dr Johan Rizwal Ismail
Dr Effarezan Abdul Rahman
Dr Lim Chiao Wen
Dr Hafisyatul Aiza Zainal Abidin
Dr Nicholas Chua Yul Chye
Dr Rizmy Najme Khir
Roseerviyana Ahmad
Noorlizah @ Wendy Usul
Masitah Abdul Wahid
Mohd Harfizzaq Anuar
Rosazelah Bt Mansor
Nurdiyana Md Hassan
Salehah Ab Rahim
Siti Syailiza Ismail
Mohd Naqiuddin Abd Rahman
Nurnadiah Bahari
Mohammad Ridhzuan
Norseha Rosly
Siti Nazira Nassaruddin
Siti Radiah Ahmad

HOSPITAL PANTAI IPOH
Dr Kevin Louis Joseph Martin Joseph

APPENDIX E: GLOSSARY

Access site occlusion	Indicates whether an access site occlusion occurred at the site of percutaneous entry during the procedure or after the laboratory visit, but before any subsequent laboratory visits. This is defined as total obstruction of the artery usually by thrombus (but may have other causes) usually at the site of access, requiring surgical repair. Occlusions may be accompanied by absence of palpable pulse or Doppler.
Acute Coronary Syndrome (ACS)	Indicates if the patient is suffering from an ACS event. ACS encompasses clinical features comprising chest pain or overwhelming shortness of breath, defined by accompanying clinical, ECG and biochemical features. ACS comprises the following: - Unstable Angina Pectoris (UAP) - NSTEMI - STEMI
Bail-out CABG	Urgent/emergent CABG as a complication related to the index PCI (e.g. secondary to stent thrombosis, left main or TVR dissection, coronary perforation, unsuccessful INDEX PCI). This also applies to where the CABG was precipitated due to worsening, sudden chest pain, CHF, AMI or anatomy.
Bleeding	The person's episode of bleeding as described by the thrombolysis in myocardial infarction (TIMI) criteria. Indicates if bleeding occurred during or after the cath. lab visit until discharge. The bleeding should require a transfusion and/or prolong the hospital stay and/or cause a drop in haemoglobin >3.0 gm/dl.
Body Mass Index (BMI)	A measurement of the relative percentages of fat and muscle mass in the human body, in which weight in kilograms is divided by height in meters and the result used as an index of obesity (kgm^{-2}). This will be autocalculated by the system.
Canadian Cardiovascular Score (CCS)	Indicates the Canadian Cardiovascular Angina Classification Score (CCS) of a patient which is categorised as: Class 0; Asymptomatic Class 1; Ordinary physical activity, such as walking or climbing the stairs does not cause angina. Angina may occur with strenuous, rapid or prolonged exertion at work or recreation. Class 2; There is slight limitation of ordinary activity. Angina may occur with moderate activity such as walking or climbing stairs rapidly, walking uphill, walking or climbing stairs after meals, in the cold, in the wind, or under emotional stress, or walking more than two blocks on the level, and climbing more than one flight of stairs at normal pace under normal conditions. Class 3; There is marked limitation of ordinary physical activity. Angina may occur after walking one or two blocks on the level or climbing one flight of stairs under normal conditions at a normal pace. Class 4; There is inability to carry on any physical activity without discomfort; angina may be present at rest.

Cardiogenic shock	Indicates if the patient fulfilled the clinical criteria for cardiogenic shock as follows: a. hypotension (a systolic BP of <90 mmHg for at least 30 minutes or the need for supportive measures to maintain a systolic BP of >90 mmHg). b. end-organ hypoperfusion (cool extremities or a urine output of less than 30 ml/h, and a heart rate >60 beats per minute). c. the haemodynamic criteria are a cardiac index of no more than 2.2l/min per square meter of body-surface area and apulmonary-capillary wedge pressure of at least 15 mmHg.
Chronic renal failure	Indicates if the patient has a history and/or documented evidence and/or have undergone treatment for chronic renal failure. Includes all patients with creatinine 200 micromol/L.
Contralateral Injections	Injection of contrast injected in the opposite non-occluded vessel.
Current smoker	Patient who regularly smokes a tobacco product/products one or more times per day or has smoked within the prior to this admission.
Diabetes	Indicates if the patient has diabetes as documented by the following: 1. A history of diabetes, regardless of duration of disease, or need for anti diabetic agents, or 2. Fasting blood glucose >7.0 mmol/L, or 3. HbA1c >6.5 mmol/L
Direct stenting	Stent deployment without prior treatment of stenotic segment.
Dissection (post-procedure)	Indicates for the treated segment (or for a significant side branch) if a dissection >5 mm was observed during the PCI procedure. Dissection is defined as the appearance of contrast materials outside of the expected luminal dimensions of the target vessel and extending longitudinally beyond the length of the lesion.
Dissection (vascular)	Indicates whether a dissection occurred at the site of percutaneous entry during the procedure or after lab visit but before any subsequent lab visits. A dissection is defined as a disruption of an arterial wall resulting in splitting and separation of the intimal (subintimal) layers.
Documented CAD	Indicates if the patient has angiographically-proven coronary disease (stenosis >50%) or has undergone percutaneous angioplasty (PCI) or coronary artery bypass graft (CABG) prior to this admission to the hospital.
Door-to-balloon time	The duration between the time patient presented to the reporting centre to the time of first intracoronary device used performed by the same centre. Applicable only to patients with STEMI undergoing urgent PCI.
Door-to-needle time	The duration between the time patients presented to the reporting centre to the time intravenous fibrinolytic therapy was administered or initiated by that same centre. Applicable only to STEMI patients receiving thrombolysis at the reporting centre.
Elective PCI	PCI performed for patients with stable CAD.
Emergency Reintervention/PCI	Indicates if the patient required an unplanned PCI during hospitalisation and prior to discharge that occurs as a complication related to the index PCI e.g., – stent thrombosis, dissection with target vessel occlusion.
French size	The French size of the guiding catheter or guiding sheath used to cannulate the ostium of the coronary artery. The largest size used should be indicated.

Functional ischaemia	Indicates if the patient has functional ischaemia as indicated by a non-invasive test such as exercise or pharmacological stress test, radionuclide, echo, CT scan to rule out ischaemia. The test could be performed at this admission (prior to the PCI), or it could be a test that resulted in the admission.
Glomerular Filtration Rate (GFR)	Glomerular filtration rate (GFR) is the volume of fluid filtered from the renal (kidney) glomerular capillaries into the Bowman's capsule per unit time calculated using the Modification of Diet in Renal Disease (MDRD) formula. GFR MDRD = 186 x (serum creatinine (µmol/L) / 88.4) -1.154 x AGE-0.203 x (0.742 if female). The unit is $mL/min/1.73m^2$.
Intra Aortic Balloon Pump (IABP)	Indicates if an intra aortic balloon pump has been used during the procedure.
Killip classification	Identifies the Killip class, as a measure of haemodynamics compromise, of the person at the time of presentation **Class I** includes individuals with no clinical signs of heart failure **Class II** includes individuals with rales in the lungs, an S3 gallop, and elevated jugular venous pressure **Class III** describes individuals with frank pulmonary oedema **Class IV** describes individuals in cardiogenic shock
Lesion code	Indicates the sites of lesion treated by PCI.
Lesion result	Indicates whether the treatment for the treated lesion was successful or unsuccessful.
Lesion type	The lesion type according to ACC/AHA guidelines that determines the complexity of the lesions thus determining the success rate and complication rates following PCI.
Loss of radial pulse	Indicates whether an acute loss of the pulse radial to the arterial access site occurred either by dissection, thrombus or distal embolisation.
LVEF	The left ventricular ejection fraction as measured by the percentage of the blood emptied from the left ventricle at the end of the contraction. Indicates the ejection fraction status at the time of PCI procedure. The most recent test within the last 6 months, including the current procedure and up to discharge following the procedure.
Medina classification	It involves assigning a binary value (1,0) to each of the three components of a bifurcation (proximal region of main branch, distal region of main branch, and the side branch) depending whether there is more than (1) or less than (0) fifty percent lesion stenosis. If only proximal segment of the main branch has a significant lesion, it becomes Medina 1,0,0. If distal segment of main branch alone is involved, it becomes 0,1,0. Sole involvement of side branch is designated 0,0,1 and involvement of all three is designated 1,1,1 and so on.

New York Heart Association	Indicates the patient's NYHA classification as follows: I. Patient has cardiac disease but without resulting limitations of ordinary physical activity; Ordinary physical activity (e.g. walking several blocks or climbing stairs) does not cause undue fatigue or dyspnoea. Limiting symptoms may occur with marked exertion. II. Patient has cardiac disease resulting in slight limitation of ordinary physical activity. Patient is comfortable at rest. Ordinary physical activity such as walking more than two blocks or climbing more than one flight of stairs results in limiting symptoms (e.g., fatigue or dyspnoea). III. Patient has cardiac disease resulting in marked limitation of physical activity. Patient is comfortable at rest. Less than ordinary physical activity (e.g., walking one to two level blocks or climbing one flight of stairs) causes fatigue or dyspnoea. IV. Patient has dyspnoea at rest that increases with any physical activity. Patient has cardiac disease resulting in inability to perform any physical activity without discomfort. Symptoms may be present even at rest. If any physical activity is undertaken, discomfort is increased.
No-reflow	Indicates for the treated segment if there was a period where no flow was noted during the PCI procedure.
Percutaneous entry	Indicates the percutaneous entry location used to provide vascular access for the procedure.
Perforation	Indicates for the treated segment if a perforation occurred during the procedure.
Pre-stenosis	Indicates the % of most severe pre-procedure stenosis assessed. This does not include collateral circulation.
Pseudoaneurysm	Indicates whether a pseudoaneurysm occurred at the site of percutaneous entry during the procedure or after the laboratory visit but before any subsequent laboratory visits. This does not account for pseudoaneurysms noted after discharge. Pseudoaneurysm is defined as the occurrence of a disruption and dilation of the arterial wall without identification of the arterial wall layers at the site of the catheter entry, as demonstrated by arteriography or ultrasound.
Smoking status	Indicates if the patient has a history confirming any form of tobacco use in the past. This includes use of cigarettes/cigars/pipes/tobacco chewing.
Status - Elective	PCI performed in patient with stable CAD either planned/staged PCI following coronary angiogram done earlier or PCI performed during the time of angiogram (ad-hoc).
Status - NSTEMI/UA	PCI for patients admitted with NSTEMI/UA.
Status - STEMI	PCI for patient admitted with STEMI following different treatment strategies.
TIA/Stroke	Indicates if the patient experienced a Cerebrovascular Accident (CVA) noted during the cath lab visit or after lab visit until discharge (or before any subsequent lab visits), as documented by CT/MRI confirmation.
Time of first balloon inflation/stent/aspiration	Indicates the time of the intracoronary treatment device deployment.
TIMI flow (Post)	Indicates the post-procedure TIMI flow down the treated vessel.
TIMI flow (Pre)	Indicates the pre-procedure TIMI flow down the treated vessel.
Vascular perforation	Perforation of the peripheral vessel where the catheter/sheath/wire is being tracked.

APPENDIX F: CASE REPORT FORM

NATIONAL CARDIOVASCULAR DISEASE DATABASE (PCI REGISTRY) NOTIFICATION FORM

For NCVD Use only:
Centre: ____
ID: ____

Instruction: Complete this form to notify all PCI admissions at your centre to NCVD PCI Registry. Where check boxes ☐ are provided, please check (√) one or more boxes. Where radio buttons ◉ are provided, check (√) only one option.

A. Date of Admission (dd/mm/yy): ☐☐☐☐☐☐ **B. Time of Admission (hh:mm):** ☐☐ : ☐☐ *(in 24hr clock)*

SECTION 1: DEMOGRAPHICS

1. Patient Name: *(as per MyKad / Other Document ID)*		**2. Hospital RN :**	
3. Identification Card Number:	**MyKad:** ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐	**Old IC No.**	
	Other ID Document No. →	***Specify type :*** (eg. passport, armed force ID)	
4. Gender:	◉ Male ◉ Female	**5. Nationality:**	◉ Malaysian ◉ Non Malaysian
6a. Date of Birth:	☐☐☐☐☐☐ (write DOB as 01/01/yy if age is known)	**6b. Age on admission:**	☐☐ *(auto calculate)*
7. Ethnic Group:	◉ Malay ◉ Punjabi ◉ Melanau ◉ Bidayuh ◉ Foreigner, specify country of origin: ……..…… ◉ Chinese ◉ Orang Asli ◉ Murut ◉ Iban ◉ Indian ◉ Kadazan Dusun ◉ Bajau ◉ Other Malaysian, specify: ……..		
8. Contact Number:	*(1):*	*(2):*	

SECTION 2 : STATUS BEFORE EVENT

1. Smoking status: ◉ Never ◉ Former (quit >30 days) ◉ Current (any tobacco use within last 30 days) ◉ Not Available

2. Medical history:

a) Dyslipidaemia ◉ Yes ◉ No ◉ Not known

b) Hypertension ◉ Yes ◉ No ◉ Not known

c) Diabetes ◉ Yes ◉ No ◉ Not known
- ☐ OHA ☐ Insulin ☐ Non pharmacology therapy/diet therapy

d) Family history of premature cardiovascular disease ◉ Yes ◉ No ◉ Not known
(1st degree relative with either MI or stroke; <55 y/old if Male & <65 y/old if Female)

e) Myocardial infarction history ◉ Yes ◉ No ◉ Not known

f) Documented Significant CAD ◉ Yes ◉ No ◉ Not known
(Presence of >50 % stenosis on CTA, angiogram, ischaemia on functional cardiac imaging such as nuclear, MRI, echo or positive treadmill test. High calcium score alone is not sufficient)

g) New onset angina (<2 weeks) ◉ Yes ◉ No ◉ Not known

h) History of heart failure ◉ Yes ◉ No ◉ Not known

i) Cerebrovascular disease ◉ Yes ◉ No ◉ Not known

j) Peripheral vascular disease ◉ Yes ◉ No ◉ Not known

k) Chronic renal failure ◉ Yes ◉ No ◉ Not known
(>200 µmol/L serum creatinine)
- On dialysis? ◉ Yes ◉ No

SECTION 3 : CLINICAL EXAMINATION and BASELINE INVESTIGATION

1. Anthropometric:	**a. Height:** ☐.☐☐ (m) ☐ Not Available	**b. Weight:** ☐☐☐.☐ (kg) ☐ Not Available	**c. BMI:** ☐☐☐☐ *(auto calculate)*
2. Heart rate (at start of PCI):	☐☐☐ beats/min	**3. Blood pressure (at start of PCI):**	**a. Systolic:** (mmHg) **b. Diastolic:** (mmHg)
4. Fasting Blood Glucose:	☐☐☐.☐ mmol/L ☐ Not Available	**5. Hb A1c:**	☐☐☐.☐ % ☐ Not Available
6a. Total cholesterol:	☐☐☐.☐ mmol/L ☐ Not Available	**6b. LDL Levels:**	☐☐☐.☐ mmol/L ☐ Not Available
7. Baseline creatinine:	☐☐☐.☐ µmol/L ☐ Not Available	**8. Baseline ECG:**	☐ Sinus rhythm ☐ 2nd/3rd AVB ☐ RBBB ☐ Atrial Fibrillation ☐ LBBB ☐ ST Deviation *(for GRACE Score)*
9. Non Invasive Test:	i) ◉ Done → ☐ Stress/ Exercise Test ☐ Nuclear ☐ MRI ☐ Stress Echo ☐ DSE ☐ CT Scan ◉ Not Done	ii) Functional Ischaemia ◉ Positive ◉ Negative ◉ Equivocal	
10. Glomerular Filtration Rate (GFR):	**a. MDRD:** ☐☐☐.☐ mL/min/1.73m² *(auto calculate)*	**b. Cockcroft-Gault:** ☐☐☐.☐ mL/min *(auto calculate)*	

Formula: GFR (Modification of Diet in Renal Disease (MDRD) : 186 x (serum creatinine [micromol/L] / 88.4) $^{-1.154}$ x (age) $^{-0.203}$ x (0.742 if female)
GFR (Cockcroft-Gault formula) : Male : 1.23 x (140 - Age) x Weight (kg) / serum Creatinine (micromol/L)
Female : 1.04 x (140 - Age) x Weight (kg) / serum Creatinine (micromol/L)

SECTION 4 : PREVIOUS INTERVENTIONS

1. Previous PCI: ◉ Yes ◉ No
- Date of most recent PCI (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
- ☐ Not Available

2. Previous CABG: ◉ Yes ◉ No
- Date of most recent CABG (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
- ☐ Not Available

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 5 : CARDIAC STATUS AT PCI PROCEDURE

1. Angina type: ○ None ○ Atypical ○ Typical

2. Canadian Cardiovascular Score (CCS): ○ Asymptomatic ○ CCS 1 ○ CCS 2 ○ CCS 3 ○ CCS 4

3. NYHA: ○ NYHA I ○ NYHA II ○ NYHA III ○ NYHA IV

4. Killip Class (STEMI & NSTEMI)
○ I No clinical signs of HF ○ II Left Heart Failure (LHF) ○ III Acute Pulmonary Oedema (APO) ○ IV Cardiogenic Shock ○ Not Applicable / Not Available

5. Coronary Artery Disease (CAD) Presentation:
○ STEMI ○ NSTEMI ○ UA ○ Chronic Stable Angina
→ ☐ Anterior ☐ Lateral ☐ Inferior ☐ Others, specify: _____
☐ Posterior ☐ Right sided ☐ Left Main Stem

6. STEMI Event: (Please complete if <24 hrs since onset of STEMI symptoms)

a) STEMI onset:	i. Date: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) ☐ Not Applicable	ii. Time: ☐☐ : ☐☐ (in 24hr clock)
b) Arrival at first hospital (non PCI hospital):	i. Date: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) ☐ Not Applicable	ii. Time: ☐☐ : ☐☐ (in 24hr clock)
c) Arrival at PCI hospital:	i. Date: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) ☐ Not Applicable	ii. Time: ☐☐ : ☐☐ (in 24hr clock)
d) First device (balloon inflation/ stent/ aspiration):	i. Date: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) ☐ Not Applicable	ii. Time: ☐☐ : ☐☐ (in 24hr clock)
e) In hospital STEMI:	i. Date: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) ☐ Not Applicable	ii. Time: ☐☐ : ☐☐ (in 24hr clock)

7. EF Status (at time of PCI procedure): ☐☐☐ % (Do not use '>' or '<' symbol) ☐ Not Available

8. Cardiac Arrest: ○ Out of hospital ○ At admission (for GRACE score)

9. GRACE Score: (only for STEMI & NSTEMI) (*auto calculate*)

SECTION 6 : CATH LAB VISIT

1. a) Date of procedure: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) **1. b) Time of procedure:** ☐☐ : ☐☐ (*in 24hr clock*)

2. PCI status
○ Elective → ○ Staged PCI ○ Ad hoc
○ NSTEMI/UA → ○ Urgent (within 24hrs) ○ In hospital(> 24hrs) ○ PCI within 30days post event
○ STEMI → ○ Primary ○ Delayed Routine PCI ○ Rescue ○ Delayed Selective PCI ○ Pharmacoinvasive

3. Medication:

a) Thrombolytics	○ Yes → i) Time duration: ○ <3hrs ○ 3-6hrs ○ 6-12hrs ○ 12-24hrs ○ >24hrs ii) Types: ○ Streptokinase ○ tPA ○ Tenecteplase ○ Others, specify:_____			
b) IIb / IIIa Blockade	○ Yes → ○ Prior ○ During ○ After	○ No		
c) Heparin	○ Yes ○ No		d) LMWH	○ Yes ○ No
e) Ticlopidine	○ Yes ○ No		f) Fondaparinux	○ Yes ○ No
g) Bivalirudin	○ Yes ○ No		h) Aspirin	○ Yes ○ No
i) Prasugrel	○ Yes ○ No		k) Clopidogrel	○ Yes ○ No → First/ Load dose: ○ 75mg ○ 300mg ○ 600mg ○ ≥1200mg
j) Ticagrelor	○ Yes ○ No			
l) Others	○ Yes, specify:	○ No		

4. Planned duration of DAPT: ○ 1 month ○ 3 months ○ 6 months ○ 12 months ○ >12 months ○ Not Available

5. Percutaneous entry: ☐ Brachial ☐ Femoral ☐ Radial ☐ Ulnar

6. Closure device: ○ No ○ Seal ○ Suture ○ Other, specify: _____ ○ Exoseal

7. Coronary disease >50% stenosis: ☐ LAD ☐ LCx ☐ RCA ☐ Graft ☐ LMS

8. Fluoroscopy time: ☐☐☐ . ☐ minutes ☐ Not Available

9. Total dose: ☐☐☐☐☐ mGy ☐ Not Available

10. Contrast volume: ☐☐☐ ml ☐ Not Available

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

Instructions: 1. For skip lesion, please document as different lesions. Please check one lesion code per page (i.e. : for 2 lesions, please use 2 separate Section 7).
2. Documented Ramus Intermediate Lesions as lesion code 15.
3. For long lesion, please document as one single lesion.
4. Please document intervention involves side branch as a second lesion.

SECTION 7 : PCI PROCEDURE DETAILS *(Complete for ALL interventions. Please use one form per lesion treated)*

1. Total No. of lesion treated: *(Please use one form for one lesion treated)*

2. Dominance: ○ Left ○ Right ○ Co-dominance

3. Lesion code (1-25): ☐☐ to ☐☐ *(if applicable)*

4. Coronary lesion:
- ○ De novo ○ Restenosis *(no prior stent)*
- ○ Stent thrombosis → ○ Acute ○ Late ○ Sub Acute ○ Very Late
- ○ In stent restenosis
  - i. Duration: ☐☐ Year(s) ☐☐ Month(s) *(*Duration from the known previous procedure)* ○ Not available
  - ii. Prior stent type: ○ DES ○ BMS ○ BVS ○ Mg ○ Others, specify:……..
  - iii. Classification:
    - ○ Class I *(Focal ISR)*
    - ○ Class II *('Diffuse intrastent' ISR)*
    - ○ Class III *('Diffuse proliferative' ISR)*
    - ○ Class IV *(ISR with 'total occlusion')*

5. Lesion type: ○ A ○ B1 ○ B2 ○ C

6. Location in graft: (complete for graft PCI only)
○ Ostial ○ Native ○ Body ○ Anastomosis

7. Lesion description: *[if intervention involved bifurcation lesion, please record information of side branch (SB) using a separate form_ Section 7.1 A or B]*
- ☐ Ostial ☐ CTO>3mo ☐ Calcified lesion
- ☐ LMS ☐ Thrombus ☐ Not Applicable
- ☐ Bifurcation → a) ○ SB Treated ○ SB Not treated *(only if SB ≥ 2.0mm)*
- b) Medina Classification: i) MB prox.: ○0 ○1 ii) MB dist.: ○0 ○1; iii) SB1: ○0 ○1 iv) SB2: ○0 ○1

8. Pre PCI % of stenosis: ☐☐☐ % TIMI Flow (pre): ○TIMI-0 ○TIMI-1 ○TIMI-2 ○TIMI-3

9. Post PCI % of stenosis: ☐☐☐ % TIMI Flow (post): ○TIMI-0 ○TIMI-1 ○TIMI-2 ○TIMI-3

10. Estimated Lesion Length: ☐☐☐ mm

11. Perforation: ○ Yes ○ No
- i) Classification
  - ○ Type I *(extraluminal crater without extravasation)*
  - ○ Type II *(pericardial or myocardial blushing)*
  - ○ Type III *(perforation ≥1mm diameter with contrast streaming)*
  - ○ Cavity spilling

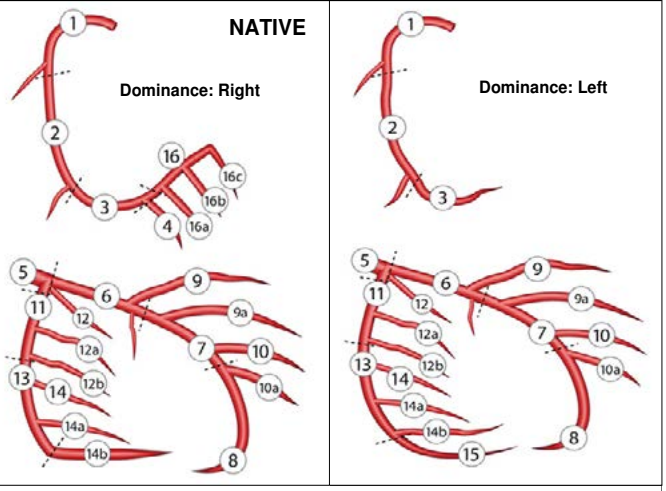
12. French Size: (i) ○ Guiding catheter (ii) ○ Guiding sheath
(ii) ○4 ○5 ○6 ○7 ○8 ○ Other, specify: …..
(iii) Types of guiding catheter: ……

13. Was lesion treated? ○ Yes ○ No

14. Lesion result: ○ Successful ○ Unsuccessful

15. Dissection: *(Post procedure)* ○ Yes → ○ Flow limiting ○ Non flow limiting ○ No

16. Slow Flow/ No reflow: ○ Yes → ○ Transient ○ Persistent ○ No



GRAFT
Graft PCI lesion codes 18-25. Also record grafted native coronary vessel

Graft	Target vessel	Graft	Target vessel	Graft	Target vessel
☐ 18 LIMA	☐☐	☐ 21 SVG2	☐☐	☐ 24 RAD2	☐☐
☐ 19 RIMA	☐☐	☐ 22 SVG3	☐☐	☐ 25 RAD3	☐☐
☐ 20 SVG1	☐☐	☐ 23 RAD1	☐☐		

17. Stent / DEB details per lesion: *(please refer instruction sheet for stent codes)*

	a. Stent code	Others, specify:	b. Diameter (mm)	c. Length (mm)
#1	☐☐☐	_____	☐.☐☐	☐☐
#2	☐☐☐	_____	☐.☐☐	☐☐
#3	☐☐☐	_____	☐.☐☐	☐☐
#4	☐☐☐	_____	☐.☐☐	☐☐
#5	☐☐☐	_____	☐.☐☐	☐☐
#6	☐☐☐	_____	☐.☐☐	☐☐

18. Maximum balloon:
- a) Predilatation: i) Size: ☐.☐☐ mm ii) Types: ☐ Regular ☐ NC ☐ Cutting ☐ Scoring
- b) Postdilatation: i) Size: ☐.☐☐ mm ii) Pressure: ☐☐ atm

19. Intracoronary devices used:
- ☐ IVUS ☐ OCT ☐ FFR ☐ Aspiration catheter ☐ POBA ☐ Micro catheter
- ☐ Angiojet ☐ Rotablator ☐ Extension catheter ☐ Coil ☐ Double Lumen micro catheter ☐ Others,specify: _____
- ☐ Embolic Protection → ○ Filter ○ Proximal

20. Other adjunctive procedure: ○ Yes → ☐ Ventilator ☐ Temporary Cardiac Pacing Wire ○ No

21. Circulatory support: ○ Yes → ☐IABP ☐Impella ☐ECMO ☐PCPS ○ No

22. Direct stenting: ○ Yes ○ No

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 8 : PROCEDURAL COMPLICATION

1. Outcome:

a. Significant Periprocedural MI
- ○ Yes ○ No ○ Not Available
  - ☐ Rise in CK/CKMB > x3 URL ☐ Rise in Troponin > x5 URL
  - ☐ ECG changes

b. Emergency Reintervention / PCI
- ○ Yes ○ No ○ Not Available

i) Stent thrombosis	○ Yes ○ No	iv) Coronary perforation	○ Yes ○ No
ii) Dissection	○ Yes ○ No	v) New ischaemia	○ Yes ○ No
iii) Cardiac perforation	○ Yes ○ No	vi) Cardiac tamponade	○ Yes ○ No

c. Bail-out CABG	○ Yes ○ No
d. Cardiogenic shock	○ Yes ○ No
e. Arrhythmia (VT/VF/Brady)	○ Yes ○ No
f. TIA / Stroke	○ Yes ○ No
g. Tamponade	○ Yes ○ No
h. Contrast reaction	○ Yes ○ No
i. New onset / worsened heart failure	○ Yes ○ No
j. Worsening renal impairment *(rise of post procedural creatinine >25% from baseline)*	○ Yes ○ No

2. Vascular complications:

a. Bleeding	○ Yes ○ No ○ Minimal *(non-CNS bleeding, non-overt bleeding, < 3g/dL Hb)* ○ Minor *(non-CNS bleeding with 3-5g/dL Hb drop)* ○ Major *(any intracranial bleed or other bleeding ≥ 5g/dL Hb drop)* Bleeding site: ○ Retroperitoneal ○ Percutaneous entry site ○ Others, specify: ……
b. RBC/ Whole Blood Transfusion	○ Yes ○ No
c. Access site occlusion	○ Yes ○ No
d. Loss of radial pulse	○ Yes ○ No
e. Dissection	○ Yes ○ No
f. Pseudoaneurysm	○ Yes ○ No ○ Ultrasound compression ○ Surgery ○ Others, specify: ……
g. Perforation	○ Yes ○ No

SECTION 9 : IN-HOSPITAL OUTCOME

1. Outcome:

○ Alive →
- a) Date of Discharge (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
- b) Medication:

	Yes	No		Yes	No
Aspirin	○	○	Statin	○	○
Clopidogrel	○	○	Beta Blocker	○	○
Ticlopidine	○	○	ACE inhibitor	○	○
Warfarin	○	○	ARB	○	○
Prasugrel	○	○	Other antiplatelet, specify:……..	○	○
Ticagrelor	○	○	Others, specify: ……..	○	○
NOAC	○	○			

○ Death →
- a) Date of Death (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
- b) Primary cause of death: ○ Cardiac ○ Renal ○ Others, specify: …….. ○ Infection ○ Neurological ○ Vascular ○ Pulmonary
- c) Location of death: ○ In Lab ○ Out of Lab

○ Transferred to other hospital →
- a) Date of Transfer (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
- b) Name of hospital: ……

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 7.1 A: ADVANCED PCI PROCEDURE DETAILS (NON LMS BIFURCATION LESION FOR SIDE BRANCH)

Instructions: 1. **Please fill up this section for when non LMS Bifurcation Side Branch treated.**
2. **If non LMS bifurcation side branch is <u>not treated</u>, please <u>fill up no. 1, 2, 3, 5, 7, 8, 9 and 10.</u>**

1. Lesion code (1-25): ☐☐ to ☐☐ *(if applicable)*

2. Coronary lesion:
- ○ De novo
- ○ Restenosis *(no prior stent)*
- ○ Stent thrombosis → ○ Acute ○ Late ○ Sub Acute ○ Very Late
- ○ In stent restenosis
  - i. Duration: ☐☐ Year(s) ☐☐ Month(s)
    - ○ Not available
    - *(*Duration from the known previous procedure)*
  - ii. Prior stent type:
    - ○ DES ○ BMS ○ BVS ○ Mg
    - ○ Others, specify:……..
  - iii. Classification:
    - ○ Class I *(Focal ISR)*
    - ○ Class II *('Diffuse intrastent' ISR)*
    - ○ Class III *('Diffuse proliferative' ISR)*
    - ○ Class IV *(ISR with 'total occlusion')*

3. Lesion description:
- ☐ CTO>3mo
- ☐ Calcified lesion
- ☐ Thrombus
- ☐ Not Applicable

4. Size SB (mm): ○ 2.0 - 2.5 ○ >2.5

5. Estimated lesion length: ☐☐☐ mm

6. Pre PCI % of stenosis: ☐☐☐ % TIMI Flow (pre): ○ TIMI-0 ○ TIMI-1 ○ TIMI-2 ○ TIMI-3

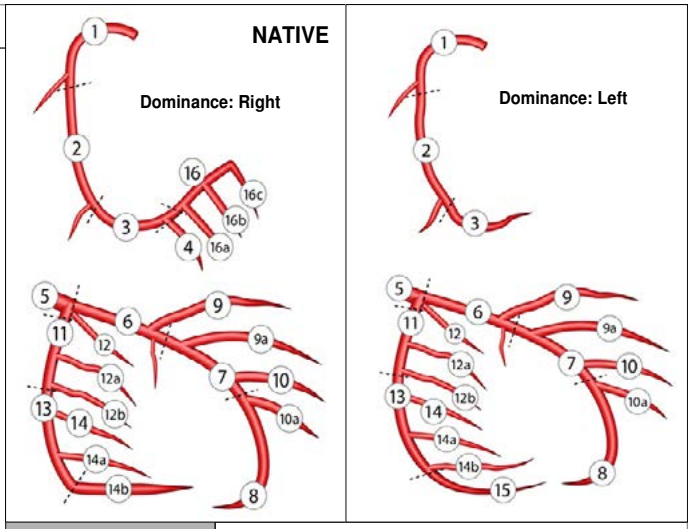
7. Post PCI % of stenosis: ☐☐☐ % TIMI Flow (post): ○ TIMI-0 ○ TIMI-1 ○ TIMI-2 ○ TIMI-3

8. Protect with wire: ○ Yes ○ No

9. Bifurcation techniques:

○ 1 stent →
- ○ Simple cross over
- ○ Ostial Stenting
- ○ Simple cross over with kissing balloon
- ○ Simple cross over with drug eluting balloon side branch
- ☐ Proximal optimisation technique (POT)

○ 2 stents →
- a. ○ Planned ○ Provisional
- b. ○ Cullote ○ Double kiss crush ○ Crush ○ Reverse crush ○ Mini crush ○ T ○ Double barrel Y ○ Small protrusion (TAP) ○ Dedicated bifurcation stent ○ V
- ☐ Proximal optimisation technique (POT)
- ○ Others, specify: _____



10. Perforation: ○ Yes ○ No
- i) Classification
  - ○ Type I *(extraluminal crater without extravasation)*
  - ○ Type II *(pericardial or myocardial blushing)*
  - ○ Type III *(perforation ≥1mm diameter with contrast streaming)*
  - ○ Cavity spilling

11. Lesion result: ○ Successful ○ Unsuccessful

12. Dissection: (Post Procedure): ○ Yes → ○ Flow limiting ○ Non flow limiting ○ No

13. Slow Flow/ No reflow: ○ Yes → ○ Transient ○ Persistent ○ No

14. Final Kissing: ○ Yes ○ No ○ Failed

15. Stent / DEB details per lesion: *(please refer instruction sheet for stent codes)*

	a. Stent code	Others, specify:	b. Diameter (mm)	c. Length (mm)
#1	☐☐☐	_____	☐☐.☐☐	☐☐
#2	☐☐☐	_____	☐☐.☐☐	☐☐
#3	☐☐☐	_____	☐☐.☐☐	☐☐

16. Maximum balloon:
- a) Predilatation:
  - i) Size: ☐.☐☐ mm
  - ii) Types: ☐ Regular ☐ NC ☐ Cutting ☐ Scoring
- b) Postdilatation:
  - i) Size: ☐.☐☐ mm
  - ii) Pressure: ☐☐ atm

17. Intracoronary devices used:
- ☐ IVUS
- ☐ OCT
- ☐ FFR
- ☐ Aspiration catheter
- ☐ POBA
- ☐ Micro catheter
- ☐ Angiojet
- ☐ Rotablator
- ☐ Extension catheter
- ☐ Coil
- ☐ Double Lumen micro catheter
- ☐ Others,specify: _____

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 7.1 B: ADVANCED PCI PROCEDURE DETAILS (FOR LEFT MAIN STEM)

1. LMS intervention:	◯ Unprotected ◯ Protected	**2. Location:**	☐ Ostial ☐ Mid ☐ Distal & Bifurcation
3. IVUS guided:	◯ Yes ◯ No	**4. OCT guided:**	◯ Yes ◯ No
5. CSA intervention:	**a. Pre:** ☐☐.☐ mm^2	**b. Post:**	☐☐.☐ mm^2
6. Side branch wire protected:	◯ Yes ◯ No	**7. Final kissing:**	◯ Yes ◯ No ◯ Failed

8. Techniques:

◯ 1 stent
- ◯ Simple cross over
- ◯ Ostial Stenting
- ◯ Simple cross over with kissing balloon
- ◯ Simple cross over with drug eluting balloon SB

◯ 2 stents
- a. ◯ Planned ◯ Provisional
- b. ◯ Cullote ◯ Crush ◯ Mini crush ◯ Double barrel Y ◯ Dedicated bifurcation stent ◯ Others, specify: _____
  ◯ Double kiss crush ◯ Reverse crush ◯ Small protrusion (TAP) ◯ T ◯ V

Instructions: **1. Please fill up this section for Distal & Bifurcation.**
2. If not treated, please fill up no. 1, 2, 3, 5, 7, 8, 9 and 10.

1. Lesion code (1-25): ☐☐ to ☐☐ *(if applicable)*

2. Coronary lesion:
- ◯ De novo
- ◯ Restenosis *(no prior stent)*
- ◯ Stent thrombosis → ◯ Acute ◯ Late ◯ Sub Acute ◯ Very Late
- ◯ In stent restenosis
  - i. Duration: ☐ Year(s) ☐ Month(s) *(*Duration from the known previous procedure)* ◯ Not available
  - ii. Prior stent type: ◯ DES ◯ BMS ◯ BVS ◯ Mg ◯ Others, specify:……..
  - iii. Classification:
    - ◯ Class I *(Focal ISR)*
    - ◯ Class II *('Diffuse intrastent' ISR)*
    - ◯ Class III *('Diffuse proliferative' ISR)*
    - ◯ Class IV *(ISR with 'total occlusion')*

3. Lesion description: ☐ CTO>3mo ☐ Calcified lesion ☐ Thrombus ☐ Not Applicable

4. Size SB (mm): ◯ 2.0 - 2.5 ◯ >2.5

5. Estimated lesion length: ☐☐☐ mm

6. Pre PCI % of stenosis: ☐☐☐ % TIMI Flow (pre): ◯ TIMI-0 ◯ TIMI-1 ◯ TIMI-2 ◯ TIMI-3

7. Post PCI % of stenosis: ☐☐☐ % TIMI Flow (post): ◯ TIMI-0 ◯ TIMI-1 ◯ TIMI-2 ◯ TIMI-3

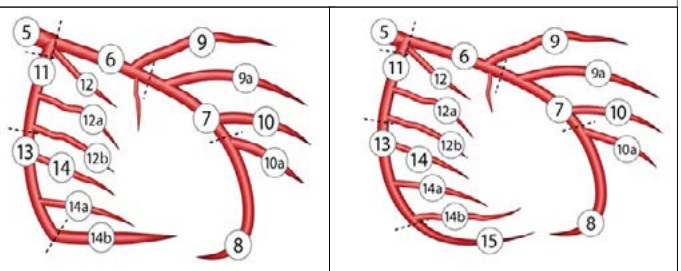
8. Protect with wire: ◯ Yes ◯ No

9. Bifurcation techniques:

◯ 1 stent →
- ◯ Simple cross over
- ◯ Ostial Stenting
- ◯ Simple cross over with kissing balloon
- ◯ Simple cross over with drug eluting balloon side branch
- ☐ Proximal optimisation technique (POT)

◯ 2 stents →
- a. ◯ Planned ◯ Provisional
- b. ◯ Cullote ◯ Crush ◯ Mini crush ◯ Double barrel Y ◯ Dedicated bifurcation stent ◯ V ◯ Double kiss crush ◯ Reverse crush ◯ T ◯ Small protrusion (TAP)
  ☐ Proximal optimisation technique (POT)
  ◯ Others, specify: _____

Dominance: Right **NATIVE** **Dominance: Left**



10. Perforation: ◯ Yes ◯ No
- i) Classification
  - ◯ Type I *(extraluminal crater without extravasation)*
  - ◯ Type II *(pericardial or myocardial blushing)*
  - ◯ Type III *(perforation ≥1mm diameter with contrast streaming)*
  - ◯ Cavity spilling

11. Lesion result: ◯ Successful ◯ Unsuccessful

12. Dissection: (Post Procedure): ◯ Yes → ◯ Flow limiting ◯ Non flow limiting ◯ No

13. Slow Flow/ No Reflow: ◯ Yes → ◯ Transient ◯ Persistent ◯ No

14. Final Kissing: ◯ Yes ◯ No ◯ Failed

15. Stent / DEB details for lesion: *(please refer instruction sheet for stent codes)*

	a. Stent code	Others, specify:	b. Diameter (mm)	c. Length (mm)
#1	☐☐☐	_____	☐.☐☐	☐☐
#2	☐☐☐	_____	☐.☐☐	☐☐
#3	☐☐☐	_____	☐.☐☐	☐☐

16. Maximum balloon:
- a) Predilatation: i) Size: ☐.☐☐ mm; ii) Types: ☐ Regular ☐ NC ☐ Cutting ☐ Scoring
- b) Postdilatation: i) Size: ☐.☐☐ mm; ii) Pressure: ☐☐ atm

17. Intracoronary devices used:
- ☐ IVUS
- ☐ OCT
- ☐ FFR
- ☐ Aspiration catheter
- ☐ POBA
- ☐ Micro catheter
- ☐ Angiojet
- ☐ Rotablator
- ☐ Extension catheter
- ☐ Coil
- ☐ Double Lumen micro catheter
- ☐ Others,specify: _____

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 7.1 C: ADVANCED PCI PROCEDURE DETAILS (FOR CTO >3 months)

1. CTO characteristics:	**i. Estimated length of CTO (mm):**	○ < 20 ○ ≥ 20		
	ii. Side branches *(within 3mm of entry)*:	○ Yes ○ No		
	iii. Entry site:	○ Blunt ○ Tapered		
	iv. Calcification:	○ Yes ○ No		
	v. Bridging collaterals:	○ Yes ○ No		
	vi. Tortuosity/ Bend > 45°:	○ Yes ○ No		
	vii. Re-attempt lesion:	○ Yes ○ No		
	viii. JCTO Score:	[ ] *(autocalculated)*		
	ix. Duration of CTO:	[ ] ○ Months or ○ Years ○ Not Available		
2. Guide size:	○ 5F ○ 6F ○ 7F ○ 8F		**3. Contralateral injections:**	○ Yes ○ No
4. IVUS guided:	○ Yes ○ No		**5. CTA guided:**	○ Yes ○ No
6. Approach	☐ Antegrade:	☐ Single wire ☐ Parallel wire ☐ Anchor wire ☐ Anchor balloon ☐ STAR ☐ Others, specify: _____	☐ Retrograde:	☐ CART ☐ Reverse CART ☐ Knuckle wire ☐ Kissing wire technique ☐ Others, specify:_____
7. Name of wires: *(please follow the sequence)*	1) _____ 5) _____ 2) _____ 6) _____ 3) _____ 7) _____ 4) _____ 8) _____			
8. Name of wire that crossed:				
9. Other devices:	☐ Over the wire balloon ☐ Rapid exchange balloon ☐ Microcatheter ☐ Extension catheter	☐ Cosair ☐ Tornus ☐ Rotablator ☐ CrossBoss	☐ Re-entry devices: → ○ Stingray ○ Double lumen micro catheter ☐ Others, specify:	
10. Result:	○ Failed attempt ○ Lesion crossed → ○ Only wire crossed ○ Successful PCI			
11. Complication:	**i. Perforation:**	○ Yes → ☐ Wire ☐ Balloon ☐ Stent ☐ Guiding catheter ○ No		

a. Patient Name:		b. MyKad/Other ID No.:		c. Date of Procedure:	

SECTION 7.1 D: ADVANCED PCI PROCEDURE DETAILS (FOR CALCIFIED LESION)

1. Angiography severity:

- ◯ None *(no radiopacity)*
- ◯ Mild *(densities noted only after contrast injection)*
- ◯ Moderate *(radiopacities noted only during the cardiac cycle before contrast injection)*
- ◯ Severe *(radiopacities noted without cardiac motion before contrast injection)*

2. IVUS assessment:

- ◯ Yes → Findings:
  - i) Arc of calcium (degree): ◯ <90 ◯ 91— 180 ◯ 181— 270 ◯ 271— 360
  - ii) Length of calcium (mm): ◯ ≤ 5 ◯ 6— 10 ◯ ≥ 11
  - iii) Location of calcium: ◯ Superficial only ◯ Deep only ◯ Superficial + Deep
- ◯ No

3. Predilatation:

- ☐ Compliant Balloon
- ☐ Cutting Balloon
- ☐ Tornus
- ☐ Others, specify: ……..
- ☐ Non Compliant Balloon
- ☐ Scoring Balloon
- ☐ Rotablator →
  - a) No of Burr: ☐
  - b) Burr size: i) ☐ . ☐☐ mm
  - ii) ☐ . ☐☐ mm
  - iii) ☐ . ☐☐ mm

NATIONAL CARDIOVASCULAR DISEASE DATABASE (PCI REGISTRY) FOLLOW UP FORM

For NCVD Use only:
Centre: ☐☐☐
ID: ☐☐☐☐☐☐

Instruction: This form is to be completed at patient follow up *after* 30 days, 6 months or 12 months of 1st admission. Where check boxes ☐ are provided, please check (√) one or more boxes. Where radio buttons ◯ are provided, check (√) only one option.

A. Reporting Centre			
B. Patient Name:			
C. Identification Card Number:	MyKad: ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐	Old IC No.	
	Other ID Document No. →	*Specify type :* (eg. passport, armed force ID)	
D. Type of Follow Up:	◯ 30 days ◯ 6 months ◯ 12 months	**E. Date of Follow Up:** (dd/mm/yy)	☐☐ / ☐☐ / ☐☐

SECTION 1: OUTCOME

1. Outcome:

◯ Alive →

a) Medication:

	Yes	No		Yes	No		Yes	No
Aspirin	◯	◯	ACE inhibitor	◯	◯	NOAC	◯	◯
Clopidogrel	◯	◯	ARB	◯	◯	Other antiplatelet, specify: ……	◯	◯
Ticlopidine	◯	◯	Warfarin	◯	◯			
Statin	◯	◯	Prasugrel	◯	◯	Others, specify ……	◯	◯
Beta blocker	◯	◯	Ticagrelor	◯	◯			

◯ Death →
a) Date of Death (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
b) Cause of death: ◯ Cardiac ◯ Non cardiac ◯ Others, specify: ……

◯ Transferred to other hospital →
a) Date of Transfer (dd/mm/yy): ☐☐ / ☐☐ / ☐☐
b) Name of hospital: ……

◯ Lost to follow up →
a) Date of last follow up (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

2. Has patient stopped smoking? ◯ Yes (quit >30 days) ◯ No ◯ Not Applicable

SECTION 2: READMISSION (within the follow up duration)

1. Has patient been readmitted to hospital? ◯ Yes ◯ No ◯ No information available

	Readmission reason:	CCS:	Angiography:
1. Date of readmission: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) **Readmission location:**	◯ Non cardiac ◯ CHF ◯ Recurrent angina ◯ Arrhythmia ◯ ACS → ◯ STEMI ◯ NSTEMI ◯ UA ◯ Staged revascularization → ◯ PCI ◯ CABG	◯ Asymptomatic ◯ CCS 1 ◯ CCS 2 ◯ CCS 3 ◯ CCS 4 ◯ Not Available	◯ Yes ◯ No ◯ Not Applicable
2. Date of readmission: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) **Readmission location:**	◯ Non cardiac ◯ CHF ◯ Recurrent angina ◯ Arrhythmia ◯ ACS → ◯ STEMI ◯ NSTEMI ◯ UA ◯ Staged revascularization → ◯ PCI ◯ CABG	◯ Asymptomatic ◯ CCS 1 ◯ CCS 2 ◯ CCS 3 ◯ CCS 4 ◯ Not Available	◯ Yes ◯ No ◯ Not Applicable
3. Date of readmission: ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) **Readmission location:**	◯ Non cardiac ◯ CHF ◯ Recurrent angina ◯ Arrhythmia ◯ ACS → ◯ STEMI ◯ NSTEMI ◯ UA ◯ Staged revascularization → ◯ PCI ◯ CABG	◯ Asymptomatic ◯ CCS 1 ◯ CCS 2 ◯ CCS 3 ◯ CCS 4 ◯ Not Available	◯ Yes ◯ No ◯ Not Applicable

NATIONAL HEART ASSOCIATION OF MALAYSIA
Heart House, D-13A-06. Menara Suezcap 1, KL Gateway
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