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*National Cardiovascular Disease Database*

# ANNUAL REPORT OF THE NCVD - PCI REGISTRY *year 2007*

**Editors:**
**Wan Azman Wan Ahmad**
**Sim Kui-Hian**

CRC
MINISTRY OF HEALTH MALAYSIA
*Research that matters to patients*

# National Cardiovascular Disease Database (NCVD)

# Annual Report of the Percutaneous Coronary Intervention (PCI) Registry

# 2007

Editors:

Wan Azman Wan Ahmad
Sim Kui-Hian

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## ACKNOWLEDGEMENTS

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We would especially like to thank the following:

- Melbourne Interventional Group (MIG), Australia
- Ministry of Health Malaysia
- National Institute of Health (NIH), Malaysia
- Clinical Research Centre (CRC), Malaysia
- National Heart Association of Malaysia (NHAM)
- The members of various expert panels
- Our source data providers
- Focal Imagery Photography (www.focalimagery.carbonmade.com)

## LIST OF CONTRIBUTORS

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2. Dato' Seri Dr Robaayah Zambahari
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4. Dato' Dr Omar Ismail
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6. Dr Lim Teck Onn
7. Dr Liew Houng Bang
8. Dr Chee Kok Han
9. Dr Alan Fong Yean Yip
10. Dr Lu Hou Tee
11. Dr Azmee Mohd Ghazi
12. Dr Syahidah Syed Tamin
13. Ms S Gunavathy Selvaraj
14. Ms Hamimatunnisa Johar
15. Ms Noor Amirah Muhamad

## FOREWORD BY THE DIRECTOR GENERAL OF HEALTH, MALAYSIA

Percutaneous Coronary Intervention (PCI) for coronary artery disease has seen rapid and significant technological advances since its introduction, in the last 30 years. The technique has been adopted worldwide and now is the commonest modality of revascularization, with increasing numbers of patients being treated every year.

In Malaysia, PCI has taken a great stride forward in the last 20 years. It was performed at various setups, including the National Heart Institute, Ministry of Health hospitals, university hospitals and also private hospitals. In recognition of the importance of this treatment modality in this country, it is timely for Malaysia to have its own registry.

This report provides information on the establishment of PCI services in our country, patient characteristics, clinical presentations, lesions characteristics, procedural details with regards to device utilisation and outcomes. As the report comprehensively covers such vital information it will undoubtedly be used as a point of reference for policy makers in future planning and funding of cardiac care services.

I would like to congratulate the National Cardiovascular Disease Database team for the production and publication of the inaugural PCI Registry report for year 2007. Together, I would like to commend the Clinical Research Centre, National Institute of Health, Malaysia and the National Heart Association of Malaysia for coordinating and supporting this registry. This is indeed an important endeavour in striving to provide state-of-the-art care for our ischaemic heart disease patients in this country.

I wish you all the best and thank you for this fine effort.

**Y. Bhg. Tan Sri Dato' Seri Dr Hj Mohd Ismail Merican**
Director-General of Health Malaysia
Ministry of Health Malaysia

## PREFACE

It is with great pleasure and pride that we see the first National Cardiovascular Disease Database (NCVD) – Percutaneous Coronary Intervention (PCI) Registry report move from dream into reality, to help us practice evidence-based medicine and health economics better.

The PCI Registry is unique in that we have, close collaboration with the Melbourne Interventional Group (MIG) registry.

We would like to express our heartfelt thanks to the Clinical Research Centre (CRC) network of Ministry Of Health Malaysia and the National Heart Association of Malaysia for the financial support; the members of the governance board, chairman of NCVD – PCI Registry and the committee, MIG, Australia, chairman of NCVD publications and the committee, CRC Malaysia, Hospital Kuala Lumpur (HKL) project management team and last but not least, all the investigators and especially the study nurses and clinical research assistants in the participating hospitals across the country; sacrificing hours of labour in turning our dream into a reality.

We would like to dedicate our very own first NCVD – PCI Registry report to everyone who has contributed to this registry. You are the reason and pride of this success.

Lastly, we look forward to a hundred percent participation across the country in order for it to be a truly "national" cardiovascular database and hope to see many more publications following the establishment of this registry in the years ahead.

Thank you

**Prof Dr Sim Kui-Hian**
Co-Chairman
NCVD Governance Board
President
National Heart Association of Malaysia

**Dato' Seri Dr Robaayah Zambahari**
Co-chairman
NCVD Governance Board

## FOREWORD

Since the advent of Percutaneous Coronary Intervention (PCI) in Malaysia in the mid 1980s, there has not been a national registry to record the PCI procedures that which had been performed in the country. There were some concerted efforts in the past but the data collected was very limited and mainly centered on a few institutions and not surprisingly this endeavour soon fizzled out.

The National Cardiovascular Disease Database (NCVD) - PCI Registry was the result of collaboration between the Ministry of Health Malaysia (MOH), Clinical Research Centre (CRC) and the National Heart Association of Malaysia (NHAM). We were given monetary support with generous funds from MOH and coordinating staff from the CRC. The registry started registering data online since January 2007 and it is with much pride that these findings are now being published in this maiden annual report. A note of appreciation goes out to Prof Dr Wan Azman Wan Ahmad, Prof Dr Sim Kui Hian and their team for compiling this annual report.

We have realised from early days the importance of having our own national data. With this we can calculate the number of PCI procedures performed in the country, the different types of devices that have been used, complexity of the cases and most importantly, the outcome of the procedures. In the future, we hope to gauge the cost-effectiveness of PCIs and its usefulness in the treatment of coronary artery disease in Malaysia. It will be also possible to see the trends and the advances in technology, in the coming years.

Even though the numbers of institutions involved in the NCVD - PCI Registry are still limited, we hope that other institutions, particularly the private hospitals, will come forward to contribute to this registry in the years to come. We would like to receive continued support from MOH and CRC for the NCVD - PCI Registry until this registry is able to be self-sustaining, with support from NHAM and other organisations.

I would like to extend my appreciation to those who worked hard in maintaining this registry and keeping it going. They have spent a lot of time and effort despite the difficulties and challenges faced especially in its initial year. To Prof Dr Sim Kui-Hian, Dr Liew Houng Bang (secretary of this registry), Ms Gunavathy Selvaraj, Ms Noor Amirah Muhamad and Ms Hamimatunnisa Johar, from CRC, steering committee members, all the doctors, staff nurses, paramedical staff, research officers and other personnel who were involved in collecting and entering data on-line. Not forgetting also our statisticians who churned out results which could be digested and analysed. We could not have done it without your enthusiasm, hard work and belief that this registry can be conducted successfully. This annual report is a testament to all your efforts.

Thank you

**Dato' Dr Rosli Mohd Ali**
Chairman of Steering Committee
NCVD - Percutaneous Coronary Intervention (PCI) Registry

## ABBREVIATIONS

| | |
|---|---|
| ACS | Acute Coronary Syndrome |
| BMI | Body Mass Index |
| BMS | Bare Metal Stent |
| CABG | Coronary Artery Bypass Graft |
| CAD | Coronary Artery Disease |
| CPG | Clinical Practice Guidelines |
| CRC | Clinical Research Centre |
| CRF | Case Report Form |
| CVD | Cardiovascular Disease |
| DBMS | Database Management System |
| DES | Drug Eluting Stent |
| EDC | Electronic Data Capture |
| EF | Ejection Fraction |
| FFR | Fractional Flow Reserve |
| ICL | Interventional Catheterisation Lab |
| ICT | Information and Communication Technology |
| IT/IS | Information Technology and Information System |
| IVUS | Intravascular Ultrasound |
| LDL | Low Density Lipoprotein |
| LMWH | Low Molecular Weight Heparin |
| MIG | Melbourne Interventional Group |
| MOH | Ministry of Health |
| NCVD | National Cardiovascular Disease Database |
| NHAM | National Heart Association of Malaysia |
| NSTEMI | Non ST- Elevation Myocardial Infarction |
| PCI | Percutaneous Coronary Intervention |
| PMP | Per Million Population |
| RCC | Registry Coordinating Centre |
| SAP | Statistical Analysis Plan |
| SC | Site Coordinator |
| SD | Standard Deviation |
| SDP | Source Data Provider |
| STEMI | ST– Elevation Myocardial Infarction |
| TIMI | Thrombolysis In Myocardial Infarction |
| UA | Unstable Angina |
| AVNRT | Atrioventricular Nodal Reentry Tachycardia |
| MI | Myocardial Infarction |
| PTCRA | Percutaneous Transluminal Coronary Rotational Atherectomy |
| PDA | Patent Ductus Arteriosus |
| AVR | Aortic Valve Replacement |
| MVR | Mitral valve repair |
| ASD | Atrial Septal Defect |
| VSD | Ventricular Septal Defect |

## FOUNDATION OF THE NCVD-PCI REGISTRY

H B Liew, M A Rosli, W A W Azman, Z Robaayah, K H Sim, on behalf of the NCVDPCI Investigators

In Malaysia, percutaneous coronary intervention (PCI) was introduced in the year 1983, and has grown over the last two decades. Up-to-date, at least 35 public, private and teaching hospitals have performed approximately 9000 PCI procedures annually. However, there was no national registry to record clinical data. A minority of hospitals collected information for local use only, with variable data elements collected.

It was against this background, that the PCI registry was established to fulfill the need for a large scale, national level, multi-centred, collaborative group; to ensure uniform data collection and clinical follow-ups. The PCI registry was the second registry established under the National Cardiovascular Disease Database (NCVD). Hence, the registry was named NCVD - PCI Registry. The other was the ACS registry which was officially launched on 31$^{st}$ March 2006.

### Aim of the NCVD-PCI Registry

The eventual goal of NCVD - PCI Registry is to provide a contemporary appraisal of Malaysian interventional cardiology practice, to improve the short-term and long-term outcomes of coronary artery disease. Ultimately, we hope that the registry will engage all interventional cardiologists to commit to this nationwide effort towards continuous quality improvement, and facilitate the introduction of international, multi-centred, randomized clinical trials in interventional cardiology.

It is hoped that this voluntary collaborative group will act as a catalyst for individual research ideas and projects.

The objectives are:

1. To determine the number, and to evaluate and monitor the outcomes of PCI, based on selected performance indicators.

2. To determine the cost of cardiovascular disease care to the nation and to evaluate the cost-effectiveness of treatment and prevention programs.
3. To determine the level of adherence to current practice guidelines.
4. To stimulate and facilitate research.
5. To facilitate quality improvement activities of participants (eg. door-balloon-time, in primary infarct PCI).
6. To act as a reference for future studies (eg. volume, pattern of practice, temporal trend, etc.).
7. To facilitate future research and development.
8. To benchmark with other national PCI registries.

This report is the "beginning of the beginnings"; to share the findings from our collaboration among the main Malaysian PCI centres, in the first year of this registry. We hope to achieve the other objectives in the near future.

## Methodology

### *Registry design*

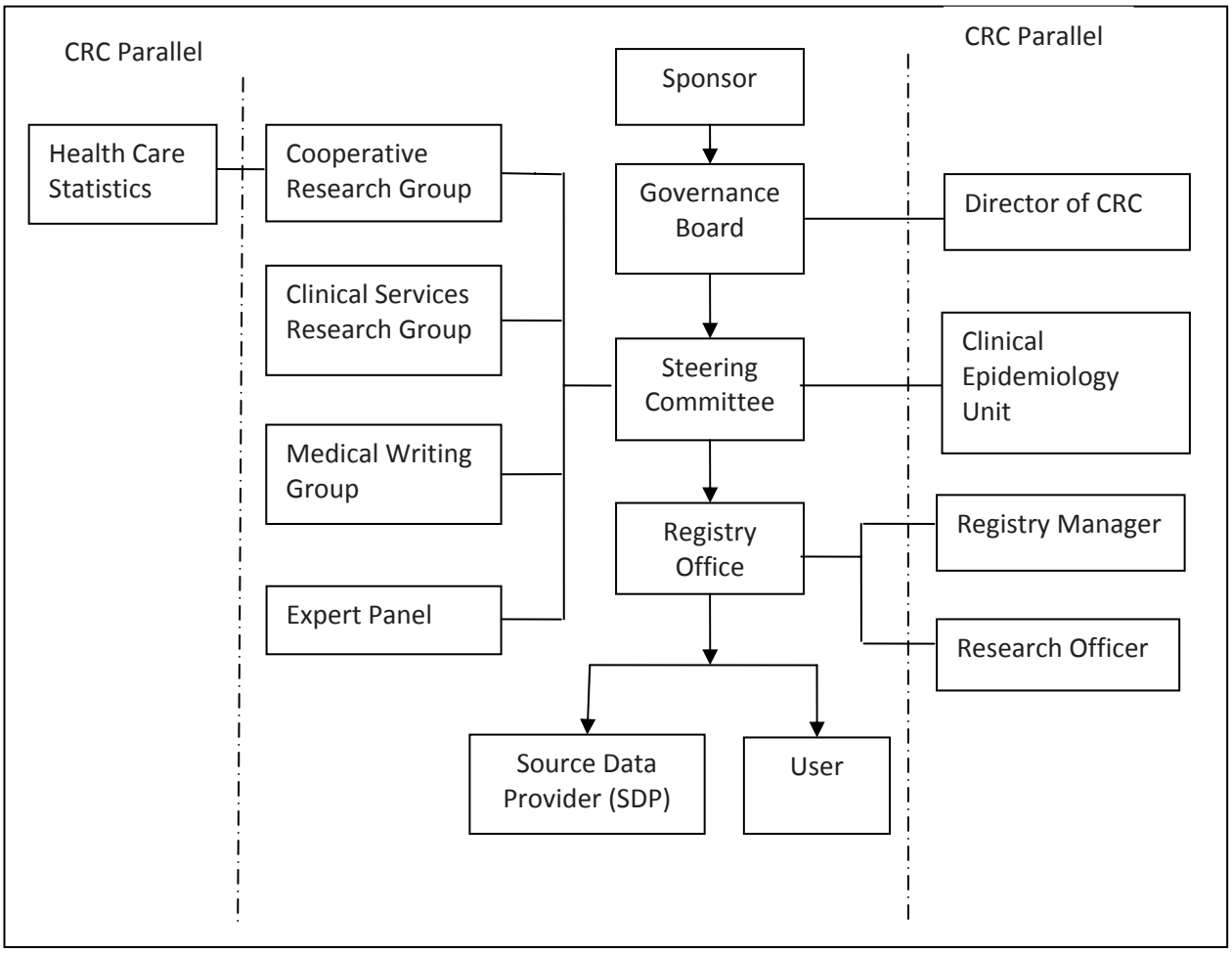
The NCVD - PCI registry is a voluntary, multi-centered, observational cohort study designed to evaluate the health outcome of patients of ages 18 years old and above with coronary artery disease, undergoing percutaneous coronary intervention at participating clinical centres.

### *Establishment of dataset*

The standardized data abstraction form and dataset definitions were adopted from those of the Melbourne Interventional Group (MIG) PCI Registry. The MIG collaborative group has consented to the adoption through goodwill and in anticipation of future collaboration. The MIG abstraction form was developed after reference to current international databases including the American College of Cardiology-National Cardiovascular Data Registry (ACC-NCDR), and interventional databases at Cleveland Clinic and Washington Hospital Centre, USA.

The case report form (CRF) was designed to collect detail demographic, past medical history, clinical and procedural information and pharmacotherapy. The registry data collection schedule was started with initial notification for each PCI procedure performed, then followed with follow-ups at 30-days, 6-months and 12-months intervals.

**Registry Organisation Structure**



***Governance Board***

The Governance Board was established in year 2006 by sponsors to oversee the operations of the National Cardiovascular Disease Database. The MOH, universities, professional bodies, NGOs and private healthcare providers were represented in this committee to ensure that the NCVD stays focused on its objectives, its continuing relevance and justification.

Current membership of the board is as follows:

| No. | Name | Designation |
|---|---|---|
| 1 | Prof Dr Sim Kui Hian<br>**(Co-chairman)** | Head, Department of Cardiology,<br>Sarawak General Hospital<br>Head, Clinical Research Centre Sarawak<br>President, National Heart Association of Malaysia (NHAM) |
| 2 | Dato' Seri Dr Robaayah Zambahari<br>**(Co-chairman)** | Medical Director/Senior Consultant Cardiologist,<br>National Heart Institute |
| 3 | Dato' Dr Omar Ismail | Head,<br>Department of Cardiology,<br>Penang Hospital |
| 4 | Dato' Dr Jeyaindran Sinnadurai | Head,<br>Department of Medicine,<br>Kuala Lumpur Hospital |
| 5 | Dr Inderjeet Kaur Gill | Principle Assistant Director,<br>Medical Development Division,<br>Ministry of Health Malaysia |
| 6 | Prof Dr Wan Azman Wan Ahmad | Head,<br>Department of Medicine,<br>University Malaya Medical Centre |
| 7 | Dr Balachandran Satiamurti | Deputy Director,<br>Non-communicable Disease Section,<br>Ministry of Health Malaysia |
| 8 | Dato' Dr K Chandran | Head,<br>Department of Medicine,<br>Raja Permaisuri Bainun Hospital |

| No. | Name | Designation |
|---|---|---|
| 9 | Dato' Dr Haji Sapari Satwi | Head,<br>Department of Medicine,<br>Tengku Ampuan Afzan Hospital |
| 10 | Dr Lim Teck Onn | Director,<br>Network of Clinical Research Centres,<br>Ministry of Health Malaysia |
| 11 | Dr Hendrick M. Y. Chia | Past-President,<br>National Heart Association of Malaysia |
| 12 | Dato' Dr Khoo Kah Lin | Director,<br>The Heart Foundation of Malaysia |
| 13 | Prof Dr Abdul Rashid Abdul Rahman | Vice- President,<br>Research & International Development,<br>Cyberjaya University College of Medical Sciences |
| 14 | Dato' Dr Azhari Rosman | Vice-President,<br>National Heart Association of Malaysia |

***Steering Committee***

The steering committee comprises of individuals who are subject matter experts, drawn from the various centres that are involved in the MOH, universities and private hospitals. They have convened to decide on the initial data collection process, develop the pro- forma and data content as well as to guide future developments. They ensure that the database has a sound technical as well as scientific basis.

The role of the steering committee is to:

- Establish policies and procedures for the registry's conduct
- Motivate source data providers (SDPs) to continue participation in the registry
- Disseminate information about the registry
- Communicate results locally and internationally
- Approve, and if necessary validate the statistical analysis plan
- Undertake Quality Control of the reported data
- Determine policies and procedures for the operations of the database
- Establish the Registry Coordinating Centre and appoint its project team members
- Direct the activities of the Registry Coordinating Centre

The current membership of the steering committee is as follows:

| No. | Name | Centre |
|---|---|---|
| 1 | Dato' Dr Rosli Mohd Ali (**Chairman)** | National Heart Institute |
| 2 | Dato' Seri Dr Robaayah Zambahari | National Heart Institute |
| 3 | Prof Dr Sim Kui Hian | Sarawak General Hospital |
| 4 | Prof Dr Wan Azman Wan Ahmad | University Malaya Medical Centre |
| 5 | Dato' Dr Omar Ismail | Penang Hospital |
| 6 | Dr Abdul Kahar Abdul Ghapar | Serdang Hospital |
| 7 | Dr Lee Chuey Yan | Sultanah Aminah Hospital |
| 8 | Dr Liew Houng Bang | Queen Elizabeth Hospital |
| 9 | Assoc Prof Dr Oteh Maskon | Universiti Kebangsaan Malaysia Hospital |
| 10 | Dr Choo Gim Hooi | KPJ Selangor Specialist Hospital |
| 11 | Dr Lu Hou Tee | Sultanah Aminah General Hospital |
| 12 | Dr Muhammad Ali Sheikh Abdul Kader | Penang Hospital |
| 13 | Dr Nik Halmey Nik Zainal Abidin | Gleneagles Intan Medical Centre |
| 14 | Dr A Sri Ranga | Serdang Hospital |
| 15 | Dr Noorfaizan Saaidin | KPJ Selangor Specialist Hospital |

***Registry Coordinating Centre (RCC)***

| | |
|---|---|
| Clinical Registry Manager | Ms S Gunavathy Selvaraj |
| Clinical Registry Associate | Ms Noor Amirah Muhamad |
| Clinical Registry Associate | Ms Hamimatunnisa Johar |

***Supporting Staff from the Clinical Research Centre***

The Clinical Research Centre (CRC) of the Ministry of Health provides technical support for the NCVD-PCI Registry. The clinical epidemiologists provide methodological and epidemiological inputs, while the database is supported on CRC's IT infrastructure.

| | |
|---|---|
| Clinical Epidemiologist | Dr Jamaiyah Haniff |
| | Ms S Gunavathy Selvaraj |
| ICT Manager | Madam Celine Tsai Pao Chien |
| Database Administrator | Ms Lim Jie Ying |
| Application Developer | Ms Amy R. Porle |
| Network Administrator | Mr Kevin Ng Hong Heng |
| | Mr Adlan Ab. Rahman |
| Webmaster & Desktop Publisher | Ms Azizah Alimat |
| Clinical Data Manager | Ms Teo Jau Shya |

**Biostatistics Consultants**

Ms Lena Yeap Lay Ling

Dr Hoo Ling Ping

Ms Norhafizah Ab. Manan

***Medical Writing Group***

A committee was constituted to prepare the registry's annual and interim reports, and to prepare manuscripts for journal submission for particular studies based on the registry data. The current members of the medical writing committee of the PCI registry are as follows:

| No. | Name | Centre |
|---|---|---|
| 1 | Prof Dr Wan Azman Wan Ahmad (**Chairman)** | University Malaya Medical Centre |
| 2 | Prof Dr Sim Kui Hian | Sarawak General Hospital |
| 3 | Dato' Dr Rosli Mohd Ali | National Heart Institute |
| 4 | Dato' Dr Omar Ismail | Penang Hospital |
| 5 | Dr Liew Houng Bang | Queen Elizabeth Hospital |
| 6 | Dr Chee Kok Han | University Malaya Medical Centre |
| 7 | Dr Alan Fong Yean Yip | Sarawak General Hospital |
| 8 | Dr Lu Hou Tee | Sultanah Aminah Hospital |
| 9 | Dr Azmee Mohd Ghazi | National Heart Institute |
| 10 | Dr Syahidah Syed Tamin | National Heart Institute |

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## INTRODUCTION

The history of interventional cardiology has moved from diagnostic to various therapeutic procedures, innovations, discoveries made either by chance, intuition or just perseverance. Thirty years have passed since Andreas Gruentzig, acclaimed as the father of Interventional Cardiology, performed the first balloon angioplasty in Zurich, Switzerland. Six years later, Associate Professors Dr Singham and Dr Anuar Masduki performed the first coronary angioplasty, in 1983, in Malaysia. Since then, percutaneous coronary intervention has grown and expanded rapidly at the Institut Jantung Negara, Ministry of Health hospitals, university hospitals and private hospitals.

The first Clinical Practice Guidelines (CPG) on Percutaneous Coronary Intervention (PCI) was launched by Y.Bhg. Tan Sri Dato' Seri Dr Hj. Mohd Ismail Merican, Director-General of Health Malaysia, in conjunction with the 13$^{th}$ Annual Scientific Meeting of the National Heart Association of Malaysia, in April 2009. This was a remarkable milestone in the history of interventional cardiology in Malaysia.

We believe that the annual report of the NCVD-PCI registry 2007 together with the CPG - PCI will provide valuable information of the gaps that lie in 'real' practice and provide guidelines for further improvement. This report is divided into five chapters and important summary points have been highlighted after each chapter.

Chapter 1: Provision of PCI services in Malaysia
Chapter 2: Patient Characteristics
Chapter 3: Clinical Presentations and Investigations
Chapter 4: Procedural Details
Chapter 5: Outcome

This report is the fruit of a lot of hard work, perseverance and dedication of all levels of people who are involved in this registry, and I would like to acknowledge all those who have made this report possible. Now we can take pride that we have our very own data to refer to at national and international meetings.

Thank you

**Prof Dr Wan Azman Wan Ahmad**
Chairman
NCVD Medical Writing and Publication Committee

# THE DEVELOPMENT OF PERCUTANEOUS CORONARY INTERVENTION (PCI) IN MALAYSIA

**Hospital Kuala Lumpur (HKL) and Institut Jantung Negara (IJN)**

Robaayah Zambahari
*MBBS (Mal), AM, FRCP (Glasg), FRCP (Lond), FACC, FAPSIC (Asia Pacific), FNHAM (Mal), FAsCC (ASEAN)*

Following the first coronary angioplasty in September 1977 by Dr Andreas Gruentzig, this procedure spread throughout the world, initially slowly, but with the development of new devices and medications which improved the safety and durability of the procedure, particularly with the advent of stenting, the number of procedures and the extent of the types of lesions that which could be addressed, increased exponentially. The other form of revascularization, coronary artery bypass surgery, popularly known as CABGS, with new developments, particularly internal mammary artery grafting, remained as the more durable procedure, but continues to be considered as more invasive and reserved only for the more extensive disease.

I wish to recognise and pay tribute to Dr Nik Zainal for pioneering the cardiology services within the government set-up in 1977 and for setting up the cardiology – cardiothoracic, cardiac- anaesthesiology departments in Hospital Kuala Lumpur in 1982.

The first coronary angiogram in Malaysia was performed by Dr Nik Zainal in Hospital Kuala Lumpur (formerly known as General Hospital Kuala Lumpur), in 1982 and the first coronary artery bypass graft surgery by Dr Rozali Wathooth, in September 1982. In the initial period, cardiac catheterisation, left heart catheterisation, left ventriculograms and coronary angiograms were done via brachial cutdown approach, necessitating repair of the cutdown site at the end of the procedure. In late 1982, transcutaneous femoral approach, via a direct puncture to the femoral artery, was introduced and this quickly became the more popular approach.

The first PCI in Malaysia was performed by Dr Singham and Dr Anuar Masduki in the University Hospital, now known as University Malaya Medical Centre (UMMC), in 1983. Following an initial lull period, the procedure grew again, initially slowly from 1988, with visits by Dr Simon Stertzer and Dr Joseph Walton. Here I wish to recognise Dr Jeyamalar with

whom I initially started doing the procedures together, and Dr Kannan, who elected to 'step aside' to give us the opportunity to gain maximum experience, in the belief that it is best to allow us maximum exposure and experience.

In 1989, Dr David Clarke from San Francisco Heart Institute visited University Malaya Medical Centre. During this visit, Dr Jeyamalar, Dr Kannan, Dr Ng Swee Choon (from Subang Jaya Medical Centre) and I performed PCI with guidance and suggestions from Dr Clarke.

After about a year, in 1989, having had 'adequate' exposure and experience, I started PCI in Hospital Kuala Lumpur,whereas Dr Jeyamalar and Dr Kannan continued on in University Malaya Medical Centre.

The availability of intra-coronary stents increased the safety margin of PCIs. By tacking dissection flaps, they reduced the incidence of myocardial infarction and the need for emergency coronary artery bypass surgery. When the Palmatz Schartz intra-coronary stents first became available, their makers, Johnson & Johnson Medical required potential users to understudy stent implantation by experienced interventionalists. Dr Ng Swee Choon went to understudy stenting by Dr Nobuyoshi in Fukuoka, Japan and I myself later went to see understudy Dr Richard Schartz at Scripps Clinic in San Diego. The first intra-coronary stenting in Malaysia was in May 1992, performed by Dr Ng Swee Choon in Subang Jaya Medical Centre.

In IJN, other cardiologists or interventionalists came on board, Dr Zainal Hamid, Dr Dewi Ramasamy, Dr Rosli Mohd Ali, Dr David Chew, Dr Mohd Nasir Muda, Dr Aizai Azan, Dr Razali Omar, Dr Amin Ariff, Dr Azhari Rosman, Dr Lam Kai Huat, Dr Azlan Hussin, Dr Shaiful Azmi, Dr Balachandran, Dr Ahmad Khairuddin, to name some, and through the years we have continued to develop the procedures.

Other devices developed for coronary interventions were rotational atherectomy, directional atherectomy, and "diagnostic" devices like intravascular ultrasound (IVUS) and fractional flow reserve (FFR). Rotational atherectomy, was introduced to Malaysia by Dr Simon Stertzer when we performed the first case in 1991. Today, rotational atherectomy has niche indications, for calcified lesions and lesions that are "uncrossable" or "undilatable". We performed the first directional atherectomy in 2002. However, as this device did not

demonstrate clear benefits in interventional clinical trials, after a few cases, we discontinued the use of this device. Intravascular ultrasound (IVUS) interrogates the vessel from within. IVUS debuted in Malaysia when we first performed it in 1993. In the last three years, out of all the cases in the cardiac-catheterisation laboratories, the percentage of IVUS cases in the Institut Jantung Negara alone accounted for 10.2%, 9.1% and 13.5% for 2006, 2007 and 2008, respectively. Another diagnostic procedure, evaluating fractional flow reserve (FFR), was first performed locally in 2001. Presently FFR is not yet being used routinely in IJN.

Initially the approach for PCI was percutaneous transfemoral. Dr Zainal Hamid and Dr Nasir Muda together with Dr Shigeru Saito performed the first transradial procedure in 1997. This approach grew and currently constitutes about 39% of our total PCI procedures.

The first primary PCI in acute myocardial infarction was performed by Dr Zainal Hamid and Dr Razali Omar on 19th July 1995. This case was distinct; the patient was a 36 years old policeman who 'collapsed' while chasing a robber. He was seen in the emergency department at 1.05 p.m. and the electrocardiogram (ECG) showed acute extensive anterior myocardial infarction. Femoral puncture was performed at 1.50 p.m., the proximal left anterior descending artery total occlusion lesion was dilated and stented. He has remained well and is still on regular follow-up.

We used the first drug-eluting stent (DES), the sirolimus-eluting stent, Cypher on 30th May 2002 and some ten months later on 3rd March 2003, we used the Paclitaxel-eluting stent, Taxus,. Newer DES continues to become available. In 2008, DES constituted 69.2% of cases. Dr Rosli Mohd Ali performed the first drug-eluting balloon PCI in 2001. In the recent years, the number of PCIs and coronary artery bypass graft surgeries (CABGS) performed in IJN are as follows:-

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|
| PCI | 1728 | 1977 | 2231 | 2558 | 2623 | 2348 |
| PTCRA | 38 | 56 | 68 | 37 | 28 | 47 |
| DES (%) | 29.7 | 46.3 | 57.4 | 56.3 | 59.6 | 69.2 |
| Radial | 842 | 723 | 876 | 856 | 1060 | 920 |
| IVUS | - | - | - | 262 | 240 | 319 |
| CABGS | 892 | 992 | 972 | 968 | 919 | 937 |

Some of our consultants and registrars, who had spent varying periods of time in Department of Cardiology, Hospital Kuala Lumpur and Institut Jantung Negara and who left for private practice or to join other hospitals, went on to develop PCI techniques in their places of practice and I wish to acknowledge them, and their current places of practice, as follows (in no specific order):-

| Cardiologists | Organisation |
|---|---|
| Dr Zainal Abidin Hamid | Pantai Hospital Kuala Lumpur |
| Dr Dewi Ramasamy | Gleneagles Intan Hospital |
| Dr Ahmad Nizar Jamaluddin | KPJ Selangor Specialist Hospital |
| Dr Omar Ismail | Penang Hospital |
| Dr Lam Kai Huat | Assunta Hospital |
| Dr Devan Pillay | Gleneagles Intan Hospital |
| Dr Raj Kumar Menon | KPJ Selangor Specialist Hospital |
| Dr Teh Aik Seng | Adventist Hospital |
| Dr Yap Sau Peng | Puteri Specialist Hospital |
| Dr Lai Voon Ming | Sri Kota Medical Centre |
| Dr Na Boon Seng | Loh Guan Lye Hospital |
| Dr Choo Gim Hooi | KPJ Selangor Specialist Hospital |
| Dr Lim Guan Choon | Lam Wah Ee Hospital |
| Dr Philip Ho Yew Choong | Pantai Hospital |
| Dr Hasral Noor Hasni | Ipoh Specialist Hospital |
| Dr Choong Choon Hooi | Fatimah Hospital |
| Dr Chang Sau Kong | Adventist Hospital |
| Dr Tan Huat Chai | Fatimah Hospital |
| Dr Foong Yi Kwan | Mutiara Hospital |
| Dr Aminudin Sani | Kedah Medical Centre |
| Dr Ng Then Chun | Ipoh Specialist Hospital |
| Dr Kevin Joseph | Pantai Putri Hospital |
| Dr Lai Yee Cheak | Metro Specialist Hospital |
| Dr Shanker Moorthy | Prince Court Medical Centre |
| Dr Ngim Chim Aik | Johor Specialist Hospital |
| Dr Lim Seh Kin | Penang Hospital |

| Cardiologists | Organisation |
|---|---|
| Dr Tee Heng Giap | Mahkota Medical Centre |
| Dato' Dr Tan Kien | Kuantan Specialist Hospital |
| Dr Ng Kok Huan | Tengku Ampuan Afzan Hospital |
| Dr Tiang Soon Wee | Damansara Specialist Hospital |
| Dr Chong Yoon Sin | Serdang Hospital |

The Institut Jantung Negara has an arrangement with the Sabah state government for the last 10 years where an interventional cardiology team (consisting of a consultant cardiologist, angiographer, interventional scrub nurse and cardiovascular technologist) and cardiac surgical – cardiac anaesthesiology team (consisting of consultant cardiothoracic surgeon, cardiothoracic surgical registrar, consultant cardiac anaesthesiologist, surgical scrub nurse and perfusionist) will go for a week every month to provide cardiological and cardiac (and lung) surgical services. In the single cardiac catheterisation laboratory in Sabah Medical Centre (SMC), the vast majority of cases came from Queen Elizabeth Hospital, and for these cases Dr Phanindranath who initially assisted but now over the time has gained experience and expertise to perform PCI independently. Two other interventionalists from Sabah Medical Centre are Dr Tseu Fui Loong and Dr Philip Lim. The number of cases in Sabah has grown over the years, as follows:-

Number of Interventional Catheterisation Lab (ICL) cases in SMC, Year 1998 - 2008

| Cardiology | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coronary Angiogram | 33 | 124 | 182 | 210 | 246 | 198 | 255 | 265 | 282 | 309 | 381 | 2485 |
| PCI | 12 | 29 | 60 | 69 | 120 | 79 | 123 | 158 | 222 | 208 | 207 | 1287 |
| Permanent/Dual Chamber Pacemaker | - | - | 2 | 5 | 6 | 11 | 30 | 29 | 23 | 32 | 22 | 160 |
| Others | - | 3 | - | - | - | 9 | 9 | 4 | 1 | 2 | 2 | 30 |
| Total | 45 | 156 | 244 | 284 | 372 | 297 | 417 | 456 | 528 | 551 | 612 | 3962 |

Number of Cardiothoracic surgical cases in SMC, Year 1998 - 2008

| Cardiothoracic Surgery | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CABG | 9 | 31 | 43 | 52 | 55 | 38 | 35 | 36 | 40 | 44 | 53 | 436 |
| PDA Ligation | 1 | 6 | - | 4 | 1 | - | 1 | - | - | - | | 13 |
| AVR/MVR | 3 | 20 | 20 | 16 | 26 | 15 | 23 | 39 | 45 | 57 | 67 | 331 |
| ASD / VSD | 1 | 14 | 1 | 2 | 3 | 2 | 8 | 1 | 1 | - | | 33 |
| Others | 1 | 9 | 2 | 8 | 21 | 12 | 20 | 32 | 28 | 43 | 43 | 219 |
| Total | 15 | 80 | 66 | 82 | 106 | 67 | 87 | 108 | 114 | 144 | 163 | 1032 |

It should be noted that number of CABG performed were consistent by years and this is due to the development of PCI in Hospital Kuala Lumpur and Institut Jantung Negara. PCI was also progressing and developing in University Malaya Medical Centre, Penang Hospital, Sarawak General Hospital, University Kebangsaan Malaysia Hospital, University Sains Malaysia Hospital, Sultanah Aminah Hospital, Serdang Hospital and many private centres and hospitals throughout Malaysia.

From percutaneous intervention perspective, the Institut Jantung Negara has evolved over the years from being a service provider to an institution which plays a concomitant role in knowledge dissemination. In 2003, it began to informally accept fellows from regional and international medical institutions to subspecialties in various aspects of cardiac intervention. The Institut Jantung Negara played a major role in live interventional courses, with the first 'Malaysia Live' in 2004, and the first 'Institut Jantung Negara (Paediatric) Live', also in 2004. Malaysia Live is an annual cardiovascular interventional symposium with live transmission, organised by the interventional cardiovascular society, a member society within the National Heart Association of Malaysia, with global participants and live cases transmission to an audience, on the latest techniques and paradigms in the field of cardiac intervention. Institut Jantung Negara was the Malaysian transmission site for the first four years, with University Malaya Medical Centre being the transmission center in 2008. IJN had also participated with live case transmissions to other interventional meetings, notably to Singapore Live in 2002, the EuroPCR in Paris in 2005, Complex Cardiovascular Therapeutics CCT Kobe in 2005, Asian Interventional Cardiovascular Therapeutics AICT New Delhi in 2006 and TCT-Asia Pacific Angioplasty Summit in Korea in 2007.

Although this is on the development of PCI in Hospital Kuala Lumpur and the Institut Jantung Negara, I wish to recognise also the parallel development of cardiac surgical procedures, initially under Dr Rozali Wathooth, followed by Dr Yahya Awang and Dr Mohd Azhari Yakub, and other esteemed cardiothoracic surgeons along with cardiac anaesthesiologists, initially Dr Radhakrishnan and Dr Mary Samuel, and subsequently Dr Mohd Hassan Ariff, Dr Sharifah Suraya and other esteemed cardiac anaesthesiologists. I also wish to recognise the parallel development of electrophysiology, peripheral vascular intervention and paediatric cardiological intervention. In the field of electrophysiology, following the first radiofrequency ablation for atrioventricular nodal reentry tachycardia (AVNRT) by Dr Ahmad Murtazam and Dr Ahmad Nizar in 1992, electrophysiology, ablative procedures and pacing procedures have developed exponentially under Dr Razali Omar and Dr Azlan Husin, with the aquisition of equipment and expertise for three dimensional mapping, atrial fibrillation ablation and cardiac resynchronization therapy.

The interventional procedures extended beyond vascular intervention. The first coil embolization of septal branch for symptomatic hypertrophic obstructive cardiomyopathy was done by Dr Amin Ariff and I in 1999; subsequently symptomatic hypertrophic cardiomyopathy was addressed with transcoronary (alcohol) myocardial septal ablation, the first by Dr Rosli Mohd Ali and Dr Razali Omar, in May 2005. In paediatric cardiology, following balloon atrial septostomy in 1985 and pulmonary valve balloon dilatation for pulmonary valve stenosis in 1987, both by Dr Chan Kak Chen, subsequent escalating development from then onwards was led by Dr Mazeni Alwi and Dr Hasri Samion. In peripheral vascular intervention, following the first balloon dilatation for renal artery stenosis in 1995 by Dr Dewi Ramasamy and renal artery stenting in 1997 by Dr Rosli Mohd Ali, other initial peripheral vascular interventions including iliac and aorto-iliac stenting in 1994 and carotid artery stenting in 1999, which were performed by Dr Rosli Mohd Ali and me, our initial cases together, in the belief that the learning phases would be enhanced when performed by two interventionalists. The first endovascular abdominal aortic aneurysm repair (EVAR) in Malaysia was performed by a vascular surgeon. In IJN, Dr. Rosli Mohd Ali and I did the first case in the interventional catheterisation laboratory, in October 2001, with Dr Azhari Yakub's team handling the arterial cutdown and subsequent repair, and Dr Hassan Ariff's team attending to the patient's general anaesthesia. Dr Rosli went on to develop peripheral vascular intervention and has been recently joined by Dr Shaiful Azmi.

PCI development is only possible with the participation and contribution of other ancillary staff, notably angiographers, nurses and cardiovascular technologists. I wish to register my gratitude for their involvement, participation and sacrifices. Many cases were and continue to be performed beyond normal working hours. Primary PCI are done as and when the patients present themselves, with the target door-to-balloon time of below 90 minutes.

I wish to thank Puan Dolly Mohd Ali for her help in obtaining the data and information and Puan Hamizah Hamzah for typing this manuscript. This script is written from memory and available records and I apologize for any unintended inaccuracies and any inadvertent omission.

**Ministry of Health Hospitals**

Omar Ismail, Lee Chuey Yan, Sim Kui-Hian, Abd. Kahar Ghapar, Abd. Rahim Tahir, Azerin Othman, Abd. Hadi Jaafar and Liew Houng Bang on behalf of all MOH Heart Centres

After the corporatization of the Cardiology/Cardiothoracic services at Hospital Kuala Lumpur as the Institut Jantung Negara in 1991, the decentralization policy was carried out by establishing Ministry of Health Heart centres at Penang Hospital (1994), Sultanah Aminah Hospital (1996), Sarawak General Hospital (2001), Serdang Hospital (2006), Sultanah Bahiyah Hospital (September 2007), in Kota Bharu. There has been a visiting cardiology team from Raja Perempuan Zainab II Hospital to Universiti Sains Malaysia Hospital since April 2009 and recently on June 19$^{th}$ 2009 to Tuanku Ampuan Afzan Hospital, with the cooperation of the Medical Faculty, International Islamic University, Kuantan, to spread and strengthen these services in the East Coast. God-willing, by the end of 2009, a cardiology team from Queen Elizabeth Hospital, Sabah will begin their interventional services at the Sabah Medical Centre to continue the good work that was started by the Institut Jantung Negara team at this centre, since 1998.

In addition to sending senior cardiology fellows for advanced training either at IJN or abroad, various proctorship programs were implemented at MOH Heart centres to strengthen our services with the help of eminent cardiologists locally from IJN and also internationally from Asia, Australia, Europe and USA. We also had the support from our colleagues from the

Paediatric Cardiology, Cardiothoracic Surgery and Cardiothoracic Anaesthesia Units, in addition to other services in MOH hospitals.

It is our hope that these essential services will be made available and accessible nationwide in most of the state hospitals in Malaysia, by the year 2020.

MOH Heart Centres and annual Statistics of PCIs performed as shown below:

| Hospital | Year of Establisment | 2nd year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|
| Penang Hospital | 1994 | 38 | 565 | 507 | 528 | 665 | 669 | 424* |
| Sultanah Aminah Hospital | 1996 | 89 | 514 | 498 | 644 | 625 | 496 | 541 |
| Sarawak General Hospital | 2001 | 219 | 222 | 233 | 242 | 273 | 412 | 415 |
| Serdang Hospital | 2006 | - | - | - | - | - | 186 | 378 |
| Sultanah Bahaiyah Hospital | 2007 | - | - | - | - | - | - | 92 |
| Raja Perempuan Zainab II Hospital | Apr 2009 | - | - | - | - | - | - | - |
| Tengku Ampuan Afzan Hospital | June 2009 | - | - | - | - | - | - | - |
| TOTAL | | 346 | 1301 | 1238 | 1414 | 1563 | 1763 | 1850 |

**Interventional Catheterisation Laboratory (ICL) of Penang Hospital has been closed for 6 months for upgrading &the installation of 2nd ICL, and targeted to be ready by September 2009*

**University Malaya Medical Centre**

Wan Azman Wan Ahmad
*FRCP,FAMM,FNHAM,FCAPSC,FAsCC,FAPSIC,FACC,FESC,FSCAI*

Cardiac catheterisation began at the University Malaya Medical Centre (UMMC) in 1971 by Prof Dr H.O. Wong, Dr Singham and Dr T.H. Goh investigating congenital and rheumatic heart disease patients. Professor Dr J. Ward Kennedy, M.D, M.A.C.C from University of Washington, Seattle USA, who later rose to become one of the most distinguished Professor in Cardiology and who also became the President of American College of Cardiology (2004), came to UH in 1972/73. Under his care the cardiology services expanded and strengthened. Again in 1991 Prof Dr Ward Kennedy spent a further four months at UMMC.

Cardiac Surgery support was provided by Professor Dr. N.K. Yong and subsequently by Dr H.S. Saw.Prof Dr N.K. Yong did the first open heart bypass surgery in South East Asia, for Atrial Septal Defect closure in 1971. Coronary angiogram was first started in UH by Associate Professors Dr Singham and Dr Anuar Masduki in 1982. In 1983 they successfully performed the first coronary angioplasty in Malaysia. The angioplasty was performed on an Indian male patient with subtotal proximal left anterior descending artery stenosis, with good results. Their experience with a few more patients was presented at the Malaysia-Singapore Congress of Medicine that year.

The good work of Assoc Prof Dr Singham and Assoc Prof Dr Anuar Masduki was continued by Dr Ng Swee Choon, Dr Kannan, Dr Jeyamalar, Dr Ong Mei Lin and Dr Shatar Dahlan, after they left UMMC. During these periods we have had many eminent visiting cardiologists who came to work in our cardiac catheterisation laboratory. Among them was Dr Simon Stertzer who was a good friend of Andreas Gruentzig. Prof Dr Hung came in 1991 and again in 1992 to teach us the Inoue technique for Percutaneous Transluminal Mitral Commisuratomy.

Other eminent cardiologists who have helped to establish the interventional work at UMMC were Dr Shigeru Saito of Shonan Kamakura Hospital Japan, Dr Harry Suryapranata of Hospital De Weezenlanden Netherlands and Dr Spencer B.King III of the Piedmont Hospital, Atlanta Fuqua Heart Centre USA.

I would like to acknowledge Prof Dr C.C. Lang who joined the Department of Medicine in 1996 and strengthened our research development. Prof Dr Lang's wife Assoc Prof Dr Anna Maria Choy started the electrophysiology work at UMMC. Around 1997 Prof Dr K.H. Tan joined UMMC and further enhanced our interventional work. Other cardiologists who spent varying periods of time at UMMC and who have now left for private practice whose contributions I would like to recognise are as follows:-

1 Dr Suren Thuraisingham
2 Dr Soo Chee Seong
3 Dr Liao Chi Ming
4 Dr Chan Chong Guan
5 Dr Jesudason
6 Dr Betty Teh

7 Dr Siow Fook Soon

8 Dr Haizal Haron Kamar

9 Dr Nik Asmah Nik Hussain

10 Dr Nik Halmey Nik Zainal Abidin

11 Dr Syahidah Syed Tamin

UMMC performs between 800-1000 interventional procedures per year. Other cardiologists who have contributed to this registry are Assoc Prof Dr Imran Zainal Abidin, Assoc Prof Dr Chee Kok Han, Dr Chong Wei Peng and Dr Ramesh Singh. Lastly but not least, I would like to acknowledge all cardiology lecturers, trainees, fellows and our laboratory technologists for helping to obtain these data.

**Private Hospital**

Wan Azman Wan Ahmad
*FRCP,FAMM,FNHAM,FCAPSC,FAsCC,FAPSIC,FACC,FESC,FSCAI*

The first Percutaneous Transluminal Coronary Angioplasty (PTCA) at a private hospital was done at Subang Jaya Medical Centre in September 1989 by Assoc Prof Dr Anuar Masduki on a 34 year old Chinese patient with subtotal proximal Left Anterior Descending (LAD) stenosis, with good results. He required re-PTCA of same LAD site and severe Proximal Left Circumlex (LCx) lesions only 10 years later.

# CHAPTER 1: PROVISION OF CATHETERISATION LABORATORY SERVICES IN MALAYSIA

(RESERVED)

# CHAPTER 2: PATIENT CHARACTERISTICS

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This chapter examines demographic and clinical parameters of patients who underwent Percutaneous Coronary Intervention (PCI) during the calendar year 2007 in Malaysian PCI sites that contributed to this inaugural report.

In total, 3677 patients underwent PCI in Malaysia in the year 2007, with 3920 procedures performed: 3442 patients had 1 PCI, 227 patients had two PCIs, and eight patients had three PCIs performed.

The mean age of the patients was 56.7±10.11 years. Twenty four percent (24%) of them were aged below 50 years, 64.9% aged between 50 and 70 years while 11.1% were aged 70 years and above. Approximately eighty one percent (81.2%) of the patients were male. Under ethnic distribution, 46.7% were Malays, 25.1% Chinese and 23.8% Indians. Non-Malay Bumiputeras accounted for 1.8% of those who underwent PCI.

In terms of admission status of the patients undergoing PCI, 71.4% were elective admissions, while 20.5% were referred cases. Notably, 4.7% of the patients were referred from the emergency department, and a further 0.9% was transferred from another facility for this procedure.

**Significant past medical history**

Cardiovascular risk factor (CVRF) profiling of patients undergoing PCI was undertaken: smoking habit, dyslipidaemia, hypertension, diabetes, family history of premature cardiovascular disease (CVD) and a known history of myocardial infarction (MI). In addition, we also analysed other factors such as previously documented coronary artery disease (CAD), history of new-onset angina, history of congestive cardiac failure (CCF), chronic lung disease, cerebrovascular disease, peripheral artery disease and chronic renal impairment.
With 81.4% of data fields pertaining to smoking history complete, we found that 16% of those undergoing PCI were current smokers, 28.6% former smokers, and 36.8% who were non-smokers.

Of the other more contemporary CVRF, 75.3% of patients undergoing PCI had a history of dyslipidaemia, 74.2% had hypertension, 45.6% had diabetes (with 73.8% requiring only oral hypoglycaemic agents, and 9.1% requiring insulin), and 16% having family history of premature CVD.

About thirty five percent(34.8%) of the patients undergoing PCI had a previous documented history of MI, 54.7% had previous documented CAD, 23% had new-onset angina, 3.4% had a known history of CCF, 0.8% with chronic lung disease, 1.6% with cerebrovacsular disease, 1% with peripheral vascular disease and 6% with chronic renal failure.

About twenty two percent (21.7%) of the patients undergoing PCI were known to have history of CAD (i.e. combining those previously known to have had a MI, angiographically documented CAD >50% or history of angina – chronic or new onset).

The mean baseline creatinine was 125.36 mcmol/L, with a median of 98.0 mcmol/L (ranged from 60 – 1280 mcmol/L). Baseline serum cholesterol was 4.57 ± 1.35 mmol/L; serum LDL was 2.64 ± 1.26 mmol/L. Mean body mass index (BMI) of the patients was 26.38 ± 4.21 $kg/m^2$. About twenty three percent (22.9%) of the patients had had a previous PCI performed, while 3.6% had previous coronary artery bypass surgery.

**PCI Institutions and other Sub-analyses**

In the eight reporting sites for PCI in 2007, we noted that the Institut Jantung Negara occupied the prime position for procedures performed, responsible for 58.9% of the total number reported nationally. The Ministry of Health tertiary referral Cardiology centres in Penang (Penang Hospital, PH), Kuching (Sarawak General Hospital, SGH) and Johor Bahru (Sultanah Aminah Hospital, SAHJB) were responsible for 12.5%, 9.7% and 8.3% of reported PCI procedures performed, respectively. University Malaya Medical Centre (UMMC) was responsible for 9.6% of the total reported PCIs performed nationally. These five reporting centres accounted for approximately 99% of reported PCI procedures for 2007 in Malaysia. For the purpose of subsequent analyses and sub-analyses, we have focused on data from these five sites (Refer to table 2.2b).

In terms of ethnic distribution of patients undergoing PCI, there was a fair reflection of the population of the referral base, for each site. In the four highest reporting sites in West Malaysia (IJN, PH, SAHJB and UMMC), Malays accounted for 38.6 - 53.9% of the patients undergoing PCI, with 17.4 - 36.4% Chinese and 22.5 - 34.2% were of Indian ethnic origin. In the East Malaysian site (SGH), Malays accounted for 21.4%, Chinese 55.1%, Indians 0.9%, while 21.7% were Non-Malay Bumiputeras.

Gender distribution amongst the five sites was generally similar, with more men undergoing PCI as compared to women. The largest variation- was at UMMC (73% male) and SGH (90.6% male).

The age variations for patients undergoing PCI were more notable: About twenty seven percent (26.7%) of male patients were under 50 years old, while only 12.4% of females were in this age group. About thirty five percent (34.8%) of male patients were over the age of 60 years, as compared to 57.8% of females. In the age group between 50 and 60 years of age, 38.5% were male as compared to 29.8% female.

Age-gender-ethnic group analyses revealed interesting findings: amongst male patients, 14.2% were Malays under the age of 50 years, as compared to 6.9% Indians, 4.7% Chinese and 1.1% were males of other (Non-Malay Bumiputeras, other Malaysians and Foreigners combined) ethnic groups. Amongst female patients, 5.8% were Malays under the age of 50 years, as compared to 4.7% Indians, 1.2% Chinese and 0.6% were females of other ethnic groups.

In the analyses of the presence of the more common CVRF (dyslipidaemia, hypertension, diabetes, family history of premature CVD, smoking and obesity), we noted that in our patients undergoing PCI, 98.4% had at least 1 risk factor (6.5% with one risk factor, 19.3% with two risk factors , 33.3% with three risk factors, and 39.4% with four or more risk factors). These findings were comparable between genders.

**Discussion**

Comparing our patients who underwent PCI with other major Registries (SCAAR[1] and Ontario[2]), it is clear that our reported patient population is different. Our patients are younger (56.7 year old in NCVD-PCI vs. 65.7 years old in SCAAR vs. 62.3 years old, in Ontario, [mean age in years]) and have a higher proportion of males (81.2% in NCVD-PCI vs. 71.7% in SCAAR vs. 72.2%, in Ontario). Malaysian patients undergoing PCI appear to be of a higher risk category when comparing the presence of some risk factors such as diabetes (45.6% in NCVD-PCI vs. 19.6% in SCAAR vs. 31.3%, in Ontario) and hypertension (74.2% in NCVD-PCI vs. 45.0% in SCAAR vs. 36.8% in Ontario). However in contrast, relatively less of our PCI

population are active smokers (16% in NCVD-PCI vs. 19% in SCAAR) with a lower past history of heart failure (3.4% in NCVD-PCI vs. 7.6% in SCAAR vs. 5.2%, in Ontario). The differences in the findings regarding ethnic demographics in the age-gender analyses could indicate a different pathophysiological process of premature development of CAD, as do the findings of a relatively bigger population, particularly the male gender under the age of 50 years, without established CVRF, who undergo PCI in Malaysia. On the other hand, overall for our PCI population, significantly, 98.4% have at least one established CVRF.

**Summary**

1. In 2007, we recorded 3677 patients who underwent 3920 PCI procedures in Malaysia.
2. About 71% percent (71.4%) of PCI procedures were performed as elective cases.
3. Malaysians undergoing PCI (mean age of 56.7 years) were younger as compared to those patients in some developed countries.
4. About ninety eight percent (98.4%) of patients undergoing PCI had at least one established cardiovascular risk factor.
5. We have a higher incidence of diabetes among the patients (45%) undergoing PCI.

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**Table 2.1 Characteristics of patients who underwent PCI, NCVD-PCI Registry, 2007**

| | Total No. of Patients=3677 | |
|---|---|---|
| | n | % |
| **Demographics** | | |
| Age, Years | | |
| N | 3677 | |
| Mean(SD) | 56.7 (10.11) | |
| Median (min,max) | 57 (23,90) | |
| | | |
| Age group, no. (%) | | |
| 20-<30 | 15 | 0.4 |
| 30-<40 | 144 | 3.9 |
| 40-<50 | 725 | 19.7 |
| 50-<60 | 1355 | 36.9 |
| 60-<70 | 1031 | 28 |
| 70-<80 | 379 | 10.3 |
| >=80 | 28 | 0.8 |
| | | |
| Gender, no. (%) | | |
| Male | 2986 | 81.2 |
| Female | 691 | 18.8 |
| | | |
| Ethnic group, no. (%) | | |
| Malay | 1718 | 46.7 |
| Chinese | 924 | 25.1 |
| Indian | 874 | 23.8 |
| Orang Asli | 0 | 0 |
| Kadazan Dusun | 1 | 0 |
| Melanau | 0 | 0 |
| Murut | 0 | 0 |
| Bajau | 0 | 0 |
| Bidayuh | 12 | 0.3 |
| Iban | 56 | 1.5 |
| Punjabi | 46 | 1.3 |
| Other Malaysian | 26 | 0.7 |
| Foreigner | 14 | 0.4 |
| Not Available | 6 | 0.2 |
| | | |
| **Other coronary risk factors** | | |
| Smoking, no. (%) | | |
| Never | 1354 | 36.8 |
| Former (quit>30 days) | 1051 | 28.6 |
| Current (any tobacco use within last 30 days) | 587 | 16 |
| Not Available | 685 | 18.6 |
| | | |

| | Total No. of Patients=3677 | |
|---|---|---|
| | n | % |
| Family history of premature cardiovascular disease, no. (%) | | |
| Yes | 598 | 16.3 |
| No | 2594 | 70.5 |
| Not known | 485 | 13.2 |
| | | |
| Body Mass Index (BMI), kg/m2 | | |
| N | 2735 | |
| Mean(SD) | 26.38 (4.21) | |
| Median (min,max) | 26.03 (14.88,51.37) | |
| | | |
| BMI, kg/m2, no. (%) | | |
| <18.2 | 36 | 1.3 |
| 18.5-23 | 522 | 19.1 |
| >23 | 2177 | 79.6 |
| | | |
| **Co-morbidities** | | |
| Dyslipidaemia, no. (%) | | |
| Yes | 2770 | 75.3 |
| No | 659 | 17.9 |
| Not known | 248 | 6.7 |
| | | |
| Hypertension, no. (%) | | |
| Yes | 2730 | 74.2 |
| No | 871 | 23.7 |
| Not known | 76 | 2.1 |
| | | |
| Diabetes, no. (%) | | |
| Yes | 1676 | 45.6 |
| No | 1906 | 51.8 |
| Not Known | 95 | 2.6 |
| | | |
| Type of diabetes treatment, no. (%) | | |
| OHA | 1237 | 73.8 |
| Insulin | 153 | 9.1 |
| OHA + Insulin | 29 | 1.7 |
| Not Known | 257 | 15.3 |
| | | |
| Myocardial infarction history, no. (%) | | |
| Yes | 1280 | 34.8 |
| No | 2167 | 58.9 |
| Not known | 230 | 6.3 |
| | | |

| | Total No. of Patients=3677 | |
|---|---|---|
| | n | % |
| Documented Coronary Artery Disease, no. (%) | | |
| Yes | 2012 | 54.7 |
| No | 1555 | 42.3 |
| Not known | 110 | 3 |
| | | |
| New onset angina (<2weeks), no. (%) | | |
| Yes | 846 | 23 |
| No | 2726 | 74.1 |
| Not known | 105 | 2.9 |
| | | |
| Congestive Heart Failure (2weeks prior), no. (%) | | |
| Yes | 124 | 3.4 |
| No | 3440 | 93.6 |
| Not known | 113 | 3.1 |
| | | |
| Chronic lung disease, no. (%) | | |
| Yes | 28 | 0.8 |
| No | 3577 | 97.3 |
| Not known | 72 | 2 |
| | | |
| Cerebrovascular disease, no. (%) | | |
| Yes | 57 | 1.6 |
| No | 3547 | 96.5 |
| Not known | 73 | 2 |
| | | |
| Peripheral vascular disease, no. (%) | | |
| Yes | 36 | 1 |
| No | 3560 | 96.8 |
| Not known | 81 | 2.2 |
| | | |
| Chronic renal failure (>200micromol), no. (%) | | |
| Yes | 220 | 6 |
| No | 3377 | 91.8 |
| Not known | 80 | 2.2 |
| | | |
| * Coronary artery disease, no. (%) | | |
| Yes | 2775 | 75.5 |
| No | 798 | 21.7 |
| Not known | 104 | 2.8 |
| | | |

**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) Chronic angina (onset more than 2 weeks ago), 4) New onset angina (less than 2 weeks)*
*Note: 'Not known' includes patients who do not know their co-morbidities as well as missing data*

| | Total No. of Patients=3677 | |
|---|---|---|
| | n | % |
| **Baseline investigation** | | |
| Baseline creatinine, mmol/L | | |
| N | 3403 | |
| Mean(SD) | 125.36 (125.82) | |
| Median, (min,max) | 98.0 (60.0,1280.0) | |
| Not Available | 274 | 7.5 |
| | | |
| Baseline creatinine, mmol/L | | |
| <100 mmol/L | 1785 | 48.5 |
| 100 – 199 mmol/L | 1419 | 38.6 |
| > 200 mmol/L | 199 | 5.4 |
| Not Available | 274 | 7.5 |
| | | |
| **Total cholesterol, mmol/L | | |
| N | 1162 | |
| Mean(SD) | 4.57 (1.35) | |
| Median, (min,max) | 4.3 (2.5,24.2) | |
| Not Available | 850 | 42.3 |
| | | |
| **LDL levels, mmol/L | | |
| N | 1142 | |
| Mean(SD) | 2.64 (1.26) | |
| Median, (min,max) | 2.4 (1.0,18.0) | |
| Not Available | 870 | 43.3 |
| | | |
| **Previous Intervention** | | |
| Previous PCI, no. (%) | | |
| Yes | 841 | 22.9 |
| No | 2824 | 76.8 |
| Not Available | 12 | 0.3 |
| | | |
| Previous CABG, no. (%) | | |
| Yes | 133 | 3.6 |
| No | 3527 | 95.9 |
| Not Available | 17 | 0.5 |
| | | |

*** Mean (SD) of Total Cholesterol, mmol/L and LDL levels, mmol/L is of the patients who had documented coronary artery disease*

| | Total No. of Patients=3677 | |
|---|---|---|
| | n | % |
| **Admission status, no. (%)** | | |
| Referral | 754 | 20.5 |
| Elective | 2625 | 71.4 |
| Emergency Department | 174 | 4.7 |
| Transfer from other facility | 33 | 0.9 |
| Out of hospital cardiac arrest | 1 | 0 |
| Others | 17 | 0.5 |
| Not Available | 73 | 2 |

Figure 2.1.1 Age group (years) distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

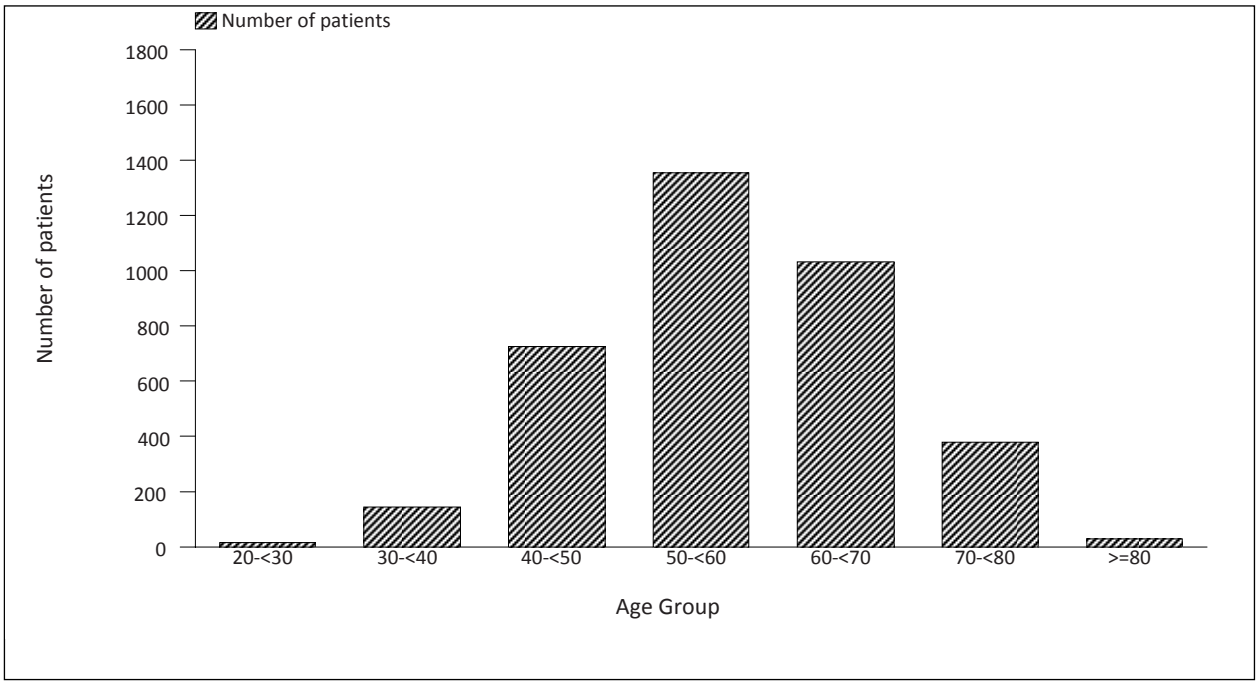


Figure 2.1.2 Gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

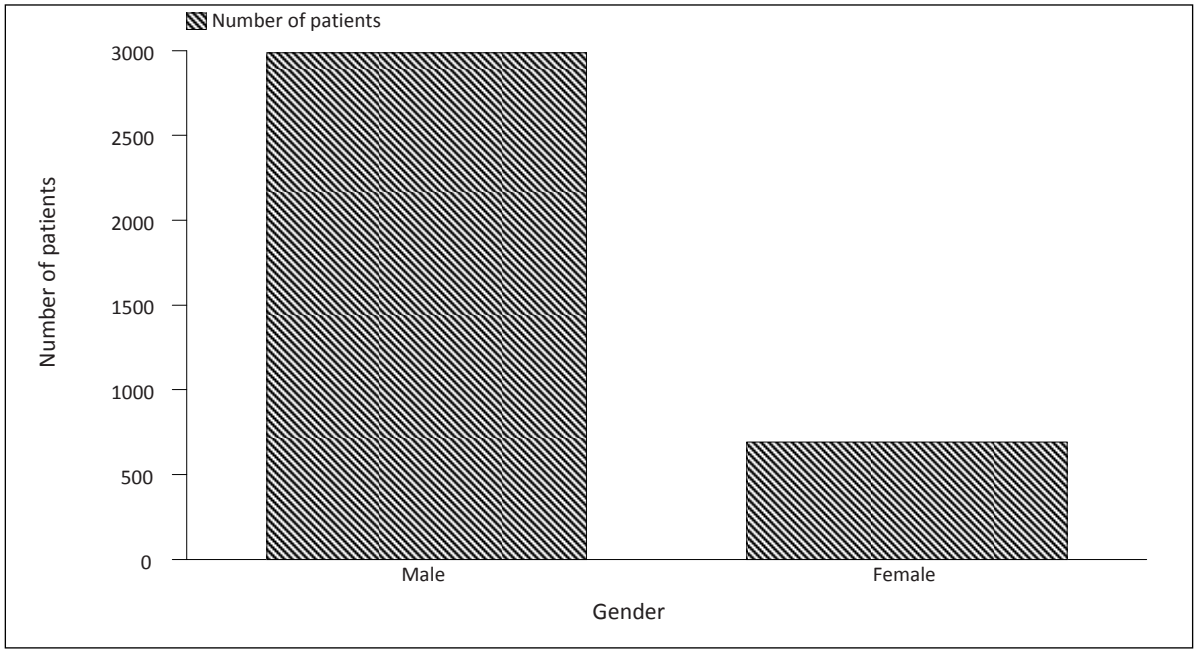



Figure 2.1.3 Ethnic group distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

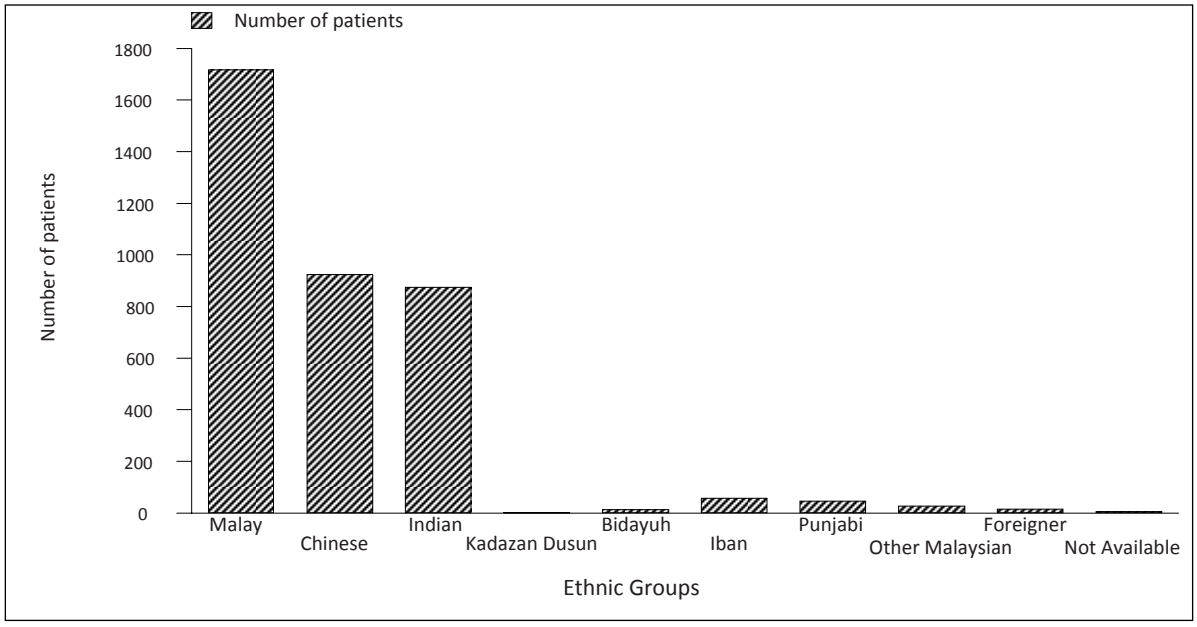


Figure 2.1.4 Smoking status of patients who underwent PCI, NCVD-PCI Registry, 2007

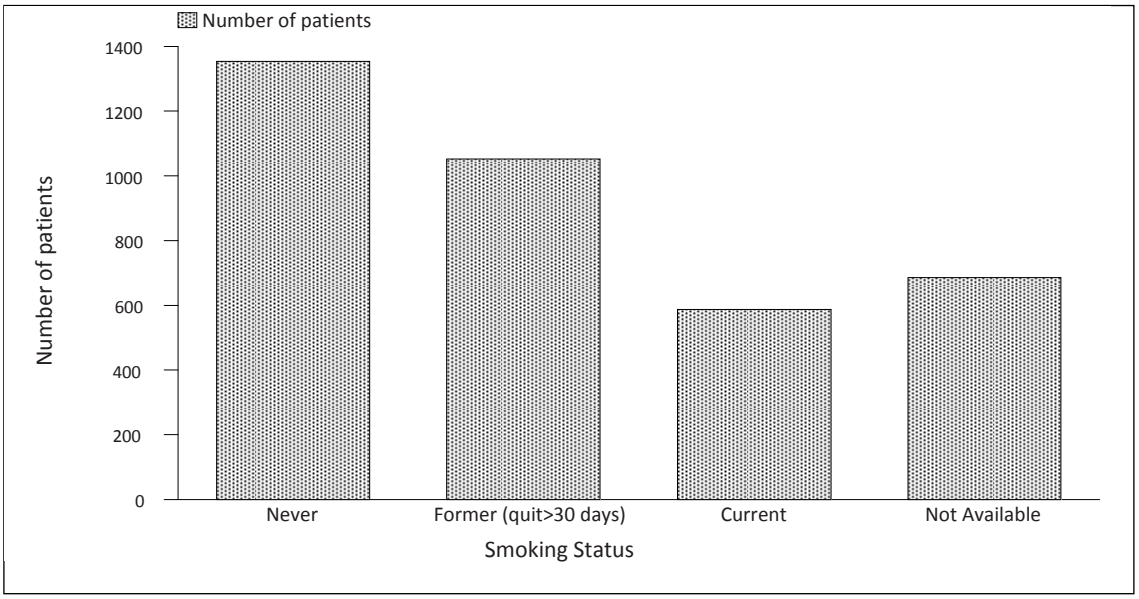



Figure 2.1.5 Family history of premature cardiovascular disease of patients who underwent PCI, NCVD-PCI Registry, 2007

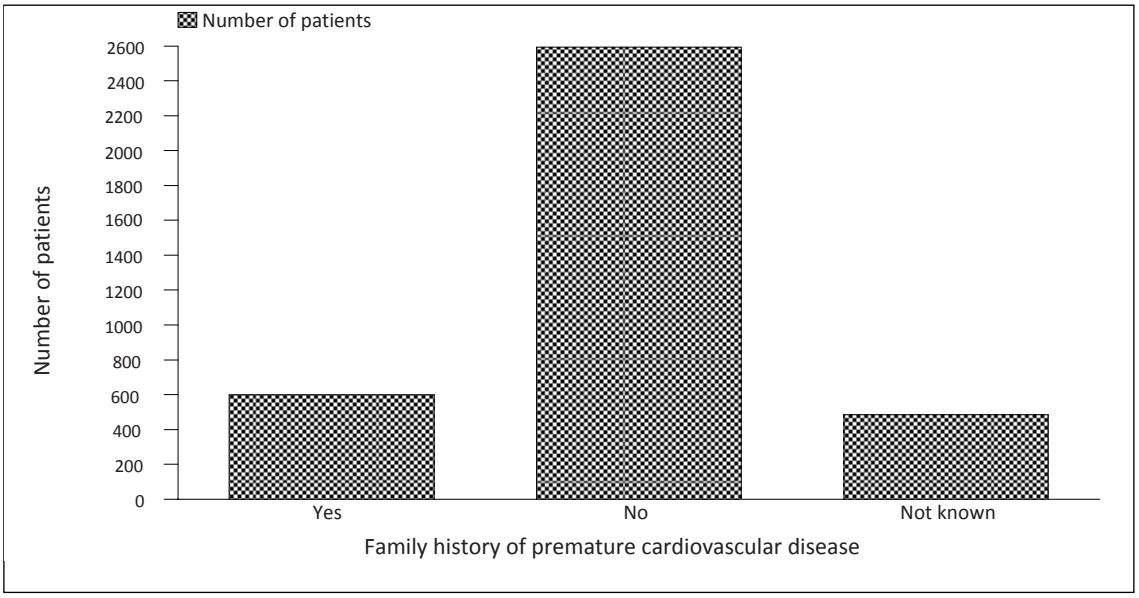


Figure 2.1.6 Body Mass Index (BMI) of patients who underwent PCI, NCVD-PCI Registry, 2007

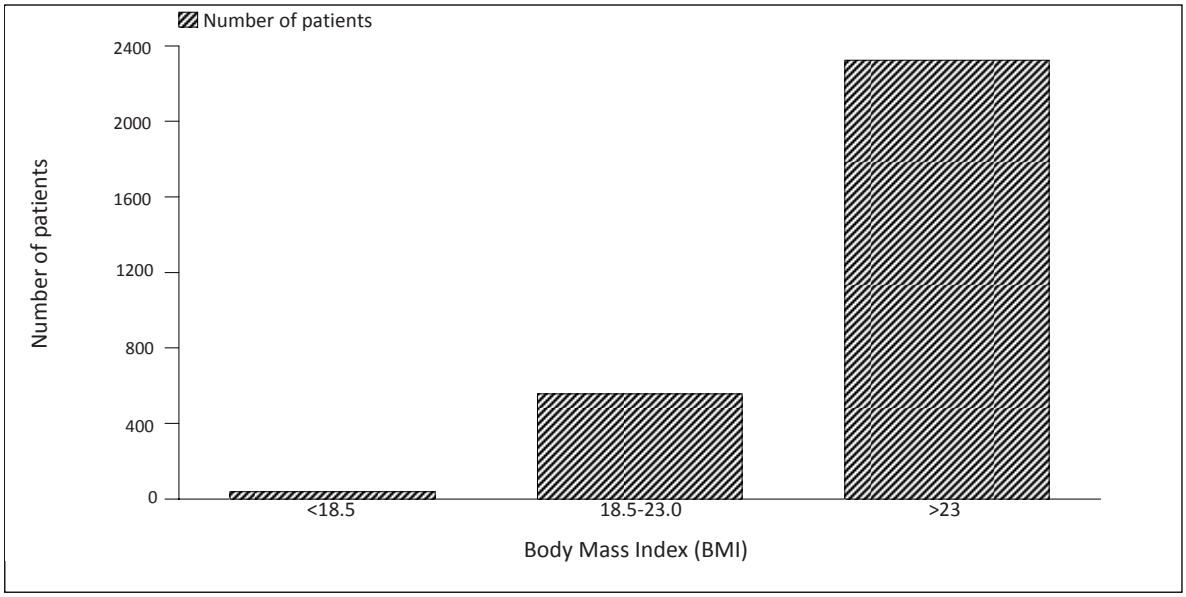
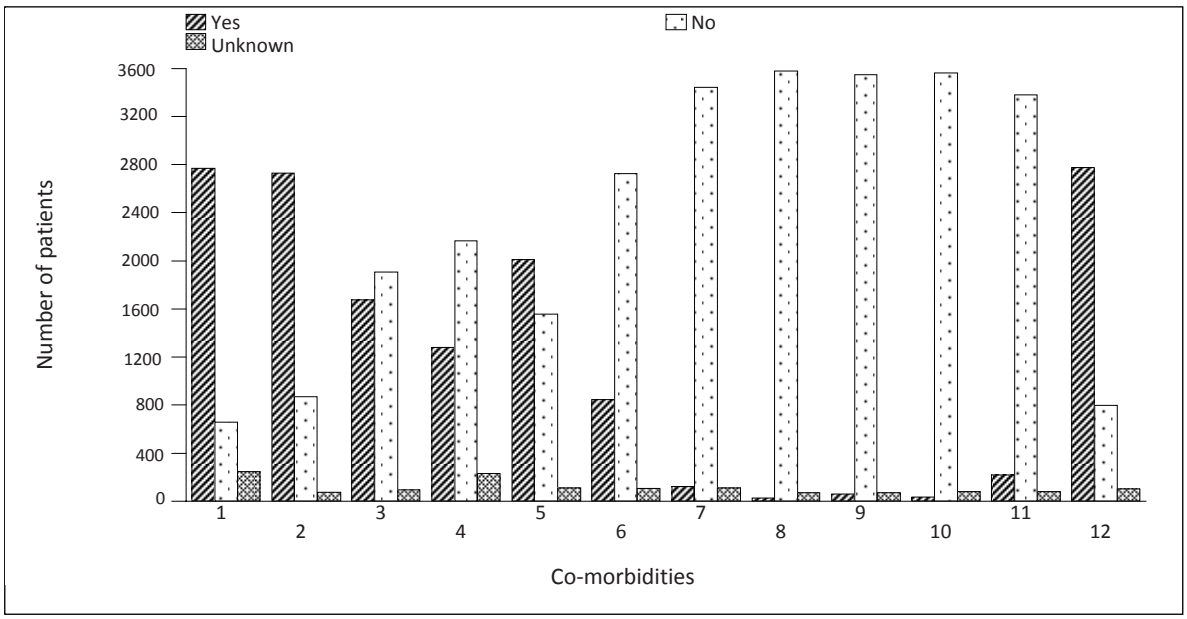



Figure 2.1.7 Co-morbidities of patients who underwent PCI, NCVD-PCI Registry, 2007




*1.Dyslipidaemia, 2.Hypertension, 3.Diabetes 4. History of Myocardial infarction, 5.Documented CAD, 6. New onset angina (less than 2 weeks) 7. Congestive Heart Failure (more than 2 weeks prior), 8. Chronic Lung Disease, 9. Cerebrovascular Disease, 10. Peripheral vascular disease, 11. Chronic renal failure, 12. 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) Chronic angina (onset more than 2 weeks ago), 4) New onset angina (less than 2 weeks)*

Figure 2.1.8 Patients who had previous revascularization procedure, NCVD-PCI Registry, 2007

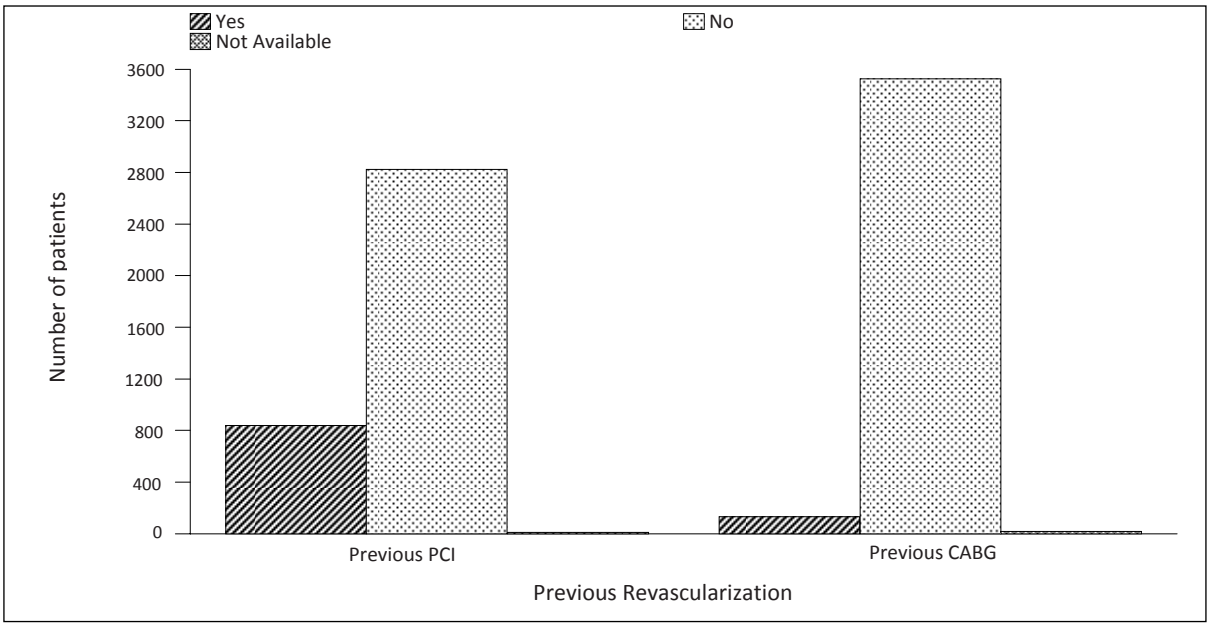
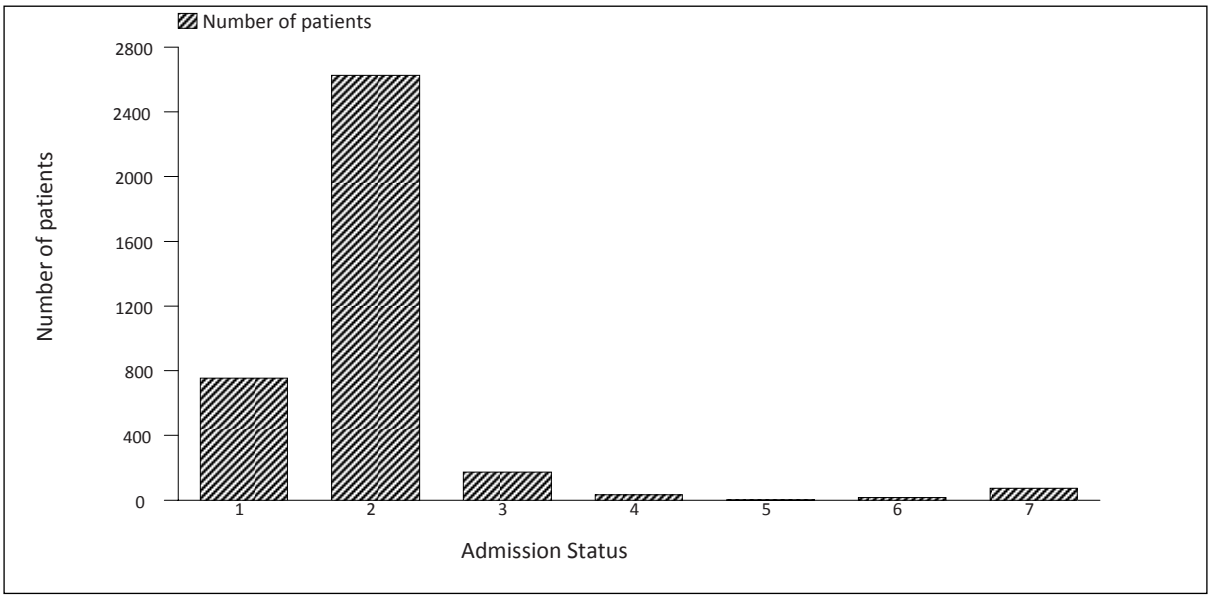



Figure 2.1.9 Admission status of patients who underwent PCI, NCVD-PCI Registry, 2007




*1. Referral, 2. Elective 3. Emergency department, 4. Transfer from other facility, 5. Out of hospital cardiac arrest, 6. Others, 7. Not Available*

**Table 2.2 Distribution of patients by number of procedures, NCVD-PCI Registry, 2007**

| No. of Procedures | No. of patients | Total no. of procedures |
|---|---|---|
| 1 | 3442 | 3442 |
| 2 | 227 | 454 |
| 3 | 8 | 24 |
| **Grand Total** | **3677** | **3920** |

Figure 2.2 Distribution of patients by number of procedures, NCVD-PCI Registry, 2007

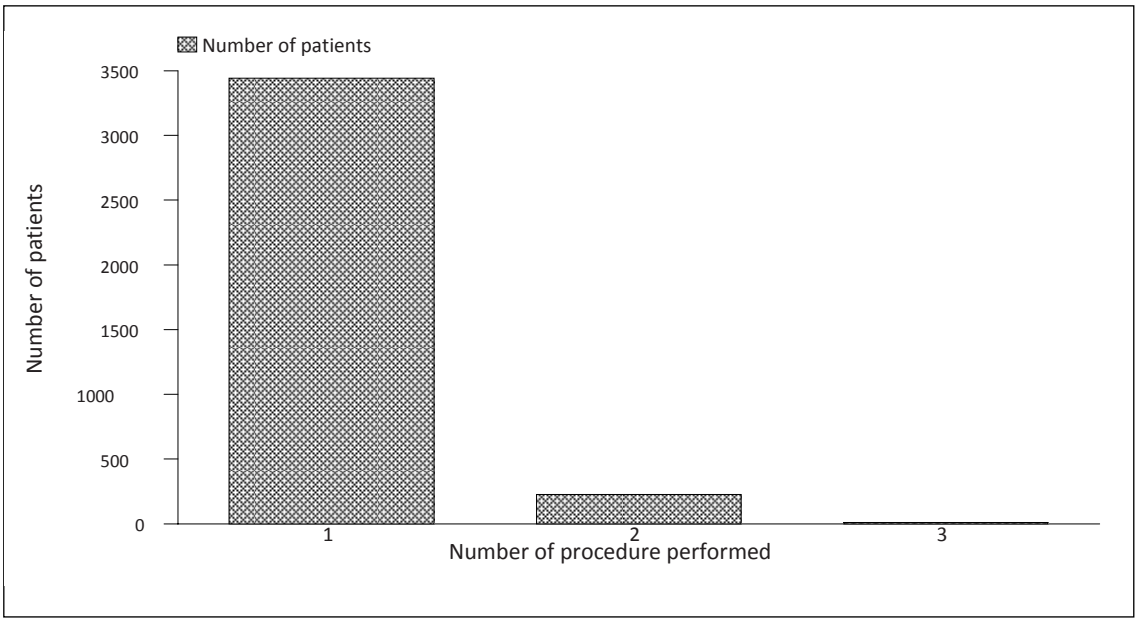



**Table 2.3.1 Distribution of patients who underwent PCI, by SDP, NCVD-PCI Registry, 2007**

| **No.** | **Source Data Providers** | **No.** | **%** |
|---|---|---|---|
| 1 | University Malaya Medical Centre | 363 | 9.9 |
| 2 | National Heart Institute | 2161 | 58.8 |
| 3 | Penang Hospital | 454 | 12.3 |
| 4 | Sarawak General Hospital | 341 | 9.3 |
| 5 | Sultanah Aminah Hospital | 324 | 8.8 |
| 6 | KPJ Selangor Specialist Hospital | 13 | 0.4 |
| 7 | Serdang Hospital | 5 | 0.1 |
| 8 | Universiti Kebangsaan Malaysia Hospital | 16 | 0.4 |
| | **Total** | 3677 | 100 |

** Each SDP started to contribute data at different time period*

Figure 2.3.1 Distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

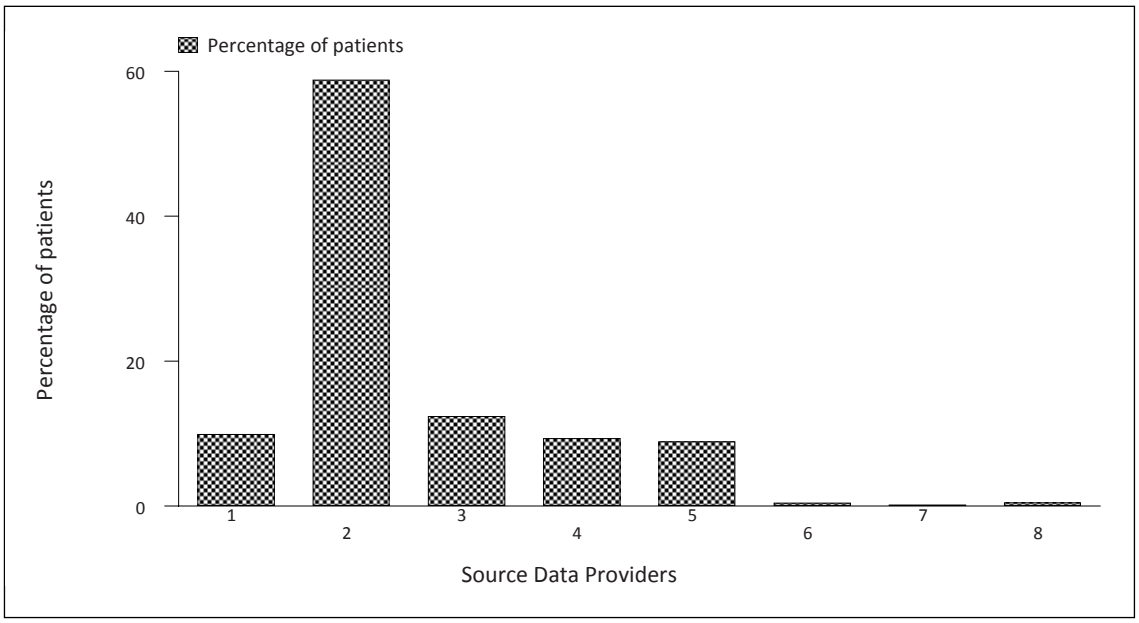



**Table 2.3.2 Distribution of PCIs performed by Source Data Providers (SDPs), NCVD-PCI Registry, 2007**

| No. | Source Data Providers | No. | % |
|---|---|---|---|
| 1 | University Malaya Medical Centre | 377 | 9.6 |
| 2 | National Heart Insitute | 2309 | 58.9 |
| 3 | Penang Hospital | 490 | 12.5 |
| 4 | Sarawak General Hospital | 380 | 9.7 |
| 5 | Sultanah Aminah Hospital | 327 | 8.3 |
| 6 | KPJ Selangor Specialist Hospital | 15 | 0.4 |
| 7 | Serdang Hospital | 6 | 0.2 |
| 8 | Universiti Kebangsaan Malaysia Hospital | 16 | 0.4 |
| | **Total** | **3920** | **100** |

Figure 2.3.2 Distribution of PCIs performed by Source Data Providers (SDPs), NCVD-PCI Registry, 2007

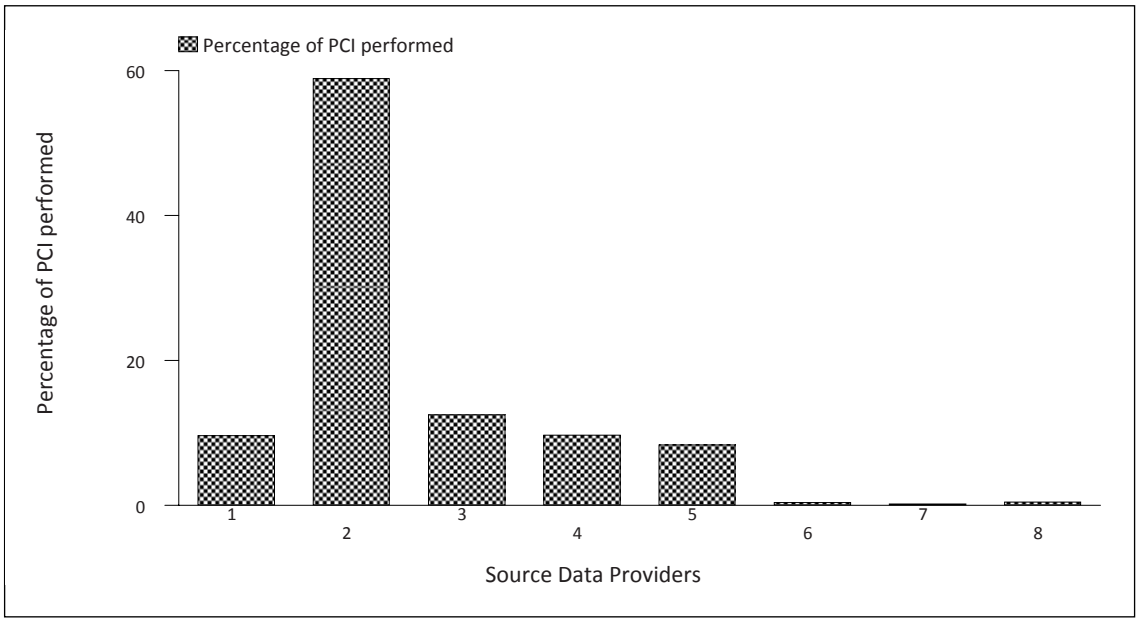



**Table 2.4.1 SDP-ethnicity distribution of patients who underwent PCI, NCVD-PCI Registry, 2007 (row percent)**

| No. | Source Data Provider | Ethnic group | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Malay | | Chinese | | Indian | | *Others | | Not Available | | Total | |
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| 1 | University Malaya Medical Centre | 148 | 40.8 | 78 | 21.5 | 124 | 34.2 | 13 | 3.6 | 0 | 0 | 363 | 100 |
| 2 | Institut Jantung Negara | 1164 | 53.9 | 377 | 17.4 | 564 | 26.1 | 56 | 2.6 | 0 | 0 | 2161 | 100 |
| 3 | Penang Hospital | 188 | 41.4 | 154 | 33.9 | 105 | 23.1 | 5 | 1.1 | 2 | 0.4 | 454 | 100 |
| 4 | Sarawak General Hospital | 73 | 21.4 | 188 | 55.1 | 3 | 0.9 | 74 | 21.7 | 3 | 0.9 | 341 | 100 |
| 5 | Sultanah Aminah Hospital | 125 | 38.6 | 118 | 36.4 | 73 | 22.5 | 7 | 2.2 | 1 | 0.3 | 324 | 100 |
| 6 | KPJ Selangor Specialist Hospital | 7 | 53.8 | 3 | 23.1 | 3 | 23.1 | 0 | 0 | 0 | 0 | 13 | 100 |
| 7 | Serdang Hospital | 3 | 60 | 1 | 20 | 1 | 20 | 0 | 0 | 0 | 0 | 5 | 100 |
| 8 | Universiti Kebangsaan Malaysia Hospital | 10 | 62.5 | 5 | 31.3 | 1 | 6.3 | 0 | 0 | 0 | 0 | 16 | 100 |

**Others includes Orang asli, Kadazan, Melanau, Murut, Bajau, Bidayuh, Iban, other Malaysian and Foreigner*

Figure 2.4.1 SDP-ethnicity distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

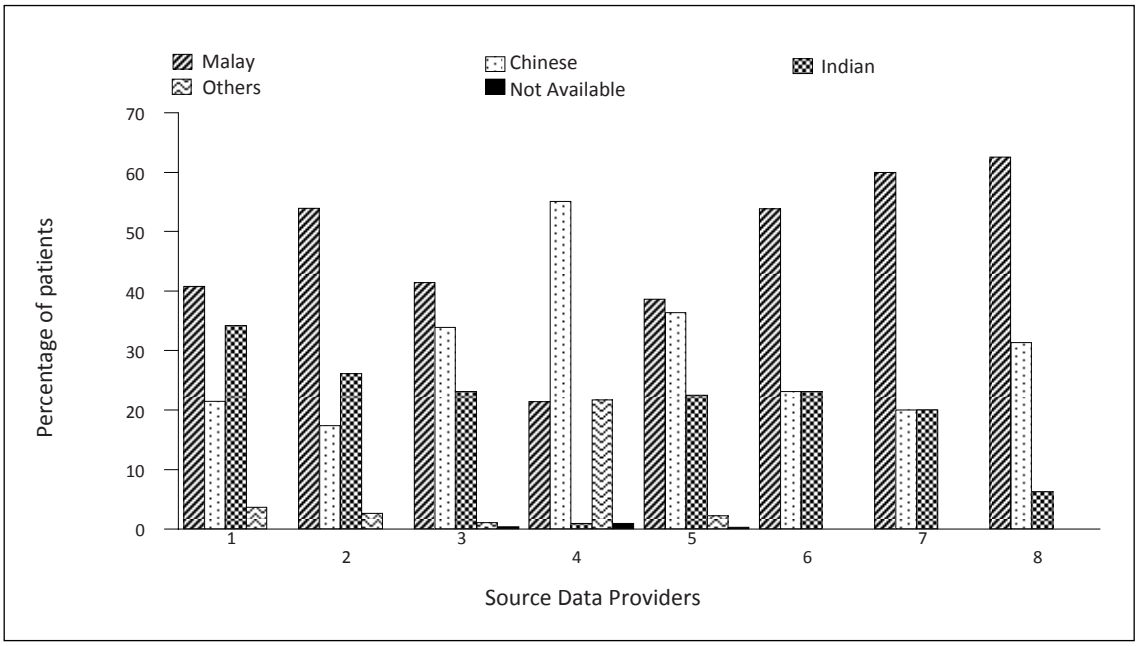



**Table 2.4.2 SDP-gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2007 (row percent)**

| No. | Source Data Provider | Gender | | | | | |
|---|---|---|---|---|---|---|---|
| | | Male | | Female | | Total | |
| | | No. | % | No. | % | No. | % |
| 1 | University Malaya Medical Centre | 265 | 73 | 98 | 27 | 363 | 100 |
| 2 | Institut Jantung Negara | 1746 | 80.8 | 415 | 19.2 | 2161 | 100 |
| 3 | Pulau Pinang Hospital | 353 | 77.8 | 101 | 22.2 | 454 | 100 |
| 4 | Sarawak General Hospital | 309 | 90.6 | 32 | 9.4 | 341 | 100 |
| 5 | Sultanah Aminah Hospital, Johor Bahru | 282 | 87 | 42 | 13 | 324 | 100 |
| 6 | KPJ Selangor Specialist Hospital | 12 | 92.3 | 1 | 7.7 | 13 | 100 |
| 7 | Serdang Hospital | 4 | 80 | 1 | 20 | 5 | 100 |
| 8 | Universiti Kebangsaan Malaysia Hospital | 15 | 93.8 | 1 | 6.3 | 16 | 100 |

Figure 2.4.2 SDP-gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

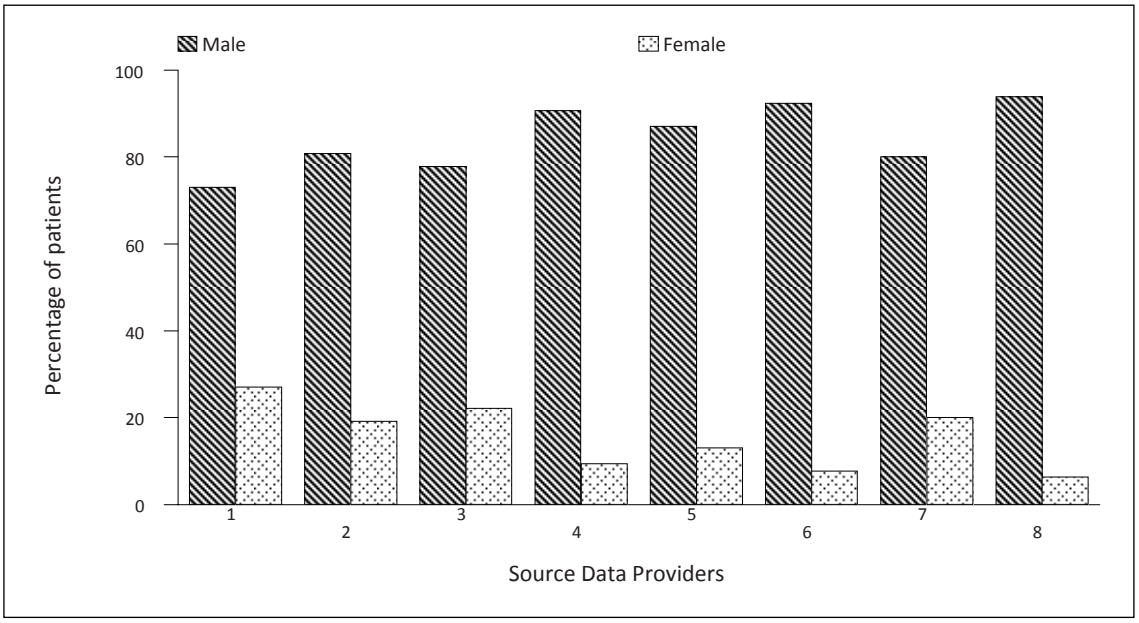



**Table 2.5 Age-gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2007**

| Age Group | Gender | | | |
|---|---|---|---|---|
| | Male | | Female | |
| | No. | % | No. | % |
| 20-<30 | 13 | 0.4 | 2 | 0.3 |
| 30-<40 | 139 | 4.7 | 5 | 0.7 |
| 40-<50 | 646 | 21.6 | 79 | 11.4 |
| 50-<60 | 1149 | 38.5 | 206 | 29.8 |
| 60-<70 | 770 | 25.8 | 261 | 37.8 |
| 70-<80 | 248 | 8.3 | 131 | 19 |
| >=80 | 21 | 0.7 | 7 | 1 |
| **Total** | 2986 | 100 | 691 | 100 |

Figure 2.5 Age-gender distribution of patients who underwent PCI, NCVD-PCI Registry, 2007

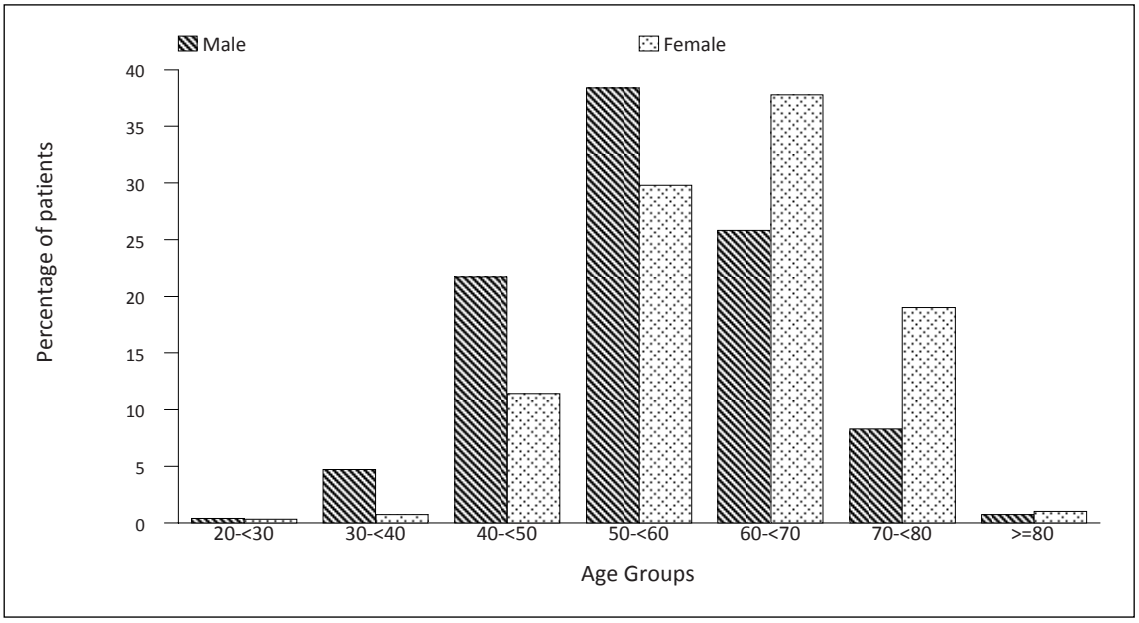



**Table 2.5.1 Age-gender distribution of patients who underwent PCI, by ethnic group, NCVD-PCI Registry, 2007**

| Gender | Age Group | Ethnic group | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Malay | | Chinese | | Indian | | Others* | | Not Available | |
| | | No. | % | No. | % | No. | % | No. | % | No. | % |
| Male | 20-<30 | 5 | 0.2 | 5 | 0.2 | 2 | 0.1 | 1 | 0 | 0 | 0 |
| | 30-<40 | 78 | 2.6 | 18 | 0.6 | 36 | 1.2 | 7 | 0.2 | 0 | 0 |
| | 40-<50 | 339 | 11.4 | 115 | 3.9 | 166 | 5.6 | 26 | 0.9 | 1 | 0 |
| | 50-<60 | 590 | 19.8 | 260 | 8.7 | 247 | 8.3 | 50 | 1.7 | 1 | 0 |
| | 60-<70 | 321 | 10.8 | 254 | 8.5 | 164 | 5.5 | 30 | 1 | 1 | 0 |
| | 70-<80 | 99 | 3.3 | 82 | 2.7 | 58 | 1.9 | 9 | 0.3 | 0 | 0 |
| | >=80 | 9 | 0.3 | 6 | 0.2 | 4 | 0.1 | 2 | 0.1 | 0 | 0 |
| | **Total** | 1441 | 48.3 | 740 | 24.8 | 677 | 22.7 | 125 | 4.2 | 3 | 0.1 |
| Female | 20-<30 | 2 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 30-<40 | 2 | 0.3 | 0 | 0 | 3 | 0.4 | 0 | 0 | 0 | 0 |
| | 40-<50 | 36 | 5.2 | 8 | 1.2 | 30 | 4.3 | 4 | 0.6 | 1 | 0.1 |
| | 50-<60 | 97 | 14 | 44 | 6.4 | 56 | 8.1 | 9 | 1.3 | 0 | 0 |
| | 60-<70 | 102 | 14.8 | 74 | 10.7 | 73 | 10.6 | 11 | 1.6 | 1 | 0.1 |
| | 70-<80 | 36 | 5.2 | 54 | 7.8 | 35 | 5.1 | 5 | 0.7 | 1 | 0.1 |
| | >=80 | 2 | 0.3 | 4 | 0.6 | 0 | 0 | 1 | 0.1 | 0 | 0 |
| | **Total** | 277 | 40.1 | 184 | 26.6 | 197 | 28.5 | 30 | 4.3 | 3 | 0.4 |

** 'Others' includes Orang asli, Kadazan, Melanau, Murut, Bajau, Bidayuh, Iban, other Malaysian and Foreigner*

Figure 2.5.1a Age-gender distribution of male patients who underwent PCI, by ethnic group, NCVD-PCI Registry, 2007

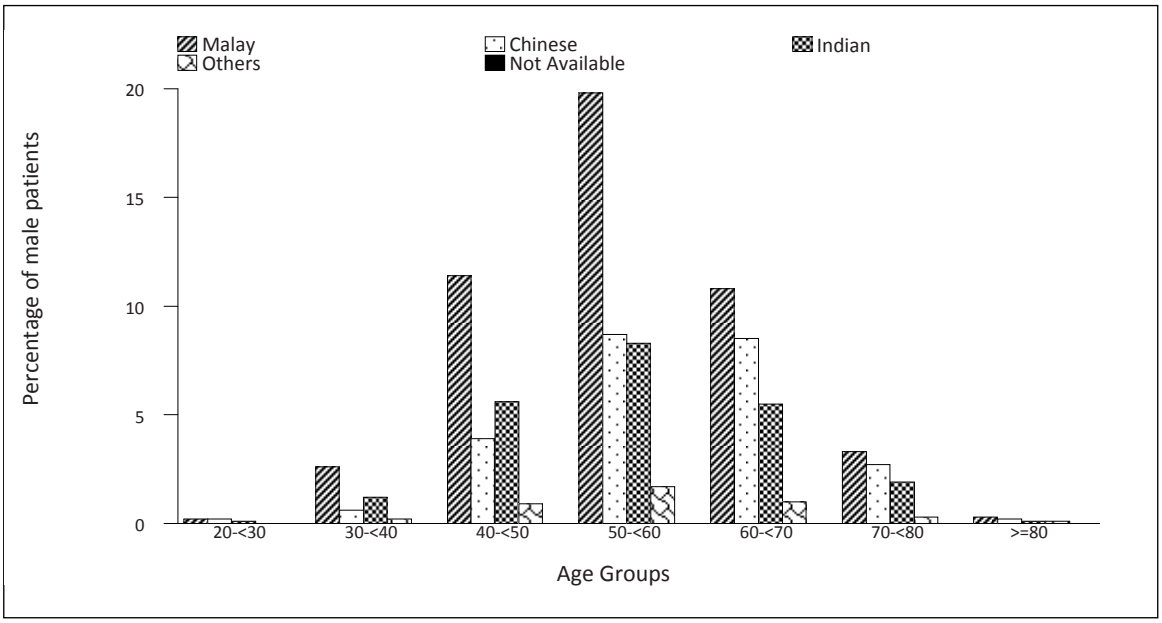



Figure 2.5.1b Age-gender distribution of female patients who underwent PCI, by ethnic group, NCVD-PCI Registry, 2007

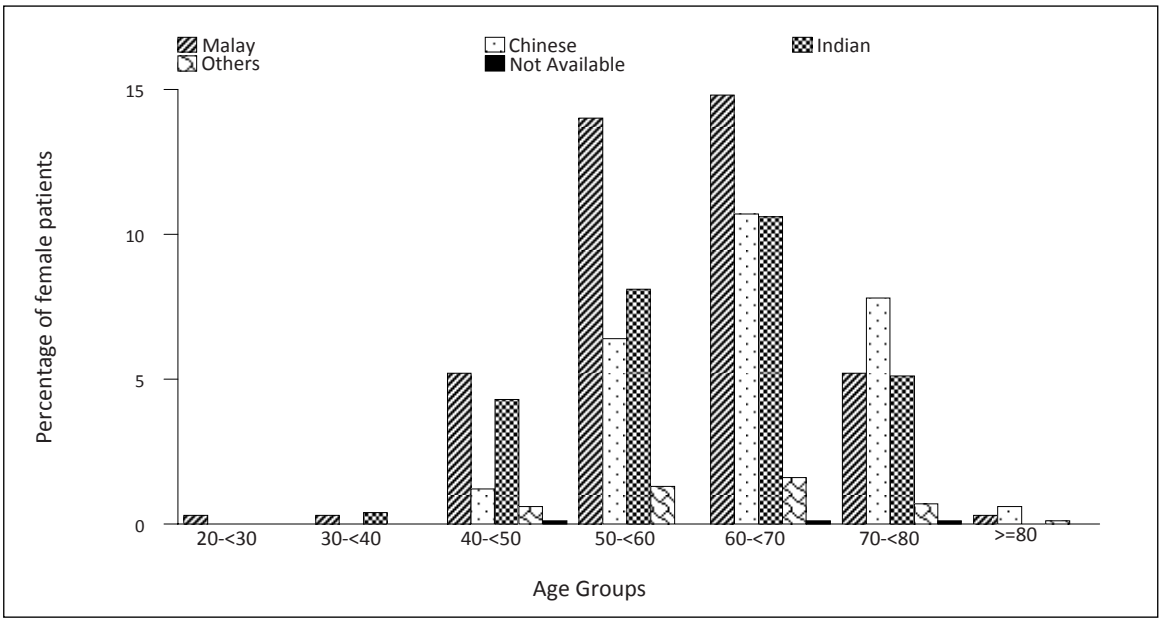


**Table 2.5.2 Age-gender distribution of patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007**

| Gender | Age Group | Pre-morbid diabetes | | | | | |
|---|---|---|---|---|---|---|---|
| | | Diabetic | | Non-Diabetic | | Not Known | |
| | | No. | % | No. | % | No. | % |
| Male | 20-<30 | 2 | 0.1 | 9 | 0.3 | 2 | 0.1 |
| | 30-<40 | 42 | 1.4 | 97 | 3.2 | 0 | 0 |
| | 40-<50 | 232 | 7.8 | 402 | 13.5 | 13 | 0.4 |
| | 50-<60 | 512 | 17.1 | 607 | 20.3 | 29 | 1 |
| | 60-<70 | 351 | 11.8 | 395 | 13.2 | 24 | 0.8 |
| | 70-<80 | 99 | 3.3 | 141 | 4.7 | 8 | 0.3 |
| | >=80 | 5 | 0.2 | 16 | 0.5 | 0 | 0 |
| | **Total** | 1243 | 41.6 | 1667 | 55.8 | 76 | 2.5 |
| Female | 20-<30 | 1 | 0.1 | 1 | 0.1 | 0 | 0 |
| | 30-<40 | 2 | 0.3 | 3 | 0.4 | 0 | 0 |
| | 40-<50 | 55 | 8 | 22 | 3.2 | 2 | 0.3 |
| | 50-<60 | 140 | 20.3 | 62 | 9 | 4 | 0.6 |
| | 60-<70 | 163 | 23.6 | 92 | 13.3 | 6 | 0.9 |
| | 70-<80 | 70 | 10.1 | 55 | 8 | 6 | 0.9 |
| | >=80 | 2 | 0.3 | 4 | 0.6 | 1 | 0.1 |
| | **Total** | 433 | 62.7 | 239 | 34.6 | 19 | 2.7 |

Figure 2.5.2a Age-gender distribution of male patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007

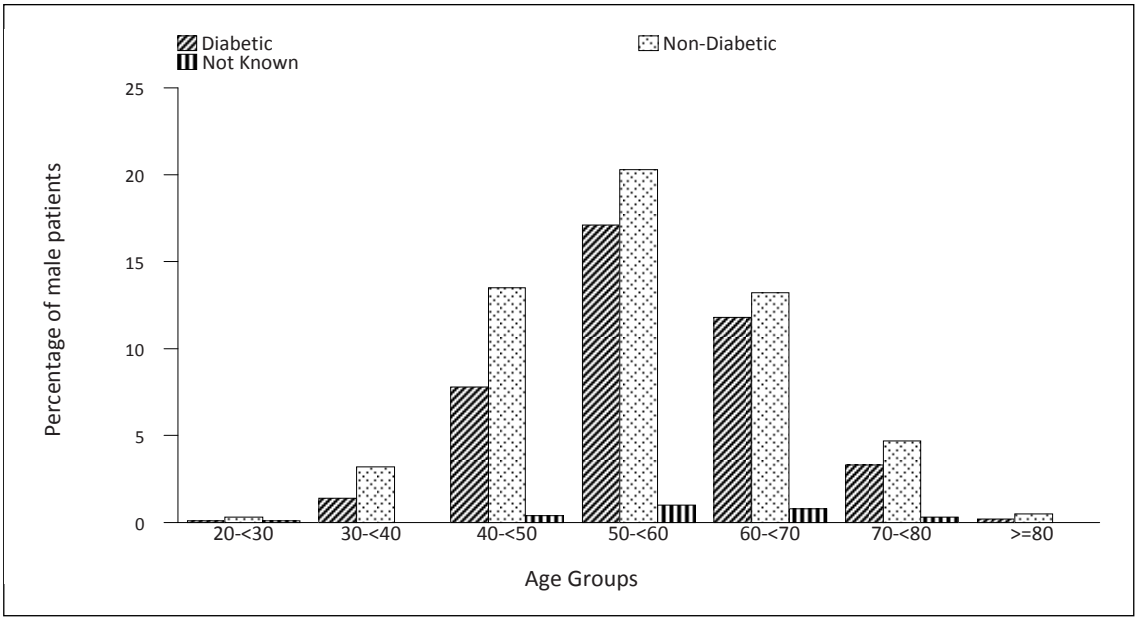


Figure 2.5.2b Age-gender distribution of female patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007

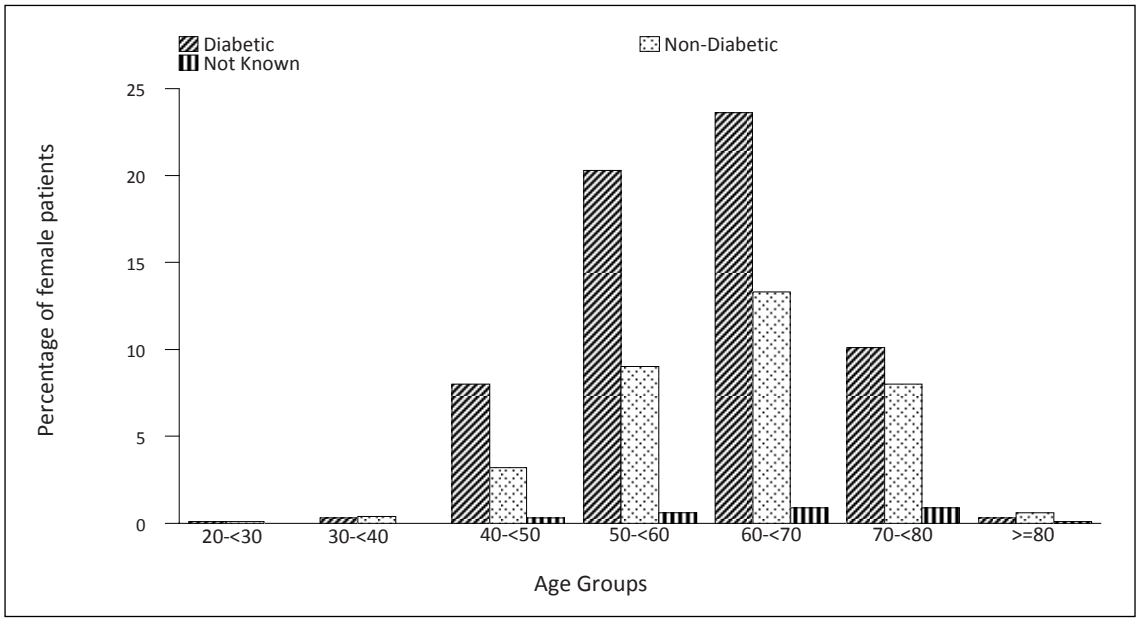



**Table 2.5.3 Age-gender distribution of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007**

| Gender | Age Group | Pre-morbid hypertension | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hypertensive | | Non-Hypertensive | | Not Known | |
| | | No. | % | No. | % | No. | % |
| Male | 20-<30 | 3 | 0.1 | 7 | 0.2 | 3 | 0.1 |
| | 30-<40 | 74 | 2.5 | 63 | 2.1 | 2 | 0.1 |
| | 40-<50 | 402 | 13.5 | 232 | 7.8 | 13 | 0.4 |
| | 50-<60 | 830 | 27.8 | 297 | 9.9 | 21 | 0.7 |
| | 60-<70 | 598 | 20 | 156 | 5.2 | 16 | 0.5 |
| | 70-<80 | 209 | 7 | 34 | 1.1 | 5 | 0.2 |
| | >=80 | 18 | 0.6 | 3 | 0.1 | 0 | 0 |
| | **Total** | 2134 | 71.5 | 792 | 26.5 | 60 | 2 |
| Female | 20-<30 | 1 | 0.1 | 1 | 0.1 | 0 | 0 |
| | 30-<40 | 4 | 0.6 | 1 | 0.1 | 0 | 0 |
| | 40-<50 | 58 | 8.4 | 18 | 2.6 | 3 | 0.4 |
| | 50-<60 | 171 | 24.7 | 31 | 4.5 | 4 | 0.6 |
| | 60-<70 | 239 | 34.6 | 18 | 2.6 | 4 | 0.6 |
| | 70-<80 | 118 | 17.1 | 9 | 1.3 | 4 | 0.6 |
| | >=80 | 5 | 0.7 | 1 | 0.1 | 1 | 0.1 |
| | **Total** | 596 | 86.3 | 79 | 11.4 | 16 | 2.3 |

Figure 2.5.3a Age-gender distribution of male patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007

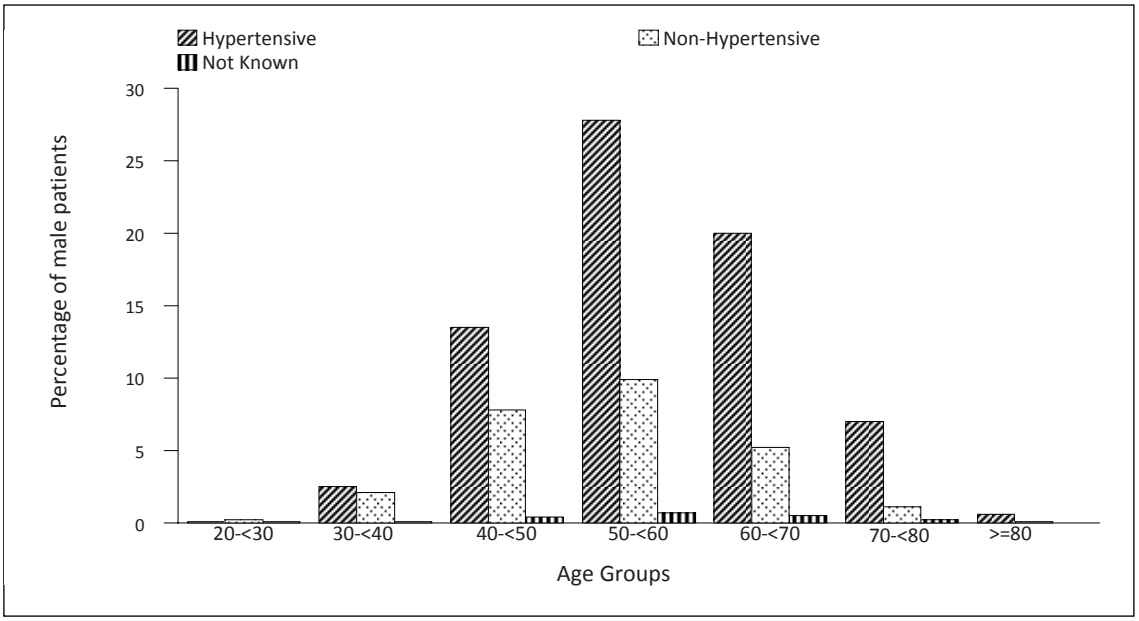



Figure 2.5.3b Age-gender distribution of female patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007

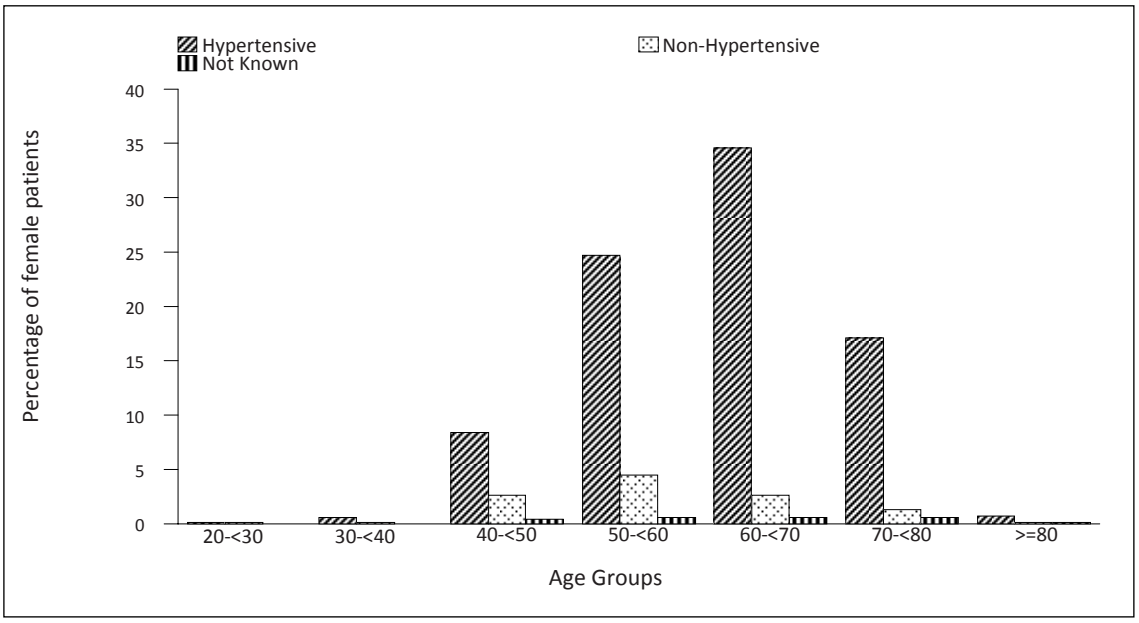


**Table 2.5.4 Age-gender distribution of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007**

| Gender | Age Group | Pre-morbid dyslipidaemia | | | | | |
|---|---|---|---|---|---|---|---|
| | | Yes | | No | | Not Known | |
| | | No. | % | No. | % | No. | % |
| Male | 20-<30 | 8 | 0.3 | 2 | 0.1 | 3 | 0.1 |
| | 30-<40 | 107 | 3.6 | 31 | 1 | 1 | 0 |
| | 40-<50 | 470 | 15.7 | 130 | 4.4 | 47 | 1.6 |
| | 50-<60 | 863 | 28.9 | 212 | 7.1 | 73 | 2.4 |
| | 60-<70 | 583 | 19.5 | 130 | 4.4 | 57 | 1.9 |
| | 70-<80 | 192 | 6.4 | 40 | 1.3 | 16 | 0.5 |
| | >=80 | 15 | 0.5 | 6 | 0.2 | 0 | 0 |
| | **Total** | 2238 | 74.9 | 551 | 18.5 | 197 | 6.6 |
| Female | 20-<30 | 2 | 0.3 | 0 | 0 | 0 | 0 |
| | 30-<40 | 4 | 0.6 | 0 | 0 | 1 | 0.1 |
| | 40-<50 | 62 | 9 | 10 | 1.4 | 7 | 1 |
| | 50-<60 | 162 | 23.4 | 32 | 4.6 | 12 | 1.7 |
| | 60-<70 | 202 | 29.2 | 42 | 6.1 | 17 | 2.5 |
| | 70-<80 | 96 | 13.9 | 23 | 3.3 | 12 | 1.7 |
| | >=80 | 4 | 0.6 | 1 | 0.1 | 2 | 0.3 |
| | **Total** | 532 | 77 | 108 | 15.6 | 51 | 7.4 |

Figure 2.5.4a Age-gender distribution of male patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007

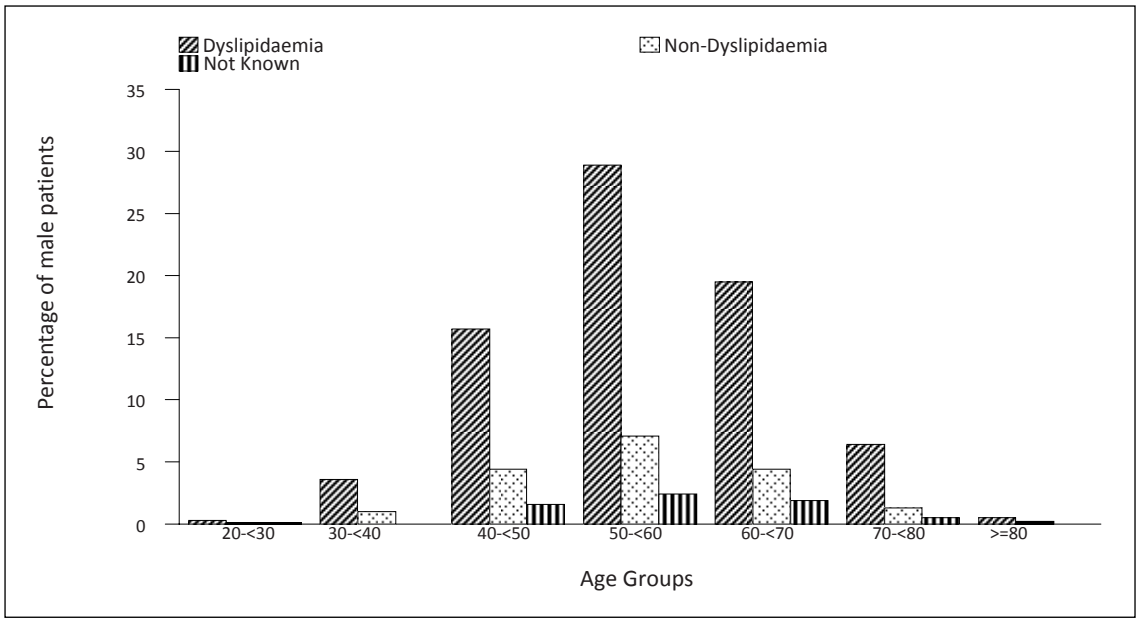


Figure 2.5.4b Age-gender distribution of female patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007

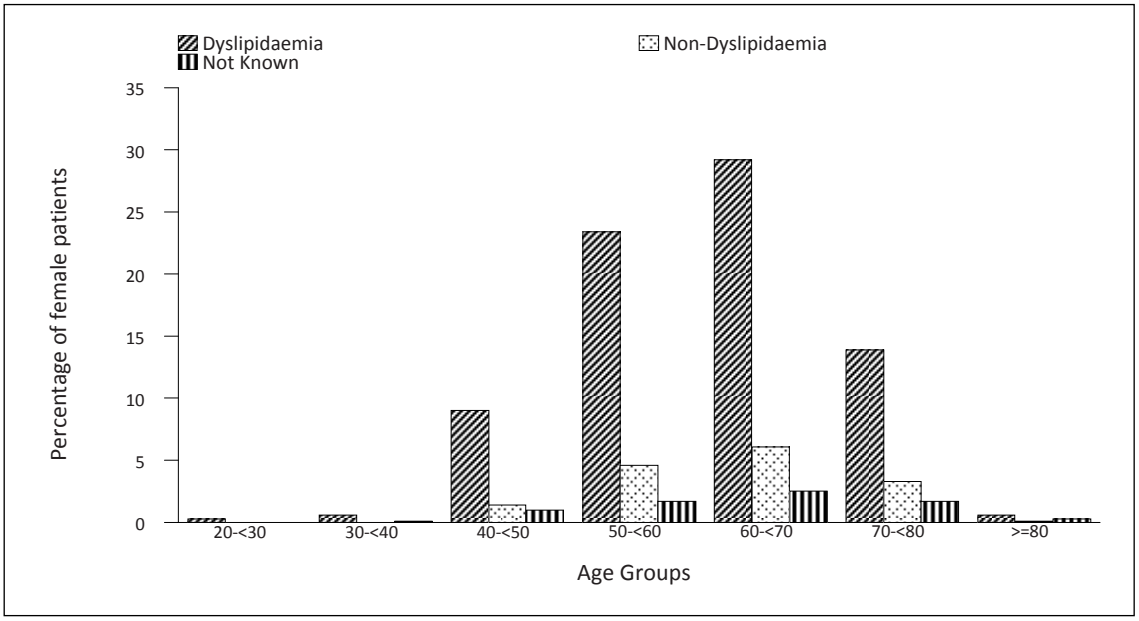



**Table 2.5.5 Age-gender distribution of patients who underwent PCI, by family history of premature cardiovascular disease, NCVD-PCI Registry, 2007**

| Gender | Age Group | Family history of premature cardiovascular disease | | | | | |
|---|---|---|---|---|---|---|---|
| | | Yes | | No | | Not Known | |
| | | No. | % | No. | % | No. | % |
| Male | 20-<30 | 4 | 0.1 | 7 | 0.2 | 2 | 0.1 |
| | 30-<40 | 39 | 1.3 | 93 | 3.1 | 7 | 0.2 |
| | 40-<50 | 146 | 4.9 | 433 | 14.5 | 68 | 2.3 |
| | 50-<60 | 177 | 5.9 | 821 | 27.5 | 150 | 5 |
| | 60-<70 | 87 | 2.9 | 583 | 19.5 | 100 | 3.3 |
| | 70-<80 | 30 | 1 | 163 | 5.5 | 55 | 1.8 |
| | >=80 | 0 | 0 | 18 | 0.6 | 3 | 0.1 |
| | **Total** | 483 | 16.2 | 2118 | 70.9 | 385 | 12.9 |
| Female | 20-<30 | 0 | 0 | 2 | 0.3 | 0 | 0 |
| | 30-<40 | 4 | 0.6 | 1 | 0.1 | 0 | 0 |
| | 40-<50 | 19 | 2.7 | 46 | 6.7 | 14 | 2 |
| | 50-<60 | 38 | 5.5 | 147 | 21.3 | 21 | 3 |
| | 60-<70 | 42 | 6.1 | 182 | 26.3 | 37 | 5.4 |
| | 70-<80 | 12 | 1.7 | 93 | 13.5 | 26 | 3.8 |
| | >=80 | 0 | 0 | 5 | 0.7 | 2 | 0.3 |
| | **Total** | 115 | 16.6 | 476 | 68.9 | 100 | 14.5 |

Figure 2.5.5a Age-gender distribution of male patients who underwent PCI, by family history of premature cardiovascular disease, NCVD-PCI Registry, 2007

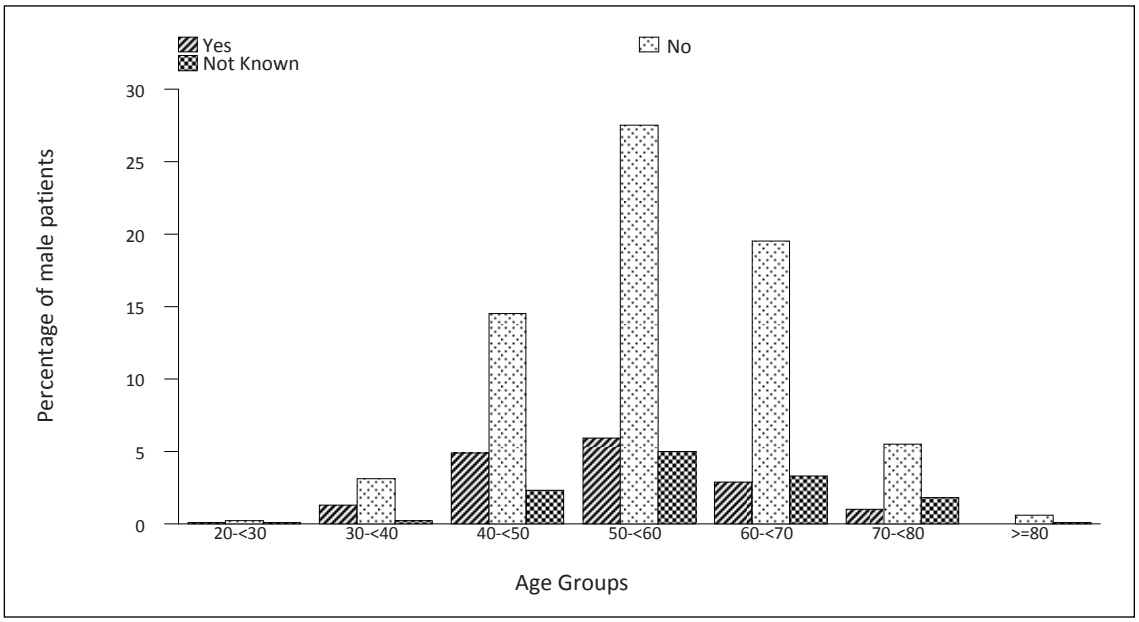



Figure 2.5.5b Age-gender distribution of female patients who underwent PCI, by family history of premature cardiovascular disease, NCVD-PCI Registry, 2007

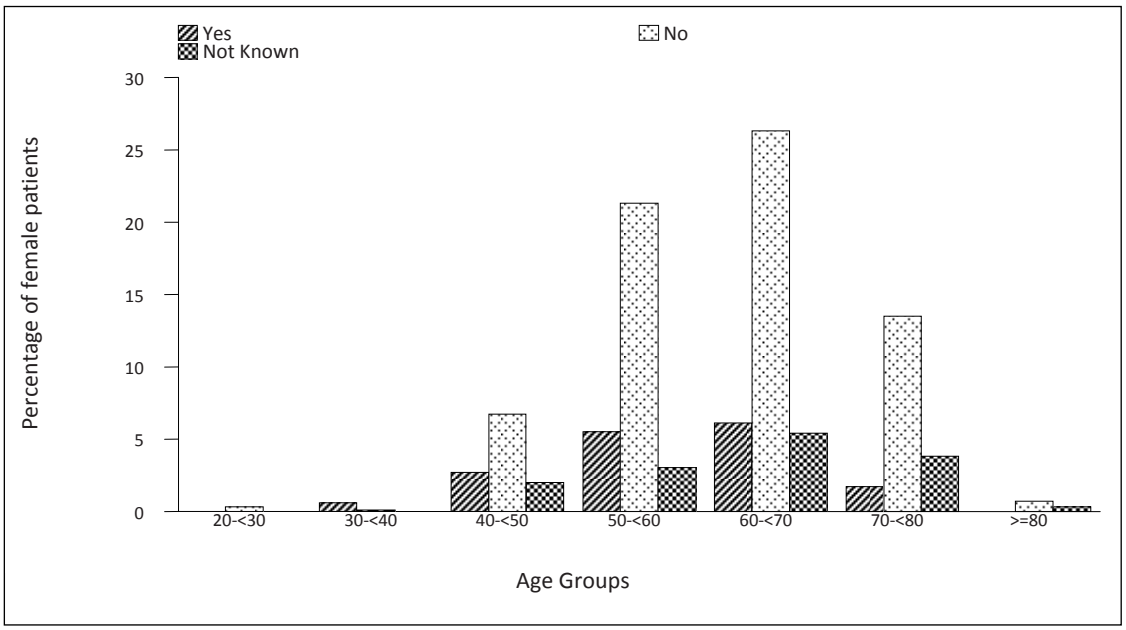


**Table 2.5.6 Age-gender distribution of patients who underwent PCI, by smoking status, NCVD-PCI Registry, 2007**

| Gender | Age Group | Smoking status | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Never | | Former (quit more than 30 days) | | Current (any tobacco use within last 30 days) | | Unknown | |
| | | No. | % | No. | % | No. | % | No. | % |
| Male | 20-<30 | 1 | 0 | 5 | 0.2 | 6 | 0.2 | 1 | 0 |
| | 30-<40 | 19 | 0.6 | 43 | 1.4 | 55 | 1.8 | 22 | 0.7 |
| | 40-<50 | 139 | 4.7 | 210 | 7 | 199 | 6.7 | 99 | 3.3 |
| | 50-<60 | 314 | 10.5 | 415 | 13.9 | 194 | 6.5 | 225 | 7.5 |
| | 60-<70 | 225 | 7.5 | 269 | 9 | 91 | 3 | 185 | 6.2 |
| | 70-<80 | 78 | 2.6 | 82 | 2.7 | 22 | 0.7 | 66 | 2.2 |
| | >=80 | 6 | 0.2 | 10 | 0.3 | 2 | 0.1 | 3 | 0.1 |
| | **Total** | 782 | 26.2 | 1034 | 34.6 | 569 | 19.1 | 601 | 20.1 |
| Female | 20-<30 | 2 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 30-<40 | 4 | 0.6 | 0 | 0 | 1 | 0.1 | 0 | 0 |
| | 40-<50 | 60 | 8.7 | 3 | 0.4 | 3 | 0.4 | 13 | 1.9 |
| | 50-<60 | 171 | 24.7 | 3 | 0.4 | 4 | 0.6 | 28 | 4.1 |
| | 60-<70 | 220 | 31.8 | 7 | 1 | 8 | 1.2 | 26 | 3.8 |
| | 70-<80 | 109 | 15.8 | 4 | 0.6 | 2 | 0.3 | 16 | 2.3 |
| | >=80 | 6 | 0.9 | 0 | 0 | 0 | 0 | 1 | 0.1 |
| | **Total** | 572 | 82.8 | 17 | 2.5 | 18 | 2.6 | 84 | 12.2 |

Figure 2.5.6a Age-gender distribution of male patients who underwent PCI, by smoking status, NCVD-PCI Registry, 2007

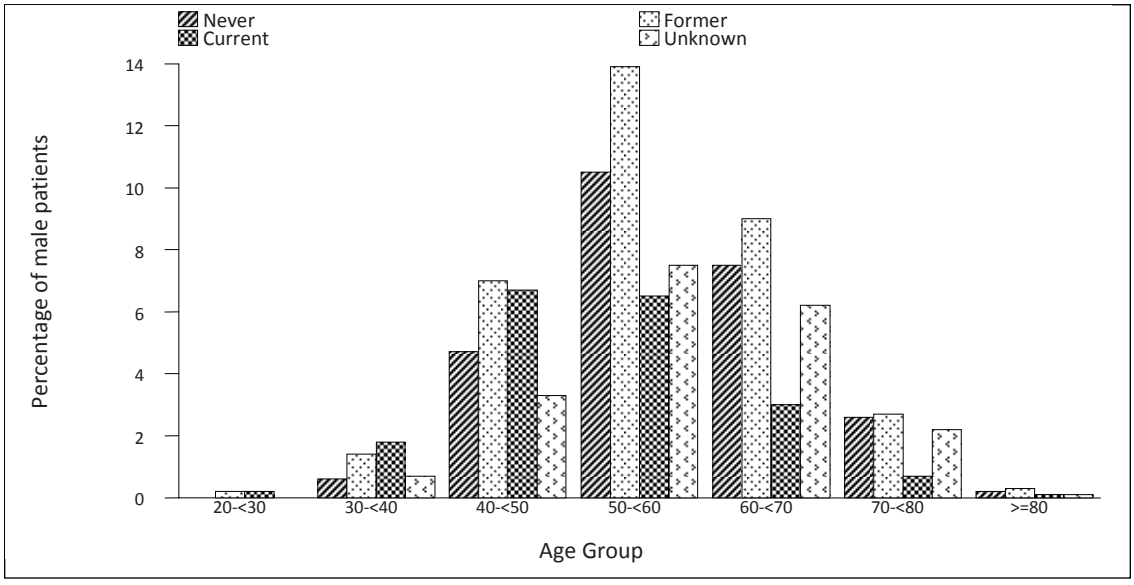


Figure 2.5.6b Age-gender distribution of female patients who underwent PCI, by smoking status, NCVD-PCI Registry, 2007

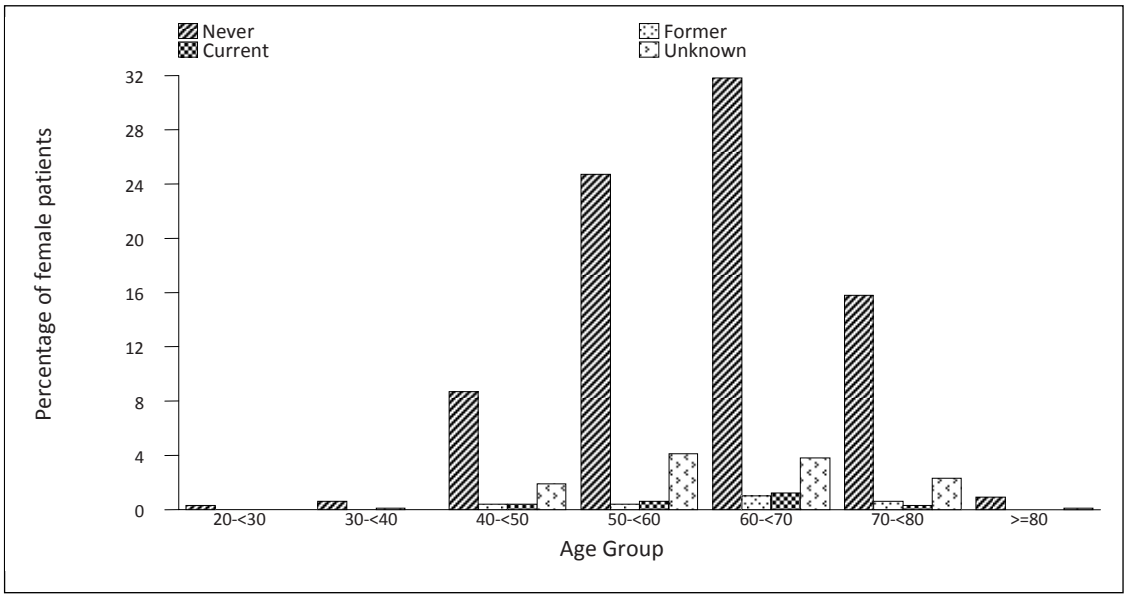



**Table 2.5.7 Age-gender distribution of patients who underwent PCI, by new onset of angina, NCVD-PCI Registry, 2007**

| Gender | Age Group | New onset of angina | | | | | |
|---|---|---|---|---|---|---|---|
| | | Yes | | No | | Unknown | |
| | | No. | % | No. | % | No. | % |
| Male | 20-<30 | 5 | 0.2 | 8 | 0.3 | 0 | 0 |
| | 30-<40 | 29 | 1 | 109 | 3.7 | 1 | 0 |
| | 40-<50 | 148 | 5 | 488 | 16.3 | 11 | 0.4 |
| | 50-<60 | 257 | 8.6 | 865 | 29 | 26 | 0.9 |
| | 60-<70 | 175 | 5.9 | 567 | 19 | 28 | 0.9 |
| | 70-<80 | 70 | 2.3 | 172 | 5.8 | 6 | 0.2 |
| | >=80 | 4 | 0.1 | 15 | 0.5 | 2 | 0.1 |
| | **Total** | 688 | 23 | 2224 | 74.5 | 74 | 2.5 |
| Female | 20-<30 | 0 | 0 | 2 | 0.3 | 0 | 0 |
| | 30-<40 | 1 | 0.1 | 3 | 0.4 | 1 | 0.1 |
| | 40-<50 | 15 | 2.2 | 60 | 8.7 | 4 | 0.6 |
| | 50-<60 | 45 | 6.5 | 154 | 22.3 | 7 | 1 |
| | 60-<70 | 61 | 8.8 | 187 | 27.1 | 13 | 1.9 |
| | 70-<80 | 33 | 4.8 | 92 | 13.3 | 6 | 0.9 |
| | >=80 | 3 | 0.4 | 4 | 0.6 | 0 | 0 |
| | **Total** | 158 | 22.9 | 502 | 72.6 | 31 | 4.5 |

Figure 2.5.7a Age-gender distribution of male patients who underwent PCI, by new onset of angina, NCVD-PCI Registry, 2007

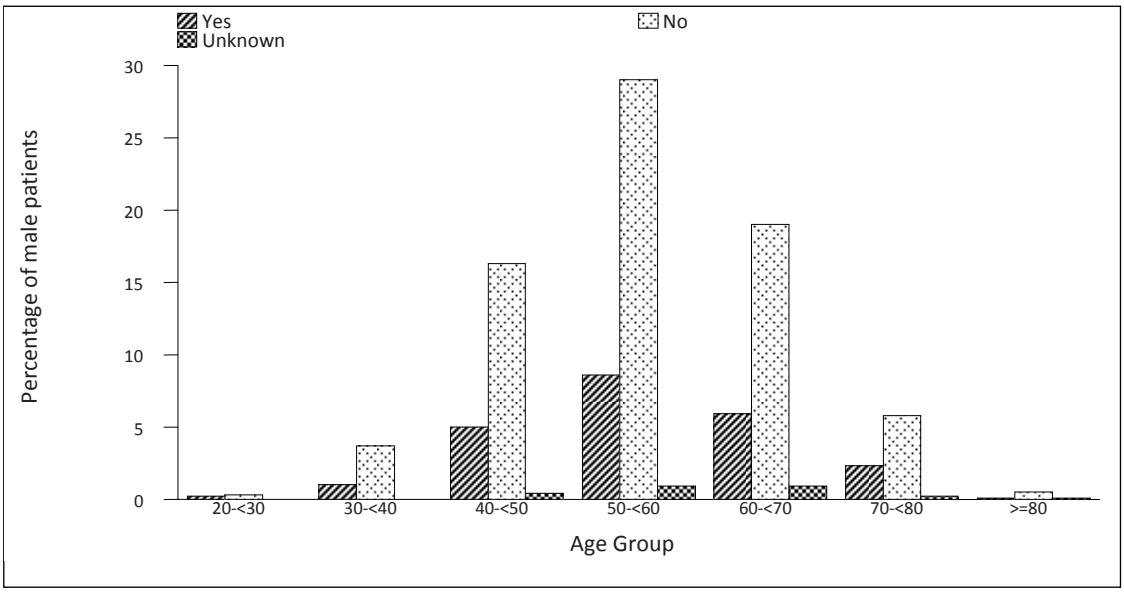



Figure 2.5.7b Age-gender distribution of female patients who underwent PCI, by new onset of angina, NCVD-PCI Registry, 2007

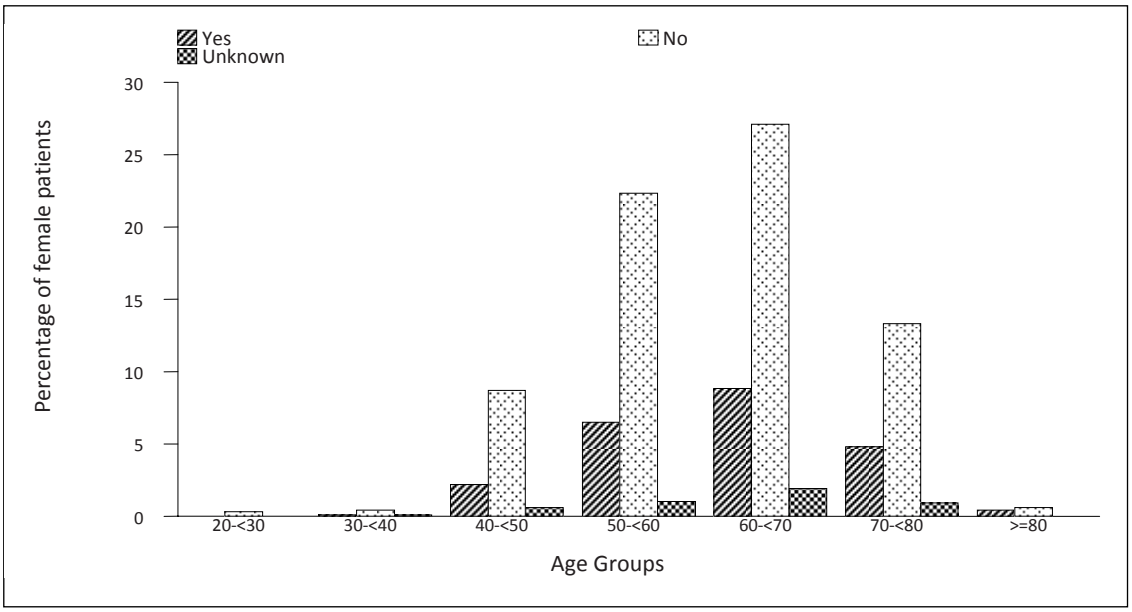


**Table 2.6 Presence of cumulative risk factors, NCVD-PCI Registry, 2007**

| Presence of cumulative risk factors * | Total | |
|---|---|---|
| | No. | % |
| None | 57 | 1.6 |
| 1 risk factor | 239 | 6.5 |
| 2 risk factors | 709 | 19.3 |
| 3 risk factors | 1224 | 33.3 |
| >3 risk factors | 1448 | 39.4 |

** Risk factors are defined as presence of dyslipidaemia, hypertension, diabetes, family history of premature cardiovascular disease, smoking and obesity*

Figure 2.6 Distribution of presence of cumulative risk factors, NCVD-PCI Registry, 2007

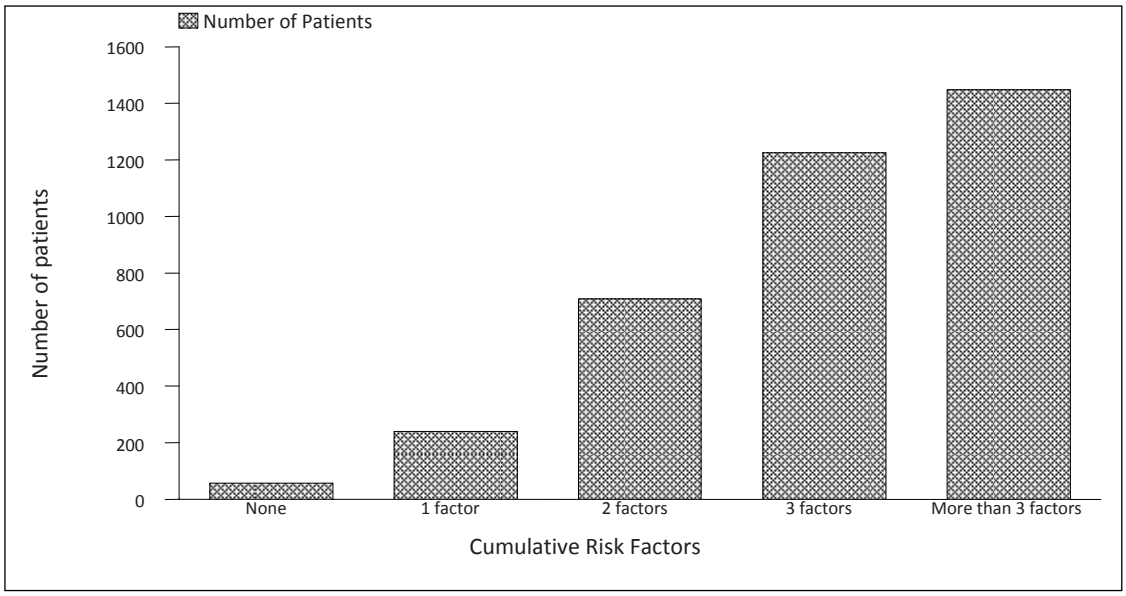
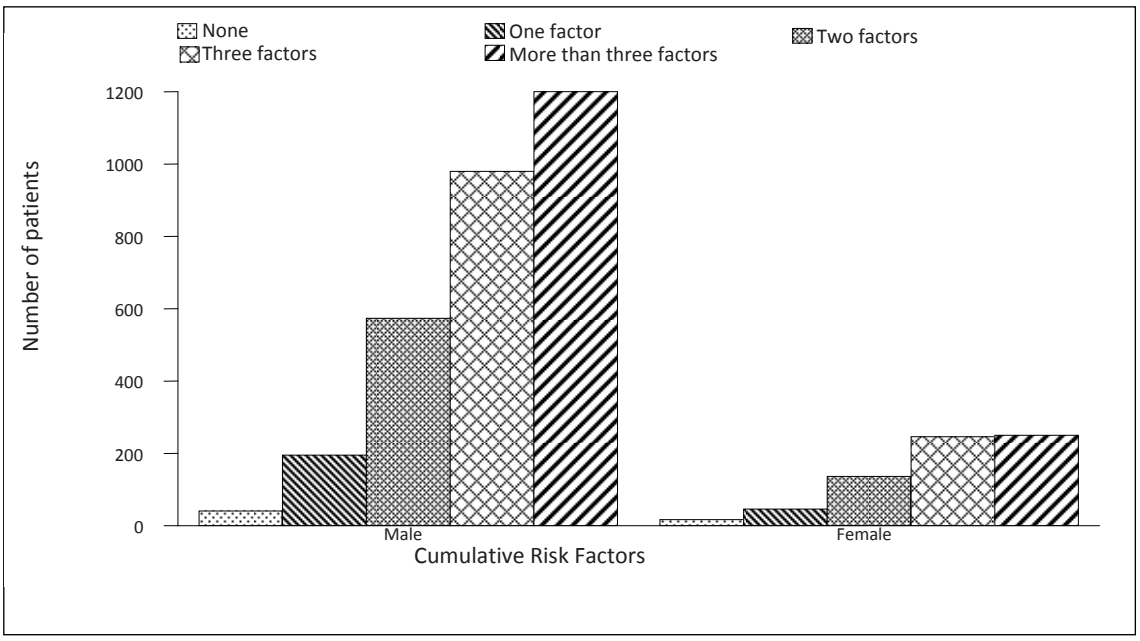


**Table 2.6.1 Presence of cumulative risk factors by gender, NCVD-PCI Registry, 2007**

| Gender | Presence of cumulative risk factors * | Total | |
|---|---|---|---|
| | | No. | % |
| Male | None | 41 | 1.4 |
| | 1 risk factor | 194 | 6.5 |
| | 2 risk factors | 573 | 19.2 |
| | 3 risk factors | 979 | 32.8 |
| | >3 risk factors | 1199 | 40.2 |
| Female | None | 16 | 2.3 |
| | 1 risk factor | 45 | 6.5 |
| | 2 risk factors | 136 | 19.7 |
| | 3 risk factors | 245 | 35.5 |
| | >3 risk factors | 249 | 36 |

** Risk factors are defined as presence of dyslipidaemia, hypertension, diabetes, family history of premature cardiovascular disease, smoking and obesity*

Figure 2.6.1 Distribution of presence of cumulative risk factors, by gender, NCVD-PCI Registry, 2007



# CHAPTER 3: CLINICAL PRESENTATIONS & INVESTIGATIONS

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Patient's heart rate and blood pressure were recorded at the beginning of PCI procedures in this registry. The mean heart rate was 71.3 (SD 15.65) beats per minute, mean systolic blood pressure (SBP) was 139.8mmHg (SD 26.2) and diastolic blood pressure (DBP) was 76.9mmHg (SD 13.0).

Thrombolysis In Myocardial Infarction (TIMI) risk index is derived from age, heart rate (HR) and systolic blood pressure (SBP), i.e. TIMI Risk Index (TRI) = [HR x $(age/10)^2$ ]/SBP. The three strata of risk categories are: low (<30), intermediate (30-70), and high (>70). This simple risk index provides important information about mortality in patients across the spectrum of myocardial infarction, ST Elevation Myocardial Infarction (STEMI) and Non-ST Elevation Myocardial Infarction (NSTEMI). The majority of cases (94%) in this cohort had low TIMI risk index.

Eighty five percent of patients were in sinus rhythm. Atrial fibrillation was noted in 1% of them. Congestive heart failure was noted at the time of PCI procedure in 4% of cases (n=160). New York Heart Association (NYHA) classes for the cohort are as follow: class I, 67%; class II, 17%; class III, 3%; class IV, 1%. Chronic stable angina was recorded in 57% of cases. Accordingly the Canadian Cardiovascular Society Score for angina (CCS) is: class I, 33%, class II, 36%, class III, 5% and class IV, 3%.

Acute coronary syndromes comprise of 20% (n=784), of which approximately 42% was STEMI, 30% was NSTEMI and 24% was unstable angina. The majority of patients were presented late (refer to Table 3.5). Cardiogenic shock was reported in 68 patients (approximately 2%). Left ventricular ejection fraction (LVEF) was noted only in 796 procedures (approximately 25% of cases), with a mean LVEF of 51.5% (SD 13.5%). Primary infarct PCI was performed in 18% of STEMI, 58 cases out of the documented 330 STEMI cases. The median door-to-balloon time was 93.5 minutes.

**Summary**

1. Chronic stable angina was noted in 57% of cases, with the majority of them in CCS class I-II.
2. The majority of patients had low TIMI risk index, and only 4% had congestive heart failure.
3. Acute coronary syndromes comprise of 20% of cases. Cardiogenic shock was noted in approximately 2% of the cases.
4. Primary infarct PCI was performed in 18% of STEMI, with a median door-to-balloon time of 93.5 minutes.

**References**

1. Wiviott S.D. Application of the Thrombolysis In Myocardial Infarction Risk Index in Non–ST-Segment Elevation Myocardial Infarction Evaluation of Patients in the National Registry of Myocardial Infarction., Journal of Amercian College of Cardiology. 2006; 47:1553– 8
2. Wiviott S.D. Performance of the Thrombolysis In Myocardial Infarction Risk Index in the National Registry of Myocardial Infarction-3 and -4: A Simple Index That Predicts Mortality in ST-Segment Elevation Myocardial Infarction. Journal of Amercian College of Cardiology. 2004; 44:783–9

**Table 3.1 Patient clinical status at time of PCI procedure, NCVD-PCI Registry, 2007**

| | Total No. of Procedures=3920 | |
|---|---|---|
| | n | % |
| **Clinical examination** | | |
| Heart rate at presentation, beats/minute (n=3624) | | |
| Mean(SD) | 71.34 (15.68) | |
| Median, (min,max) | 69 (25,181) | |
| Not Available | 296 | 8.2 |
| | | |
| Systolic blood pressure,mmHg (n=3623) | | |
| Mean(SD) | 139.71 (26.16) | |
| Median, (min,max) | 139 (62,227) | |
| Not Available | 297 | 8.2 |
| | | |
| Diastolic blood pressure, mmHg (n=3626) | | |
| Mean(SD) | 76.95 (13) | |
| Median, (min,max) | 78 (13,120) | |
| Not Available | 294 | 8.1 |
| | | |
| TIMI Risk Index (TRI) (n=3526) | | |
| Mean(SD) | 17.22 (7.81) | |
| Median (min,max) | 16 (3,90) | |
| Not Available | 394 | 11.2 |
| | | |
| TRI Classification, no. (%) | | |
| Low <30 | 3320 | 94.2 |
| Intermediate 30-70 | 200 | 5.7 |
| High >70 | 6 | 0.2 |
| | | |
| Baseline ECG, no. (%) | | |
| Sinus rhythm | 3339 | 85.2 |
| Atrial fibrillation | 31 | 0.8 |
| $2^{nd}/3^{rd}$ AVB | 22 | 0.6 |
| LBBB | 20 | 0.5 |
| RBBB | 22 | 0.6 |
| | | |
| **Cardiac Status at PCI Procedure** | | |
| Congestive heart failure, no. (%) | | |
| Yes | 160 | 4.1 |
| No | 3664 | 93.5 |
| Not Available | 96 | 2.4 |
| | | |

| | Total No. of Procedures=3920 | |
|---|---|---|
| | n | % |
| NYHA, no. (%) | | |
| NYHA I | 2628 | 67 |
| NYHA II | 647 | 16.5 |
| NYHA III | 101 | 2.6 |
| NYHA IV | 29 | 0.7 |
| Not Available | 515 | 13.1 |
| | | |
| Functional ischaemia, no. (%) | | |
| Not Applicable | 3002 | 76.6 |
| Positive | 704 | 18 |
| Negative | 50 | 1.3 |
| Equivocal | 31 | 0.8 |
| Not Available | 133 | 3.4 |
| | | |
| Canadian Cardiovascular Score (CCS), no. (%) | | |
| CCS 1 | 1277 | 32.6 |
| CCS 2 | 1405 | 35.8 |
| CCS 3 | 182 | 4.6 |
| CCS 4 | 128 | 3.3 |
| Asymptomatic | 270 | 6.9 |
| Not Available | 658 | 16.8 |
| | | |
| Ejection Fraction (EF) status, no. (%) | | |
| Mean(SD) | 792 | |
| Median (min,max) | 51.43(13.44) | |
| Not Available | 53 (18,80) | |
| | 3128 | 79.8 |
| Cardiogenic shock, no. (%) | | |
| Yes | 67 | 1.7 |
| No | 3853 | 98.3 |
| | | |
| Intra-Aortic Balloon Pump (IABP), no. (%) | | |
| Yes | 69 | 1.8 |
| No | 3760 | 95.9 |
| | | |
| Acute Coronary Syndrome, no. (%) | | |
| Yes | 780 | 19.9 |
| No | 3041 | 77.6 |
| Not Available | 99 | 2.5 |
| | | |
| ACS Type, no. (%) | | |
| STEMI | 330 | 42.3 |
| NSTEMI | 233 | 29.9 |
| UA | 192 | 24.6 |
| Not Available | 25 | 3.2 |
| | | |

| | Total No. of Procedures=3920 | |
|---|---|---|
| | **n** | **%** |
| ACS Symptom Onset, no. (%) | | |
| <6 hours | 112 | 14.4 |
| 6-24 hours | 118 | 15.1 |
| >24 hours-7 days | 309 | 39.6 |
| Not Available | 241 | 30.9 |
| | | |
| STEMI, no. (%) | | |
| Anterior | 148 | 44.8 |
| Non-anterior | 100 | 30.3 |
| Not Available | 82 | 24.8 |
| | | |
| Ejection Fraction (EF) status, (n=792) | | |
| Mean(SD) | 51.43(13.44) | |
| Median (min,max) | 53 (18,80) | |
| Not Available | 3128 | 79.8 |
| | | |
| Killip class, no. (%) in STEMI only | | |
| I | 157 | 47.6 |
| II | 50 | 15.2 |
| III | 15 | 4.5 |
| IV | 26 | 7.9 |
| Not Applicable/Not Available | 82 | 24.8 |
| | | |
| **STEMI : Time-to-treatment analysis** | | |
| Symptom-to-door (n=52) | | |
| Mean(SD) | 172.25(140.81) | |
| Median (min,max) | 123.5 (0,659) | |
| Not Available | 278 | 84.2 |
| | | |
| Door-to-balloon (n=58) | | |
| Mean(SD) | 116.43 (123.88) | |
| Median (min,max) | 93.5 (0,868) | |
| Not Available | 53 | 47.7 |
| | | |
| Transfer time (n=24) | | |
| Mean(SD) | 71.75(88.12) | |
| Median (min,max) | 51.5 (0,300) | |
| Not Available | 87 | 78 |
| | | |

Figure 3.1.1 Distribution of functional ischaemia, by PCI procedures performed, NCVD-PCI Registry, 2007

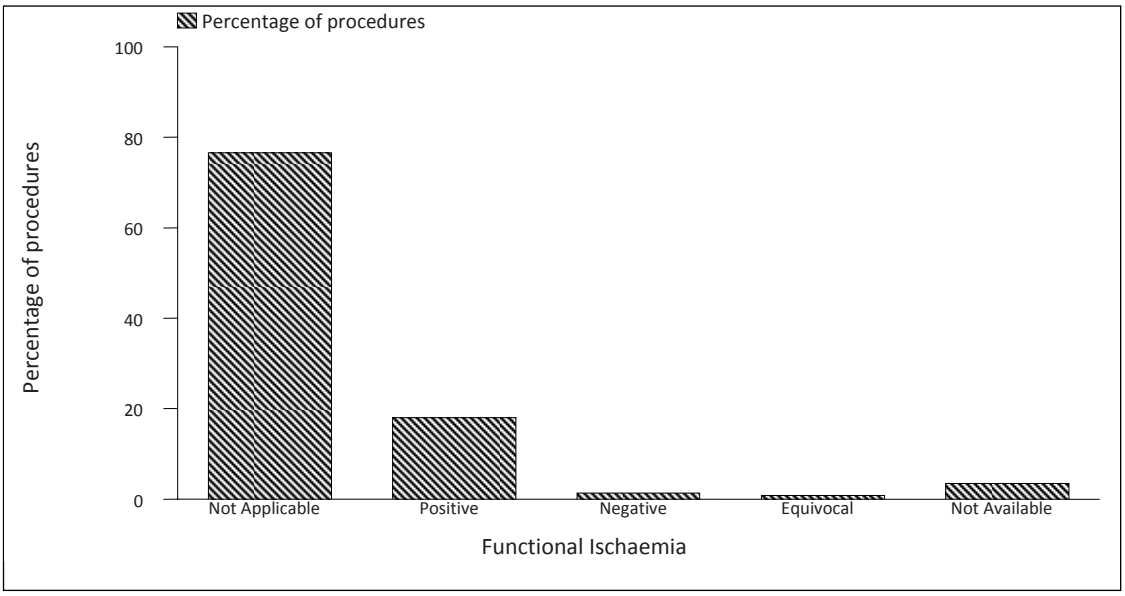


Figure 3.1.2 Distribution of ACS stratum, NCVD-PCI Registry, 2007

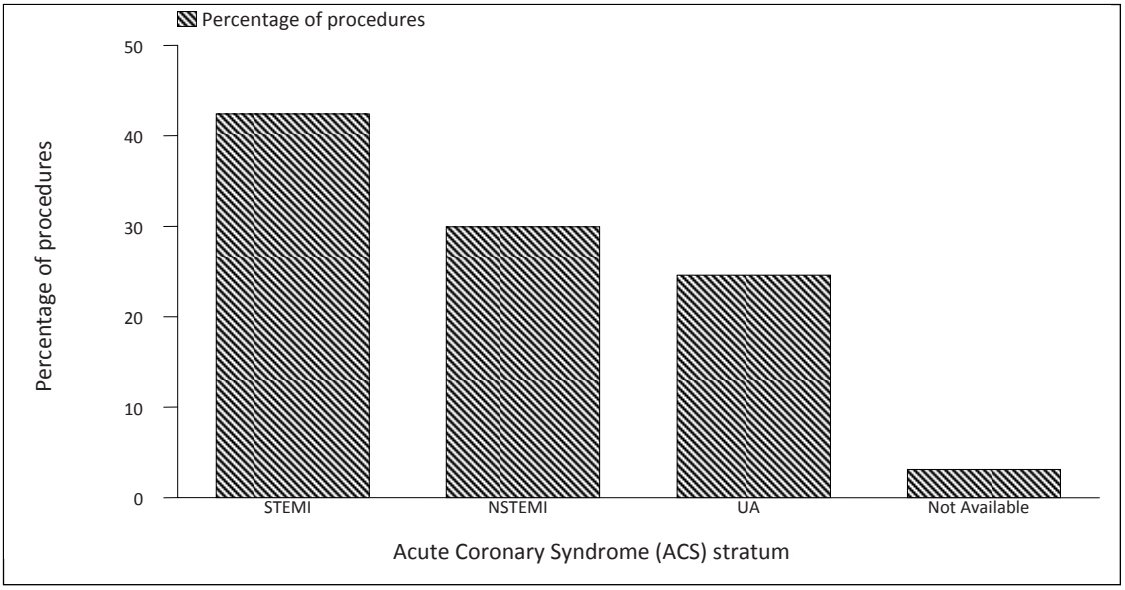

Figure 3.1.3 TIMI Risk Index classification, by PCI procedures performed, NCVD-PCI Registry, 2007

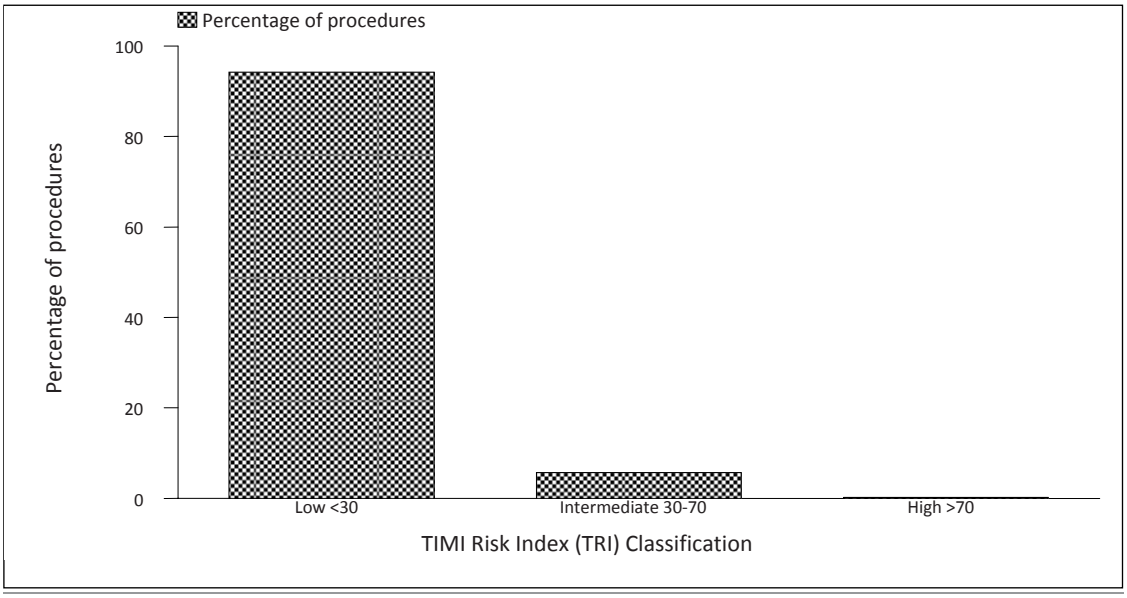


**Table 3.2 Time to treatment for STEMI, comparing patients with or without transfer, NCVD-PCI Registry, 2007**

| | With transfer | | Without transfer | |
|---|---|---|---|---|
| | **mean** | **SD** | **mean** | **SD** |
| N | 44 | | 8 | |
| Symptom- to -door (minutes) | 165.4 | 146.27 | 210 | 105.36 |
| N | 20 | | 38 | |
| Door- to -balloon (minutes) | 91.1 | 97.25 | 129.8 | 135.12 |
| N | 24 | | - | - |
| Transfer- to-PCI centre (minutes) | 71.75 | 88.12 | - | - |
| N | 17 | | 38 | |
| Symptom- to- balloon (minutes) | 322.5 | 165.11 | 287.2 | 149.95 |

**Table 3.3 Comparison of heart rate according to PCI status, NCVD-PCI Registry, 2007**

| Heart rate (beats/min) | Elective | | Urgent | | Rescue | | Primary | | Not Available | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| <=60 | 624 | 18 | 26 | 14 | 7 | 9 | 11 | 11 | 3 | 18 |
| 60-80 | 2011 | 57 | 89 | 47 | 23 | 30 | 35 | 34 | 9 | 53 |
| > 80-100 | 527 | 15 | 44 | 23 | 27 | 36 | 34 | 33 | 1 | 6 |
| >100 | 104 | 3 | 18 | 9 | 12 | 16 | 18 | 17 | 1 | 6 |
| Not Available | 267 | 8 | 13 | 7 | 7 | 9 | 6 | 6 | 3 | 18 |
| **Total** | 3533 | 100 | 190 | 100 | 76 | 100 | 104 | 100 | 17 | 100 |

**Table 3.4 Comparison of heart rate according to ACS subtypes, NCVD-PCI Registry, 2007**

| Heart rate (beats/min) | STEMI | | NSTEMI | | UA | | NA | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| <=60 | 36 | 10.9 | 38 | 16.3 | 25 | 13 | 5 | 20 |
| 60-80 | 150 | 45.5 | 122 | 52.4 | 109 | 56.8 | 13 | 52 |
| > 80-100 | 85 | 25.8 | 44 | 18.9 | 37 | 19.3 | 4 | 16 |
| >100 | 41 | 12.4 | 17 | 7.3 | 5 | 2.6 | 1 | 4 |
| Not Available | 18 | 5.5 | 12 | 5.2 | 16 | 8.3 | 2 | 8 |
| **Total** | 330 | 100 | 233 | 100 | 192 | 100 | 25 | 100 |

**Table 3.5 Duration of symptom at presentation for STEMI and NSTEMI patients, NCVD-PCI Registry, 2007**

| ACS Symptom Onset | STEMI | | NSTEMI | |
|---|---|---|---|---|
| | No. | % | No. | % |
| <6 hours | 92 | 27.9 | 10 | 4.3 |
| 6-24 hours | 69 | 20.9 | 27 | 11.6 |
| >24 hours – 7 days | 111 | 33.6 | 87 | 37.3 |
| Not Available | 58 | 17.6 | 109 | 46.8 |
| **Total** | 330 | 100 | 233 | 100 |

# CHAPTER 4: PROCEDURAL DETAILS

## 4.1 PROCEDURAL SETTINGS

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## 4.2 LESION CHARACTERISTICS

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## 4.1 PROCEDURAL SETTINGS

This chapter summarizes the procedural settings and treatment of patients who underwent PCI in 2007 based on our PCI registry.

In total, 3920 PCIs were performed in 2007. The majority of the PCIs were performed as Elective case (90.1%; n=3533). Urgent case which comprises both NSTEMI and Unstable Angina accounted for 4.8% (n=190). The remaining 4.6% were Rescue PCI (n=76) and Primary PCI (n=104).

About eighty seven percent (86.7%; n=3397) of PCIs were performed during the same laboratory visit as the diagnostic coronary angiogram (ad-hoc). Comparatively, STEMI and NSTEMI, PCIs were performed as ad-hoc procedures in 90.6% and 91.8% of the cases respectively.

Analysing the different approaches of percutaneous entry for PCI, femoral approach accounted for 59.4% (n=2330) and 33.8% (n=1325) were of Radial approach. The remaining 1.8% was distributed between Brachial and multiple sites.

The size of percutaneous access was measured based on the French size. 73.9% (n=2897) of patients had a size 6 French, 20.3% (n=797) size 7 French and 1.3% (n=50) size 8 French.

As for the methods of closure for percutaneous entry, the majority of cases (91.8%; n=3599) were manually compressed (manually or using device). The remaining methods were Seal (2.1%; n=82) and Suture (1%; n=38).

Looking at the extent of coronary artery disease, 55.3% (n=2167) of PCIs were performed in multiple vessel disease, 43.4% (n=1702) in single vessel disease and the remaining were grafts 1 %( n=38) and Left Main disease 0.9% (n=36).

The mean fluoroscopy time was 22.08minutes (SD 22.16), median was 15.7min (2.2-180). The average dose of radiation was 618.38mGy (SD 2659.22), median dose was 122mGy (3.2m-max 47351). The reason for the great disparity between the minimum and maximum fluoroscopy time and dose of radiation is due to the reason that PCIs can be performed in

simple Type A lesions to more complicated ones such as Type C and others, the longer procedural time being associated with higher dosage of radiation.

Most of the contrasts used for these procedures were non-ionic i.e. 75.7% (n=2966). Only 4% (n=156) were ionic. The mean contrast volume was 179.72 mls (SD 71.63), median 165 mls (25-500). The higher contrast load reflects the more complicated PCI cases.

**Treatment of patients undergoing PCI**

In STEMI, 32.4% (n=107) of patients undergoing PCI received thrombolytic treatment prior to the procedure. 21.5% (n=23) of them received thrombolysis more than 7 days before the procedure, 21.5% (n=23) within 12-24 hours and 15.9% (n=17) received within less than 3 hours. The remaining cases were, 11.2% (n=12) within 3-6 hours, 10.3% (n=11) 6-12 hours and 12.1% (n=13) within 1-7 days.

About six percent (6.3%; n=245) of patients undergoing PCI received GP IIb/IIIa blocker, and out of this group, 40.0% (n=98) of them received prior to PCI, 39.2% (n=96) received during and 9.0% (n=22) received after the procedure.

Nearly all of them (99.5 %; n=3899) who underwent PCI received intravenous unfractionated Heparin and in the majority of cases (65.5%; n=2437), Heparin were given during the procedure but in 17.2% (N=672) of them it was given prior to the procedure.

About five percent (5.2%; n=203) of patients received LMWH. The majority of these patients, (78.8%; n=160) received prior to procedure, 4.9% (n=10) received during procedure and 8.4% (n=17) received after procedure.

Aspirin and Clopidogrel were the two most common choice of antiplatelet therapy used in PCI. Ticlopidine was used only in 3.9% (n=152) of cases. Nearly all of them (95.5%; n=3742) were on Aspirin and the majority of them (90.6%; n=3390) received aspirin prior to the procedure. Similarly, Clopidogrel usage was recorded as 97.6% (n=3824) and the majority of these patients (92.1; n=3520) received Clopidogrel prior to the procedure. The most common loading dose for Clopidogrel was 300mg (46.9%; n=1795) and only 7.2% of them (n=277) received 600mg. About thirty four percent (33.8%; n=1291) received only 75mg

prior to the PCI (these patients had been on long term Clopidogrel therapy, prior to procedure).

Following PCI, the duration of Clopidogrel would depend on the clinical setting and the type of stents implanted. About 25.7% (n=1007) of the cases were planned for one month of Clopidogrel, 6.8% (n=267) for three months, 21.3% (n=836) for six months, 22.0% (n=861) for 12 months and 13.9% (n=546) for longer than one year. In cases where BMS was implanted, 44% (n=1030) of the cases were planned for one month duration and for the rest were between three months to more than one year. In cases with DES, 29.7% (n=710) were planned for six months, 34.8% (n=831) planned for 12 months and 20.4% (n=488) planned for more than one year of Clopidogrel.

**Summary points**

1. The majority of PCIs performed in Malaysia in 2007 were Elective cases and in most cases PCIs were performed as ad-hoc.
2. Femoral access remains the most common percutaneous entry followed by Radial and in the majority of patients the closure percutaneous access was compressed manually or using device.
3. Clopidogrel and Aspirin remains the two most common antiplatelet therapy for patients undergoing coronary intervention and most commonly used in combination.
4. In cases where DES was implanted, Clopidogrel was planned for 6months in 29.7%, 12months in 34.8% and more than 1 year in 20.4% of the cases.

**Table 4.1.1 Characteristics of PCI procedures performed, NCVD-PCI Registry, 2007**

| | Total No. of Procedures =3920 | |
|---|---|---|
| | n | % |
| PCI Status, no. (%) | | |
| Elective | 3533 | 90.1 |
| Urgent(NSTEMI/UA) | 190 | 4.8 |
| Rescue | 76 | 1.9 |
| Primary | 104 | 2.7 |
| Not Available | 17 | 0.4 |
| | | |
| Staged PCI, no. (%) | | |
| Yes | 766 | 21.7 |
| No | 1754 | 49.7 |
| Not Available | 1012 | 28.7 |
| | | |
| Ad-hoc PCI, no. (%) | | |
| Yes | 3397 | 86.7 |
| No | 471 | 12 |
| Not Available | 52 | 1.3 |
| | | |
| Percutaneous entry, no. (%) | | |
| Brachial | 28 | 0.7 |
| Radial | 1325 | 33.8 |
| Femoral | 2330 | 59.4 |
| Multiple site | 43 | 1.1 |
| Not Available | 194 | 4.9 |
| | | |
| French size, no. (%) | | |
| 5 | 15 | 0.4 |
| 6 | 2897 | 73.9 |
| 7 | 797 | 20.3 |
| 8 | 50 | 1.3 |
| Others | 2 | 0.1 |
| Not Available | 159 | 4.1 |
| | | |
| Closure device, no. (%) | | |
| No | 3599 | 91.8 |
| Seal | 82 | 2.1 |
| Suture | 38 | 1 |
| Others | 6 | 0.2 |
| Not Available | 195 | 5 |
| | | |
| Extent of Coronary disease, no. (%) | | |
| Single vessel disease | 1702 | 43.4 |
| Multiple vessel disease | 2167 | 55.3 |
| Graft | 38 | 1 |
| Left main | 36 | 0.9 |

| | Total No. of Procedures =3920 | |
|---|---|---|
| | **n** | **%** |
| Fluoroscopy time, minutes | | |
| N | 3142 | |
| Mean(SD) | 22.08 (22.16) | |
| Median(min,max) | 15.7 (2.2,180) | |
| Not Available | 778 | 19.8 |
| | | |
| Total dose, mGy | | |
| N | 1469 | |
| Mean(SD) | 618.38 (2659.22) | |
| Median(min,max) | 122 (3.2,47351) | |
| Not Available | 2451 | 62.5 |
| | | |
| Contrast type, no. (%) | | |
| Ionic | 156 | 4 |
| Non-ionic | 2966 | 75.7 |
| Not Available | 798 | 20.4 |
| | | |
| | | |
| Contrast volume, ml | | |
| N | 3212 | |
| Mean(SD) | 179.72 (71.63) | |
| Median(min,max) | 165 (25,500) | |
| Not Available | 708 | 18.1 |
| | | |
| | | |
| Thrombolytics, no. (%) (only in STEMI) | | |
| Yes | 107 | 32.4 |
| No | 219 | 66.4 |
| Not Available | 4 | 1.2 |
| | | |
| Thrombolytics given, no. (%) | | |
| <3 hrs | 17 | 15.9 |
| 3-6 hrs | 12 | 11.2 |
| 6-12 hrs | 11 | 10.3 |
| 12-24 hrs | 23 | 21.5 |
| 1-7 days | 13 | 12.1 |
| >7 days | 23 | 21.5 |
| Not Available | 8 | 7.5 |
| | | |
| Adjunctive pharmacotherapy | | |
| | | |
| IIb/IIIa Blockade, no. (%) | | |
| Yes | 245 | 6.3 |
| No | 3642 | 92.9 |
| Missing | 33 | 0.8 |

| | Total No. of Procedures =3920 | |
|---|---|---|
| | n | % |
| IIb/IIIa Blockade given, no. (%) | | |
| Prior | 98 | 40 |
| After | 22 | 9 |
| During | 96 | 39.2 |
| Not Available | 29 | 11.8 |
| | | |
| Heparin, no. (%) | | |
| Yes | 3899 | 99.5 |
| No | 0 | 0 |
| Not Available | 21 | 0.5 |
| | | |
| Heparin given, no. (%) | | |
| Prior | 672 | 17.2 |
| After | 8 | 0.2 |
| During | 2437 | 62.5 |
| Not specified | 782 | 20.1 |
| | | |
| LMWH, no. (%) | | |
| Yes | 203 | 5.2 |
| No | 3658 | 93.3 |
| Not Available | 59 | 1.5 |
| | | |
| LMWH given, no. (%) | | |
| Prior | 160 | 78.8 |
| After | 17 | 8.4 |
| During | 10 | 4.9 |
| Not specified | 16 | 7.9 |
| | | |
| Ticlopidine, no. (%) | | |
| Yes | 152 | 3.9 |
| No | 3727 | 95.1 |
| Not Available | 41 | 1 |
| | | |
| Ticlopidine given, no. (%) | | |
| Prior | 130 | 85.5 |
| After | 2 | 1.3 |
| During | 2 | 1.3 |
| Not Available | 18 | 11.8 |
| | | |
| Aspirin, no. (%) | | |
| Yes | 3742 | 95.5 |
| No | 162 | 4.1 |
| Not Available | 16 | 0.4 |
| | | |

| | Total No. of Procedures=3920 | |
|---|---|---|
| | **n** | **%** |
| Aspirin given, no. (%) | | |
| Prior | 3390 | 90.6 |
| After | 40 | 1.1 |
| During | 63 | 1.7 |
| Not Available | 249 | 6.7 |
| | | |
| Clopidogrel, no. (%) | | |
| Yes | 3824 | 97.6 |
| No | 88 | 2.2 |
| Not Available | 8 | 0.2 |
| | | |
| Clopidogrel given, no. (%) | | |
| Prior | 3520 | 92.1 |
| After | 72 | 1.9 |
| During | 103 | 2.7 |
| Not Available | 129 | 3.4 |
| | | |
| Prior, no. (%) | | |
| <6 hrs | 570 | 16.2 |
| 6-12 hrs | 1171 | 33.3 |
| >34-72 hrs | 313 | 8.9 |
| >72 hrs | 1158 | 32.9 |
| Not Available | 308 | 8.8 |
| | | |
| First starting dose, no. (%) | | |
| 75 mg | 1291 | 33.8 |
| 300 mg | 1795 | 46.9 |
| 600 mg | 277 | 7.2 |
| >=1200 mg | 1 | 0 |
| Not Available | 460 | 12 |
| | | |
| Planned duration of Clopidogrel/Ticlopidine, no. (%) | | |
| 1 month | 1007 | 25.7 |
| 3 months | 267 | 6.8 |
| 6 months | 836 | 21.3 |
| 12 months | 861 | 22 |
| >12 months | 546 | 13.9 |
| Not Available | 403 | 10.3 |
| | | |
| Clopidogrel/ Ticlopidine Usage, no. (%) | | |
| Ticlopidine only | 51 | 1.3 |
| Clopidogrel only | 3723 | 95.0 |
| Ticlopidine and Clopidogrel | 101 | 2.6 |
| None given | 45 | 1.1 |
| | | |

Figure 4.1.1.1 PCI status of patients who underwent PCI, NCVD-PCI Registry, 2007

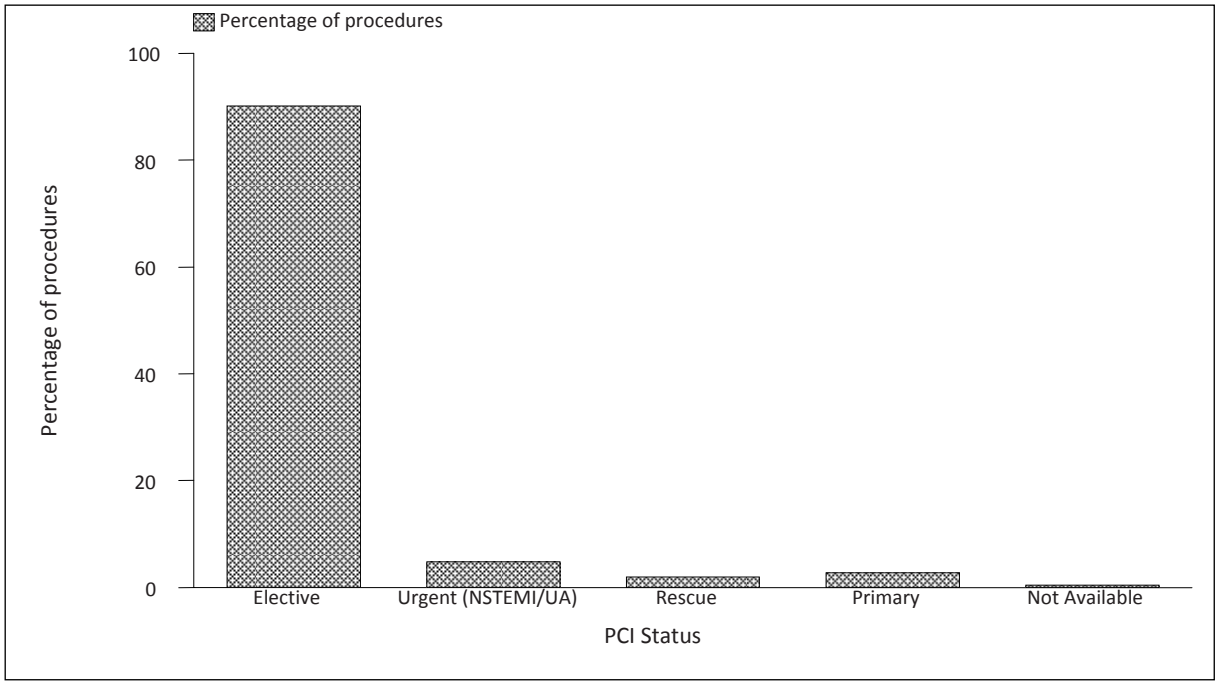



Figure 4.1.1.2 Distribution of patients who received ad-hoc PCI, NCVD-PCI Registry, 2007

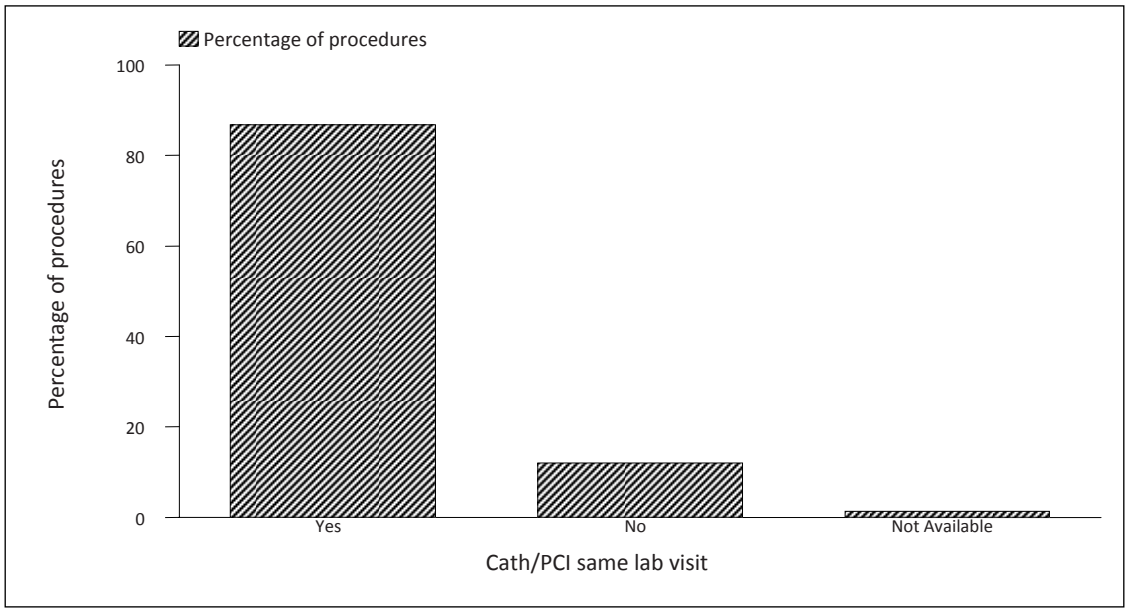


Figure 4.1.1.3 Type of percutaneous entry for patients who underwent PCI, NCVD-PCI Registry, 2007

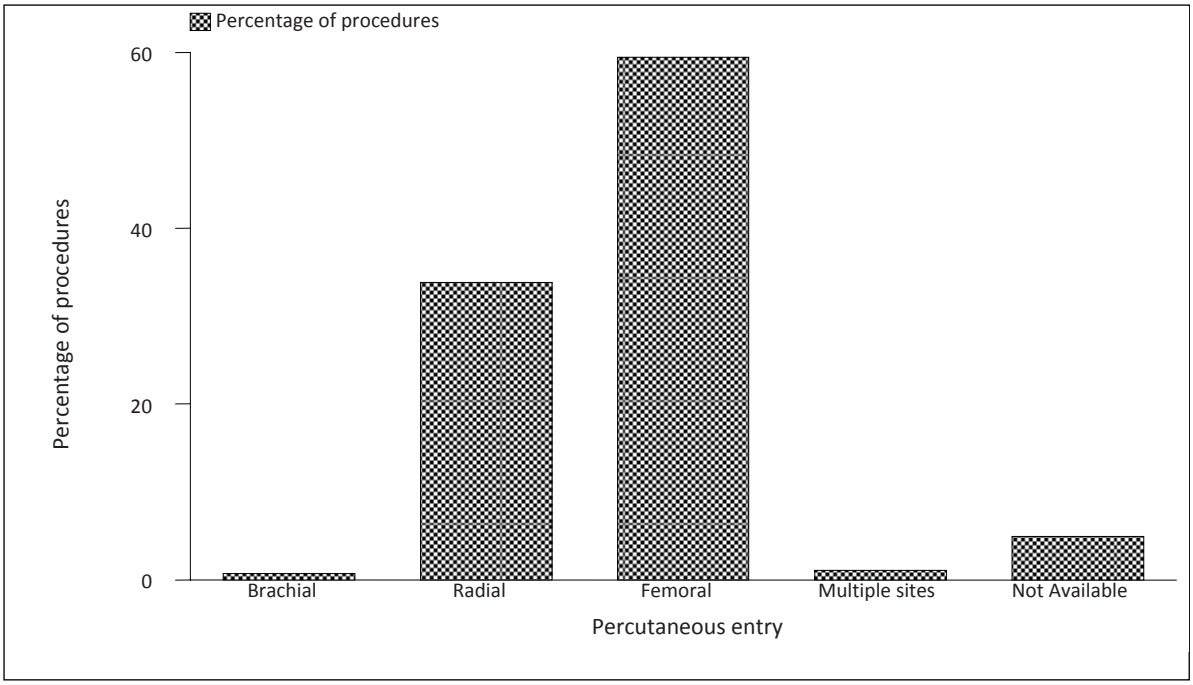



Figure 4.1.1.4 Distribution of French size for patients who underwent PCI, NCVD-PCI Registry, 2007

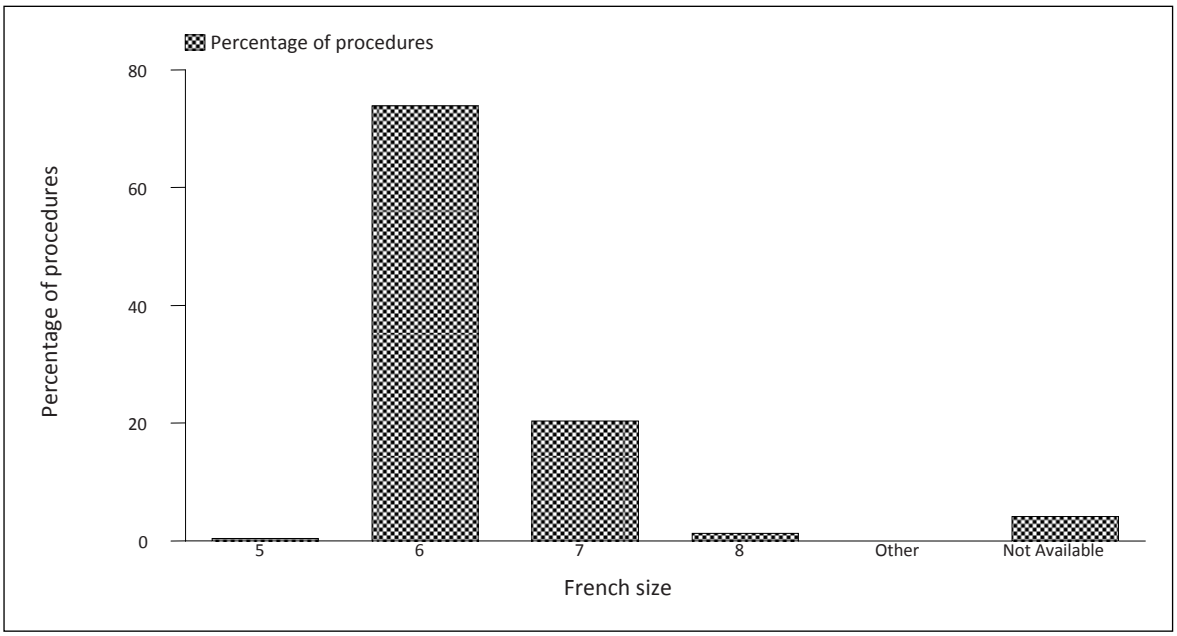


Figure 4.1.1.5 Distribution of contrast type for patients who underwent PCI, NCVD-PCI Registry, 2007

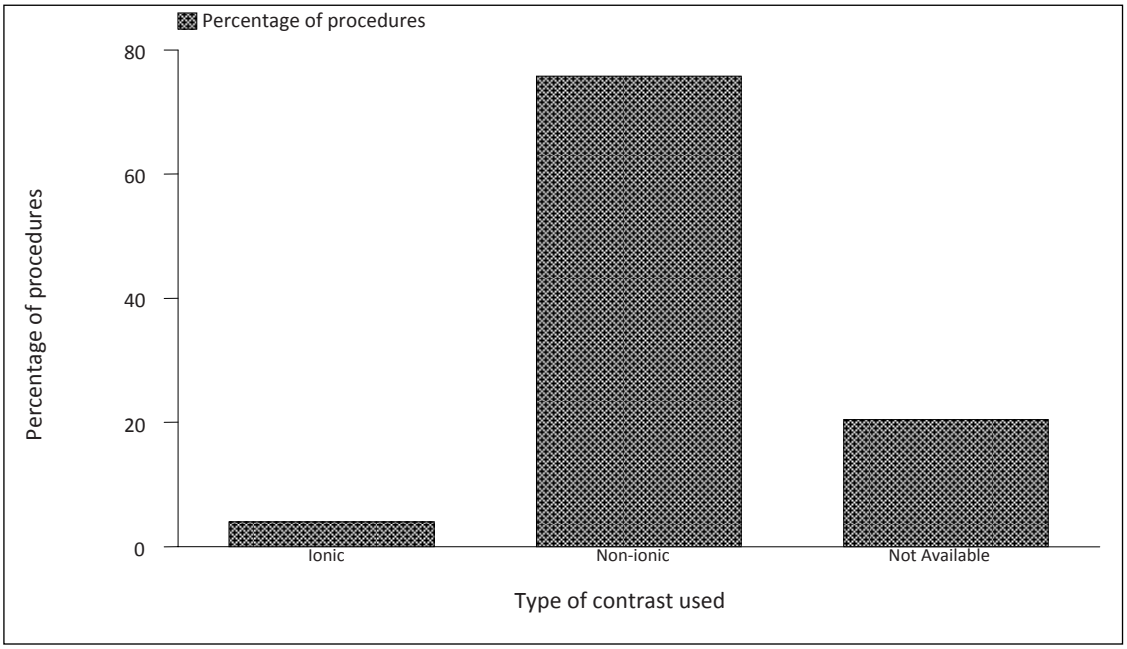



Figure 4.1.1.6 Distribution of adjunctive pharmacotherapy for patients who underwent PCI, NCVD-PCI Registry, 2007

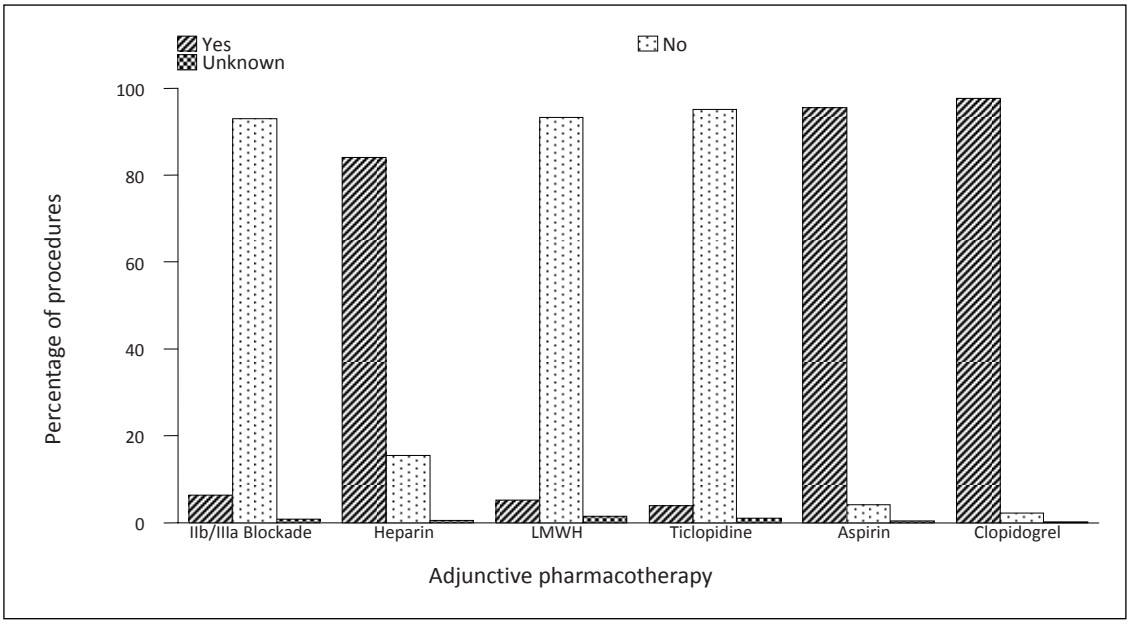


**Table 4.1.2 Comparison of STEMI and NSTEMI patients who received ad-hoc PCI, NCVD-PCI Registry, 2007**

| Cath/PCI same lab visit | STEMI | | NSTEMI | |
|---|---|---|---|---|
| | n | % | n | % |
| Yes | 299 | 90.6 | 214 | 91.8 |
| No | 24 | 7.3 | 17 | 7.3 |
| Not Available | 7 | 2.1 | 2 | 0.9 |
| Total | 330 | 100 | 233 | 100 |

**Table 4.1.3 Usage of thrombolytics in STEMI patients who underwent PCI, NCVD-PCI Registry, 2007**

| PCI status | STEMI | | | | | | |
|---|---|---|---|---|---|---|---|
| | Thrombolytics | | | | | | |
| | Yes | | No | | Missing | | Total |
| | n | % | n | % | n | % | |
| Urgent | 23 | 21.5 | 34 | 15.5 | 0 | 0 | 57 |
| Rescue | 50 | 46.7 | 16 | 7.3 | 1 | 25 | 67 |
| Not Available | 5 | 4.7 | 0 | 0 | 0 | 0 | 5 |
| Total | 107 | 100 | 219 | 100 | 4 | 100 | 330 |

**Table 4.1.4 Patients who underwent PCI after thrombolytics therapy, NCVD-PCI Registry, 2007**

| Thrombolytics given | PCI Status | | | | | |
|---|---|---|---|---|---|---|
| | Urgent | | Rescue | | Not available | |
| | n | % | n | % | n | % |
| <3 hrs | 5 | 17.9 | 11 | 20.8 | 1 | 16.7 |
| 3-6 hrs | 1 | 3.6 | 11 | 20.8 | 0 | 0 |
| 6-12 hrs | 4 | 14.3 | 7 | 13.2 | 1 | 16.7 |
| 12-24 hrs | 11 | 39.3 | 9 | 17 | 2 | 33.3 |
| 1-7 days | 1 | 3.6 | 9 | 17 | 0 | 0 |
| >7 days | 2 | 7.1 | 2 | 3.8 | 1 | 16.7 |
| Not Available | 4 | 14.3 | 4 | 7.5 | 1 | 16.7 |

**Table 4.1.5 Duration of Thienopyridine in patients who underwent PCI, NCVD-PCI Registry, 2007**

| Duration of Clopidogrel/Ticlopidine | Intracoronary devices used | | | | | |
|---|---|---|---|---|---|---|
| | Balloon only | | Drug Eluting Stent | | Bare Metal Stent | |
| | n | % | n | % | n | % |
| 1 month | 132 | 29.7 | 35 | 1.5 | 1032 | 44 |
| 3 months | 21 | 4.7 | 119 | 5 | 199 | 8.5 |
| 6 months | 96 | 21.6 | 710 | 29.7 | 377 | 16.1 |
| 12 months | 80 | 18 | 831 | 34.8 | 299 | 12.8 |
| >12 months | 49 | 11 | 488 | 20.4 | 239 | 10.2 |
| Not Available | 67 | 15.1 | 206 | 8.6 | 197 | 8.4 |
| Total | 445 | 100 | 2389 | 100 | 2343 | 100 |

**Table 4.1.6 Access site of patients who underwent procedures, by PCI status, NCVD-PCI Registry, 2007**

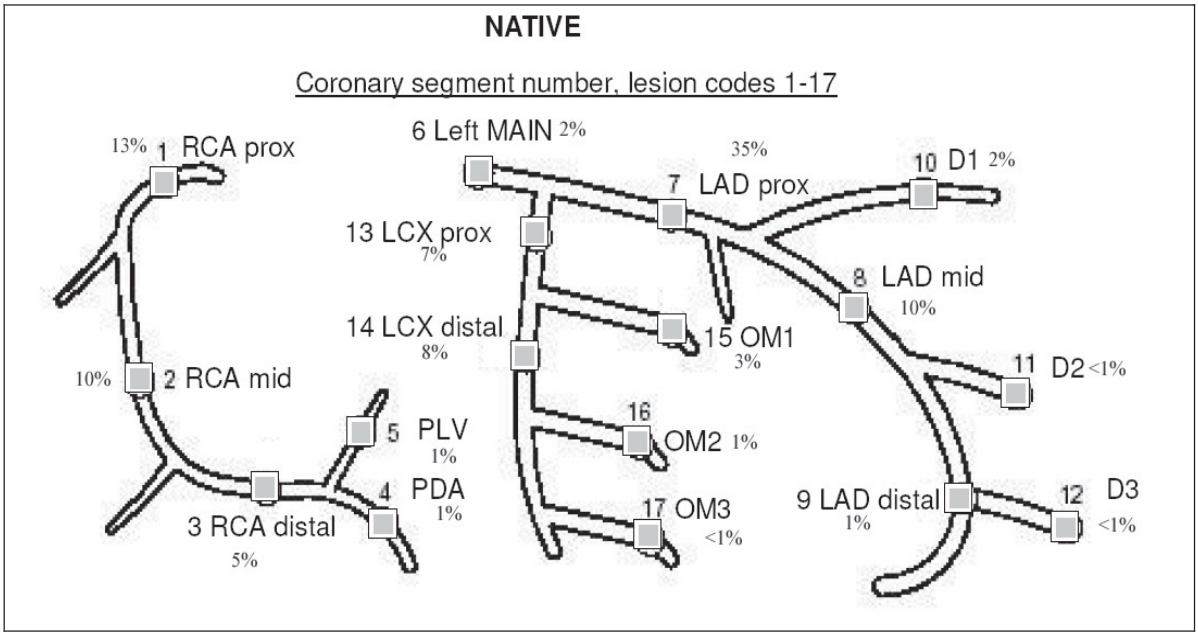
| | Elective | | Urgent | | Rescue | | Primary | | Not Available | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % |
| Brachial | 28 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Radial | 1267 | 35.9 | 37 | 19.5 | 8 | 10.5 | 8 | 7.7 | 5 | 29.4 |
| Femoral | 2021 | 57.2 | 145 | 76.3 | 67 | 88.2 | 87 | 83.7 | 10 | 58.8 |
| Multiple site | 38 | 1.1 | 3 | 1.6 | 0 | 0 | 2 | 1.9 | 0 | 0 |
| Not Available | 179 | 5.1 | 5 | 2.6 | 1 | 1.3 | 7 | 6.7 | 2 | 11.8 |

### 4.2 LESION CHARACTERISTICS

In 2007, a total of 5512 lesions were treated with PCIs. On average, 1.50 lesions per patient were treated with PCI and 1.4 lesions were treated during each procedure.

**Anatomical location of the lesion**

Figure 4.2 Anatomical location of lesions treated with Percutaneous Coronary Intervention, NCVD-PCI Registry, 2007




Among the 5512 lesions treated with PCI, proximal left anterior descending artery was the most common site of lesion location (34.5%). This was followed by proximal right coronary artery (13.1%), mid right coronary artery (10.2%) and mid left anterior descending artery (9.7%). Left main stem PCI was performed in 1.8% of all PCIs. PCI to the graft was performed in 60 lesions. Among the graft lesions, one lesion was in the previous radial graft, seven were located within the LIMA graft while the remaining ones were in the saphenous vein graft.

**Table 4.2.1 Summary of location of lesions treated with Percutaneous Coronary Intervention, NCVD-PCI Registry, 2007**

| Location of lesion | No. | % |
|---|---|---|
| **Left Main Stem** | **97** | **1.8** |
| **Left Anterior Descending Artery (LAD)** | **2643** | **48.0** |
| LAD proximal | 1903 | 34.5 |
| LAD mid | 532 | 9.7 |
| LAD distal | 72 | 1.3 |
| D1 | 125 | 2.3 |
| D2 | 9 | 0.2 |
| D3 | 2 | 0.0 |
| **Right Coronary Artery (RCA)** | **1644** | **29.8** |
| RCA proximal | 722 | 13.1 |
| RCA mid | 564 | 10.2 |
| RCA distal | 277 | 5.0 |
| PDA | 45 | 0.8 |
| PLV | 36 | 0.7 |
| **Left Circumflex Artery (LCx)** | **996** | **18.0** |
| LCX proximal | 387 | 7.0 |
| LCX distal | 410 | 7.4 |
| OM1 | 154 | 2.8 |
| OM2 | 35 | 0.6 |
| OM3 | 10 | 0.2 |
| **Grafts** | **60** | **1.0** |
| Saphenous Vein Graft | 52 | 0.9 |
| Left internal mammary artery graft | 7 | 0.1 |
| Radial artery graft | 1 | 0.0 |

**Lesion characteristics**

**Table 4.2.2 Characteristics of lesions treated by PCI, NCVD-PCI Registry, 2007**

| Lesion type | No. | % |
|---|---|---|
| De Novo | 5115 | 92.8 |
| Restenosis | | |
| In-Stent restenosis | 233 | 4.2 |
| Restenosis (No prior stent) | 12 | 0.2 |
| Stent thrombosis | 22 | 0.4 |

The majority of the lesions treated in the registry were de novo (5115 lesions, 92.8%). In-Stent Restenosis (ISR) constituted a total of 233 lesions (4.2%). Acute stent thrombosis was very rare in the registry.

The mean lesion length was 24.40 mm (SD ± 15.18mm). The mean pre-procedure lesion estimated stenosis was 84.41% (SD ± 12.14%).

Most of the lesions were of type C (44.2%) followed by type B (41.3%). Among the lesions treated by PCI, about 28.3% were of high risk characteristics (such as ostial, bifurcation, totally occluded and thrombus). The cardiac centres involved in the registry were treating high risk lesions with PCI.

**Table 4.2.3 Prevalence of lesions according to American College of Cardiology (ACC) classifications, NCVD-PCI Registry, 2007**

| Lesion type | No. | % |
|---|---|---|
| A | 631 | 11.4 |
| B1 | 1239 | 22.5 |
| B2 | 1038 | 18.8 |
| C | 2436 | 44.2 |

**Table 4.2.4 Prevalence of high risk lesion type, NCVD-PCI Registry, 2007**

| Lesion type | No. | % |
|---|---|---|
| Ostial | 359 | 6.5 |
| Bifurcation | 441 | 8.0 |
| CTO<3mo | 161 | 2.9 |
| CTO>3mo | 430 | 7.8 |
| Thrombus | 170 | 3.1 |

Most of the lesions (90.9%) achieved TIMI 3 flow after the intervention (as shown in the Table 4.2.5).

**Table 4.2.5 Comparison of TIMI flow grade before and after procedure, NCVD-PCI Registry, 2007**

| TIMI flow grade | Pre-Procedure (%) | Post Procedure (%) |
|---|---|---|
| TIMI-0 | 712 (12.9) | 114 (2.1) |
| TIMI-1 | 245 (4.4) | 32 (0.6) |
| TIMI-2 | 755 (13.7) | 69 (1.3) |
| TIMI-3 | 3528 (64.0) | 5013 (90.9) |

**Types of Stents Used**

**Table 4.2.6 Types of stents used, NCVD-PCI Registry, 2007**

| Type of stent | No. | % |
|---|---|---|
| Drug Eluting Stent | 3453 | 53.6 |
| Bare Metal Stent | 2735 | 42.5 |
| Antibody stent | 109 | 1.7 |
| Bio-absorbable stent | 2 | 0.0 |

A total of 6299 stents were used in 5512 lesions treated with PCI. An average of 1.23 stents was used per lesion treated. Drug eluting stents were used in 53.6% of PCIs while bare metal stents were used in 42.5% of PCIs. About 19.4% of patients were treated with direct stenting. Balloon only angioplasty (POBA) without stenting was performed in 445 (8.1%) patients.

The mean stent length was 22.75mm (standard deviation ± 7.28mm). The mean stent diameter was 2.99mm (SD ± 0.46mm). Drug eluting stents were more commonly used in both longer lesions (mean 24.97 mm SD±7.01) as well as smaller (shorter) ones (mean 2.89 mm SD±0.39) as compared to bare metal stents which was, mean 20.26mm; SD±6.66, in longer lesions and mean 2.89 mm; SD±0.39 in smaller (shorter) ones.

**Lesion Complications during PCI**

**Table 4.2.7 Types of post procedure complications, NCVD-PCI Registry, 2007**

| Type of complication | No. | % of procedure (n=3920) |
|---|---|---|
| Dissection | 216 | 3.9 |
| No reflow | 80 | 1.5 |
| Transient | 50 | |
| Persistent | 20 | |
| Non-specified | 10 | |
| Acute closure | 24 | 0.4 |
| Perforation | 16 | 0.3 |

The most common complication arising during PCI was vessel dissection. PCI failed in about 3.9% of lesions treated. Perforation and acute closure were rare occurrences during PCI.

**Additional Devices used during PCI**

Other devices were not commonly used during PCIs. The two most common additional devices used during PCIs were cutting balloon and intravascular ultrasound.

**Table 4.2.8 Types of devices used during Percutaneous Coronary Intervention, NCVD-PCI Registry, 2007**

| Device | No. | % |
|---|---|---|
| Cutting balloon | 112 | 2.0 |
| IVUS | 136 | 2.5 |
| Rotablator | 36 | 0.7 |
| Distal Embolic Protection | 12 | 0.2 |
| Other Intracoronary devices | 201 | 3.6 |

**In- stent restenosis (ISR)**

A total of 233 (4.2% of all lesions treated) In-Stent Restenosis (ISR) were noted in the 2007 registry. Nearly all of the reported ISR occurred in the native coronary artery (97%). ISR within the saphenous vein graft occurred in seven cases. No ISR was reported in the LIMA graft. The majority of the ISR (123 lesions, 52.8%) occurred in the previous bare metal stent (BMS) implantation. Seventy three percents (31.3%) of ISR occurred in the previous drug eluting stent (DES) implantation.

**Table 4.2.9 Types of prior stents used in In- Stent Restenosis,** NCVD-PCI Registry, 2007

| Type of prior stent | No. | % |
|---|---|---|
| Bare Metal Stent | 123 | 52.8 |
| Drug Eluting Stent | 73 | 31.3 |
| Others | 7 | 3.0 |

The mean estimated length of the lesions was 23.61 (SD ±15.53) mm. Among all the ISR, 12.9% of cases was of TIMI 0 flow. TIMI 3 flow was seen only in 58.8% of cases prior to intervention. Nearly all (93.1%) achieved TIMI 3 flow after the intervention.

A total of 39 cases of ISR presented as acute coronary syndrome (ACS). Unstable angina (59%) was the most common presentation among those who were presented with ACS, followed by Non ST elevated myocardial infarct (25.6%) and acute ST elevated myocardial infarct (15.4%).

Balloon angioplasty (including cutting balloon) without stenting was performed in 85 (36.5%) of the cases. A total of 170 of ISR cases were stented. Most (75.3%) of the ISRs were treated with drug eluting stents. Bare metal stents were used in 19.4% of the ISRs. The mean stent diameter was 3.04 (SD ±0.45) mm. The mean length of stents used was 24.08 (SD ± 7.41) mm. Direct stenting was not used as frequent as in naïve coronary artery lesion. Only eleven cases (4.7%) were treated with direct stenting. PCI was unsuccessful in only six cases (2.6%) while no data was available on four cases.

**Table 4.2.10 Types of stents used in the In-Stent Restenosis, NCVD-PCI Registry, 2007**

| Type of stent used in the ISR | No. | % |
|---|---|---|
| Drug eluting stent | 128 | 75.3 |
| Bare metal stent | 33 | 19.4 |
| Antibody coated stent | 2 | 1.2 |
| Bio-absorbable stent | 1 | 0.6 |
| Other stents | 6 | 3.5 |

Cutting balloon was used more frequently among patients with ISR. A total of 19.7% of cases used cutting balloon in the intervention. Intravascular ultrasound (IVUS) guidance was used in about 10.3% of cases.

**Table 4.2.11 Types of devices used in the In-Stent Restenosis, NCVD-PCI Registry, 2007**

| Device | No. | % of all ISR cases |
|---|---|---|
| Cutting balloon | 46 | 19.7 |
| IVUS | 24 | 10.3 |
| Rotablator | 2 | 0.9 |
| Distal Embolic Protection | 1 | 0.4 |
| Other Intracoronary devices | 8 | 3.4 |
| Missing data | 5 | 2.1 |

Complications were uncommon in the intervention of In-Stent Restenosis. Dissection was the most common complication. PCI was unsuccessful in seven patients.

**Table 4.2.12 Types of complications in post In- Stent Restenosis, NCVD-PCI Registry, 2007**

| Type of complication | No. | % of Total No. of Procedures (n=216) |
|---|---|---|
| Dissection | 7 | 3.2 |
| Unsuccessful PCI | 7 | 3.2 |
| No reflow (transient) | 1 | 0.5 |
| Perforation | 1 | 0.5 |

**PCI of left main stem**

**Table 4.2.13 Types of lesions in left main stem procedure, NCVD-PCI Registry, 2007**

| Type of lesion | No. | % |
|---|---|---|
| De Novo | 91 | 94 |
| In-Stent Restenosis<br>• Previous DES<br>• Previous BMS<br>• Missing | <br>2<br>1<br>1 | 4 |
| Missing data | 2 | 2 |

A total of 93 left main stem (LMS) PCIs were performed in 97 lesions in 2007. Most of the lesions were of de novo lesions and 4% were In-Stent Restenosis. The majority of the left main stem intervention was done on unprotected LMS. Indeed, only nine (9.7%) patients had had previous bypass surgery. Most of the interventions were performed using femoral approach (76.3%) but radial approach was not uncommon (16.1%).

Most of the LMS interventions were done as elective cases. About 18.3% of all LMS interventions were performed in patients presented with acute coronary syndrome.

**Table 4.2.14 Clinical presentation of Left Main Stem, NCVD-PCI Registry, 2007**

| Clinical Presentation | No. | % of Total No. of procedures |
|---|---|---|
| Elective PCI | 74 | 79.6 |
| Acute Coronary Syndrome | | |
| ST Elevation Myocardial Infarct/ STEMI | 6 | 6.5 |
| NSTEMI | 6 | 6.5 |
| Unstable Angina | 5 | 5.3 |
| Missing data | 2 | 2.1 |

Mean pre-procedure lesion stenosis was 81.1% (SD ±13.65%). TIMI flow prior to PCI was presented in the table. The TIMI flow achieved TIMI 3 in all cases after the procedure.

**Table 4.2.15 TIMI flow Prior to Intervention, NCVD-PCI Registry, 2007**

| TIMI flow Prior to Intervention | No. | % |
|---|---|---|
| TIMI-0 | 8 | 8 |
| TIMI-1 | 7 | 7 |
| TIMI-2 | 15 | 15 |
| TIMI-3 | 63 | 65 |
| Missing data | 4 | 4 |

The mean length of the lesions was 33.04 mm (SD ±19.89). This long length is most likely due to the operator stenting across the left main stem either into the LAD or LCx. All lesions were stented. Direct stenting technique was used in six patients. Most of the lesions (89.2%) were stented with drug eluting stents. The mean stent length was 22.65 mm (SD ±7.5) and the mean stent diameter was 3.17 mm (SD ± 0.54).

**Table 4.2.16 Types of stents, NCVD-PCI Registry, 2007**

| Type of stent | No. | % |
|---|---|---|
| Drug Eluting Stent (DES) | 157 | 89.2 |
| Bare Metal Stent (BMS) | 18 | 10.2 |
| Antibody Coated Stent | 1 | 0.6 |
| Missing data | 0 | 0 |

LMS intervention with intravascular ultrasound (IVUS) was uncommon in this cohort of patients. Only 23.7% of the interventions were performed with IVUS guidance. Intra-aortic balloon pump support was used in 15.1% of patients undergoing LMS intervention.

**Table 4.2.17 Types of devices used in Left Main Stem, NCVD-PCI Registry, 2007**

| Device | No. | % of all LMS cases |
|---|---|---|
| IVUS | 23 | 23.7 |
| Intraaortic balloon pump | 14 | 15.1 |
| Rotablator | 5 | 5.2 |
| Cutting balloon | 4 | 4.1 |
| Distal Embolic Protection | 1 | 1 |

Most of the patients will be put on long term dual antiplatelet therapy. Indeed, about 80% of patients will be put on dual antiplatelet therapy for one year or more.

**Table 4.2.18 Planned duration of dual antiplatelet therapy, NCVD-PCI Registry, 2007**

| Planned duration of dual antiplatelet therapy | No. | % |
|---|---|---|
| 1 month | 4 | 4 |
| 3 months | 1 | 1 |
| 6 months | 7 | 7 |
| 12 months | 31 | 32 |
| >12 months | 47 | 48 |
| Missing data | 7 | 7 |

**PCI to the Grafts**

A total of 53 PCIs were performed in 60 lesions present in the bypass grafts. Most of the grafts were saphenous vein grafts (86.7%) and LIMA grafts (11.7%). Only one radial graft PCI was noted in the current registry.

**Table 4.2.19 Lesion types, NCVD-PCI Registry, 2007**

| Lesion type | No. | % |
|---|---|---|
| De Novo | 49 | 82 |
| In-Stent Restenosis | 7 | 12 |
| Stent thrombosis | 0 | 0 |
| Restenosis (No prior stent) | 0 | 0 |
| Missing data | 4 | 7 |

Most of the lesions were of de novo type. Among the seven cases of ISR, the previous stents used were drug eluting stent in six of the cases. The mean length of the lesions was 22.0 mm (SD±16.31). TIMI flow before and after PCI was shown in the table.

**Table 4.2.20 TIMI flow grade, NCVD-PCI Registry, 2007**

| TIMI flow grade | Pre-Procedure | Post Procedure |
|---|---|---|
| TIMI-0 | 2 | 1 |
| TIMI-1 | 6 | 0 |
| TIMI-2 | 20 | 1 |
| TIMI-3 | 30 | 56 |
| Missing data | 2 | 2 |

No complications were reported among these patients.

Most patients were discharged with long term dual antiplatelet therapy, about 50% of them for twelve months or more.

**Table 4.2.21 Planned duration of dual antiplatelet therapy, NCVD-PCI Registry, 2007**

| Planned duration of dual antiplatelet therapy | No. | % |
|---|---|---|
| 1 month | 10 | 17 |
| 3 months | 1 | 2 |
| 6 months | 14 | 23 |
| 12 months | 24 | 40 |
| >12 months | 6 | 10 |
| Missing data | 5 | 8 |

# CHAPTER 5: OUTCOME

## 5.1 IN-HOSPITAL OUTCOME
## 5.2 OUTCOME AT DISCHARGE & AT 30-DAY FOLLOW UP

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The in-hospital, all cause-mortality for the entire cohort was 1.1% (41 patients), of which only a few were in the elective cases (0.4%), and 0.7% in the non-elective ones. The majority (80%) was cardiac related and 20 % were due to other causes (infection, neurological, vascular).

Among those in the non-elective cases, (5%) were in urgent group, (11%) were in rescue group and (7%) were in the primary PCI in STEMI patients.

Mortality in the patients presenting with shock was high, i.e. 28%. Although this is lower than the cohort in the SHOCK trial, but the total number is too small for comparison. Those who developed shock during or post-PCI had a significantly higher mortality rate, 79 %.

There was a higher rate of mortality in patients with poor TIMI flow post-PCI (TIMI 0, 1 = 7.1% and TIMI 2 = 8.6%), as compared to those with TIMI 3 (0.7%). Only a very small number of patients (0.5%=18 patients) developed periprocedural Myocardial Infarct. This same small proportion (0.4%=17 patients) required emergency re-intervention/PCI and only one (0.025%) needed bail-out CABG.

Occurrences of other complications were low, including, cardiogenic shock (0.5%), arrhythmia (0.5%), stent thrombosis (0.2%), stroke (0.1%), heart failure (0.2%), impaired renal function (0.2%) and vascular/access related complications (1.3%). Although these appeared higher in elective cases, the overall total number was small and there was disproportionate numbers of non-elective vs. elective cases (387 vs. 3533).

Only few patients required readmission (3%), a majority of them were readmitted for staged/planned PCI (54%). Others were for recurrent angina (15%) and a few patients for other reasons (heart failure [2 patients], AMI [1 patient], CABG [2 patients] and unplanned PCI [2 patients]).

The 30-day mortality rate was 1.8 % (64 patients). However, only about 40% of the data were gathered on the 30-day follow-ups, the others were from National Death Registry.

**Summary**

1. PCI is safe with low total mortality rates (1.1% in-hospital, 1.8% 30-day).
2. Occurrence of other complications were also low <0.5% (Peri-procedural MI, heart failure, stroke, re-intervention, bail-out CABG, vascular–access related and renal impairment).
3. Poor prognostic factors were Killip Class IV and poor TIMI flow post PCI (0-2). There was a non-significant trend of high mortality rate in Killip III patients, diabetics, elderly, rescue PCI, previous MI, hypertensive and female patients, in descending order.

**References:**

1. Katritsis D.G., Meier B. Percutaneous coronary intervention for stable coronary artery disease. Journal of American College of Cardiology. 2008; 52: 889-893
2. Dzavik V., Sleeper L.A., Cocke T.P. & et al for the SHOCK Investigators**.** Early revascularization is associated with improved survival in elderly patients with acute myocardial infarction complicated by cardiogenic shock: a report from the SHOCK Trial Registry. European Heart Journal. 2003; 24 : 828-837
3. Jeger R.V., Radovanovic D., Hunziker P.R. & et al. Ten-year trends in the incidence and treatment of cardiogenic shock. Ann Intern Med. 2008; 149: 618-626

## 5.1 IN-HOSPITAL OUTCOME

**Table 5.1.1 Summary of in-hospital outcome for patients who underwent PCI, NCVD-PCI Registry, 2007**

| | Total No. of Procedures=3920 | |
|---|---|---|
| | n | % |
| Periprocedural MI, no. (%) (based on clinical diagnosis) | | |
| Yes | 18 | 0.5 |
| No | 3798 | 96.9 |
| Not Available | 104 | 2.7 |
| | | |
| Emergency Reintervention/PCI, no. (%) | | |
| Yes | 15 | 0.4 |
| No | 3799 | 96.9 |
| Not Available | 106 | 2.7 |
| | | |
| Bail-out CABG, no. (%) | | |
| Yes | 1 | 0 |
| No | 3818 | 97.4 |
| Not Available | 101 | 2.6 |
| | | |
| Other complications | | |
| | | |
| Cardiogenic shock (after procedure), no. (%) | 19 | 0.5 |
| Arrhythmia(VT/VF/Brady), no. (%) | 18 | 0.5 |
| TIA/Stroke, no. (%) | 3 | 0.1 |
| Tamponade, no. (%) | 4 | 0.1 |
| Contrast reaction, no. (%) | 4 | 0.1 |
| New onset/worsened heart failure, no. (%) | 8 | 0.2 |
| New renal impairment, no. (%) | 8 | 0.2 |
| Max post procedural rise in creatinine, no. (%) | 21 | 0.5 |
| | | |
| Max post procedural rise in creatinine, micromol/L | | |
| N | 21 | |
| Mean (SD) | 401.14 (220.04) | |
| Median(min,max) | 375 (86,880) | |
| | | |
| Vascular complications | | |
| Bleeding, no. (%) | 36 | 0.9 |
| | | |
| Type of bleeding, no. (%) | | |
| Major | 3 | 8.3 |
| Minor | 4 | 11.1 |
| Minimal | 24 | 66.7 |
| Not Available | 5 | 13.9 |
| | | |

| | Total No. of Procedures=3920 | |
|---|---|---|
| | n | % |
| Bleeding site, no. (%) | | |
| Retroperitoneal | 1 | 2.8 |
| Percutaneous entry site | 23 | 63.9 |
| Others | 5 | 13.9 |
| Not Available | 7 | 19.4 |
| | | |
| Access site occlusion, no. (%) | 0 | 0 |
| Loss distal pulse, no. (%) | 0 | 0 |
| Dissection, no. (%) | 10 | 0.3 |
| Pseudoaneurysm, no. (%) | 4 | 0.1 |
| | | |
| Management of Pseudoaneurysm, no. (%) | | |
| Ultrasound compression | 0 | 0 |
| Surgery | 1 | 25 |
| Others | 1 | 25 |
| Not Available | 2 | 50 |

## 5.2 OUTCOME AT DISCHARGE & 30-DAY FOLLOW- UP

**Table 5.2.1a Overall outcome of patients who underwent PCI, NCVD-PCI Registry, 2007**

| OUTCOME* | Overall outcome | | | |
|---|---|---|---|---|
| | Outcome at discharge | | 30-day** | |
| | n | % | n | % |
| Alive | 3637 | 98.9 | 1457 | 41.3 |
| Death | 40 | 1.1 | **64 | 1.8 |
| Follow- Up Not Available | 0 | 0 | 2006 | 56.9 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

Figure 5.2.1a (i) Outcome at discharge of patients who underwent PCI, NCVD-PCI Registry, 2007

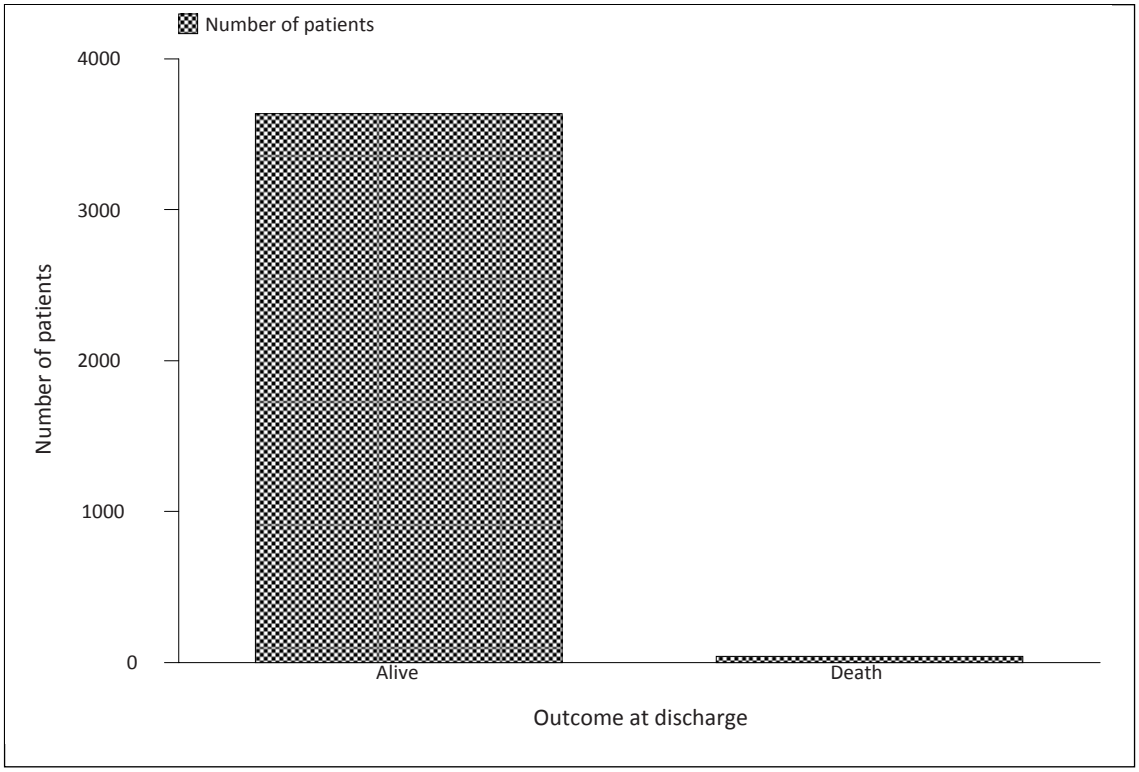


Figure 5.2.1a (ii) 30-day outcome of patients who underwent PCI, NCVD-PCI Registry, 2007

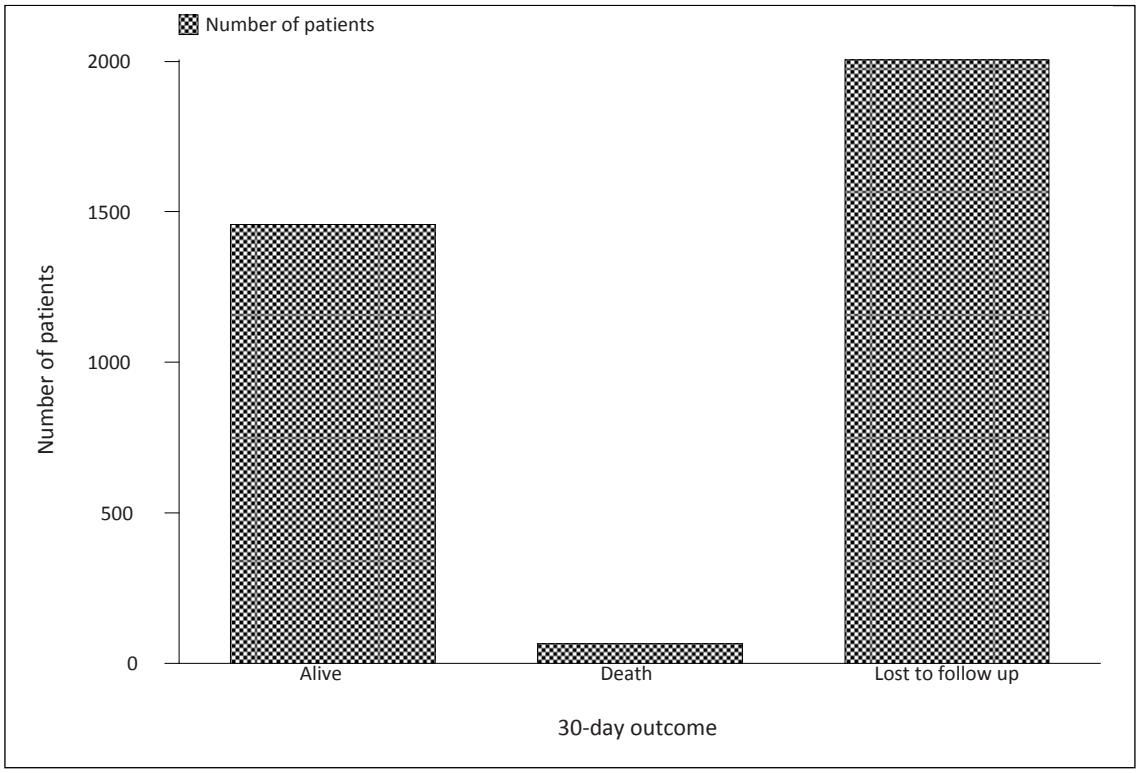



**Table 5.2.1b Overall outcome for patients who underwent PCI, by age group (years), NCVD-PCI Registry, 2007**

| OUTCOME* | Outcome at discharge | | | | | | 30-day** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Young | | Middle-aged | | Elderly | | Young | | Middle-aged | | Elderly | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| Alive | 158 | 99.4 | 2065 | 99.3 | 1414 | 98.3 | 62 | 41.1 | 854 | 43.1 | 541 | 40 |
| Death | 1 | 0.6 | 15 | 0.7 | 24 | 1.7 | 2 | 1.3 | 25 | 1.3 | 37 | 2.7 |
| Follow-Up Not Available | 0 | 0 | 0 | 0 | 0 | 0 | 88 | 58.3 | 1119 | 56.4 | 799 | 59.1 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

*Young is defined as age from 20 to less than 40 years, middle-aged is defined as age between 40 to less than 60 years and elderly is defined as 60 years and above*

Figure 5.2.1b (i) Outcome at discharge of patients who underwent PCI, by age group (years), NCVD-PCI Registry, 2007

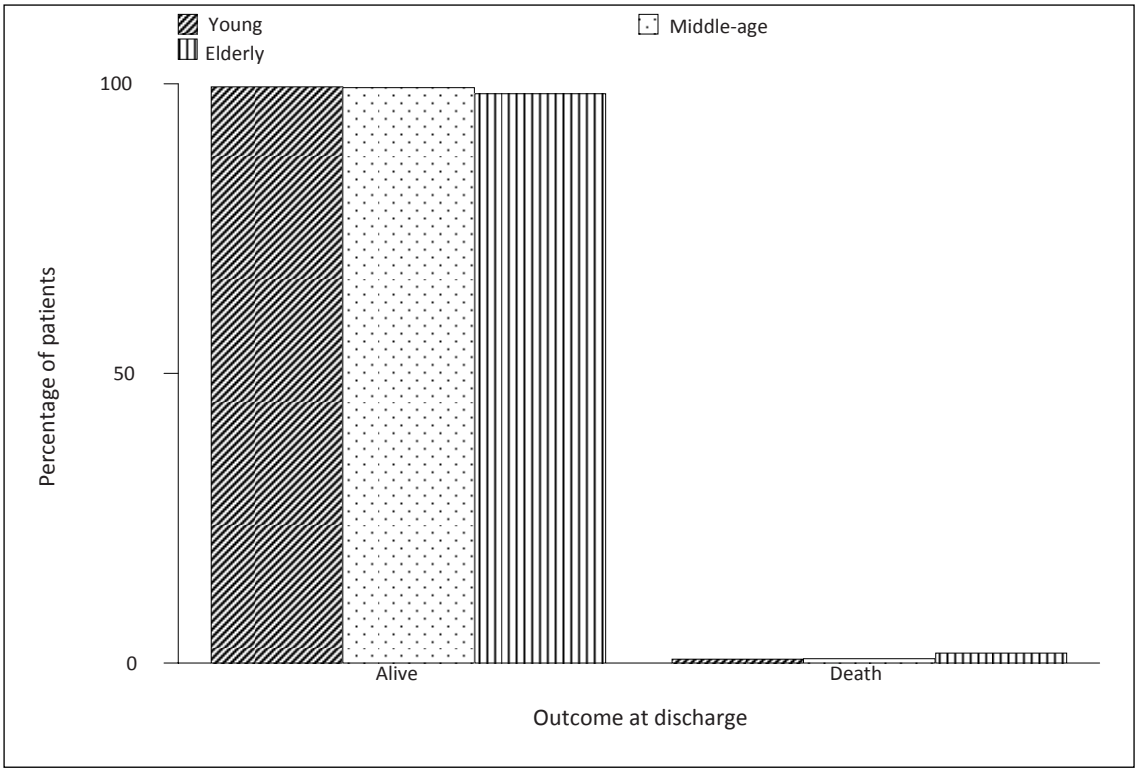



Figure 5.2.1b (ii) 30-day outcome of patients who underwent PCI, by age group (years), NCVD-PCI Registry, 2007

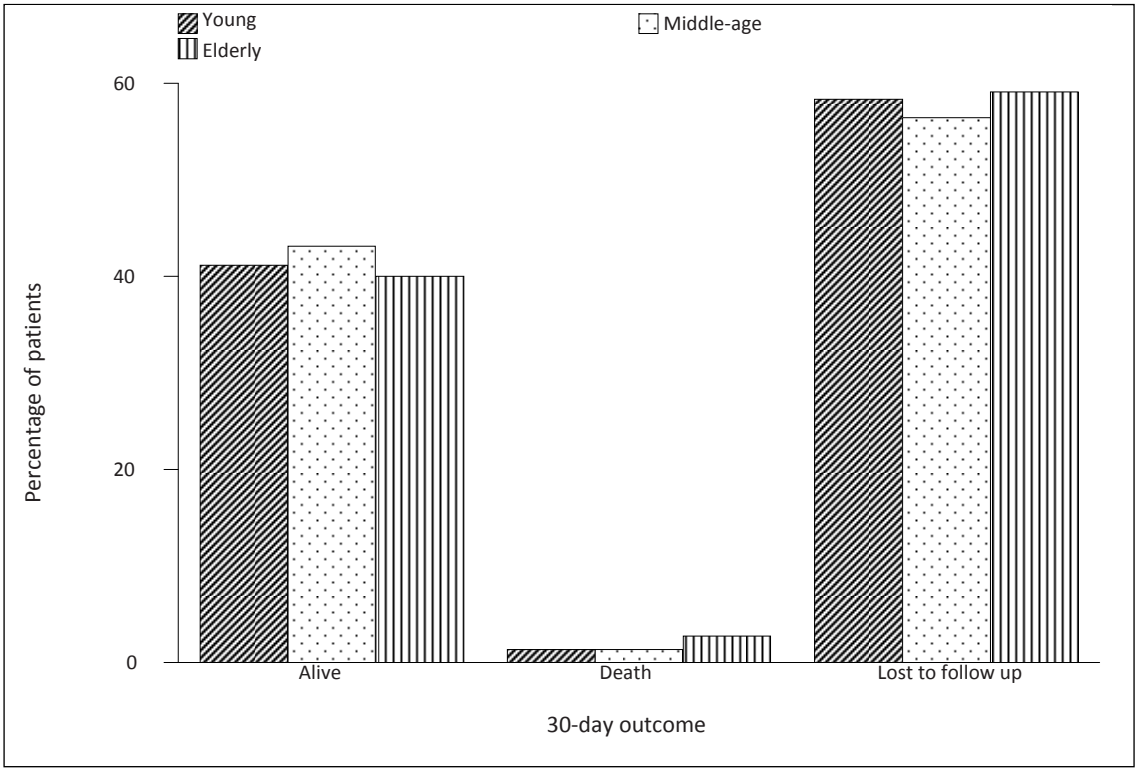


**Table 5.2.1c Overall outcome of patients who underwent PCI, by gender, NCVD-PCI Registry, 2007**

| OUTCOME* | Outcome at discharge | | | | 30-day** | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | n | % | n | % | n | % | n | % |
| Alive | 2957 | 99 | 680 | 98.4 | 1208 | 42.6 | 249 | 38.2 |
| Death | 29 | 1 | 11 | 1.6 | 49 | 1.7 | 15 | 2.3 |
| Follow-Up Not Available | 0 | 0 | 0 | 0 | 1607 | 56.7 | 399 | 61.2 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

Figure 5.2.1c (i) Outcome at discharge of patients who underwent PCI, by gender, NCVD-PCI Registry, 2007

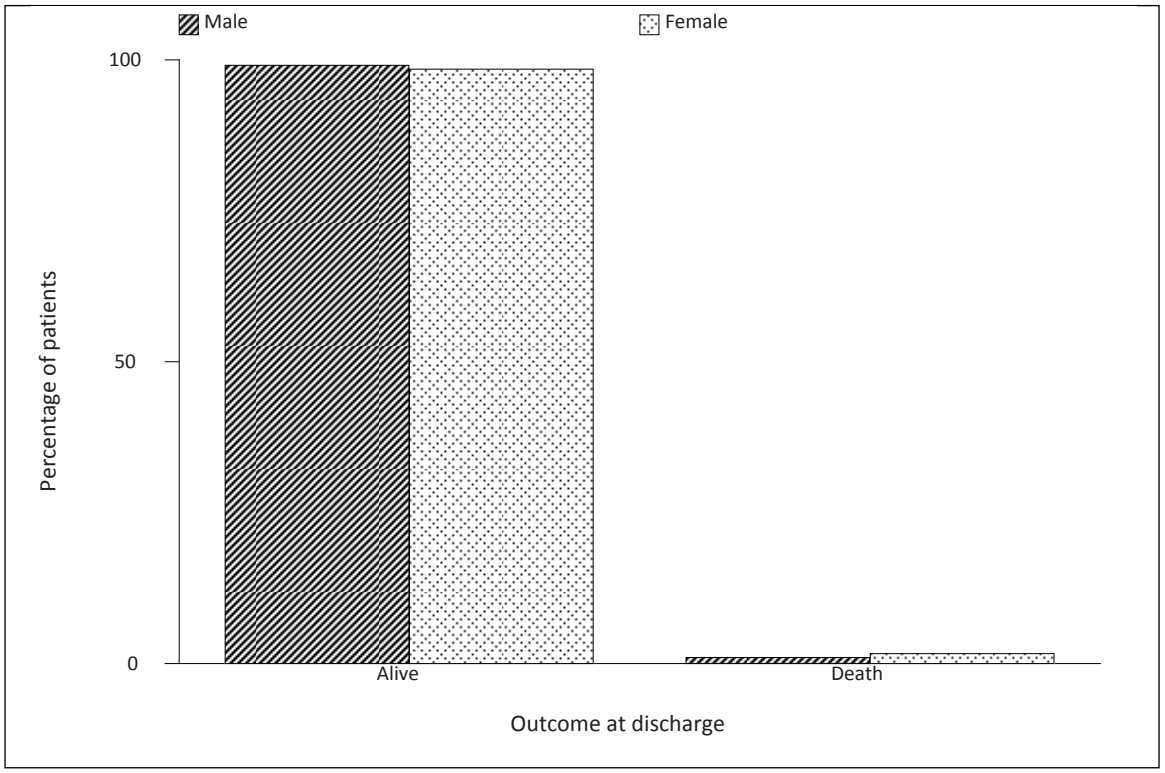


Figure 5.2.1c (ii) 30-day outcome of patients who underwent PCI, by gender, NCVD-PCI Registry, 2007

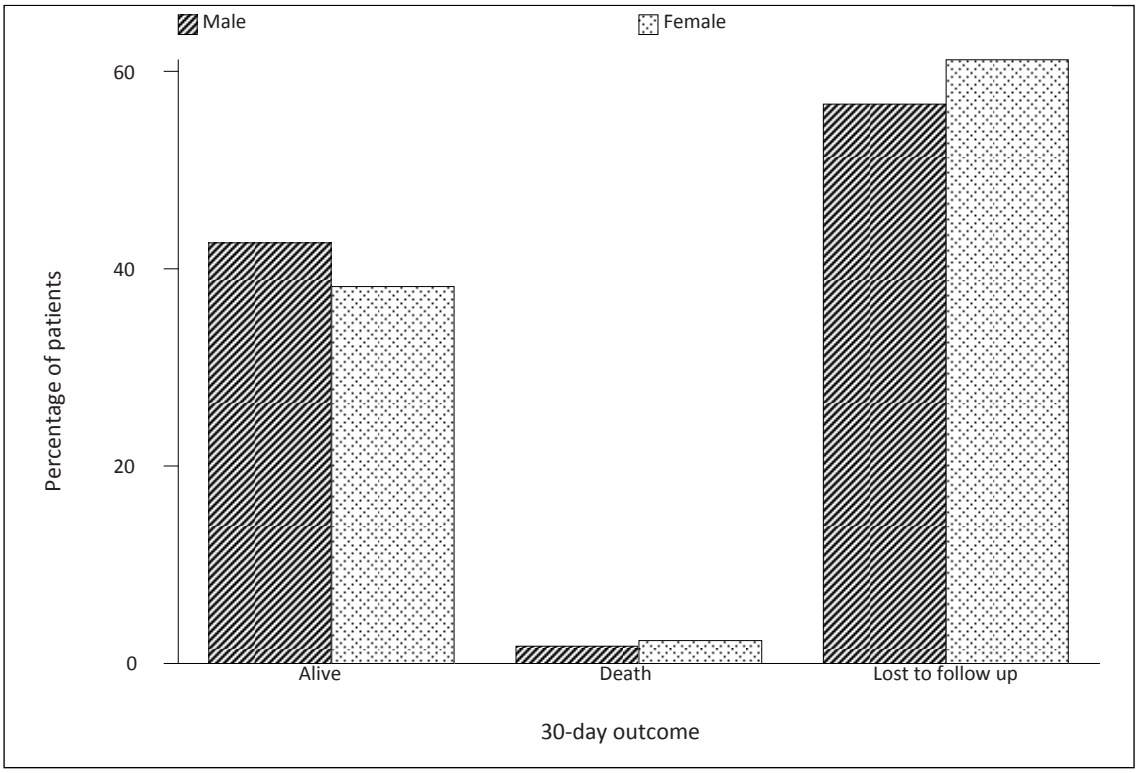



**Table 5.2.1d Overall outcome of patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007**

| OUTCOME* | Outcome at discharge | | | | | | 30-day** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Diabetic | | Non-diabetic | | Not known | | Diabetic | | Non-diabetic | | Not known | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| Alive | 1653 | 98.6 | 1893 | 99.3 | 91 | 95.8 | 598 | 38 | 826 | 45.2 | 33 | 37.9 |
| Death | 23 | 1.4 | 13 | 0.7 | 4 | 4.2 | 36 | 2.3 | 23 | 1.2 | 5 | 5.5 |
| Follow-Up Not Available | 0 | 0 | 0 | 0 | 0 | 0 | 961 | 61.1 | 992 | 54.3 | 53 | 60.9 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

Figure 5.2.1d (i) Outcome at discharge of patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007

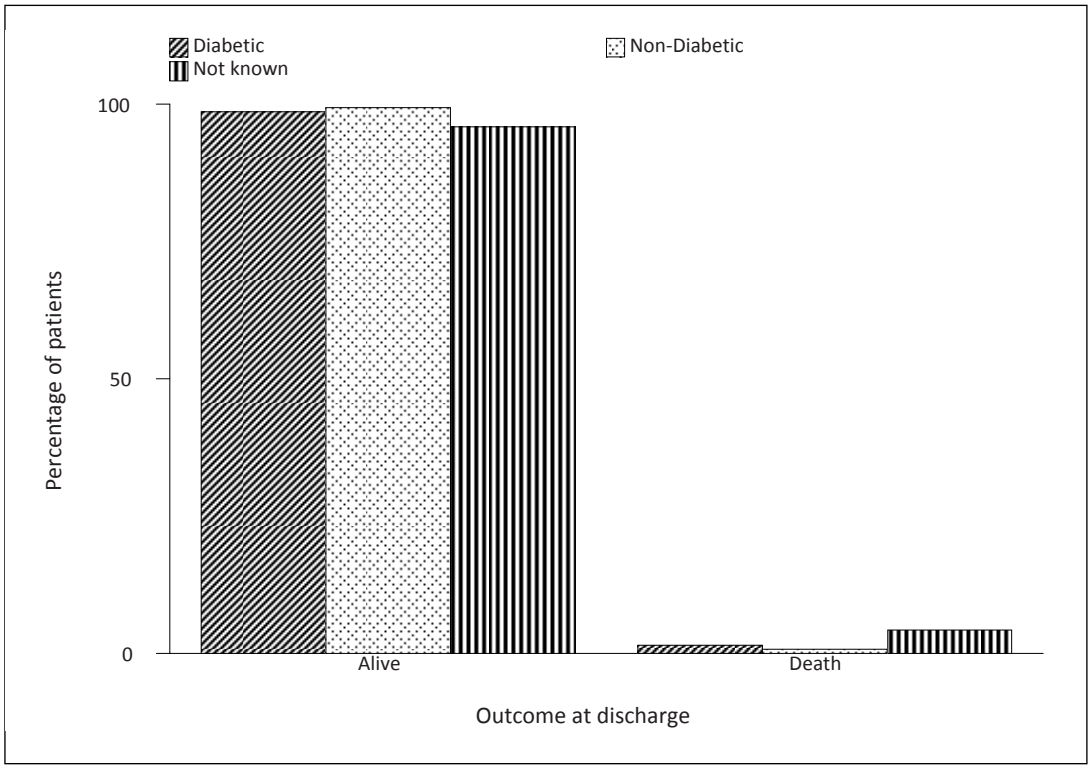


Figure 5.2.1d (ii) 30-day outcome of patients who underwent PCI, by pre-morbid diabetes, NCVD-PCI Registry, 2007

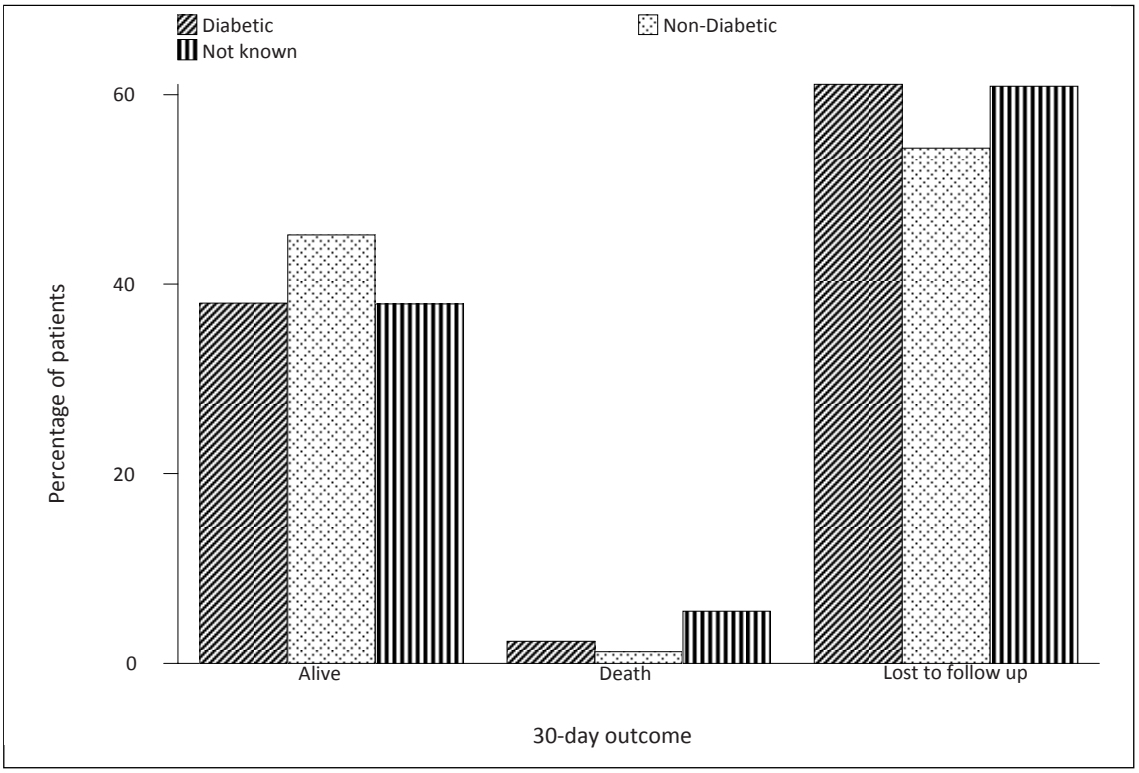



**Table 5.2.1e Overall outcome of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007**

| OUTCOME* | Outcome at discharge | | | | | | 30-day** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hypertensive | | Non-Hypertensive | | Not known | | Hypertensive | | Non-Hypertensive | | Not known | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| Alive | 2698 | 98.8 | 865 | 99.3 | 74 | 97.4 | 1049 | 40.9 | 385 | 45.3 | 23 | 31.9 |
| Death | 32 | 1.2 | 6 | 0.7 | 2 | 2.6 | 53 | 2 | 8 | 0.9 | 3 | 4.1 |
| Follow-Up Not Available | 0 | 0 | 0 | 0 | 0 | 0 | 1495 | 58.3 | 463 | 54.5 | 48 | 66.7 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

Figure 5.2.1e (i) Outcome at discharge of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007

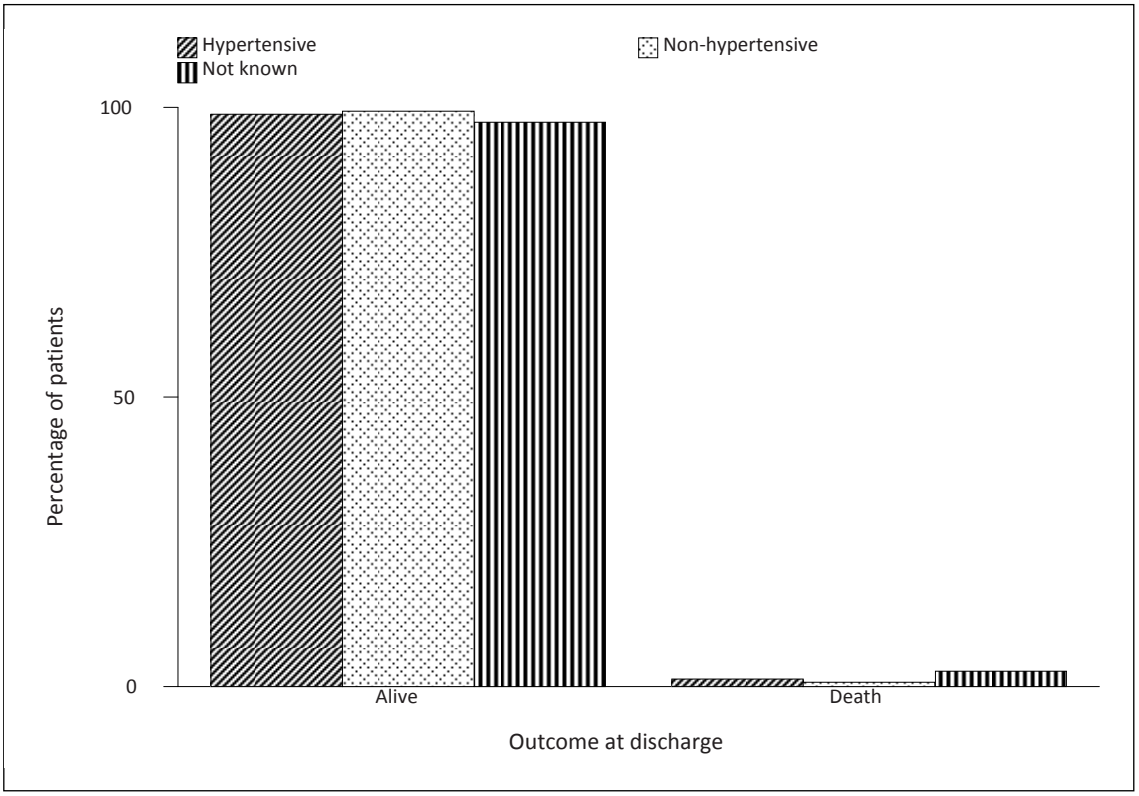


Figure 5.2.1e (ii) 30-day outcome of patients who underwent PCI, by pre-morbid hypertension, NCVD-PCI Registry, 2007

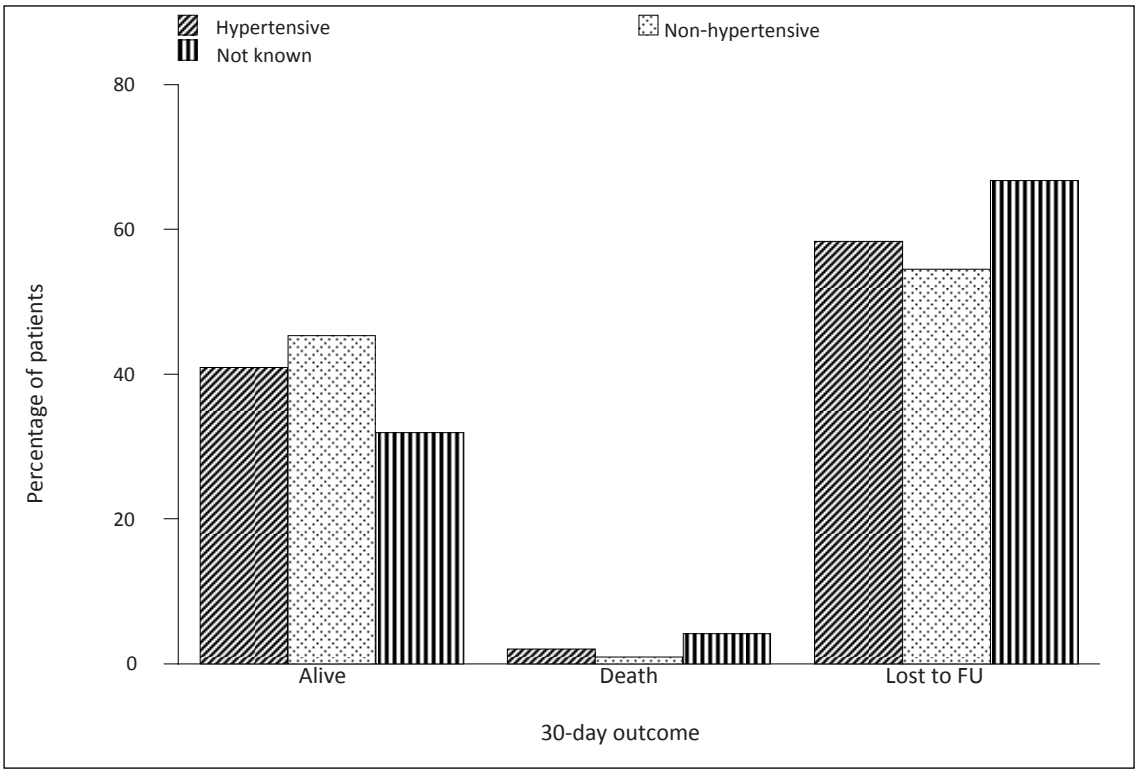



**Table 5.2.1f Overall outcome of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007**

| * OUTCOME | Outcome at discharge | | | | | | 30-day** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dyslipidaemic | | Non-dyslipidaemic | | Not known | | Dyslipidaemic | | Non-dyslipidaemic | | Not known | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| Alive | 2746 | 99.1 | 651 | 98.8 | 240 | 96.8 | 1028 | 39.1 | 322 | 51.3 | 107 | 45.9 |
| Death | 24 | 0.9 | 8 | 1.2 | 8 | 3.2 | 42 | 1.6 | 12 | 1.9 | 10 | 4.1 |
| Follow-Up Not Available | 0 | 0 | 0 | 0 | 0 | 0 | 1580 | 60.2 | 302 | 48.1 | 124 | 53.2 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

Figure 5.2.1f (i) Outcome at discharge of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007

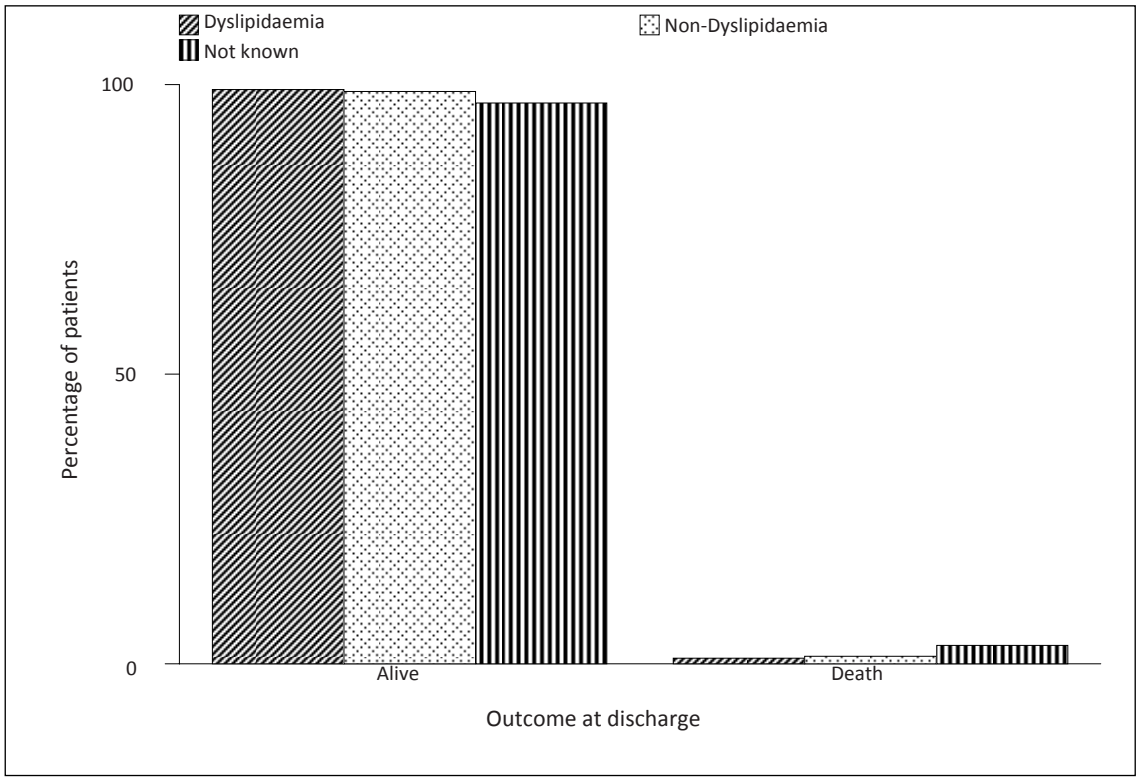


Figure 5.2.1f (ii) 30-day outcome of patients who underwent PCI, by pre-morbid dyslipidaemia, NCVD-PCI Registry, 2007

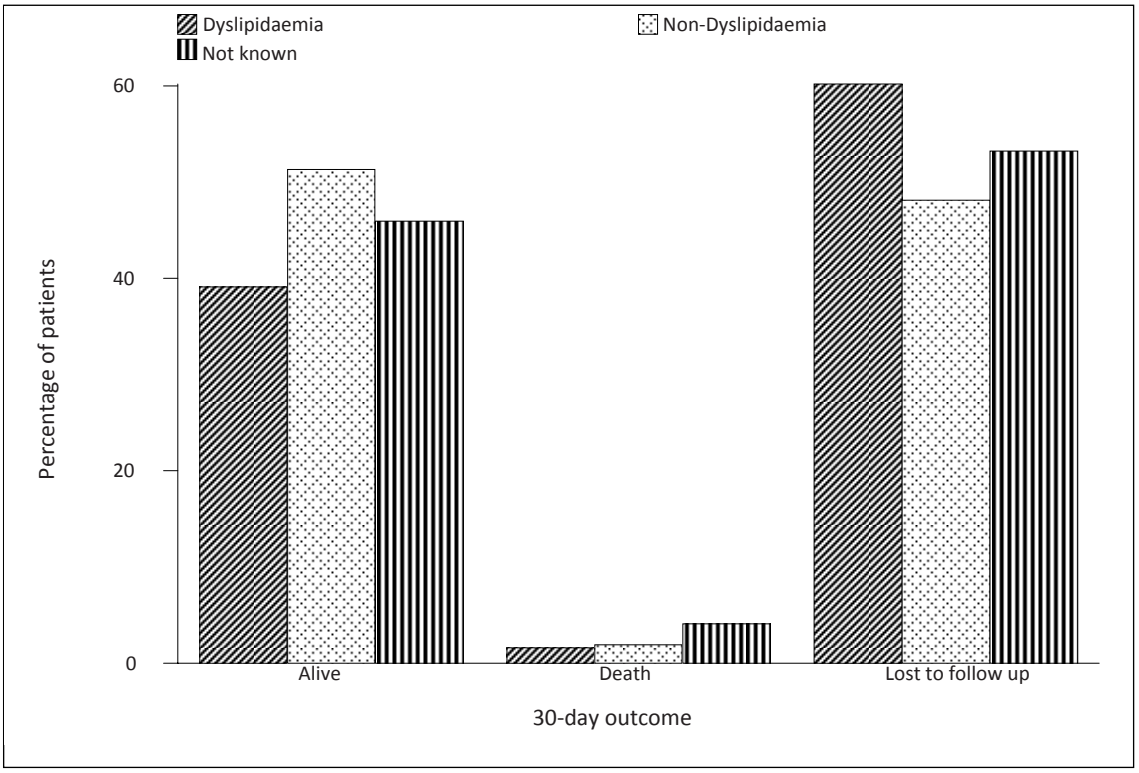



**Table 5.2.2 Medication for patients who underwent PCI, NCVD-PCI Registry, 2007**

| | Outcome at discharge N=3637 | | 30-day** N=1457 | |
|---|---|---|---|---|
| *Medication | N | % | N | % |
| Aspirin | 3362 | 92.4 | 1370 | 94 |
| Clopidogrel | 3434 | 94.4 | 1094 | 75.1 |
| Ticlopidine | 293 | 8.1 | 155 | 10.6 |
| Dual antiplatelet (Aspirin + Clopidogrel/Ticlopidine) | 3290 | 90.5 | 1062 | 72.9 |
| Statin | 3253 | 89.4 | | |
| Beta blocker | 2521 | 69.3 | | |
| Ace inhibitor | 1974 | 54.3 | | |
| ARB | 476 | 13.1 | | |
| Warfarin | 43 | 1.2 | | |
| Others | 2280 | 62.7 | 1154 | 79.2 |
| Not Available | 56 | 1.5 | 18 | 1.2 |

** Available for those who are alive*

**Table 5.2.3 Cause of death of patients who underwent PCI, NCVD-PCI Registry, 2007**

| | Outcome at discharge* | | 30-day** | |
|---|---|---|---|---|
| Medication | N | % | N | % |
| Cardiac | 32 | 80 | 36 | 56.3 |
| Non-cardiac[+] | | | | |
| Renal | 0 | 0 | 0 | 0 |
| Infection | 2 | 5 | 2 | 3.1 |
| Neurological | 1 | 2.5 | 1 | 1.6 |
| Vascular | 1 | 2.5 | 1 | 1.6 |
| Pulmonary | 1 | 2.5 | 1 | 1.6 |
| Others | 0 | 0 | 2 | 3.1 |
| Not Available | 3 | 7.5 | 21 | 32.7 |
| TOTAL | 40 | 100 | 64 | 100 |

**The outcome data has been derived based on data matching with National Death Register data*

*** Including patients who died in hospital*

*[+] Patients may have more than one condition that caused death*

**Table 5.2.4 Location of death of patients who underwent PCI, NCVD-PCI Registry, 2007**

| | In-hospital Mortality | |
|---|---|---|
| Location of death | N | % |
| In Lab | 4 | 10 |
| Out of Lab | 33 | 82.5 |
| Not Available | 3 | 7.5 |

**Table 5.2.5 Outcome at discharge of patients who developed cardiogenic shock post-PCI, NCVD-PCI Registry, 2007 (n=3677)**

| | Cardiogenic Shock Post-Procedure | | | | | |
|---|---|---|---|---|---|---|
| Outcome* | Yes | | No | | Missing | |
| | No | % | No | % | No | % |
| Death | 15 | 78.9 | 22 | 0.6 | 3 | 3.1 |
| Alive | 4 | 21.1 | 3540 | 99.4 | 93 | 96.9 |

**The outcome data has been derived based on data matching with National Death Register data*

**Table 5.2.6 Outcome at discharge, by post PCI TIMI flow, NCVD-PCI Registry, 2007 (n=3677)**

| | Post PCI TIMI flow | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0, 1 | | 2 | | 3 | | Not Available | |
| Outcome* | No | % | No | % | No | % | No | % |
| Death | 9 | 7.1 | 5 | 8.6 | 23 | 0.7 | 2 | 1.5 |
| Alive | 118 | 92.9 | 53 | 91.4 | 3334 | 99.3 | 133 | 98.5 |

**The outcome data has been derived based on data matching with National Death Register data*

**Table 5.2.7 Outcome at discharge, by contrast volume used, NCVD-PCI Registry, 2007 (n=3677)**

| Contrast volume | Death* | Alive* |
|---|---|---|
| N | 32 | 2986 |
| Mean (SD) | 190.31 (89.25) | 178.96 (70.73) |
| Median (Min, max) | 180 (25,380) | 160 (25,500) |
| Not Available | 8 | 651 |

**The outcome data has been derived based on data matching with National Death Register data*

**Table 5.2.8 Summary of 30-day readmission status of patients who underwent PCI, NCVD-PCI Registry, 2007 (N = total no. of procedures for 30-day follow- up, 3731)**

| **Readmission** | **N** | **%** |
|---|---|---|
| Yes | 114 | 3.1 |
| No | 1481 | 39.7 |
| Not Available | 2136 | 57.3 |
| | | |
| Readmission reason, no.% | | |
| CHF | 2 | 1.8 |
| AMI | 1 | 0.9 |
| Recurrent angina | 18 | 15.8 |
| Arrhythmia | 0 | 0 |
| PCI-planned | 58 | 50.9 |
| PCI-unplanned | 2 | 1.8 |
| CABG | 2 | 1.8 |
| Others | 17 | 14.9 |
| Not Available | 14 | 12.3 |

**Table 5.2.9 Procedural complications and clinical outcomes, according to PCI status, NCVD-PCI Registry, 2007**

| Variable | Elective | | Urgent | | Emergency/ Rescue | | Primary | | Missing | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Death | 15 | 37.5 | 8 | 20.0 | 8 | 20.0 | 8 | 20.0 | 1 | 2.5 | 10 | 100 |
| Periprocedural MI | 15 | 88.2 | 1 | 5.9 | 0 | 0 | 1 | 5.9 | 0 | 0 | 17 | 100 |
| Non fatal MI (AMI) | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100 |
| Further PCI- (planned PCI) | 22 | 91.7 | 2 | 8.3 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 100 |
| Recurrent angina (CCS>1) | 14 | 82.4 | 1 | 5.9 | 0 | 0 | 2 | 11.8 | 0 | 0 | 17 | 100 |
| Repeat PCI - (Unplanned) | 2 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 100 |
| | | | | | | | | | | | | |
| Procedural complications | | | | | | | | | | | | |
| Stent thrombosis | 7 | 87.5 | 0 | 0 | 1 | 12.5 | 0 | 0 | 0 | 0 | 8 | 100 |
| Dissection | 3 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 100 |
| Perforation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bail out CABG | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100 |
| Cardiogenic shock | 7 | 36.8 | 3 | 15.8 | 3 | 15.8 | 6 | 31.6 | 0 | 0 | 19 | 100 |
| Arrhythmia | 10 | 55.6 | 4 | 22.2 | 1 | 5.6 | 2 | 11.1 | 1 | 5.6 | 18 | 100 |
| TIA/stroke | 1 | 33.3 | 2 | 66.7 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 100 |
| Tamponade | 3 | 75.0 | 0 | 0 | 1 | 25.0 | 0 | 0 | 0 | 0 | 4 | 100 |
| Contrast reaction | 2 | 50.0 | 0 | 0 | 0 | 0 | 2 | 50.0 | 0 | 0 | 4 | 100 |
| New/worsened Heart Failure | 4 | 50.0 | 1 | 12.5 | 0 | 0 | 3 | 37.5 | 0 | 0 | 8 | 100 |
| New renal impairment | 3 | 42.7 | 0 | 0 | 1 | 14.3 | 3 | 42.9 | 0 | 0 | 7 | 100 |
| Bleeding | 21 | 63.6 | 7 | 21.2 | 1 | 3.0 | 4 | 12.1 | 0 | 0 | 33 | 100 |
| Access site occlusion | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loss distal pulse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dissection | 7 | 70 | 0 | 0 | 2 | 20 | 1 | 10 | 0 | 0 | 10 | 100 |
| Pseudoaneurysm | 4 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 100 |

**Table 5.2.10 Prognostic factors for in-hospital mortality among patients who underwent PCI, NCVD-PCI Registry, 2007**

| Factor | N | Hazard ratio | 95% CI | *P value |
|---|---|---|---|---|
| Age group | | | | |
| 20 - <60 (ref) | 2239 | 1.00 | | |
| >= 60 | 1438 | 3.30 | 0.84, 12.93 | 0.087 |
| Gender | | | | |
| Male (ref) | 2986 | 1.00 | | |
| Female | 691 | 1.23 | 0.33, 4.60 | 0.755 |
| PCI status | | | | |
| Elective (ref) | 3322 | 1.00 | | |
| Urgent | 178 | 0.68 | 0.06, 7.81 | 0.755 |
| Rescue | 69 | 3.08 | 0.61, 15.61 | 0.175 |
| Primary | 94 | 1.39 | 0.19, 9.93 | 0.742 |
| Diabetes mellitus | | | | |
| No (ref) | 1906 | 1.00 | | |
| Yes | 1676 | 5.61 | 1.01, 31.17 | 0.049 |
| Myocardial infarction history | | | | |
| No (ref) | 2167 | 1.00 | | |
| Yes | 1280 | 0.39 | 0.10, 1.55 | 0.183 |
| Hypertension | | | | |
| No (ref) | 871 | 1.00 | | |
| Yes | 2730 | 3.02 | 0.34, 27.01 | 0.323 |
| Killip class | | | | |
| I (ref) | 785 | 1.00 | | |
| II | 190 | 2.61 | 0.40, 17.11 | 0.316 |
| III | 29 | 13.72 | 1.76, 107, 11 | 0.012 |
| IV | 32 | 31.35 | 4.51, 217.76 | > 0.005 |

** using Cox regression with forward variable selection*

# APPENDIX A: DATA MANAGEMENT

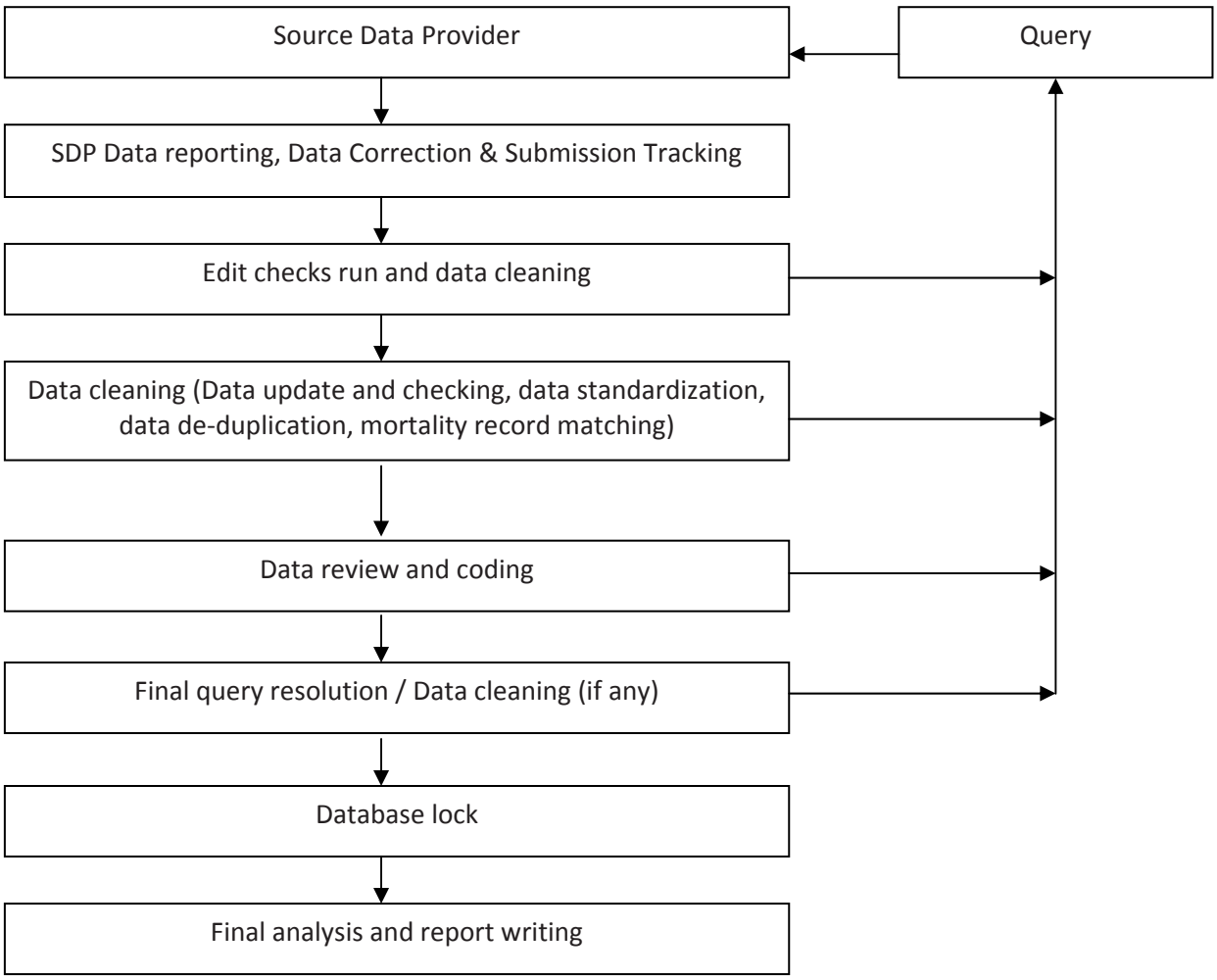
The National Cardiovascular Disease Database (NCVD) Registry maintains two different databases for cardiovascular diseases, i.e. for Acute Coronary Syndrome and Percutaneous Coronary Intervention. Data is stored in SQL Server due to the high volume of data accumulated throughout the years.

**Data sources**

Source Data Providers (SDPs) of NCVD-PCI registry comprises of hospitals with interventional cardiologists 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 Registry.



*SDP Data reporting, Data Correction and Submission tracking*

Data reporting by SDP is done via Web Applications e-Case Report Forms.

There are a number of data security features that are designed into the NCVD web application (eCRF) such as web owner authentication, 2-level user authentication (user name and password authentication and a Short Messaging System (SMS) of authorisation code of 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 NCVD-PCI Notification form on an ad-hoc basis whenever a procedure is performed. SDP also submits follow-up data at 30 days, 6 months and 12 months post notification date intervals. An alert page containing all the overdue submissions for follow-up at 30-days, 6-months and 12-months post notification date is available to users to ease them for 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 patient be 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. ACS and PCI 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 manner. 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 standardization, 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 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 anti-static 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 are also provided such as usage and performance report, operating system maintenance and monitoring, bandwidth monitoring and systems health monitoring.

# APPENDIX B: STATISTICAL METHODS

The statistical methods described were used to summarise the data collected from the National Cardiovascular Database (NCVD). In this report, two sources of data have been used for analyses. They were the centre survey data and the NCVD-PCI registry data.

**Provision of acute coronary care services in Malaysia**
Chapter 1 of this report is reserved for the next publication.

The analyses for the rest of this report were generated based on the NCVD- PCI registry data, using the following analysis set:

The data without missing information on status of percutaneous coronary intervention, details of procedures and those of ages above 18 years old that which had been collected until 31st December 2007 by NCVD-PCI were analysed. The data were stratified to reflect differences in

- Demography: race, gender, age
- Medical factors: pre-morbid or past medical history
- Therapy: lesion characteristics and type of stent used

**Methods for handling missing data and outliers**

The outliers were set to missing (see table below)

| Fields | Acceptable range |
|---|---|
| Age | >18 years old |
| Height | 130 cm – 250 cm |
| Weight | 40 kg – 200 kg |
| Heart rate | 25 – 200 beats/min |
| Systolic BP | 60 – 230 mmHg |
| Diastolic BP | 10 – 120 mmHg |
| Creatinine | 60.0 micromol/L (min) |
| TC | 2.5 mmol/L – 25.0 mmol/L |
| LDL | 1.0 mmol/L – 20.0 mmol/L |
| EF status | 15% – 80% |
| Fluoroscopy time | 2 mins – 180 mins |
| Contrast volume | 15 ml – 500 ml |
| Pre-stenosis % | 10% - 100% |
| Post-stenosis % | 0% - 100% |
| Estimated lesion length | 1-120 mm |
| a. Stent length | 8 – 50 mm |
| b. Diameter | 2.00 – 7.00 mm |
| Max balloon size used | 1 - 6 mm |
| Max stent/balloon deploy pressure | 1 - 30 atm |

**Patient Characteristics**

The information on patient characteristics was summarised in chapter 2 of this report. The tables included patients' age, gender, ethnic group, admission status, coronary risk factors, anthropometric measurements, co-morbidity, previous interventions and also the distribution of patients, by source data providers (SDPs). For summarising continuous data, the mean, standard deviation, median, minimum and maximum were reported. On the other hand, both the frequency count and percentage were reported for discrete data. Invariably, there were situations where there was missing data. Analysis was confined to available data and no imputation was done.

**Clinical Presentations & Investigations**

Chapter 3 of the report basically was to summarize the patient clinical examination, cardiac status at PCI procedure, ACS, STEMI: time-to-treatment analysis, comparison of time to STEMI treatment according to patients with transfer or without transfer, comparison of heart rate according to PCI settings, comparison of heart rate according to ACS subtypes and duration of symptom at presentation according to ACS. For continuous data, the mean, standard deviation, median, minimum and maximum were reported. On the other hand, frequency count and percentage were reported for discrete data.

**Procedural Details**

The procedural settings and treatments that were provided to the patients were mainly summarized in chapter 4. PCI procedural details of lesion characteristics were also reported.

**Clinical Outcomes**

Chapter 5 summarized the overall in-hospital as well as 30-day outcomes for patients with PCI. Cross tabulations of outcomes by gender, age group, and pre-morbid conditions such as diabetes, hypertension, dyslipidaemia were included in this chapter. Tabulation of the overall in-hospital as well as 30-day medications by outcomes were presented for patients who underwent PCI. Other tabulations present data such as location of death, by the overall in-hospital as well as 30-day outcomes for patients with PCI, outcome by cardiogenic shock (post-procedure), procedural complications and clinical outcomes according to PCI status. Tabulation of discharge outcome by post-PCI TIMI flow and contrast volume used were presented. 30 days readmission and also reason for readmission were tabulated. Prognostic factors for in-hospital death as well as death within 30 days were summarised among patients who underwent PCI. No imputation was done for this chapter.

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## APPENDIX D: CATHETERISATION LABORATORY SERVICES SURVEY PARTICIPATION

We extend our appreciation to the following centres that have contributed in the interventional catheterisation laboratory services survey for year 2007 and 2008, conducted from June 2009 to July 2009:

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We would also like to extend our appreciation to the manufacturers or distributors of the stents which have contributed to this survey

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A heart-felt appreciation is extended to everyone who has contributed to the successful publication of this inaugural report.

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**Pulau Pinang Hospital**

Dr Muhammad Ali Sheikh Abdul Kader
S/N Yeap Say Choo
S/N Rosni Bahama
S/N Hani Yusrina Abdullah
S/N Mas Ayu Romeli
Nor Izzat Che Harun
Salawati Saedin
Tan Nan Yen

**Institut Jantung Negara**

Dato' Seri Dr Robaayah Zambahari
Dato' Dr Rosli Mohd Ali
Dr Razali Omar
Dato' Dr David Chew Soon Ping
Dato' Dr Hj Azhari Rosman
Datuk Dr Mohd Nasir Muda
Dr Aizai Azan Abd Rahim
Dato' Dr Amin Ariff Nuruddin
Dr Lam Kai Huat
Dr Azlan Hussin
Dr Shaiful Azmi Yahaya
Dr Ahmad Khairuddin
Dato' Dr K Balachandran
Dr Emily Tan Lay Koon
Dr Surinder Kaur
Dr Chong Yoon Sin
Dr Mohd Rahal Yusoff
Dr Ismail Yaakob
Dr Tan Huat Chai
Dr Sanjiv Joshi
Dr Ng Kok Huan
Dr Tiang Soon Wee
Dr Hasral Noor Hasni
Dr Foong Yi Kwan
Dr Kevin Joseph
Dr Lim Eu Jin
Dr Chiew Kean Shyong
Dr Do Van Buu Dan
Dr Nadeem Ahmad
Dr Hazlyna Kamaruddin
Dr Sanjaya William
Dr Al Fazir Omar
Dr Suhaimi Osman
Dr Khine Shein
Dr Mahmood Sabruddin Zulkifli
Dr Mahmood Ul Hassan
Dr Azmee Mohd Ghazi
Dr Syahidah Syed Tamin
Dr Khurshid Ahmed
Hasmawati Abu Bakar
Nurzaliza Radzali
Nur Fazila Sulaiman
Jacqueline Lucy De Costa
Nor'aini Kaimi

**Sultanah Aminah Hospital**

Dr Lee Chuey Yan
Dr Neoh Eu Rick
Dr Edward Mah
Dr Ling Kah Hing
Dr Ngoyu Chin Huat
Dr Lim She Kin
Matron Rokayah Ismail
S/N Sharifah Ibrahim
Dr Lu Hou Tee
S/N Sharipah Hamid
S/N Zaiton Ghazali

**Sultanah Aminah Hospital**

Dr Saravanan Krishnan
Dr Tan Vern Hsen
Dr Benjamin Leo
Dr Liew Chee Koon
S/N Fauziah Mohd Tahir
Thevamalar Kannadason

**Sarawak General Hospital**

Prof Dr Sim Kui Hian
Dr Ang Choon Kiat
Dr Alan Fong Yean Yip
Dr Chan Wei Ling
Dr Ong Tiong Kiam
Dr Liew Chee Khoon
Dr Annuar Rapaee
Dr Liew Houng Bang
Sr Margaret Puyang
S/N Liew Nyen Fong
S/N Zalina Mat
S/N Tan Lee Choo
S/N Danny Day AK Dudu
S/N Sandy Possey AK Ajin
S/N Cynthia Nobert Meriter
Sithy Harjieah Ibrahim
Sr Tan Hoon Yian
Dr Doreen Chan
Dr Hasnur Syareena
Dr Norafini Salamon
Dr Adeline Chia
Dr Nor Hanim Mohd Amin
Dato' Dr Yew Kuan Leong

**Hospital Serdang**

Dr Abd Kahar Abd Ghapar
Dr Ernest Ng Wee Oon
Dr Ravinderjit Singh
Dr Md Zamri A. Rahman
Dr A Sri Ranga
Dr Lim Kim Meng
Dr Ida Nazia
Dr Siti Dalila
Dr Nabilah Sulaiman
Yap Yee Guan
Dr Wong Teck Wee
Dr Firdaus Abd Rahim
Dr Ahmad Fazli Abdul Aziz
S/N Bungan Antok
S/N Norzee Hussin
S/N Azrina Nasir
S/N Suhaila Abu Bakir
S/N Juliana AK Nyadong
S/N Norziliana Nordin

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Dr Oteh Maskon
Dr Azarisman Shah Mohd Shah
Salwani Fadzilah Ismail
Dr Harris Ngow Abdullah
Dr Ika Faizura
Dr Masliza Mahmod
Dr Ting Chih Kuan

**Universiti Sains Malaysia Hospital**

Assoc Prof Dr Zurkurnai Yusoff

**Mahkota Medical Centre**

Assoc Prof Dr Chin Sze Piaw

**KPJ Selangor Specialist Hospital**

Dr Choo Gim Hooi

Dr Noorfaizan Saaidin

**Sunway Medical Centre**

Dr Hendrick MY Chia

**Sime Darby Medical Centre**

Dr Kannan Pasamanickam

**KPJ Damansara Specialist Hospital**

Dr Tamil Selvan Muthusamy

## APPENDIX F: 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:<br>- Unstable Angina Pectoris (UAP)<br>- NSTEMI<br>- STEMI |
| Baseline creatinine | The amount of serum creatinine in the blood at admission. Records the absolute result of the most recent serum creatinine measurement, in micromol/L to two decimal points |
| Blood pressure (Diastolic) at start of PCI | The person's measured diastolic blood pressure in mmHg (at start of PCI) |
| Blood pressure (Systolic) at start of PCI | The person's measured systolic blood pressure in mmHg (at start of PCI) |
| Canadian Cardiovascular Score (CCS) | Indicates the Canadian Cardiovascular Angina Classification Score (CCS) of a patient which is categorised as:<br>Class 0; Asymptomatic<br>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<br>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<br>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<br>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:<br>a. hypotension ( a systolic BP of <90mmHg for at least 30 minutes or the need for supportive measures to maintain a systolic BP of > 90mmHg)<br>b. end-organ hypoperfusion (cool extremities or a urine output of less than 30ml/h, and a heart rate >60 beats per minute)<br>c. the haemodynamic criteria are a cardiac index of no more thann 2.2l/min per square meter of body-surface area and a pulmonary-capillary wedge pressure of at least 15mmHg |
| Cath/PCI same lab visit | Indicates if the patient had a PCI at the same time as the diagnostic coronary angiogram. Elective patients may have the diagnostic and therapeutic procedures separately. Emergency or acute patients often have their diagnostic and therapeutic procedures concurrently (Ad-hoc) |
| Cerebrovascular disease | Indicates if the patient has a history of stroke and/or transient ischaemic attack (TIA) or documented evidence of cerebrovascular disease (CT scan, MRI), prior to this admission to the hospital |
| Chronic lung disease | Indicates if the patient has a history of chronic lung disease including chronic obstructive pulmonary disease (COPD), chronic pulmonary fibrosis, cycstic fibrosis or bronchiectasis, or receiving treatments for these conditions, prior to this admission to the hospital. Previous acute pneumonia and ventilation for acute respiratory distress are excluded |
| 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 |
| Congestive heart failure (more than 2 weeks prior) | Indicates if the patient has a history of heart failure or documented evidence (echocardiography, MRI, nuclear imaging, ventriculography) of left ventricular systolic dysfunction prior to this admission to the hospital |
| Congestive heart failure (recent 2 weeks) | Indicates whether, within 2 weeks prior to this procedure, a physician has diagnosed that the patient is currently in congestive heart failure (CHF), the diagnosis of CHF was made before this admission,<br>OR CHF can be diagnosed based on careful history and physical examination, or by one of the following criteria:<br>a. Paroxysmal nocturnal dyspnoea (PND) and/or fatigue<br>b. Dyspnoea on exertion (DOE) due to heart failure<br>c. chest x-ray (CXR) showing pulmonary congestion<br>d. Pedal oedema or dyspnoea treated with medical therapy for heart failure |

| | |
|---|---|
| Current smoker | Patient who regularly smokes a tobacco product / products one or more times per day or has smoked within the 30 days prior to this admission |
| Diabetes | Indicates if the patient has a history of diabetes mellitus diagnosed prior to this admission to the hospital or currently receiving treatment for diabetes |
| Dissection | Indicates whether a dissection occurred at the site of percutaneous entry during the procedure or after the laboratory visit, but before any subsequent laboratory 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 percutaenous angioplasty (PCI) or coronary artery bypass graft (CABG) prior to this admission to the hospital |
| Dyslipidaemia | Indicates if the patient has a history of dyslipidaemia diagnosed prior to this admission to the hospital or currently receiving treatment for dyslipidaemia |
| Elective PCI | Indicates whether the patient's cardiac function has been stable in the days or weeks prior to the procedure. The procedure could be deferred without increased risk of compromised cardiac outcome |
| Family History of Premature Cardiovascular Disease | Indicates if the patient has a 1st degree family member (parents or siblings) who suffered a myocardial infarction and/or stroke before the age of 55 years |
| Former smoker | Patient who has stopped smoking tobacco products more than 30 days before this admission |
| Functional ischaemia | Indicates if the patient has functional ischaemia. Where a non-invasive test such as exercise or pharmacologic stress test, radionuclide, echo, CT scan was done to rule out ischaemia. The test could be performed during this admission (prior to the PCI), or it could be a test that resulted in the admission |
| Heart rate (at start of PCI) | Indicates the patient's heart rate in beats/minute at start of PCI |
| Height (in cm) | Measurement of the patient's height in cm. Indicates if the height was taken. Measurements may be taken at any time prior to discharge. However measurements taken after prolonged hospitalisation (>2 weeks) or following surgery or after prolonged intensive unit stay, may not be accurate |
| Hypertension | Indicates if the patient has a history of hypertension diagnosed prior to this admission to the hospital or is currently receiving treatment for hypertension, or if the blood pressure is more than 140mmHg systolic or more than 90mmHg diastolic on at least 2 occasions |

| | |
|---|---|
| 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<br>**Class I** includes individuals with no clinical signs of heart failure<br>**Class II** includes individuals with rales in the lungs, an S3 gallop, and elevated jugular venous pressure<br>**Class III** describes individuals with frank pulmonary oedema<br>**Class IV** describes individuals in cardiogenic shock |
| Loss of distal pulse | Indicates whether a loss of the pulse distal to the arterial access site occurred (peripheralembolization). Peripheral embolization is defined as a loss of distal pulse, pain and/or discolouration (especially the toes). This can include cholesterol emboli. |
| Low Density Lipids (LDL) Levels | Most recent LDL-C level recorded in mmol/L |
| Myocardial infarction history | Indicates if the patient has a myocardial infarction history prior to this admission to the hospital |
| New onset angina (Less than 2 weeks) | Indicates if the patient has new angina symptoms within the past 2 weeks prior to this admission to the hospital |
| New York Heart Association | Indicates the patient's NYHA classification as follows:<br>I. Patient has cardiac disease but without resulting limitations of ordinary physical activity; Ordinary physical activity (eg.., walking several blocks or climbing stairs) does not cause undue fatigue or dyspnoea. Limiting symptoms may occur with marked exertion<br>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 2 blocks or climbing more than one flight of stairs results in limiting symptoms (e.g., fatigue or dyspnoea)<br>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<br>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 |

| | |
|---|---|
| Percutaneous entry | Indicates the percutaneous entry location used to provide vascular access for the procedure |
| Peripheral vascular disease | Indicates if the patient has a history and/or documented evidence and/or has undergone treatment for peripheral vascular disease (including aortic aneurysm; peripheral artery disease, intermittent claudication and/or previous peripheral artery stenting or bypass; renal artery stenosis and/or previous renal artery stenting) |
| Previous CABG | Previous Coronary Artery Bypass surgery by any approach prior to the current PCI procedure |
| Previous PCI | Indicates if patient has had a prior Percutaneous Transluminal Coronary Angioplasty, Coronary Atherectomy, and/or Coronary Stent done at any time prior to this PCI procedure (which may include those done during the current admission) |
| 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 |
| Staged PCI | For an elective PCI only. Indicates if this PCI is being performed as part of a multi-vessel revascularization strategy |
| Time of first balloon inflation / stent / aspiration | Indicates the date and time of the intra-coronary treatment device deployment. If the exact time of first treatment device deployment is not known, the time of the start of the procedure can be taken as an indication |
| Urgent PCI | Indicates when all of the following conditions are met:<br>- Not elective status<br>- Not rescue status<br>- Procedure required during same hospitalization in order to minimize chance of further clinical deterioration<br>- Worsening, sudden chest pain, CHF, acute myocardial infarction (AMI), IABP, unstable angina |
| Weight (in kg) | Measurement of the patient's weight in kg. Indicates the weight taken to two decimal points. Measurements may be taken at any time prior to discharge. However measurements taken after prolonged hospitalisation (>2 weeks) or following surgery or after prolonged intensive unit stay may not be accurate |

# APPENDIX G: CASE REPORT FORM

# NATIONAL CARDIOVASCULAR DISEASE DATABASE- PCI REGISTRY NOTIFICATION FORM

For NCVD Use only:
ID: / 
Centre:

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

**A. Centre Code:** **Or Reporting centre name:** **B. Date of Admission :** (dd/mm/yy)

## SECTION 1 : DEMOGRAPHICS

**1. Patient Name :**

**2. Local RN No:** *(if applicable)*

**3. Identification Card Number :**
*MyKad / MyKid:* - -  *Old IC:*
*Other ID document No:* → *Specify type (eg.passport, armed force ID):*

**4. Gender:** ◉ Male ◉ Female

**5. Nationality:** ◉ Malaysian ◉ Non Malaysian

**6a. Date of Birth:** (dd/mm/yy)

**6b. Age on admission:** Auto Calculated

**7. Ethnic Group:**
◉ Malay ◉ Sikh ◉ Melanau ◉ Bidayuh ◉ Foreigner, specify country of origin: .....
◉ Chinese ◉ Orang Asli ◉ Murut ◉ Iban
◉ Indian ◉ Kadazan Dusun ◉ Bajau ◉ Other M'sian, specify : .....

**8. Contact Number** *(1):* *(2):*

**9. Admission Status:**
◉ Referral ◉ Emergency Department ◉ Out of hospital cardiac arrest
◉ Elective ◉ Transfer from other facility ◉ Other, specify : .....

## SECTION 2 : STATUS BEFORE EVENT

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

**2. Premorbid or past medical history :**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a) Dyslipidaemia | ◉ Yes | ◉ No | ◉ Not known | f) Documented CAD | ◉ Yes | ◉ No | ◉ Not known |
| b) Hypertension | ◉ Yes | ◉ No | ◉ Not known | g) New onset angina (less than 2 weeks) | ◉ Yes | ◉ No | ◉ Not known |
| c) Diabetes | ◉ Yes | ◉ No | ◉ Not known → ☐ OHA ☐ Insulin | h) Congestive Heart failure (more than 2 weeks prior) | ◉ Yes | ◉ No | ◉ Not known |
| d) Family history of premature cardiovascular disease | ◉ Yes | ◉ No | ◉ Not known | i) Chronic lung disease | ◉ Yes | ◉ No | ◉ Not known |
| e) Myocardial infarction history | ◉ Yes | ◉ No | ◉ Not known | j) Cerebrovascular disease | ◉ Yes | ◉ No | ◉ Not known |
| | | | | k) Peripheral vascular disease | ◉ Yes | ◉ No | ◉ Not known |
| | | | | l) Chronic renal failure | ◉ Yes | ◉ No | ◉ Not known |

## SECTION 3 : CLINICAL EXAMINATION and BASELINE INVESTIGATION

**1. Anthropometric :** **a. Height:** (cm) ☐ Not Available **b. Weight:** (kg) ☐ Not Available **c. BMI:** Auto Calculated

**2. Heart rate (at start of PCI):** (beats / min)

**3. Blood pressure (at start of PCI):** **a. Systolic:** (mmHg) **b. Diastolic:** (mmHg)

**4. Baseline creatinine :** micromol/L ☐ Not Available

**5. Total cholesterol:** mmol/L ☐ Not Available

**6. LDL levels:** mmol/L ☐ Not Available

**7. Baseline ECG :** (check where applicable)
☐ STEMI → ◉ Anterior ◉ Non-anterior
☐ NSTEMI
☐ Sinus rhythm ☐ Atrial Fibrillation ☐ 2nd /3rd AVB ☐ LBBB ☐ RBBB

## 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. Centre Code: | |
|---|---|---|---|
| c. Identification Card Number : | | d. Local RN No (if applicable): | |

## SECTION 5 : CARDIAC STATUS AT PCI ROCEDURE

| | | | |
|---|---|---|---|
| **1. Congestive Heart Failure :** (recent 2 weeks) | ○ Yes ○ No | **2. NYHA:** | ○ NYHA I ○ NYHA II ○ NYHA III ○ NYHA IV |
| **3. Killip class :** (AMI only) | ○ I ○ II ○ III ○ IV ○ Not Applicable/ Not Available | **4. Functional ischaemia:** | ○ Not applicable ○ Positive ○ Negative ○ Equivocal |
| **5. Cardiogenic shock:** | ○ Yes ○ No | **6. IABP:** | ○ Yes ○ No |
| **7. Acute Coronary Syndrome:** | ○ Yes ○ No → ○ STEMI ○ NSTEMI ○ UA | **8a. Angina type:** | ○ None ○ Atypical ○ Chronic Stable Angina ○ UAP |
| **8b. ACS symptom onset :** | ○ <6 hours ○ >24 hours - 7 days ○ 6-24 hours ○ Not Available | **9. Canadian Cardiovascular Score (CCS):** | ○ CCS 0 ○ CCS 1 ○ CCS 2 ○ CCS 3 ○ CCS 4 |
| **10. STEMI Event :** (Please complete if <24 hours since onset of STEMI symptoms) | a) STEMI time of onset in 24 hr clock (hh:mm): | | □□ : □□ |
| | b) Time of arrival at first hospital (hh:mm) : (For patients transferred only) | | □□ : □□ ☐ Not Applicable |
| | c) Time of arrival at PCI hospital (hh:mm) : | | □□ : □□ |
| | d) Time of first balloon inflation/ stent/ aspiration (hh:mm) : | | □□ : □□ |
| **11. EF Status (at time of PCI procedure)** (Do not use '>' or '<' symbol) | | | □□ % ☐ Not Available |

## SECTION 6 : CATH LAB VISIT

| | | |
|---|---|---|
| **1. Date of procedure:** (dd/mm/yy) | □□ / □□ / □□ | |
| **2a. PCI status:** | ○ Elective → 2b. Staged PCI: ○ Yes ○ No ○ Not Available | ○ Urgent (NSTEMI/UA) ○ Rescue ○ Primary |
| **3. Cath/PCI same lab visit:** | ○ Yes ○ No | |
| **4. Medication:** | a) Thrombolytics | ○ Yes → ○ <3hrs ○ 3-6hrs ○ 6-12hrs ○ 12-24hrs ○ 1-7days ○ >7days ○ No |
| | b) IIb / IIIa Blockade | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | c) Heparin | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | d) LMWH | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | e) Ticlopidine | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | f) Bivalirudin | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | g) Aspirin | ○ Yes → ○ Prior ○ After ○ During ○ No |
| | h) Clopidogrel | ○ Yes → ○ Prior ○ After ○ During → ○ <6 hrs ○ 6-24 hrs ○ >24 - 72 hrs ○ >72 hrs; First / load dose: ○ 75mg ○ 300mg ○ 600mg ○ ≥ 1200mg; ○ No |

| | | | |
|---|---|---|---|
| **5. Planned duration of clopidogrel/ticlopidine:** | ○ 1 month ○ 3 months ○ 6 months ○ 12 months ○ >12 months ○ Not Available | **6a. Percutaneous entry:** | ○ Brachial ○ Radial ○ Femoral ○ Multiple site |
| **6b. French size** (Guiding catheter) | ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ Other,specify: _____ | **6c. Closure device:** | ○ No ○ Seal ○ Suture ○ Other,specify: _____ |
| **7. Extent of coronary disease:** | ☐ Single vessel disease ☐ Multiple vessel disease ☐ Graft ☐ Left Main | | |
| **8a. Fluoroscopy time:** | □□□.□ minutes ☐ Not Available | **8b. Total Dose:** | □□□.□ mGy ☐ Not Available |
| **9a. Contrast type :** | ○ Ionic → ○ HEXABRIX 320 ○ Other, specify: _____ | ○ Non-Ionic → ○ IOPAMIRO 300 ○ IOPAMIRO 370 ○ ULTRAVIST 300 ○ ULTRAVIST 370 ○ XENETIX 300 ○ XENETIX 350 ○ VISIPAQUE 320 ○ OMNIPAQUE 300 ○ OMNIPAQUE 350 ○ Other, specify: _____ | |
| **9b. Contrast Volume :** | □□□ ml ☐ Not Available | | |

| a. Patient Name : | | b. Centre Code: | |
|---|---|---|---|
| c. Identification Card Number : | | d. Local RN No (if applicable): | |

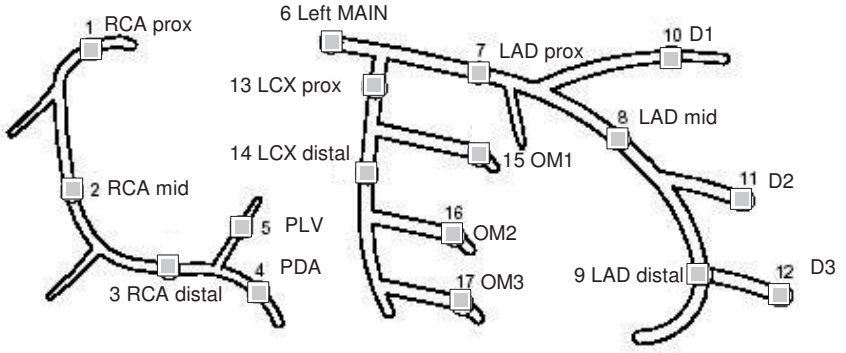
**Instruction: Please check one lesion code per page (Section 7: PCI Procedure Details)**

## SECTION 7: PCI PROCEDURE DETAILS

**1. Total no.of lesion treated :**

**NATIVE**

Coronary segment number, lesion codes 1-17




Document intermediate lesions as lesion code 15

**GRAFT**

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

| Graft | Target Vessel |
|---|---|
| 18 LIMA | |
| 19 RIMA | |
| 20 SVG 1 | |
| 21 SVG 2 | |
| 22 SVG 3 | |
| 23 RAD 1 | |
| 24 RAD 2 | |
| 25 RAD 3 | |

Complete for all intervene. Complete and attach additional lesion column if necessary.

**2. Lesion Code: (1-25)** ____ ____ to ____ ____ *(if applicable)*

**3. Coronary lesion:** ◉ De novo ◉ Acute stent thrombosis → a.Type: ◉ Acute ◉ Sub acute ◉ Late ◉ Restenosis (No prior stent) ◉ In stent restenosis → b.Prior stent type: ◉ DES ◉ BMS ◉ Others _____

**4. Lesion type:** ◉ A ◉ B1 ◉ B2 ◉ C

**5. Location in graft:** (complete for graft PCI only) ◉ Ostial ◉ Mid ◉ Native ◉ Proximal ◉ Distal ◉ Anastomosis

**6. Lesion description:** ☐ Ostial ☐ Bifurcation *(if intervention involved sidebranch, please record as a second lesion)* ☐ CTO < 3mo ☐ CTO > 3mo ☐ Thrombus ☐ Not Applicable

**7. Pre-stenosis % :** ____ ____ ____ TIMI Flow (pre): → ◉ TIMI-0 ◉ TIMI-1 ◉ TIMI-2 ◉ TIMI-3

**8. Post-stenosis % :** ____ ____ ____ TIMI Flow (post): → ◉ TIMI-0 ◉ TIMI-1 ◉ TIMI-2 ◉ TIMI-3

**9. Estimated lesion length:** ____ ____ mm

**10. Acute closure:** ◉ Yes ◉ No

**11. Dissection:** ◉ Yes ◉ No

**12. Perforation:** ◉ Yes ◉ No

**13. No Reflow:** ◉ Yes → ◉ Transient ◉ Persistent ◉ No

**14. Lesion Result:** ◉ Successful ◉ Unsuccessful

**15. Stent details for lesion:**

| | a. Stent Code | b. Length (mm) | c. Diameter(mm) | Others, specify: |
|---|---|---|---|---|
| #1 | | | . | |
| #2 | | | . | |
| #3 | | | . | |
| #4 | | | . | |
| #5 | | | . | |
| #6 | | | . | |

**16. Maximum balloon size / pressure:**

a) Maximum balloon size used: ____ . ____ ____ mm

b) Maximum stent / balloon deploy pressure: ____ ____ atm

**17. Intracoronary devices used:**

☐ Unsuccessful ☐ Balloon only ☐ Bare Metal Stent ☐ Drug Eluting Balloon ☐ Distal Embolic Protection → ◉ Filter ◉ Balloon ◉ Proximal

☐ Cutting balloon ☐ DES ☐ Flowire

☐ IVUS ☐ Rotablator ☐ Other, specify: _____

**18. Direct stenting:-**

◉ Yes ◉ No ◉ Not available

| a. Patient Name : | | b. Centre Code: | |
|---|---|---|---|
| c. Identification Card Number : | | d. Local RN No (if applicable): | |

## SECTION 8 : IN HOSPITAL OUTCOME (after procedure)

**1. Outcome:**

| | |
|---|---|
| a. Periprocedural MI | ◯ Yes ◯ No ◯ Not Available |
| b. Emergency Reintervention / PCI: | ◯ Yes ◯ No<br>i) Stent thrombosis: ◯ Yes ◯ No<br>ii) Dissection: ◯ Yes ◯ No<br>iii) Perforation: ◯ Yes ◯ No<br>iv) Others,specify: _____ ◯ Yes ◯ No |
| c. Bail-out CABG | ◯ Yes ◯ No |
| d. Cardiogenic shock (after procedure) | ◯ 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. New renal impairment | ◯ Yes ◯ No ◯ Not Available |
| k.Max post procedural rise in creatinine | ◯ Yes ◯ No ◯ Not Available<br>a) ☐☐☐.☐ micromol/L b) Date (dd/mm/yy): ☐☐/☐☐/☐☐ c) Autocalculate: (days) ☐☐☐ |

**2. Vascular Complications:**

| | |
|---|---|
| a. Bleeding | ◯ Yes ◯ No<br>◯ Major (Any intracranial bleed or other bleeding ≥ 5g/dL Hb drop)<br>◯ Minor (Non-CNS bleeding with 3-5g/dL Hb drop)<br>◯ Minimal (Non-CNS bleeding, non-overt bleeding, <3g/dL Hb drop)<br>Bleeding site:<br>◯ Retroperitoneal ◯ Others, specify: _____<br>◯ Percutaneous entry site |
| b. Access site occlusion | ◯ Yes ◯ No |
| c. Loss of distal pulse | ◯ Yes ◯ No |
| d. Dissection | ◯ Yes ◯ No |
| e. Pseudoaneurysm | ◯ Yes ◯ No<br>◯ Ultrasound compression ◯ Others, specify:<br>◯ Surgery _____ |

## SECTION 9 : OUTCOME AT DISCHARGE

**1. Outcome:**

◯ Alive →

a) Date of Discharge (dd/mm/yy): ☐☐/☐☐/☐☐

b) Medication:

| | Yes | No | | Yes | No |
|---|---|---|---|---|---|
| Aspirin | ◯ | ◯ | Ace Inhibitor | ◯ | ◯ |
| Clopidogrel | ◯ | ◯ | ARB | ◯ | ◯ |
| Ticlodipine | ◯ | ◯ | Warfarin | ◯ | ◯ |
| Statin | ◯ | ◯ | Others, specify _____ | ◯ | ◯ |
| Beta blocker | ◯ | ◯ | | | |

◯ 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 centre: →

a) Date of transfer (dd/mm/yy): ☐☐/☐☐/☐☐

b) Name of centre: _____

# NATIONAL CARDIOVASCULAR DISEASE DATABASE - PCI REGISTRY
# FOLLOW UP AT 30 DAYS

For NCVD Use only:
---
ID: ____ / ____
Centre: ____

***Instruction:*** *This form is to be completed at patient follow up* ***after 30 days of 1st admission.*** *Following performed by telephone interview. Where check boxes ☐ are provided, check (√) one or more boxes. Where radio buttons ◉ are provided, check (√) one box only.*

| | | | |
|---|---|---|---|
| **Ai. Name of Reporting centre:** | | **Aii. Or Reporting centre code:** | |
| **B. Patient Name :** | | | |
| **C. Identification Card Number :** | *MyKad / MyKid:* ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐ | *Old IC:* | |
| | *Other ID document No:* → | *Specify type (eg.passport, armed force ID):* | |
| **D. Date of Follow Up:** (dd/mm/yy) | ☐☐ / ☐☐ / ☐☐ | | |

## SECTION 1 : OUTCOME

**1. Outcome:**

◉ Alive →

b) Medication:

| | Yes | No | Unknown |
|---|---|---|---|
| Aspirin | ◉ | ◉ | ◉ |
| Clopidogrel | ◉ | ◉ | ◉ |
| Ticlopidine | ◉ | ◉ | ◉ |
| Others, specify: _____ | ◉ | ◉ | ◉ |

◉ Death →

a) Date of Death (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

b) Cause of death:
- ◉ Cardiac
- ◉ Non cardiac
- ◉ Others, specify: _____

◉ Transferred to other centre: →

a) Date of transfer (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

b) Name of centre: _____

◉ Lost to follow up →

a) Date of last follow up (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

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

**3. Readmission:**

◉ Yes →
◉ No

a) Date of readmission (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

b) Readmission location: _____

c) Readmission Reason: →

| | | |
|---|---|---|
| ◉ CHF | ◉ Arrhythmia | ◉ CABG |
| ◉ AMI | ◉ PCI – planned | ◉ Others, specify |
| ◉ Recurrent angina | ◉ PCI – unplanned | _____ |

# NATIONAL CARDIOVASCULAR DISEASE DATABASE - PCI REGISTRY
# FOLLOW UP AT 6 AND 12 MONTHS

For NCVD Use only:
---
ID: ____ / ____
Centre: ____

***Instruction:*** *This form is to be completed at patient follow up* ***6 and 12 months of 1st admission.*** *Following performed by telephone interview. Where check boxes ☐ are provided, check (√) one or more boxes. Where radio buttons ◉ are provided, check (√) one box only.*

| | | | |
|---|---|---|---|
| **Ai. Name of Reporting centre:** | | **Aii. Reporting centre code:** | |
| **B. Patient Name :** | | | |
| **C. Identification Card Number :** | *MyKad / MyKid:* ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐ | *Old IC:* | |
| | *Other ID document No:* | *Specify type (eg.passport, armed force ID):* | |
| **D. Type of Follow Up:** | ◉ 6 months ◉ 12 months | **E. Date of Follow Up (dd/mm/yy):** | ☐☐ / ☐☐ / ☐☐ |

## SECTION 1 : OUTCOME

**1. Outcome:**

◉ Alive →

a) Medication:

| | Yes | No | Unknown | | Yes | No | Unknown |
|---|---|---|---|---|---|---|---|
| Aspirin | ◉ | ◉ | ◉ | Ace Inhibitor | ◉ | ◉ | ◉ |
| Clopidogrel | ◉ | ◉ | ◉ | ARB | ◉ | ◉ | ◉ |
| Ticlodipine | ◉ | ◉ | ◉ | Warfarin | ◉ | ◉ | ◉ |
| Statin | ◉ | ◉ | ◉ | Others, specify _____ | ◉ | ◉ | ◉ |
| Beta blocker | ◉ | ◉ | ◉ | | | | |

◉ Death →

a) Date of Death (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

b) Cause of death: ◉ Cardiac ◉ Non cardiac ◉ Others, specify: _____

◉ Transferred to other centre: →

a) Date of transfer (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

b) Name of centre: _____

◉ Lost to follow up →

a) Date of last follow up (dd/mm/yy): ☐☐ / ☐☐ / ☐☐

## SECTION 2 : SMOKING STATUS

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

## SECTION 3 : READMISSION (Within 12 months after 1st notification)

**1. Has patient been readmitted to hospital?** ◉ Yes ◉ No

| | Date of Readmission | Readmission location: | Readmission reason: | CCS | Angiography | AMI | PCI | CABG |
|---|---|---|---|---|---|---|---|---|
| 1 | ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) | | ◉ CHF ◉ AMI ◉ Recurrent angina ◉ Arrhythmia ◉ PCI – planned ◉ PCI – unplanned ◉ CABG ◉ Others, specify _____ | ◉ CCS 0 ◉ CCS 1 ◉ CCS 2 ◉ CCS 3 ◉ CCS 4 ◉ Not Available | ◉ Yes ◉ No ◉ Not Applicable | ◉ No ◉ STEMI ◉ NSTEMI ◉ Not Applicable | ◉ No ◉ TVR ◉ Non TVR ◉ Not Applicable ◉ TLR → Lesion Code (1-25): ☐☐ | ◉ Yes → TVR: ◉ Yes ◉ No ◉ No ◉ Not Applicable |
| 2 | ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) | | ◉ CHF ◉ AMI ◉ Recurrent angina ◉ Arrhythmia ◉ PCI – planned ◉ PCI – unplanned ◉ CABG ◉ Others, specify _____ | ◉ CCS 0 ◉ CCS 1 ◉ CCS 2 ◉ CCS 3 ◉ CCS 4 ◉ Not Available | ◉ Yes ◉ No ◉ Not Applicable | ◉ No ◉ STEMI ◉ NSTEMI ◉ Not Applicable | ◉ No ◉ TVR ◉ Non TVR ◉ Not Applicable ◉ TLR → Lesion Code (1-25): ☐☐ | ◉ Yes → TVR: ◉ Yes ◉ No ◉ No ◉ Not Applicable |
| 3 | ☐☐ / ☐☐ / ☐☐ (dd/mm/yy) | | ◉ CHF ◉ AMI ◉ Recurrent angina ◉ Arrhythmia ◉ PCI – planned ◉ PCI – unplanned ◉ CABG ◉ Others, specify _____ | ◉ CCS 0 ◉ CCS 1 ◉ CCS 2 ◉ CCS 3 ◉ CCS 4 ◉ Not Available | ◉ Yes ◉ No ◉ Not Applicable | ◉ No ◉ STEMI ◉ NSTEMI ◉ Not Applicable | ◉ No ◉ TVR ◉ Non TVR ◉ Not Applicable ◉ TLR → Lesion Code (1-25): ☐☐ | ◉ Yes → TVR: ◉ Yes ◉ No ◉ No ◉ Not Applicable |