

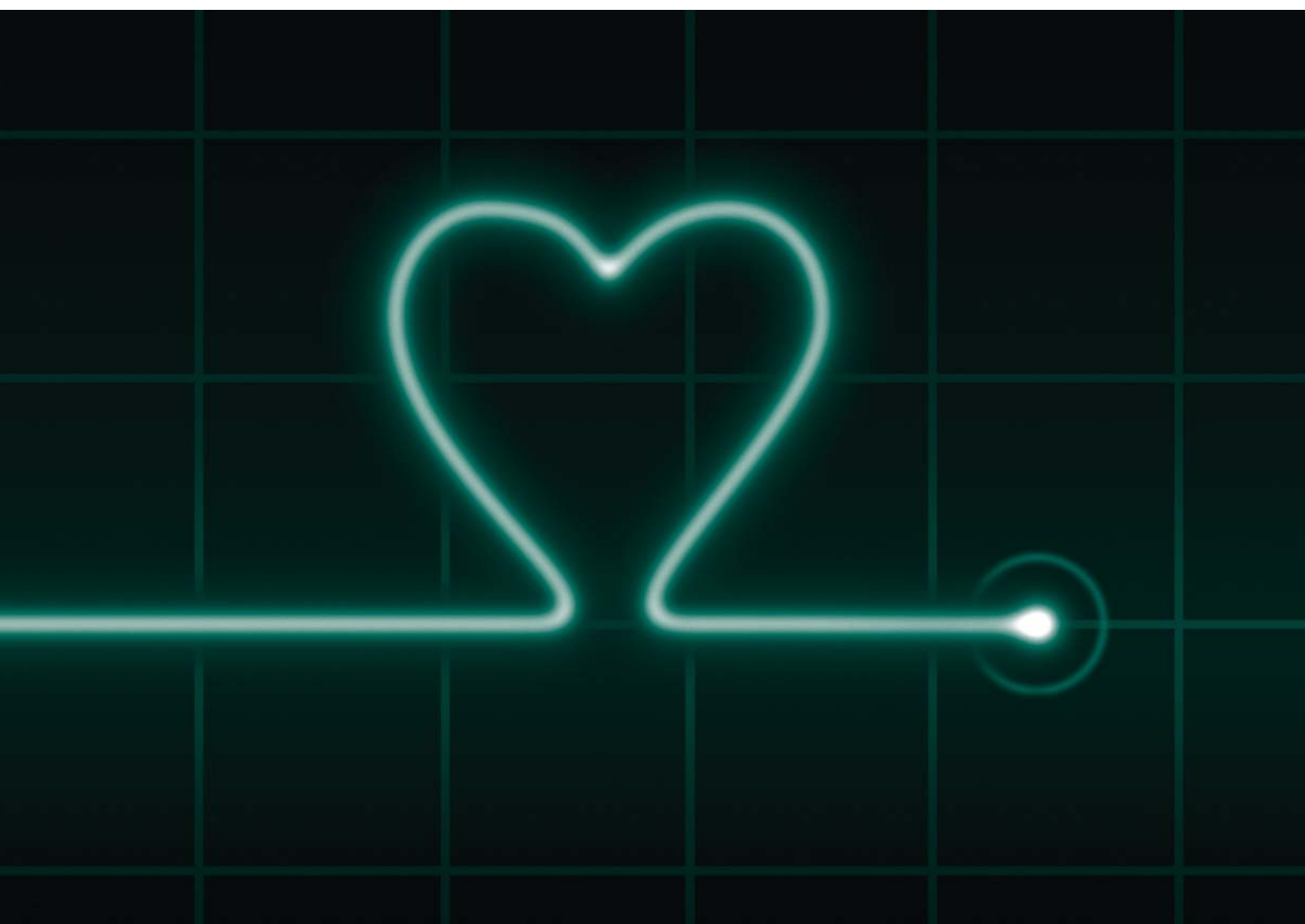
# National Coronary Angioplasty Audit



## A Rapidly Evolving way to Treat Patients with Heart Disease:

Report on Percutaneous Coronary Intervention in the United Kingdom 2005

Data from January 2005 to December 2005, Peter F Ludman on behalf of the British Cardiovascular Intervention Society



Prepared in association with:



FOR HEALTH AND SOCIAL CARE





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The main objective of this audit is to describe and improve the care of patients who undergo Percutaneous Coronary Intervention (PCI) procedures in the UK. The audit provides a mechanism to collect procedure-specific data based on the current minimum British Cardiovascular Interventional Society dataset. This audit project is being delivered in collaboration with the [British Cardiovascular Interventional Society](#).

The audit described here allows clinicians to assess key aspects of the quality of their care when performing Percutaneous Coronary Intervention (PCI). This is a United Kingdom wide audit performed by the Audit Officer of the British Cardiovascular Intervention Society (BCIS) with participation from hospitals performing PCI procedures.

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# Foreword

The British Cardiovascular Intervention Society (BCIS) and the Department of Health (DOH) are committed to ensuring that Percutaneous Coronary Intervention (PCI) is performed to the highest standards in the United Kingdom. In addition we are committed to presenting angioplasty data to the public in a clear and understandable way. This report is part of this process.

Within this report is an analysis of all PCI procedures performed across the United Kingdom in the calendar year 2005. The aim of this audit is to help clinicians who treat patients with coronary artery disease assess key aspects of the quality of the care they provide when performing PCI. It also describes changing trends and patterns in the provision of this treatment.

It is planned that in the future the audit will become progressively more sophisticated, so that risk adjusted outcomes can be measured. This will provide more reliable information about the quality of care that patients receive, and will be available to clinicians, managers, patients and the public.



**Professor Roger Boyle**

National Director for Heart  
Disease and Stroke

A handwritten signature in black ink that reads "Roger Boyle".



**Dr Martyn Thomas**

President British Cardiovascular  
Intervention Society

A handwritten signature in black ink that reads "Martyn Thomas".

# Acknowledgements

The National Percutaneous Coronary Intervention Audit has been developed and run by the British Cardiovascular Intervention Society (BCIS) since 1992 and more recently has received support from The Information Centre for health and social care (The IC) and The Healthcare Commission. The analysis on which this report is based was undertaken by the BCIS Audit Officer, Dr Peter Ludman.

Author of the National Coronary Angioplasty Audit

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# 1.0 Executive Summary

Coronary heart disease accounts for about one in five deaths in men and one in six deaths in women. In addition, the British Heart Foundation estimate that there are over 1 million men living in the UK who have or have had angina (heart-related chest pain), and over 840,000 women.

Percutaneous Coronary Intervention (PCI) is a rapidly evolving technique used to treat patients whose coronary arteries – which supply the heart with blood - are narrowed or blocked. The procedure works by mechanically improving blood flow to the heart. First, the doctor uses x-ray images of the heart arteries to make the position and shape of any narrowing or blockages visible (a 'coronary angiogram'). If the clinical circumstances and the angiogram findings suggest that something needs to be done to physically modify the blood flow to the heart, then the majority of patients are treated by PCI.<sup>1</sup> A small balloon is inserted which, when inflated, squashes the fatty tissue out of the way and widens the artery. In most cases, a 'stent' is then implanted - a metal mesh tube that stays permanently in place to keep the artery wall open. Treatment thus aims to prevent the arteries blocking (which might cause a heart attack) and improve flow to the heart muscle to alleviate the symptoms of angina.

The audit described here allows clinicians to assess key aspects of the quality of their care when performing PCI. This is a United Kingdom wide audit performed by the Audit Officer of the British Cardiovascular Intervention Society (BCIS) with participation from hospitals performing PCI procedures. This audit has recently been enhanced by the Information Centre for health and social care, using information collected by its Central Cardiac Audit Database (CCAD) which allows electronic transfer of much more detailed information. CCAD is part of the Information Centre for health and social care's, National Clinical Audit Support Programme (NCASP), who are the single largest provider of clinical audits covering the care of patients with heart disease, diabetes and cancer on behalf of the Healthcare Commission. The National Clinical Audits aim to improve treatment of patients and improve patient care and outcomes. They offer reliable information to help health professionals to continually measure and improve the care by

comparing their work to specific standards and national trends. Healthcare professionals can use the clinical audit findings so that changes can then be made to improve the care provided. Repeated monitoring is used to confirm that improvements are being sustained. This portion of the audit is funded by the Healthcare Commission.

Since January 1992, all centres in the United Kingdom have submitted paper audit returns to the British Cardiovascular Intervention Society. The development of the detailed audit using CCAD for England and Wales has been more recent, but the last two years have been strong ones for the audit. By November 2006, over 80 per cent of NHS units in England and Wales were submitting data to CCAD, with the rest due to come online in the very near future. It is planned that next year the audit will provide casemix adjusted outcomes information for different hospitals. This means outcomes adjusted for how ill patients are when they receive care, how old they are, etc, ensuring that reliable evidence about the quality of care and patients' outcomes is available for clinicians, managers, patients and the public. In addition, we will examine delays to treatment of patients by primary PCI, which is increasingly being used instead of thrombolysis in the treatment of heart attack patients. The audit will continue to provide clinicians with crucial information against standards of best practice that they can use to identify opportunities to further improve patient care.

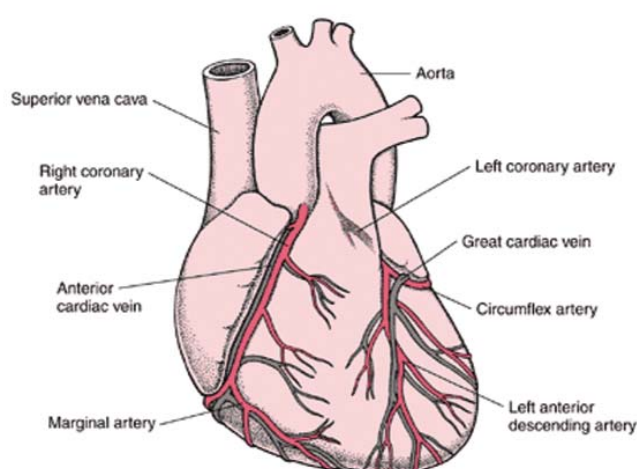
## Key findings include:

- The number of angiograms and PCI treatments both exceed the numbers expected by the National Service Framework (NSF) for Coronary Heart Disease, but are less than that recommended by the British Cardiovascular Society (BCS). For PCIs, the NSF target in 2000 was 750 per million population (pmp), and the BCS 2003 target was 1,400 pmp, with expectations that the level might need to be 2-3,000 pmp. The actual number in England in 2005 was 1,169 pmp and in Wales 873 pmp. These numbers are also less than in most other developed European countries.
- The rapid increase in the use of coronary angiography and PCI is due to a number of factors. These include the previous marked under-provision of catheter lab equipment and personnel, the recent large expansion of such provision, and information from large clinical trials that supports the use of early coronary angiography and revascularisation in patients presenting with acute coronary syndromes.
- It is gratifying to see that the number of PCIs carried out each year in both England and Wales is fast increasing – twice as many were performed in 2005 than in 2000.
- In 2005, for every 4 patients who needed revascularisation treatment, 3 were treated by PCI and 1 by CABG. There has been a progressive increase in the ratio of patients treated by PCI to CABG which reflecting advances in PCI technology and treatment of patients earlier in the course of the disease process (when more patients can be successfully treated by PCI).
- The National Institute for Health and Clinical Excellence (NICE) recommend that “Stents should be used routinely where PCI is the clinically appropriate procedure for patients with either stable or unstable angina or with acute myocardial infarction”.<sup>2</sup> The great majority of procedures do now involve stent insertion (94 per cent), suggesting that this aspect of good practice is being met.
- 60 per cent of the stents inserted in England, and 77 per cent of those in Wales, were coated with a drug designed to pass into the wall of the artery to try to improve the longer term success rates of the procedure (these coated stents are called drug-eluting stents). The National Institute for Health and Clinical Excellence (NICE) recommend that “A drug-eluting stent should be used if the person has angina, and the inside diameter of the artery is less than 3 mm across, or the narrowed area is more than 15 mm long.”<sup>3</sup> Research suggests that compliance with the NICE guidance on use of such stents would result in about 76 per cent of patients being treated with a drug eluting stent<sup>4</sup>, which is in keeping with the rates observed in this audit and suggests that recommended practice is being followed.
- The overall rate of death before discharge from hospital following PCI has remained fairly stable over recent years at around 0.5-0.7 per cent, and there has been a marked fall in the need for emergency coronary artery bypass surgery to try to solve a PCI complication (in 2005, this occurred in less than 0.2 per cent of all procedures).
- The risk of in-hospital death for emergency patients varies according to clinical syndrome. For patients with unstable angina or NSTEMI, the in-hospital mortality is less than 1 per cent. For patients with STEMI the mortality is higher at about 5 per cent.
- The ability to estimate mortality after discharge from hospital is clearly very important. The unique ability of the CCAD data collection method to track late mortality has shown that in the longer term, 95 per cent of patients treated via PCI are still alive 3 years later, and 92 per cent after 5 years. This method for looking at longer term outcome has enormous potential to investigate what happens to patients long after they leave hospital, and cross linking the data from the heart attack and other audits will allow us to observe a much more complete ‘patient journey’ than has ever been possible in the past.

The rest of this report contains more details and graphs of the audit findings. The complete set of data from the 2005 audit was presented at the British Cardiovascular Intervention Society’s annual meeting (BCIS) in 2006 and is available for download at the society’s web site [www.bcis.org.uk](http://www.bcis.org.uk).

## 2.0 Introduction

The heart is a muscular pump which moves blood around the body, which contains the oxygen and food your body's organs need to function. To pump properly the heart muscle needs its own blood supply, and this is provided by vessels called the coronary arteries. If these arteries get narrowed or blocked, and the supply to a region of heart muscle is reduced, then this region may start to contract less well, and ultimately this region may die.



The sensation that many people experience when their heart muscle does not get enough blood supply is called angina, which is usually felt as a tight constricting feeling across the chest. If a region of heart muscle dies, this is called a 'heart attack' or 'myocardial infarction'.

Coronary Heart Disease (CHD), causes over 117,000 deaths a year in the United Kingdom, accounting for approximately one in five deaths in men and one in six deaths in women ([www.heartstats.org](http://www.heartstats.org)). While death rates for CHD have been falling rapidly in the UK since the late 1970s they are still amongst the highest in Western Europe.

There is considerable variation in mortality from CHD across the UK. Death rates are higher in Scotland than the South of England, in manual workers than in non-manual workers and in certain ethnic groups.

In addition to being a leading cause of mortality, a large number of people suffer symptoms as a result of coronary artery disease. The British Heart Foundation estimate that there are over 1 million men living in the UK who have or have had angina and over 840,000 women giving a total of just under 2 million.

Treatment of narrowed coronary arteries has 2 aims. The first is to try to prevent the coronary arteries blocking which might cause a myocardial infarction and lead to heart failure or death. The second is to improve flow to the heart muscle to alleviate symptoms of angina.

There are three aspects to most people's treatment. Medication is required in all cases. In addition many patients benefit from either:

- Percutaneous Coronary Intervention (PCI) or
- Coronary Artery Bypass Surgery (CABG)

Both these procedures are ways of mechanically improving blood flow to the heart muscle, and are called 'revascularisation procedures'. There are many factors used to decide firstly whether either is necessary, and if they are, which is most appropriate for an individual patient.

If either of these 2 procedures might be required, then it is first necessary to visualise the coronary arteries so that it is possible to see where the narrowings and blockages are. This is done by performing a 'coronary angiogram' which is essentially a special x-ray test.

### 2.1 The Coronary Angiogram procedure:

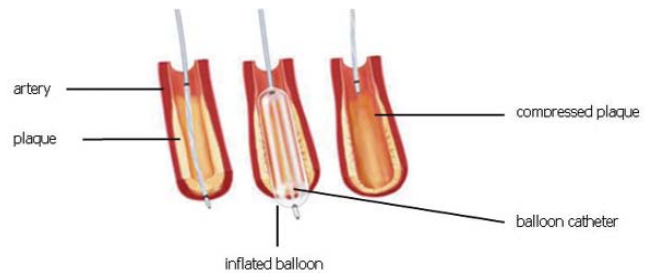
During this procedure, x-ray images are made of the heart arteries, while a special liquid is injected into them to make them visible. The procedure can be performed from the artery at the top of the leg, or in the wrist, and is performed under local anaesthetic. The area of skin is made numb using local anaesthetic and through this area a long thin tube (called a catheter) is fed into the artery. It is then guided under X-ray imaging control until the tip reaches the heart.

When the tip of the catheter is in position a special liquid is injected into the heart arteries so that they show up on the x-ray machine. The position and shape of any narrowings in these arteries can therefore be identified. This part of the procedure is called an angiogram, and usually takes about 30 minutes. It can be performed as a day case procedure, or as a prelude to a Percutaneous Coronary Intervention (PCI), which would then occur immediately after the images are obtained.

If the clinical circumstances and the angiogram findings suggest that something needs to be done to physically modify the blood flow to the heart, then out of every 4 patients, 3 will need a PCI, and 1 will need a Coronary Artery Bypass Operation (CABG) (Please see page 17, Figure 6: PCI vs Isolated CABG Numbers, UK).

## 2.2 Percutaneous Coronary Intervention:

A Percutaneous Coronary Intervention (PCI) starts just like an angiogram. Then, once the images have been taken, a very thin wire is steered under x-ray image control, across the narrowed part of coronary artery. Once in place, a balloon is fed over this wire and so tracked across the narrowing. Inflating the balloon squashes the fatty tissue out of the way and widens the artery. This may need to be done several times to be successful in fully widening the artery. In most cases a stent is then implanted. A stent is a small metal mesh in the shape of a tube which can be used to scaffold the artery wall in order to keep it open. The stent is crimped over the balloon, which is used to deploy it against the inner wall of the artery. As the balloon inflates, so the stent is expanded, pressing out against the arterial wall, so helping to hold open the newly widened artery. The balloon is then deflated and withdrawn, leaving the stent in place. In the last few years we have seen the development of special stents called 'drug eluting' stents, which have a drug on their surface. This drug passes into the wall of the artery it is scaffolding to try to improve the longer term success rates of the procedure.



Following a PCI, most patients return home the next day. Generally, this is a very safe form of treatment. The potential complications can be broadly split into those that occur during or very shortly after angioplasty, and those that occur weeks or months later.

**Early complications:** At the time of PCI it is sometimes not possible to successfully open up the blocked vessel. Generally if the vessel was narrowed the success rates are very high, but if the vessel was completely blocked before the procedure, the chances of re-opening it are rather lower. In addition, but very rarely it is sometimes necessary to resort to emergency coronary artery bypass surgery to treat a complication. This occurs in less than 0.3 per cent of cases (Figure 12). Any treatments involving the coronary arteries may, rarely, be associated with complications such as stroke, heart attack or death (the risk is less than 1 per cent). As can be seen from the audit, some patients are at higher risk of developing complications than others. For example, the treatment of a patient in a stable situation is associated with complication rates of less than 1 per cent, but in the context of an acute heart attack, this may rise to 10 per cent or more.

**Potential later complications:** After PCI, the symptoms of angina are usually much improved. There follows a period when the walls of the newly stretched arteries heal. Over the course of the first six months, cells grow over this part of the artery wall, and form a new lining, usually embedding the stent within the artery wall. If the healing process is over exuberant this can lead to re-narrowing of the artery. If this is going to occur it usually does so within the first 6 months. Thereafter the risk of the vessel re-narrowing or even blocking abruptly is extremely low (less than 1 per cent per year).

## 3.0 Audit background

From 1992, PCI activity across the UK has been gathered by the audit officer of the British Cardiovascular Intervention Society (BCIS) and presented to the society annually. These presentations are now published on the society's website ([www.bcis.org.uk](http://www.bcis.org.uk)).

These audits have addressed a number of issues for the provision of care, to the outcome following procedures. The data have been gathered by asking all units that perform PCI to complete paper forms that summarised their year's activity.

### 3.1 Central Cardiac Audit Database (CCAD)

In order to improve a number of aspects of this audit, particularly to greatly increase the amount of detailed information about each PCI procedure that can be collected and analysed, BCIS have been working with CCAD to roll out electronic data collection for England and Wales. The CCAD project (which is part of the Information Centre for health and social care) is described in detail at: [www.ic.nhs.uk](http://www.ic.nhs.uk). In brief, this project is funded by the Healthcare Commission, and infrastructure provided by the National Clinical Audit Support Programme. The audits that concern PCI are under the clinical lead of the BCIS audit secretary, Peter Ludman.

For the first time, the annual audit of PCI activity in 2005 made extensive use of data that had been uploaded to CCAD, with the analyses presented being a combination of data from the usual paper forms (for all the United Kingdom), and also from the electronic data available on CCAD central servers (from many of the English and Welsh centres). This clearly demonstrated that by mid 2006 the uptake of this new system was well advanced and beginning to provide essential audit information.

### 3.2 Audit data

The detailed audit presentation can be downloaded from the web at: [www.bcis.org.uk](http://www.bcis.org.uk). This report provides an overview of some of the key features, and how they pertain to national targets and the evolution of the provision of PCI.

### 3.3 Participating Hospitals

The following table displays a list of all participating hospitals (NHS and private) in the United Kingdom who contributed to the 2005 BCIS Percutaneous Coronary Intervention Audit. Those who contributed data to CCAD in 2005 are indicated with a green tick.

Name of Hospital	Contributed data to CCAD for the national audit
Aberdeen Royal Infirmary	
Belfast City Hospital	
Birmingham City Hospital	
Birmingham Heartlands Hospital	✓
BMI Alexandra Hospital (p)	
BMI Park Hospital (p)	
BMI Priory Hospital (p)	
Bradford Royal Infirmary	✓
Bristol Royal Infirmary	✓
BUPA Cambridge Lea Hospital (p)	
BUPA Hospital Leeds (p)	
BUPA Hospital Leicester (p)	
BUPA Hospital Southampton (p)	
Capio Yorkshire Clinic (p)	
Castle Hill Hospital (Hull and East Yorkshire NHS Trust)	✓
Cheltenham General Hospital	
City General Hospital, Stoke	
Classic Hospital Hull and East Riding	
Cromwell Hospital (p)	
Derbyshire Royal Infirmary	✓
Derriford Hospital	✓
Eastbourne Hospital	
Edinburgh Royal Infirmary	✓
Freeman Hospital	
Glasgow Royal Infirmary	
Glasgow Western Infirmary	
Glenfield Hospital	
Golden Jubilee National Hospital (formerly HCI) (p)	✓
Hairmyres Hospital	
Hammersmith Hospital	
Harefield Hospital	✓
Harley Street Clinic (p)	
Heart Hospital (University College London)	✓
Hemel Hempstead General	✓
James Cook University Hospital	✓
John Radcliffe Hospital	✓
King Edward VII	✓
Kings College Hospital	✓

Leeds Nuffield Hospital (p)	
Liverpool Cardiothoracic Centre	✓
London Bridge Hospital (p)	
Barts and the London NHS Trust	✓
London Independent Hospital (p)	
Manchester Royal Infirmary	✓
Manor Hospital (p)	
Morrison Hospital	
New Cross Hospital	✓
North Hampshire Hospital	✓
Northern General Hospital	✓
Northwick Park Hospital	
Nottingham City Hospital	
Papworth Hospital	
Queen Alexandra Hospital, Portsmouth	✓
Queen Elizabeth Hospital, Birmingham	✓
Rochdale Infirmary, Silver Heart Unit Penine	
Ross Hall Hospital	
Royal Berkshire and Battle Hospital	
Royal Bournemouth Hospital	✓
Royal Brompton Hospital	✓
Royal Cornwall Hospital	
Royal Devon and Exeter Hospital	✓
Royal Free Hospital	✓
Royal Sussex County Hospital	✓
Royal Victoria Hospital	
Sandwell District General Hospital	
Southampton General Hospital	
Southend Hospital	✓
St Anthony's Hospital (p)	
St George's Hospital	✓
St Mary's Hospital, London	✓
St Peter's Hospital	✓
St Thomas' Hospital	✓
Taunton and Somerset	
Torbay Hospital	✓
University Hospital of Wales	✓
Victoria Hospital	✓
Walsgrave Hospital	
Wellington Hospital (p)	
Western General Hospital	
Whipps Cross University Hospital	✓
Wythenshawe Hospital	✓
Yorkshire Heart Centre (Leeds General Infirmary)	✓

\* (p) denotes private hospital

# 4.0 Revascularisation rates in the United Kingdom

## 4.1 Coronary angiography

In 2005, 205,782 diagnostic coronary angiograms were performed. This represents a rate of 3,418 angiograms pmp. There is no government target for coronary angiograms, but the National Service Framework (NSF) for Coronary Heart Disease targets for revascularisation (published in 2000) would be expected to lead to a rate of about 3000 angiograms pmp. The British Cardiovascular Society made recommendations in 2002 that would be expected to lead to over 5,000 angiograms pmp (Hackett D, BCS Working Group on Cardiology Workforce Requirements 2003).

To get some perspective it is useful to look at the rates of coronary angiography across Europe. The latest data are available from 2003.

## 4.2 Percutaneous coronary angioplasty

In 2005, there were a total of 70,142 PCIs performed in the calendar year 2005. With an estimated UK population of 60,209,500 in mid 2005, this represents a PCI rate of 1,165 PCI pmp.

The National Service Framework for Coronary Heart Disease, published in 2000 set a number of targets. While this document is now 6 years old, it gives an idea of how the service provision in the UK has improved. The NSF target for PCI was 750 pmp. The British Cardiac Society published a workforce planning document in 2003 suggesting an immediate increase in the target to 1400 pmp, but with expectations that the required level might be 2,000 to 3,000 pmp. Comparisons with provision in Europe are moot, as it can be seen that the United Kingdom has rates of PCI that are considerably lower than most of the other developed European nations (Figure 2 and 3).

Figure 1: Coronary angiography across Europe. Data from 2003, from Cook S et al for WG 10 of the ESC. EuroIntervention 2006;1:374

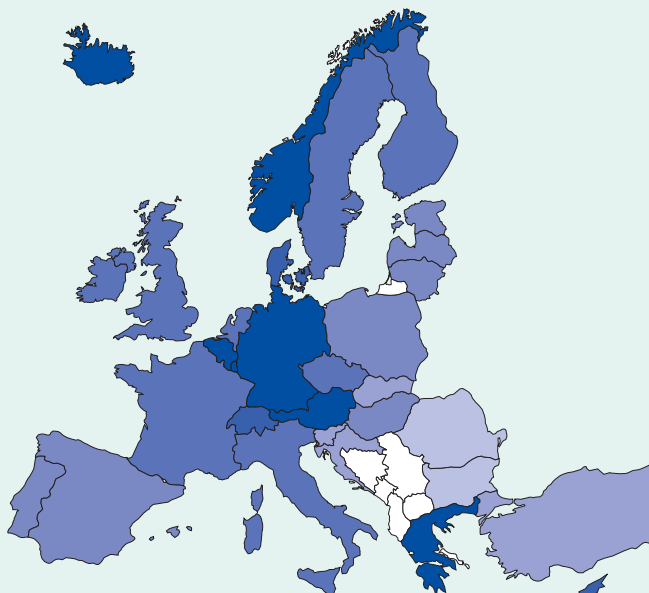
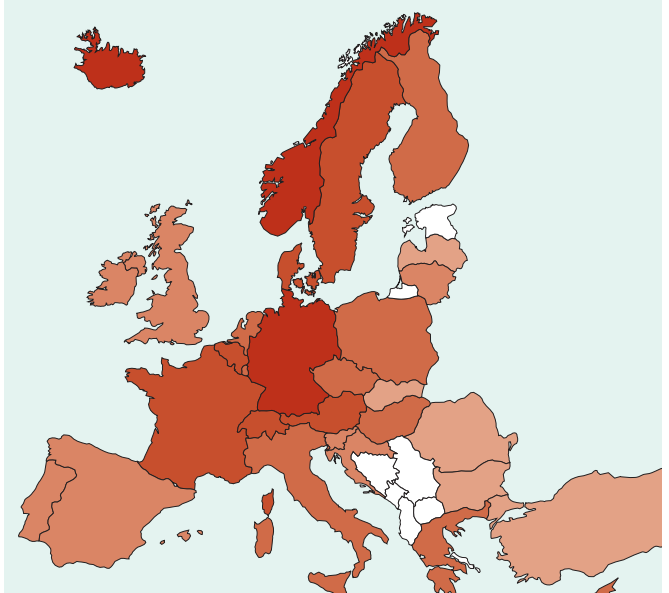
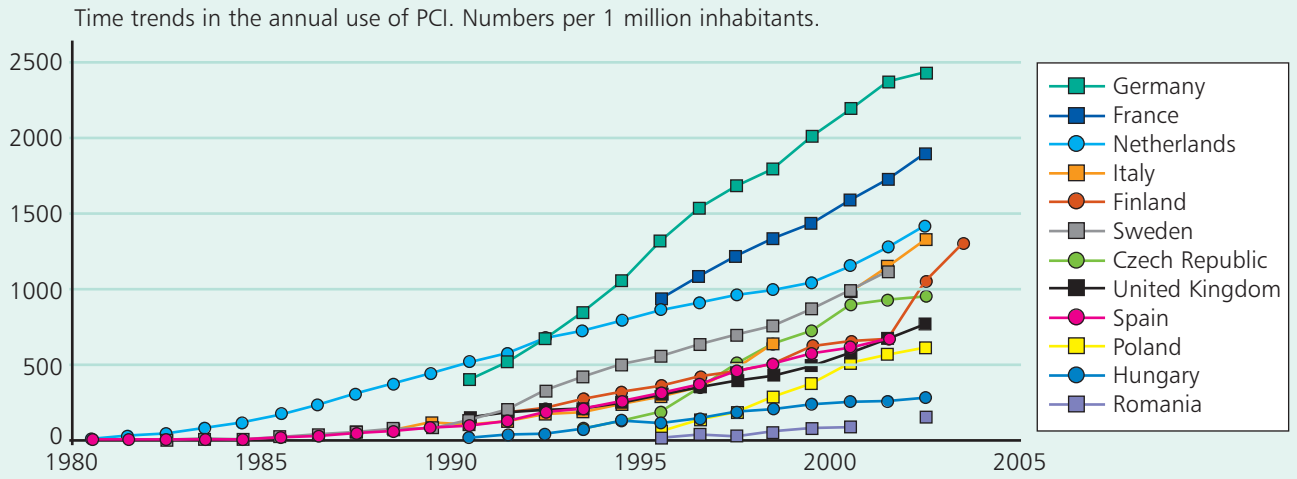


Figure 2: Coronary angioplasty across Europe. Data from 2003, from Cook S et al for WG 10 of the ESC. EuroIntervention 2006;1:374

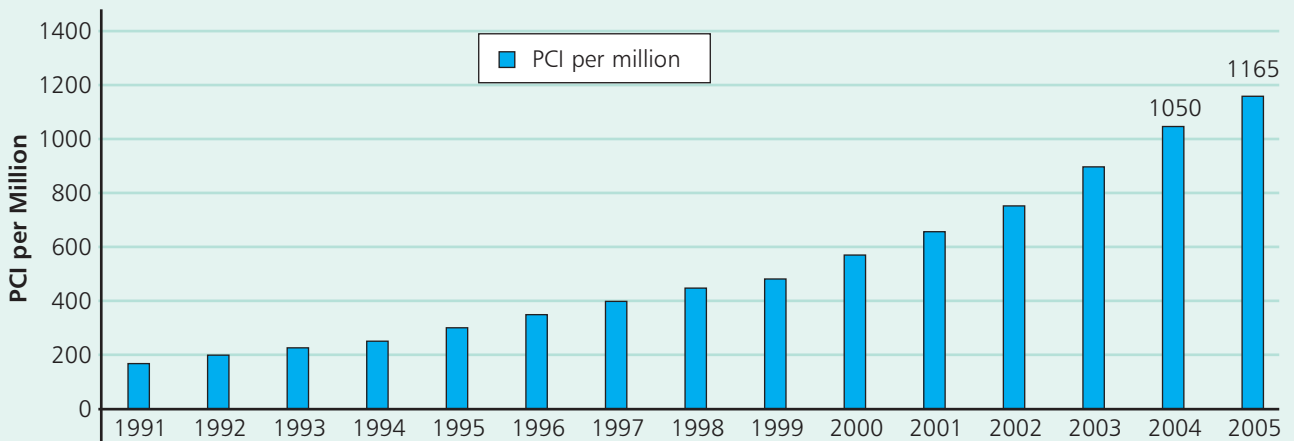


**Figure 3: Cardiovascular Diseases in Europe 2004. Euro Heart Survey 3rd Report**



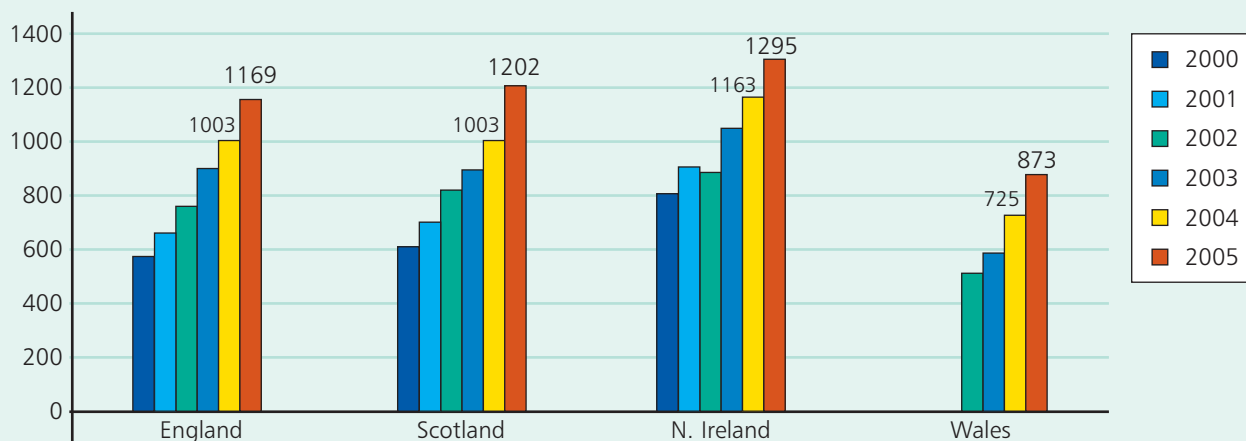
The graph below shows that across the UK, rates of PCI have exceeded the NSF target since 2002, and continue to rise, but have not yet reached the British Cardiac Society Workforce planning target of 1,400 pmp (Figure 4).

**Figure 4: PCI activity to 2005 (UK)**



There remain large differences in the provision of care between the UK countries. As seen below (Figure 5).

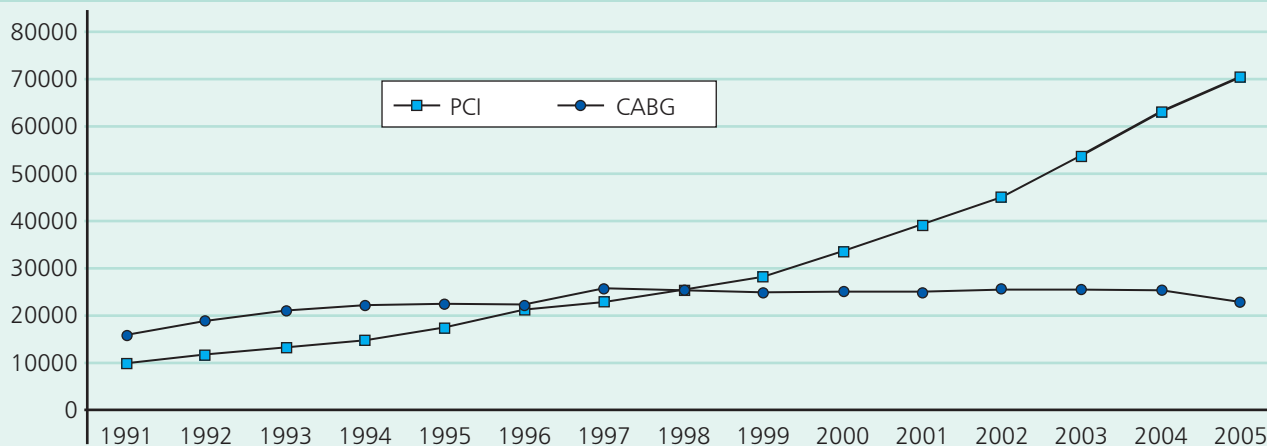
Figure 5: PCIs/million UK Countries (2000 to 2005)



While PCI activity has risen above 1000 pmp in England, Scotland and Northern Ireland, the provision in Wales only exceeded NSF targets for the first time in 2005, showing a marked under provision of healthcare compared with the rest of the UK.

Of the 2 options (PCI or CABG), there has been a big increase in the use of coronary angioplasty, while the number of patients being treated by bypass surgery has altered very little over recent years (Figure 6). This is due to a long overdue expansion in the facilities to both investigate and treat patients, and the treatment of patients earlier in the course of the disease (which often means that they can be treated by angioplasty rather than bypass surgery).

Figure 6: PCI vs Isolated CABG Numbers (UK). 1991 to 2005



Note: CABG data for financial yr, and all PCI v NHS CABG

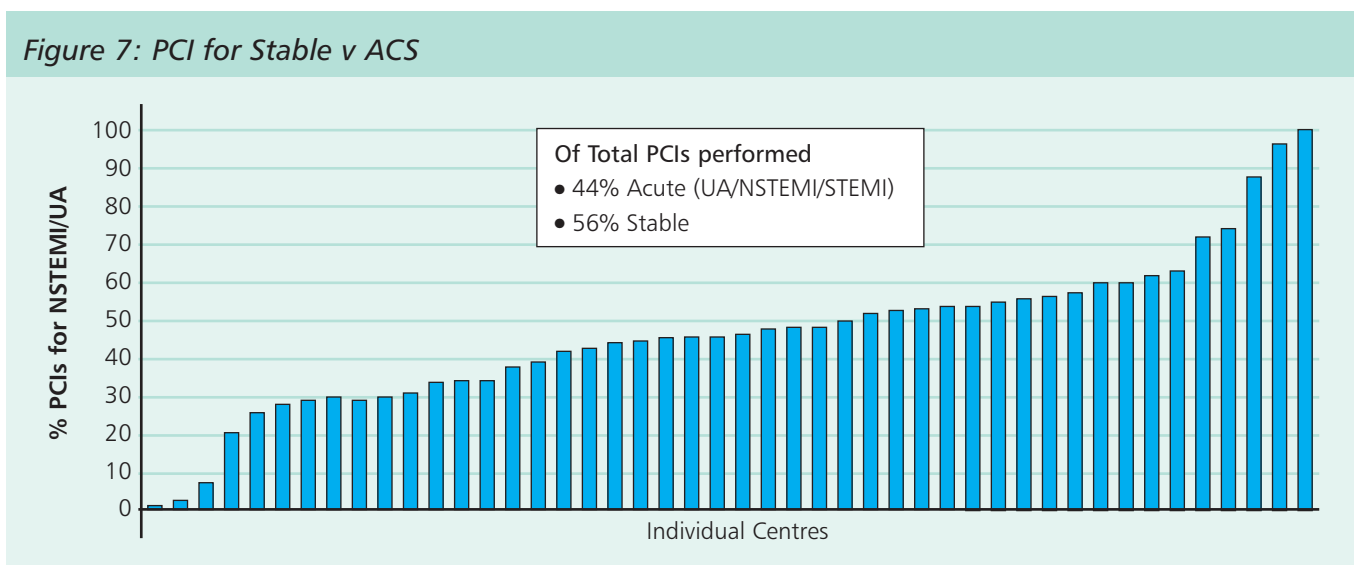
### 4.3 Clinical Presentation

Patients can develop symptoms of coronary disease in a number of ways. They may for example notice a gradual onset of chest pain on exertion. If they are being treated as an outpatient, then such a patient is usually described as having 'stable angina'. Alternatively a patient may present with sudden onset of symptoms that leads to a hospital admission. Such a presentation would be described as being an acute coronary syndrome, which may

include unstable angina or a myocardial infarction. Myocardial infarction is further subdivided into 2 different electrocardiographic presentations – ST elevation myocardial infarction (STEMI) and non ST elevation myocardial infarction (NSTEMI).

It can be seen that there is a fairly even split between those being treated for stable symptoms and for acute coronary syndromes, but with quite a lot of individual variation between different units (Figure 7).

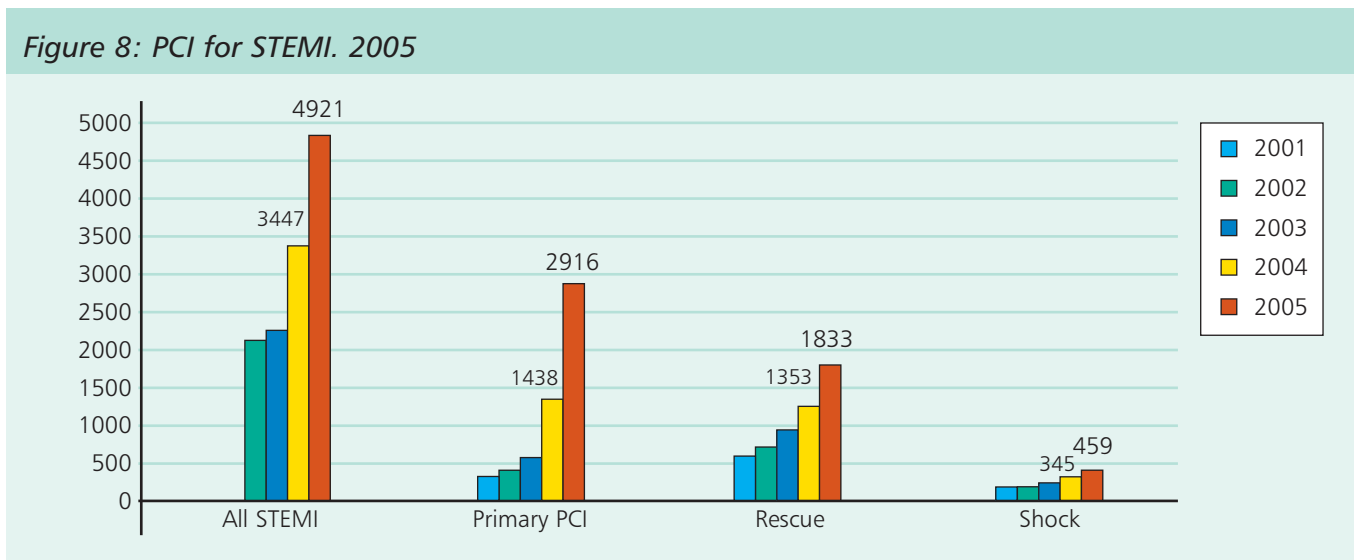
Figure 7: PCI for Stable v ACS



Currently the commonest treatment for STEMI is thrombolysis, and this therapy, which must be delivered very quickly, is the subject of the Myocardial Infarction National Audit Project (MINAP) Audit ([http://www.rcplondon.ac.uk/college/ceeu/ceeu\\_ami\\_home.htm](http://www.rcplondon.ac.uk/college/ceeu/ceeu_ami_home.htm)).

There has been an increase in the use of PCI in place of thrombolysis, so called primary PCI, and also the use of PCI where thrombolysis has been used, but has failed to work (so called rescue PCI). The increasing use of these treatments is shown below (Figure 8).

Figure 8: PCI for STEMI. 2005



For the first time in 2005 it can be seen that primary PCI dominates rescue PCI, and that the overall number of patients being treated in this way has risen sharply.

#### 4.4 Process

During angioplasty, after the vessel has been dilated, there is increasing evidence that where possible, a stent should be inserted, as it is associated with a better outcome. There are technical reasons why this is not always possible, but the issue of stent implantation has been the subject of the National Institute of Clinical Excellence recommendation "Stents should be used routinely where PCI is the clinically appropriate procedure for patients with either stable or unstable angina or with acute myocardial infarction".<sup>2</sup>

It can be seen that the use of stents has increased in line with these recommendations, so that stents are now used in more than 90 per cent of procedures (Figure 9).

An over-exuberant healing process following stent implantation can lead to renarrowing of the vessel, usually 4 to 6 months after the procedure.

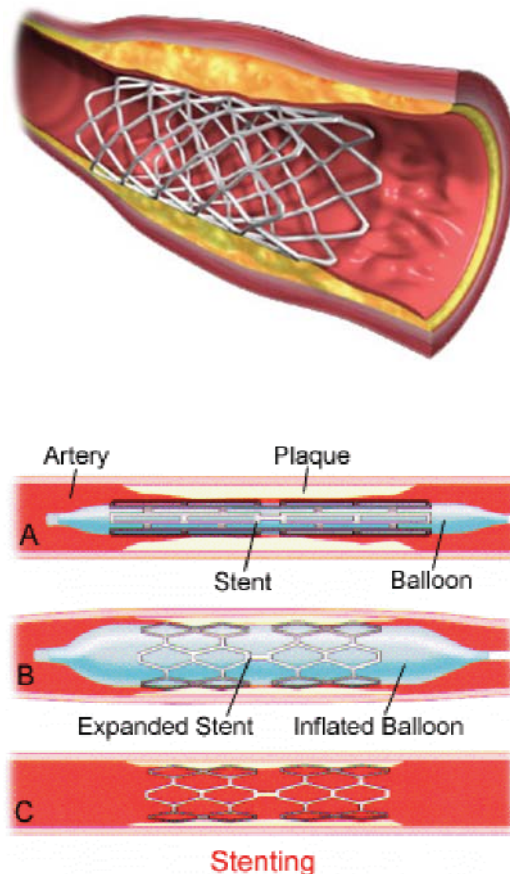


Figure 9: Stent procedures. 2005 data from 53 of 65 centres

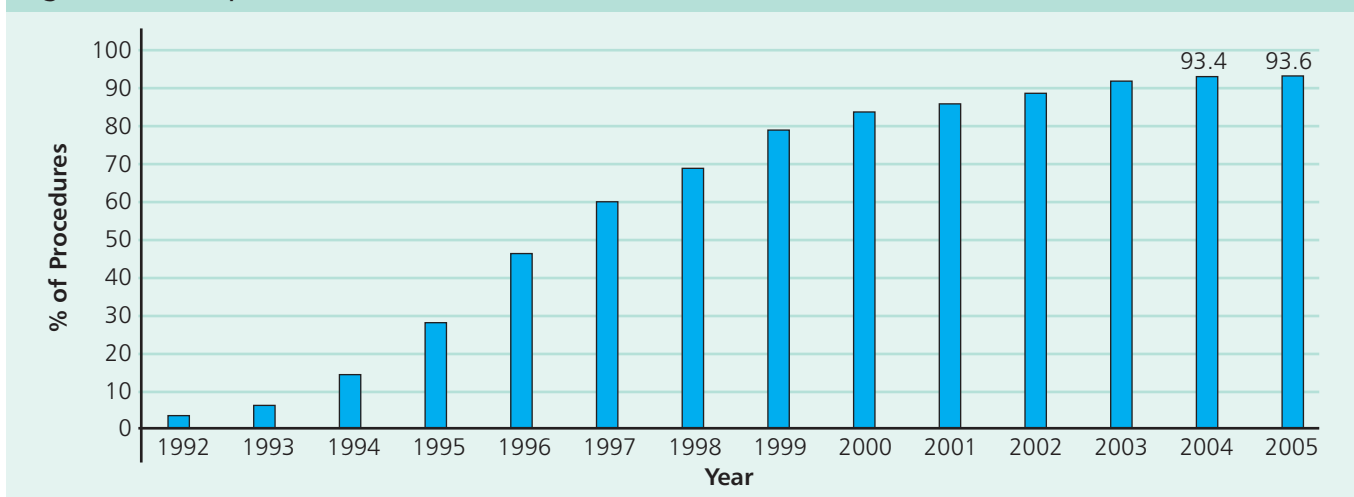
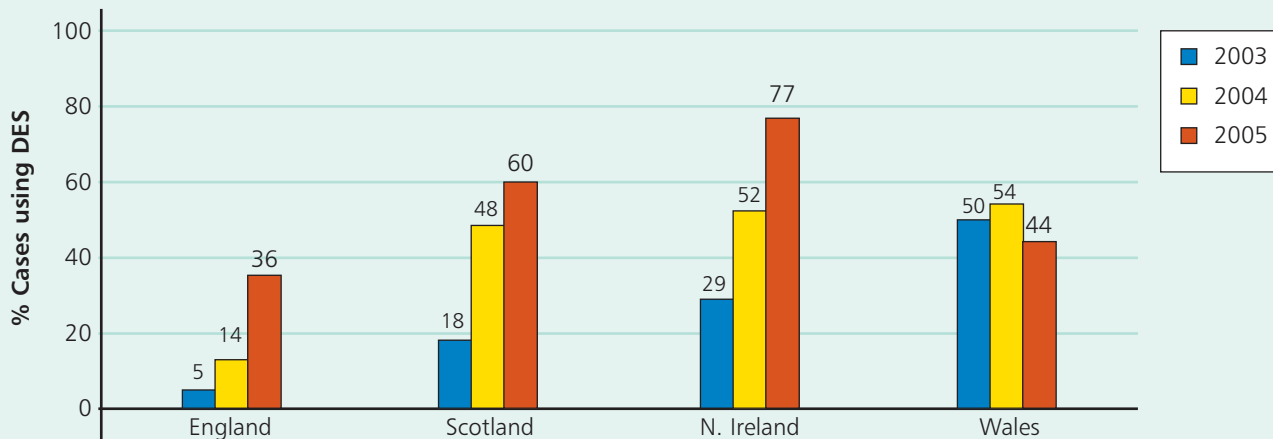


Figure 10: Drug Eluting Stent cases - NHS. 2005 data from 63 of 65 NHS centres



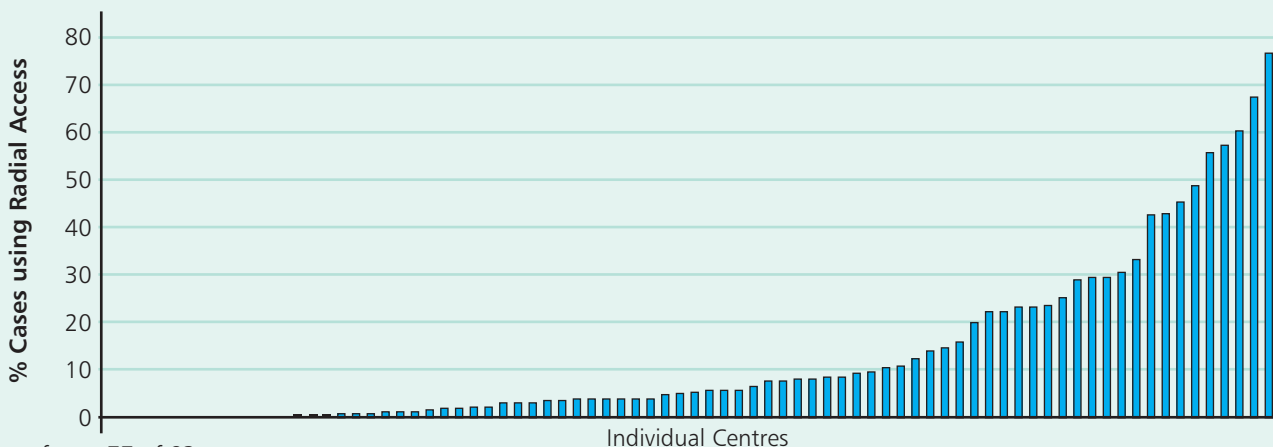
Drug eluting stents have been developed to reduce this problem. The increasing use of these stents in the UK countries is shown above (Figure 10).

The National Institute for Health and Clinical Excellence (NICE) recommend that "A drug-eluting stent should be used if the person has angina, and the inside diameter of the artery is less than 3 mm across, or the narrowed area is more than 15 mm long."<sup>3</sup> Research suggests that compliance with the NICE guidance on use of such stents would result in about 76 per cent of patients being treated with a

drug eluting stent<sup>4</sup>, which is in keeping with the rates observed in this audit and suggests that recommended practice is being followed.

Traditionally, the femoral artery has been used to gain access to the circulation, and so PCI has involved inserting tubes into this artery at the top of the leg. There has been increasing interest in the use of the radial artery (at the wrist) as this approach can be associated with fewer complications at the puncture site. The increasing interest in using this approach can be seen in the graph below (Figure 11).

Figure 11: Radial Artery Access. 11,010 cases: 15.7% of all PCI (10.2% in 2004)

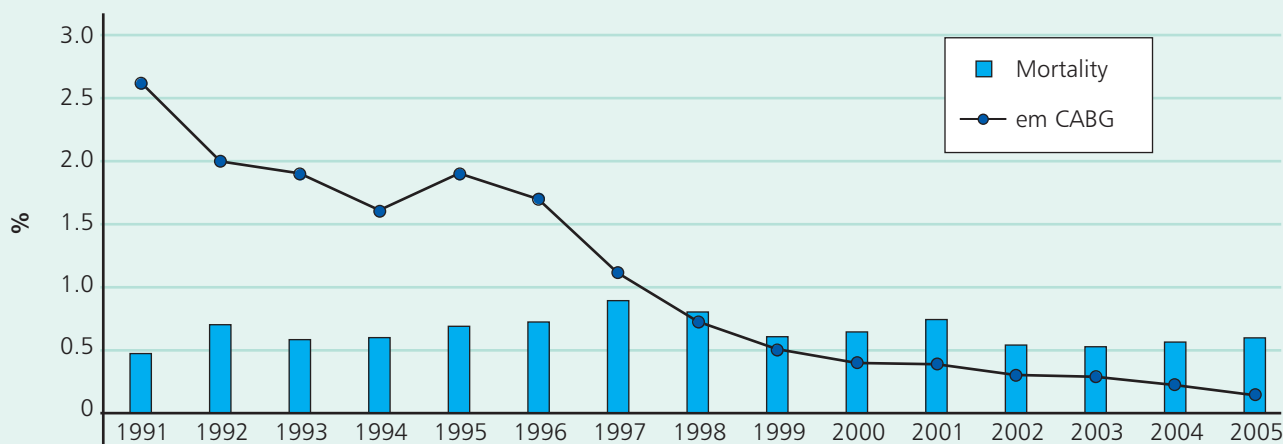


## Outcome

The complications from PCI have fallen progressively as techniques have evolved. Nevertheless this has also meant that the procedure can be offered to patients who are considerably sicker, and in whom a higher risk of complications is expected. The overall

rate of death before discharge from hospital following PCI has remained fairly stable over recent years at around 0.5 to 0.7 per cent, but there has been a marked fall in the need for emergency coronary artery bypass surgery to try to solve a PCI complication, so that in 2005, this occurred in less than 0.2 per cent of all procedures (Figure 12).

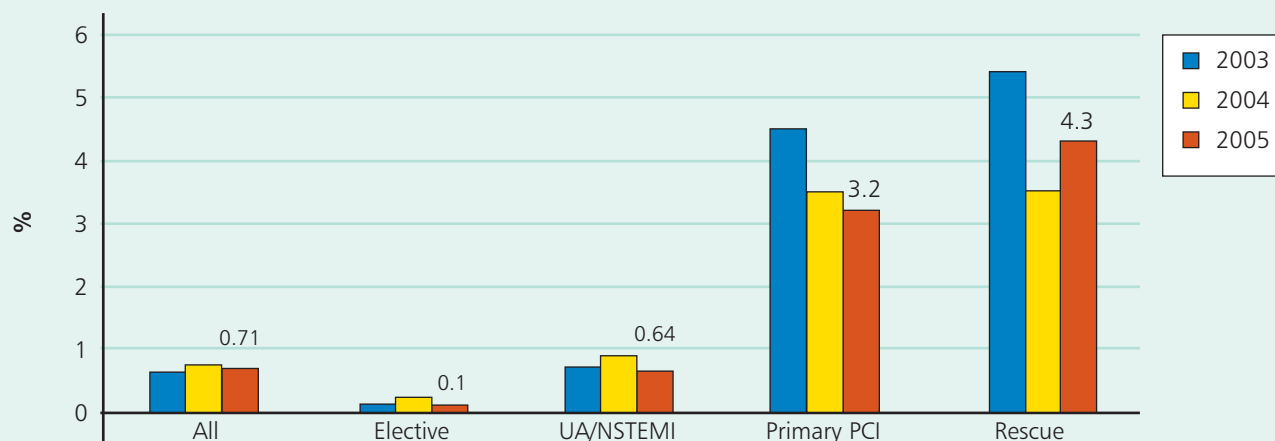
Figure 12: All Procedures: Outcome



It is important to understand that the risk of dying when presenting with coronary disease is largely dependent on the clinical scenario. Some patients have a very high risk of dying from their disease (whether or not a PCI is performed). A coronary angioplasty may well offer them a big reduction in that risk, but nevertheless the overall mortality risk will still be higher than patients who have little chance of succumbing to their disease in the first place.

It is often those at highest risk who have the most to gain from a PCI procedure. The risks in some broadly different groups of patient are shown below (Figure 13), and can be seen to have not altered much over the past few years.

Figure 13: Summary: Mortality. Risk Stratified by Syndrome



'Elective' describes patients who are placed on a waiting list and are therefore admitted routinely from home. The remainder have all been treated during an emergency admission to hospital brought about by unexpected angina. Those with 'UA / NSTEMI' are usually treated urgently, within a few days of admission. Those presenting and treated for primary PCI or Rescue, are much sicker, and need to be treated much more quickly.

Mortality figures presented above are all up to hospital discharge only. The CCAD project allows very accurate tracking of later mortality using the Office of National Statistics tracking via the NHS number. Preliminary results of such an analysis are shown below (Figure 14 and 15).

Figure 14: Survival after Elective PCI. (Tracking performed July 2005)

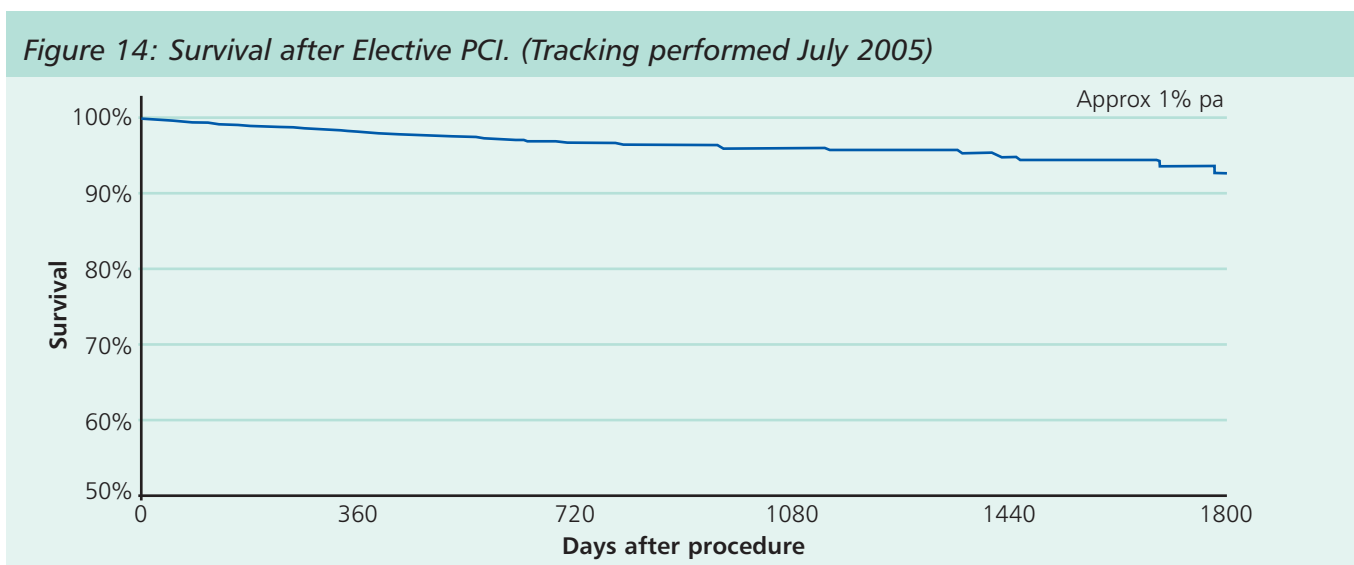
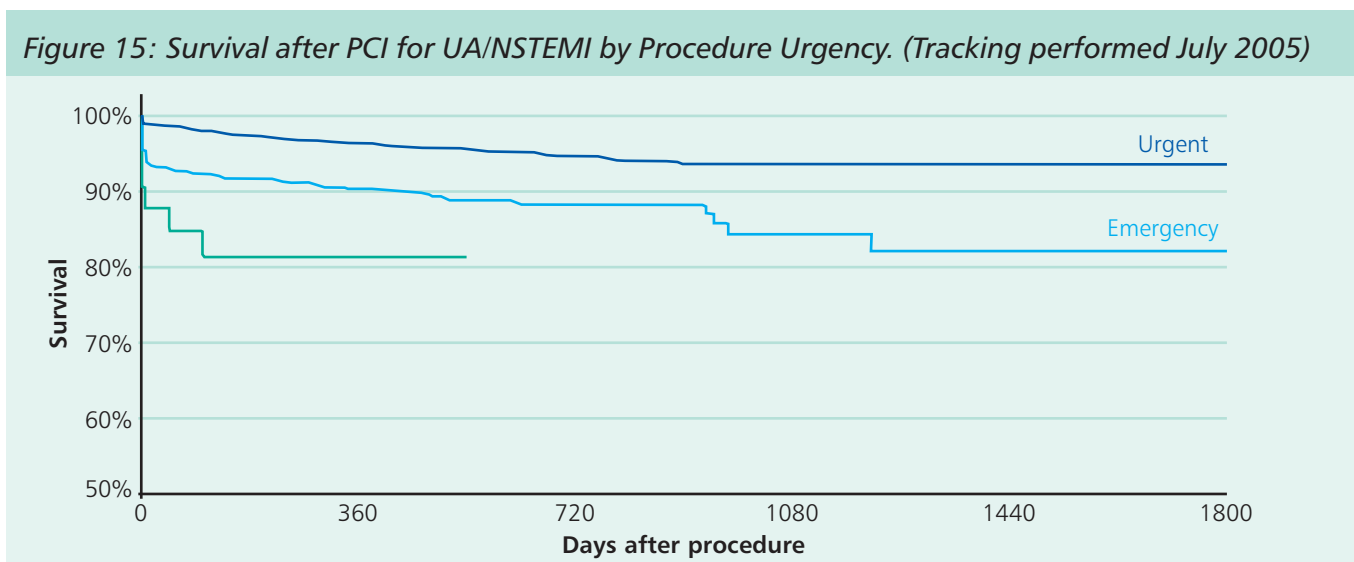


Figure 15: Survival after PCI for UA/NSTEMI by Procedure Urgency. (Tracking performed July 2005)



This method for looking at longer term outcome has enormous potential to give us data about what happens to patients long after they leave hospital,

and cross linking the datasets in CCAD will allow us to observe a much more complete 'patient journey' than has ever been possible in the past.

# 5.0 The Future

To look at PCI procedures in more detail, we plan to make more extensive use of the data collected by CCAD. The first part of this process was to get all hospitals to submit data using this system. As of November 2006, over 80 per cent of NHS units in England and Wales were submitting, and those units outstanding are coming online in the very near future.

The next phase is to optimize the quality of the data submitted. To this end an analysis program has been designed which allows every unit to see their data in CCAD, and to see the precise way calculations are performed on these data to derive the analysis information (some of which presented above). This transparency will allow units to double check the accuracy of their data. This program has been rolled out in October 2006.

In addition, we must make sure that the key items of data are as complete as possible for all units. These data items are those required to perform accurate risk stratified analysis of outcomes. Part of the analysis tool developed above lists the percentage completeness of these specific data items, to make it clear how successful units are at gathering critical parts of the overall dataset.

Once such data are complete we will move to a method of reporting outcomes that is risk stratified.

In addition, we are working to produce process audit. A program is currently being constructed to examine delays to treatment of patients being treated by primary PCI, which is increasingly being used instead of thrombolysis in the treatment of STEMI.

# Glossary

A number of terms are essentially synonymous and used to describe the same procedure: thus a [Coronary Angioplasty](#) is also called a [Percutaneous Coronary Intervention](#), abbreviated to [PCI](#).

[Coronary Artery Bypass Surgery](#), sometimes abbreviated to bypass surgery or CABG

Other abbreviations in alphabetical order:

<b>BCIS</b>	British Cardiovascular Intervention Society
<b>CCAD</b>	Central Cardiac Audit Database
<b>DES</b>	Drug Eluting Stent
<b>IC</b>	Information Centre for health and social care
<b>MINAP</b>	Myocardial Infarction National Audit Project
<b>NCASP</b>	National Clinical Audit Support Program
<b>NSTEMI</b>	Non ST elevation myocardial infarction
<b>STEMI</b>	ST elevation myocardial infarction

# References

- <sup>1</sup> Some patients are treated with a Coronary Artery Bypass Operation (CABG). Another audit describes outcomes for these patients, and a 'public portal' website allows patients to see the results for their local heart surgery centre [<http://heartsurgery.healthcarecommission.org.uk>]. The Healthcare Commission also funds audits of heart attacks, heart failure and other aspects of heart disease.
- <sup>2</sup> NICE TA71: Ischaemic heart disease - coronary artery stents (October 2003)
- <sup>3</sup> NICE TA071: Ischaemic heart disease – coronary artery stents review (October 2003)
- <sup>4</sup> S. N. Doshi, P. F. Ludman, J. N. Townend, N. P. Buller. Estimated annual requirement for drug eluting stents in a large tertiary referral centre, according to new NICE criteria. *Heart* 2004;90; suppl II A41





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