National Audit of Angioplasty Procedures 2010

This is the fifth written report of the United Kingdom National Audit of Percutaneous Coronary Interventional (PCI) procedures. The audit uses mechanisms developed in collaboration with the Central Audit Cardiac Database to collect procedure-specific data based on the current minimum British Cardiovascular Interventional Society (BCIS) dataset (link British Cardiovascular Interventional Society). Annual audits from 1992 are available for download from the BCIS web site, where a more detailed set of analyses relating to this report can also be found. The main objective of this audit is to help improve the care of patients who undergo PCI procedures in the UK. The audit allows clinicians to assess key aspects of the quality of their care when performing these procedures, and compare their results with those from across the UK. The audit is performed by the Audit Lead of the British Cardiovascular Intervention Society (BCIS) with participation from all hospitals performing PCI procedures. The data included in this report relates to procedures performed between 1st January and 31st December 2009. Aimed at healthcare professionals, medical directors, managers and clinical governance leads, the report describes progress to date, key clinical findings and patient outcomes.

Electronic copies of this report can be found at www.ic.nhs.uk. For further information about this report please contact The Information Centre for health and social care's (The IC) Contact Centre 0845 300 6016 or email: enquiries@ic.nhs.uk quoting document reference IC03020111.

Clinical Audit Support Unit (CASU)
The NHS Information Centre for health and social care
1 Trevelyan Square
Boar Lane
Leeds
LS1 6AE

Prepared in partnership with:

The British Cardiovascular Intervention Society (BCIS) BCIS is an affiliated group of the BCS and has charitable status. The Charity's objects are the advancement of education for the benefit of the public by research into coronary angioplasty, cardiac valvuloplasty and other interventional cardiovascular procedures and the dissemination of the useful results of such research.

The Healthcare Quality Improvement Partnership (HQIP) promotes quality in healthcare. HQIP holds commissioning and funding responsibility for the National Angioplasty Procedures Audit and other national clinical audits.

The NHS Information Centre for Health and Social Care (The NHS IC) is England's central, authoritative source of essential data and statistical information for frontline decision makers in health and social care. The NHS IC managed the publication of the 2009 annual report.

National Audit of Angioplasty Procedures 2010

The 2010 report of the National Audit of Percutaneous Coronary Intervention in the United Kingdom. For the audit period between January 2009 and December 2009.

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Foreword

Growth in the number of coronary angioplasties continues in the UK albeit at a slower rate than previously. Although its rate of growth was higher in 2009, service provision remains lower in Wales than elsewhere in the UK. Much of the growth is due to an increase in both emergency and urgent clinical work in the setting of acute coronary syndromes, which accounts for 80% of all activity in some units. Primary angioplasty is now the preferred reperfusion therapy for patients with ST elevation myocardial infarction (STEMI) and although the country has made great strides to change from a strategy of thrombolysis we have not yet provided the level of coverage required. Further growth over the next few years is likely. Some centres have become designated heart attack centres and some are not. It is important for us to recognise these differences in case mix when comparing unit outcomes.

The national audit exercise is dependent on good information. We have identified key variables that allow us to utilise a validated risk model so that we can make allowances for variation in case mix. We congratulate all hospitals that perform PCI that have engaged with this process, although 5 NHS centres and the majority of private centres have failed to provide information. Overall, though, we have seen year on year improvements in data completeness.

Apart from differences in the provision of services across the UK, we can observe other variations. The reasons for these differences have not been analysed but, for example, the use of drug-eluting stents (which have a lower rate of restenosis) is lowest in Scotland. Whether this represents true differences in the population, more astute targeting of this technology on those most likely to benefit, or practice related to resource restrictions is unknown. We do not know as yet whether this variation results in differing requirements for repeat revascularisation procedures. There is also considerable variation in the uptake of the radial arterial approach to angioplasty, with a growing evidence base that this is associated with fewer complications than the femoral approach.

The maturation of the data collection exercise now allows us to provide risk-adjusted outcome data for individual units and the encouraging thing for commissioners and patients is that on this quality marker, all units are performing either as well as or better than expected.

Although considerable work has been done to switch to a primary angioplasty programme for STEMI, there is considerable variation in both door-to-balloon and call-to-balloon times, both measures of process that affect outcomes. Those centres with poor times need to learn from centres that are performing well and hopefully this variance will reduce over the next few years.

The annual collation of data and its analysis are down to the formidable work of Peter Ludman, Lead for the BCIS Data Monitoring and Analysis Group, and the support provided by David Cunningham and Nadeem Fazal of the Central Cardiac Audit Database (CCAD). We are also very grateful to Andrew Donald for the work that enables us to feed regular reports to individual centres, providing constant feedback on their activity, clinical processes and outcomes. Participation in this rolling national audit programme enables all centres to constantly review their performance and strive to improve when established markers of quality are not being met.

Mark de Belder
President, British Cardiovascular Society

Acknowledgements

The National Percutaneous Coronary Intervention Audit has been developed and run by the British Cardiovascular Intervention Society (BCIS) since 1988 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 Lead, Dr Peter Ludman, author of the National Coronary Angioplasty Audit.

Peter F Ludman MA MD FRCP FESC
Consultant Cardiologist,
Queen Elizabeth Hospital,
Birmingham, UK
Audit Lead for the British Cardiovacular Intervention Society

We would like to acknowledge the important contribution of NHS Trusts and the individual clinicians, nurses and audit teams who are participating in this audit.

1 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 (a minority treated by coronary artery bypass surgery). 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 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 patterns and quality of their care when performing coronary angiogram and PCI. This is a United Kingdom wide audit performed by the Audit Lead of the British Cardiovascular Intervention Society (BCIS). The audit is funded by the Healthcare Quality Partnership (HQIP). This audit is enhanced by the Central Cardiac Audit Database (CCAD) which allows electronic transfer of much more detailed information. This data collection and analysis for centres in England and Wales has project management and specialist IT support provided by the Clinical Audit Support Unit (CASU), which is part of the NHS Information Centre for health and social care (The IC).

Key findings

- There are now 105 PCI centres in the United Kingdom
- The number of PCIs in the UK was 1,345 per million population (pmp). These numbers remain less than in most other developed European countries. The number of angiograms and PCI procedures are also less than that recommended by the British Cardiovascular Society (BCS), but both exceed the numbers expected by the National Service Framework (NSF) for Coronary Heart Disease. For PCIs, the NSF target in 2000 was 750 pmp, and the BCS 2003 target was 1,400 pmp, with expectations that the level might need to be 2-3,000 pmp.
- There has been an increase in PCI activity in all the UK countries. Wales still has the lowest rate at 1200 pmp compared with the highest in Northern Ireland at 1704 pmp.
- For the past 4 years the rate of increase in overall number of PCI procedures performed remains at the lowest level since records began in 1992, at under 5%.
- The rate of primary PCI (to treat ST elevation MI in place of thrombolysis) continues to rise, and reached 221 pmp in 2009. This treatment option was provided 24/7 by 56 of the 88 NHS PCI centres.
- Centre size: there is evidence that suggests improved outcomes for patients being treated in higher volume PCI centres, particularly those that perform at least 400 procedures pa. This forms part of the recommendations of the Joint Working Group on PCI of BCIS and the British Cardiovascular Society.[1] In 2009 20% of PCI units were performing 400 or less cases pa, but the majority of these were new units undertaking a gradually increasing volume of work.
- 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".[2] The great majority of procedures do now involve stent insertion (95 per cent), suggesting that this aspect of good practice is being met.
- Following concerns about the safety of drug eluting stents in September 2006, there was a fall in their use to 55 per cent across the UK. Data from 2009 suggest an increase in their use now that safety issues are better understood, and are not dissimilar from what might be predicted from the National Institute for Health and Clinical Excellence (NICE) updated guidelines.[3,4] Nevertheless there are large differences in the rate of DES use in the different UK countries.
- The use of the radial artery for access has increased progressively from 10% in 2004 to 43% in 2009. This audit analysis supports the literature demonstrating a lower complication rate when PCI is performed via their radial artery, with approximately a halving of access site related complications.
- The overall rate of death before discharge from hospital following PCI has gradually risen over the past few years. This is due to a change in case mix. There has been no evidence of a change in the outcomes when patients in similar clinical presentations are compared. For stable elective patients, in hospital mortality is less than 0.15 %, for patients with unstable angina or NSTEMI, the in hospital mortality is less than 0.6 per cent. For patients with STEMI the mortality is higher at about 4 per cent.
- Analysis of risk adjusted outcome (major adverse cardiac and cerebrovascular events) from the 2007, 2008 and 2009 data combined shows that all units in the United Kingdom are performing as well or better than would be predicted from the model used for risk adjustment.
- National and International guidelines recommend that in the emergency treatment of patients with ST elevation MI, angioplasty treatment should be performed within 90 minutes of arrival of the patient at the angioplasty site (DTB time), and within 150 minutes of a patient's call for help (CTB time). The data for units performing PPCI for STEMI are presented as funnel plots. A DTB < 90 min was achieved in 87.3%, and CTB < 150 min in 75.3% of cases. This compares very favourably with international statistics.
- Patient who need to be transferred between hospitals for primary PCI had longer delays than those admitted direct to a PCI centre.
- There has been a further improvement in the number of centres sending data to CCAD for electronic collection and analysis, and a marked improvement in the quality of data submitted.

The rest of this report contains more details and graphs of the audit findings. The complete set of data from the 2009 audit was presented at the British Cardiovascular Intervention Society's annual meeting (BCIS) in autumn 2010 and is available for download at the society's website www.bcis.org.uk.

2 Data completeness

Of 88 NHS PCI centres in the UK, all but 5 submitted data for 2009 activity to CCAD. The centres that failed to submit were 3 English centres (Queen Elizabeth Hospital Woolwich, Ealing Hospital London and Kings Mill Hospital Nottinghamshire), 1 Scottish Centre (Hairmyers Hospital), and 1 centre in Northern Ireland (Belfast City Hospital). Five of 17 private hospitals in the UK also submitted data via CCAD.

There has been a further improvement in the completeness of the fields for each of the procedures entered into CCAD for the 2009 data. The actual percentage completeness for hospitals in England and Wales is listed below:

Table 1
Data completeness for PCI units in England and Wales 2009

		Hospital	Date of Birth	Sex	Medical History	Pre-procedure shock	Procedure urgency	Vessels treated	Renal disease	Diabetes	Discharge date	Discharge status	PCI hospital outcome	NHS number
England	nhs	AEI. Royal Albert Edward Infirmary	99.5	99.8	95.2	100	100	92.4	99.3	98.9	100	100	95.7	97.5
England	nhs	AMG. Wycombe General Hospital	99.8	99.6	61.8	100	100	100	98.9	99.2	52.1	55.6	100	99.1
England	nhs	BAL. Barts and the London	100	100	97.5	99.6	99.9	99.4	99.3	99.4	97.7	94	93.2	90.8
England	nhs	BAS. Basildon Hospital	100	100	90.7	98.2	100	100	84.7	97	92.1	96.7	100	99
England	nhs	BAT. Royal United Hospital Bath	100	100	30.3	99.2	100	100	88	79.4	52.2	52.5	100	96.6
England	nhs	BHH. Rochdale Infirmary	100	99.8	100	100	100	100	100	99.8	98.9	100	98.3	99.6
England	nhs	BHL. Liverpool Heart and Chest Hospital	100	100	100	100	100	100	99.9	99.9	100	100	100	99.6
England	nhs	BHR. Royal Berkshire and Battle Hospital	100	100	100	100	100	100	100	100	100	100	100	99.1
England	nhs	BOU. Royal Bournemouth General Hospital	100	100	94.9	100	100	100	98.9	99.6	99.4	100	100	99.6
England	nhs	BRD. Bradford Royal Infirmary	100	99.6	100	100	100	98.9	99.6	99.6	100	100	99.6	96.5
England	nhs	BRI. Bristol Royal Infirmary	100	99.8	95	100	99.6	99.5	99.4	99.5	100	99.3	100	99.5
England	nhs	CGH. Conquest Hospital	100	100	100	100	100	100	100	100	100	100	100	100
England	nhs	CHG. Cheltenham General Hospital	100	100	99.8	100	100	96.9	98.8	99.7	100	100	91.6	99.7
England	nhs	CHH. Castle Hill Hospital	100	100	98.4	100	100	100	100	100	100	100	100	95.8
England	nhs	CHN. Nottingham City Hospital	100	100	58	95.2	100	100	77.5	81.4	100	100	100	99
Wales	nhs	CLW. Glan Clwyd DGH Trust	100	100	96.2	100	100	100	99.5	80.4	97.8	98.9	100	100
England	nhs	DER. Derby Royal Infirmary	100	100	97.6	100	100	100	99.8	100	94.5	99.3	99.5	100
England	nhs	DGE. Eastbourne DGH	100	100	100	100	100	100	100	100	100	100	100	99.6
England	nhs	DUD. City Hospital	100	100	100	100	100	97	100	100	100	100	100	98.3
England	nhs	DVH. Darent Valley Hospital	100	98.9	96	98.9	100	100	84.7	80.8	98.3	98.3	100	99.4
England	nhs	EAL. Ealing Hospital	No data											
England	nhs	EBH. Birmingham Heartlands Hospital	100	99.7	94.3	98	100	97	95.2	94.7	95	97.5	92.7	95.8
England	nhs	ESU. East Surrey Hospital	100	99.4	100	93.7	99.7	98.7	91.9	91.6	100	100	100	95.9
England	nhs	FRE. Freeman Hospital	100	100	97.7	98.3	100	98.1	96.8	99.1	100	100	100	99.9
England	nhs	FRM. Frimley Park Hospital	100	100	100	100	100	100	100	100	100	100	100	99.1
England	nhs	FRY. Frenchay Hospital	99.5	96.7	100	100	100	100	96.3	99.1	100	99.5	98.1	98.6
England	nhs	GEO. St George's Hospital	100	100	99.6	100	100	100	99.8	99.9	100	99.9	100	83
England	nhs	GRL. Glenfield Hospital	100	100	99.6	100	100	99.9	99.1	99.6	99.5	99.5	99.5	99.3
England	nhs	GWH. Queen Elizabeth Hospital, Woolwich	No data											

Table 1 continued
Data completeness for PCI units in England and Wales 2009

		Hospital	Date of Birth	Sex	Medical History	Pre-procedure shock	Procedure urgency	Vessels treated	Renal disease	Diabetes	Discharge date	Discharge status	PCI hospital outcome	NHS number
England	nhs	HAM. Hammersmith Hospital	99.9	99.9	100	100	100	94	78.2	70.9	100	99.9	100	90.2
England	nhs	HH. Harefield Hospital	100	99.9	98.4	98.8	100	99.8	98	99.2	99.4	99.6	95.8	95.2
England	nhs	HHH. Hemel Hempstead General Hospital (legacy)	100	100	0	100	100	0	96.3	100	70.4	70.4	0	96.3
England	nhs	HRI. Hull Royal Infirmary (legacy)	100	100	100	100	100	100	100	100	100	100	100	94.5
England	nhs	KCH. King's College Hospital	100	100	97.1	99.6	99.9	96.4	95.6	98.3	99	99.3	95.3	97.2
England	nhs	KGH. Kettering General Hospital	100	99.7	100	100	100	99.8	100	100	99	100	100	99.7
England	nhs	KMH. Kings Mill Hospital	No data											
England	nhs	KSX. Kent & Sussex Hospital	100	98	91.8	100	100	100	100	86.9	3.3	4.1	100	86.1
England	nhs	LGI. Yorkshire Heart Centre	100	99.9	97.1	100	100	99.5	95.4	98.5	99.7	99.8	99.7	99.2
England	nhs	LIN. Lincoln County Hospital	100	100	100	100	100	100	88.3	87.6	100	100	100	100
England	nhs	LIS. Lister Hospital	100	99.5	98.5	99.6	100	100	98.8	99.5	99.3	100	100	100
England	nhs	MAY. Mayday University Hospital	100	100	100	100	100	97.3	74.9	85.9	100	100	76.4	99.3
Wales	nhs	MOR. Morriston Hospital	100	100	91.5	99.3	100	98.6	96.2	98.1	100	95.2	98.2	98.2
England	nhs	MPH. Taunton & Somerset	99.7	99.7	100	100	100	97.4	98.8	100	99.7	99.7	97.4	97.8
England	nhs	MRI. Manchester Royal Infirmary	100	99.9	100	99.9	100	99.6	97.6	96.5	99.9	99.9	95.8	97.1
England	nhs	NCR. New Cross Hospital	100	100	98.3	99.7	100	100	99.3	99.7	98.3	99	96.2	97.5
England	nhs	NGS. Northern General Hospital	100	100	99.9	99.8	99.9	100	100	99.7	99.7	99.7	99.8	99.7
England	nhs	NHB. Royal Brompton Hospital	100	99.9	99.8	96.8	100	99.8	98.6	99.6	97.7	99	99.5	83.8
England	nhs	NHH. North Hampshire Hospital	100	100	100	83	100	100	88.6	76.6	100	100	100	95.2
England	nhs	NOR. Norfolk & Norwich Hospital	100	100	98	100	99.8	99.9	92.9	99.3	93	100	95	99.1
England	nhs	NPH. Northwick Park Hospital	100	100	99.8	11.8	99.7	94.4	67.4	76.4	68.6	90.5	99.5	84.7
England	nhs	NTH. Northampton General Hospital	100	100	99.7	7.4	93.4	97.7	89.5	91.1	63.5	93.3	100	99.7
England	nhs	PAP. Papworth Hospital	100	100	92.9	100	99.9	100	98.5	100	100	100	100	97.6
England	nhs	PLY. Derriford Hospital	100	100	91.2	98.2	100	100	93.1	92.8	100	100	100	99.5
England	nhs	PMS. The Great Western Hospital	100	100	97.6	100	100	100	94.8	97.6	98.8	98.8	99.3	100
England	nhs	QAP. Queen Alexandra Hospital	100	99.7	99.3	100	100	99.4	99.5	99.5	99.2	99.6	94.6	99.2
England	nhs	QEB. Queen Elizabeth Hospital Edgbaston	100	100	100	100	100	100	100	100	100	100	100	99.1
England	nhs	RAD. John Radcliffe Hospital	100	99.9	100	100	100	100	99.6	85.9	100	99.9	100	98.9
England	nhs	RCH. Royal Cornwall Hospital	100	100	99.7	100	100	99.9	99.5	100	100	100	100	96.6
England	nhs	RDE. Royal Devon & Exeter Hospital	100	99.9	100	96.8	100	97.3	99.4	99.8	100	100	100	99.4
England	nhs	RFH. Royal Free Hospital	100	100	100	100	99.6	97.6	100	100	100	100	100	98.4
England	nhs	RSC. Royal Sussex County Hospital	100	100	96.7	100	100	97.9	96.5	98	100	99.7	100	99.5
England	nhs	SAN. Sandwell District General Hospital	100	100	100	100	100	96.3	100	100	100	100	99.8	99.5
England	nhs	SCM. James Cook University Hospital	100	100	99.6	100	100	100	98.5	99.8	100	99.9	100	99.8

Table 1 continued
Data completeness for PCI units in England and Wales 2009

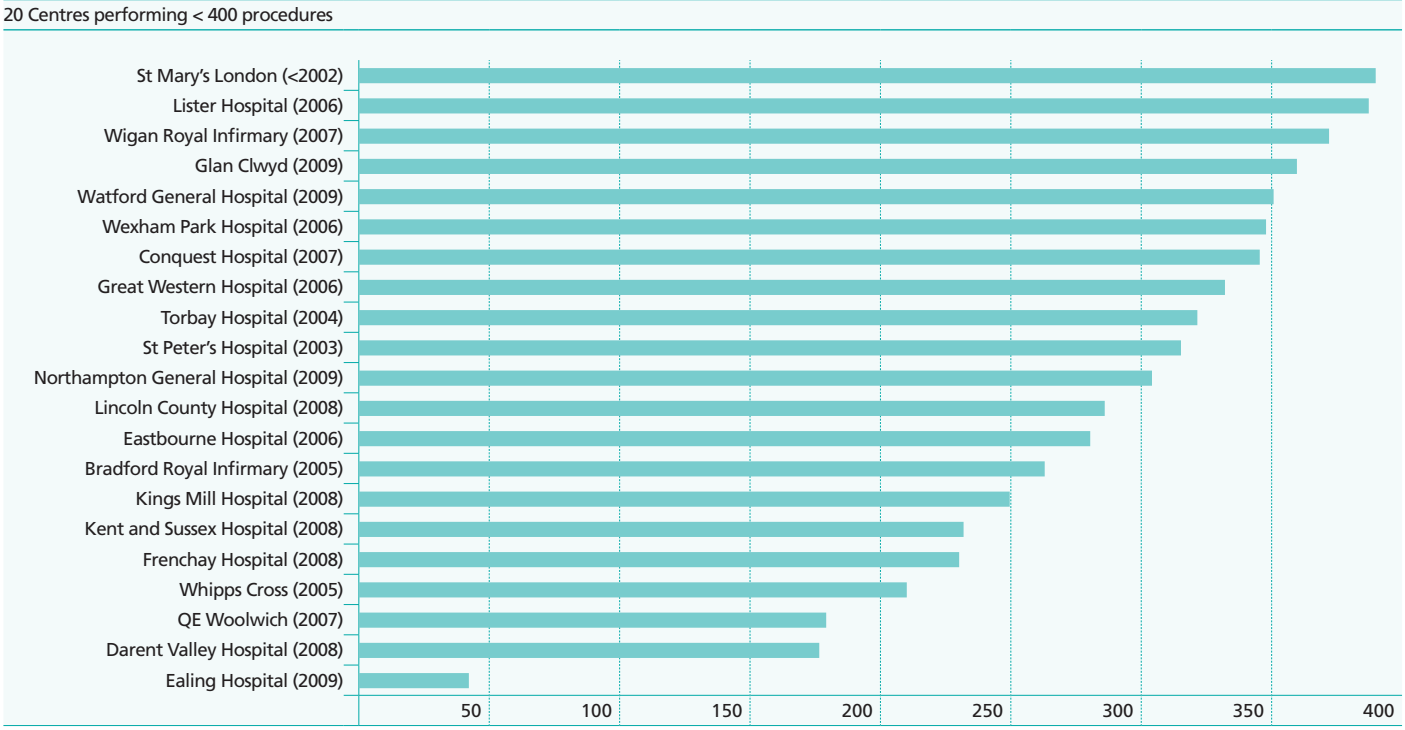
		Hospital	Date of Birth	Sex	Medical History	Pre-procedure shock	Procedure urgency	Vessels treated	Renal disease	Diabetes	Discharge date	Discharge status	PCI hospital outcome	NHS number
England	nhs	SGH. Southampton General Hospital	100	99.7	90.4	100	100	99	99.7	99.9	100	100	99	100
England	nhs	SPH. St Peter's Hospital	100	100	100	100	100	100	100	100	100	100	100	95.5
England	nhs	STH. St Thomas' Hospital	100	100	99.2	100	100	100	95	96.7	100	100	100	95.2
England	nhs	STM. St Mary's Hospital	100	99.5	99.5	100	100	89.7	98.5	100	99	100	100	93
England	nhs	STO. North Staffordshire Hospital	99.8	97.9	99.7	100	100	97.6	95.6	98.3	99.8	99.4	94.3	95.8
England	nhs	SUN. Sunderland Royal Hospital	100	100	100	100	100	100	99.8	100	100	100	100	100
England	nhs	TOR. Torbay Hospital	100	99.7	99.1	98.8	100	99.7	99.7	99.7	99.7	99.7	99.7	99.4
England	nhs	UCL. University College Hospital	100	100	100	100	100	100	99.6	97.6	96.9	99.7	100	92.4
Wales	nhs	UHW. University Hospital of Wales	100	100	99.1	99.8	99.9	99.7	99.8	99.8	97.9	99.3	98.9	97.2
England	nhs	VIC. Victoria Hospital	99.9	99.9	99.9	98.4	99.7	92.4	100	100	96.9	100	100	98.9
England	nhs	WAL. Walsgrave Hospital	100	100	96.8	100	100	100	97.9	99.8	100	100	99.9	98.5
England	nhs	WAT. Watford General Hospital	100	100	100	98.5	99.4	99.7	99.7	99.7	99.7	100	100	100
England	nhs	WDH. Dorset County Hospital	100	99.8	91.1	100	99.8	98.8	99.3	99.4	98.9	98.9	98.8	98.5
England	nhs	WEX. Wexham Park Hospital	100	100	100	100	100	100	100	100	100	100	100	99.4
England	nhs	WHC. Whipps Cross University Hospital	100	100	93.1	100	100	100	100	72.2	99.5	100	100	96.3
England	nhs	WHH. William Harvey Hospital	100	99.8	97	97	99.5	98.8	95.3	92.1	93.3	99.8	96.5	97.8
England	nhs	WRC. Worcestershire Royal Hospital	100	100	100	100	100	100	100	100	100	100	100	100
England	nhs	WRG. Worthing Hospital	100	100	83.9	100	100	100	98	99.8	98.7	98.7	100	99.1
England	nhs	WYT. Wythenshawe Hospital	100	100	100	100	100	100	100	100	100	100	100	99.7

3 Infrastructure

The number of sites performing percutaneous coronary intervention has not changed since 2008, but there has been a fall in the number of sites performing angiography only. Thus in the United Kingdom there were a total of 105 PCI centres, and 76 angiography only centres in 2009. There are data from many countries that suggest improved outcomes for patients being treated in higher volume centres, particularly those that perform at least 400 procedures per annum. This recommendation therefore forms part of the report by the Joint Working Group on Percutaneous Coronary Intervention of the British Cardiovascular Intervention Society and the British Cardiovascular Society entitled 'Recommendations for good practice and training'[1].

The majority of units perform considerably greater numbers than 400 pa. The percentage performing less than 400 has fallen since 2008 to 20%, and these units are shown in figure 3.1 below. In the majority of cases this is because the unit is new, and undertaking a gradually increasing volume of work. The start date for the unit's PCI program can be seen in the figures.

Figure 3.1
Centres performing less than 400 PCI procedures in 2009, and the start year of the PCI program.



4 PCI rates in the United Kingdom

There was a total of 83,130 PCIs performed in the calendar year 2009. This represents a rate of 1,345 PCI pmp.

While the most appropriate rate of PCI pmp is difficult to judge, and will depend on many factors including the varying demographic profiles of populations in different countries, the UK has a lower rate than most of the rest of the developed European countries. The rate of increase in PCI in the UK over the last 4 years remains at its lowest level that at any time since records began in 1992, at under 5%.

There remain large differences in PCI rates between the UK countries, with the lowest provision in Wales at 1200 pmp compared with the highest in Northern Ireland at 1704 pmp. However the biggest increase in provision since 2007 has been in Wales (Figure 4.2).

Figure 4.1
Graph of absolute number of PCIs and rates pmp.

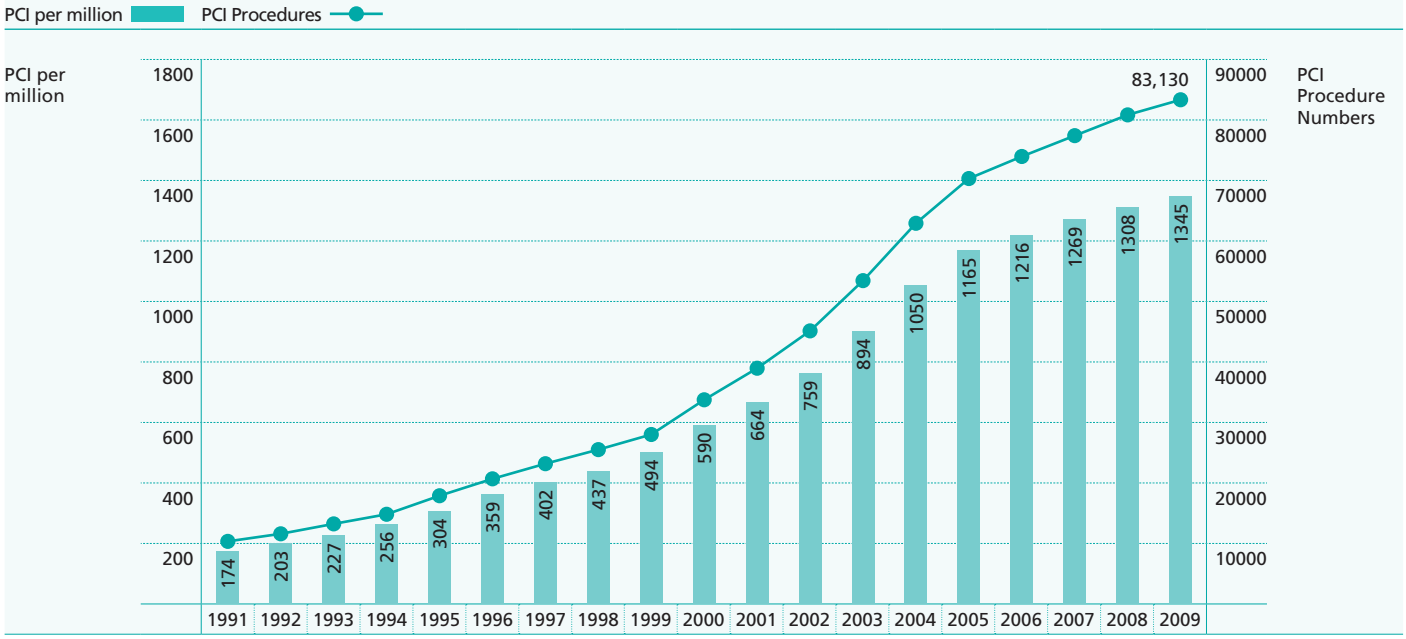
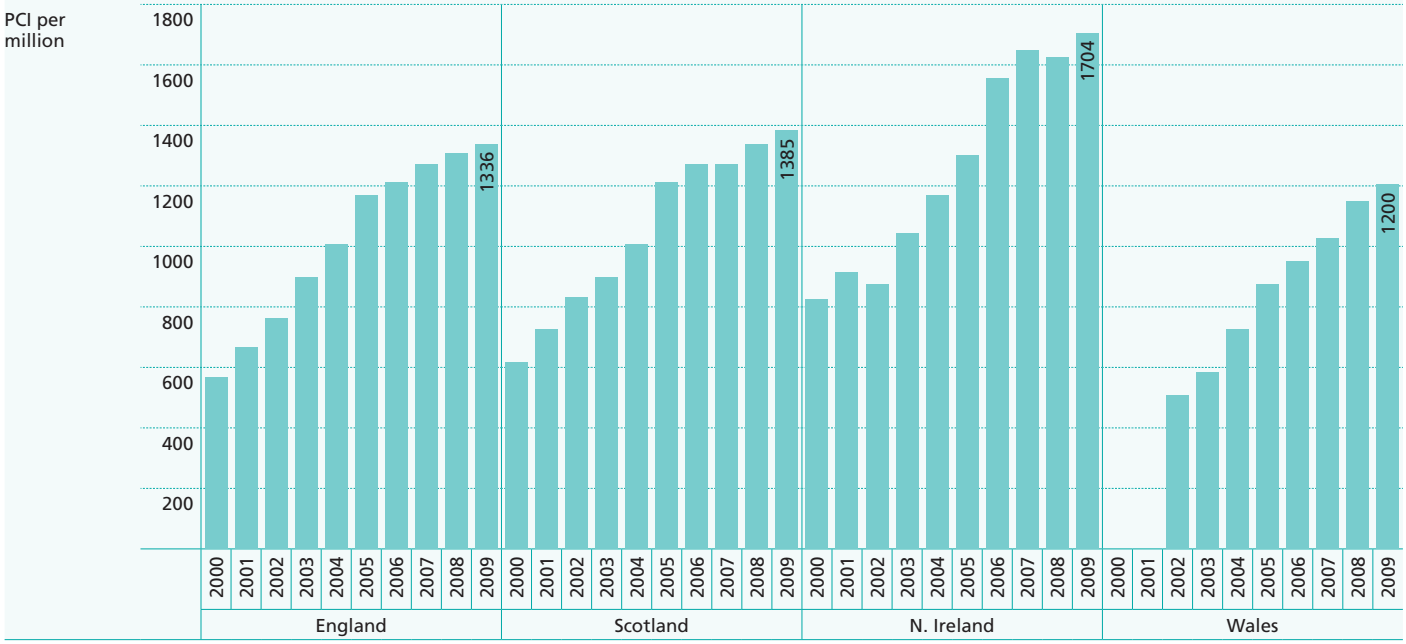


Figure 4.2
PCI activity per million population in the UK countries.



There has been a further increase in the use of primary PCI in place of thrombolysis to treat patients presenting with ST elevation MI. As with overall PCI rates, there are differences in the provision of primary PCI between the UK countries, with Wales again having the lowest rates per million population, but the largest rate of increase (figure 4.3). The growth in the use of PPCI in the UK is extremely fast, and if all patients with STEMI were treated by PPCI we might expect a rate of approximately 500 to 700 pmp.

There has been an increase in the number of centres offering primary PCI as a treatment for ST elevation myocardial infarction, 76 or 88 NHS centres offering this service during normal working hours, and 56 of the 88 offering the service at all hours. A map showing the distribution of this activity across the UK is given in Figure 4.4.

Figure 4.3
Rates of Primary PCI activity for ST elevation MI, per million population in the UK countries

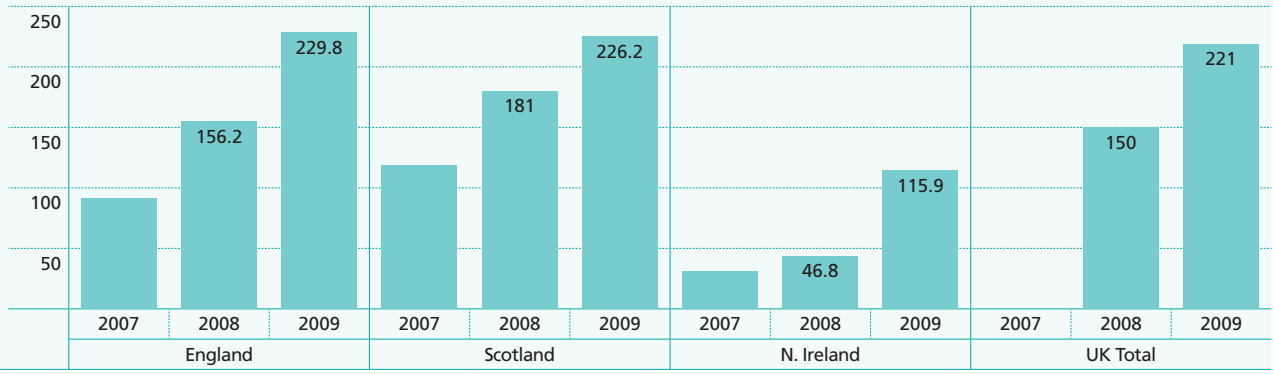
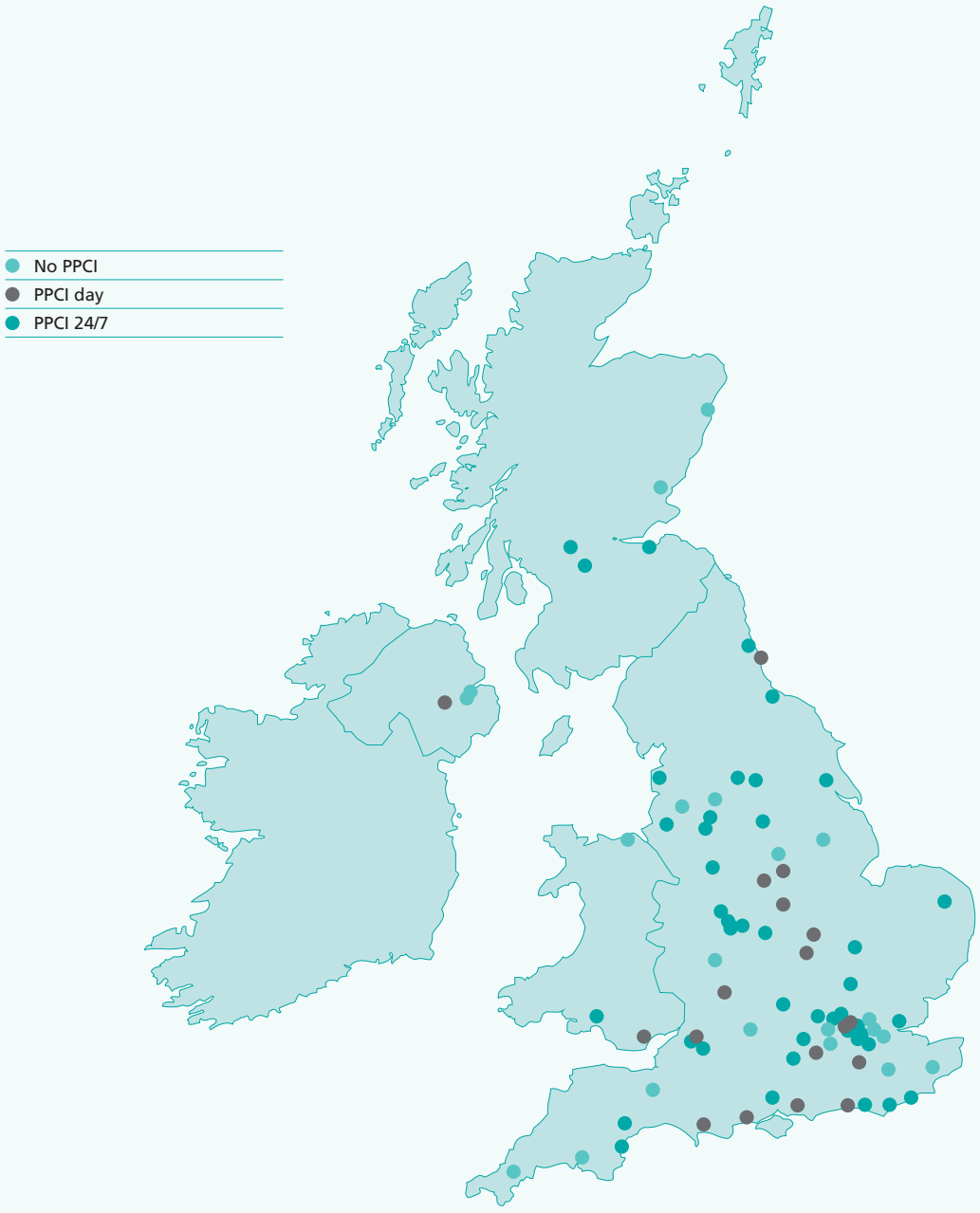


Figure 4.4
PCI centres and their provision of primary PCI therapy across the UK



5 Demographics

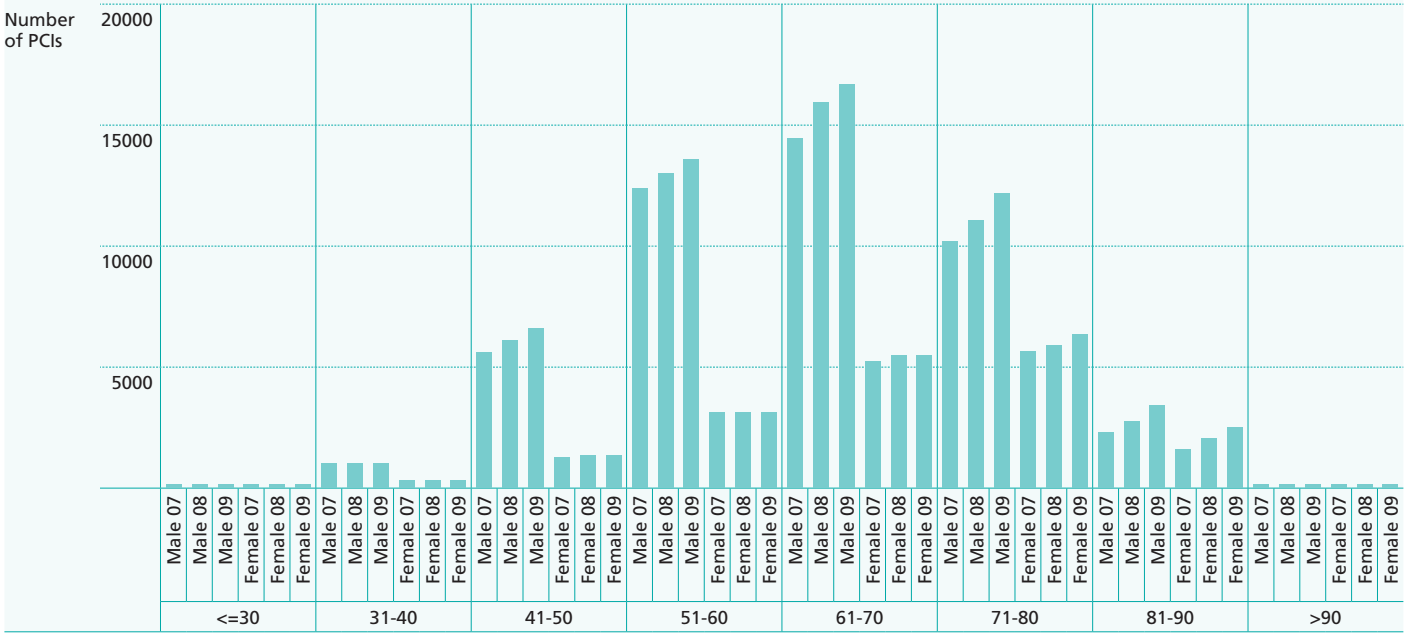
The characteristics of the patients being treated by PCI are displayed in figures 5.1 and 5.2

Figure 5.1

	2007	2008	2009
Age (mean)	**64.3 years**	**64.4 years**	**65.0 years**
Sex (male)	73.6%	73.8%	73.9%
Diabetic	17.5%	18.0%	18.2%
Previous CABG	8.5%	9.1%	8.6%
Previous PCI	18.6%	21.1%	22.3%
Previous MI	29.5%	30.2%	28.8%

Figure 5.2

Male mean = 63.7 Female mean = 68.7



6 Stents

Overall use of stents remains high at 92%. There has been a gradual increase in the percentage of patients treated with drug eluting stents now that initial concerns about long term safety have been better understood. The percentage use seems to have levelled off at approximately what might have been predicted if units were following recommendations from current NICE guidance, (figure 6.1) though there are very large differences in practice in the different UK countries (figure 6.2).

Figure 6.1
PCI with Drug Eluting Stents (mean of % use by Centres).

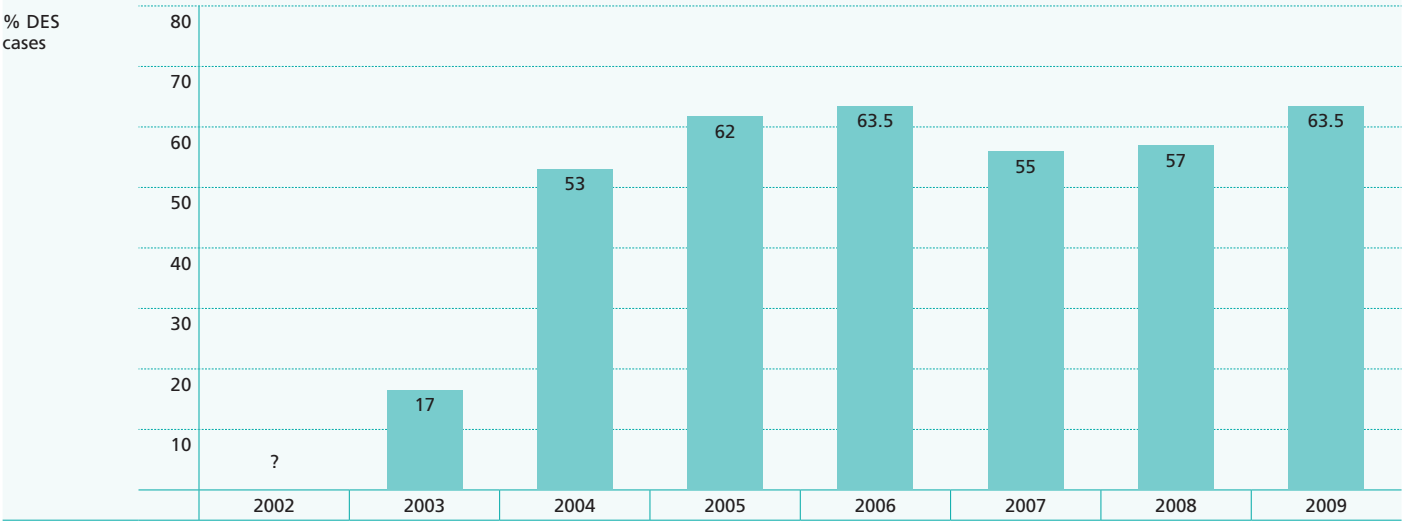
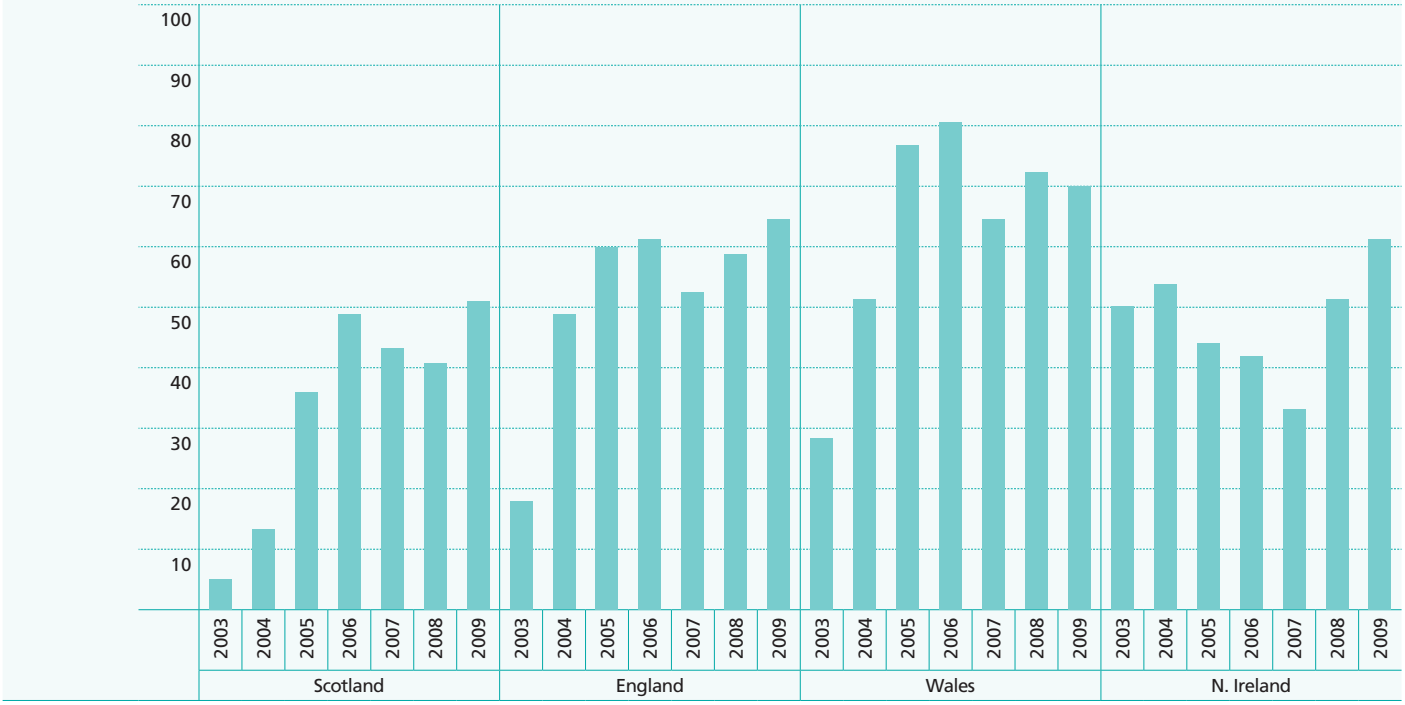


Figure 6.2
DES (Drug Eluting Stent) use by country.



7 Arterial Access route

When performing coronary intervention, catheters (thin tubes) are introduced to the patient's arterial system, so that the coronary arteries can be reached and treated. Initial access to the coronary arteries was achieved using the femoral artery at the top of the leg. However some of the commonest complications after PCI relate to difficulty stopping this artery from bleeding after the equipment has been removed at the end of the procedure. As PCI equipment has become smaller, it has been possible to perform almost all PCI from the radial artery at the wrist.

Robust data shows that this is associated with fewer complications, as it is easier to stop any bleeding, and there are fewer nearby structures that can be damaged. There are particular methods needed to use the radial artery, and thus some additional training is needed for those used to the femoral method. Nevertheless there has been an increasing adoption of this method as can be seen from figure 7.1.

The hoped for reduction in complication rates does appear to born out (figure 7.2).

Figure 7.1
The increasing adoption of the radial artery as access site for PCI in the UK.

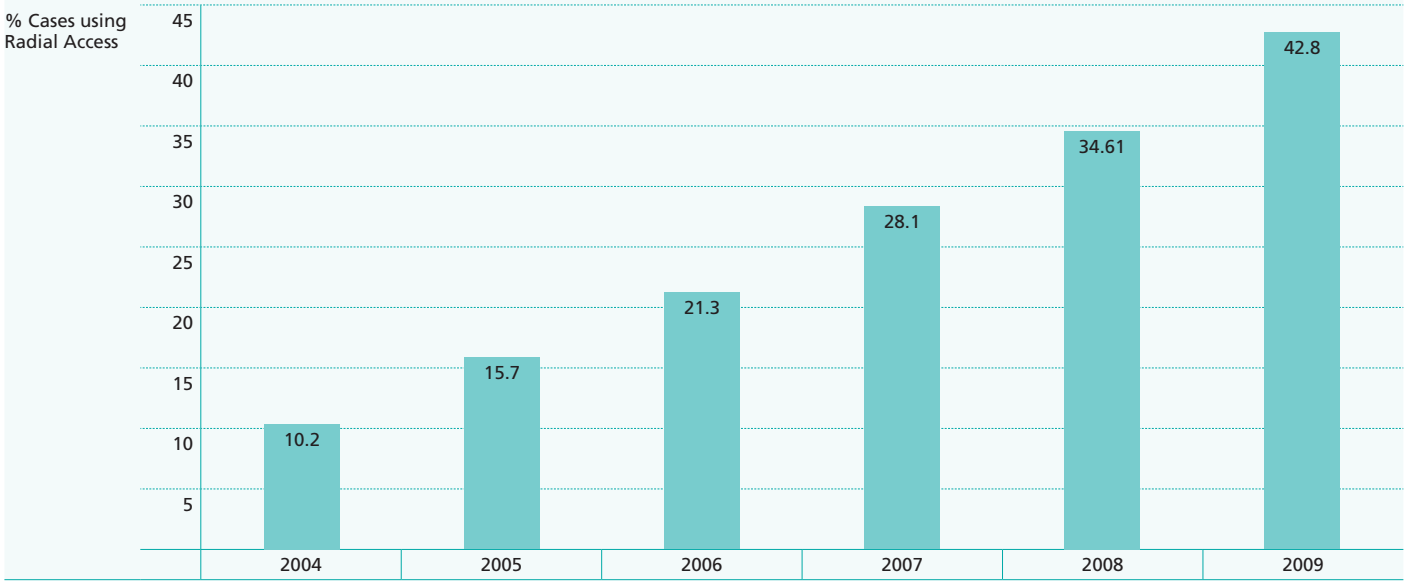


Figure 7.2
Access site complication rates in PCI using femoral access versus radial access.

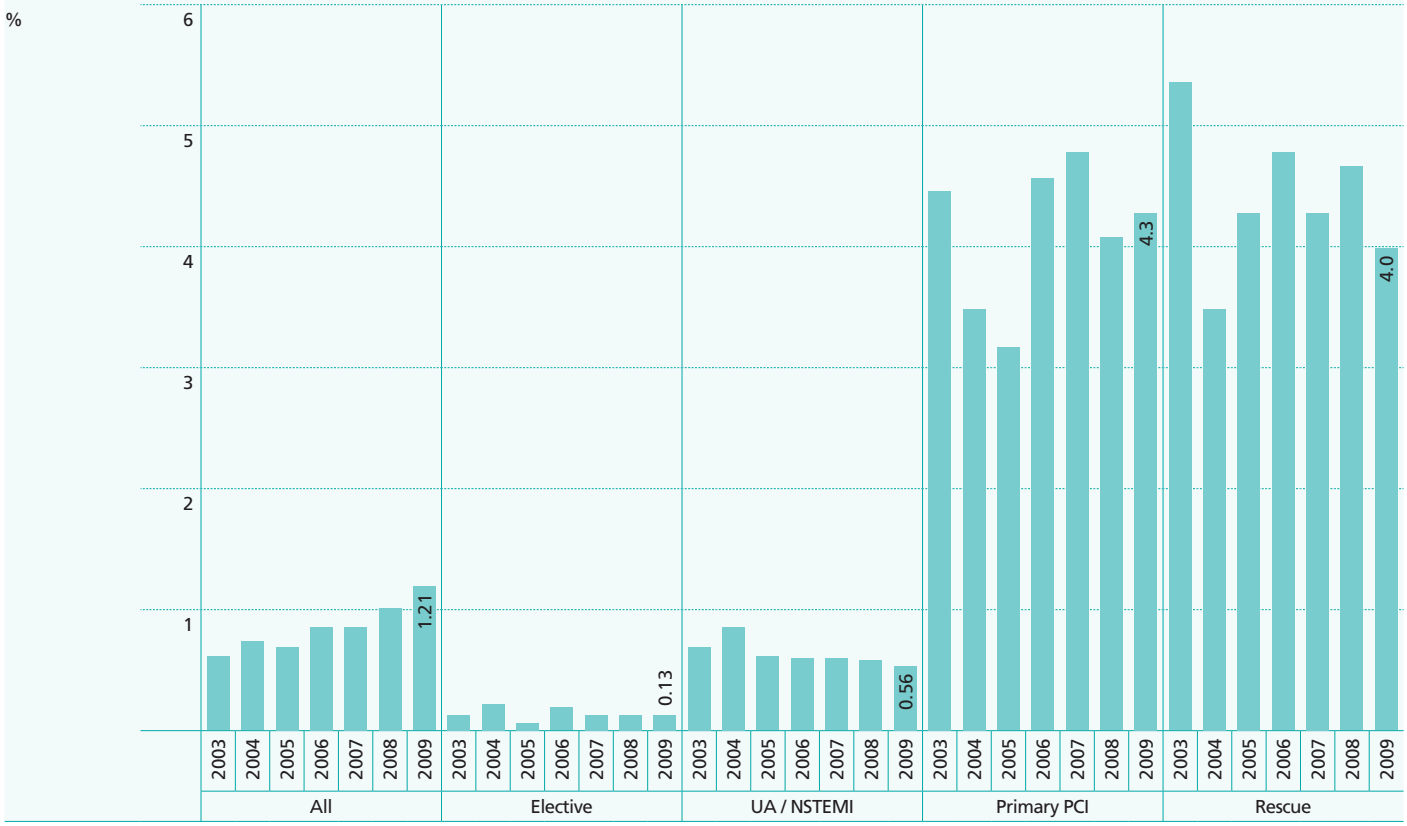
Complications to hospital Dx: False aneurysm, Haemorrhage (retroperitoneal, delay Dx, surgery), Art occlusion / dissection, Any need for surgery

8 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 rate of requirement for emergency CABG remains very low at less than 1%. The overall rate of death before discharge from hospital following PCI has, however, gradually increased over the past few years.

By looking at mortality for each of the major presenting syndromes it can be seen that the outcomes for each of these groups have remained stable (figure 8.1). Thus the increase in overall mortality is due to an increasing proportion of sicker patients being treated by PCI. This change in case mix is being driven by a big increase in the use of emergency PCI to treat ST elevation MI, primary PCI (figure 8.2).

Figure 8.1
Outcome by syndrome



Overall the percentage of PCI for STEMI has doubled over the last 4 years, with a fall in the percentage of patients with stable angina falling from about 50% to 40%, while the percentage with Non ST elevation acute coronary syndromes has remained level at about 38% (Figure 8.3).

This analysis clearly demonstrates the importance of risk adjustment in the assessment of outcome to help avoid misleading conclusions. To assess the performance of all UK units PCI centres, we analysed their outcome data for a 3 year period (2007, 2008 and 2009 data combined). The North West Quality Improvement Program (NQWIP)5 model was used to adjust for varied case mix. The results of this analysis are shown in figure 8.4, and demonstrate that no unit is performing less well than would be predicted by the model.

Figure 8.2
Increase in Primary PCI

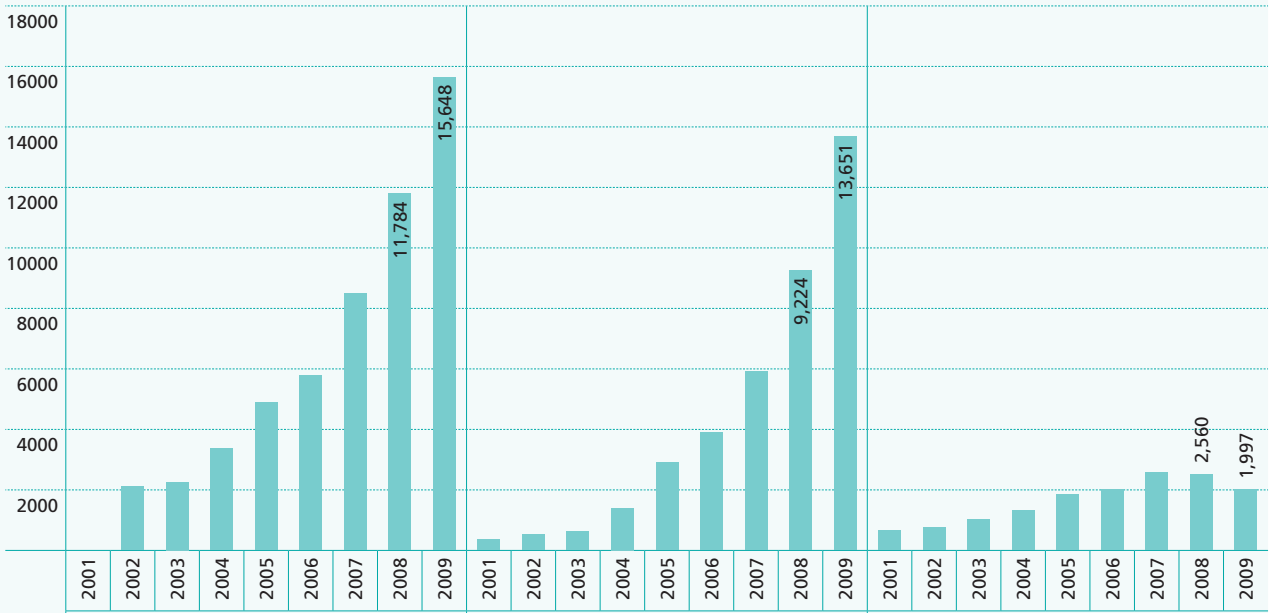
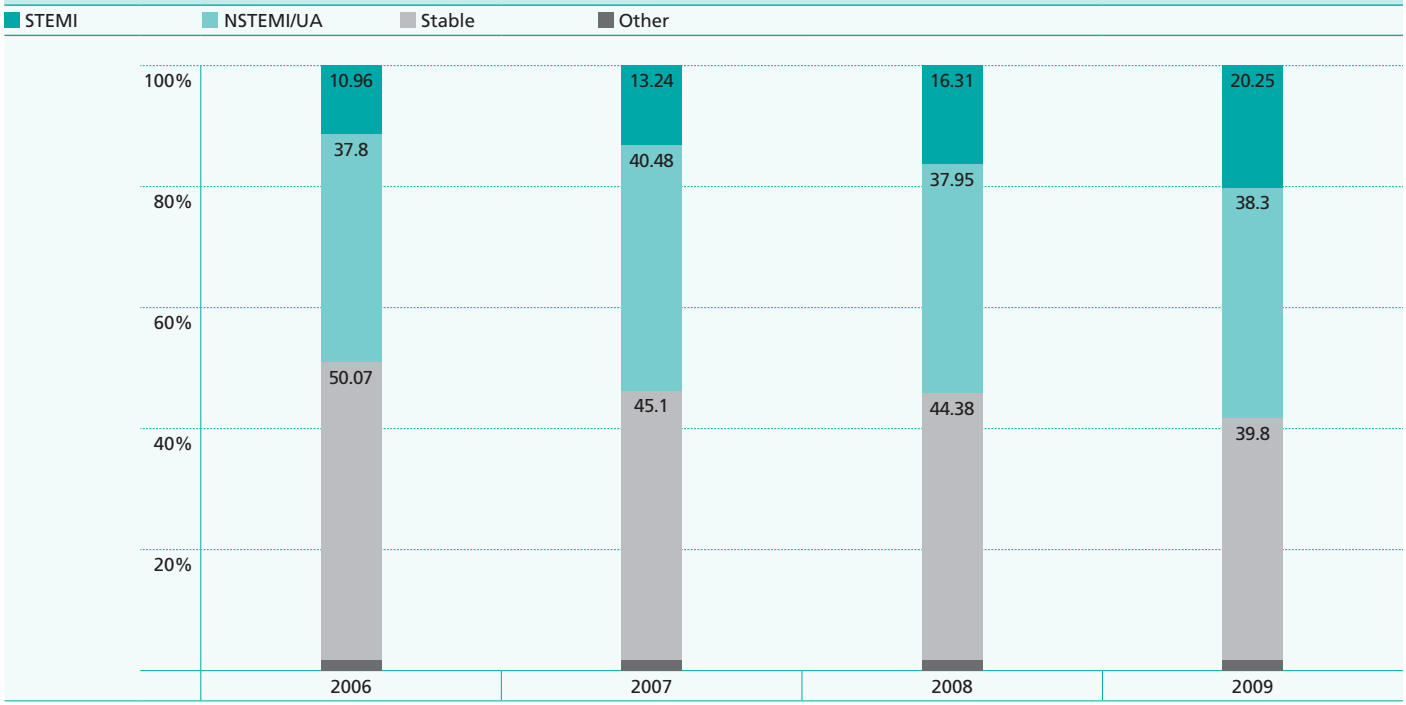


Figure 8.3
Changing case mix



All models have limitations and these sorts of results must be interpreted with caution. The results are not only dependant on the model, but also on the accuracy of data entry, both in recording a patient's risk factors, and to capture adverse outcomes. To try to avoid the problem of under reporting of adverse outcomes we plan to use a mortality only model, with the CCAD link to the NHS Central Register to validate outcomes.

We have started to use the NHS Central Register to assess the outcomes of relatively homogenous groups of patients. For example the validated 30 day mortality for all patients treated by primary PCI for ST elevation myocardial infarction is shown in the funnel plot figure 8.5.

Figure 8.4
Risk adjusted major adverse cardiac and cerebrovascular events (MACCE) for each UK unit with data in CCAD

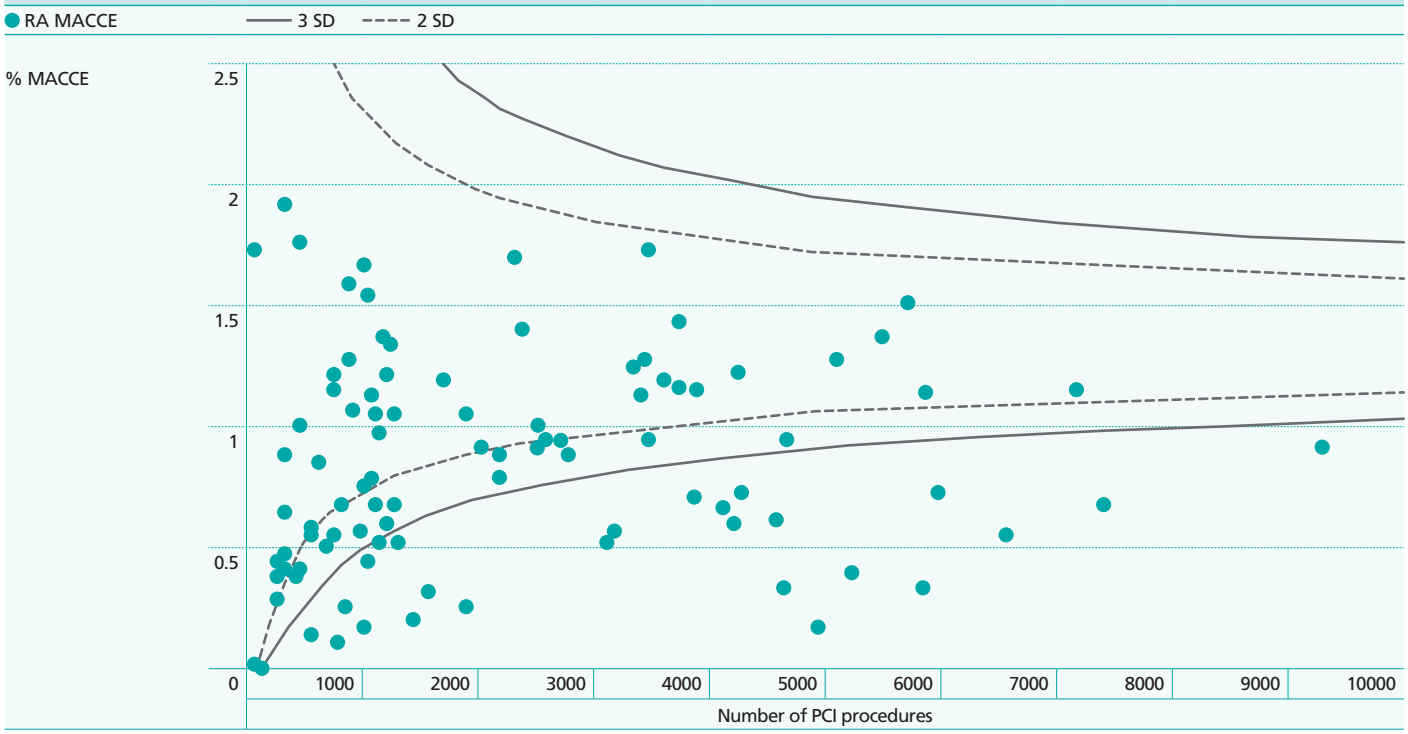
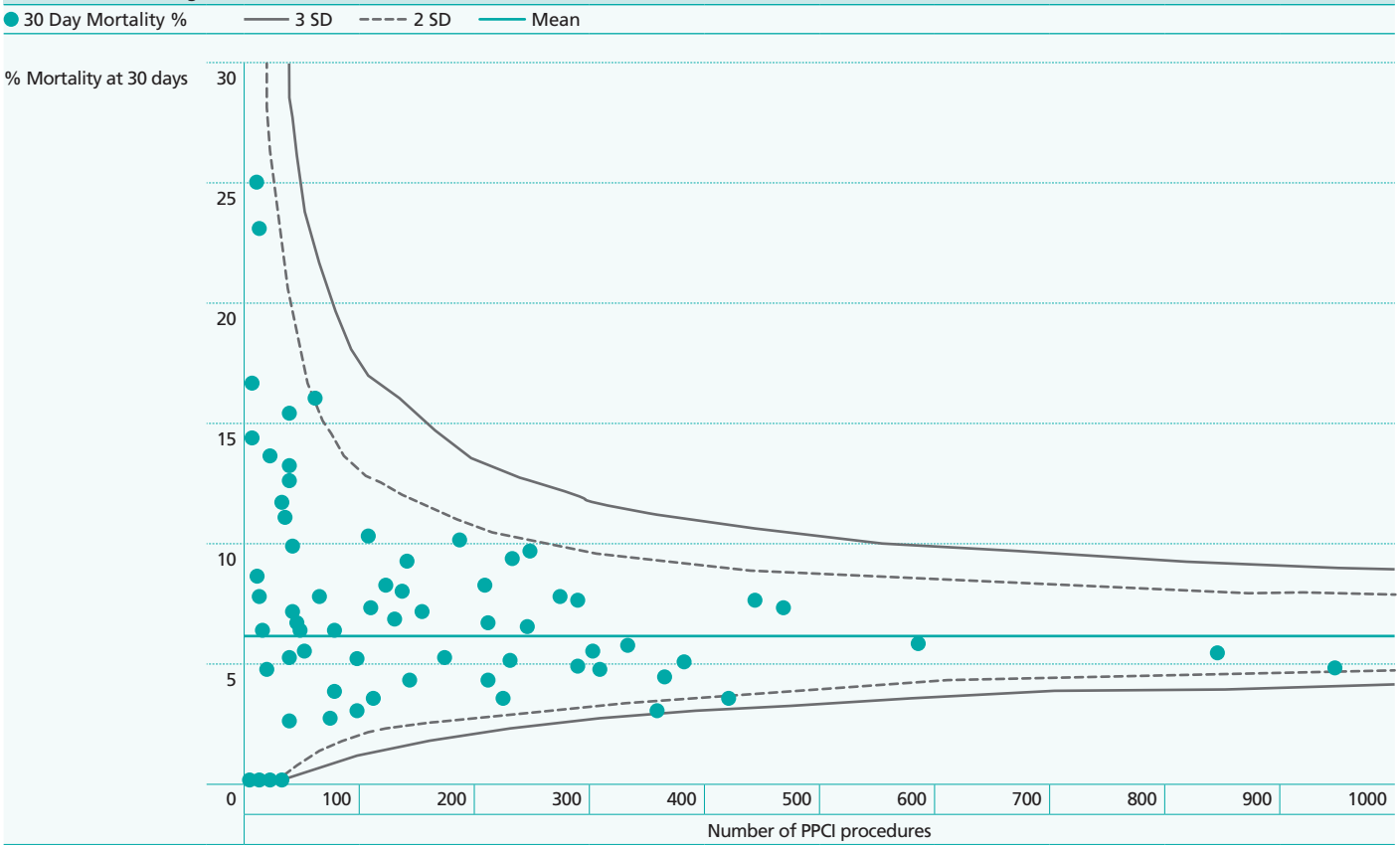


Figure 8.5
Independently validated 30 day mortality following primary PCI. Each unit is represented by a point on the graph according to the total number of primary PCI procedures performed against their 30 day mortality. No unit has a mortality above the 3 SD line, suggesting that no unit's outcomes are statistically significantly worse than the average.



9 Delays to treatment

In the treatment of STEMI by PCI, any delay in the performance of a PCI is associated with a worse outcome for the patient. There are 2 important procedural measures. The patient call for help to time of PCI treatment (call-to-balloon time) measures the entire process of care, and the time a patient arrives at a PCI centre to the time of PCI treatment (door-to-balloon time) which assesses how quickly the PCI unit can respond to the emergency. There are two routes into a PCI centre for emergency PCI. One where an ambulance brings the patient directly to that centre, and the other, where a patient first presents to a hospital that is not capable of performing PCI and is then transferred to the PCI centre (interhospital transfer). The transfer process engenders additional delays as can be seen in the overall summary data in figure 9.1.

A strategy to try to avoid interhospital transfers is likely to result in quicker and therefore better treatment.

The units that have performed more than 10 primary PCIs during 2009 and their codes are shown in table 2.

The percentage of cases treated within target times by each PCI centre are presented in figures 9.3 and 9.4.

Figure 9.1
Average time delays to emergency treatment in patients admitted directly to PCI centres (Direct) versus transferred from another hospital to the PCI centre IHT (Inter hospital transfer)

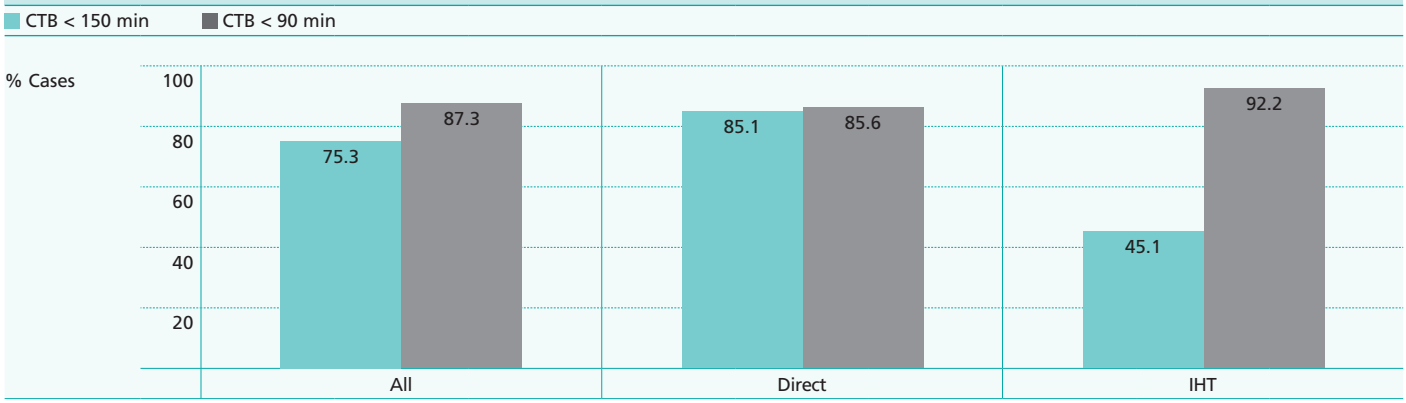


Table 2
PCI units performing more than 10 primary PCIs.

AMG. Wycombe General Hospital	MPH. Taunton & Somerset
BAL. Barts and the London	MRI. Manchester Royal Infirmary
BAS. Basildon Hospital	NCR. New Cross Hospital
BAT. Royal United Hospital Bath	NGS. Northern General Hospital
BHL. Liverpool Heart and Chest Hospital	NHB. Royal Brompton Hospital
BHR. Royal Berkshire and Battle Hospital	NHH. North Hampshire Hospital
BOU. Royal Bournemouth General Hospital	NOR. Norfolk & Norwich Hospital
BRI. Bristol Royal Infirmary	PAP. Papworth Hospital
CGH. Conquest Hospital	PLY. Derriford Hospital
CHG. Cheltenham General Hospital	QAP. Queen Alexandra Hospital
CHH. Castle Hill Hospital	QEB. Queen Elizabeth Hospital Edgbaston
CHN. Nottingham City Hospital	RAD. John Radcliffe Hospital
CRG. Craigavon Area Hospital	RDE. Royal Devon & Exeter Hospital
DER. Derby Royal Infirmary	RFH. Royal Free Hospital
DGE. Eastbourne DGH	RSC. Royal Sussex County Hospital
DUD. City Hospital	RVB. Royal Victoria Hospital
EBH. Birmingham Heartlands Hospital	SAN. Sandwell District General Hospital
ERI. Royal infirmary of Edinburgh	SCM. James Cook University Hospital
ESU. East Surrey Hospital	SGH. Southampton General Hospital
FRE. Freeman Hospital	STH. St Thomas' Hospital
FRM. Frimley Park Hospital	STO. North Staffordshire Hospital
GEO. St George's Hospital	TOR. Torbay Hospital
GRL. Glenfield Hospital	UCL. University College Hospital
HAM. Hammersmith Hospital	UHW. University Hospital of Wales
HH. Harefield Hospital	VIC. Victoria Hospital
KCH. King's College Hospital	WAL. Walsgrave Hospital
KGH. Kettering General Hospital	WAT. Watford General Hospital
LGI. Yorkshire Heart Centre	WDH. Dorset County Hospital
LIS. Lister Hospital	WRG. Worthing Hospital
MOR. Morriston Hospital	WYT. Wythenshawe Hospital

Figure 9.3
Call to balloon time: percentage of patient treated within 150 minutes of calling for help.

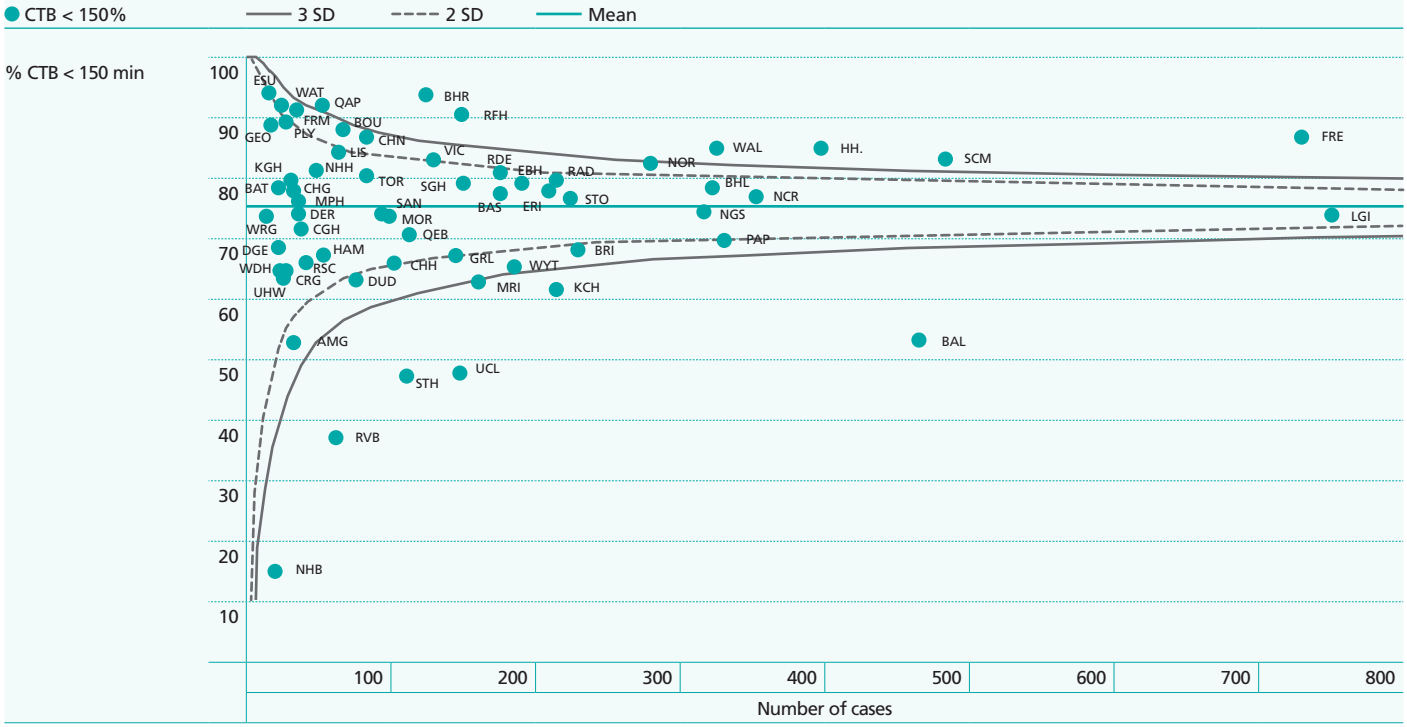


Figure 9.4
Door to balloon time: percentage of patients being treated within 90 minutes of arriving at a PCI centre.

10 The Future

In addition to annual analysis of the BCIS audit data, reports of speed of treatment of patients with STEMI are sent to each PCI centre monthly. Reports of risk adjusted outcomes for each unit are sent to each unit every 3 months. We have developed an information governance framework that will allow the BCIS audit dataset to be analysed in more detail so that it can be used to answer more complex audit and research questions, and we hope to see the output from these investigations in the near future. Links with the MINAP audit will be strengthened, including work on a joint dataset so that data from both audits can be combined to enhance the completeness of the description and measurement of patient care.

11 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:

BCIS: British Cardiovascular Intervention Society

CASU: Clinical Audit Support Unit

CCAD: Central Cardiac Audit Database

CTB: Call to balloon time

DES: Drug eluting stent

DTB: Door to balloon time

HQIP: Healthcare Quality Improvement Partnership

IHT: Inter hospital transfer

NHS IC: NHS Information Centre for health and social care

MINAP: Myocardial Ischaemia National Audit Project

NSTEMI: Non ST elevation myocardial infarction

STEMI: ST elevation myocardial infarction

12 References

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(2) Ischaemic Heart Disease - Coronary Artery Stents. NICE Guidance 2003;TA 71.

(3) Drug-eluting stents for the treatment of coronary artery disease. NICE Guidance 2008;TA 152.

(4) Doshi SN, Ludman PF, Townend JN, Buller N. Estimated annual requirement for drug eluting stents in a large tertiary referral centre, according to new NICE criteria. Heart 2004; 90(Suppl II):A41.

(5) Grayson AD, Moore RK, Jackson M et al. Multivariate prediction of major adverse cardiac events after 9914 percutaneous coronary interventions in the north west of England. Heart 2006; 92(5):658-663.

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