



Heart Improvement

## A Guide to Implementing Primary Angioplasty



## Contents

Foreword	3
Purpose of this document	4
Introduction	4
Background	5
Current provision of Primary PCI (PPCI) in the UK	6
Challenges in developing a PPCI service	6
Does every PCI centre need to provide 24/7 PPCI?	7
Does the size of a PCI centre affect patient outcomes?	8
Should a non 24/7 PCI centre perform any PPCI?	8
Commissioning a PPCI service	10
Help with implementation	14
Summary	14
Appendix 1 - Key studies in PPCI	15
Appendix 2 - PCI consensus meeting	16
Appendix 3 - Treatment options for STEMI	17
References	18

---

[www.improvement.nhs.uk/heart/reperfusion](http://www.improvement.nhs.uk/heart/reperfusion)

## Foreword

---



In only six months since the publication of new national good practice guidance on treatment of heart attack, NHS Improvement have looked at the major issues and obstacles to rolling out primary percutaneous coronary angioplasty (PCI) services across England and brought together all their learning in this helpful commissioning guide.

The guide provides a brief overview of current provision of primary PCI, a discussion of the issues and some useful suggestions to assist in the planning and commissioning of primary PCI services.

I would like to thank Jim McLenachan, Sheelagh Machin and Carol Marley at NHS Improvement for their work to support implementation of primary PCI services including their work on this document and to thank all those in cardiac networks who have informed the production of this guide.

**Professor Roger Boyle CBE**

National Director for Heart Disease and Stroke  
Department of Health

## Purpose of this document

In October 2008, the Government suggested a rapid expansion of coronary angioplasty (Primary Percutaneous Coronary Intervention or PPCI) for treatment of heart attack patients in England (1). NHS Improvement (formerly the Heart Improvement Programme) was tasked with facilitating the national roll-out of PPCI for heart attack patients. Initial discussions with a number of cardiac networks revealed several obstacles that were common to all. The aim of this document is to provide commissioners, strategic health authorities (SHAs), cardiac networks, primary care trusts (PCTs), hospital trusts and ambulance trusts with a synopsis of the major issues involved in developing an equitable, high quality coordinated service for heart attack patients in line with the Lord Darzis' recommendations and the requirements of world class commissioning.

Its main purpose is to enable the effective commissioning of evidence based care by providing a national assessment of need, reviewing current service provision and the available evidence to aid local prioritisation and the specification of services to be provided.

## Introduction

Evidence suggests that patients who have suffered a heart attack have a greater chance of survival and recovery if they are treated in a specialist centre that provides primary percutaneous coronary intervention (PPCI).

'SHA visions have sent a powerful message that the most effective treatments should be available for all NHS patients. Their plans for transforming treatment for heart attacks vividly illustrate this' (2).

The final report of the National Infarct Angioplasty Project (NIAP) was published on 20th October 2008 (1). NIAP was an observational study to test the feasibility of establishing coronary angioplasty (Percutaneous Coronary Intervention or PCI) as the initial treatment (in place of thrombolysis) for heart attack patients across England. The key findings of the NIAP study were as follows:

1. PPCI can be delivered within acceptable treatment times in a variety of settings.
2. Direct admission to a cardiac catheter laboratory is the preferred route of admission to achieve timely treatment. This shifts the onus of diagnosis onto the ambulance service and away from Accident and Emergency departments.

### **As a result of their findings, the overall conclusions of NIAP were:**

1. national roll-out of PPCI is feasible over the next three years
2. the aim should be to achieve treatment times of 120 minutes or less
3. hybrid services offering daytime PPCI and out-of-hours thrombolysis are not satisfactory
4. a PPCI service needs to be 24/7 and the procedures should be carried out in a centre with a sufficiently high volume of cases to maintain and develop skills.

## Background

In 2007, 77,373 PCI procedures were performed in 98 PCI centres in the UK (3). PCI patients fall into three main groups:

### 1. Patients with stable angina

These patients are referred by their general practitioner to either a rapid access chest pain clinic or a general cardiology clinic. They generally undergo treadmill testing or some other non-invasive assessment of ischaemia followed by diagnostic coronary angiography as a day patient procedure. If they have ongoing symptoms, and suitable anatomy, they will be referred for PCI. Current waiting times are around 4-6 weeks; these are considered clinically acceptable and are compatible with the 18 week referral to treatment pathway provided the waiting times for clinic appointment, non-invasive testing and angiography, are reasonably short.

### 2. Patients with non-ST elevation acute coronary syndrome (NSTEMACS)

These patients are admitted acutely through an Accident and Emergency department into a cardiology (or sometimes general medical) ward. They are treated initially with anti-platelet, anticoagulant and anti-anginal drugs. If they have raised cardiac markers (e.g. troponin), or ongoing symptoms, indicating that they are at high risk of further events, they will usually undergo angiography and be considered for revascularisation, in the form of either PCI or coronary artery bypass graft (CABG). If they have been admitted to a hospital with on-site PCI, the angiogram and PCI will be carried out as a single procedure. If admitted to a hospital without onsite PCI, the angiogram may be carried out at the admitting hospital with onward referral to the PCI centre. Alternatively, patients may be



transferred to the PCI centre for an angiogram with follow-on PCI if required. Current clinical guidelines suggest that PCI should be performed within 72 hours of admission. NSTEMACS patients occasionally require immediate access to a cardiac catheter lab because of haemodynamic instability, ongoing ischaemia or other co-morbidities, but most can be treated during daylight hours.

### 3. Patients with ST segment elevation myocardial infarction (STEMI)

Immediate PCI is now the preferred treatment (over thrombolysis) for patients presenting with ST segment elevation MI (STEMI) provided it can be delivered within an appropriate timeframe. These patients are taken directly to the PCI centre for primary PCI. This should be performed as soon as possible and preferably within 120 minutes of the patient first summoning medical help. Primary PCI, therefore, mandates 24 hour access to the cardiac catheter lab.

### Current provision of Primary PCI (PPCI) in the UK

The current provision of PPCI in the UK shows huge geographical variation. In 2007-8, 27% of STEMI patients in England and Wales were treated with PPCI but the PPCI rates ranged from almost 100% in London and The Black Country to less than 10% in 13 of the 28 cardiac networks in England (4). In some areas, PPCI may be offered only on a 9-5 Monday to Friday basis with patients receiving thrombolysis at all other times. According to the BCIS Audit of 2007, only 22 of the 98 British PCI centres offered a 24/7 service for PPCI (3).

### Challenges in developing a PPCI service

Patients have heart attacks at all times of the day and night. To be effective, all treatment, whether thrombolysis or PPCI, should be provided as quickly as possible. The key studies of PPCI are summarised in appendix 1. PPCI has been shown to be significantly better than thrombolysis in preventing death, recurrent myocardial infarction and stroke when both treatments are administered at the same time. The issue, therefore, is at what timepoint does delayed PPCI become less effective than thrombolysis? Published data (see appendix 1) suggests that the mortality benefit of PPCI over thrombolysis is lost when the delay to PPCI reaches 114 minutes. However, other data suggest that a longer time delay may be acceptable, and moreover, that the other benefits of PPCI, such as reduction of stroke and reinfarction, are not lost at this time period.



Currently, the NIAP guidance is to aim for a time to treatment with PCI within 120 minutes of the patient calling for help.

The challenge in developing a PPCI service, therefore, is to ensure that most patients, at whatever time they present and wherever they present, undergo PPCI within 120 minutes of first medical contact. This involves collaboration between the ambulance service, the cardiac departments, the cardiac catheter labs and the Accident and Emergency departments. It is likely that there will be individual patients where the 120 minutes timeline will be difficult to meet; for most regions of the country, however, such patients represent a small minority and should not obstruct clear improvements in systems of care. Where the time delay for an individual patient is likely to be significantly greater than 120 or 150 minutes, then pre-hospital thrombolysis should be considered but the patient should then be transferred to the PPCI centre for further evaluation and treatment as necessary. In general, the implementation of a simple protocol is likely to lead to better outcomes than any attempt to provide a more complex algorithm where the potential for confusion, or even error, is greater.

When setting up a service, it is important to note that 120 minutes is an aspirational time to treatment and is not a defined quality standard. Based on the largest body of evidence to date, PPCI may be the optimum strategy provided the call-to-balloon time does not exceed 150 minutes (i.e. the equivalent of a call-to-needle time of 30 minutes plus the 114 minutes during which PPCI is superior to thrombolysis).

At a national consensus meeting (September 2008), chaired by Professor Roger Boyle, there was clear national consensus that cardiac networks should take the lead on developing their local 24/7 PPCI service (appendix 2).

### **Does every PCI centre need to provide 24/7 PPCI?**

There are 69 NHS PCI centres in England; less than one-third of these currently provide a 24/7 PPCI service (4). The remaining centres provide either no PPCI service or service during restricted hours only (usually Monday to Friday 9-5).

Working on a rate of presentation of STEMI patients of 600 per million of the population per annum, and on the assumption that 22% of patients present between midnight and 8am (5), eighteen patients, on average, will present with STEMI each night (midnight to 8am) in England. To have all 69 cath labs in England staffed and available to perform PPCI, but waiting for just 18 patients, would be hugely wasteful.

Furthermore, PCI centres with a single cardiac catheter lab may find their daytime work schedule disrupted if they attempt to run a 24/7 PPCI service. If cardiac catheter lab staff work a

normal day, and are then called back in for a single PPCI procedure, then the European Working Time Directive (EWTD) states that they should have 11 hours continuous rest within any 24 hour period. If the procedure ran from 4am until 5am, then the staff would not be expected to work again until 4pm that day.

The unpredictability of PPCI presentations, and the subsequent unpredictability of staff availability the following day, is a problem for all 24/7 PPCI centres but may be easier to manage in a large centre with six catheter labs and a large staff pool than in a centre with a single cardiac catheter lab. Some organisations (e.g. West Midlands) have mandated that PCI centres with a single catheter lab should not be set up as PPCI centres.

It is important that any centre starting a primary PCI programme understands that primary PCI is different from other forms of PCI. Patients are sicker, complications are more frequent and there is greater requirement for intra-aortic balloon pumping, mechanical variation etc. The BCIS national PCI audit shows that the mortality for primary PCI is around 4.6-4.8% (3). This is approximately six times the mortality for NSTEMI PCI and more than twenty times the mortality risk for elective PCI. It therefore seems sensible that centres should only undertake primary PCI if they have 24-hour consultant cardiology availability (i.e. a consultant cardiology rota) to manage patients following PPCI for STEMI. This may be an issue with some non 24/7 PCI centres.

Local factors and local geography will influence how many PPCI centres are required. In most densely populated areas of England, particularly if there are good transport links, one 24/7 PPCI centre should comfortably be able to serve a population of 1.5 - 2 million.

### Does the size of a PCI centre affect patient outcomes?

This has been a contentious area for a number of years. However, there is growing evidence that, in the setting of acute PCI for STEMI, patient outcomes are better in centres with a larger volume of cases. In Germany, an analysis of almost 28,000 patients compared outcomes in larger with smaller centres. There were no mortality differences for patients without a myocardial infarction. Among those patients with an acute myocardial infarction, there was a stepwise (and significant) reduction in mortality when moving from low volume to high volume centres. Centres in the top quartile for volume (performing > 521 procedures per year) had a mortality of 2.78% compared with 3.97% for centres performing 196-323 procedures per year and 4.41% for centres performing less than 166 procedures per year (6).

Analysis of the greater Paris PCI registry showed similar results. Death rates for planned procedures were low and equivalent for small (<400 cases per year) and larger (>400 cases per year) centres. For emergency procedures, however, the mortality rate was significantly lower in the centres performing more than 400 cases per year (6.75% vs 8.54%,  $p < 0.05$ ) (7).

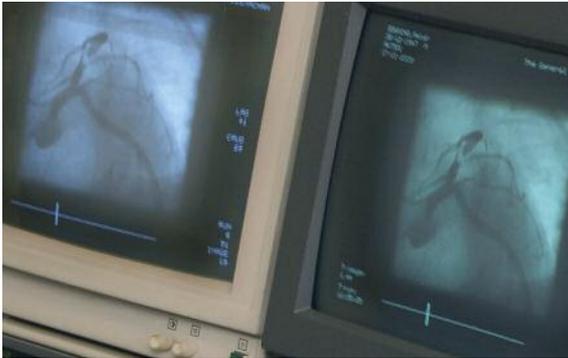
### Should a non 24/7 PCI centre perform any PPCI?

If we consider a cardiac network with one 24/7 PCI centre and three PCI centres where the cardiac catheter labs are non 24/7, then there are three possible treatment scenarios for STEMI patients: (appendix 3).

1. all STEMI patients are transferred directly to the 24/7 centre. This would include any STEMI patients who present directly to hospitals operating a non 24/7 PCI service.
2. all STEMI patients are taken to the nearest cardiac catheter lab. This means that a proportion of patients would be taken for PPCI to the non 24/7 centres although the majority (those presenting between 5pm and 8am Monday to Friday plus all weekend and Bank Holiday presenters) would be taken to the 24/7 centre.
3. all STEMI patients diagnosed by the ambulance service are taken directly to the 24/7 centre but the small number who self-present at the non 24/7 PCI centre would have their procedure locally provided the cardiac catheter lab was available.

All three options have their advantages and disadvantages.

**Option 1** is the simplest from the organisational viewpoint; it provides a single route of referral (and single phone call) regardless of the time of day or day of the week. Furthermore, with the advent of designated centres for major trauma and stroke disease, ambulance services are now increasingly familiar with the concept of bypassing a local hospital in order to deliver a



patient to a specialist treatment centre. For this reason, this is the preferred option in many areas of the country (London, Newcastle, South Tees, West Yorkshire, and Greater Manchester).

**Option 2** is organisationally more complex but provides shorter transport times for weekday daytime presenters. Some ambulance services prefer this option because their vehicles are less likely to be 'off site' during the day. However, many ambulance service Medical Directors say the uncertainty about what to do with a patient at 8.30 am or 4.45 pm makes this system unwieldy. If this option is considered further, the non 24/7 centre must make an absolute commitment to provide PPCI between the agreed hours every normal working day regardless of other commitments.

**Option 3** is a variation of option 2; it has the disadvantage that the 9-5 centre will see very few PPCI patients and will struggle to maintain and develop skills.

When planning services, it is important to realise that the travel time (in the ambulance) is only one component of the call-to-balloon time. The door-to-balloon time within the hospital is also an important component. A 'pre-alert' call from

the ambulance is essential to allow the catheter lab to prepare for the patient's arrival. For out-of-hours referrals, the pre-alert allows the staff to travel to the hospital while the patient is being transported. Thus a travel time of 60-90 minutes may be perfectly reasonable if this is the time taken for all the catheter lab staff to travel to the PCI centre and prepare for the patient's procedure. Provided the patient is taken directly to the cardiac catheter lab (and not to Accident and Emergency or to Coronary Care), then it should still be possible to meet the 120 minute call-to-balloon time. Door-to-balloon times may be affected by the size of the centre. During normal working hours, door-to-balloon times may be shorter in a 24/7 centre with six cardiac catheter labs, four of which are engaged in PCI than in a non 24/7 centre with a single cardiac catheter lab, particularly if the pre-alert time is short. However, the balance between a shorter transport time and a possibly longer door-to-balloon time will depend on local geography and will need to be monitored closely, whatever option is chosen.

Regardless of where the PPCI procedures take place, consideration should be given to those interventionists working at non 24/7 centres contributing to the regional out-of-hours on-call rota. There are 547 trained interventional cardiologists in the UK (3). If out-of-hours PPCI is provided by 20-25 centres in the UK, then the on-call frequency could be as low as one night every three weeks. In practice, those at the non 24/7 centres will have other on-call commitments and a full commitment to the rota is often not practical. Nevertheless, any contribution to the regional rota at the 24/7

centre is generally welcomed. An appropriate programmed activity (PA) calculation for the average amount of work done during on-call should be made and this reimbursed from the 24/7 to the non 24/7 trust. This system already works well in some areas of the country and helps to maintain and develop the skills of those interventionists based at hospitals not providing a PPCI service.

### Commissioning a PPCI service

In some ways, commissioning of a PPCI service differs from the commissioning of other new clinical services. The procedure (PCI) is already commissioned. Initial fears that commissioning a PPCI service might lead to a substantial growth in total PCI numbers have been unfounded. In West Yorkshire, the introduction and roll-out of PPCI to a population of around three million has led to no increase in absolute PCI numbers, even though PPCI now makes up 30% of the total PCI procedures. The reason for this is clear: when thrombolysis was the standard treatment for STEMI patients, around 60-70% of thrombolysed patients underwent angiography and/or PCI within six months of their initial presentation. Therefore, a policy of PPCI brings forward the PCI procedure to the time when the patient has most to gain.

The NIAP recommendation was simply that:  
**“the procedures should be carried out in a centre with a sufficiently high volume of cases to maintain and develop skills.”**

**In West Yorkshire, PPCI commenced in Leeds in April 2005 and was later rolled out to the rest of the network. For each patient, Leeds PCT paid the acute PCI tariff. However, it no longer paid the MI tariff and had to pay for a smaller number of subsequent angiography and PCI procedures. This resulted in a saving to Leeds PCT of £750,000 in the first year. For subsequent years, Leeds PCT reduced the SLA with Leeds Teaching Hospitals NHS Trust for MI stays and subsequent angiograms and the ‘savings’ were directed into other services (8).**

Indeed, the overall cost to commissioners of treating STEMI may fall following the introduction of PPCI.

### Steps:

#### **1. A network-wide discussion on the number and location of centres that will provide PPCI.**

This will be determined by geography, access to the centres and the expected number of PPCI cases. These data should be available from the MINAP report (4). As noted earlier, this is unlikely to represent a significant increase in PCI activity unless the pre-existing level of intervention in the network was particularly low. The service may be provided by a mixture of 24/7 and non 24/7 PCI centres (see above). If a PCI service serves a population of 500,000, and runs a 24/7 service, then it would expect to see around 300 PPCI patients per annum. If the service is 9-5, 365 days per year, then it would expect to treat around 58% of all PPCI patients in the area. If the service runs 9-5,

Monday to Friday, and is closed on Bank Holidays, then it would expect to perform PPCI on approximately 40% of all STEMI patients from its catchment area (i.e. 2-2.5 procedures per week on average).

There is a risk of very patchy and fragmented services being developed. Smaller PCI centres (e.g. with two or three PCI operators) may feel threatened by the loss of some PCI activity to their local 24/7 PCI centre and may feel obliged to develop a 9-5 Monday to Friday PPCI service. It is clearly important that the best interests of the patients are the primary concern. As noted earlier, the mortality risk for STEMI patients undergoing PCI is approximately six times the mortality for non-STEMI PCI. These patients, therefore, require access to a highly trained team in the catheter laboratory and in the coronary care unit. If the procedure has been complicated, patients will require further specialist cardiology input at any time of the day or night. For this reason, setting up a 9-5 PPCI service in a hospital without a consultant cardiology rota is not recommended. When considering 9-5 centres, the network, the commissioners and the ambulance trust(s) need to balance carefully the benefits of shorter transfer times for a minority of the patients presenting for PPCI against the published data (outlined above) relating larger procedural volumes to better patient outcomes. At present, there is no national recommendation on the minimum number of PPCI procedures that should be performed by any centre. However, one advisory group has recommended that only PCI centres performing more than 400 PCI procedures per annum should be commissioned as primary PCI centres.

**2. Equality Impact Assessment.** Local data and community intelligence will be required to assess the needs of the population and to provide equitable access for patients in rural areas will require longer ambulance journey times. In areas with very long travel times to the PPCI centre it may be appropriate to continue with a pre hospital thrombolysis service with the patients then transferring to a PCI centre for angiography/PCI within a 24-hour timeframe (9).

**3. Setting up a 24/7 service.** The 24/7 PCI centre is likely to require additional non-medical staff (nursing staff, cardiac physiologists and radiographers) to cope with the increased frequency of out-of-hours and weekend working. With a high expectation of night working, there may be a knock-on effect to daytime staffing which needs to be considered. If the European Working Time Directive is observed, then staff who work after midnight will normally be allowed 11 hours' rest prior to returning to work. This will require a larger workforce and flexibility in the workforce. Under Payment by Results (PBR), there is no additional funding for a PPCI procedure carried out at 3am compared to one at 3pm. As mentioned earlier, the increase in total PCI numbers may be very modest. The PPCI centre, therefore, will incur additional staffing costs which will not necessarily be balanced by extra income under PBR. Furthermore, some staff members may have chosen cardiac catheter laboratory work specifically because the daytime hours of working, with a low frequency of night-time working, suited their domestic circumstances.

The shift towards more frequent out-of-hours working will require careful planning. If additional staff are not employed, the delivery of daytime cardiac catheter lab work (elective PCI, angiography, pacing, EP etc) is likely to be compromised.

**4. Return to local hospital.** One of the advantages of a PPCI policy is that it shortens hospital stay when compared to thrombolysis, most patients being discharged on day three. Depending on local arrangements, the patient may remain in the PCI centre and then be discharged directly home; in other centres, patients are transferred back to the local hospital a few hours after the PPCI procedure. This is sometimes referred to as 'repatriation' although the patient may well have been admitted directly to the PCI centre via the ambulance service and may never have been in the local hospital.

**5. Impact of PPCI on the DGH.** A policy of PPCI will have a major effect on the function of the district general hospital (DGH) coronary care unit (CCU). The emphasis on the DGH CCU will change from treating thrombolysed STEMI patients to treating post-PPCI patients and NSTEMI patients. PPCI will also have an impact on DGH income. In some centres, because of the overall savings, PCTs have agreed to pay a PCI tariff to the PCI centre and an additional 'short stay tariff' to the DGH which takes the patient soon after the PPCI procedure. In other centres, a 'tariff split' arrangement has been discussed with, for example, 80% of the PCI tariff going to the PCI centre and 20% to the hospital which takes the patient within 24 hours of the procedure. This may become more



straightforward when there is a specific tariff for rehabilitation which will usually be paid to the local hospital.

**6. Commissioning of the ambulance service.**

The ambulance service is the cornerstone to providing timely PPCI. As with stroke and serious trauma, PPCI represents a major change in the function of ambulance personnel who now play a key role in diagnosis and in determining where the patient will be best treated. Setting up the service, therefore, requires careful modelling of exactly what is required. In general, the ambulance service is not required to make additional emergency journeys with STEMI patients although the journeys will be longer if the patient bypasses the local hospital. Return of the patient to the local hospital after PPCI may be a new service; in many instances, however, patients received thrombolysis at their local hospital and were then transferred, by ambulance, to a PCI centre. In each network, the amount of additional ambulance activity required will depend on the model of PPCI delivery chosen and on the pre-existing arrangements for inter-hospital transfer of MI



patients. Isochrone mapping of journey times may be a useful tool when calculating journey times to PPCI centres.

**7. Rehabilitation and longer term management.** Patients treated with primary angioplasty have a shorter hospital stay characterised by transfers across clinical settings. An unintended consequence of this is the reduction in time available for health professionals to provide the patient and family with health education and psychological support. To ensure that patients do not 'fall through gaps' clear communication is required between acute services and the primary care trust. The involvement of cardiac rehabilitation teams during the early planning phase of services is recommended. Cardiac rehabilitation services may require additional resources with emphasis upon service delivery in a primary care rather than acute care setting. Effective discharge planning and timely referral for cardiac rehabilitation supports early recovery and secondary prevention.

**8. Impact of families and carers.** Another unintended consequence of PPCI is that the short hospital stay may contribute towards

patients and their families developing misconceptions about heart attack as an acute self limiting event rather than a marker of a long term condition (10). They believe the problem has been 'fixed'. If the long term nature of the condition is not appreciated by the patient and their family, then the impact of advice about behaviour modification such as smoking cessation, weight loss, and regular exercise may be reduced. The provision of information about prescribed medications, dietary recommendations and levels of physical exercise are important for patients and their families. Additional support may be required for elderly patients, those managing multiple co morbidities or those who have experienced complications (eg cardiac arrest). Patients and families are not always certain of where hospital care 'finishes' and community care 'begins' so information about who they may contact if they experience difficulties during early recovery is valuable.



### Help with implementation

NHS Improvement - Heart Improvement Programme is providing support for the implementation of PPCI as stated in 'Treatment of Heart Attack National Guidance'. This support is in the form of a series of themed national meetings and bespoke support for cardiac networks and SHAs from the national clinical lead and national improvement lead for reperfusion. Up to date information, resources and case studies are available on a dedicated web page on the NHS Improvement website. Further information and contact details can be found on the website at: [www.improvement.nhs.uk/heart/reperfusion](http://www.improvement.nhs.uk/heart/reperfusion)



### Summary

The implementation of PPCI as the default treatment nationally for patients with STEMI cuts across many boundaries. Those cardiac networks who have not yet implemented PPCI can learn a great deal from the areas of the country where the service is already up and running. The experience of the North East of England, one of the NIAP pilot sites, summarises the major issues. They concluded that the implementation of PPCI across the region revolved around finding acceptable answers to five key questions:

1. What are the patient pathways associated with the implementation of PPCI?
2. What is the appropriate Payment by Results structure for funding these pathways?
3. What are the additional ambulance services required to support these pathways?
4. What is the knock-on impact to non-PPCI units of moving to PPCI?
5. What are the commissioning impacts for all PCTs and acute trusts in the region, including the one-off consequences of commissioning change and the sustained revenue consequences and impact on system-wide viability?

## Appendix 1: Key Studies in Primary PCI

### **1. Primary PCI versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials.**

The Lancet 2003;361:13-20

Keeley E, Boura J, Grines C.

In this meta-analysis of 23 randomised trials, involving 7,739 patients, primary PCI was associated with significant reduction in death (7% vs 9%), non-fatal re-infarction (3% vs 7%) and stroke (1% vs 2%). However, the studies included in this meta-analysis relate to patients presenting to PCI centres. In the UK, many patients present acutely to non-PCI hospitals.

### **2. A comparison of coronary angioplasty with fibrinolytic therapy in acute myocardial infarction.**

Anderson HR, Nielsen TT, Rasmussen K, et al  
N Engl J Med 2003;349:733-742

In the studies included in the meta-analysis described above (Keeley et al), patients presenting to a PCI-capable hospital were randomised to either PPCI or thrombolysis. In this study (DANAMI-2), 1129 patients presenting to non-PCI centres were randomised to either immediate thrombolysis (at the community hospital) or to transportation by ambulance to a PCI centre for primary PCI. The primary end-point (death, re-infarction or disabling stroke) was significantly lower in the PPCI group than in the thrombolysis group (8.5% vs 14.2%,  $p < 0.002$ ) even though the PPCI group had an

additional ambulance journey and a delay in starting the reperfusion treatment. The median time interval from randomization to the start of treatment was 20 minutes (range 15-30 minutes) for those patients in community hospitals treated with thrombolysis and 90 minutes (range 74-108 minutes) for those patients transported to a PPCI centre.

### **3. Hospital Delays in Reperfusion for ST-Elevation Myocardial Infarction: Implications When Selecting a Reperfusion Strategy.**

Pinto DS, Kirtane AJ, Brahmajee K, et al.  
Circulation 2006;114:2019-2025.

In this observational study, the inherent delay in PPCI was calculated by subtracting door-to-needle times from door-to-balloon times in a very large registry of 192,000 MI patients. After correction for patient and hospital-based factors, the timepoint at which the odds of death with PCI were equal to those for thrombolysis occurred when the PCI delay (i.e. the difference between door-to-needle and door-to-balloon times) was 114 minutes.

## Appendix 2: National PCI Consensus Meeting

A national PCI consensus meeting was held by NHS Improvement on 24th September 2008. Invited to the meeting were cardiac network representatives and interventional cardiologists from large (surgical) centres, from PCI centres without on-site surgical cover and from DGHs planning to set up PCI services. Speakers included Dr Roger Boyle (National Director for Heart and Stroke), Dr Huon Gray (Author of the NIAP report) and Dr Mark de Belder (President of the British Cardiovascular Intervention Society). The discussion centred on the current status of PCI delivery in the UK, requirements for new centres to deliver more PCI, the role of cardiac networks and issues around measuring and reporting quality.

### **The main areas of agreement consensus were:**

#### **1. Networks**

Agreement was reached that networks are the correct building blocks for planning PCI services. Cardiac networks are patient focused and provide a forum to arrive at a clinical consensus on patient care. They are able to discuss the whole patient pathway across boundaries able to take a strategic view and influence trusts. There was also agreement that cross boundary working is required to deliver equitable services for patients. Cross boundary working was especially pertinent for working with ambulance services.

#### **2. Workforce**

Workforce issues for all catheter lab staff were discussed. Centres should observe the European Working Time Directive with regard to rest for on-call staff who have been working during the night. For consultant staff, this means altering job plans so that the consultant has no fixed commitments after a night on-call. It was acknowledged that this may have adverse effects on catheter lab scheduling and productivity.

Possible destabilisation and recruitment issues were discussed. This could be destabilisation of the DGH with deskilling of CCU staff if the care of STEMI patients transfers from a DGH to a 24/7 PCI centre. On the other hand, 24/7 working may cause some staff to move away from the 24/7 PCI centre to a non-24/7 PCI centre.

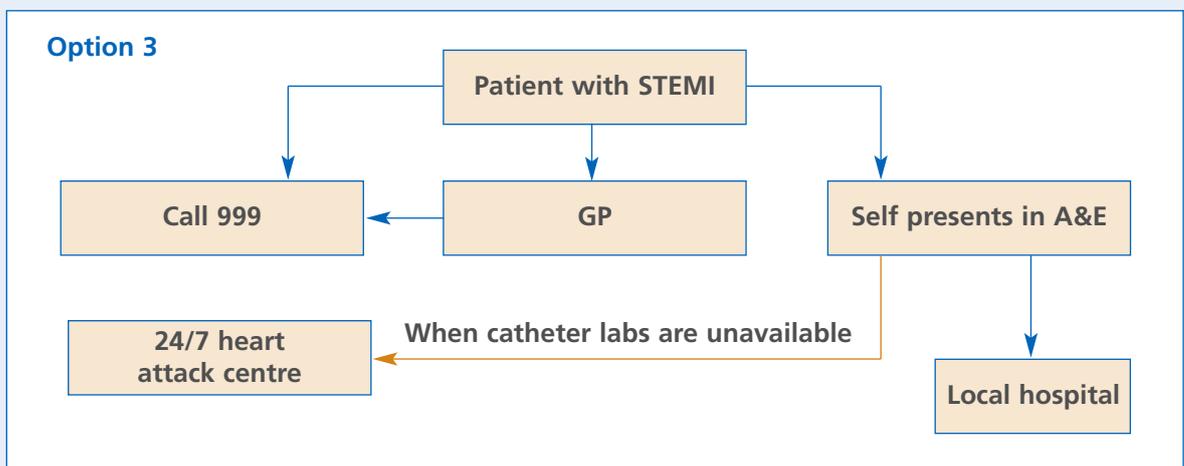
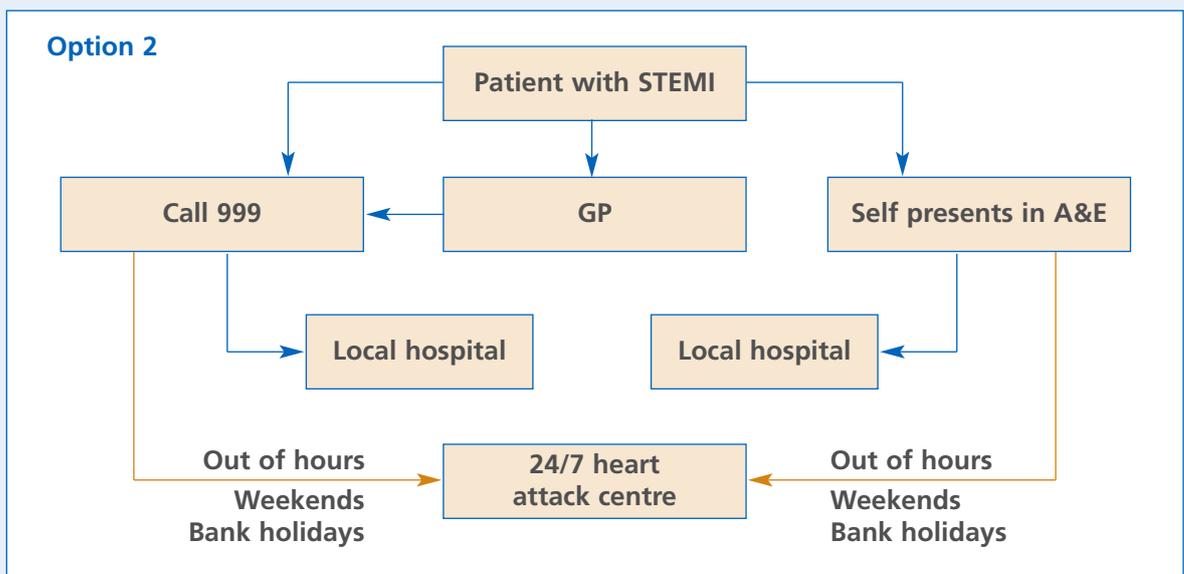
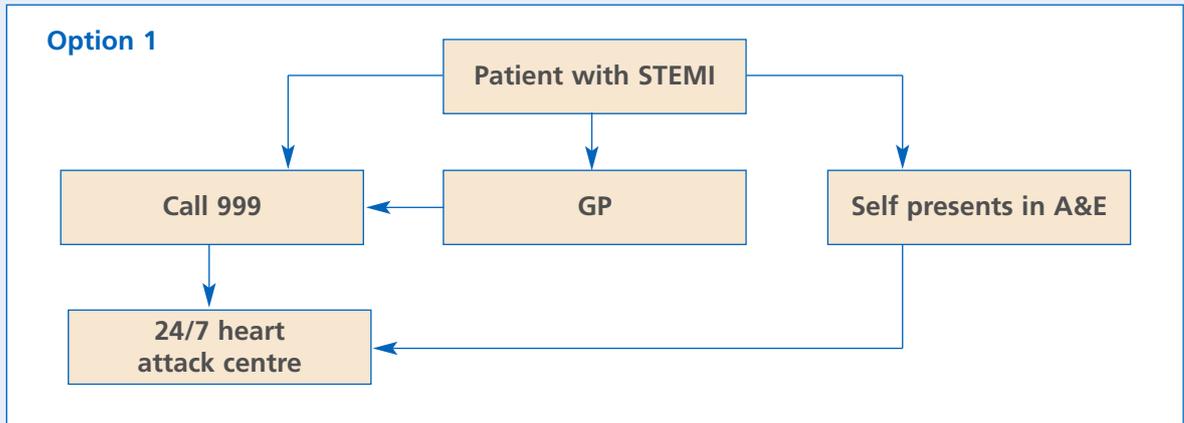
#### **3. British Cardiovascular Intervention Society (BCIS)**

The majority agreed that the BCIS peer review scheme was still required and BCIS had a role in the accreditation of new centres and in setting, and publishing, agreed standards.

#### **4. Measuring and reporting quality**

There was general agreement that quality in PCI is difficult to measure and that more robust outcome data are required including evidence relating volume of activity to outcomes.

Appendix 3: Treatment Options for STEMI



## References

1. Department of Health (2008) Treatment of Heart Attack National Guidance – Final Report of the National Angioplasty Project (NIAP)
2. Darzi A (2008) High Quality Care for All
3. British Cardiovascular Intervention Society (2007) Audit report  
www.bcis.org.uk/resources/audit
4. Royal College of Physicians (2008) Myocardial Ischaemia National Audit Report (MINAP) How the NHS manages heart attacks
5. Primary percutaneous coronary intervention for acute ST segment elevation myocardial infarction - first year's experience of a tertiary referral centre in the UK. Dorsch MF, Blackman DJ, Greenwood J, et al  
Clinical Medicine 2008;8:259-263.
6. Volume-outcome relation for contemporary percutaneous coronary interventions (PCI) in daily clinical practice: is it limited to high-risk patients? Results from the Registry of Percutaneous Coronary Interventions of the Arbeitsgemeinschaft Leitende Kardiologische Krankenhausärzte (ALKK). Zahn R, Gottwik M, Hochadel M, et al.  
Heart 2008;94:329-335
7. Is the volume-outcome relation still an issue in the era of PCI with systematic stenting? Results of the greater Paris area PCI registry. Spaulding C, Morice MC, Lancelin B, et al.  
European Heart Journal 2006;27:1054-1060
8. West Yorkshire Cardiovascular Network (2008) – personal communication
9. 'Management of acute myocardial infarction in patients presenting with persistent ST elevation' European Society of Cardiology Guidelines Van de Werf F, Bax J, Betriu, et al. European Heart Journal (2008) 29,2909-2945
10. Primary angioplasty for heart attack: mismatch between expectation and reality. Astin F, Closs SJ, McLenachan JM, et al  
Journal of Advanced Nursing 2008;65:72-83

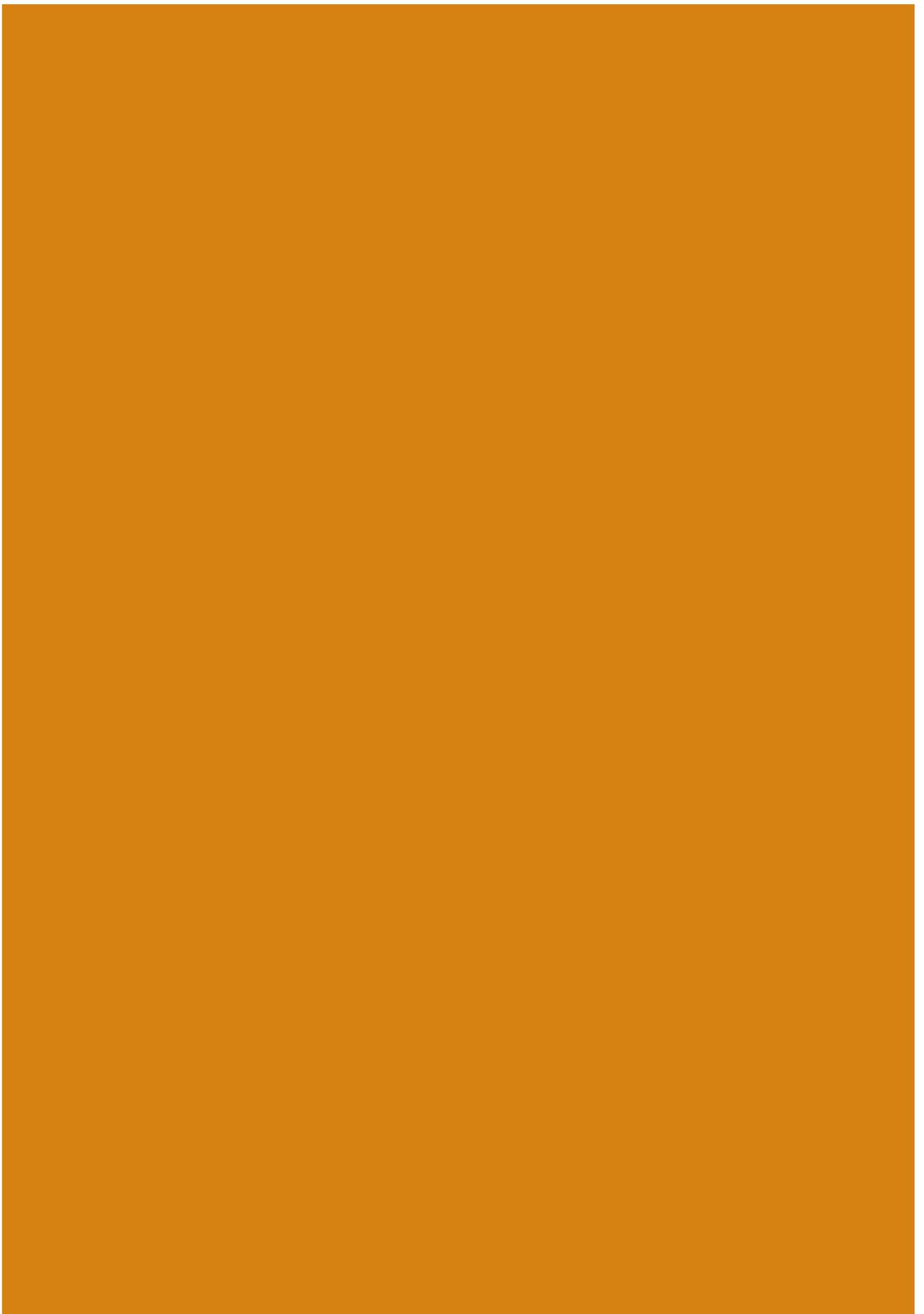
## Authors

**Dr J M McLenachan**, National Clinical Lead, Reperfusion, NHS Improvement, Consultant Cardiologist, Leeds General Infirmary

**Carol Marley**, National Improvement Lead, Reperfusion, NHS Improvement

**Sheelagh Machin**, Director, Heart, NHS Improvement

April 2009





## NHS Improvement

With nearly ten years practical service improvement experience in cancer, diagnostics and heart, NHS Improvement aims to achieve sustainable effective pathways and systems, share improvement resources and learning, increase impact and ensure value for money to improve the efficiency and quality of NHS services.

Working with clinical networks and NHS organisations across England, NHS Improvement helps to transform, deliver and build sustainable improvements across the entire pathway of care in cancer, diagnostics, heart and stroke services.

## NHS Improvement

3rd Floor | St John's House | East Street | Leicester | LE1 6NB  
Telephone: 0116 222 5184 | Fax: 0116 222 5101

[www.improvement.nhs.uk](http://www.improvement.nhs.uk)



Delivering tomorrow's  
improvement agenda  
for the NHS

