Evaluation of the National Infarct Angioplasty Project

Report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO)

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Executive summary

Background

Primary percutaneous coronary intervention (PCI) and thrombolysis (clot-busting drugs) are two alternative treatments for ST-elevation myocardial infarction (heart attack). Primary PCI appears to be more effective than thrombolysis, but costs more to deliver and requires reorganisation of acute services. The National Infarct Angioplasty Project (NIAP) involved establishing primary PCI at ten hospitals to test the feasibility of delivering this service in the NHS.

Aims

- To describe the models of service delivery established at the NIAP sites.
- To assess the workforce implications of a primary PCI service and explore the effect upon staff.
- To explore the feasibility of implementing primary PCI.
- To explore the experience and measure patient and carer satisfaction with primary PCI and thrombolysis-based care.
- To compare costs of primary PCI and thrombolysis, and estimate the cost-effectiveness of PCI-based care.

About this study

We evaluated implementation of primary PCI at NIAP hospitals and compared it to thrombolysis-based care at control hospitals.

- We described the systems used to deliver primary PCI using site visits, data collected by the NIAP hospitals and routinely available health and population data.
- Staff at seven NIAP hospitals contributed to the workforce and organisational study by completing a survey and participating in focus groups and interviews. Ethnographic observations were undertaken in catheter laboratories and objective data were collected on primary PCIs conducted in the month of study. In total 460 observations were collected.
- Patient and carer perspectives were explored using (a) face-to-face semi-structured interviews with ten patients and six carers, (b) postal questionnaires to 679 patients and 486 carers across four NIAP and four control sites, and (c) further interviews with eleven patients at NIAP sites and six at controls.

- Cost-effectiveness was assessed using a decision-analysis model populated with cost and time delay data from the NIAP hospitals and four control hospitals.

Key findings

All ten NIAP hospitals implemented primary PCI, although not all provided a 24/7 service. Evaluation showed the following:

- The NIAP hospitals varied in size, configuration, infrastructure, referral routes and activity levels.
- The NIAP hospitals treated 2072 patients (71% male, age range 24 to 104) over the evaluation year, 70% admitted directly to a primary PCI hospital and 30% transferred from a non-PCI hospital.
- Median call-to-balloon times were 87 minutes for direct to catheter laboratory, 132 minutes via coronary care, 140 minutes via the emergency department, and 161 minutes for transfers from a non-PCI hospital.
- Establishing the full 24-hour primary PCI service from the start appeared to work better than incremental expansion.
- Staff needed to work in a flexible, multi-skilled manner across traditional task boundaries.
- On-going training was required to retain experienced team members.
- Failure to harmonise staff pay and conditions before commencing the service meant inequity of reward and rest after out-of-hours working.
- Primary PCI required simple direct access for patients and good teamworking across professional boundaries.
- Building and maintaining relationships with key stakeholders was critical to service development and sustainability.
- Regular audit of the heart attack pathway identified blockages limiting the capacity of the system.
- Development of primary PCI may have been associated with knock-on effects upon elective services and particularly upon rehabilitation.
- Patients and carers reported high overall levels of satisfaction with NIAP and control care (patients 78% v 71% excellent ($p=0.074$), carers 63% v 55% ($p=0.049$)).
- Patients at NIAP sites reported higher levels of satisfaction than control sites with the time waited and the efficiency of treatment (80% v 67% excellent ($p<0.001$) and 83% v 74% ($p=0.009$)).

- Satisfaction with information given on how to manage the condition in future was lower in NIAP than control sites (38% v 46% excellent (p=0.049)).
- The mean cost of the treatment episode was £3,509 for thrombolysis at control sites, £4,361 for thrombolysis at NIAP sites, and £5,176 for PPCI at NIAP sites.
- Primary PCI-based care was more expensive than thrombolysis-based care but at £4520 per quality-adjusted life year gained would be considered cost-effective
- Direct access to the primary PCI hospital catheter laboratory was most likely to be cost-effective, whereas thrombolysis-based care was dominant when analysis was limited to those transferred from a non-PCI centre.

This evaluation was not randomised and was designed to measure the feasibility of establishing a national service rather than clinical benefits of primary PCI. NIAP hospitals were chosen to participate in this pilot study on the basis of willingness and ability to establish a primary PCI service, so they may not be representative of typical NHS hospitals. They also served a more urban, younger and more ethnically diverse population than the United Kingdom average. We did not evaluate the long-term sustainability of primary PCI services.

Conclusion

Primary PCI is feasible in a variety of settings, acceptable to patients and carers, generally supported by staff, and is likely to be a cost-effective use of NHS resources for patients directly accessing a PCI centre. However, primary PCI is unlikely to be cost-effective if significant time delays are incurred, such as those observed in this study when patients arrived via a non-PCI hospital. We have highlighted several organisational features that influence successful implementation.

Glossary of abbreviations, terms and definitions

Definitions

Angiogram	Diagnostic X-ray movie imaging of the coronary arteries (+/- left ventricle) following injection of contrast (dye) selectively into these structures via a catheter.
Angioplasty	See PCI
Catheter Laboratory	The area of the hospital where angioplasty is performed.
CCU	Coronary Care Unit. The area of the hospital where patients with a heart attack are initially treated.
CHD	Coronary Heart Disease. Hardening of the blood vessels supplying the heart, which can lead to a heart attack.
CTB	Call to balloon (time). The time delay between the patient calling for medical assistance and successful inflation of the angioplasty balloon to restore blood flow.
CTN	Call to needle (time). The time delay between the patient calling for medical assistance and administration of intravenous thrombolysis.
Emergency department	The area of the hospital where emergency patients are initially assessed and treated. Also known as Accident & Emergency (A&E) or Casualty.
Heart attack	A blockage of the blood vessel supplying the heart leading to heart damage and the risk of death or complications. In this report we use the term “heart attack” to refer to ST-elevation myocardial infarction.
In-hospital thrombolysis	Use of clot busting drugs by hospital doctors or nurses after the patient arrives at hospital.
PCI	Percutaneous coronary intervention. Use of a catheter passed into the blood vessels supplying the heart to open a blood vessel. Often followed by placement of a stent to keep the blood vessel open. Also referred to as angioplasty.
Pre-hospital thrombolysis	Use of clot busting drugs by ambulance paramedics or general practitioners before the patient arrives at hospital.
Primary PCI	PCI performed as an emergency to treat a heart attack.

Rescue PCI	PCI performed as an emergency after initial unsuccessful treatment of a heart attack with thrombolysis.
Thrombolysis	Use of a clot-busting drug to break down the blood clot causing a heart attack.

Abbreviations

AMI	Acute myocardial infarction
BCIS	British Cardiovascular Intervention Society
BCS	British Cardiovascular Society
CABG	Coronary artery bypass graft
CCAD	Central Cardiac Audit Database
CCU	Coronary Care Unit
CHD	Coronary heart disease
CI	Confidence interval
CL	Catheter laboratory
CTB	Call to balloon
CTN	Call to needle
DES	Drug eluting stents
DGH	District general hospital
DTB	Door to balloon
DTN	Door to needle
ECG	Electrocardiogram
ED	Emergency department
IABP	intra-aortic balloon pump
ICER	Incremental cost-effectiveness ratio
IH	In-hours
LOS	Length of stay
MI	Myocardial infarction (see 'heart attack')
MINAP	Myocardial Infarction National Audit Project
NIAP	National Infarct Angioplasty Pilots
NHS	National Health Service
OOH	Out of hours
PCI	Percutaneous coronary intervention
PPCI	Primary PCI
QALY	Quality-adjusted life year
RCT	Randomised controlled trial
STEMI	ST-elevated myocardial infarction (see 'heart attack')
UK	United Kingdom
US	United States
WTP	Willingness to pay

Disclaimer

This report presents independent research commissioned by the National Institute for Health Research (NIHR). The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the NHS, the NIHR, the SDO programme or the Department of Health

Addendum

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