

NATIONAL CARDIAC AUDIT PROGRAMME

2019 NCAP ANNUAL REPORT

IMPROVING CARDIOVASCULAR
OUTCOMES: TIMELY, SPECIALIST,
EVIDENCE-BASED CARE

NICOR

THE NATIONAL INSTITUTE FOR CARDIOVASCULAR OUTCOMES RESEARCH (NICOR)



NICOR is a partnership of clinicians, IT experts, statisticians, academics and managers who, together, are responsible for six cardiovascular clinical audits (the National Cardiac Audit Programme – NCAP) and a number of new health technology registries, including the UK TAVI registry. Hosted by Barts Health NHS Trust, NICOR collects, analyses and interprets vital cardiovascular data into relevant and meaningful information to promote sustainable improvements in patient well-being, safety and outcomes. It is commissioned by the Healthcare Quality Improvement Partnership (HQIP) with funding from NHS England and GIG Cymru /NHS Wales, and additional support from NHS Scotland. Funding is being sought to aid the participation of hospitals in Northern Ireland, the Republic of Ireland and the private sector.

Email: bartshealth.nicor-generalenquiries@nhs.net

BARTS HEALTH NHS TRUST



With a turnover of £1.5 billion and a workforce of around 17,000, Barts Health is a leading healthcare provider in Britain and one of the largest NHS Trusts in the country. The Trust's five hospitals – St Bartholomew's Hospital in the City, including the Barts Heart Centre, The Royal London Hospital in Whitechapel, Newham University Hospital in Plaistow, Whipps Cross University Hospital in Leytonstone and Mile End Hospital – deliver high quality compassionate care to the 2.5 million people of east London and beyond.

THE HEALTHCARE QUALITY IMPROVEMENT PARTNERSHIP (HQIP)



HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies. www.hqip.org.uk/national-programmes

UCLPARTNERS



UCLPartners is a leading academic health science partnership that brings together people and organisations to transform the health and well-being of the population. Working in partnership and at pace, its members from the NHS and higher education support the healthcare system serving over six million people in parts of London, Hertfordshire, Bedfordshire and Essex. UCLP has supported NICOR in the preparation of this report. <https://uclpartners.com/>

© 2019 Healthcare Quality Improvement Partnership (HQIP)

This report was published on 12 September 2019



CONTENTS

Report at a glance	1
How to use this report	2
1. Introduction	3
2. Selected observations	4
3. QI theme: The need for timely care	7
3.1 Times to deliver primary percutaneous coronary intervention (PPCI) for patients with ST-elevation myocardial infarction (STEMI)	7
3.2 Times for angiography and percutaneous coronary intervention (PCI) for patients with non-ST-elevation myocardial infarction (NSTEMI)	11
3.3 Times to urgent coronary artery bypass graft (CABG) surgery, when indicated (usually after an acute coronary syndrome)	15
4. QI theme: The need for specialist care	18
4.1 Antenatal diagnosis of fetal cardiovascular abnormalities	18
4.2 Access to specialist care for patients suffering a heart attack or with heart failure	21
4.3 Cardiac rehabilitation for heart attack and heart failure patients	25
5. QI theme: The need for evidence-based care, delivered equitably	28
5.1 Use of day-case elective percutaneous coronary intervention (PCI)	28
5.2 Use of radial access for PCI procedures	30
5.3 Use of disease-modifying medicines in heart failure with reduced ejection fraction	32
5.4 Deep wound infections after cardiac surgery requiring additional surgery	34
6. Developments for the NCAP audit	37
References	38

REPORT AT A GLANCE

The National Cardiac Audit Programme 2019 Annual Report covers over 300,000 records across five clinical areas: Congenital Heart Disease, Heart Attack, Percutaneous Coronary Interventions (PCI), Adult Surgery and Heart Failure. It highlights quality improvement opportunities under the themes of the need for timely care, the need for specialised care and the need for evidence-based care delivered equitably.

The need for timely care

There has been a further deterioration in the time to delivery of urgent primary percutaneous coronary intervention (PPCI) in cases of higher risk heart attacks. Patients with ST-elevation myocardial infarction (STEMI) have seen the median 'call-to-balloon' time going up by **9 minutes** over the last 3 years.



Times to carrying out angiography and percutaneous coronary intervention (PCI) for patients with non-STEMI vary considerably between hospitals. The delays are especially long for patients requiring an inter-hospital transfer.

Times to urgent coronary artery bypass graft (CABG) surgery have not improved significantly at a national level. Just over **one third** of patients have the procedure within **7 days** of the diagnostic angiogram.



The need for specialist care

Antenatal diagnosis of fetal cardiovascular abnormalities in children who have an intervention in the first year continues to improve. Overall rate of detection has risen to over **50%**, with particularly good improvements in cases of hypoplastic left heart syndrome (HLHS, **93%**) and transposition of the great arteries with intact ventricular septum (TGA-IVS, **76%**).



Access to specialist care for patients suffering a higher risk heart attack or with heart failure is generally good. 96% of NSTEMI and 82% of heart failure patients are seen by specialist teams. There is much more variability in the case of NSTEMI patients and those with heart failure who are not admitted to cardiac wards.

Referral rates to cardiac rehabilitation for heart attack patients vary widely between hospitals. A reasonable goal is that **85%** of patients should be referred for rehabilitation, a rate that only around half of hospitals are achieving. For patients with heart failure, only **15%** are referred as an in-patient for cardiac rehabilitation.



The need for evidence-based care, delivered equitably

Use of day-case elective percutaneous coronary intervention (PCI) is growing, with some centres performing day case PCI in almost all elective cases, and some where almost all patients are kept in overnight following their procedure.

The use of radial access for PCI procedures is preferred and has climbed steadily over the last decade. **All but 10** hospitals meet or exceed the current BCIS standard of using radial artery access in **≥75%** of cases. Overall, **87%** of cases involve radial access and almost two fifths of hospitals now use this technique for **≥90%** of patients.



More heart failure patients with reduced ejection fraction (HFrEF) should be offered the best-practice package of all three disease-modifying medicines. Well over half of hospitals are not achieving the target of offering this package of medicines to at least 60% of patients, with the result that nationally 47% of patients were offered it. These hospitals should especially look to increase the use of mineralocorticoid receptor antagonists (MRAs).

Deep wound infections after cardiac surgery requiring additional surgery are seen in no more than 1% of cases. However, there is a more than tenfold variation between centres with approximately half of hospitals with cardiac surgical units able to report rates of 0.3% or lower.

For a summary of all the recommendations in the report, [click here](#)

HOW TO USE THIS REPORT

Need for timely care

Need for specialist care

Need for evidence based care, delivered equitably

Access all supporting documents mentioned below at www.nicor.org.uk/national-cardiac-audit-programme/

Main report

Carry on reading for the Annual NCAP Report

Key messages

Key messages can be found [here](#)

Audit specific reports

Choose audit specific reports from the NCAP page [here](#)

Local reports

Find the full list of audits [here](#)

Patient report

Find the patient report online [here](#)

for QUALITY IMPROVEMENT



Hospitals want to:

improve practice by comparing local results and benchmarking against the national picture and also by learning best practice from other hospitals.

WHAT TO READ

Main report

Key messages

Audit specific reports

Local reports

for COMMISSIONERS



Commissioners want to:

know how local services are performing and find out what the national picture is to compare.

WHAT TO READ

Main report

Key messages

Local reports

for PATIENTS & THE PUBLIC



Patients want to:

understand their condition and what level of care they are likely to receive, and find support.

WHAT TO READ

Main report

Patient report

Local reports

1. INTRODUCTION

In 2018, we published the [first combined report of the National Cardiovascular Audit Programme \(NCAP\)](#), bringing together six major cardiovascular domains into one audit. In doing so, we took the opportunity to review 50 years of developments in diagnostic procedures and therapeutic advancements in cardiovascular medicine and surgery, as well as the way that service delivery had changed over time. These changes have brought about more effective and more efficient care for patients and improved outcomes.

The evidence base continues to expand as new scientific discoveries are made and new clinical trials are reported. These are then reviewed and cost-effectiveness evaluations made before the results are adopted in routine clinical practice. However, the uptake of novel treatments or new ways of delivering services is variable. If the novel approach comes with improved outcomes, more efficient systems of care or cost savings, then there is a clear advantage to society to promote adoption and to reduce such variation. Conversely, where new evidence demonstrates no benefit from an existing treatment, then withdrawal of that treatment, or using it only in specific subsets where benefit can be shown, is desirable.

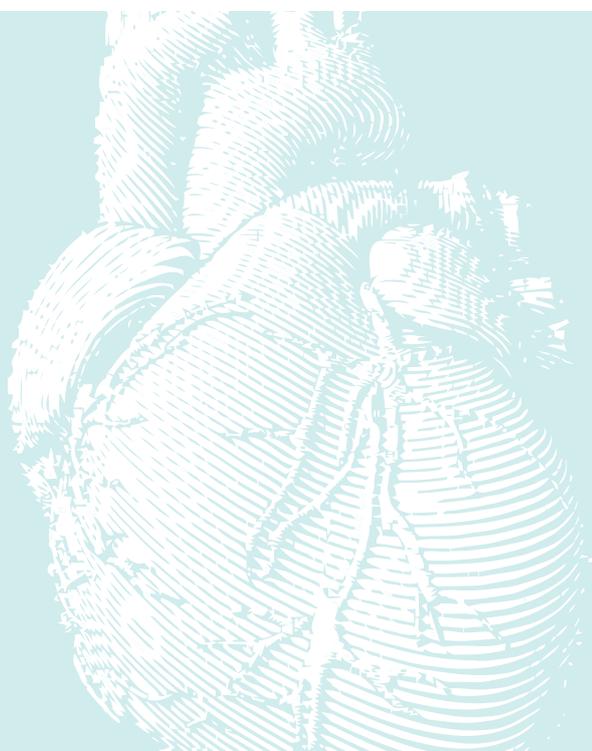
NCAP collects data from two domains that are concerned with particular disease processes (heart attacks and heart failure) and four that cover delivery of specific services (procedures for patients with congenital heart disease, percutaneous coronary intervention, cardiac surgery and the management of cardiac rhythm abnormalities). This year's report highlights the results

from five of the six sub-specialty domains. The redesign of the National Audit of Cardiac Rhythm Management (NACRM) in 2017/18 means its report for this year will be issued at a later date with the aim of it being published in line with the other five domains.

As well as providing a national overview, increasingly we are focusing on tailoring the information to the needs of individual stakeholders: the hospitals that collect it, healthcare commissioners and patients and carers. We acknowledge the huge effort by all involved, whether the professional societies that lead on the individual programmes, the frontline services that collect the data, the administrative teams that support local audit programmes or the hospital management teams. This effort brings benefits. The NCAP is proud to play its role in the quest to improve outcomes for patients and to help deliver treatments that improve their quality of life.

We are able to report a reassuring overall picture with many such improvements. However, there are some areas where we have seen either an overall deterioration in the quality of services or find considerable unwarranted variation in the delivery of services between hospitals. So there remains much scope for improvement and we are committed to helping national regulators, commissioners and local teams in their endeavours to deliver this.

Professor John Deanfield, Director of NICOR



2. SELECTED OBSERVATIONS

This report focuses on three broad quality improvement (QI) themes:

- **Timely care** – are patients receiving care quickly enough to obtain the greatest possible benefit?
- **Specialist care** – is treatment provided by those who are best trained to deliver the relevant care?
- **Evidence-based care delivered to a uniformly high standard** – how well are local services providing care against current standards?

This aggregate report focuses on these themes and does not describe all the data available from NCAP. The complete analyses for the individual audits are available [here](#).

Apart from the selected QI metrics, which are reported in more detail, some selected headlines from the full analyses are shown below.

CONGENITAL

(data from NCHDA – National Congenital Heart Disease Audit)

- 12,247 congenital procedures were reported in 2017/18 from 13 paediatric/mixed centres (11 in England, 1 in Scotland and 1 in the Republic of Ireland) and 15 centres only undertaking adult congenital procedures (12 in England, 1 in each of Scotland, Wales and Northern Ireland).
- Surgical procedures accounted for 43% of all procedures (the number of such cases fell slightly); there were also somewhat fewer paediatric catheter-based procedures but an increase in interventional procedures in adults, such that catheter-based procedures now account for 30% of the total.
- The complexity of congenital procedures is reflected in the number of cases where two consultants work together, with joint working in over 10% of surgical, 25% of interventional procedures in neonates and a third of interventional procedures in adults between 2015/16 and 2017/18.
- The 30-day unadjusted post-surgical mortality rate for under-16s has fallen to its lowest level at 1.4% for 2017/18, outcomes that are amongst the best reported worldwide.
- 30-day post-surgical hospital-level aggregated survival rate using STAT procedure-linked risk-adjusted methodology for adults (16 years and over) is reported for the first time. For patients between 2015/16 and 2017/18, survival was 11% higher than predicted with this model with all centres better than the alert and alarm limits.
- For patients reported between 2015/16 and 2017/18, 30-day post-procedural complication rates for under-16s are reported for the first time. This includes 0.7% of cases requiring an emergency (surgery or transcatheter) procedure, 2.2% requiring life support and 3.3% for those needing renal replacement therapy (dialysis).
- While unplanned re-intervention data were examined for the first time, this revealed significant data quality issues that will be the subject of further work.

HEART ATTACK

(data from MINAP – Myocardial Ischaemia National Audit Project)

- 102,056 patients were reported to MINAP in 2017/18; 92,233 of these had a confirmed heart attack, of which 35,740 were STEMI (39%) and 56,493 NSTEMI (61%).
- The median age of males suffering a heart attack (66 years) was 8 years younger than that of females (74 years).
- There is a rising prevalence of diabetes in patients experiencing their first heart attack, from 14% in 2003/4 to 21% in 2017/8.
- Smokers were about ten years younger at presentation than non-smokers (median age of smokers presenting with either STEMI or NSTEMI was 59 years compared to 70.6 years for those who had never smoked).
- Patients with a BMI of ≥ 40 present at an age which is eight to ten years younger than those with a BMI of 25 (for example, females with a BMI ≥ 40 had a mean age at presentation of about 63 years compared to about 74 for those with a BMI of 25).
- 47,803 NSTEMI patients (84.6%) were eligible for angiography in 2017/18, of which 85.5% had an angiogram performed pre-discharge.

PERCUTANEOUS CORONARY INTERVENTION

(data from NAPCI – National Audit of Percutaneous Coronary Intervention)

- 102,258 percutaneous coronary intervention (PCI) procedures were performed in the UK in 2017/18, representing 1,548 per million population.
- These procedures were undertaken in 118 PCI hospitals (101,057 patients in 98 NHS centres and 1,201 patients in 20 private centres).
- The median procedure volume per hospital was 1,552 PCIs in 35 surgical centres and 613 PCIs in 63 off-site centres.
- 37 PCI hospitals in the UK (31%) performed fewer than the recommended minimum number of 400 procedures, including 17 NHS centres (17% of NHS centres).
- 19 hospitals (including one NHS centre) performed fewer than 200 procedures for three successive years.
- 14,527 patients underwent isolated non-emergency coronary artery bypass graft (CABG) operations in the same period, with a national 7 : 1 PCI : CABG ratio.
- The proportion of procedures performed for an acute coronary syndrome is stable at about 67%, of which 27% are for the emergency treatment of STEMI by primary PCI.
- In 2017/18, 58 hospitals offered primary PCI for the emergency treatment of STEMI, 24/7 every day of the year, and a further ten link to form a hybrid service.
- There has been a slight increase (to 1.8%) in the proportion of PCI procedures being performed in the context of a ventilated patient after out-of-hospital cardiac arrest.
- Of 663 consultant operators, only 5.7% are female.

ADULT SURGERY

(data from NACSA – National Adult Cardiac Surgery Audit)

- 102,276 operations were reported between 2015/16 and 2017/18; when the subset of agreed high-risk cases is removed, this resulted in 97,262 cases for analysis.
- There has been a fall in the number of cardiac operations in recent years: 32,295 operations were performed in 2017/18, representing a 22% reduction compared with 10 years ago.
- 14,527 underwent isolated non-emergency CABG in 2017/18, a 13% reduction over 4 years. The number of urgent cases has remained about the same over the last 3 years (about 6890 patients per year) but there has been a significant fall in elective CABG cases (from 9901 in 2014/15 to 7622 in 2017/18).
- After the introduction of transcatheter aortic valve implantation (TAVI), there was an initial increase in numbers of patients undergoing isolated aortic valve replacement (AVR) or AVR with CABG, but there has been a fall in numbers in the last 2 years (isolated AVR cases 5401 in 2014/15 to 5158 in 2017/18; AVR plus CABG cases 3421 in 2014/15 to 2766 in 2017/18).
- Complication rates after first-time CABG in 2017/18 remain low: re-operation rates for bleeding 2.57%; stroke 0.61%; significant renal failure 1.63%; but there is variation between hospitals.
- In-hospital mortality for the 97,262 cases between 2015/16 and 2017/18 was 1.82%, so 98.18% survive the operation; survival after non-emergency isolated CABG or AVR was 99%.
- Of 257 consultants performing cardiothoracic surgery, only 7 (2.7%) are female.

HEART FAILURE

(data from NHFA – National Heart Failure Audit)

- Of 68,266 submissions in 2017/18, 58,885 patients admitted with heart failure (HF) in England and Wales were analysed. This is a reduction from previous years because of a new cleaning algorithm (see HF domain report, page 9, section 3.2), and so these patients almost certainly represent a higher-risk group than previously reported; 34% have diabetes.
- 88% underwent echocardiography, but 31% of those under general medical care do not undergo this.
- In 2017/18, the prescription of disease-modifying medications for patients with heart failure and reduced ejection fraction (HFrEF) has improved further: 89% on a beta blocker, 84% on an Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker (ACE-i/ARB), 53% on a Mineralocorticoid Receptor Antagonist (MRA). There is, however, considerable inter-hospital variation.
- Only 47% have cardiology follow-up and 58% had follow-up with a HF nurse specialist. However, only 37% of discharged patients had a follow-up appointment within 2 weeks.
- In-hospital and 1-year mortality was lower in patients receiving specialist care.

3. QI THEME: THE NEED FOR TIMELY CARE

Once a diagnosis is made and a treatment plan has been agreed, then treatment should be delivered in a timely fashion, as delays might influence outcomes. In serious cases (e.g. a patient with a large heart attack), treatment should be delivered as quickly as the emergency services can do so. In other situations, delays, whilst not directly affecting outcomes, are inconvenient and may lead to inefficiencies (e.g. patients waiting for transfer from one hospital to another for specialised care). In this section, several important timelines are analysed.

3.1 TIMES TO DELIVER PRIMARY PERCUTANEOUS CORONARY INTERVENTION (PPCI) FOR PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION (STEMI)

3.1.1 WHY IS THIS IMPORTANT?

Once STEMI has been recognised, the sooner that primary PCI (PPCI) is performed the more likely it is that significant heart muscle damage can be prevented and more patients survive. The timeliness of PPCI is therefore an important measure of the quality of care.

In about 80% of cases admitted with a heart attack the patient calls for help by dialling '999'. Attending paramedics can make the diagnosis of STEMI by performing an electrocardiogram (ECG). Ideally, the paramedics will then transport the patient as quickly as possible to a hospital that can provide immediate PCI, alerting that hospital while en route. The time taken to move through this 'pathway' can be assessed with the following key time periods:

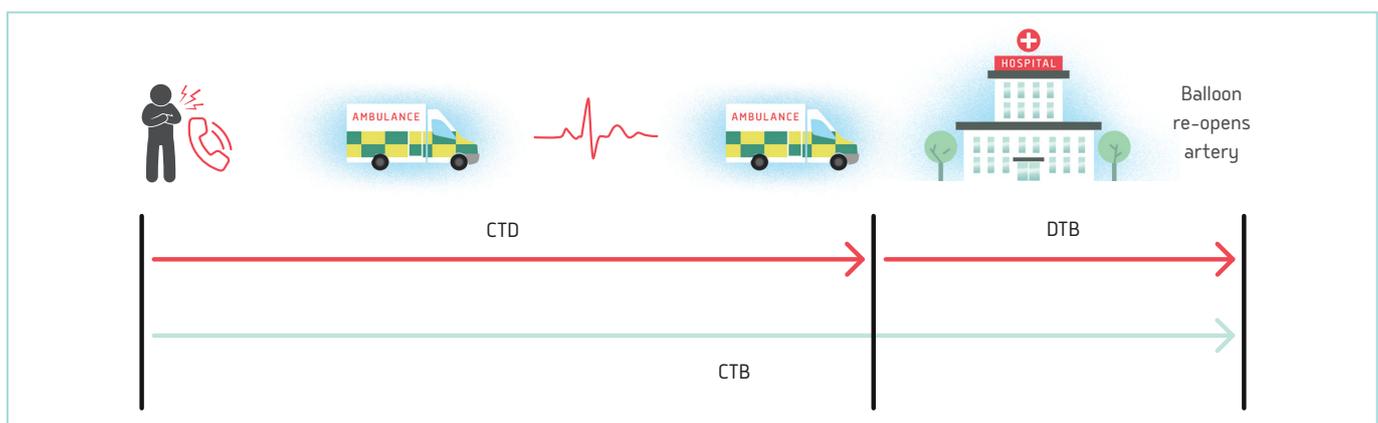
- Call-to-balloon time (CTB): the overall response of the health service from the time the patient calls for help until the PCI, when the blocked vessel is opened with a balloon

and stent. This is made up of the CTD and DTB times.

- Call-to-door time (CTD): during which the ambulance service must respond to the call, make a pre-hospital assessment, provide appropriate treatments and convey the patient to hospital. This is a measure of ambulance service response.
- Door-to-balloon time (DTB): during which hospital staff must confirm the diagnosis, assess the patient's suitability for PCI, prepare for and begin to perform the PCI. This is a measure of the hospital response.

The various time intervals reported in MINAP and NAPCI are represented in Figure 3.1. These times are important, as it has been estimated that for every 15 minutes delay there will be approximately six additional deaths per 1000 patients treated.¹

Figure 3.1: Time intervals in treatment of STEMI



3.1.2 QI RECOMMENDATIONS

1. All Sustainability and Transformation Partnerships (STPs)/local health systems should have in place the protocols and infrastructure to fast track to the PPCI team those heart attack patients presenting themselves to A&E or other settings without PPCI facilities.
2. All ambulance services need to review service delivery for patients with STEMI to see if the lengthening CTD times can be reversed.
3. All ambulance services and hospitals should put in place a single point of contact at the PPCI centre to activate the PCI team, which should be ready to receive the patient on arrival.
4. All ambulance services and hospitals should ensure that, wherever possible, the patient is taken directly to the catheter lab at the PPCI centre – the room in which PCI is performed.
5. Hospitals not reaching the current national or BCIS DTB standards should undertake a clinical pathway process review and identify areas where delays can be avoided. Advice should be sought from centres where such work has resulted in the meeting of the current standards.
6. Every patient suspecting a heart attack should call for an ambulance and not attempt to take themselves to hospital.

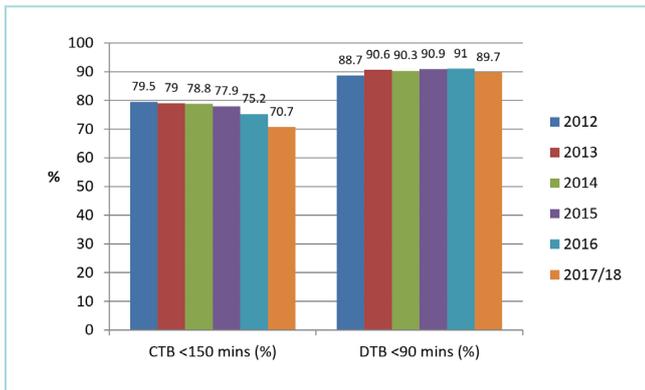
3.1.3 AUDIT FINDINGS

In the last 5 years, DTB times (hospital performance) have remained the same, but there has been a lengthening of CTD times (implying that ambulance response times have become slower). This has resulted in an overall worsening of CTB times – a finding in both the MINAP and NAPCI analyses. The reasons for this deterioration in the pre-hospital phase are unclear. Since 2015, CTB times have increased by 9 minutes and this deterioration might be expected to account for approximately 100 fewer lives saved in the UK.

A focus is needed to reverse the deterioration in ambulance response times. In addition, although the overall DTB times are good, there is still considerable variation between hospitals. Improvement in the slower centres is therefore also needed to improve patient care.

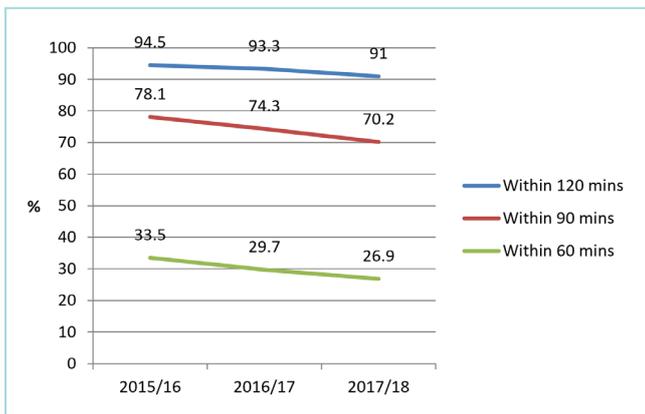
Metric	Evidence base	Standard/target	Result	Trend
CTB times	BCIS ² / ESC ³ / NICE ⁴	At least 75% of all patients should have a CTB time of less than 150 minutes.	24 of 68 PPCI services reach this standard (excluding hospitals with low volumes). In 2014, 78% of patients had a CTB time <150 minutes, but this has now fallen to 70.7%. Patients requiring transfer between hospitals suffer a 53-minute additional delay.	9-minute deterioration in median CTB observed over the last 3 years (14-minute deterioration since 2011).
CTD times		There are currently no agreed standards for CTD times although the data for each ambulance trust are provided.	Median CTD time varies between ambulance trusts from a little over 60 minutes to a little under 90 minutes.	Overall median CTD time has increased from 67 minutes in 2014/15 to 77 minutes.
DTB times	ESC ³	Target 1: All eligible patients should have a DTB time of less than 90 minutes.	89.7% are performed within 90 minutes. Five hospitals achieve this in <75%.	No significant change over the last 3 years.
	BCIS ²	Target 2: At least 75% of all patients should have a DTB time of less than 60 minutes.	76.8% are performed within 60 minutes. 31 hospitals achieve this in <75%.	

Figure 3.2: Temporal trends in proportion of patients with CTB <150 mins and DTB times <90 mins (NAPCI data)



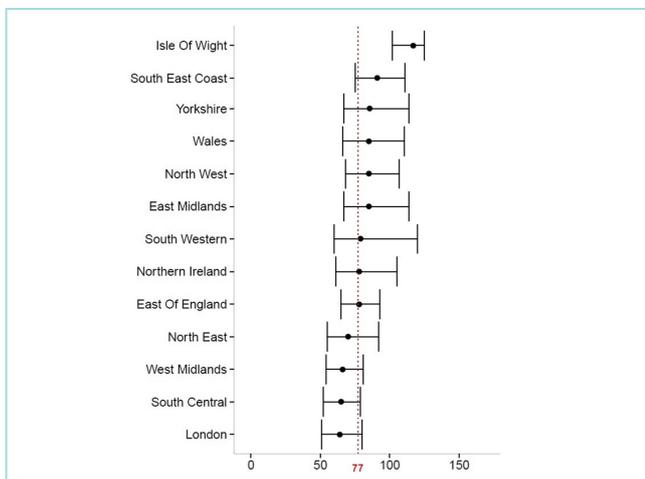
[Note: Excludes patients in shock or on a ventilator; includes both direct admissions and those requiring a transfer.]

Figure 3.3: Temporal trends in CTD times showing the proportion of patients arriving at hospital within given time intervals after calling an ambulance (MINAP data)



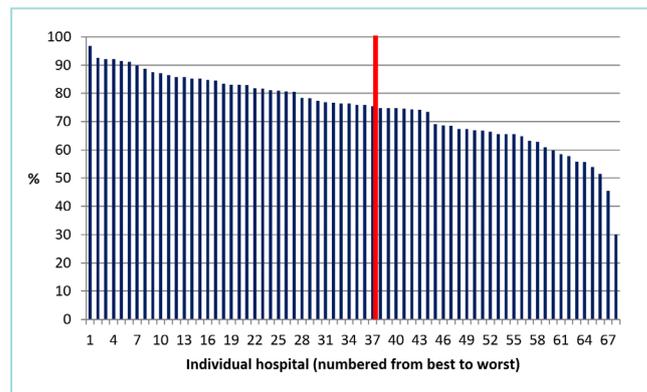
3.1.4 PERFORMANCE OF INDIVIDUAL AMBULANCE TRUSTS AND PPCI HOSPITALS

Figure 3.4: Median CTD time for PPCI by ambulance trusts (MINAP data)



[NOTE: Median time (in minutes) and interquartile range (IQR) shown by trusts, as well as the overall median. The Isle of Wight is a special case as patients have to be transported off the island to a mainland PPCI hospital.]

Figure 3.5: Proportion of procedures with >75% of DTB times less than 60 minutes in PCI hospitals (NAPCI data)



[Note: The hospitals to the right of the red line are those that fail to achieve DTB times of less than 60 minutes in ≥75% of cases. Data from 68 hospitals; hospitals reporting <20 cases excluded.]

[Click here](#) to see the performance of each individual hospital.

CASE STUDY: Optimising door-to-balloon times for a centre with an A&E Department

John Radcliffe Hospital, Oxford: Andrew Lucking, Consultant Cardiologist

- Strong ethos of teamwork.
- Single point of contact (via dedicated phone extension) within CCU with whom inbound ambulance crews and other colleagues communicate; details including ETA and 10-minute call are relayed to the catheter lab coordinator and interventional cardiologist on-call in order to ensure one of our coronary labs is free at the time the patient arrives.
- Dedicated catheter lab entrance within 20 metres of our coronary labs, with reserved ambulance bay immediately outside.
- Patients taken directly to the catheter lab.

CASE STUDY: Optimising door-to-balloon times for a centre with no A&E department

Castle Hill Hospital, Hull: Richard Oliver, Consultant Cardiologist

- Having no emergency department access avoids delays that other hospitals have.
- Single point of contact to activate the team.
- All patients delivered straight to our catheter lab where PPCI staff are waiting.
- Probably an optimal catchment area (approximately 600 cases/year) so more than one patient arriving at any one time is unusual (possibly a problem for larger units).
- PPCI prioritised, with three labs available during the day on a flexible basis.

3.2 TIMES FOR ANGIOGRAPHY AND PERCUTANEOUS CORONARY INTERVENTION (PCI) FOR PATIENTS WITH NON-ST-ELEVATION MYOCARDIAL INFARCTION (NSTEMI)

3.2.1 WHY IS THIS IMPORTANT?

National and international guidelines recommend that angiography is performed within 72 hours of admission to hospital, to achieve optimal outcomes and reduce inefficiencies. After angiography, patients may be treated with continuing medical therapy alone, or might need some form of intervention on the coronary arteries, whether by PCI or coronary artery bypass surgery (CABG).

In some cases, a further period of consideration and discussion is required to weigh up whether PCI or CABG would be preferable and to allow fully informed shared decision-making. However, as PCI is often done immediately after angiography, the recommendation is that PCI is performed within 72 hours of admission to hospital.

3.2.2 QI RECOMMENDATIONS

- 7. All hospitals and ambulance trusts should ensure that local service delivery times for angiography and PCI for patients with NSTEMI (particularly for patients requiring inter-hospital transfer) are reviewed and that where delays are identified:**
 - **Multidisciplinary groups are set up to undertake a regional clinical pathway process review, and agree actions to bring times within the recommended standards**
 - **Quality improvement action plans and business cases are drawn up to ensure a resolution of identified blocks to optimal care**
 - **Advice is sought from hospitals contributing to the NCAP where such work has resulted in the meeting of the current standards**

3.2.3 AUDIT FINDINGS

Time to angiography following NSTEMI varies considerably; only 57% of patients undergo this investigation within 72 hours. Time to angiography can be calculated for 111 hospitals, of which 57 achieved the original NHS England 'Best Practice

Tariff' target of providing angiography within 72 hours for at least 60% of patients.⁵ Times to angiography are particularly long for patients who are first admitted to hospitals that do not

provide angiography services and so require transfer to another hospital.

Delays in some hospitals are substantial, yet the highest

performing hospitals report providing an angiogram within 72 hours of admission to more than 85% of patients.

Time to PCI following angiography is improving but only 55% of patients undergo treatment within 72 hours of admission.

Metric	Evidence base	Standard/target	Result	Trend
Time to angiography for NSTEMI patients	ESC / EACTS ⁶ / NICE ⁷	High-risk patients with NSTEMI should undergo angiography (unless a contra-indication) within 72 hours of arrival at hospital. The Best Practice Tariff uplift ⁵ is achieved if >60% of patients undergo angiography within 72 hours.	56.7% underwent angiography within 72 hours; 43.3% waited >72 hours and 29.8% waited >96 hours. Only 57/111 hospitals with data provide angiography for 60% of patients within 72 hours. Median time is 57 hours for direct admissions (IQR 27-99), but 76 hours for transfer patients (IQR 45-122).	3.5 percentage point improvement in times to angiography over the last 3 years, but still <60% of all patients are investigated within the target.
Time to PCI for NSTEMI patients	ESC / EACTS ⁶ / NICE ⁷	High-risk patients with NSTEMI who are treated with PCI should undergo PCI within 72 hours of arrival at hospital. Taking into account the effect of comorbidities and case mix, a reasonable goal for PCI hospitals is 75% of patients undergo PCI within 72 hours.	Only 11/62 (17.7%) hospitals with data provide PCI for 75% of patients within 72 hours.	Times to PCI have improved over the last 3 years, but still only 55% of all patients are treated within the target.

Figure 3.6: Temporal trends for time to angiography for patients with NSTEMI (MINAP data)

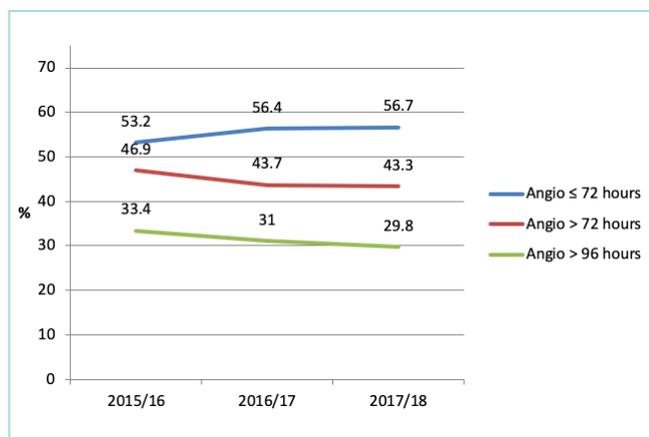
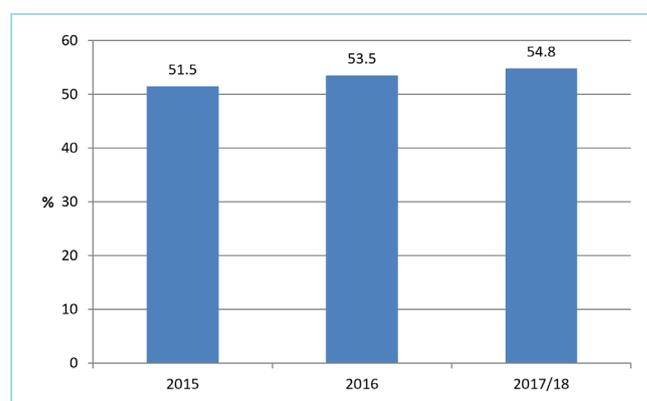
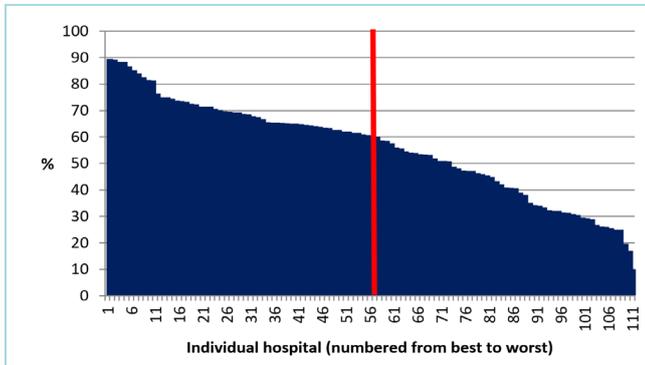


Figure 3.7: Temporal trends for proportion of NSTEMI patients undergoing PCI within 72 hours (NAPCI data)



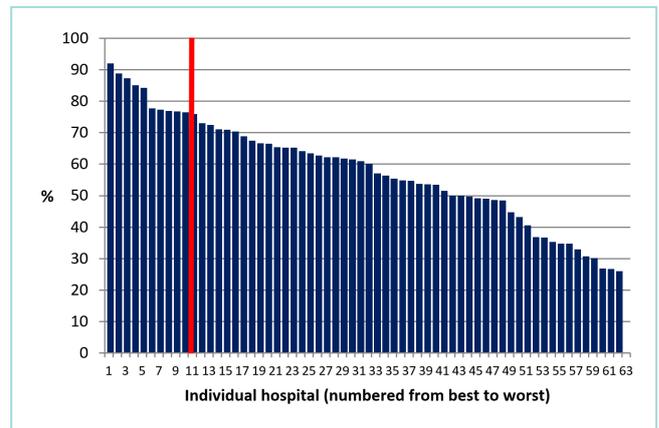
3.2.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 3.8: Proportion of NSTEMI cases undergoing angiography within 72 hours, 2017/18 (MINAP data)



[Note: Hospitals to the right of the red line **fail** to achieve the 60% Best Practice Tariff target. Data from 111 hospitals; 95 hospitals reporting <20 cases or incomplete data excluded.]

Figure 3.9: Proportion of NSTEMI patients undergoing PCI, where indicated, within 72 hours (NAPCI data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of $\geq 75\%$ of patients undergoing PCI within 72 hours. Data from 62 hospitals.]

CASE STUDIES: Identifying and tackling bottlenecks for angiography/PCI (including for acute coronary syndrome patients)

Kettering General Hospital: Kai Hogrefe, Consultant Cardiologist

- High-sensitivity troponin T was incorporated in the emergency department.
- Cardiac Outreach Service (COS) was introduced and delivered by advanced nurse practitioners and cardiology middle grades, supported by the consultant of the week/on-call consultant and the 'hot lab' team (dedicated to urgent work).
- 7-day 'Consultant-of-the-Week' model ensures daily reviews and senior decision-making, reducing delays in treatment and discharge.
- Middle grade cardiology rota was redesigned and cover for Cardiac Chest Pain Unit provided until midnight. Direct admission of NSTEMI cases to the cardiology unit was introduced.
- Daily 'hot lab' morning session provided Monday to Friday (three catheter labs). 'Hot lab' sessions run on most weekends, following a consultant-led ward round identifying appropriate patients, supported by the primary PCI team working flexibly.
- Guideline-recommended discharge pathways for acute coronary syndrome (ACS) patients were implemented, keeping length of stay for PPCI and NSTEMI patients as short as possible. This is supported by the cardiac investigations unit, cardiac rehabilitation and heart failure services.

Royal Berkshire Hospital, Reading: Tracey Realey, Projects Nurse for Acute Medicine

- Electronic referrals for patients that require a review by the cardiologist of the week.
- Early identification of patients that require a bed on either the Cardiac Care Unit or the Cardiology Ward.
- Running a ward list daily, following the completion of the booked out-patients list.
- Running an angiogram service for in-patients on a Sunday.

Hywel Dda University Health Board, Wales: Adrian Raybould, Consultant Cardiologist

Morrison Cardiac Centre, Swansea: Zia Ul Haq, Cardiology Specialist Registrar

- In an area characterised by geographical and rural challenges, a common pathway of referral to the regional cardiac centre was put in place for patients admitted to any one of four non-interventional general hospitals. A regional approach was considered.
- A 'treat and repatriate' service was initiated using just two day-case beds at the cardiac centre and a dedicated ambulance service.
- Achieved a reduction in referral to angiography time from 10 days to 3.5 days over the first 7 weeks.
- Reduced the number of patients waiting in the non-interventional hospitals from 30 to just four after 7 weeks.
- 82 patients made use of the two day-case beds, with only four patients needing overnight stay at the centre.

3.3 | TIMES TO URGENT CORONARY ARTERY BYPASS GRAFT (CABG) SURGERY, WHEN INDICATED (USUALLY AFTER AN ACUTE CORONARY SYNDROME)

3.3.1 WHY IS THIS IMPORTANT?

After a heart attack, many patients are advised to have urgent CABG. However, these patients will already have been prescribed dual anti-platelet therapy at the time of diagnosis, so performing immediate surgery in these circumstances is associated with a higher risk of bleeding and is logistically challenging. To allow the surgery to proceed, one of these medicines is usually stopped and a few days allowed for its effect to wear off, thereby reducing the bleeding risk. Taking this into account, the recommendation is to perform surgery 5–7 days after the medicine is stopped. This time also allows for other aspects of care to be optimised before the urgent operation.

Following angiography, some patients have to be transferred to another hospital for their surgery. This transfer process can often lead to considerable delays against the target, because of the time taken to arrange and complete the move and because of the competing calls on the capacity of the surgical team. For this group of patients with acute coronary syndrome though, the risks of future events will be reduced if surgery is offered within the recommended time. More research is needed to determine whether there are subsets of patients for whom their delayed treatment, typically as an elective case, is as safe as early in-house treatment.

3.3.2 QI RECOMMENDATIONS

- 8. All hospitals should ensure patients requiring urgent CABG receive this treatment within 7 days of the angiogram. In most circumstances, this implies the patients should undergo CABG as an in-patient.**
- 9. Hospitals not reaching the current standards should**

undertake a regional or hospital-centred clinical pathway process review and identify areas where delays can be avoided. Advice should be sought from centres where such work has resulted in the meeting of the current standards. A quality improvement action plan should be instigated to reduce delays.

3.3.3 AUDIT FINDINGS

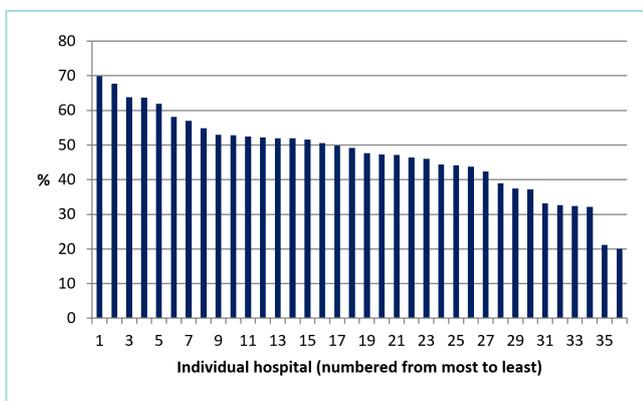
Data completeness was inadequate, being <50% complete in six hospitals. National figures have improved slightly from a median delay of 11 days in 2015 to 10 days in 2017/18. However, only 34% of patients had urgent surgery within 7 days of angiography. Nine hospitals had a mean delay of ≤ 7 days (six NHS centres and three private). Six centres (all NHS) had a mean delay of 14 days or more. Only three NHS hospitals and five private centres operated on more than half of patients within 7 days. Ten NHS centres achieved this in less than or

equal to a quarter of cases. National figures have not improved significantly.

Some centres discharge many of these patients after the acute episode to be re-admitted electively at a later stage for CABG. This policy has the effect of reducing pressure on in-patient hospital beds but has the potential disadvantage of exposing the patient to the risk of a recurrent cardiac event while waiting for CABG. It also increases the elective waiting list.

Metric	Evidence base	Standard/target	Result	Trend
Time from angiography to urgent CABG	ESC ⁸	The CQUIN (Commissioning for Quality and Innovation) target suggests that 100% of patients should undergo CABG within 7 days of the diagnostic angiogram. ⁹ Taking into account comorbidities and case mix, a reasonable goal for hospitals is 75% of all urgent patients undergo CABG within 7 days of the diagnostic angiogram.	The mean wait remains at 10 days; only 34% have surgery within 7 days. Ten trusts achieved this target in less than 25% of cases.	Mean time to surgery is 10 days, down from 11 days over the last 3 years.

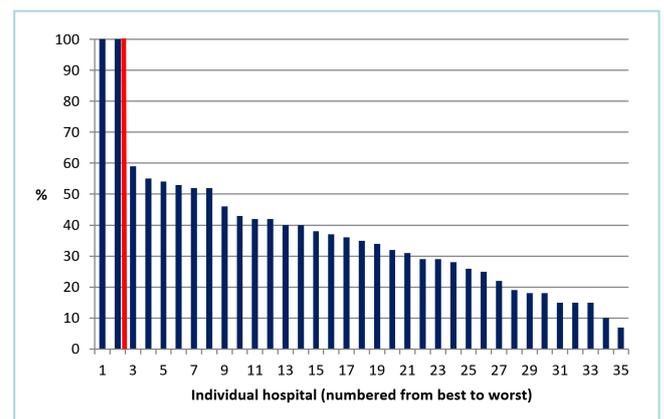
Figure 3.10: Proportion of urgent CABG cases by hospital, 2017/18 (NACSA data)



[Note: Urgent cases as a percentage of the total of urgent and elective cases. Data from private hospitals excluded.]

3.3.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 3.11: Proportion of patients undergoing urgent CABG within 7 days of angiography by hospital, 2017/18 (NACSA data)



[Note: Hospitals to the right of the red line fail to achieve the target of $\geq 75\%$ of urgent CABG cases being operated on within 7 days. The top two centres are private centres with a very small number of cases. Data from six centres excluded because of poor data completeness.]

[Click here](#) to see the performance of each individual hospital.

CASE STUDY: Reducing waits for patients needing urgent CABG

University Hospital of North Midlands: Christopher Satur, Cardiothoracic Surgeon

- Prompted by the CQUIN target, the pathway for patients requiring cardiac surgery, including urgent cardiac surgery following inter-hospital transfer, was reviewed and a new process introduced.
- The need for excellent communication between our unit and Consultant Cardiologists of referring hospitals was highlighted.
- Use of nurse coordinators and preoperative optimisation reduced cancellations for medical reasons (such as stopping certain preoperative medications in a timely manner – especially anti-platelet medicines, treating diabetes, etc.); occult infection was identified and treated early, diabetes management optimised, and smoking cessation introduced.
- Nurse coordinators ensure prompt transfer, allowing sufficient time for preoperative assessment and management.
- On transfer, a named consultant surgeon is identified with the soonest available operating space. Whilst it is the aim that the named consultant will provide surgical treatment, a shared approach to maximise utilisation of theatre sessions is practised. Transfer of care to another consultant with a vacant operating session is therefore encouraged.
- The hospital was the top-performing NHS hospital in 2017/8, with 59% of patients receiving urgent CABG within a week.

4. QI THEME: THE NEED FOR SPECIALIST CARE

Specialist teams working to agreed clinical protocols are more likely to deliver evidence-based treatment than teams that have a much wider remit. This has been shown in the Heart Failure audit reports over several years. Each of the individual domain reports outline aspects of this theme, but here we highlight three areas where further improvements in access to specialised care are desirable.

4.1 | ANTENATAL DIAGNOSIS OF FETAL CARDIOVASCULAR ABNORMALITIES

4.1.1 WHY IS THIS IMPORTANT?

About eight in every 1000 babies are born with a heart or circulatory disorder. Delays in making a diagnosis are associated with poorer outcomes. Ideally, the diagnosis of heart disease should be made before the birth of the baby; identification before birth is referred to as antenatal diagnosis. Following an antenatal diagnosis, parents can then be counselled, and specialised services can be forewarned and available to provide optimal care for the infants, some of whom will require emergency treatment.

Antenatal diagnosis is only possible with sophisticated

ultrasonography equipment and very skilled obstetric sonographers. This requires appropriate levels of staff with the necessary training. The Congenital audit has seen a gradual improvement in antenatal diagnosis, but further improvement is desirable. Not all congenital lesions can be detected before birth. However, for infants requiring intervention in the first year, the pick-up rate has increased to just over 50% and for complex lesions the pick-up rate has improved to around 80%. However, some centres perform better than others and there is a need to bring all centres up to the optimal level.

4.1.2 QI RECOMMENDATION

10. All hospitals should aim to increase the rate of antenatal diagnosis of conditions requiring intervention in the first year by reviewing the staffing levels, the availability of

the necessary ultrasonography equipment and ensuring that obstetric sonography staff are receiving appropriate education and training.

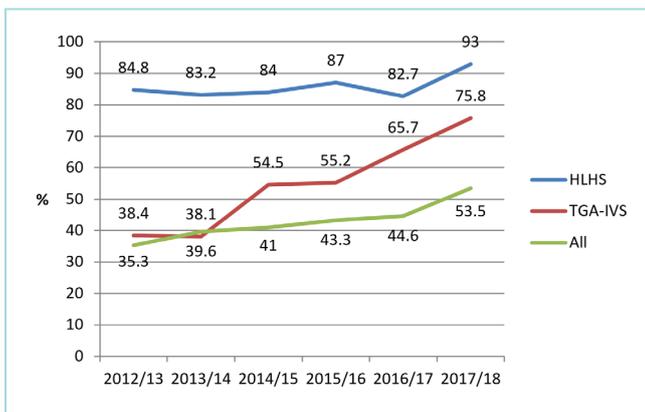
4.1.3 AUDIT FINDINGS

There is continuing improvement in the antenatal diagnosis of congenital heart conditions that have an intervention in the first year across the UK and Republic of Ireland. There is particularly good detection of cases with hypoplastic left heart syndrome (HLHS) and excellent improvement in diagnostic rate for transposition of the great arteries with intact ventricular septum (TGA-IVS) to over 75%.

While most individual hospitals are improving and the best performing regions and hospitals have a detection rate of 70% overall and 100% for certain specific abnormalities, there does remain variation between centres. It is also important to note that the reported detection rates are based only on patients having an intervention in the first year after birth.

Metric	Evidence base	Standard/target	Result	Trend
Antenatal diagnosis of fetal cardiovascular abnormalities	Antenatal detection is associated with better pre-procedural condition and higher neonatal post-procedural survival with fewer post-procedural complications. ¹⁰	There are currently no agreed international standards, but the aim is for an antenatal diagnosis in at least 75% of all abnormalities where intervention is undertaken in the first year, and 90% for two specific abnormalities: hypoplastic left heart syndrome (HLHS) and transposition of the great arteries with intact ventricular septum (TGA-IVS).	Overall 53.5% of cases diagnosed antenatally. 93% of HLHS cases were identified. 75.8% of TGA-IVS cases were identified.	Gradual improvement seen overall and for the two specific diagnoses in the last 10 years.

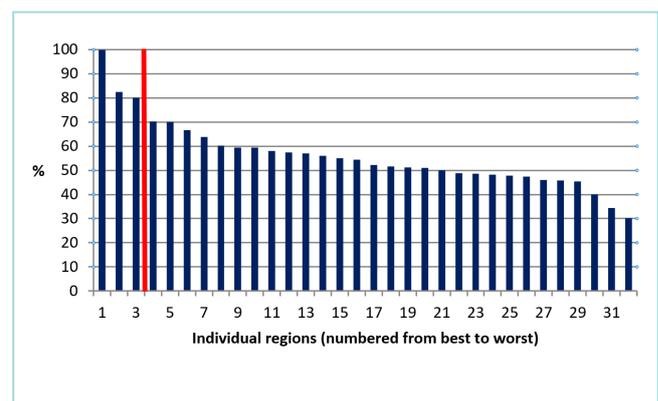
Figure 4.1: Temporal trends in proportion of infants diagnosed antenatally who underwent an intervention in the first year, 2008/09–2017/18 (NCHDA data)



[Note: All = all infants treated in the first year diagnosed antenatally; HLHS = infants diagnosed antenatally with hypoplastic left heart syndrome who underwent an intervention at less than 6 months of age; TGA-IVS = infants diagnosed antenatally with transposition of the great arteries with intact ventricular septum who underwent an intervention at less than 6 months of age.]

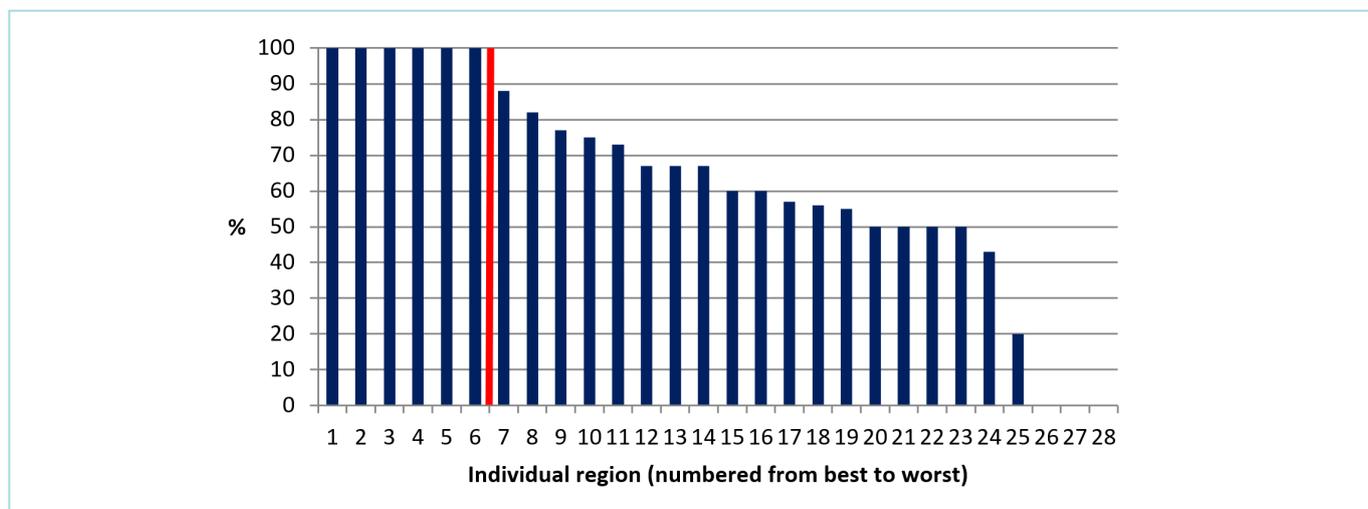
4.1.4 PERFORMANCE OF INDIVIDUAL REGIONS

Figure 4.2: Proportion of infants who underwent an intervention in the first year and who were diagnosed antenatally, 2017/18 (NCHDA)



[NOTE: Regions to the right of the red line are **not** achieving $\geq 75\%$ of cases treated in the first year diagnosed antenatally. The overall detection rate for 2015/16–2017/18 was 46.5%. It was 53.5% for 2017/18. Data from 32 regions; data from South Wales regions are included together, overseas and unknown cases excluded. The figures do not take into account the volumes of cases seen by a region (range 2–242), with the best region seeing only 2 cases who were potentially diagnosable antenatally.]

Figure 4.3: Proportion of infants with transposition of great arteries and intact ventricular septum who underwent an intervention at less than 6 months of age and who were diagnosed antenatally, 2015/16–2017/18 (NCHDA data)



[Note: Regions to the right of the red line have **not** reached a level of $\geq 90\%$ diagnosed antenatally. Data from regions with no potential cases in these three years, those from overseas and those with unknown regions excluded. The figures do not take into account the volumes seen by a region (range 0–37), with all regions scoring 100% having fewer than 4 cases potentially detectable.]

[Click here](#) to see the performance of each individual geographical region (Local Area Team)

CASE STUDY: Improving antenatal detection of fetal abnormalities

Russells Hall Hospital, Dudley: Suzanne Schlanker, Lead Sonographer

- Following the updated fetal cardiac protocol of the NHS Fetal Anomaly Screening Programme, requiring us to examine five views of the heart, our challenge was to bring all members of staff to the same level, improving their detection rates, knowledge and confidence.
- We used online training, but contacted the charity Tiny Tickers <https://www.tinytickers.org/professionals/training-services/> because its theory-based practical training seemed ideal for our needs. Staff were given hands-on training, using their own machines in their own setting. Training included aspects of the patient experience and delivering difficult news.
- As a result, the ability and confidence of our staff are greatly improved. As a department we are competent at identifying the five views and in using the supplementary views to further aid diagnoses and are increasingly detecting heart conditions at earlier gestation. We now have an excellent detection rate for cardiac defects, with 100% of auditable cardiac conditions being detected last year. We are incredibly proud of this achievement.
- We intend to continue our annual training and have recently invested in new equipment. As a department, we are also interested in pursuing advanced cardiac training for our staff members to further improve our service.

4.2 | ACCESS TO SPECIALIST CARE FOR PATIENTS SUFFERING A HEART ATTACK OR WITH HEART FAILURE

4.2.1 WHY IS THIS IMPORTANT?

International guidelines recommend that patients admitted to hospital with a heart attack are cared for by teams of specialist cardiovascular clinicians to ensure that they receive effective and efficient treatments. Such treatments include a variety of medicines that have been shown to improve outcomes and reduce the risk of further heart attack. The doses of these medicines have to be optimised over time. Further, as explained above, selected patients with higher risk characteristics require angiography, sometimes followed by PCI or CABG.

For those patients with significant heart pump dysfunction, additional treatment should be considered, such as sophisticated pacemaker systems, for these have been shown to give the best chances of survival with a good quality of life. Judging which patients will benefit from such advanced interventions requires expertise.

Increasingly, hospitals use specialised groups of nurses or physiologists with specific clinical skills, working alongside

the consultant staff, to ensure that a comprehensive 'bundle of care' is considered and offered where appropriate.

Similarly, specialist cardiac nurses can contribute to the evaluation of patients and the provision of optimal care when they present to hospital with heart failure. Not all patients with heart failure need to be admitted to hospital. Across the country, integrated care teams are providing community as well as hospital services. These teams offer continuous support for patients, to promote the best possible quality of life and to reduce the need for admission or readmission to hospital.

Patients need careful evaluation to identify the underlying causes of their heart failure and, just as in the case of heart attack, to consider the use of special medicines and pacemaker systems that have been shown to improve survival and quality of life. Careful assessment of patients with heart failure will reveal some who have significant heart valve abnormalities that require surgery or percutaneous interventions. Better outcomes are achievable with integrated specialist care.

4.2.2 QI RECOMMENDATIONS

11. All hospitals should ensure that all heart attack and heart failure patients have equal access to specialist care, regardless of which type of ward they are admitted to, either by:

- admitting a higher proportion to a cardiology ward, or by
- putting in place specialised nursing cardiac 'outreach' teams that are able to play a role in the care of patients on other types of wards.

12. Hospitals not achieving the targets for access to specialist care should undertake a review of staffing structures and clinical protocols and are also advised to learn from centres that provide the best care.

4.2.3 AUDIT FINDINGS

The vast majority of patients admitted with heart attack are seen by specialist cardiology teams. All those undergoing PPCI for STEMI are necessarily managed by interventional cardiologists during the earliest phase of their admission. 96% of patients with NSTEMI are seen by cardiology teams. Only 22 hospitals report less than 90% of patients being seen by a cardiologist during their admission.

For those patients admitted with HF, 82% are seen by a

specialist HF team. This is a slight improvement on previous figures.

Admission to specialist wards gives a better chance of gaining access to specialist care, receiving outcome-modifying treatments and referral to cardiac rehabilitation. For patients with STEMI, most are likely to be nursed on a coronary care unit or cardiology step-down ward. For NSTEMI, there has been a gradual increase in the proportion being admitted to, and managed on, cardiology specialty wards during the first 24

hours of their stay in hospital. However, there is considerable variation between hospitals. 69 hospitals report that at least 75% of NSTEMI patients are managed on cardiology specialty wards, while fewer than 25% of patients are so managed in 39 hospitals.

Only 46% of patients admitted with HF are nursed on a cardiac ward. There has been no significant change over time. This might represent an appropriate decision to nurse a patient

on a general medical ward because of multiple comorbidities requiring other services or it may indicate a 'ceiling of care' related to the number of available specialist cardiology wards. For those HF patients admitted to a cardiology ward, 99% are seen by the specialist team. For those admitted to general medical wards, only 68% see a specialist. However, there is considerable variation between hospitals, with two-fifths of hospitals failing to achieve specialist review rates of over 80%.

Metric	Evidence base	Standard/target	Result	Trend
Specialist care for patients admitted with a heart attack	ESC ^{6,11}	All higher risk patients with a primary diagnosis of a heart attack should be seen during admission by a member of a specialist clinical team. Taking into account comorbidities and case mix, a reasonable goal is 90% of patients seen by a member of a specialist clinical team.	96% of patients with NSTEMI are seen by a member of a specialist cardiology team.	No change over the last 2 years.
Specialist care for patients admitted with HF	NICE ^{12,13} / ESC ¹⁴ / NCEPOD ¹⁵	All patients admitted with heart failure should be seen by a member of a specialist HF team. The Best Practice Tariff target is for 60% of patients to be seen. ¹⁶ Taking into account comorbidities and case mix, a reasonable goal is 80% of patients seen by a member of a specialist clinical team.	82% are seen by a specialist HF team (57% are seen by a consultant, 49% by a nurse specialist). 99% on a cardiology ward are seen by a specialist, but only 68% of patients on a general medical ward.	Improved by 2 percentage points over the last 2 years.
Admission to specialist ward for heart attack patients	ESC ^{6,7}	All higher-risk patients with a primary diagnosis of a heart attack (NSTEMI or STEMI) should be admitted to a specialist ward. Taking into account comorbidities and case mix, a reasonable goal is 80% of patients admitted to a specialist ward.	61% of NSTEMI patients are nursed on a cardiology specialist ward.	For NSTEMI, an increase from 57.8% in 2015/16 to 61% in 2017/18.
Admission to specialist ward for HF patients	NICE ^{12,13} / ESC ¹⁴ / NCEPOD ¹⁵	All patients admitted with heart failure should be admitted to a cardiology ward unless comorbidities imply that their care is better coordinated under other hospital services. Taking into account comorbidities and case mix, a reasonable goal is 70% of patients admitted to a specialist ward.	Only 46% are admitted to a cardiology ward.	No change.

Figure 4.4: Proportion of NSTEMI patients (MINAP data) and HF patients (NHFA data) seen by a specialist team, 2015/16–2017/18

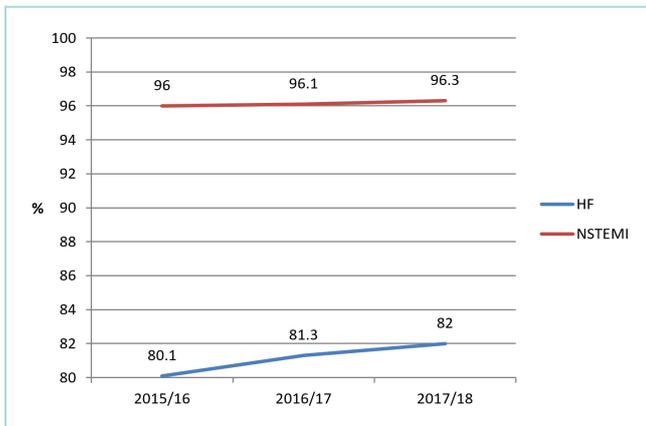


Figure 4.5: Proportion of HF patients admitted to a specialist ward, 2014/15–2017/18 (NHFA data)

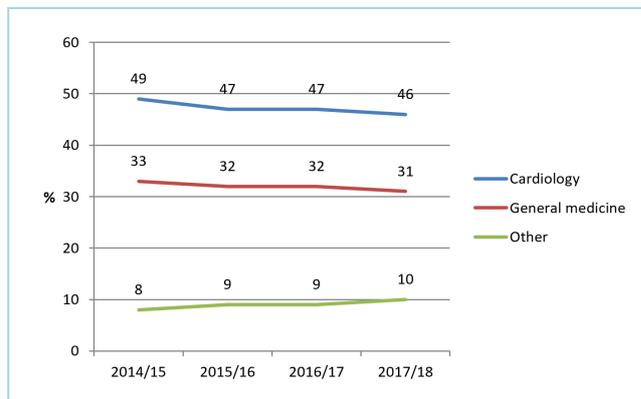
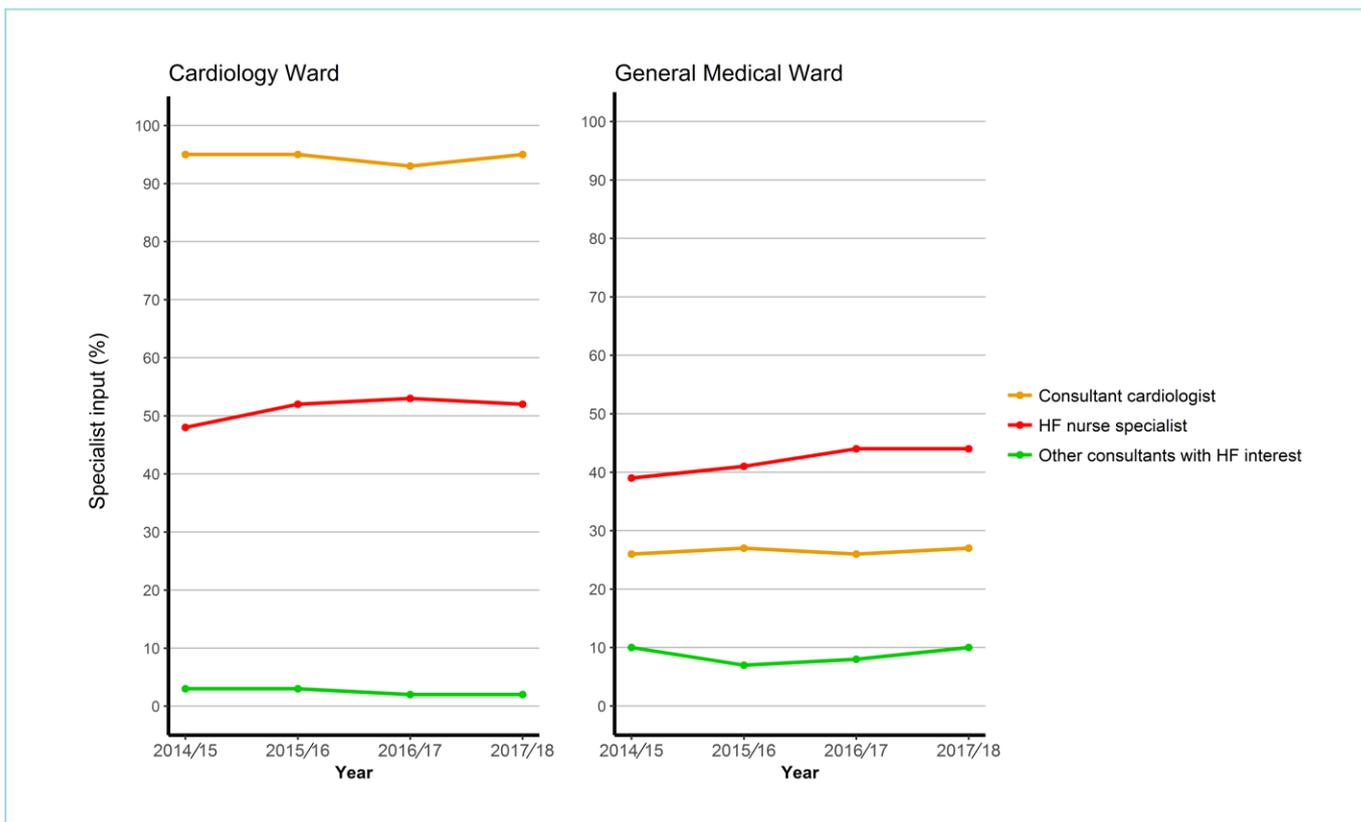
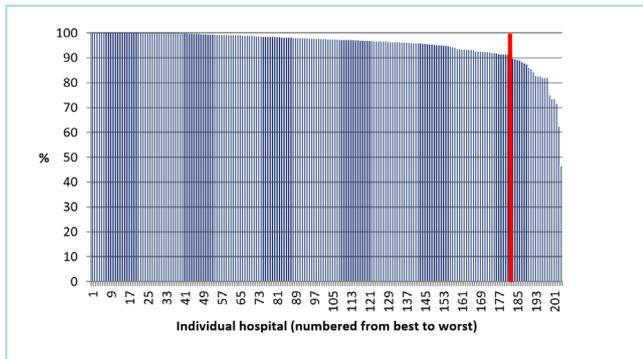


Figure 4.6: Access for heart failure patients to specialist teams based on type of ward, 2014/15–2017/18 (NHFA data)



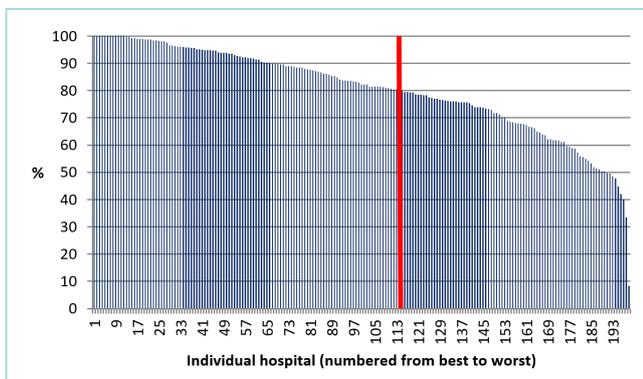
4.2.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 4.7: Proportion of heart attack patients receiving specialist care, by hospital, 2017/18 (MINAP data)



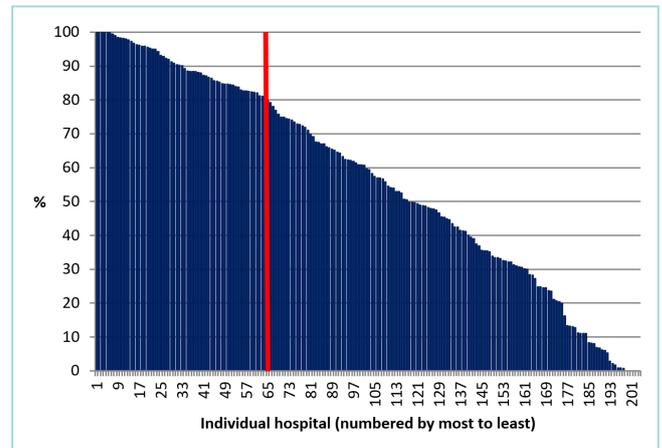
[Note: Hospitals to the right of the red line **fail** to achieve the target of $\geq 90\%$ of cases being seen by a specialist team. Data from 204 hospitals; two hospitals reporting < 20 cases excluded.]

Figure 4.8: Proportion of HF patients receiving specialist care, by hospital, 2017/18 (NHFA data)



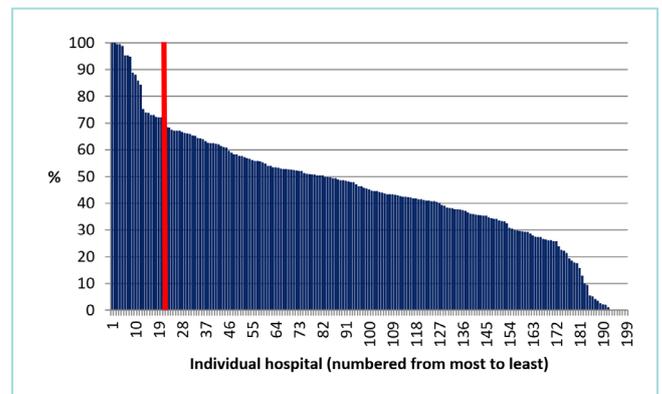
[Note: Hospitals to the right of the red line **fail** to achieve the target of $\geq 80\%$ of patients being seen by a specialist team. Data from 199 hospitals; ten hospitals reporting < 20 cases or inadequate data excluded.]

Figure 4.9: Proportion of heart attack patients admitted to a specialist ward, by hospital, 2017/18 (MINAP data)



[Note: Hospitals to the right side of the red line **fail** to achieve the target of $\geq 80\%$ of patients being admitted to a cardiology ward. Data from 204 hospitals; two hospitals reporting < 20 cases excluded.]

Figure 4.10: Proportion of HF patients admitted to a specialist ward, by hospital, 2017/18 (NHFA data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of $\geq 70\%$ of patients being admitted to a cardiology ward. Data from 199 hospitals; ten hospitals reporting < 20 cases or inadequate data excluded.]

[Click here](#) to see the performance of each individual hospital.

CASE STUDY: Providing specialist care for heart failure patients

St Mary's Hospital, Paddington: Dr C Plymen, Consultant Cardiologist

- Prior to 2016, there was no Heart Failure Consultant. In the last two years, HF service delivery has been redesigned.
- A brain natriuretic pathway (BNP) was developed: if BNP is high with symptoms/signs of HF, echocardiography is prioritised.
- Consultant-led HF-specific ward rounds with specialist nurse were introduced three days a week.
- A daily HF specialist nurse ward round was introduced with accessibility via bleep for advice.
- The Cardiology Specialist Registrar takes all cardiology referrals and reviews patients as necessary.
- The HF ward round list is generated from the Cardiology Specialist Registrar reviews and direct referrals via our patient electronic system. This has an easy online form to request HF specialist review with a proforma that collects all mandatory data for NICOR.
- A dedicated administrator facilitates data upload.
- A proactive training programme was introduced for all teams at St Mary's Hospital at all levels. Joint working with geriatricians, all medical teams, the intensive care and cardiac investigations units facilitated and advertised this service.
- >95% of patients now have specialist review.

4.3 | CARDIAC REHABILITATION FOR HEART ATTACK AND HEART FAILURE PATIENTS

4.3.1 WHY IS THIS IMPORTANT?

Patients with heart failure and those suffering a heart attack benefit from cardiovascular rehabilitation. This is a structured programme that includes, among other things, education (about cardiac conditions, lifestyle choices, the rationale for relevant medicines) and graded physical exercise. Completion

of such a programme has been associated with better outcomes. Moreover, the ethos of cardiac rehabilitation is to provide emotional support, helping patients rebuild their confidence after the shock of having a heart attack or being given a diagnosis of 'heart failure'.

4.3.2 QI RECOMMENDATIONS

- 13. All hospitals should ensure that all appropriate heart attack and heart failure patients are referred for cardiac rehabilitation and that such rehabilitation services are appropriately staffed.**

4.3.3 AUDIT FINDINGS

Referral to cardiac rehabilitation programmes following heart attack has not previously been reported for individual hospitals. Overall, 81% of patients who survived to be discharged were referred. There was wide variation between hospitals and some problems with data quality. 15 hospitals were excluded

from analysis because in at least 50% of cases the relevant data item was left blank or described as 'unknown'.

Very few patients with heart failure are referred as an in-patient for cardiac rehabilitation (15.2%); 22% of patients on a cardiology ward are referred vs only 9% on a general medical

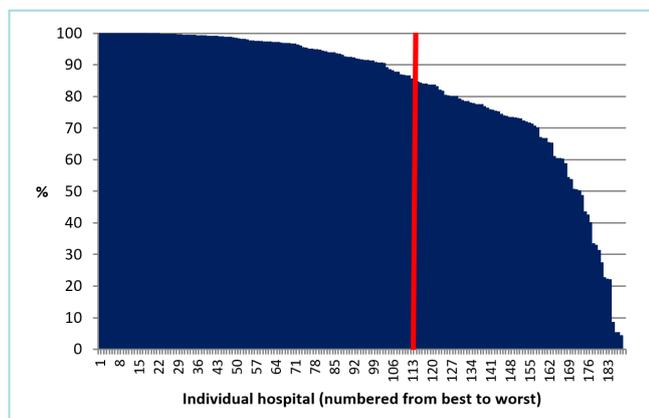
ward. It is possible that community heart failure services refer patients to cardiac rehabilitation but this is not currently captured by the NHFA dataset. A few centres have a high rate

of referral but the majority of centres refer less than 10% of patients.

Metric	Evidence base	Standard/target	Result	Trend
Referral to cardiac rehabilitation for heart attack patients	NICE ^{17,18}	All patients should be offered cardiovascular rehabilitation. Taking into account comorbidities and case mix, a reasonable goal is 85% of patients referred for rehabilitation.	81% are referred to cardiac rehabilitation.	No previous comparator.
Referral to cardiac rehabilitation for patients admitted with heart failure	ESC ¹⁴ / NICE ¹⁹	All patients should be offered cardiovascular rehabilitation. Taking into account comorbidities and case mix, a reasonable goal is 60% of patients referred for rehabilitation.	15.2% are referred to cardiac rehabilitation.	Up by 1.8 percentage points over the last year from 13.4%.

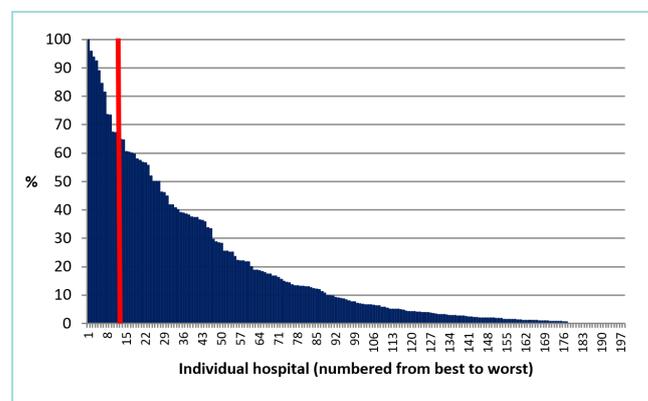
4.3.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 4.11: Proportion of patients admitted with a heart attack referred for cardiac rehabilitation, 2017/18 (MINAP data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of ≥85% of patients referred for cardiac rehabilitation. Data from 189 hospitals; 17 excluded as inadequate data.]

Figure 4.12: Proportion of heart failure patients referred while an in-patient for cardiac rehabilitation, 2017/18 (NHFA data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of ≥60% of patients referred for cardiac rehabilitation. Data from 198 hospitals; 11 hospitals reporting <20 cases or inadequate data excluded.]

[Click here](#) to see the performance of each individual hospital.

CASE STUDY: Improving referral of heart attack patients to cardiac rehabilitation

Harrogate District Foundation Trust, Harrogate: Anne Degruchy (MINAP Data Collection Officer), Emma Edgar (Lead Cardiac Nurse), Carol Bagshaw (Cardiac Rehabilitation Nurse)

- Three very experienced cardiac rehabilitation nurses champion the process.
- Acute coronary syndrome (ACS) referrals are picked up via: (a) checking secure email from other hospitals and post-surgical patients; (b) reviewing all troponin tests during the last 24 hours and checking any positive results, ruling out non-ACS causes; (c) attending a cardiology meeting every morning to discuss current in-patients; (d) attending the Medical Admissions Unit, Medical Short Stay and CCU every day; and (e) direct referrals from GPs and nurses on the ward.
- Patients are seen during their admission and contacted within a week from discharge or referral.
- Cardiac nurse team provides full cardiac rehabilitation for all ACS patients; cardiac rehabilitation tailored and individualised; home visits, clinic appointments, telephone consultation and exercise groups offered.
- Well-known and established team, who work in both the hospital and community setting.
- The team is accessible to patients via NHS secure email, giving nurses' email addresses and contact numbers. All patients are given a named nurse for continuity of care.
- A telephone support line is available within office opening hours for patients to continue to use after discharge.
- Patients are given a patient satisfaction questionnaire in order to audit the cardiac rehabilitation service, enabling continuous improvement of service.

CASE STUDY: Improving referral of heart failure patients to cardiac rehabilitation

Newham University Hospital, Barts Health NHS Trust: Sarah Walsh, Lead Heart Failure Nurse

- The importance and benefit of referral of all heart failure patients was discussed at an 'away day' and pitfalls in the service were reviewed. A number of changes were made.
- Communication: The cardiac rehabilitation team was invited to multidisciplinary team meetings and patients' care was shared.
- Referral pathway: An email system was set up instead of formal referral forms, including discharge summary and relevant details.
- Education of medical staff: Cardiac rehabilitation nurses introduced teaching sessions for ward staff and medical teams to raise awareness of the service.
- Discharge planning/documentation: Multidisciplinary team discussions are properly documented; reasons for rehabilitation are discussed with the patient and clear documentation of uptake and, where necessary, reasons why uptake was declined.
- Thus far, we have improved referral to 50% of patients.

5. QI THEME: THE NEED FOR EVIDENCE-BASED CARE, DELIVERED EQUITABLY

Major progress has been made in understanding the role of specific diagnostic methods and the role of medicines, operations or interventional procedures to improve survival and quality of life. The UK is sometimes criticised for its slow uptake of new treatments. However, over and above the evidence from clinical trials, the NHS selects specific therapies for cost-effectiveness evaluations. Once a new treatment has been approved by the NHS, commissioners work with providers to ensure that patients receive the benefits of these treatments across the country.

As with all innovations, there are early and late adopters and this can lead to geographical variation in the uptake of treatment. The domain reports look at a number of metrics, but here we have selected four areas of interest where improvements have been made yet in which there is clear evidence of hospitals that have been slow to adopt innovation.

5.1 | USE OF DAY-CASE ELECTIVE PERCUTANEOUS CORONARY INTERVENTION (PCI)

5.1.1 WHY IS THIS IMPORTANT?

When PCI was first introduced, in the first few hours after the procedure there were quite frequent complications requiring emergency treatment in about 1 in 20 cases. As a result, all patients were kept in hospital overnight to monitor for any complications. However, the procedure has evolved and become much safer, mainly due to the use of stents and special anti-platelet (blood-thinning) medicines, as well as the use of radial access, reducing the risk of bleeding from the puncture site.

While patients who need PCI for a heart attack usually still need to stay in hospital overnight, patients who are being treated electively for symptoms of stable angina usually do not.

Research has showed that for these patients it is safe to send many home on the same day as the PCI procedure. Although this is not appropriate for all patients, more and more elective cases are being performed as day cases.

Hospitals that have led the way have arranged for pre-admission clinics for patients, where the procedure is explained, the risks and benefits outlined and consent is given. In this way, the preparation for the procedure is streamlined. This allows delivery of care in a more cost-effective way and improves the patient's experience, as most prefer not to have to stay in hospital unless it is necessary.

5.1.2 QI RECOMMENDATIONS

14. All hospitals should aim to offer day-case PCI to at least 75% of their elective cases.

15. Hospitals that are not achieving the target for day-cases should undertake a process review and learn from centres that provide the best care.

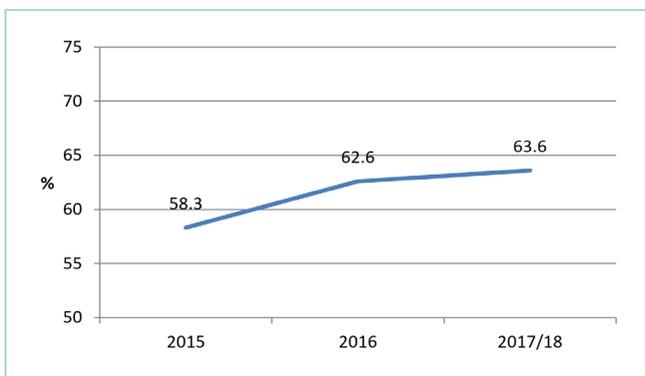
5.1.3 AUDIT FINDINGS

There is extremely wide variation, with some centres performing day-case PCI in almost all elective cases, and some where almost all patients are kept in overnight following their

procedure. The explanations will include differences in the management of wards and day units, pressure on beds from emergency admissions and differences in patient pathways.

Metric	Evidence base	Standard/target	Result	Trend
The use of day-case elective PCI	Same-day discharge in selected patients undergoing elective PCI is safe and can save costs. ^{20,21}	There is no national standard currently. Taking into account social and safety issues, a reasonable goal is $\geq 75\%$ of elective PCI procedures treated as a day case.	Only 40/112 hospitals with data perform elective PCI as a day case in $\geq 75\%$ of patients.	5-percentage point increase over the last 2 years.

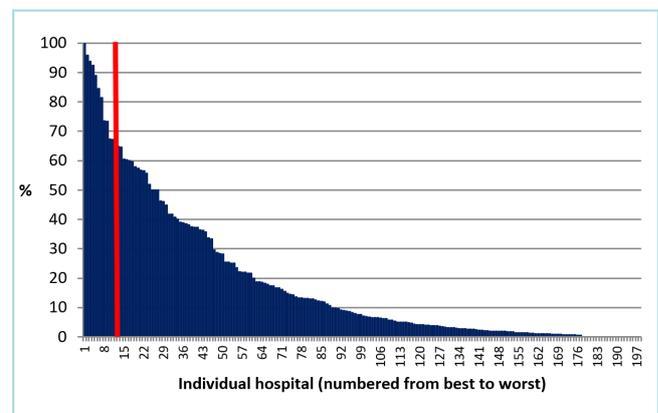
Figure 5.1: Temporal trends in the proportion of elective PCI patients being treated as a day case (NAPCI data)



[Note: the 2015 and 2016 data presented are for calendar year, whereas the 2017/18 value is for financial year.]

5.1.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 5.2: Proportion of elective PCI patients treated as a day case, 2017/18 (NAPCI data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of $\geq 75\%$ of elective PCI patients treated as a day case. Data from 112 hospitals; three hospitals with inadequate data excluded.]

[Click here](#) to see the performance of each individual hospital.

CASE STUDY: Increasing the proportion of day-case PCI

Wycombe Hospital, High Wycombe: Piers Clifford, Consultant Cardiologist

- Institution of a philosophy on the day ward that all patients should be treated as day cases.
- Overnight stays reported as an exception and reasons for admission analysed and reported at monthly catheter lab meetings (reduces admissions for 'soft' reasons).
- Internal audit showed that complexity of anatomy and number of stents did not predict need for a patient to return to the catheter lab (very low frequency).
- The only reason for keeping a patient overnight is a complication during the procedure that has caused (or may cause) the patient to become unstable.
- Over 80% of cases use radial artery access but if an Angioseal® is used after femoral cases, they can also go home.
- 'We have had only four overnight stays this year!'

5.2 | USE OF RADIAL ACCESS FOR PCI PROCEDURES

5.2.1 WHY IS THIS IMPORTANT?

When PCI was first performed, virtually all procedures used the femoral artery as the access point to the circulation. This meant inserting a tube (a 'sheath') into the groin. Subsequently, operators also used the brachial artery (inserting the sheath in at the elbow) but after the equipment was made smaller, more and more procedures could be done from the radial artery, with the sheath being inserted at the wrist. This advance has been shown to reduce bleeding and other complications. It allows patients to get up more quickly after the procedure, and in the urgent and emergency setting, outcomes are improved, with reduced mortality and morbidity.

For some patients, however, femoral access is still required. This might be because a patient's arm arteries are not suitable, or because the PCI procedure requires multiple access sites or needs to use particularly large equipment. We would not therefore expect all PCI to be performed via the wrist, but the large majority.

The UK is amongst the pioneers in taking up radial artery access for PCI. Many individual centres have a very high level of use of the radial artery but some centres still have relatively low rates.

5.2.2 QI RECOMMENDATIONS

16. Hospitals already achieving the BCIS target should aim for 85% of procedures performed using radial artery access.

17. Hospitals not achieving the BCIS target for the use of

radial artery access should set this as a quality target, supported by the necessary leadership and training.

18. Operators with low rates of radial artery access, unless justified by their case mix, should attend educational and training courses or be proctored in the technique.

5.2.3 AUDIT FINDINGS

There has been a year-on-year increase in the use of radial access over the last decade, which has resulted in all but ten hospitals meeting or exceeding the current BCIS standard of

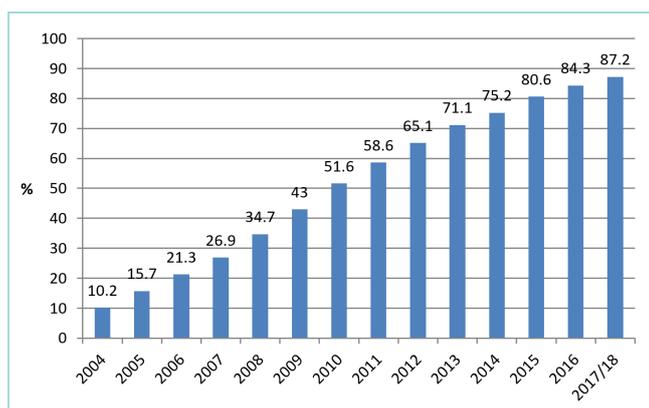
using radial artery access in $\geq 75\%$ of cases. In fact, the national average is 87% and almost two-fifths of hospitals now use this technique in $\geq 90\%$ of all cases. Notwithstanding the particular

case mix that an individual hospital may be dealing with (especially the volume of procedures required for chronic total occlusions), it is appropriate to consider setting a higher goal for

the use of radial access in order to further extend the benefits of this technique to patients.

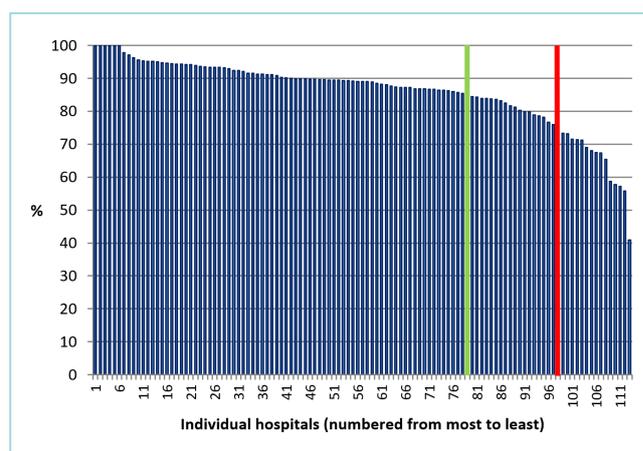
Metric	Evidence base	Standard/target	Result	Trend
The use of radial artery access for PCI procedures	ESC / EACTS ⁶	At least 75% of all PCI procedures should be performed using radial artery access. For those already achieving the BCIS target, a reasonable goal, taking into account comorbidities and case mix, is 85% of procedures performed using radial artery access.	87.2% of cases are performed with radial access. 42/113 hospitals with data (38%) perform PCI using radial access in ≥90% of cases. Ten NHS hospitals still use radial access in <75%.	Almost linear growth over the last 14 years, rising from 10.2% in 2004 to 87.2% in 2017/18.

Figure 5.3: Use of radial artery access for PCI procedures, 2004–2017/18 (BCIS data)



5.2.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 5.4: Proportion of PCI cases performed using radial artery access, 2017/18 (NAPCI data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of ≥75% of PCI procedures using radial artery access. Hospitals to the right of the green line are **not** achieving the target of ≥85% of PCI procedures using radial artery access. Data from 113 hospitals; two hospitals with inadequate data excluded.]

CASE STUDY: Increasing the use of radial artery access for PCI

St George's Hospital, London: Dr Pitt Lim, Consultant Cardiologist

- In 2014, the rate of using radial access was 33% compared to the national average of 75.2%.
- A new consultant adept at radial access was appointed in 2015. Within 6 months he was able to demonstrate that radial access was possible in all-comers, irrespective of presentation, age or gender.
- Experience was shared with colleagues with in-house support and training.
- With the publication of the Matrix trial in 2015²², the radial rate was selected as a Trust Quality Measure and all operators were encouraged to adopt the radial approach.
- The current rate is 86.4% against the national average of 87.2%

5.3 | USE OF DISEASE-MODIFYING MEDICINES IN HEART FAILURE WITH REDUCED EJECTION FRACTION

5.3.1 WHY IS THIS IMPORTANT?

A number of medicines have been shown to improve prognosis (survival rates) after admission to hospital with heart failure with reduced ejection fraction (HFrEF – when the pump power of the heart is reduced). These include the use of a beta blocker, one of either an angiotensin converting enzyme (ACE) inhibitor or an angiotensin-receptor blocker (ARB) and mineralocorticoid receptor antagonists (MRAs).

The Heart Failure audit has shown that there have been improvements in the proportion of patients receiving these

individual medicines, and that prescription rates for these 'disease-modifying' medicines is higher when the patients are looked after by specialist teams. The audit is now concentrating on examining how many patients receive all three classes of medicine (beta blockers, ACE-i/ARB (taken together) and an MRA) when they are indicated and when there is no contra-indication to the patient receiving these. There are established contra-indications to these medicines that can be taken into account, but some problems can arise unexpectedly.

5.3.2 QI RECOMMENDATIONS

19. Hospitals not achieving the 60% target of offering patients with HFrEF (and without established contra-indications) all three disease-modifying medicines should undertake a review of the clinical pathway to identify opportunities to improve performance, including learning from the hospitals that provide the best care. In

particular, the focus of this should be on increasing the use of MRAs.

20. For hospitals already meeting the target, a reasonable goal is for 80% of all patients without established contra-indications to be offered all three disease-modifying medicines.

5.3.3 AUDIT FINDINGS

Overall in the audit, 47% of those being discharged with HFrEF were on all three disease-modifying medicines. For patients on cardiology wards, the rate of prescription of all three medicines in combination has increased from 48% to 57% over the last

three years. It has increased, but more modestly, to 35% on general medical wards.

For those seen by a specialist, irrespective of their ward allocation, there was an increase from 47% to 50% for being on

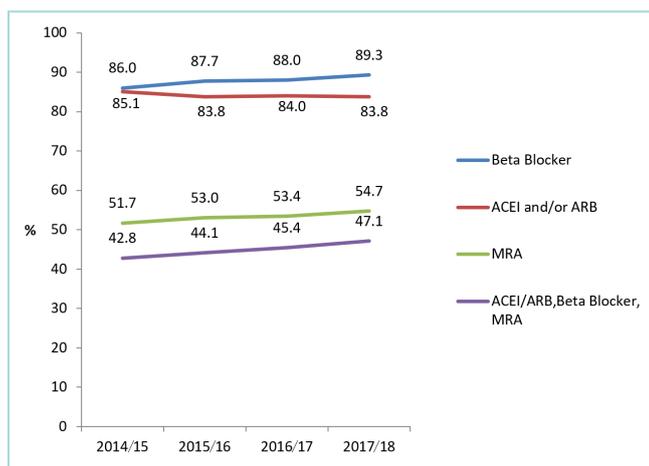
all three medicines, compared to an increase from 22% to 23% of those not seen by a specialist, in the last year. Thus, outreach services to other wards can improve care.

The trend seen over the last 4 years is for an increase in the

prescription of ACE-i/ARB medicines, beta blockers, MRAs and their combination in patients who have specialist input. Prescription rates for those who lack specialist input are largely static or falling.

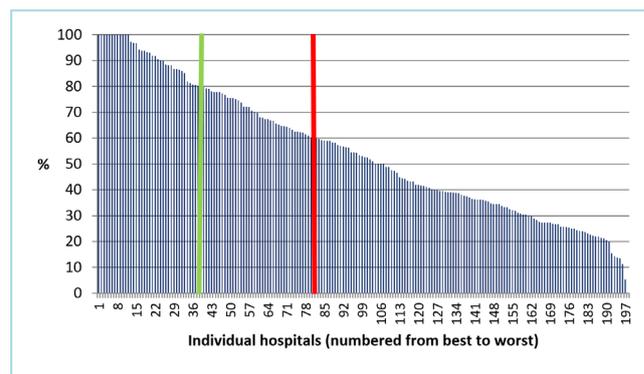
Metric	Evidence base	Standard/target	Result	Trend
The use of all three disease-modifying medicines in patients with HFrEF	NHFA consensus and review of NHFA data with analysis of variance.	At least 60% of all patients without established contra-indications should be offered all three disease-modifying medicines. For hospitals already meeting the target, a reasonable goal is 80% of all patients without established contra-indications being offered all three disease-modifying medicines.	47.1% received all three medicines overall.	4.3 percentage point increase from 42.8% over the last 3 years.

Figure 5.5: Proportion of patients with HFrEF being offered all three disease-modifying medicines, 2014/15–2017/18 (NHFA data)



5.3.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 5.6: Proportion of patients with HFrEF (without exclusions) being offered all three disease-modifying medicines, by hospital, 2017/18 (NHFA data)



[Note: Hospitals to the right of the red line **fail** to achieve the target of ≥60% of patients with HFrEF being offered all three disease-modifying medicines. Hospitals to the right of the green line are **not** achieving ≥80% of patients with HFrEF being offered all three disease-modifying medicines. Data from 198 hospitals; one hospital with incomplete data excluded.]

[Click here](#) to see the performance of each individual trust.

CASE STUDY: Improving the use of all 3 disease-modifying medicines for patients with HFrEF

Bradford Teaching Hospitals NHS Foundation Trust: Dr Sudantha Bulugahapitiya, Clinical lead for Heart Failure Services and Cardiac Imaging

- Resources – we were successful in getting funding for an in-patient heart failure nurse specialist and an audit clerk.
- An awareness campaign was sent to all wards about contacting the in-patient heart failure specialist about patients with suspected heart failure.
- A weekly multidisciplinary team meeting reviews the in-patient caseload and difficult cases in the community, enabling better integration of the hospital and community services.
- In 2017, the organisation went 'paperless', with the use of electronic patient records resulting in:
 - admissions with suspected heart failure being more easily identified
 - remotely reviewing case records throughout the hospital and undertaking 'virtual ward rounds' in the multidisciplinary team setting
 - making it a lot easier to recommend and supervise treatment optimisation
 - more efficient data collection for the Heart Failure audit.

5.4 | DEEP WOUND INFECTIONS AFTER CARDIAC SURGERY REQUIRING ADDITIONAL SURGERY

5.4.1 WHY IS THIS IMPORTANT?

Feedback to the Adult Surgery audit shows that one of the complications most feared by patients undergoing open heart surgery is the development of a wound infection, especially when this is deep, affecting the breastbone through which the

surgeon cuts to get to the heart, and so requiring additional surgical treatment. These serious infections do not happen very often, but they can be debilitating for patients and require prolonged or repeated hospital admission.

5.4.2 QI RECOMMENDATIONS

21. Hospitals with cardiac surgical units should collect data on all deep wound infections using the consistent definition provided by NACSA.

22. Hospitals with deep wound infection rates requiring additional surgery of more than 0.3% should use infection prevention best practice in striving to reduce risks at every point in the pathway of patient care.

5.4.3 AUDIT FINDINGS

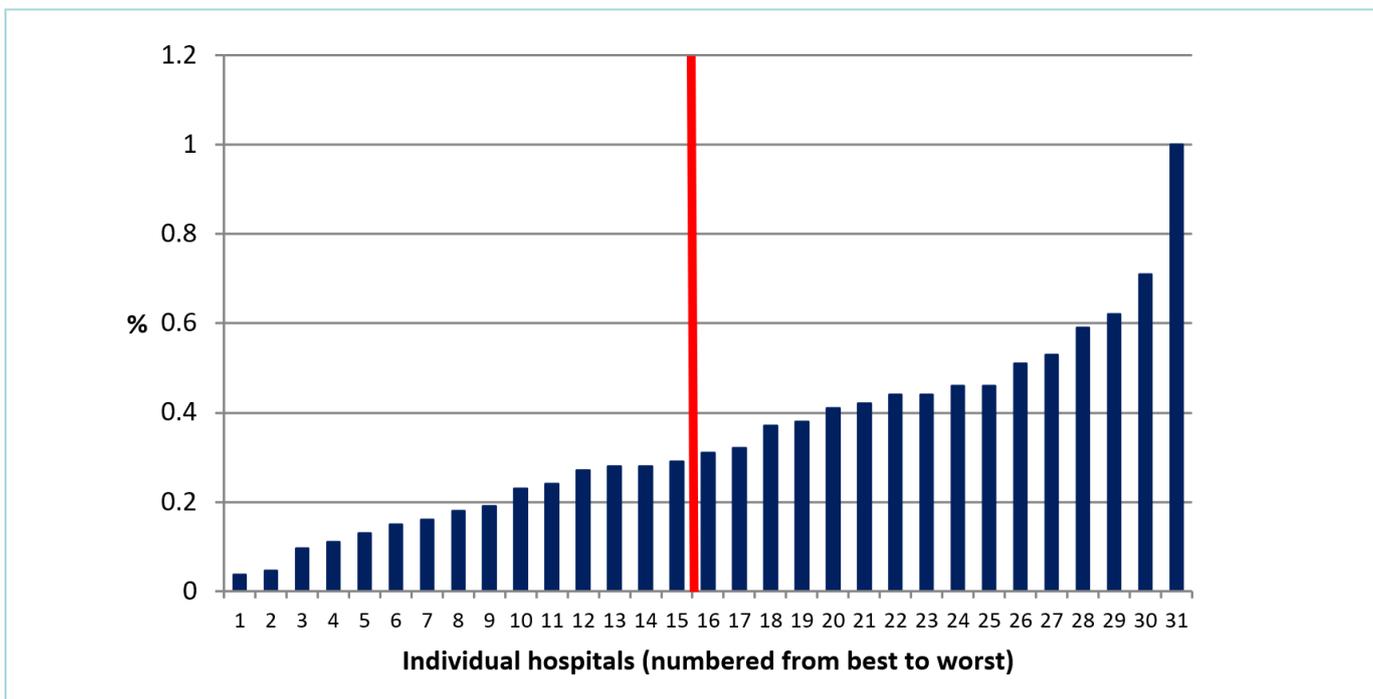
Deep wound infections requiring additional surgery are seen in no more than 1% of cases. However, there is a more than tenfold variation between centres and approximately half of hospitals with cardiac surgical units report rates of 0.3% or lower. Whether this relates to variations in practice or variations in the way hospitals capture data is not known.

Data completeness on this metric is a particular challenge and needs to be improved. Additional effort is also needed to ensure strict compliance with the definitions.

Metric	Evidence base	Standard/target	Result	Trend
Deep wound infections after cardiac surgery	NACSA data with analysis of variance.	A reasonable goal is to aim for deep wound infections occurring in less than 0.3% of cases.	All hospitals had a rate of 1% or less, but there is a tenfold variation between centres.	Data completeness across hospitals not yet sufficient to provide reliable results.

5.4.4 PERFORMANCE OF INDIVIDUAL HOSPITALS

Figure 5.7: Proportion of first-time operations with deep wound infections requiring additional surgery, by hospital, 2015/16–2017/18 (NACSA data)



[Note: Hospitals to the right of the red line have **not** achieved a rate of deep wound infections of <0.3%. Data from one hospital not included because of poor data completeness.]

[Click here](#) to see the performance of each individual trust.

CASE STUDY: Reducing deep wound infections after surgery

Royal Papworth Hospital, Cambridge: Philippa Clark (Tissue Viability Nurse), Kunal Bhakhri (Specialist Registrar), David Jenkins (Clinical Director).

- Deep sternal wound infections (DSWI) can be a devastating complication post-cardiac surgery and are associated with an increased length of stay, resource utilisation and an increased risk of death. Whilst the risk of surgical site infection (SSI) can never be completely eradicated, we have strived to eliminate DSWI with a multidisciplinary approach over the last 5 years, based on the best available evidence. Our programme uses a number of steps.
- Pre-operative swabs for MRSA at pre-admission clinic or in the community to check status before admission for elective surgery.
- Decolonisation of skin pre-operatively with antimicrobial wash the night before and the morning of surgery.
- In-house urgent patients awaiting cardiac surgery have been found to be at an increased risk of developing SSI. In-house urgent patients therefore receive daily antimicrobial wash whilst waiting as in-patients.
- Attention to antibiotic prophylaxis, ensuring medicine given early enough so blood levels appropriate at 'knife-to-skin' time, and additional doses given at end of cardiopulmonary bypass during longer operations.
- Meticulous prepping/draping in theatres, with standardised technique, chlorhexidine based, and 3-minute time out to allow drying.
- Continuous surveillance of SSI, keeping profile high, with feedback of rates to surgeons, surgical care practitioners and ward areas quarterly.
- The use of negative pressure wound therapy (NPWT) in early management instigated by a pro-active tissue viability nurse team; supported by a nurse-led wound review clinic.
- During the NCAP audit period of 2015/16–2017/18, the rate of DSWI serious enough to require surgical debridement or reconstruction, following CABG surgery at Papworth, was 0.046% (approximately 1 in 2100 cases).
- We also participated in national SSI infection audits to benchmark with peers. In the prospective GIRFT audit²³ from November 2016 for cardiac and thoracic surgery we had only 15 confirmed SSI from 2393 procedures, 0.62% infection rate.

THE NCAP AUDIT HAS A NUMBER OF DEVELOPMENT OBJECTIVES FOR THE COMING 12 MONTHS.

Align data design with potential research interests and outputs

The NCAP will also work with academic partners to ensure that the programme helps to answer questions of public concern or aid novel research themes. The programme will adapt with changing practice.

Review dataset and harmonise definitions

The NCAP brought together six different audits, each of which was developed independently and with varying methodologies. To optimise the utilisation of the unified programme, we will review the data fields and establish a single harmonised dataset.

Drive improvements to data quality

Previous work to help hospitals improve their data quality will be programmed into our new IT platform and developed further. Data analysis will take account of data quality from individual hospitals and should a minimum quality not be received, those hospitals will be overtly excluded from reports.

Develop better audit and QI tools for hospitals

We will develop a Quality Improvement Strategy and implement a number of changes in the way we report back to hospitals, commissioners and other stakeholders. We will also consider how we can develop tools to help local or regional quality improvement teams make changes where these are necessary.

Capture innovative treatments and service delivery

As innovations in service delivery and new technology come into mainstream medical practice, there will be a need for new or refined datasets and new analyses. We will work with the professional societies and regulatory bodies to ensure that the NCAP captures contemporary and relevant data to assist in the adoption of cost-effective treatments or programmes.

Introduce a new data validation process and more frequent reporting

A current limitation of the NCAP relates to the time needed for the annual validation of data and its impact on the time needed for analyses and reporting. Given the importance of key metrics, validation is necessary but we will review the process and plan to introduce a new process to allow for more frequent reporting.

Raise the profile of NCAP resources for use in QI

We will further develop our Communications Strategy to ensure that there is widespread dissemination of the NCAP analyses and QI outputs and that all stakeholders know how to find information to suit their own requirements.

REFERENCES

1. McNamara RL, Wang Y, Herrin J, et al. J Am Coll Cardiol 2006;47(11):2180-6
2. MacCarthy PA, Blackman DJ, Hildick-Smith D, Banning AP. British Cardiovascular Intervention Society PPCI for STEMI Position Statement 2016. https://www.bcis.org.uk/wp-content/uploads/2016/12/MacCarthy_PA_072016_BCIS.pdf
3. ESC Clinical Practice Guidelines 2017. Acute myocardial infarction in patients presenting with ST-segment elevation (Management of). <https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Myocardial-Infarction-in-patients-presenting-with-ST-segment-elevation-Ma>
4. NICE Clinical Guideline [CG167] July 2013. Myocardial infarction with ST-segment elevation: acute management. <https://www.nice.org.uk/guidance/cg167/chapter/1-Recommendations>
5. NHS England Best Practice Tariff proposals 2016. <https://www.england.nhs.uk/wp-content/uploads/2016/08/best-practice-tariff-prop.pdf>
6. 2018 ESC/EACTS Guidelines on myocardial revascularization. <https://academic.oup.com/eurheartj/article/40/2/87/5079120#133836057>
7. NICE QS68, September 2014. Acute coronary syndrome in adults. <https://www.nice.org.uk/guidance/qs68/chapter/Quality-statement-3-Coronary-angiography-and-PCI-within-72-hours-for-NSTEMI-or-unstable-angina>
8. 2015 ESC Guidelines for the management of acute coronary syndromes – web addenda. <http://bit.ly/2XSY7fl>
9. CQUIN IM1 Reducing cardiac surgery non-elective inpatient waiting. <https://www.england.nhs.uk/wp-content/uploads/2016/03/im1-reduc-cardiac-surgry-non.pdf>
10. Holland BJ, Myers JA, Woods CR Jr. Prenatal diagnosis of critical congenital heart disease reduces risk of death from cardiovascular compromise prior to planned neonatal cardiac surgery: a meta analysis. Ultrasound Obstet Gynecol 2015;45:631–8
11. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. <https://academic.oup.com/eurheartj/article/37/3/267/2466099>
12. NICE Clinical Guideline [CG187] October 2014. Acute heart failure: diagnosis and management. <https://www.nice.org.uk/guidance/cg187>
13. NICE QS 103, December 2015. Acute heart failure. <https://www.nice.org.uk/guidance/qs103/chapter/Quality-statement-3-Organisation-of-care-early-specialist-input>
14. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. <https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure>
15. NCEPOD report. Acute heart failure: failure to function. November 2018. <https://www.ncepod.org.uk/2018ahf.html>
16. NHS England and NHS Improvement 2017/18 and 2018/19 National Tariff Payment System. https://improvement.nhs.uk/documents/1047/Annex_F_guidance_on_best_practice_tariffs.pdf
17. NICE Clinical Guideline [CG172]. Myocardial infarction: cardiac rehabilitation and prevention of further cardiovascular disease. <https://www.nice.org.uk/guidance/cg172>
18. NICE Pathway. Cardiac rehabilitation after myocardial infarction. <http://bit.ly/30GyAD4>
19. NICE Guideline [NG106], September 2018. Chronic heart failure in adults: diagnosis and management. <https://www.nice.org.uk/guidance/ng106>
20. Abdelaal E, Rao SV, Gilchrist IC, et al. Same-day discharge compared with overnight hospitalization after uncomplicated percutaneous coronary intervention: a systematic review and meta-analysis. JACC Cardiovascular Interventions 2013; 6(2):99–112 <http://dx.doi.org/10.1016/j.jcin.2012.10.008>
21. Amin AP, Pinto D, House JA, et al. Association of same-day discharge after elective percutaneous coronary intervention in the United States with costs and outcomes. JAMA Cardiol. 2018; 3(11):1041–9 Sep 26. doi: 10.1001/jamacardio.2018.3029.
22. Valgimigli M, Gagnor A, Calabro P, et al. MATRIX Investigators. Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. Lancet 2015;385(9986):2465–2476.
23. <https://gettingitrightfirsttime.co.uk/wp-content/uploads/2018/04/GIRFT-Cardiothoracic-Report-1.pdf>

THANKS AND ACKNOWLEDGEMENTS

This report was prepared by Mark de Belder (NCAP), Ross Pow (Power of Numbers Ltd) and the Clinical Leads of the specialty audits: Rodney Franklin (NCHDA), Clive Weston (MINAP), Peter Ludman (NAPCI), Andrew Goodwin (NACSA) and Theresa McDonagh (NAHF).

We would like to thank the contribution of the following individuals and organisations:

- All hospitals and individual cardiologists, nurses, data managers and clinical audit teams who contribute to this audit. Without their engagement, patients would not have benefited from improved care over the last ten years.
- The clinical teams who have contributed a case study. By sharing best practice, they illustrate the role of good quality data in improving patient care.
- Our patient representatives on the NCAP Operational and Methodology Group and the NICOR Patient Advisory Group and Panel for their contribution to the programme and their help in determining the content of this report.
- Richard Fitzgerald and Sarah Brown as patient advisors who shaped and contributed to the drafting of the Patient report.
- The members of each domain expert group that support the clinical leads.
- Mike Roberts, Ben Bray and Rachel Penniston at UCL Partners for advising on quality improvement methodology and development of new outputs to help hospitals and commissioners with local performance management.
- Kate Gentles (KG Editing) and Daniel Olivier-Argyle (strangelydrawn.co.uk) for their editing and design skills.
- Barts Health NHS Trust for their continued support.

We acknowledge the enormous amount of work of the entire NCAP team: Sarah Ajayi, Anthony Bradley, James Chal, Lin Denne, Akosua Donkor, Nadeem Fazal, Yasin Gulam, Anil Gunesh, Andrew Harrison, Devina Khambhaita, Sue Manuel, Sheila Marcial, Sam McAlister, Kelly O'Brien, Satya Phanthala, Robin Philip, Sunil Rai, Elizabeth Raidan, Aminat Shote, Shenaka Singarayer, Marion Standing and Jiaqiu Wang.

The NCAP is funded by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). Please go to www.hqip.org.uk for more information.

Email: bartshealth.nicor-generalenquiries@nhs.net

This report is available online at <https://www.nicor.org.uk/national-cardiac-audit-programme/>