A stylized, light blue graphic of a human heart with its major arteries and veins. A black ECG line is superimposed over the heart. The background features a large, curved white shape on a dark red background, with faint binary code (0s and 1s) and circuit-like patterns in the upper right.

NATIONAL CARDIAC
AUDIT PROGRAMME (NCAP)

2022 REPORT

The heart in lockdown

(2020/21 and 2018/21 data)

NICOR



The National Institute of 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.

Email: nicor.auditenquiries@nhs.net



Barts Health NHS Trust

With a workforce of around 17,000 people, 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 Hospital in Plaistow, Whipps Cross 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/

© 2022 Healthcare Quality Improvement Partnership (HQIP)
This report was published on 16 June 2022

Contents

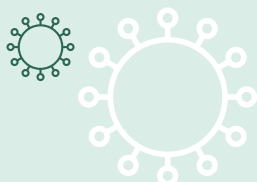
	Report at a glance	4
	Executive summary	5
	Summary of recommendations in the domain reports	8
1	Introduction	11
2	The country-level impacts of COVID-19 on cardiovascular services	12
	2.1 Some cardiovascular admissions and procedures were affected more than others	12
	2.2 Treatment strategies appear to have been modified in some cases	15
	2.3 There were changes in case mix and demographics	16
	2.4 General surgical centres were impacted more than specialist ones	17
	2.5 Patient outcomes have been maintained	18
	2.6 Many aspects of care were maintained or improved	19
	2.7 Some care pathways were negatively influenced by the pandemic	23
	2.8 COVID-19 has had a huge impact on the experiences of patients and the NHS workforce	27
3	New data tools to review regional variations and hospital performance	30
	3.1 Antenatal detection of congenital lesions	30
	3.2 New tools to demonstrate regional differences	30
	3.3 New ways to see combined results of hospital performance	33
4	Lessons and recommendations to aid service recovery and to deal with future pandemic-type scenarios	34
	4.1 Patients with acute chest pain syndromes or acute breathlessness should call for help as they normally would	34
	4.2 The capacity and role of the ambulance services should be reviewed	34
	4.3 ITU capacity should be reviewed but ring-fenced ITU beds are needed for cardiothoracic services	34
	4.4 Elective treatment programmes should be separated from urgent and emergency services to protect the continued delivery of specialist cardiovascular services	35
	4.5 Clinical targets will only be met with increased capacity for cardiovascular services	35
	4.6 Shifting to alternative treatments may help deal with the backlog	35
	4.7 Data are important and regional teams need to understand local and national variability in the delivery of care	35
	4.8 We must learn how best to use telemedicine to improve services and experiences	36
	4.9 Provision of pre-admission clinics greatly improves efficiency	36
	4.10 Post-discharge services must be appropriately organised and resourced	36
	4.11 Collaboration between units maintained some services and benefitted patients	36
5	References	37
6	Glossary	38
7	Thanks and acknowledgements	39

ANNUAL REPORT AT A GLANCE

Data from the period April 2020 to March 2021

The report covers the 12 months from 1st April 2020 to 31st March 2021, the first year of the coronavirus disease (COVID-19) pandemic, including the first wave of hospital admissions in March/April 2020 and the second wave from the end of 2020 to early 2021.

Impact on admissions and procedures



Substantial drops in acute cardiovascular admissions during the first wave of COVID-19 hospitalisations

- Approximately **40%** fewer patients admitted with non-ST-elevation myocardial infarction (NSTEMI); admissions for ST-elevation myocardial infarction (STEMI) down **25%**
- Fall of nearly **30%** in patients admitted with heart failure (HF)
- **80%** fall in adult cardiac surgery and **50%** fall in surgery for congenital heart disease
- **50%** drop in all cardiac rhythm management (CRM – device and ablation) procedures with a virtual cessation of ablation procedures
- **70%** fall in elective percutaneous coronary intervention (PCI), **35%** fall in PCI for NSTEMI and **14%** fall in Primary PCI (PPCI)
- **20%** fall in transcatheter aortic valve implantation (TAVI)

Significant but smaller reductions in the second COVID-19 wave

- Smaller falls in the second wave for all procedures except for PPCI

The year 2020/21 as a whole saw substantial reductions in activity

- There was a **9%** reduction in STEMI patients
- Admissions for patients with NSTEMI fell by **18%**
- Adult cardiac surgical activity and cardiac rhythm management (CRM) procedures both fell by over **30%**
- **40%** fall in aortic valve surgical procedures but this was compensated by an overall increase of **11%** in TAVI procedures
- **17%** reduction in interventions for patients of all ages with congenital heart disease; **44%** fall in surgery for adults with congenital heart disease
- **10%** fall in both elective and urgent PCI procedures, but **2%** overall increase in PPCI procedures

Impact on clinical pathways

Where things got worse/causes for concern

- **22%** increase in waiting times for coronary artery bypass grafting (CABG), with range of **21%-94%** across different countries
- Only **37%** of patients with STEMI received PPCI within 2 hours of calling for help
- Fall in use of echocardiography for heart failure patients – only **48%** of hospitals achieved the target
- Referrals to cardiac rehabilitation for heart failure patients fell (only **12%**) as did specialist follow-up (to **35%**)

Things that stayed the same

- Mortality rates for acute admissions unchanged (STEMI **7%**, NSTEMI **3.3%**, HF **9%**)
- Mortality for most cardiac interventions unchanged (e.g., all PCI **2%**, PPCI **5.5%**, NSTEMI PCI **0.75%**)
- Crude mortality for adult cardiac surgery slightly increased to **3.3%** but explained by changes in case mix – no hospital outliers after risk adjustment
- Crude mortality for congenital heart disease surgery lower than pre-pandemic levels (**1.6%**)

Things that got better

- Antenatal detection of congenital heart defects requiring intervention in the first year improved to **52%**
- More STEMI patients investigated by echocardiography (**77%**)
- Increased prescription of mineralocorticoid receptor antagonists (MRAs) to heart attack patients with poor left ventricular function – now **74%**
- Increased referral of heart attack patients to cardiac rehabilitation – exceeded the **85%** target at the end of 2020/21
- Increased use of secondary prevention medication for patients with heart failure but still only **52%** received all three disease-modifying drugs



Executive summary

The 2022 annual report of the National Cardiac Audit Programme (NCAP) focuses on how cardiovascular services were impacted by the first year of the COVID-19 pandemic. NCAP comprises six domains, each of which is concerned with a particular cardiovascular disease area or treatment:

1. The National Congenital Heart Disease Audit (NCHDA), the 'Congenital' audit
2. The Myocardial Ischaemia National Audit Project (MINAP), the 'Heart Attack' audit
3. The National Audit of Percutaneous Coronary Interventions (NAPCI), the 'Angioplasty' audit
4. The National Adult Cardiac Surgery Audit (NACSA), the 'Cardiac Surgery' audit
5. The National Heart Failure Audit (NHFA), the 'Heart Failure' audit
6. The National Audit of Cardiac Rhythm Management (NACRM), the 'Heart Rhythm' audit

The report covers the 12 months from 1st April 2020 to 31st March 2021, the first year of the pandemic.¹ The NHS faced huge challenges during this time. Across cardiovascular services, bed capacity and staff were redeployed to support COVID-19 patients. Out-patient services were seriously disrupted. There were high levels of illness across the workforce. Staff

had to take special measures to protect patients as well as themselves.

Maintaining clinical care for patients has been the top priority of the cardiovascular community. Alongside this, great efforts were made to maintain a flow of audit data to the NCAP programme delivered by the National Institute for Cardiovascular Outcomes Research (NICOR). This has enabled the analytical work needed to track the impact of the pandemic on cardiovascular services and patients.

With our academic partners, we quickly summarised the early effects on services in our 2020 COVID report, [Rapid cardiovascular data: we need it now \(and in the future²\)](#) along with the [updates](#) that followed. The British Heart Foundation also described the disruption to services and its consequence ([The untold heartbreak. Cancelled procedures. Missed appointments. Lost lives³](#)).

This report, with a more comprehensive dataset for 2020/21, now looks at the overall impact of the pandemic in that first year. The NCAP analyses combined with inputs from our clinical colleagues, patients and carers, have allowed us to summarise experiences during that time as well as highlighting lessons to be learned for service recovery and quality improvement.

Impact on admissions and procedures and where practice changed

FIRST AND SECOND WAVES

Substantial drops in acute cardiovascular admissions during the first wave of COVID-19 hospitalisations

Approximately 40% fewer patients admitted with lower risk non-ST-segment elevation myocardial infarction (NSTEMI); admissions for higher risk ST-segment elevation myocardial infarction (STEMI) down 25%.

Nearly 30% fall in admissions with heart failure (HF).

80% fall in adult cardiac surgery and 50% fall in surgery for congenital heart disease.

50% drop in all cardiac rhythm management (CRM – device and ablation) procedures with a virtual cessation of ablation procedures.

70% fall in elective percutaneous coronary intervention (PCI), 35% fall in PCI for NSTEMI and 14% fall in Primary PCI (PPCI).

20% fall in transcatheter aortic valve replacement (TAVI).

Significant but smaller reductions in the second COVID-19 wave	There were smaller falls in the second wave for all procedures except for PPCI
YEAR AS A WHOLE	
Overall acute admissions down during 2020/21	<p>9% reduction in those with STEMI.</p> <p>18% fall in those with NSTEMI.</p> <p>12% fall in admissions for heart failure.</p>
Substantial reduction in most procedures over the year (but increases in PPCI and TAVI)	<p>Over 30% falls in adult cardiac surgical activity and cardiac rhythm management (CRM) procedures.</p> <p>34% fall in total aortic valve procedures (>2000 patients with aortic valve disease untreated); 40% fall in surgical procedures but compensated by an overall increase of 11% in TAVI procedures, with TAVI: surgical aortic valve replacement (AVR) ratio increasing to 2.3:1.</p> <p>17% reduction in interventions for patients with congenital heart disease; 44% fall in surgery for adults with congenital heart disease.</p> <p>10% fall in all PCI procedures, affecting elective and urgent procedures, but 2% overall increase in PPCI procedures; PCI:coronary artery bypass graft (CABG) ratio increased to nearly 10:1.</p>

Impact on clinical pathways

WHERE CLINICAL PATHWAYS WORSENERD / CAUSES FOR CONCERN	
Big increase in waiting times for CABG	22% increase in waiting times for CABG, with a range of 21%-94% across different countries.
Longer delays for PPCI	Only 37% of patients with STEMI received PPCI within 2 hours of calling for help.
HF patients had fewer investigations and fewer referrals for post-discharge care	<p>Falls in use of echocardiography for heart failure patients – only 48% of hospitals achieved the target.</p> <p>Falls in referrals to cardiac rehabilitation (only 12%) and specialist follow-up for heart failure patients (to 35%).</p>
WHERE LEVELS OF CARE WERE MAINTAINED OR REMAINED BROADLY STABLE	
Mortality rates unchanged	<p>Mortality for acute admissions were unchanged (STEMI 7%, NSTEMI 3.3%, HF 9%).</p> <p>Mortality for most cardiac interventions unchanged (for example, all PCI 2%, PPCI 5.5%, NSTEMI PCI 0.75%).</p> <p>Crude mortality for adult cardiac surgery slightly increased to 3.3% but explained by changes in case mix and no hospital outliers after risk-adjustment.</p> <p>Crude mortality for congenital heart disease surgery was lower than pre-pandemic levels (1.6%).</p>

WHERE THINGS IMPROVED

Many examples of maintained or improved performance despite the pandemic

Antenatal detection of congenital heart defects requiring intervention in the first year improved to 52%.

More STEMI patients investigated by echocardiography – now 77%.

Increased prescription of mineralocorticoid receptor antagonists (MRAs) to heart attack patients with poor left ventricular function – now 74%.

Increased referral of heart attack patients to cardiac rehabilitation – exceeded the 85% target at the end of 2020/21.

Increased use of secondary prevention medication for patients with heart failure but still only 52% receive all three disease-modifying drugs.

Summary of recommendations in the domain reports

NATIONAL CONGENITAL HEART DISEASE AUDIT (NCHDA) REPORT

1. The NCHDA has made significant progress with the development of better definitions to help centres record post-procedural complications, allowing consistent data submission and accurate analysis of early morbidities associated with cardiac surgery. All hospitals should comply with the accurate recording of these complications according to the existing definitions.
2. Screening hospitals should aim to increase the rate of antenatal diagnosis of conditions requiring intervention in the first year. Individual congenital heart disease networks should improve rates of antenatal diagnosis by reviewing staffing, infrastructure, education and training requirements.

MYOCARDIAL ISCHAEMIA NATIONAL AUDIT PROJECT (MINAP) AND NATIONAL AUDIT OF PERCUTANEOUS CORONARY INTERVENTION REPORTS

3. In the management of STEMI, staff in hospitals where Call-To-Balloon (CTB) time standards are not being met should work with partner Ambulance Trusts, emergency departments, neighbouring non-interventional hospitals and cardiologists to better understand delays in provision of primary PCI. This may include making improvements to the hospital response to the arrival of a patient but may also focus on ways to improve pre-hospital Call-To-Door (CTD) times.

Since the end of the present annual audit cycle significant pressures on the ability of Ambulance Trusts to hand over care of patients upon arrival at hospital may further adversely affect this metric.
4. In the management of both STEMI and NSTEMI, staff in hospitals with lower rates of provision of an echocardiogram should undertake a review

of data collection processes – to ensure that the reported rate accurately reflects practice – and then review the patient pathway to identify opportunities for echocardiography during the index admission.

Consideration should be given to performing a limited ‘bedside’ echocardiogram if there are difficulties obtaining timely detailed ‘departmental’ studies.

Where patients are discharged early to another hospital before an echocardiogram can be performed there must be a clear request to perform the test at the receiving hospital.

5. Those hospitals not reaching recommended levels for admitting patients with heart attack to a cardiac ward should review their systems and bed allocations to maximise access to cardiac care. This may require novel use of dedicated multi-specialty ‘high care’ beds and provision of cardiac outreach services to those nursed outside cardiac facilities.
6. Those hospitals with low rates of cardiology involvement in the care of patients with heart attack should undertake a review of their data collection processes – to ensure that the submitted data reflects practice. If it does, there should be consideration of improved provision of cardiac care during admissions.

This might require increased staffing or more flexible use of members of the cardiology team – for example Nurse Specialists and Physician Associates.
7. Those hospitals with low rates of angiography in eligible NSTEMI patients should perform a review of their systems of data collection and submission, and their systems for managing acute coronary syndromes (ACS).
8. In those hospitals where the 72 hour quality standard for angiography following admission with NSTEMI is not met commissioning groups, managerial and clinical leaders should engage in a process of system review, economic appraisal and quality improvement. This may require changes within hospitals, across referral

networks and/or in the overall commissioning of services.

There should be an emphasis on early reliable identification of suitable patients, streamlined referrals, and adequate capacity for transferring patients into (and out of) interventional hospitals; this may involve weekend angiography lists for such patients.

Anecdotal reports suggest that since the end of the present annual audit cycle the improvements seen here have not been maintained. Any lessons regarding more timely care that have been learned during the pandemic should be incorporated within plans for post-COVID recovery of services.

9. In the management of both STEMI and NSTEMI, staff in hospitals not meeting the standard for prescription of all secondary prevention medication prior to discharge should first explore data completeness and ensure that their data are a valid representation of practice. If suboptimal performance is confirmed quality improvement programmes should be implemented.

These might include the use of discharge pro-forma or checklists, direct involvement of specialist cardiac pharmacists or 'ACS nurse specialists'.

10. Staff in those hospitals with lower rates of prescription of aldosterone antagonists should ensure that patients with impaired left ventricular (LV) function are identified by echocardiography (or some other reliable assessment method) and that such patients are considered for appropriate treatment.

This might require the use of discharge pro-forma or checklists and the direct involvement of specialist cardiac pharmacists, 'ACS nurse specialists' and specialist sonographers.

11. Hospitals not meeting the standards for referral of patients to cardiac rehabilitation following either STEMI or NSTEMI should review the provision of services and identify early patients who might benefit.

This could include routine distribution of cardiac rehabilitation information/invitation leaflets to all patients admitted to cardiac facilities, and the inclusion of such information in discharge checklists.

All hospitals should ensure equitable access to cardiac rehabilitation. Rehabilitation staff who were redeployed to ward-based duties during

the pandemic should return to their original practices.

NATIONAL AUDIT OF PERCUTANEOUS CORONARY INTERVENTION (NAPCI) REPORT

12. It is recommended that operators undertaking Left Main Stem PCI use intravascular imaging (either intravascular ultrasound [IVUS] or optical coherence tomography [OCT]) to guide interventional strategy and optimise stent expansion and apposition, in line with international consensus statements around best practice.
13. Hospitals should seek to modify their pathways and ward structures to reduce unnecessary overnight stays for patients undergoing elective PCI.

The explanation for the wide variation seen between hospitals will include differences in the management of wards and day units, pressure on beds from emergency admissions and differences in patient pathways.

14. Hospitals not meeting the standards for the use of drug-eluting stents during primary PCI should review their cases to see where improvements can be made.

NATIONAL ADULT CARDIAC SURGERY AUDIT (NACSA) REPORT

15. Hospitals with prolonged waiting times for elective CABG surgery should review their processes and referral pathways to identify the causes of any delays. If necessary, advice should be sought from centres with evidence of the best performance. A quality improvement (QI) action plan should be instigated to achieve this target.

Units not achieving the target should consider ring-fencing level 3 intensive therapy unit (ITU) facilities and seek to make greater use of day-of-surgery admissions (DOSAs) and enhanced recovery after surgery (ERAS) to improve patient flows and outcomes.

Patients should be offered surgery in neighbouring hospitals with shorter waiting times if reductions in waiting times cannot be demonstrated.

16. Hospitals not reaching the target of urgent CABG performed within 7 days after coronary angiography should undertake a review of their processes to identify where delays occur and how these can be avoided. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to reduce delays.

Units not achieving the target should consider ring-fencing level 3 ITU facilities and seek to make greater use of enhanced recovery after surgery (ERAS) to improve.

17. Hospitals not reaching the 75% target of urgent CABG performed within 7 days of coronary angiography should undertake a review of their processes to identify where delays occur and how these can be avoided. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to reduce delays.

Units not achieving the target should consider ring-fencing level 3 ITU facilities and seek to make greater use of enhanced recovery after surgery (ERAS) to improve patient flows and outcomes.

18. Hospitals not reaching the DOSA target should undertake a review of their processes to identify the barriers to achieving this target (such as introducing pre-assessment clinics). If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to achieve this target.

NATIONAL HEART FAILURE AUDIT (NHFA) REPORT

19. Hospitals not achieving the recommended standard of the use of in-patient echocardiography for patients with acute heart failure should urgently review their clinical pathways and ensure that echocardiography is performed and ideally within the first 48 hrs of admission.
20. Hospitals should ensure that high-risk cardiac patients have access to a cardiology ward. Heart failure patients are often the highest risk.
21. Hospitals not achieving the standards for ensuring a patient with acute heart failure is managed on a cardiology ward or seen by a heart failure team should review their pathways of care and consider a quality improvement

programme to improve on their current performance.

Hospitals that do not have a clinical lead for Heart Failure should appoint one: ideally a consultant cardiologist with sub-specialty training in heart failure.

Hospitals that do not have access to specialist heart failure nurses within their hospital team or in the community should urgently seek to appoint them.

22. Greater attention is needed to ensure all patients with heart failure with reduced ejection fraction (HFrEF) receive the disease-modifying drugs that they should be on unless there is a contra-indication. This can be increased by patients being managed on cardiology wards or being seen by a HF specialist team, early during an admission. Those hospitals not meeting the expected standards should perform a clinical pathway review to investigate where improvements can be made.
23. More attention to follow-up arrangements is required so that patients are referred for Cardiology & Specialist Heart Failure Nurse follow-up, ideally leaving hospital with their first appointment. Hospitals should review their pathways for referral to cardiac rehabilitation to allow greater access and uptake for heart failure patients.

NATIONAL AUDIT OF CARDIAC RHYTHM MANAGEMENT (NACRM) REPORT

24. The fall in procedure numbers has been largely a result of the pandemic, and not within the control of specialists. However, doctors who have become de-skilled should consider undertaking procedures jointly with colleagues, especially for complex or high-risk cases. Those persistently undertaking very small volumes of procedures should examine whether this is sustainable, as should their hospitals.

1 | Introduction

The 2022 annual report of the National Cardiac Audit Programme (NCAP) focuses on how cardiovascular services were impacted by the first year of the COVID-19 pandemic. NCAP comprises six domains, each of which is concerned with a particular cardiovascular disease area or treatment:

- The National Congenital Heart Disease Audit (NCHDA), the 'Congenital' audit
- The Myocardial Ischaemia National Audit Project (MINAP), the 'Heart Attack' audit
- The National Audit of Percutaneous Coronary Interventions (NAPCI), the 'Angioplasty' audit
- The National Adult Cardiac Surgery Audit (NACSA), the 'Cardiac Surgery' audit
- The National Heart Failure Audit (NHFA), the 'Heart Failure' audit
- The National Audit of Cardiac Rhythm Management (NACRM), the 'Heart Rhythm' audit

The report covers the 12 months from 1st April 2020 to 31st March 2021, the first year of the pandemic.¹ The NHS faced huge challenges during this time. Across cardiovascular services, bed capacity and staff were redeployed to support COVID-19 patients. Out-patient services were seriously disrupted. There were high levels of illness across the workforce. Staff had to take special measures to protect patients as well as themselves.

Maintaining clinical care for patients has been the top priority of the cardiovascular community. Alongside this, great efforts were made to maintain a flow of

audit data to the NCAP programme delivered by the National Institute for Cardiovascular Outcomes Research (NICOR). This has enabled the analytical work needed to track the impact of the pandemic on cardiovascular services and patients.

With our academic partners, we quickly summarised the early effects on services in our 2020 COVID report, [Rapid cardiovascular data: we need it now \(and in the future\)](#)² along with the [updates](#) that followed. The British Heart Foundation also described the disruption to services and its consequence ([The untold heartbreak. Cancelled procedures. Missed appointments. Lost lives](#)³).

This annual report, with a more comprehensive dataset for 2020/21, now looks at the overall impact of the pandemic in that first year.

The rest of this report comprises three sections:

- **Section 2** summarises the country-level impacts of COVID-19 on cardiovascular services. Data from all 6 domains cover England and Wales and for some Northern Ireland. Scotland is not included as it has a separate audit programme.
- **Section 3** introduces the development of new data tools to demonstrate regional variations in procedure numbers and quality of care.
- Lessons and recommendations to aid service recovery and to deal with future pandemic-type scenarios are provided in **Section 4**.

2 | The country-level impacts of COVID-19 on cardiovascular services

The first year of the pandemic resulted in substantial reductions in expected admissions and tens of thousands of procedures were not performed. The troughs in activity coincided with the peak waves of COVID-19 admissions. Cardiac surgery and elective procedures were impacted most. There was less impact on PCI than cardiac surgery with evidence of a change in treatment strategy for patients with coronary or valve disease.

2.1 Some cardiovascular admissions and procedures were affected more than others

During the pandemic, cardiovascular services have largely been affected by the number of NHS hospital admissions related to COVID-19. As documented in public health metrics and communicated by the media, these hospitalisations came in waves [Figure 2.1].

Against this backdrop, some cardiovascular admissions and procedures were affected more than others on a month-by-month basis [Figure 2.2]. There were also differences in the overall impact on activity and outcomes over the whole year, as some services recovered or sustained more than others [Figure 2.3].

Figure 2.1: Number of new UK hospitalisations with COVID-19 per day, 23/03/20 – 11/01/22 [UK Health Security Agency data]⁴

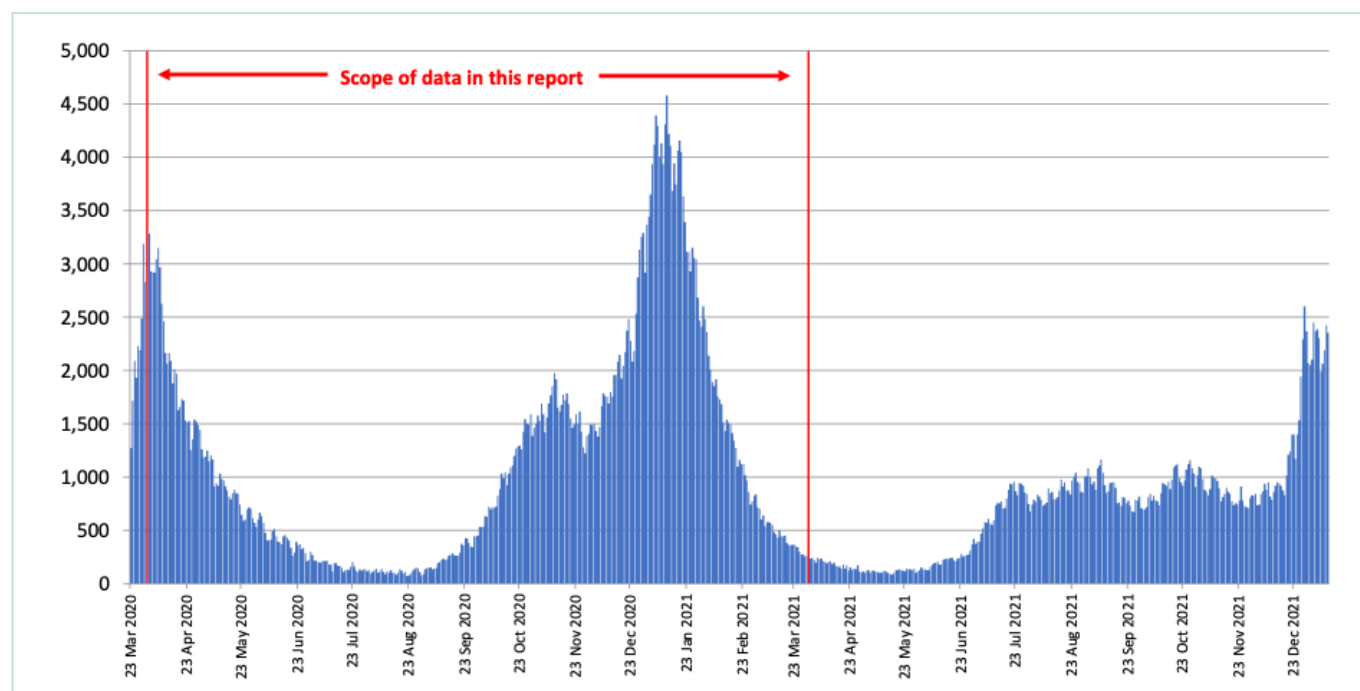
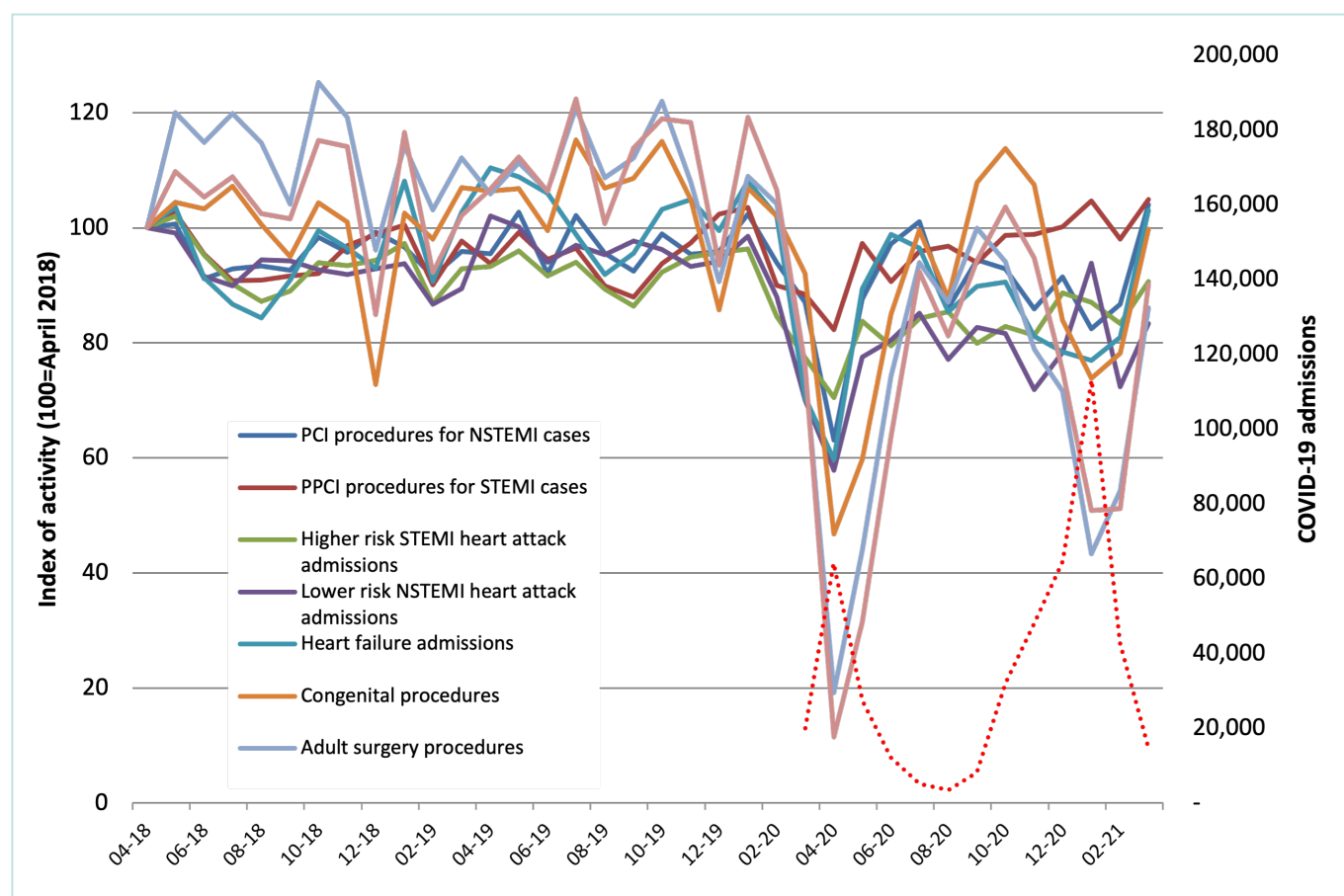
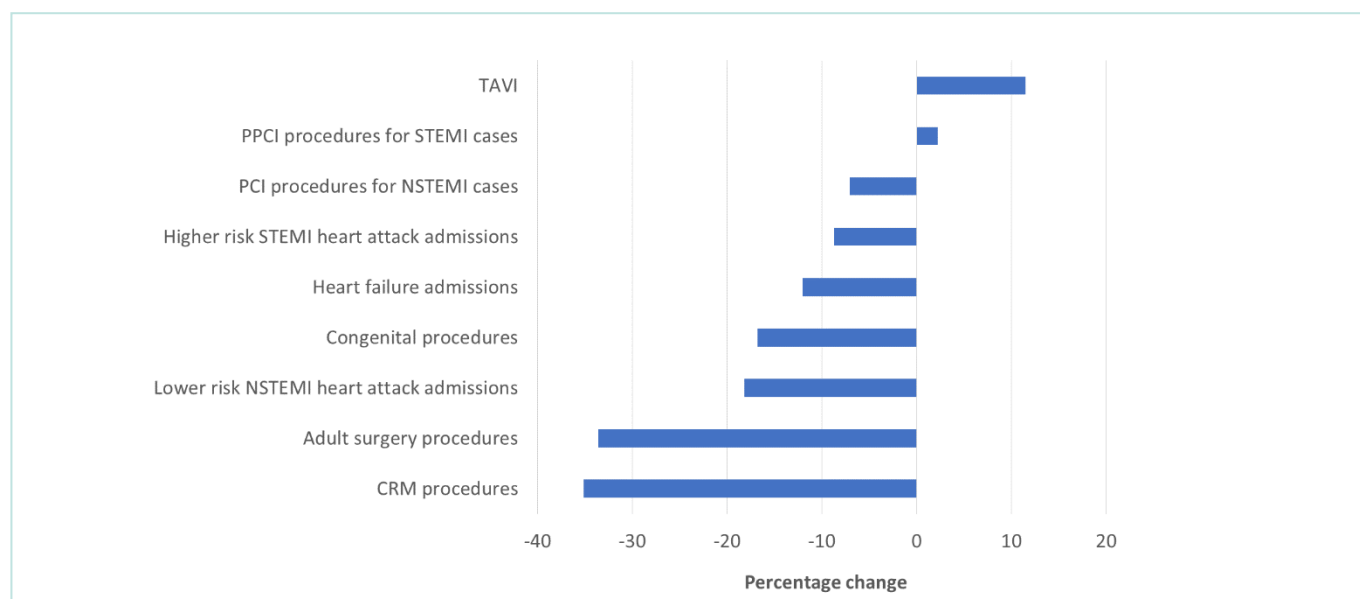


Figure 2.2: Index of admissions or procedures by month across selected cardiovascular conditions and services, 2017/18 – 2020/21 [NCAP data]



COVID: coronavirus disease; CRM: cardiac rhythm management; NSTEMI: non-ST-elevation myocardial infarction; PCI: percutaneous coronary intervention; PPCI: primary percutaneous coronary intervention; STEMI: ST-elevation myocardial infarction

Figure 2.3: Percentage change in the number of admissions or procedures for selected cardiovascular conditions and services, comparing 2020/21 with 2019/20 [NCAP data]



NCAP data does not include Scottish centres. For TAVI, data from private centres and one NHS centre not included.

The headlines are:

- **Heart attack patients arriving in hospital down 17%**

The number of heart attack cases dropped more than 14,000 from pre-pandemic years. A 9% fall in higher risk ST-segment elevation myocardial infarction (STEMI) cases combined with an 18% drop in lower risk non-ST-segment elevation myocardial infarction (NSTEMI). The drop started two weeks prior to the first lockdown in March 2020, driven it is believed, by a fear of an admission to hospital.^{5,6}

- **Total PCI activity down 9.8%**

There was a 19.7% reduction in Northern Ireland, 10.3% in England but only 1.2% in Wales.

- **Primary percutaneous coronary interventions (PPCIs) up 2%**

Although there was an initial fall of 10–15% in the first wave, the number of PPCI procedures recovered; given the lower number of STEMI admissions, this suggests that proportionately fewer patients were deemed unsuitable for this treatment.

- **Heart failure admissions fell by 12%**

There was a 40% reduction in expected admissions during the first wave and a 23% reduction in the second wave, with a rapid return to normal rates after each wave.

- **Surgical procedures for congenital heart disease down 18%**

These have been declining for the last ten years but a 50% drop during the first wave contributed to a steep overall reduction in 2020/21.

- **Adult surgical procedures down 34%**

Cardiac surgery virtually stopped in April 2020. Although activity was restored to about 80% of usual levels by the summer, the second wave saw a further dramatic fall. It is likely that a higher proportion of emergency and urgent cases were stabilised using PCI, with less need for an ITU bed, rather than being considered for surgery. Activity in Wales fell 48% (42% in Northern Ireland and 33% in England), possibly due in part to the tragic death of a cardiac surgeon from COVID-19 and a series of COVID-19-related post-operative deaths early in the pandemic. In contrast, Wales had the smallest fall in PCI activity, suggesting that patients who might have been considered for cardiac surgery were stabilised with PCI instead.

- **TAVI procedures increased by almost 12%**

Whereas valve surgery was severely impacted during the pandemic waves, the use of TAVI fell by 30% and 14% in the two waves but activity after these troughs was greater than in previous years. Very few of these cases now require an ITU bed post-procedure.

- **CRM procedures (implantable devices and ablation) fell 35%**

There was an almost complete cessation of all ablation procedures during the first wave with a rapid return to normal but then a further substantial drop in the second wave. There were overall 22% and 27% falls in pacemaker and complex device implants.

- **Elective treatment was more adversely affected than urgent procedures**

Congenital heart disease procedures for neonates and infants, typically more urgent cases, fell less than those for children and adults. Adult cardiac surgery and PCI also experienced more dramatic reductions in elective treatment cases. CRM device implants aimed at prevention were initially impacted more than those for urgent patients, although the latter fell more over the year (by 30%), probably because fewer heart attack admissions reduced the need for treatment.

2.2 Treatment strategies appear to have been modified in some cases

There were falls in both cardiac surgical and PCI procedures over the year, but the fall in cardiac surgery was proportionately greater than for PCI and so the PCI:CABG ratio increased [Figure 2.4].

Elective PCI procedures fell as much as overall cardiac surgical procedures during the waves of the pandemic, but there were smaller falls in PCI

for STEMI and NSTEMI, which make up a large proportion of total PCI activity [Figure 2.5]. It is likely that some urgent cases that would normally have been considered for surgery were stabilised with PCI instead. Activity however in cardiac surgery and PCI was reverting to pre-pandemic levels by March 2021 and so the ratio is likely to fall again.

Figure 2.4: CABG and PCI procedures in the UK (excluding Scotland), 2013/14 – 2020/21 [NACSA and NAPCI data]

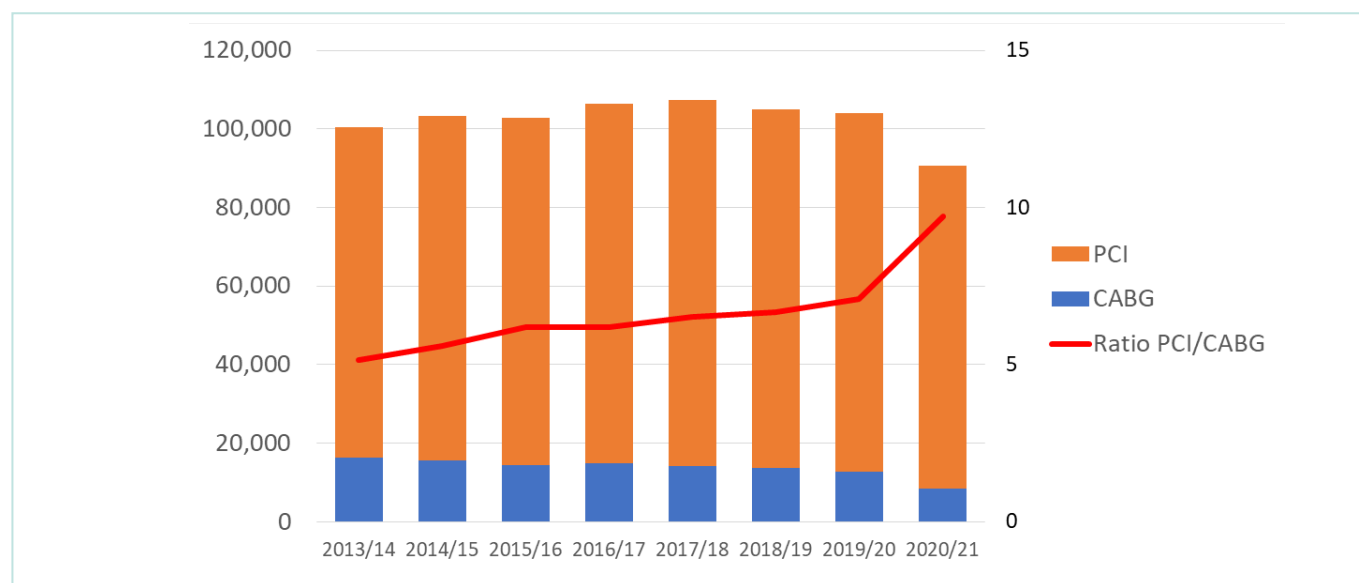
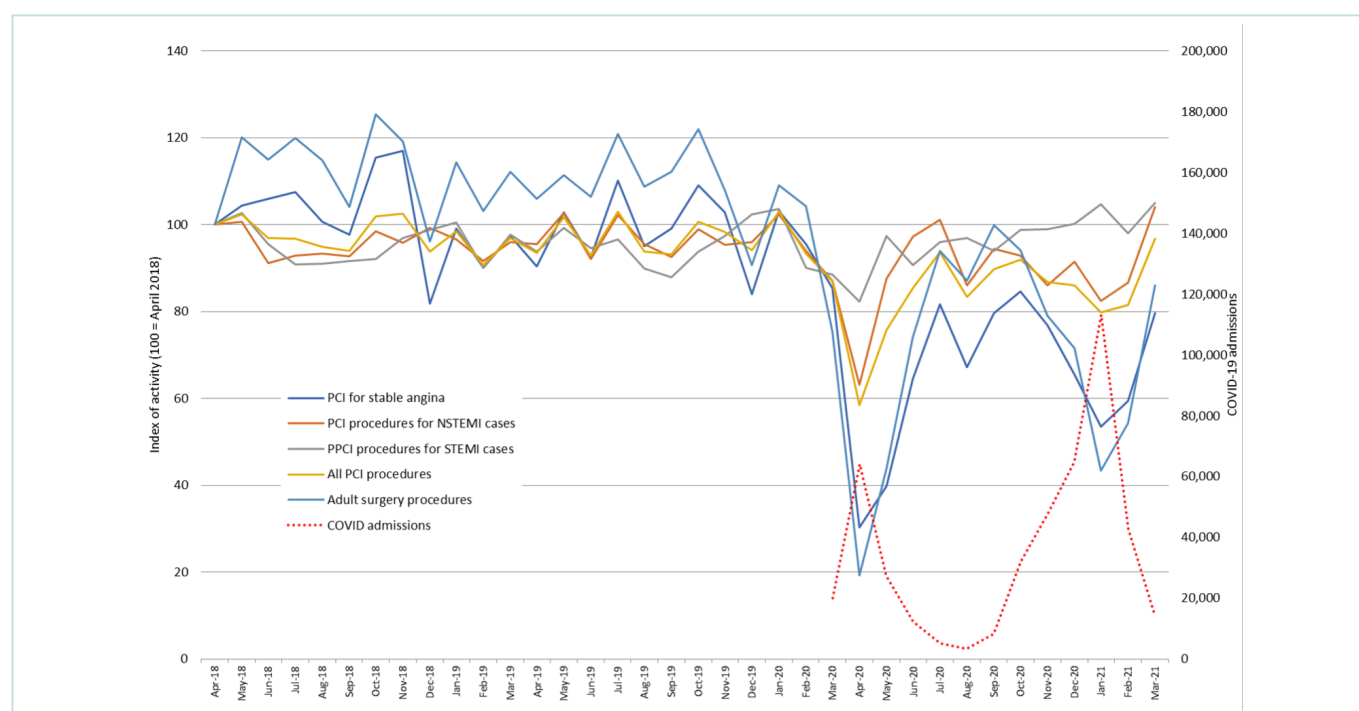
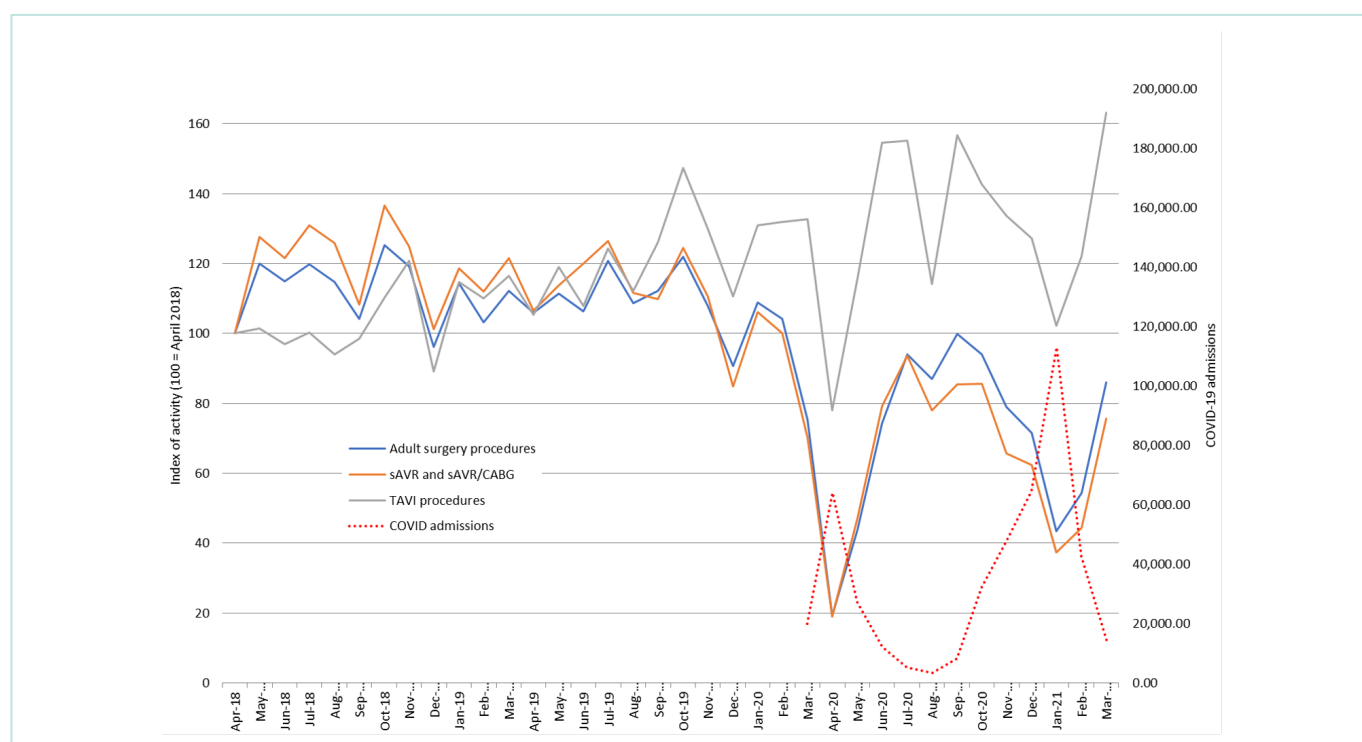


Figure 2.5: Index of activity for all cardiac surgery and PCI (excluding Scotland), 2018/19 – 2020/21 [NACSA and NAPCI data]



As for Figure 2.2

Figure 2.6: Index of activity for all cardiac surgery, surgical aortic valve replacement and TAVI, 2018/19 – 2020/21 [NACSA and UK TAVI Registry data]



As for Figure 2.2; sAVR: surgical aortic valve replacement; CABG: coronary artery bypass graft; TAVI: transcatheter aortic valve implantation

Similarly, the fall in surgical procedures for aortic valve disease fell drastically during the waves of COVID-19 admissions, mirroring the overall fall in surgical activity. Whereas there were also falls in TAVI activity during these periods, these were proportionately lower and overall TAVI activity increased for the

year [Figure 2.6]. It is likely that more patients were considered for TAVI, which does not usually require an ITU bed, than surgical valve replacement, which does. In spite of more TAVI procedures, more than 2000 expected aortic valve procedures were not performed in 2020/21.

2.3 There were changes in case mix and demographics

The pandemic affected certain cohorts of patients more than others. Reasons behind this should be explored but it is important that messaging does not inadvertently disadvantage the elderly or different ethnic groups.

The headlines are:

- **Numbers of older heart attack patients down most**

There was a greater proportionate reduction in the number of patients ≥ 75 years of age admitted with a heart attack; For NSTEMI, a drop of 22% in this group compared to 14% in the <65 years cohort, and for STEMI a 13% fall vs 5% for the younger patients.

- **Fewer older patients with heart failure were admitted**

The gradual year-on-year increase in average age of patients admitted with heart failure did not continue in 2020/21. There was a slight fall in the mean age of all patients from 78.4 years to 77.8 years (75.8 for males and 80.2 years for females).

- **Cases of white patients with higher risk STEMI heart attack down 14%**

Overall, there was a 9% fall in admissions with STEMI, with a 14% reduction in white ethnicity patients but a 4% increase in patients from non-white ethnicities.

- **Admissions of Asian and Black ethnic groups with lower risk NSTEMI down 20%**

Admissions of non-white (predominantly Asian and Black ethnicity) patients with NSTEMI fell by 20%, those for white patients by 16%.

- **Cardiac surgery patients aged 80 or over down 50%**

The proportionate reduction in cardiac surgery patients steadily increased with age and was higher

for females. Compared with 2019/20, the falls in operations for males in the <60, 60–69, 70–79, ≥80 year age groups were 27.9%, 30.1%, 36.5% and 48.9% respectively; falls for females were 23.8%, 31.8%, 37.9% and 51.8% respectively.

- **Adult cardiac operations in females have fallen slightly more over several years**

There has been a 34.6% fall for female patients compared to a 33.2% fall for males since 2016/17.

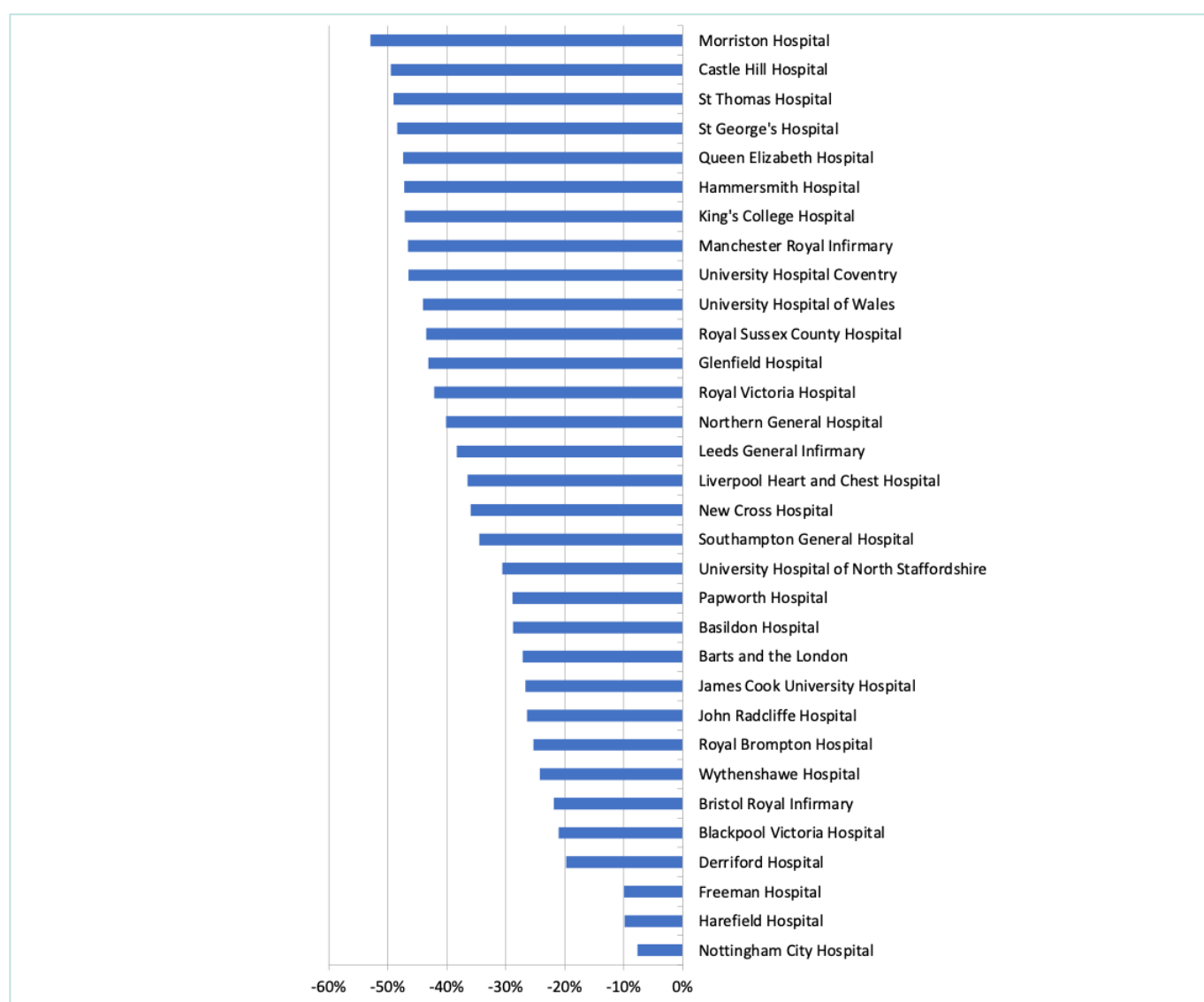
2.4 General surgical centres were impacted more than specialist ones

The 34% fall in cardiac surgical procedures for 2020/21 was not spread evenly across hospitals, with the range varying from 8% to 52% [Figure 2.7].

Those least impacted included protected cardiovascular units without on-site A&E departments

and others designated as sites for cardiothoracic surgery (for example in London), distanced from general services that were most affected by COVID-19. There are potential lessons here for future service design and protection of specialist care.

Figure 2.7: Percentage reduction in cardiac surgical activity by hospital, 2020/21 compared to 2019/20 [NACSA data]



2.5 Patient outcomes have been maintained

Although there was a fear in some patients about the possibility of contracting COVID-19 in hospital, this happened only to a small proportion of patients overall.⁷

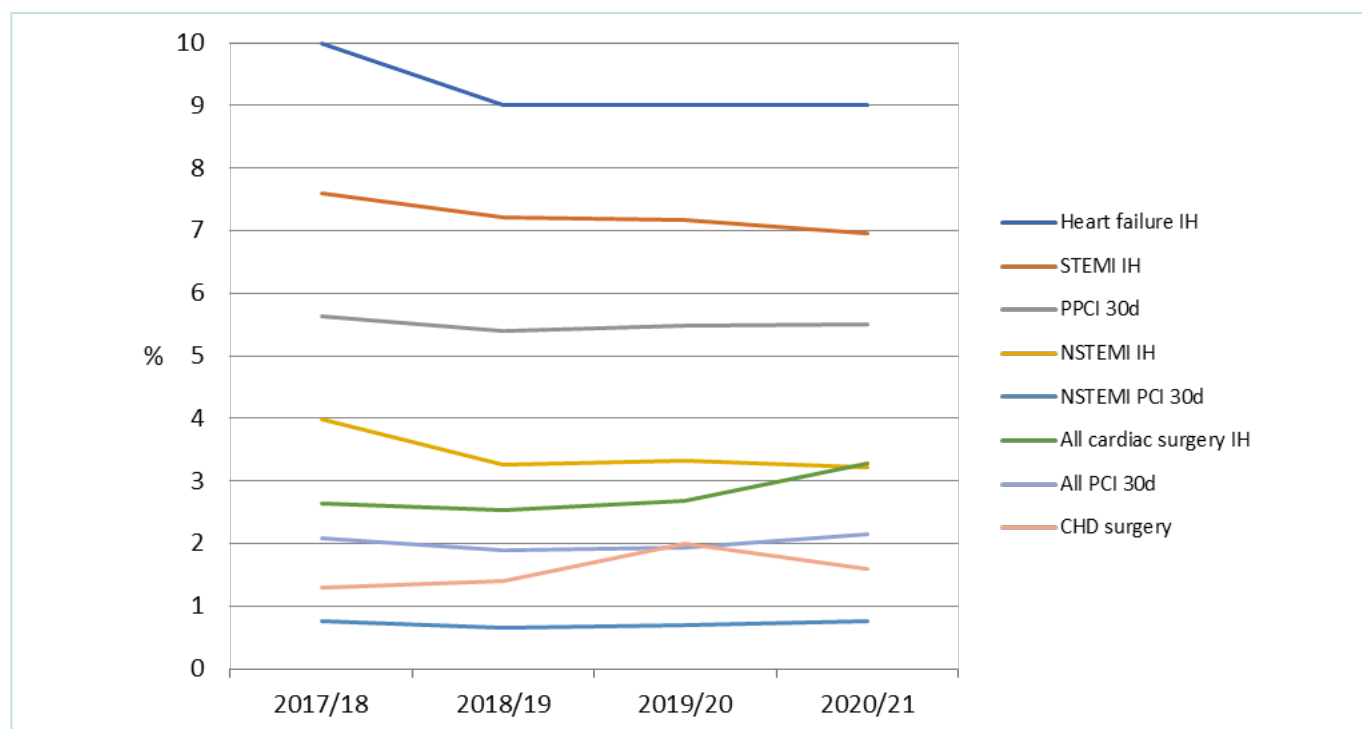
Importantly [Figure 2.8], there was no change in mortality:

- after admission with a heart attack or heart failure
- after elective, urgent or emergency PCI procedures with outcomes after PCI for all types of procedures as expected
- for adult cardiac surgery as, despite a small rise in the crude mortality rate for urgent cases, the risk-adjusted analysis has shown no outliers and so was as predicted at hospital level

- for congenital patients undergoing surgery and those requiring surgery for heart lesions saw their risk-adjusted survival rates increase slightly in 2020/21.

Accepting there were some changes in case-mix (highlighting the importance of risk-adjustment methods to look at this in greater detail), these results are a testament to hospital services that took as many measures as they could to protect patients against acquiring COVID-19 infections in hospital.

Figure 2.8: In-house (IH) or 30-day (30d) mortality after admissions for a heart attack or heart failure, or after cardiac interventions [NCAP data]



2.6 Many aspects of care were maintained or improved

2.6.1 Antenatal detection of congenital lesions requiring early intervention was maintained

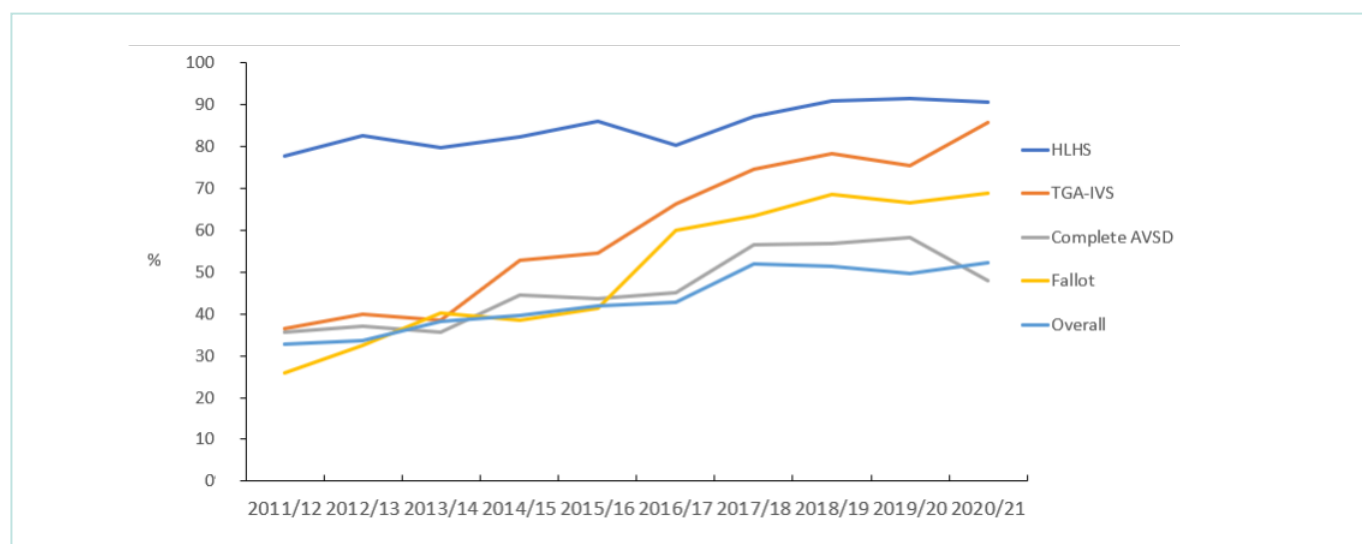
Hospitals have maintained, or slightly improved their performance in the antenatal detection of lesions requiring an intervention within the first year of life [Figure 2.9].

2.6.2 Levels of care of patients with a heart attack were maintained or improved

For patients admitted with a heart attack, the proportion admitted to a cardiology ward was maintained (62.1%, up slightly from 61.3% in 2019/20), a very high proportion (96.5%) were seen by a member of a specialised cardiology team and a high level (90.3%) were discharged on all secondary prevention medications for which they were eligible.

The proportion of patients with STEMI being investigated with in-house echocardiography increased from 76.3% on 2019/20 to 77.2% (having been 57.5% in 2010/11) [Figure 2.10].

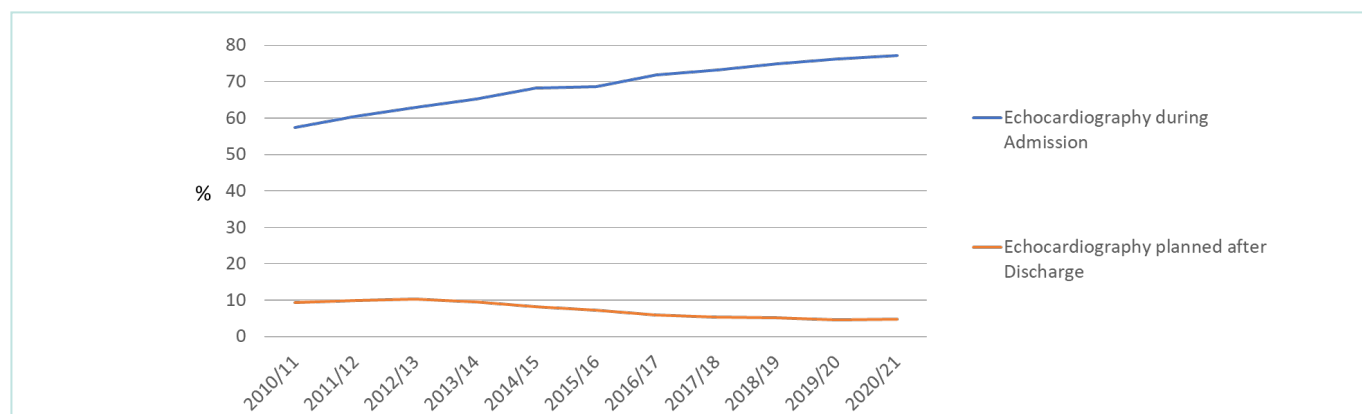
Figure 2.9: Proportion of patients in the UK and Republic of Ireland undergoing procedures in infancy successfully diagnosed antenatally (2011/12 – 2020/21) [NCHDA data]



HLHS = hypoplastic left heart syndrome; TGA-IVS = transposition of the great arteries with intact ventricular septum; AVSD = atrioventricular septal defect; Fallot = tetralogy of Fallot

Data from hospitals in Scotland excluded for all years

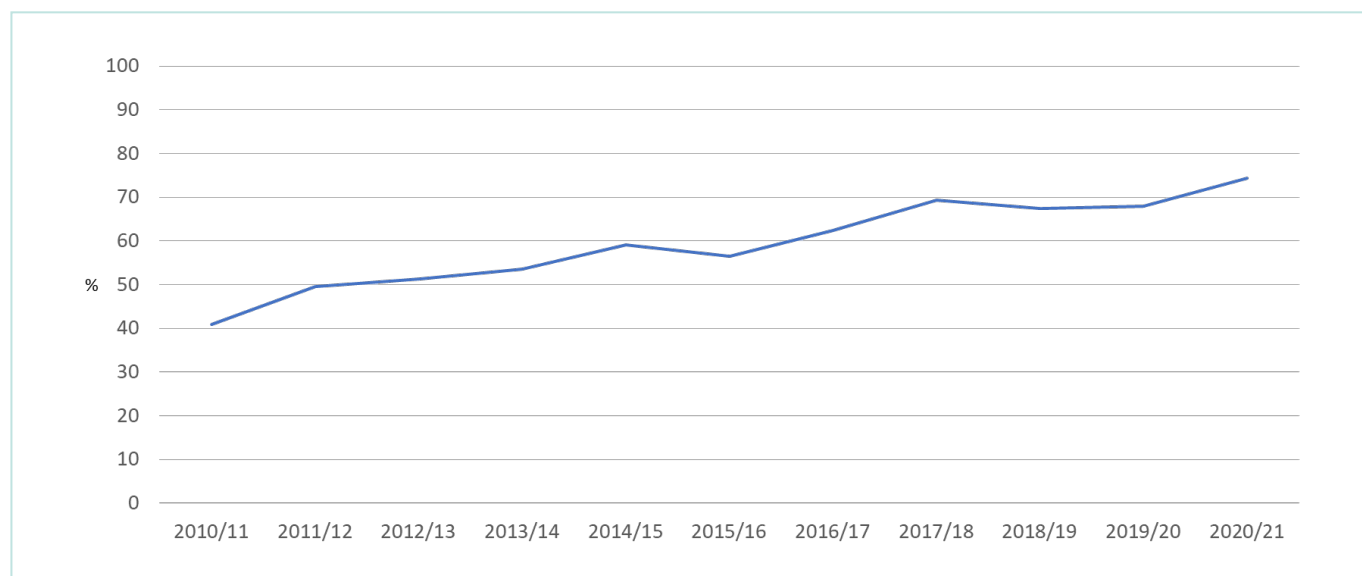
Figure 2.10: Proportion of patients who undergo echocardiography following STEMI, 2010/11 – 2020/21 [MINAP data]



MINAP has highlighted the prescription of mineralocorticoid receptor antagonists (MRAs) for patients with poor left ventricular function following a heart attack. These have been shown to improve

survival. Even though, in general, patients were discharged a day earlier, proportionately more were prescribed these drugs [Figure 2.11].

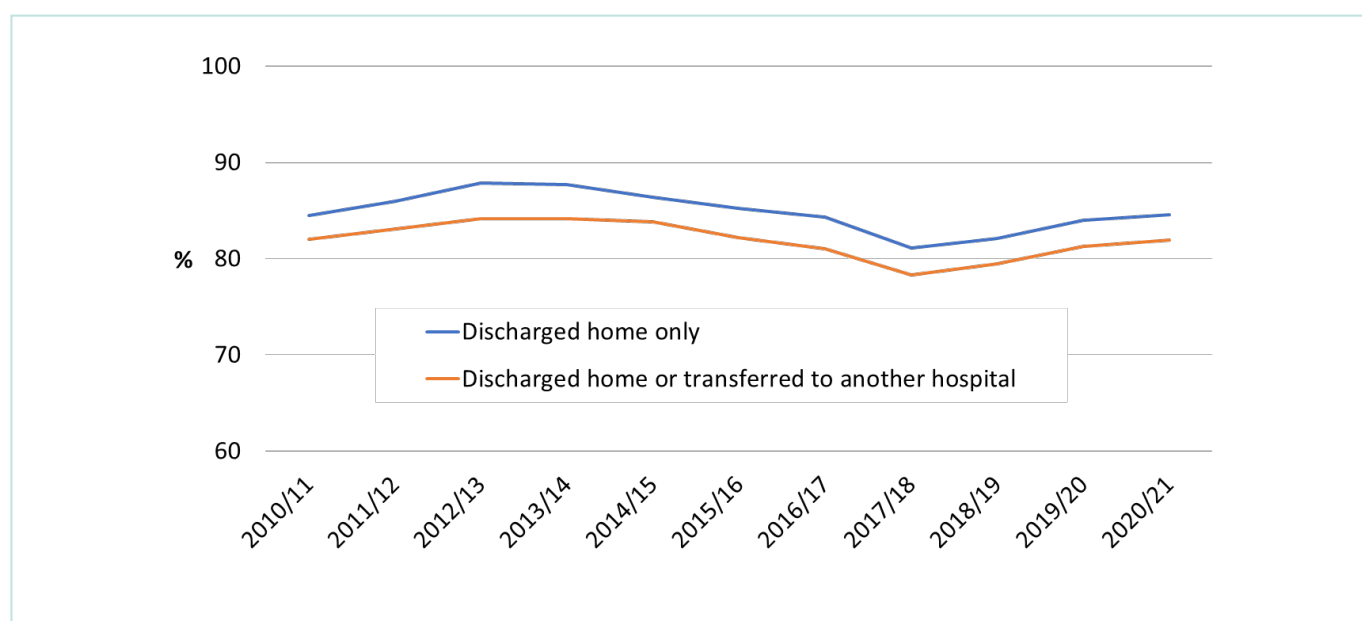
Figure 2.11: Trend in use (%) of aldosterone antagonists in those with STEMI and significant left ventricular systolic impairment, 2010/11 – 2020/21 [MINAP data]



Accepting that fewer patients were admitted with myocardial infarction over the year as a whole, the proportion of patients referred for cardiac

rehabilitation improved with rates reaching just over the NHS target.

Figure 2.12: Proportion (%) of patients (STEMI and NSTEMI combined) referred for cardiac rehabilitation programmes, 2010/11 to 2020/21 [MINAP data]



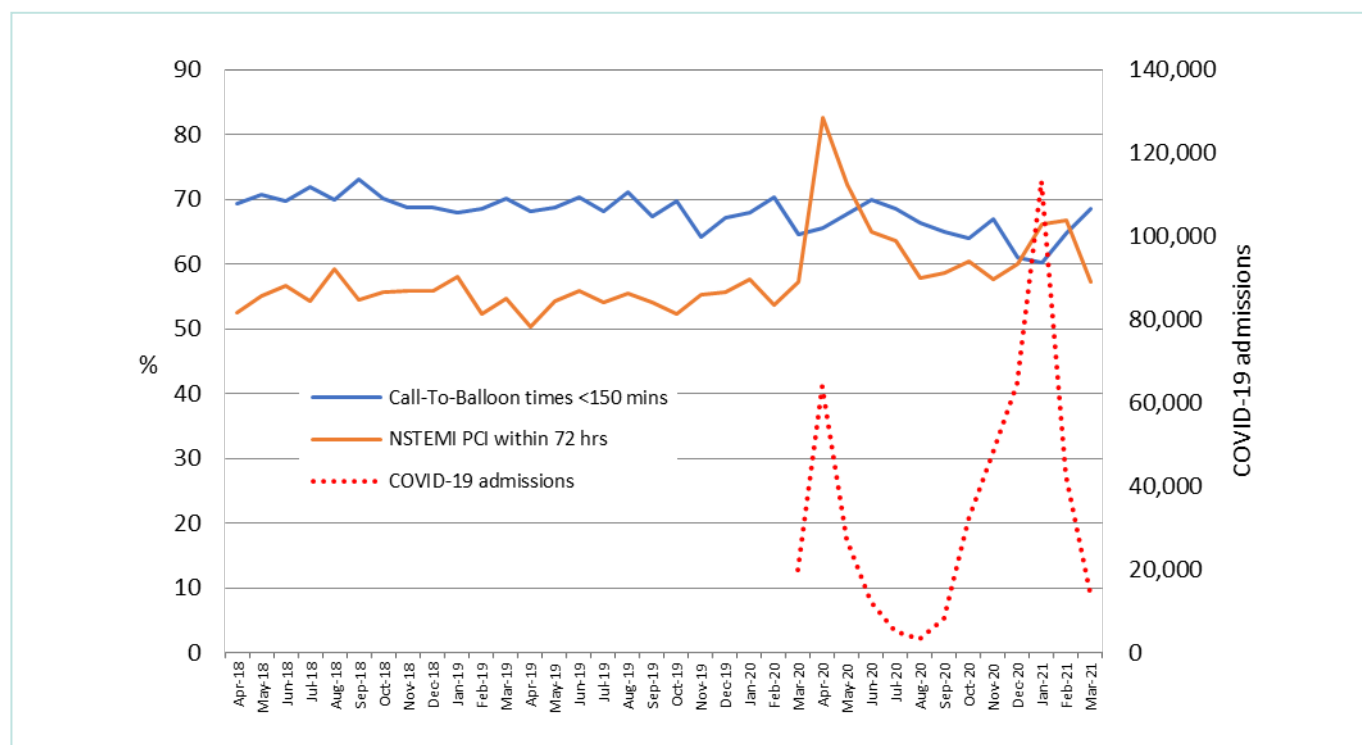
* See The NHS Long Term Plan⁸

2.6.3 Patients admitted with lower risk heart attacks underwent earlier investigation

Although there was a fall in the number of patients with NSTEMI who underwent angiography prior to discharge (81.1%, down from 83.5% in 2019/20), those undergoing the procedure within 72 hours rose from 54% to 66% overall. For patients with

NSTEMI undergoing PCI, timeliness of treatment was significantly improved during the first wave. The proportion of those receiving PCI within 72 hours of admission increased from around 55% to more than 80%, then began to fall again to about 60%, rose again to more than 65% in the second wave but fell towards <60% again in March 2021 [Figure 2.13].

Figure 2.13: Percent of patients with NSTEMI treated by PCI who received the intervention within 72 hours of admission (NAPCI data) and Call-To-Balloon times for STEMI, 2018/19 to 2020/21 (NAPCI and MINAP data)



This apparent improvement towards meeting the target was because of increased availability of catheter laboratory time for urgent cases given the virtual cessation of the elective PCI programme. However, as the elective programme re-started, capacity issues re-emerged and the ability to reach the quality targets fell. Greater capacity within the NHS will be needed if optimal care is to be provided to both elective and urgent patients.

2.6.4 The use of adjunctive imaging to guide PCI procedures increased

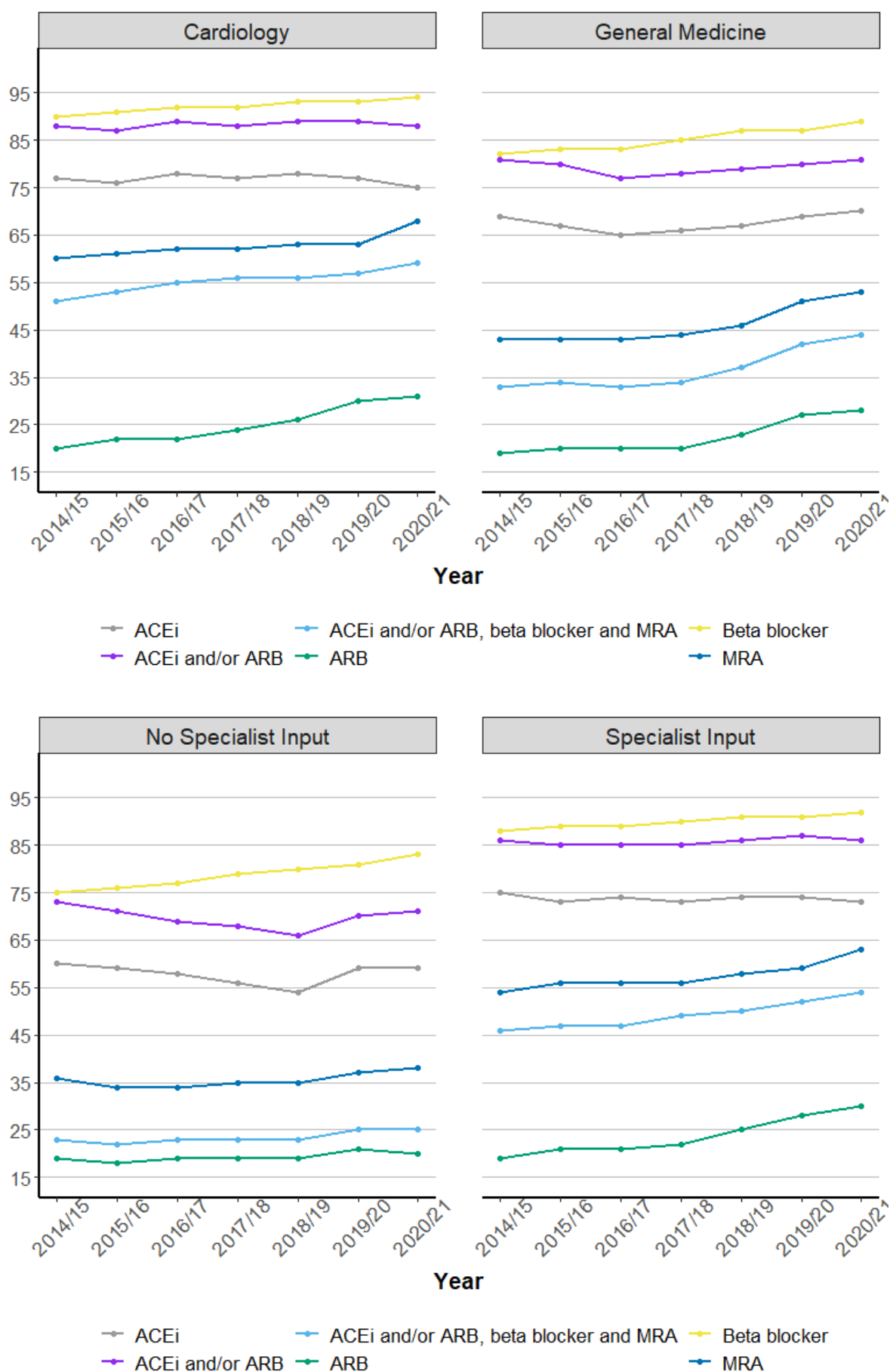
For higher risk patients requiring PCI, including those with left main stem and/or triple vessel coronary disease, there is evidence that the outcomes of PCI for left main stem lesions are improved if the procedures are guided by intravascular imaging, whether by intravascular ultrasound (IVUS) or optical coherence tomography (OCT).^{9,10} For the first time, the NAPCI has evaluated the use of adjunctive imaging for these lesions and found a gradual increase in its use over

time from 57% in 2018/19 to 67% in 2020/21 but there is wide inter-hospital variance from 100% to less than 10%. Given that some complex patients are likely to have been treated with PCI rather than CABG during the pandemic, optimising technique and outcomes for PCI is evidently important.

2.6.5 More medications that improve prognosis were prescribed to patients with heart failure

Proportionately more patients with heart failure with reduced ejection fraction were discharged on a beta blocker or an MRA, both of which improve prognosis. This increased performance occurred in the face of a reduced length of stay by one day. Use of these drugs, and the use of an angiotensin-converting enzyme (ACE) inhibitor or an angiotensin receptor blocker (ARB), depended on where the patient was managed and whether they were seen by a specialist [Figure 2.14].

Figure 2.14: Percentage of HFrEF patients on discharge by place of care and specialist input in England and Wales, 2014/15 – 2020/21 [NHFA data]



2.7 Some care pathways were negatively influenced by the pandemic

2.7.1 Continuing deterioration in CTB and CTD times for patients with STEMI

Although PPCI procedure numbers were not significantly impacted by the second wave, times to treatment were significantly affected. Call-To-Balloon (CTB) times dipped during both waves, and especially the second wave, suggesting that the Ambulance Trusts were under particular pressure during this time [Figure 2.13].

About 65% of cases had a CTB time <150 minutes in March/April 2020, with a subsequent improvement towards 70% but this fell to <60% in January 2021. Door-To-Balloon (DTB) times deteriorated slightly (median times +2 minutes compared to the previous year) but have been relatively unchanged over the last decade. The highlighted dips contributed to an overall deterioration of CTB times by 4 minutes compared with the previous year (and now 20 mins worse than ten years ago) [Figure 2.15].

The proportion of patients receiving PPCI within 150 minutes from the time of call for help was 65.2% (compared to 78.9% in 2010/11) and the proportion

within 120 minutes was 36.8% (compared to 56.7% in 2010/11). As discussed in previous reports, the year-on-year deterioration in this metric is troubling, primarily because it is associated with a higher mortality. Given the known pressures on the Ambulance Trusts in 2021/22, it is likely that performance on this metric will deteriorate further before it begins to improve, but a concerted national effort will be needed to address this.

2.7.2 Fewer patients admitted with heart failure received echocardiography and fewer received specialist follow-up

Although a slightly higher proportion of patients were admitted to a cardiology ward in 2020/21, this was still fewer than 50%. Fewer patients were investigated with an echocardiogram [Figure 2.16].

Fewer patients received specialist follow-up and/or were referred to cardiac rehabilitation [Figure 2.17]. The national target for the latter is 85% and national, regional and local efforts are required to change this.

Figure 2.15: Trend in Call-To-Balloon (CTB) times (minutes) – median and interquartile ranges, 2010/11 – 2020/21 [MINAP data]

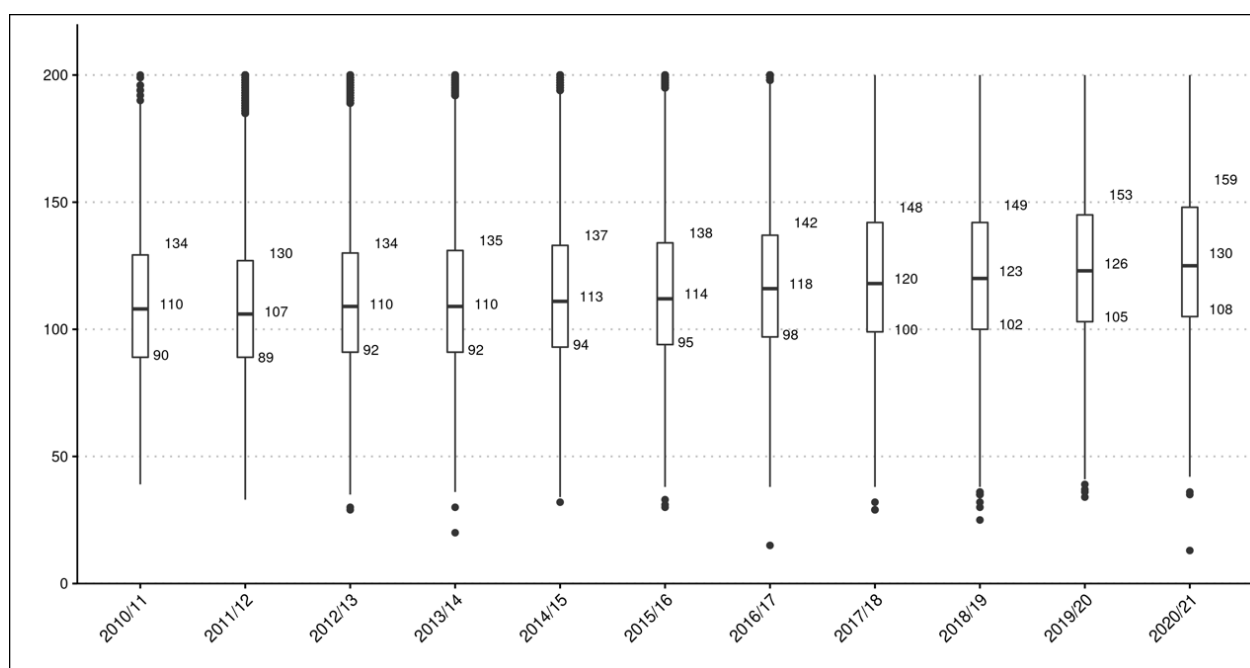


Figure 2.16: Percentage of HF patients receiving ECG and echocardiography diagnostic tests, 2014/15 – 2020/21 [NHFA data]

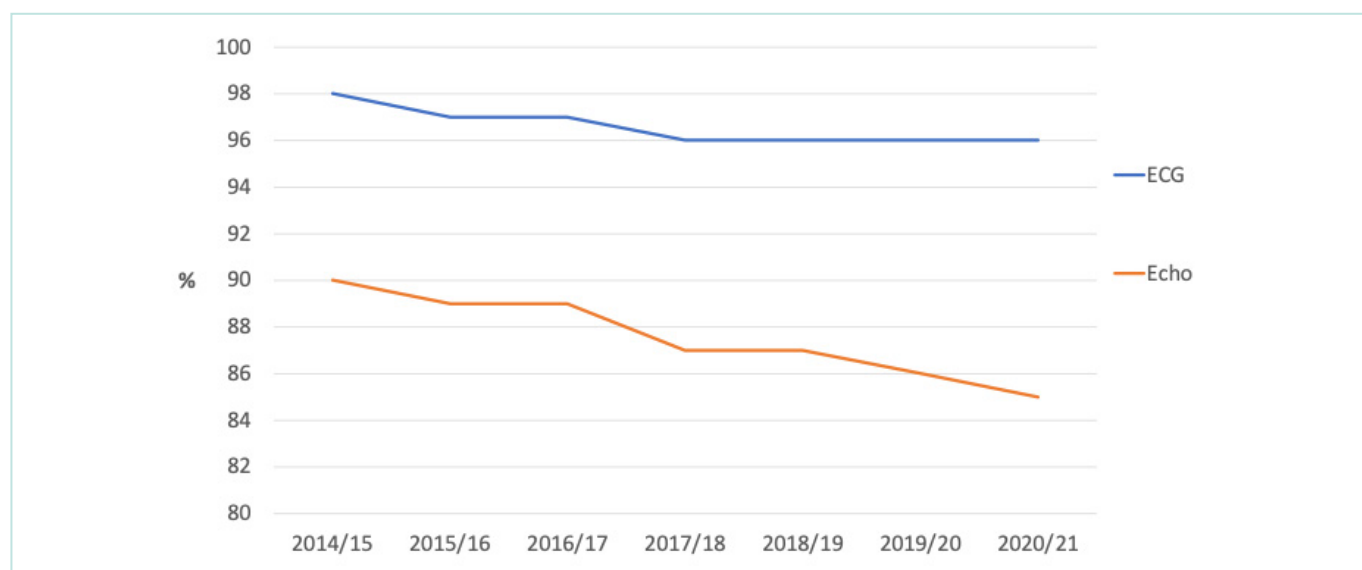
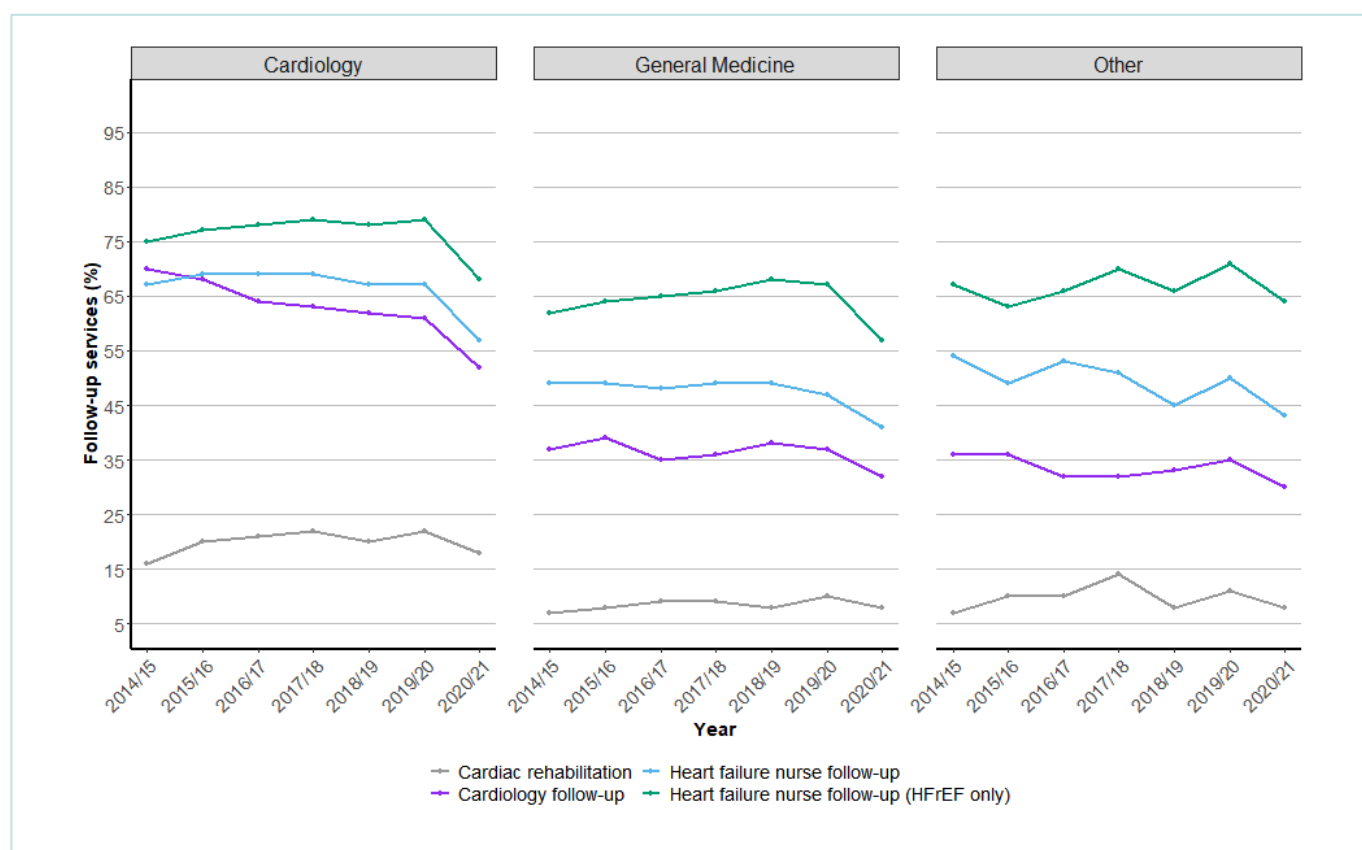


Figure 2.17: Trends in multidisciplinary HF team follow-up post discharge in England and Wales, 2014/15 – 2020/21 [NHFA data]



2.7.3 Waiting times for elective cardiac surgery have deteriorated

Given the large fall in urgent cases, it is perhaps not surprising that the waiting time for urgent cardiac surgery fell by one day, although no country was able to meet the pre-pandemic targets. However, there has been a significant increase in waiting times for elective CABG (all countries, but worse in Northern Ireland and Wales) [Figure 2.18].

2.7.4 Reduction in day of surgery admissions

Probably because of the inability to run the necessary pre-admission clinics, there was unfortunately a fall in the day-of-surgery admissions [Figure 2.19]. Given that this aspect of care aids efficiency and is preferred by patients, it is perhaps unfortunate that such pre-admission clinics were not maintained at a time when it could be argued they were most needed.

Figure 2.18: Waiting time for elective CABG (days from angiography to operation date) since 2013/14, by UK country (excluding Scotland) [NACSA data]

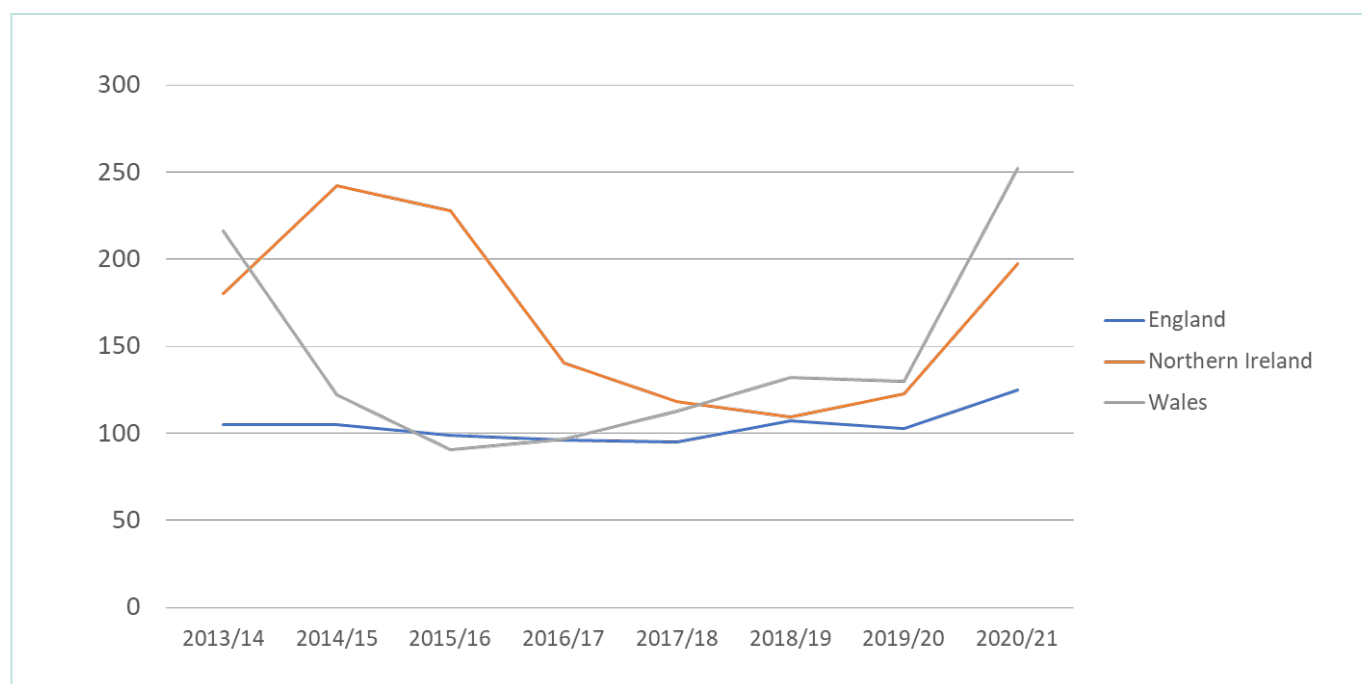
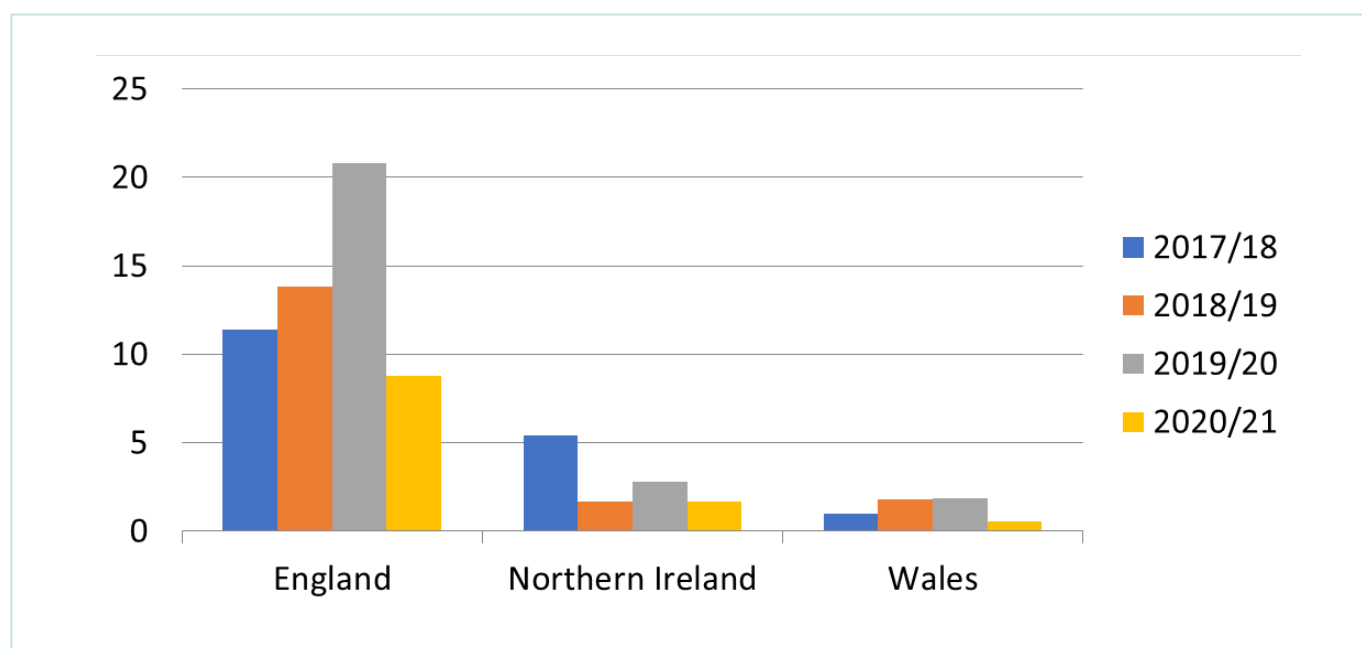


Figure 2.19: Proportion of patients undergoing elective CABG with day-of-surgery admission (DOSA), by country, 2017/18 to 2020/21 [NACSA data]



2.7.5 Fewer hospitals maintained their minimum volumes of procedures

Given the drop in pacemaker and device procedures it is perhaps not surprising that this meant that there was an increase in the number of centres that were unable to reach the minimum volume of activity recommended in national standards [Figure 2.20 and Figure 2.21].

There were similar falls in the number of individual operators who failed to meet the national standard for minimum procedure numbers, this applying not only to pacemaker and complex device implants but also to ablation procedures.

Figure 2.20: Number of hospitals achieving the recommended minimum number of pacemaker procedures, England and Wales hospitals, 2016/17 to 2020/21 [NACRM data]

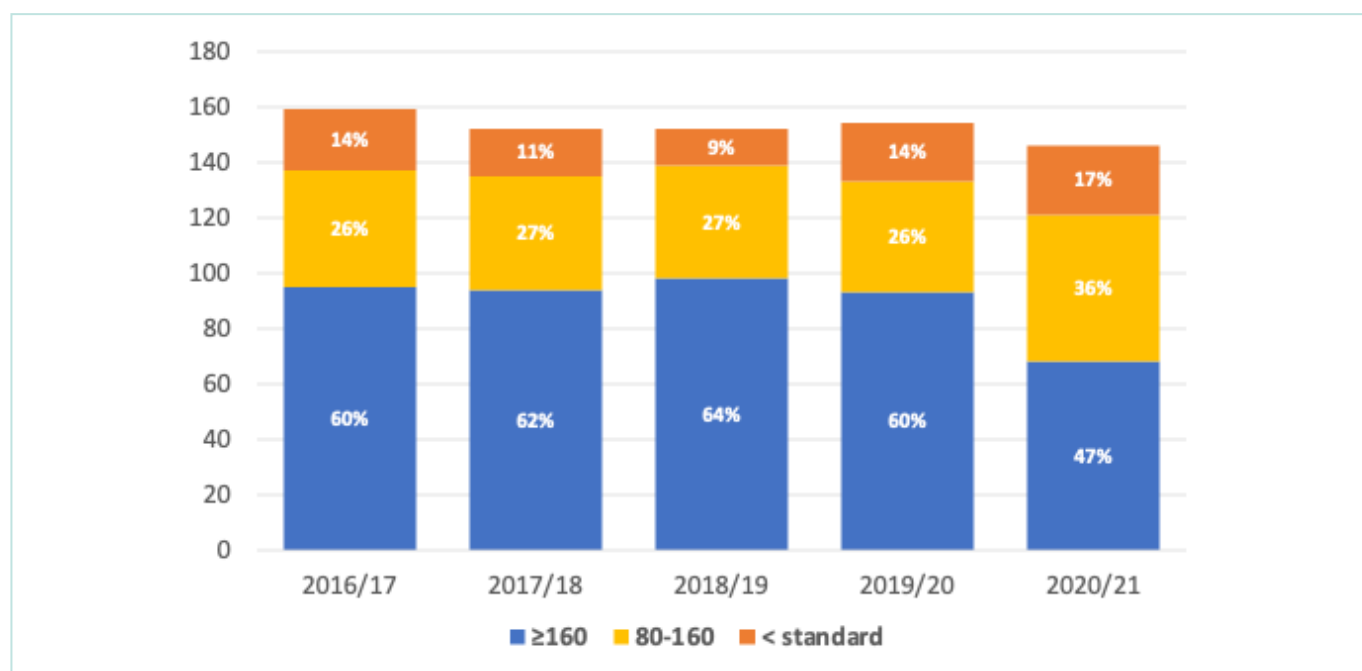
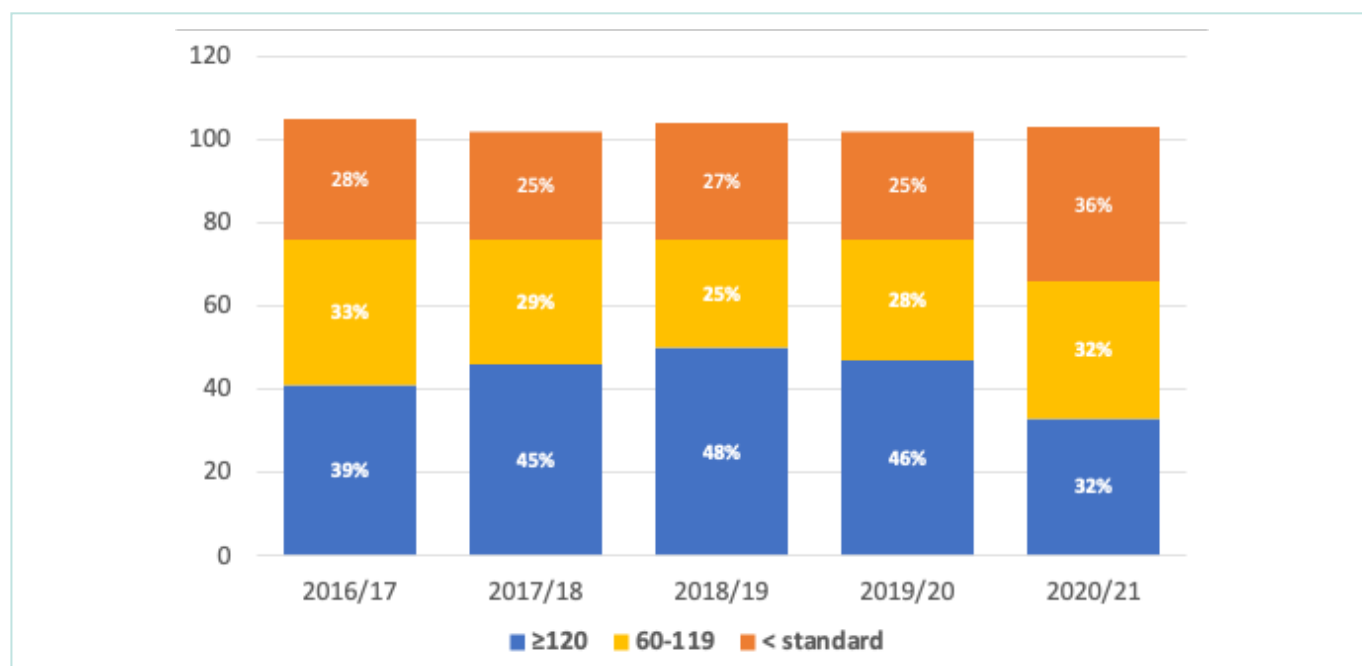


Figure 2.21: Number of hospitals achieving minimum number of complex device implants, England and Wales hospitals, 2016/17 to 2020/21 [NACRM data]



2.8 COVID-19 has had a huge impact on the experiences of patients and the NHS workforce

2.8.1 What it has been like to be a patient

There is no better way of summarising this than the poignant description in the [NACSA](#) report, provided by Linda, a patient awaiting and undergoing a cardiac surgical procedure whilst her husband was ill. Excerpts are provided here.

“My husband was on the ground floor next to a window, and as I couldn’t see him due to COVID regulations, I used to phone him and stand outside the window so he could see me while we spoke...I went home and he died about half past 11. I was alone, and I had no one with me. It felt difficult to tell my story over the phone to everyone who needed to be told, and I couldn’t see people because of the restrictions, so there are people I’ve never really talked about it with.

I was in hospital for five days. I wasn’t able to have visitors. I agreed with one friend that she would be the contact point with the hospital, so the hospital kept her informed and she spoke to everyone else. I had my phone during the whole time but I could hardly hold a phone. Later on I did video calls. Everyone was very understanding about people calling their friends and families who couldn’t visit.

I had to do all my own post-op monitoring, I haven’t seen any doctor face to face since the surgery apart from a scan a year after, and I knew I was at risk if I were to go into a doctor’s surgery, so I stayed at home.

One of the first nights after my surgery a nurse came over to ask me if I was okay, because I was still awake in the dark. I asked her if I could tell her something and she took my hand. I told her that my husband had died. She said she was very sorry and asked when. “Two weeks ago” I replied. And she hooked her foot around a chair and asked me to tell her about it. Whatever else was going on, she stayed with me until I fell asleep. These are the things I will remember. The kindness she showed me. Everyone may have been rushed off their feet, and there was COVID, but I never ever felt that they didn’t have time for me.”

Other experiences are highlighted in our [report for Patients and Carers](#). These highlight just a few of the issues that have been raised by patients. Many have had problems accessing healthcare, there has been confusion over public messaging, anxiety over whether it was safe to attend hospital whether in acute or elective situations, worries about communications and concerns about lack of care following discharge. Some quotes from patients include:

“There was also a little uncertainty about whether my operation could go ahead as planned, because of the possibility of COVID infection among staff.”

“It also seemed that others missed their families and were sad that they could not have visitors; I think that we all worried about how our loved ones felt.”

“Because of COVID the follow up appointment three months later was a telephone appointment. They advised me not to come into hospital and to manage my condition at home with diazepam and extra beta blockers if I had another episode. He told me that as soon as things improved I would be contacted for a proper follow up and checks. However this didn’t happen and there was no further follow up.”

“It was as if he’d disappeared into a black hole for weeks. It was extremely difficult to get any information on his condition and wellbeing, we couldn’t visit him in hospital due to the restrictions, and when staff did call they called the wrong person and had incorrect details.”

2.8.2 What it has been like to be a cardiovascular doctor, nurse or other allied health professional

The story of what it has been like to be part of the ITU and respiratory teams dealing directly with COVID-19 cases has been relayed through social media and news or documentary programmes. Less has been told of what it has been like out of the COVID limelight, trying to deal with one's own specialty whilst doing everything possible to help the hospital's COVID programme. In discussions and in several of our domain reports a number of features for the cardiovascular workforce have been highlighted.

- The fear of catching COVID-19, both in general and also during procedures, especially on patients known to have COVID-19;
- The fear of spreading COVID or taking COVID-19 home to one's family or, in some cases, the separation from one's family to avoid this;
- The pain of losing colleagues to COVID-19;

"On the 6th of April 2020, we sadly lost a very dear member of our surgical team to COVID. As a longstanding and greatly respected member of the department, his loss was deeply felt by all who knew him within the Health Board and the wider cardiothoracic community." [Consultant Cardiothoracic Surgeon, from NACSA report]

- The fatigue associated with the additional efforts to cover for absent colleagues, either through illness or self-isolation;
- The need to don appropriate protective gear for every procedure performed and learning to deal with the discomfort, avoidance of dehydration and other impacts such as aggravation of skin conditions;
- The anxiety related to not having appropriate levels of protective gear at the start of the pandemic;
- The concern about the inherent delays in the treatment of heart attack patients and their impact on outcomes;
- Not being able to undertake procedures that you knew were needed because of a lack of an ITU or other hospital bed or the hospital policies to defer all elective cases;
- Delays to one's own specialist area related to re-deployment of essential staff;

- Anxiety around loss of clinical experience and maintaining skills;

"When I come to perform a procedure which would have been routine before the pandemic, frankly I feel rusty. I worry that I am not doing the best job I can for my patients. Many of my colleagues, both junior and senior, share my concerns and we hope that we can get back to normal very soon." [Consultant Cardiologist, from NACRM report]

- Anxieties related to having to learn new skills during such re-deployment;
- Frustrations around not being able to contribute as much as others whilst not being able to undertake one's own workload;
- Dealing with the anxieties of patients whose treatments were being delayed and dealing with some adverse outcomes that were possibly associated with these delays;
- Undertaking remote clinics either by telephone or telemedicine facilities but not being able to examine a patient or having timely access to investigations that were deemed appropriate;
- Taking on additional administrative work associated with remote working or telemedicine;
- Disruption to training and teaching as well as having to find alternatives to one's usual continued medical education (CME) and continued professional development (CPD) requirements;
- The shut-down of research activity except for trials aligned to the pandemic;
- Concerns about dealing with the recovery phase and the ensuing backlog.

All staff readily accepted the consequences of the pandemic and the need to prioritise efforts to accommodate both the COVID-19 patients as well as the continuing emergency cases. They accepted that these worries and inconveniences had to be put aside to deal with the immediate concerns. In addition, a true sense of collegiality grew and a sense that 'we were in this together' created a positive team ethos.

"Like most centres, cardiac surgical activity was greatly curtailed while rapid reconfiguration of hospital services took place, leading to loss of our ITU and ward capacity. The challenge to develop a 'safe pathway' for urgent and

emergency cardiothoracic surgery during the first wave was met admirably by members of our department. From the rapid roll out of PPE, establishing patient testing and isolation pathways, maintaining an ever changing physical 'footprint' for the service. This included creation of a theatre 'bubble', comprising an operative theatre, with two adjacent theatres converted into ITU 'pods'. Witnessing our ability to maintain a critical service while chaos reigned around us was truly remarkable, and testimony to the professionalism, collaboration, and resourcefulness of all the teams involved.”
[Consultant Cardiothoracic Surgeon, from NACSA report]

Some of the new ways of working are likely to remain and offer advantages and efficiencies to the healthcare system. Permanent use of telemedicine for initial triage and follow-up of various stable conditions is likely but the patient and clinician's voices must be heard to ensure that timely face-to-face consultations are available for proper diagnosis and management of many of the conditions presenting to the cardiovascular community.

The impact on the elective programme and routine care has been very significant and there are on-going discussions about whether an alternative approach might have been taken and how the system now deals with the backlog. These concerns are magnified as staff shortages are faced. The loss of some of our European or other overseas colleagues, the impact of sick leave, burn-out and early retirements and a need to manage workloads at an acceptable and sustainable pace all have to be taken into consideration. The workforce's need to achieve an appropriate work-life balance during a recovery phase will be essential. Expectations from the public will have to be managed carefully and politicians will have to engage with the professions to ensure a clear pathway is developed with the appropriate infrastructure for recovery.

2.8.3 What it has been like to be a trainee

In some regards, trainees have had a unique experience of what it is like to deal with an infectious disease pandemic. They have tirelessly contributed to the efforts to deal with the challenge, covering for each other and others, working additional shifts and in areas outside of their specialist interests. They have learned new skills and contributed enormously to the NHS's ability to handle COVID. All of the issues described in section 2.8.2 have been relevant to the

trainee workforce, but in addition, there has been a fundamental disruption to the training they would normally have received.

Re-deployment took them away from their chosen specialty teachers and mentors. The reduction in the elective programme significantly impacted on their ability to learn new specialist skills and has put back their timetable to develop and to prepare for post-graduate exams. These issues have been highlighted in the [NACRM](#) and [NACSA](#) reports, where ablation procedures were virtually abandoned during the early phase of the pandemic. Allowing those most affected to catch up with their development whilst continuing the training of those newly joining the specialist programmes will be a challenge and some modifications might be needed to training programmes to accommodate this.

There has been a reduction in the number of trainees gaining experience in device implants which started pre-pandemic, especially in those with larger numbers of cases, the latter being magnified in 2020/21. A similar picture is seen with a reduction in trainees having a larger experience with ablation procedures, so that more trainees were exposed to moderate numbers of cases.

“I was due to start Cardiology Speciality Training in 2020, but I was redeployed on three separate occasions to cover General Medicine due to the pandemic. I lost probably in the region of 6 months of dedicated Cardiology training because of this that year.

Unfortunately, on returning to a 'normal' rota in 2021, this was then changed, and I still (in 2022) have a more intense General Medicine commitment to deal with the challenging inpatient situation due to ongoing COVID and acute pressures. Overall, I have spent more time covering General Medicine than Cardiology in the past year.

Now, having lost so much time for specialist training, I am trying to catch up on echocardiography, putting in pacemakers and undertaking angiograms, as is everyone else, limiting access to training opportunities. This has meant, for example, that training in putting in pacemakers has become sporadic, and it feels like I am starting again on every list.

Overall, COVID has exacerbated an already tricky training environment and resulted in a significant amount of lost training in my specialty.”
[Cardiothoracic Trainee, from NACRM report]

3 | New data tools to review regional variations and hospital performance

NICOR is putting in place new data tools that will enable individual NHS hospitals, Integrated Care Systems (ICSs) and the public to identify local variations in admissions, procedures or performance.

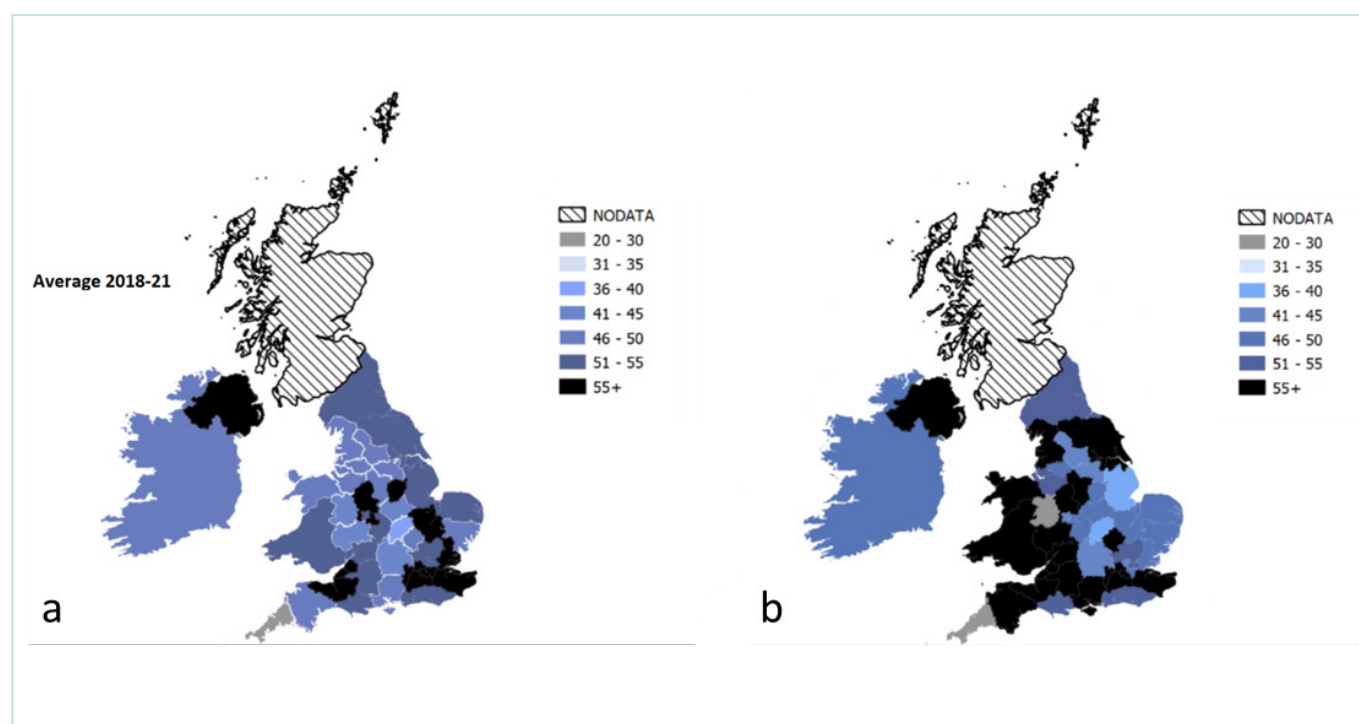
This will include the opportunity to show data as a map. A number of examples of what will become available are shown below.

3.1 Antenatal detection of congenital lesions

There has been a gradual improvement in the antenatal detection of congenital lesions requiring intervention within the first year of life. Figure 3.1 shows that detection rates across England centres

for the 12 months between April 2020 and March 2021 were notable higher compared to the average detection over the period 2018 to 2021.

Figure 3.1: Overall antenatal detection rates of congenital lesions requiring intervention within the first year of life, by STP for 2018-2021 and 2020/21



3.2 New tools to demonstrate regional differences

The mapping tools will be made available at Sustainability and Transformation Partnership (STP), ICS and (in Wales) Board level. They will be modifiable such that they might be based on postcode data (i.e. how many patients from a particular region have

undergone treatment, regardless of provider) or on provider data (i.e. how many patients have undergone treatment at this centre and from what regions). Although they are not yet ready for launch we provide some preliminary examples for demonstration.

3.2.1 Variation in isolated surgical aortic valve intervention and TAVI procedures

A map of the variability in provision of isolated surgical aortic valve replacement together with TAVI procedures is shown in Figure 3.2. Note that the data behind these examples are preliminary and at this stage do not represent verifiable activity.

Similar maps will be available for the Welsh Health Boards [Figure 3.3]

The content and details are still to be finalised and discussions will ensue about which maps are most useful to commissioners and hospitals (e.g. all TAVI vs all surgical AVR rather than isolated AVR, elective vs urgent cases etc.).

Figure 3.2: Preliminary data for TAVI and isolated surgical AVR procedures by Clinical Commissioning Group, 2020/21 [NACSA and UK TAVI Registry data]

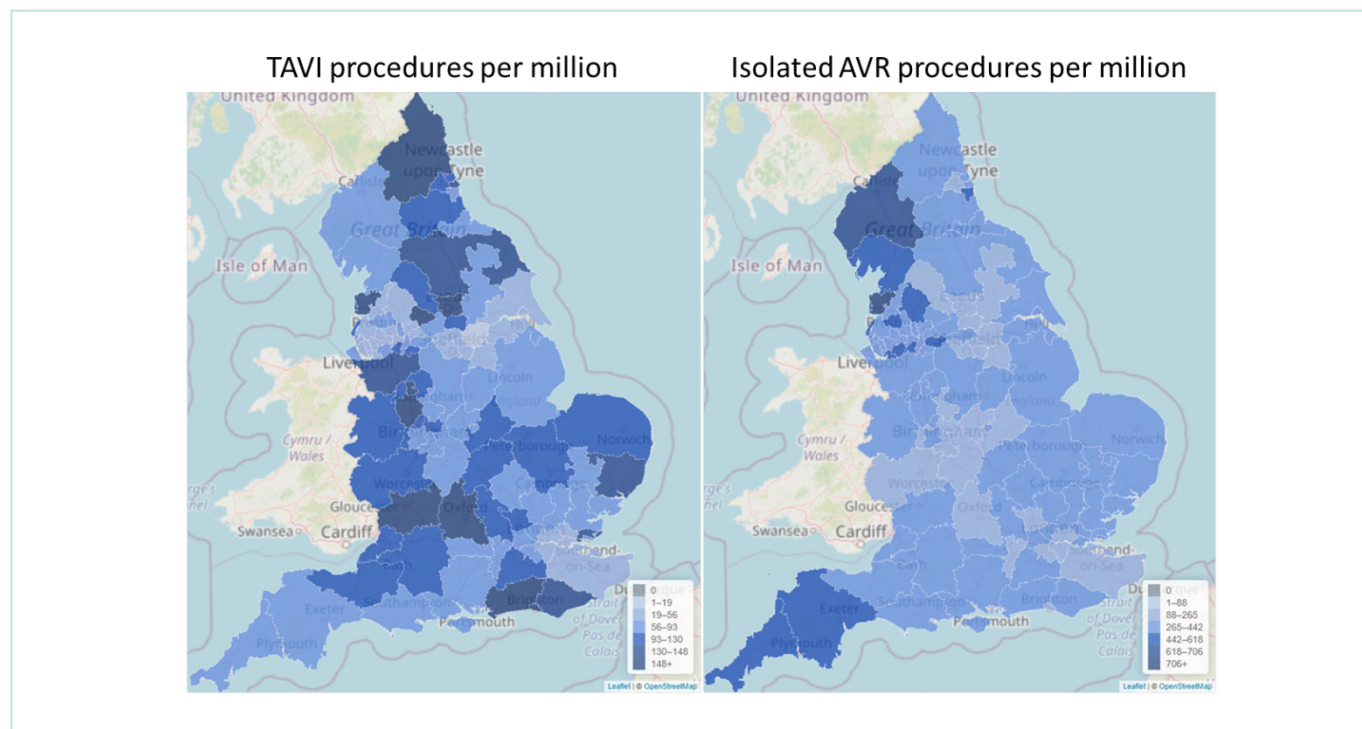
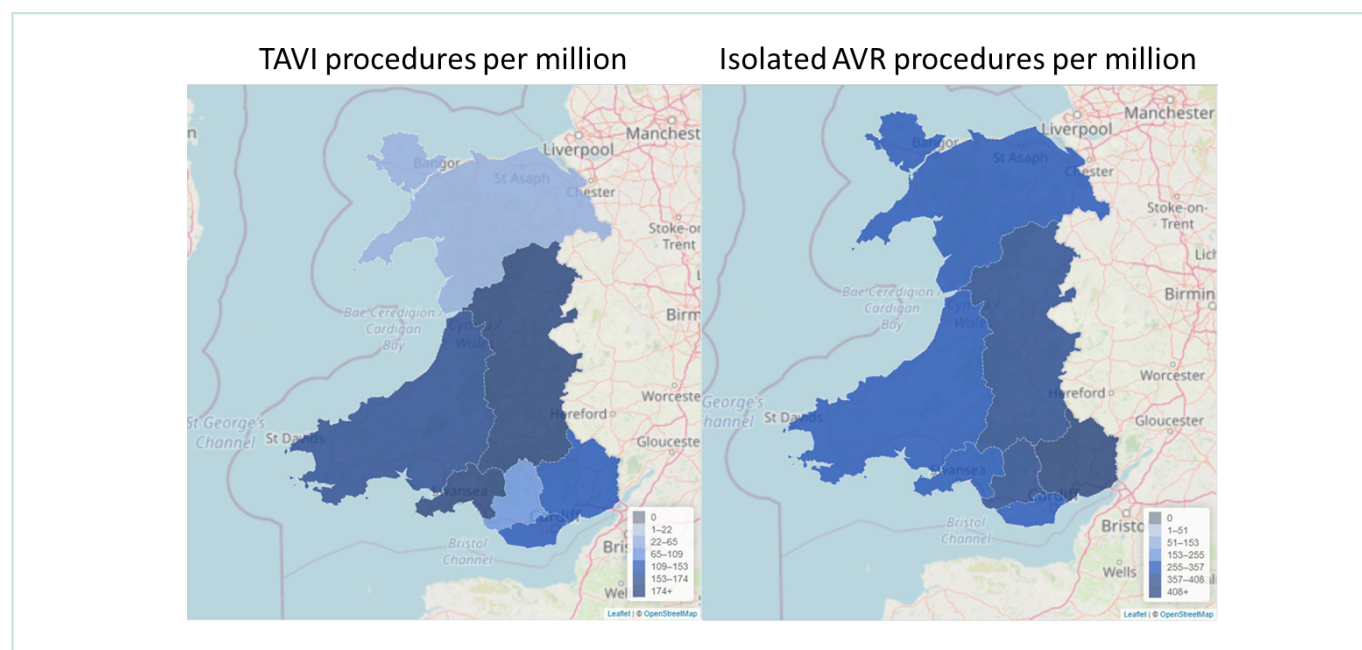


Figure 3.3: Preliminary data for TAVI and isolated surgical AVR procedures for Welsh Health Boards, 2020/21 [NACSA and UK TAVI Registry data]



3.2.2 Differences in PCI and CABG activity in different regions

Similarly, there might be a desire to look at regional differences in revascularisation modalities [Figure 3.4].

For PCI, there has been a significant growth in procedures for patients with chronic total obstructions of their coronary arteries. These are complex procedures requiring skilled teams. Availability will depend largely on the availability of such expertise in different centres [Figure 3.5].

The tools provided will enable different subsets of patients to be analysed across the domains of the NCAP. These data will enable discussions at local level. Understanding variability requires additional detailed analysis but also a local knowledge of the available infrastructure. It is likely that differences in these are as important, if not more important than demographic differences between regions.

Figure 3.4: Preliminary levels of all PCI and all CABG activity at CCG level, 2020/21 [NAPCI and NACSA data]

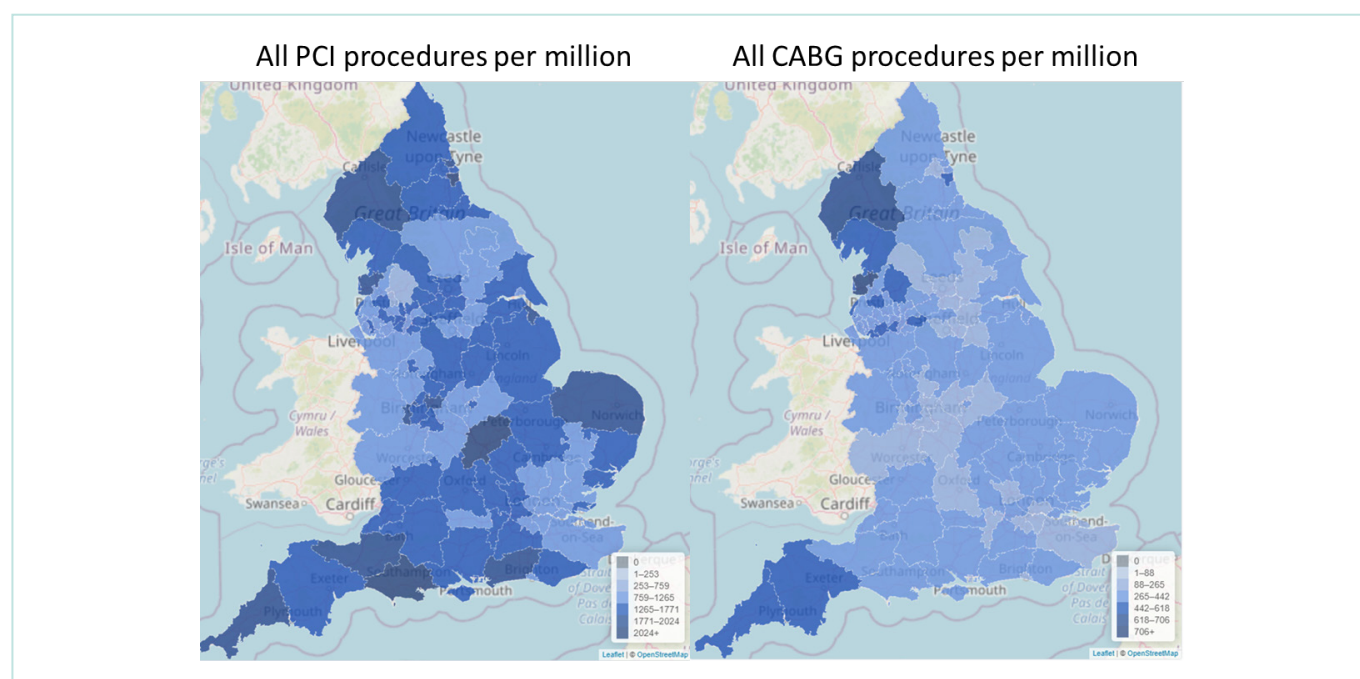
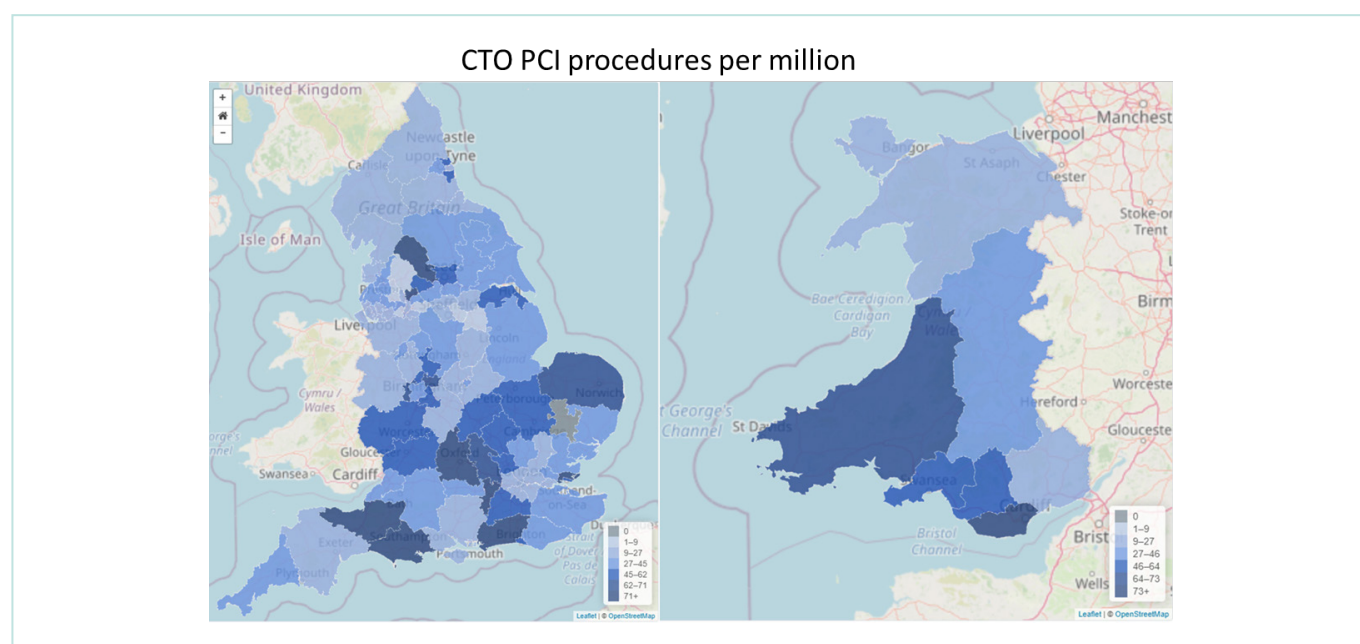


Figure 3.5: Preliminary PCI procedures per million for chronic total occlusions (CTOs) by CCGs and Health Boards, 2020/21 [NAPCI data]



3.3 New ways to see combined results of hospital performance

NICOR is also developing new ways of combining the data that are available in the individual reports so that both hospitals and commissioners can review local performance across domains from a single source.

These will be online tools, and after identifying a region, an individual hospital can be selected. A front page will demonstrate the activity for a specific

period of time in the different domains of the audit programme [Figure 3.6].

By clicking on the ‘View of QI metrics’ for a specific domain, the observer will be taken to a summary of the hospital performance for the selected metrics [Figure 3.7]. Work is on-going to programme the detail needed.

Figure 3.6: Preliminary review of the NCAP domains an individual hospital participates in with designated activity by year

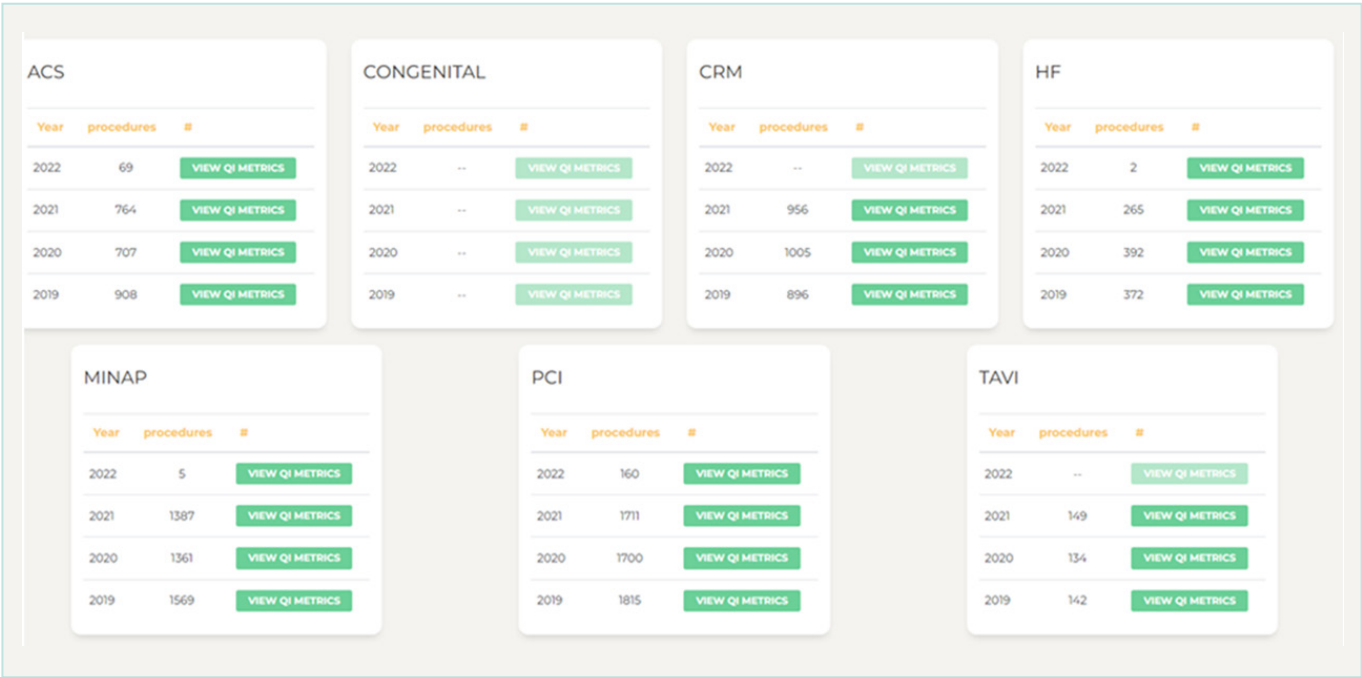
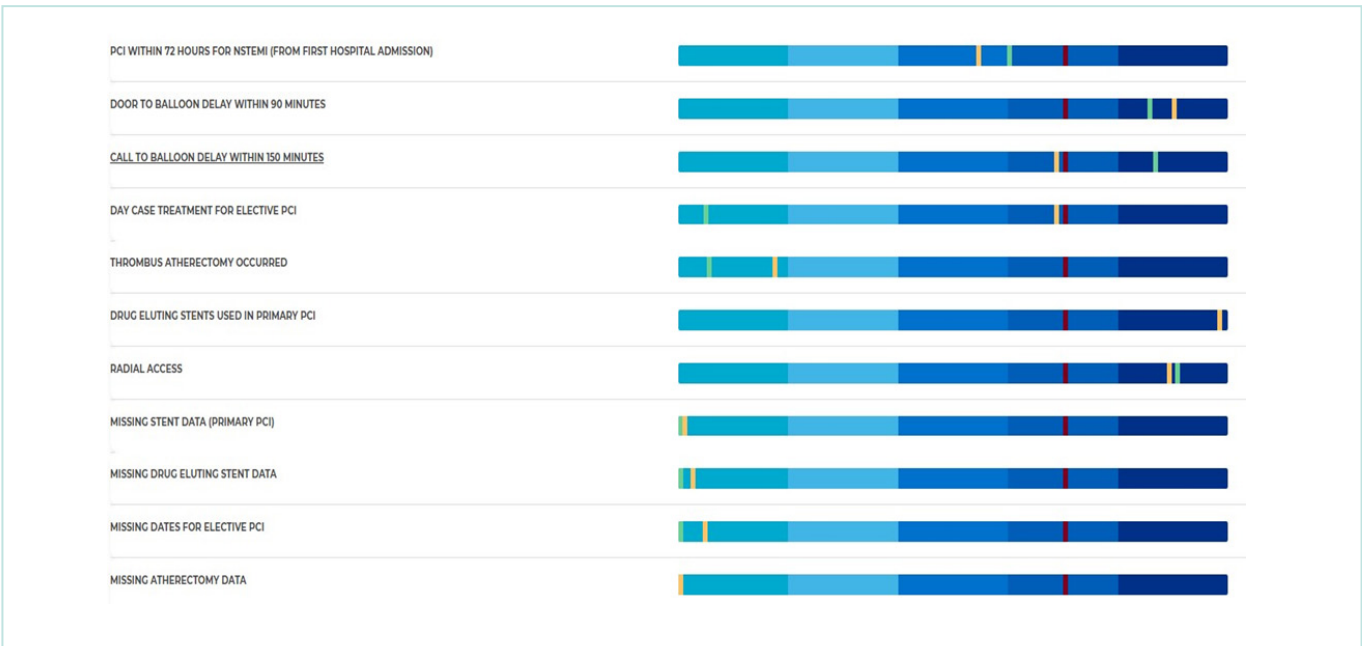


Figure 3.7: Mock-up of data for a specific hospital in various QI metrics with target (red), national average (yellow) and local hospital (green) performance



4

Lessons and recommendations to aid service recovery and to deal with future pandemic-type scenarios

A review of the future shape of how medical and surgical services are provided will assist routine care as well as the ability of the NHS to handle a national crisis. The analyses in this report can contribute to a debate on many issues, including:

- **Appropriate uses of telemedicine**
- **Improved triage of urgent and emergency cases**
- **Enhanced pre-hospital care**
- **Separation of elective and urgent/emergency service delivery**
- **Necessary levels of NHS beds and ITU capacity**
- **Ring-fencing of specialist ITU capacity**
- **Specialist staffing levels and their balance**
- **Improved pre-admission and post-discharge services**

4.1 Patients with acute chest pain syndromes or acute breathlessness should call for help as they normally would

A fear of contracting COVID-19 in hospital probably prevented some patients seeking treatment in hospital. In practice, while 20–25% of those hospitalised with COVID in the first wave were thought to have contracted the virus in hospital, these cases eventually represented only just over 1% of total COVID cases.⁷

Hospitals rapidly learned how to develop COVID-free areas and staff were trained in use of PPE. Patients were protected from COVID-19 as much as possible. Although COVID-19 did impact on the outcomes of a small minority of patients,¹¹ the results in this report demonstrate that outcomes were as expected for the vast majority of patients across the cardiovascular conditions and treatments covered by the audit.

Given this, it is far better that patients with a suspected heart attack or acute breathlessness or worsening oedema call for help and are admitted to hospital for optimal care. NHS England has recently delivered a strong message to the public about this.¹² This message should be highlighted when circumstances are such that for the majority of the population, lockdown may be essential.

4.2 The capacity and role of the ambulance services should be reviewed

For many years now, we have seen an increase in Call-To-Balloon times for patients with STEMI, which impacts adversely on survival. This was highlighted in the second wave of the pandemic. The ambulance services are clearly under great pressure. A review of how patients are triaged is necessary. If the ambulance services are expected to have a major role, then this impacts on their ability to deal rapidly with real emergency and urgent cases. Even during a crisis, rapid hand-over at hospital is necessary to maximise the ability of the ambulance services to provide care.

4.3 ITU capacity should be reviewed but ring-fenced ITU beds are needed for cardiothoracic services

There are long-standing debates about whether ITU capacity is sufficient in the UK, usually around winter pressures but now critically exposed by the pandemic. There is a balance to be struck between the pressures of a national crisis and the ebb and flow of seasonal variations, but further appraisal of NHS beds will be required with consideration of the need to handle intermittent crises as well as seasonal pressures. One

strong message that comes from our analyses is the need to ring-fence cardiothoracic ITU beds, even in a pandemic, to be able to maintain greater capacity for surgical throughput.

4.4 Elective treatment programmes should be separated from urgent and emergency services to protect the continued delivery of specialist cardiovascular services

Over the last two years, hospitals became adept at creating 'COVID-free' environments and these should be implemented early in future pandemics. The availability of personal protective equipment (PPE) and training of services is clearly essential. But there are also further debates about whether the separation of elective and urgent/emergency work would assist not only at a time of crisis but with routine care as well. Whether such plans become a default in the NHS remains to be seen but at the outset of any future pandemic, plans should be in place to protect the continued delivery of specialist cardiovascular services.

4.5 Clinical targets will only be met with increased capacity for cardiovascular services

This report highlights the efforts that hospitals have made to continue with good care for patients with cardiovascular disease during the pandemic. There are, though, areas of concern, and in some cases the pandemic has thrown fresh light on key problems.

For example, NCAP has repeatedly shown the delays for patients with NSTEMI requiring angiography and PCI. However, during the pandemic, when fewer of these patients were admitted, the relative capacity was increased and, as a result, national and international standards and guidelines were met for the first time. Unfortunately, as the elective PCI programmes re-started, there was a rapid fall back to pre-pandemic levels. This points to a general lack of catheter laboratory capacity and/or specialised staffing in the UK, which must be addressed if patients are to receive optimal care. Capacity can be increased by additional laboratories or extending working hours (e.g. with weekend working) as long as staffing levels can support this.

4.6 Shifting to alternative treatments may help deal with the backlog

There are on-going discussions around the pros and cons of different revascularisation procedures and different techniques for treating patients with valve conditions. Innovative treatments take some time to find their 'right level' but in certain circumstances, as with the pandemic, it is useful to know that the capacity and expertise needed for one treatment type can be made available when that needed for conventional treatments is used for other purposes.

4.7 Data are important and regional teams need to understand local and national variability in the delivery of care

The NCAP receives data from hospitals and we are developing tools to ensure that the information derived from our analyses is made available to the participating hospitals as soon as possible. It is important however to make information more readily available to commissioners, as well as patients and carers. The information provided will assist discussions at a local level around optimising care. Regional teams working collaboratively can then work on solutions to deliver aspects of care where performance is less than ideal. For example, the NCAP has highlighted the need for national, regional and local work to reverse the worrying trend for increasing Call-To-Balloon times for patients with STEMI.

Even at a time of crisis, there is an interesting variation in how certain hospitals maintained or even improved performance whilst others struggled more. Inter-regional discussions would highlight innovative ways of working that overcome seemingly insurmountable obstacles.

Performance can only be assessed with information. It is crucial at a time of crisis to maintain the delivery of data to national audits as well as administrative services.

4.8 We must learn how best to use telemedicine to improve services and experiences

In addition to our usual analysis we have sought feedback this year on challenges faced by not only the patients but also the clinical teams delivering services and their trainees. All areas of medicine have introduced telemedicine into practice and, emerging from the pandemic, we must learn how to use this to improve efficiency but at the same time allowing rapid access to face-to-face consultations whenever necessary, as these are essential for this specialty.

For patients who have to be isolated, facilities such as web-cams and telemedicine software should be available for patients and carers to enable appropriate communication with healthcare professionals, with sufficient support staff to assist patients in their use.

4.9 Provision of pre-admission clinics greatly improves efficiency

Not only during a time of crisis, but also with routine care, services should run as efficiently as possible. This means that clinicians should be freed to deliver their expertise with appropriate support from administrative and clerical services. The perpetual squeeze on the latter has made it difficult to achieve the former and the balance of the workforce should be reviewed.

Re-organisation of services to deliver day case PCI, day-of-surgery admissions and better after-care of patients has reduced bed days, improves throughput and makes for a better experience for patients. However, it requires well-designed and run pre-admission services. These should not be dismantled at a time they are needed most.

4.10 Post-discharge services must be appropriately organised and resourced

At a time when there were pressures to discharge patients early, appropriate levels of post-discharge care should have been available. Although referrals for cardiac rehabilitation were maintained for those with a heart attack, that was not the case for patients with heart failure and there was a fall in the provision of post-discharge follow-up care. We have also learned from our patients how they felt isolated and vulnerable following discharge after cardiac surgical procedures. There should be a focus on changes to improve and audit this care.

4.11 Collaboration between units maintained some services and benefitted patients

Within the congenital heart disease services, congenital centres worked together to maintain the quality of services during the pandemic. Two major heart centres specialising in congenital heart disease were converted to support centres for severely affected COVID-19 patients and cardiac procedures which would have taken place there were relocated to other hospitals. Similar reorganisations were performed with cardiac surgery in London. Such collaborative work would be beneficial in normal practice.

5 | References

1. Some metrics require three years of consecutive data and are based on data between 2018 and 2021.
2. Rapid cardiovascular data: We need it now (and in the future).
<https://www.nicor.org.uk/wp-content/uploads/2020/09/NICOR-COVID-2020-Report-FINAL.pdf>
3. British Heart Foundation. The untold heartbreak. Cancelled procedures. Missed appointments. Lost lives.
<https://www.bhf.org.uk/what-we-do/policy-and-public-affairs/legacy-of-covid>
4. UK summary. Coronavirus (COVID-19) in the UK (data.gov.uk)
<https://coronavirus.data.gov.uk/?ga=2.71370842.816030994.1642517961-887450290.1612440425>
5. Mafham MM, Spata E, Goldacre R, Gair D, Curnow P, Bray M, Hollings S, Roebuck C, Gale CP, Mamas MA, Deanfield JE, de Belder MA, Luescher TF, Denwood T, Landray MJ, Emberson J, Collins R, Morris E, Casadei B, Baigent C. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. *Lancet*. 2020 Aug 8;396(10248):381-389. doi: 10.1016/S0140-6736(20)31356-8. Epub 2020 Jul 14. PMID: 32679111
6. Wu J, Mamas M, Rashid M, Weston C, Hains J, Luescher T, de Belder MA, Deanfield JE, Gale CP. Patient response, treatments and mortality for acute myocardial infarction during the COVID-19 pandemic. *Eur Heart J Qual Care Clin Outcomes*. 2021 May3;7(3):238-46. doi: 10.1093/ehjqcco/qcaa062. PMID: 32730620
7. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/961210/S1056_Contribution_of_nosocomial_infections_to_the_first_wave.pdf
8. <https://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf>
9. Neumann FJ, Sousa-Uva M, Ahlsson A, Alfonso F, Banning AP, Benedetto U, Byrne RA, Collet JP, Falk V, Head SJ, Jüni P, Kastrati A, Koller A, Kristensen SD, Niebauer J, Richter DJ, Seferovic PM, Sibbing D, Stefanini GG, Windecker S, Yadav R, Zembala MO; ESC Scientific Document Group. 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J* 2019 Jan 7;40(2):87-165 doi: 10.1093/eurheartj/ehy394 PMID: 30165437
10. Kinnaird T, Johnson T, Anderson R, Gallagher S, Sirker A, Ludman P, de Belder MA, Copt S, Oldroyd K, Banning A, Mamas M, Curzen N. Intravascular Imaging and 12-Month Mortality After Unprotected Left Main Stem PCI. An Analysis From the British Cardiovascular Intervention Society Database. *JACC Cardiovasc Interv* 2020 Feb 10;13(3):346-357 doi: 10.1016/j.jcin.2019.10.007. PMID: 32029252
11. Rashid M, Wu J, Timmis A, Curzen N, Clarke S, Zaman A, Nolan J, Shoaib A, Mohamed MO, de Belder MA, Deanfield J, Gale CP, Mamas MA. Outcomes of COVID-19 Positive Acute Coronary Syndrome Patients; a multisource Electronic Healthcare Records Study from England. *J Intern Med*. 2021 Jul;290(1):88-100. doi: 10.1111/joim.13246. PMID: 33462815
12. <https://www.england.nhs.uk/2022/02/nhs-launches-lifesaving-campaign-to-tackle-heart-attack-myths/>

6 | Glossary

A glossary of relevant terminology, abbreviations and acronyms is available [here](#).

7 | Thanks and acknowledgements

The NCAP is grateful to all participating hospitals for the efforts they make to provide data on the care they deliver. We are especially indebted to our Patient Representative Group chaired by Sarah Murray and the patients who work with the domain expert groups and help shape our programme. We are also grateful to all other patients and carers who contribute through our Virtual Patient Panel.

We are especially grateful to colleagues in the Quality Improvement team at [UCL Partners](#) for the advice provided over the last few years, and particular thanks go to Ross Pow of [Power of Numbers Ltd](#) for his guidance to the NCAP team, his editing skills (and stamina!) and on the presentation of our outputs. We are extremely grateful to our designer, [Helen Joubert](#), for her assistance in the design and production of our reports.

We are also very grateful to our colleagues at the Healthcare Quality Improvement Partnership for their support and advice and to Professor Rumana Omar and her team at the [Department of Statistical Science](#), University College London, for support with statistical methodology. We are most grateful for the support and guidance from Professor Charles Knight, OBE and his management team at Barts Health NHS Trust.

The report is written by Mark de Belder, Ross Pow and John Deanfield with input from the entire NCAP team. We are very grateful to our Clinical Leads, who continue to work tirelessly on this programme. They are Dr Abbas Khushnood (NCHDA), Dr Clive Weston (MINAP), Professor Peter Ludman (NAPCI), Mr Andrew Goodwin (NACSA), Professor Theresa McDonagh (NHFA) and Dr Francis Murgatroyd (NACRM). We also acknowledge the support of the Deputy Leads (Mr Serban Stoica [NCHDA], Dr Ali Dana [MINAP], Professor Mamas Mamas [NAPCI], Dr Mark Dayer and Dr Ross Hunter [NACRM], Dr Suzanna Hardman [NHFA]) and the entire membership of the specialty Domain Expert Groups for each of the NCAP domains who give their time to support the Clinical Leads.

As always, we acknowledge the enthusiasm, commitment and skills of the entire NCAP Delivery Group:

Sarah Ajayi, Anthony Bradley, Gabriel Burcea, James Chal, Lin Denne, Akosua Donkor, Nadeem Fazal, Yasin Gulam, Anil Gunesh, Andy Harrison, Satya Kalla, Jane Kerr, Sue Manuel, Sheila Marcial, Sam McAlister, Kelly O'Brien, Ebere Okafor, Samuel Perwaiz, Aminat Shote, Shenaka Singarayer, Satya Phantala, Robin Philip, Rosemary Porter and Jiaqiu Wang. We are especially indebted to Dr Glen Martin for analytical support.

The NCAP is commissioned 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: nicor.auditenquiries@nhs.net

This report is available online [here](#).