



# Cardiology

## GIRFT Programme National Specialty Report

By Dr Sarah Clarke and Professor Simon Ray  
GIRFT Clinical Leads for Cardiology

February 2021



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# Foreword from Professor Tim Briggs

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I am delighted to recommend this Getting It Right First Time (GIRFT) review of cardiology, led by Dr Sarah Clarke and Professor Simon Ray.

This report comes at a time when the NHS has undergone profound changes in response to the COVID-19 pandemic. The unprecedented events of 2020/21 – and the extraordinary response from everyone working in the NHS – add greater significance to GIRFT's recommendations, giving many of them a new sense of urgency.

Actions in this report, such as adopting digital technologies and increasing the use of virtual clinics where face-to-face contact is not necessary, can help the NHS as it faces the substantial challenge of recovering services, while remaining ready for any future surges, by operating more effectively and safely than ever before.

Sarah and Simon's report brings the GIRFT approach to cardiology, a broad and technical specialty which often bridges the gap between medicine and surgery. Cardiologists' work can span from conducting therapeutic interventions in cath labs to imaging and care on the wards.

The report, based on Sarah and Simon's insights from deep-dive visits to 63 trusts alongside the national data, identifies areas of unwarranted variation in cardiology and sets out recommendations that can deliver improvements to patient care and outcomes, as well as freeing up NHS capacity in order to treat more patients. Key recommendations in the report include moving to a network model of delivery for cardiac services in order to ensure equitable care for all patients, improving clinical pathways and access to imaging and workforce.

It has been heartening to hear about the many examples of excellent practice Sarah and Simon have seen on their visits, some of which are included in this report, and the openness they have found with colleagues to listen to the data and improve services. This engagement is essential, as GIRFT cannot succeed without the backing of clinicians, managers, and all of us involved in delivering care.

With the recommendations and actions set out in this report, and the urgency added by the COVID-19 pandemic, I hope that GIRFT will provide further support and impetus for all those involved in cardiology to work together, shoulder to shoulder, to improve treatment, care and outcomes for our patients.



## **Professor Tim Briggs CBE**

*GIRFT Programme Chair and National Director of Clinical Improvement for the NHS.*

*Professor Tim Briggs is consultant orthopaedic surgeon at the Royal National Orthopaedic Hospital NHS Trust, where he is also Director of Strategy and External Affairs.*

*He led the first review of orthopaedic surgery that became the pilot for the GIRFT programme, which he now chairs.*

*Professor Briggs is also National Director of Clinical Improvement for the NHS.*

# Introduction from Dr Sarah Clarke and Professor Simon Ray

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Over the last two years we have visited more than 63 trusts providing cardiology services across England. As practitioners, it has been an enormous privilege for us to meet with so many of our colleagues doing the same work, to learn from their experience and share what we have learned from our analysis of the data.

Through the process of deep dives across the country we have been encouraged by the openness of colleagues to engage with the process and listen to what the data tells us about variations and areas for improvement for their services. We have also been delighted to see many instances of good practice, some of which we have included in our report.

Our review has highlighted a number of key issues. Chief among them is the significant variation in access to cardiology services. We believe that moving to a network model, shaped by local need rather than geography, is absolutely critical to delivering more equitable high quality care. Clearer care pathways, supported by the smooth flow of data between primary, secondary and tertiary care, will ensure that patients have the most efficient journey through the system, and that the best possible outcomes are achieved. There is also a pressing need to tackle high vacancy rates in the specialty, to upskill existing staff and to ensure that the extended workforce is being deployed to maximum effect.

While the majority of our deep-dive visits took place pre-COVID-19, the impact of the pandemic on healthcare delivery has been impossible to ignore and is inevitably reflected in this report. It has brought suffering to many and placed huge strain on resources, but it has also accelerated the pace of change in many areas including the uptake of technology to support remote triaging and monitoring, virtual reviews and more. We welcome these shifts in practice, supporting and enabling as they do many of the recommendations we make in this report, and hope to see these positive changes sustained in the long term.

Cardiovascular disease remains one of the leading causes of mortality in England, accounting for a quarter of all deaths each year and many more people living with the debilitating effects. By reducing unwarranted variation, and closing gaps in provision, there is potential to deliver improved outcomes for thousands of people each year. In making our recommendations, we do not seek to be prescriptive; rather, our aim is to create stronger systems and support to enable colleagues to do their best and level up to best practice.

We are delighted to have had the opportunity to lead this Getting It Right First Time cardiology review and we hope that it will help all of us to deliver a better service and improved outcomes for patients.



## **Dr Sarah Clarke**

### *GIRFT Clinical Lead for Cardiology*

*Dr Clarke is a consultant cardiologist and clinical director for strategic development, at the Royal Papworth Hospital NHS Foundation Trust, Cambridge. She is a past president of the British Cardiovascular Society, and clinical vice president of the Royal College of Physicians.*



## **Professor Simon Ray**

### *GIRFT Clinical Lead for Cardiology*

*Professor Ray is a consultant cardiologist at the Manchester University NHS Foundation Trust, Honorary Professor of Cardiology at the University of Manchester, and President of the British Cardiovascular Society.*

# Statements of support

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## British Heart Foundation

Organisation of services for patients with heart and circulatory diseases presents a particular challenge to the NHS. The needs range from prompt care for heart attacks and effective, efficient delivery of diagnostic tests through to palliative care for those with advanced heart failure. We can be very proud of some of the services that the NHS currently provides, which are as good as anywhere in the world, for example the provision of acute intervention for major heart attacks. However, we know in many areas we can do better.

This need for improvement and better organisation of services has been further sharpened by the COVID-19 pandemic. Worrying data have emerged of the impact of the restrictions imposed by the pandemic on the care of the people with heart and circulatory diseases and laid bare existing inequalities in care. As the system adapts, it is not enough to simply turn services back on. We need to learn from both our successes and failures and build back better. New ways of working developed during the COVID-19 pandemic should be evaluated and, where appropriate, grasped. This can be done by selecting what works best to improve patient experience and outcomes, while ensuring inequalities in healthcare access are not exacerbated, or created, as a result.

This report, written by practising cardiologists and based on visits to the large number of trusts that provide cardiology services and conversations with people on the frontline, provides a framework for the organisation of cardiology services for effective and efficient delivery. The recommendations are grounded in what can be realistically achieved to make a difference. The emphasis on networks and local development of care pathways will help to ensure that all the partners and the whole multi-disciplinary team are involved in the delivery of care and know their respective roles and responsibilities. While the report is directed towards the NHS in England, its recommendations have relevance for the devolved nations as well.

If the recommendations of the report are enacted and realised, they will lead to major benefits for the over seven million people living with heart and circulatory diseases in the UK, and the many more who will suffer these diseases in the future. The British Heart Foundation is pleased to support this important endeavour.



**Professor Sir Nilesh J Samani**

*Medical Director, British Heart Foundation*

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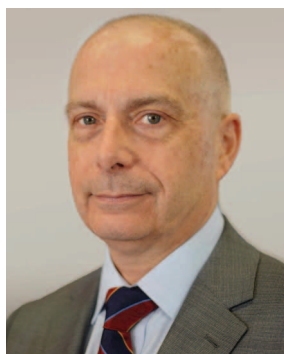
## NHS England and NHS Improvement

I am very pleased as National Clinical Director for Heart Disease to endorse the GIRFT cardiology national report and the recommendations within. Sarah Clarke and Simon Ray joint GIRFT Clinical Leads for cardiology and the whole GIRFT team have undertaken a rigorous process of visits. They are to be commended for their comprehensive evaluation of cardiology services across England, gaining unique insights into services utilising the GIRFT methodology.

The report highlights key areas of improvement within cardiology services. The case for moving services towards a network model, fully integrating acute services with primary and community care, reflecting the patients' care pathway, is clearly outlined. In addition, it is commended that the report highlights areas of unwarranted variation and the importance of sharing examples of best practice to help improve equity of access for all patients across England.

It is important that the recommendations of the GIRFT report reflect and complement the NHS Long Term Plan ambitions related to cardiology particularly with regards to workforce and imaging, heart failure, heart valve disease and heart attack pathways of care. I look forward to continuing to work with the GIRFT team and other stakeholders to help take this improvement work forward.

This report shows how cardiology services should adapt in order to continue to provide the level of service required both now, during the ongoing COVID-19 pandemic, and in the future.



**Professor Nick Linker**

*National Clinical Director for Heart Disease,  
NHS England and NHS Improvement*

# Executive summary

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An estimated 6.1 million people in England<sup>1</sup> are currently living with cardiovascular disease (CVD). Although mortality rates from CVD fell by 52% between 1990 and 2013,<sup>2</sup> CVD remains one of the biggest killers in the UK.<sup>3</sup> Healthcare costs relating to heart and circulatory disease are estimated at £7.4bn each year, while the wider cost to the economy in England is estimated at £15.8bn annually.<sup>4</sup>

Therefore, prevention, diagnosis and management of CVD forms a key part of the NHS England and NHS Improvement (NHSE/I) Long Term Plan.<sup>5</sup> The falling CVD mortality rate has been the biggest contributor to increased life expectancy for men and women within the UK. However, demographic shifts within our society mean that CVD-related mortality is increasing. To address this, we need to review the ways cardiac services are delivered and who is delivering them, to ensure both that patients are getting the care they need during the ongoing COVID-19 pandemic, and that services are fit for the future.

## Managed clinical networks

Currently, acute cardiology services are focused around hospitals rather than care pathways. This can be detrimental to patients and risks inappropriate duplication of provision and inadequate – and inequitable – access to care. The COVID-19 pandemic has highlighted fragilities in the system and provides a further rationale for changing the way services are delivered.

We believe that the best way to deliver equity of access to appropriate services and expertise, match demand to capacity and make the most efficient use of resources is to create a network model. This should be dictated by function and local need, not geography, and should reflect the fact that patients will need access to various tiers of service on both an elective and an emergency basis.

## Workforce, rostering, rotas and job planning

Deep-dive visits have uncovered high vacancy rates in a number of roles at a time when expansion of the workforce is required. Recruitment into training schemes needs to be increased, particularly for cardiac physiology and the development of extended roles, including that of the advanced clinical practitioner (ACP), should be encouraged for all appropriate cardiovascular health professionals. Staff should be able to work across trusts within a network.

All NHS cardiologists should by default participate in appropriate general and/or subspeciality on-call rotas. Consultant ward rounds should be job planned and undertaken, preferably as a consultant of the week (COW) model, seven days a week reviewing all acute and longer-stay cardiology patients ensuring continuity of care. Appropriate diagnostic and interventional services should run seven days per week to ensure prompt access and to reduce length of stay.

## Data flow and referral across pathways

To ensure timely investigation and treatment, all relevant clinical data including imaging must be accessible at all parts of the pathway from primary to tertiary care and incorporated in a single continuous electronic NHS record. All referrals to secondary care should be triaged with maximum use made of ERS–Advice and Guidance and with virtual rather than face to face appointments where clinically appropriate. All this activity must be job planned. Initial investigations should be performed either in advance or, for face to face clinics, on the same day and be available at the time of the consultation. Optimal use should be made of digital health care technologies across pathways.

## Patient flow and care pathways

Each network should have pathways in place that ensure patients have prompt access to appropriate diagnostics and interventions consistent with current guidelines. This will require an expansion of the workforce, investment in imaging infrastructure (particularly computed tomography coronary angiography (CTCA)) and a network-wide review of patient flows to ensure that all facilities in the network are being used to their maximum advantage. For instance, the move away from coronary angiography as a purely diagnostic procedure offers the opportunity for diagnostic-only catheter labs (cath labs) to be used alternatively as network pacing and device hubs or to be replaced by cardiac CT facilities.

<sup>1</sup> British Heart Foundation estimate based on prevalence data from the Quality Outcomes Framework, [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>2</sup> Bhatnagar, P., Wickramasinghe, K., Wilkins, E. and Townsend N. (2016) Trends in the epidemiology of cardiovascular disease in the UK <https://heart.bmj.com/content/heartjnl/102/24/1945.full.pdf>.

<sup>3</sup> British Heart Foundation, England factsheet [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>4</sup> British Heart Foundation, England factsheet: [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>5</sup> [www.longtermplan.nhs.uk/](http://www.longtermplan.nhs.uk/)

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Maximal use should be made of day case pathways incorporating conscious sedation rather than general anaesthesia. Where day case admissions are not possible, early discharge protocols should be developed. All appropriate patients should be offered rehabilitation, including those with heart failure (HF).

## The cardiology footprint

Every hospital admitting cardiology patients must have a dedicated CCU or HDU including a procedure room. Cardiology beds should be co-located and in hospitals with a cath or pacing lab there should be ring-fenced beds, trolleys or chairs in a day ward and/or radial lounge in close proximity.

## Multidisciplinary teams

Multidisciplinary meetings (MDMs) are an essential part of cardiology treatment pathways and a core function of the heart team. Currently, there is significant variation in access to regular, quorate cardiovascular MDMs. The main reasons for this are lack of access to appropriate technology and lack of availability of multidisciplinary team (MDT) members. MDMs should be virtual by default. Core members should be job planned to attend, and there should be scope for bringing in additional clinical opinion as needed.

## Data and registries

Cardiology has mature national registries for PCI, devices and ablation, HF and congenital cardiology, run within the National Institute for Cardiovascular Outcomes Research (NICOR). Trusts should be resourced to allow weekly data upload to the registries.

Currently, the degree of clinical involvement with coding varies significantly between trusts. Correct coding is important not just for financial reasons but also for identifying variation in the quality of care. and all trusts should ensure that there is a mechanism for capture of the key information from the clinical record and regular clinical validation of coding data.

## Digital transformation and cardiology

Cardiology has long been an innovative specialty, and should be at the forefront of the digital transformation needed to improve the quality of our services. Key areas for development include:

- improving communication between cardiology services and patients, between colleagues and between secondary and tertiary care;
- making more effective use of the growing volume of patient-generated data;
- and using AI to identify patterns that may not be apparent to clinicians.

Any service redesign must have patient-centred care at its heart.

## Optimising medicines for cardiac patients

It is estimated that only between 30% and 50% of patients with long-term conditions currently take their medicines as prescribed, and a number of studies show high rates of non-adherence to secondary prevention medicines. All hospitals should implement robust evidence-based prescribing guidelines covering both primary and secondary care to ensure optimal outcomes for patients across the clinical interface.



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## **Cardiology devices supply chain cost efficiency and resilience**

It is essential that a mechanism is developed for the ongoing surveillance of all implanted cardiac devices. The combination of fragmented contractual arrangements, product level fragmentation and change as well as high levels of price variation, suggest that significant efficiencies can be gained from aggregating demand, stimulating competition, and making improved contractual commitments. We estimate that these could have financial, administrative and inventory management benefits in excess of £35m–£40m per year. In order to achieve these efficiencies, it is essential that procurement and supply chain activities are clinically led both nationally and locally to ensure that product choices are evidence based.

## **Reducing the impact of litigation**

Cardiology is the third highest medical specialty for number of claims and claims cost and the 15th highest across all specialities in terms of claims cost during the financial years 2013/14–2017/18. Although there has not been a substantial increase in the number of claims over this period, there has been a sizeable increase in the costs associated with litigation claims.

It was clear during GIRFT visits that many providers had little knowledge of the claims against them. This includes some with high litigation costs per admission as well as those at the low end. As a consequence, there is an opportunity to learn from the claims to inform future practice.

Cardiology is one of the largest medical specialties. It focuses on the diagnosis and treatment of disorders of the heart and circulatory system.

Cardiovascular disease (CVD) includes atherosclerosis, or the build-up of fatty deposits in the arteries, and is linked to an increased risk of blood clots and damage to the arteries in organs including the brain, heart, kidneys and eyes. It also includes irregular heart rhythms such as atrial fibrillation (AF) which can cause stroke, valvular heart disease and disorders of the heart muscle, known as cardiomyopathies.

It is estimated that 6.1 million people in England<sup>6</sup> are currently living with CVD. The incidence is higher in those with a family history of CVD, and in people from South Asian or Afro-Caribbean backgrounds. Although mortality rates from CVD fell by 52% between 1990 and 2013,<sup>7</sup> CVD remains one of the biggest killers in the UK, responsible for more than a quarter of all deaths – around 136,000 each year.<sup>8</sup> Indeed, healthcare costs relating to heart and circulatory disease are estimated at £7.4bn each year, while the wider cost to the economy in England (including premature death, disability and informal costs) is estimated at £15.8bn annually.<sup>9</sup> People living with CVD often have comorbidities and conditions such as heart failure (HF) are becoming more prevalent due to our ageing population.

CVD therefore forms a key part of the NHSE/I Long Term Plan.<sup>10</sup> The falling mortality rate for people living with CVD has been the biggest contributor to increased life expectancy for men and women within the UK. However, demographic shifts within our society mean that CVD-related mortality is increasing. To address this, we need to review the ways cardiac services are delivered so they are fit for the future. Digital tools will underpin many of the necessary changes and must be embraced as part of service transformation. Our review and recommendations align with moves already under way towards integration of services and a “system by default” approach in the NHS.

## How cardiology services are organised and the impact of COVID-19

Cardiology is a multidisciplinary specialty which includes, in addition to medical and nursing staff, many different professionals such as cardiac physiologists, pharmacists, radiologists and others. It is a varied specialty involving a high proportion of urgent and emergency work, as well as elective procedures and the management of outpatients and patients in the community with long-term conditions. Outside secondary care, significant prevention work is being undertaken within primary and community care to tackle modifiable risk factors of CVD such as high blood pressure, obesity and tobacco use. Adoption of a healthy lifestyle and self-management of long-term conditions may be encouraged and supported through the use of digital tools such as ‘Couch to 5k’ and ‘mapmydiabetes’.

How acute services are organised varies between different types of hospital. We go into more detail in our report as to what we believe hospitals – whether they are a district general hospital, a tertiary referral centre or a quaternary service – should be delivering. In implementing change it is vital to ensure equity of access and care for all patients.

The impact of COVID-19 on cardiology services, like the rest of the NHS, has been dramatic. There was a huge decrease in elective and acute cardiology activity during the peak of the first wave of the pandemic (spring 2020), and while there will be ongoing challenges for the service to ensure infection control, there are also opportunities arising. The pandemic has accelerated several changes in clinical practice, particularly involving digital technology, that are positive and should be sustained over the long term.

These include areas of rapid change such as the widespread adoption of virtual clinics in place of traditional outpatient appointments, and the introduction of the NHS ‘AttendAnywhere’ platform and patient portals that allow patients to view their records and communicate with clinical teams across primary and secondary care. Examples of these include ‘Patient Knows Best’ and ‘MyHealth’, which have already been implemented across several regions, including the north-west London integrated care system (ICS). The NHS also purchased a licence for Microsoft Teams to facilitate document sharing and videoconferencing.

We will go into more detail in our report on how we believe cardiology can meet the challenges it faces and continue to improve care and outcomes for cardiac patients.

<sup>6</sup> British Heart Foundation estimate based on prevalence data from the Quality Outcomes Framework, [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>7</sup> Bhatnagar, P., Wickramasinghe, K., Wilkins, E. and Townsend N. (2016) Trends in the epidemiology of cardiovascular disease in the UK <https://heart.bmj.com/content/heartjnl/102/24/1945.full.pdf>.

<sup>8</sup> British Heart Foundation, England factsheet: [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>9</sup> British Heart Foundation, England factsheet: [www.bhf.org.uk/what-we-do/our-research/heart-statistics](http://www.bhf.org.uk/what-we-do/our-research/heart-statistics)

<sup>10</sup> [www.longtermplan.nhs.uk/](http://www.longtermplan.nhs.uk/)

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## Commissioning and delivery

Cardiology is a mixed commissioning model speciality.<sup>11</sup> This includes locally commissioned cardiac services in primary and secondary care and specialised commissioned cardiac services in tertiary and quaternary care.

Services commissioned by NHSE/I Specialised Commissioning include:

- the treatment of certain heart rhythms using interventional cardiac electrophysiology (EP), ie ablation;
- the use of devices such as implantable cardioverter defibrillators (ICD) to treat abnormally fast, life-threatening heart rhythms;
- services to treat people with inherited cardiac conditions (ICCs);
- transcatheter therapies for heart valve disease, such as transcatheter aortic valve implantation (TAVI);
- opening acutely occluded arteries as the first treatment following specific types of heart attack, i.e. primary percutaneous coronary intervention (PPCI);
- cardiac surgery including provision of surgical interventions for coronary revascularisation, and valve disease requiring surgical valve repair or replacement;
- cardiac magnetic resonance imaging (CMR); and
- adult congenital heart disease (ACHD) services.

## The review process

The data sources are selected and the metrics for each area of practice are developed in partnership with the Getting It Right First Time (GIRFT) programme clinical leads for that area, ensuring they are relevant to the decisions a senior clinician in that field may have to make. The data pack for cardiology includes metrics from national datasets such as Hospital Episode Statistics (HES), the National Institute for Cardiovascular Outcomes Research (NICOR) and the National Cardiac Benchmarking Collaborative (NCBC), supported by a bespoke questionnaire developed by the clinical leads.

Some of the themes explored in the national report are not supported by national level data or the questionnaire, but have emerged from conversations with trusts as part of the deep-dive visits. We have conducted an analysis of observation notes that are created after each deep-dive visit to identify and provide an evidence base for these themes.

## Deep-dive visits

With the national metrics agreed, the data analysis team generates individual reports for each hospital trust that is participating in the programme. These reports, or data packs, compare the trust's performance with the national data, enabling the trust to see how its activity levels, commissioning decisions, costs and patient outcomes for different procedures measure up to those of its peers.

These individual reports are not designed for wider publication but rather to give the trust an insight into their own area of practice. They are issued to the trust in advance of a scheduled meeting between the clinical leads and staff at the trust. At the meeting – known as a deep-dive visit – the clinical leads discuss the individual data packs and information in the questionnaire with the trust, with a particular focus on the areas where the data show variation between national norms and the trust's performance. Where the data indicate that the trust may be underperforming in some way, this is explored in more detail to see whether there is an explanation. Where appropriate, the trust can then draw on the expertise of senior clinicians in the field as they discuss specific challenges they face and consider potential changes to practice not only at a trust level but also at a network level.

Conversely, where the data indicate the trust is outperforming its peers, clinical leads seek to understand if this is appropriate practice, what the trust is doing differently and how its approach, if appropriate, could be adopted by others to improve performance across the NHS.

Feedback from trusts has been uniformly positive and, in every case, actionable steps have been identified to improve aspects of local provision.

After the deep-dive visit a report is produced that highlights areas of good practice at trust or network level that could be adopted elsewhere. In addition, the report lists the agreed actions for the trust to take forward with the support of the GIRFT team.

The majority of our deep-dive visits were conducted before the COVID-19 pandemic.

<sup>11</sup> [www.england.nhs.uk/commissioning/spec-services/npc-crg/group-a/a05/](http://www.england.nhs.uk/commissioning/spec-services/npc-crg/group-a/a05/)

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## **The scope of this review**

Cardiology is a broad specialty covering a number of different conditions and sub-specialties. GIRFT focuses on reducing variation in practice and improving care and outcomes for patients attending hospitals. Cardiology services delivered both urgently and electively must have good links with primary and community care as well as with trusts within their network.

Cardiothoracic surgery, stroke medicine and diabetes are not in the scope of this report and are covered by other GIRFT national reports. Also out of scope are specialist services for adult congenital heart disease and nationally commissioned services such as cardiac transplantation and pulmonary hypertension.

# Recommendations

Recommendation	Actions	Owners	Timescale
<b>1.</b> All hospitals must deliver cardiology services as part of a defined and agreed network model.	<p><b>a</b> GIRFT will work with NHSE/I to scope a strategy for clinical networks.</p> <p><b>b</b> GIRFT will work with networks to conduct an audit of services in preparation of a move to a network model of care.</p>	GIRFT, NHSE/I, networks, Integrated Care Systems (ICS).	Networks should commence discussions immediately with the aim of establishing definitive structures within two years.
<b>2.</b> All hospitals receiving acute medical admissions must have a consultant cardiologist on-call 24/7 who is able to return to the hospital as required. There should be a consultant job planned specifically to review newly admitted and acutely unwell inpatients 7/7 and a consultant job planned (note this may be the same consultant) to deliver 7/7 review of other inpatients, ensuring continuity of care.	<b>a</b> GIRFT to work with Health Education England (HEE), NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.	GIRFT, NHSE/I, HEE, Royal College of Physicians (RCP), British Cardiovascular Society (BCS), British Cardiovascular Intervention Society (BCIS), the British Heart Rhythm Society (BHRS), Royal College of Nursing (RCN).	As soon as possible and within two years of publication.
<b>3.</b> All NHS consultant cardiologists should, by default, participate in an on-call rota for general and/or specialist cardiology.	<b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.	GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN.	As soon as possible and within two years of publication.
<b>4.</b> All members of the wider heart team should be supported to work in extended roles and trusts should ensure that appropriate staff (including ACPs, specialist nurses and cardiac physiologists) are trained, accredited and authorised to prescribe medications relevant to their role.	<b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.	GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN, and British Society of Echocardiography (BSE).	As soon as possible and within two years of publication.
<b>5.</b> Each network must ensure that there are clearly defined patient pathways covering all acute hospitals for the provision of 24/7 emergency temporary pacing and 7/7 permanent pacing.	<b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.	GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN.	As soon as possible and within two years of publication.

Recommendation	Actions	Owners	Timescale
<b>6.</b> All outpatient referrals should be triaged with maximum use made of the ERS–Advice and Guidance function. Appropriate investigations should be requested so that all results are available for advice or review in clinic. Clinics should, by default, be conducted virtually unless not feasible for the patient or if ‘face-to-face’ is required to progress clinical decision-making.	<p><b>a</b> GIRFT to work with the Outpatient Transformation Programme (OTP) to scope strategy for continued cardiology outpatient transformation.</p> <p><b>b</b> GIRFT will support the Royal College of General Practitioners (RCGP) and NHSE/I to create referral guidance that covers outpatients and imaging in primary care.</p> <p><b>c</b> Digital solutions should be exploited to improve patient pathway and access to information across the system.</p>	GIRFT, NHSE/I, RCGP, BCS, RCP.	For significant progress within a year of publication.
<b>7.</b> Networks should ensure that stable chest pain pathways are consistent with the recommendations of NICE CG95. Invasive angiography should, as a default, be performed as ‘proceed’ and must be performed in PCI-enabled cath lab by a PCI-trained operator.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>8.</b> Networks must ensure that all hospitals performing PCI have a 24/7 on-site rota for urgent return to the cath lab.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>9.</b> All designated PPCI centres must provide a 24/7/365 service and all PCI operators should, by default, participate in a PPCI on-call rota.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>10.</b> For the acute chest pain pathway, all networks should provide 7/7 ACS lists, accessible to all hospitals in the network. Coronary angiography ‘proceed’ should be performed within 72 hours for patients without high risk features, within 24 hours for high risk patients and within 2 hours for the highest risk patients. Where cardiac surgery is required, this should by default be undertaken within seven days of coronary angiography.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>11.</b> In each hospital there should be a specialist consultant lead for HF, supported by a multidisciplinary HF team. Secondary care services should be integrated with community teams, with regular joint multidisciplinary meetings (MDMs).	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, British Society for Heart Failure (BSH), BHRS, BACPR.	For significant progress within a year of publication

Recommendation	Actions	Owners	Timescale
<b>12.</b> All networks should ensure that rehabilitation is offered to all eligible patients, including those with HF.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS, BSH, BHVS, BHRS, BACPR.	For significant progress within a year of publication
<b>13.</b> All networks should ensure pathways are in place for the diagnosis and management of patients with heart valve disease, including referral to specialist aortic and mitral/tricuspid teams at a tertiary centre.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS, BHVS.	For significant progress within a year of publication
<b>14.</b> Arrhythmia pathways should incorporate rapid access clinics, which may be led by ACPs, specialist nurses or cardiac physiologists, for the assessment of palpitations and suspected or confirmed AF. Cardioversions should, by default, be nurse, physiologist or ACP led and undertaken outside the cath lab.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BHRS, and BACPR.	For significant progress within a year of publication
<b>15.</b> Networks should ensure that all hospitals admitting acute cardiology patients have 24/7 access to emergency echo including the facility for immediate remote expert review as required. Elective/urgent echo should be routinely undertaken 7/7. Urgent TOE should be available 7/7 and delivered on a network basis).	<b>a</b> GIRFT to work with NHSE/I, BSE and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSE.	For significant progress within a year of publication
<b>16.</b> Networks should ensure that all hospitals have ready access either on site or at network level to CTCA including CT-FFR, with all of the images reported by appropriately trained cardiologists and/or radiologists.	<b>a</b> GIRFT to work with NHSE/I and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSCI.	For significant progress within a year of publication
<b>17.</b> Networks should ensure that all hospitals have ready access on a network basis to dedicated sessions of CMR, including stress CMR, with all of the images reported by appropriately trained cardiologists and/or radiologists.	<b>a</b> GIRFT to work with NHSE/I, BSCI, BSCMR and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSCI, BSCMR.	For significant progress within a year of publication

Recommendation	Actions	Owners	Timescale
<b>18.</b> Nuclear cardiology services, including PET and PET-CT, should be available at a network level.	<b>a</b> GIRFT to work with NHSE/I and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, British Nuclear Cardiology Society (BNCS)	For significant progress within a year of publication
<b>19.</b> All networks should ensure that: (a) there are MDMs for HF and device implantation for all relevant patients within the network; b) there are MDMs for review of patients for revascularisation, aortic valve disease, mitral/tricuspid valve disease, endocarditis and EP at network level; and (c) there are pathways to access external MDMs in ICC, ACHD, advanced HF and low volume interventions if these are not provided within the network.	<b>a</b> GIRFT to work with NHSE/I, trusts and cardiac networks to ensure appropriate MDMs in place as per guidance.	GIRFT, NHSE/I, trusts, BCS.	For progress within a year of publication.
<b>20.</b> All trusts should ensure that audit teams are appropriately resourced to provide weekly uploads of data to the national cardiac registries.	<b>a</b> NHSE/I should work with GIRFT to ensure the financial sustainability of cardiac registries. <b>b</b> All trusts should assess resource requirements with a view to completing weekly uploads.	GIRFT, cardiology networks, trusts, NICOR, HQIP, BCS, NHSE/I and NHS Digital.	For progress within a year of publication.
<b>21.</b> Trusts must ensure that there is regular clinical validation of coded data, that all relevant clinical information is captured and readily available to coders and that clinical staff are fully aware of the importance of accurate coding, especially that of co-morbidities.	<b>a</b> Coders have full access to clinical record that is easy to view and interrogate. <b>b</b> Use EPRs to ensure that all clinical information on a patient is captured. <b>c</b> The GIRFT clinical coding team to work with trusts to make sure staff are trained to capture all relevant information.	GIRFT, cardiology networks, trusts, NICOR, HQIP, BCS, NHSE/I.	For progress within a year of publication.
<b>22.</b> Care pathway redesign using digital tools needs to be clinically led and patient centred. Examples of good practice can be found in the NHSX Cardiology Digital Playbook and appropriate governance standards should be adhered to.	<b>a</b> GIRFT will support ongoing work of NHS Digital and NHSX in (including NHS Digital Playbook) the digital transformation of cardiology services.	GIRFT, cardiology networks, NHS Digital, NHSX, individual trusts.	For progress within a year of publication.
<b>23.</b> All networks should implement robust evidence-based prescribing guidelines which are regularly reviewed and cover both primary and secondary care, ensuring optimal outcomes for patients across the clinical interface.	<b>a</b> GIRFT to support trusts and networks to implement prescribing guidelines.	Trusts, networks, GIRFT, NHSE/I	For progress within a year of publication.



Recommendation	Actions	Owners	Timescale
<p><b>24.</b> NHSX and the Department of Health and Social Care should work to ensure that there is clinical engagement with the procurement of cardiac devices and that all devices are subject to systematic surveillance to ensure their safety and efficacy.</p>	<p><b>a</b> Improve awareness of costs and product utilisation across the NHS by providing cardiology supply chain analytics.</p> <p><b>b</b> Work with NHSE/I to prioritise and review the safety, efficacy and relative risk of all cardiology Class III and Class IIb devices in the NHS supply chain.</p> <p><b>c</b> Work with NHSX and NHS trusts to support the implementation of Scan4Safety and POCT in cath labs as well as to submit data to the NHS Digital Medical Device Information System (MDIS).</p> <p><b>d</b> Work with the HCTED programme on device assessment and supply chain surveillance data to support implementation.</p> <p><b>e</b> Work with NHS Supply Chain and the cardiology devices industry to improve supply chain value and resilience in cardiology device supply chains.</p> <p><b>f</b> Work with NHSX, NHS Digital, HQIP, NICOR and the cardiology devices industry to review existing registry and audit activities as well as to define a roadmap for a cardiology device level outcome registry and to realise the value of NHS data for development and innovation.</p>	<p>GIRFT, NHSE/I, NHS Digital, NHSX, NHS Supply Chain, DHSC.</p>	<p>Ongoing.</p>
<p><b>25.</b> Trusts should work to reduce litigation costs by adopting the GIRFT 5-point plan.</p>	<p><b>a</b> Clinicians and trust management to assess their benchmarked position compared with the national average when reviewing estimated litigation cost per activity. Trusts would have received this information in the GIRFT Litigation data pack.</p> <p><b>b</b> Clinicians and trust management to discuss with the legal department or claims handler claims submitted to NHS Resolution included in the data set to confirm correct coding to that department. Inform NHS Resolution of any claims which are not coded correctly to the appropriate specialty via <a href="mailto:CNST.Helpline@resolution.nhs.uk">CNST.Helpline@resolution.nhs.uk</a></p> <p><b>c</b> Claims should be triangulated with learning themes from complaints, inquests and patient safety incidents.</p> <p><b>d</b> Where trusts are outside the top quartile of trusts for litigation costs per activity GIRFT will be asking national clinical leads and regional hubs to follow up and support trusts in the steps taken to learn from claims. GIRFT will share examples of good practice with trusts where it would be of benefit.</p>	<p>GIRFT, NHS Resolution</p>	<p>Ongoing.</p>

# Findings and recommendations

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## Managed clinical networks

From the deep-dive visits, it is clear that the way cardiology services are planned, commissioned and delivered needs to change. The current situation, where services are focused around hospitals rather than pathways, can be detrimental to patients and risks both inappropriate duplication of provision and inadequate – and inequitable – access to care. The COVID-19 pandemic has highlighted fragilities in the system and provides a further rationale for changing the way services are delivered.

There is considerable variation across the country in access to services. Notably, some trusts are not providing 24/7 on-call for cardiology (see *Workforce, rostering, rotas and job planning*, page 21). Sometimes neighbouring trusts are offering the same services as each other, with one or both operating at low volumes. We believe that the best way to deliver equity of access to appropriate services and expertise, match demand to capacity and make the most efficient use of resources is to create a network model built around provision of cardiology services.

The shape of any future networks should be dictated by function and local need, not geography. They will not necessarily align with the footprint set out in sustainability and transformation plans, integrated care systems or other existing networks. Whatever form they take, networks must ensure that quality of service is consistent across the network, and that all services are delivered to current established standards and guidelines, by health professionals who are appropriately trained and qualified.

As explained below, network structures should reflect the fact that patients will need access to various tiers of service on both an elective and an emergency basis. In some cases, the solution may well be to create networks within networks – for instance a number of smaller pacing networks within a wider cardiac surgical network. Flexibility is key, but nevertheless there are a number of fundamentals that every functional cardiac network should be able to provide. Some of these will also be required in every hospital admitting acute cardiology patients.

The following are essential to a functional network:

1. Sufficient appropriately trained consultant cardiologists to provide a full cardiology on-call rota 24/7 and 7/7 ward rounds of all cardiology inpatients for each hospital admitting acute cardiology patients (see *Workforce, rostering, rotas, ward rounds and job planning*).
2. A multidisciplinary workforce that utilises digital ‘staff passports’ to allow working across multiple sites within a network.
3. Access for all hospitals admitting acute cardiology patients to emergency echocardiography 24/7 and urgent/elective echocardiography 7/7, and urgent access 7/7 to a TOE service.
4. Seven-day access for all hospitals to cardiac CT, including CTCA and to CMR.
5. Pathways to access PET and nuclear medicine imaging.
6. Pathways for 24/7 temporary wire implantation and 7/7 permanent pacemaker system implantation.
7. Pathways to access a 24/7 EP service for life-threatening arrhythmias
8. Coronary angiography with ‘proceed’ performed in a PCI enabled lab by a PCI-trained operator.
9. 7/7 ACS lists, accessible to all hospitals in the network (see recommendation 10).
10. A 24/7/365 PPCI service.
11. A 24/7 service to interrogate cardiac implantable electronic devices (CIEDs).
12. Access to regular formal MDMs.
13. Pathways to access HF and device services at local level.
14. Pathways to access revascularisation, TAVI, EP and cardiac surgery at network level.
15. Pathways to access advanced HF, ICC, ACHD and low volume specialist interventions not provided within the network, e.g. left atrial appendage occlusion (LAAO), at regional or supra-regional level.

A network model will also offer other benefits. Some smaller hospitals face challenges in recruiting consultants and other healthcare professionals to their cardiology service for a range of reasons, including geography and the limited range of services they offer. A model that provides opportunities to work across trust boundaries could help resolve this issue. A network approach will also support more effective training and skills development.

The use of digital ‘staff passports’ would be a means of enabling staff from different disciplines to move and work between different trusts on an ‘as required’ basis.

Regional dashboards for inter-hospital transfers for care, e.g. non-ST-elevation myocardial infarction (NSTEMI), TAVI and cardiac surgery, are important for communication and tracking of these patients.

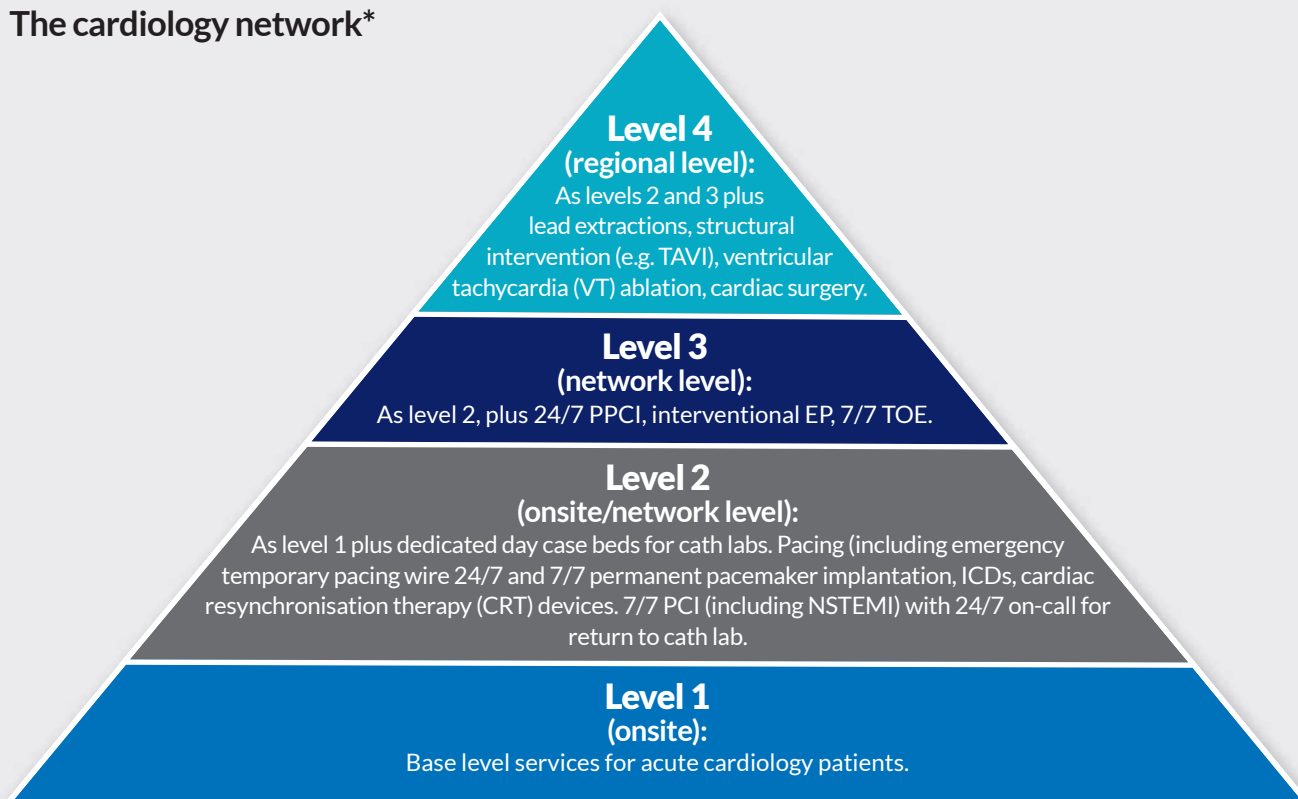
There are certain essential services that must be provided at each hospital admitting acute cardiology patients within a network (see below).

### Essential services required on site at each hospital admitting acute cardiology patients within a network

- Coronary care unit (CCU) or equivalent high dependency unit (HDU)
- Dedicated (ring-fenced) inpatient beds
- 24/7 consultant on-call
- 7/7 cardiology consultant ward review for all cardiology inpatients
- 24/7 emergency echocardiogram provision and review (including virtual review) and 7/7 elective/urgent echocardiography.

Services should be organised as pyramid, with all hospitals offering a base level of services for acute cardiology patients, and more specialist services available at network or regional level (see boxout).

### The cardiology network\*



\*Note that all hospitals must be part of a network with access to all four levels

Supra-regional centres will provide more specialised services for more than one network.

## Recommendation

Recommendation	Actions	Owners	Timescale
<p><b>1.</b> All hospitals must deliver cardiology services as part of a defined and agreed network model.</p>	<p><b>a</b> GIRFT will work with NHSE/I to scope a strategy for clinical networks.</p> <p><b>b</b> GIRFT will work with networks to conduct an audit of services in preparation of a move to a network model of care.</p>	<p>GIRFT, NHSE/I, networks, Integrated Care Systems (ICS).</p>	<p>Networks should commence discussions immediately with the aim of establishing definitive structures within two years.</p>

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## Workforce, rostering, rotas and job planning

### Workforce

Workforce issues are a common theme across the NHS.\* In cardiology, deep dives have uncovered high vacancy rates in a number of roles, notably in cardiac physiology, as well as variation in how the workforce is utilised and the extent to which extended roles have been adopted. In some cases, a perverse incentive in the form of competitive band inflation is acting as another barrier to staff retention. Increasing capacity where necessary, and training and upskilling are key to meeting growing demand and delivering care in the most efficient and cost-effective way. ACP roles offer the opportunity for healthcare professionals from a variety of backgrounds to acquire the skills and experience required to practice at an advanced level across traditional professional boundaries.<sup>12</sup> We strongly encourage the development of ACP roles within cardiology services for nursing, pharmacy and other advanced roles.

We support the concept of a mobile workforce through the implementation of 'staff passports'. The ability to work across hospital sites facilitates delivery of network functions and also provides support in case of staff shortages. Examples are included throughout the report but include delivery of on-call rotas, weekend ward rounds, outpatient services and emergency temporary pacing.

### Capacity and recruitment

Analysis conducted on behalf of Health Education England (HEE) highlights a number of capacity issues across a wide range of roles, all of which will need to be addressed in order to meet the requirements set out in the NHS Long Term Plan. These include:

- **Consultant cardiologists:** Currently, there is one cardiologist per 41,335 of the population with significant regional variation. To achieve consistent coverage at the level that currently exists in the north of England (one per 36,000) would require the creation of and successful appointment to 94 new consultant posts. This is unlikely to happen without an increase in, and redistribution of national training numbers (NTNs).
- **NTNs:** There are 789 NTN holders in England. There is substantial regional inequity in allocations, with disproportionately high numbers in London.<sup>13</sup> The total number of NTNs is currently capped by HEE and there is a need both for a redistribution of training posts away from London and an overall expansion of trainee numbers.
- **Specialty and associate specialist (SAS) doctors:** Negotiations are ongoing for the development of a senior non-training grade. There is potential for doctors at this grade to contribute to under-staffed general cardiology on-call rotas which are not always viable due to the lack of consultant cardiologists.
- **Physician associates (PAs):** A non-medical (health or life science) graduate who has undertaken post-graduate training can contribute to delivery of cardiac services through supporting doctors by admitting patients, performing some diagnostics, making management plans and providing health promotion and disease prevention advice for patients. PAs will soon be able to prescribe within their defined scope of practice and fully support the wider team.
- **ACPs and specialist nurses:** ACPs and specialist nurses are essential for the day-to-day delivery of cardiac services and to help deliver the NHS Long Term Plan.<sup>14</sup> ACPs and specialist nurses should be triaging patients, providing care across a pathway, delivering clinics, prescribing independently and undertaking appropriate extended roles, e.g. cardioversion, implanting loop recorders and securing patient consent (see case study on page 23). Current estimates are that between three and four heart failure specialist nurses or ACPs are needed per 100,000 population<sup>15</sup> to deliver the requirements of the Long Term Plan, as opposed to the one per 100,000 previously recommended.<sup>16</sup> For chest pain and arrhythmia pathways, it is estimated that 7.5 whole time equivalent (WTE) specialist nurses or ACPs are required per million of the population.

\* See *We are the NHS: People Plan for 2020/21 – action for us all for an NHS-wide view on workforce issues, and Integration and innovation: working together to improve health and social care for all for proposals on workforce planning in the context of integrated care.*

<sup>12</sup> [www.hee.nhs.uk/our-work/advanced-clinical-practice/what-advanced-clinical-practice](http://www.hee.nhs.uk/our-work/advanced-clinical-practice/what-advanced-clinical-practice); see also *Multi-professional framework for advanced clinical practice in England. 2017. www.hee.nhs.uk/sites/default/files/documents/Multi-professional%20framework%20for%20advanced%20clinical%20practice%20in%20England.pdf*

<sup>13</sup> *Royal College of Physicians, Focus on physicians: 2018–19 census (UK consultants and higher specialty trainees) www.rcpmedicalcare.org.uk/developing-physicians/specialties/cardiology/workforce*

<sup>14</sup> [www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf](http://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf), p 62

<sup>15</sup> *Masters, J., Barton, C., Blue, L. and Welstand, J. (2019) Brit. J. Cardiac Nursing;14:1-12.*

<sup>16</sup> *McDonagh, T.A., Blue, L., Clark, A.L., et al. (2011) European Society of Cardiology Heart Failure Association Standards for delivering heart failure care. Eur.J. Heart Fail., 13:*

- **Cardiac physiologists:** There is a very significant shortfall in the cardiac physiology workforce, in part due to a lack of trainees coming through the national training scheme. Retention is also a major issue, partly as a consequence of a lack of training and career progression opportunities and partly as a consequence of pay incentives offered elsewhere. Around 760 new cardiac physiologists are needed to meet demand over the next ten years, of whom 460 should be in echocardiography. Cardiac physiologists should be undertaking extended roles such as valve surveillance clinics, stress echocardiography and implantation of loop recorders. Consideration should be given to establishing networks of cardiac physiologists to provide peer support and mentoring and promote dissemination of specialist skills.
- **Pharmacists (also ACPs):** The extended role of pharmacists in the community and in the hospital setting is increasingly being recognised. Pharmacists provide advice, primary and secondary prevention, medication advice and should be able to prescribe and titrate within defined boundaries. They also have a role to play in blood pressure monitoring and arrhythmia detection.

The following workforce issues are also likely to have a negative impact on the delivery of cardiology services, unless steps are taken to address them:

- Between 10% and 15% of radiographer posts are unfilled at a time when a major increase in capacity to perform CTCA is required to meet the requirements of NICE CG95.<sup>17</sup> The most recent census carried out by the College of Radiographers in late 2018 found a vacancy rate of 10% across the diagnostic radiography workforce in England.<sup>18</sup>
- There is a pressing need for an increase in appropriately trained cardiologists, radiologists and radiographers to support the expansion in CTCA and CMR.
- In a report published in October 2020, Professor Sir Mike Richards has recommended that the radiology workforce increase by 2,000 and radiographers by 4,000 as well as other support staff in order to meet growing demand and support the development of 'community diagnostic hubs' to separate inpatient and outpatient pathways\*.
- Assuming that efforts to increase uptake of cardiac rehabilitation are successful, there will be a need to increase the multidisciplinary cardiac rehabilitation workforce.

## Deployment and upskilling

Currently, there is considerable variation in how the cardiology workforce is being deployed. For example:

- Some consultants are expected to carry out elective work, e.g. managing outpatient clinics and/or imaging lists and/or cath lab lists at the same time as being on-call. This is not appropriate: on-call should be protected time.
- Of the 63 trusts visited during deep dives at the time of writing, specialist nurses were currently able to prescribe in just 23. In some, plans to enable nurse prescribing were in the pipeline; in others, there were no plans at all. ACPs or specialist nurses capable of prescribing should be available to provide support to clinics, ward rounds and other activities 7/7.
- There is also variation in the extent to which specialist nurses are being deployed to independently run HF, chest pain and arrhythmia clinics, and to carry out procedures such as cardioversions. These extended roles are encouraged.
- While in many hospitals cardiac physiologists are conducting stress echocardiography and running valve surveillance clinics, in others they are not operating with an extended skill set. Extended roles are to be encouraged.

Upskilling the workforce is key to meeting the challenges presented by workforce shortages. So too is greater formalisation of extended roles, which will help to increase retention by creating opportunities for career development and progression. This is already occurring in some hospitals, particularly within physiologist and specialist nursing teams.

Ensuring that professionals are operating with an extended skill set will also help to maximise capacity across the service as a whole, as well as eliminating variations in skill levels between individuals ostensibly performing the same role in different trusts. It is important that the workforce is enabled to work more flexibly across networks using a staff passport-type system to ensure standardisation of pathways (see *Patient flow and care pathways*, page 34) including 7/7 access to some services, e.g. echocardiography.

Many pathways within cardiology are delivered by a heart team, the exact make-up of which will vary with the specific clinical conditions being addressed. All the staff groups mentioned above will form part of the various heart teams along with cardiac surgery, cardiac radiology, vascular interventional radiology, and representatives from other medical specialties including elderly care, renal and anaesthetics/critical care for specific patient groups.

\*Richards (2020) *Diagnostics: Recovery and Renewal*

<sup>17</sup> [www.nice.org.uk/guidance/CG95](http://www.nice.org.uk/guidance/CG95)

<sup>18</sup> [www.sor.org/sites/default/files/document-versions/diagnostic\\_workforce\\_census\\_2018.pdf](http://www.sor.org/sites/default/files/document-versions/diagnostic_workforce_census_2018.pdf)

## CASE STUDY

### Delivering a streamlined Acute Coronary Syndrome service with ACP-led discharge of patients

#### Royal Papworth Hospital Foundation Trust

An audit in July 2020, based on normal activity, established that Acute Coronary Syndrome (ACS) patients without complications were spending an average of 1.55 days (41.35 hours) at the Royal Papworth Hospital. It was proposed that the hospital's cardiology Advanced Clinical Practitioner (ACP) team could support patient discharge to help reduce the length of stay further.

The cardiology ACP team at Papworth Hospital has been established for two years. Due to increasing demand the trust increased the number of acute cardiology beds. Reducing length of stay for patients is a trust priority to create more bed capacity and improve patient satisfaction.

#### Actions taken

The ACP team undertook the 'consent' training supervised by cardiology SpRs and consultants. In addition, the team is compliant with the National Institute for Health Research (NIHR) Good Clinical Practice eLearning modules which are updated every three years.

The majority of the ACP team are also competent prescribers and can care for the whole patient episode including clerking, examination, consent, prescribing, review, education and discharge. The team work with the wider non-clinical and clinical team to ensure patient flow is efficient and is a visible contact for all.

The cardiologist identifies suitable patients for discharge. It provides an opportunity for the ACP team to build relationships with the patients, work autonomously and take ownership of patient care. It has significantly increased ACP job satisfaction and been welcomed by the wider team. Re-audit is expected to show a reduction in length of stay and improved patient satisfaction, and the team hopes to expand to all ACS patients and other transfers.

## The cardiology footprint

Each hospital receiving acute cardiology patients must have a dedicated CCU or HDU which, with a suitable room, can also be used for temporary pacing, cardioversions, TOE and, in some centres intra-aortic balloon pump (IABP), pending transfer of patients to surgery. This eases demand on intensive care units (ICUs). The CCU/HDU should preferably be adjacent to a dedicated cardiology ward which can be used for step down care. Cardiology patients should be co-located in the hospital to facilitate streamlined specialist care by the multidisciplinary team and efficient ward rounds. All this aids timely decision-making and discharge planning.

There should be dedicated ring-fenced beds, trolleys or chairs in a day ward facility and/or radial lounge to ensure activity in the cath lab is not interrupted. There should be a dedicated cardiac physiology department supporting inpatient and outpatient activity that complies with current requirements for accreditation by Improving Quality in Physiological Services (IQIPS). There should be sufficient space for administrative and clinical support staff to work in an appropriate and safe environment and this must include private areas for confidential conversations.

## Rostering

Electronic rostering is an effective way of ensuring that the cardiology workforce – our greatest asset – is being deployed in the most efficient way possible. It enables flexible work patterns with cross-cover and clear demarcation of sessions which can then feed into job planning. These packages will to an extent automate rota generation, taking into account rules/staff preferences. The current fixed annual job plan is too inflexible for a team-based approach. E-rostering, with its automatic tracking of hours/flexibility to change work patterns depending on evolving commitments, could potentially improve productivity in many departments. There are several general platforms in use (e.g. those developed by Allocate), as well as specialist scheduling/rostering software packages such as CareCube which was developed in Liverpool to meet the needs of cardiac cath labs.

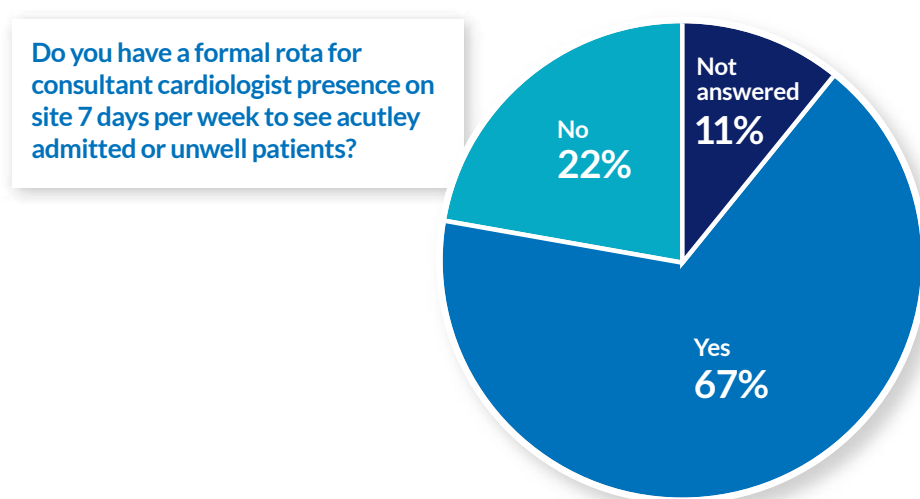
## Rotas

During our deep dives we found significant variation between hospitals in out-of-hours rota arrangements for key cardiology rotas. These are summarised here.

### General cardiology consultant rota

A large proportion of work in cardiology is generated by emergency admissions, and 30% of acute admissions are related to CVD. Any hospital admitting cardiology patients should provide 24/7 consultant on-call, and this must include returning to the hospital as required or requested. Deep dives have shown that currently around one-third of hospitals – in particular smaller ones – are not providing this level of cover through their on-call rota (see **Figure 1**). On-call can be onerous and to minimise inappropriate calls there should be locally agreed guidance regarding escalation to the on-call cardiology consultant out of hours. Contact details for all on-call staff should be readily available.

**Figure 1: Trusts with a formal rota for consultant cardiologist presence 7/7 (107 respondents)**



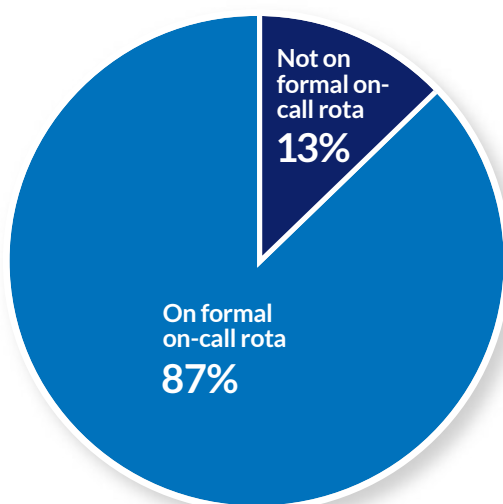
Source: GIRFT questionnaire 2019

Our view is that a minimum rota frequency of one in six is appropriate for 24/7 general cardiology consultant on-call. By default, all cardiologists with an NHS contract should contribute to a general and /or subspecialty on-call rota. Where an individual hospital is unable to meet this requirement on-call should be arranged on a network basis in partnership with adjacent trusts. It should be noted that nationally just over 13% of consultant cardiology posts are not contributing to any formal on-call rota (see **Figure 2**).

For a very small number of geographically remote hospitals where network on-call arrangements are not feasible, formal remote cover from another hospital may be required. This must include the ability to review images remotely (including echocardiography). This could take the form of a virtual rota with the ability to transfer a patient as required to the nearest 24/7 on-call hospital.



**Figure 2: Percentage of consultant posts that contribute to a formal on-call rota (cardiology, acute medicine or PPCI)**



Source: GIRFT questionnaire data

### **Primary percutaneous coronary intervention (PPCI) rota**

PPCI substantially improves outcomes for patients with ST segment elevation myocardial infarction (STEMI) compared with thrombolysis. It should be delivered on a network basis in centres providing a continuous 24/7/365 service. All interventionists undertaking PCI within the network should, by default, contribute to the service. This will help to maintain acute skills and ensure that rotas can cope with demand, providing a safe and effective service to patients which does not place excessive demands on operators and cath lab teams. Our view – which we share with the British Cardiovascular Intervention Society (BCIS) – is that PPCI rotas should be a minimum of one in six.

In accordance with BCIS recommendations, each full day of consecutive on-call should be followed by one half-day of compensatory rest in lower volume centres (<400 PPCI procedures per year) and one full day of compensatory rest in higher volume centres (>400 PPCI procedures per year).

### **Percutaneous coronary intervention (PCI) rota**

Rapid access to PCI within 72 hours, or within 24 hours for higher risk patients<sup>19</sup> and 2 hours for those at very high risk, has been shown to improve outcomes in ACS. These targets can only be met if ACS lists run seven days per week. As such, each network should ensure that all hospitals have access to 7/7 PCI services for ACS patients, including high risk NSTEMI patients. Depending on the volume of activity this could overlap with the PPCI rota, but in many networks it will require the participation of other PCI-enabled cath labs. Although unscheduled return to the cath lab is uncommon, each hospital performing PCI must be able to deal with this eventuality without requiring emergency transfer to another site. Therefore, each hospital providing PCI must have a cath lab team on a rota to cover return of patients to the cath lab 24/7.

### **Echocardiography rota**

Echocardiography is a valuable investigation not only for assessment of elective cardiac patients but also in the assessment of acute cardiac presentations. Echocardiography must be available 7/7 in all hospitals with an acute medical take.

All hospitals admitting acute cardiology patients should have a rota to deliver emergency echocardiography to at least British Society of Echocardiography (BSE) level 1 standard, 24/7. There should be a network 24/7 rota with the ability for immediate remote review of images by a consultant cardiologist with expertise in echocardiography, with repeat scanning the following day by an accredited operator, as required. There should be a network rota to deliver urgent TOE 7/7 with nurse or physiologist support. This may require patient transfer to a suitably equipped hospital.

<sup>19</sup> [www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Coronary-Syndromes-ACS-in-patients-presenting-without-persistent-ST-segm](http://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Coronary-Syndromes-ACS-in-patients-presenting-without-persistent-ST-segm)

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## Temporary and permanent pacing and device interrogation rotas

Symptomatic patients with heart block may require urgent temporary pacing; but not all cardiologists are capable of placing a temporary pacing wire. Each network must therefore have a formal on-call rota (or rotas) for emergency temporary pacing that covers all hospitals admitting acute medical patients 24/7. This could take the form of primary pacing centres where patients with symptomatic brady-arrhythmias are directed to a temporary pacing wire-enabled hospital or to mobile pacing teams, on staff passports, attending the hospital where they have been admitted.

Patients with temporary wires and those with heart block who are initially managed medically need access to prompt implantation of a permanent system without having to wait for the next routine list and so all networks should have a rota for 7/7 pacemaker implantation. All hospitals should also ensure access to a formal 24/7 rota for emergency device interrogation which could be organised on a network basis.

## Electrophysiology

There should be access 24/7, at a regional level, to an EP service for patients with life-threatening arrhythmias such as VT storm.

## Ward rounds

Ward rounds are undertaken in order to assess the progress of individual patients and review them for investigation, diagnosis and treatment, with a view to planning timely discharge or making suitable arrangements for onward care.

All acutely admitted patients and all inpatients should be reviewed daily (7/7) to ensure continuity of care, planning and tracking of investigations and treatment, and timely discharge. The team should be led by a consultant. Currently, as **Figure 1** (above) shows, at least 22% of trusts are failing to meet this standard. Some trusts will need to make significant changes to the way they work in order to achieve this including, e.g. adopting a network model of ward cover at weekends. Depending on the volume of patients to be seen it may be possible to provide ward rounds at more than one hospital, but this must not compromise standards of care at either site.

One approach that has been found to work well in terms of both resource efficiency and continuity of care is the consultant of the week (COW) model (7/7). The COW is free from other job planned activities for a week, spending their time reviewing acute cardiac inpatients and seeing ward referrals on a daily basis. There also needs to be a mechanism for daily review of all longer stay patients. In some trusts this may also be performed by the COW; in others additional ward-based consultant cover may be required. It is important that ward rounds are consultant-led, 7/7.

To maximise efficiency of ward rounds digital tools for handover, task management and bleep replacement should be considered. Examples from the NHS Apps Library<sup>20</sup> include Hospify (healthcare messaging) and Pando (task management).

Ward rounds should be planned and scheduled for the whole team. Longer ward rounds should include a break for team members.

Electronic communication applications should replace handwritten notes for handover and task management in order to reduce governance risks. Again, Pando is an example of suitable technology.

The ward round team must include a clinical team member with direct knowledge of the patient (e.g. a senior nurse, ACP, PA or ward-based doctor) to present the patient, and a team member who is able to record the findings, management plan and discussions with the patient, prescribe and request tests as the round progresses, and provide general administrative support. This could be any appropriately qualified and competent healthcare professional.

In advance of the ward round there should be a board round – a summary discussion of each patient's journey, and what is required that day in order for it to progress – attended by all members of the team. This can be used to plan the round and set priorities, e.g. seeing acutely unwell patients first, followed by those who are due to be discharged.

Ideally there should be a mechanism in place to ensure that tasks can be picked up and completed during the ward round without interruption.

At the end of the round there should be a debrief to discuss actions and priorities. For trainees, rounds provide valuable learning opportunities.

<sup>20</sup> [www.nhs.uk/apps-library/](http://www.nhs.uk/apps-library/)

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## Job planning

It is important that all activities, elective and emergent, are appropriately job planned and that protected time is given to activities such as on-call and ward rounds. This must include time dedicated to preparation and conducting of MDTs, triaging and preparation of clinics.

On-call rotas must be compliant with the standards suggested in this report and appropriate compensatory rest factored in. The job planning process must allow for a mobile workforce, making use of staff passports.

### CASE STUDY

## Implementing a consultant of the week model

### St Helens and Knowsley Hospitals NHS Trust

In September 2018, the trust introduced a COW service, with the aim of providing more consistent and reliable ward cover and better continuity of care for patients. Prior to the change, consultant cardiologists were allocated on-call week, during which time they had sole responsibility for managing all patients on the CCU, undertaking a daily ward round and providing a central contact point for referrals from other parts of the trust.

#### Delivering a sustainable service

Under the new arrangements, consultants have a week allocated to on-call on the CCU followed by a week covering the ward. The coronary care week remains unchanged. During 'ward week' the consultant does a ward round on a Monday, Wednesday and Friday. Tuesday and Thursday they undertake a board round and review any new or unstable patients. The consultant on call will also review referrals and provide in-reach into the admission units, providing management plans for patients and identifying those requiring cardiology beds. This is also supported by the cardiology nurse specialist team.

During these two weeks the cardiologist cannot take annual leave. This has resulted in more structure and transparency with regard to rota planning and ensures cover is maintained for inpatient areas. It supports a multidisciplinary approach with other specialist teams able to review patients collaboratively if required.

#### Results

The COW service delivered immediate service improvements. Patients know the consultant that they will be seen by and this results in consistency in care and shared decision-making. Junior doctors are better supported, and ward staff are better able to support the consultant.

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## CASE STUDY

### Using extended roles to deliver a more efficient cardioversion service

#### University Hospitals of Leicester NHS Trust

Since 2017, the trust has been using physician anaesthetic assistants (PAAs) to support a new way of delivering cardioversion aimed at reducing pressure on beds and delays, as well as freeing up consultant cardiology and anaesthetist time.

#### Delivering a sustainable service

The majority of procedures are carried out in the cath lab anaesthetic room, with the PAA administering the sedative. Propofol has replaced Midazolam. To further improve the sustainability of the service, in September 2018 an advanced nurse practitioner was assessed as competent to perform the cardioversions themselves. Now, procedures on day of admission are non-medically led, with a consultant cardiologist available to support as needed. Patients spend their – much reduced – recovering time in the day case cardiology ward radial lounge, rather than occupying a bed.

#### Results

The new service is both safe and efficient. Activity has increased by 22%, with no lists cancelled. Length of stay has been reduced by 40% and the bed base is protected for other cardiology procedures. Some 97% of patients who had previously undergone cardioversion preferred the new service, while 99% of first-time patients reported having a positive experience. Increased utilisation of extended roles had delivered other benefits, e.g. PAAs are now also supporting ablation procedures.

## Recommendation

Recommendation	Actions	Owners	Timescale
<p><b>2.</b> All hospitals receiving acute medical admissions must have a consultant cardiologist on-call 24/7 who is able to return to the hospital as required. There should be a consultant job planned specifically to review newly admitted and acutely unwell inpatients 7/7 and a consultant job planned (note this may be the same consultant) to deliver 7/7 review of other inpatients, ensuring continuity of care.</p>	<p><b>a</b> GIRFT to work with Health Education England (HEE), NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.</p>	<p>GIRFT, NHSE/I, HEE, Royal College of Physicians (RCP), British Cardiovascular Society (BCS), British Cardiovascular Intervention Society (BCIS), the British Heart Rhythm Society (BHRS), Royal College of Nursing (RCN).</p>	<p>As soon as possible and within two years of publication.</p>
<p><b>3.</b> All NHS consultant cardiologists should, by default, participate in an on-call rota for general and/or specialist cardiology.</p>	<p><b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.</p>	<p>GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN.</p>	<p>As soon as possible and within two years of publication.</p>
<p><b>4.</b> All members of the wider heart team should be supported to work in extended roles and trusts should ensure that appropriate staff (including ACPs, specialist nurses and cardiac physiologists) are trained, accredited and authorised to prescribe medications relevant to their role.</p>	<p><b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.</p>	<p>GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN, and British Society of Echocardiography (BSE).</p>	<p>As soon as possible and within two years of publication.</p>
<p><b>5.</b> Each network must ensure that there are clearly defined patient pathways covering all acute hospitals for the provision of 24/7 emergency temporary pacing and 7/7 permanent pacing.</p>	<p><b>a</b> GIRFT to work with HEE, NHSE/I and professional societies to audit workforce requirements for a comprehensive 24/7 cardiology service.</p>	<p>GIRFT, NHSE/I, HEE, RCP, BCS, BCIS, BHRS, RCN.</p>	<p>As soon as possible and within two years of publication.</p>

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## Data flow and referral across pathways

Data must flow smoothly along all parts of the care pathway from primary to secondary to tertiary care. Clinical information, electrocardiograms (ECGs) and images must be electronically readily accessible, through a continuous NHS record of care, in different parts of the network, including the independent sector, to enable timely care and avoid duplication.

Referral platforms must allow secure, auditable flow of information between different parts of the care pathway. Tools such as 'referapatient' which manage the interaction from primary through to specialist care are used in neurosurgery in London and beyond, but also in some cardiology networks.

## Delivering outpatient care

Cardiology is the fifth highest outpatient speciality within the NHS, with approximately 4.5 million appointments in 2018/19.<sup>21</sup> Demand is steadily increasing as the population grows and ages.

Cardiology is one of the 14 high volume elective care specialties that form part of the Elective Care Transformation Programme (ECTP), which will also support the outpatient targets set out in the Long Term Plan. The Programme sets out three focus areas for cardiology:

1. streamlining the referral process;
2. supporting shared decision-making, e.g. through the use of digital health tools and personal health budgets; and
3. exploring the potential for replacing traditional outpatient appointments with virtual clinics, technological solutions, care closer to home<sup>22</sup> and Patient Initiated Follow Up.<sup>23</sup>

These changes need to be accelerated and expanded, particularly in the light of the COVID-19 pandemic, with the aim of optimising outpatient pathways. This must be through:

1. provision of consistent ERS–Advice and Guidance. Digital platforms to address this interface between primary and secondary care are increasingly being used, e.g. the use of Cinapsis in Gloucestershire;
2. triaging and providing initial diagnostic activity in the community, where possible in future through community diagnostic hubs;
3. reducing the number of referrals that require consultation in secondary care; and
4. using remote consultations as a default.

Social distancing requirements will mean that outpatient capacity may be significantly reduced. Taking steps to reduce the number of referrals is a logical first step towards alleviating pressure on outpatient services.

In order to achieve this, primary/community care should have ready access to essential diagnostics within each primary care network (PCN), in future in community diagnostic hubs, without the need for a secondary care referral. N-terminal pro B-type natriuretic peptide (NT-pro BNP) for the assessment of potential heart failure must be available to every primary care practice. Other cardiology services that should be provided in the community include:

1. echocardiography;
2. ambulatory blood pressure (BP) monitoring; and
3. ambulatory heart rhythm monitoring.

These diagnostic hubs must be delivered in partnership and under the governance of local secondary care cardiology services and it is essential that all images and reports are routinely incorporated into an NHS record of care that is accessible across the system.

<sup>21</sup> <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-outpatient-activity>  
<https://files.digital.nhs.uk/33/EF9007/hosp-epis-stat-outp-summ-rep-2018-19-rep.pdf>

<sup>22</sup> [www.england.nhs.uk/wp-content/uploads/2019/04/cardiology-elective-care-handbook.pdf](http://www.england.nhs.uk/wp-content/uploads/2019/04/cardiology-elective-care-handbook.pdf)

<sup>23</sup> [www.england.nhs.uk/outpatient-transformation-programme/patient-initiated-follow-up-giving-patients-greater-control-over-their-hospital-follow-up-care/](http://www.england.nhs.uk/outpatient-transformation-programme/patient-initiated-follow-up-giving-patients-greater-control-over-their-hospital-follow-up-care/)

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## Referral pathways into secondary care

Primary care teams need ready access to ERS–Advice and Guidance from secondary care in order to minimise the need for outpatient attendances. Some of this can be provided online, as local protocols, at network level. Maximum use should be made of this but any clinical input to an ERS–Advice and Guidance service should be job planned (see page 26) and all communication should form part of a patient’s NHS record of care. During the deep dives, 78% of trusts reported regular use of ERS–Advice and Guidance although in many instances it was not appropriately job planned (see **Figure 3**).

No secondary care appointments should be made without appropriate clinical triage of the referral. In particular, untriaged ERS appointments should stop. Triage can be carried out by any professional with the appropriate skills and competencies. In addition to consultant triage, we saw a variety of approaches to achieving this on our visits. In some areas clinical assessment services screen referrals from primary care and in some trusts a consultant nurse is job planned to carry out the task, for example.

Where investigations are required, these should be undertaken upfront and reviewed to decide if a consultation is necessary or whether the patient can be managed in primary care. Where a secondary care appointment is required, all relevant investigations should be requested and performed in advance of clinics such that results are available in time for the clinic. For face-to-face clinics relevant investigations may be performed on the day but only if results will be available in time for the consultation.

Referrals should be triaged as:

1. advice/investigations only;
2. virtual consultation following appropriate investigation and with results available; or
3. face-to-face consultation with appropriate results available.

Consultations should be virtual by default. It is recognised that there are patients where this may be technically difficult or not feasible. In addition, there are some situations where a face-to-face appointment may be more appropriate, e.g. in cases of new onset HF and complex valve disease, where formal examination will assist decision-making. Return patients should only be reviewed face-to-face where necessary to monitor ongoing care.

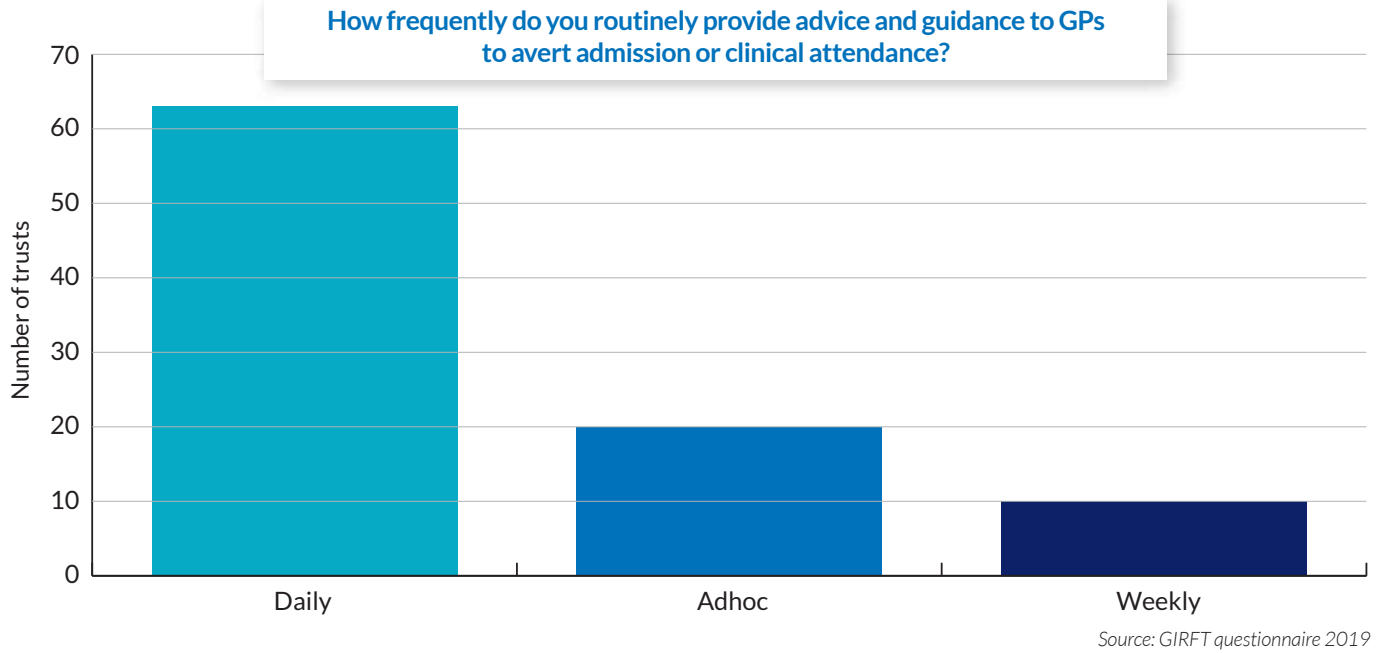
This change in how clinics are delivered will require considerable investment in IT infrastructure across the NHS. The government’s paper, *The future of healthcare: our vision for digital, data and technology in health and care*,<sup>24</sup> sets out its plans for managing demand and creating a sustainable NHS, including by moving away from a paper-based system. During the COVID-19 pandemic there was a significant shift to ERS–Advice and Guidance and virtual clinics. Steps must be taken to ensure that this is developed and sustained in the long term.

Face-to-face secondary care clinics can be held in a non-hospital setting. If combined with ‘community diagnostic hubs’ this would provide the ability to run rapid access clinics, for example for chest pain, palpitations and HF, completely segregated from inpatient care – particularly important in the pandemic era. Maximum use should be made of services led by ACPs, specialist nurses, cardiac physiologists and pharmacists, trained, accredited and authorised to prescribe relevant medications. ERS–Advice and Guidance is also appropriate for some team-to-team referrals within secondary care.

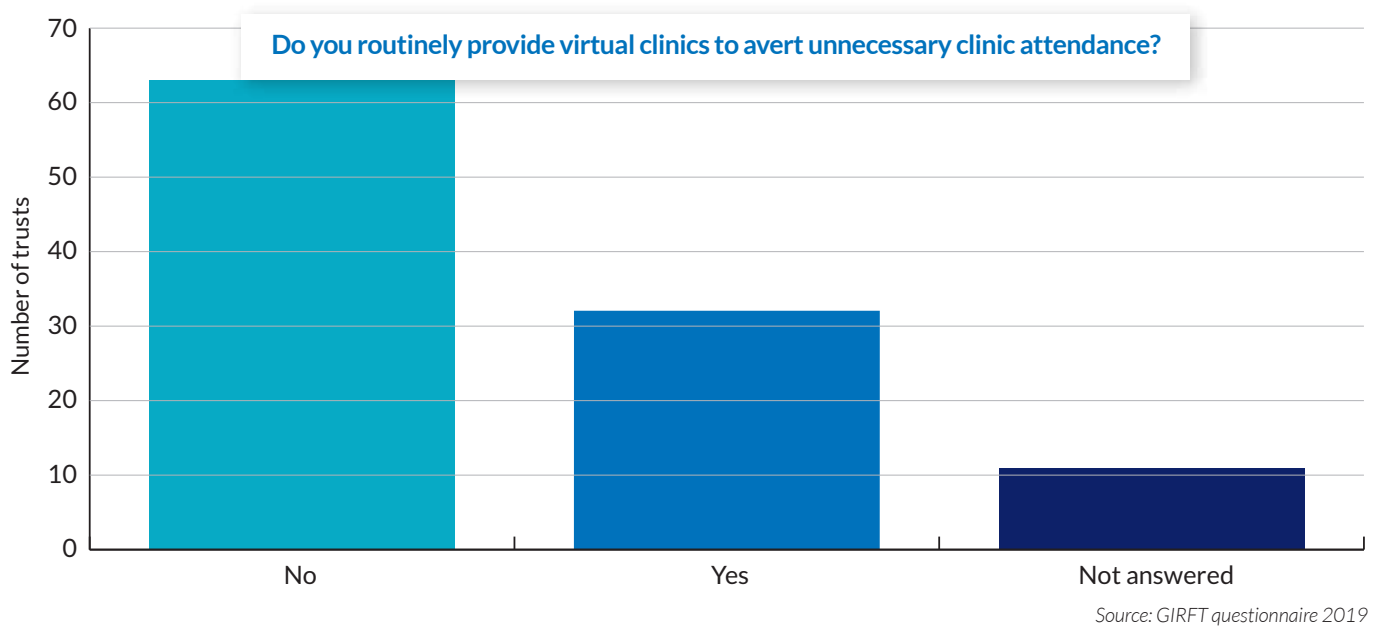
Pre-COVID-19, few virtual specialist clinics were undertaken (see **Figure 4**), but there is clearly potential for many specialist clinics to be performed remotely, especially joint clinics where more than one specialist needs to be involved, e.g. ICC clinics. In place of a specialist visiting a referring centre to see patients, a virtual clinic could be held using the facilities of the referring hospital so that the patient, referring team members and specialist can all be present. Other healthcare professionals can also join as needed to create a multidisciplinary consultation. This can be applicable across a network and include primary care.

<sup>24</sup> [www.gov.uk/government/publications/the-future-of-healthcare-our-vision-for-digital-data-and-technology-in-health-and-care/the-future-of-healthcare-our-vision-for-digital-data-and-technology-in-health-and-care](https://www.gov.uk/government/publications/the-future-of-healthcare-our-vision-for-digital-data-and-technology-in-health-and-care/the-future-of-healthcare-our-vision-for-digital-data-and-technology-in-health-and-care)

**Figure 3: Number of trusts that routinely provide advice and guidance to GPs to avert admission or attendance (107 respondents)**



**Figure 4: Number of trusts that routinely run virtual clinics in order to avert clinic attendance (107 respondents)**





## Recommendation

Recommendation	Actions	Owners	Timescale
<p><b>6.</b> All outpatient referrals should be triaged with maximum use made of the ERS-Advice and Guidance function. Appropriate investigations should be requested so that all results are available for advice or review in clinic. Clinics should, by default, be conducted virtually unless not feasible for the patient or if 'face-to-face' is required to progress clinical decision-making.</p>	<ul style="list-style-type: none"> <li><b>a</b> GIRFT to work with the Outpatient Transformation Programme (OTP) to scope strategy for continued cardiology outpatient transformation.</li> <li><b>b</b> GIRFT will support the Royal College of General Practitioners (RCGP) and NHSE/I to create referral guidance that covers outpatients and imaging in primary care.</li> <li><b>c</b> Digital solutions should be exploited to improve patient pathway and access to information across the system.</li> </ul>	<p>GIRFT, NHSE/I, RCGP, BCS, RCP.</p>	<p>For significant progress within a year of publication.</p>

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## Patient flow and care pathways

The term 'patient flow' describes how patients move through their healthcare journey. Having evidenced-based care pathways in place should help to ensure that patients have the most efficient journey possible, from primary care to secondary/tertiary care and in closing the loop back to primary/community care. The journey should be seamless and include appropriate support from ERS–Advice and Guidance, appropriate triage and investigation, timely review and treatment with clear onward plans and support at discharge.

Patient portals lower barriers to patients accessing care. They enable patients to own the access to their records and allow different healthcare professionals to access their data as the patient follows a care pathway (including moving from one organisation to another). This has been achieved to some extent through the implementation of platforms such as Patient Knows Best in north-west London. Patients can use the tool to receive correspondence and targeted information, access their health data, complete Patient Reported Outcome Measures (PROMs)/symptom questionnaires and to communicate securely with the clinical teams looking after them.

Our deep dives have identified variation in the effective implementation of certain care pathways. We have focused on the most relevant ones here.

### The stable chest pain pathway

Patients on the stable chest pain pathway should be seen in a clinic within two weeks of referral. As a default, clinics should be run by appropriate healthcare professionals who can prescribe to protocol and be able to consent, where appropriate, for coronary angiography and invasive imaging/physiology and stenting at the same sitting ('?proceed'), with later validation by the operator. Diagnostic imaging following a chest pain clinic appointment should be completed within six weeks.

NICE CG95, published in 2016, sets out a pathway for assessing, diagnosing and treating patients presenting with stable chest pain.<sup>25</sup> The 2019 European Society of Cardiology (ESC) guidelines for the diagnosis and management of chronic coronary syndromes<sup>26</sup> are also endorsed by the BCS. All networks should have a plan to ensure implementation of CG95. Currently, there is very significant variation in how CG95 is being implemented, primarily relating to a lack of access to CTCA. This should be the first diagnostic modality for the majority of patients, with the exception of those with high risk features who should go direct to invasive coronary angiography '?proceed' to stent. Some hospitals are still reliant on treadmill exercise testing which has a very limited role in the diagnosis of coronary disease.

All hospitals require ready access (within a maximum of six weeks) to other non-invasive imaging modalities where CTCA is not appropriate, including stress echocardiography and stress CMR and myocardial perfusion scintigraphy (MPS) with single photon emission computed tomography (SPECT) or positron emission tomography (PET).

The default for patients requiring coronary angiography on the chest pain pathway, stable or unstable, should be listing for invasive coronary angiogram with the ability to proceed if appropriate to invasive diagnostics including pressure wire, coronary angioplasty and stenting *at the same sitting* by a PCI-capable operator in a PCI cath lab.

Invasive coronary angiography in advance of non-coronary cardiac surgery should also be undertaken by a PCI-enabled operator in a PCI cath lab so that invasive imaging/physiology such as intravascular ultrasound (IVUS), optical coherence tomography (OCT) or a pressure wire study can be performed, as required, to guide surgical strategy.

### The unstable chest pain/rapid NSTEMI pathway

NICE CG94<sup>27</sup> covers the various pathways for ACS, focusing on the early management of unstable angina and NSTEMI from diagnosis through to discharge from hospital. The 2020 ESC guidelines for the management of non ST-elevation ACS<sup>28</sup> are also endorsed by the BCS. Timely treatment is critical in avoiding adverse outcomes, including further cardiovascular events and death. There is considerable variation in the time from admission to angiography for NSTEMI patients and many hospitals are failing to meet the targets for high risk and non-high risk patients.

For the highest risk ACS patients, the target is invasive angiography/proceed within two hours, requiring direct admission or rapid transfer of patients to a PCI centre. Networks should ensure adoption of this pathway in order to deliver more timely treatment and reduce length of stay. Only around 62% of respondents to the GIRFT questionnaire reported that they had a pathway for rapid transfer of high risk NSTEMI patients (see **Figure 5**).

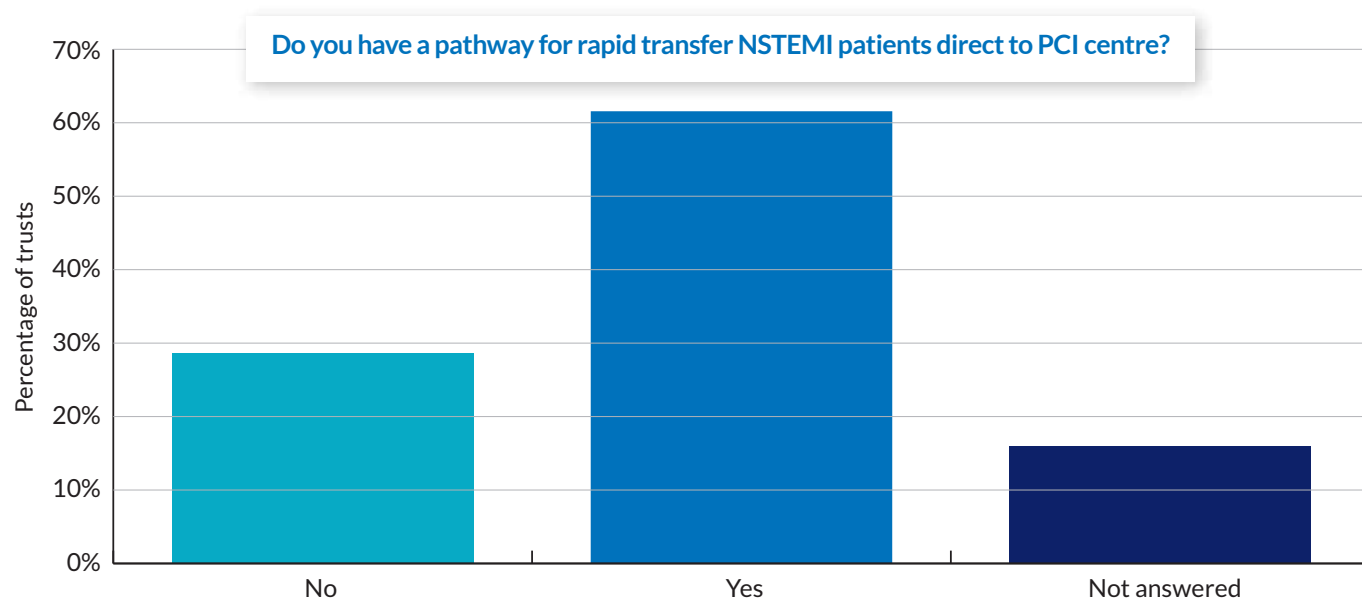
<sup>25</sup> [www.nice.org.uk/guidance/cg95/chapter/Recommendations](http://www.nice.org.uk/guidance/cg95/chapter/Recommendations)

<sup>26</sup> [www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Chronic-Coronary-Syndromes](http://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Chronic-Coronary-Syndromes)

<sup>27</sup> [www.nice.org.uk/guidance/cg94](http://www.nice.org.uk/guidance/cg94)

<sup>28</sup> <https://academic.oup.com/eurheartj/advance-article/doi/10.1093/eurheartj/ehaa575/5898842>

**Figure 5: Percentage of trusts with a pathway in place for rapid transfer of NSTEMI patients (107 respondents)**



Source: GIRFT questionnaire 2019

ACPs/specialist nurses are key to the delivery of the ACS pathway: reviewing the patient on admission; triaging with the on-call consultant; prescribing medication to protocol; and consenting for the invasive coronary angiogram 'proceed' to stent with later validation by the operator. They should also manage the patient post-procedure and be involved in the discharge process ensuring referral to local cardiac rehabilitation services. They should be part of the revascularisation MDT (see Multidisciplinary teams, page 53).

## The PPCI pathway

PPCI must be carried out in designated heart attack centres (HACs). These should be operating 24/7. Currently, there are a small number of hospitals providing PPCI during limited daytime hours. During the deep dives it became apparent that this has potential to create uncertainty for ambulance services as well as distorting workload and on-call rotas in designated HACs and should therefore cease.

HACs should be designated on a regional basis. Hospitals currently performing PPCI for limited hours must either be designated as a HAC and move to 24/7 provision or their activity should be incorporated into a designated HAC with the default that all interventional cardiologists within the network must, by default, contribute to the PPCI on-call rota at the HAC.

## The heart failure pathway

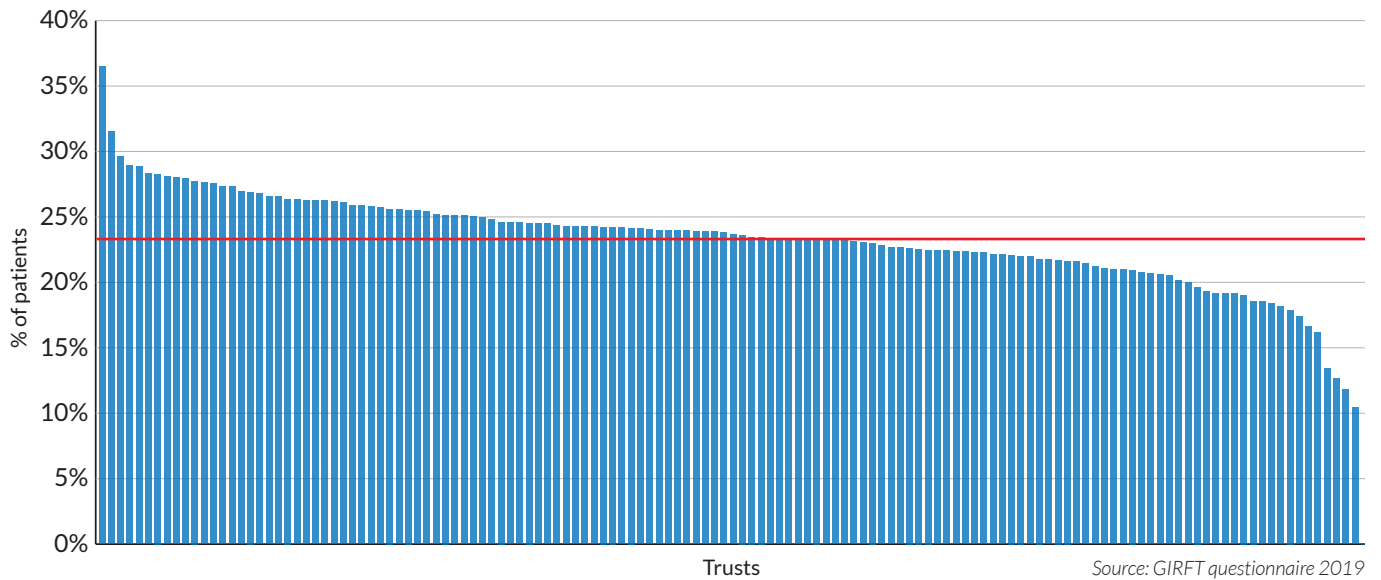
NICE CG106<sup>29</sup> covers the diagnosis and management of chronic HF in people aged 18 and over. The BCS also endorses the 2016 ESC guidelines on diagnosis and treatment of acute and chronic heart failure.<sup>30</sup> Most HF patients are elderly, with comorbidities, and the number of cases is increasing year on year. Many present in primary care, so ensuring that GPs are equipped to correctly identify them and refer them on as appropriate for further investigation and treatment is a significant challenge.

Another challenge in the implementation of the pathway is meeting the requirement that all inpatient HF patients be seen by a specialist during their stay as an inpatient and reviewed within two weeks of discharge. Currently there is significant variation in meeting these targets and this may be contributing to high rates of readmission – 23% nationally, as shown in **Figure 6**. In addition, there is significant variability of in-patient mortality within 30 days, as shown in **Figure 7**.

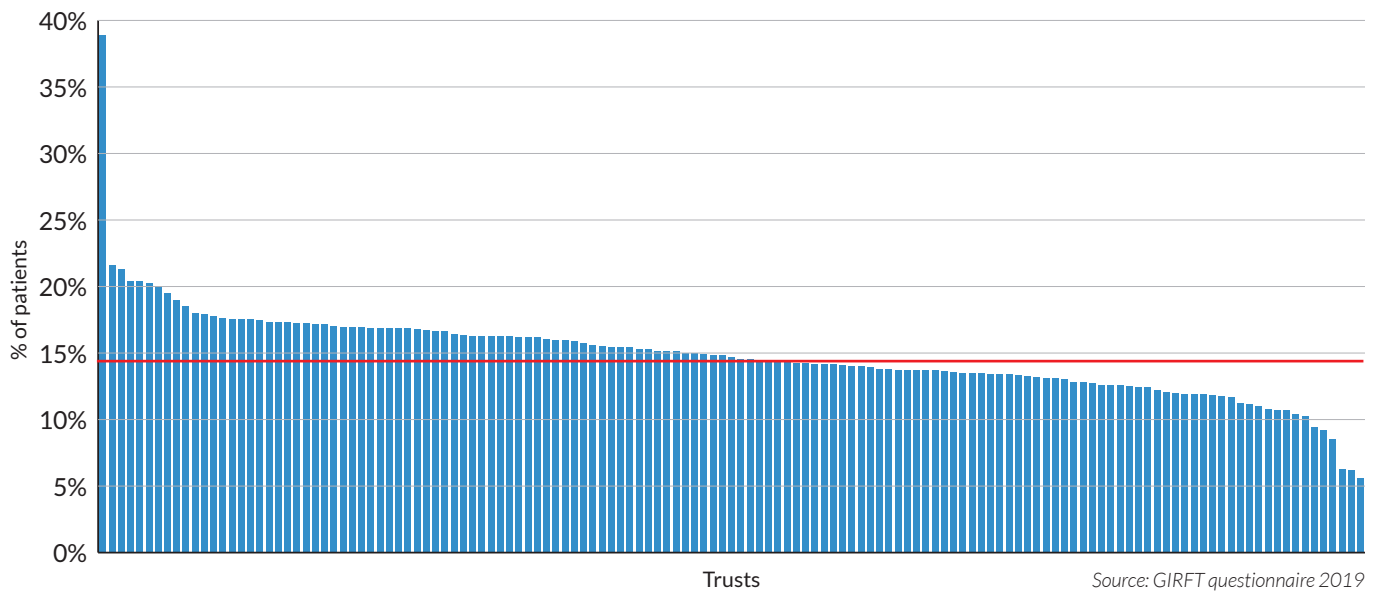
<sup>29</sup> [www.nice.org.uk/guidance/ng106](http://www.nice.org.uk/guidance/ng106)

<sup>30</sup> [www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure](http://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure)

**Figure 6: Percentage of HF patients readmitted to hospital within 30 days of discharge**



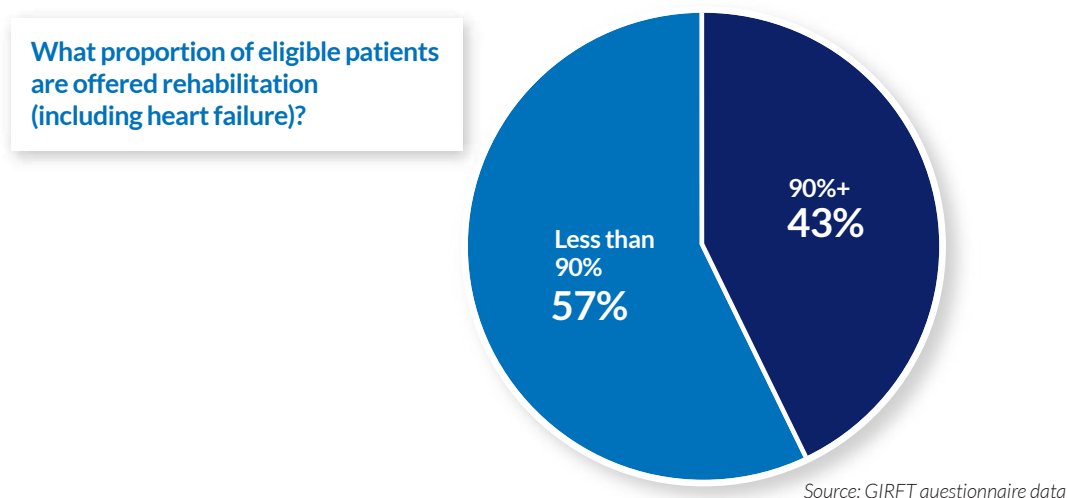
**Figure 7: Percentage of HF patients who died in hospital or during readmission within 30 days of discharge (April 2017–Mar 2019)**



In some centres HF patients are automatically identified to the heart team through NT-pro BNP or abnormal echocardiograms and this should be encouraged. Clinical review two weeks post-discharge by a specialist is required to assess response to treatment and for medication optimisation.

There is also variation in treatment of HF, in particular with regard to the proportion of eligible patients that are offered cardiac rehabilitation. According to the National Audit of Cardiac Rehabilitation<sup>31</sup> just over half of eligible patients currently take up cardiac rehabilitation. The results of our questionnaire show that fewer than half – 43% – of trusts state that they are offering rehabilitation services to at least 90% of eligible patients (see **Figure 8**).

**Figure 8: Percentage of eligible patients offered rehabilitation (107 respondents)**



As a result, too many HF patients are coming into secondary care, or being readmitted. Experience suggests that patients who receive cardiac rehabilitation and are followed up in the community within two weeks of discharge have better outcomes, including a lower chance of readmission and lower mortality rates.

Currently, many patients with HF with preserved ejection fraction (HFpEF) are not being seen in HF clinics, even though it is clear that they could benefit from this type of support. Instead, they are either returning to their GP or remaining in secondary care. This is simply a question of resource: currently, there are not enough specialist nurses to provide the support needed by these patients who are typically elderly and present with comorbidities (see *Workforce, rostering, rotas and job planning*, page 21).

The NHS Long Term Plan puts considerable emphasis on the importance of diagnosis in the community and rapid treatment with appropriate drugs, including intravenous diuretics in ambulatory care centres or in the community. Where patients present in secondary care and do not need ongoing specialist management, there is clear scope for them to be referred direct to a specialist nurse/ACP community HF clinic.

The development of a dedicated integrated HF service (spanning primary and secondary care) is key to reducing morbidity and mortality in this group of patients. To achieve this, services need to share management and governance structures, and staff should be able to move freely across care systems where possible, using a staff passport system. The service should be led by a consultant cardiologist with an interest in HF. All members of the combined community and secondary care MDT should come together at least once a month to discuss cases and for learning opportunities (see *Multidisciplinary teams*, page 53).

Specialist nurses/ACPs should be prescribing within their specialty to initiate and titrate medication. In addition, they should have access to community or ambulatory care settings to refer patients for IV diuretics in order to reduce readmission rates.

The average age of an HF patient in England is 83 years. Therefore, the management of these patients should also include professionals from palliative care and discussions regarding advanced care planning. Shared decision-making should take place with patients and families regarding their treatment.

<sup>31</sup> [www.bhf.org.uk/informationsupport/publications/statistics/national-audit-of-cardiac-rehabilitation-quality-and-outcomes-report-2018](http://www.bhf.org.uk/informationsupport/publications/statistics/national-audit-of-cardiac-rehabilitation-quality-and-outcomes-report-2018)

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## The valve disease pathway

Complex pathways in patients with heart valve disease may lead to long delays before the delivery of definitive treatment. The development of TAVI and of specialist mitral and aortic surgery has acted as a catalyst for the reorganisation of valve disease services. The British Heart Valve Society (BHVS) has published a framework for network-based care of heart valve disease<sup>32</sup> which emphasises the importance of an integrated approach across primary, secondary and tertiary care. Each network should have formal pathways agreed for the assessment, surveillance and referral of patients with valve disease.

To ensure that serial referrals are avoided and that all relevant treatment options are considered, each tertiary centre should have a single point of entry into a pathway for the assessment of patients referred for consideration of intervention for severe aortic valve disease and another for the assessment of severe mitral/tricuspid disease (see Multidisciplinary teams, page 53). Referrals should be made to the relevant heart team rather than to an individual cardiologist or surgeon.

Low volume interventions such as para-valvular leak closure should be concentrated in the hands of a limited number of experienced teams in specialist heart valve centres on a regional or supra-regional basis.

Endocarditis represents a particular challenge as patients may present in a decompensated state requiring rapid decision-making. Early surgery has been shown to improve outcomes in high risk patients. All networks should have a formal pathway for the rapid assessment and referral of suspected endocarditis patients to a surgical centre 7/7 to minimise delays in definitive treatment. This should include referral of non-emergency patients to a network endocarditis MDT via a single point of entry (see Multidisciplinary teams, page 53).

## The arrhythmia pathway

With an ageing population has come a significant rise in numbers of patients with AF – the most common sustained cardiac arrhythmia – and an accompanying increase in demand for services. Waiting times for EP appointments are among the highest we have seen during deep dives. The NHS Long Term Plan has stated that better identification and management of AF is a priority, and key to reducing risk of stroke. AF should be being routinely identified in the community, including through NHS Health Checks and opportunistic identification. The Long Term Plan envisages community pharmacists playing a key role here, by carrying out routine pulse checks.

In secondary care, patients identified with AF during an admission should be reviewed by a specialist nurse-led team under the supervision of a cardiologist and appropriate treatment commenced without delay. In some hospitals the stroke team contribute to this service by identifying AF in their patients and referring on.

Patients referred from primary care or requiring follow-up from an inpatient episode should be seen in an AF or arrhythmia clinic which should be specialist nurse/ACP- or physiologist-led, with consultant support. Staff leading these clinics should be prescribing. The direct current (DC) cardioversion service should also be specialist nurse/ACP- or physiologist-led and cardioversions should be performed outside the cath lab.

All networks must have pathways in place for referral of patients to specialist EP services. Maximal use should be made of virtual clinics where possible (see Data flow and referral across pathways, page 28) to avoid the need for patients to travel on multiple occasions to a specialist centre.

## Cardiac rehabilitation

Cardiac rehabilitation services are important for the recovery and wellbeing of coronary, valve, HF and cardiac surgical patients. These can be run from the community or hospital settings but must be integrated with teams working across the system. All eligible patients should be offered cardiac rehabilitation including the option of virtual rehabilitation at home.

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## CASE STUDY

### Delivering cardiac rehab services through a social enterprise model

#### University Hospitals Coventry & Warwickshire NHS Trust

Atrium Health Ltd is a social enterprise offering cardiac and pulmonary rehabilitation services, physical activity programmes and health promotion interventions. Set up in 2012 in response to rising demand, the service aims to offer seamless care for patients transitioning from acute care to long-term rehabilitation. Atrium employs five staff and operates with a number of service level agreements with the NHS and one direct contract with Coventry and Rugby CCG.

#### Community engagement and shared learning

The social enterprise approach offers flexibility in terms of delivery and the opportunity to pursue a range of funding streams. High levels of engagement with local communities, combined with the support of a large team of volunteers, has helped Atrium achieve the goal of providing truly empowering, locally relevant health services.

Close ties with researchers at Coventry University and the University of Warwick ensure that clinical interventions are at the cutting edge of innovation, e.g. in the use of High Intensity Interval Training (HIIT) with cardiac patients and early recruitment to rehabilitation. Learnings are shared widely with other clinical teams. The opportunity to participate in large-scale research programmes and to work with digital technology including apps has a positive impact on staff recruitment and retention.

#### Results

The centre receives about 2000 visits per month. Ease of access, the pleasant non-clinical environment, continuity of care and high levels of staff expertise means that many patients have been using the service for years. The centre operates without waiting lists or staff vacancies.

## Recommendations

Recommendation	Actions	Owners	Timescale
<b>7.</b> Networks should ensure that stable chest pain pathways are consistent with the recommendations of NICE CG95. Invasive angiography should, as a default, be performed as 'proceed' and must be performed in PCI-enabled cath lab by a PCI-trained operator.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>8.</b> Networks must ensure that all hospitals performing PCI have a 24/7 on-site rota for urgent return to the cath lab.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>9.</b> All designated PPCI centres must provide a 24/7/365 service and all PCI operators should, by default, participate in a PPCI on-call rota.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>10.</b> For the acute chest pain pathway, all networks should provide 7/7 ACS lists, accessible to all hospitals in the network. Coronary angiography 'proceed' should be performed within 72 hours for patients without high risk features, within 24 hours for high risk patients and within 2 hours for the highest risk patients. Where cardiac surgery is required, this should by default be undertaken within seven days of coronary angiography.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS.	For significant progress within a year of publication
<b>11.</b> In each hospital there should be a specialist consultant lead for HF, supported by a multidisciplinary HF team. Secondary care services should be integrated with community teams, with regular joint multidisciplinary meetings (MDMs).	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, British Society for Heart Failure (BSH), BHRS, BACPR.	For significant progress within a year of publication
<b>12.</b> All networks should ensure that rehabilitation is offered to all eligible patients, including those with HF.	<b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.	GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS, BSH, BHVS, BHRS, BACPR.	For significant progress within a year of publication



## Recommendations (continued)

Recommendation	Actions	Owners	Timescale
<p><b>13.</b>All networks should ensure pathways are in place for the diagnosis and management of patients with heart valve disease, including referral to specialist aortic and mitral/tricuspid teams at a tertiary centre.</p>	<p><b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.</p>	<p>GIRFT, NHSE/I, clinical networks, NICE, BCS, BCIS, BHVS.</p>	<p>For significant progress within a year of publication</p>
<p><b>14.</b>Arrhythmia pathways should incorporate rapid access clinics, which may be led by ACPs, specialist nurses or cardiac physiologists, for the assessment of palpitations and suspected or confirmed AF. Cardioversions should, by default, be nurse, physiologist or ACP led and undertaken outside the cath lab.</p>	<p><b>a</b> GIRFT will support NHSE/I regions and networks to audit current level of trust implementation of clinical pathways.</p>	<p>GIRFT, NHSE/I, clinical networks, NICE, BCS, BHRS, and BACPR.</p>	<p>For significant progress within a year of publication</p>

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## Improving access to imaging

Cardiac imaging has a vital role to play in improving early diagnosis in CVD, and as a tool to support clinical decision-making. The NHS Long Term Plan states that the number of patients referred for diagnostic tests has risen by 25% over the past five years, and that capacity is not keeping pace with this growth in demand.<sup>33</sup>

Imaging is used in both the diagnosis and ongoing treatment of patients with CVD. Currently, patient access to certain imaging modalities – in particular CT and CMR – varies considerably between trusts, as does reporting time. This is having a negative impact on patients, who face longer waiting times and delays in diagnosis.

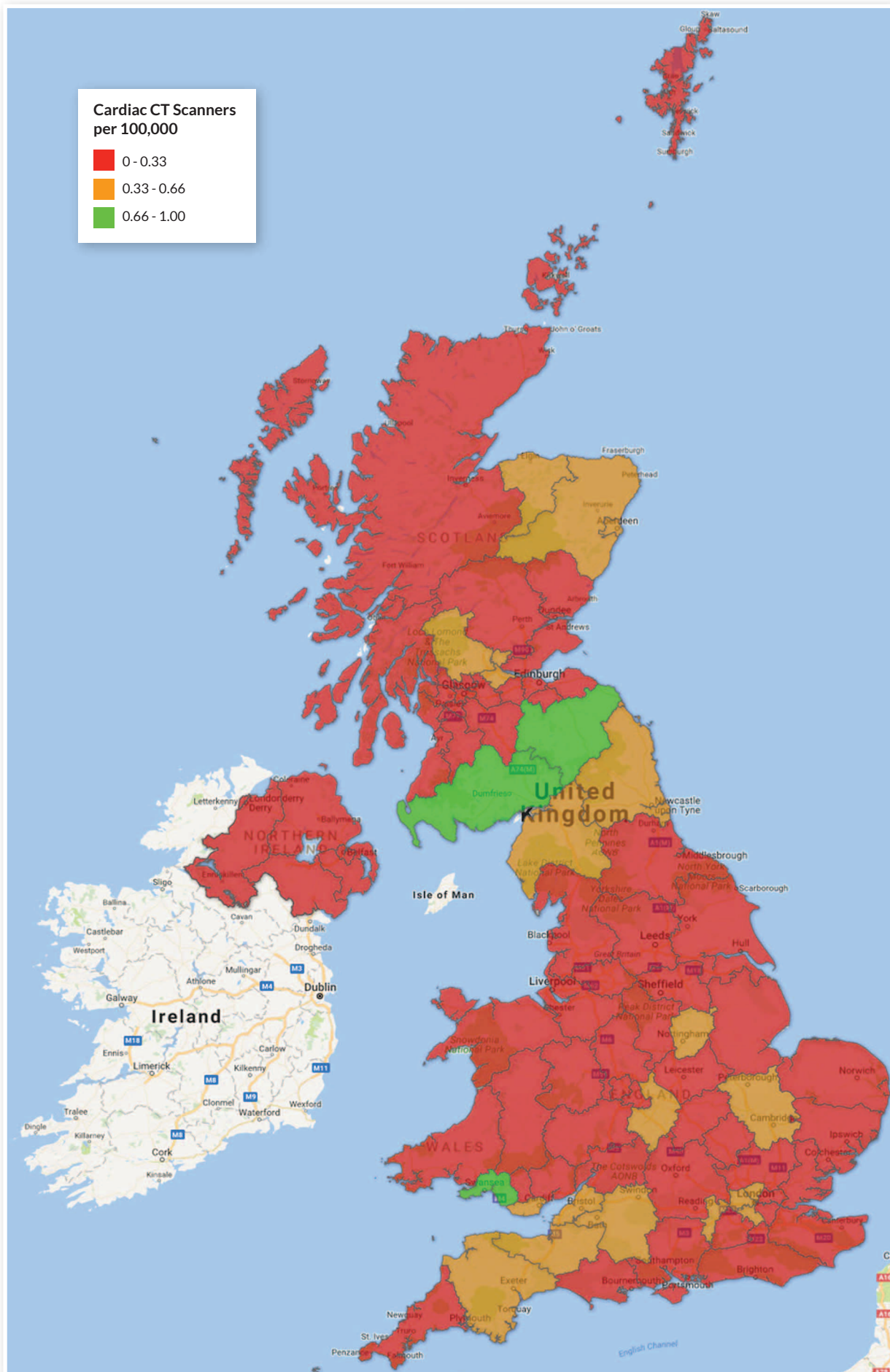
Lack of capital investment in the NHS estate over long a period of time has led to a shortage of equipment: the number of magnetic resonance imaging (MRI) scanners and CT scanners is among the lowest in the Organisation for Economic Co-operation and Development (OECD) countries at 7.2 MRI scanners per million of population and 9.5 CT scanners per 100,000 of the population (see **Figure 9**).<sup>34</sup>

In 2019 NHSE/I commissioned Professor Sir Mike Richards, former national clinical director for cancer and chief inspector for hospitals, to conduct a wide-ranging review of diagnostic services. As mentioned previously he has recommended an uplift in the number of radiologists and radiographers (see *Workforce, rostering, rotas and job planning*, page 21). His report also calls for an increase in capacity within diagnostic imaging, most notably a 100% increase in CT capacity. We welcome these recommendations, and our recommendations for cardiac imaging align fully with them.

<sup>33</sup> [www.sor.org/sites/default/files/document-versions/diagnostic\\_workforce\\_census\\_2018.pdf](http://www.sor.org/sites/default/files/document-versions/diagnostic_workforce_census_2018.pdf)

<sup>34</sup> [www.oecd-ilibrary.org/docserver/health\\_glance-2017-61-en.pdf?expires=1578733731&id=id&accname=guest&checksum=3C107BF9BD2D75BC3199A79419F49097](http://www.oecd-ilibrary.org/docserver/health_glance-2017-61-en.pdf?expires=1578733731&id=id&accname=guest&checksum=3C107BF9BD2D75BC3199A79419F49097)

Figure 9: Heat map of CTCA-capable scanners in the UK



Source: BMJ, Heart Online First<sup>35</sup>

<sup>35</sup> <https://heart.bmj.com/content/heartjnl/early/2017/11/14/heartjnl-2017-311846.full.pdf>

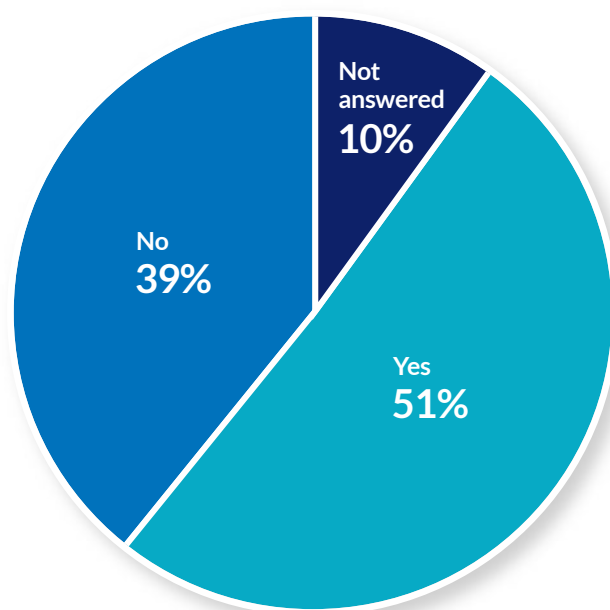
The requirements for imaging delivery within a network and relevant workforce shortages have been summarised above (see *Managed clinical networks*, page 18 and *Workforce, rostering, rotas and job planning*, page 21). Network delivery of cardiac imaging will make the most efficient use of available facilities, minimise duplication and improve equity of access. It is also in line with the recommendations set out in the NHSE/I proposal to implement collaborative imaging networks across England.<sup>36</sup>

## Echocardiography

Networks should ensure that all hospitals with an acute medical take admitting acute cardiology patients can provide 24/7 emergency echocardiography. The national shortage of accredited echocardiographers has made this very difficult to achieve and so the model has to change. All hospitals should ensure there is a rota to provide emergency echo cover to at least BSE Level 1.<sup>37</sup> This should be linked to network provision for the immediate remote expert review of scans 24/7. This will require the facility for secure image sharing and a network on call rota. Digital solutions may help in the future. Urgent TOE must also be available on a network basis 7/7.

Echocardiography services should be provided seven days per week to facilitate patient flows and to maximise throughput. Currently, only just over half (51%) of trusts are doing so, as shown in **Figure 10**.

**Figure 10: Percentage of trusts providing 7/7 echo on site (107 respondents)**



Source: GIRFT questionnaire data

Achieving this target will require a national programme to expand the echocardiography workforce (see *Workforce, rostering, rotas and job planning*, page 21) and innovative organisation of the existing workforce across networks using 'staff passporting' to support provision of a seven-day service.

Stress echocardiography, both pharmacological and exercise, should be available on a network basis and can form part of the extended role for cardiac physiologists. All services should meet BSE accreditation requirements.<sup>38</sup>

TOE should be available on a network basis for both inpatients and outpatients, and delivered by trained operators performing at least 75 procedures a year in accordance with BSE guidance. In addition, each network should provide an urgent TOE service, with trained operators supported by a cardiac physiologist or nurse, on a rota, 7/7. This may require transfer of the patient to a hospital with the appropriate equipment. Staff passports may be required to deliver this.

<sup>36</sup> <https://improvement.nhs.uk/resources/transforming-imaging-services-in-england-a-national-strategy-for-imaging-networks/>

<sup>37</sup> [www.bsecho.org/Public/Accreditation/Personal-accreditation/Level-1/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/Level-1-accreditation.aspx?hkey=6099b4b8-5cb9-4425-a201-1874aadcb73f](http://www.bsecho.org/Public/Accreditation/Personal-accreditation/Level-1/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/Level-1-accreditation.aspx?hkey=6099b4b8-5cb9-4425-a201-1874aadcb73f)

<sup>38</sup> [www.bsecho.org/Public/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/Stress-echocardiography-accreditation.aspx](http://www.bsecho.org/Public/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/Stress-echocardiography-accreditation.aspx)

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## Cardiac computerised tomography (CT)

All hospitals require access to cardiac CT, including CTCA, either on site or within a network. CTCA is the default first investigation for all but high risk patients on the stable chest pathway and should be available to all chest pain clinics within six weeks for routine referrals. All sites delivering CTCA should meet British Society of Cardiovascular Imaging (BSCI) requirements for volume and accreditation for all reporting cardiologists and radiologists.<sup>39</sup> Within a network CTCA should be available on a 7/7 basis.

CT-FFR adds functional imaging to the anatomical information provided by CTCA and reduces the need for secondary investigations. CT-FFR needs to be more widely available and should be planned as part of the provision of CTCA within all networks.

CTCA is best delivered by teams performing high volumes of scans either in dedicated sessions or on a dedicated scanner. Heart rate control is key. Where required, beta blockers should either be prescribed and taken in advance or prescribed and administered by ACPs or radiographers trained to do so.

CTCA can be independently reported by either cardiologists or radiologists with appropriate training and accreditation at a minimum of BSCI level 2 (or equivalent).<sup>40</sup> Local arrangements must be in place to ensure appropriate review of any concerning extra-cardiac findings.

## Cardiac magnetic resonance imaging (CMR)

CMR imaging is an important investigation for patients with ischaemic heart disease, HF and cardiomyopathy, and for some patients with valve disease. It is delivered most efficiently on high volume dedicated cardiac scanners working 7/7 and should be provided by teams meeting the standards set by the British Society of Cardiovascular Magnetic Resonance (BSCMR).<sup>41</sup>

CMR scans can be independently reported by appropriately trained cardiologists or radiologists with at least BSCMR/European Association of Cardiovascular Imaging (EACVI) level 2 accreditation (equivalent training and ongoing experience).<sup>42</sup>

## Nuclear cardiology

Demand for functional imaging, including MPS, on chest pain pathways will change with the growth of CTCA but it remains a useful test for the investigation of chest pain in those patients not suitable for other imaging modalities.

PET-CT for the investigation of myocardial viability, cardiac sarcoidosis and device-related infect and “Bone” scintigraphy for cardiac amyloidosis should be available on a network basis.

<sup>39</sup> <https://bsci.org.uk/standards-and-guidelines/ct-coronary-angiography-service-specification/>

<sup>40</sup> <https://bsci.org.uk>

<sup>41</sup> <https://bsci.org.uk/standards-and-guidelines/bscmr-bsci-standards-document/>

<sup>42</sup> *ibid.*

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## CASE STUDY

### Seven-day cardiac physiology services: a tertiary centre model

#### Manchester University NHS Foundation Trust

The trust has established seven-day cardiac physiology services, in line with recommendations set out in the 2015 Strategic Review of Cardiac Physiology Services in England. The focus is on three key areas of service:

- echocardiography – both inpatients and outpatients;
- cardiac device management – covering unscheduled remote downloads and any on-the-day requests, including implants;
- and cath lab intervention – elective lists and primary PCI.

The service went 'live' in April 2018 following a staff consultation period. The focus was very much on encouraging staff to recognise the benefits to patients and to get involved in the process of designing a service that worked for the whole team.

#### Implementing the changes

The department was split into teams consisting of: four physiologists; one pacing specialist; one lab specialist; two echo specialists; and one member of the admin team to cover reception duties. Two full-day outpatient and two full-day inpatient echo lists were moved from week days into the weekend and weekend daytime catheter lab on-call cover was removed. Staff work a full weekend in return for their preferred choice of lieu days the following week – most commonly either Monday/Tuesday or Thursday/Friday.

#### Results

Improvements in patient care were apparent from the start; weekend echocardiograms within the first month identified a large pulmonary embolus, a post-infarct ventricular septal defect and infective endocarditis; and the pacing team detected sustained ventricular tachycardia on an unscheduled download. All of this had an immediate impact on treatment pathways and also reduced the pressure on the cardiology specialist registrar on-call.

Inpatient echo waiting times were reduced from an average of three days to an average of 1.3 days, helping the trust to achieve an inpatient revascularisation target of five days. For patients attending for outpatient elective echocardiograms, benefits include: less traffic and easier parking; no need to take time off work or arrange childcare; and for some of the elderly patients, being able to have a family member bring them to their appointment.

Staff soon identified the positive aspects of the new arrangements. For example, there is no longer a big pile of inpatient referrals waiting on a Monday morning; the smaller weekend team allows for a calmer and quieter working environment and having lieu days in the week works well when planning annual leave. Staff were also encouraged by the obvious benefits to patients, and felt they were making a worthwhile contribution to patient care.

## Recommendations

Recommendation	Actions	Owners	Timescale
<b>15.</b> Networks should ensure that all hospitals admitting acute cardiology patients have 24/7 access to emergency echo including the facility for immediate remote expert review as required. Elective/urgent echo should be routinely undertaken 7/7. Urgent TOE should be available 7/7 and delivered on a network basis).	<b>a</b> GIRFT to work with NHSE/I, BSE and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSE.	For significant progress within a year of publication
<b>16.</b> Networks should ensure that all hospitals have ready access either on site or at network level to CTCA including CT-FFR, with all of the images reported by appropriately trained cardiologists and/or radiologists.	<b>a</b> GIRFT to work with NHSE/I and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSCI.	For significant progress within a year of publication
<b>17.</b> Networks should ensure that all hospitals have ready access on a network basis to dedicated sessions of CMR, including stress CMR, with all of the images reported by appropriately trained cardiologists and/or radiologists.	<b>a</b> GIRFT to work with NHSE/I, BSCI, BSCMR and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, BSCI, BSCMR.	For significant progress within a year of publication
<b>18.</b> Nuclear cardiology services, including PET and PET-CT, should be available at a network level.	<b>a</b> GIRFT to work with NHSE/I and cardiac networks on creating new models for cardiac imaging, ensuring timely investigations using the most appropriate modalities for patients.	NHSE/I, BCS, British Nuclear Cardiology Society (BNCS)	For significant progress within a year of publication

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## Streamlining cath lab provision and services

### Cath lab utilisation

The catheter laboratory or 'cath lab' is really a misnomer for cardiac imaging and procedure facilities that provide invasive procedures under local and general anaesthesia. These include coronary angiography/coronary intervention, CIED implantation, invasive EP and structural intervention. Some cath labs have a larger footprint, also functioning as co-existing operating suites, in which case they are known as 'hybrid cath labs'.

The role of the cath lab has changed rapidly with the development of CTCA and the move to default listing of angiography 'proceed' for both stable and acute chest pain pathways. There has been a marked reduction in the need for standalone diagnostic coronary angiography and there is no longer a requirement for cath labs that perform angiography without PCI. The future of cath labs that are not performing PCI should be reviewed on a network basis as there may be opportunities to develop network pacing and device hubs by redirecting patient flows away from tertiary centres, subject to minimum volume requirements being met.

The cath lab should be run by a co-ordinator using a scheduler that allows optimal flow through the lab, particularly for non-elective work. There should be dedicated ring-fenced day case beds and/or a radial lounge. At the start of the day, each cath lab team (all present) should have a 'huddle' to introduce each other, discuss expected activity and ensure all equipment is working. A WHO checklist<sup>43</sup> must be undertaken with the whole team present before commencing each case. After a difficult case and at the end of the day there should be a team debrief to look at what went well and what could have been done differently and better. There should be a full debrief for all deaths in the cath lab.

Elective patients should have been virtually pre-admitted where possible and digital solutions are evolving for virtual consent (e.g. Concentric). Non-elective patients should preferably be seen by the relevant ACP/specialist nurse on arrival, consented and pre-medicated.

Patients should be ready well in advance of their allocated procedure time such that if a preceding case does not proceed, another case can be sent for. Provided compliance with social distancing guidance can be followed, patients should be brought to a 'holding bay' in the cath lab in advance of the procedure for check-in and to optimise turnaround time and cath lab utilisation.

### Coronary angiography and intervention

Networks should ensure that all diagnostic angiography is carried out in PCI-enabled labs to ensure that adjunctive diagnostic technologies such as IVUS, OCT and FFR are available as required without the need for a repeat procedure.

All coronary cath labs should have access to mechanical support, i.e. IABP, with appropriate protocols in place for escalation to further support and to surgery. Procedures should be undertaken via the radial approach by default.

Where there is a suite of cath labs, at least one should be designated as a 'hot lab' to take non-elective and acute cases (NSTEMI, rapid NSTEMI and PPCI) 24/7. Cath labs can be designated for elective cases but should flex if they have capacity to take on non-elective emergent work when the hot lab is busy in order to optimise patient flow and cath lab utilisation. The network should ensure that ACS lists are undertaken 7/7 and are accessible to all hospitals to maintain patient flow and reduce unnecessary length of stay. At weekends, provision could be at network level.

For non-elective patients where a revascularisation discussion is required, a same day referral should be made to a revascularisation MDM run at a network level (see Multidisciplinary teams, page 52). Emergency cases, such as PPCI, that require a surgical opinion should be discussed directly with the on-call surgeon.

Elective patients and most NSTEMI (aside from PPCI), where appropriate, should be considered for same day discharge. This should be ACP/specialist nurse-led, if possible, with referral to the local cardiac rehabilitation service as appropriate.

### Pacing and devices

All hospitals implanting cardiac rhythm management (CRM) devices should ensure that their service complies fully with current British Heart Rhythm Society (BHRS) guidance.<sup>44</sup> Recommended minimum activity levels for individual operators are set out in **Figure 11**.

<sup>43</sup> [https://apps.who.int/iris/bitstream/handle/10665/70080/WHO\\_IER\\_PSP\\_2008.07\\_eng.pdf;jsessionid=6DA81A997F7593EE781BF523161E9A56?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/70080/WHO_IER_PSP_2008.07_eng.pdf;jsessionid=6DA81A997F7593EE781BF523161E9A56?sequence=1)

<sup>44</sup> <https://bhrs.com/wp-content/uploads/2019/10/BHRS-standards-January-2018-Implantation-and-Follow-Up-of-CRM-Devices-in-Adults.pdf>



**Figure 11: Recommended device implant numbers**

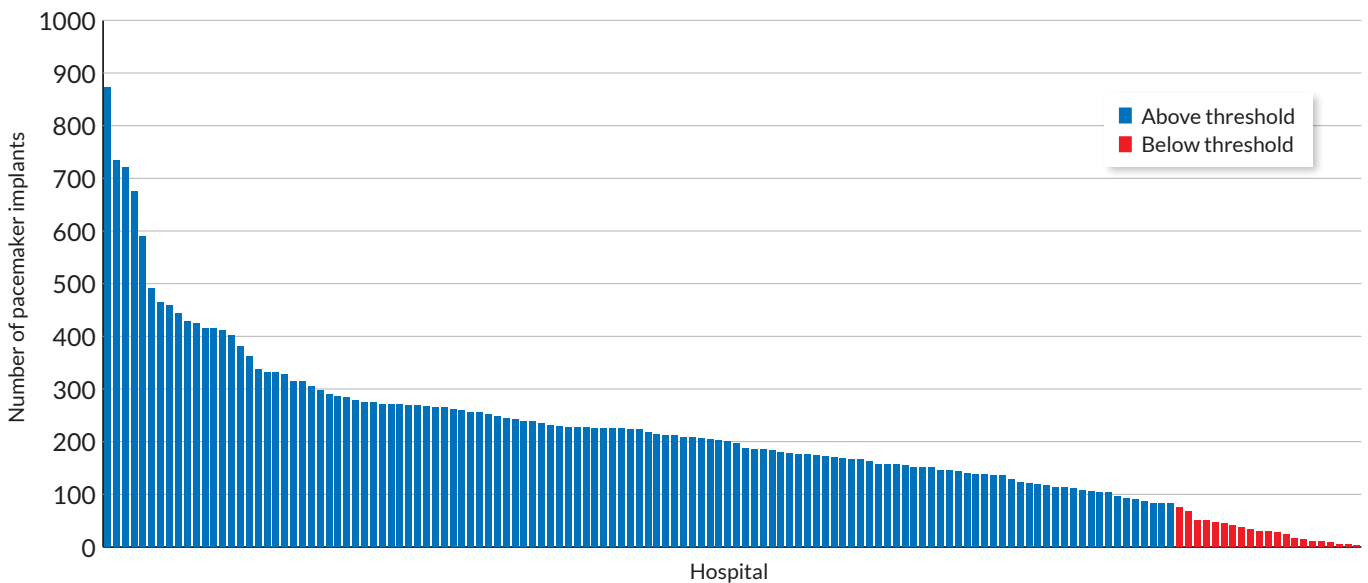
<b>Pacemaker only implanter</b>	Minimum of 35 new implants per year
<b>Complex device implanter</b>	
<b>Non-CRT implanter</b>	Minimum of 60 device implants per year of which 30 must be new ICD implants or upgrades
<b>CRT implanter</b>	60 device implants per year of which 30 must be complex devices and at least 20 should be new CRT-D/P implants or upgrades

NB. An implanter (operator) is defined as a clinician who is either the main individual performing the case or is present throughout the procedure and plays an active part in the procedure. This does not include merely observing the case or offering advice from within or outside the operating room.

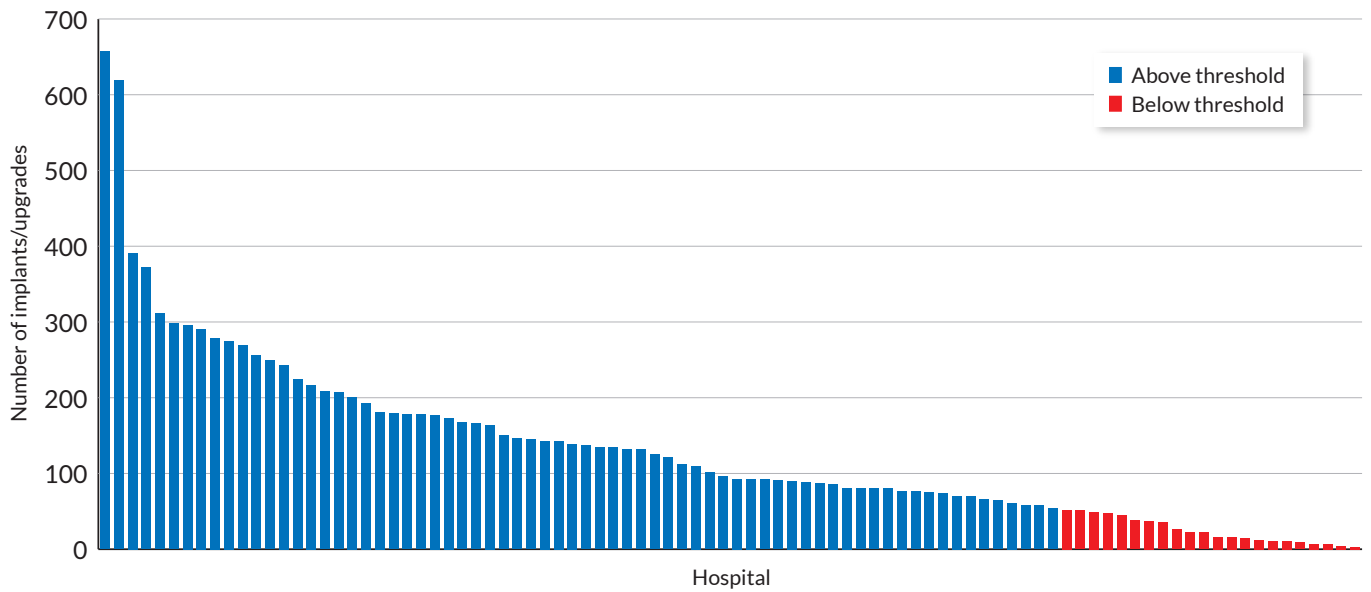
Source: BHRS

For each individual hospital implanting simple devices (note these volumes refer to individual hospitals, not to multi-site trusts) there should be a minimum of two implanting cardiologists together implanting a minimum of 80 new implants per year. Where complex devices are implanted, each hospital should implant at least 60 per year. Current actual numbers are shown in **Figure 12** and **Figure 13**.

**Figure 12: Number of new bradycardia pacemaker implants reported, by hospital (2018/19)**



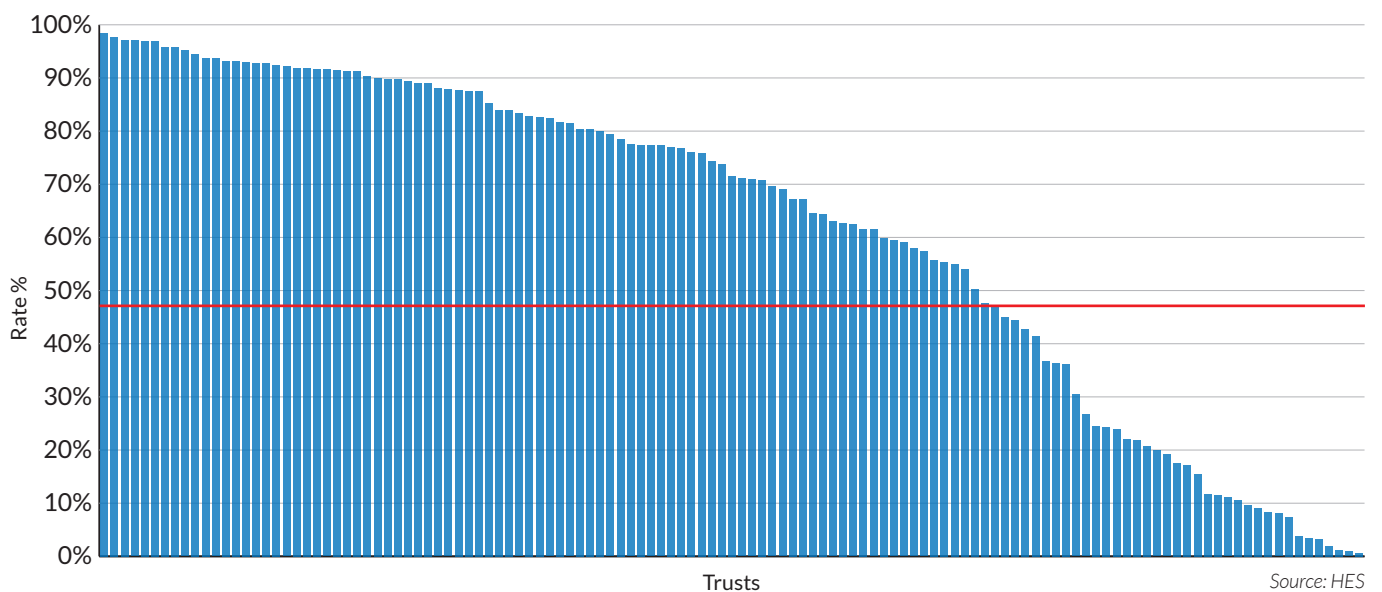
**Figure 13: Number of complex implants/upgrades reported, by hospital (2018/19)**



Day case implant under local anaesthetic (LA) with sedation should be the default for all elective CIEDs, accepting that there are some specific indications for implant under general anaesthetic (GA). Insertable cardiac monitors should be implanted by physiologists or ACPs/specialist nurses, as part of an extended role, in a suitable non-cath lab environment. For both simple and complex CIEDs, remote follow-up should be the norm.

Currently, as **Figure 14** shows, there is very significant variation in day case rates for CRM procedures, from 1% to 98%, with a national average rate of 47%.

**Figure 14: Day case rate for CRM operations (Apr 2017–Mar 2019)**



Source: HES

Lead extractions should be undertaken according to current guidelines.<sup>45</sup> Medium and high risk extractions (as defined in the guidelines) should only be carried out in surgical centres where appropriate back up is readily available.

Cardioversions should not be routinely undertaken in a cath lab. These should be ACP/ specialist nurse- or physiologist-led and while still commonly undertaken under GA, some are being undertaken under conscious sedation under agreed local protocols.

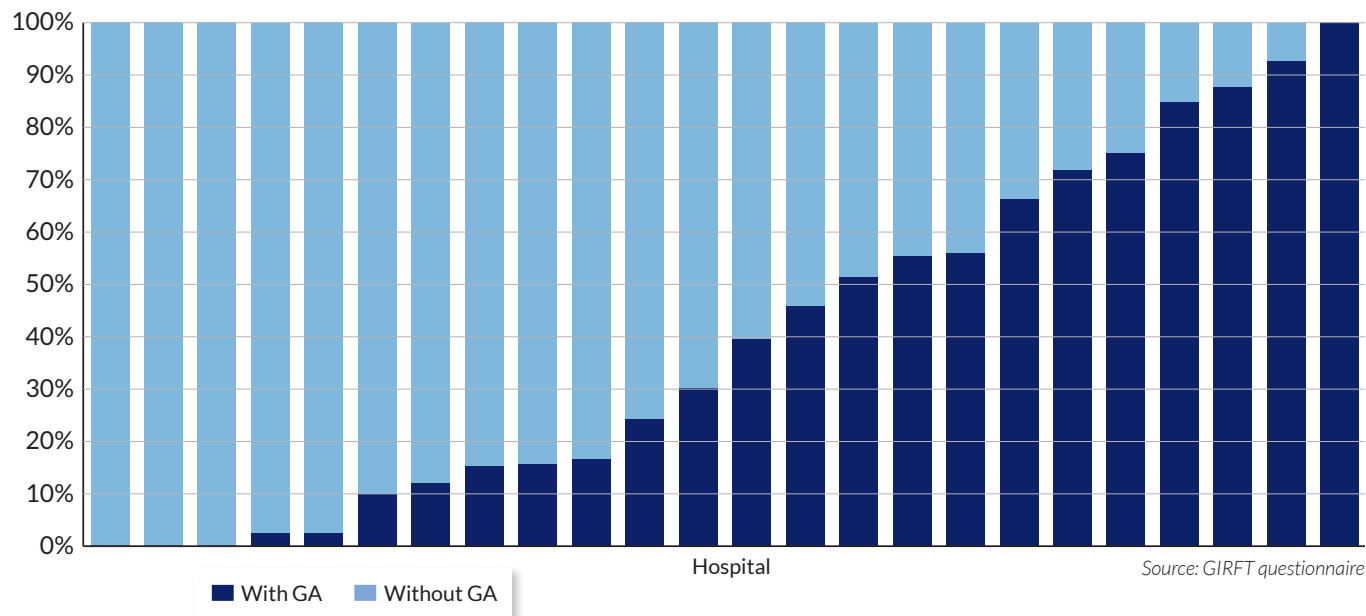
## Ablation

All hospitals (individual sites) should meet BHRS standards for delivery of ablation services.<sup>46</sup> There should be a minimum of two active interventional cardiac electrophysiologists per centres (one of whom should ideally be certified by the BHRS, European Heart Rhythm Association (EHRA) or the International Board of Heart Rhythm Examiners (IBHRE). Formal support from larger centres is encouraged for centres establishing de novo invasive EP services. Complex ablation should not be performed in single operator centres.

All interventional electrophysiologists should perform at least 50 catheter ablation procedures per year as an ‘operator’. For those undertaking complex ablation, a minimum of 25 of these procedures should be complex; however, 50 is desirable. Those undertaking fewer than 25 AF ablations per year have a demonstrably higher complication rate. An operator performing more than 50 complex ablations per year will be deemed to have met the minimum requirements for both simple and complex ablations.

Hospitals should work towards maximising cath lab resource utilisation. There is currently substantial variation in the proportion of AF ablation performed under GA, from less than 10% to 100% (see **Figure 15**). GA is resource intensive and a major contributor to turnaround times, especially as induction and recovery often have to take place within the cath lab itself. Many AF ablations, especially for first time cases, can be performed safely with conscious sedation, and centres should explore whether this will improve resource utilisation without compromising patient experience.

**Figure 15: GA vs sedation rates for EP/ablation**



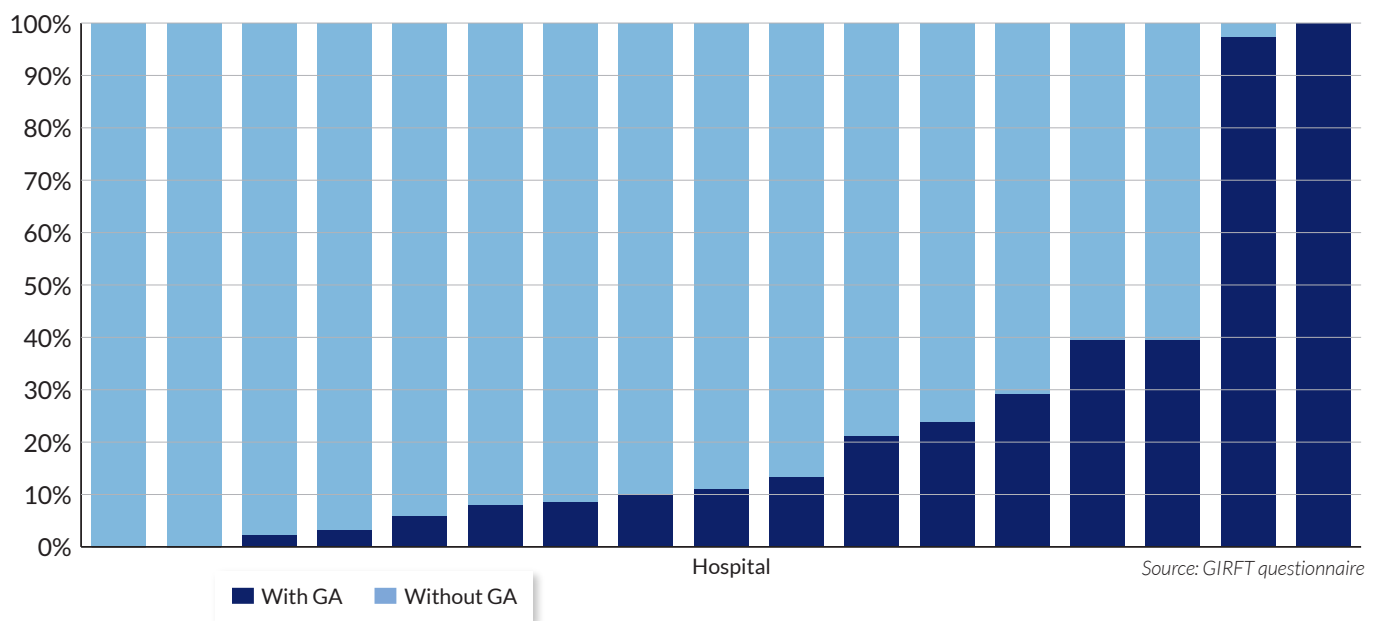
<sup>45</sup> <https://www.heartrhythmalliance.org/files/files/Standards%20for%20lead%20extraction%20May%202019.pdf>

<sup>46</sup> <https://bhhs.com/wp-content/uploads/2020/04/British-Heart-Rhythm-Society-Standards-Ablation-2020-1.pdf>

## Transcatheter aortic valve replacement (TAVI)

There is variation in the productivity of TAVI services with full day lists varying from two to four or even five cases. This reflects local resourcing including the availability of ring-fenced beds but there is also variability in the use of GA (see **Figure 16**) and, to a lesser extent, in choice of access route. Some units are performing almost all TAVI procedures under conscious sedation via the transfemoral route and this should be the default, allowing for four straightforward cases on a full day list. Uncomplicated patients should routinely be returned to a monitored ward bed after a short period of observation in a recovery area (one to two hours) rather than requiring a CCU admission. Most uncomplicated patients should be fit for discharge within 72 hours and maybe sooner, social circumstances permitting.

**Figure 16: GA vs sedation rates for TAVI**



There is also variability in the use of balloon aortic valvuloplasty (BAV) as a standalone procedure around a mean of 14% of TAVI volumes that cannot be explained by demographic variation. In some instances, this reflects long waiting lists but feedback from deep dives suggest that the primary driver is operator preference. BAV should be a niche procedure used for palliative treatment where the heart team feels that TAVI is not an option.

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## Multidisciplinary teams

MDTs and MDMs are an essential part of cardiology treatment pathways and a core function of the heart team. MDMs are evolving rapidly with the development of technology to support multi-site virtual meetings. Guidance is currently being updated by a joint Working Group of the BCS, BCIS, the Society for Cardiothoracic Surgery (SCTS), and the Association for Cardiac Anaesthesia and Critical Care (ACTACC).

The role of the MDM is to provide a consensus view as to which treatment strategy is optimal for an individual, based on the available evidence as well as the collective experience of the individual specialists and their service in general and taking patient preference into account.

To be effective, MDMs must be quorate, with appropriate attendees (see table below), and equipped to discuss all aspects of care. By default, MDMs should be virtual, enabling equal access for referring centres. There must be a chair, a co-ordinator (see boxout below) and a person responsible for taking minutes (this may be part of the co-ordinator's role). The GIRFT report for cardiothoracic surgery<sup>47</sup> has already indicated that visits to referring hospitals by a cardiac surgeon do not constitute an MDM.

Currently, there is significant variation in access to regular, quorate cardiovascular MDMs. The main reasons for this are lack of access to appropriate technology and lack of availability of MDT members. In most cases MDMs are occurring weekly, but for inpatients decisions need to be made on a more frequent, preferably daily, basis.

Core members should be job planned to attend, and there should be scope for bringing in additional clinical opinion as needed. A clinician who is familiar with the patient and their needs and preferences should present their case. If this is a trainee, the responsible consultant must be present to agree any decisions. A standard pro forma should include essential information about the patient and all appropriate investigations and imaging should be available for review at the meeting. Patients should not be presented until all relevant information is available.

An individual name should be attached to each recommendation, and that person held accountable for taking action to avoid unnecessary delays. Digital systems for the tracking of patient flows through MDMs to treatment are available.

### The role of the MDM co-ordinator

All MDMs need effective co-ordination and administrative support to operate efficiently. Every MDM should have a dedicated co-ordinator, whose role should include:

- scheduling dates and times for MDMs well in advance;
- ensuring that meetings are quorate;
- ensuring all relevant patient information and imaging is available to present;
- ensuring that virtual technology is accessible;
- scheduling virtual involvement of referring consultants;
- ensuring that all attendees are registered for each patient discussion in the minutes and minutes taken accurately reflect the discussion;
- providing formal feedback to referring consultant/clinical team;
- scheduling procedures with the relevant team;
- acting as liaison point regarding any changes in the patient's condition and/or rescheduling of procedures; and
- liaising with relevant teams to ensure the patient pathway is followed through to completion.

<sup>47</sup> <https://gettingitrightfirsttime.co.uk/wp-content/uploads/2018/04/GIRFT-Cardiothoracic-Report-1.pdf>

Involving the patient and/or carer in the MDM is currently not routine but there must be mechanisms in place to ensure that a patient's wishes can be taken into consideration during the MDM and that patients are informed of any recommendations arising from the meeting. The adoption of virtual MDMs may allow patient/carers participation, where relevant, in future.<sup>48</sup>

The following sets out some requirements for specialty-specific MDMs.

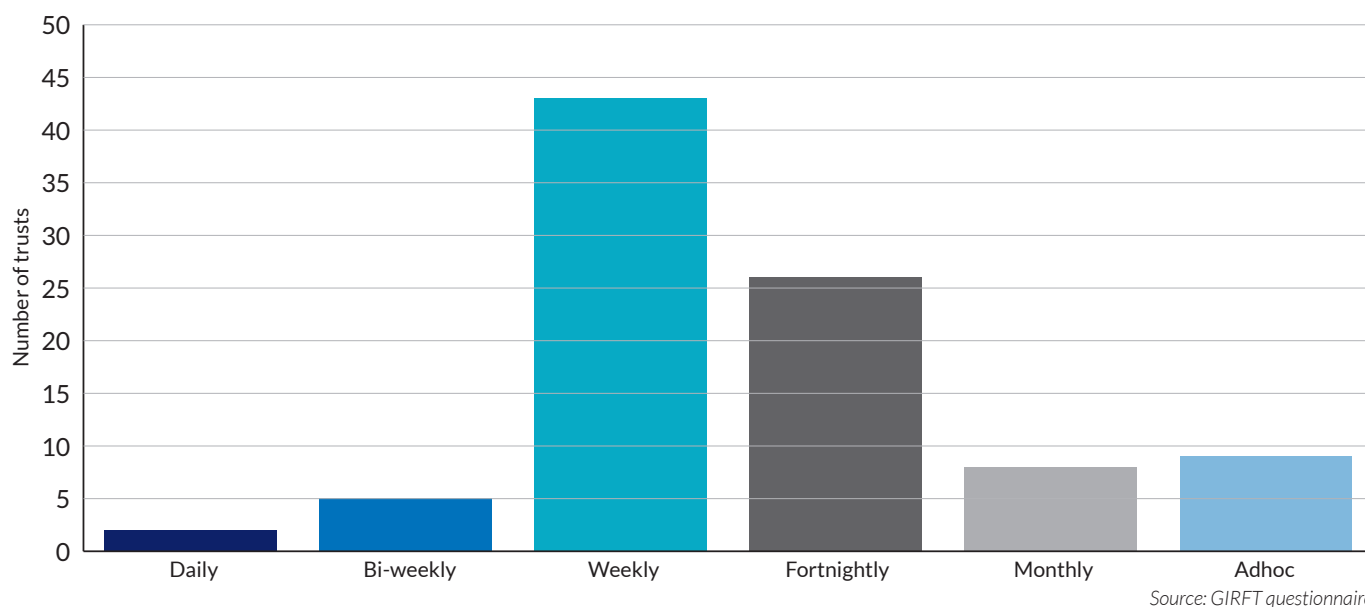
## The revascularisation MDM

Treatment options for coronary revascularisation vary from medical therapy, PCI and stenting to coronary artery bypass graft (CABG) surgery. Customised tools such as Syntax II41 combine anatomical and clinical variables to provide individual prognostic risk assessment. Together with published guidelines and patient preference, this will guide the decision between PCI, CABG and medical therapy. Shared decision-making has an important role to play here as well.

Elective and ACS cases undergoing diagnostic angiography, in which revascularisation is considered and in which evidence base and Syntax II score suggest surgery as a treatment option, should be discussed at the MDM. This applies particularly to cases in which the coronary anatomy might have prognostic significance (i.e. left main stem (LMS) or multi-vessel disease in which proximal left anterior descending artery (LAD) obstruction is a component). It is important that patients are fully informed of options and associated risks so they can make an informed decision.

The revascularisation MDM should be run from the surgical centre(s) at a defined time, ideally on a daily basis. It must be accessible to referring clinicians from around the network. Currently, there is significant variation in the frequency with which revascularisation MDMs are held, as shown in **Figure 17**.

**Figure 17: Frequency with which formal MDMs are held to assess revascularisation decisions (93 respondents)**



Following the MDM, recommendations should be shared with the patient for shared decision-making and a plan agreed which – in cases involving inpatient surgery – should include the date of the operation and the name of the operator. If the assigned surgeon is not present at the meeting, they should be contacted regarding the case. If necessary, inpatients should be transferred the day before the planned operation day. If there are doubts about their candidacy for inpatient surgery, the patient may be transferred for surgical assessment on a treat and return basis.

<sup>48</sup> <https://academic.oup.com/ejcts/article/48/4/524/2464969>

## The endocarditis MDM

Every tertiary cardiothoracic centre should have an endocarditis service with a single point of entry to an MDM, so that patients from around the network can be reviewed. The endocarditis MDT should include microbiologists and/or infectious disease specialists, cardiologists and at least one cardiac surgeon. Currently there is variable provision in tertiary centres with a lack of clear referral pathways and consequent delays in decision-making and definitive treatment. This needs to be addressed so that these patients are reviewed on a prompt and regular basis to agree appropriate treatment/timing of surgery.

The network should ensure there is a defined referral pathway for urgent/emergency patients that provides rapid decision-making and urgent surgery as required.

## The heart failure/device MDM

We support the development of integrated HF services across community and secondary care. Currently, some community HF services are operating without any cardiology oversight. Joint MDMs are an effective way of addressing this gap.<sup>49</sup>

MDMs should be held in every HF service to discuss any patients where management is complex, e.g. because of a failure to respond to treatment, along with eligibility for device implantation. These could be held locally or on a network basis. Each network should have a pathway of referral to an advanced heart failure service or potential candidates for heart transplantation and mechanical circulatory support (MCS).

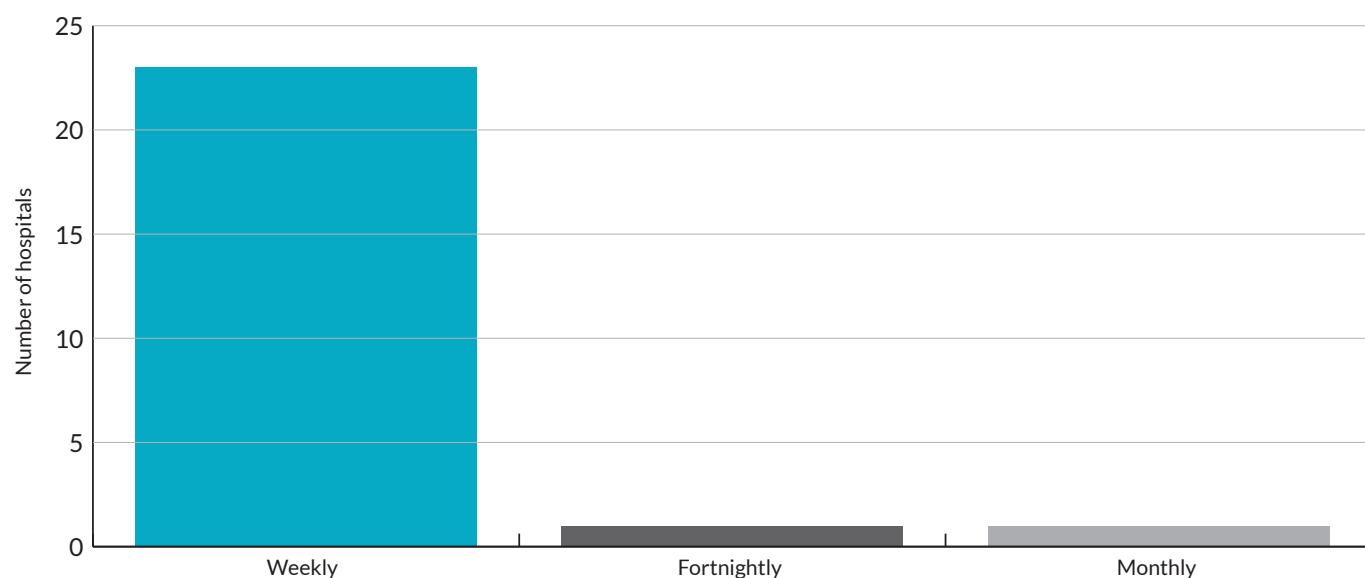
## Valve disease MDM

All valve patients should come through a single disease specific portal (aortic or mitral/tricuspid) with a rapid triage protocol to direct obvious cases to surgery/TAVI etc. and with a focus on the more complex cases/less obvious decisions at the MDM.

## The aortic MDM

Each network should have an aortic MDM for consideration of patients who are candidates for surgical AVR or TAVI. Such meetings should be held at least weekly, as is currently occurring in a significant majority of trusts that responded to the questionnaire (see **Figure 18**). There should be a single point of referral for patients with severe aortic valve disease to avoid parallel pathways that create potential for cross referral and delay in decision-making.

**Figure 18: Frequency of TAVI multidisciplinary meetings (25 respondents)**



Source: GIRFT questionnaire

## The mitral/tricuspid MDM

Each network should have a mitral/tricuspid MDM for consideration of patients who are candidates for mitral or and/or tricuspid surgery and, as technology evolves, for percutaneous interventions.

## Structural MDMs

All other structural interventions, such as patent foramen ovale (PFO) closure, should be discussed at a relevant MDM. Low volume, niche procedures such as paravalvular leak closure and post-myocardial infarction ventricular septal defect (post-MI VSD) closure should all be discussed at an appropriate MDM. This may be supra-regional.

## Inherited cardiac condition and adult congenital heart disease MDM

ICCs make up a relatively small proportion of the workload of most cardiologists and patients may present with complex problems requiring multidisciplinary input. Each network should have a formal pathway to access an ICC MDM for appropriate patients. This MDM may not necessarily be based within the patients network. Similar considerations apply to ACHD and each network should have clear pathways for referral to a specialist ACHD MDM.

## Network MDMs: a summary of frequency and attendance

MDM	Core attendees	Optional attendees	How often should meetings be held?
Revascularisation	MDM co-ordinator. Consultant interventional cardiologist. Consultant cardiac surgeon (preferably two).	General cardiologist. Imaging cardiologist. Care of the elderly physician. Consultant anaesthetist/intensivist.	Ideally daily.
Endocarditis	MDM co-ordinator. Consultant cardiologist with an interest in valve disease. Consultant cardiac surgeon. Infectious disease/microbiology consultant.	Cardiologist with expertise in CMR and CT. Cardiac anaesthetist/intensivist.	Weekly (or more frequent as required).
Heart failure	MDM co-ordinator. Clinical lead for HF, HF ACPs, specialist nurses (community and secondary care).	Healthcare professional with expertise in specialist prescribing in HF. Cardiac rehabilitation. Device consultant. Palliative care.	Weekly.
Aortic	TAVI co-ordinator. ACP or specialist nurse. Interventional cardiologist. Cardiologist with expertise in valve disease/imaging. Cardiac surgeon.	Cardiac anaesthesia/critical care. Care of the elderly consultant as required. Vascular surgery/ interventional vascular radiology.	At least weekly.
Mitral/tricuspid	MDM co-ordinator. ACP or specialist nurse. Cardiologist with expertise in valve disease/ echocardiography Cardiac surgeon. Interventional cardiologist (where percutaneous treatments are available).	Cardiac anaesthesia/critical care. Care of the elderly consultant.	Weekly.



## CASE STUDY

# Using an MDM to prioritise patients for surgery during the COVID-19 pandemic

## Royal Brompton & Harefield NHS Foundation Trust

As one of two cardiac surgical 'hubs' for London, the requirement was to provide emergency and urgent-elective cardiac surgical services in the context of the COVID-19 pandemic. The challenge was to identify and prioritise patients in local district general hospitals (DGHs) on elective cardiac surgical waiting lists based on clinical urgency.

### The MDM process

A daily heart MDM was convened using Microsoft Teams. The meeting was chaired jointly by a senior cardiac surgeon and a diagnostic cardiologist, and attendees included consultant surgeons, interventional and imaging cardiologists, radiologists, intensivists, anaesthetists, pharmacists and nurse practitioners. Patients' clinical situation, imaging and laboratory test results were reviewed, COVID-19 status clarified and any further investigations agreed upon. The Patient Pathway Manager, Fitness-for-Surgery team (FFS) and theatre scheduling team all joined the calls, so that once a patient had been accepted for urgent surgery, a suitable date and theatre slot could be allocated in real time and an admission plan formulated.

### Results

The MDM succeeded in its key aim of prioritising the sickest patients and getting them into surgery. Feedback from participants suggests that it also promoted greater inclusivity and collaboration. Communicating decisions simultaneously to people in different teams (e.g. scheduling and FFS) saved time and reducing errors due to miscommunication. Teams who would usually not be involved in patient care at the planning stage – such as pharmacists – felt better prepared to manage patients transferred in with complex diagnoses such as endocarditis. For cardiac surgical and cardiology trainees it was an excellent learning opportunity.

## Recommendation

Recommendation	Actions	Owners	Timescale
<b>19.</b> All networks should ensure that: (a) there are MDMs for HF and device implantation for all relevant patients within the network; b) there are MDMs for review of patients for revascularisation, aortic valve disease, mitral/tricuspid valve disease, endocarditis and EP at network level; and (c) there are pathways to access external MDMs in ICC, ACHD, advanced HF and low volume interventions if these are not provided within the network.	<b>a</b> GIRFT to work with NHSE/I, trusts and cardiac networks to ensure appropriate MDMs in place as per guidance.	GIRFT, NHSE/I, trusts, BCS.	For progress within a year of publication.

## Data and registries

Cardiology is extremely fortunate to have mature national registries for PCI, devices and ablation, HF and congenital cardiology. These registries are run within NICOR, and funded through the Healthcare Quality Improvement Partnership (HQIP) by NHSE/I, NICOR also hosts the TAVI registry for which there is no established future funding stream. These registries have been essential to the GIRFT process and are critical to future quality improvement and quality assurance within cardiology as well as a tremendous resource for research. The independent Medicines and Medical Devices Safety Review has also underlined the importance of data on devices and clinical outcomes, leading to the creation of the Medical Device Safety Programme.

In recent years NICOR has been under-resourced and it is essential that a secure funding stream is established that will allow both the continuation of the existing registries, including TAVI, and the addition of new registries as technology evolves – for instance percutaneous mitral valve implants. It is also essential that trusts are adequately resourced to allow weekly uploads of data to the NICOR registries.

The availability of such high quality structured data opens up opportunities to collaborate both nationally and internationally through initiatives such as ESC Euroheart.<sup>50</sup>

## Coding

The deep dive visits identified that the degree of clinical involvement with coding varied significantly between trusts. Correct coding is important not just for financial reasons but also for identifying variation in the quality of care and all trusts should ensure that there is regular clinical validation of coding data. Optimal coding requires that coders have access to the full clinical record in a form which is easy to review and interrogate. This is best achieved within a fully integrated electronic patient record (EPR) such that procedural and diagnostic information is automatically captured and repetitive data entry avoided. Discharge summaries are an important source of coding information and are often completed by relatively junior members of staff. It is therefore important that trainee doctors and other staff groups completing discharge letters have formal induction into the importance of accurate coding and training in the use of local systems to facilitate this.

## Recommendations

Recommendation	Actions	Owners	Timescale
<b>20.</b> All trusts should ensure that audit teams are appropriately resourced to provide weekly uploads of data to the national cardiac registries.	<p><b>a</b> NHSE/I should work with GIRFT to ensure the financial sustainability of cardiac registries.</p> <p><b>b</b> All trusts should assess resource requirements with a view to completing weekly uploads.</p>	GIRFT, cardiology networks, trusts, NICOR, HQIP, BCS, NHSE/I and NHS Digital.	For progress within a year of publication.
<b>21.</b> Trusts must ensure that there is regular clinical validation of coded data, that all relevant clinical information is captured and readily available to coders and that clinical staff are fully aware of the importance of accurate coding, especially that of co-morbidities.	<p><b>a</b> Coders have full access to clinical record that is easy to view and interrogate.</p> <p><b>b</b> Use EPRs to ensure that all clinical information on a patient is captured.</p> <p><b>c</b> The GIRFT clinical coding team to work with trusts to make sure staff are trained to capture all relevant information.</p>	GIRFT, cardiology networks, trusts, NICOR, HQIP, BCS, NHSE/I.	For progress within a year of publication.

<sup>50</sup> [www.escardio.org/Research/euroheart](http://www.escardio.org/Research/euroheart)

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## Digital transformation and cardiology

### The need for digital transformation

Cardiology, with its number and range of patients encompassing both acute and chronic conditions and a proud history as an innovative specialty, must be at the forefront of the digital transformation needed to improve the quality of our services. Clinical leadership is vital to the necessary redesign of care pathways. The Wachter report<sup>51</sup> (among others) identified lack of clinical engagement and leadership as key reasons for the failure of previous IT projects. If clinicians are driving the change and demanding more from digital tools, this increases the probability of successful implementation.

### Patient care

Patient-centred care must be at the heart of service redesign. Although advances in artificial intelligence and precision medicine are likely to be important over the next decade, much of the technology already exists. Seamless care pathways need to be developed taking full advantage of digital services, enhancing the partnership between patients and all the clinicians involved in their care. Digital tools should enhance the patient-clinician relationship, reducing clinician burden and releasing 'time to care'. Examples of areas where they may impact are provided throughout the report. In addition, examples and case studies of innovation and digital tools in the cardiology care pathways can be seen in publications from NHSX including the Cardiology Digital Playbook.

It is important to remember that digital tools have the potential to increase health inequalities as well as reduce them, and strenuous efforts must be made to prevent this.

### Communication

Many of the sections in the report refer to how we communicate with patients and colleagues. The barriers between patients and cardiology services need to be lowered to improve care quality and also to forestall deterioration that might lead to hospital admission that could otherwise have been avoided. Communication between cardiology services in secondary and tertiary care needs to be improved if networks are to function optimally.

### Patient-generated data

The use of remote monitoring for cardiac implantable devices has shown how much data can be generated by patients. It has dramatically changed the way we provide care to these patients. This is only a foretaste of what is to come – apps, wearables and other innovations are likely to dramatically extend the quantity and range of data patients will present to clinicians. We need to plan how we are going to deal with this deluge of data and use it to provide high quality care in ways that would not have been considered possible even ten years ago.

### Artificial intelligence

The use of machine learning to identify patterns that may not be apparent to clinicians is increasingly being applied in a variety of ways ranging from predicting AF using sinus rhythm ECGs to the probability of DNA (Did Not Attend) for MRI scans. These technologies are likely to fundamentally alter how we provide care and open up new possibilities in preventive care.

### Governance

Good governance is crucial. Whilst digital tools are vital for both current and future care it is an imperative that appropriate consideration is given to ethics, privacy, cyber security and compliance with data protection standards. Guidance includes compliance with GDPR and the NHS Digital Health Technology Standard.

### The future

There are myriad technologies which are available now; some are referenced throughout the report. However, the digital revolution in healthcare will continue. The power of artificial intelligence and precision medicine is slowly coming into focus. To fully grasp these opportunities, we need to ensure that we as cardiologists are receptive and ready to use them to improve patient care.

<sup>51</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/550866/Wachter\\_Review\\_Accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/550866/Wachter_Review_Accessible.pdf)

## CASE STUDY

### Using new technology to manage demand across cardiology pathways

#### Chelsea and Westminster Hospitals NHS Foundation Trust

The Chelsea and Westminster NHS Foundation Trust Test Beds project set out to tackle a key NHS priority: managing demand for urgent care across cardiology pathways. The West Middlesex site of the trust in particular serves an area of high cardiovascular mortality and morbidity, with high use of unscheduled care. The project had three key aims:

- increasing patient knowledge, control and self-management;
- increasing access to other services; and
- reducing the number of unnecessary unplanned visits.

#### Flexible service and greater transparency

The project involved using a number of apps including Patients Know Best, DrDr, medopad and waitless in combination with setting up of hot clinics and expanding our ambulatory care service. The apps gave people the ability to see their own records, record measurements such as blood pressure and weight, direct message clinical teams and book/change appointments.

#### Results

Levels of engagement were high among both patients and clinical teams. In all, more than 1,000 patients used the system. One of the key drivers for success was the engagement and expertise of the IT team and project managers. There were also some lessons learned: more dedicated training would help patients to understand all the features on offer; and having a better understanding of data governance structure and architecture would also have helped in terms of getting primary care records joined up.

## Recommendation

Recommendation	Actions	Owners	Timescale
<b>22.</b> Care pathway redesign using digital tools needs to be clinically led and patient centred. Examples of good practice can be found in the NHSX Cardiology Digital Playbook and appropriate governance standards should be adhered to.	<b>a</b> GIRFT will support ongoing work of NHS Digital and NHSX in (including NHS Digital Playbook) the digital transformation of cardiology services.	GIRFT, cardiology networks, NHS Digital, NHSX, individual trusts.	For progress within a year of publication.

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## Optimising medicines for cardiac patients

All hospitals should implement robust evidence-based prescribing guidelines which cover both primary and secondary care to ensure optimal outcomes for patients across the clinical interface. Where possible a system (ICS/sustainability and transformation partnership (STP)) by default approach should be taken to developing integrated formularies and prescribing guidelines. Pharmacists should be present on ward rounds to advise on safe and effective prescribing. Specialist pharmacists and nurse prescribers should be used to support medicines optimisation at ward level or in outpatient clinics, with pharmacists focusing on patients with comorbidities and/or complex medications. A system-wide approach should be taken to medicines optimisation in cardiology. It is estimated that between 30 to 50% of patients with long-term conditions take their medicines as prescribed. Several studies have shown high rates of non-adherence to secondary prevention medicines.

Discharge summaries should include a management plan for primary care highlighting medicines optimisation required following discharge and who has clinical responsibility after discharge for titrating medicines and any ongoing monitoring requirements. This should be communicated to the GP practice and the community pharmacy to minimise risk of errors at the transfer of care. As part of medicines optimisation, patients should be counselled on the medicines they have been prescribed including rationale, dose, frequency, common side-effects and monitoring requirements. This should be supported by written or visual information. Secondary care pharmacy teams should work with medical and nursing colleagues to increase the awareness and uptake of community pharmacy services that facilitate improved transfer of care, e.g. New Medicines Service (NMS) and Discharge Medicines Service (DMS) in community pharmacies.

Specialist cardiovascular medicine pharmacists in hospitals have for many years worked closely with other clinicians, taking part in ward rounds, outpatient anticoagulation clinics and monitoring and reviewing treatment with medicines. There are integrated pharmacist-led models of practice across England to support medicines optimisation in AF, hypertension and coronary heart disease (CHD). Examples include consultant pharmacists in cardiology and specialist pharmacists leading clinics working with specialists in secondary care, GPs, practice nurses and pharmacists in primary care including community pharmacy.

### CASE STUDY

## Pharmacist-led integrated services

### Barts Health NHS Trust

Barts Health NHS Trust has a comprehensive suite of specialist cardiovascular pharmacist-led integrated services to optimise the management of AF and secondary prevention in CHD. Redbridge CCG and local hospital trusts supported a programme to improve anticoagulation, blood pressure and cholesterol management: The ABC of AF Improvement. The programme was delivered by a clinical pharmacist in 43 general practices, who used Active Patient Link (APL-AF) software to identify and electronically review the records of AF patients potentially suitable for anticoagulation.<sup>52</sup>

The trust has also tested the feasibility of a community pharmacy-led AF detection service with a robust referral pathway to the specialist arrhythmia pharmacist. Community pharmacists were trained to use the Kardia monitor to undertake the trace with a referral pathway to the trust in patients aged over 65 years. Now there are plans for specialist-led services to expand to include post-myocardial infarction (MI) multidisciplinary clinics to support effective up-titration of secondary prevention medicines based on a retrospective audit of patients discharged requiring up-titration of secondary prevention medicines.

## Medication safety

The NHS Business Services Authority (NHSBSA) medication safety indicators include anticoagulants and antiplatelets due to high rates of gastrointestinal bleeds. Anticoagulants, antiplatelets and non-steroidal anti-inflammatory drugs (NSAIDs) cause over a third of admissions due to avoidable adverse drug reactions.<sup>53</sup> Special care should be taken when prescribing high risk drugs, for example dual antiplatelet therapy or triple therapy (anticoagulation plus dual antiplatelet therapy) to communicate doses and duration of therapy on clinical letter and discharge correspondence.

<sup>52</sup> <https://bmjopenquality.bmj.com/content/8/4/e000783>.

<sup>53</sup> [www.eepru.org.uk/wp-content/uploads/2020/03/medication-error-report-edited-27032020.pdf](http://www.eepru.org.uk/wp-content/uploads/2020/03/medication-error-report-edited-27032020.pdf)

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## Recommendation

Recommendation	Actions	Owners	Timescale
<b>23.</b> All networks should implement robust evidence-based prescribing guidelines which are regularly reviewed and cover both primary and secondary care, ensuring optimal outcomes for patients across the clinical interface.	<b>a</b> GIRFT to support trusts and networks to implement prescribing guidelines.	Trusts, networks, GIRFT, NHSE/I.	For progress within a year of publication.

# Financial impact statement

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## Calculating gross notional financial opportunities and cost implications in GIRFT reports

GIRFT reports provide financial opportunity figures to illustrate how improving clinical care will also improve productivity, using a methodology endorsed by the Healthcare Financial Management Association (HFMA). These figures are calculated after the report's draft recommendations are finalised, and after establishing what changes to clinical metrics they would be expected to deliver. The financial opportunity figures are not used to inform the report's findings or the development of the recommendations.

The financial opportunities provided are gross and notional. They are not inherently cash-releasing and apply a notional financial value to activity, ordinarily using figures from national prices or reference costs. They are not a net figure, because implementation costs could not usually be calculated in this way: costs may be locally contingent or otherwise not calculable using reference costs or national prices. Instead, implementation costs are identified separately, in consultation with colleagues in NHSE/I, once draft recommendations have been finalised from a clinical perspective.

The opportunities figure includes reductions to:

- length of stay (LoS);
- planned admissions where no procedure took place;
- re-operation rates;
- readmissions;
- outpatient attendances and follow-ups; and
- unnecessary procedures and appointments.

## Financial opportunities and potential cost implications from this report

We have calculated that the gross notional financial opportunity within cardiology could be between £13.91m and £28.61m recurring per annum. Key components of the notional opportunity include:

- reduction of NSTEMI length of stay;
- reducing TAVI length of stay;
- reducing HF emergency admissions; and
- reducing inpatient admissions by increasing day cases for simple CRM procedures.

The report is explicit that many of its recommendations are intended to make a case for investment, but no spending commitment is made in the report. Some of these recommendations reflect existing NHS Long Term Plan commitments and so would already be funded. During implementation, potential costs would be considered further, accounting for all existing expectations on the service.

Improvement	Standard			Target		
	Target	Activity opportunity*	Gross notional financial opportunity**	Target	Activity opportunity*	Gross notional financial opportunity**
<p><b>Development of acute coronary syndrome (ACS) pathway</b> (recommendation 9)</p> <p>Opportunity = Reduce NSTEMI length of stay Base data: April 17- Mar 19.</p> <p>Cost estimated based on actual/suspected MI - EB10 - non-elective excess bed day (17/18 ref costs uplifted to 20/21 prices)</p>	<p>Lower quartile</p> <p>7 days NSTEMI length of stay</p>	<p>23,500 bed days</p>	<p>£7.99m</p>	<p>National average</p> <p>6.28 days NSTEMI length of stay</p>	<p>44,600 bed days</p>	<p>£15.16m</p>
<p><b>Heart failure (HF) rehabilitation offered to all eligible patients</b> (Recommendation 11)</p> <p>Opportunity = Reduce HF emergency readmissions Base data: April 17- Mar 19.</p> <p>Cost estimated on non-elective HF HRGs EB02/03 (18/19 ref costs uplifted to 20/21 prices)</p>	<p>National average</p> <p>24% HF emergency readmissions</p>	<p>800 emergency admissions</p>	<p>£1.72m</p>	<p>Best quartile</p> <p>22% HF emergency readmissions</p>	<p>1,500 emergency admissions</p>	<p>£3.22m</p>
<p><b>Day case under LA should be the default for simple cardiac rhythm management (CRM) procedures</b> (no specific recommendation - see page 49)</p> <p>Opportunity = Reduce elective IP admissions by increasing day case rates for simple CRM procedures Base data: April 17-Mar 19</p> <p>Cost estimated based on low ccc CRM (pacemaker) HRGs - average elective less day case (18/19 ref costs uplifted to 20/21 prices)</p>	<p>National average</p> <p>47% day case rate for simple CRM procedures</p>	<p>2,900 elective admissions</p>	<p>£2.57m</p>	<p>Best quartile</p> <p>90% day case rate for simple CRM procedures</p>	<p>8,000 elective admissions</p>	<p>£7.09m</p>



Improvement	Standard			Target		
	Target	Activity opportunity*	Gross notional financial opportunity**	Target	Activity opportunity*	Gross notional financial opportunity**
<p><b>Uncomplicated TAVI patients should be fit for discharge within 72 hours</b></p> <p><i>(No specific recommendation – see page 52)</i></p> <p><b>Opportunity = Reduce LOS for TAVI procedures</b></p> <p><i>Base data: April 17–Mar 18.</i></p> <p><i>Cost estimated based on TAVI HRG excess bed day (17/18 ref costs uplifted to 20/21 prices)</i></p>	<i>National average</i>			<i>Best quartile</i>		
	11.40 days TAVI length of stay***	3,600 bed days	£1.64m	9.14 days TAVI length of stay***	6,900 bed days	£3.14m
<b>Total</b>			<b>£13.91m</b>			<b>£28.61m</b>

NOTE: The *Patient flow and care pathways* section (page 34) of this report looks at outpatient pathways and recommends a shift in delivery of outpatient care from hospital-based face-to-face outpatient attendances to virtual where appropriate for patients. The potential financial implications of this were reviewed in detail and discussed. It was decided not to include this within the financial impact statement above on the basis that it is unlikely that there would be any efficiency savings as a result of this shift, largely on the grounds that there would be no material time-saving in delivering large volumes of traditional outpatient consultations for cardiology patients as virtual (rather than face-to-face).

\* Activity opportunities are annual figures, based on one year of activity data.

\*\* Costing financial opportunity: unless otherwise stated, cost estimates are based on national average of 17/18 reference costs, uplifted to 20/21 pay and prices using tariff inflation.

\*\*\* The three-day LoS target discussed on page 51 relates specifically to a subset of TAVI procedures. The calculation here is representative as it includes all TAVI procedures.

# Cardiology devices supply chain cost efficiency and resilience

The NHS spends around £250m per year on cardiology devices. Key categories include devices such as stents and balloon catheters used in PCI, ICDs, pacemakers, TAVI valves and closure devices such as patent foramen ovale (PFO) closures. These categories are shown in **Figure 19** and **Figure 20** along with key statistics about the cardiology supply chain.

GIRFT has been working closely with the NHS Spend Comparison Service (SCS) to analyse national spend data and to increase product and cost surveillance with the aim of providing a resource that can be used to help forecast demand and highlight any disruption to the supply chain caused by the COVID-19 pandemic. The quantities and spend reported are dependent upon the data being reported by providers to the NHS Spend Comparison Service\*.

Alongside this report, a new cardiology supply chain surveillance dashboard has been released which trusts and clinicians can review and use to compare their own product utilisation data and trends over time. This is updated weekly from NHS trust purchase order systems and can be used to validate the trends described in this report as well as to review variation at a regional, sustainability transformation plan (STP) or trust level.

**Figure 19: Top procedure groups**

Product Category	Spend (£)	Quantity (Units)	Var to Min (£)	Providers	Suppliers	Brands	Product Codes	Top 5% Spend	% Supply Chain	% MPC New to Trust
<b>Grand Total</b>	<b>£210,398,189</b>	<b>1,057,305</b>	<b>£26,259,893</b>	<b>145</b>	<b>148</b>	<b>297</b>	<b>6,098</b>	<b>87%</b>	<b>40%</b>	<b>20%</b>
Percutaneous Coronary Intervention (PCI)	£57,655,045	946,467	£11,659,116	144	91	159	4,939	74%	21%	19%
ICD Procedure	£50,285,957	5,461	£2,431,584	78	14	29	229	93%	58%	20%
Pacemaker Procedure	£42,148,229	79,467	£9,860,009	127	38	74	536	88%	28%	28%
Trans-Aortic Valve Insertion (TAVI)	£36,468,848	4,357	£254,004	26	7	7	47	99%	65%	12%
Loop Recorder Procedure	£16,470,299	11,046	£1,626,726	109	6	4	26	98%	24%	28%
Ablation Procedure*	£2,966,686	2,993	£225,828	47	14	11	81	76%	30%	15%
Other	£4,403,125	7,514	£203,628	90	36	29	243	46%	41%	20%

Source: NHS SCS

**Figure 20: Top product categories**

Product Category	Spend (£)	Quantity (Units)	Var to Min (£)	Providers	Suppliers	Brands	Product Codes	Top 5% Spend	% Supply Chain	% MPC New to Trust
<b>Grand Total</b>	<b>£210,398,189</b>	<b>1,057,305</b>	<b>£26,259,893</b>	<b>145</b>	<b>148</b>	<b>297</b>	<b>6,098</b>	<b>87%</b>	<b>40%</b>	<b>20%</b>
Implant Cardioverter Defibrillator (ICD)	£50,200,092	5,362	£2,431,584	78	14	24	221	93%	58%	20%
Valve - Trans Aortic	£35,833,637	2,082	£23,022	25	4	5	33	99%	66%	8%
Pacemaker	£35,602,888	37,633	£8,760,205	117	25	32	309	90%	23%	35%
Stent - Drug Eluting	£21,256,551	85,908	£3,427,998	87	39	23	1,425	94%	19%	21%
Loop Recorder	£16,456,299	11,036	£1,626,726	109	5	4	26	99%	24%	27%
Guide Wire	£11,019,027	316,975	£2,710,269	143	29	50	384	63%	25%	12%
Balloon Catheter - Standard	£7,128,605	165,513	£1,539,514	113	47	42	1,737	80%	19%	19%
Lead	£4,515,658	19,278	£646,416	111	19	38	173	81%	64%	25%
Balloon Catheter - Drug Eluting	£3,441,137	8,667	£265,537	69	21	8	344	32%	12%	32%
Imaging Catherter	£3,361,472	6,693	£1,239,580	68	4	3	15	52%	18%	14%
Other	£21,582,823	398,158	£3,589,043	138	59	88	1,436	64%	29%	16%

Source: NHS SCS

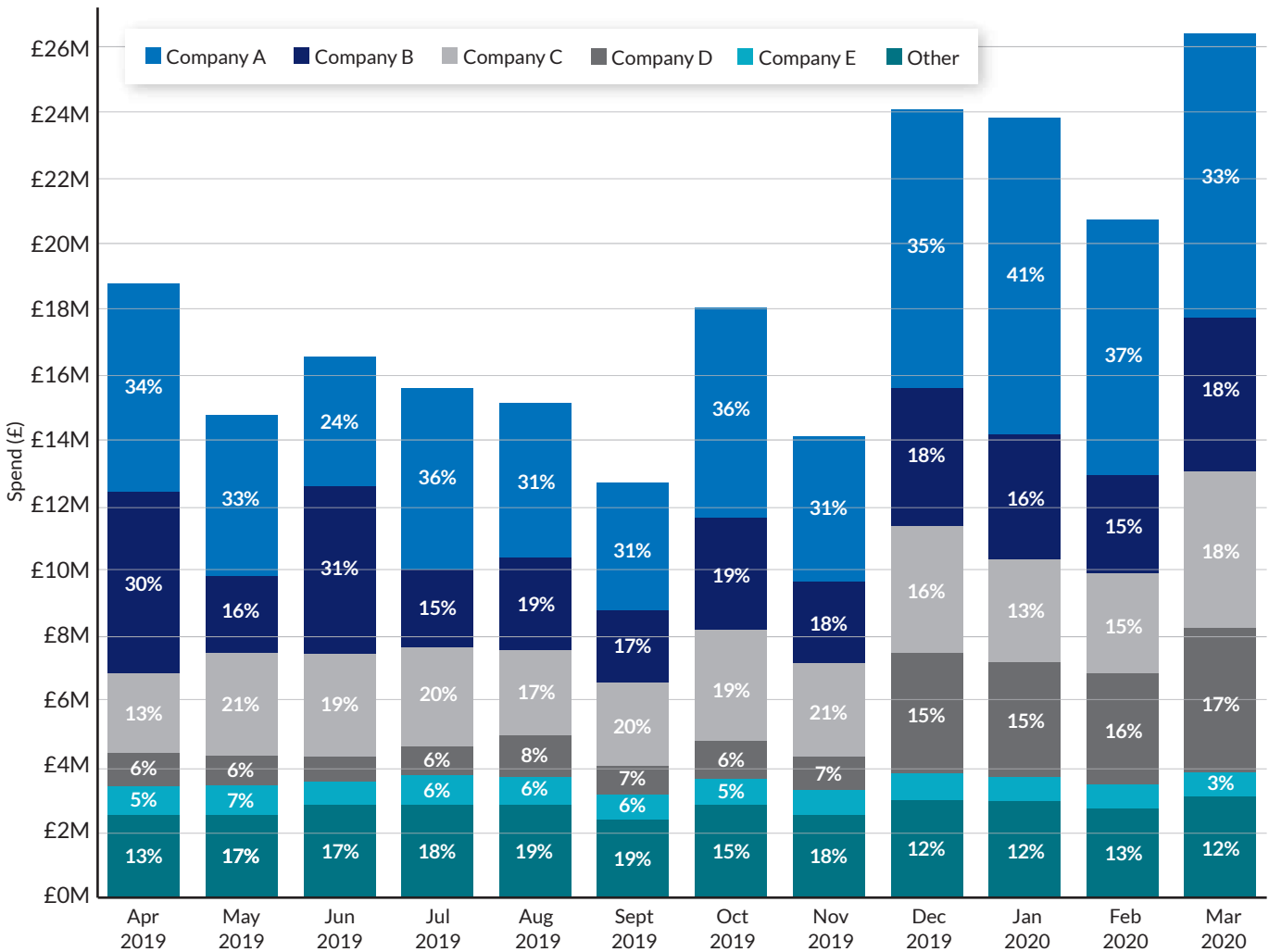
\*In some cases, the device volumes are lower than expected from Hospital Episode Statistics data e.g. ablation procedure vs device volumes. As part of our ongoing data analysis and reporting in cardiology we will be working to reconcile these variances with providers. The variances reported do remain indicative of the variation in the dataset currently available.

Although year-on-year growth in demand for devices was around 5% between 2017 and 2019, demand for cardiology devices dropped significantly in the first quarter of 2020 based on reduced hospital activity as a result of COVID-19. Demand is anticipated to return to pre-COVID levels over the course of 2021.

### The cardiology devices supply base

The top five companies in the cardiology devices supply chain account for 90% of the spend and the competitive profile may be described as a differentiated oligopoly in most categories, with close to duopolistic competition in several smaller more innovative categories (see **Figure 21** and **Figure 22**). At an STP and regional level, however, there is fragmentation. Often trusts in the same STP will have different contractual agreements.

**Figure 21: Top five companies in the cardiology devices supply chain: % spend**



Source: NHS SCS

**Figure 22: Top suppliers**

Top Supplier	Spend (£)	Quantity (Units)	Var to Min (£)	Providers	% Supply Chain	Brands	Product Codes	% MPC New to Trust	Quantity (Packs)
<b>Grand Total</b>	<b>£220,120,196</b>	<b>1,128,293</b>	<b>£34,763,954</b>	<b>144</b>	<b>36%</b>	<b>308</b>	<b>6,385</b>	<b>23%</b>	<b>598,359</b>
Company A	£74,664,180	144,853	£10,351,956	126	38%	66	1,198	21%	136,489
Company B	£42,248,825	170,974	£7,506,588	134	35%	60	1,594	24%	135,112
Company C	£37,978,281	155,484	£10,604,535	116	34%	54	819	22%	117,093
Company D	£22,732,120	1,069	£5,175	21	51%	3	18	33%	1,069
Company E	£9,714,374	227,507	£2,425,391	137	25%	25	587	19%	66,284
Other	£32,782,418	428,406	£3,870,309	139	25%	180	2,309	26%	142,312

Source: NHS SCS

## Device usage variety and variability

Innovation is cumulative and expanding in cardiology devices. There is often significant brand and product variety within each device segment.

Although the supply base is relatively consolidated at a macro level in cardiology, the brand and product offering is highly fragmented, driven by clinical preference as well as the emergence of innovative technologies and incremental product change. There are over 350 different product brands, 10,000 product codes and 700,000 units purchased in any given year.

There is a high level of product innovation and change such that 20% of product codes used in trusts were new to the trust in that year. There are around 60 brands of cardiac stent, including 24 brands of drug eluting stent (DES) in the most common size, 3mmx18mm. There is similar device and brand variety in other categories including implantable cardioverter defibrillators (ICDs) and pacemakers. The most common brands are shown in **Figure 23**.

**Figure 23: Common brands in cardiac devices**

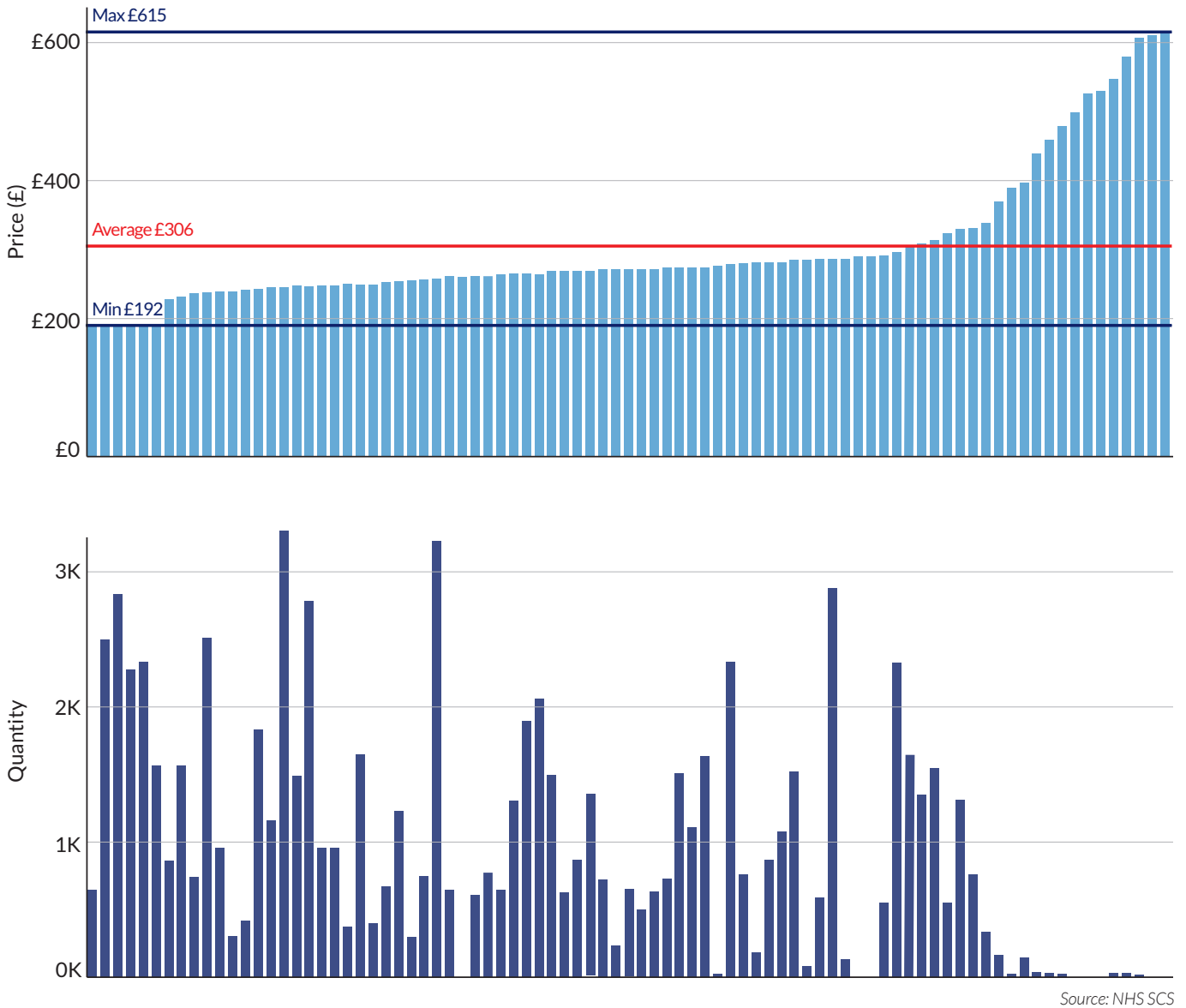
Product	Providers	Spend	Quantity (Units)	% MPC New to Trust	Min Price (£)	Med Price (£)	Max Price (£)
Valve - Trans Aortic - A	21	£19,072,750	896	24%	£21,275	£21,303	£21,331
Loop Recorder	103	£19,910,032	11,626	25%	£1,552	£1,686	£2,716
Stent - Drug Eluting - A	54	£7,826,322	34,654	19%	£176	£228	£315
ICD - A	60	£6,857,397	619	49%	£9,602	£11,065	£13,819
Valve - Trans Aortic - B	19	£5,777,500	413	55%	£13,932	£13,995	£14,156
Stent - Drug Eluting - B	70	£5,599,844	21,227	14%	£223	£264	£334
ICD - B	34	£5,469,310	625	76%	£5,101	£7,526	£10,028
ICD - C	44	£5,059,299	376	40%	£11,790	£13,602	£17,088
ICD - D	40	£5,042,404	455	42%	£8,164	£11,736	£16,993
ICD - E	39	£4,234,212	483	42%	£8,031	£8,791	£10,188
Stent - Drug Eluting - C	41	£4,143,423	11,814	23%	£306	£342	£421
Pacemaker - A	55	£3,803,549	1,130	28%	£2,896	£3,303	£3,769
ICD - F	7	£3,790,193	121	45%	£9,510	£13,111	£13,996
ICD - G	47	£3,644,142	566	46%	£4,642	£6,715	£10,488
Pacemaker - B	42	£3,616,059	4,029	51%	£424	£916	£1,881
Pacemaker - C	46	£3,531,807	2,322	46%	£1,232	£1,332	£4,161
Closure Device	103	£3,376,330	38,580	3%	£53.36	£87.33	£140

Source: NHS SCS

## Price variation

There is significant cost and price variation across cardiology devices. For example, the average cost of materials in a standardised 2.5 stent PCI procedure ranges from £780 to £2400. This is driven by underlying device price variation across cardiology which totals £26m (13% of total spend). **Figure 24** shows price variation in DESs.

**Figure 24: Price variation in drug eluting stents**



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## Efficiency opportunities

The combination of fragmented contractual arrangements, product level fragmentation and change as well as high levels of price variation, suggest that significant efficiencies can be gained from aggregating demand, stimulating competition, and making improved contractual commitments. We estimate that these could have financial, administrative and inventory management benefits in excess of £35m–£40m per year.

In order to achieve these efficiencies, it is essential that procurement and supply chain activities are clinically led both nationally and locally to ensure that product choices are evidence based and that safety and outcomes are not affected by any product change.

Over 50% of cardiology devices spend falls under the High Cost Tariff Excluded Devices (HCTED) programme. A national procurement operating model, NHS Supply Chain, is managed by Supply Chain Coordination Ltd (SCCL) and a category tower service provider.

The current share of the spend covered by NHS Supply Chain is around 30%. This is an important route to aggregating demand across the NHS and leveraging collective spend to improve NHS buying power as well as enabling future supply chain efficiency and resilience.

GIRFT specialty leads will be working alongside the HCTED team and NHS Supply Chain to ensure clinical leadership in national procurement processes as well as to develop a national procurement strategy for cardiology devices in order to achieve best value.

## Devices: safety, outcomes and surveillance

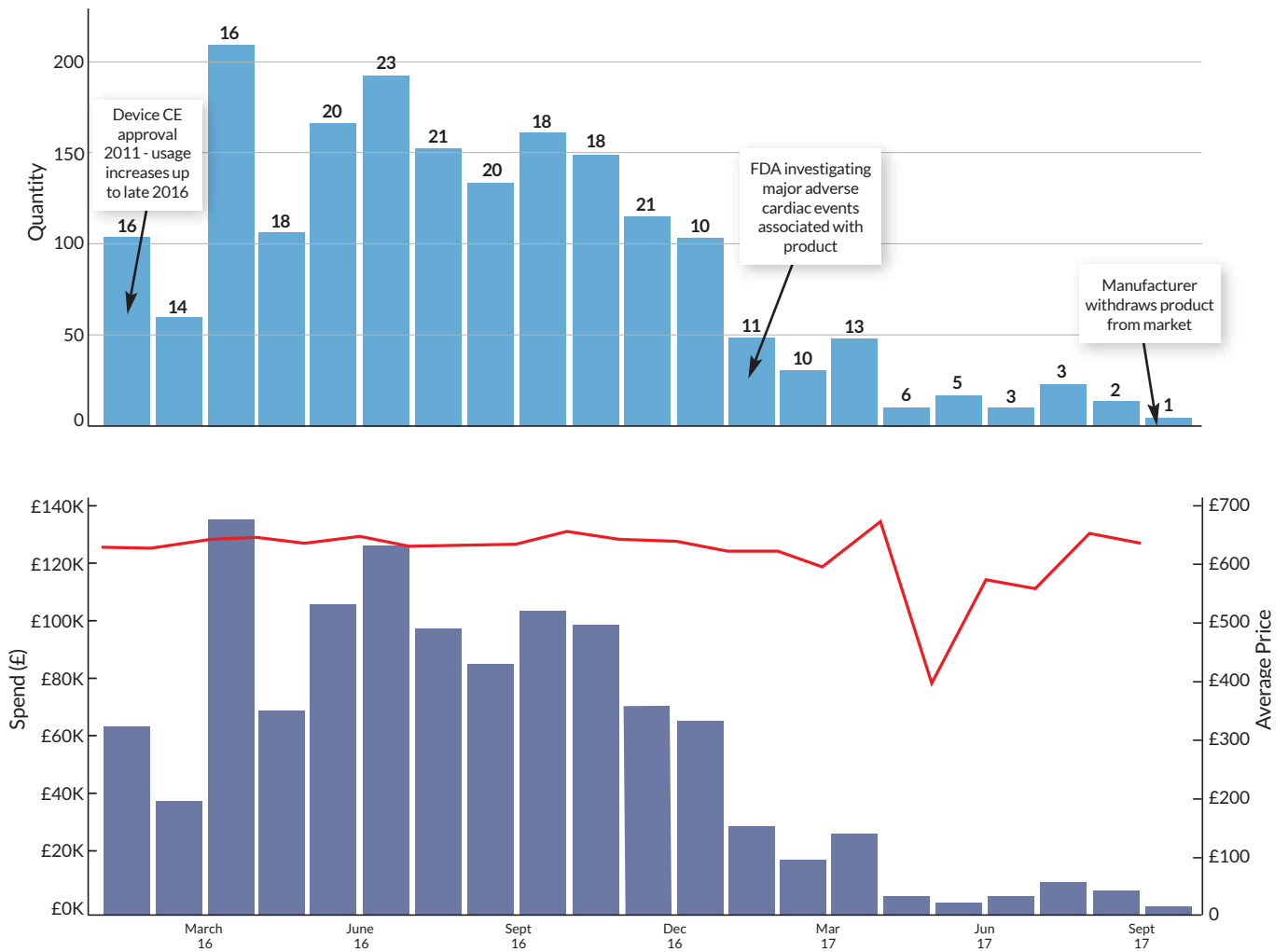
The Independent Medicines and Medical Devices Safety Review 2020<sup>54</sup> highlighted significant concerns around device safety and efficacy as well as the existing regulatory system which relies upon CE compliance for market access. Such concerns have been growing alongside increasing safety alerts and product recalls. Specifically, recommendation 7 (page 40) advocated for a central patient-identifiable database to be created, collecting key details of the implantation of all devices at the time of the operation. This can then be linked to specifically created registers to research and audit the outcomes both in terms of the device safety and patient reported outcomes measures. We support this.

Significant changes are expected to the existing UK regulatory regime. These include an increased emphasis on the obligations of healthcare providers and manufacturers to ensure device traceability and improve surveillance of usage, safety and outcomes.

Devices can access the market in Europe and the UK around three to five years prior to the US market. Whereas US regulators will look to assess the effectiveness of a device as well as its risk of harm, the CE mark simply affirms that the product “meets high safety, health and environmental protection requirements”.

**Figure 25** charts the uptake and subsequent removal from the market of a first-generation bio-resorbable cardiac stent which arrived on the UK market in 2011 with a CE mark. Some 32 providers spent more than £1.1m treating around 900 patients with a device which was double the price of established, proven stents and usage continued into late 2017, even after warnings had been published by the US Food and Drug Administration (FDA).

Figure 25: Uptake and removal from UK market of cardiac stents



Source: NHS SCS

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## Improving cardiology devices safety and outcomes

The GIRFT programme has been highlighting the need for improved device surveillance and we have been working in collaboration towards a unified architecture for medical device assessment and surveillance that is patient centred and clinician led, the key components of which are described below.

### Device-level patient outcome registries

Accurate, evidence-based device evaluation relies on real world long-term follow-up data which is difficult and costly to obtain. NICOR audits in cardiology have endeavoured to capture product level outcome data; however, the NHS currently does not routinely capture device to patient usage making data collection, aggregation, and analysis difficult.

The Medical Device Safety Programme has been established to address this. GIRFT will be working with NHSX, NHS Digital, HQIP and NICOR to develop an architecture and delivery plan for a national device level outcome registry in cardiology based on a national Medical Device Information System (MDIS) provided by NHS Digital which will collect point of care traceability data as well as matching that data to other longitudinal datasets and enabling routine surveillance of safety and outcomes.

### Electronic Point of Care Traceability and Scan4Safety

The NHS does not currently track devices to patients electronically. Recording of unique device identifiers is mostly paper based where product labels are attached to patient records. This makes recalls and product outcome review burdensome and prone to error and undermines outcome registry development.

The application of electronic Point of Care Traceability (POCT) where the unique device identifier is electronically recorded against the patient's electronic patient record (EPR) is a significant step forward in enabling device surveillance and GIRFT will be working with NHSX, NHSE/I and NHS Digital to develop an architecture and delivery plan for electronic POCT and Scan4Safety implementation in cardiology.

It is also important to note that there can be significant secondary benefits from improved tracking of device utilisation including clinical decision support, financial savings, freeing up clinical time and improved adoption of innovation. In cardiology, several trusts have identified cost savings of between 2% and 5% from optimising inventory and reducing wastage. If extrapolated across all providers, this accounts for a potential annual cost reduction of £25m–£30m.

### Structured clinician and evidence-led device assessment

Work has been done within NHSE/I Specialised Commissioning device working groups (DWGs) on the optimal specification of HCTED including in particular ICD, TAVI and PFO devices, but across other cardiology devices evidence review is left to individual clinicians and there is no structured national clinical assessment of device evidence.

The HCTED device working groups, along with the examples of structured evidence review from other specialties, such as the Orthopaedic Data Evaluation Panel (ODEP) in Orthopaedics, provide methodologies that can be used to enable a structured clinician-led assessment and rating of all Class III and Class IIb<sup>55</sup> cardiology devices.



## Recommendation

Recommendation	Actions	Owners	Timescale
<p><b>24.</b> NHSX and the Department of Health and Social Care should work to ensure that there is clinical engagement with the procurement of cardiac devices and that all devices are subject to systematic surveillance to ensure their safety and efficacy.</p>	<ul style="list-style-type: none"> <li><b>a</b> Improve awareness of costs and product utilisation across the NHS by providing cardiology supply chain analytics.</li> <li><b>b</b> Work with NHSE/I to prioritise and review the safety, efficacy and relative risk of all cardiology Class III and Class IIb devices in the NHS supply chain.</li> <li><b>c</b> Work with NHSX and NHS trusts to support the implementation of Scan4Safety and POCT in cath labs as well as to submit data to the NHS Digital Medical Device Information System (MDIS).</li> <li><b>d</b> Work with the HCTED programme on device assessment and supply chain surveillance data to support implementation.</li> <li><b>e</b> Work with NHS Supply Chain and the cardiology devices industry to improve supply chain value and resilience in cardiology device supply chains.</li> <li><b>f</b> Work with NHSX, NHS Digital, HQIP, NICOR and the cardiology devices industry to review existing registry and audit activities as well as to define a roadmap for a cardiology device level outcome registry and to realise the value of NHS data for development and innovation.</li> </ul>	<p>GIRFT, NHSE/I, NHS Digital, NHSX, NHS Supply Chain, DHSC.</p>	<p>Ongoing.</p>

# Reducing the impact of litigation

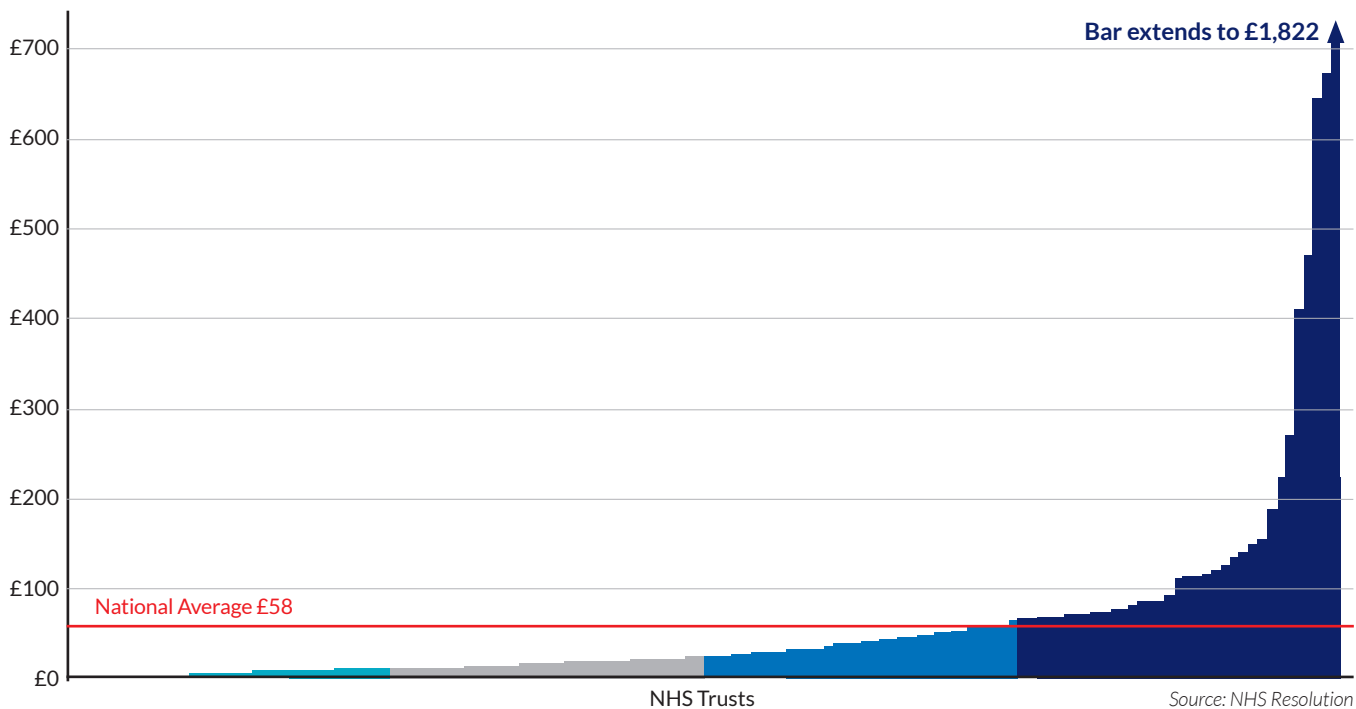
Each of the GIRFT programme teams has been asked to examine the impact and causes of litigation in their field with a view to reducing the frequency of litigation and, more importantly, reducing the incidents that lead to it. It is important for clinical staff to have the opportunity to learn from claims in conjunction with learning from complaints, patient safety incidents and inquests. This will lead to improved patient care and reduced costs both in terms of litigation itself and the management of the resulting complications of potential incidents.

It was clear during GIRFT visits that many providers had little knowledge of the claims against them. This includes some with high litigation costs per admission as well as those at the low end. As a consequence, there is an opportunity to learn from the claims to inform future practice. Further work is needed at both a local and national level to analyse claims to maximise this opportunity to improve patient care.

## Variation in average litigation costs

Data obtained from the NHS Resolution shows that clinical negligence claim costs in cardiology were estimated to have risen from £26m to £51m per year over the last five years. We found the national average estimated cost of litigation per cardiology admission was £58. There are noticeable differences between providers, as shown in **Figure 26**: the best performing provider is estimated to cost £0 per admission, while at the other end of the scale, one provider is expected to generate an average of £1,822 of litigation costs per admission.

**Figure 26: Variation in England between trusts in estimated litigation costs for cardiology per admission notified to NHS Resolution 2013/14–2017/18 (activity denominator includes all cardiology admissions)**



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## Claims, trends and causes

### Trends

Cardiology is the third highest medical specialty for number of claims and claims cost and the 15<sup>th</sup> highest across all specialities in terms of claims cost during the financial years 2013/14–2017/18. Although cardiology is in the mid-range for litigation activity compared with all clinical specialities, it is amongst the highest in the medical specialities. This is to be expected given the large number of procedures and interventions in cardiology.

Although there has not been a substantial increase in the number of claims in the specialty over the five-year period, as **Figure 27** shows there has been a sizeable increase in the costs associated with litigation claims. This may be in part due to the increasing complexity of cardiac procedures that are now being offered to patients with advanced medical conditions, but it also reflects the wider trend of increasing costs of clinical negligence claims.

**Figure 27: Volume and cost of medical negligence claims against cardiology notified to NHS Resolution 2013/14 to 2017/18**

Notification year	Total no. of claims	% change in claims	Total claim cost (£)	% change in cost
2013/14	183	-	26m	-
2014/15	216	18%	38m	46%
2015/16	202	-6%	38m	1%
2016/17	188	-7%	47m	21%
2017/18	217	15%	51m	10%
<b>Grand Total</b>	<b>1,006</b>	<b>-</b>	<b>201m</b>	<b>-</b>

Source: NHS Resolution

### Causes

Common causes for litigation in cardiology were identified using NHS Resolution data (see **Figure 28**). It is important to note that more than one cause can be assigned to each claim. The most frequent cause for litigation in cardiology is 'treatment', followed by 'diagnosis'. Additionally, clinical negligence claims associated with intra-procedure problems and the consenting process, although occurring less frequently, were associated with higher costs per claim. This highlights the importance of informed patient consent especially in the post-Montgomery era.

**Figure 28: Top six most frequent causes for litigation in cardiology and associated costs 2013/14–2017/18**

Cause	No. of claims	% of total claims	Total claim cost (£)	% of total claim cost	Cost per claim (£)
Treatment	414	41%	£77,172,852	38%	£186,408
Diagnosis	156	16%	£27,230,715	14%	£174,556
Medication error	49	5%	£8,204,515	4%	£167,439
Nursing care/assistance	47	5%	£2,633,840	1%	£56,039
Procedure-related	45	4%	£15,442,881	8%	£343,175
Consent	42	4%	£15,199,410	8%	£361,891

Source: NHS Resolution

## Severity of patient outcome

Outcomes involving a patient death were associated with 30% of clinical negligence claims (see **Figure 29**). This is unsurprising as cardiology cases often involve management of patients with multiple severe medical comorbidities, high associated morbidity and in urgent or emergency situations. Additionally, as more patients are undergoing complex investigations and procedures that may be invasive, ‘unnecessary pain’ and ‘unnecessary procedure’ feature in the five most frequent associated patient ‘injury’ codes in clinical negligence claims in cardiology.

**Figure 29: Top five most frequent patient injuries associated with clinical negligence claims in cardiology and associated costs 2013/14–2017/18**

Injury	No. of claims	% of total claims	Total estimated cost (£)	% of total claim cost	Mean cost per claim (£)
Fatality	301	30%	£43,428,752	22%	£144,282
Unnecessary pain	158	16%	£7,124,381	4%	£45,091
Cardiac arrest	141	14%	£21,008,553	10%	£148,997
Cardiovascular condition	110	11%	£11,823,492	6%	£107,486
Unnecessary procedure	80	8%	£3,729,760.83	2%	£46,622

Source: NHS Resolution

## Patient safety

As a speciality, cardiology has robust practices in place to monitor clinician outcomes and scrutinise the safety of devices used in procedures such as insertion of permanent pacemakers and endovascular placement of cardiac valve replacements. Much of this is organised through the National Cardiac Audit Programme.<sup>56</sup> Adherence to these national audits prioritises patient safety and prevents repeated adverse incidents and the resulting litigation. Alongside this, the aforementioned Medical Device Safety Programme will help reduce patient harm linked to devices.

## Recommendation

Recommendation	Actions	Owners	Timescale
<p><b>25.</b> Trusts should work to reduce litigation costs by adopting the GIRFT 5-point plan.</p>	<p><b>a</b> Clinicians and trust management to assess their benchmarked position compared with the national average when reviewing estimated litigation cost per activity. Trusts would have received this information in the GIRFT Litigation data pack.</p> <p><b>b</b> Clinicians and trust management to discuss with the legal department or claims handler claims submitted to NHS Resolution included in the data set to confirm correct coding to that department. Inform NHS Resolution of any claims which are not coded correctly to the appropriate specialty via <b><i>CNST.Helpline@resolution.nhs.uk</i></b></p> <p><b>c</b> Claims should be triangulated with learning themes from complaints, inquests and patient safety incidents.</p> <p><b>d</b> Where trusts are outside the top quartile of trusts for litigation costs per activity GIRFT will be asking national clinical leads and regional hubs to follow up and support trusts in the steps taken to learn from claims. GIRFT will share examples of good practice with trusts where it would be of benefit.</p>	<p>GIRFT, NHS Resolution</p>	<p>Ongoing.</p>

<sup>56</sup> [www.nicor.org.uk/about-nicor/](http://www.nicor.org.uk/about-nicor/)

# About the GIRFT programme

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Getting It Right First Time (GIRFT) is a national programme designed to improve treatment and care by reviewing health services. It undertakes clinically-led reviews of specialties, combining wide-ranging data analysis with the input and professional knowledge of senior clinicians to examine how things are currently being done and how they could be improved.

Working to the principle that a patient should expect to receive equally timely and effective investigations, treatment and outcomes wherever care is delivered, irrespective of who delivers that care, GIRFT aims to identify approaches from across the NHS that improve outcomes and patient experience, without the need for radical change or additional investment. While the gains for each patient or procedure may appear marginal they can, when multiplied across an entire trust – and even more so across the NHS as a whole – deliver substantial cumulative benefits.

The programme was first conceived and developed by Professor Tim Briggs to review elective orthopaedic surgery to address a range of observed and undesirable variations in orthopaedics. In the 12 months after that pilot programme, it delivered an estimated £30m–£50m savings in orthopaedic care – predominantly through changes that reduced average length of stay and improved procurement.

The same model is now being applied to over 40 different areas of clinical practice. It consists of four key strands:

1. A broad data gathering and analysis exercise, performed by health data analysts, which generates a detailed picture of current national practice, outcomes and other related factors.
2. A series of discussions between clinical specialists and individual hospital trusts, which are based on the data – providing an unprecedented opportunity to examine individual trust behaviour and performance in the relevant area of practice, in the context of the national picture. This then enables the trust to understand where it is performing well and what it could do better – drawing on the input of senior clinicians.
3. A national report, that draws on both the data analysis and the discussions with the hospital trusts to identify opportunities for NHS-wide improvement.
4. An implementation phase where the GIRFT team supports providers to deliver the improvements recommended.

## Implementation

GIRFT works in partnership with NHSE/I regional teams to help trusts and their local partners to implement improvements and address the issues raised in both the trust data packs and the national specialty reports. The GIRFT team provides support at a local level, advising on how to reflect the national recommendations into local practice and supporting efforts to deliver any trust specific recommendations emerging from the GIRFT visits. GIRFT also helps to disseminate best practice across the country, matching up trusts who might benefit from collaborating in selected areas of clinical practice. Through all its efforts, local or national, the GIRFT programme strives to embody the ‘shoulder to shoulder’ ethos that has become GIRFT’s hallmark, supporting clinicians nationwide to deliver continuous quality improvement for the benefit of their patients.

# Glossary

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## '?proceed'

Where a patient is listed for a coronary angiogram with or without coronary angioplasty and, if the coronary angiogram identifies narrowing or blockages within the arteries they may be widened / opened during the same procedure.

## Ablation

Ablation, also known as catheter ablation, is a treatment that aims to control or correct certain types of abnormal heart rhythms. Either heat (radiofrequency ablation) or freezing (cryoablation) can be used on the area of the heart that is causing the abnormal heart rhythm.

## Active Patient Link (APL)

Active Practice Link (APL) tools are practice-facing clinical tools that show in the GP practice the characteristics of people with a particular condition, e.g. atrial fibrillation, heart failure, hypoglycaemic risk.

## Acute coronary syndrome (ACS)

The term 'acute coronary syndromes' (ACS) encompasses a range of conditions including unstable angina, non-ST-segment-elevation myocardial infarction (**NSTEMI**) and ST-segment-elevation myocardial infarction (**STEMI**) that are due to a sudden reduction of blood flow to the heart.

## Adult congenital heart disease (ACHD)

A general term for a range of birth defects that affect the normal workings of the heart.

## Advanced clinical practitioners (ACPs)

Advanced clinical practitioners come from a range of professional backgrounds such as nursing, pharmacy, paramedics and occupational therapy. They are healthcare professionals educated to master's level and have developed the skills and knowledge to allow them to take on expanded roles and scope of practice caring for patients.

## Aortic valve disease

There are two main aortic valve diseases: aortic stenosis, where the valve is narrowed, restricting blood flow; and aortic regurgitation, where the valve allows blood to leak back into the heart.

## Atrial fibrillation (AF)

Atrial fibrillation is a heart condition that causes an irregular and often abnormally fast heart rate.

## Balloon aortic valvuloplasty (BAV)

A procedure which stretches the aortic valve to improve the symptoms of aortic stenosis.

## Brady-arrhythmia

A slow heart rate, typically defined as a rate of less than 60 beats per minute.

## Cardiac implantable electronic devices (CIEDs)

A term that encompasses pacemakers for bradyarrhythmia treatment, implantable cardioverter defibrillators (ICDs) for tachyarrhythmia management, and cardiac resynchronisation therapy (CRT) devices for systolic dysfunction with conduction delays.

## Cardiac magnetic resonance imaging (CMR)

CMR, sometimes known as cardiac MRI, is a medical imaging technology for the non-invasive assessment of the function and structure of the cardiovascular system.

## Cardiac resynchronisation therapy (CRT) devices

A CRT device is a special pacemaker that specifically aims to improve the coordination of the heart's contractions. It consists of a pulse generator placed under the skin below the collarbone that is connected to three leads that are threaded along veins to the heart.

## Cardiac rhythm management (CRM) devices

CRM devices include pacemakers, implantable cardiac defibrillators (ICDs) and CRT devices.

## Cardiovascular disease (CVD)

CVD is a general term for conditions affecting the heart or blood vessels. It's usually associated with a build-up of fatty deposits inside the arteries (atherosclerosis) and an increased risk of blood clots. It can also be associated with damage to arteries in organs such as the brain, heart, kidneys and eyes.

## Cardioversion

A treatment which aims to correct an abnormal heart rhythm (arrhythmia) by applying an electric shock to the heart through electrodes placed on the chest.

## Catheterisation (cath) lab

A cath lab is where tests and procedures including ablation, angiogram, angioplasty and implantation of pacemakers/ICDs are carried out.

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### **Commissioning**

The process of identifying local health needs, and purchasing and reviewing services to meet those needs.

### **Comorbidities**

The simultaneous presence of two or more chronic diseases or conditions in a patient.

### **Computerised tomography (CT)**

A CT or computerised tomography scan makes use of computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional images of specific areas of a scanned object, allowing the user to see inside the object without cutting.

### **CT coronary angiography (CTCA)**

A computerized tomography (CT) coronary angiogram is an imaging test that uses an X-ray machine to look at the arteries that supply blood to the heart.

### **CT-fractional flow reserve (CT-FFR)**

An invasive imaging modality that enables the physiological assessment of coronary artery disease by measuring the ratio of maximum flow in a stenotic artery to maximum blood flow if the same artery were normal.

### **Coronary artery bypass graft (CABG)**

A coronary artery bypass graft involves taking a blood vessel from another part of the body (usually the chest, leg or arm) and attaching it to the coronary artery above and below the narrowed area or blockage. This new blood vessel is known as a graft.

### **Coronary care unit (CCU)**

A CCU looks after patients who need a higher level of care than normal after acute heart-related illnesses, such as a heart attack.

### **Coronary heart disease (CHD)**

CHD describes what happens when the heart's blood supply is blocked or interrupted by a build-up of fatty substances in the coronary arteries. CHD is also called ischaemic heart disease or coronary artery disease.

### **Daily defined dose (DDD)**

The defined daily dose (DDD) is a statistical measure of drug consumption, defined by the World Health Organization. It is used to standardise the comparison of drug usage between different drugs or between different health care environments.

### **Day case**

When a patient is admitted electively for care that day, without the use of a hospital bed or overnight stay.

### **Direct oral anticoagulants (DOACs)**

Anticoagulant medicines prevent the blood from clotting as quickly as it normally does, thus reducing the risk of stroke.

### **Discharge Medicines Service (DMS)**

A community-pharmacy based service providing information and guidance on medicines for patients being discharged from hospital.

### **Echocardiogram (echocardiography)**

An ultrasound scan of the heart.

### **Elective Care Transformation Programme (ECTP)**

Launched in 2017, this NHS programme is leading transformative change to make sure patients needing planned care see the right person, in the right place, first and every time, and get the best possible outcomes, delivered in the most efficient way.

### **Elective surgery or care**

Surgery or care that is scheduled/planned rather than an emergency.

### **Electronic Referral Service (ERS) Advice and Guidance**

This NHS service enables clinicians to seek advice from each other, e.g. on a patient's treatment plan or ongoing management, test results or the most appropriate care pathway.

### **Endocarditis**

A rare and potentially fatal infection of the inner lining of the heart (the endocardium), most commonly caused by bacteria entering the blood and travelling to the heart.

### **Heart attack centres (HACs)**

Centres provide specialist emergency care and treatment for anyone suspected of having a heart attack or an acute heart rhythm disorder requiring acute intervention.

### **Heart block**

A condition where the heart beats more slowly or with an abnormal rhythm, resulting from a problem with the electrical pulses that control how the heart beats.



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### **Heart failure with preserved ejection fraction (HFpEF)**

HFpEF occurs when the lower left chamber (left ventricle) of the heart is not able to fill properly with blood during the diastolic (filling) phase. The amount of blood pumped out to the body is less than normal. It is also called diastolic heart failure.

### **High dependency unit (HDU)**

High Dependency Units (HDUs), also called step-down, progressive and intermediate care units provide care for patients who need more intensive observation, treatment and nursing care than is possible in a general ward but slightly less than that given in intensive care.

### **Hospital Episode Statistics (HES)**

Data collected during a patient's time at hospital and submitted to allow hospitals to be paid for the care they deliver. The aim is to collect a detailed record for each 'episode' of admitted patient care delivered in England, either by NHS hospitals or delivered in the independent sector but commissioned by the NHS.

### **Imaging**

Medical imaging is the technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention, as well as visual representation of the function of some organs or tissues.

### **Implantable cardioverter defibrillators (ICD)**

A small device fitted under the skin to monitor the heart rhythm and correct it where needed by sending an electrical current to the heart.

### **Implantable loop recorder**

An implantable loop recorder or ILR is a small device that is inserted under the skin and records the electrical activity of your heart.

### **Inherited cardiac conditions (ICCs)**

A group of genetic disorders that primarily affect the heart, including conditions such as cardiomyopathy, inherited electrical conditions called channelopathies and problems with the main blood vessel carrying blood from the heart, the aorta.

### **Integrated care systems**

NHS organisations, in partnership with local councils and others, taking collective responsibility for managing resources, delivering NHS standards, and improving the health of the population they serve.

[www.england.nhs.uk/integratedcare/integrated-care-systems](http://www.england.nhs.uk/integratedcare/integrated-care-systems)

### **International normalised ratio (INR)**

An INR test measures the time it takes for blood to clot and is used to monitor the effect of blood-thinning medicines, or anticoagulants.

### **Interventional cardiac electrophysiology (EP)**

Interventional cardiac EP includes conventional and complex catheter ablations of abnormal heart rhythms and management of CIEDs.

### **Interventional radiology**

Interventional radiology (IR) refers to minimally invasive, image-guided medical treatments. Procedures use real-time imaging techniques, including X-rays and ultrasound, to guide the operator.

### **Intra-aortic balloon pump (IABP)**

A therapeutic device to encourage the heart to pump more blood. A balloon is placed in the aorta via a catheter, and attached to a computer console with a mechanism for inflating and deflating the balloon as needed.

### **Intravascular ultrasound (IVUS)**

IVUS is a means of 'seeing' inside a coronary artery by means of miniature transducers (which emit high frequency sound waves) attached to the end of a catheter.

### **Left anterior descending artery (LAD) obstruction**

The LAD usually supplies most of the blood to the main pump or left ventricle of the heart. Obstruction of the LAD artery can cause angina or a heart attack..

### **Left atrial appendage occlusion (LAAO)**

LAAO or LAA closure is a minimally invasive procedure used to reduce the risk of a stroke in patients with AF.

### **Left main stem (LMS) disease**

See Left anterior descending artery (LAD) obstruction.

### **Length of stay (LoS)**

The number of days that a patient is in hospital as an inpatient. Can be pre-operative, post-operative, or the sum of both.

### **Magnetic resonance imaging (MRI)**

MRI uses strong magnetic fields, magnetic field gradients, and radio waves to generate images of the organs in the body.

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### **Mechanical circulatory support (MCS)**

A collective term for mechanical devices used to support the function of the heart in cases of advanced HF, e.g. an Intra-aortic balloon pump (IABP).

### **Mitral valve**

The valve that lets blood flow from the left atrium of the heart to the left ventricle.

### **Multidisciplinary team (MDT)**

A team of healthcare professionals from different disciplines who work together in caring for the patient.

### **Multi-vessel disease**

Multi-vessel coronary artery disease is a disease stage in which at least two of the coronary arteries is involved with atherosclerosis of significant severity.

### **Multidisciplinary meeting (MDM)**

An MDM brings together a group of professionals from one or more clinical disciplines who together make decisions regarding recommended treatment of individual patients.

### **National training numbers (NTNs)**

A unique identifier issued by a postgraduate dean to an employee where the employee has formally accepted, or commenced, an employee training activity as a specialist registrar.

### **New Medicines Service (NMS)**

A pharmacist-based service offering additional help and advice to patients who have been prescribed a medicine to treat a long-term condition for the first time.

### **Non-elective surgery or care**

Surgery or care that is carried out as an emergency rather than being planned (elective).

### **Non-ST-elevation myocardial infarction (NSTEMI)**

An NSTEMI is a type of heart attack. It may be less serious than a STEMI because the supply of blood to the heart may be only partially, rather than completely, blocked. As a result, a smaller section of the heart may be damaged. However, an NSTEMI is still regarded as a serious medical emergency. Without treatment, it can progress to serious heart damage.

### **Non-steroidal anti-inflammatory drugs (NSAIDs)**

These medicines are widely used to relieve pain, reduce inflammation, and bring down a high temperature.

### **N-terminal pro B-type natriuretic peptide (NT-pro BNP)**

N-terminal pro B-type natriuretic peptide (NT-proBNP) is an inactive peptide released along with the active peptide hormone BNP when the walls of the heart are stretched or there is pressure overload on the heart e.g. by fluid overload.

### **Optical coherence tomography (OCT)**

Optical coherence tomography (OCT) is a method of obtaining tomographic images of a coronary artery and offers 10x higher resolution than IVUS.

### **Pacing**

Cardiac pacing involves the fitting of a pacemaker to regulate the heart rate. Pacing can be either temporary (using a pacing wire placed via a vein into the right ventricle) or permanent (where a wire(s) are placed into the right ventricle and sometimes the right atrium and connected to a small battery-operated device implanted under the skin).

### **Patent foramen ovale (PFO)**

Patent foramen ovale (PFO) is a flap between the left and right atria (upper chambers) of the heart. This exists in everyone before birth, but most often closes shortly after birth.

### **Pathway**

An agreed set of evidence-based practices and interventions for a specific patient group.

### **Patient Reported Outcome Measures (PROMs)**

Patient Reported Outcome Measures (PROMs) assess the quality of care delivered to NHS patients from the patient perspective.

### **Percutaneous coronary intervention (PCI)**

A non-surgical procedure to treat narrowing of the coronary arteries. It involves access via an artery in the arm (or occasionally the leg) and inflating balloons across narrow portions of the arteries. It usually involves placement of stents at these sites.

### **Positron emission tomography (PET) and PET-CT**

A PET scan of the heart is a noninvasive nuclear imaging test. It uses radioactive tracers (called radionuclides) to produce images of the heart.

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### **Physician associates (PAs)**

Physician associates are medically trained, generalist healthcare professionals, who work alongside doctors and provide medical care as an integral part of the multidisciplinary team.

### **Post-myocardial infarction ventricular septal defect (post-MI VSD)**

A rare and serious complication which can occur following a heart attack, in which the wall between the right and left ventricles is breached. Post-MI VSD often requires surgical treatment.

### **Pressure wire**

A pressure wire study can be carried out during coronary angiography. The device measures pressure difference in the narrowed arteries around the heart and highlights if there is reduced blood flow to the heart muscle. It helps inform if coronary stenting is appropriate.

### **Primary percutaneous coronary intervention (PPCI)**

PPCI is an emergency procedure used to treat a blocked coronary artery in patients who are having a heart attack.

### **Revascularisation**

Coronary revascularisation is where the blood supply to the heart muscle is improved either with stents or with bypass grafts

### **Single photon emission computed tomography (SPECT)**

A SPECT scan is a nuclear imaging test that integrates computed tomography (CT) and a radioactive tracer to show how blood flows to tissues and organs.

### **Specialised services**

Services that are not offered in all hospitals and so are not commissioned by CCGs. Instead, they are commissioned centrally by NHSE/I.

([www.england.nhs.uk/commissioning/spec-services](http://www.england.nhs.uk/commissioning/spec-services)).

### **Specialty and associate specialist (SAS) doctors**

Staff grade, associate specialist and specialty doctors with at least four years of postgraduate training, two of which are in a relevant specialty.

### **Stent**

A small metallic mesh tube used to re-open narrow or blocked arteries. Once inserted, it helps to ensure the artery remains open to maintain blood flow.

### **ST segment elevation myocardial infarction (STEMI)**

An STEMI is the most serious type of heart attack where there is a long interruption to the blood supply. This is caused by a total blockage of the coronary artery, which can cause extensive damage to a large area of the heart muscle.

### **Temporary wire**

See Pacing.

### **Thrombolysis**

A treatment for heart attack that uses an injection of a clot-dissolving treatment to treat blood clots blocking coronary arteries.

### **Transcatheter aortic valve implantation (TAVI)**

Replacement of a narrowed aortic valve by inserting a new valve through a catheter, usually from an artery in the leg

### **Transoesophageal echo (TOE)**

TOE uses sound waves (ultrasound) from a probe inserted into the mouth, down the throat and into the oesophagus to check the structure of the heart and how well it is functioning. The probe produces clearer and more accurate echo pictures than those taken from the front of the chest.

### **Tricuspid valve disease**

Tricuspid valve disease is a condition in which the valve between the two right heart chambers (right ventricle and right atrium) doesn't function properly, leading to blood flowing backwards through the valve or insufficient forward flow of blood.

### **Ventricular tachycardia (VT)**

A type of abnormal heart rhythm in which the heart beats too quickly – defined as more than 100 beats per minute. VT storm is the term used to describe recurrent episodes of VT.

# Acknowledgements

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We would like to thank everyone who contributed to the development of this report, starting with Professor Tim Briggs who initiated the GIRFT process and fellow GIRFT clinical leads with whom we consulted throughout deep dives and through the national report process.

We are especially grateful to the many colleagues in trusts across the country who took part in our deep-dive visits for contributing their insights and experience and ongoing support and advice. Furthermore, we would like to thank Professor Nick Linker, National Clinical Director for Cardiac Services, Dr Francis Murgatroyd cardiac rhythm audit lead at NICOR, Dr Russell Bull, President of the British Society for Cardiovascular Imaging and Mr Keith Pearce, consultant cardiac physiologist and immediate past president of the British Society for Echocardiography for their support and guidance during the development of the national report.

We have had great support from the GIRFT cardiology team. In particular, we would like to thank project manager Suzannah Davies, who organised all of our deep-dive visits and tirelessly accompanied us on trust visits, Hassan Abu-Bakir who worked with us on developing the content and recommendations of the report and with stakeholder consultation, Louise Bell who helped us to draft the report, Paul Bell for his data analysis and Caroline Ager and Matthew Barker for their support.

Thanks also go to those who helped us develop specific elements of the report: to John Machin and Annakan Navaratnam for their insight into litigation; to Julie Renfrew and Maddy Connelly for their work putting the notional financial opportunities together; to Scott Pryde for his work on medical devices and surveillance; and to Andrew Davies and Jaidev Mehta for their work on the medicines optimisation section. We would also like to thank consultant cardiologist Wajid Hussain for his input into the digital healthcare and technology aspects of the report.

Finally, as full time practising clinicians, we would like to thank our own trusts and particularly our colleagues for their support and for giving us the time we needed to deliver this programme and report. We would also like to thank our families for their support and encouragement through the process.

## Data and copyright acknowledgements

The GIRFT programme would like to thank the following organisations for making data publicly available:

- NICOR
- NCBC.

We are grateful to NHS Resolution for the litigation data provided.

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The full report and executive summary are also available to download as  
PDFs from: [www.GettingItRightFirstTime.co.uk](http://www.GettingItRightFirstTime.co.uk)