NCAP

NATIONAL CARDIAC AUDIT PROGRAMME

NICOR

National Audit of Cardiac Rhythm Management (NACRM)

2025 Annual Report

Data up to 2023/24

BHRS

British Heart Rhythm Society

Report at a glance

All data are for 2023/24 unless otherwise stated.

82,051 cardiac implantable electronic device (CIED) procedures performed

21,773 total ablation procedures performed

17,457 CIED procedures were for complex implants (Implantable Cardioverter Defibrillators [ICDs], Cardiac Resynchronization Therapy [CRT])

10,372 Atrial Fibrillation (AF) ablation procedures, increasing 53% since 2015

11,884 ICD procedures, with a 25% decrease in implant volume since 2015

77% hospitals performed more than 100 ablations, meeting the British Heart Rhythm Society (BHRS) minimum recommended volume

There is an increasing proportion of CRT Pacemaker (CRT-P) to CRT Defibrillator (CRT-D) prescription (so CRT-D:CRT-P ratio now **0.9**)

38% rate of general anaesthetic provision for ablation procedures, varying from 5 to 100% between hospitals

~4% one year mortality after an ICD implant (for procedures in 2022/23)

0.4 to 20% variation in one-year re-intervention rates for simple CIED implants performed in 2022/23, similar to previous years

There is growth in newer heart rhythm technologies:

- **403** first leadless pacemaker implants, increasing 25% since last year
- **295** first conduction system pacemaker implants, increasing 6-fold since last year
- **868** (stable volume) with new models now being implanted

Recommendations

Clinical practice

1. **Device therapy:** As pacemaker and ICD implantation rates remain below those of comparable countries, hospitals should evaluate reasons for falling demand and check practice against guidelines, as well as determine whether this in part reflects increasing waiting lists.

2. **AF Ablation:** Increasing AF ablation delivery should prompt hospitals to focus on appropriate initial patient selection and re-intervention rates.

3. **Regional variation:** Regional variation in ICD prescription and the use of general anaesthetic for some procedures should prompt hospitals to understand whether their local variation in service delivery is appropriate.

4. **Emerging technologies:** There is growth of emerging heart rhythm technologies, and centres should ensure appropriate clinical use.

Data completion

5. **Implant records**: Given an increasing obligation to monitor medical implants, all hospitals should ensure implant identifiers and relevant clinical fields are completed (see background for more details on captured fields).

6. **Emerging technologies**: Given the increasing use of emerging heart rhythm technologies, all hospitals should ensure timely data submissions to the NACRM (ensuring compliance with commissioning standards but at the very least, three-monthly data submissions) to facilitate monitoring of this changing practice.

Introduction to the report

The National Audit of Cardiac Rhythm Management (NACRM) is part of the National Cardiac Audit Programme (NCAP) delivered by the National Institute for Cardiovascular Outcomes Research (NICOR). Cardiac rhythm management (CRM) helps patients with a variety of heart rhythm conditions. Treatment includes the use of pacemakers and defibrillators (collectively termed cardiac implantable electronic devices or CIEDs) as well as cardiac electrophysiological ablation procedures.

The report presents data from April 2023 to March 2024 across England, Wales and Northern Ireland, along with longer-term trends (data for Scotland can be found in the Scottish Cardiac Audit Programme). New data included in this report include the use of general anaesthesia for electrophysiological procedures, activity for more recent technologies, and a new quality indicator for appropriateness of implantable cardioverter-defibrillator implantation.

The slides in the report are interactive so you can select and explore the data that interest you. Geographical maps are included to highlight variations in practice for specific areas of practice.

All summary statistics are based on data submitted by hospitals which have then gone through a validation process to adjudicate their accuracy. The numbers might therefore vary slightly from the recently-published interim report (produced for the first time this year) which utilised both validated as well as unadjudicated data from the participating hospitals. More details on the methods used can be found here, and this contains descriptions of the various arrhythmias, treatments, and practicalities on data submission. To support more rapid reporting in future, all hospitals are asked to submit audit data to NICOR on a monthly basis.

We are grateful to all involved in contributing to the development of this audit. Detailed information about almost 80,000 procedures has been diligently entered by hospitals, queried and cleaned before analysis is undertaken by the NICOR team. Expert advice on the design and outputs of the NACRM comes from members of the British Heart Rhythm Society (BHRS).

NICOR NACRM audit team

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The overall number of CIED procedures was broadly unchanged in 2023/24

82,051 Cardiac Implantable Electronic Device (CIED) procedures across 172 hospitals were reported to the audit in 2023/24. This included over 44,000 pacemaker and 17,000 complex CIED procedures (such as ICD, CRT-P and CRT-D).

Since 2015:

- pacemaker procedure numbers have been broadly stable
- ICD and CRT-D implants have fallen
- CRT-P implants have increased

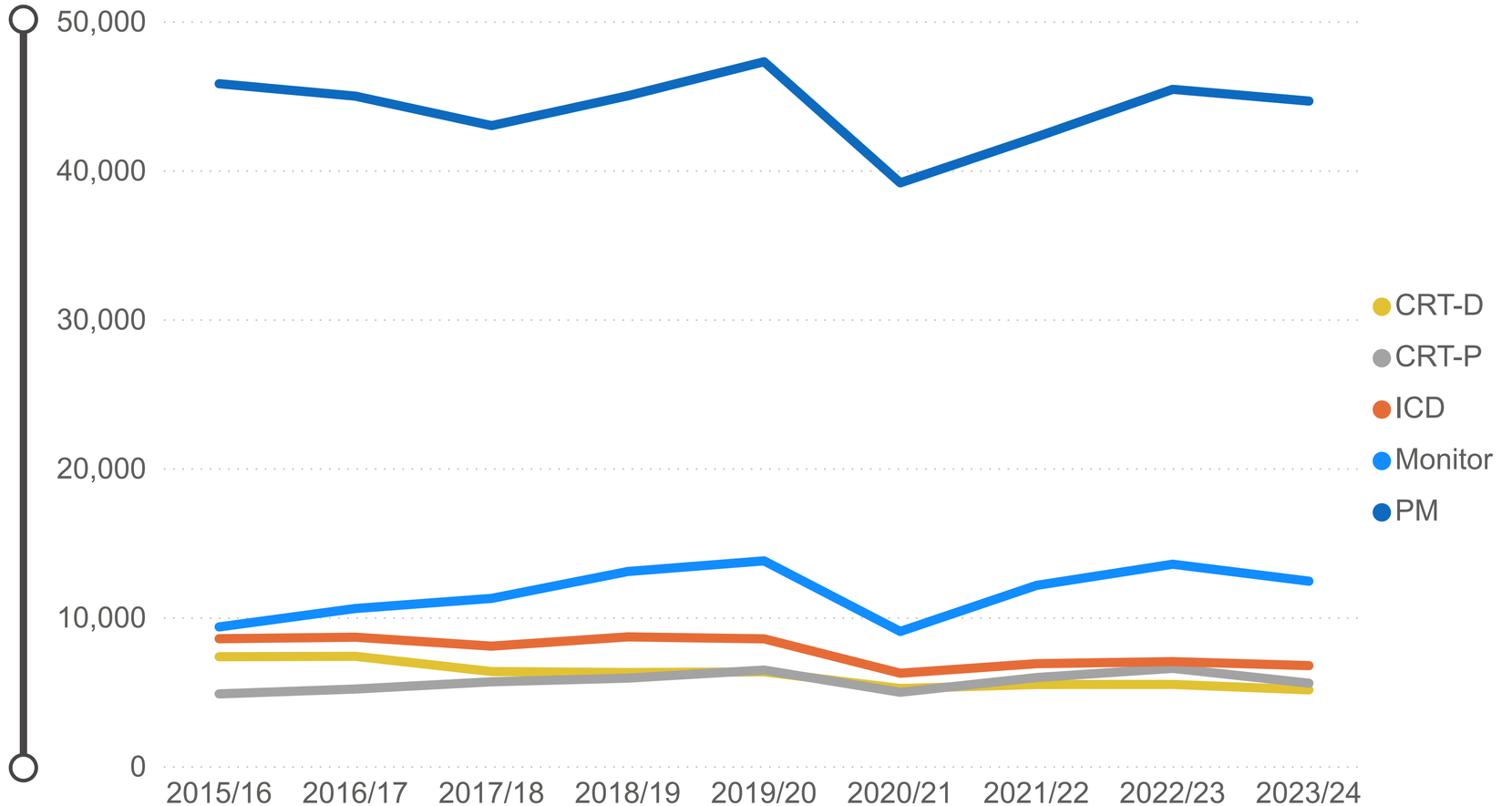
The rates per million population of pacemaker and ICD implants are below the European average, whilst the CRT rate is above the average.[1]

There has also been a gradual rise in use of implantable loop recorders (ILRs), used to help diagnose the cause of symptoms that might result from abnormal heart rhythms.

Key:
CRT-D = Cardiac Resynchronisation Therapy (CRT) Defibrillator
CRT-P = Cardiac Resynchronisation Therapy (CRT) Pacemaker
ICD = Implantable Cardioverter-Defibrillator
Monitor = Implantable Loop Recorder
PM = Pacemaker

81,985	44,639	17,437	12,415
Total Procedures	Pacemaker Procedures	Complex Procedures	Implantable Loop Recorders

All CIED procedures by type



Most hospitals deliver more than the minimum recommended number of CIED procedures

The British Heart Rhythm Society (BHRS) Standards (2024 January revision) recommend that hospitals undertake a minimum of:

- 80 new pacemaker implants per year
- 60 new ICD or CRT implants per year

Of the 168 NHS and private hospitals submitting data, 142 (85%) met BHRS standards for pacemaker implant volume. It is accepted that some (mainly paediatric) hospitals cannot meet this standard.

Selecting a Cardiac Network or hospital below or hovering over the graph shows specific data.

Key:
CRT-D = Cardiac Resynchronisation Therapy (CRT) Defibrillator
CRT-P = Cardiac Resynchronisation Therapy (CRT) Pacemaker
ICD = Implantable Cardioverter-Defibrillator
Monitor = Implantable Loop Recorder
PM = Pacemaker

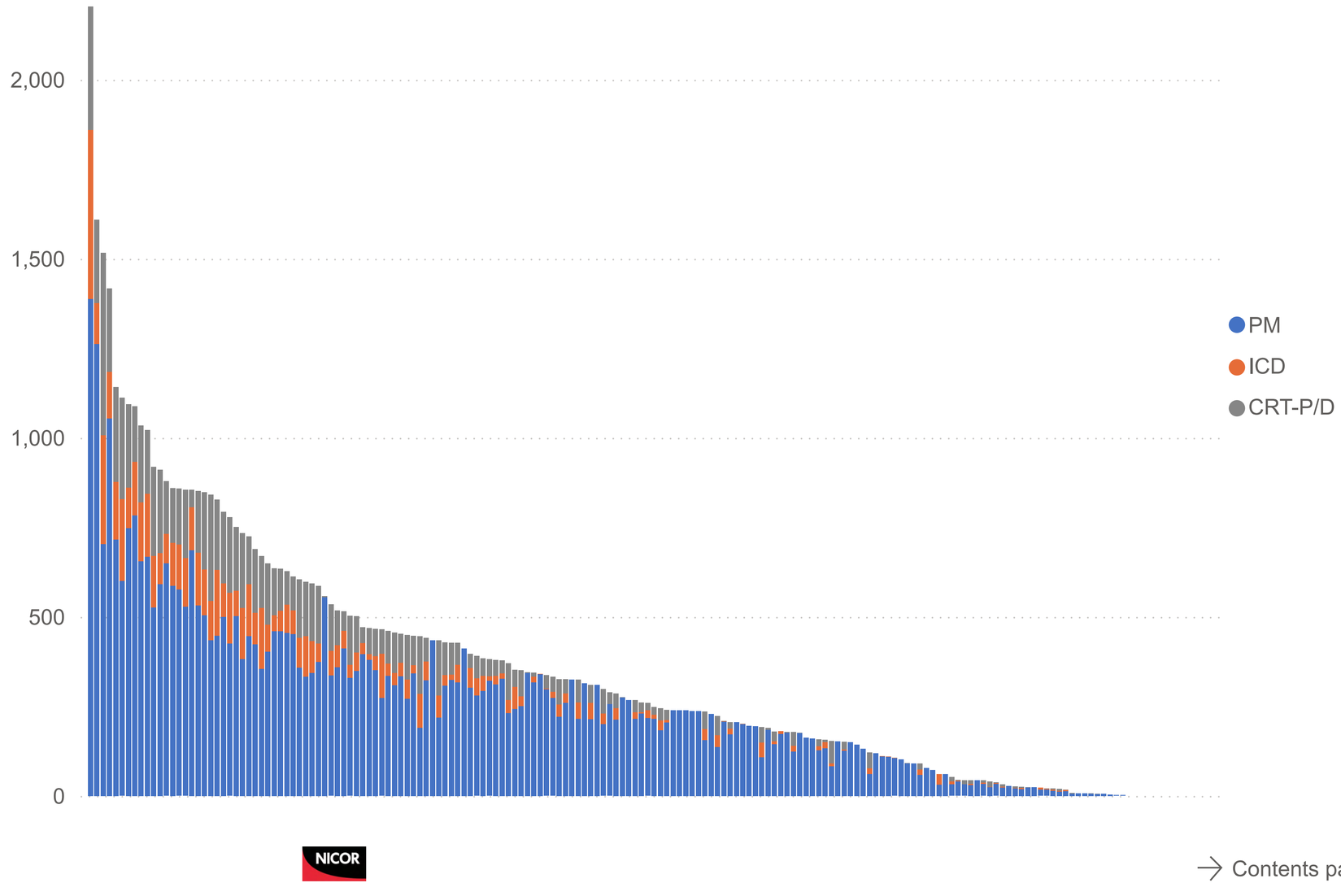
Select hospital

All

Select Cardiac Network

All

Device procedures by hospital (2023/24)



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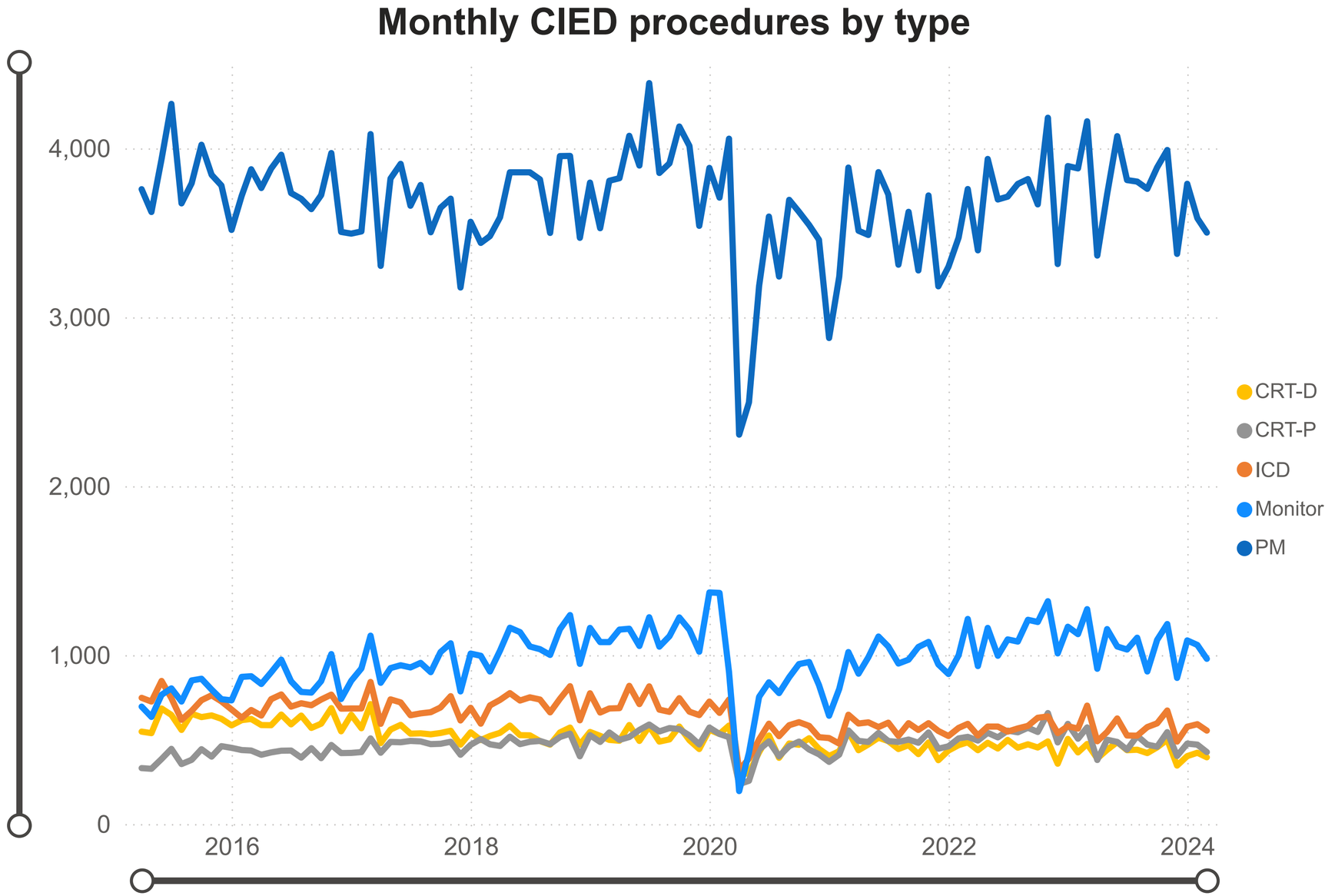
Monthly CIED procedures numbers have stabilised since the major dip during the COVID-19 pandemic

The COVID-19 pandemic had a major impact on the number of monthly CIED procedures, especially during the first peak of COVID-19 hospital admissions in 2020/21.

The biggest fluctuations in monthly activity volumes during 2023/24 was seen for pacemakers and implantable loop recorders.

Key:
CRT-D = Cardiac Resynchronisation Therapy (CRT) Defibrillator
CRT-P = Cardiac Resynchronisation Therapy (CRT) Pacemaker
ICD = Implantable Cardioverter-Defibrillator
Monitor = Implantable Loop Recorder
PM = Pacemaker



There is a 7-fold variation in pacemaker implantation rates across Integrated Care Boards / Health Boards in England and Wales

There was a wide variation in the rate of pacemaker (PM) procedures per million population (pmp) across the 42 Integrated Care Boards (ICBs) in England and 7 Health Boards in Wales.

The map based on patient home location (left) gives an indication of access to treatment while that based on hospital location indicates volume of treatment.

In 2023/24, the overall rate for England and Wales was 732 pmp. The highest rate was 1,473 pmp in Norfolk and Waveney ICBI and the lowest was 195 pmp in Cardiff and Vale University Health Board.

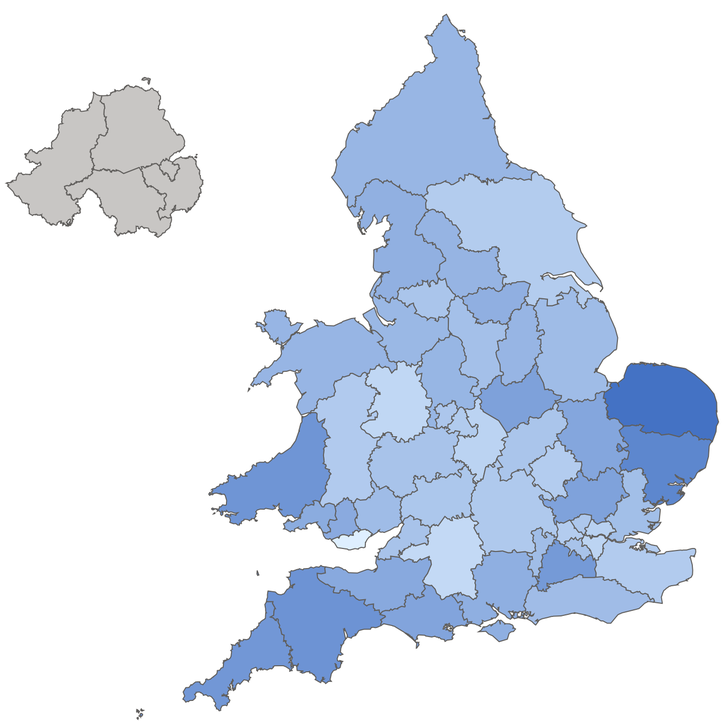
Across Cardiac Networks, the lowest rate was 357 pmp in Humber and North Yorkshire compared with 1,111 pmp in East of England.

This large variation could result from differences in:

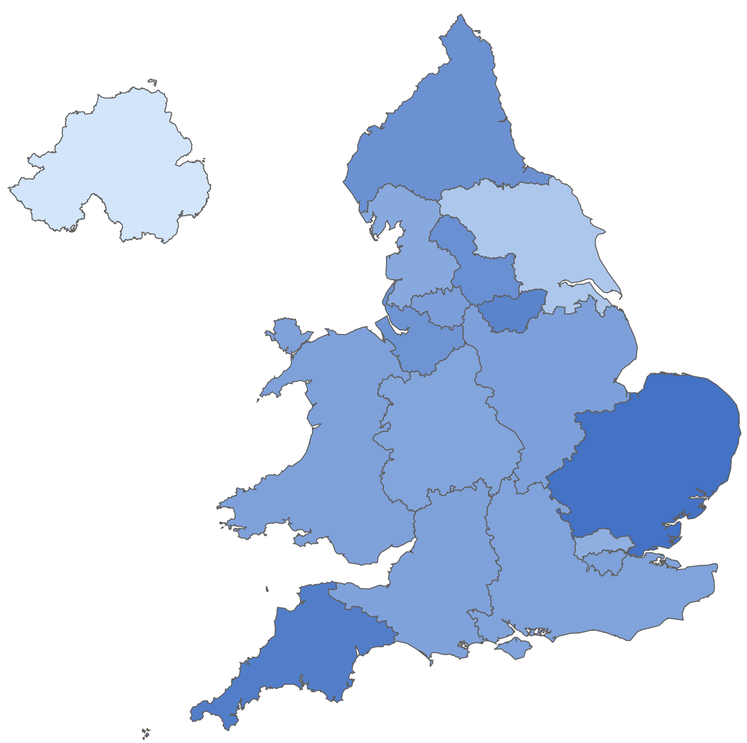
- Population demographics, particularly age and sex
- Access to treatment and capacity within hospitals
- Variation in practice.

Note: Patient home address data are not available for patients in Northern Ireland. Data for Northern Ireland in the CN map are incomplete.

PM procedures per million population by ICB/HB based on patient home location (2023/24)



PM procedures per million population by Cardiac Network based on hospital location (2023/24)



There is a 9-fold variation in the rate of CRT-P procedures across Integrated Care Boards / Health Boards in England and Wales

A Cardiac Resynchronisation Therapy Pacemaker (CRT-P) paces different parts of the left and right ventricles (the heart's pumping chambers) at the same time ('biventricular pacing'). This helps improve heart function when this is impaired. It does not have a defibrillator function.

In 2023/24, the overall procedure rate was 92 per million population (pmp).

The highest rate was 267 pmp in Cornwall and the Isles of Scilly and lowest was 29 pmp in North East London.

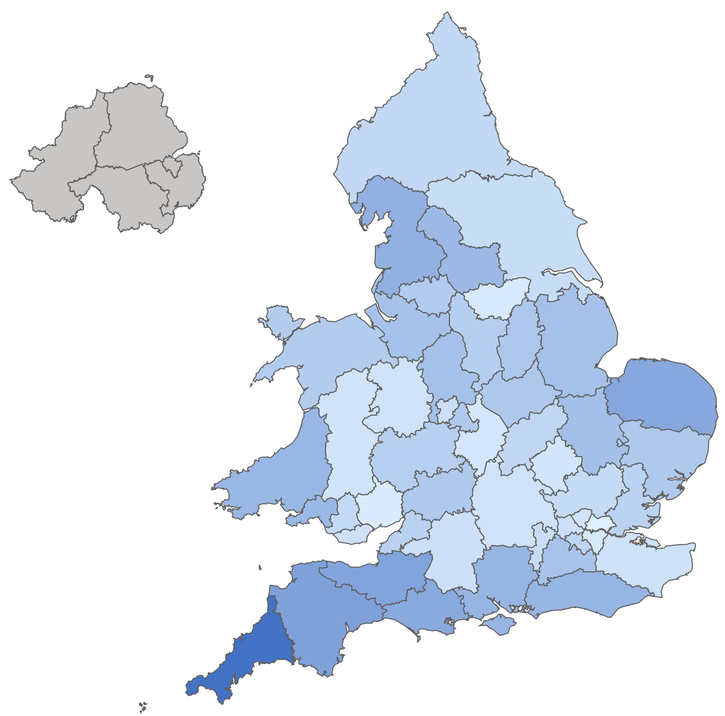
For Cardiac Networks, the highest rate was 197 pmp in the South West (Peninsula) and the lowest was 41 pmp in Humber and North Yorkshire.

This large variation could result from differences in:

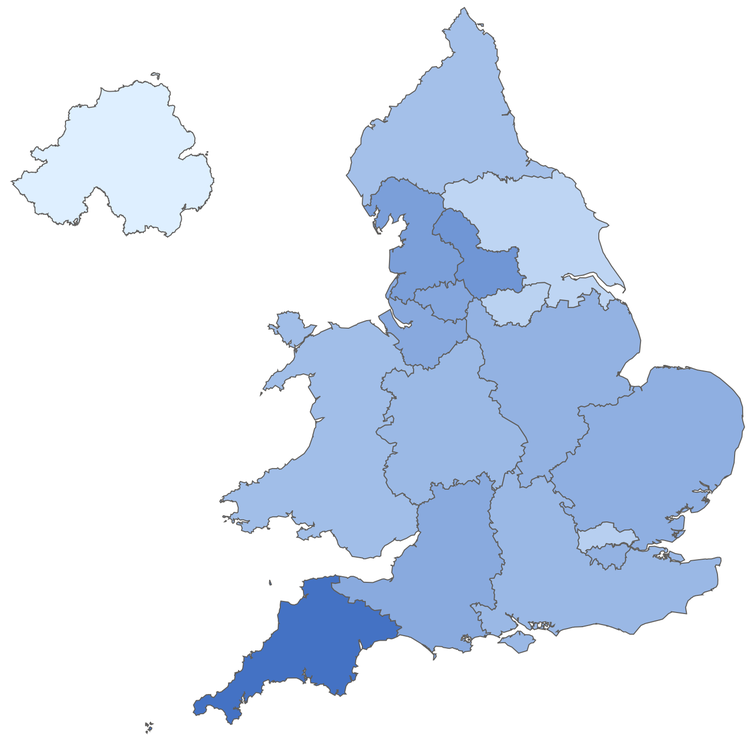
- Population demographics, particularly age and sex
- Access to treatment and capacity within hospitals
- Variation in practice.

Note: Patient home address data are not available for patients in Northern Ireland. Data for Northern Ireland in the CN map are incomplete.

CRT-P procedures per million population by ICB/HB based on patient home location (2023/24)



CRT-P procedures per million population by Cardiac Network based on hospital location (2023/24)



There is a 5-fold difference in the rate of ICD implants across Integrated Care Boards / Health Boards in England and Wales

Implantable cardioverter-defibrillator (ICD) devices are used in patients to treat most life threatening fast heart rates by delivering a small shock. They are not designed to improve heart pump function.

Across the 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs), the overall rate was 110 per million population (pmp).

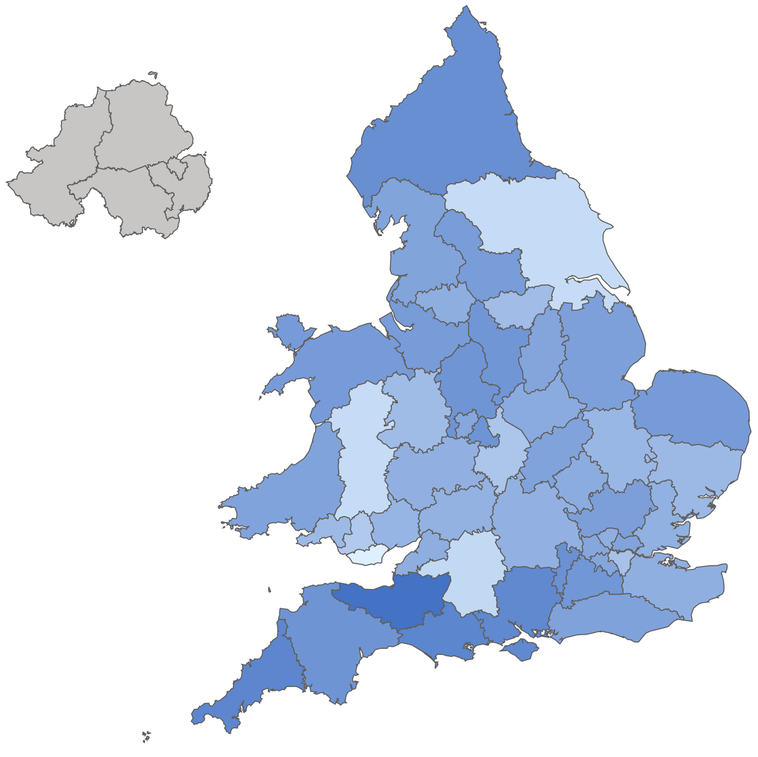
The highest rate was 170 pmp in Somerset ICB, and the lowest was 30 pmp in Cardiff and Vale University Health Board. For Cardiac Networks, the highest rate was 180 pmp in South London compared with 22 pmp in Humber and North Yorkshire.

This variation could result from differences in:

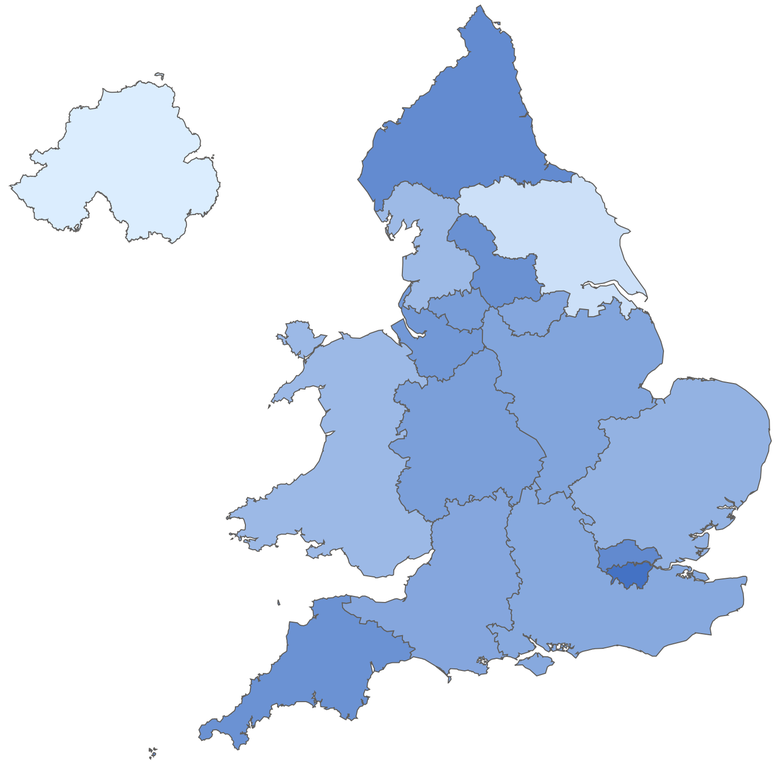
- Population demographics, particularly age and sex
- Access to treatment and capacity within hospitals
- Variation in practice.

Note: Patient home address data are not available for patients in Northern Ireland. Data for Northern Ireland in the CN map are incomplete.

ICD procedures per million population by ICB/HB based on patient home location (2023/24)



ICD procedures per million population by Cardiac Network based on hospital location (2023/24)



There is a more than five-fold difference in the rate of CRT-D procedures across the Integrated Care Boards / Health Boards in England and Wales

A Cardiac Resynchronisation Therapy Defibrillator (CRT-D) is like a CRT-P device but has defibrillator function.

In 2023/24, the overall national implant rate across the 42 Integrated Care Boards (ICBs) in England and the seven Welsh Health Boards (HBs) was 84 per million population (pmp).

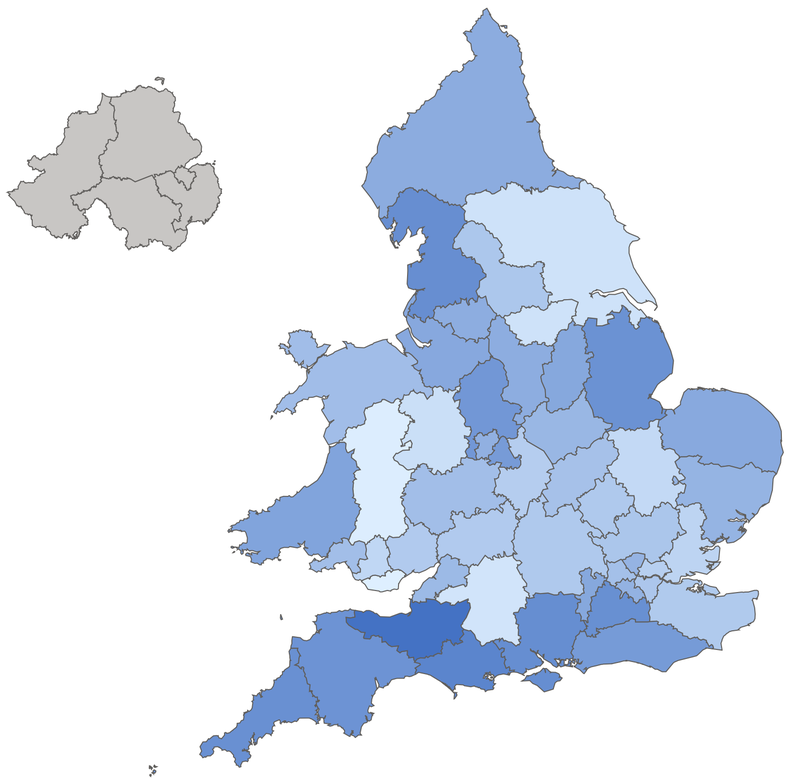
The highest rate was 151 pmp in Somerset ICB and the lowest was 28 pmp in Cardiff and Vale University Health Board. For Cardiac Networks, the highest rate was 136 pmp in South London compared with the lowest of 20 pmp in Humber and North Yorkshire.

This variation could result from differences in:

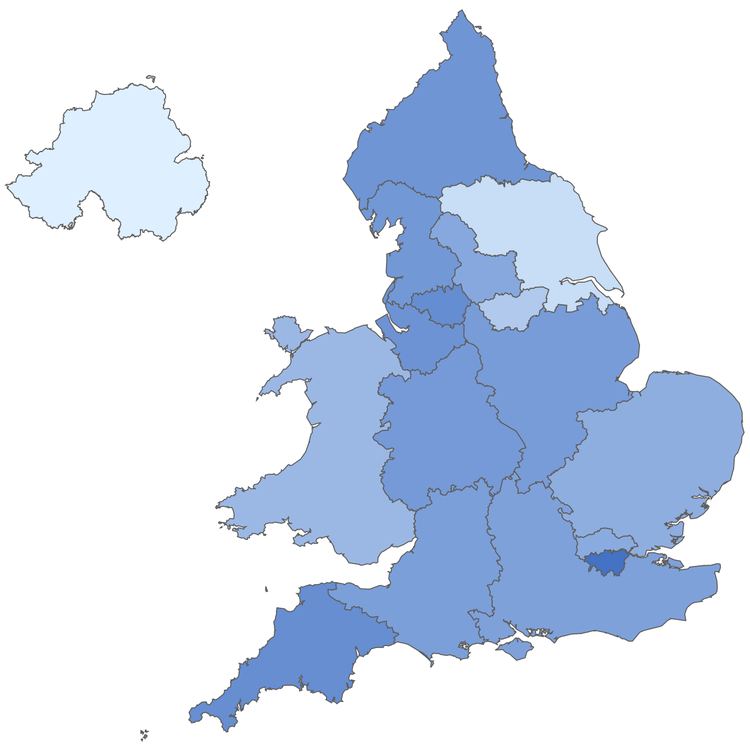
- Population demographics, particularly age and sex
- Access to treatment and capacity within hospitals
- Variation in practice.

Note: Patient home address data are not available for patients in Northern Ireland. Data for Northern Ireland in the CN map are incomplete.

CRT-D procedures per million population by ICB/HB based on patient home location (2023/24)



CRT-D procedures per million population by Cardiac Network based on hospital location (2023/24)



The number of patients with a pacemaker is increasing, resulting in a gradual rise in the number of procedures to provide a new battery ('box changes')

There were slightly fewer new pacemaker implant procedures in 2023/24 than 2015/16 (30,199 compared with 34,368).

The number of generator ('box') changes in 2023/24 has increased compared to 2015/16.

At the start of the COVID-19 pandemic, given the uncertainty of what procedural activity was going to be possible, there was a spike in the number of box changes as procedures were brought forward to clear waiting lists. The remainder of procedures are other procedures including lead intervention, not shown in the graph.

Selecting a Cardiac Network or hospital below or hovering over the graphs shows specific data.

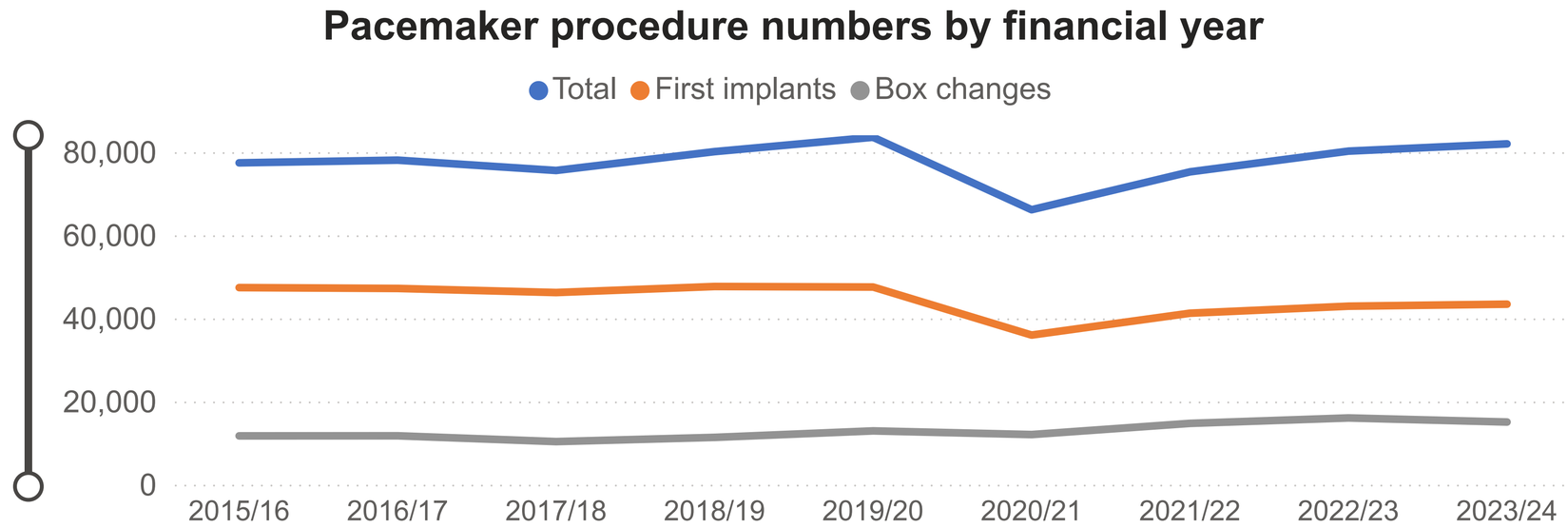
Key:
Total includes all new procedures, generator changes, upgrades, revisions, downgrades and explants
First implants includes first implants only
Box changes includes generator changes, upgrades and downgrades

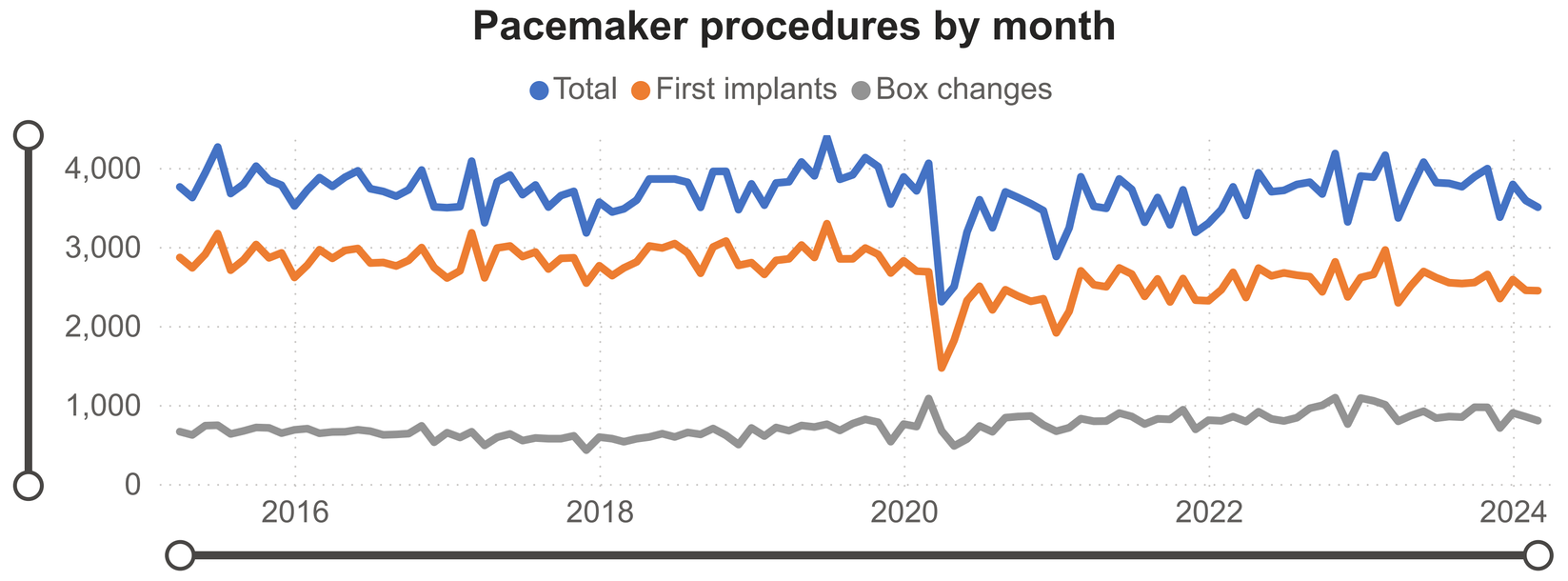
Select Cardiac Network

All

Select hospital

All





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The use of cardiac resynchronisation therapy pacemakers has increased slowly while other complex CIED procedures have declined, especially post-pandemic

In 2023/24, the number of ICD and CRT-D procedure numbers were still below pre-pandemic levels.

CRT-P procedure numbers have been rising since 2015/16 and were higher in 2023/24 (at 6,517) than before the pandemic. The proportion of CRT-D to CRT-P implants has decreased from 1.5 to 1 in 2015/16 to 0.9 to 1 in 2023/24. This likely reflects a gradual shift in clinical practice and guidelines, as trials such as DANISH have been published.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

Note: The numbers displayed are total procedures, whether new implants, generator changes, upgrades, revisions, downgrades or explants.

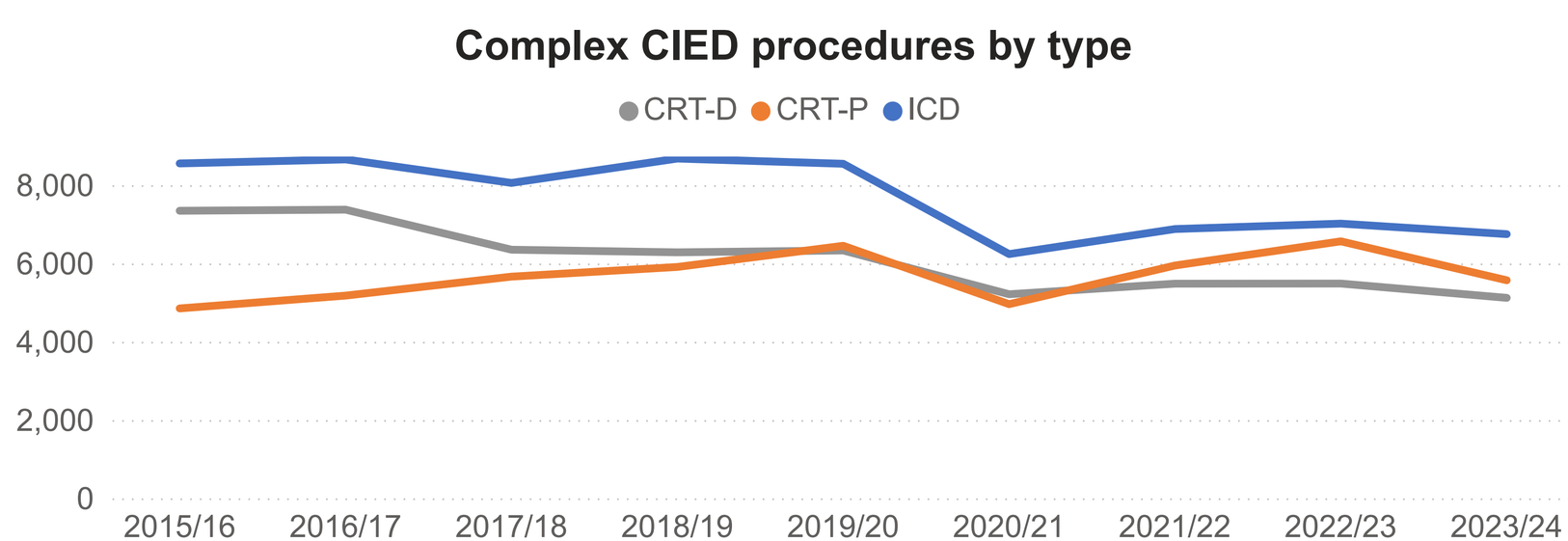
Key:
ICD = Implantable Cardioverter-Defibrillator
CRT-P = Cardiac Resynchronisation Therapy Pacemaker
CRT-D = Cardiac Resynchronisation Therapy Defibrillator

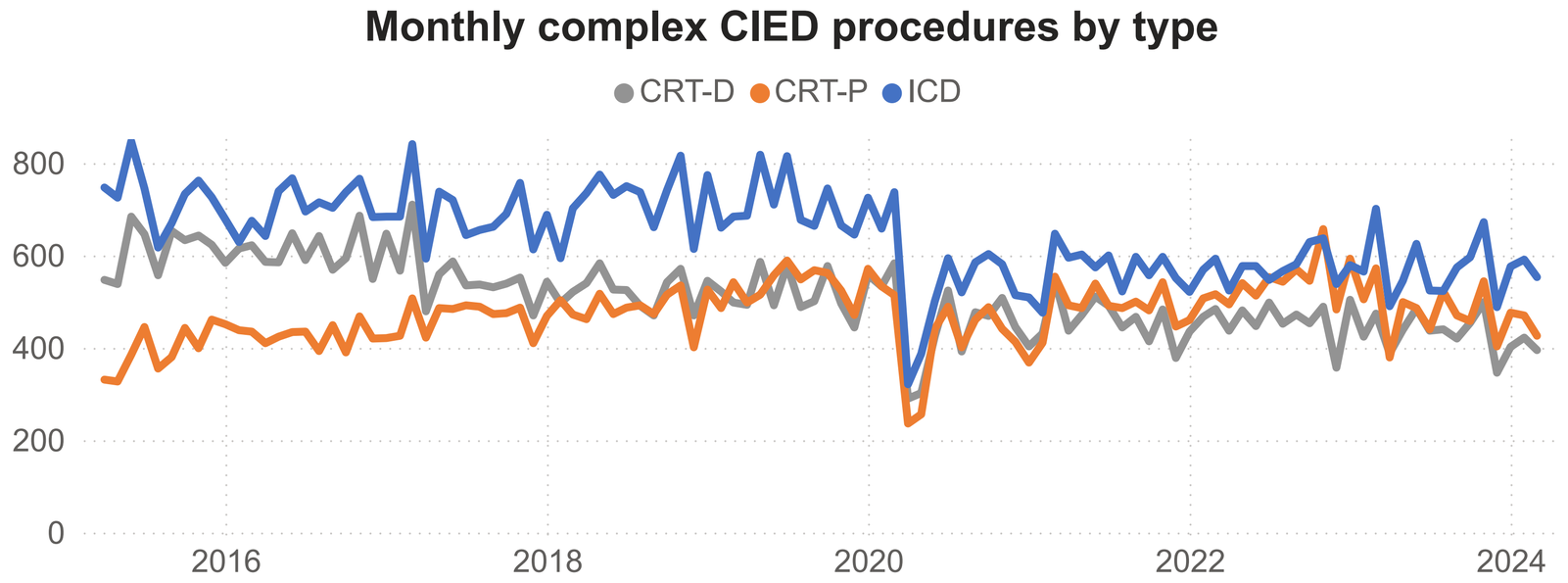
Select Cardiac Network

All

Select hospital

All





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There is large variability in the use of CRT-D compared to CRT-P between implanting hospitals

The ratio of CRT-D to CRT-P implants reflects the factors influencing the decision to implant CRT devices with and without defibrillator therapy. There is no correct proportion for best practice.

In 2023/24, the median ratio across all hospitals was 0.88. There was wide variation across individual hospitals, with the ratio ranging from 0 to 5.

Variation could result from differences in:

- Population demographics, particularly age and sex
- Access to treatment
- Clinical indications
- Variation in practice.

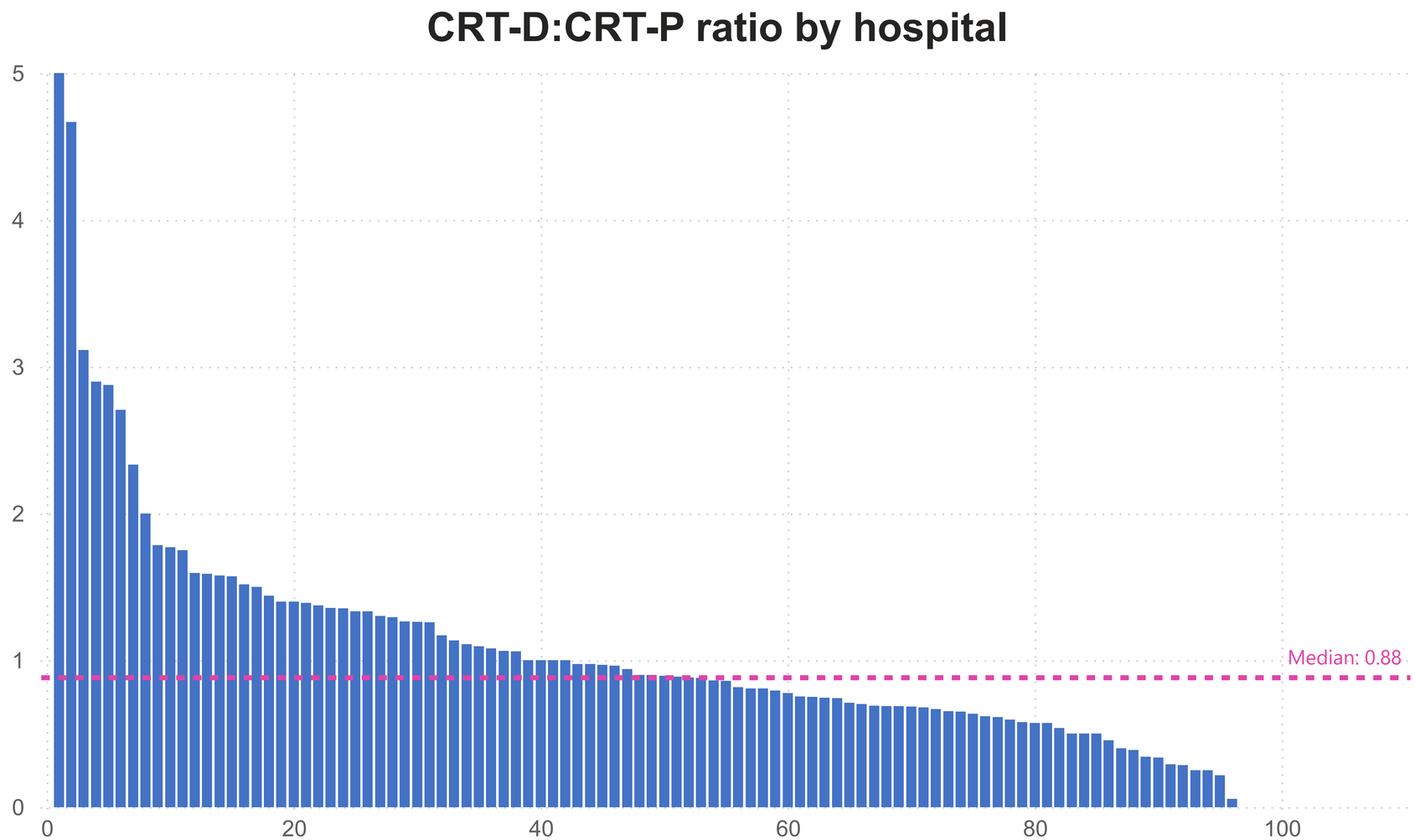
Select a Cardiac Network or hospital below to see its specific data.

Cardiac Network

All

Hospital name

All



There is a 7-fold difference in the use of CRT-D compared to CRT-P across the Integrated Care Boards / Health Boards in England and Wales

There is variation in the use of CRT-D to CRT-P implants, which may relate to indication, patient factors and co-morbidities. This will be more informed by future trials.

There is a wide variation depending on patient postcode (left), implanting hospital location (centre) and implanting region (right).

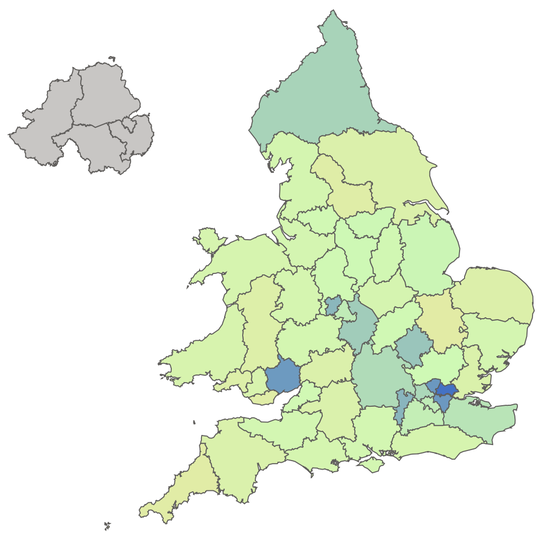
The region with the highest proportion of CRT-D to CRT-P implants was NHS Frimley ICB (82 to 41), and the region with the lowest proportion was NHS Suffolk And North East Essex (0 to 37).

Variation could result from differences in:

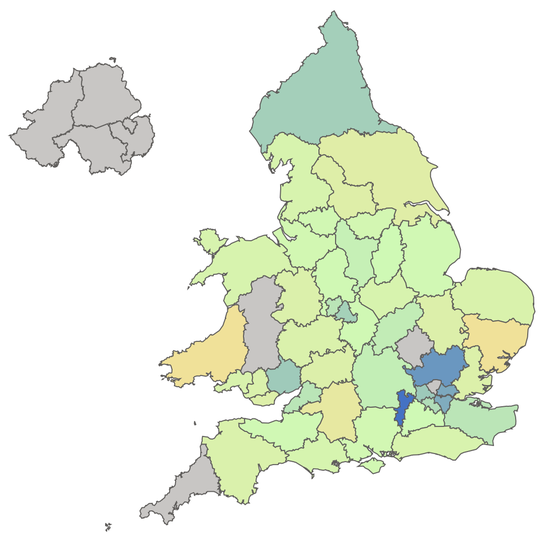
- Population demographics, particularly age and sex
- Access to treatment
- Clinical indications
- Variation in practice.

Key:
Blue = more CRT-D
Green = roughly equal
Yellow = more CRT-P
Grey = incomplete or no data

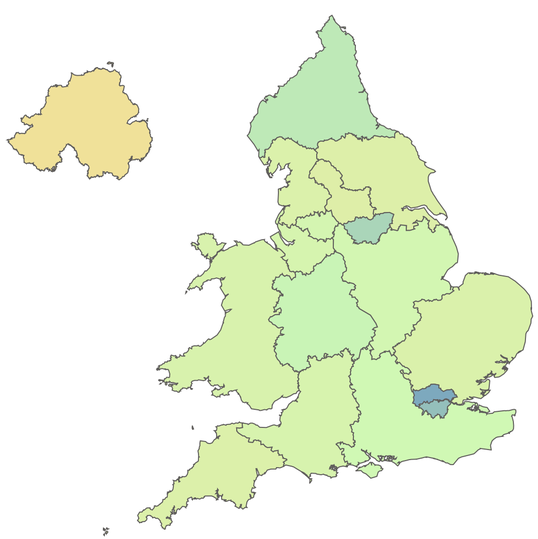
CRT-D:CRT-P ratio by ICB/HB, based on patient home address (2023/24)



CRT-D:CRT-P ratio by ICB/HB, based on hospital location (2023/24)



CRT-D:CRT-P ratio by Cardiac Network, based on hospital location (2023/24)



ICD procedure volume has declined since 2018/19

ICD implant volumes declined 24% between 2018/19 and 2023/24.

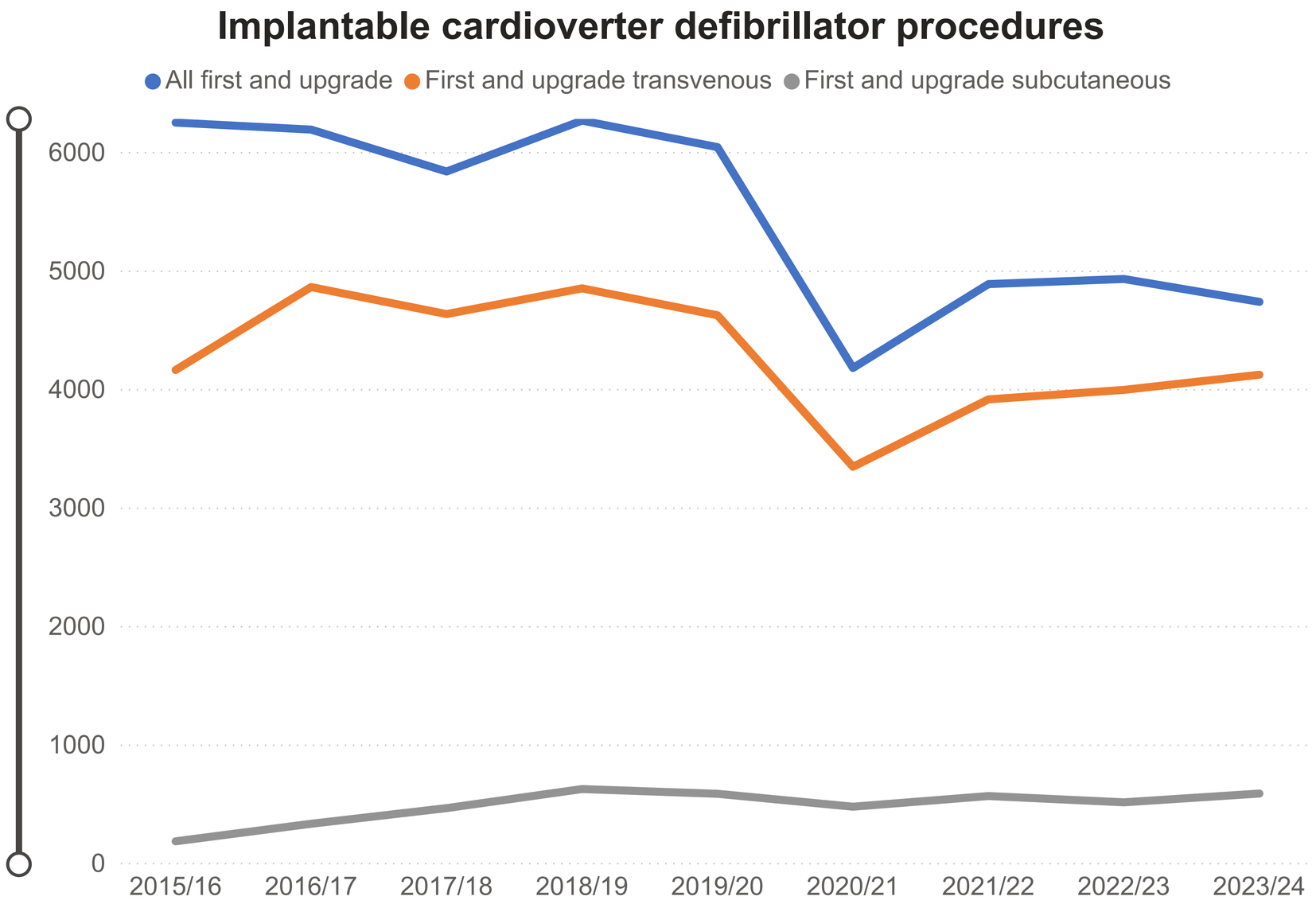
This could be related to:

- A change in clinical practice
- Better prevention of heart failure (e.g. by revascularisation)
- Better treatment of heart failure (e.g. by new medication therapies).

Selecting a Cardiac Network below shows the total figures across hospitals in that area.

Select Cardiac Network

All



One year mortality after defibrillator implantation is 4% and varies from 0 to 17% between hospitals

Defibrillators are used to prevent sudden cardiac death, and so implantation is only recommended in patients who have an expectation of good quality survival of greater than one year.

The median one year mortality rate after ICD or CRT-D implant is 4% overall. The range across hospitals is between 0 and 17%. Variation in one year mortality reflects appropriateness of patient selection and does not represent procedural risk.

Select a Cardiac Network/hospital below or hover over the graph to see specific data.

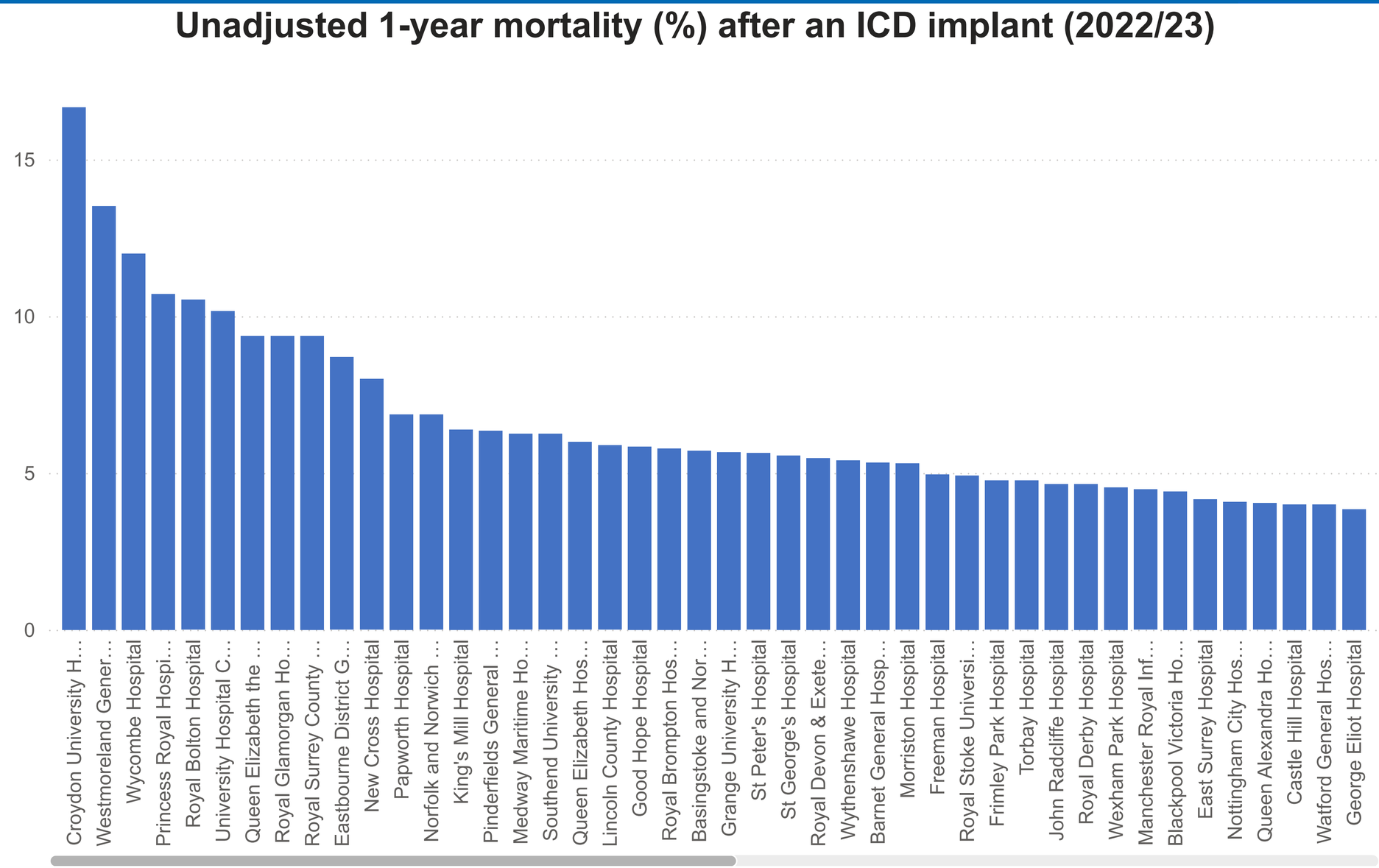
Note: centres with low implant volume > 20 implants per year are excluded.

Select hospital

All

Select Cardiac Network

All



17% of hospitals are unable to demonstrate compliance with the target set for the use of dual chamber pacing for sick sinus syndrome

One cause of abnormal heart rhythms is malfunction of the sinus node, the heart's primary pacemaker. This is known as sick sinus syndrome.

NICE guidance recommends the use of dual-chamber pacing (rather than single chamber) in this condition/setting and the audit has recommended hospitals aim to achieve this for 90% of relevant procedures.

In 2023/2024, 83% of dual chamber pacemakers for sick sinus rhythm adhered to NICE TA324 guidance. Three quarters of hospitals met the target but 33 did not. This proportion has remained similar since 2015/16.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

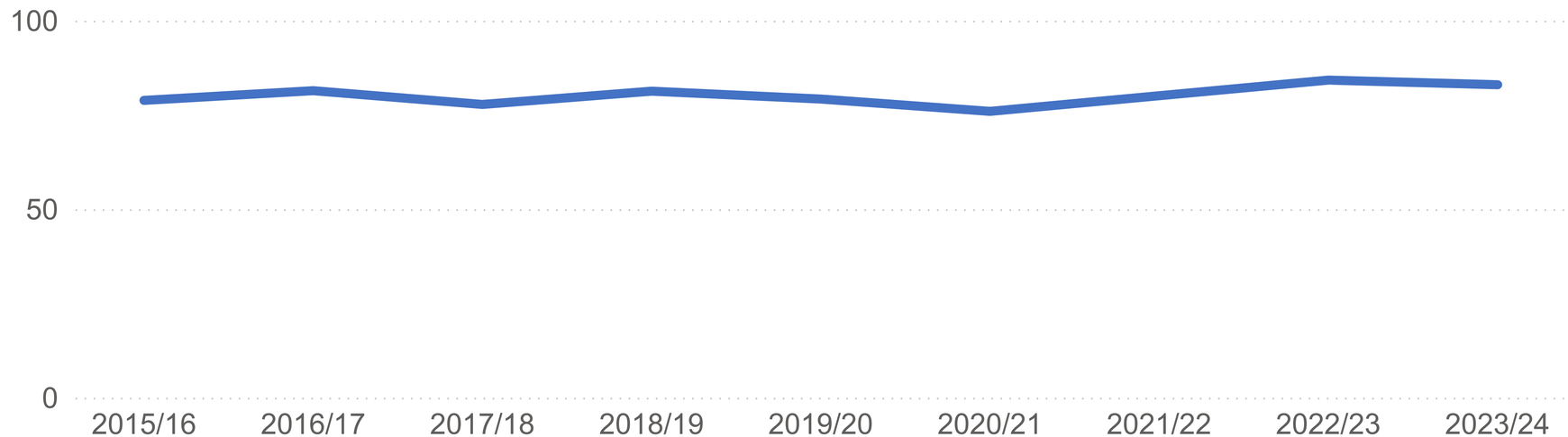
Select Cardiac Network

All

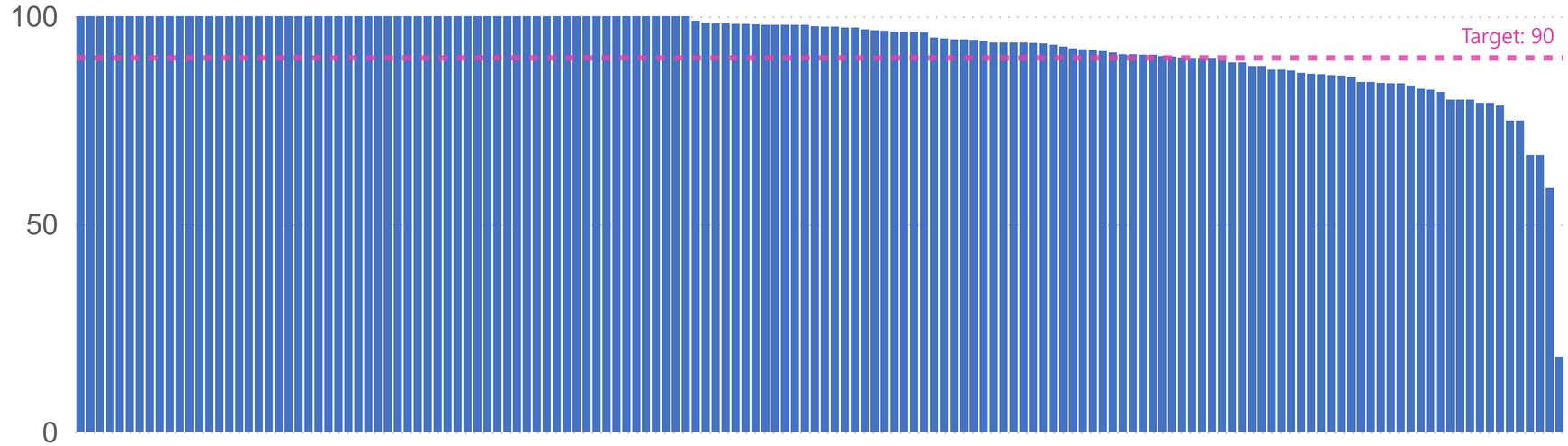
Select hospital

All

Percentage compliance with NICE guidance on dual pacing for sick sinus syndrome



Percentage compliance with NICE guidance on dual pacing for sick sinus syndrome by hospital (2023/24)



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Nearly a third of hospitals are unable to demonstrate compliance with the target set for the use of dual chamber pacing in patients with atrio-ventricular block

NICE guidance recommends dual chamber pacing for most people who have atrio-ventricular (AV) block (where the electrical signal from the upper chambers to lower chambers of the heart is impaired) with or without sick sinus syndrome, or for those with atrio-ventricular block without continuous atrial fibrillation.

The audit has recommended hospitals aim to achieve this for 90% of relevant procedures.

In 2023/2024, 87% of procedures adhered to NICE TA88 guidance for dual chamber pacemakers for atrio-ventricular block. Almost 70% of hospitals met the target but 46 did not. This proportion has remained similar since 2015/16.

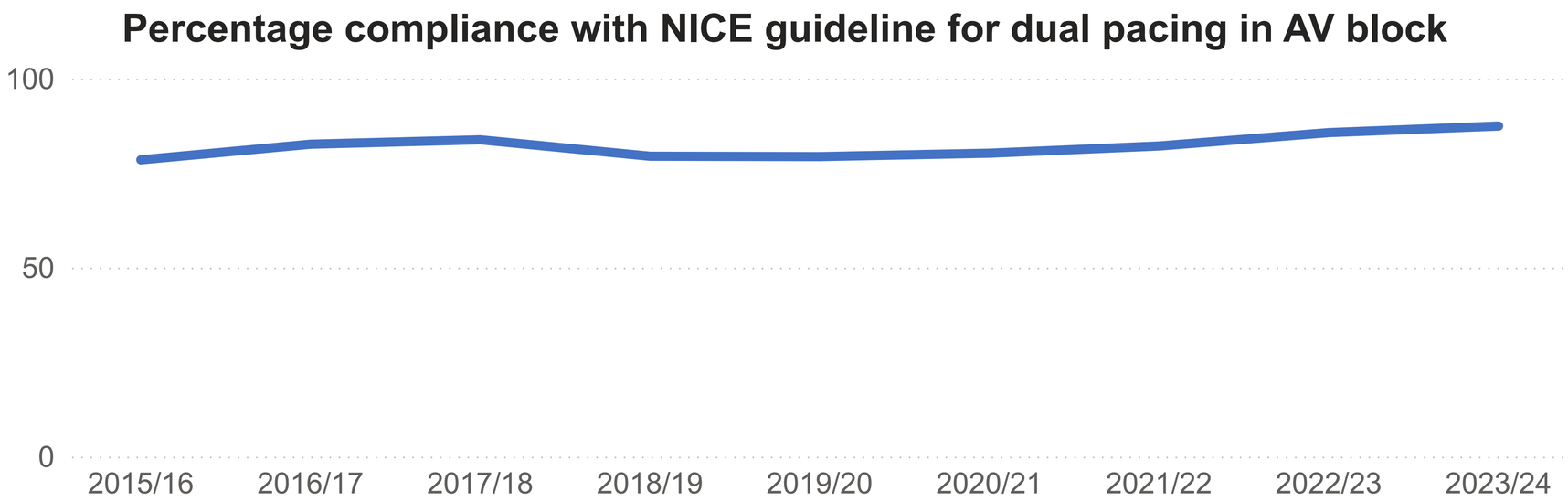
Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

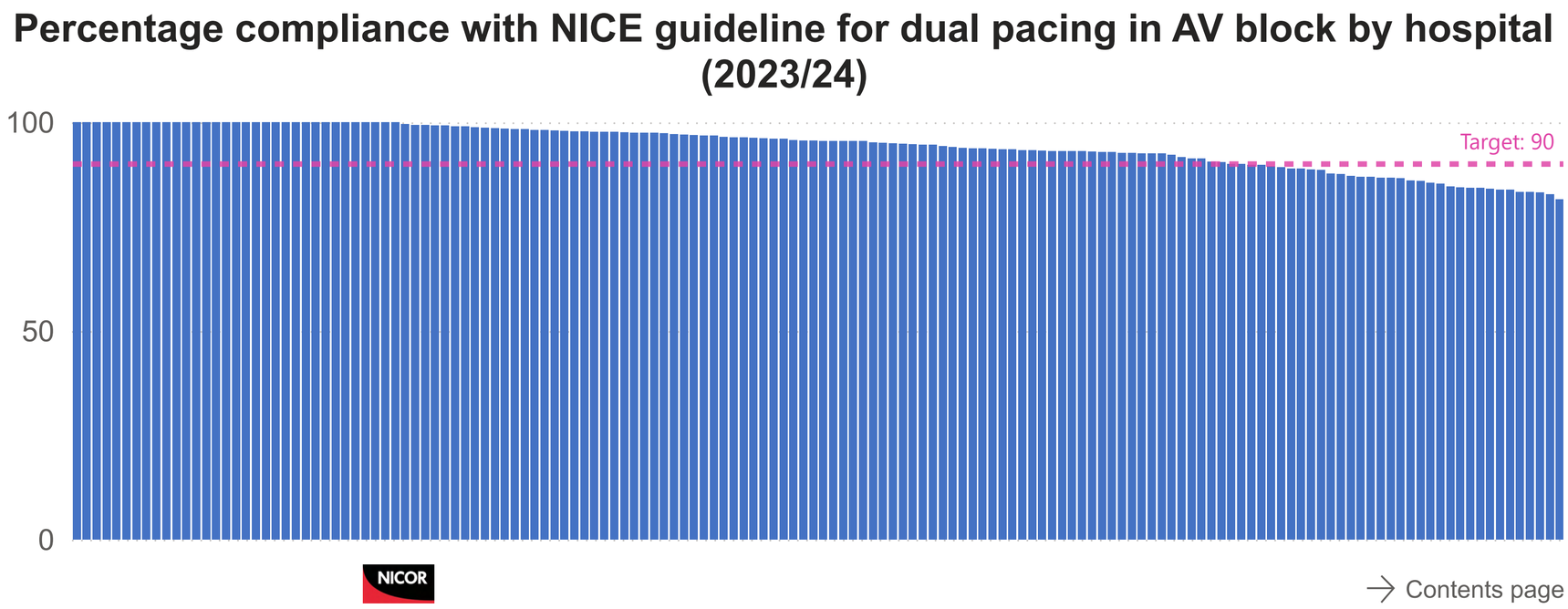
Select Cardiac Network

All

Select hospital

All





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Over a third of hospitals cannot demonstrate compliance with NICE guidance on the use of an ICD for primary prevention

NICE guidance (TA314) recommends that an implantable cardioverter defibrillator (ICD) should be implanted for primary prevention when a patient is deemed at risk but has not yet suffered from a cardiac arrest that could be life-threatening.

The audit has recommended hospitals aim to achieve this for 80% of relevant procedures.

The average compliance has remained just under 50% since 2015/16.

It is likely that non-compliance is because of data entry issues and does not reflect true performance.

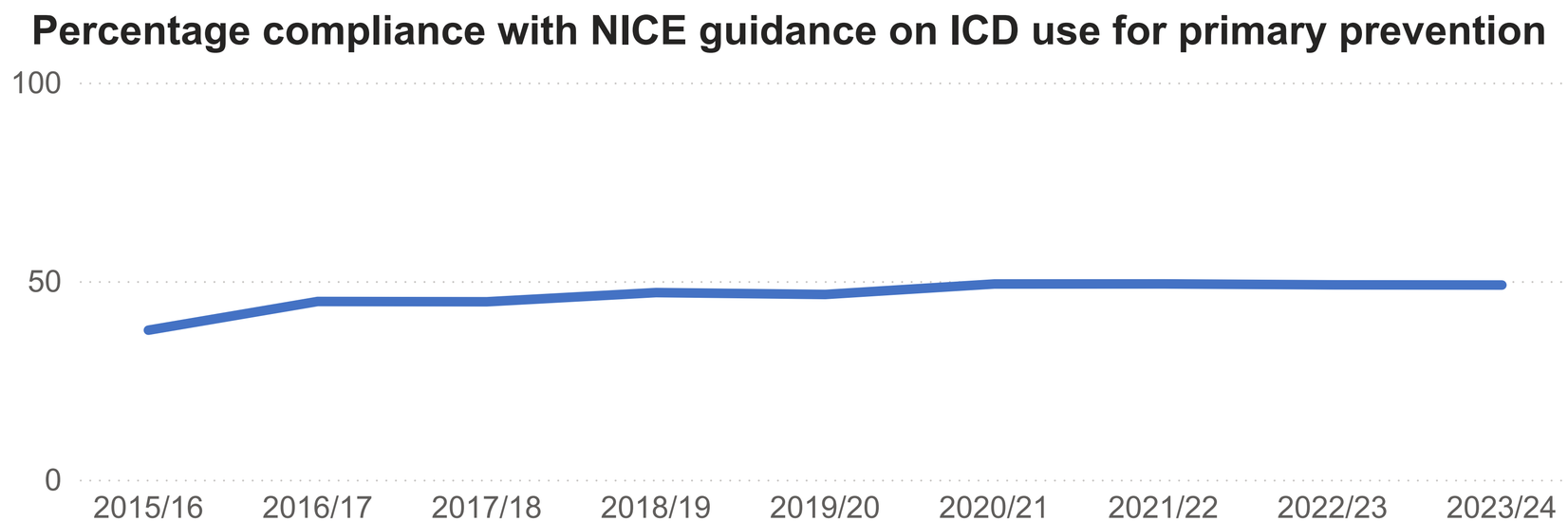
Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

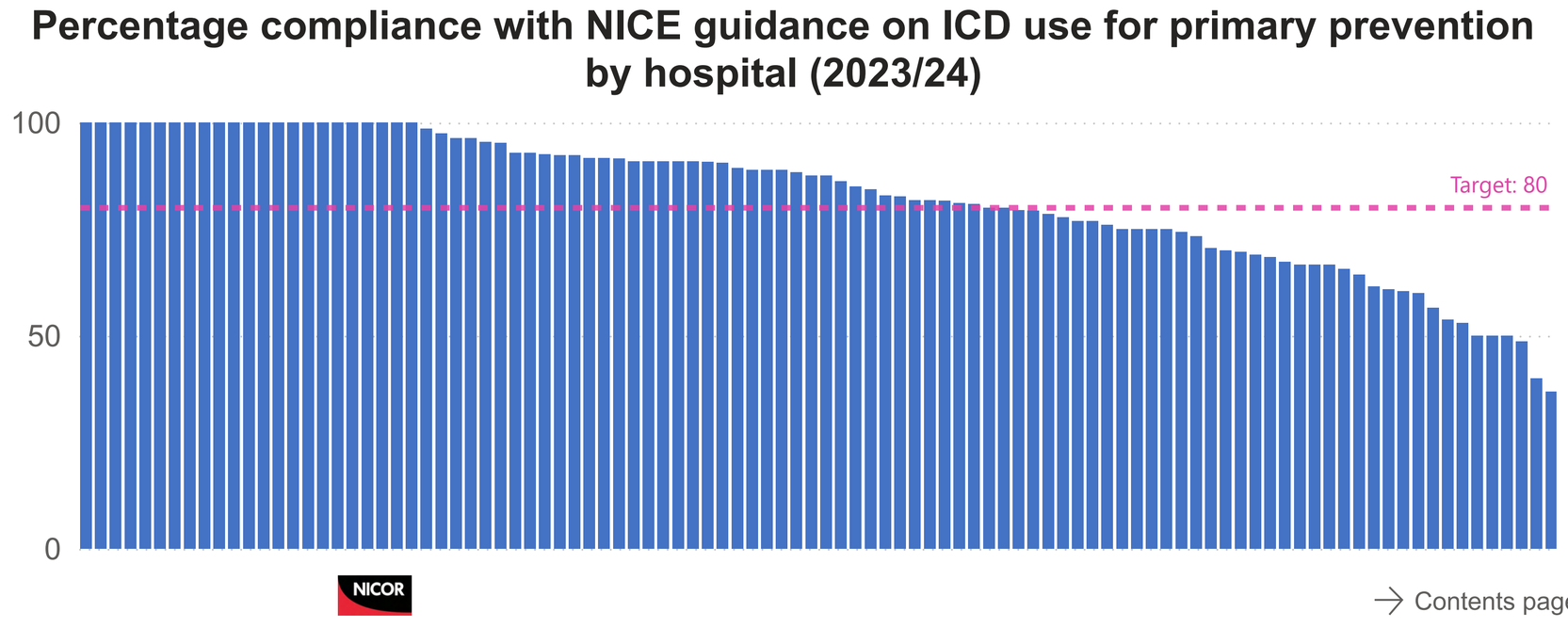
Select Cardiac Network

All

Select hospital

All





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Over 40% of hospitals are unable to demonstrate compliance with NICE guidance on the use of an ICD for secondary prevention

NICE guidance (TA314) has set criteria for when a cardioverter defibrillator (ICD) should be implanted in someone for secondary prevention (e.g. they have already survived a cardiac arrest).

The audit has recommended that, on average, 80% of implants should meet this guidance.

The average across all procedures in 2023/24 was 39%. While 42 hospitals met the target, 125 did not.

It is likely that non-compliance with this guideline is the result of issues to do with data submission.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

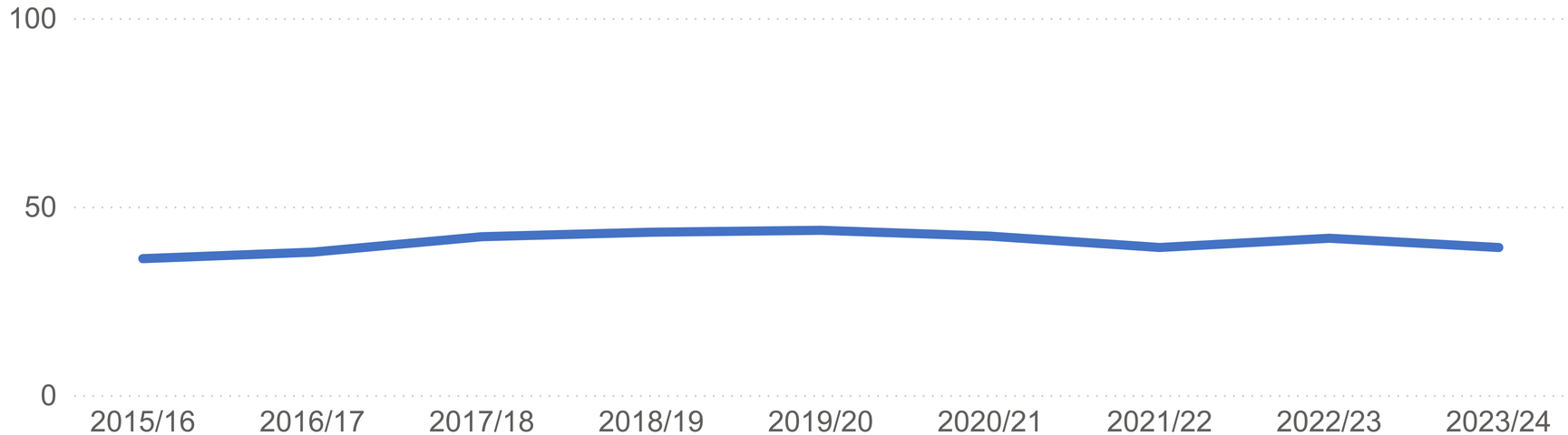
Select Cardiac Network

All

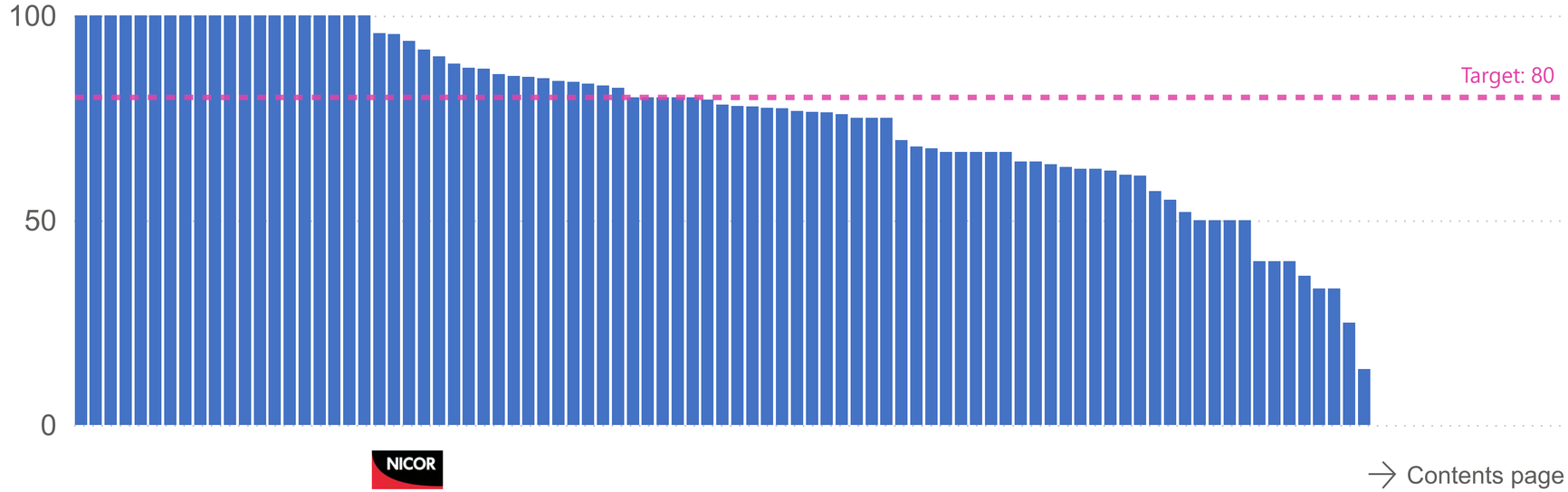
Select hospital

All

Percentage compliance with NICE guidance on use of ICD for secondary prevention



Percentage compliance with guidance on ICD use for secondary prevention by hospital (2022/23)



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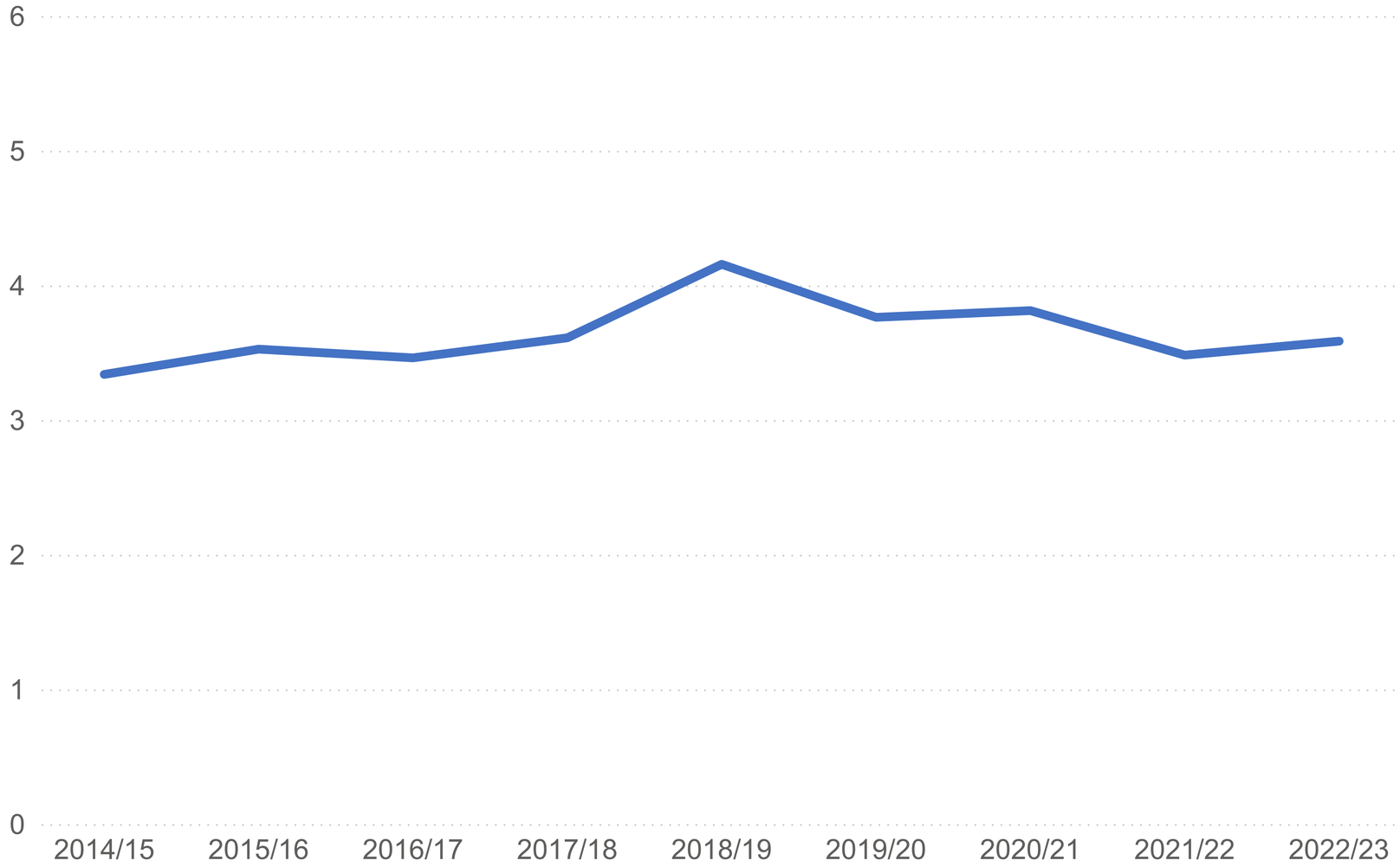
The 1-year re-intervention rate after simple CIED procedures remained at just over 3.6% in 2022/23

3.6% of patients who had a new simple CIED implant (either a single chamber or dual chamber pacemaker) in 2022/23 required some sort of re-intervention within 1 calendar year.

This figure has remained broadly stable over time.

Note: The data are one year behind the rest of the audit to allow for a complete calendar year of follow-up. The latest data presented here are for implants between April 2022 and March 2023. Patients are tracked by NHS number such that if an initial procedure takes place in one hospital, a re-operation in another hospital will be tracked. Only the first re-intervention is counted, so multiple re-interventions on the same patient are not included. The data do not account for those who may have died during the calendar year. Re-admissions for any reason where a re-intervention is not required are not included. The data do not include the need for treatment for a pneumothorax.

Percentage of simple CIED procedures requiring re-intervention within 1 year



The 1-year re-intervention rate after simple CIED implants ranges from near zero to 20% across different hospitals

There is significant variation in the rates of re-intervention after simple CIED implants across hospitals.

For 2022/23 implants, the re-intervention rate within hospitals performing more than 200 procedures ranged from 0.4% to 10.9%. Amongst hospitals undertaking a lower number of implants, there were several with re-intervention rates above 10%.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

Note: In order to show the data for individual hospitals and/or Cardiac Networks, the lower chart is derived by averaging each hospital's re-intervention rate. The percentage shown in the bottom graph therefore differs slightly from the national figure shown in the previous slide.

Select Cardiac Network

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Select hospital

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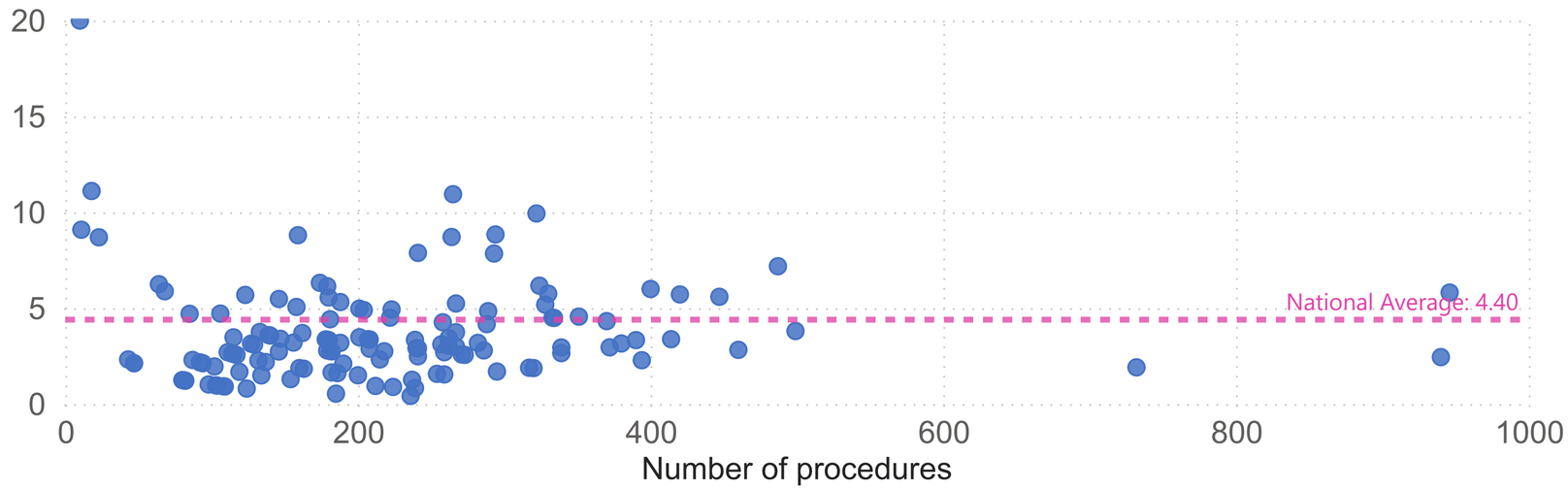
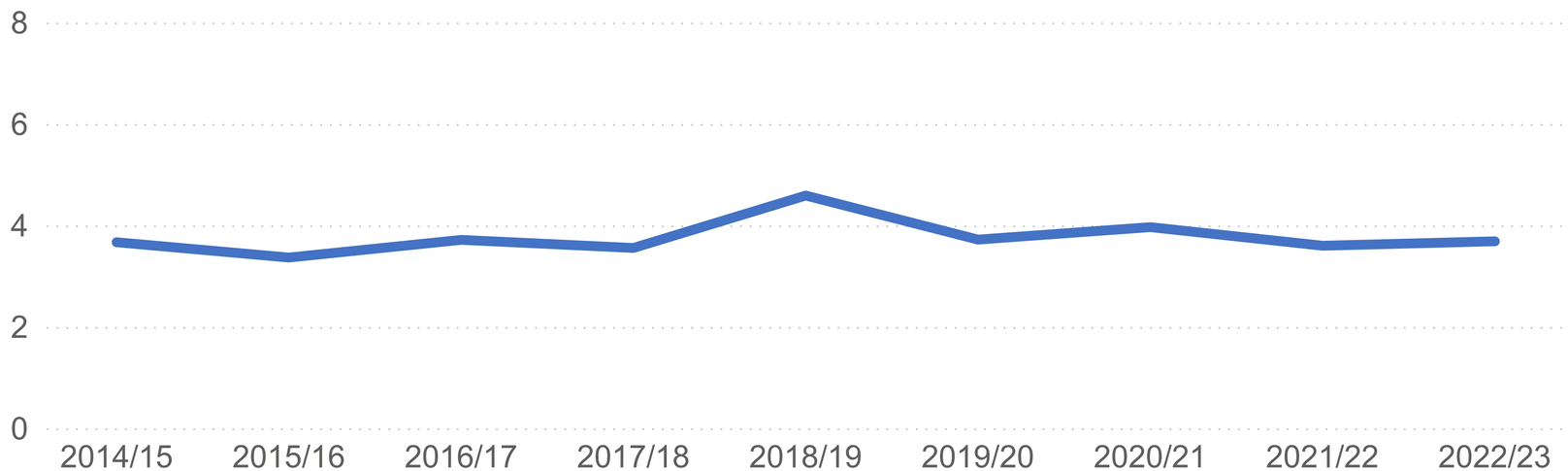
Percentage of simple CIED implants requiring re-intervention within 1 year by hospital (2022/23)



Percentage of simple CIED implants requiring re-intervention within 1 year



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The 1-year re-intervention rate after complex CIED implant is 5.6% and continues to decline

New complex CIED implants comprise:

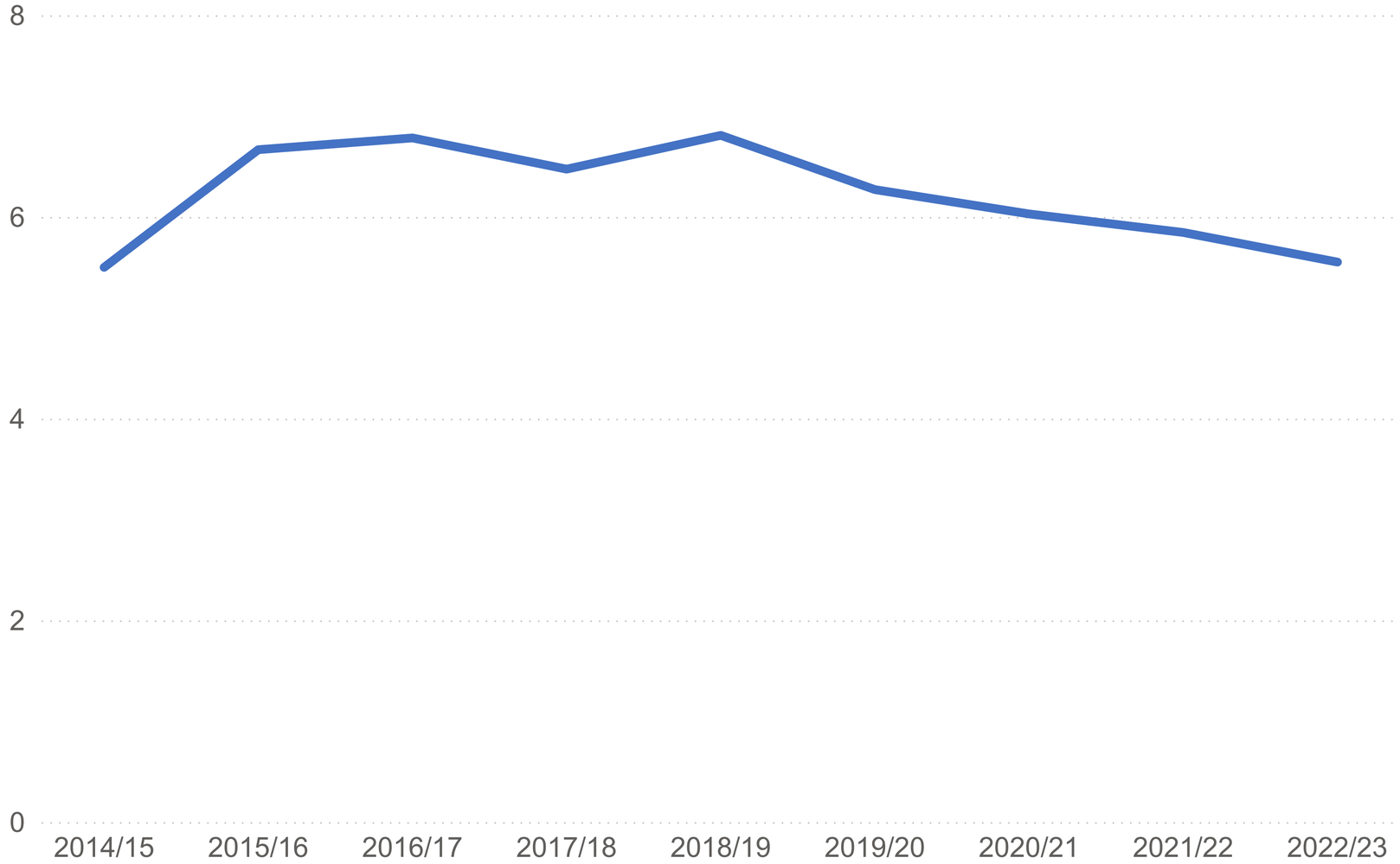
- Implantable Cardioverter-Defibrillator (ICD)
- Cardiac Resynchronisation Therapy Defibrillator (CRT-D)
- Cardiac Resynchronisation Therapy Pacemaker (CRT-P).

The overall 1-year re-intervention rate for these devices fell to 5.5% for implants in 2022/23 (a 20% reduction from a peak of 6.9% in 2018/19).

The factors driving this improvement require further investigation.

Note: The data are 1 year behind the rest of the audit to allow for a complete calendar year of follow-up. The latest data presented here are for implants between April 2022 and March 2023. Patients are tracked by NHS number such that if an initial procedure takes place in one hospital, a re-operation in another hospital will be tracked. Only the first re-intervention is counted, so multiple re-interventions on the same patient are not included. The data do not account for those who may have died during the calendar year. Re-admissions for any reason where a re-intervention is not required are not included. The data do not include the need for treatment for a pneumothorax.

Percentage of complex CIED procedures requiring re-intervention within 1 year



There is significant variation in the 1-year re-intervention rates after complex CIED implants with rates above 10% found in some hospitals

There is significant variation in re-intervention rates between hospitals following complex CIED implants.

For 2022/23 implants, the re-intervention rate amongst hospitals performing over 100 procedures ranged from 0.8% to 17%.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

Note: In order to show the data for individual hospitals and/or Cardiac Networks, the lower chart is derived by averaging each hospital's re-intervention rate. The percentage shown in the bottom graph therefore differs slightly from the national figure shown in the previous slide.

Select Cardiac Network

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Select hospital

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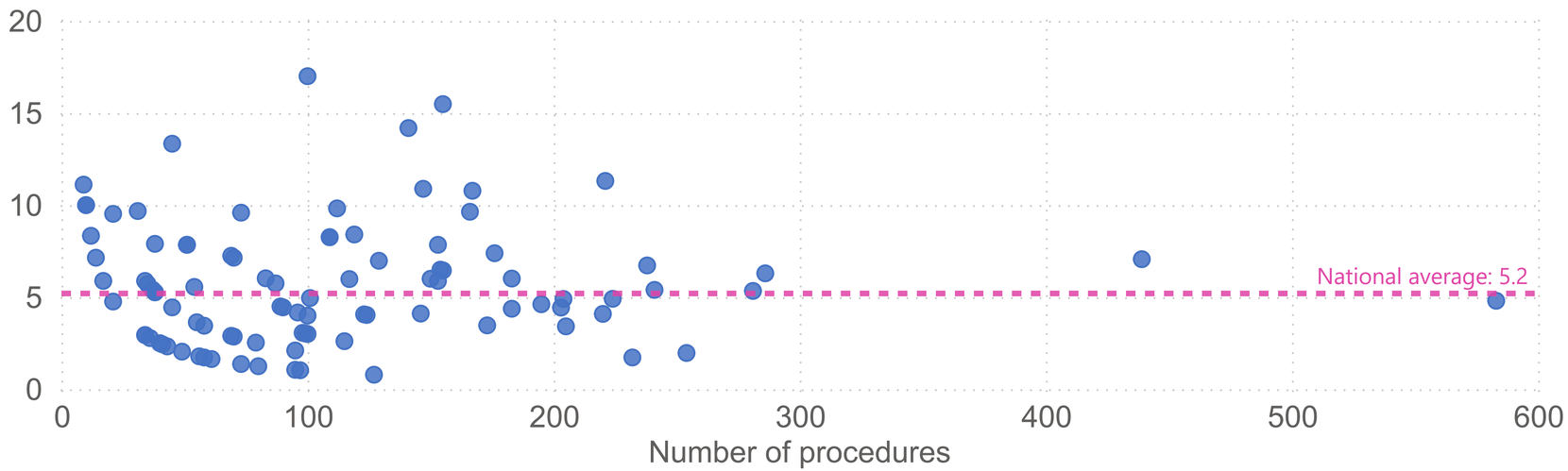
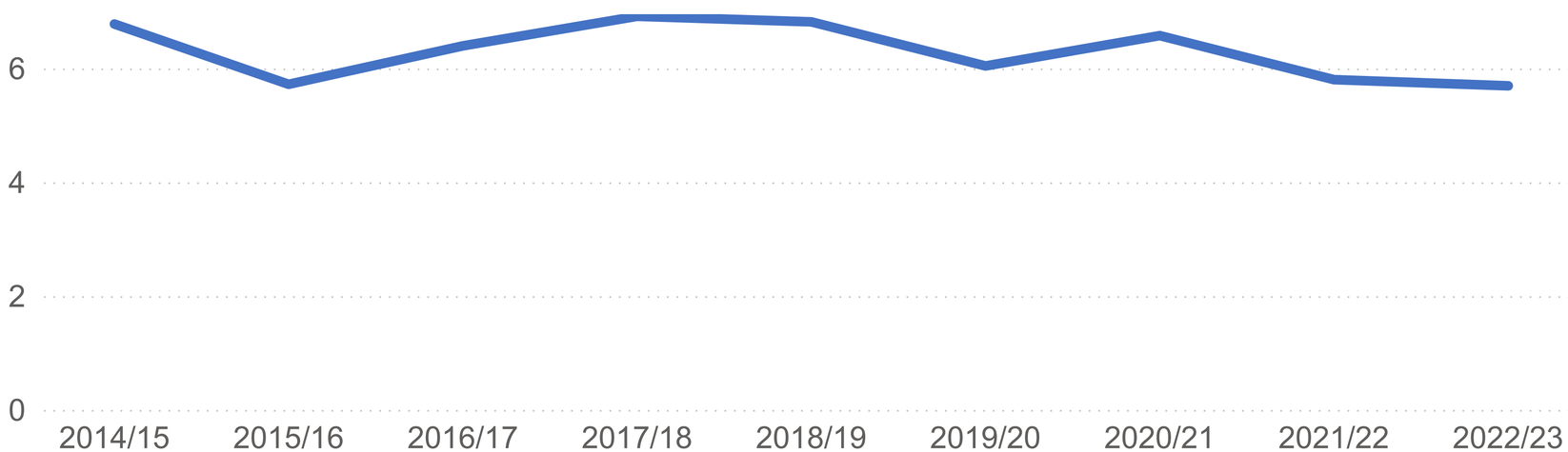
Percentage of complex CIED implants requiring re-intervention within one year by hospital (2022/23)



Percentage of complex CIED implants requiring re-intervention within one year



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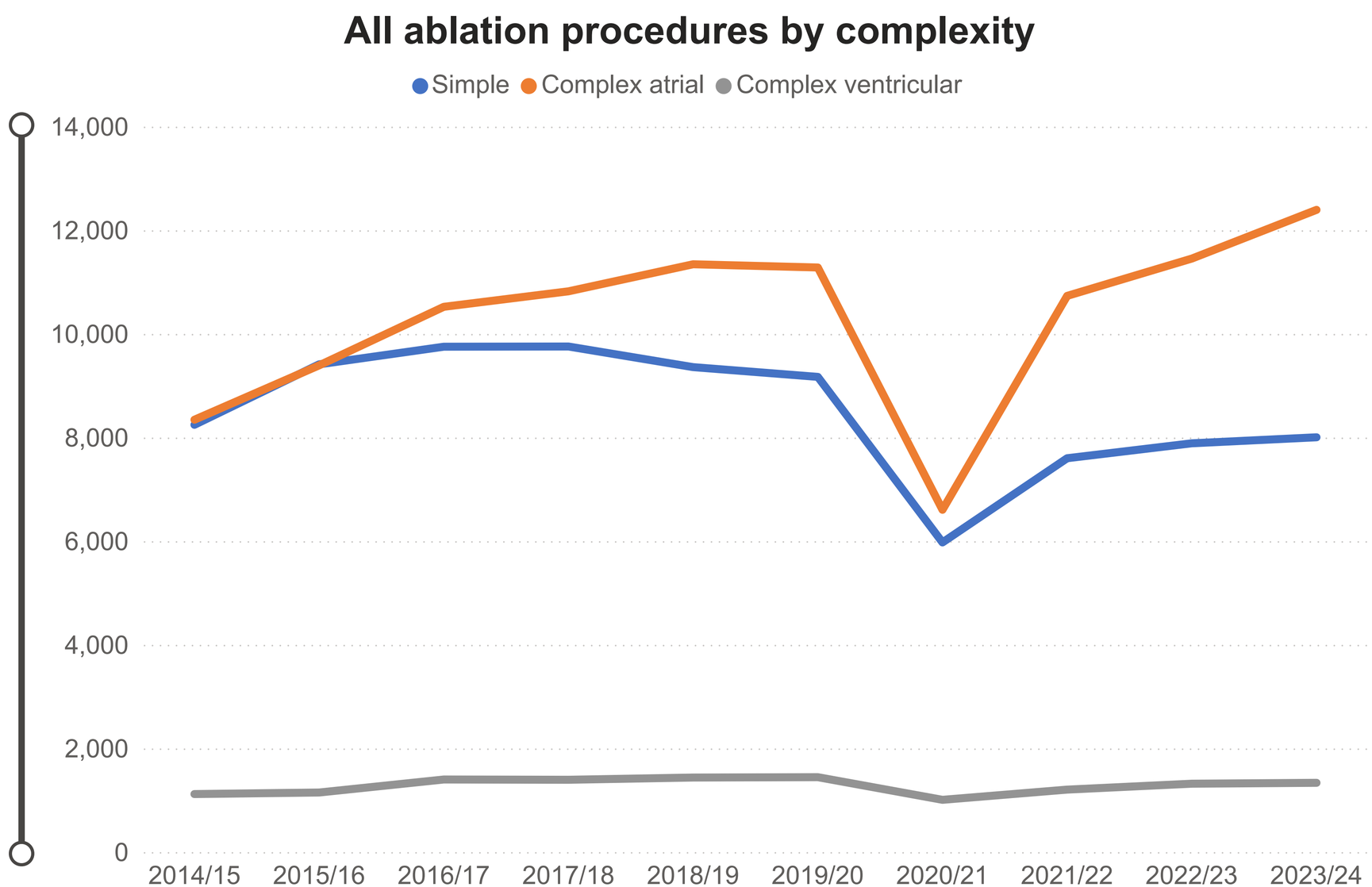
More complex atrial ablation procedures are being performed than prior to the pandemic but the number of simple ablation procedures has fallen

Although ablation procedures are categorised into simple and complex, these are all sophisticated techniques for treating specific substrates that promote fast heart rhythms. See here **(Link to be added at publication stage)** for the categorisation.

In 2023/24, there were:

- 12,393 complex atrial ablations (up from 8,343 in 2014/15)
- 8,004 simple atrial ablations (8,245 in 2014/15).

Ventricular procedures remain relatively few in number, with 1,336 performed in 2023/24.



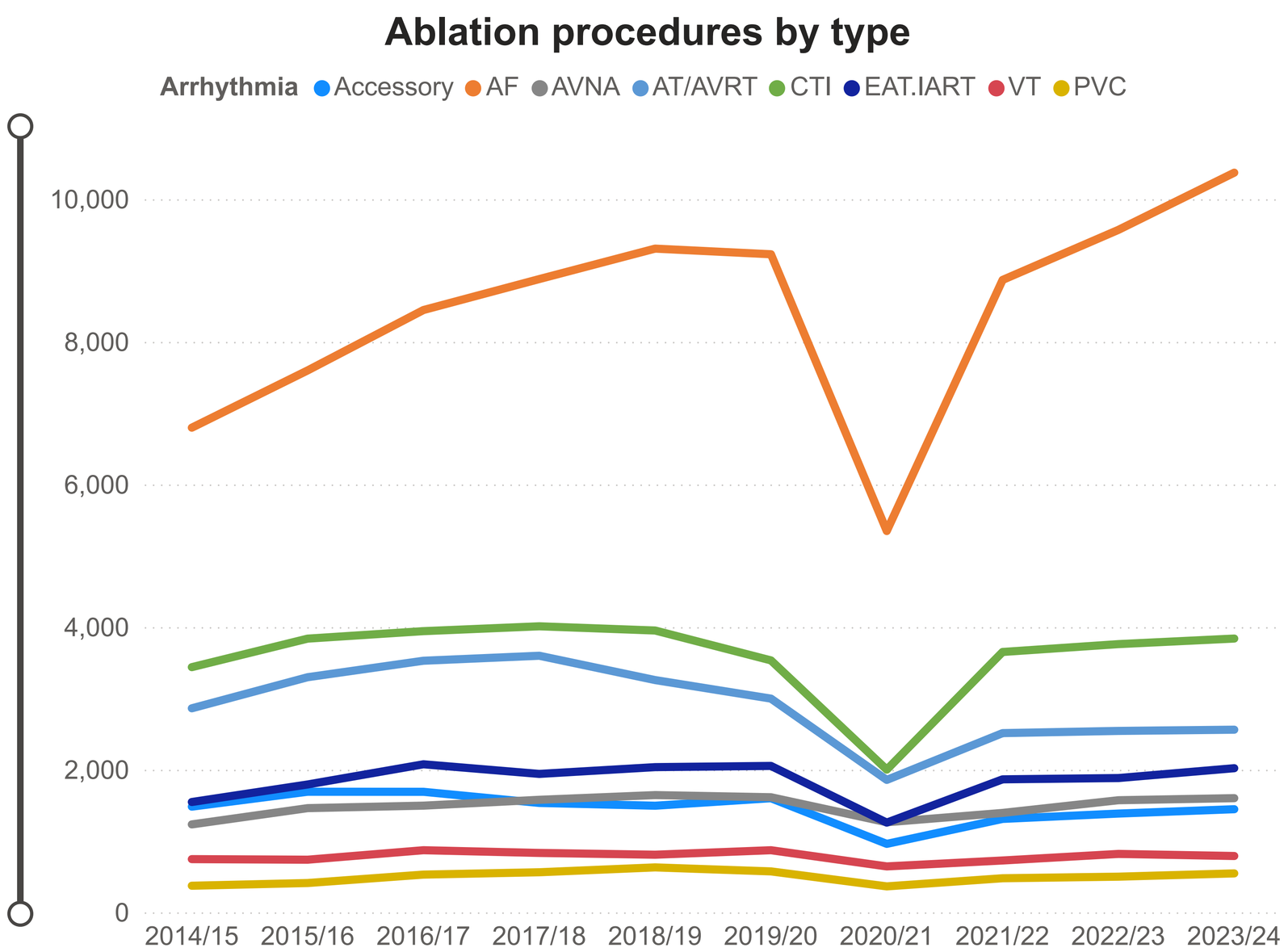
Ablation procedures by type

The COVID-19 pandemic caused a fall in the number of cases across all types of ablation procedure. Only ablation for atrial fibrillation (AF) has risen significantly since, by 52% compared with 2014/15.

The number of AV node ablations (1,601 in 2023/24) was stable, but may rise in future as a result of increasing evidence of the benefit of cardiac resynchronisation therapy (CRT) and AV node ablation in the treatment of heart failure and AF.

Ablations for AVNRT (2,561 in 2023/24) were substantially below pre-pandemic levels as is the case for accessory pathway ablations. This may reflect the observation that most centres have now ablated the majority of symptomatic cases previously managed by medication only. These levels may therefore reflect a new baseline.

Key:
AF = Atrial fibrillation
CTI = Cavo-tricuspid isthmus
AT/AVRT = Atrial tachycardia or Atrioventricular re-entrant tachycardia
EAT = Ectopic atrial tachycardia
IART = Atrial re-entry tachycardia
AVNA = Atrioventricular nodal ablation
VT = Ventricular Tachycardia
PVC = Premature Ventricular Contraction



77% hospitals deliver more than the minimum recommended number of ablations

The 2020 British Heart Rhythm Society (BHRS) Standards recommend that ablation centres undertake a minimum of 100 ablation procedures per year. This is for adult cardiology and there is no minimum recommended volume for paediatric hospitals/operators.

77% of the 57 centres submitting data met this standard in 2023/24.

It is accepted that some paediatric centres cannot meet this standard. Private hospitals do not meet this standard.

In Q1 2024/25 (April to June 2024), most hospitals are on track to perform the minimum number of annual procedures. 12 hospitals (28%) do not meet the minimum quarterly volume.

Select a Cardiac Network/ hospital below or hover over the graphs to see specific data.

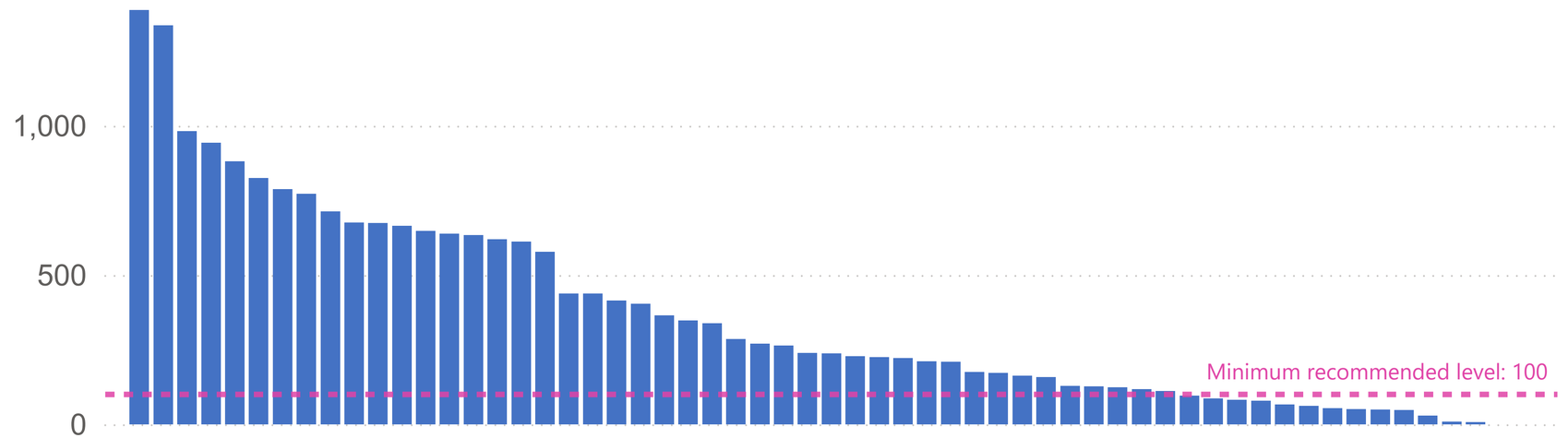
Select Cardiac Network

All

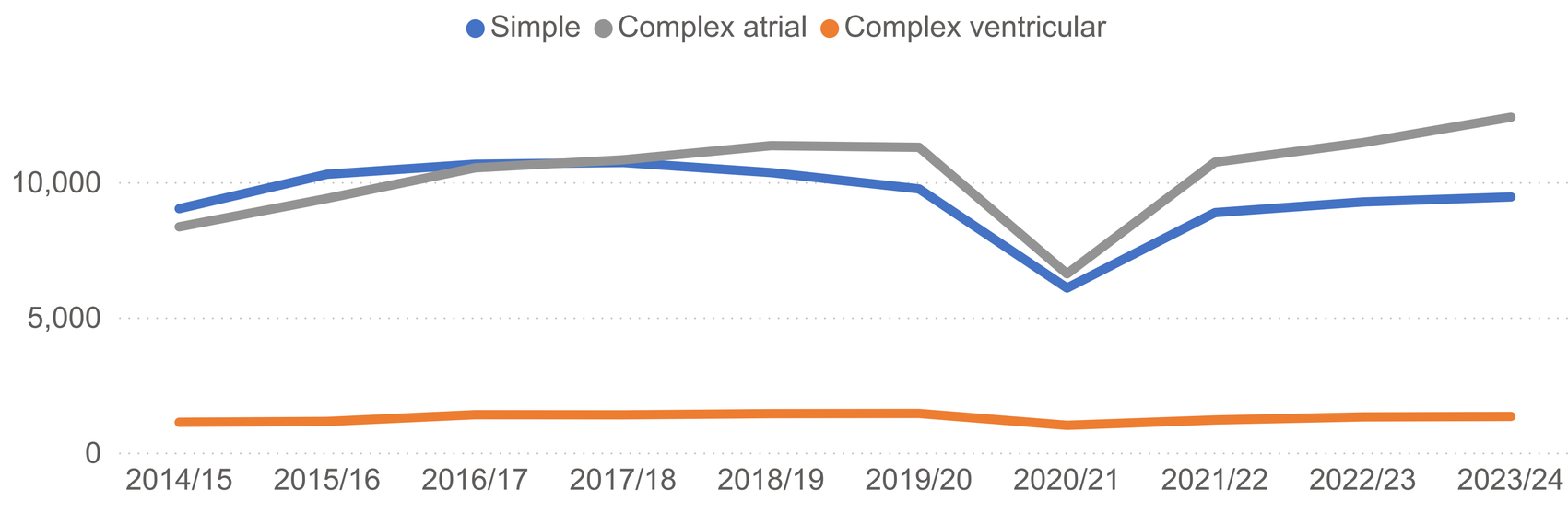
Select hospital

All

All ablation procedures by hospital (2023/24)



Complex and simple ablation procedures



There is a 5-fold difference in rates of ablation across the ICBs / HBs in England and Wales

The maps show the rate of ablation procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs)
- 16 Cardiac Networks (CNs) in England and Wales.

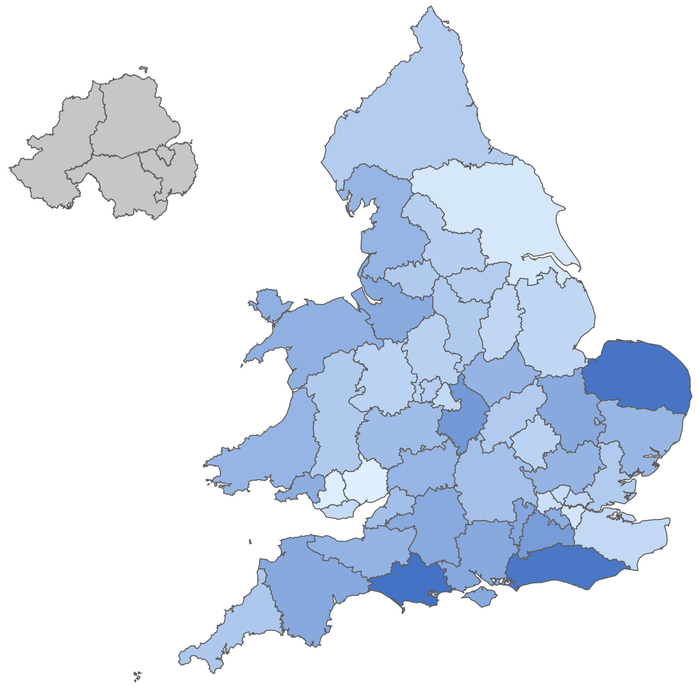
In 2023/24, the rates for ICBs/HBs varied from 141 pmp in Aneurin Bevan Health Board to 776 pmp in NHS Dorset ICB. The rates for Cardiac Networks varied from 176 pmp in Wales CN to 726 pmp in South London CN.

Variation could result from differences in:

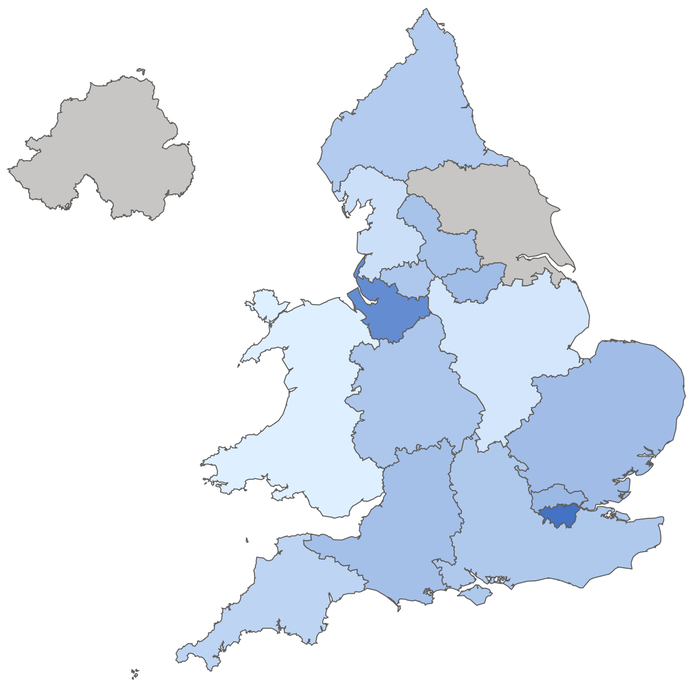
- Population demographics, particularly age and sex
- Access to treatment
- Treatment capacity within hospitals
- Variation in practice.

Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire Cardiac Network or from Northern Ireland.

Ablation procedures per million population by ICB/HB based on patient home location (2023/24)



Ablation procedures per million population by Cardiac Network based on hospital location (2023/24)



There is a more than an 8-fold difference in rates of simple ablations across the Integrated Care Boards / Health Boards in England and Wales

The maps show the rate of 'simple' ablation procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs).
- 16 Cardiac Networks (CNs) in England and Wales.

In 2023/24, the rates for ICBs/HBs varied from 45 pmp in NHS South Yorkshire ICB to 381 pmp in NHS Norfolk and Waveney ICB.

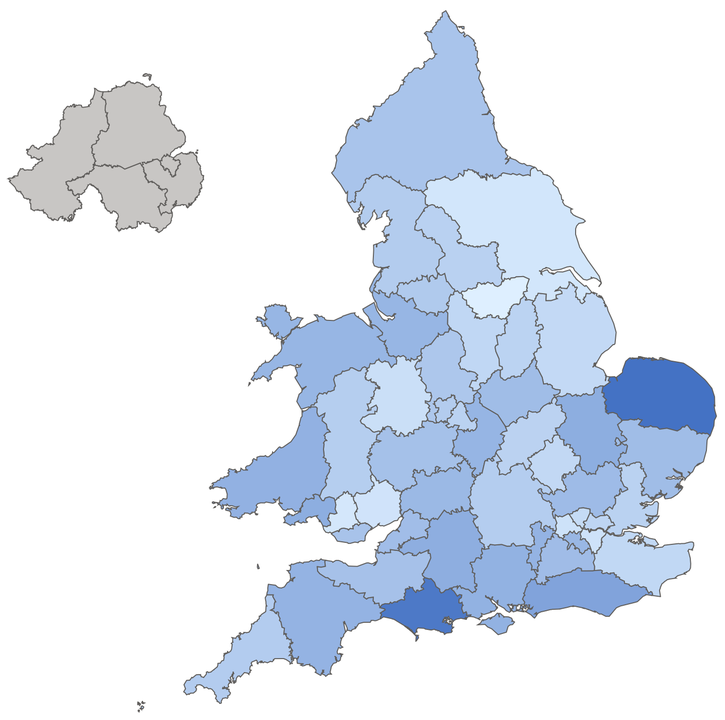
Across Cardiac Networks, the highest rate was 274 pmp in South London CN while the lowest was 49 pmp in NHS South Yorkshire CN.

Variation could result from differences in:

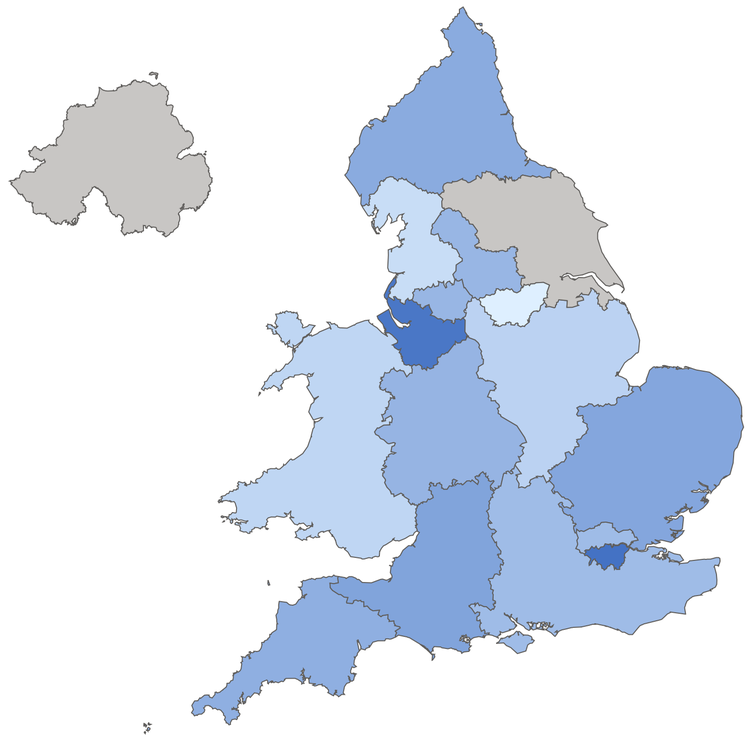
- Population demographics, particularly age and sex
- Access to treatment
- Treatment capacity within hospitals
- Variation in practice.

Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire Cardiac Network or from Northern Ireland.

Simple ablation procedures per million population by ICB/HB based on patient home location (2023/24)



Simple ablation procedures per million population by Cardiac Network based on hospital location (2023/24)



There is a more than a 5-fold difference in rates of complex atrial ablation procedures across Integrated Care Boards / Health Boards in England and Wales

The maps show the rate of 'complex' ablation procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and seven Welsh Health Boards (HBs).
- 16 Cardiac Networks (CNs) in England and Wales.

Rates amongst ICBs/HBs vary from 57 pmp for Aneurin Bevan Health Board to 467 pmp in NHS Sussex ICB.

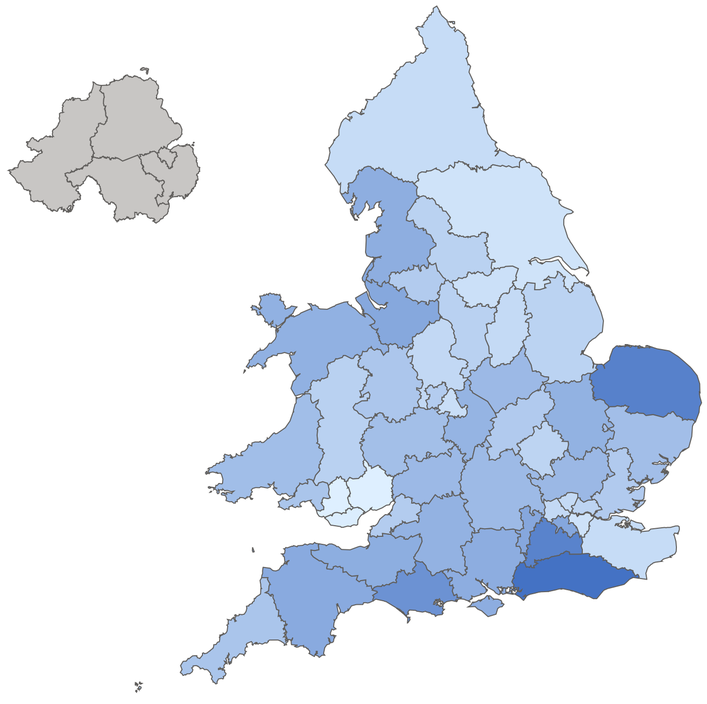
Cardiac Networks have rates that range from 65 pmp in Wales to 423 pmp in South London.

Variation could result from differences in:

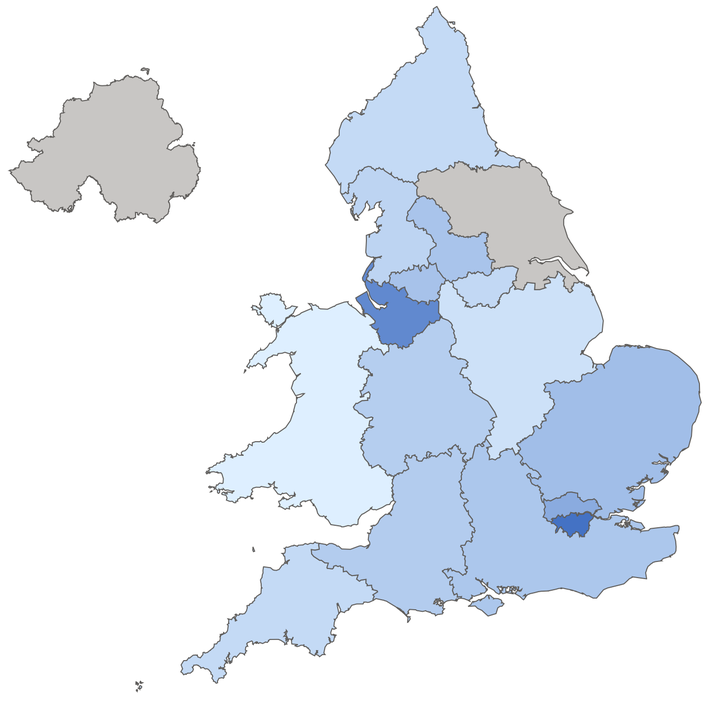
- Population demographics, particularly age and sex
- Access to treatment
- Treatment capacity within hospitals
- Variation in practice.

Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire Cardiac Network or from Northern Ireland. In North Yorkshire, patients received access to ablation but at lower rates pmp than surrounding regions.

Complex atrial ablation procedures per million population by ICB/HB based on patient home location (2023/24)



Complex atrial ablation procedures per million population by Cardiac Network based on hospital location (2023/24)



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There is a 10-fold difference in rates of ventricular ablation procedures and in some regions no procedures were recorded

The maps show the rate of complex ventricular ablation procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and seven Welsh Health Boards (HBs).
- 16 Cardiac Networks (CNs) in England and Wales.

In 2023/24, the rates in ICBs/HBs varied from 0 pmp in South Yorkshire ICB and Powys Teaching Health Board to 50 pmp for Hywel Dda University Health Board.

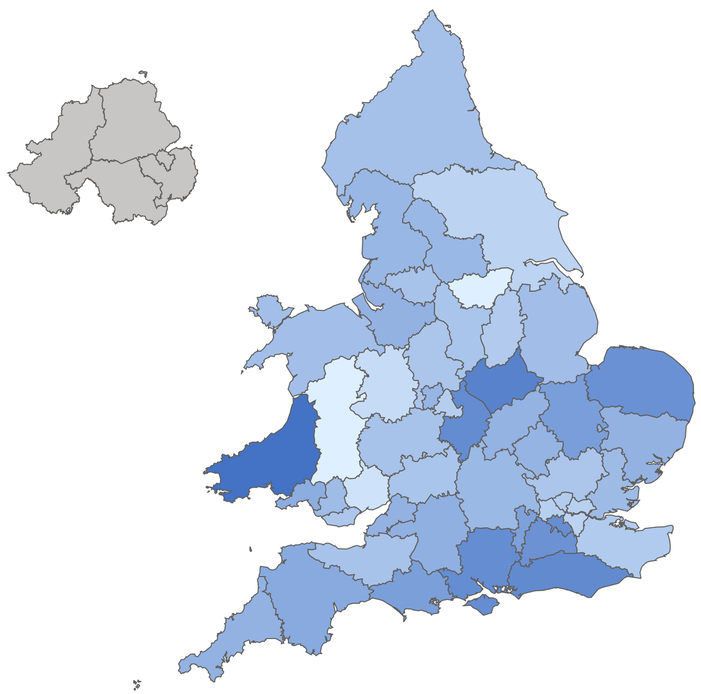
Across Cardiac Networks, the highest rate was 61 pmp in South London while the lowest was zero for South Yorkshire ICB.

Variation could result from differences in:

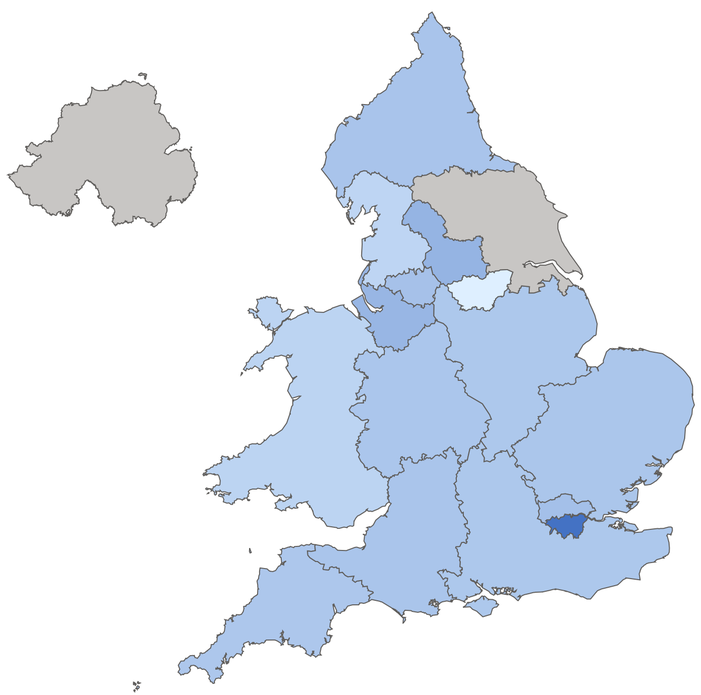
- The demographics of the population, particularly age and sex
- Access to treatment
- Treatment capacity within hospitals.
- Variation in practice.

Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire Cardiac Network or from Northern Ireland.

Ventricular ablation procedures per million population by ICB/HB based on patient home location (2023/24)



Ventricular ablation procedures per million population by Cardiac Network based on hospital location (2023/24)



General anaesthesia use for ablation procedures varies between 0 and 100% across hospitals and is increasing over time

General anaesthetic (GA) use may be used for some ablation procedures.

The highest use of general anaesthetic is 100% in 3 hospitals, and 0% in 7 hospitals, with a hospital average of 41%.

It is likely centres with high proportions performed under GA are for paediatric interventions or private hospitals.

Variation may be appropriate and based on the type of procedure, resources, and operator and patient preference.

Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

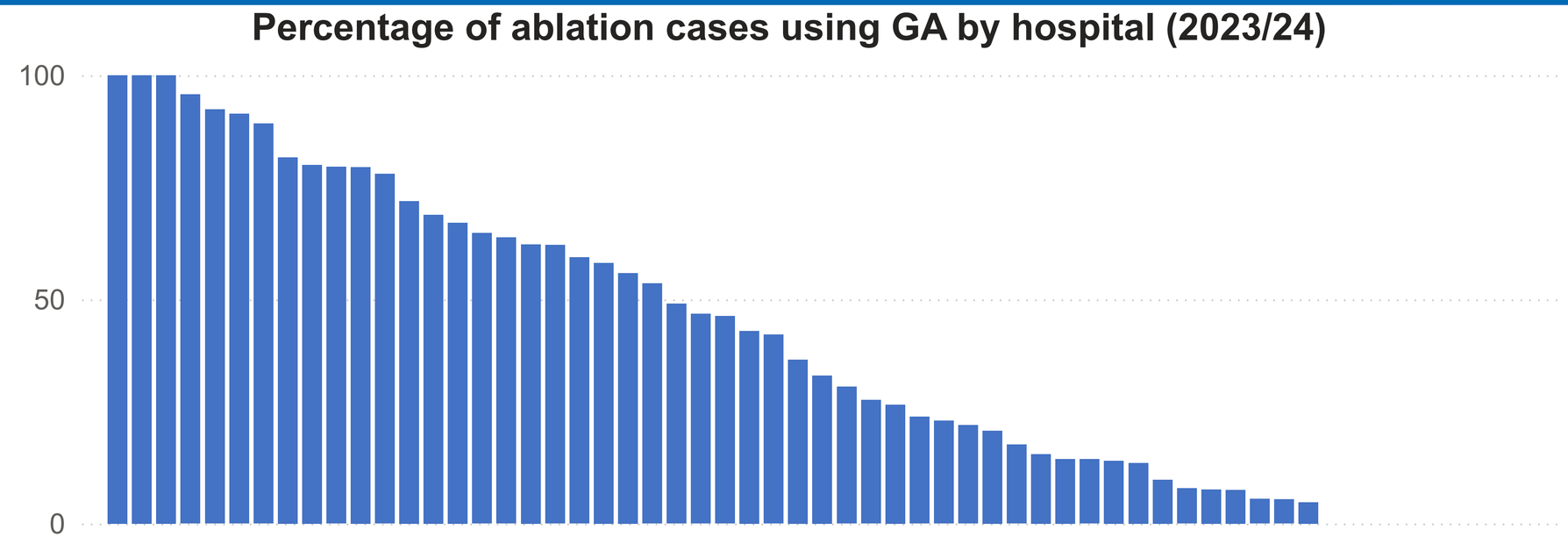
Note: The national average is calculated as the proportion of procedures for all centres performed under general anaesthetic. This is slightly lower than the hospital average as it is influenced by skews within the data.

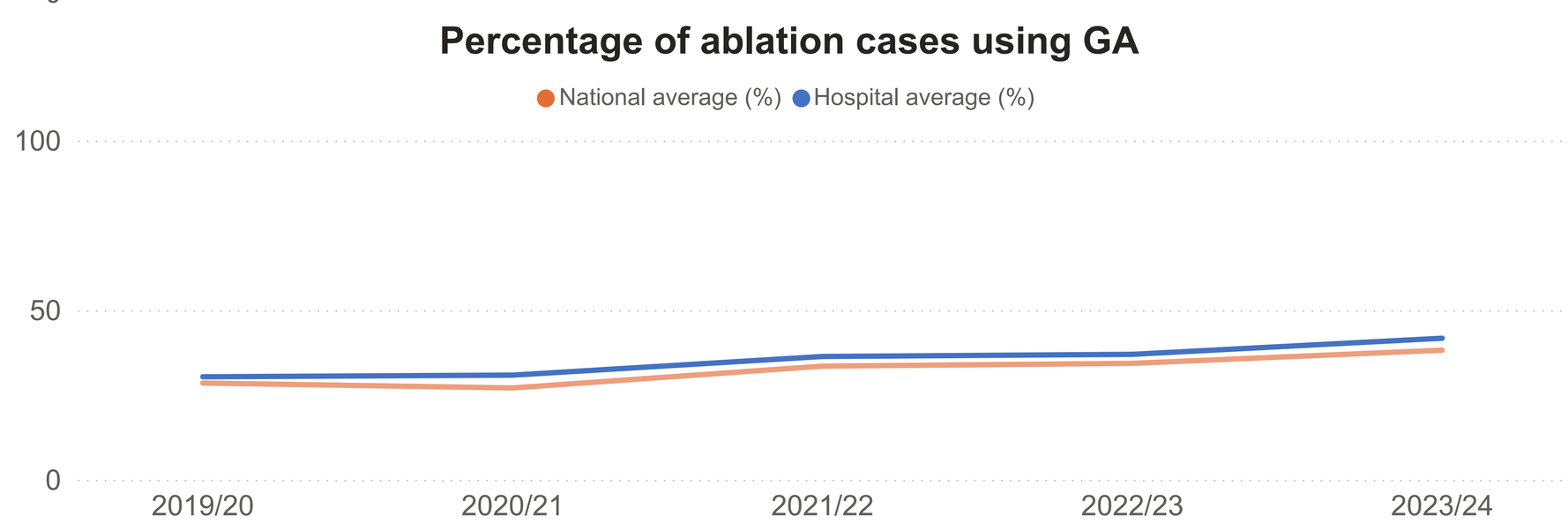
Select Cardiac Network

All

Select hospital name

All





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General anaesthesia use for ablation procedures varies 18-fold across the Integrated Care Boards / Health Boards in England and Wales

The maps show the proportion of general anaesthetic (GA) use for ablation procedures, for:

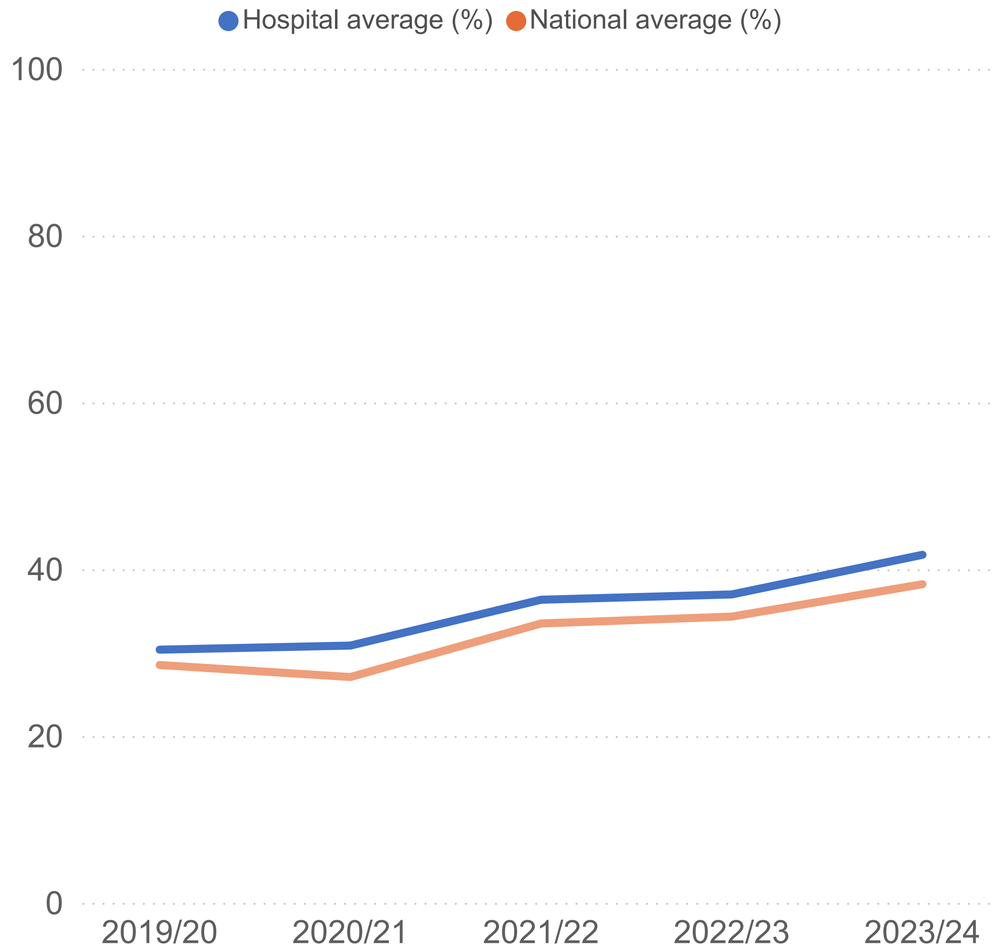
- The 42 Integrated Care Boards (ICBs) in England and seven Welsh Health Boards (HBs).
- 15 of the Cardiac Networks (CNs) in England and all of Wales.

In 2023/24, the rates in ICBs/HBs varied from 0% in 23 regions and to 100% for North Central London Integrated Care Board.

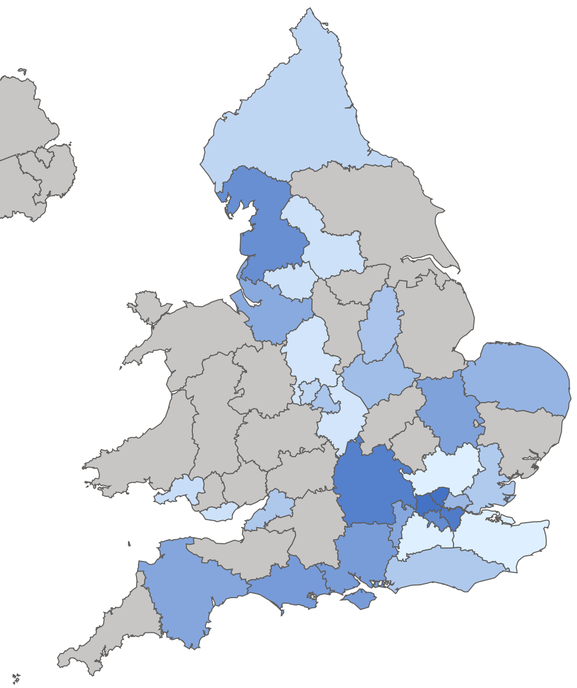
Variation may be appropriate and based on the type of procedure, resources, and operator and patient preference.

Note: The national average is calculated as the proportion of procedures for all centres performed under general anaesthetic. This is slightly lower than the hospital average as it is influenced by skewness within the data. Grey regions represents no procedures performed in that region or no data submitted.

Percentage ablation cases performed under GA



Percentage ablation cases using GA by ICB/HB (2023/24)



Ablation technology for atrial fibrillation ablation mainly uses either only radiofrequency or only cryoablation

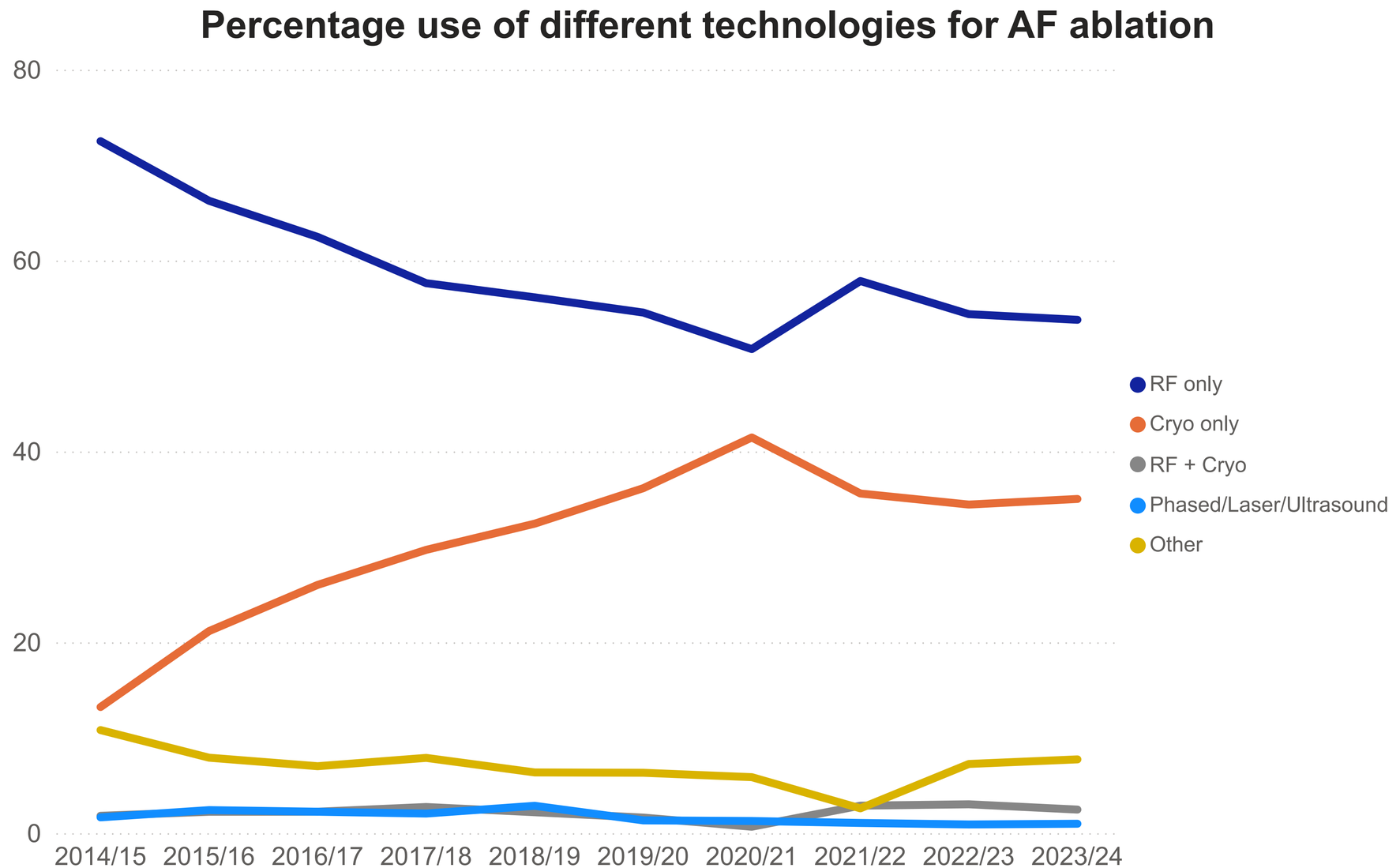
For patients with atrial fibrillation (AF), there are several technologies that can be used to perform ablation procedures.

The use of radiofrequency (RF) ablation seems to have stabilized at 54% in 2023/24, having fallen from 72% in 2014/15.

Cryoablation (Cryo) has almost trebled in use over the same period, peaking at 42% in 2020/21 and accounting for 35% of procedures in 2023/24.

New developments such as pulsed-field ablation may become more widely used going forward, although this is not formally currently captured in this report (it may be captured by the increase in the 'other' group). The dataset is changing to capture this ablation energy source, see here **(Link to be added at publication stage)** for details on data entry.

There is very little experience in the use of other technologies, such as laser or ultrasound catheter ablation.



Re-intervention rates at 1 and 2 years after simple ablation procedures are in line with expected results

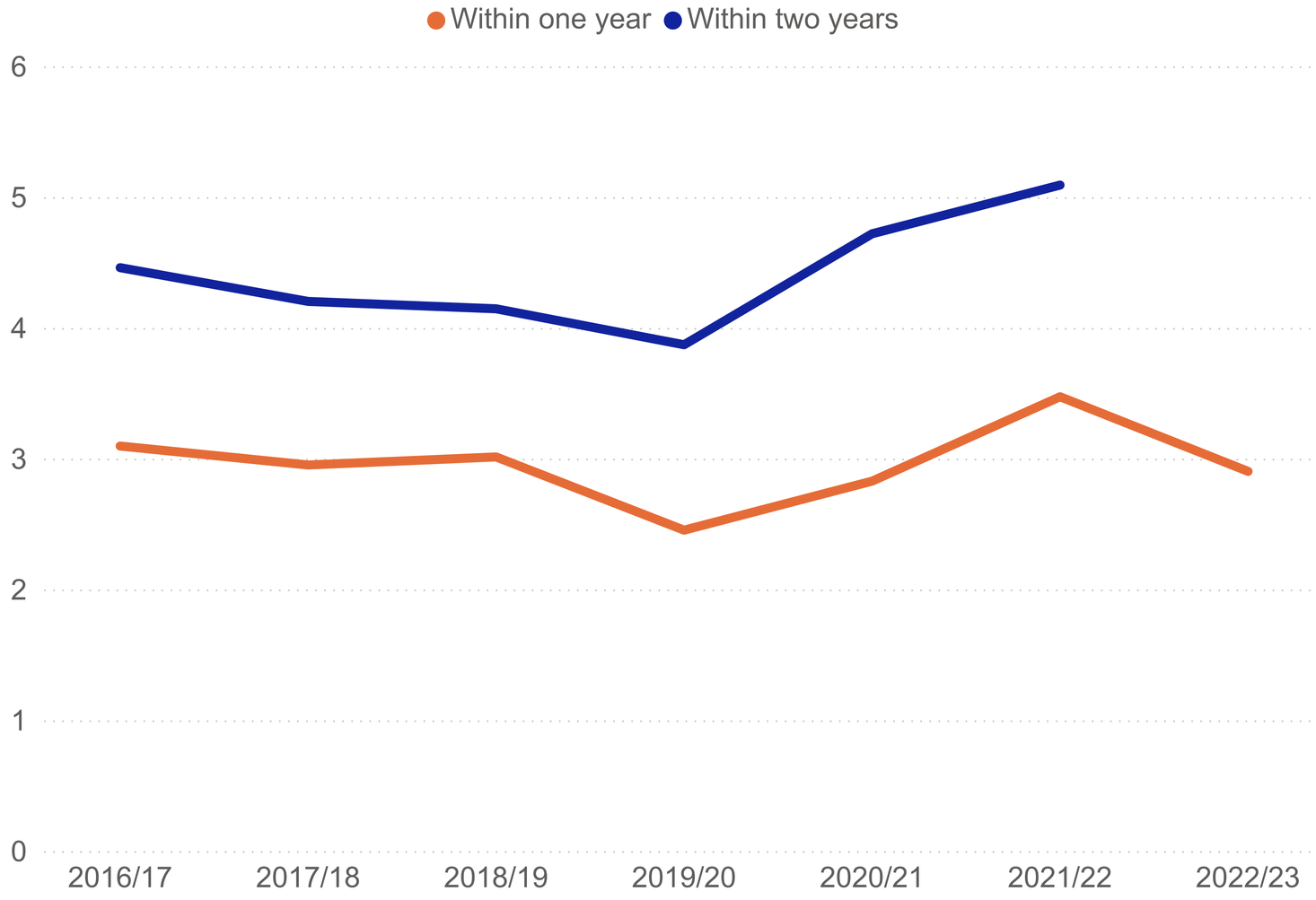
The rate of re-intervention after a first 'simple' ablation procedure has risen slightly since 2018/19, but has since been stable at 2.9% within one year and 3.5% within two years.

In patients without congenital heart disease, success rates of 97% (AVNRT) and 92% (accessory pathways) after ablation are reported, and 95% for atrial flutter.

There is a low reported recurrence rate for arrhythmias in this category, typically between 2 and 10% in the long-term (as would be broadly in line with expectations).

Note: Simple procedures include ablations for accessory pathways and atrioventricular nodal re-entrant tachycardia (AVNRT), typical atrial flutter and atrioventricular node ablations (AVNA). These rates do not represent acute complications after an ablation procedure (which are not treated by further ablation). The re-intervention rate reflects a combination of the effectiveness of the original procedure (i.e. lack of arrhythmia/symptom recurrence), the enthusiasm of the patient and doctor to re-intervene, and the time for that decision and subsequent waiting list.

Percentage of simple ablation cases requiring re-intervention within one and two years



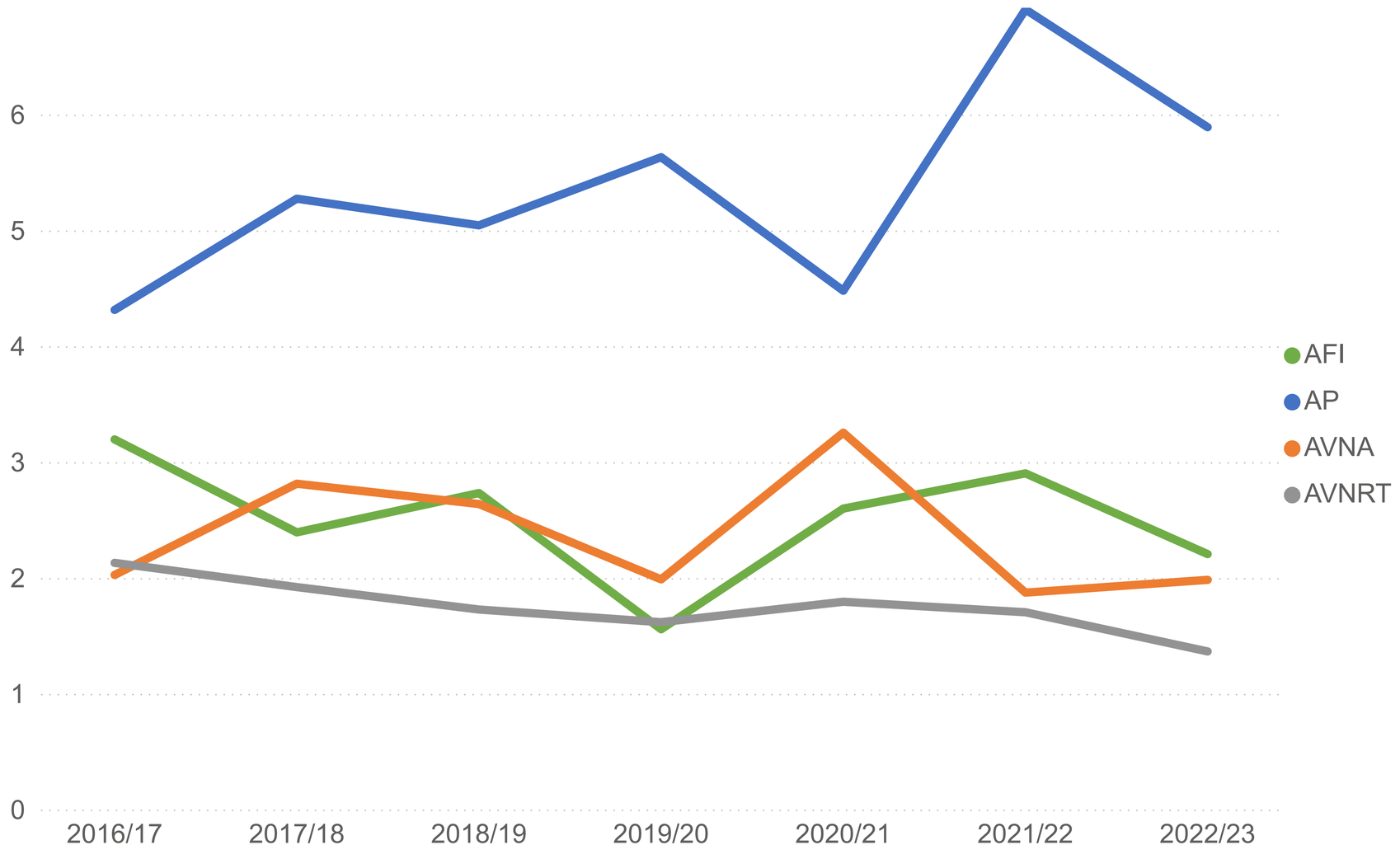
The one-year re-intervention rate after simple ablation varies from 1-6% depending on the arrhythmic substrate

Rates of re-intervention for simple ablations can be stratified by type of arrhythmic substrate (the underlying structural or electrical cardiac abnormalities that predispose an individual to arrhythmias).

For procedures carried out in 2022/23, the re-intervention rates for accessory pathways (AP) were highest, at around 6%. Those for AVNRTs were lowest at around 1.4%.

Key: AFL = Atrial flutter
AP = Accessory pathway
AVNA = Atrioventricular node ablation
AVNRT = Atrioventricular nodal re-entrant tachycardia

Percentage of ablation procedures for specific arrhythmias requiring re-intervention within 1 year by substrate



The 1-year re-intervention rates after simple ablation procedures undertaken in 2022/23 ranged from zero to 5% across individual hospitals

For simple ablations undertaken between April 2022 and March 2023, the 1-year reintervention rate was around 2% for hospitals performing more than 100 procedures (and was 2.1% for all cases).

A substantial number of centres did not record any re-interventions. This is plausible for smaller centres given the low re-intervention rates, but it is unlikely that there were no arrhythmia recurrences that would have benefited from a redo procedure. This may reflect waiting times or data reporting issues.

Select a Cardiac Network/hospital below or hover over the graph to see specific data.

Note: In order to show the data for individual hospitals and/or Cardiac Networks, the lower chart is derived by averaging each hospital's re-intervention rate. As many hospitals undertake small numbers of cases, with few or zero complications, this artificially lowers the overall average.

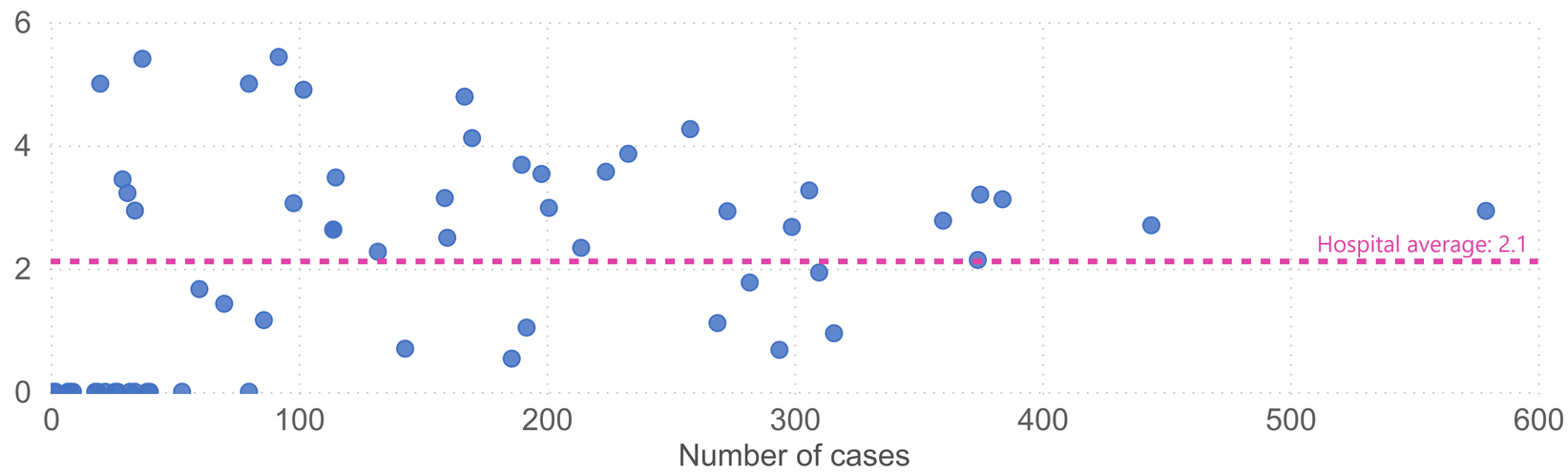
Select Cardiac Network

All

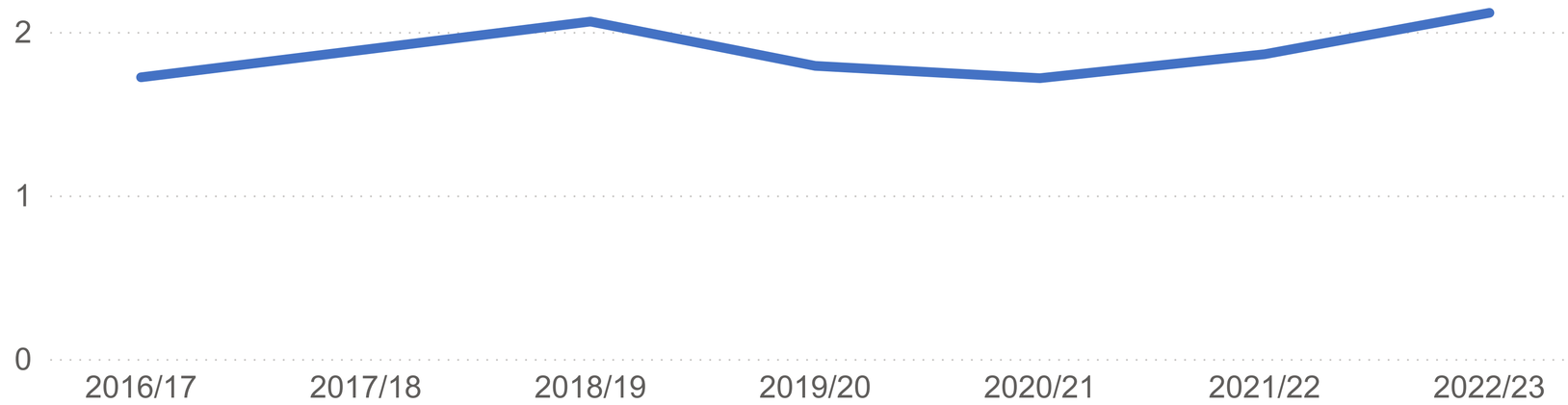
Select hospital

All

Number of procedures and percentage of simple ablations requiring re-intervention within one year by hospital (2022/23)



Percentage of simple ablations requiring re-intervention within one year



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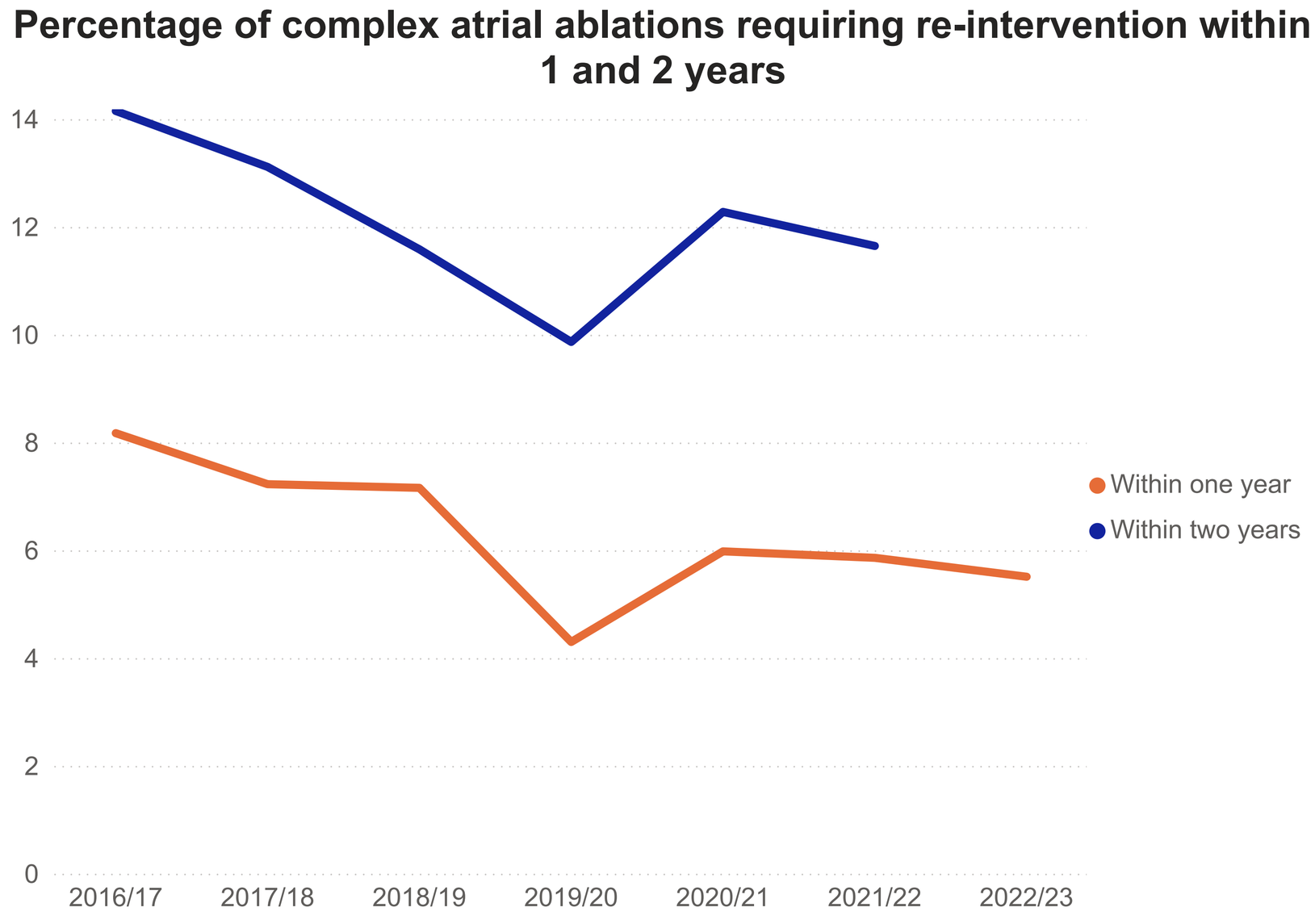
Patients may not be receiving appropriate levels of care following complex atrial ablation procedures

The rates of re-intervention for complex atrial ablation procedures have steadily fallen. For procedures performed in 2022/23 and 2021/22 respectively, the percentage requiring re-intervention was 5.5% after one year and 11.6% after two years. The equivalent figures for procedures done in 2016/17 were 8.5% and 14.4% respectively.

These most recent results represent half the rates reported in the USA where around 11% of patients having a first-time AF ablation undergo a reintervention within one year (which is lower again than the 17% seen in some clinical trials).

Consequently, the lower and falling re-intervention rates seen in the audit may mean that many patients are missing out on repeat therapy that could improve their quality of life and do not necessarily imply that outcomes are improving.

Note: Most complex atrial procedures are ablations for atrial fibrillation (AF), but left-sided and right-sided (not including typical atrial flutter) re-entrant atrial tachycardias (AT), and focal AT are included. Many of the arrhythmias will have developed as a consequence of an AF ablation.



One-year re-intervention rates after complex atrial ablations in 2022/23 ranged from 0 to over 10% but lower rates may represent poorer care

The 1-year re-intervention rate for complex atrial procedures of just over 5% is below the 10% or higher that would be expected to ensure quality of life and outcomes are maximised for patients.

It is likely that higher atrial re-intervention rates are related to hospitals being able to follow-up initial procedures faster and with shorter waiting list times.

Select a Cardiac Network/hospital below or hover over the graph to see specific data.

Note: In order to show the data for individual hospitals and/or Cardiac Networks, the lower chart is derived by averaging each hospital's re-intervention rate. As many hospitals undertake small numbers of cases, with few or zero complications, this artificially lowers the overall average.

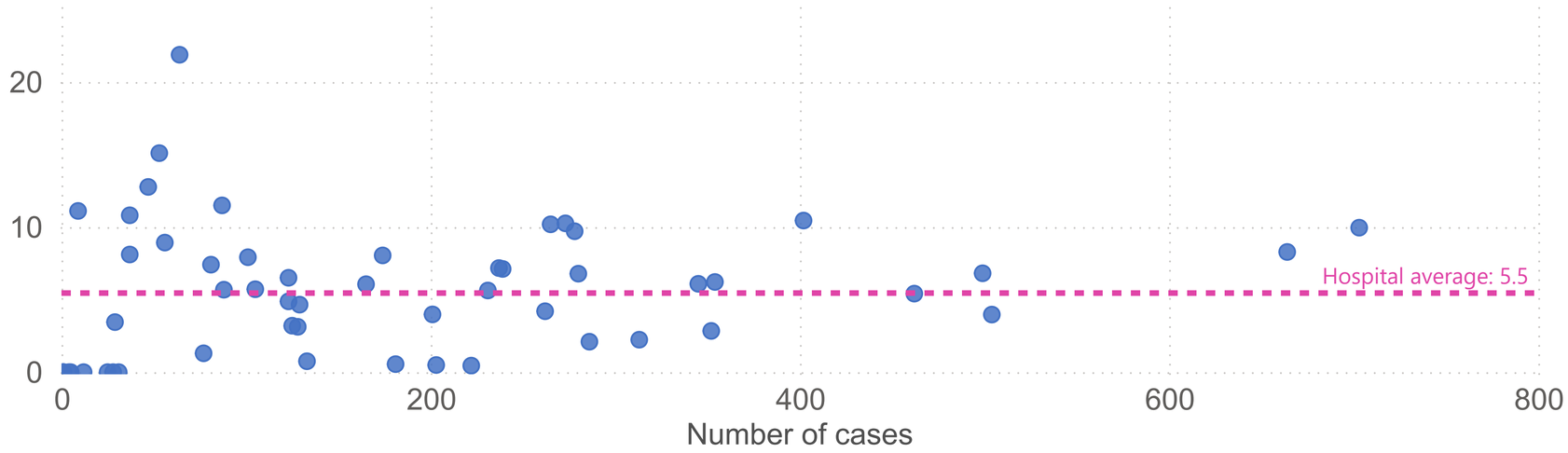
Select Cardiac Network

All

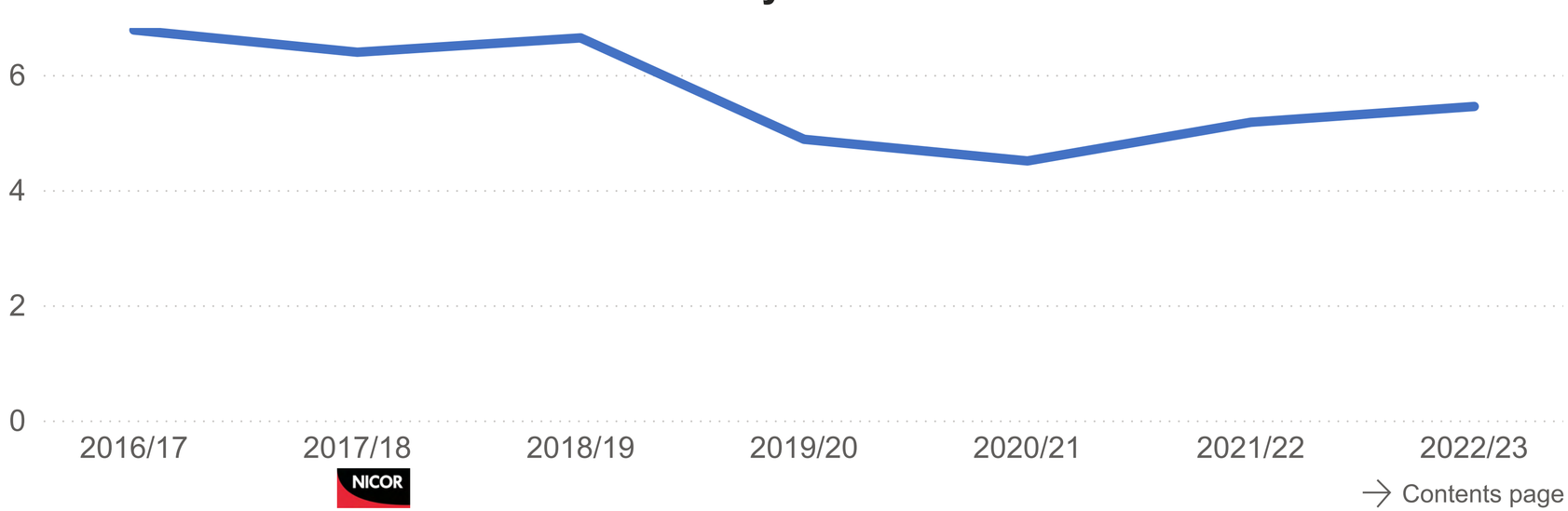
Select hospital

All

Percentage of complex atrial ablation procedures requiring re-intervention within 1 year by hospital (2022/23)



Percentage of complex atrial ablation procedures requiring re-intervention within 1 year



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Many factors have influenced repeat re-intervention rates after complex ventricular ablation procedures

Ablation procedures for ventricular arrhythmias are complex and proportionally fewer than atrial procedures.

For ventricular procedures performed in 2022/23 and 2021/22 respectively, the re-intervention rates for after 1 and 2 years both fell:

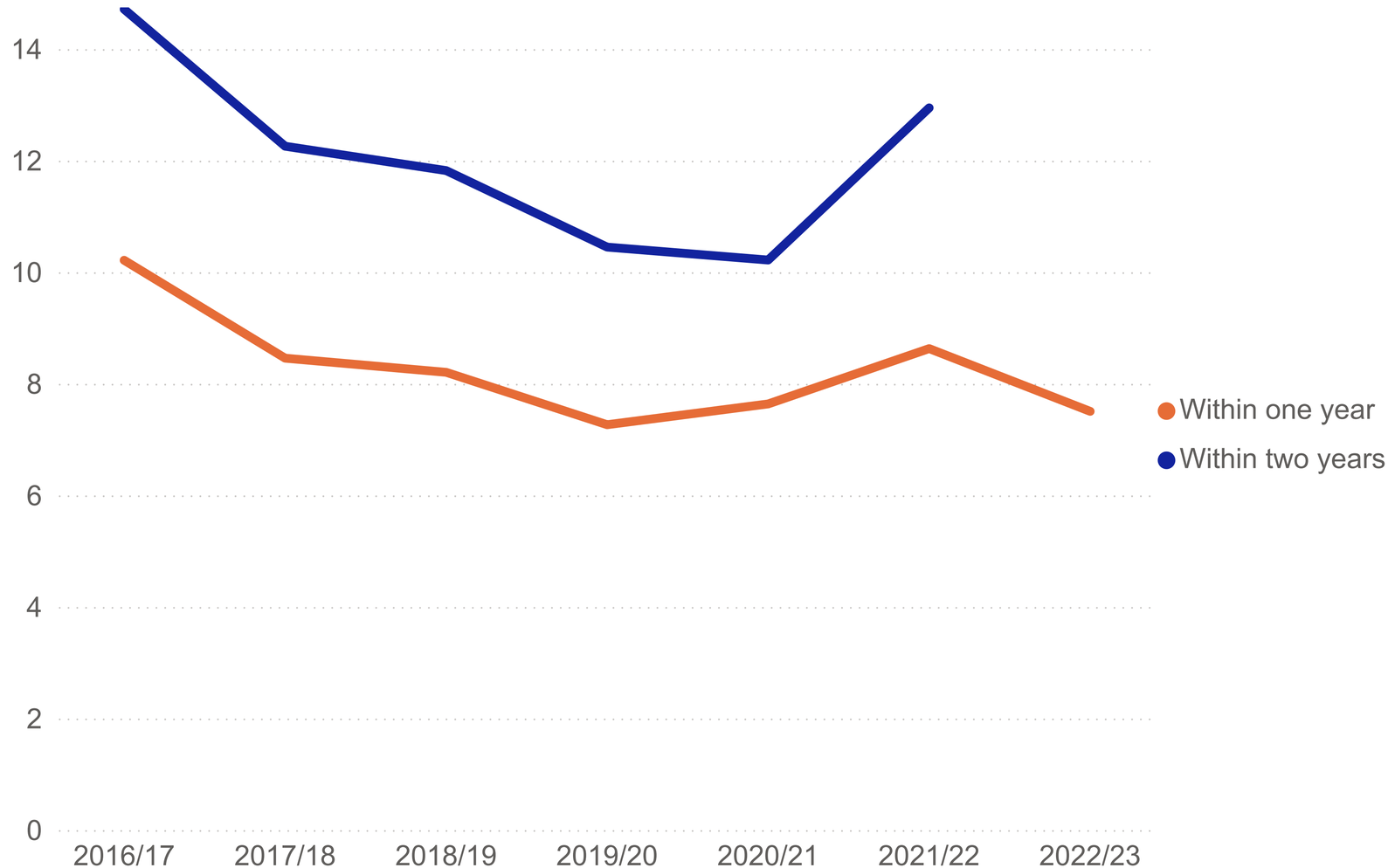
- **8.6% within one year (10.2 % in 2016/17)**
- **13.0% within two years (14.7% in 2016/17).**

What constitutes a clinically appropriate re-intervention rate is uncertain as multiple considerations influence the decision to re-intervene. These include:

- the underlying cardiac pathology
- the initial procedure performed
- the clinical status of the patient and co-morbidities.

There has been a rapid evolution of ventricular ablation techniques in recent years. This may have impacted favourably on the need for re-intervention. There is no doubt though that the COVID-19 pandemic temporarily reduced capacity and adversely affected waiting lists, both of which will also have influenced re-intervention rates.

Percentage of complex ventricular ablation procedures requiring re-intervention within one and two years



The overall one-year re-intervention rate after complex ventricular ablations is around 15% with a large but expected variation between hospitals

The number of ventricular ablation procedures is small in each hospital with re-intervention rates varying from 0-67%. These rates fall within the expected range, considering the diversity of procedures undertaken and differing underlying causes of such arrhythmias.

The variability in rates also likely reflects differences in practice, case selection and expertise (e.g. success for monomorphic ventricular tachycardia (VT) ablation is higher in patients with no structural heart disease than in those with impaired ventricular function).

As indications and techniques become better established, there may be lower and less variable re-intervention rates.

Selecting a Cardiac Network/hospital below or hovering over the graphs shows specific data.

Note: In order to show the data for individual hospitals and/or Cardiac Networks, the lower chart is derived by averaging each hospital's re-intervention rate. As many hospitals undertake small numbers of cases, with few or zero complications, this artificially lowers the overall average.

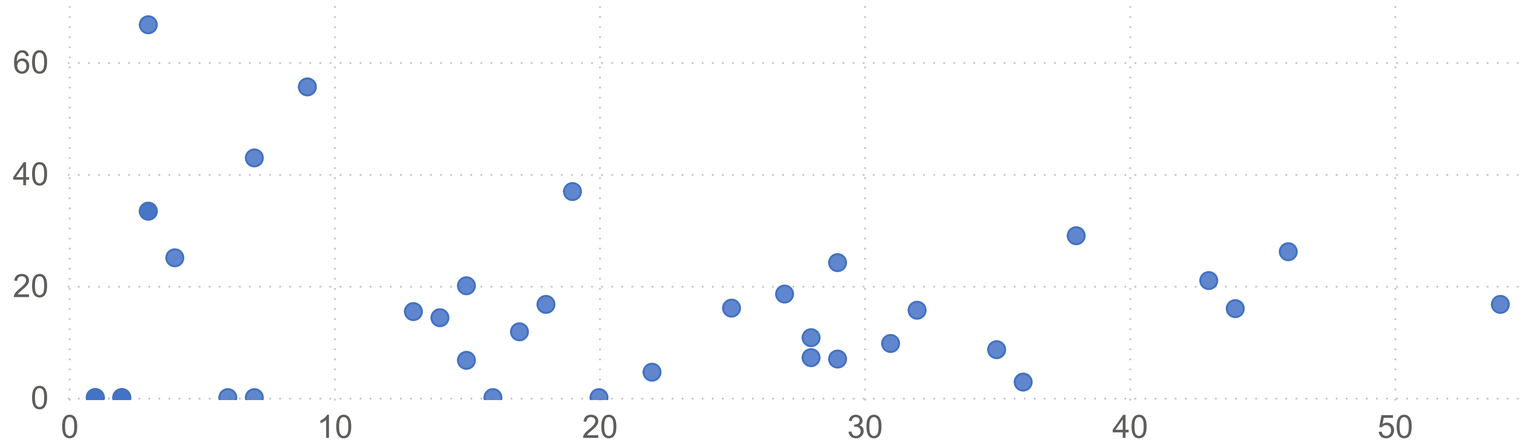
Select Cardiac Network

All

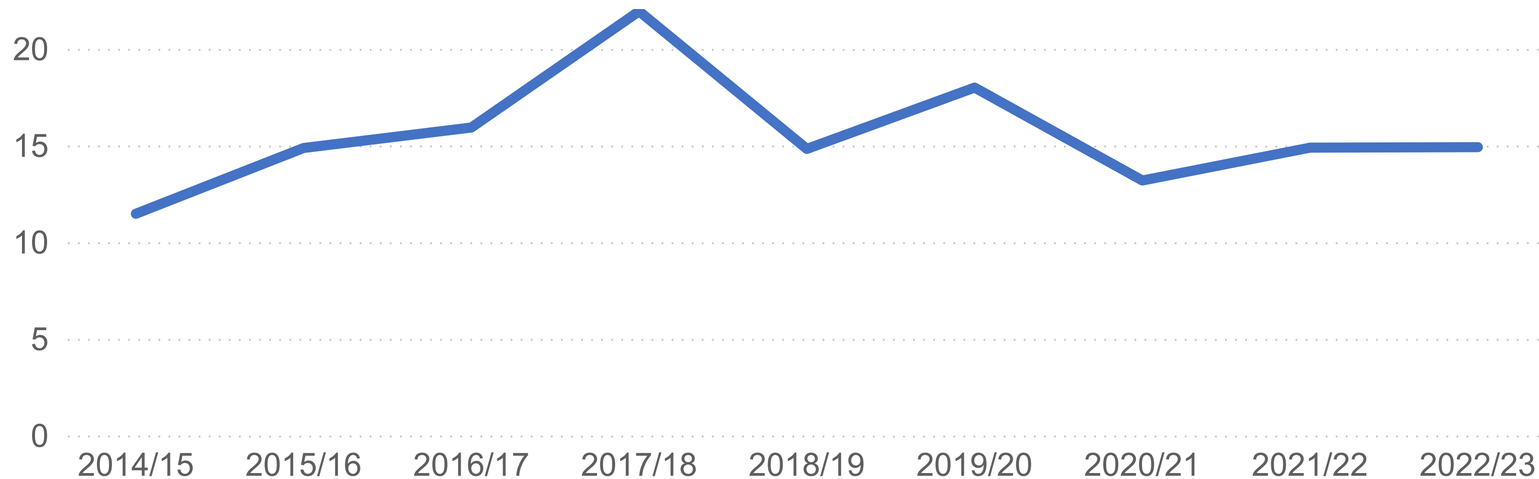
Select hospital

All

Number of procedures and percentage of ventricular ablation procedures requiring re-intervention within one year by hospital (2022/23)



Percentage of ventricular ablation procedures requiring re-intervention after one year



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There has been a steady increase in the number of leadless pacemakers implants but overall volumes are low

Pacemakers are now sufficiently small to be directly attached to the inside of the right ventricle. This avoids the need for leads placed within the heart. The techniques for implantation are evolving, and at present, they are only available in certain UK centres.

In 2023/24, there were 561 total procedures for leadless pacemakers, up from 448 in 2022/2023. This represents a 25% rise compared to 2022/23. The median age of all patients receiving leadless pacemakers was 74 years and 42% were female.

The proportion of generator changes appears stable in 2023/24 (28% of total procedures) compared to 2022/2023.

Select a Cardiac Network/hospital/year below or hover over the graphs to see specific data.

Select financial year

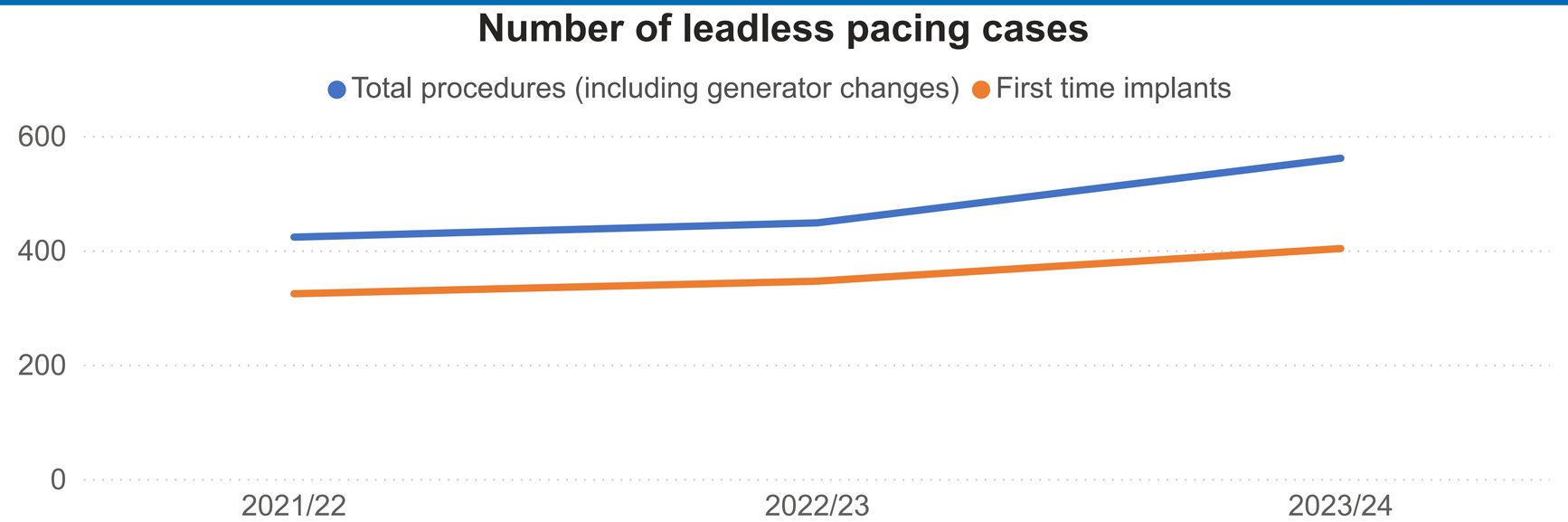
All

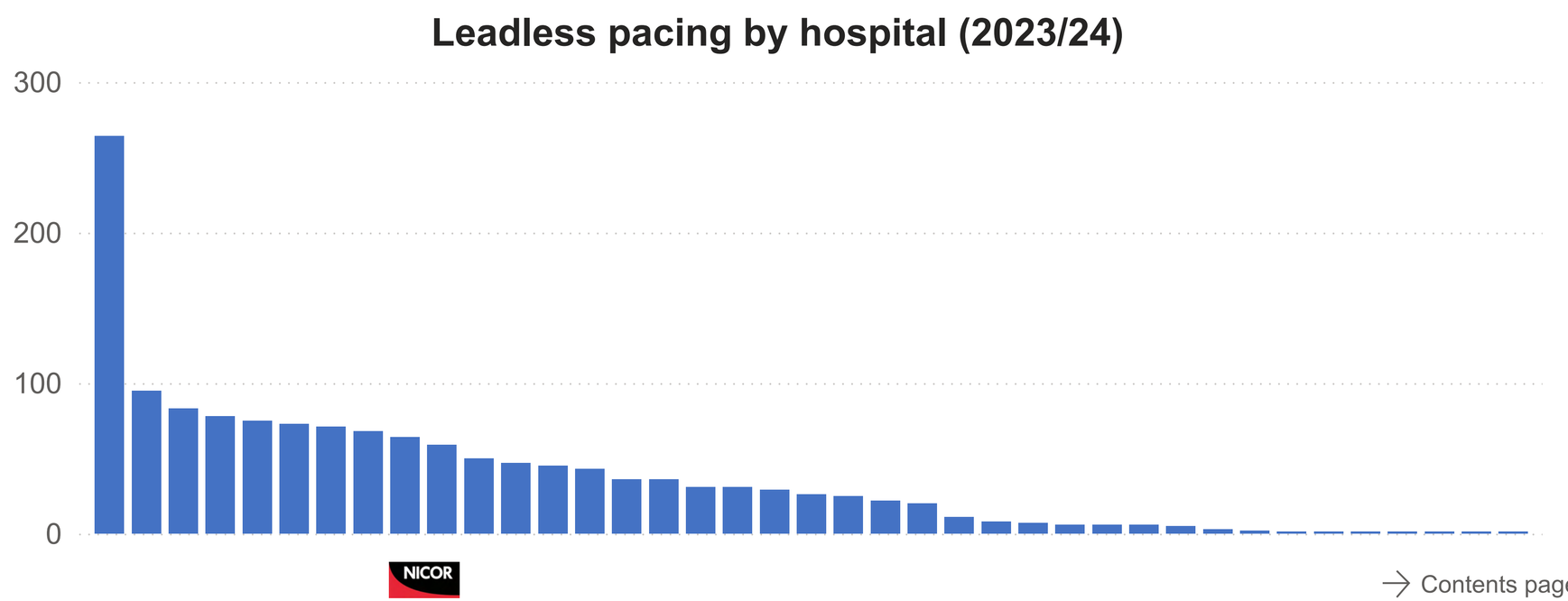
Select hospital

All

Select Cardiac Network

All





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Leadless pacing: access is variable across Integrated Care Boards / Health Boards in England and Wales

The maps show the rate of procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs).
- 16 Cardiac Networks (CNs) in England and Wales.

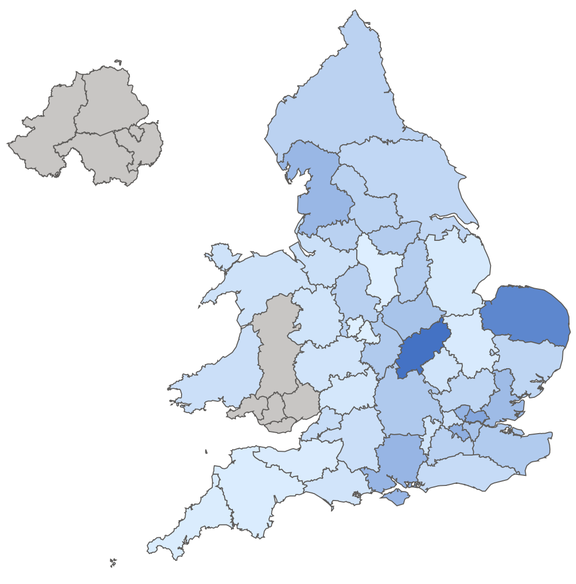
The maps show variation in patient access (left) and hospital activity grouped by different areas (middle/right).

As expected with newer technologies, there will be geographic variation. This shows that there are currently many regions without access to leadless pacing, which may change with time.

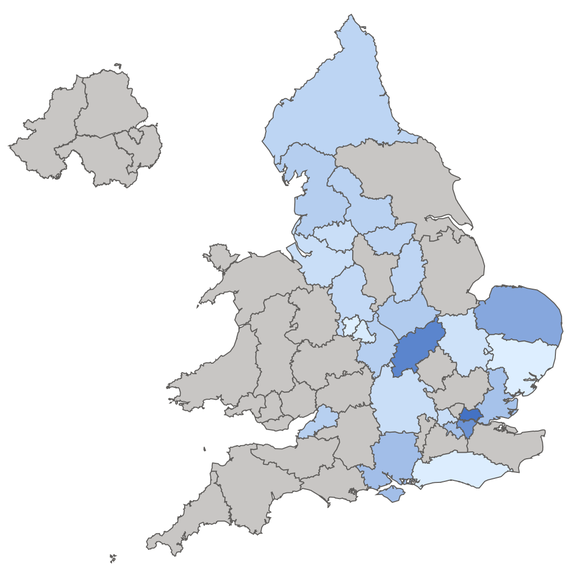
By hospital location, the highest rate is 93 pmp in NHS North East London ICB, and the lowest rate is 0 in 34 ICBs.

Note: Grey regions represents no procedures performed in that region or no data submitted.

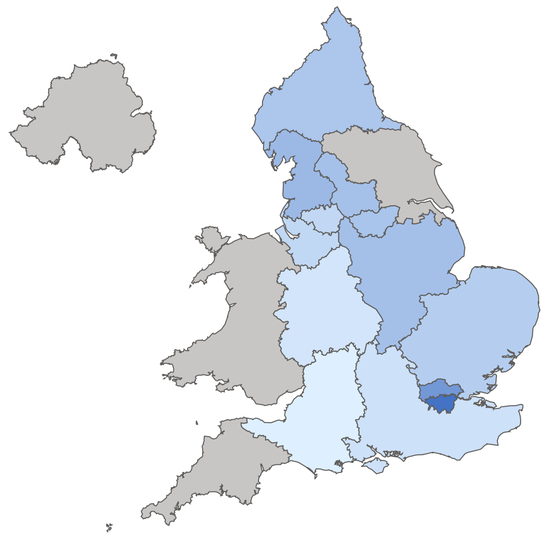
Leadless pacing rates (pmp) by ICB/HB based on patient home location (2023/24)



Leadless pacing rates (pmp) by ICB/HB based on hospital location (2023/24)



Leadless pacing rates (pmp) by Cardiac Network based on hospital location



There was a 5-fold increase in conduction system pacemaker implantation during 2023/24 but overall volumes are still low

Conduction System Pacemakers (CSPs) involves targeting a right ventricular lead to sites in the natural conduction system of the heart rather than in conventional anatomical sites. It is hypothesised that such pacing may result in better outcomes than anatomical pacing and possibly cardiac resynchronisation therapy.

In 2023/24, there were 295 CSP procedures, up from 60 in 2022/2023, a 5-fold increase.

Select a Cardiac Network/hospital/year below or hover over the graphs to see specific data.

Select financial year

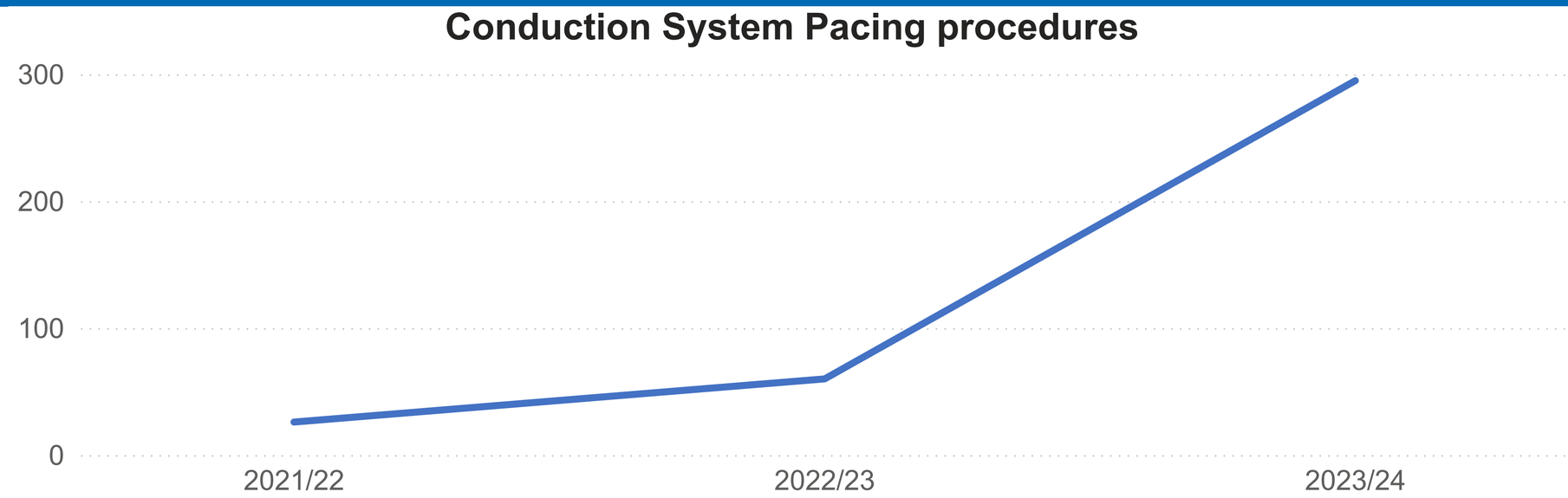
All

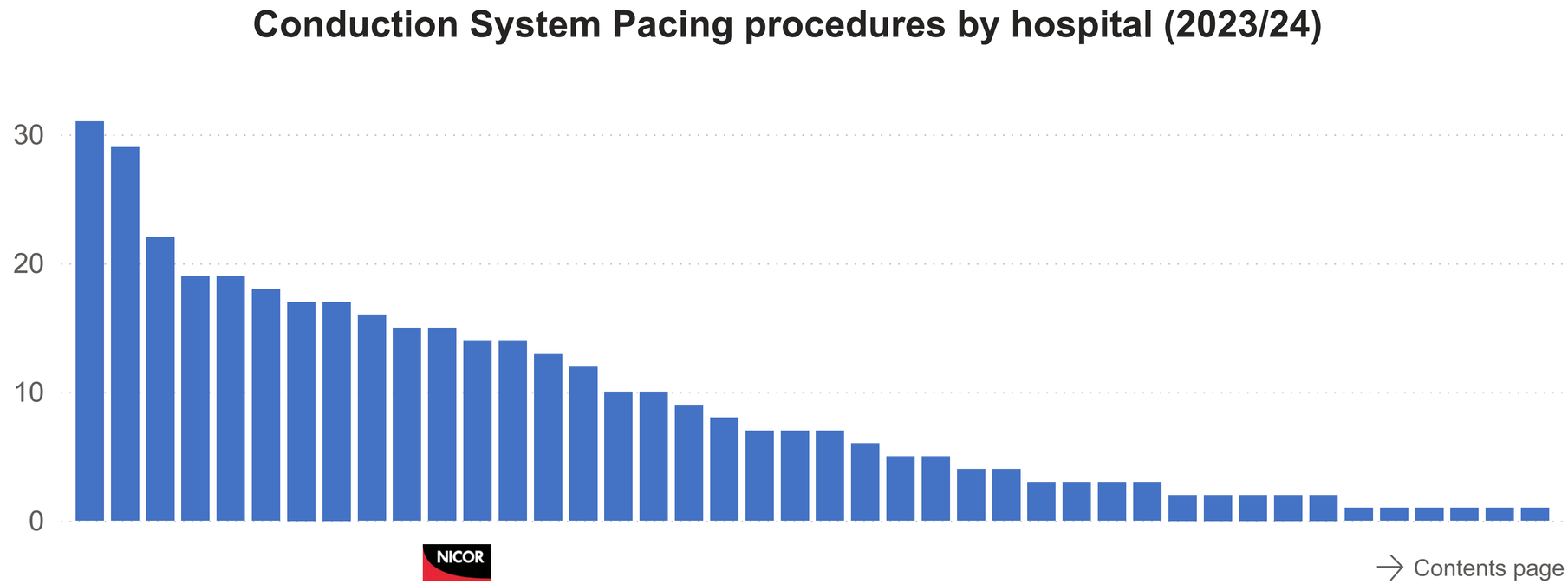
Select Cardiac Network

All

Select hospital

All





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Conduction system pacemakers are a small proportion of total pacemaker implants but are increasingly used in some centres

In 2023/24, the hospital average for the proportion of conduction system pacemakers (CSPs) was 3.4% and the national average was 0.7%. This difference is due to a large number of centres performing zero procedures.

For those centres implanting CSP devices, the proportion of total pacemaker implants ranged from less than 1% to 18%. The overall proportion has not changed significantly since 2021/2022.

The median age of all patients receiving a CSP was 76 years and 31% were female.

Select a Cardiac Network/hospital/year below or hover over the graphs to see specific data.

Select financial year

All

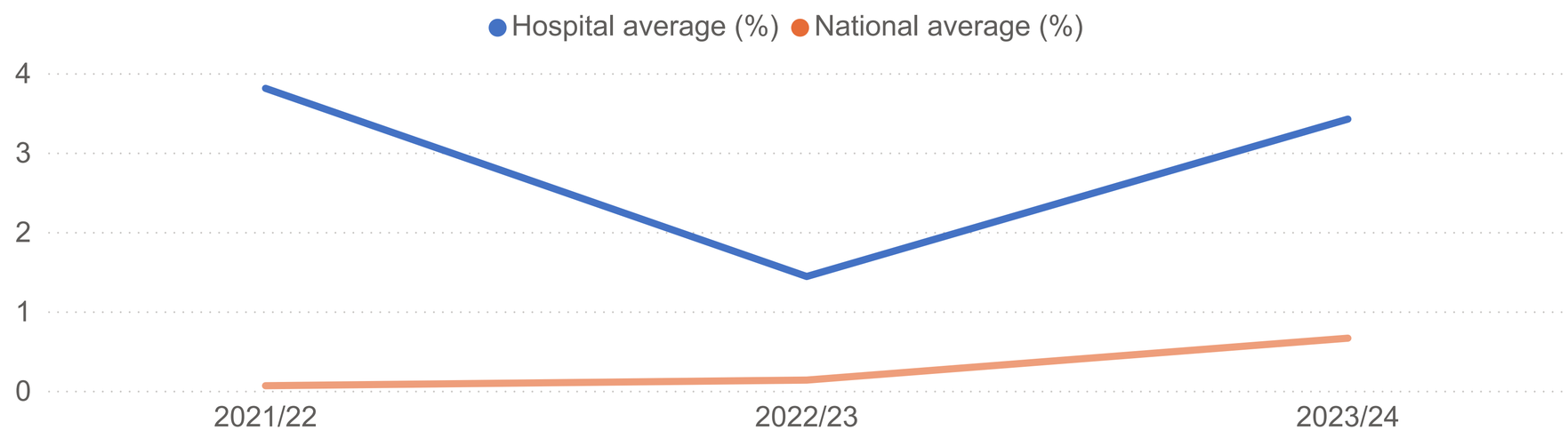
Select Cardiac Network

All

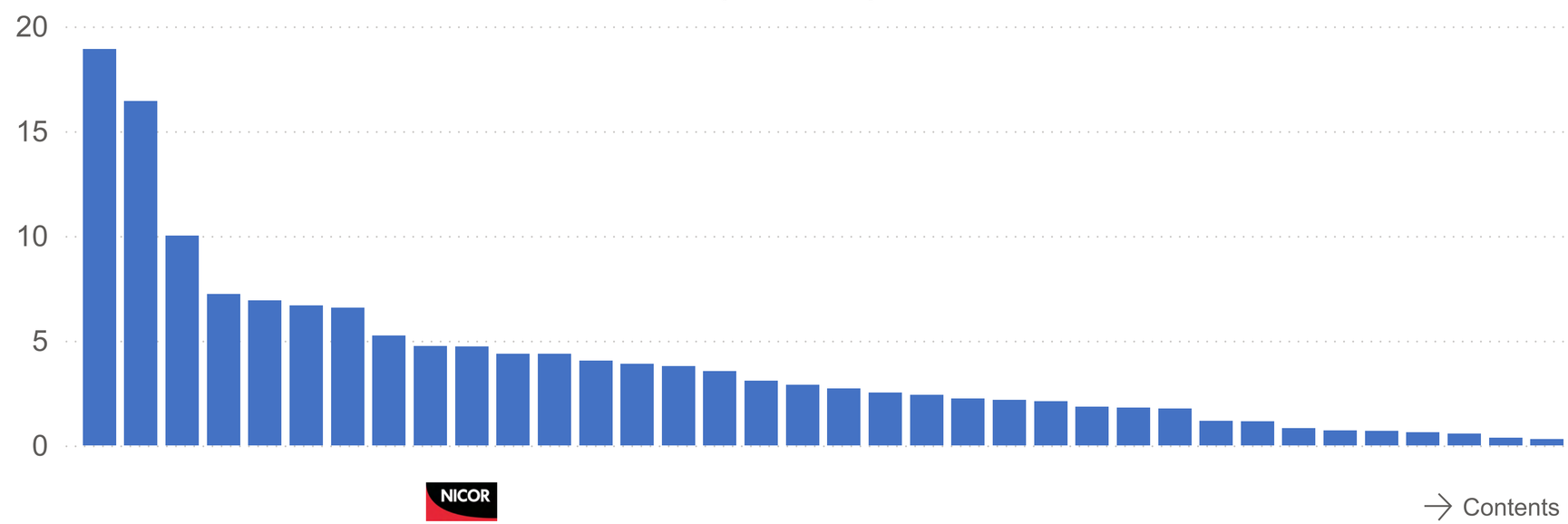
Select hospital name

All

Percentage of all PM implants that use Conduction System Pacing by year



Percentage of all PM implants that use Conduction System Pacing by hospital (2023/24)



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Conduction system pacemakers: access is variable across Integrated Care Boards / Health Boards in England and Wales

The maps show the rate of Conduction System Pacermaker (CSP) procedures per million population (pmp) for the:

- 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs)
- 16 Cardiac Networks (CNs) in England and Wales.

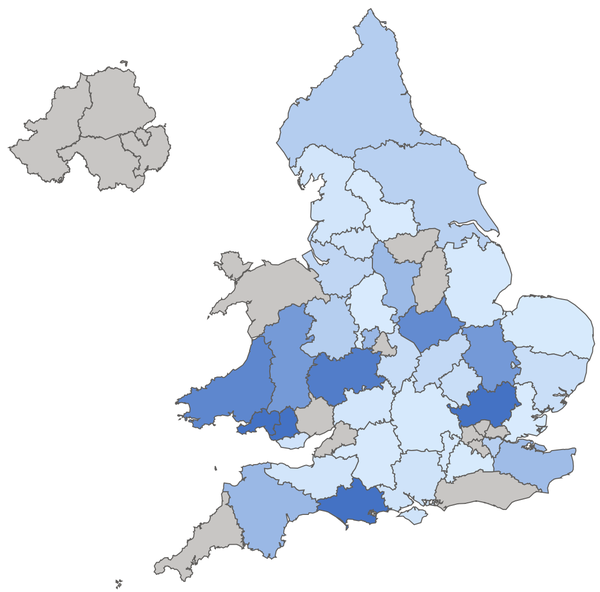
The maps show variation in patient access (left) and hospital activity grouped by different areas (middle/right).

As expected with newer technologies, these show that there are currently many regions without access to CSP technology, something which may change with time.

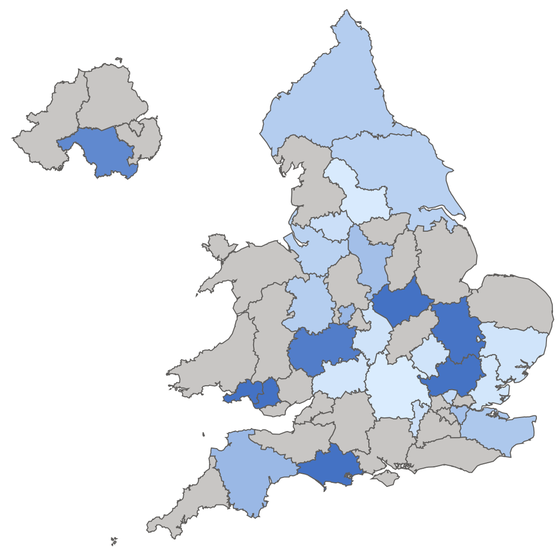
In 2023/24, the highest rate was 66 pmp in Swansea Bay ICB, and the lowest rate was 0 in 28 ICB/HBs.

Note: Grey regions represents no procedures performed in that region or no data submitted.

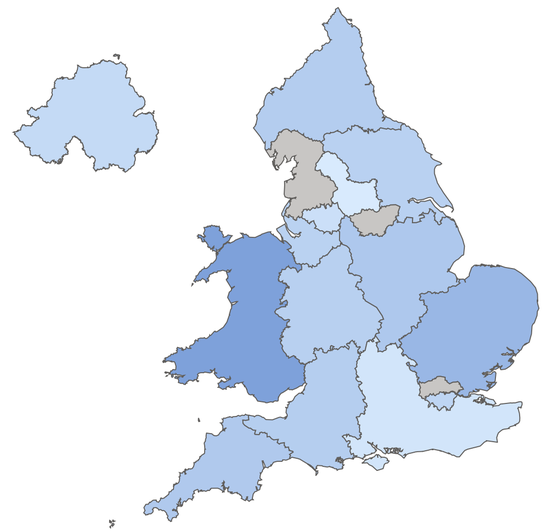
Rate of CSP procedures (pmp) by ICB/HB based on patient home location (2023/24)



Rate of CSP procedures (pmp) by ICB/HB based on hospital location (2023/24)



Rate of CSP procedures by Cardiac Network based on hospital location (2023/24)



The number of extravascular defibrillator implants implants was largely unchanged though there is variability across hospitals

Most implantable cardioverter-defibrillators (ICDs) can also act as pacemakers, though a newer type (termed extravascular ICD) has no leads in the heart and cannot pace, except briefly after delivering a shock.

Extravascular ICDs have been used for over 10 years. The BHRS recommends they are considered in selected patients needing defibrillators.

There were 868 extravascular ICD implants in 2023/2024, a level that has been stable since 2021/22. New models are being recorded and advances may change practice.

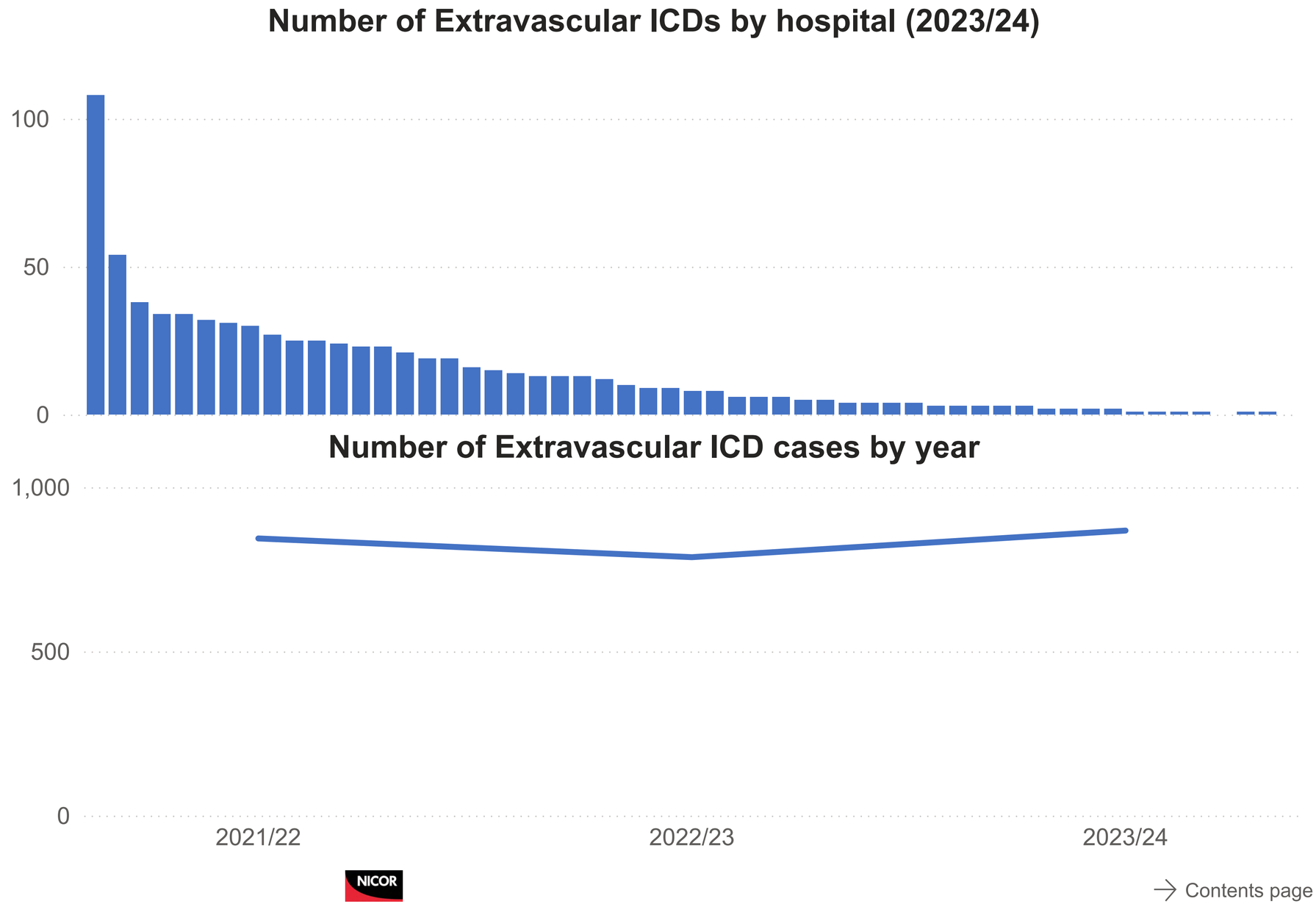
Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

Select Cardiac Network

All

Select hospital

All



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Extravascular defibrillators constitute 15% or more of total ICD implants in nearly half of all hospitals, and over 50% in two centres

In 2023/24, the hospital average for the proportion of all ICDs that were extravascular ICDs was 19% and the national average was 12%. This difference is due to a large number of centres performing zero procedures.

For those centres implanting extravascular ICDs, the proportion of these of total ICD implants ranged from 2% to 69%. The proportion has not changed significantly since 2021/2022.

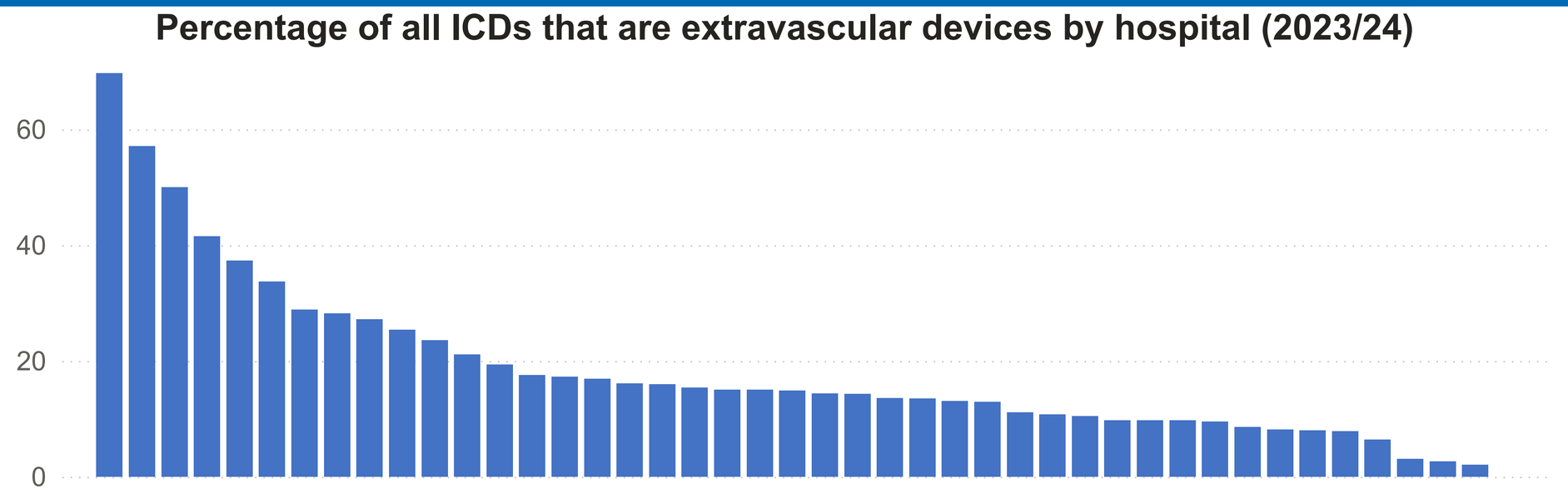
Select a Cardiac Network/hospital below or hover over the graphs to see specific data.

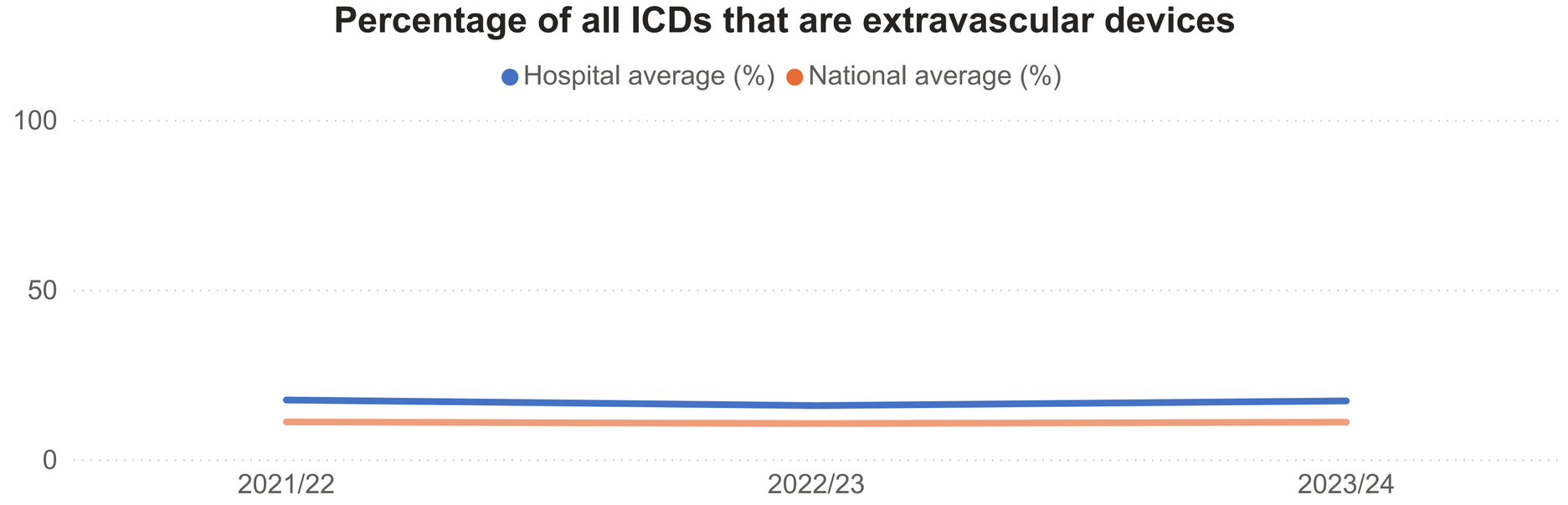
Select Cardiac Network

All

Select hospital

All





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Extravascular defibrillators: access varies across Integrated Care Boards / Health Boards in England and Wales

The maps show the rate of extravascular defibrillator procedures per million population (pmp) for the:

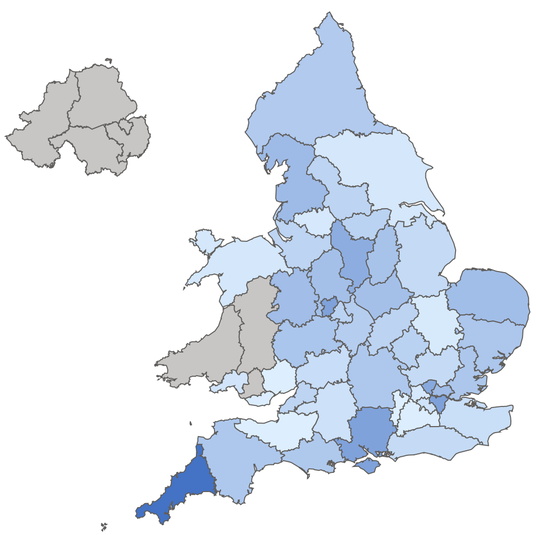
- 42 Integrated Care Boards (ICBs) in England and 7 Welsh Health Boards (HBs)
- 16 of the Cardiac Networks (CNs) in England and Wales.

The maps show variation in patient access (left), hospital availability/delivery, and regional availability/delivery. These show that most regions have access to extravascular ICD technology. There is greater access to this technology compared to leadless or conduction system pacing. This may be due to a more established evidence base, more mature referral networks and greater procedural training.

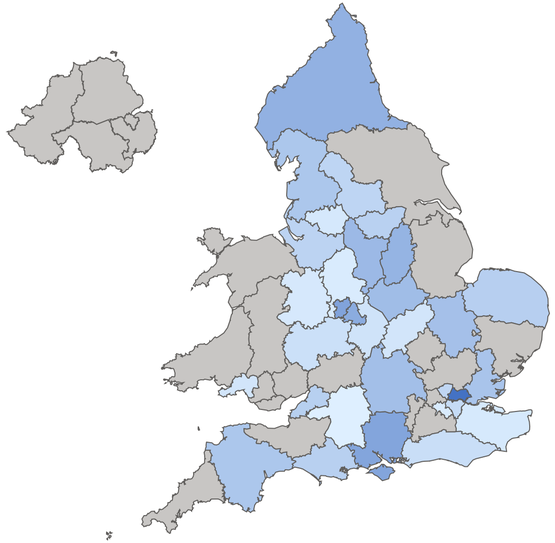
The highest rate is 98 pmp in NHS Bristol, North Somerset and South Gloucester ICB, and the lowest rate is 0 in 22 ICBs.

Note: Grey regions represents no procedures performed in that region or no data submitted.

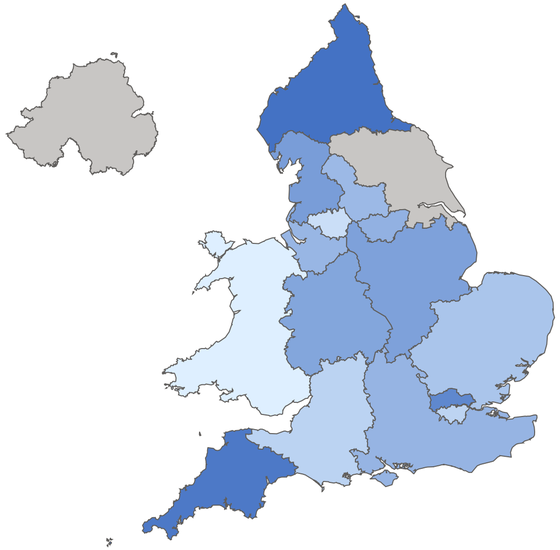
Rate of Extravascular ICD procedures (pmp) by ICB/HB based on patient home location (2023/24)



Rate of Extravascular ICD procedures (pmp) by ICB/HB based on hospital location (2023/24)



Rate of Extravascular ICD procedures by Cardiac Network based on hospital location (2023/24)



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Device procedure volume is variable across all categories of operator

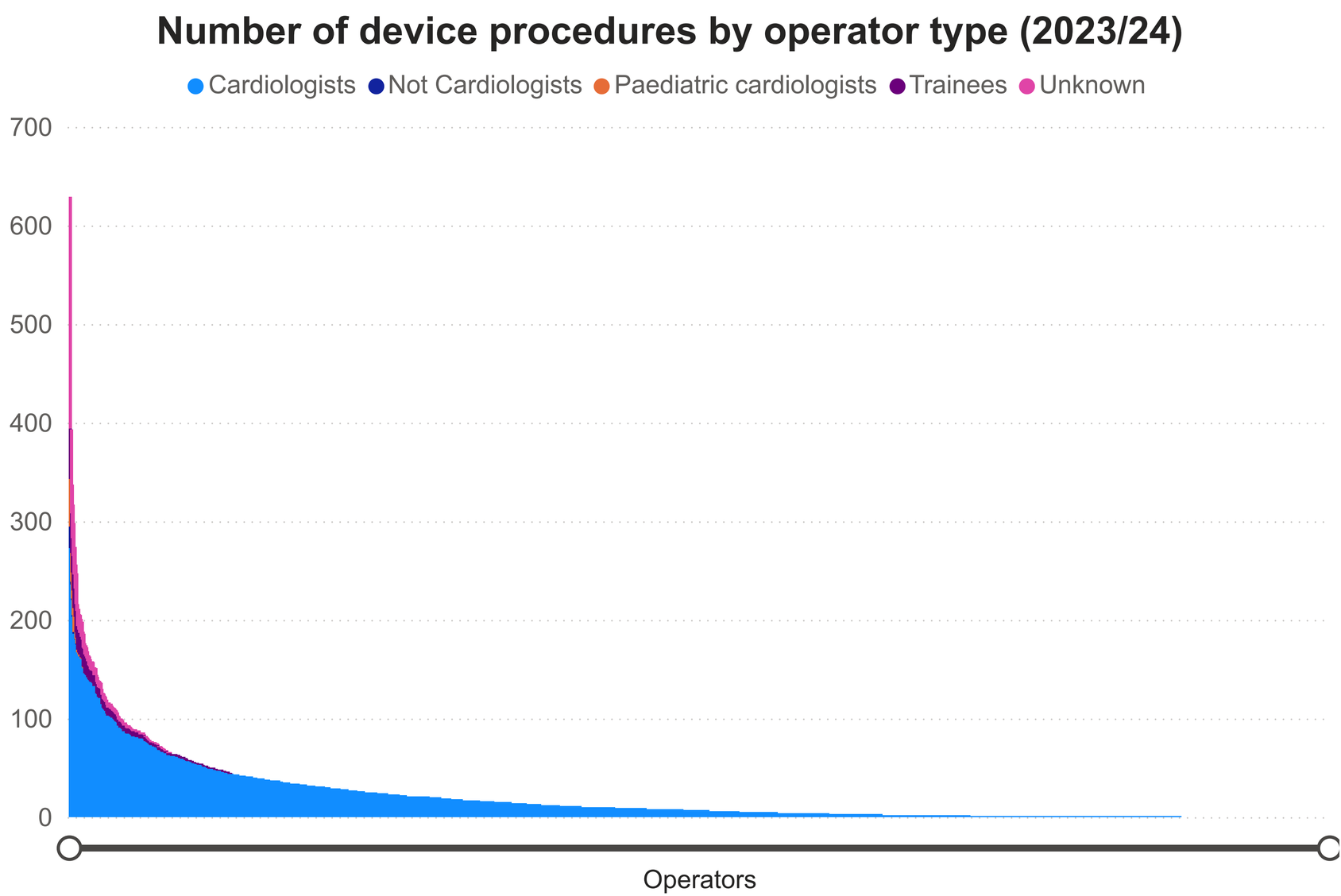
An ablation procedure is assigned to each doctor entered as 1st or 2nd scrubbed operator, or as responsible consultant (hence each procedure can contribute to the totals for more than one doctor).

Doctors have been identified solely using GMC Number and names/registered specialties have been derived from the GMC List of Registered Medical Practitioners (LRMP).

Note:
Operator volumes include:

- Consultant Cardiologists (n=1233, range of procedure volumes from 1 - 273)
- Trainees (n=179, range of procedure volumes from 1 - 51)
- Paediatric Cardiologists (n=16, range of procedure volumes from 1-48)
- Unknown (n=112, range of procedure volumes from 1 - 235)

The occasional appearance of unexpected specialties (Other) is generally due to the entry of a valid but incorrect GMC Number. It is therefore important to ensure this is correct. Blanks may indicate fellows not in formal training posts, staff grades, etc. 'Unknown' may refer to unknown GMC number, no GMC number, or non-medical practitioners (e.g. for ILR monitors).



Select operator type

All

Ablation procedure volume was variable across all categories of operator

An ablation procedure is assigned to each doctor entered as 1st or 2nd scrubbed operator, or as responsible consultant (hence each procedure can contribute to the totals for more than one doctor).

Doctors have been identified solely using GMC Number and names/registered specialties have been derived from the GMC List of Registered Medical Practitioners (LRMP).

Select an operator type below to see specific data.

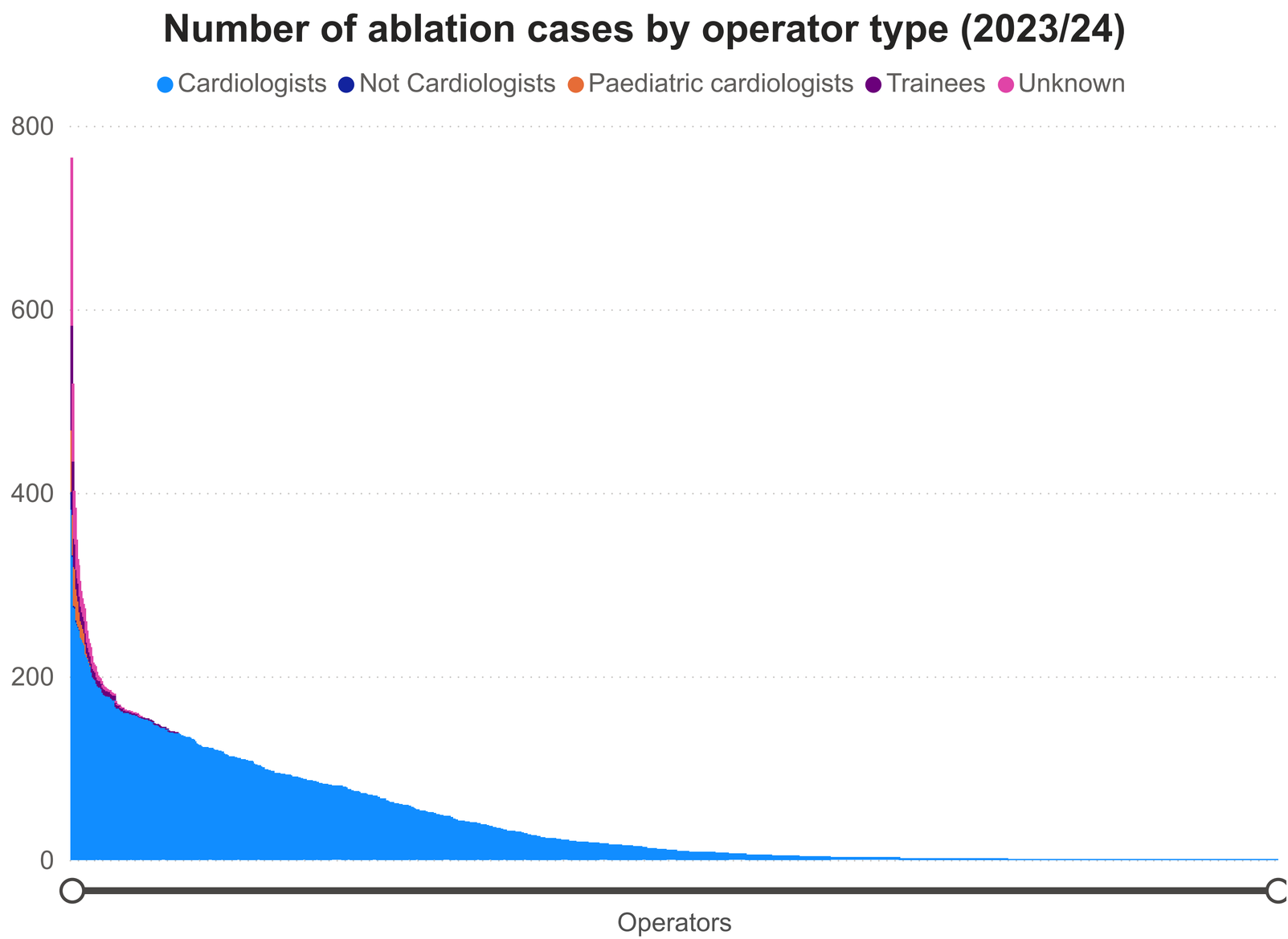
Note:
Operator volumes include:

- Consultant Cardiologists (n=1007, range of procedure volume from 1 - 382)
- Trainees (n=89, range of procedure volumes from 1 - 114)
- Paediatric Cardiologists (n=17, range of procedure volumes from 1 - 67)
- Unknown (n=59, range of procedure volumes from 1 - 183).

The occasional appearance of unexpected specialties (Other) is generally due to the entry of a valid but incorrect GMC Number. It is therefore important to ensure this is correct. Blanks may indicate fellows not in formal training posts, staff grades, etc. Unknown may refer to unknown GMC number, no GMC number, or non-medical practitioners.

Select operator type

All



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2023 ESC General Atlas survey
ESC National Cardiac Societies , European Society of Cardiology: the 2023 Atlas of Cardiovascular Disease Statistics, *European Heart Journal*, Volume 45, Issue 38, 7 October 2024, Pages 4019-4062, https://doi.org/10.1093/eurheartj/ehae466

Dual-chamber pacemaker guidance
The National Institute for Health and Care Excellence (NICE) Technology Appraisal (TA324) guidance states that: "*Dual-chamber pacemakers are recommended as an **option** for treating symptomatic bradycardia due to sick sinus syndrome without atrioventricular block".*
The National Institute for Health and Care Excellence (NICE) Technology Appraisal (TA88) states that *"for most people who have sick sinus syndrome with atrioventricular (AV) block, and for those with atrioventricular block without continuous atrial fibrillation, dual-chamber pacing is preferred to single-chamber pacing"*. In previous NACRM reports, this was referred to as Quality Standard 13.

ICD for primary prevention
NICE guidance recommends that an implantable cardioverter defibrillator (ICD) should be implanted for primary prevention when a patient is deemed at risk but has not yet suffered had an aborted sudden cardiac death. Those criteria include:

- Left ventricular dysfunction, with an ejection fraction of ≤35%, despite optimal medical therapy and who are not in NYHA functional class IV.
- A familial cardiac condition with a high risk of sudden death.
- Prior surgical repair of congenital heart disease.

In previous NACRM reports, this was referred to as Quality Standard 14.

ICD for secondary prevention
The National Institute for Health and Care Excellence (NICE) has set criteria for when an implantable cardioverter defibrillator (ICD) should be implanted for secondary prevention. These include patients who, without a treatable cause:

- have survived a cardiac arrest caused by either ventricular tachycardia (VT) or ventricular fibrillation **or**
- have spontaneous sustained VT causing syncope or significant haemodynamic compromise **or**
- have sustained VT without syncope or cardiac arrest, and also have an associated reduction in left ventricular ejection fraction (LVEF) of 35% or less but their symptoms are no worse than class III of the New York Heart Association (NYHA) functional classification of heart failure.