

NCAP

NATIONAL CARDIAC AUDIT PROGRAMME

NICOR

National Audit of Cardiac Rhythm Management (NACRM)

2024 Summary Report
(2022/23 data)

BHRS 
British Heart Rhythm Society

Cardiac rhythm management - Report at a glance

2022/23 data unless otherwise stated.



78,815 cardiac implantable electronic device (CIED) procedures in total, a slight increase on 2021/22 but still lower than pre-pandemic levels



6,517 CRT-P procedures were higher than 2019/20, though ICD implant volumes remain lower than pre-pandemic



318 leadless pacemaker first implants continued rapid growth in these procedures though overall numbers remain small



4% average one-year re-intervention rate after simple CIED implants remained in line with previous years



0 to 15% spread in one-year re-intervention rate after simple CIED implants across individual hospitals



5% average one-year re-intervention rate after complex CIED implants was lower than previous year



0 to 25% one-year re-intervention rate after complex CIED implants across individual hospitals



9,715 AF ablation procedures were performed, the highest annual figure recorded



75% of hospitals perform more than 100 ablations, meeting the BHRS recommended minimum volume



5% 1-year complex atrial ablation re-intervention rate was low and may reflect under-treatment



12% 2-year complex atrial ablation re-intervention rate was low and may reflect under-treatment



34% of AF procedures used cryoablation, in line with the previous three years.



Number of cases

1. The number of CRM cases has gradually risen since the pandemic but is still below pre-pandemic levels for most procedures. Hospitals should assess if this is because demand is falling or results from a lack of capacity and rising waiting lists.

Use of defibrillators

2. The use of defibrillators continues to decline, a trend which preceded the pandemic. Hospitals should support current randomised clinical trials (such as BRITISH) to help determine if this clinical strategy is correct.

AF ablations

3. The number of AF ablations performed in England and Wales per 100,000 of population is still lower than in many other countries, though has risen above pre-pandemic levels. Waiting times are also long. Hospitals should review their AF ablation services to ensure this is being used in all relevant cases and that the capacity is in place to reduce waiting times.

Audit data submission timeliness

4. The ambition is for this report to be updated in real-time in future. To support this, hospitals will need to provide audit data in a timelier fashion.

Introduction to the report



This is the annual report of the National Audit of Cardiac Rhythm Management (NACRM), part of the National Cardiac Audit Programme (NCAP) run by the National Institute for Cardiovascular Outcomes Research (NICOR). Cardiac rhythm management helps patients with a variety of heart rhythm conditions. Treatment includes the use of pacemakers and defibrillators (all such electronic devices implanted in the human body are now collectively referred to as cardiac implantable electronic devices or CIEDs) as well as cardiac ablations procedures.

The report covers England & Wales, with the latest data covering the 2022/23 financial year (April 2022 to March 2023) presented alongside long-term trends. Data for Scotland can be found in the Scottish Cardiac Audit Programme while Northern Ireland is unable to fully participate in the audit because of data protection issues.

All summary statistics presented in this report 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 recently published reports which utilise both validated as well as unadjudicated data from the participating hospitals. More details on the methods used can be found [here](#), and descriptions of the various arrhythmias and the treatments available for them [here](#).

The slides in the report are interactive so you can select and explore the data that interest you. This is different from the downloadable PDF of previous years and aims to be of more value to different types of reader, including patients and the public, service commissioners as well as clinicians. In making this shift, we have concentrated initially on a set of key findings but anticipate adding more analyses with time. All hospitals are asked to submit audit data to NICOR on a monthly basis to move to more rapid (and ideally real-time reporting). The next step will be to move to a quarterly update of the report.

The NACRM audit relies on the contribution of many. The device part of the audit evolved from the original British Pacing and Electrophysiology Group (BPEG) national registry. Now over 40 years old, it is the longest standing such registry in the world with details of over a million procedures. A parallel registry of electrophysiology/catheter ablation procedures commenced in 2004. Expert advice on the design and outputs of the NACRM comes from members of the British Heart Rhythm Society (BHRS). Detailed information about almost 80,000 procedures has been diligently entered by hospitals, queried and cleaned before analysis is undertaken by the NICOR team. We are grateful to all involved in contributing to the development of this audit.

NICOR NACRM audit team



Number of CIED procedures

- All CIED procedures
- Monthly CIED procedures
- PM procedures by ICB/HB/CN
- CRT-P procedures by ICB/HB/CN
- ICD procedures by ICB/HB/CN
- CRT-D procedures by ICB/HB/CN
- Types of PM procedure
- Leadless cardiac pacemakers
- Complex CIED procedures
- Types of ICD procedure

CIED compliance with standards

- NICE TA324 dual-chamber sinus
- NICE TA88 dual-chamber AV block
- NICE TA314 ICD primary
- NICE TA314 ICD secondary

CIED re-interventions

- 1-year re-intervention after simple CIED
- Simple CIED re-intervention by hospital
- 1-year re-intervention after complex CIED
- Complex CIED re-intervention by hospital

Number of ablations

- Ablation procedures by category
- Ablation procedures by type
- Ablation procedures by hospital
- Ablation procedures by ICB/HB/CN
- Simple ablation procedures by ICB/HB/CN
- Complex atrial ablations by ICB/HB/CN
- Complex ventricular ablations by ICB/HB/CN
- Ablation technology for AF

Ablation re-interventions

- Simple ablation re-intervention
- Simple ablation re-intervention by type
- Simple ablation re-intervention by hospital
- Complex atrial ablation re-intervention
- Complex atrial ablation re-intervention by hospital
- Complex ventricular ablation re-intervention
- Ventricular ablation re-intervention by hospital

References

Procedure numbers have risen but are not yet back to pre-pandemic levels



Almost 80,000 Cardiac Implantable Electronic Device (CIED) procedures were reported to the audit in 2022/23, from across 172 hospitals in England and Wales.

The number of procedures rose over the last two years but mostly remain below the levels seen before the COVID-19 pandemic (CRT-P procedures are slightly higher).

In 2022/23, there were just over 44,000 pacemaker procedures, more than double the number of complex CIEDs (which include ICDs, CRT-Ps and CRT-Ds).

The number of ICDs and CRT-Ds has fallen over time, whilst the number of CRT-P devices has been increasing. There has been a gradual rise in the number 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

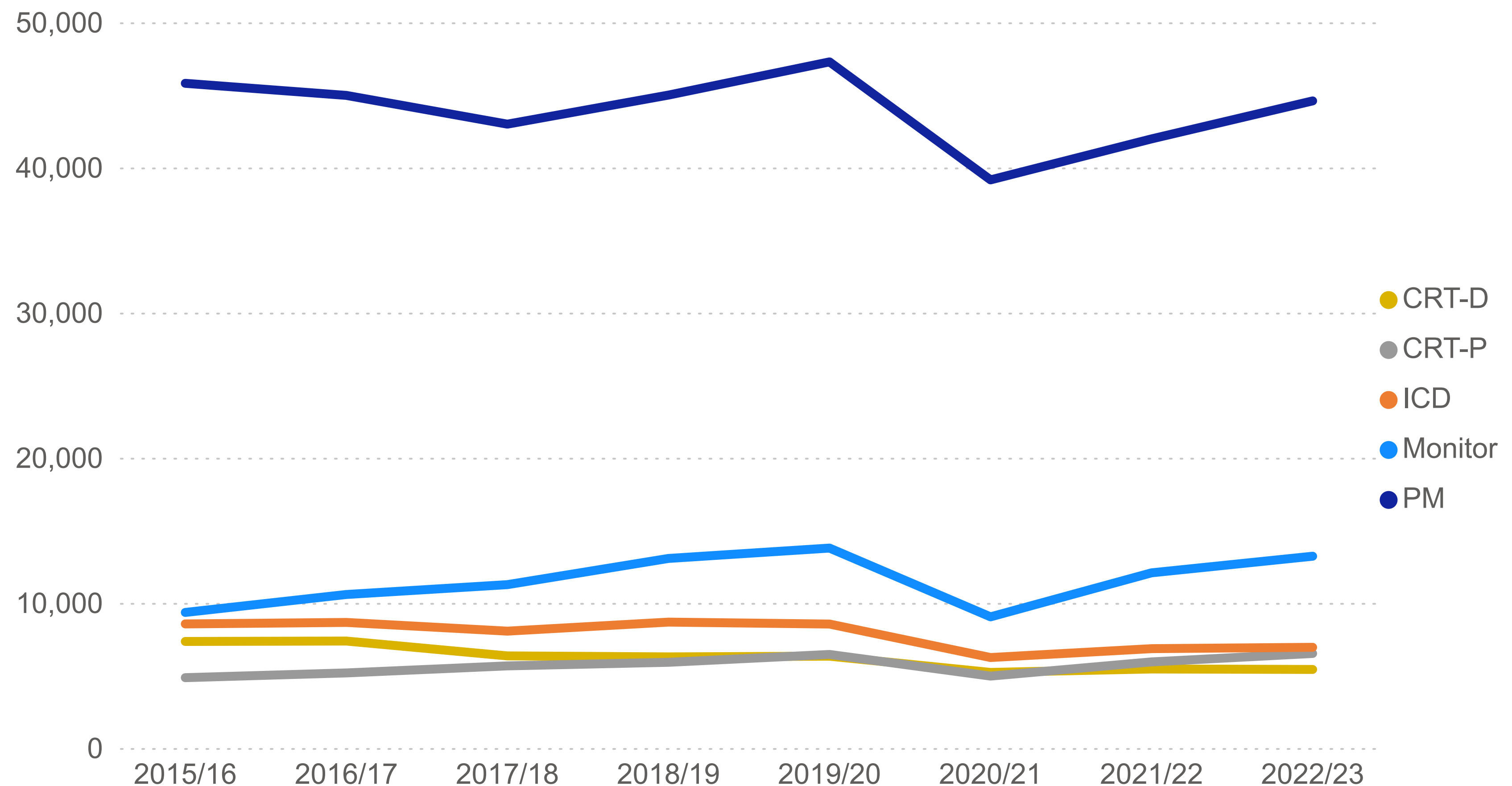
78,815
Total Procedures

44,591
Pacemaker Procedures

18,875
Complex Procedures

13,218
Implantable Loop Recorders

All CIED procedures by type



Activity of electronic device implants varies from month to month, especially for pacemakers and implantable loop recorders

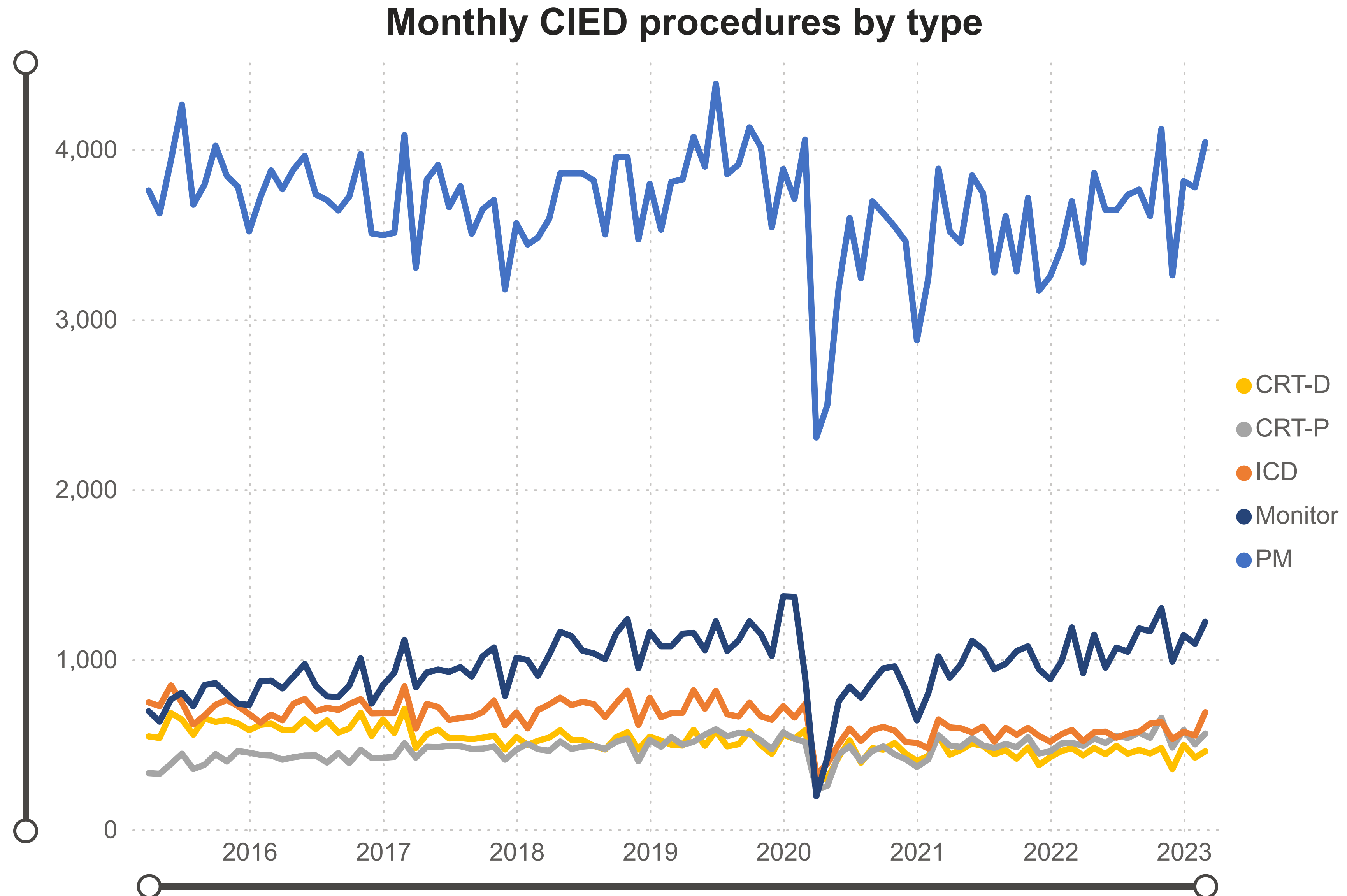


The chart highlights the dramatic impact of the COVID-19 pandemic on Cardiac Implantable Electronic Device (CIED) procedure numbers, especially during the first peak of COVID-19 hospital admissions in 2020/21.

The number of pacemaker (PM) and complex procedures fell by half or more while that for implantable loop recorders dropped by 85%.

The biggest fluctuations in the monthly activity during 2022/23 can be 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 five-fold variation in levels of pacemaker implantation across the Integrated Care Boards in England and University Health Boards in Wales



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

In 2022/23, the overall rate for England and Wales was 681pmp. The lowest rate by ICB was 252pmp in North Central London with the highest being 1,337pmp in NHS Norfolk and Waveney.

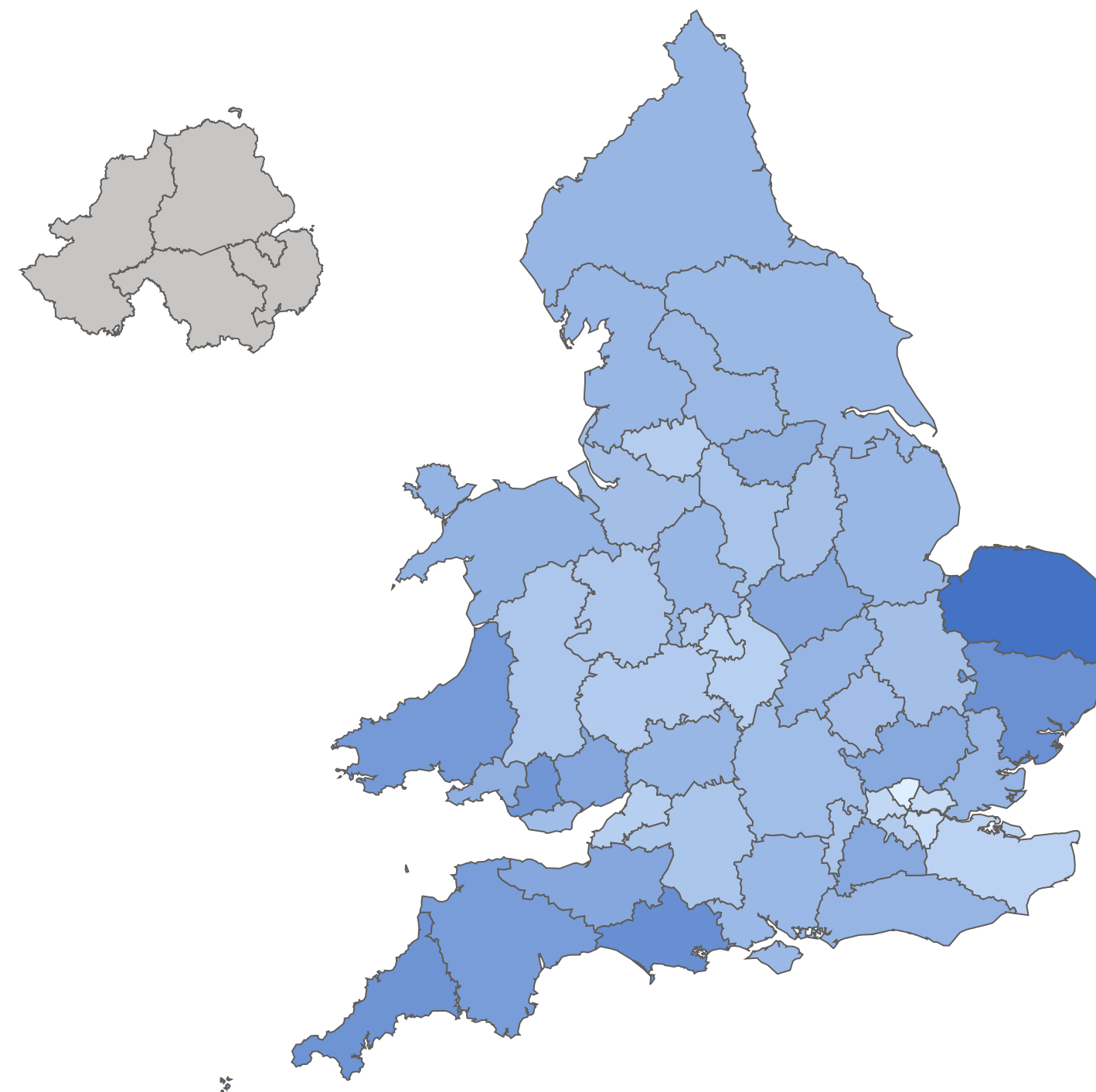
Across Cardiac Networks, the lowest rate was 468pmp in South London compared with the highest of 912pmp in South Yorkshire CN.

This large variation could result from differences in:

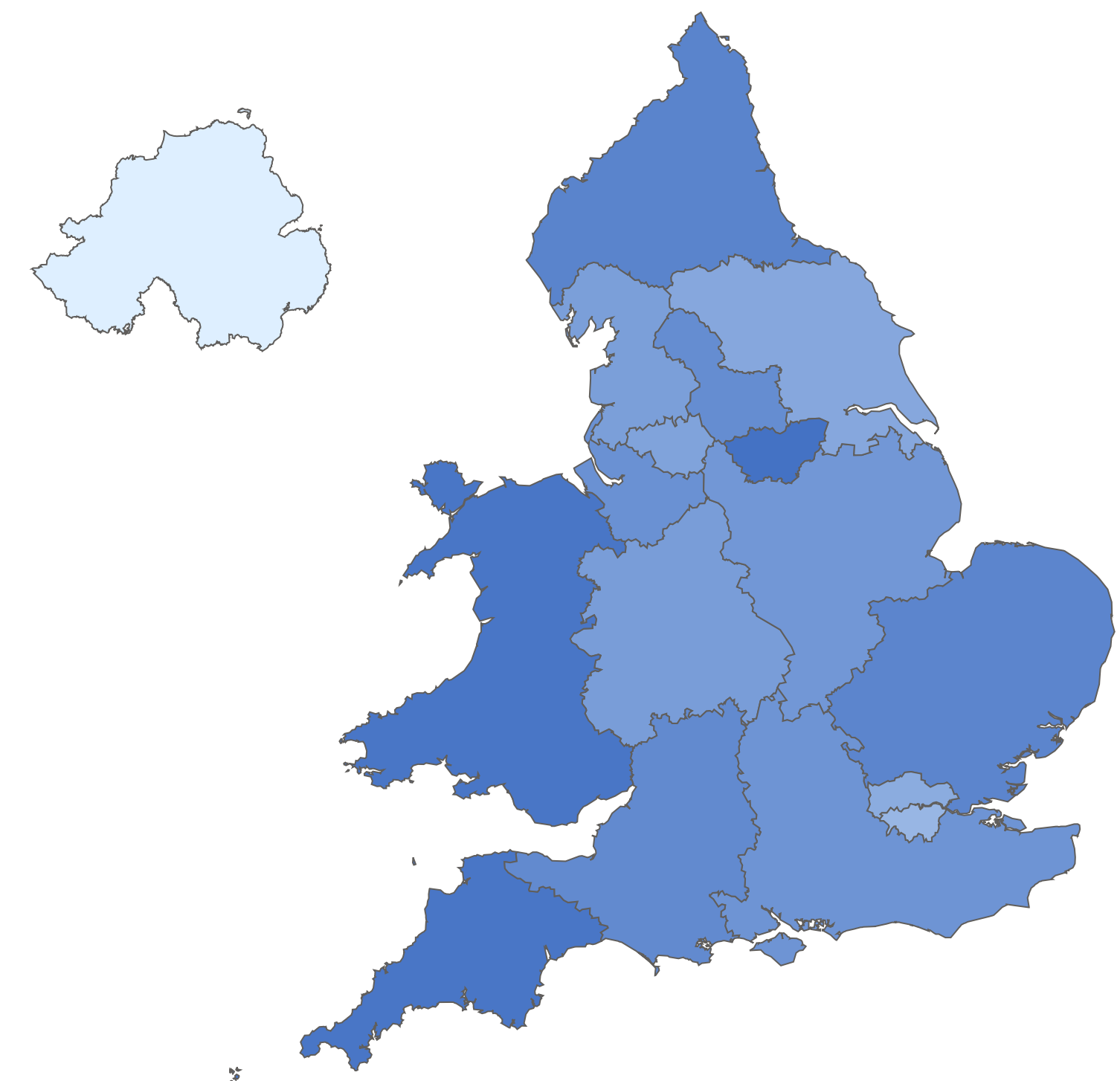
- the demographics of the population, particularly age and sex
- access to treatment
- treatment capacity within hospitals.

Note: Future reports will aim to adjust for age, sex and other demographic factors. 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 (2022/23)



PM procedures per million population by Cardiac Network based on hospital location (2022/23)



There is a ten-fold variation in the rate of CRT-P procedures across the Integrated Care Boards in England and University Health Boards in 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 2022/23, the overall rate was 83 per million population (pmp), but there was a 10-fold variation across the 42 Integrated Care Boards in England and seven Welsh University Health Boards. The highest rate was 263pmp in Cornwall and the Isles of Scilly and lowest was 23pmp in North East London.

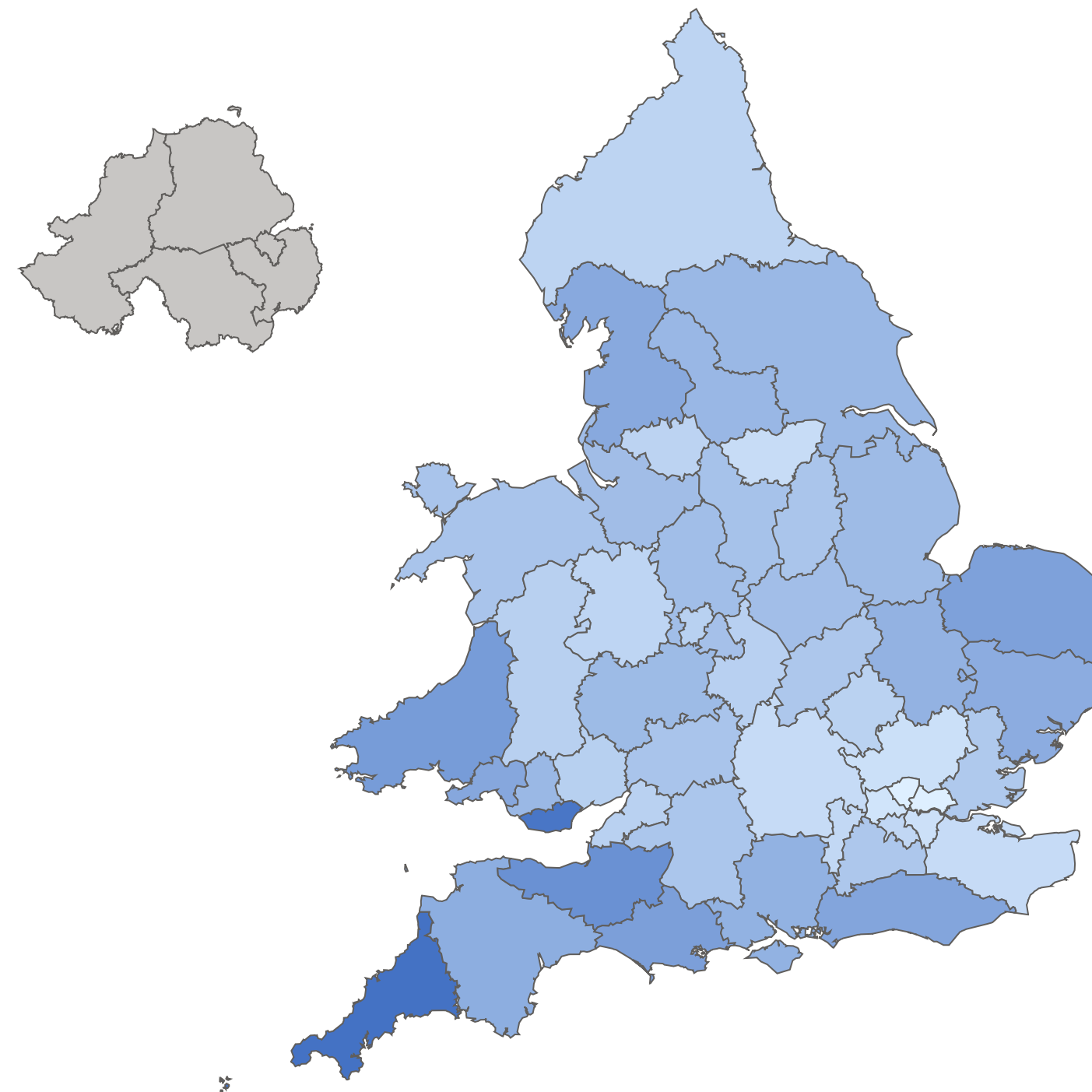
For Cardiac Networks, the highest rate was 170pmp in the South West (Peninsula) and the lowest was 54pmp in North London.

This large variation could result from differences in:

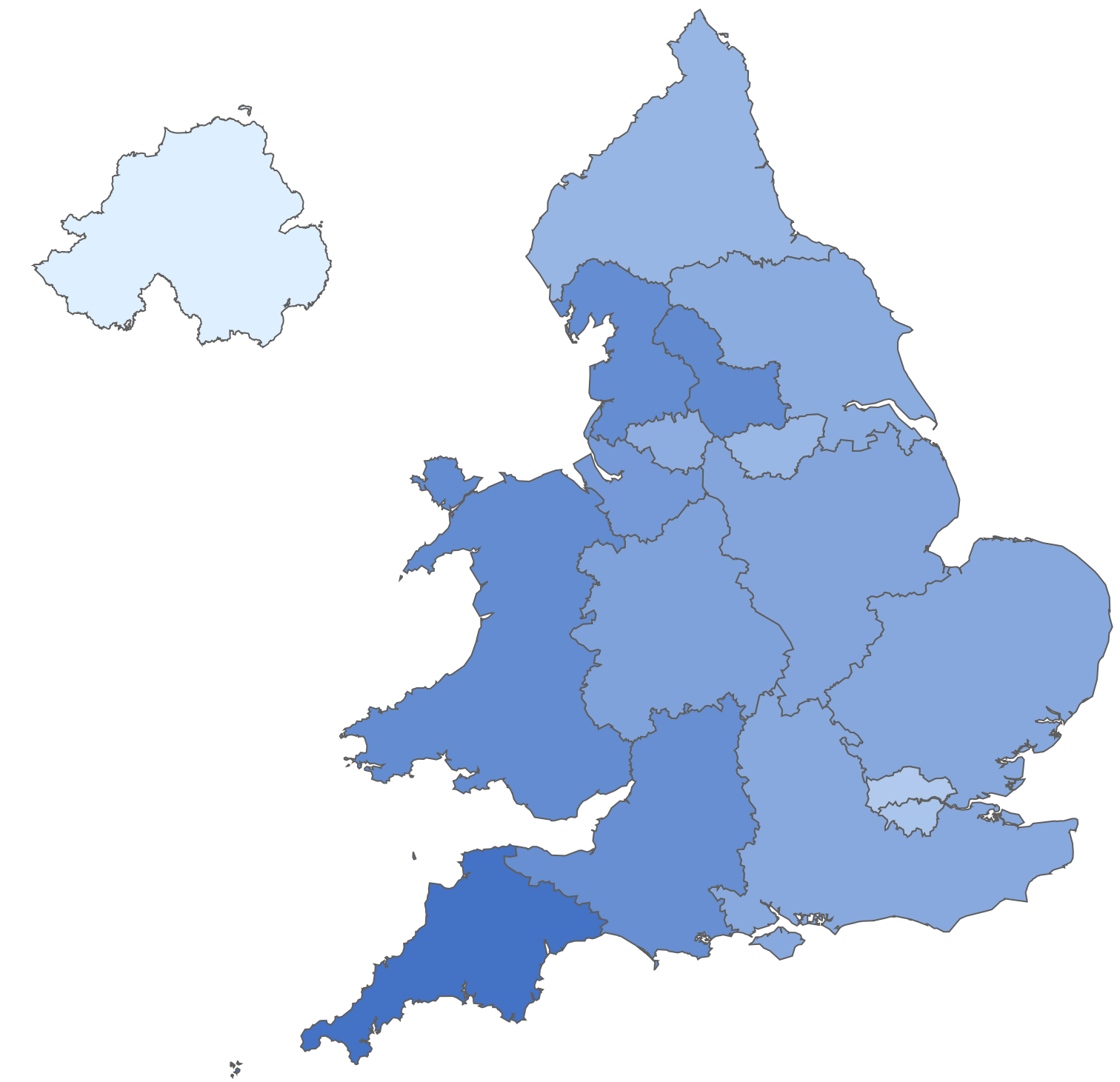
- the demographics of the population, particularly age and sex
- access to treatment
- treatment capacity within hospitals.

Note: Future reports will aim to adjust for age, sex and other demographic factors. 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 (2022/23)



CRT-P procedures per million population by Cardiac Network based on hospital location (2022/23)



There is a three-fold difference in the rate of ICD implants across the Integrated Care Boards in England and University Health Boards in 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 in England and seven Welsh University Health Boards, the average rate was 106 per million population (pmp). The highest rate was 173pmp (Hywel Dda University Health Board), and the lowest was 54pmp in North Central London.

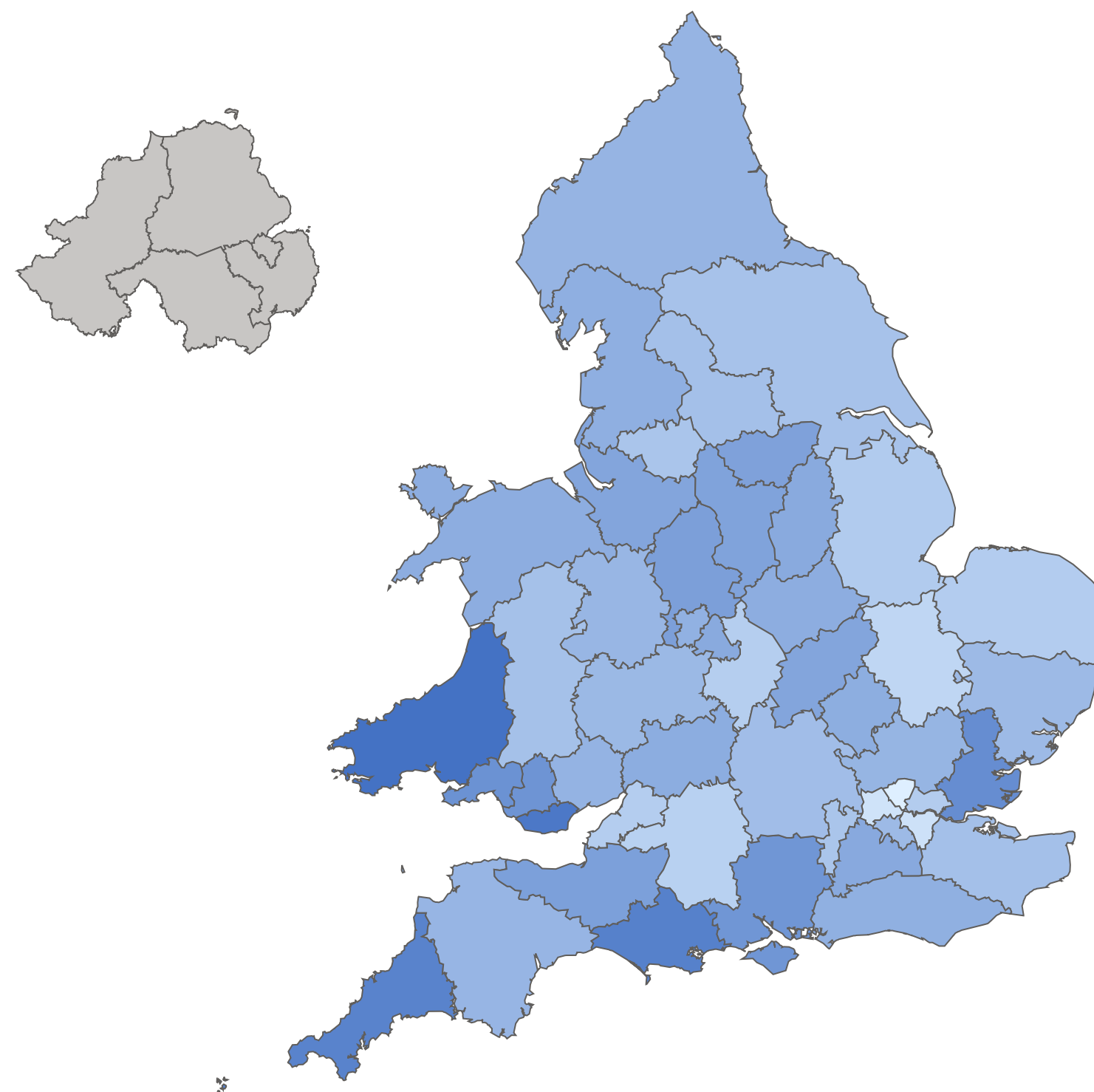
For Cardiac Networks, the highest rate was 160pmp in South Yorkshire compared with 71pmp in the East of England.

This large variation could result from differences in:

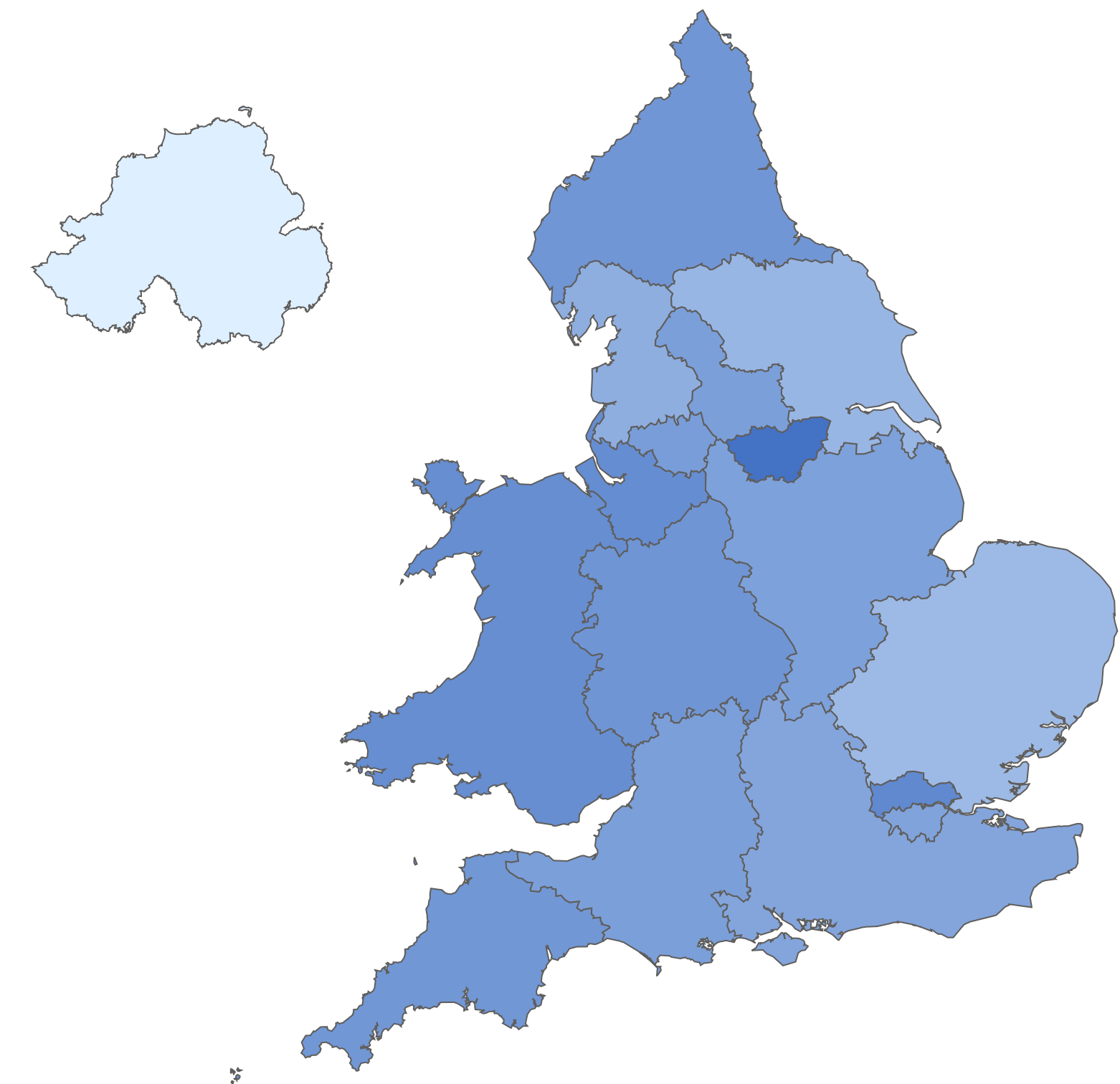
- the demographics of the population, particularly age and sex
- access to treatment
- treatment capacity within hospitals.

Note: Future reports will aim to adjust for age, sex and other demographic factors. 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 (2022/23)



ICD procedures per million population by Cardiac Network based on hospital location (2022/23)



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



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

In 2022/23, the overall national implant rate across the 42 Integrated Care Boards in England and the seven Welsh University Health Boards was 100 per million population (pmp). The highest rate was 183pmp in Cornwall and the Isles of Scilly and the lowest was 39pmp in North Central London.

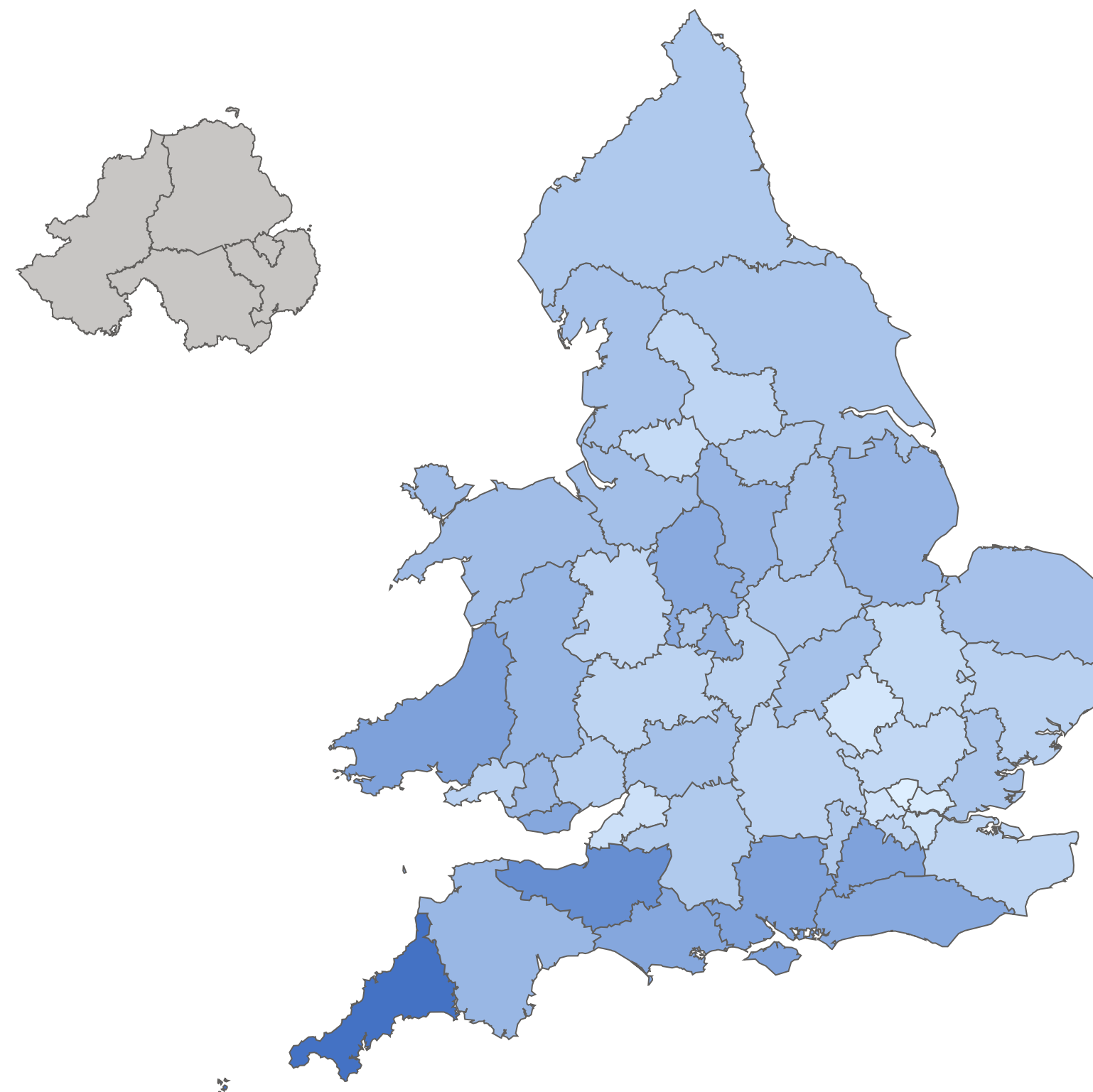
For Cardiac Networks, the highest rate was 105pmp in South Yorkshire compared with the lowest of 53pmp in the East of England.

This large variation could result from differences in:

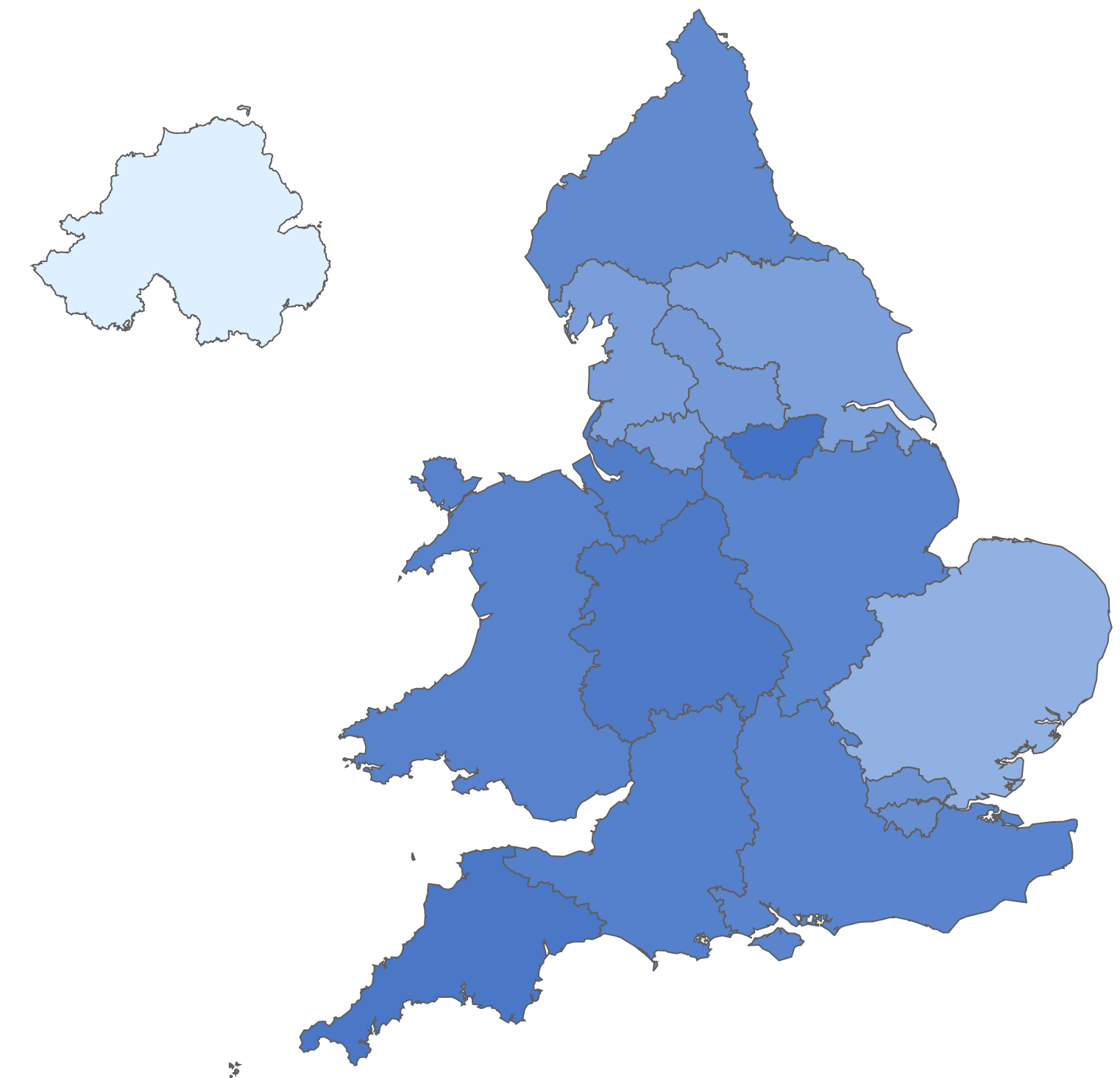
- the demographics of the population, particularly age and sex
- access to treatment
- treatment capacity within hospitals.

Note: Future reports will aim to adjust for age, sex and other demographic factors. 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 (2022/23)



CRT-D procedures per million population by Cardiac Network based on hospital location (2022/23)



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')



While procedures to fit new pacemaker implants in 2022/23 were still lower than in 2019/20, the number of generator ('box') changes increased from 9,739 in 2021/22 to 10,796 in 2022/23.

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 need for a box change is known some time in advance, so it was possible to ensure these procedures were done as a priority.

Selecting a Cardiac Network and/or hospital below shows the annual and monthly procedures for that selection.

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

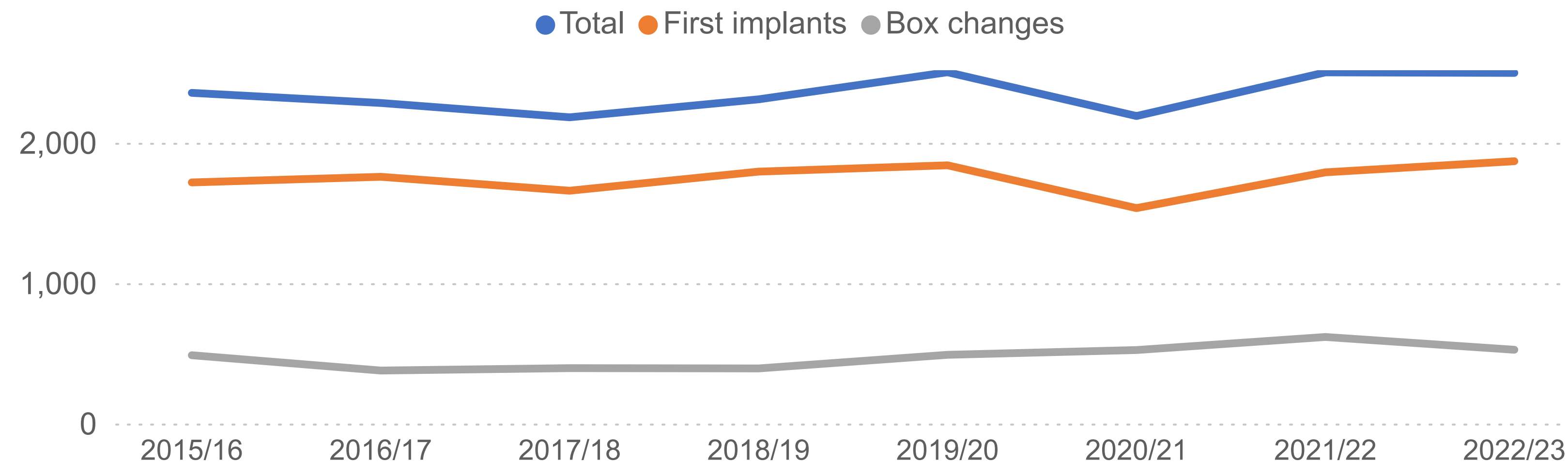
Select Cardiac Network

Northern England

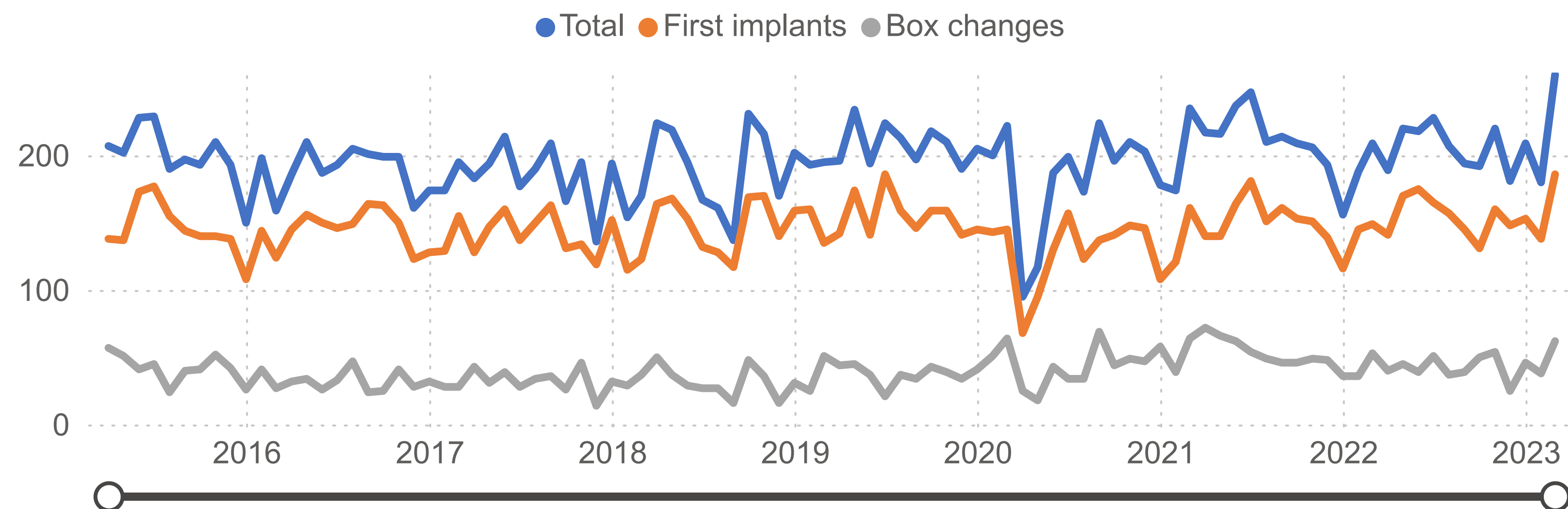
Select hospital

All

Pacemaker procedure numbers by financial year



Pacemaker procedures by month



There is a steady growth in the use of leadless pacemakers though the overall procedure numbers are still very low

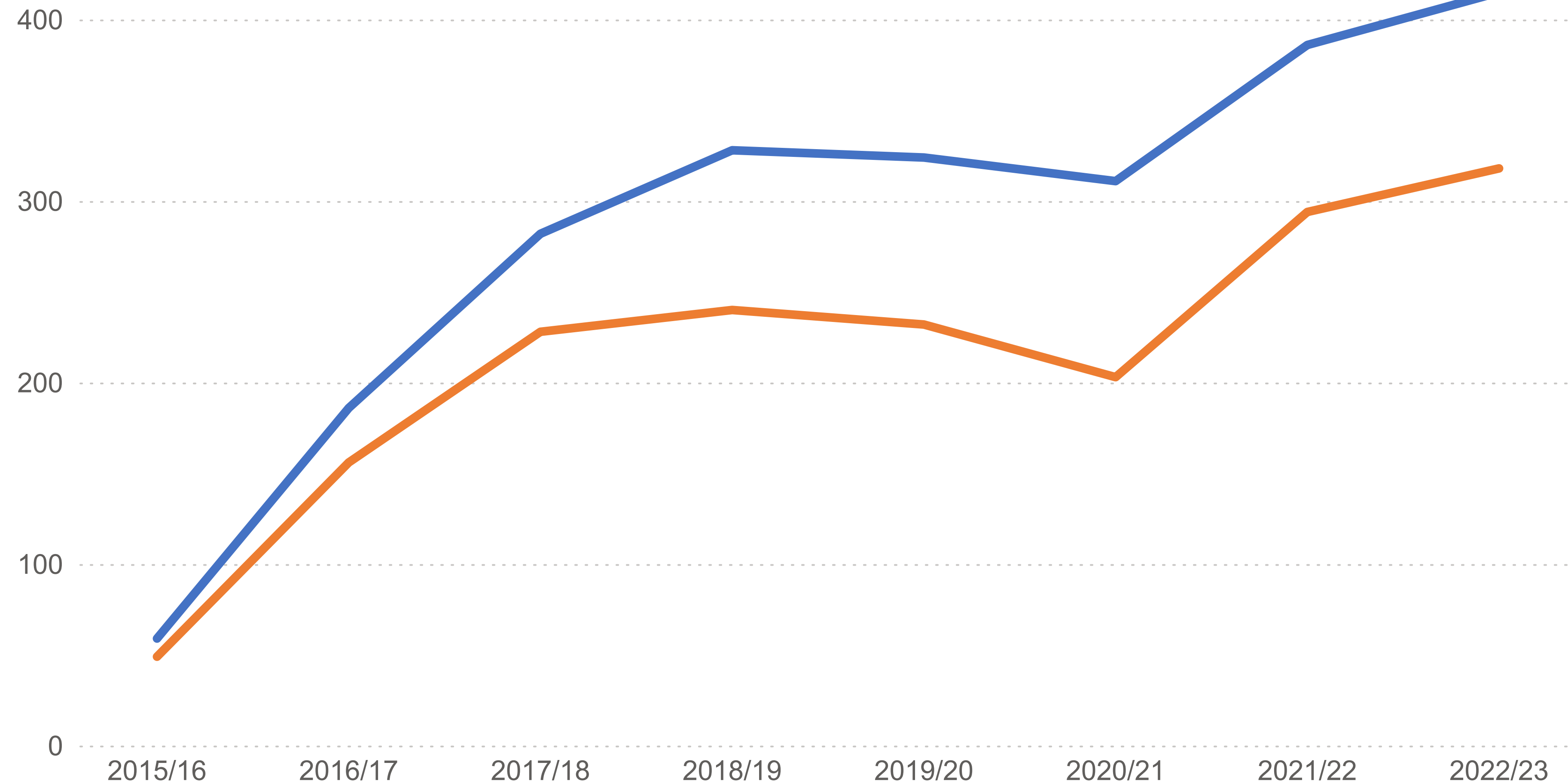


Leadless cardiac pacemaker procedures

● Total procedures (including generator changes) ● First time implants

In 2022/23, there were 415 procedures for leadless cardiac pacemakers (LCPs), up from 386 the year before.

The rate of growth since 2015/16 has been substantial but the absolute numbers are small.



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



In 2022/23, the number of ICD and CRT-D procedure numbers were still below pre-pandemic levels (numbering 6,942 and 5,416 respectively).

CRT-P procedure numbers have been rising since 2015/16 and were higher in 2022/23 (at 6,517) than before the pandemic.

This likely reflects a gradual shift away from ICD to CRT-P procedures, as trials such as [DANISH](#) have been published.

Selecting a Cardiac Network and/or hospital below shows the annual and monthly procedures for that selection.

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

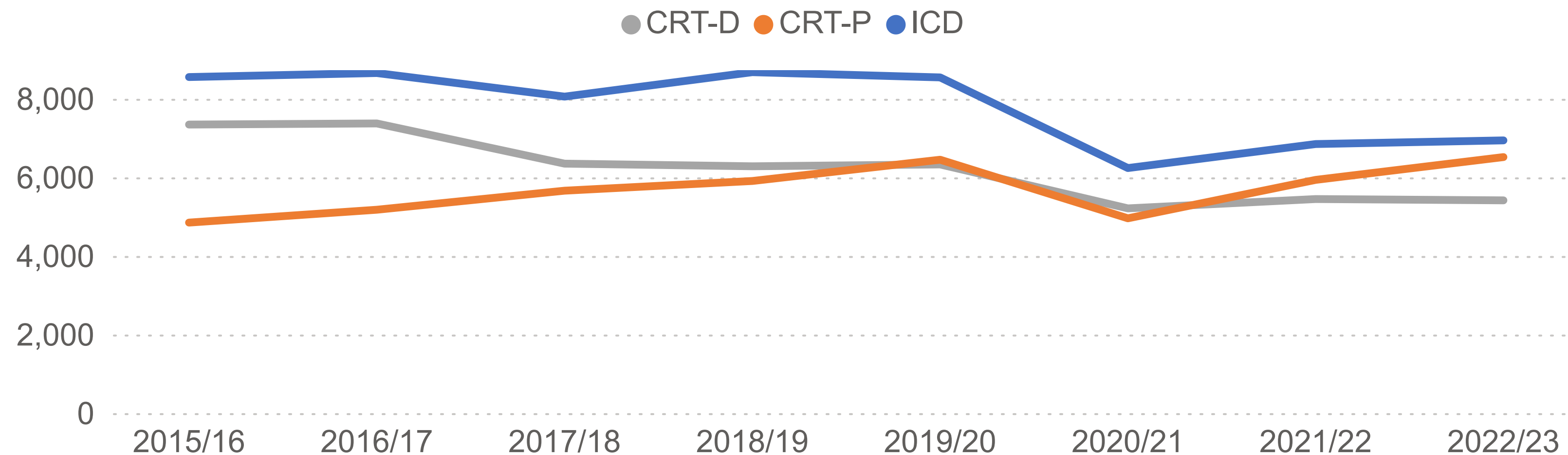
Select Cardiac Network

All

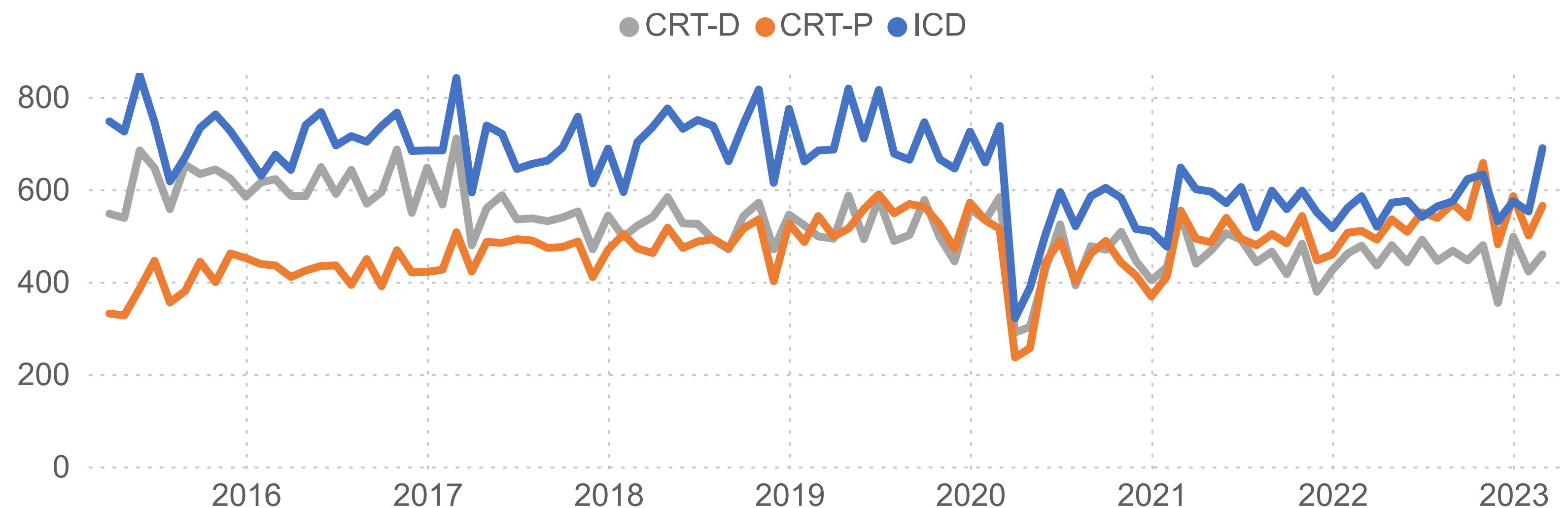
Select hospital

All

Complex CIED procedures by type



Monthly complex CIED procedures by type



Both transvenous and subcutaneous implantable cardioverter defibrillator procedures are being used less frequently



The number of implantable cardioverter defibrillator (ICD) implants remain lower than before the COVID-19 pandemic.

The total in 2022/23 (4,874) is much lower than the peak of 6,265 in 2018/19.

This could be because of:

- a shift in thinking related to better medical therapy
- the role of revascularisation
- a reappraisal of the indications for treatment.

A number of ongoing trials will provide new insights (e.g. [BRITISH](#) and [PROFID-EHRA](#)).

The use of subcutaneous ICD implants appears to be falling. After peaking in 2018/19 at 623 procedures, only 510 were recorded in 2022/23. The numbers are small though and new innovations may influence future practice.

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

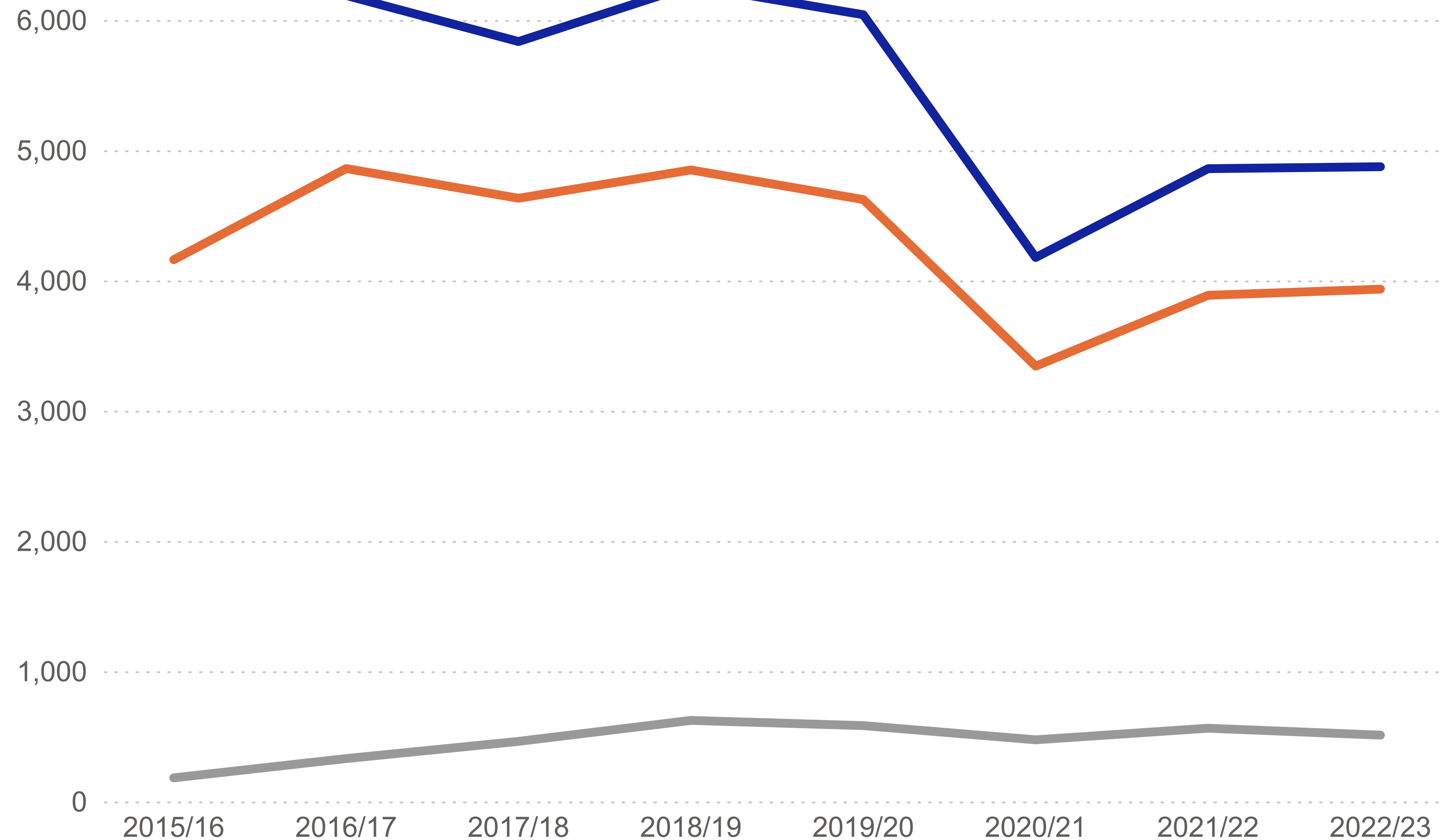
Select Cardiac Network

All



Implantable cardioverter defibrillator procedures

● All first and upgrade ● First and upgrade transvenous ● First and upgrade subcutaneous



Nearly a quarter 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) for this and the audit recommended hospitals aim to achieve this for 90% of relevant procedures.

Since 2015/16, the average has remained broadly flat around 79% and was 81% in 2022/23. Three quarters of hospitals met the target but 33 did not.

Selecting a Cardiac Network and/or hospital below shows the data for that selection.

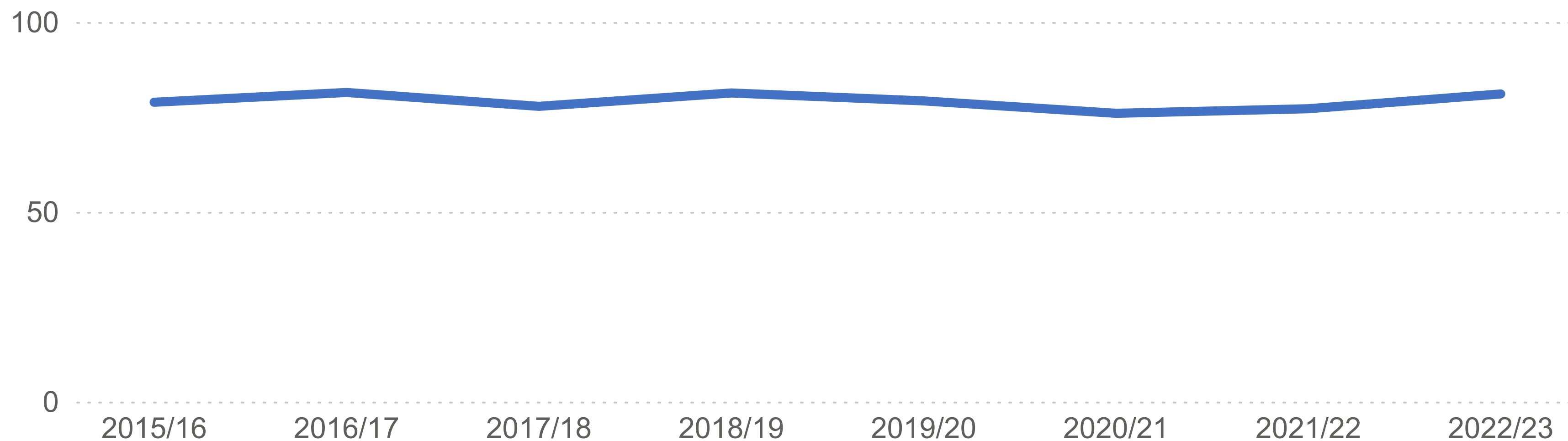
Select Cardiac Network

All

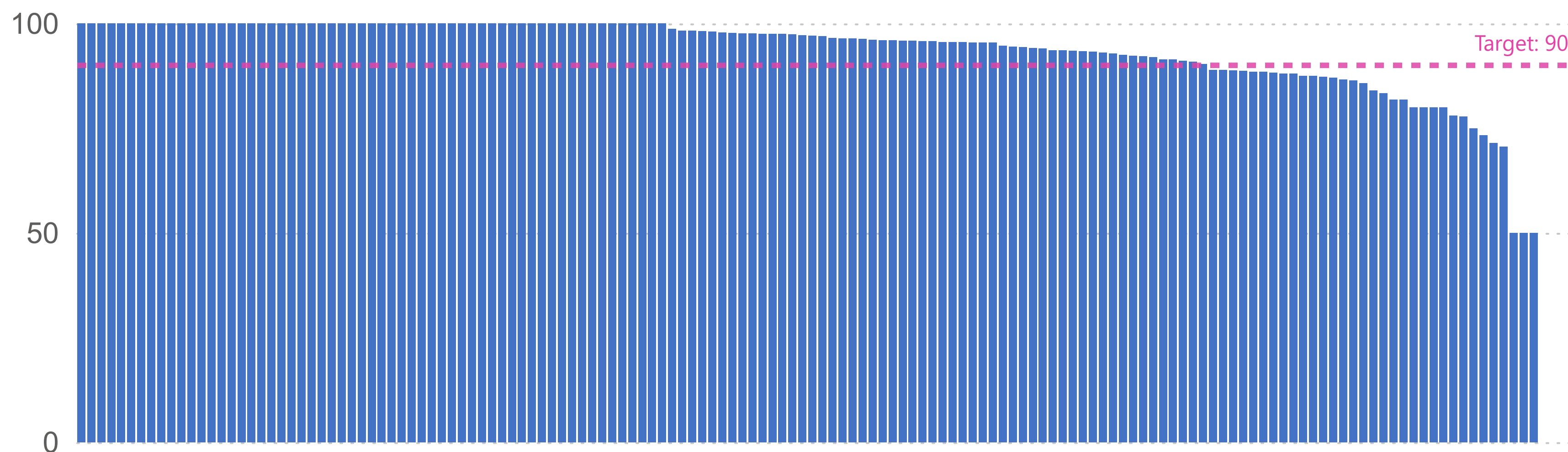
Select hospital

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 (2022/23)



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 sick sinus syndrome with atrioventricular (AV) block (where the electrical signal from the upper chambers to lower chambers of the heart is impaired), and for those with atrioventricular block without continuous atrial fibrillation.

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

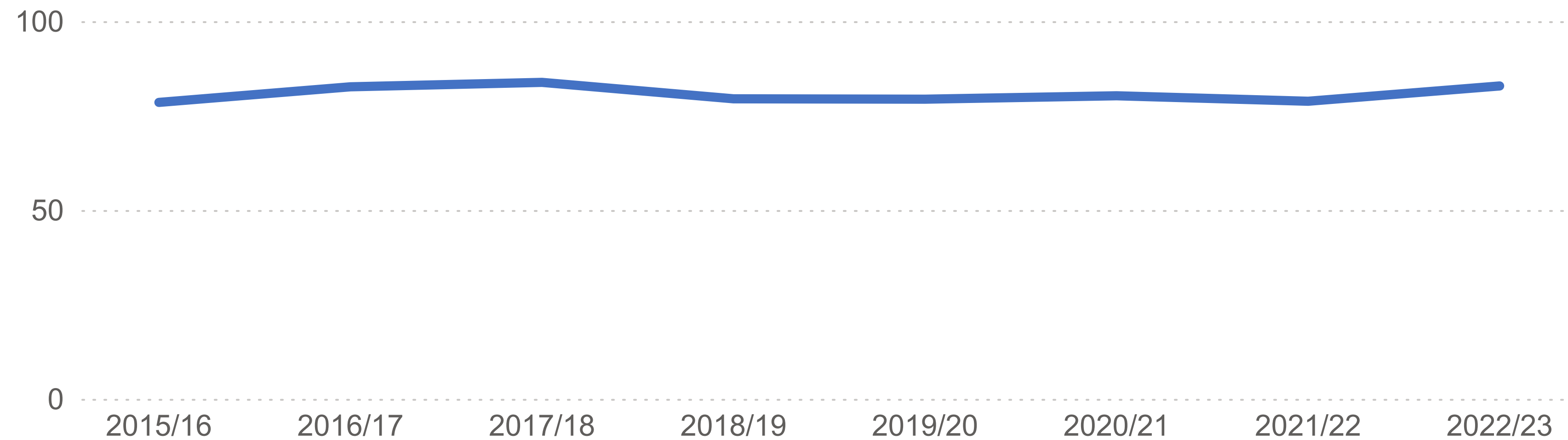
Since 2015/16, the average has remained broadly flat around 81% and was 83% in 2022/23. Almost 70% of hospitals met the target but 46 did not.

Selecting a Cardiac Network and/or hospital below shows the data for that selection.

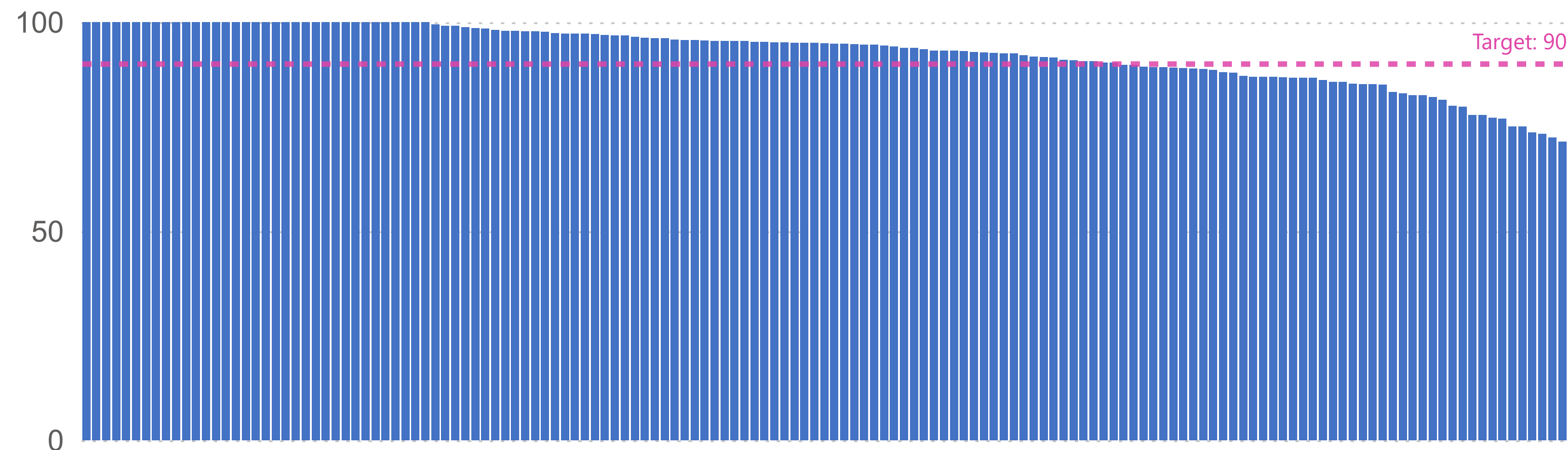
Select Cardiac Network

Select hospital

Percentage compliance with NICE guideline for dual pacing in AV block



Percentage compliance with NICE guideline for dual pacing in AV block by hospital (2022/23)



Over a third of hospitals cannot demonstrate compliance with NICE guidance on the use of an 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 from a cardiac arrest that could be life-threatening.

The audit suggested hospitals aim for 80% of procedures to comply with this guideline.

The average compliance has remained just under 50% since 2015/15.

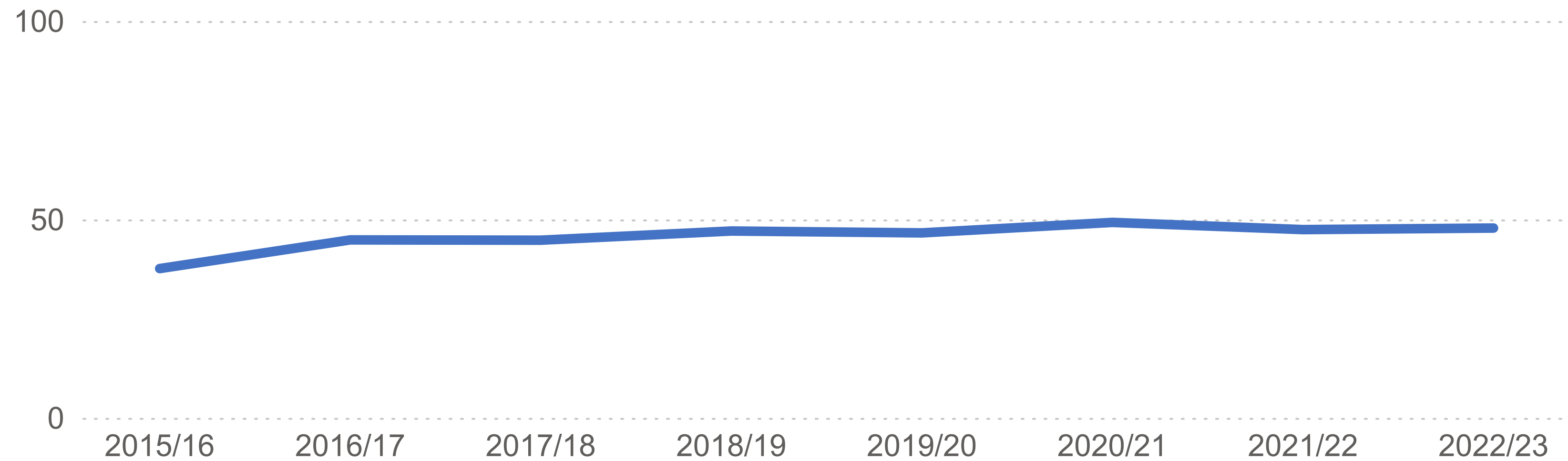
It is likely that non-compliance is because of data entry issues and does not reflect true performance.

Selecting a Cardiac Network and/or hospital below shows the data for that selection.

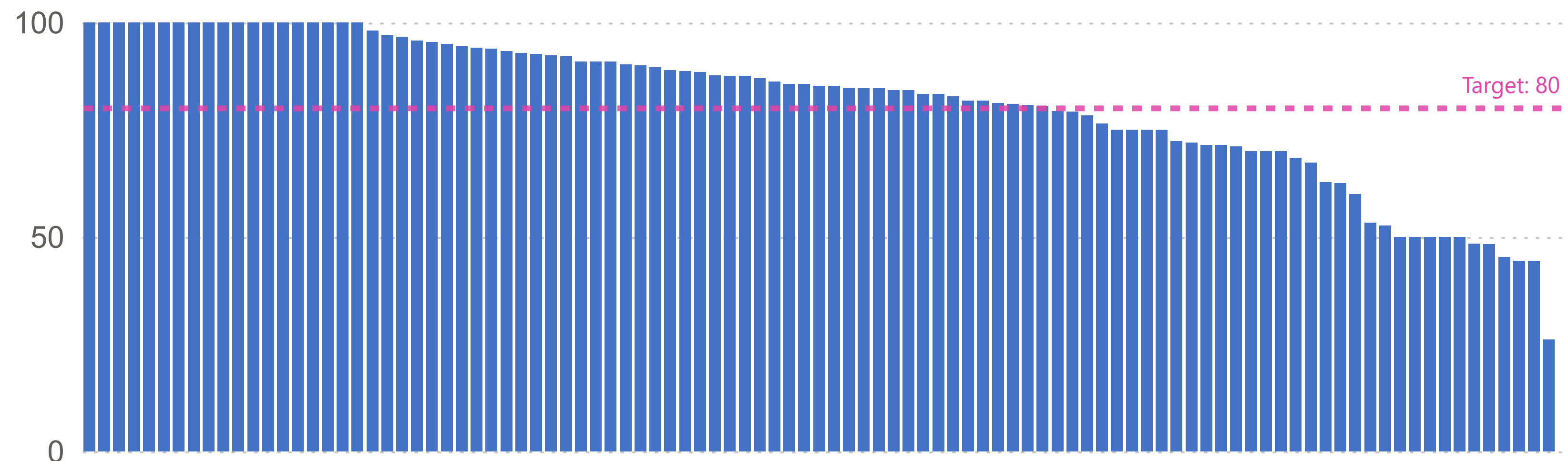
Select Cardiac Network

Select hospital

Percentage compliance with NICE guidance on ICD use for primary prevention



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



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



[NICE has set criteria](#) for when a cardioverter defibrillator (ICD) should be implanted in someone for secondary prevention (eg 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 2022/23 was 47%. While 57 hospitals met the target, 42 did not.

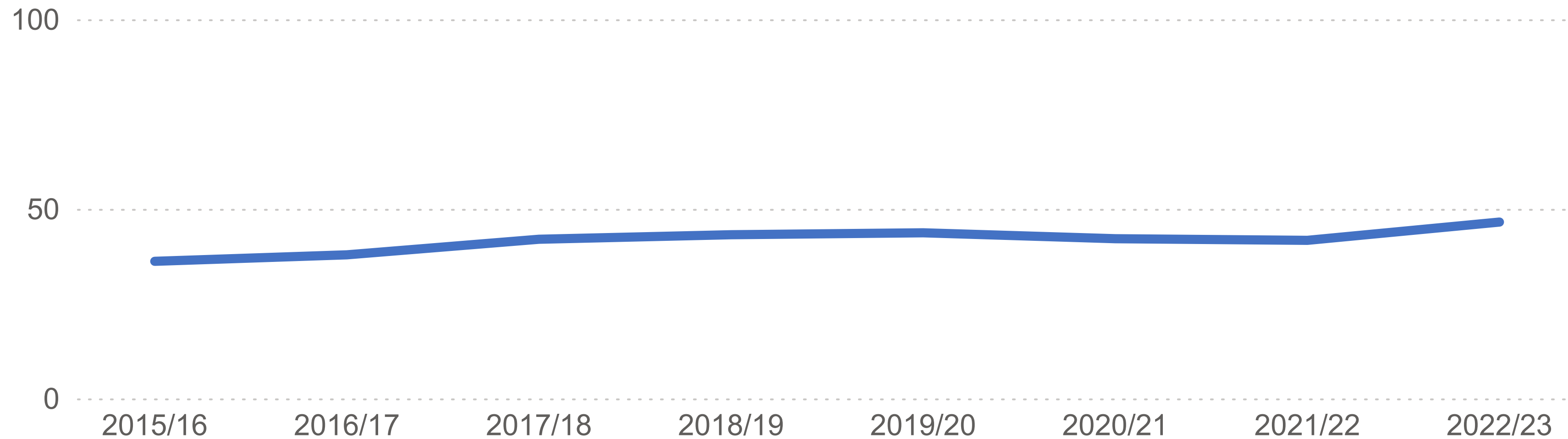
It is likely that non-compliance with this guideline is the result of issues to do with data submission.

Selecting a Cardiac Network and/or hospital below shows the data for that selection.

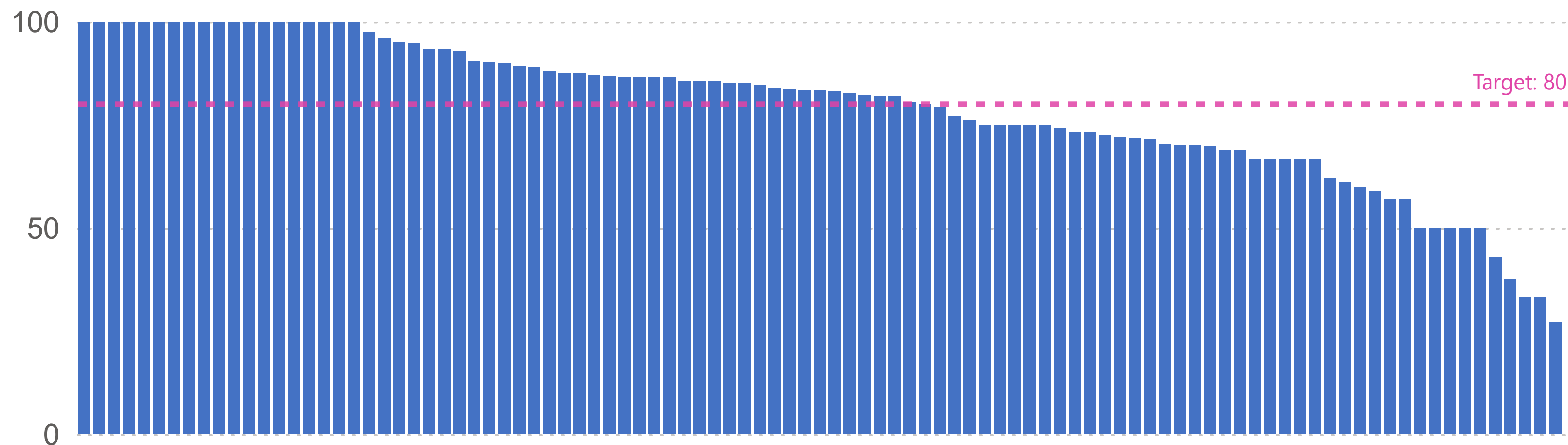
Select Cardiac Network

Select hospital

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)



The one-year re-intervention rate after single and dual chamber pacemaker procedures remained at just over 4% in 2022/23

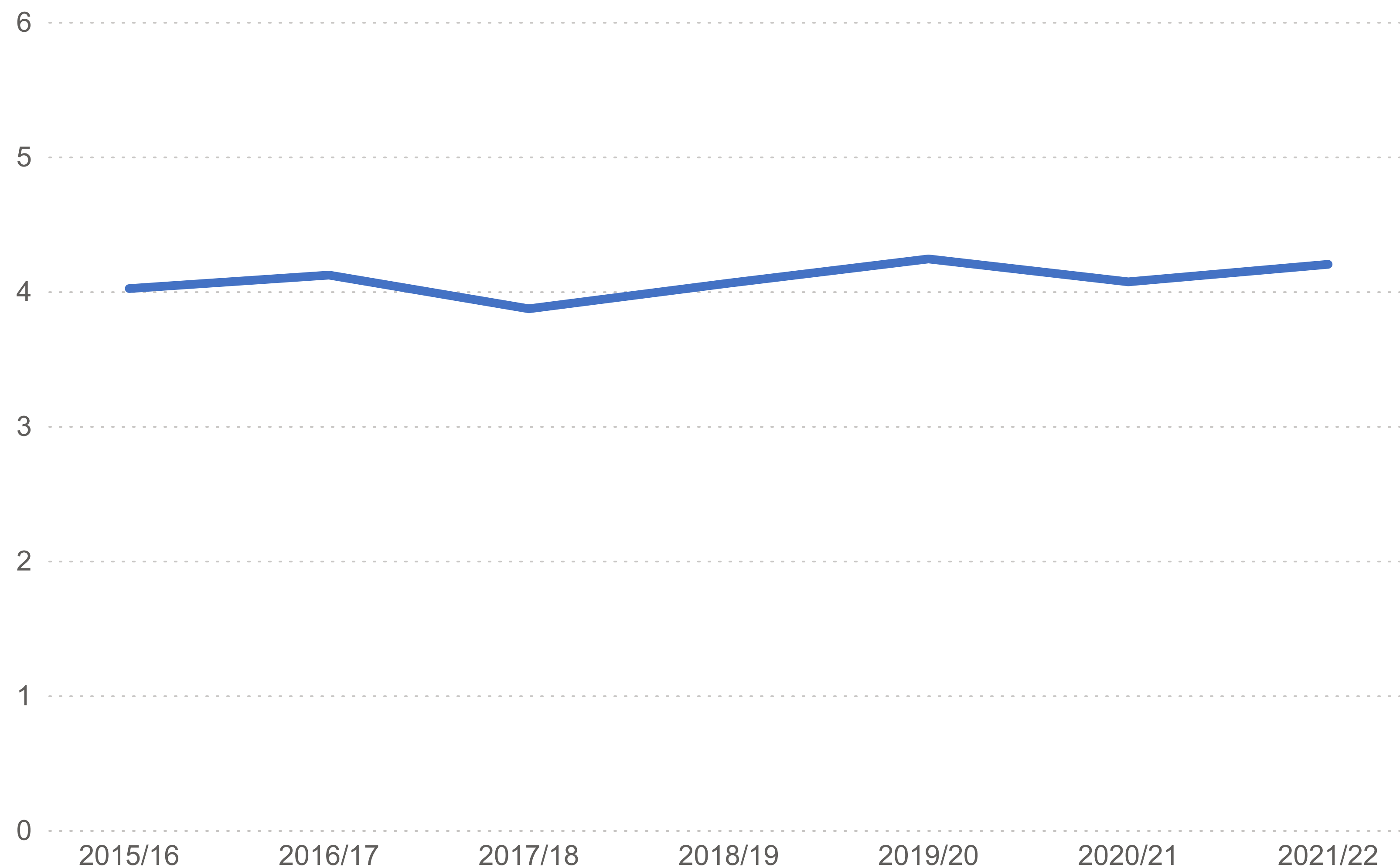


Just over 4% of patients who had a new simple CIED implant (either a single chamber or dual chamber pacemaker) in 2022/23 required any sort of re-intervention within one calendar year.

This figure has remained broadly flat 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 2021 and March 2022. 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 one year



The one-year re-intervention rate after simple CIED implants ranges from near zero to 15% across different hospitals



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

For 2021/22 implants, the re-intervention rate within hospitals performing more than 200 procedures ranged from 0.5% to 8.1%.

Amongst hospitals undertaking a lower number of implants, there were several with re-intervention rates above 10%.

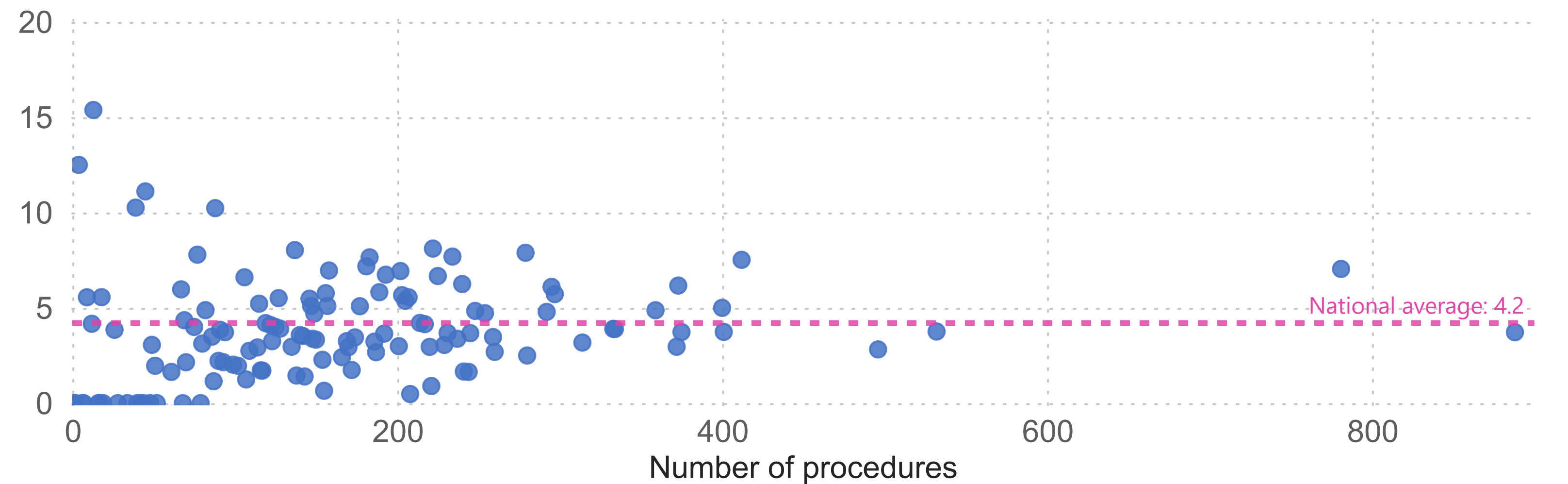
Selecting a Cardiac Network and/or hospital below shows the data for that selection.

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 such that the overall re-intervention rate shown is 3.6% rather than the true 4.2% national average.

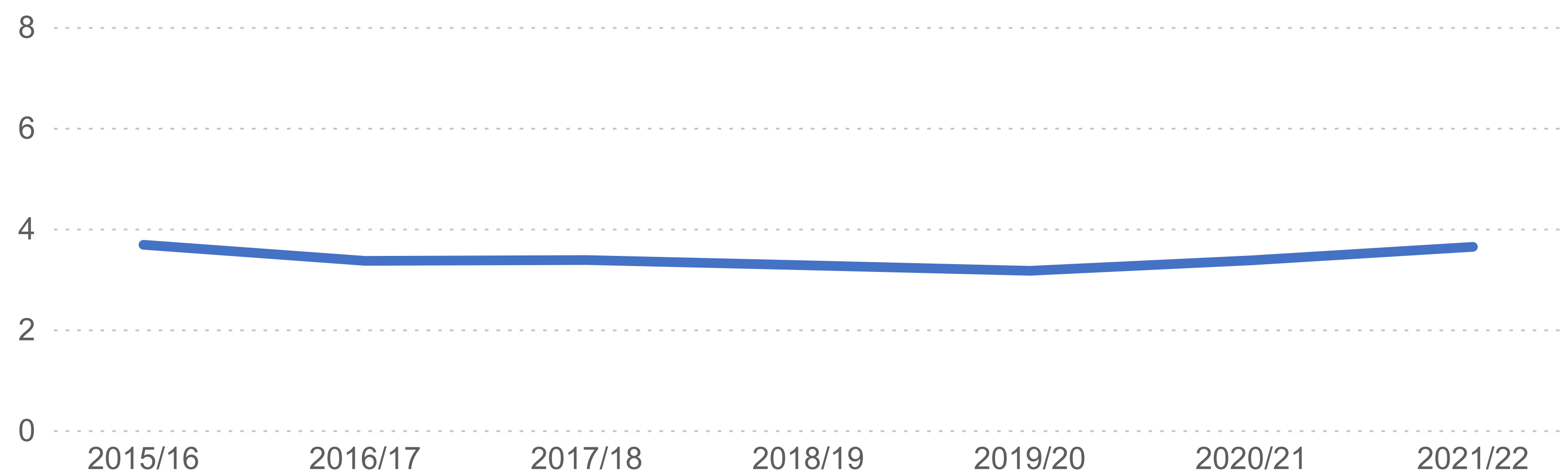
Select Cardiac Network

Select hospital

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



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



The one-year re-intervention rate after complex CIED implants has fallen over time to just over 5%



New complex CIED implants comprise:

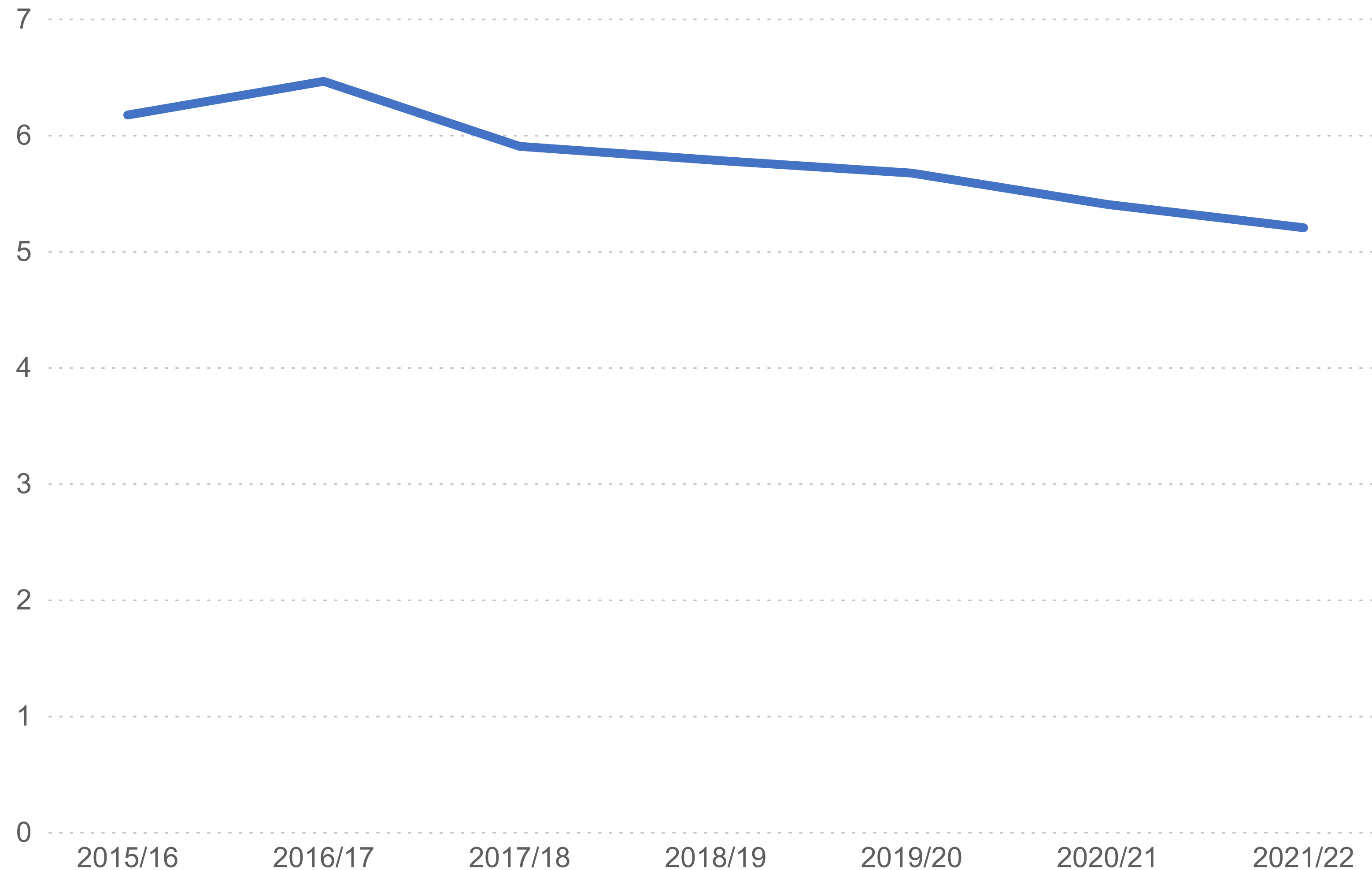
- Implantable Cardioverter-Defibrillator (ICD)
- Cardiac Resynchronisation Therapy Defibrillator (CRT-D)
- Cardiac Resynchronisation Therapy Pacemaker (CRT-P)

The overall 1-year re-intervention rate for these devices fell to 5.2% for implants in 2021/22, a 20% reduction from the 6.5% in 2016/17.

The factors driving this improvement require further investigation.

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 2021 and March 2022. 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 implants requiring re-intervention within one year



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



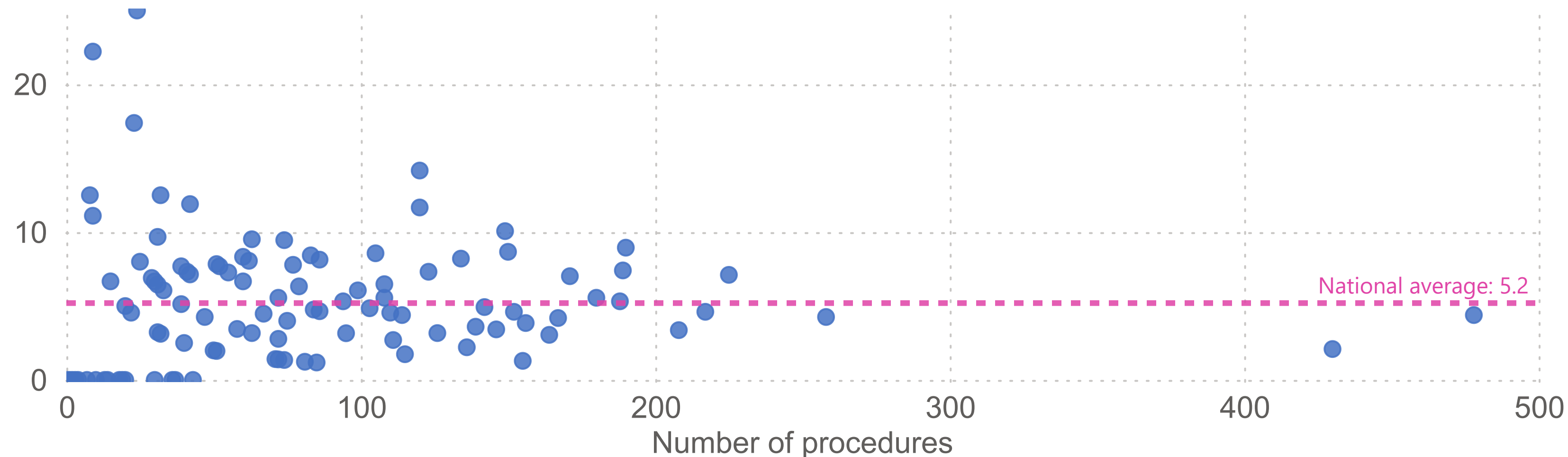
There is significant variation in re-intervention rates between hospitals following complex CIED implants.

For 2021/22 implants, the re-intervention rate amongst hospitals performing over 100 procedures ranged from 1.3% to 14.1%.

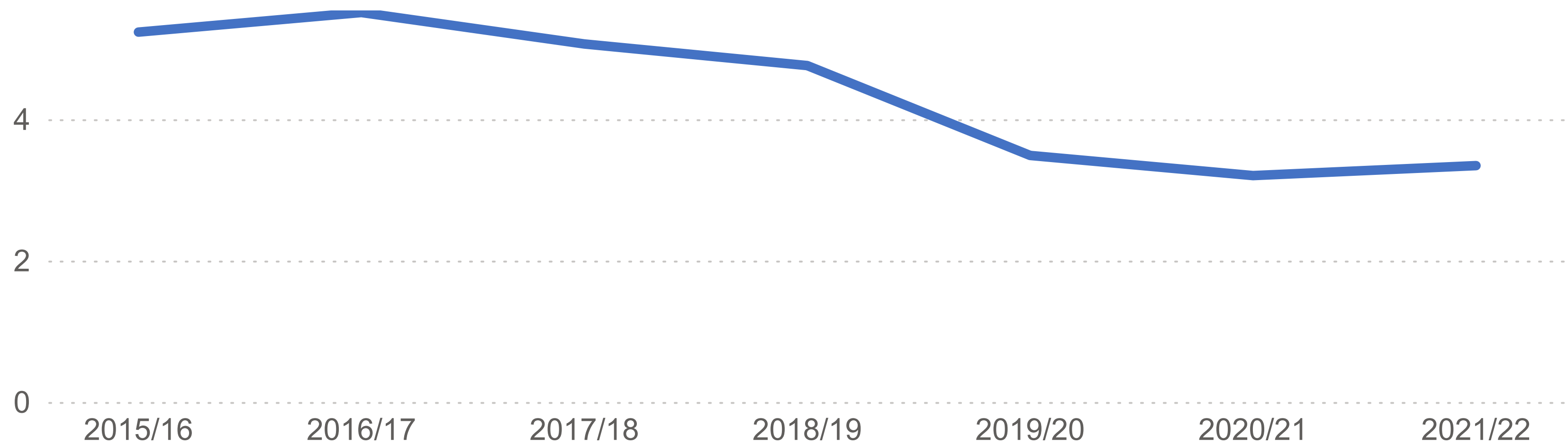
Selecting a Cardiac Network and/or hospital below shows the data for that selection.

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 such that the overall re-intervention rate shown is 3.3% rather than the true 5.2% national average.

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



Select Cardiac Network

Select hospital

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

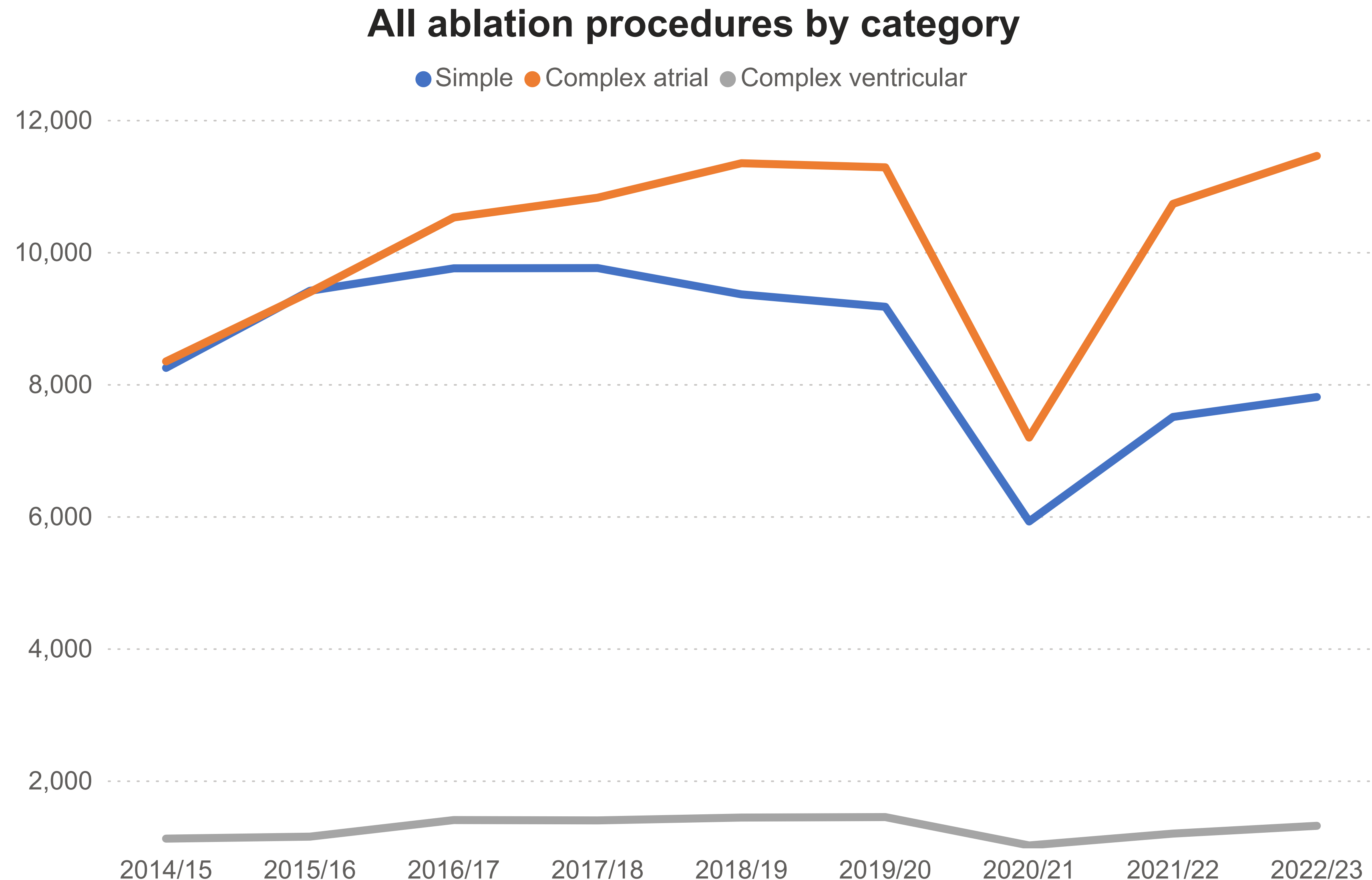


Although ablation procedures are categorised into simple and complex, these are all sophisticated techniques for treating specific substrates that promote fast heart rhythms.

There were 11,454 complex atrial ablations in 2022/23, up from 10,728 in 2021/22 and exceeding pre-pandemic levels, which peaked at 11,343 in 2018/19.

There were 7,804 simple atrial ablations, a rise on 2021/22 but still below pre-pandemic levels which approached 10,000 procedures a year. The COVID-19 pandemic seems to have accelerated a decline that began in 2016/17.

Ventricular procedures remain few in number, with 1,313 performed in 2022/23.



All types of ablation procedure, other than atrial fibrillation, remained at levels lower than before the pandemic in 2022/23

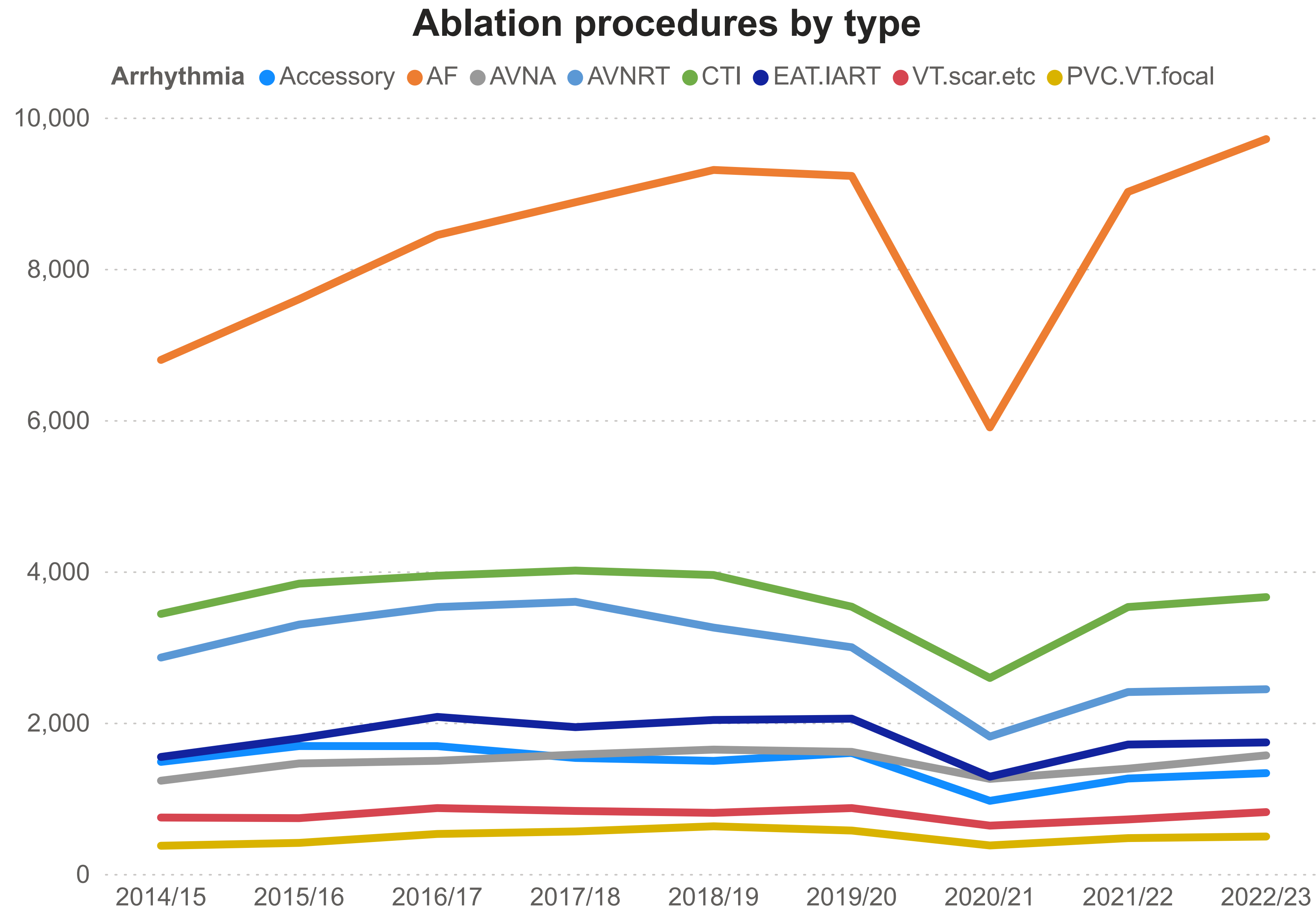


The COVID-19 pandemic caused a fall in the number of cases across all types of ablation procedure. Only ablation for atrial fibrillation (AF), with a total of 9,715 procedures in 2022/23, has risen above the levels seen in 2019/20.

The number of AV node ablations (1,739 in 2022/23) 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 (2,442 in 2022/23) 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
AVNRT = Atrioventricular nodal re-entrant tachycardia
EAT = Ectopic atrial tachycardia
IART = Intra-atrial re-entrant tachycardia
AVNA = Atrioventricular nodal ablation
VT = Ventricular tachycardia
PVC.VT = Premature ventricular contraction/VT



Most 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.

Of the 57 centres submitting data, 43 (75%) carried out more than 100 ablations, meeting the BHRS standard.

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

Selecting a Cardiac Network and/or hospital below shows the data for that selection.

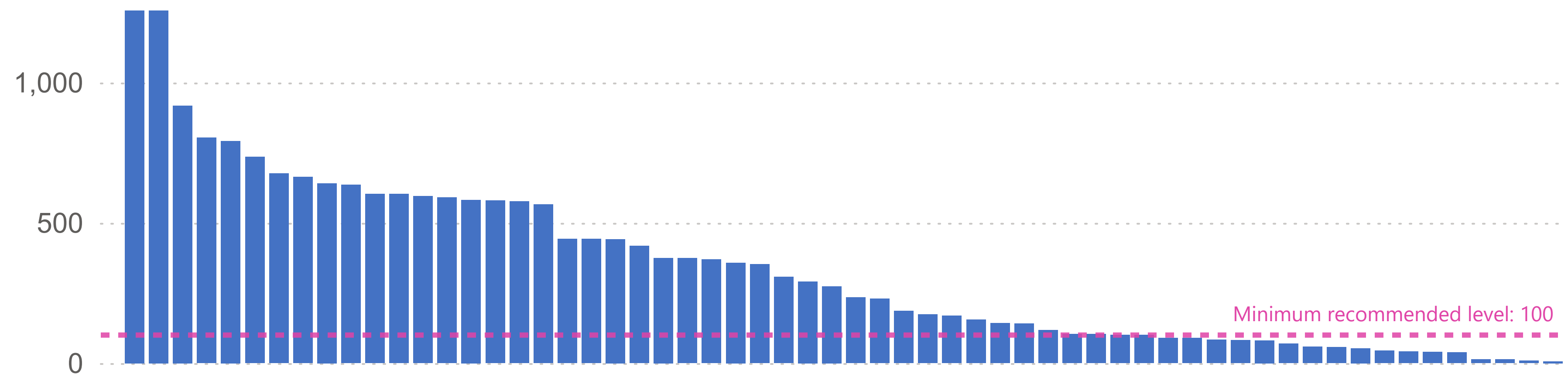
Select Cardiac Network

All

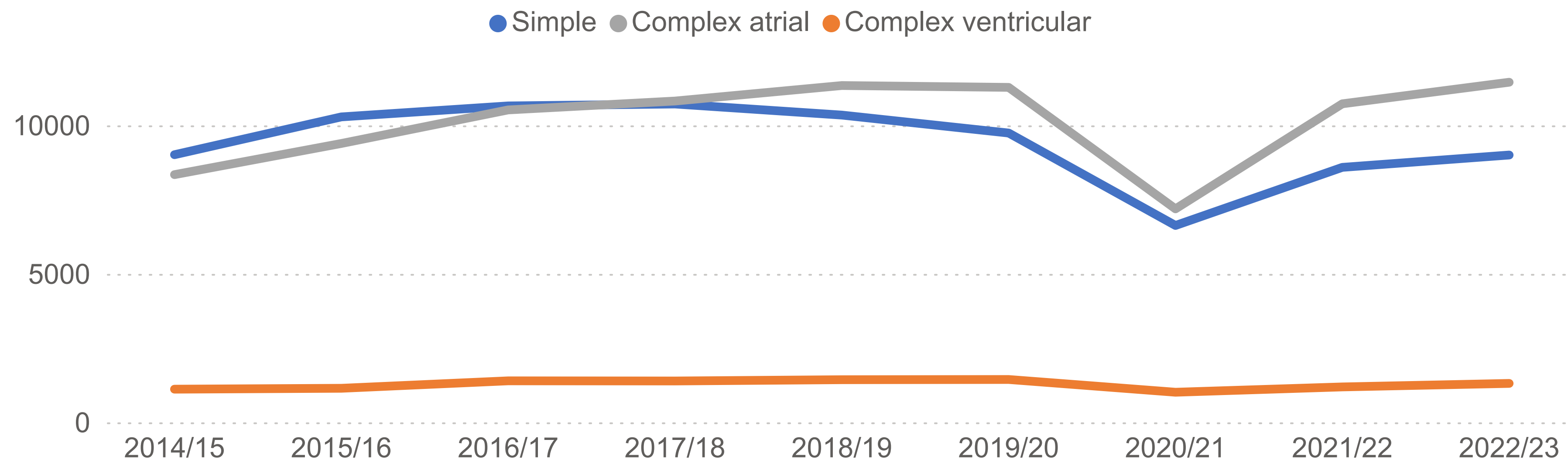
Select hospital

All

All ablation procedures by hospital (2022/23)



Complex and simple ablation procedures



There is a five-fold difference in rates of ablation across the Integrated Care Boards in England and the University Health Boards in Wales



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

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

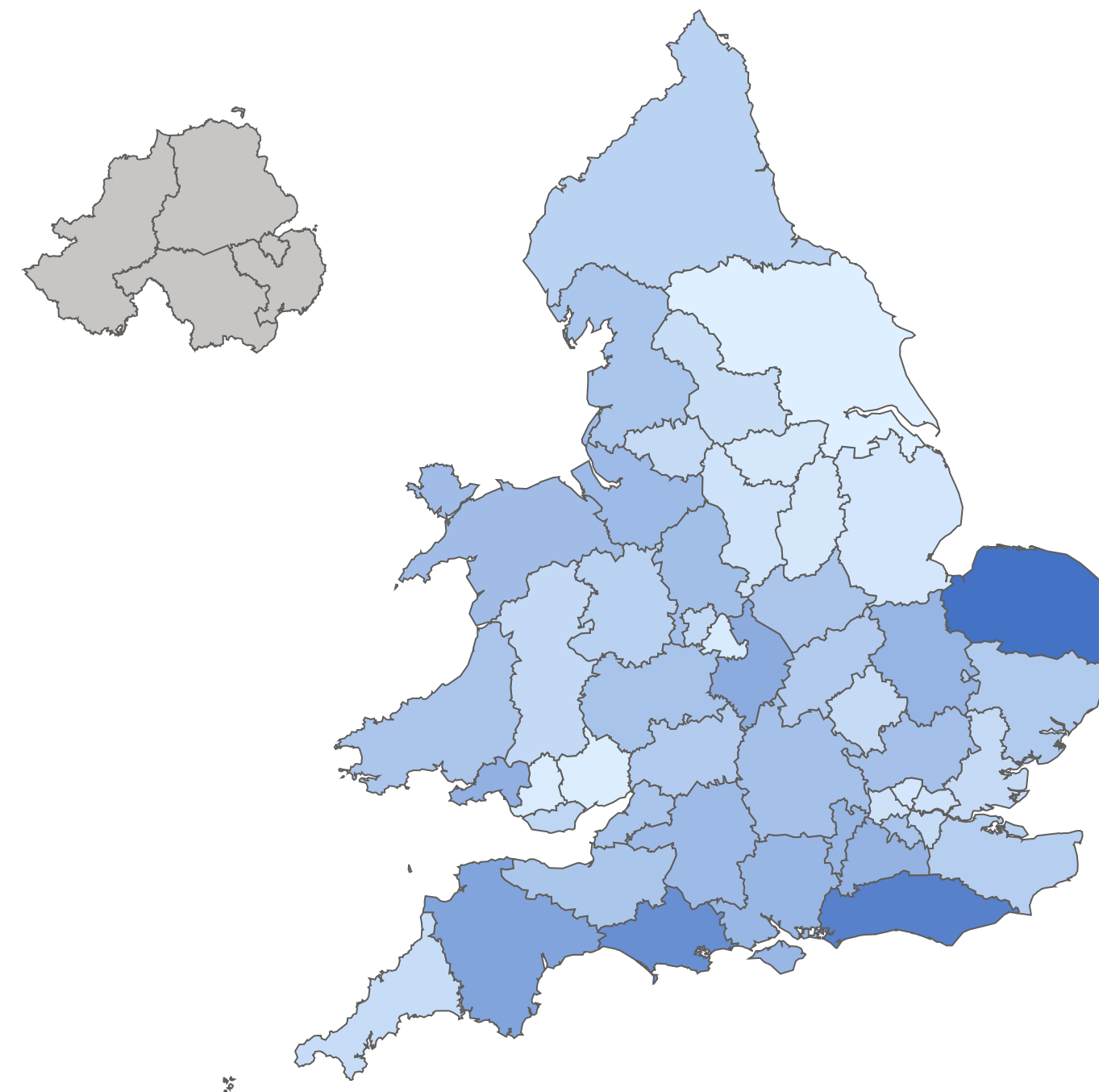
There is considerable geographic variation in ablation rates across ICBs/HBs, ranging from 159pmp in Humber and North Yorkshire to 797pmp in Norfolk and Waveney.

Ablation rates also vary at the Cardiac Network level, ranging from 172pmp in the East Midlands to 540pmp in Cheshire and Merseyside.

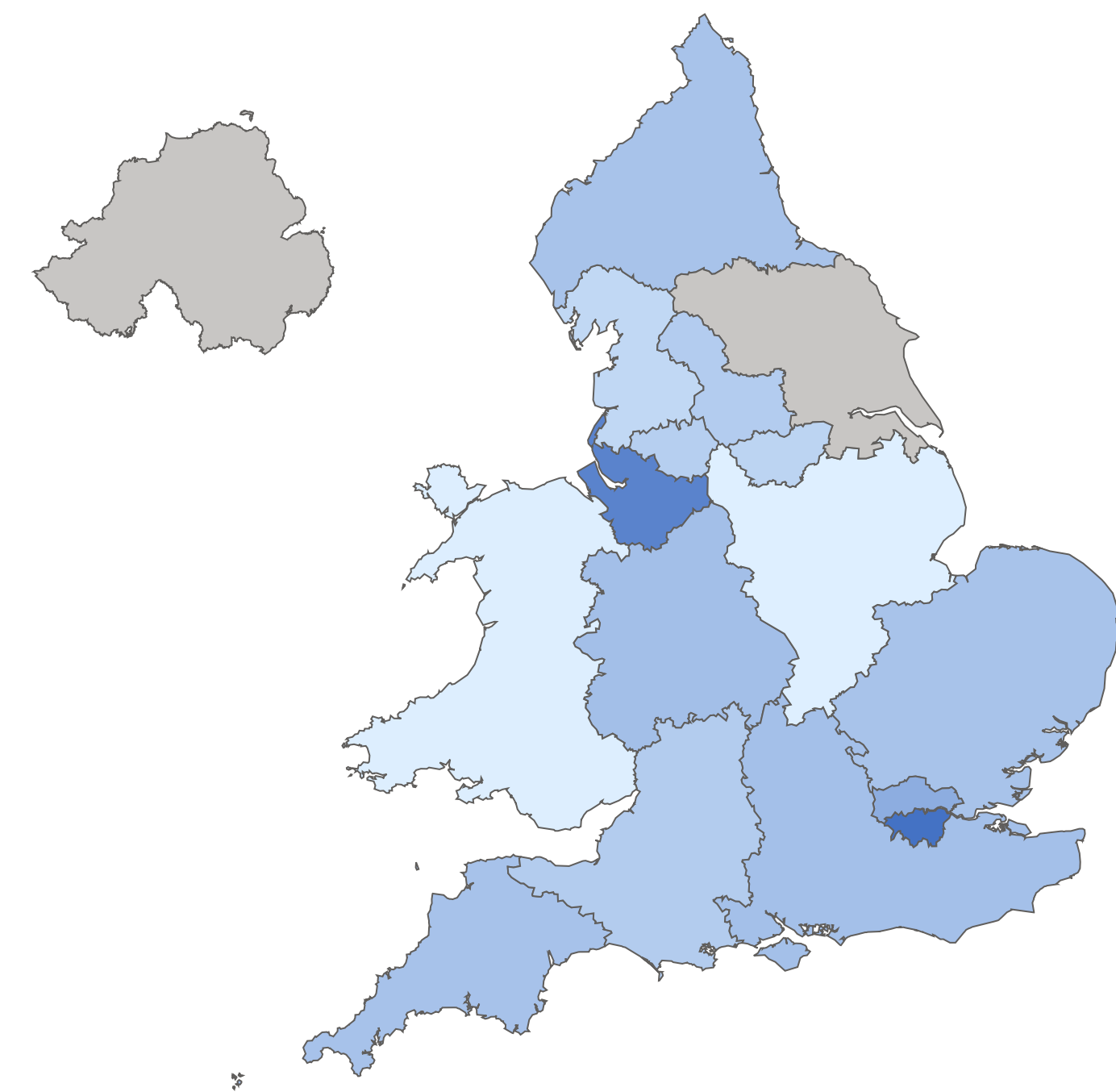
Reasons for the variance are not fully established but may include demographic differences, varying referral patterns and capacity issues. In future, these charts will be adjusted for age, sex and ethnicity.

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 (2022/23)



Ablation procedures per million population by Cardiac Network based on hospital location (2022/23)



There is a more than 20-fold difference in rates of simple ablations across the Integrated Care Boards in England and University Health Boards in Wales



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

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

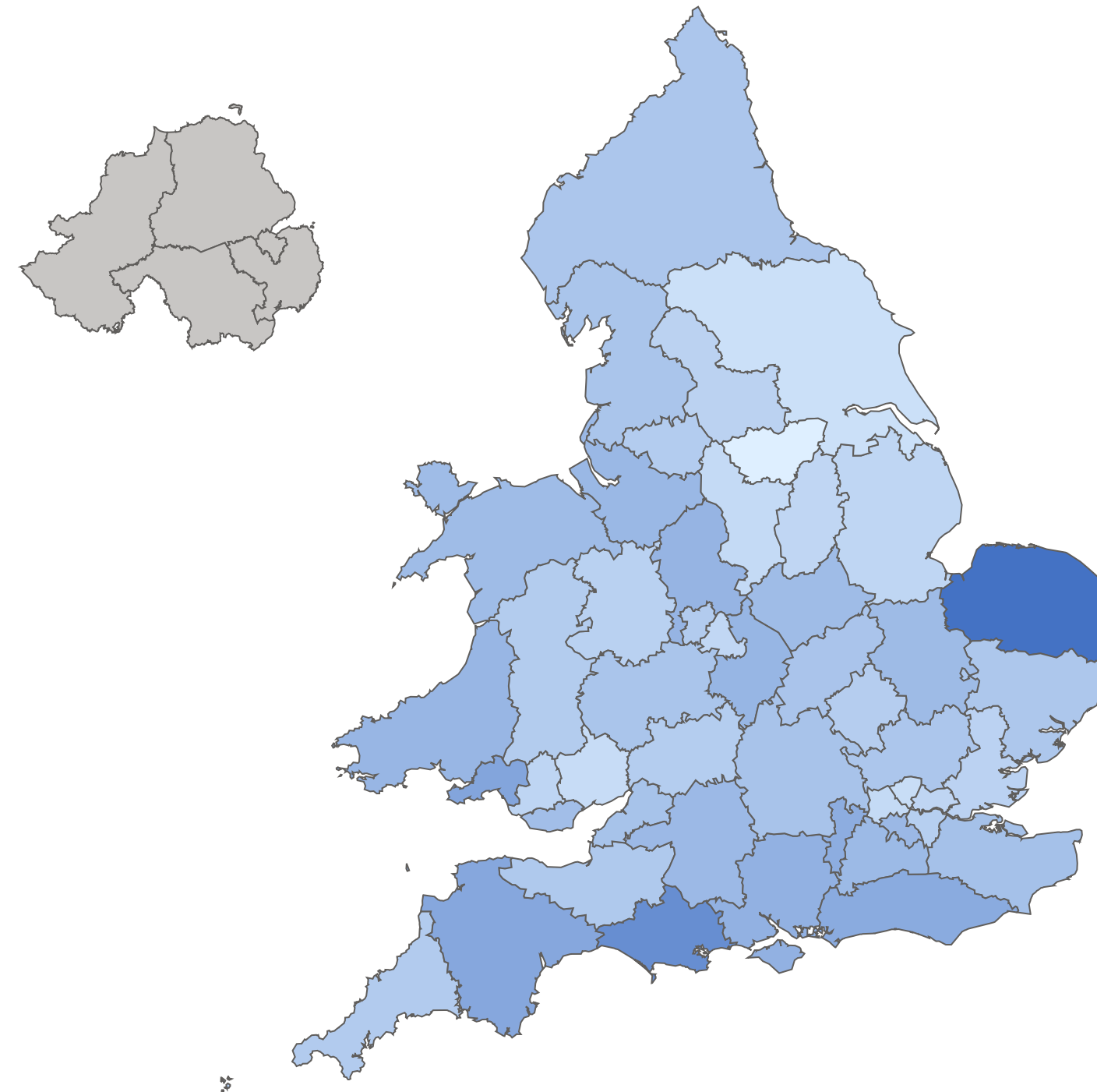
In 2022/23, the rates for ICBs/HBs varied from 16pmp in South Yorkshire to 384pmp in Norfolk and Waveney.

Across Cardiac Networks, the highest rate was 240pmp in South London while the lowest was 18pmp in South Yorkshire.

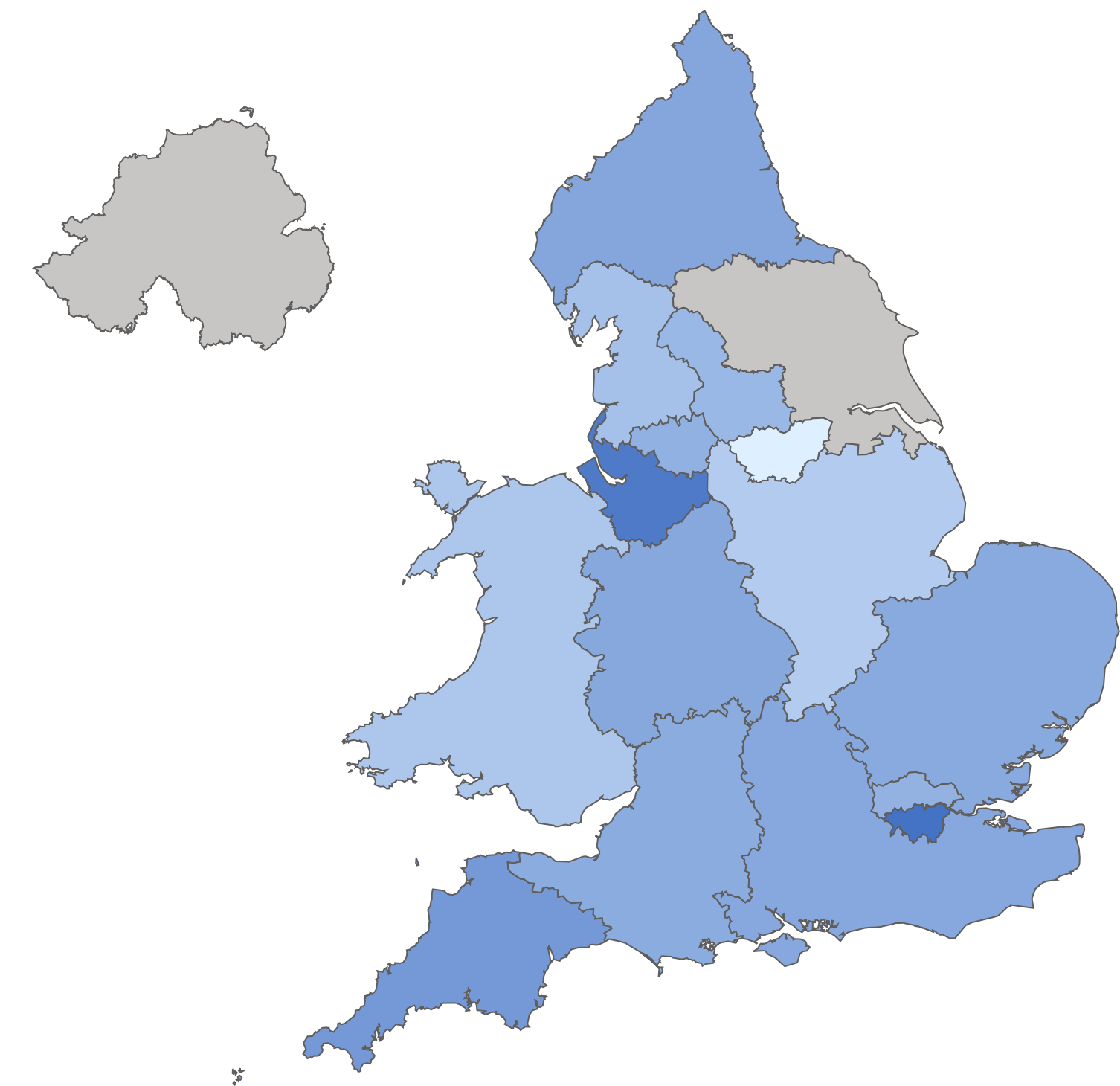
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Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire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

Simple ablation procedures per million population by ICB/HB based on patient home location (2022/23)



Simple ablation procedures per million population by Cardiac Network based on hospital location (2022/23)



There is a more than five-fold difference in rates of complex atrial ablation procedures across Integrated Care Boards in England and Health Boards in 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 University Health Boards.
- 15 of the Cardiac Networks (CNs) in England and Wales.

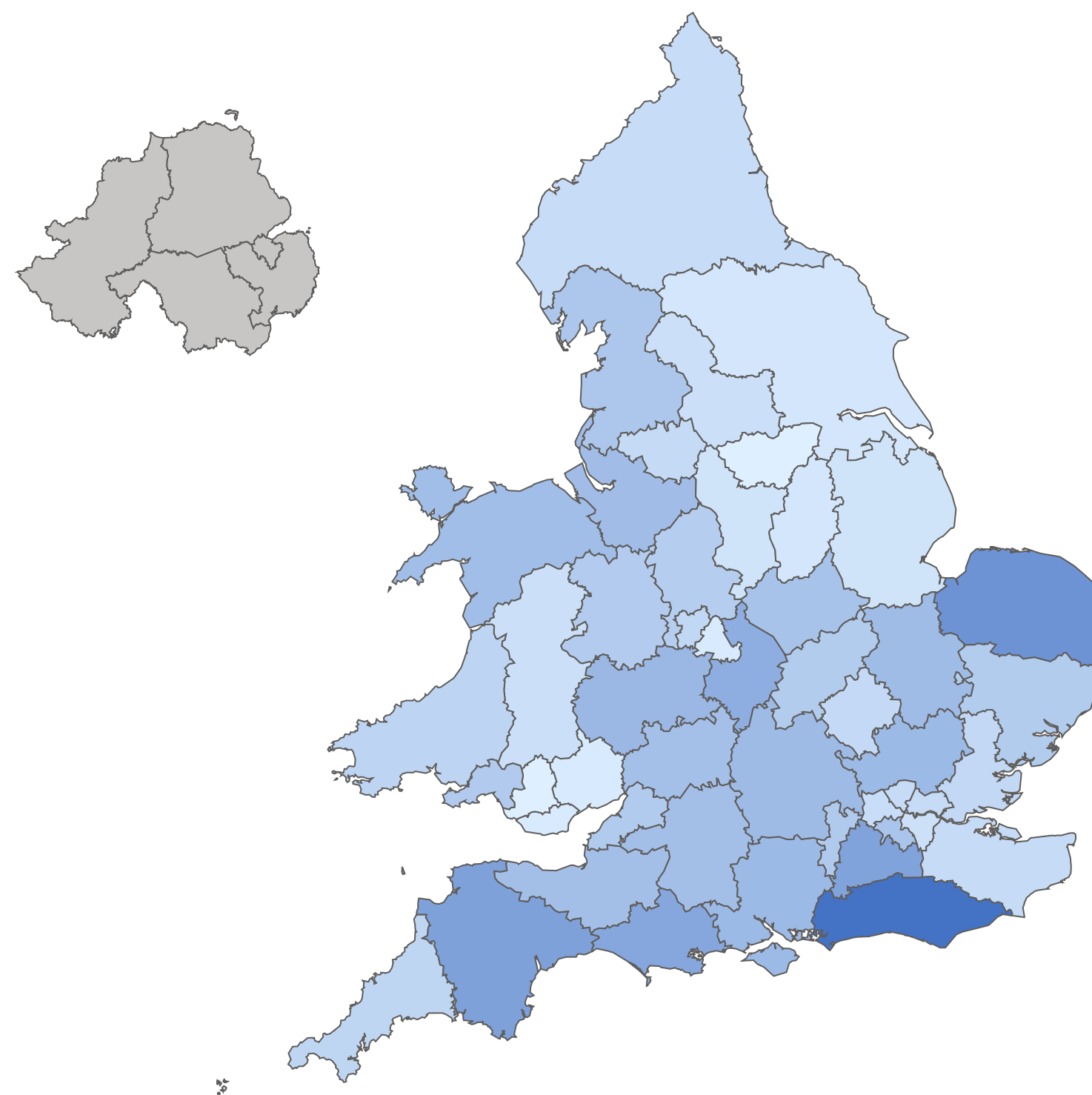
Rates amongst ICBs/HBs vary from 63pmp for Cwm Taf Morgannwg University Health Board to 468pmp in Sussex ICB.

Cardiac Networks have rates that range from 59pmp in Wales to 324pmp in South London.

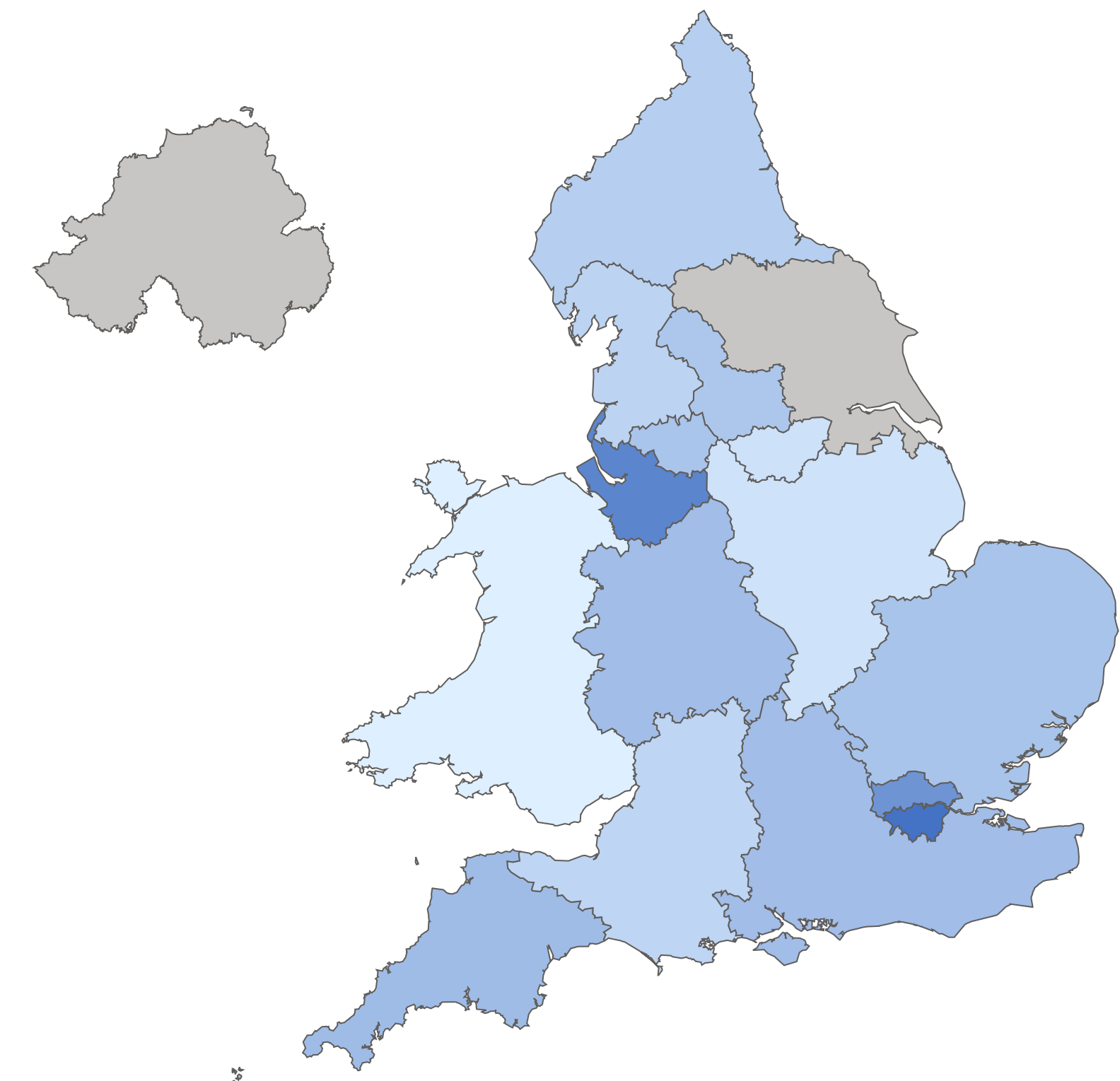
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Note: Data for ICB/HBs are based on the patient home location. Data for CNs are based on the location of the hospitals undertaking the procedure in that area. No data on ablation procedures were received from hospitals in the Humber and North Yorkshire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

Complex atrial ablation procedures per million population by ICB based on patient home location (2022/23)



Complex atrial ablation procedures per million population by Cardiac Network based on hospital location (2022/23)



Fewer ablation procedures are performed for ventricular arrhythmias and rates vary across the Integrated Care and University Health Boards



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 University Health Boards.
- 15 of the Cardiac Networks (CNs) in England and all of Wales.

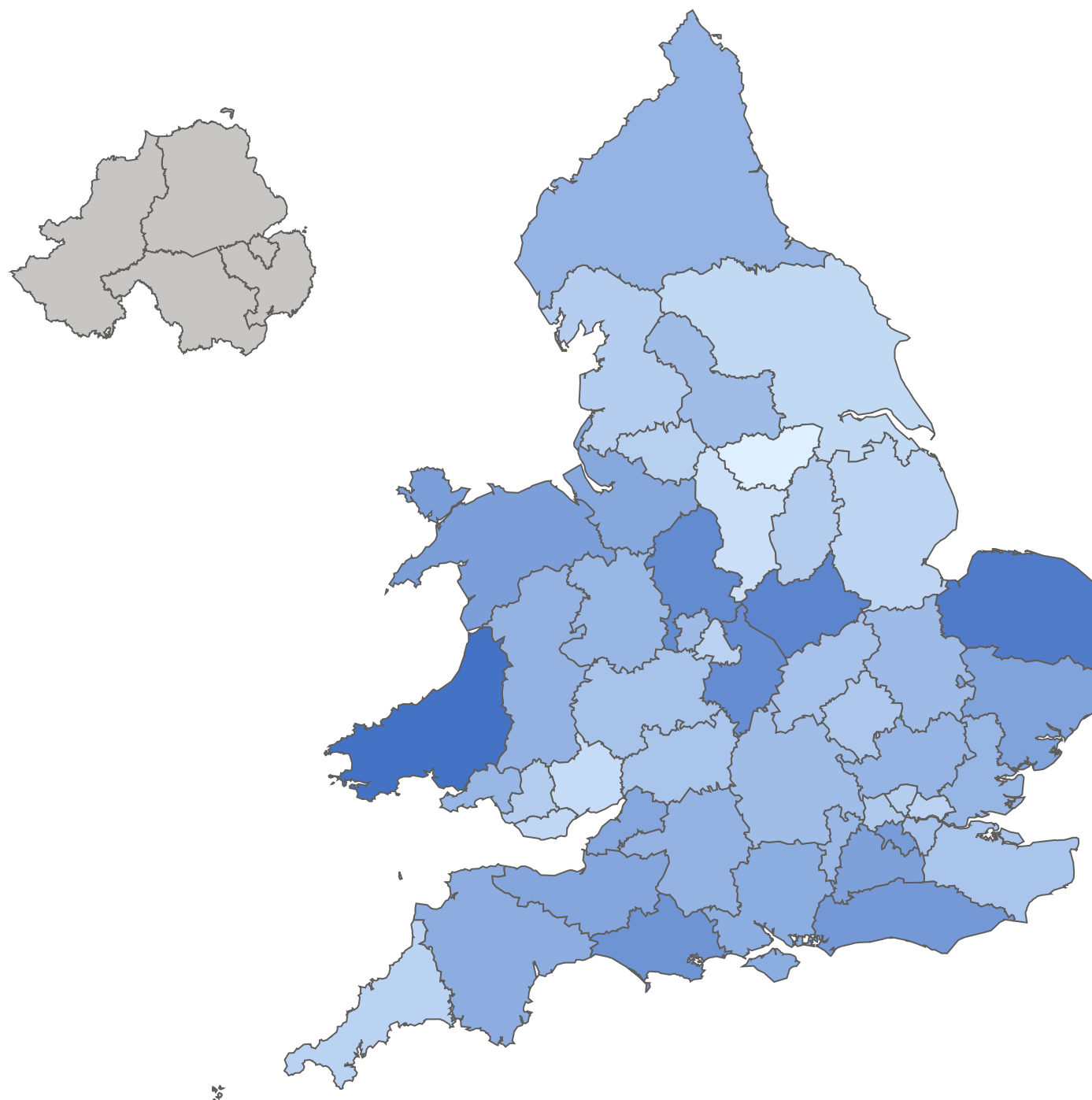
In 2022/23, the rates in ICBs/HBs varied from 2pmp in South Yorkshire ICB to 44pmp for Hywel Dda University Health Board.

Across Cardiac Networks, the highest rate was 46pmp in South London while the lowest was zero for South Yorkshire ICB.

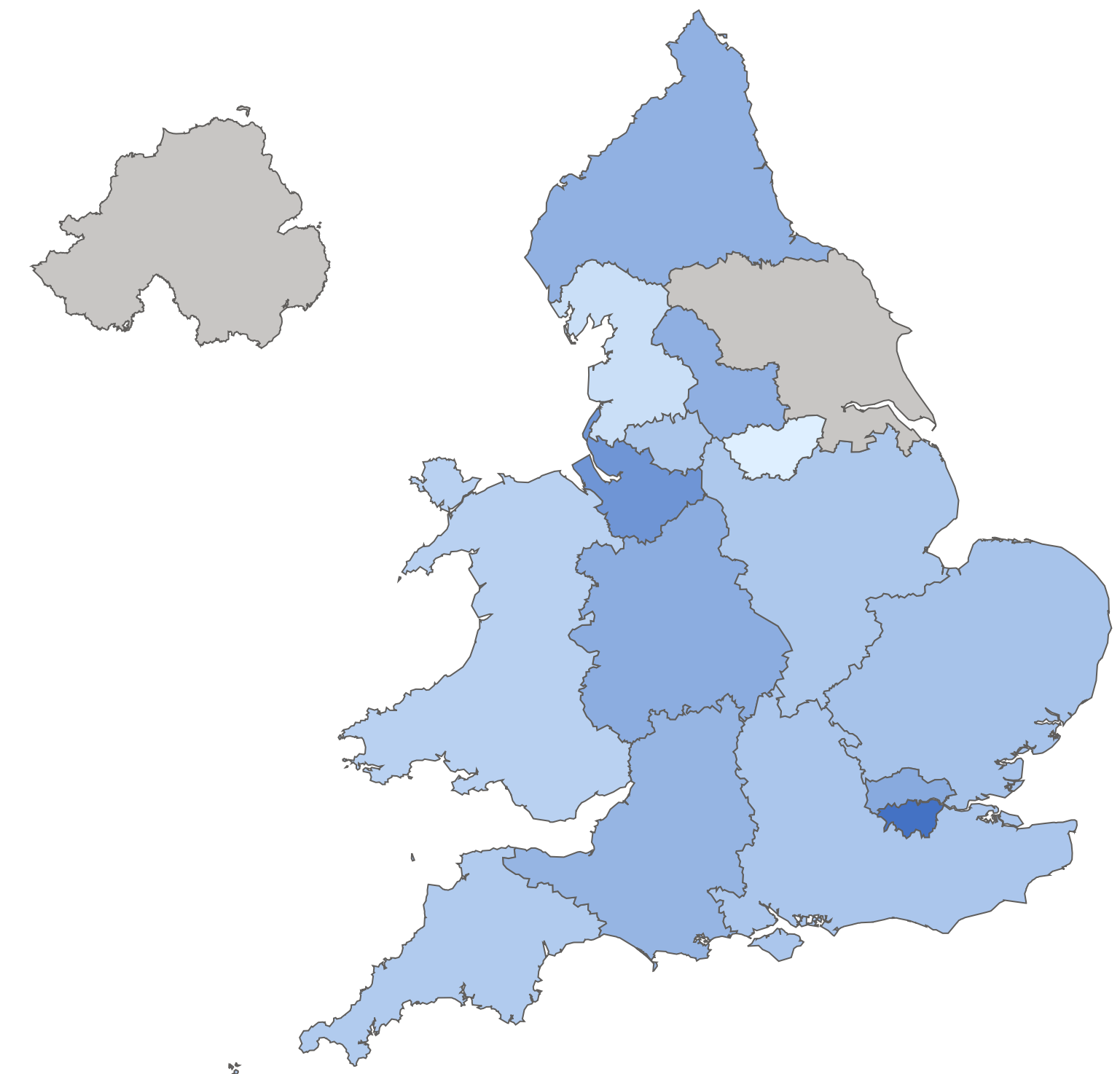
Reasons for the variance are not fully established but may include demographic differences, varying referral patterns and capacity issues. In future, these charts will be adjusted for age, sex and ethnicity.

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 (2022/23)



Ventricular ablation procedures per million population by Cardiac Network based on hospital location (2022/23)





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

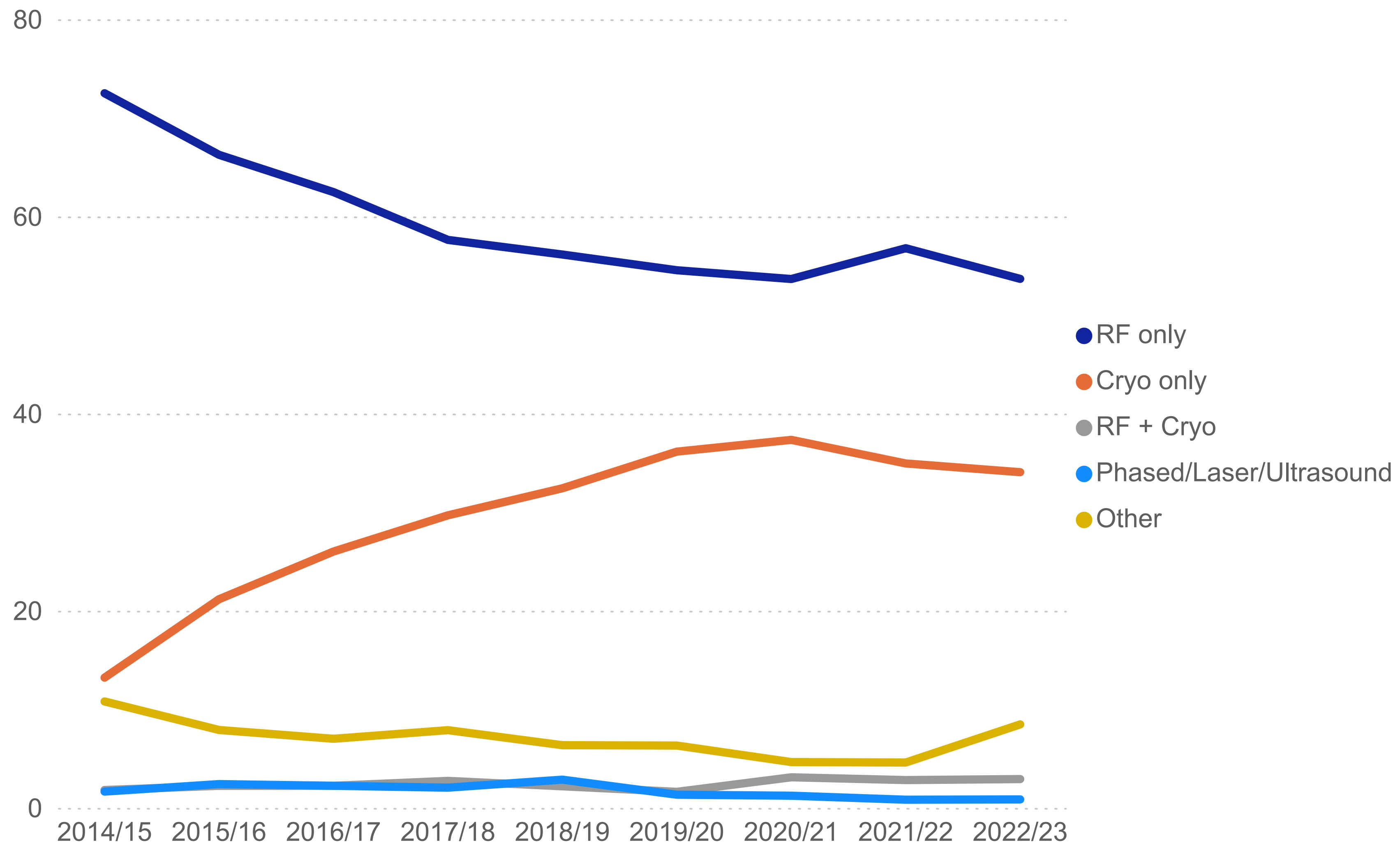
The use of radiofrequency (RF) ablation seems to have stabilised at 54% in 2022/23, having fallen from 73% in 2014/15.

Cryoablation (Cryo) has almost trebled in use over the same period, peaking at 37% in 2020/21 and accounting for 34% of procedures in 2022/23.

New developments such as pulsed-field ablation may become more widely used going forward, although this is not currently captured in this report (it may be captured by the increase in the 'other' group).

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

Percentage use of different technologies for AF ablation



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



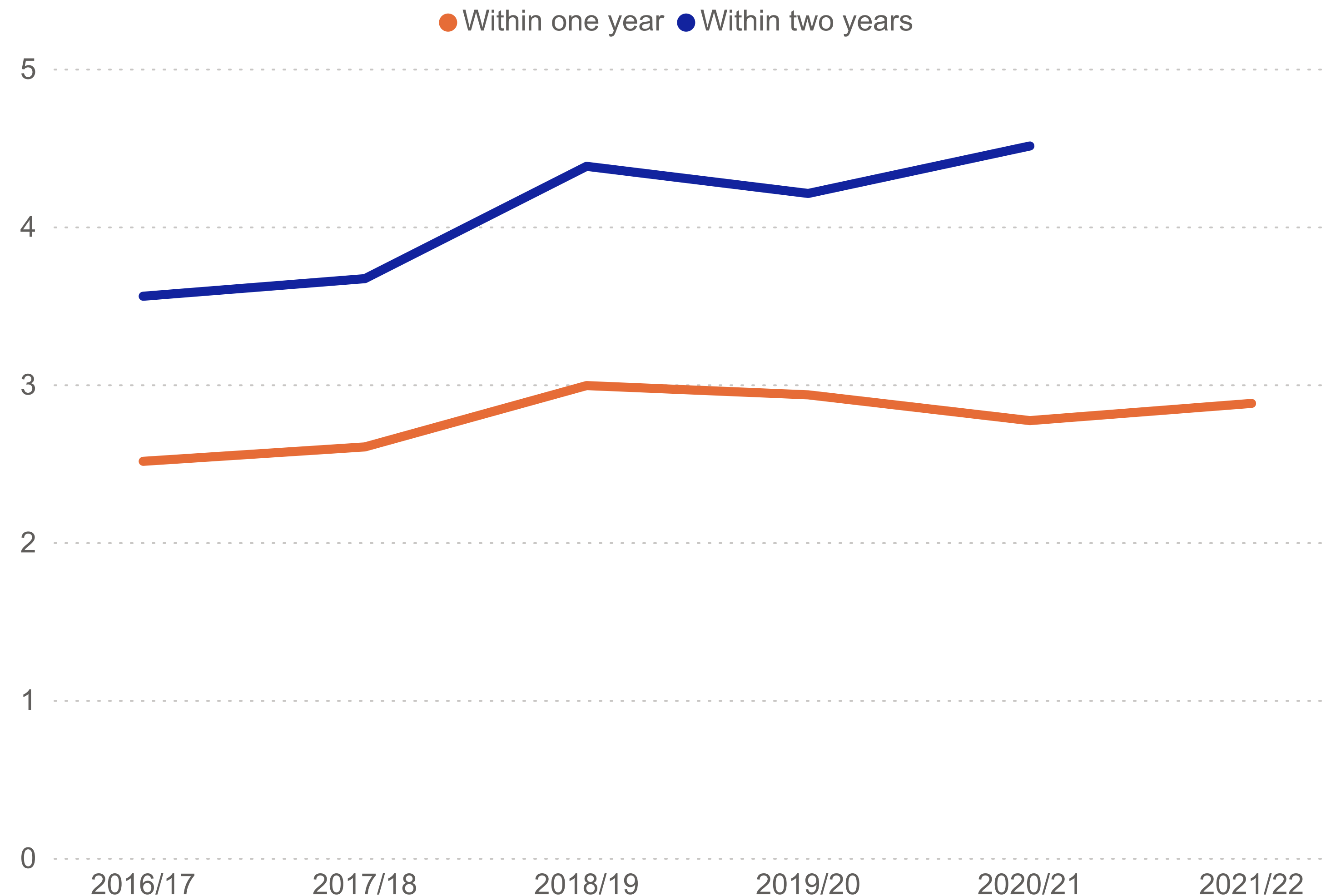
The rate of re-intervention after a first 'simple' ablation procedure has risen slightly since 2018/19 to 2.9% within one year and 4.5% within two years.

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. Therefore, the observed figures are broadly in line with expectations.

Linkage to hospital episode statistics (HES) would enable a better evaluation of complications in the short- to medium-term beyond capturing the need for a repeat ablation procedure.

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 1-5% depending on the arrhythmic substrate



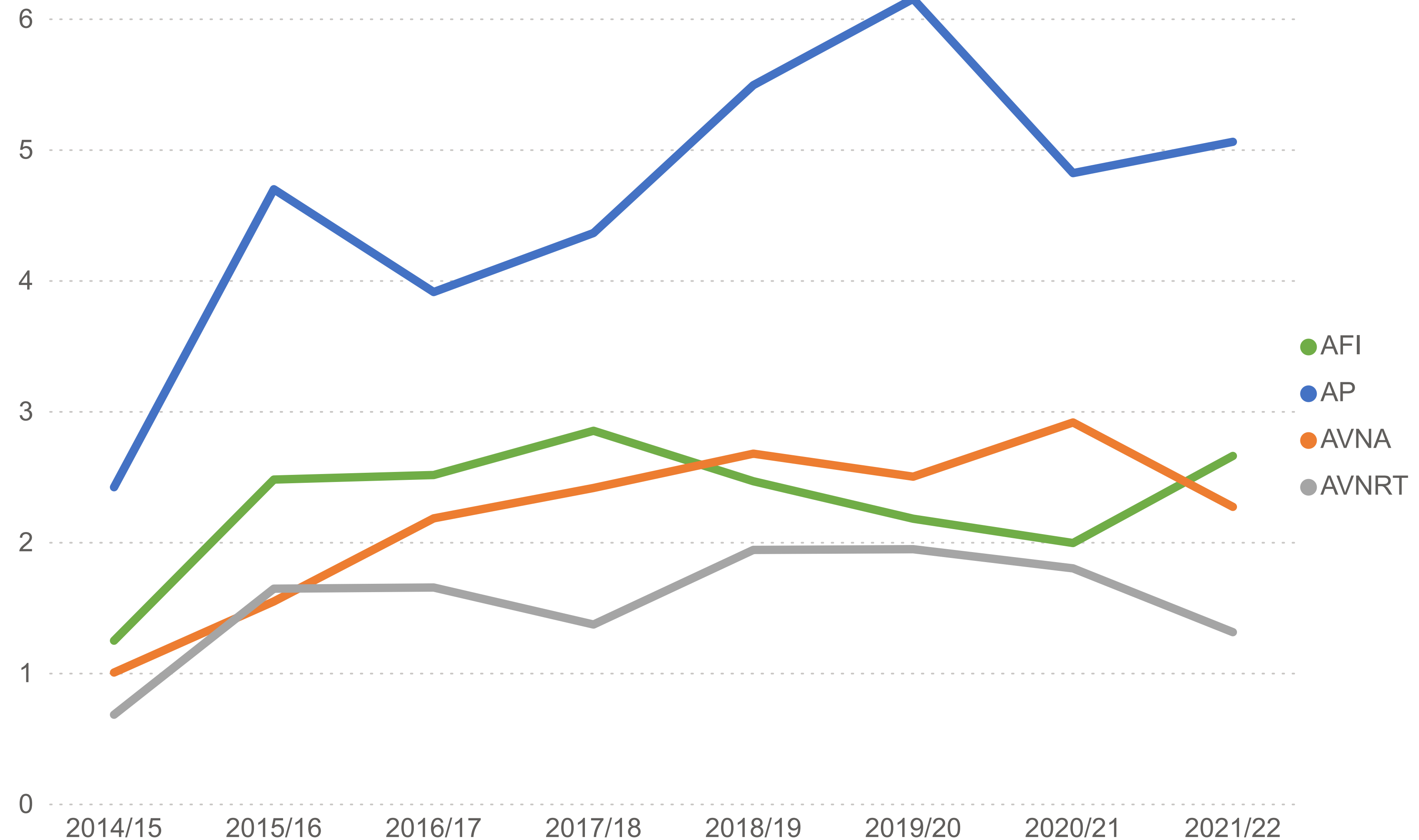
Rates of re-intervention for simple ablations can be stratified by type of arrhythmic substrate (the underlying structural or electrical cardiac abnormalities that predispose an individual to arrhythmias).

For procedures carried out in 2021/22, it is clear that re-intervention rates for accessory pathways (AP) are highest, at around 5%. Those for AVNRTs are lowest at around 1.3%.

Surprisingly, perhaps, re-intervention rates for AV node ablations (AVNA) are higher at almost 3% exceeding the re-intervention rates for atrial flutter too.

Key:
AFI = 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 one year by substrate



The one-year re-intervention rates after simple ablation procedures in 2021/22 ranged from zero to 5% across individual hospitals



For simple ablations undertaken between April 2021 and March 2022, the one-year re-intervention rate was around 2% for hospitals performing more than 100 procedures (and was 1.9% 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.

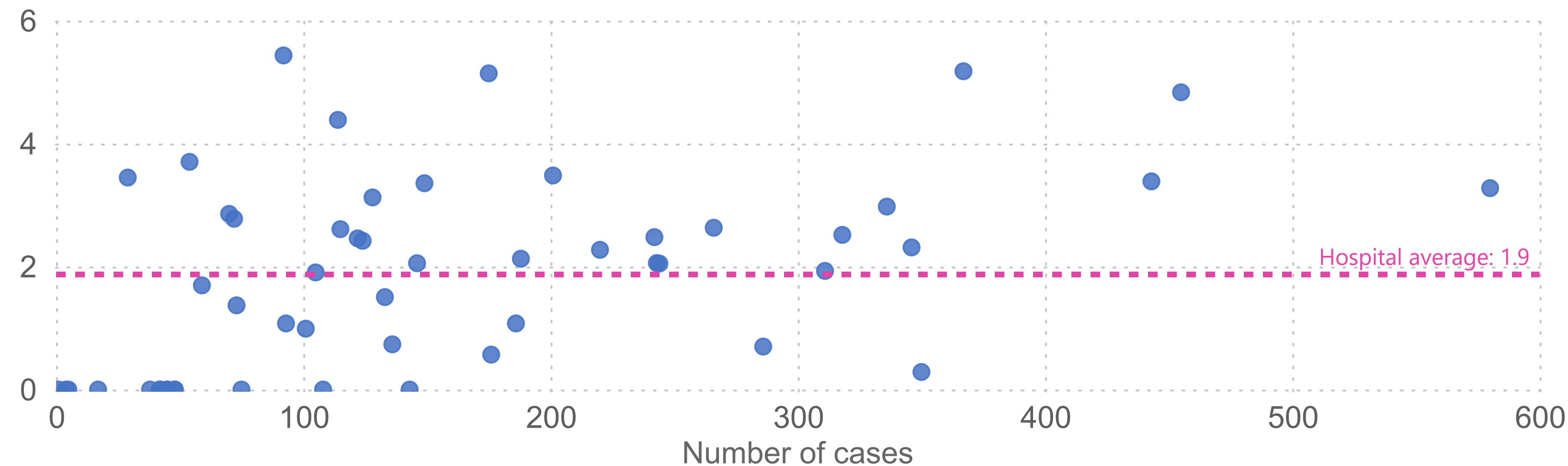
Selecting a Cardiac Network and/or hospital below shows the data for that selection.

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.

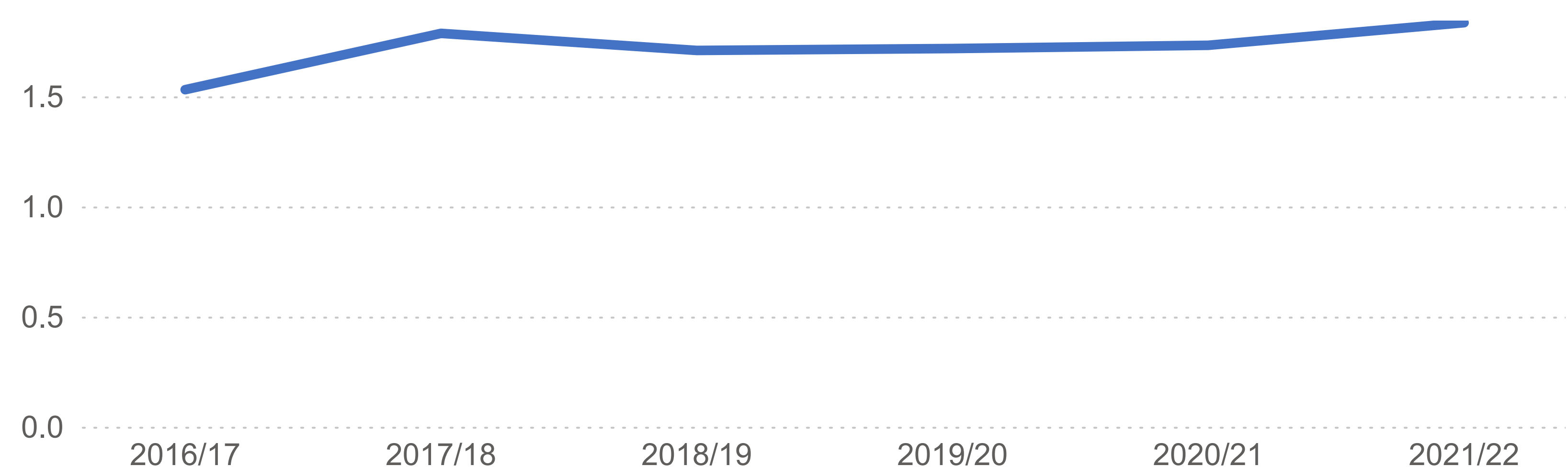
Select Cardiac Network

Select hospital

Number of procedures and percentage of simple ablations requiring re-intervention within one year by hospital (2021/22)



Percentage of simple ablations requiring re-intervention within one year



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



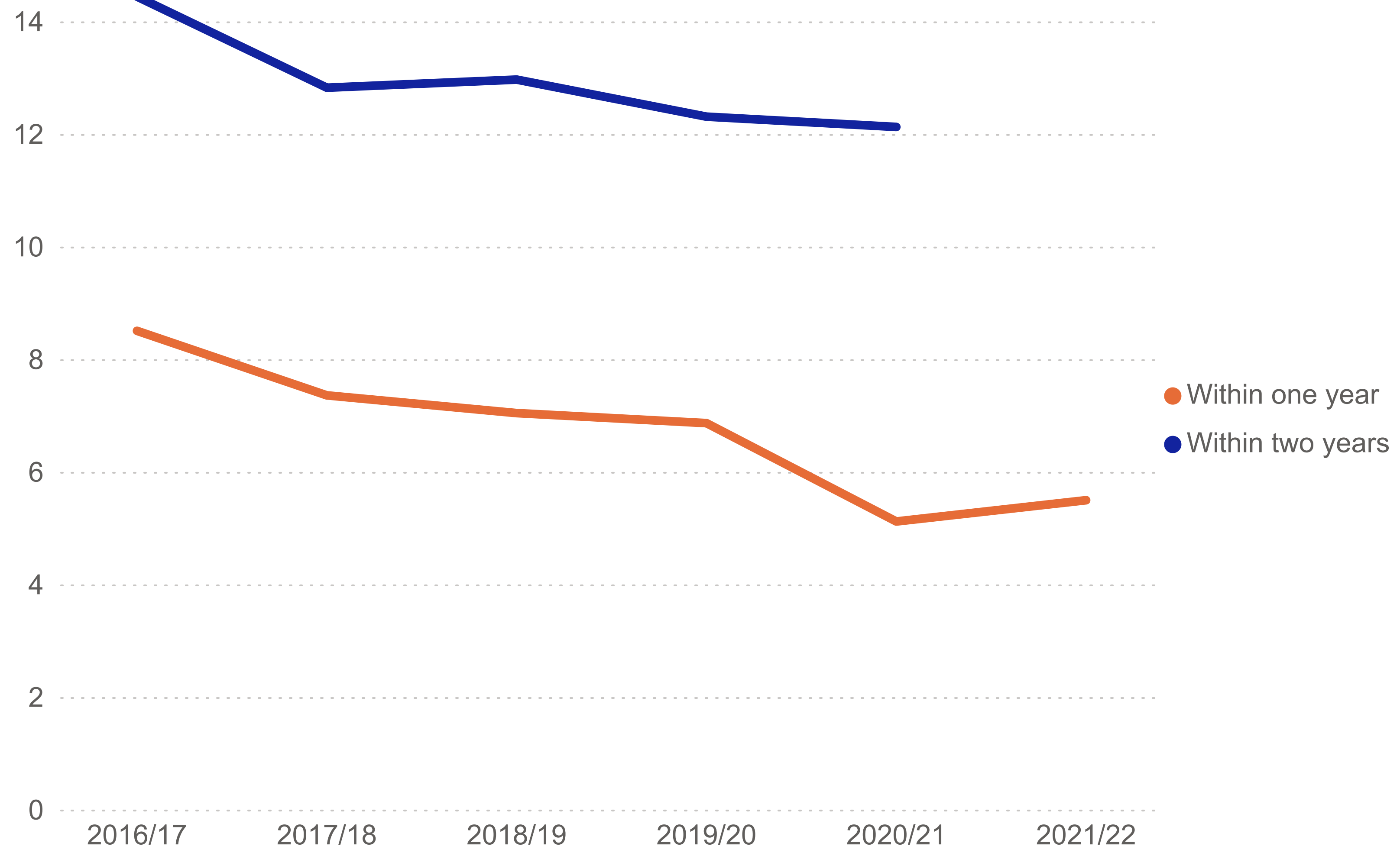
The rates of re-intervention for complex atrial ablation procedures have steadily fallen. **The percentage of procedures carried out in 2020/21 requiring re-intervention was 5.1% after one year and 12.1% after two years. The equivalent figures for procedures done in 2016/17 were 8.5% and 14.4% respectively.**

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 re-intervention 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.

Percentage of complex atrial ablations requiring re-intervention within one and two years



One-year re-intervention rates after complex atrial ablations in 2021/22 ranged from 0 to nearly 10% but lower rates probably represent poorer care



The one-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.

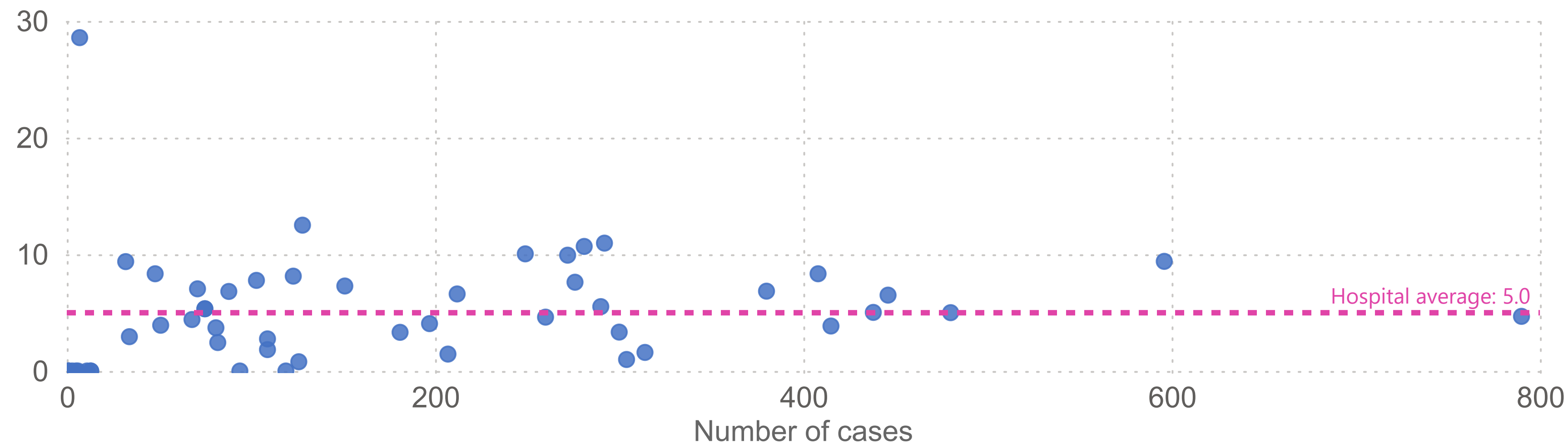
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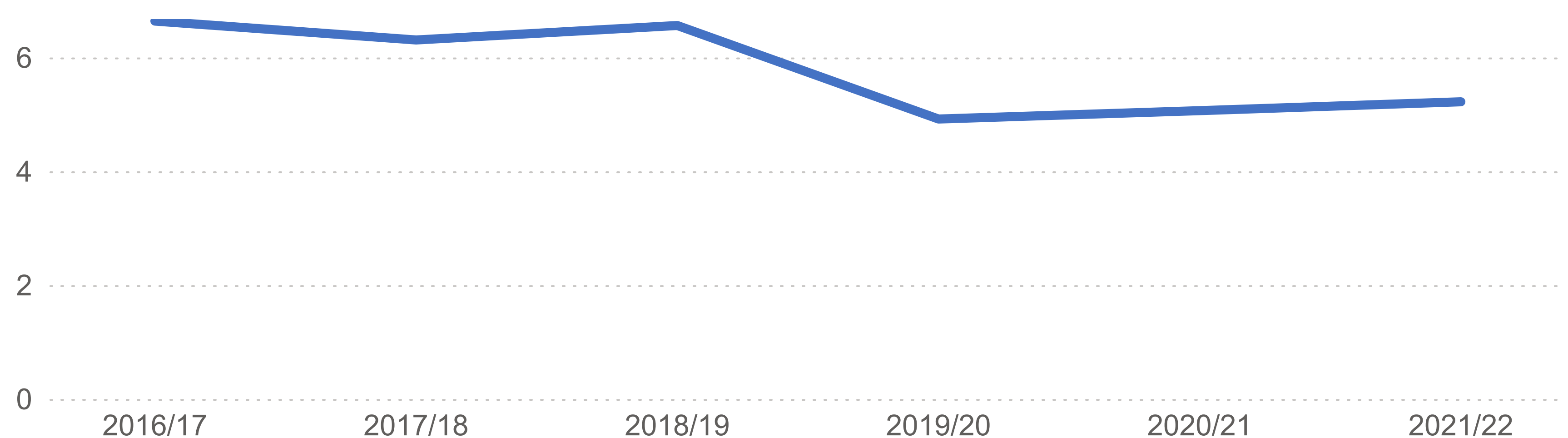
Select Cardiac Network

Select hospital

Number of procedures and percentage of complex atrial ablation procedures requiring re-intervention with one year by hopsital (2021/22)



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



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



Ablation procedures for ventricular arrhythmias are complex. There were just 1,313 (6.4%) procedures recorded in 2022/23.

For procedures performed in 2021/22, the re-intervention rates for ventricular procedures after one and two years have both fallen:

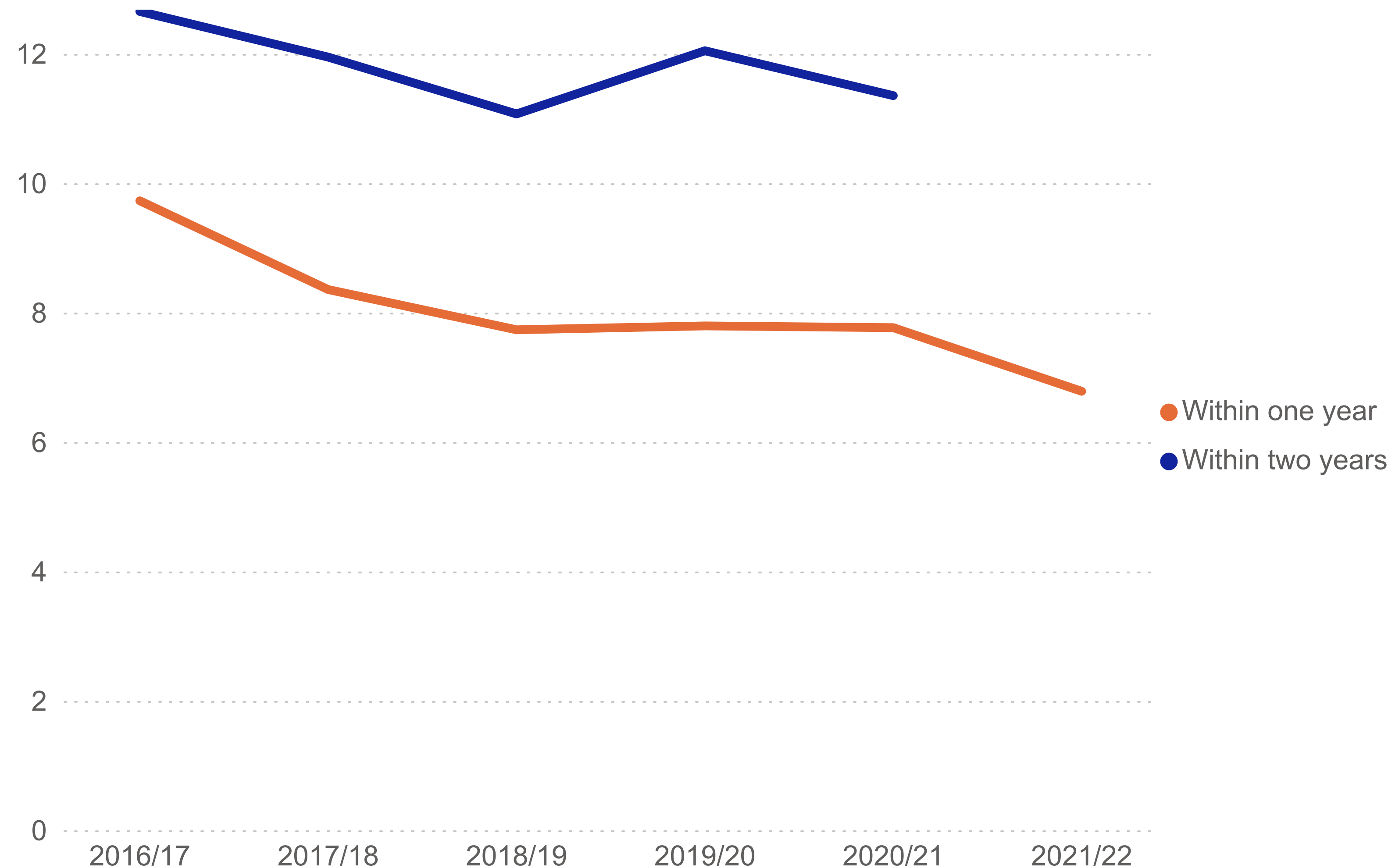
- **6.8% within one year (9.7% in 2016/17)**
- **11.4% within two years (12.7% in 2016/17)**

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 understandable variation between hospitals



The number of ventricular ablation procedures are small in each hospital with re-intervention rates varying from 0-40%. These rates fall within the expected range, considering the diversity of procedures undertaken and differing underlying causes of such arrhythmias.

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

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

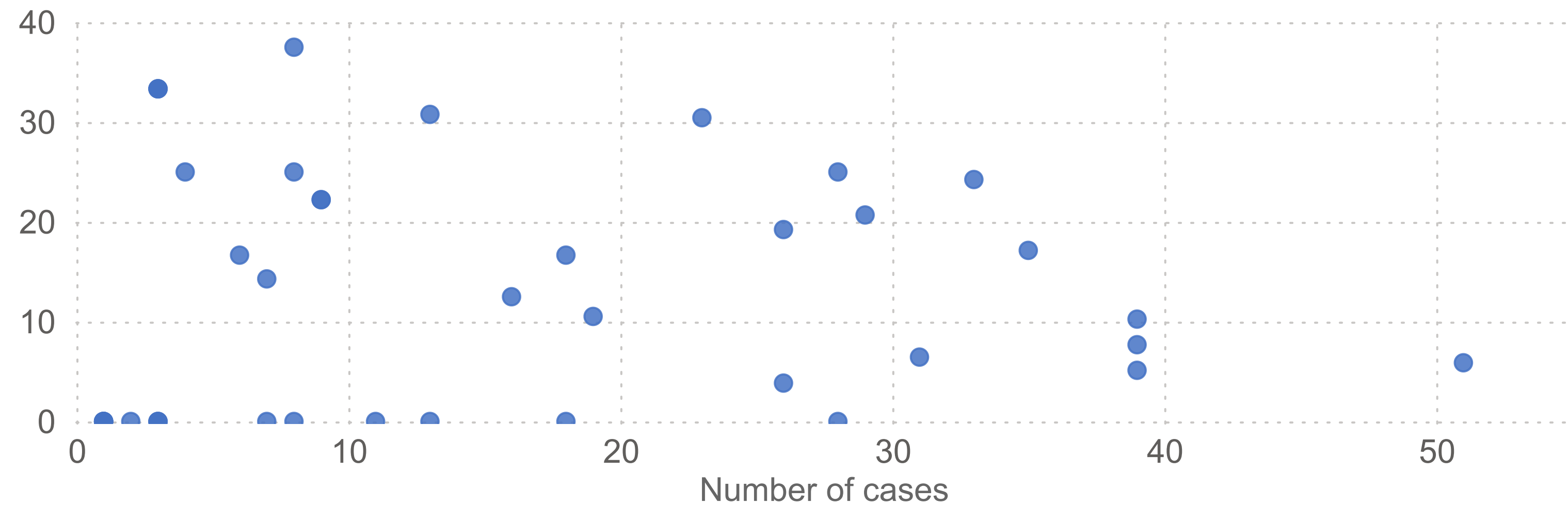
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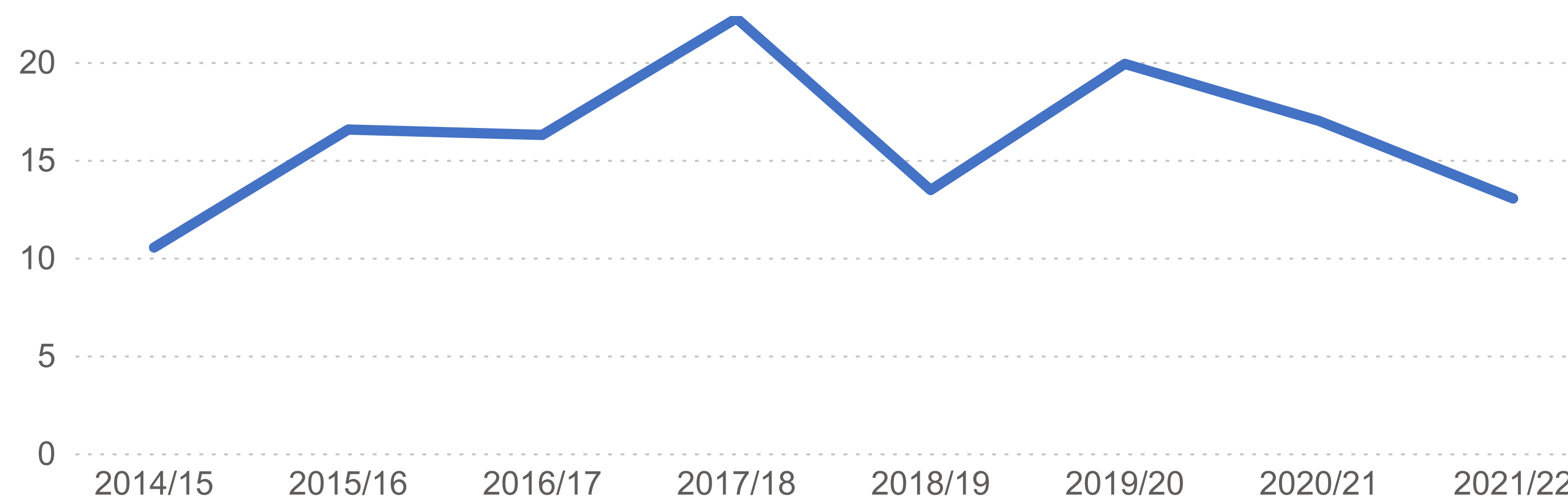
Select Cardiac Network

Select hospital

Number of procedures and percentage of ventricular ablation procedures requiring re-intervention within one year by hospital (2021/22)



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





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 $\leq 35\%$, 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.

Minimum number of ablations

This was referred to as Quality Standard 5 in previous reports. The British Heart Rhythm Society 2020 recommendations are [here](#).

Re-intervention rates in complex atrial ablation

Although ablation is a very effective procedure, in trials, recurrences of AF occur in 30-40% of patients. However, even when recurrence occurs, it does not necessarily have the same symptom burden as before an ablation, and patients may not need or want a repeat procedure. Nonetheless, repeat ablation for many patients results in improved outcomes.

Re-intervention rates in complex ventricular ablation

Re-intervention rates do not necessarily match recurrence rates. Published reports have recorded arrhythmia recurrence rates of 30% to 70%, contingent upon the underlying cardiac condition. Conversely, the published re-intervention rate for patients with structural heart disease from one experienced hospital is 30%.