



BCIS National Audit Adult Interventional Procedures

1st April 2021 to 31st March 2022

Peter F Ludman

BCIS Audit Lead

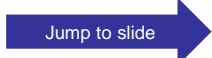



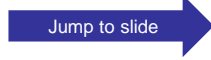
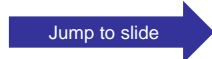


On behalf of

British Cardiovascular Intervention Society

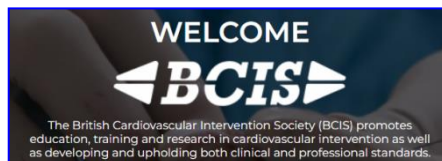
Audit Presentation

- PCI
 - Survey (UK)
 - PCI procedural data (E&W)
- Structural Intervention
- NICOR update

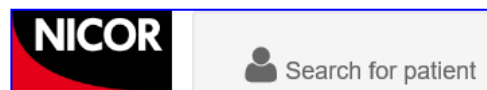
Contents



- **Structure (PCI)** 
 - Angio and PCI centres and maps
 - Total angio and PCI numbers
 - No of PCIs per centre and per angio
 - PCI pmp and by country and v CABG
 - Centre PCI volumes
 - PCI operators, by centre, by PCI
 - On call rotas for PPCI
 - On site v off site surgical cover
 - Day case activity
 - Primary PCI units
 - **NICOR data collection** 
 - Centre participation
 - Databases used
 - Case ascertainment
 - Data completeness
 - **Appropriateness (PCI)** 
 - Demographics
 - Indication for PCI / Clinical syndrome
 - PPCI activity (by unit, pmp, by vessel)
 - [PCI for out of hospital arrest](#)
 - PCI territories / vessels / lesions/LMS/CTO
 - Stents (BMS and DES)
 - [Adjunctive pharmacotherapy](#)
 - LV support and shock
 - Primary PCI for > 80 yrs
 - Extraction / Rota / IVUS / OCT / FFR / Laser etc.
 - [Arterial access](#)
 - **Process of care (PCI)** 
 - Delays to treatment
 - NSTEMI (direct v IHT)
 - Primary PCI DTB / CTB
 - IHT versus Direct admission
 - Length of stay
 - **Outcome (PCI)** 
 - MACCE
 - Peri-procedural complications and by access
 - Tracked 30 day mortality
 - Outcome by syndrome
 - Outcome by lesion subset
 - **Adult non coronary intervention** 
 - Valves
 - **TAVI** and other Aortic 
 - Mitral
 - PV / AV / TV
 - Septal ablation for HOCM
 - LAA occlusion
 - ASD / PFO / Para-prosthetic leak closure
 - Coro sinus / great vessel
 - Renal Denervation
 - NICOR Update
 - Conclusions and summary
- Appendix:**
- PCI Centre NICOR / CCAD Centre codes 

Data Sources

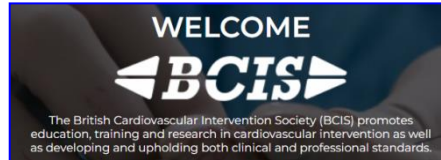


- Annual survey
 - Structure
 - Procedure totals
 - Slides labelled 'Survey'

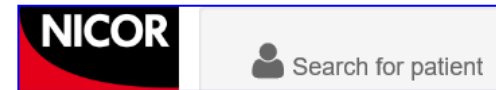




- PCI Procedural data
 - csv file upload
 - Direct entry
- Extract
- ONS track  Office for National Statistics
- Cleaning
- Analysis 
- Outputs
 - Benchmarking / COP / QI

Data Sources



- Annual survey
 - Structure
 - Procedure totals
 - Slides labelled 'Survey'



- PCI Procedural data
 - csv file upload
 - Direct entry
- Extract
- ONS track  Office for National Statistics
- Cleaning
- Analysis 
- Outputs
 - Benchmarking / COP / QI

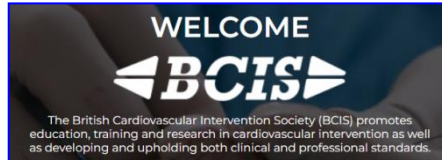


← or →



Data extract
xx-xx-2019

Data Sources



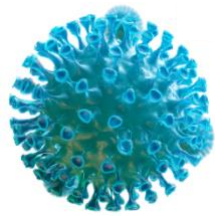
- Annual survey



- PCI Procedural data

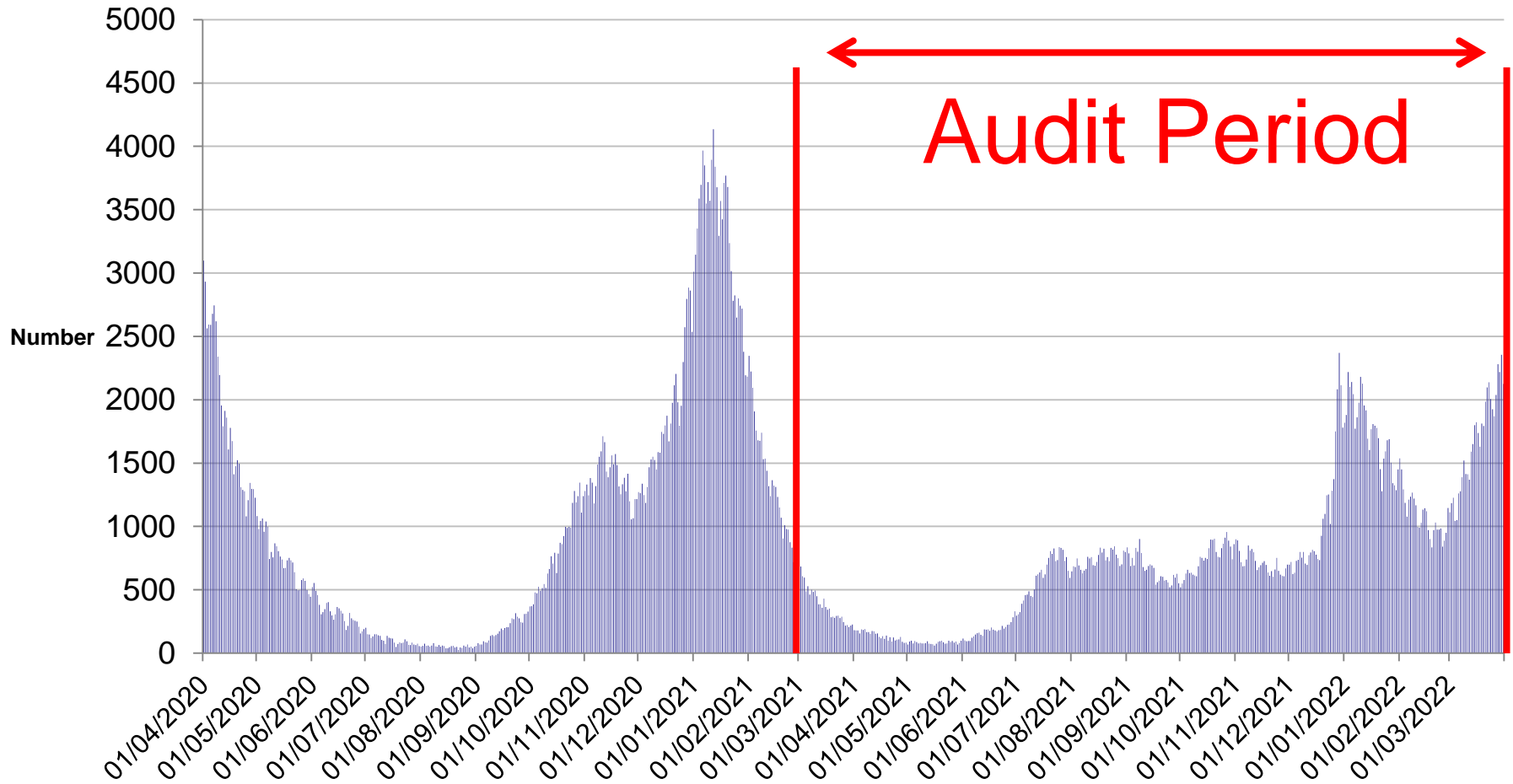
1 of 3





COVID-19

Daily COVID-19 Admissions UK



Audit Presentation

- PCI
 - Survey (UK)
 - PCI procedural data (E&W)
- Structural Intervention
- NICOR update

Structure of PCI Provision



PCI Centres

1 of 3

Year		PCI Centres
	Stopped	Started
2010		<ul style="list-style-type: none"> • Spire Shawsfair Park, Edinburgh • Altnagelvin (previous angio) • Bedford (previous angio) • Medway (previous angio) • Pindefields (previous angio) • Raigmore, Inverness (previous angio) • Royal Blackburn (previous angio) • Salisbury (previous angio) • Scunthorpe (previous angio) • York District general (previous angio)
2011	<ul style="list-style-type: none"> • St Mary's, London 	<ul style="list-style-type: none"> • Royal Gwent, Newport (previous angio) • Spire Hospital, Southampton (previous angio) • Calderdale Royal, Halifax (previous angio) • Cumberland Infirmary, Carlisle (previous angio)
2012	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Spire Bristol Hospital
2013	<ul style="list-style-type: none"> • Whipps Cross 	<ul style="list-style-type: none"> • None

PCI Centres

2 of 3

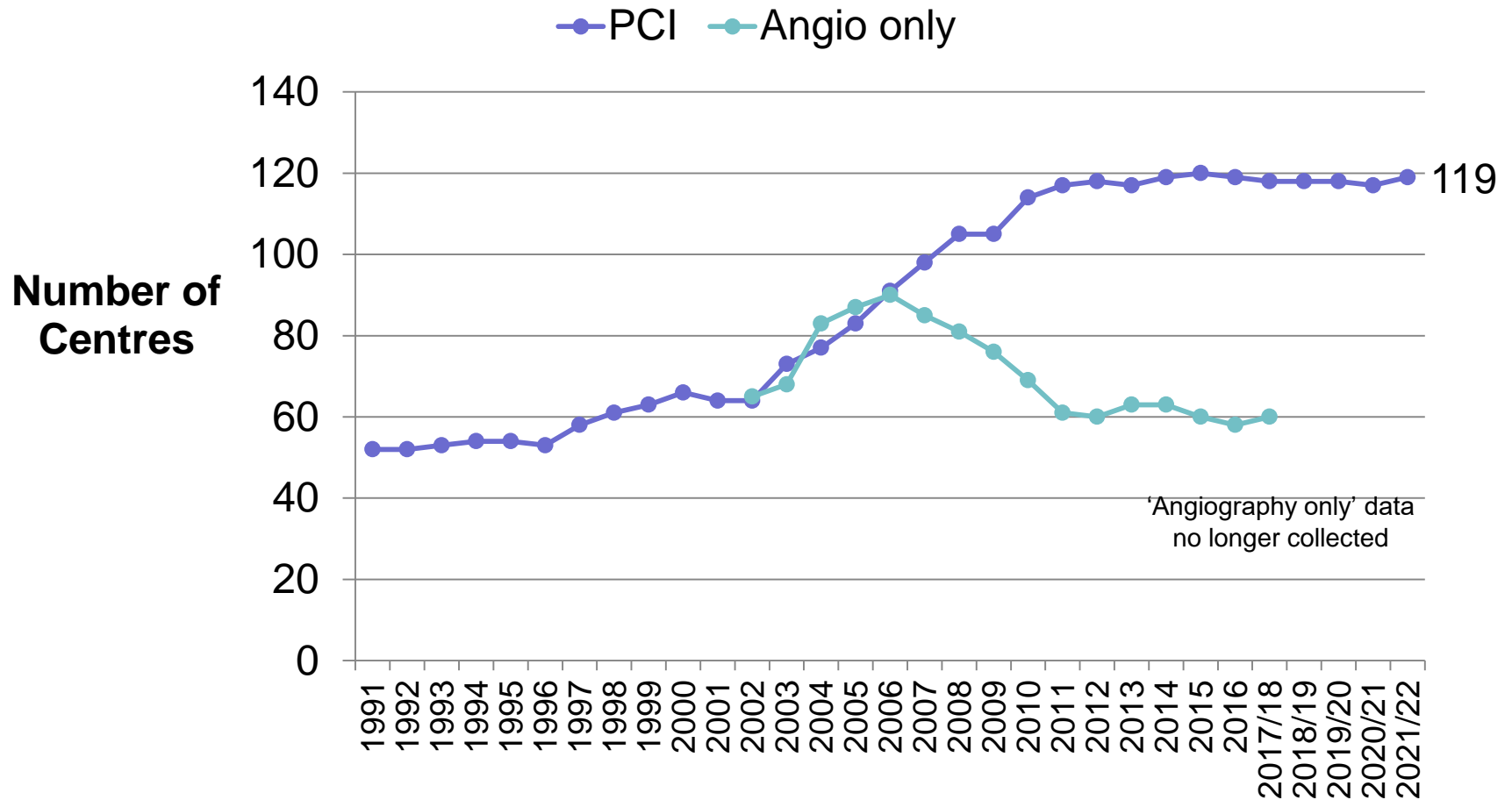
Year		PCI Centres	
	Stopped		Started
2014	<ul style="list-style-type: none"> • None 		<ul style="list-style-type: none"> • Luton and Dunstable • Kent Institute of Medicine and Surgery • Spire Cardiff Hospital • Ipswich Hospital (previous angio) • Frenchay moves to Southmead
2015	<ul style="list-style-type: none"> • None 		<ul style="list-style-type: none"> • Nuffield Health, Bournemouth
2016	<ul style="list-style-type: none"> • Sandwell (activity to Birmingham City site) 		<ul style="list-style-type: none"> • UCL closes and combines with BAL in move to Barts Heart Centre (SBH) • Duchy Hospital, Cornwall (previous angio)
2017	<ul style="list-style-type: none"> • Belfast City Hospital • Spire Leeds 		<ul style="list-style-type: none"> • West Middlesex University Hospital
2018-19	<ul style="list-style-type: none"> • No change 		<ul style="list-style-type: none"> • No change
2019-20	<ul style="list-style-type: none"> • Duchy Hospital, Cornwall 		<ul style="list-style-type: none"> • Spire Manchester Hospital
2020-21	<ul style="list-style-type: none"> • London Independent 		<ul style="list-style-type: none"> • Scunthorpe (SCU) moves to Diana Princess of Wales Hospital, Grimsby (GGH) • Royal Gwent Hospital (GWE) moves to GWE-> Grange University Hospital (GUH)

PCI Centres

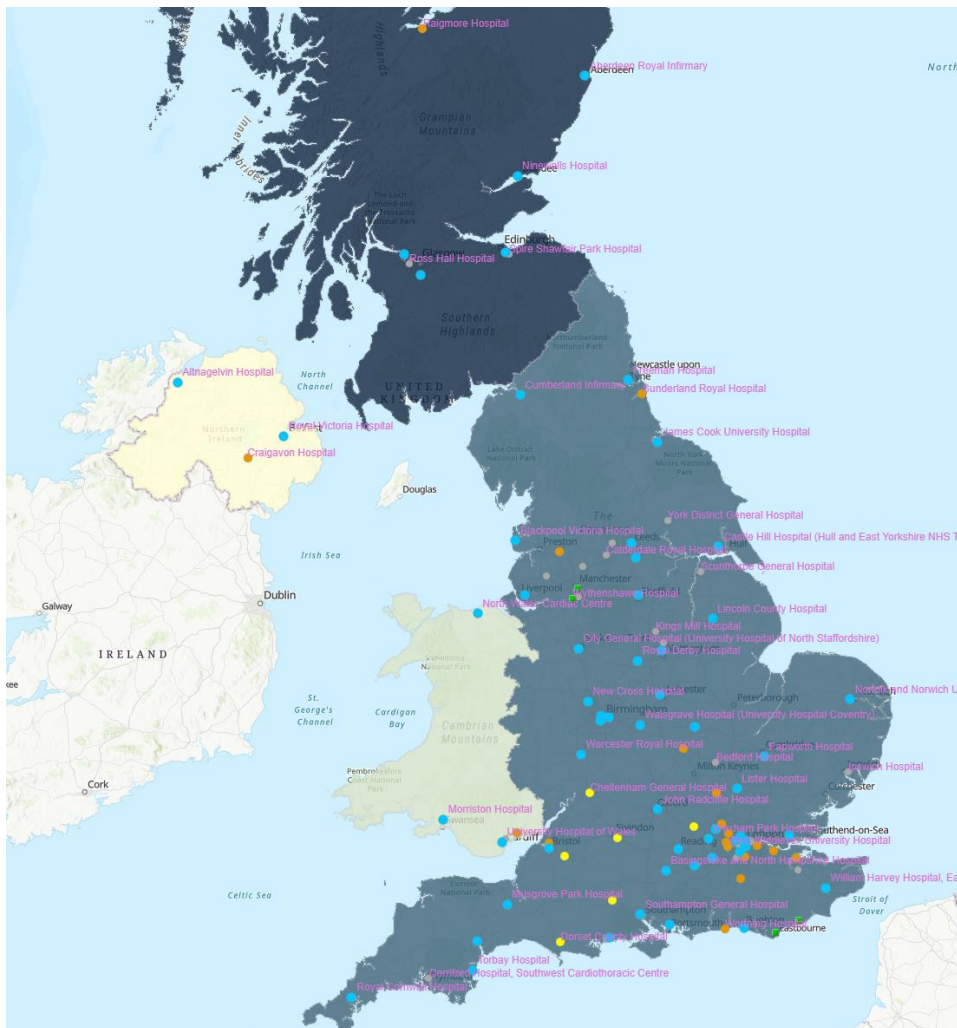
3 of 3

Year	PCI Centres	
	Stopped	Started
2021-22	<ul style="list-style-type: none">Ealing lab refurbish from April 2021 to Sept 2022 (so will restart 2023)	<ul style="list-style-type: none">Scunthorpe (SCU) moves to Diana Princess of Wales Hospital, Grimsby (GGH) (but this year both labs active alt days)Spire Nottingham (started 2018)

UK Centres



PCI Centres in 2021-22



	NHS	Private
Scotland	6	2
England	85	18
N Ireland	3	0
Wales	4	1
Total	98	21
Total	119	

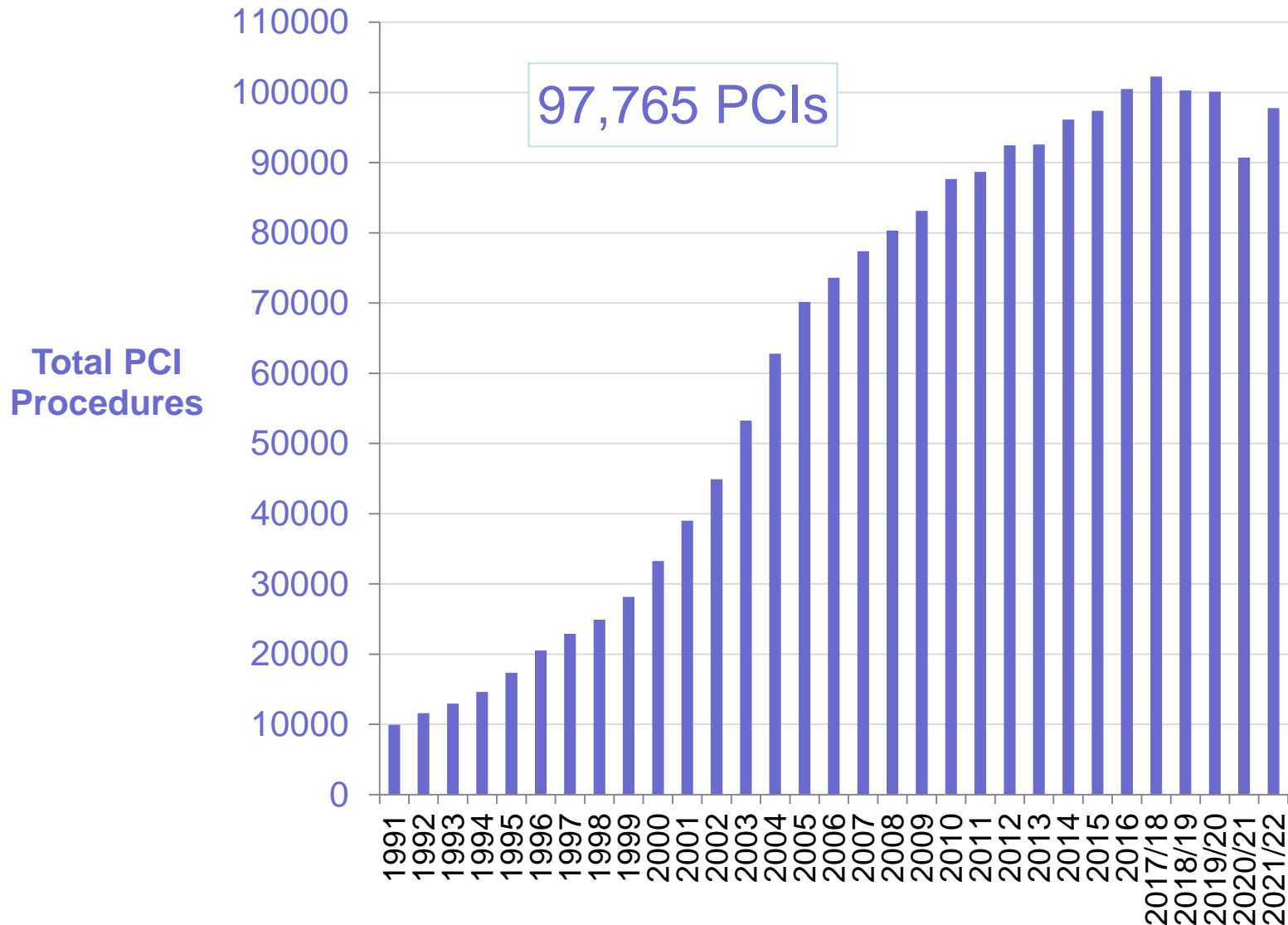
Annual Survey

Survey completeness

– All UK - 100%

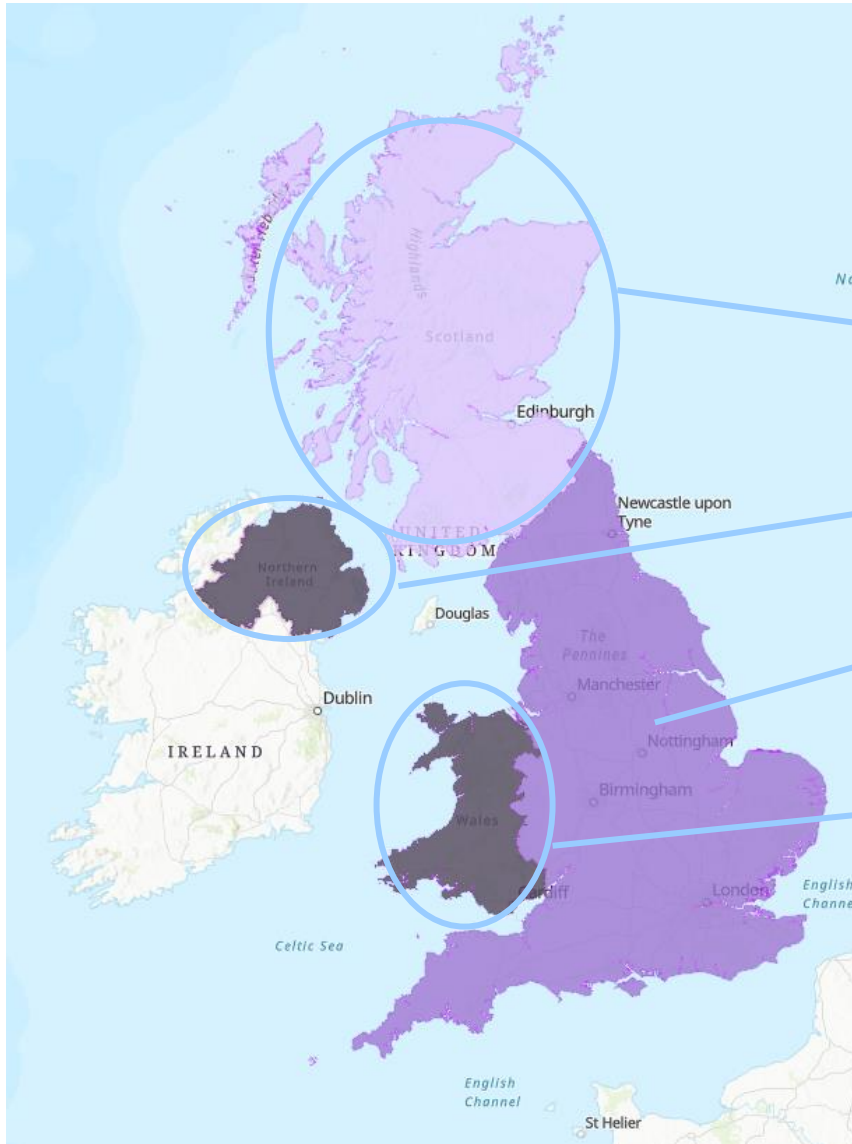


Total PCI activity all UK



Population estimates

Mid 2021 - **Census data** for E,W,NI, Estimate for S



UK Total: 69.98 m

Scotland 5.48 m

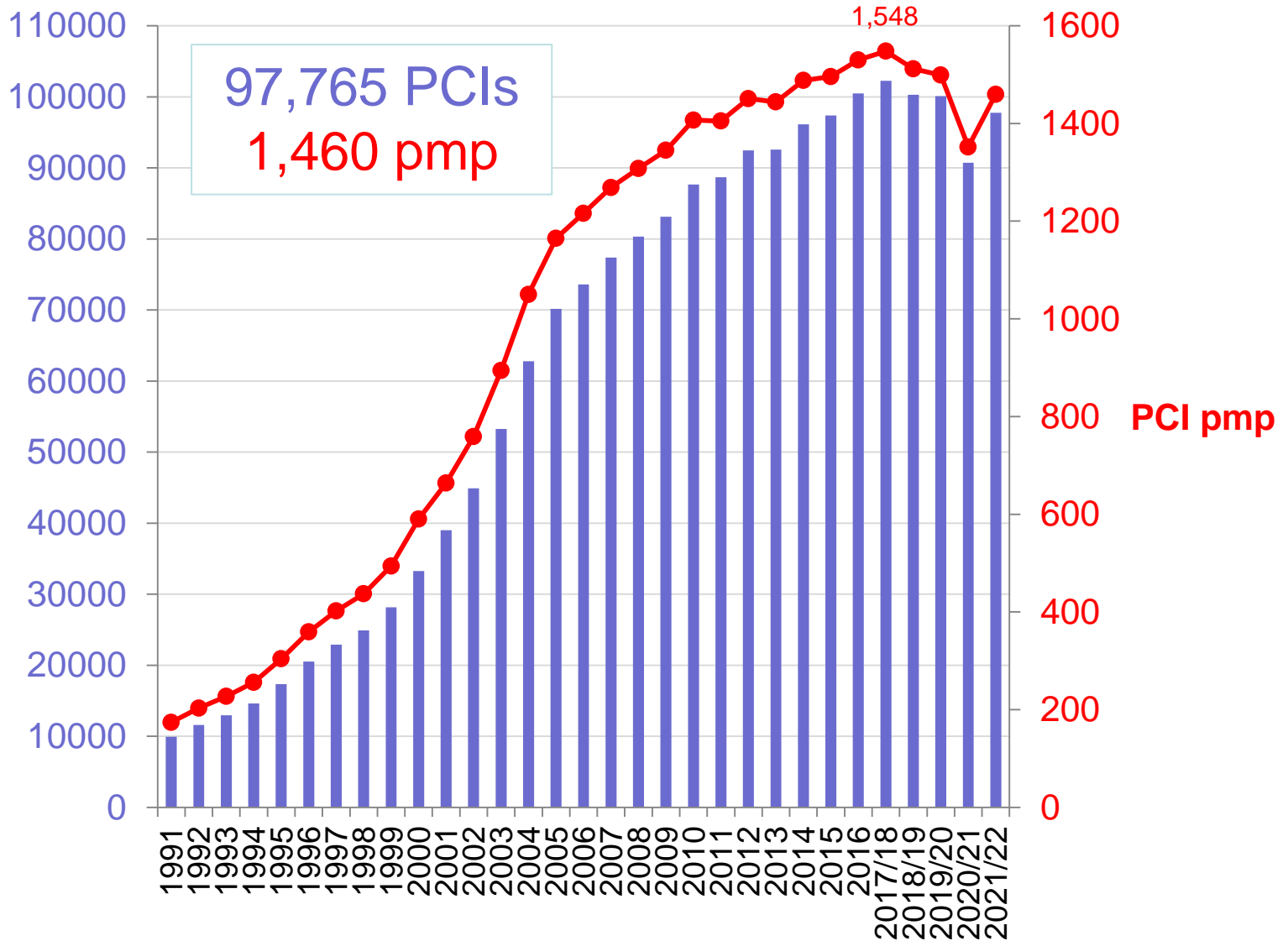
Northern Ireland 1.922 m

England 56.490 m

Wales 3.107 m

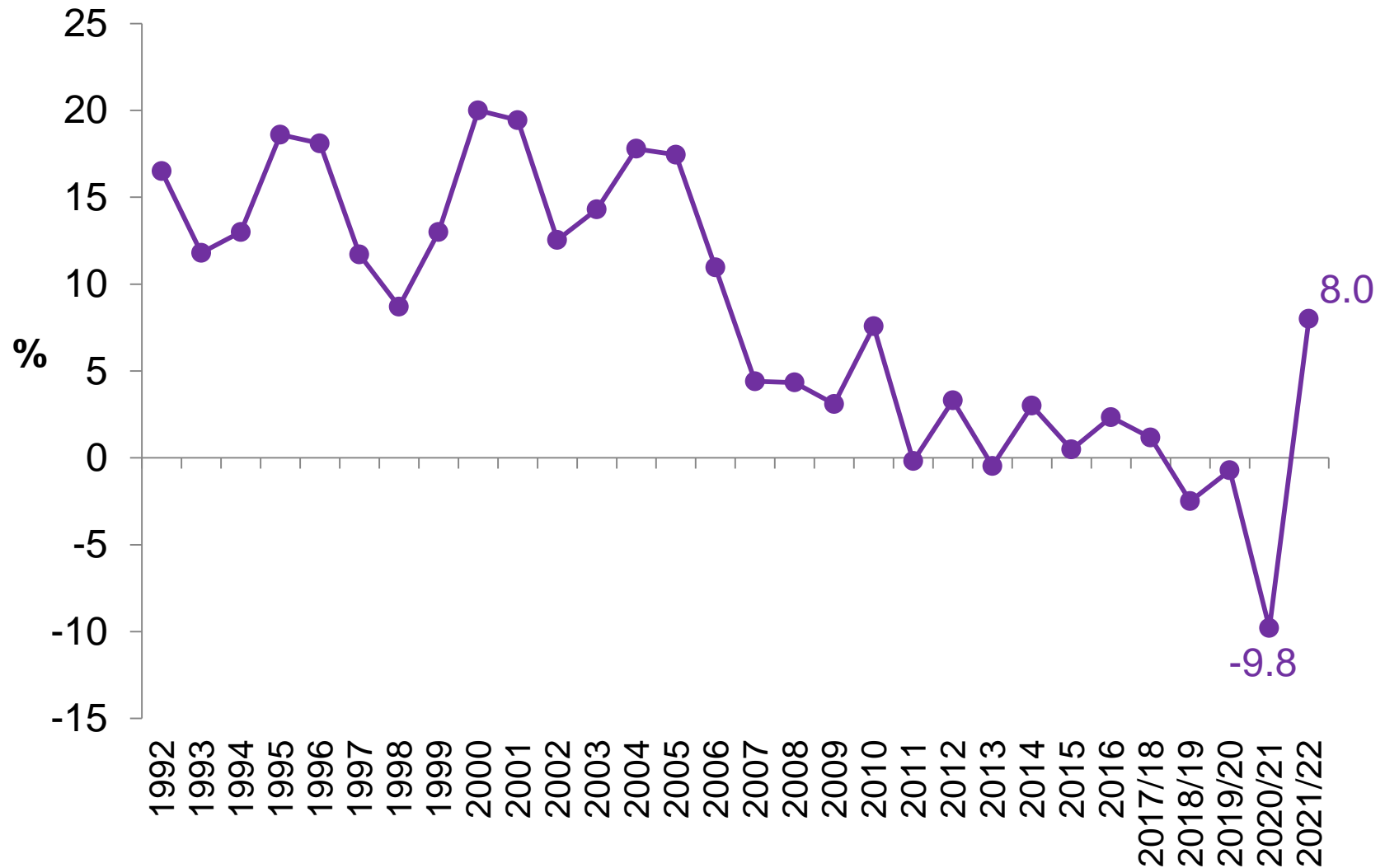
Total PCI activity all UK

Total PCI Procedures



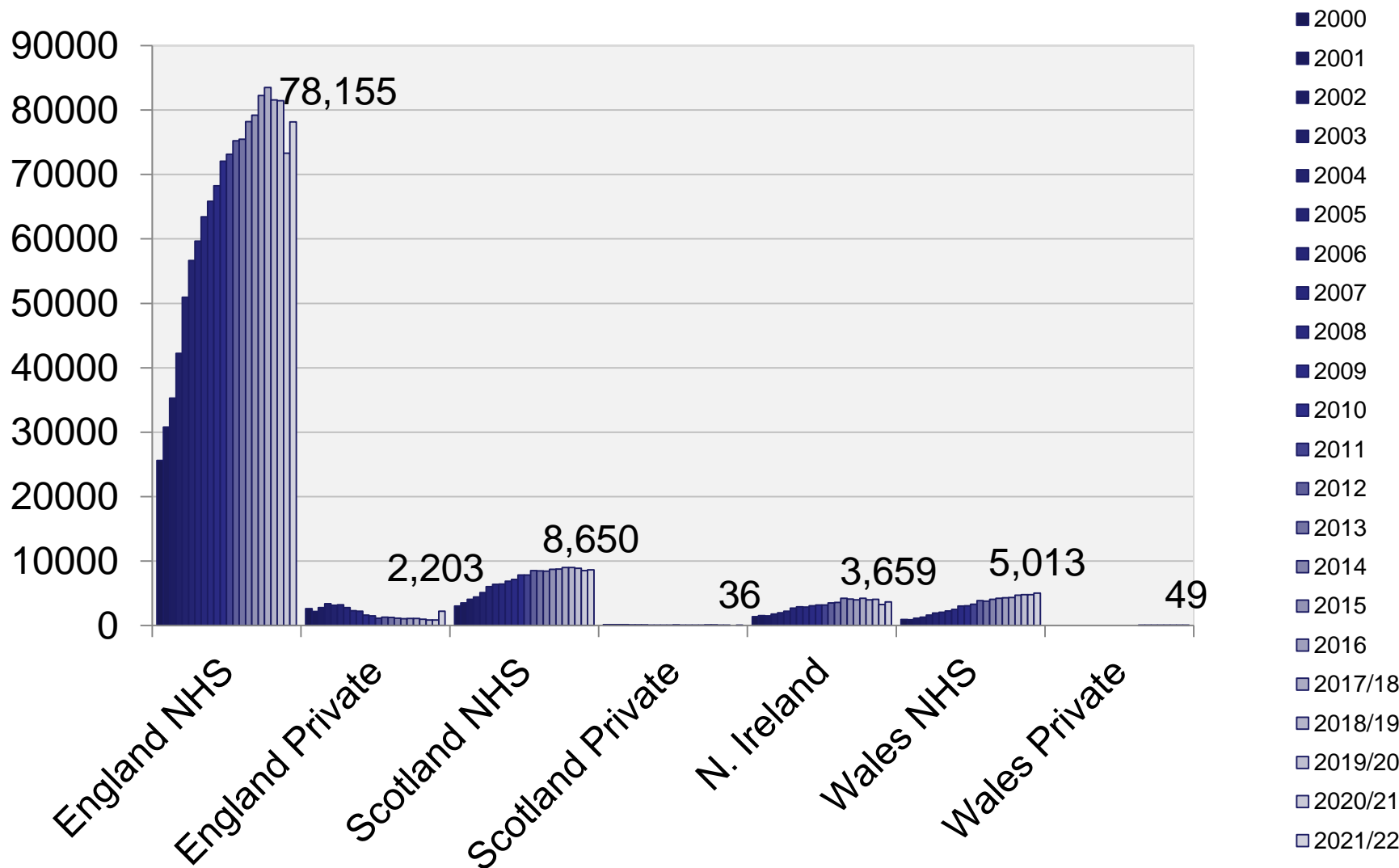
PCI pmp all UK

Rate of Increase



Total PCIs in the UK

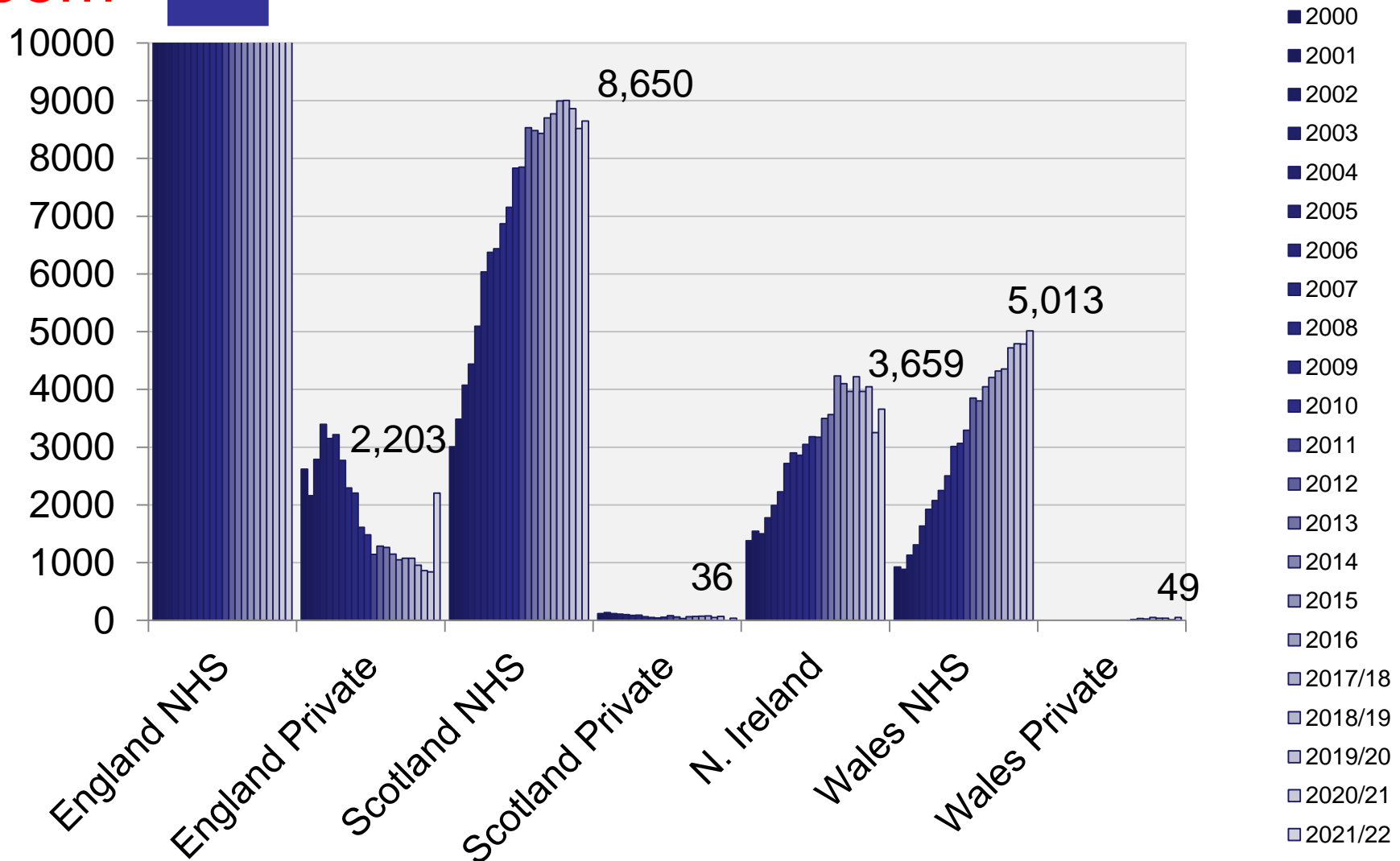
by Country and Type of Institution



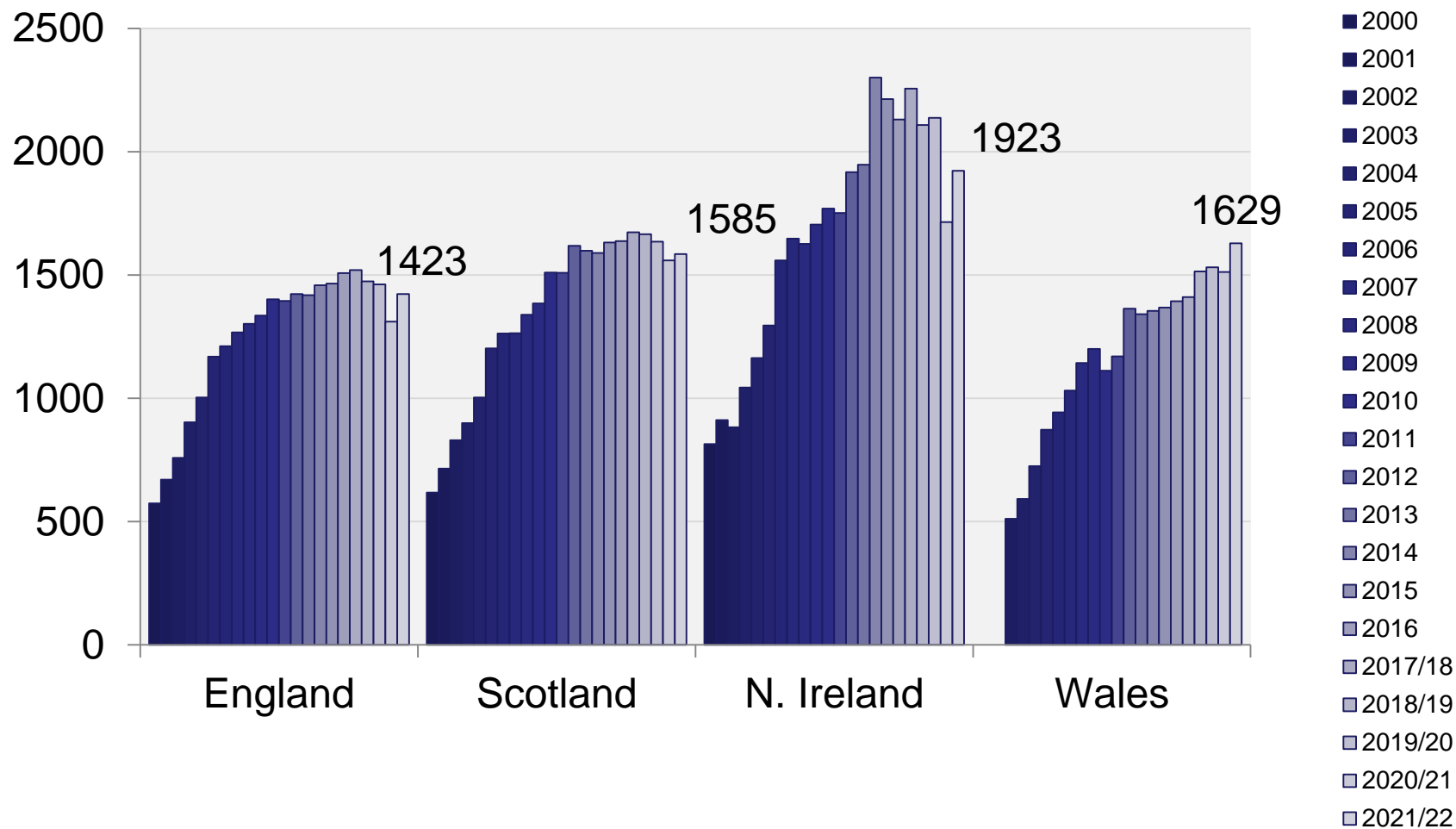
Total PCIs in the UK

by Country and Type of Institution

Zoom

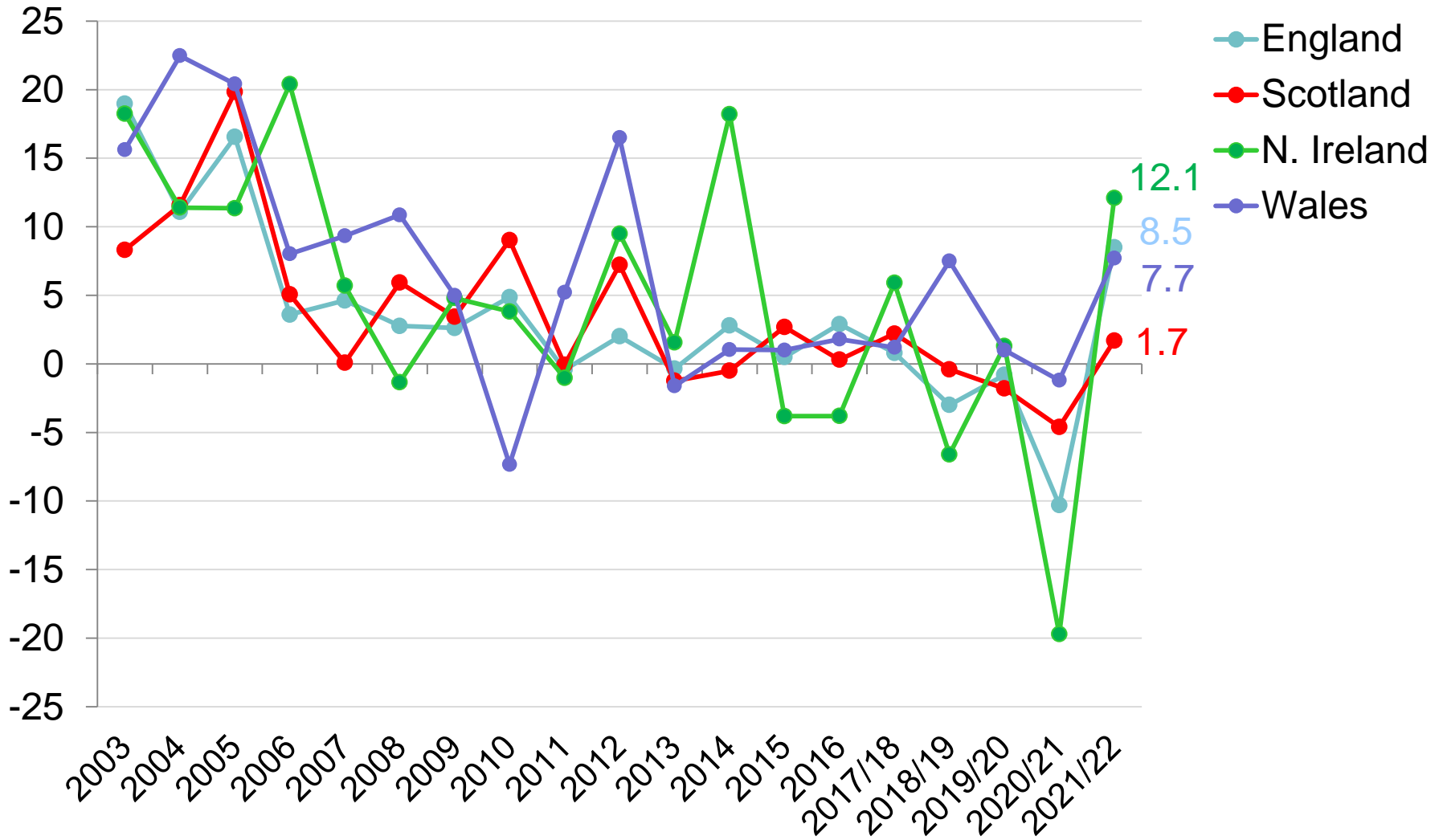


PCI pmp By UK Country



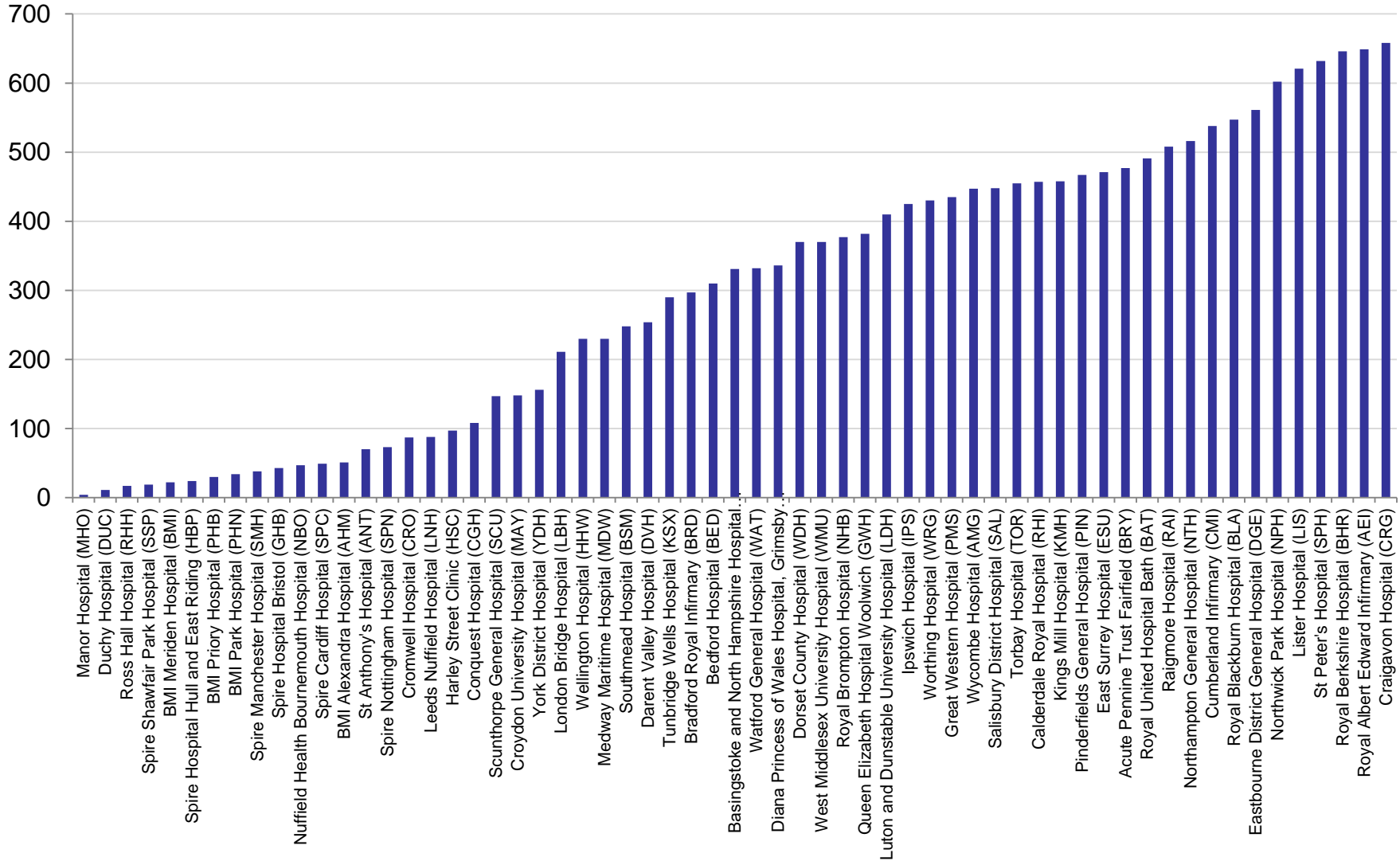
PCI pmp

Rate of Increase by UK Country



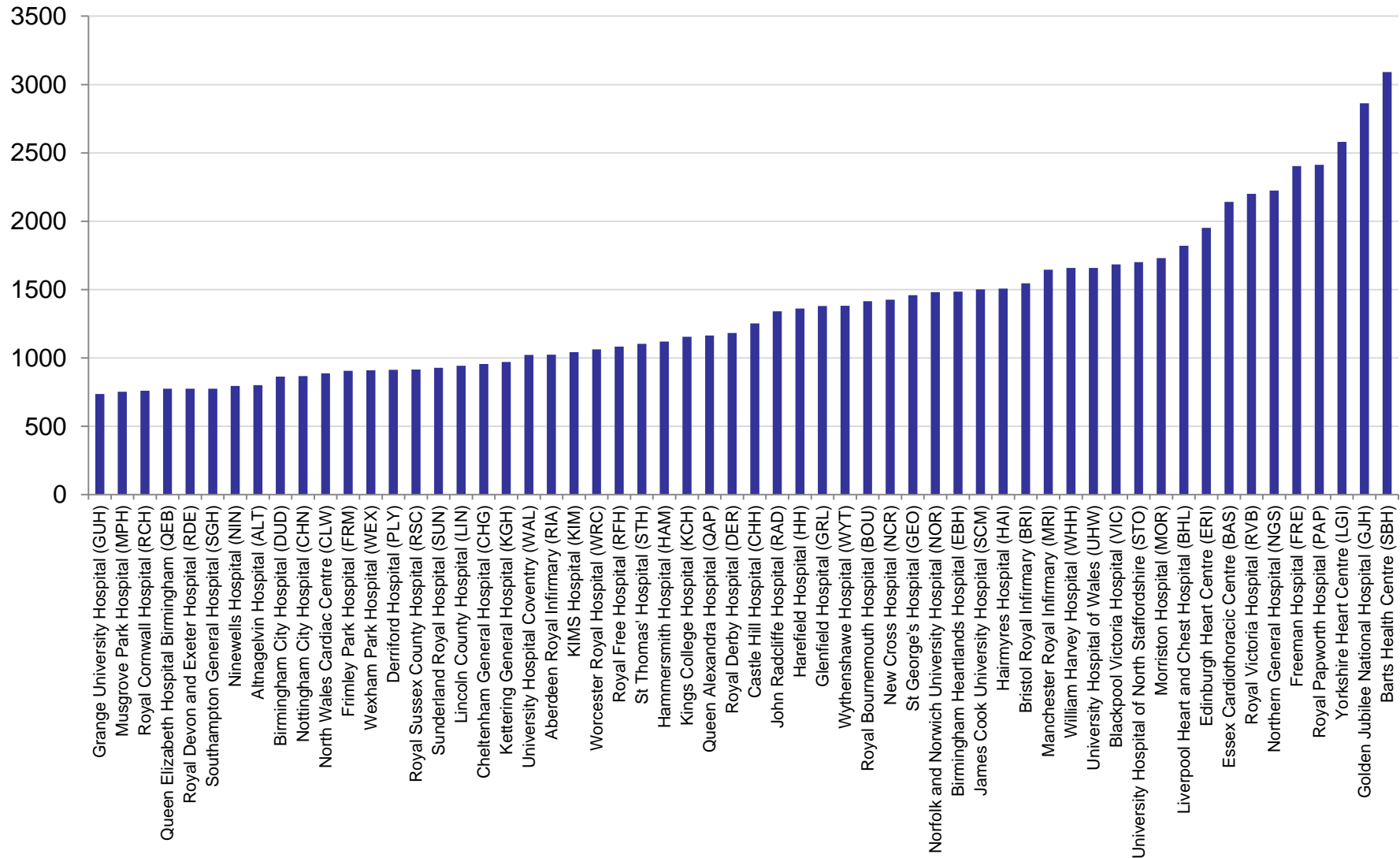
Number of PCIs per Centre

Ordered by 2021-2022 activity (1 of 2)



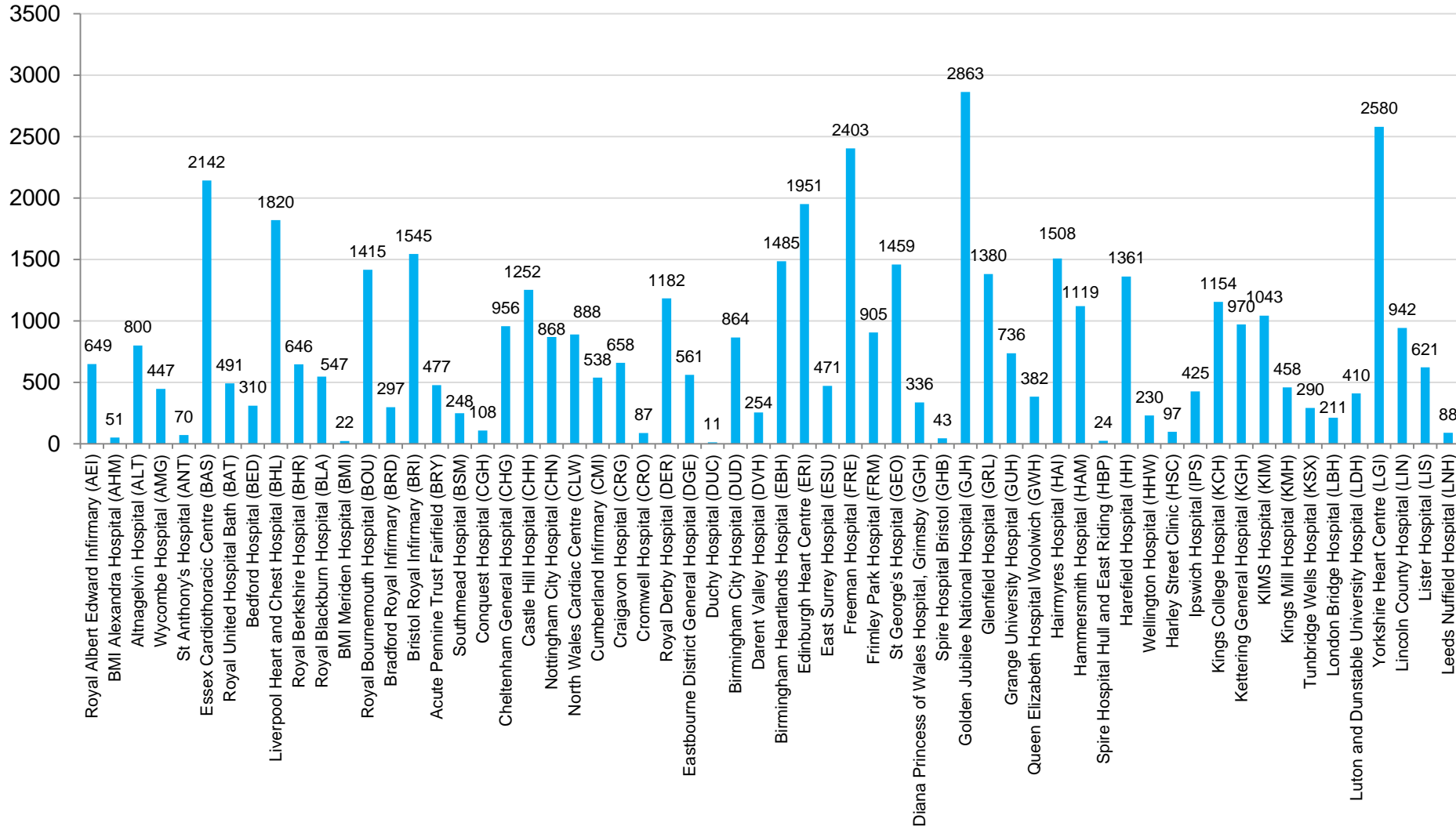
Number of PCIs per Centre

Ordered by 2021-2022 activity (2 of 2)

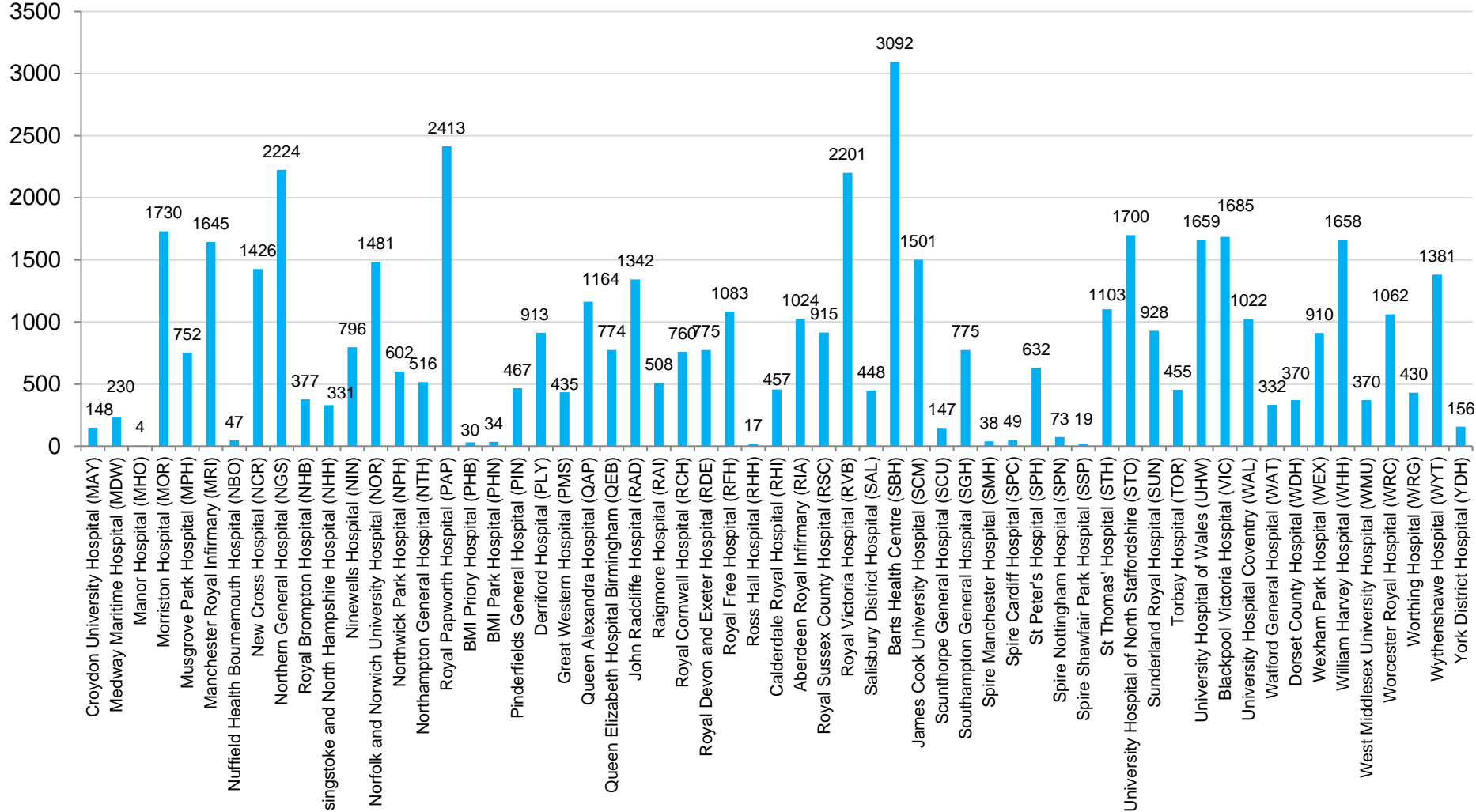


Number of PCIs per Centre

(Hosp code A to L)

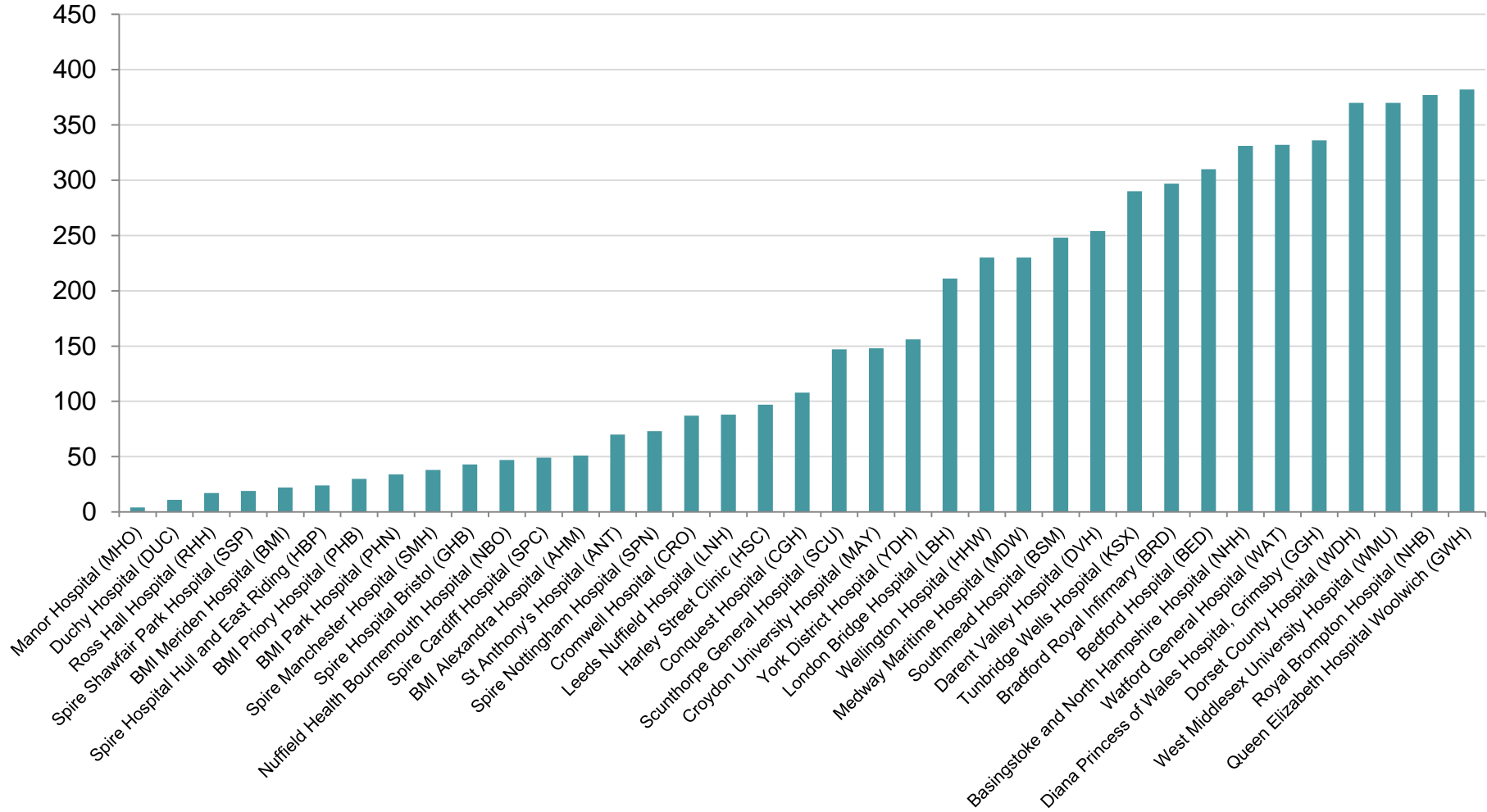


Number of PCIs per Centre (Hosp code M to Y)



Centres < 400 PCIs

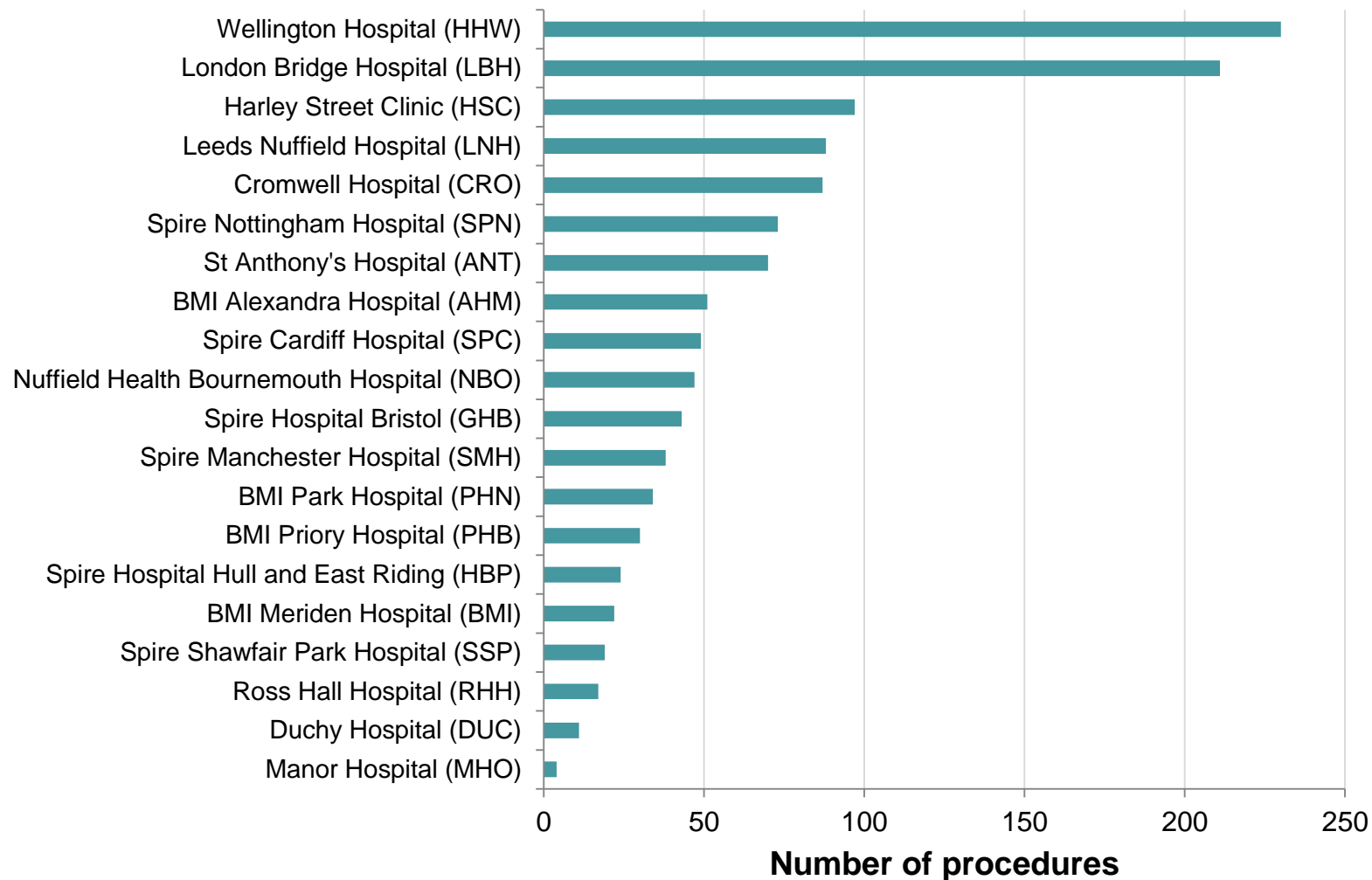
NHS and Private



37 Centres performing < 400 cases

Centres < 400 PCIs

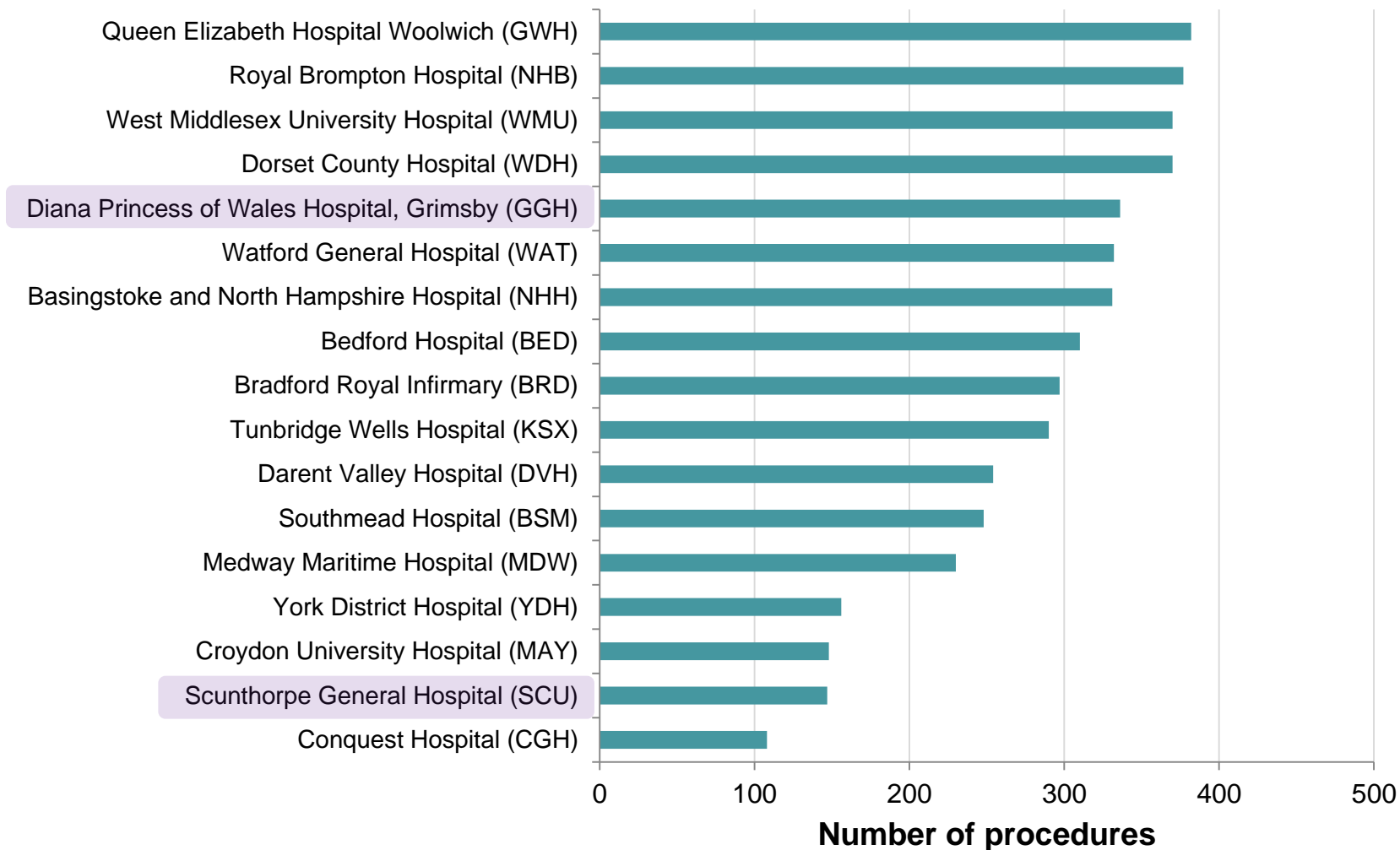
Private



20 Centres performing < 400 cases

Centres < 400 PCIs

NHS

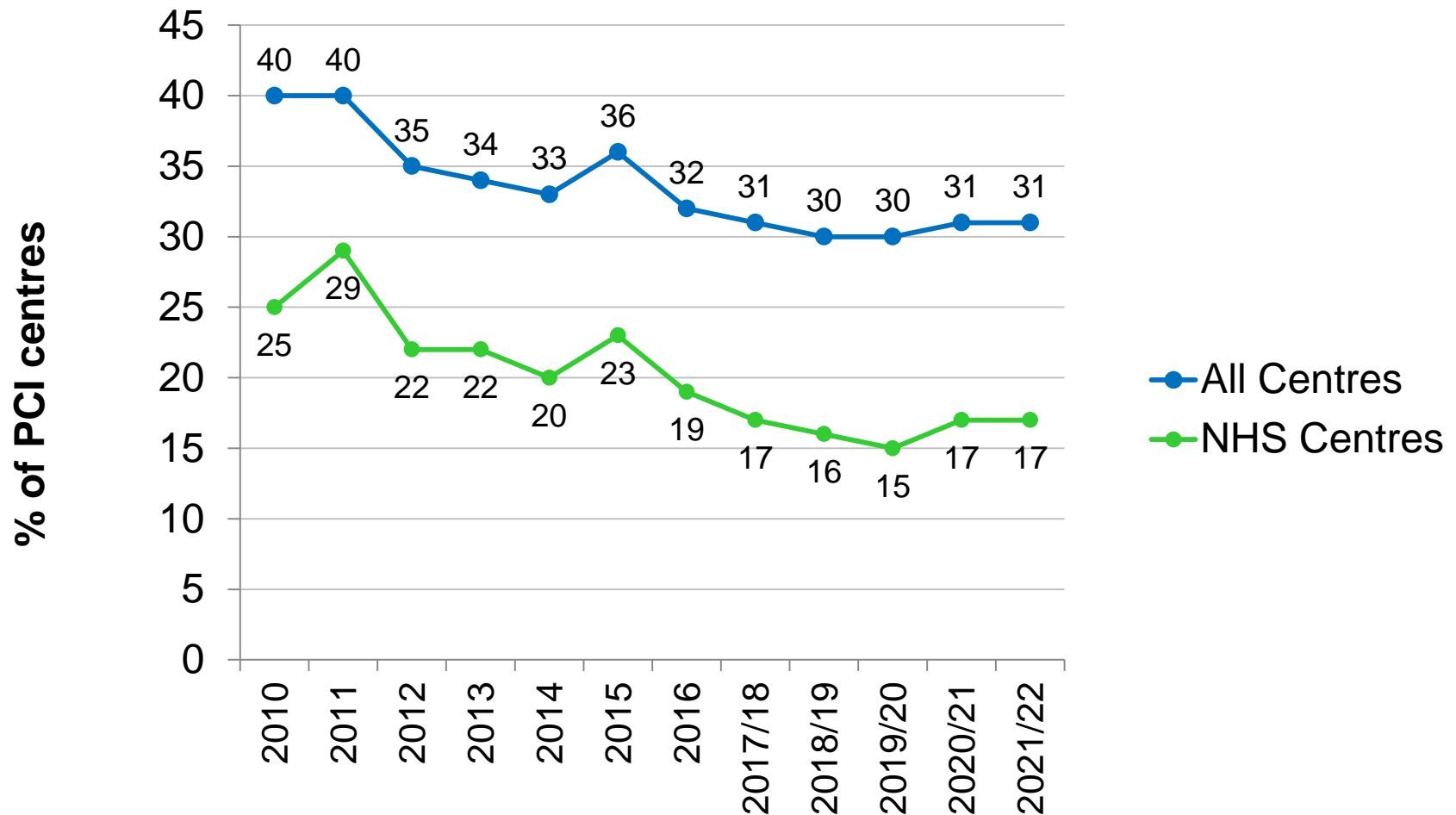


17 Centres performing < 400 cases

4 Centres performing < 200 cases

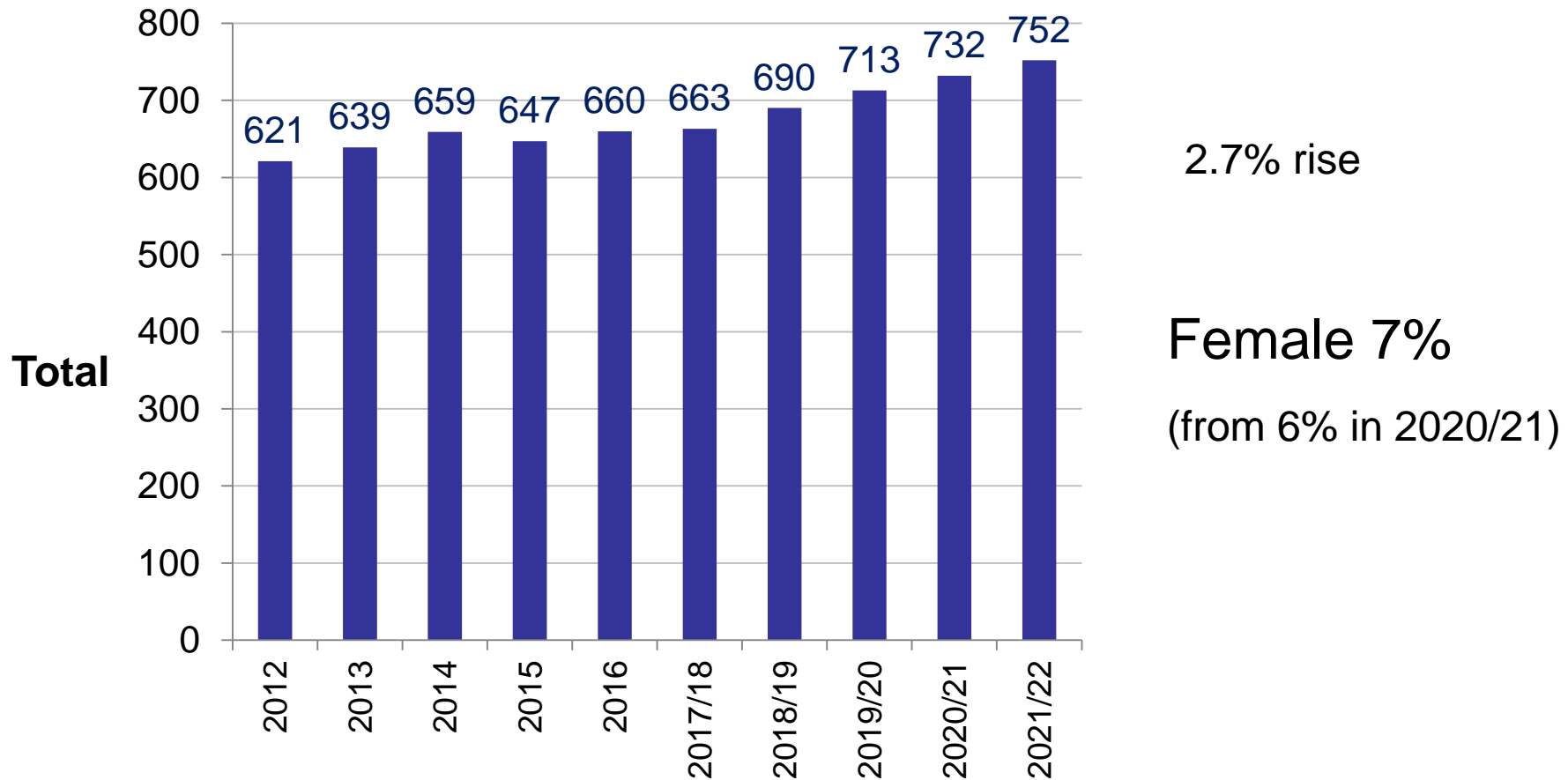
Number of PCIs per Centre

% Centres < 400 cases pa



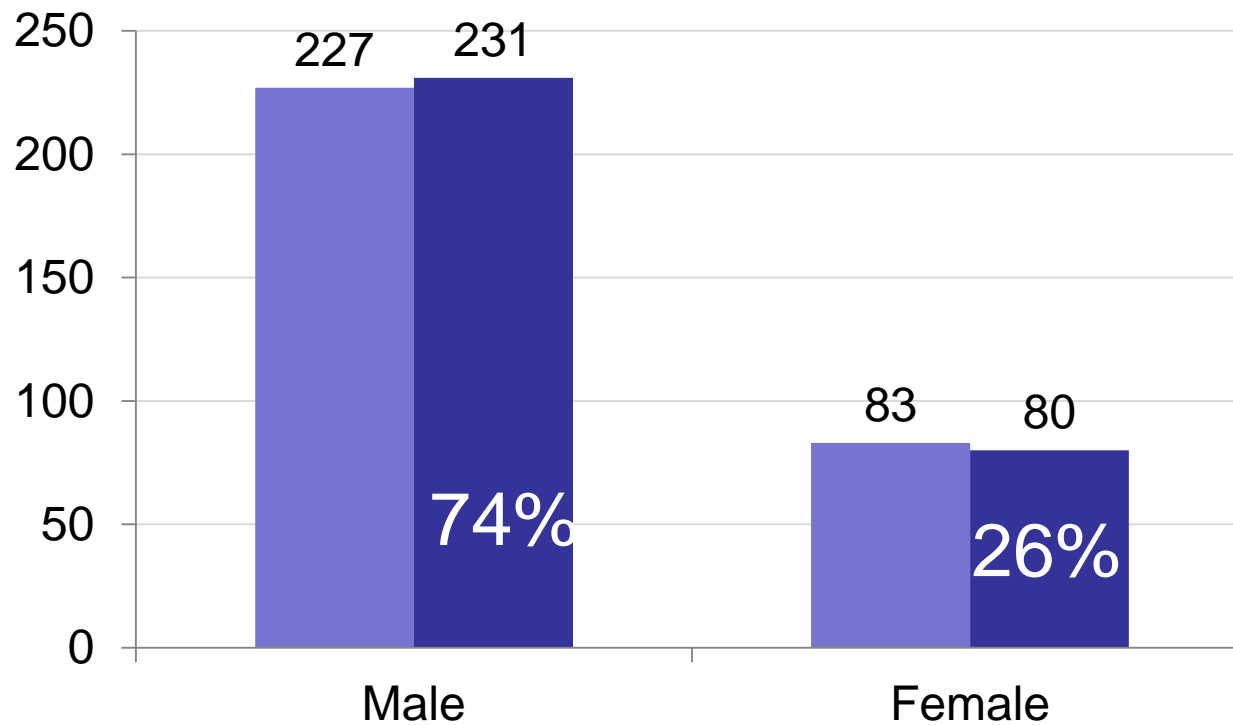
Interventional Consultants

- Number of PCI operators by GMC number

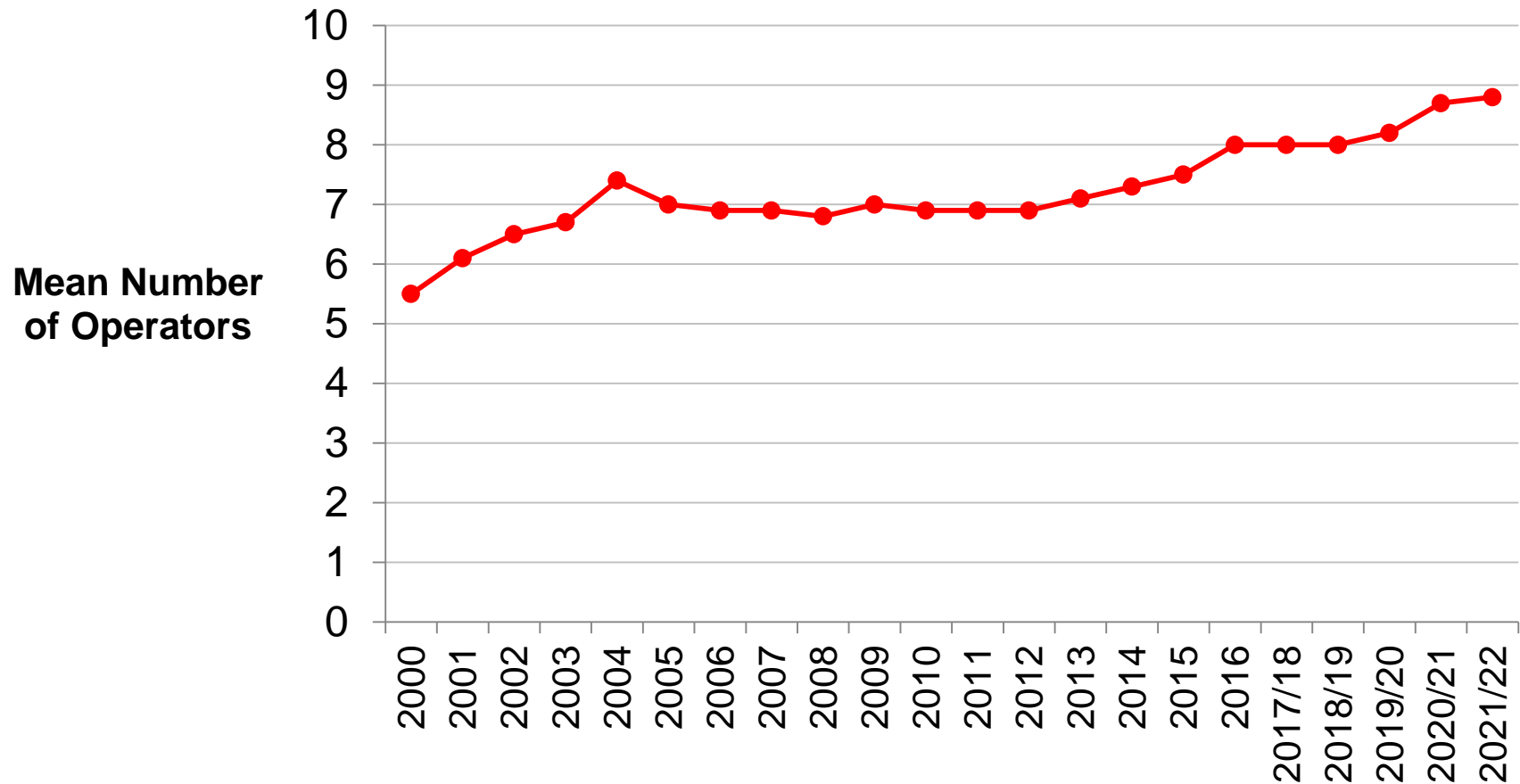


Trainees

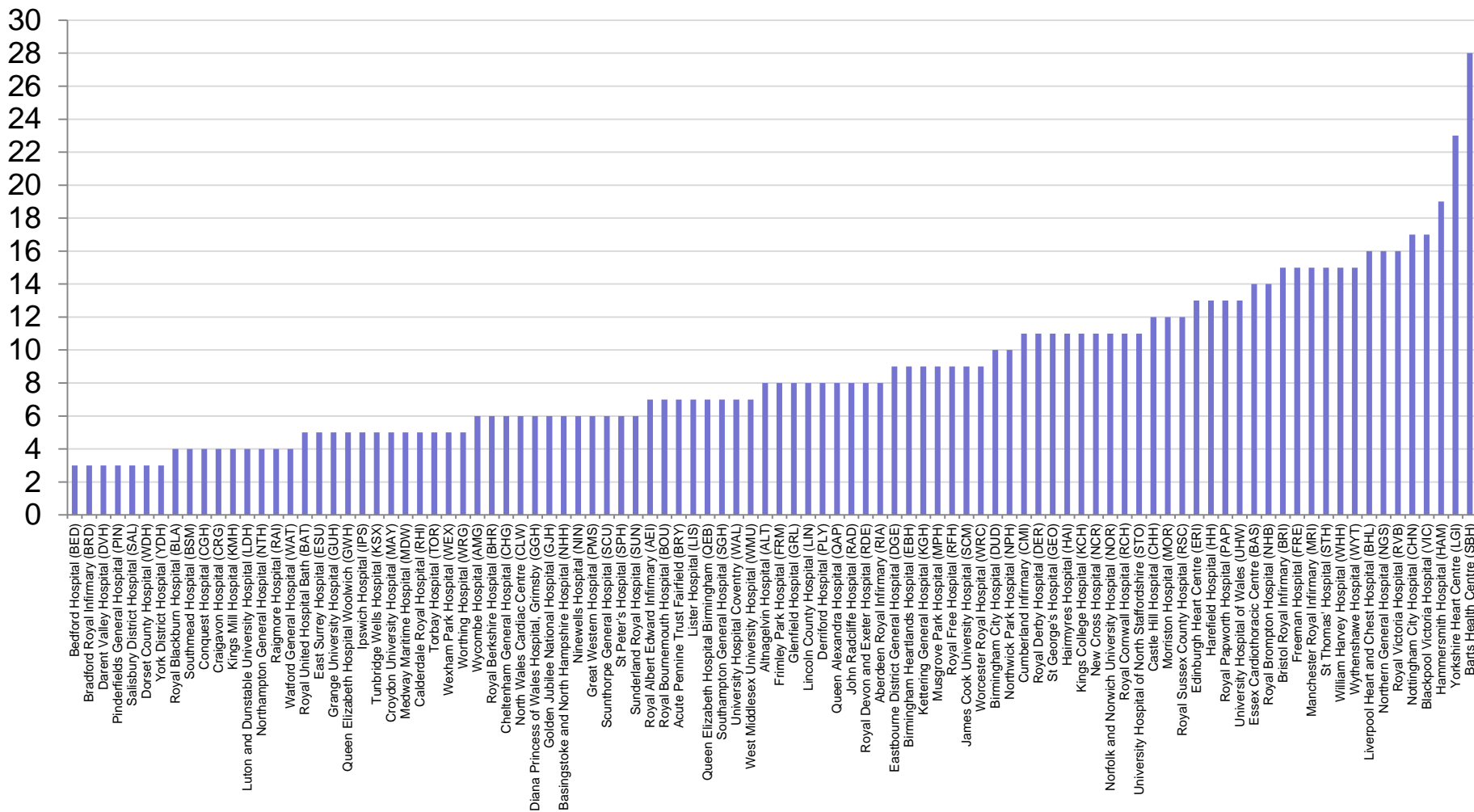
Number of SpRs as PCI trainees



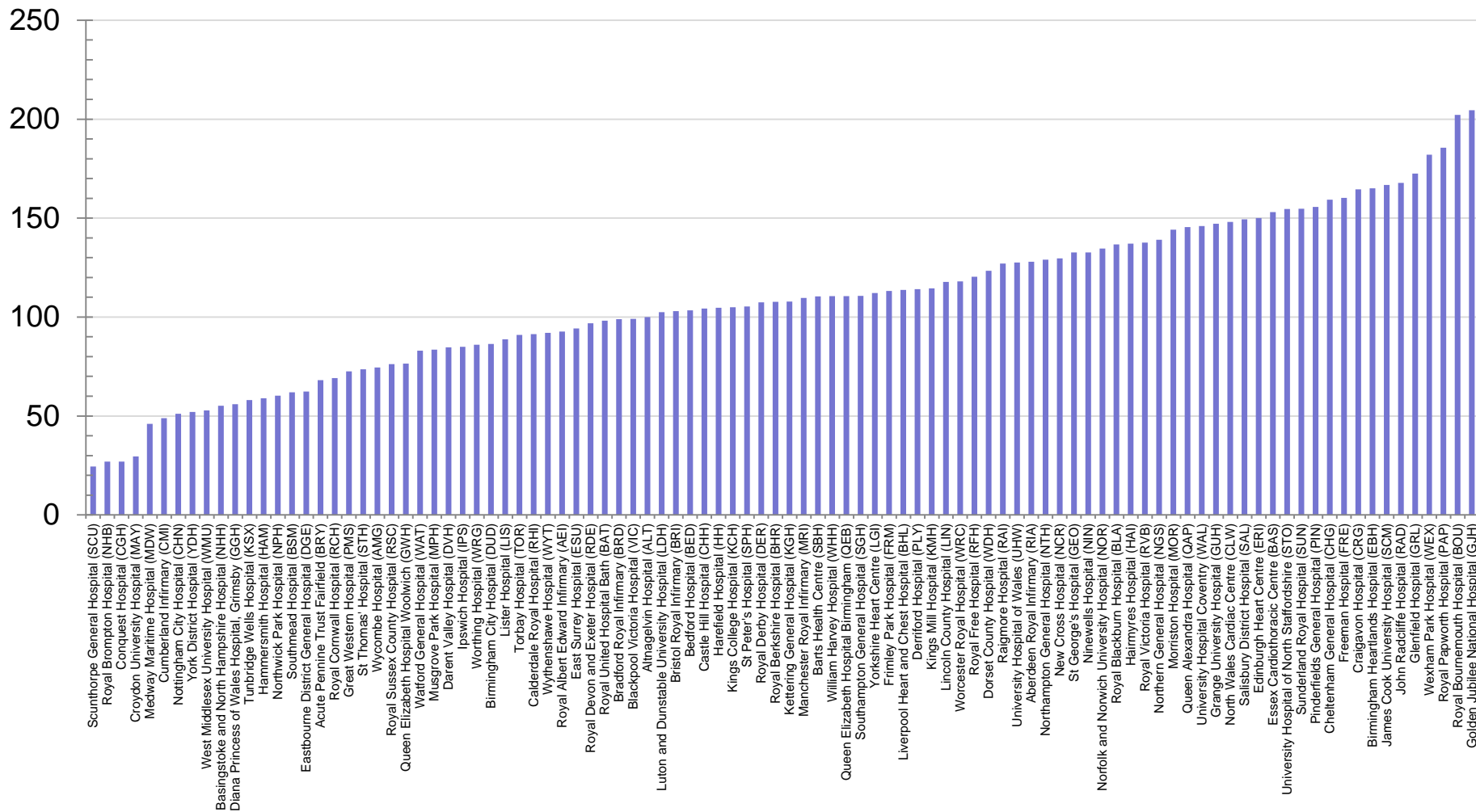
No. of Consultants (Per NHS Centre)



No. of Consultants In NHS centres (2021/22)

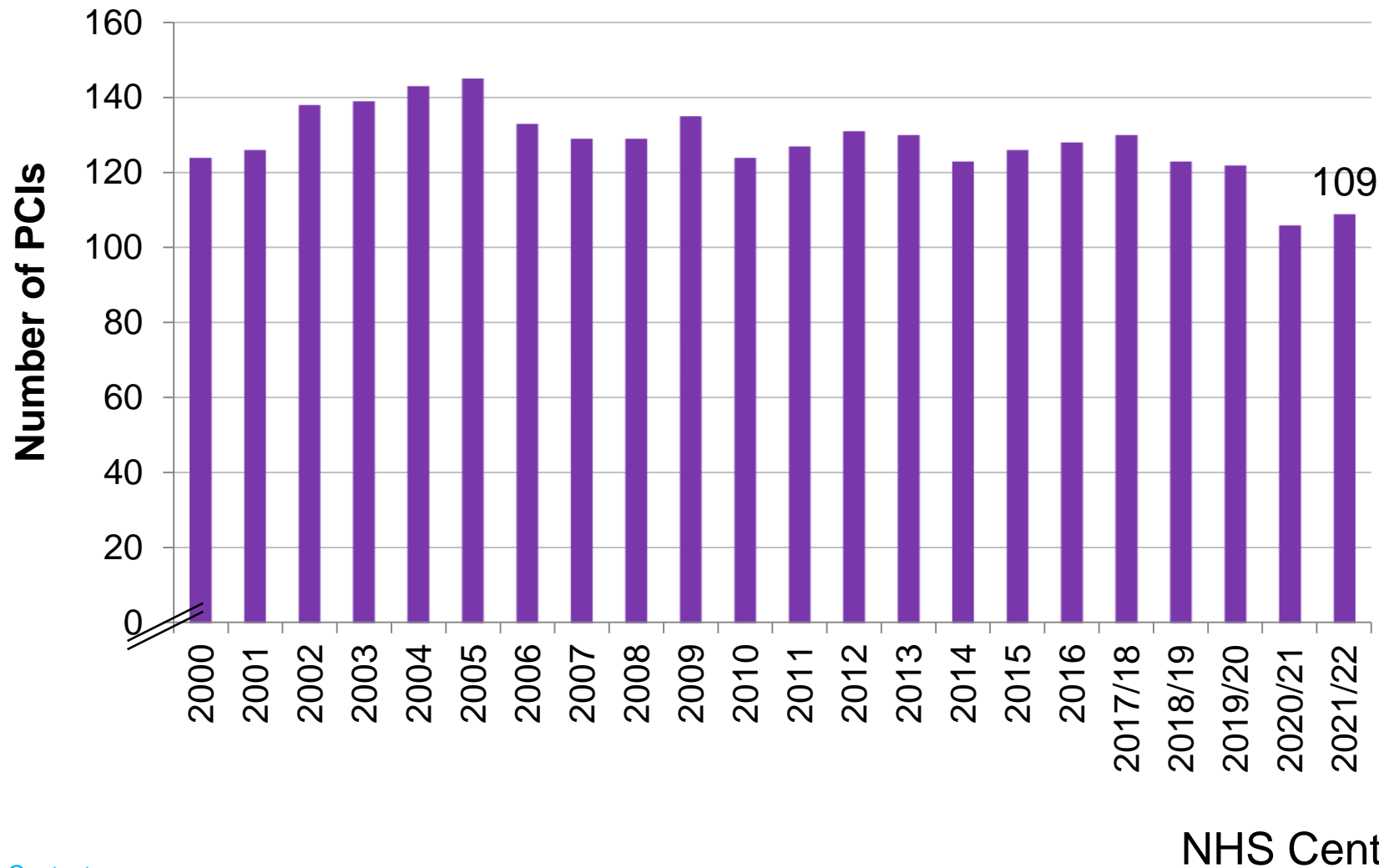


PCIs per Consultant (NHS Centres 2020/21)



PCI per Consultant

PCI Centre case volume / Number of operators



Primary PCI Rotas



Primary Percutaneous Coronary Intervention for ST Elevation Myocardial Infarction
Position statement for Facilities and Emergency Medical Staffing July 2016

MacCarthy PA, Blackman DJ, Hildick-Smith D, Banning AP

2 Staffing Standards

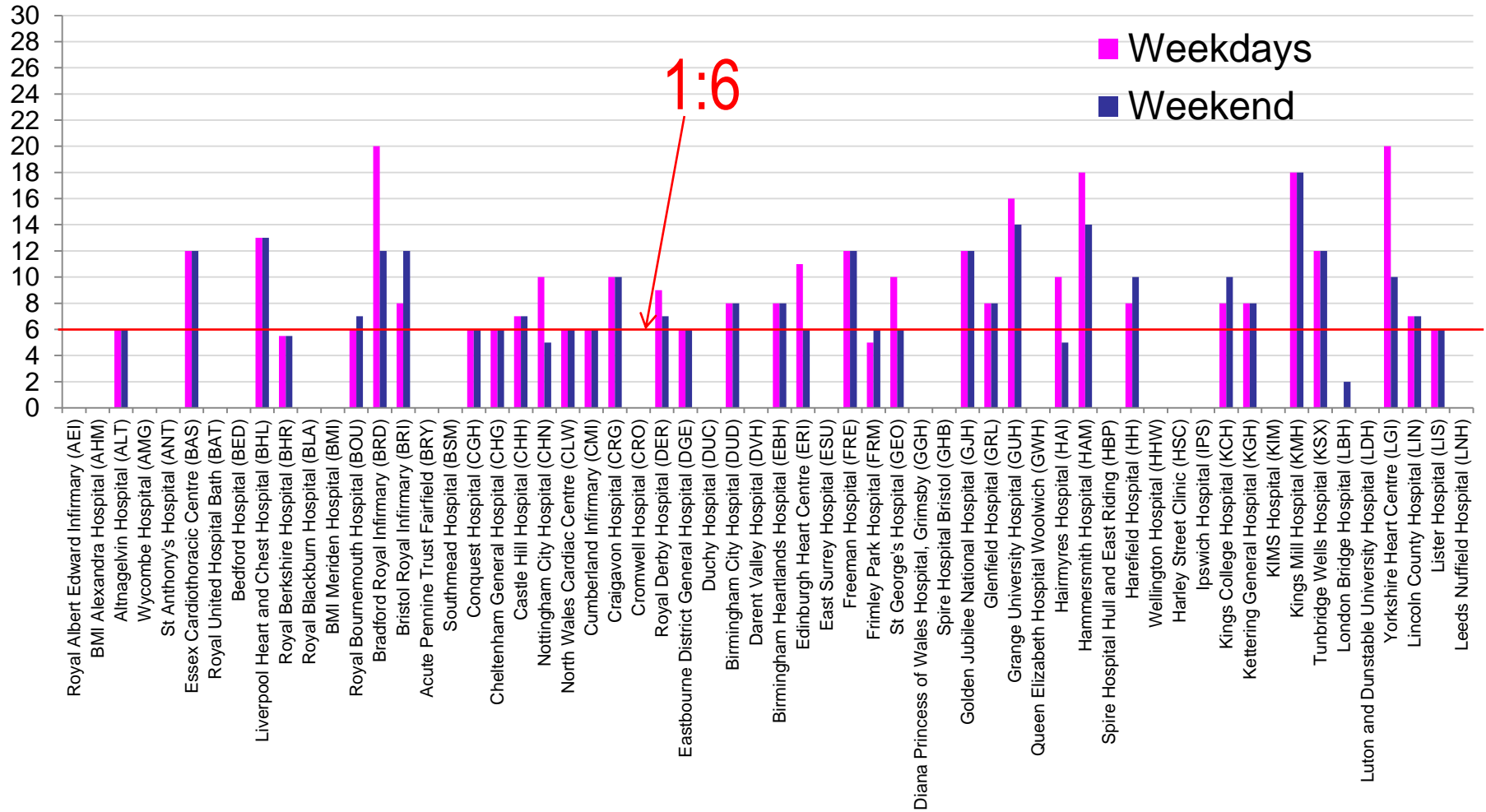
2.1 Primary PCI rotas:

Key Recommendations

- The maximum frequency of on-call rota for any individual should not be more frequent than 1:6
- A Consultant Interventional Cardiologists rota will include:-
 - One half-day of compensatory rest for each full day of consecutive on-call in lower volume centres (<400 PPCI procedures per year)
 - One full day of compensatory rest for each full day of consecutive on-call in higher volume centres (\geq 400 PPCI procedures per year)

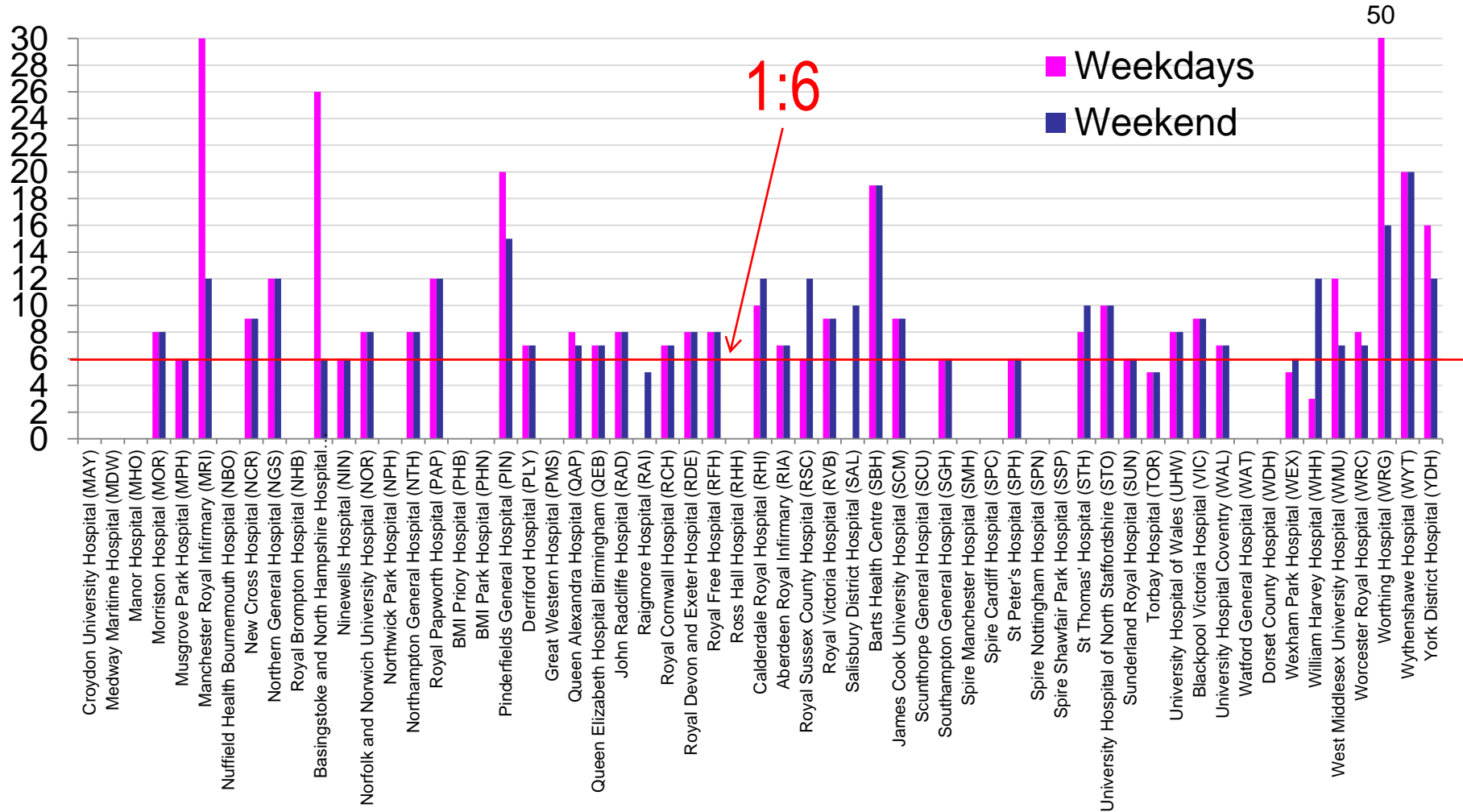
PPCI

On call Rotas (unit codes A to L)



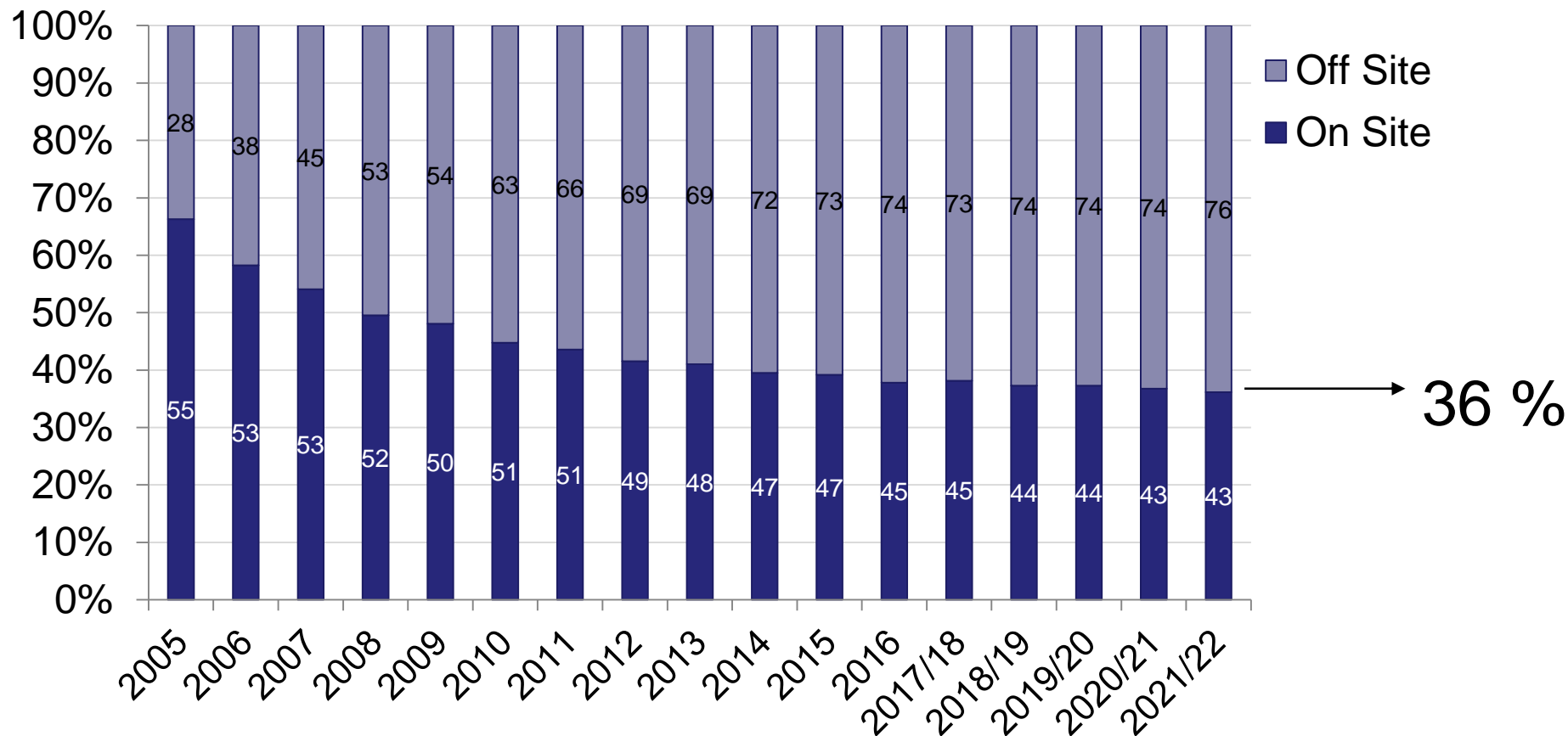
PPCI

On call Rotas (L to Y)



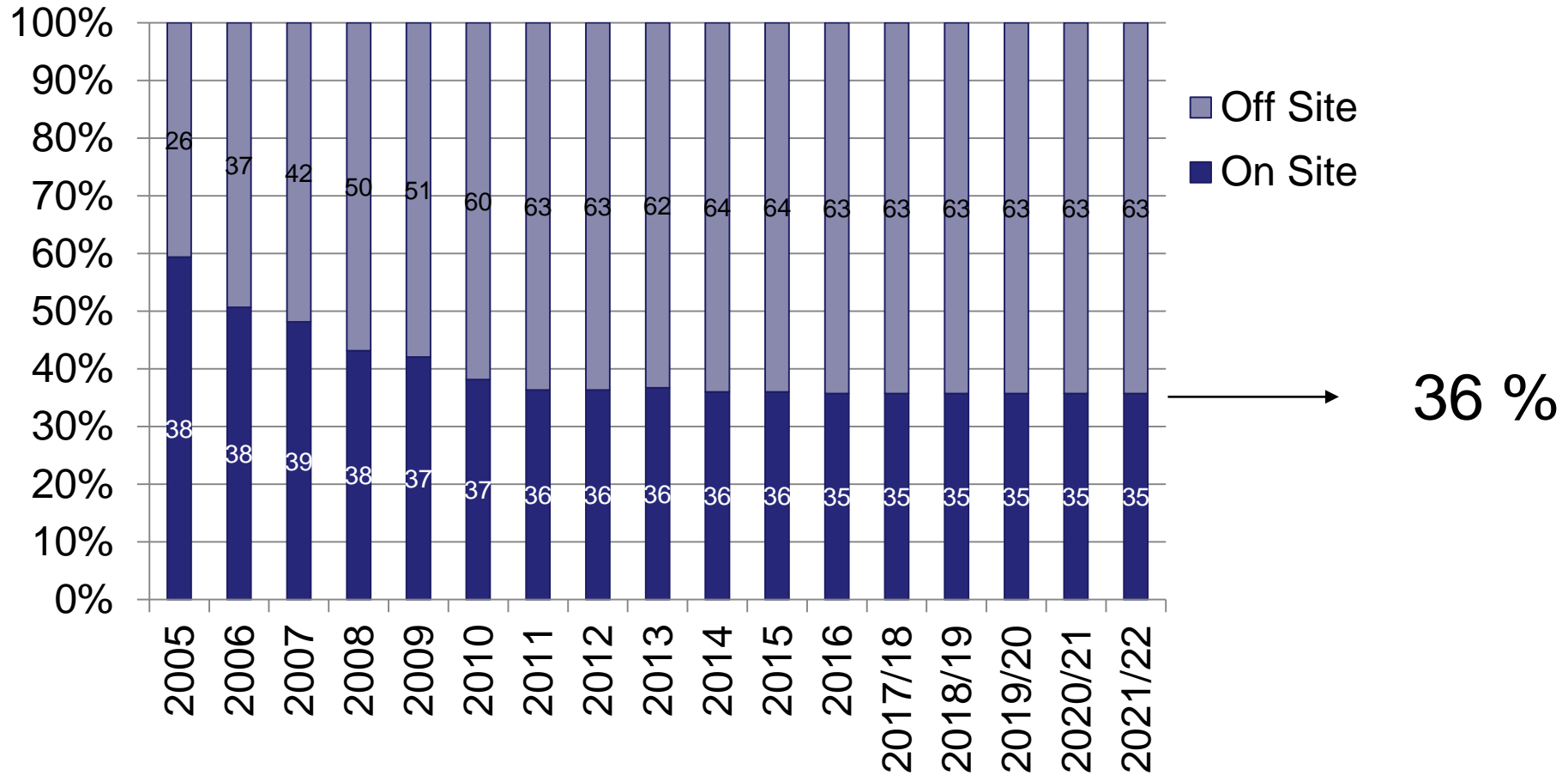
On v Off Site Surgery

All Centres (NHS and private)



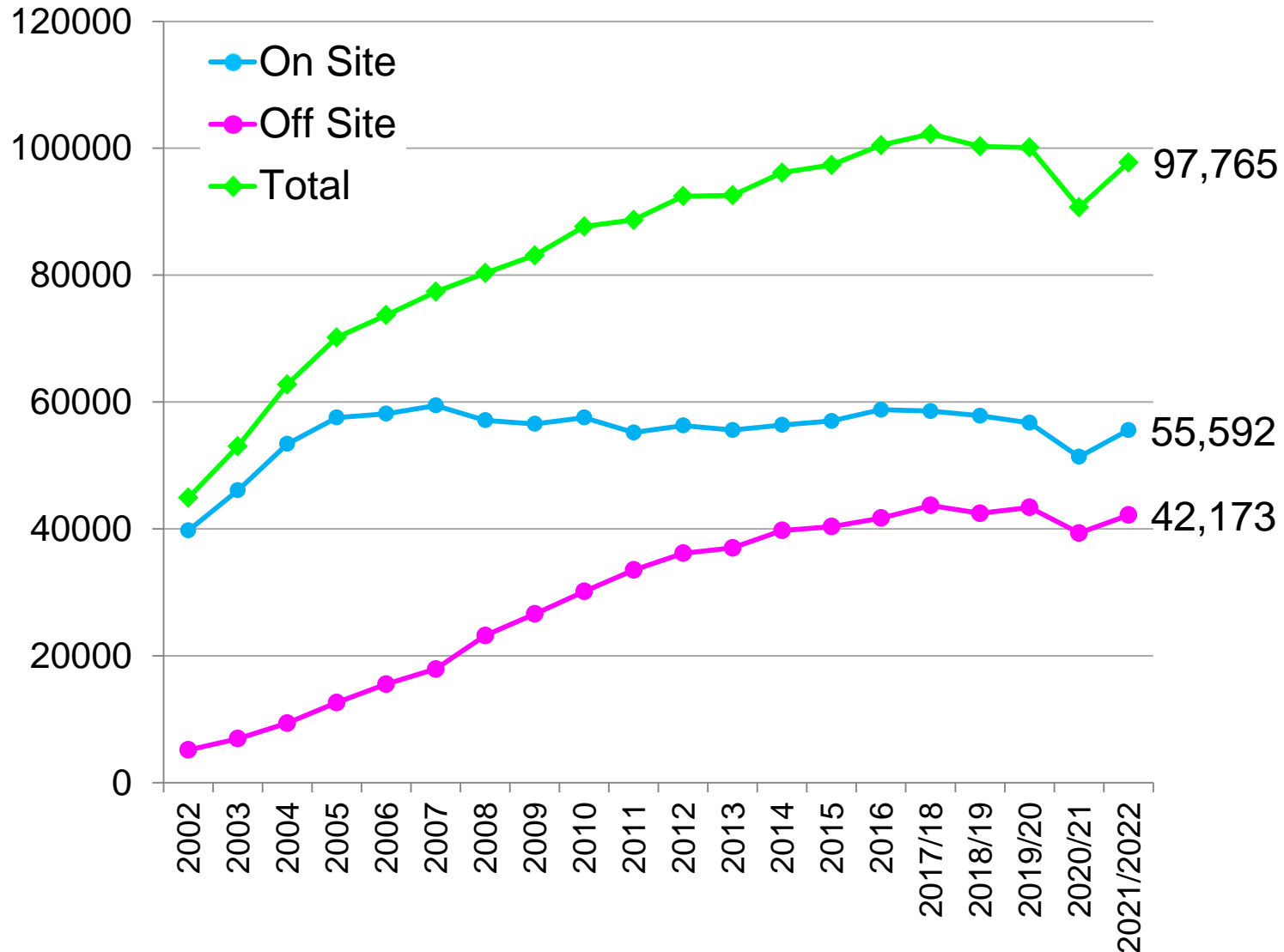
On v Off Site Surgery

NHS Centres Only



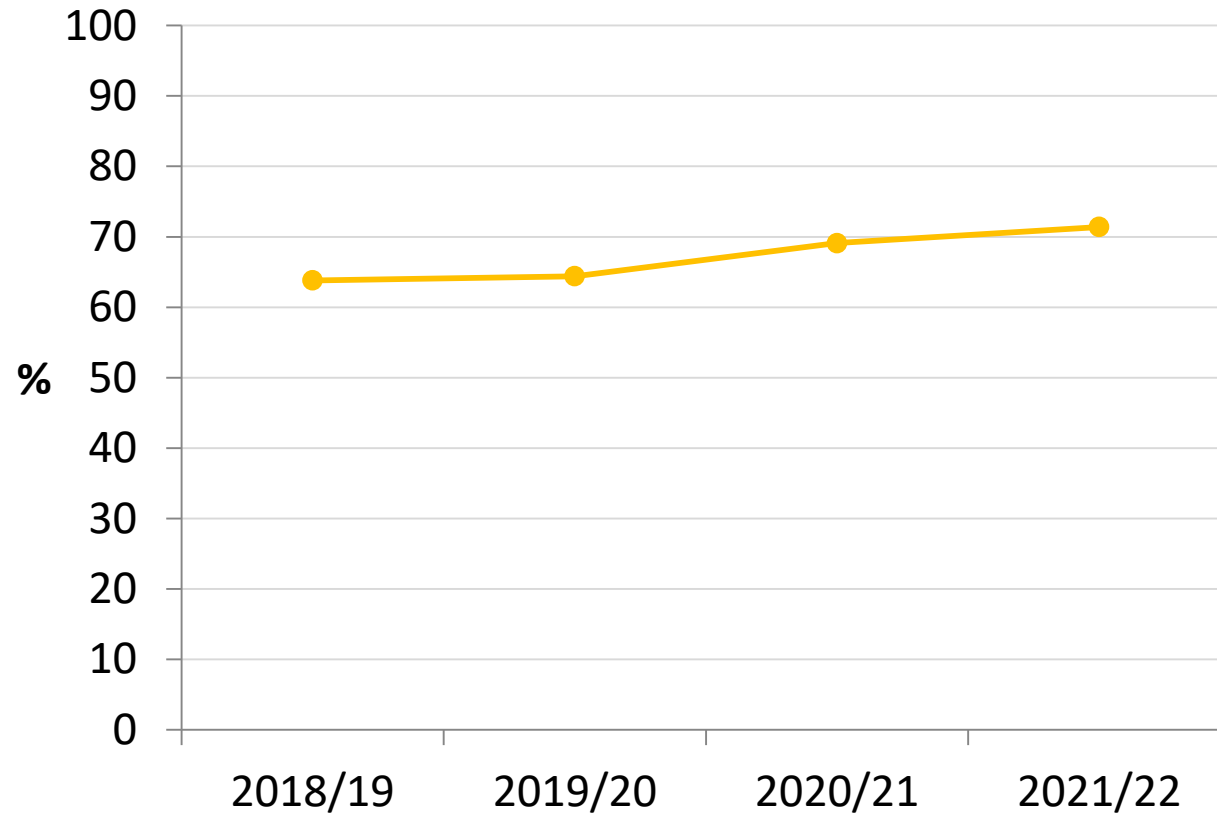
Total Number of PCIs

By Surgical cover NHS & Private

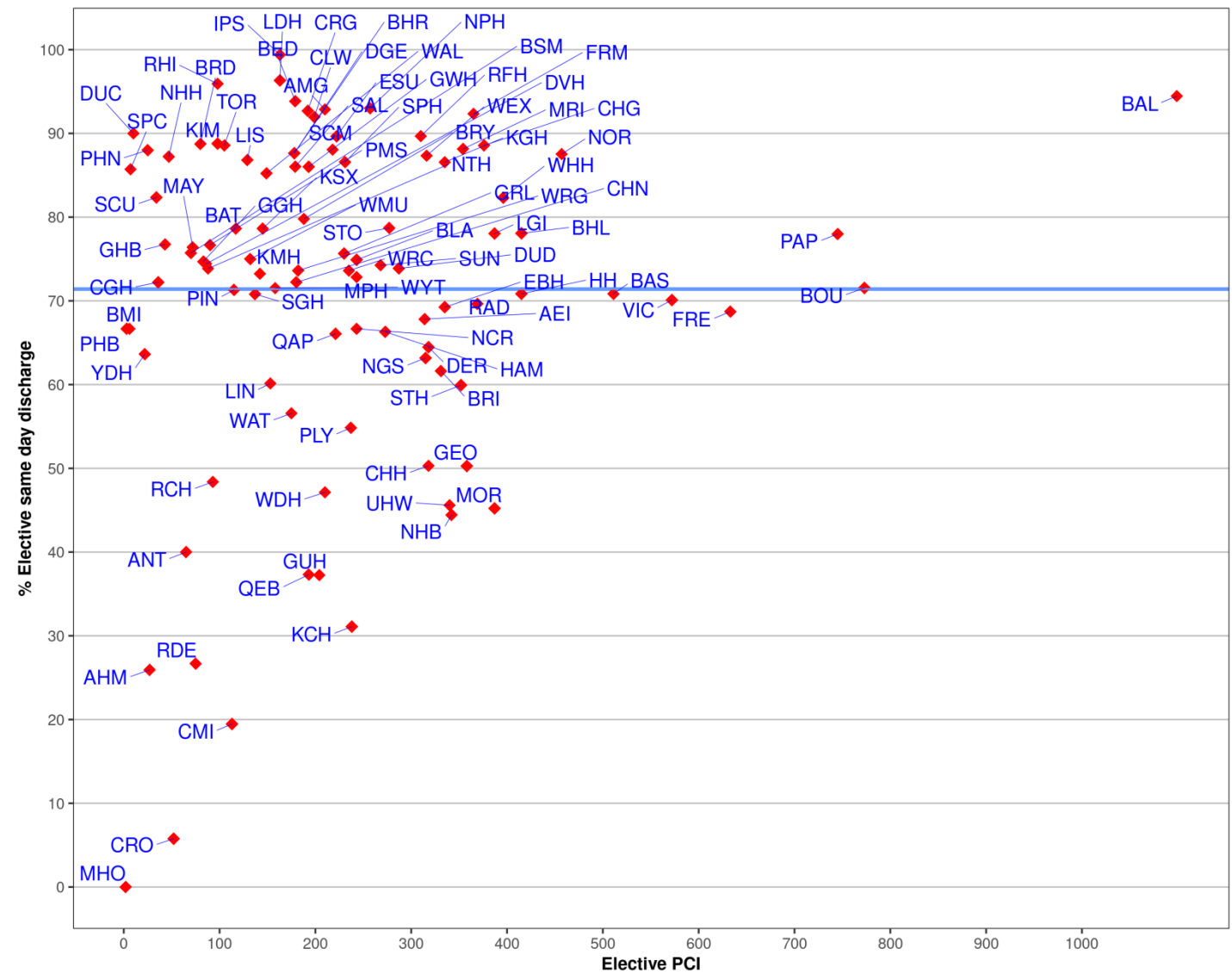


Day Case PCI

Elective Procedures - Trends

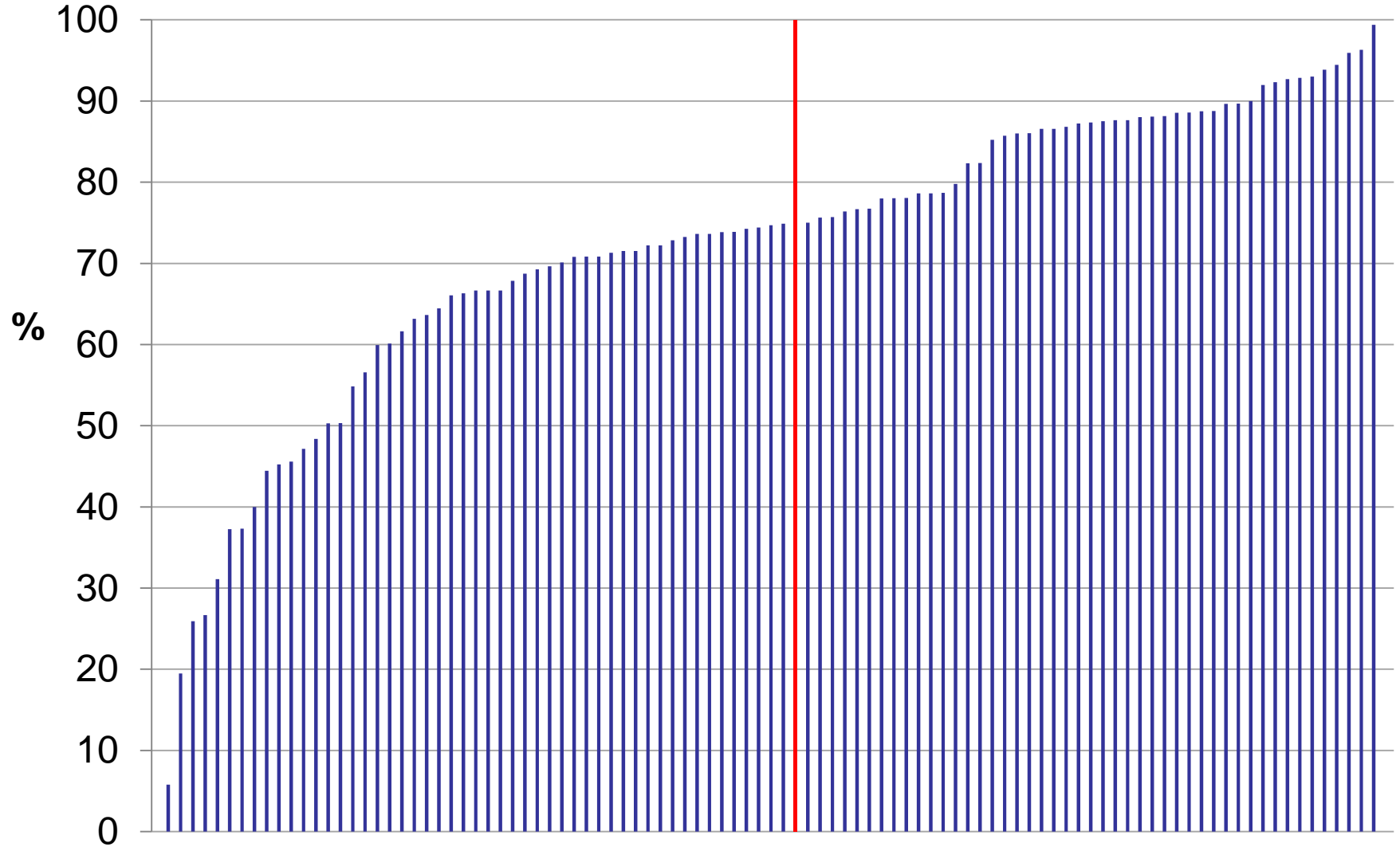


Day Case PCI Elective Procedures



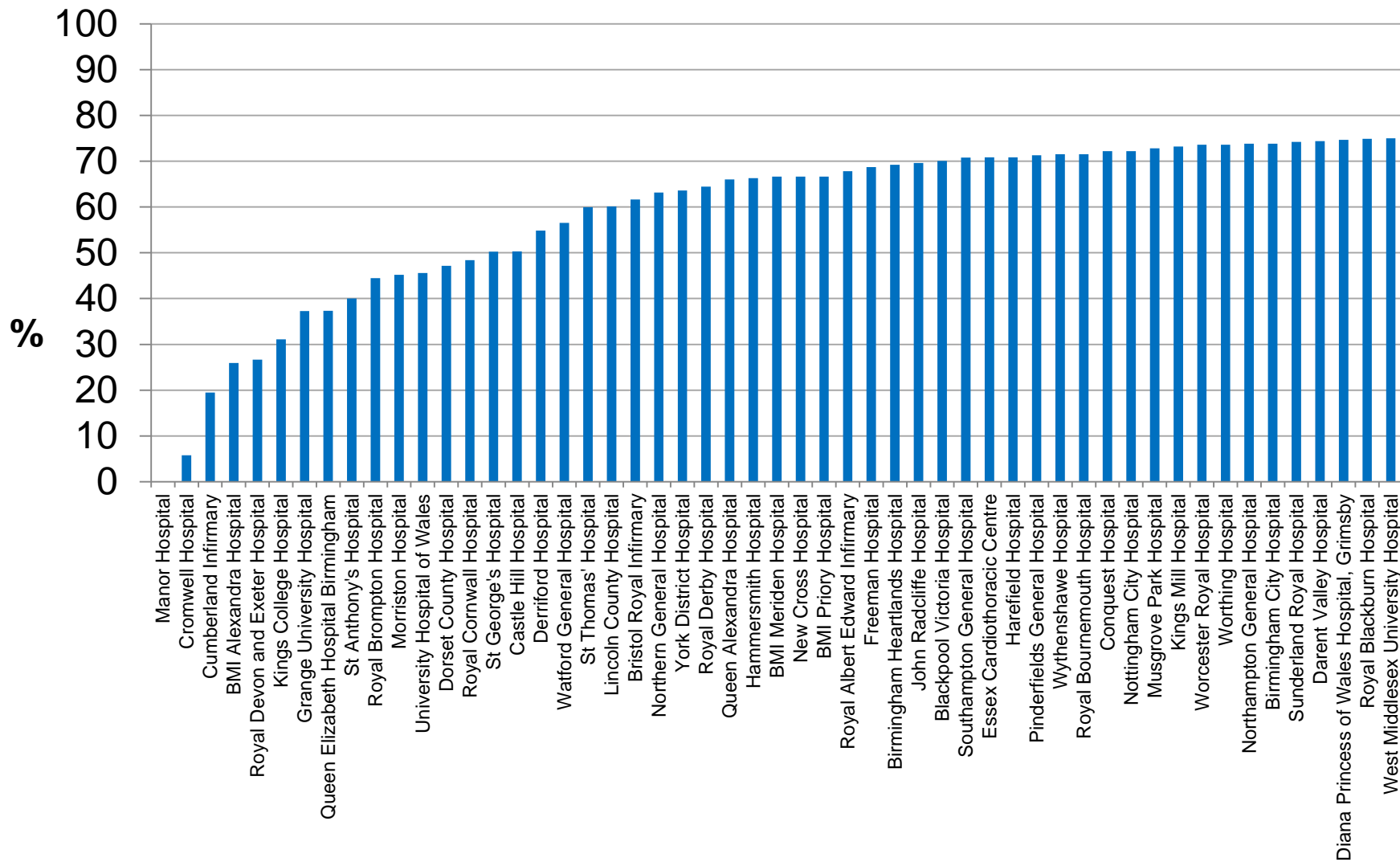
Day Case PCI

Planned Elective Procedures



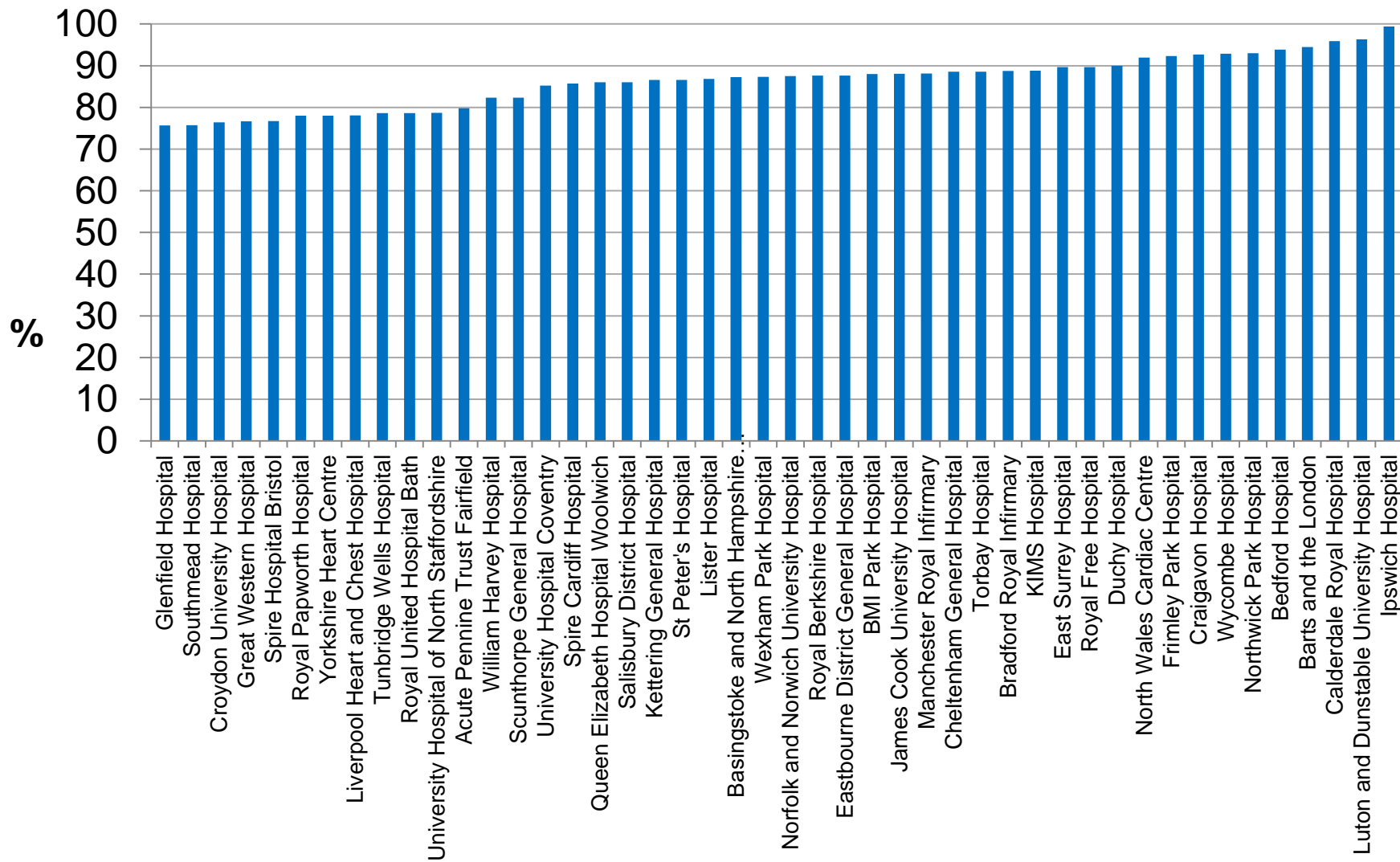
Day Case PCI

Planned Elective Procedures (0-75%)



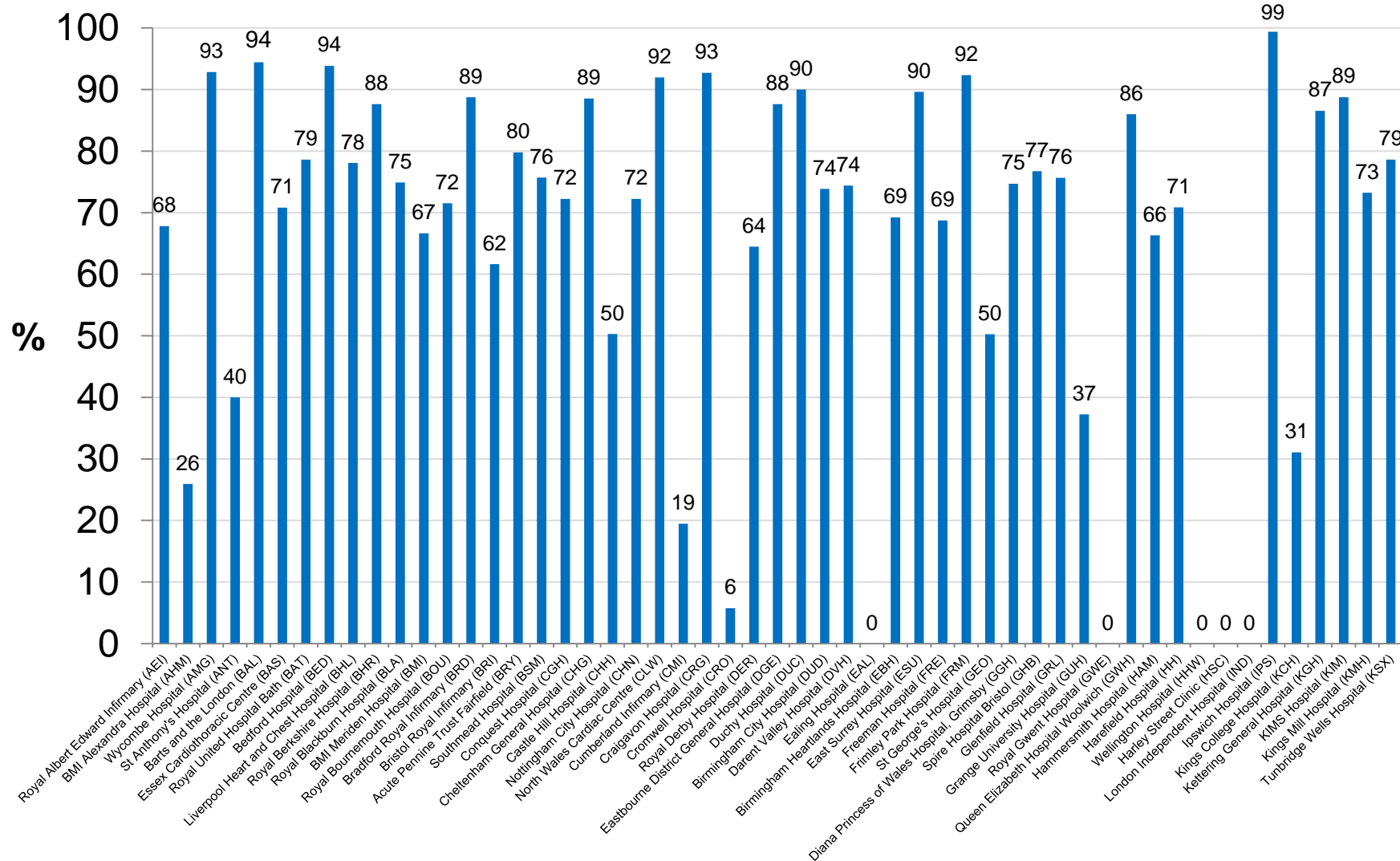
Day Case PCI

Planned Elective Procedures (>75%)



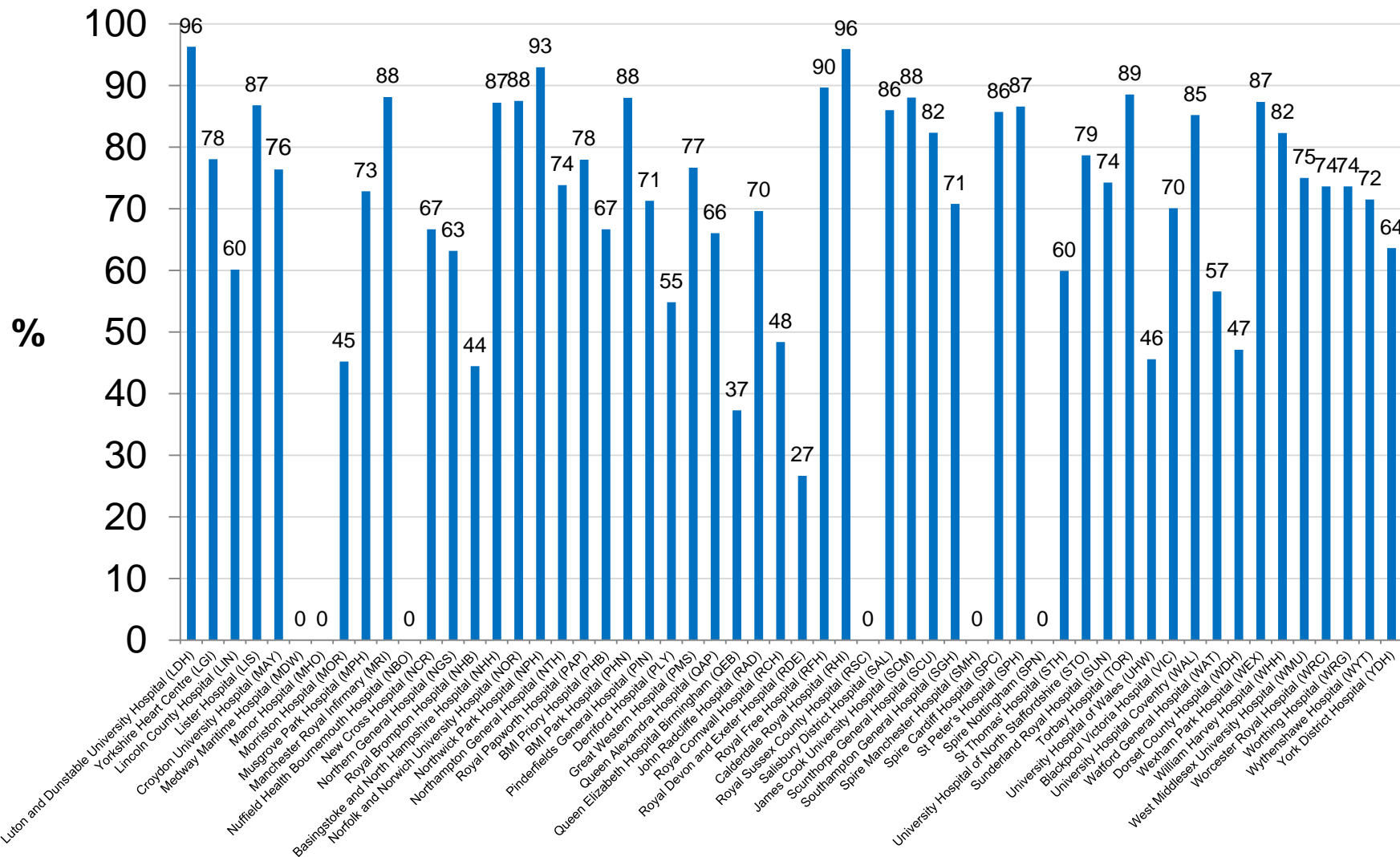
Day Case PCI

Planned Elective Procedures (Hospital code A-K)

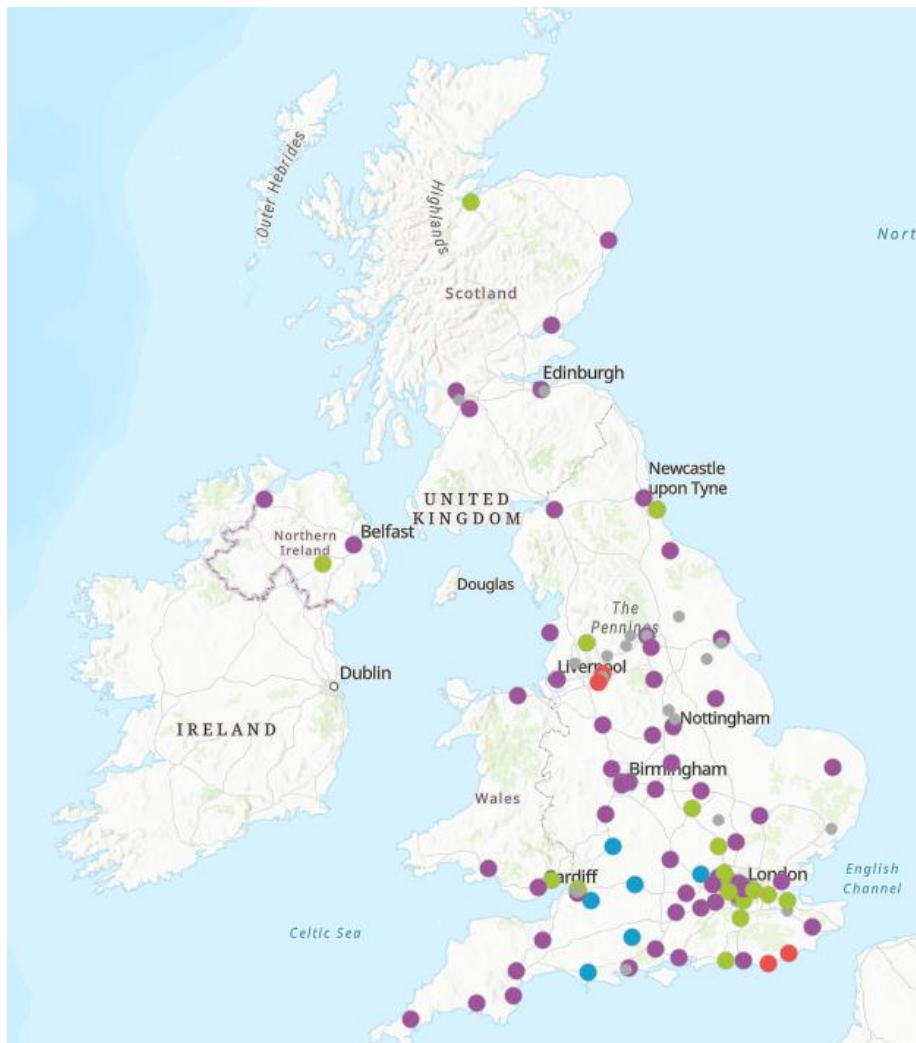


Day Case PCI

Planned Elective Procedures (Hospital code L-Y)



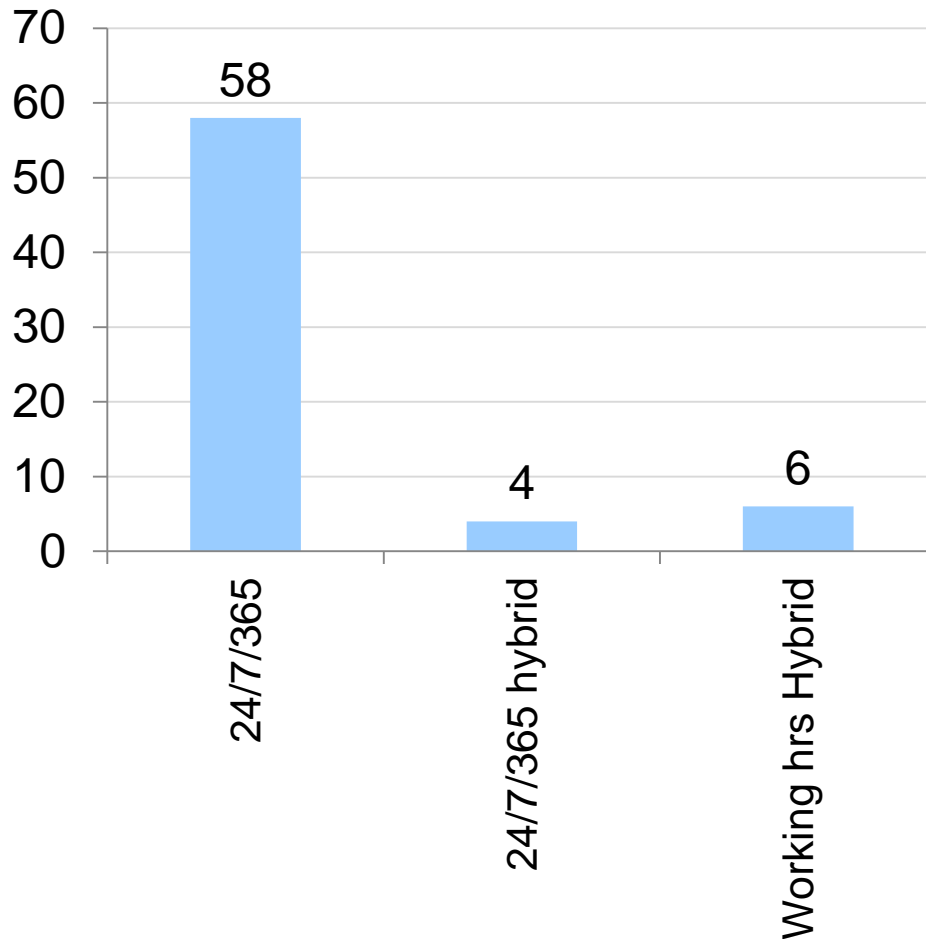
Primary PCI 2021/22



Interactive map: <https://arcg.is/0uW0av>

Primary PCI

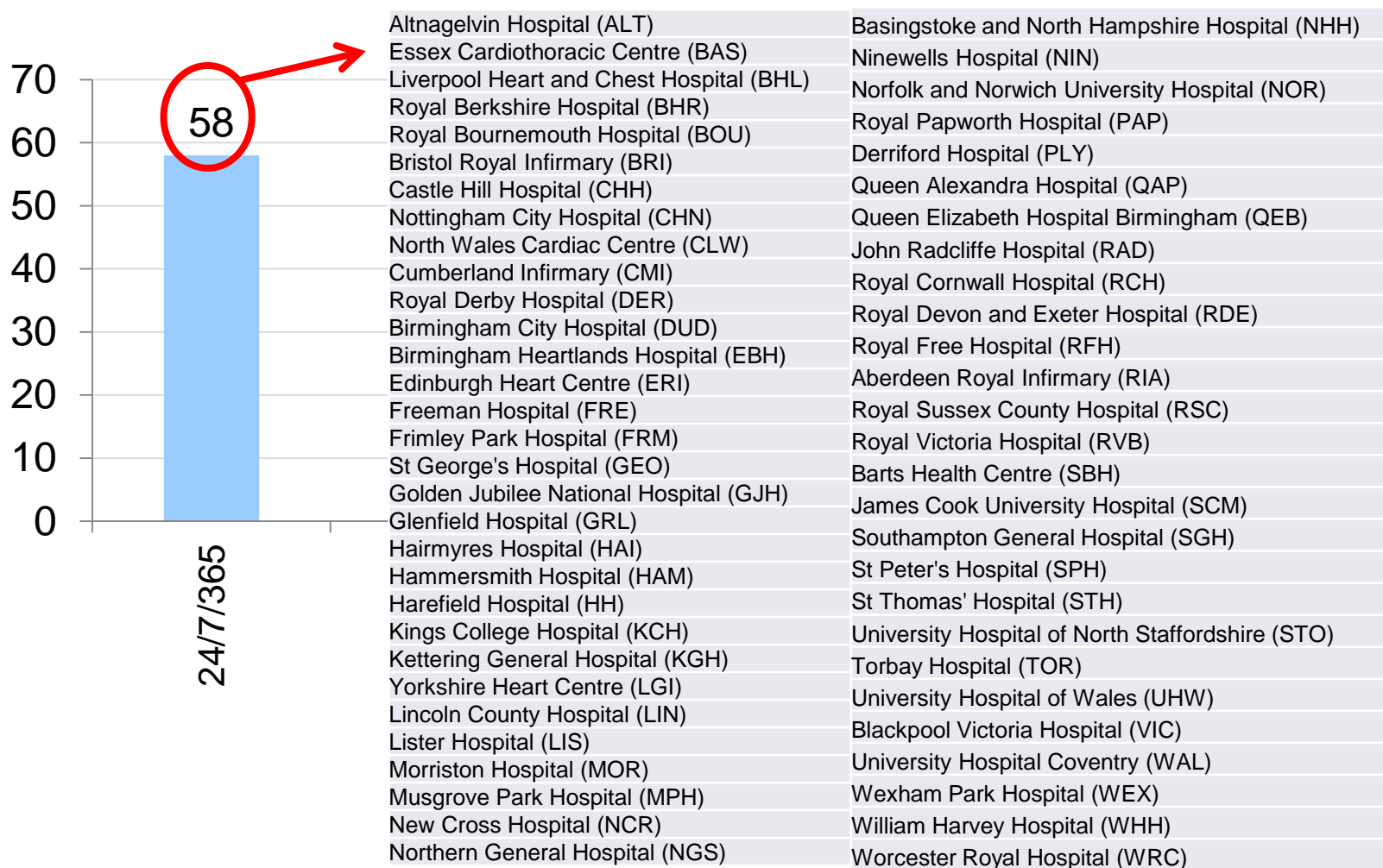
Pattern of activity offered (NHS 2021/22)



Paramedic Destinations
for STEMI:
68 Centres

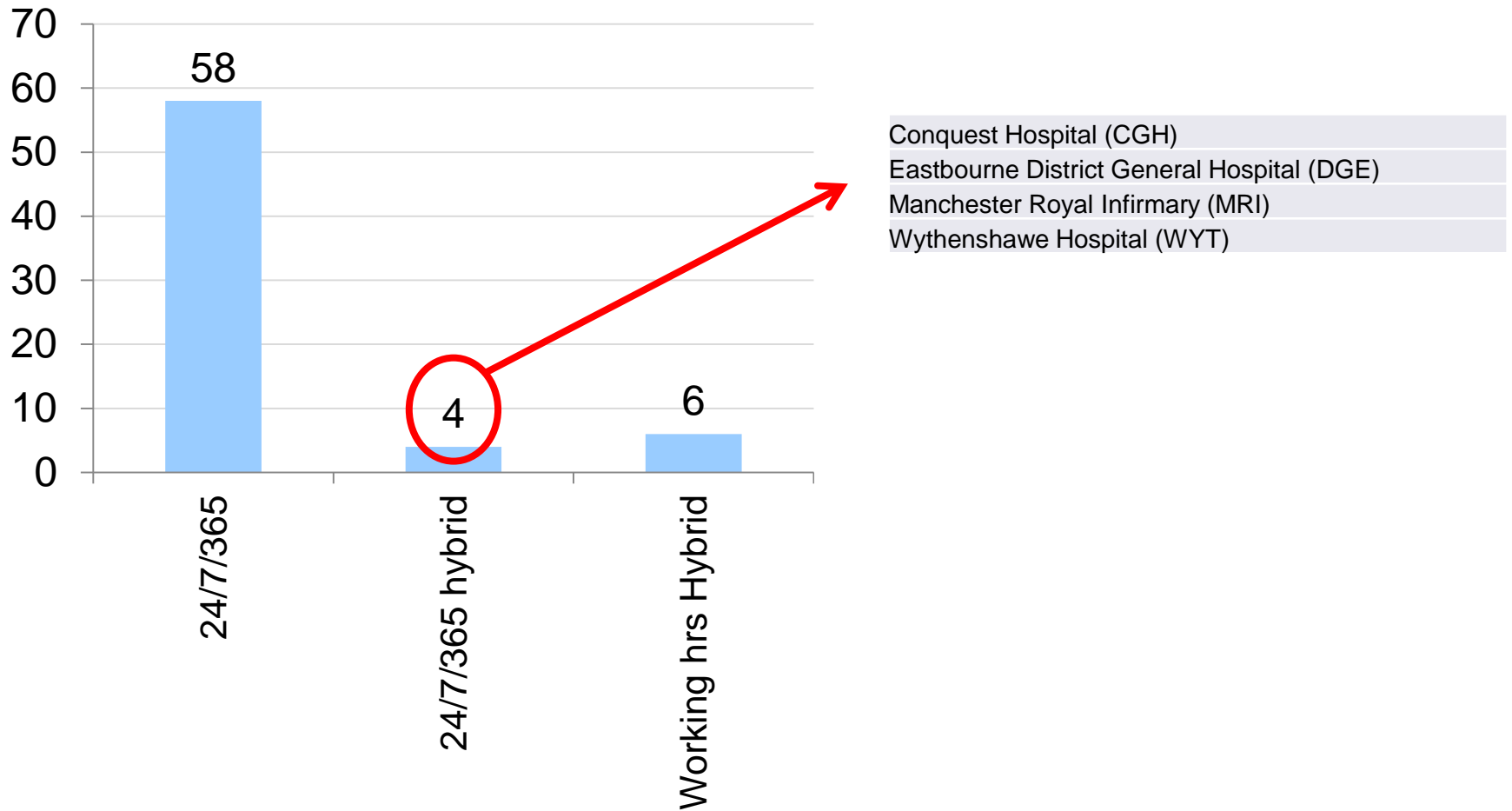
Primary PCI

Pattern of activity offered (NHS 2021/22)



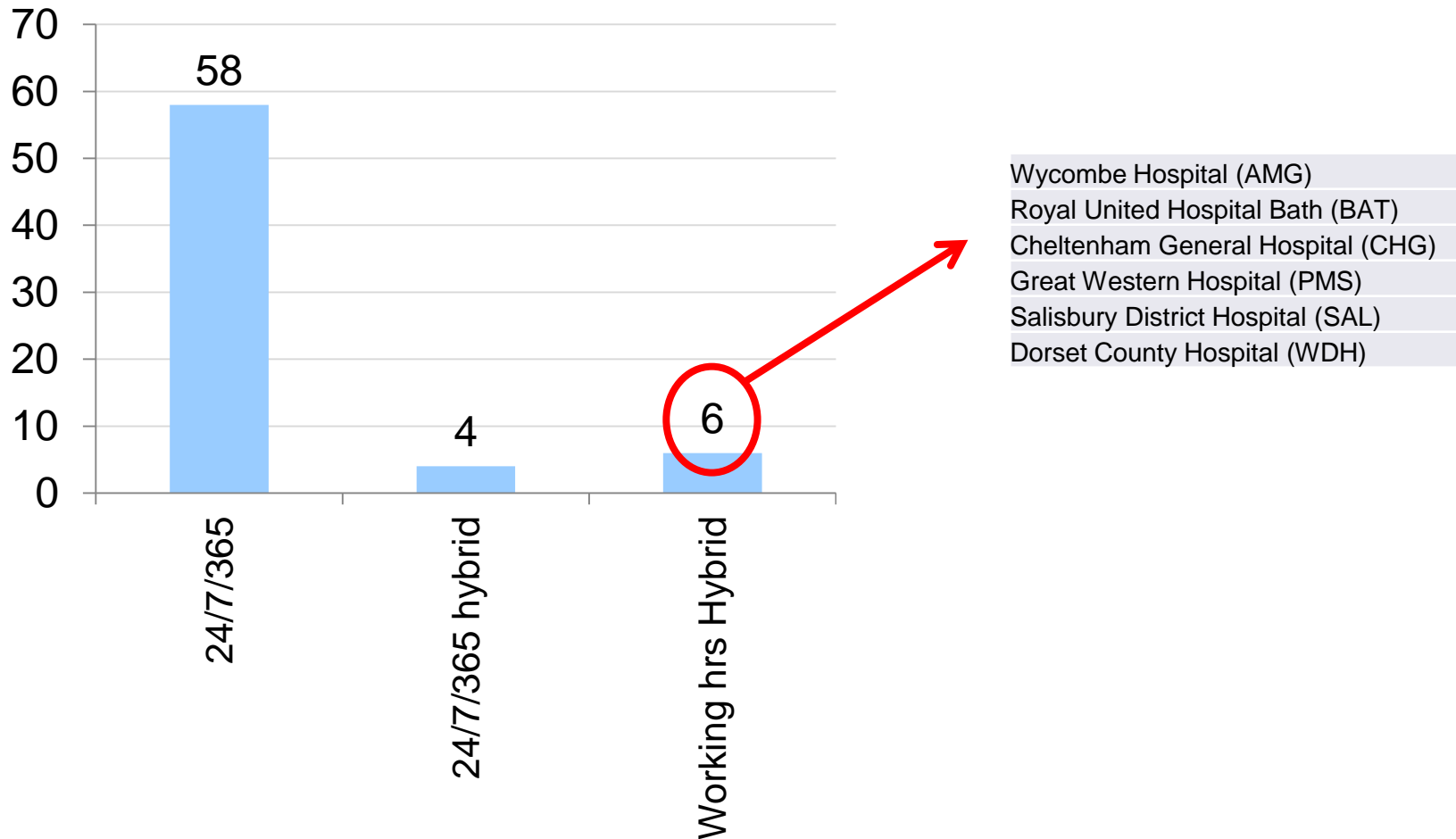
Primary PCI

Pattern of activity offered (NHS 2021/22)



Primary PCI

Pattern of activity offered (NHS 2021/22)



Routine Repatriation

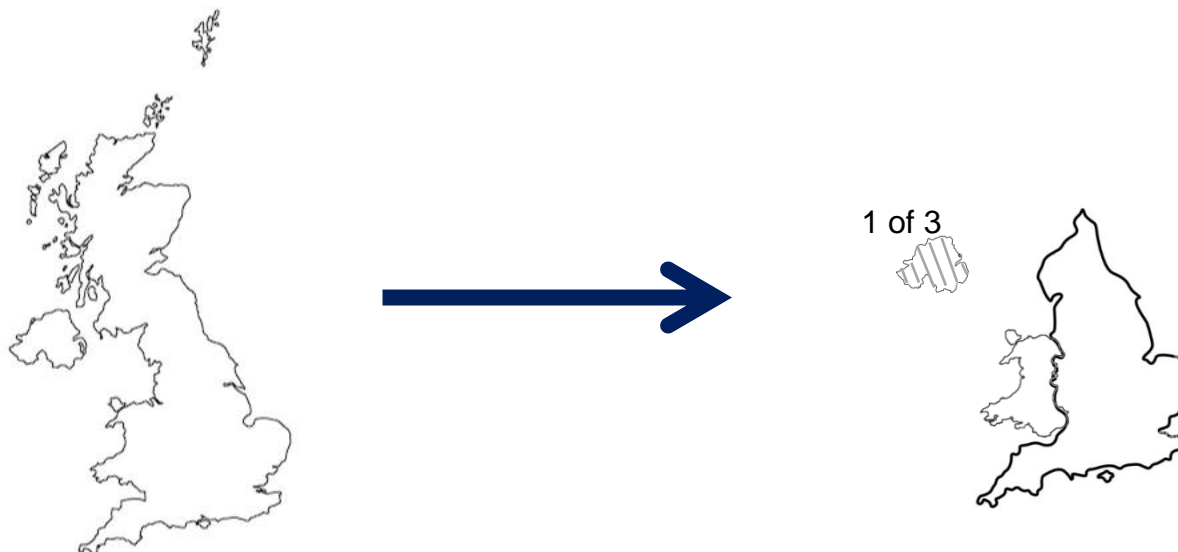
Following Primary PCI for STEMI

20 Centres

Altnagelvin Hospital (ALT)
Royal Blackburn Hospital (BLA)
Conquest Hospital (CGH)
Nottingham City Hospital (CHN)
Eastbourne District General Hospital (DGE)
Edinburgh Heart Centre (ERI)
Golden Jubilee National Hospital (GJH)
Grange University Hospital (GUH)
Hairmyres Hospital (HAI)
Kings College Hospital (KCH)
Yorkshire Heart Centre (LGI)
Morrison Hospital (MOR)
Musgrove Park Hospital (MPH)
Manchester Royal Infirmary (MRI)
Northern General Hospital (NGS)
Ninewells Hospital (NIN)
Royal Victoria Hospital (RVB)
University Hospital of Wales (UHW)
West Middlesex University Hospital (WMU)
York District Hospital (YDH)

Audit Presentation

- PCI
 - Survey (UK)
 - PCI procedural data (E&W)
- Structural Intervention
- NICOR update



Procedure Specific Data Analysis

- Data Quality
 - Centre participation
 - Case ascertainment
 - Data completeness

Procedure Specific Data Analysis

- Data Quality
 - Centre participation
 - Case ascertainment
 - Data completeness

Procedure Specific Analysis

Participation in NICOR 2021/22

		Total No. of Centres	Data to NICOR	Missing
England	NHS	85	83	2
	Private	18	10	8
Wales	NHS	4	4	0
	Private	1	1	0
N Ireland		3	1	2
Scotland	NHS	6	0	6
	Private	2	0	2

Procedure Specific Analysis

Participation in NICOR 2021/22

		Total No. of Centres	Data to NICOR	Missing
England	NHS	85	83	2
	Medway Maritime Hospital (MDW)			8
	<i>Currently updating data collection processes for the future</i>			0
	Royal Sussex County Hospital (RSC)			0
	<i>Export file mapping error to be corrected</i>			0
	Private	1	1	0
N Ireland		3	1	2
Scotland	NHS	6	0	6
	Private	2	0	2

Procedure Specific Analysis

Participation in NICOR 2021/22

		Total No. of Centres	Data to NICOR	Missing
England	NHS	85	83	2
	Private	18	10	8
Wellington Hospital (HHW)				0
Harley Street Clinic (HSC)				0
London Bridge Hospital (LBH)				2
Nuffield Health Bournemouth Hospital (NBO)				6
Spire Manchester Hospital (SMH)				2
Spire Nottingham Hospital (SPN)				2
Spire Hospital Hull and East Riding (HBP)				
Leeds Nuffield Hospital (LNH)				

Procedure Specific Analysis

Participation in NICOR 2021/22

		Total No. of Centres	Data to NICOR	Missing
England	NHS	85	83	2
	Private	18	7	8
Wales	NHS	4	4	0
	Private	1	1	0
Northern Ireland	NHS	3	1	2
	Private	6	0	6
	Private	2	0	2



Procedure Specific Analysis

Participation in NICOR 2021/22

		Total No. of Centres	Data to NICOR	Missing
England	NHS	85	83	2
	Private	18	7	8
Altnagelvin Hospital (ALT)			4	0
Royal Victoria Hospital (RVB)			1	0
N Ireland		3	1	2
Scotland	NHS	6	0	6
	Private	2	0	2

Procedure Specific Analysis

Participation in NICOR 2021/22

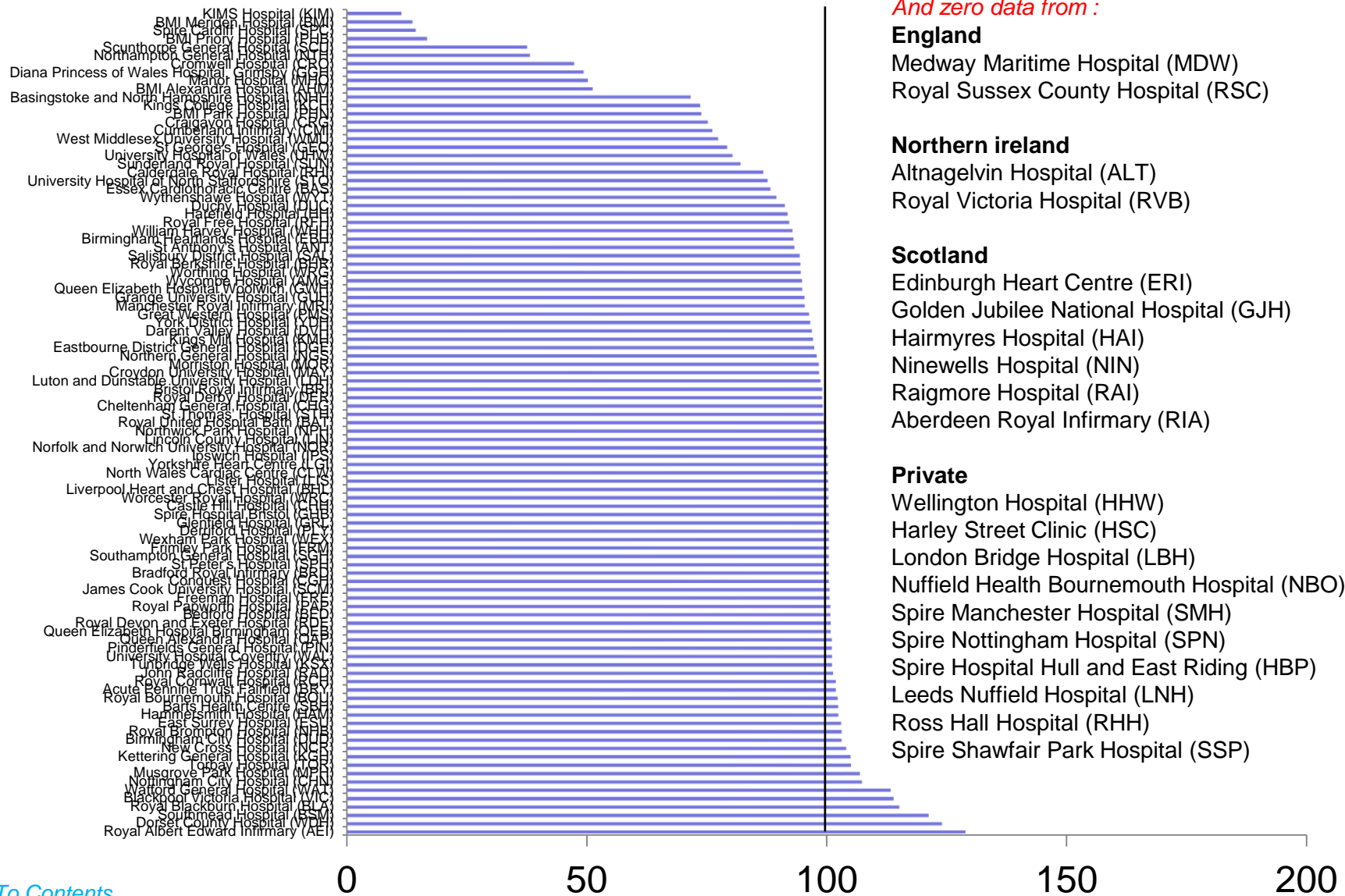
		to		Missing
		R		
Edinburgh Heart Centre (ERI)				
Golden Jubilee National Hospital (GJH)				
Hairmyres Hospital (HAI)				2
Ninewells Hospital (NIN)				8
Raigmore Hospital (RAI)				0
Aberdeen Royal Infirmary (RIA)				0
Ross Hall Hospital (RHH)				2
Spire Shawfair Park Hospital (SSP)				0
Scotland	NHS	6	0	6
	Private	2	0	2

Procedure Specific Data Analysis

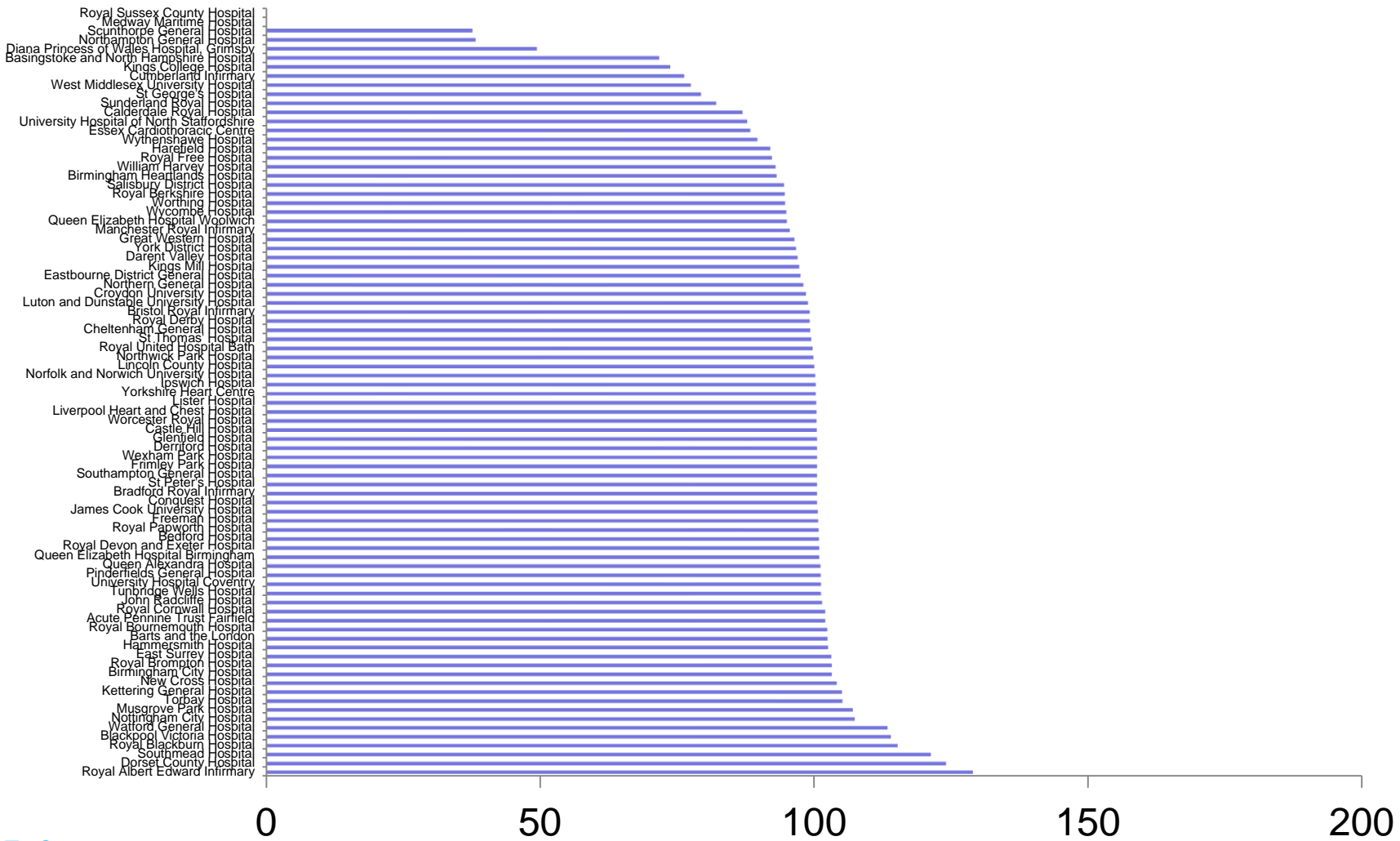
- Data Quality
 - Centre participation
 - Case ascertainment
 - Data completeness

NICOR Case Ascertainment

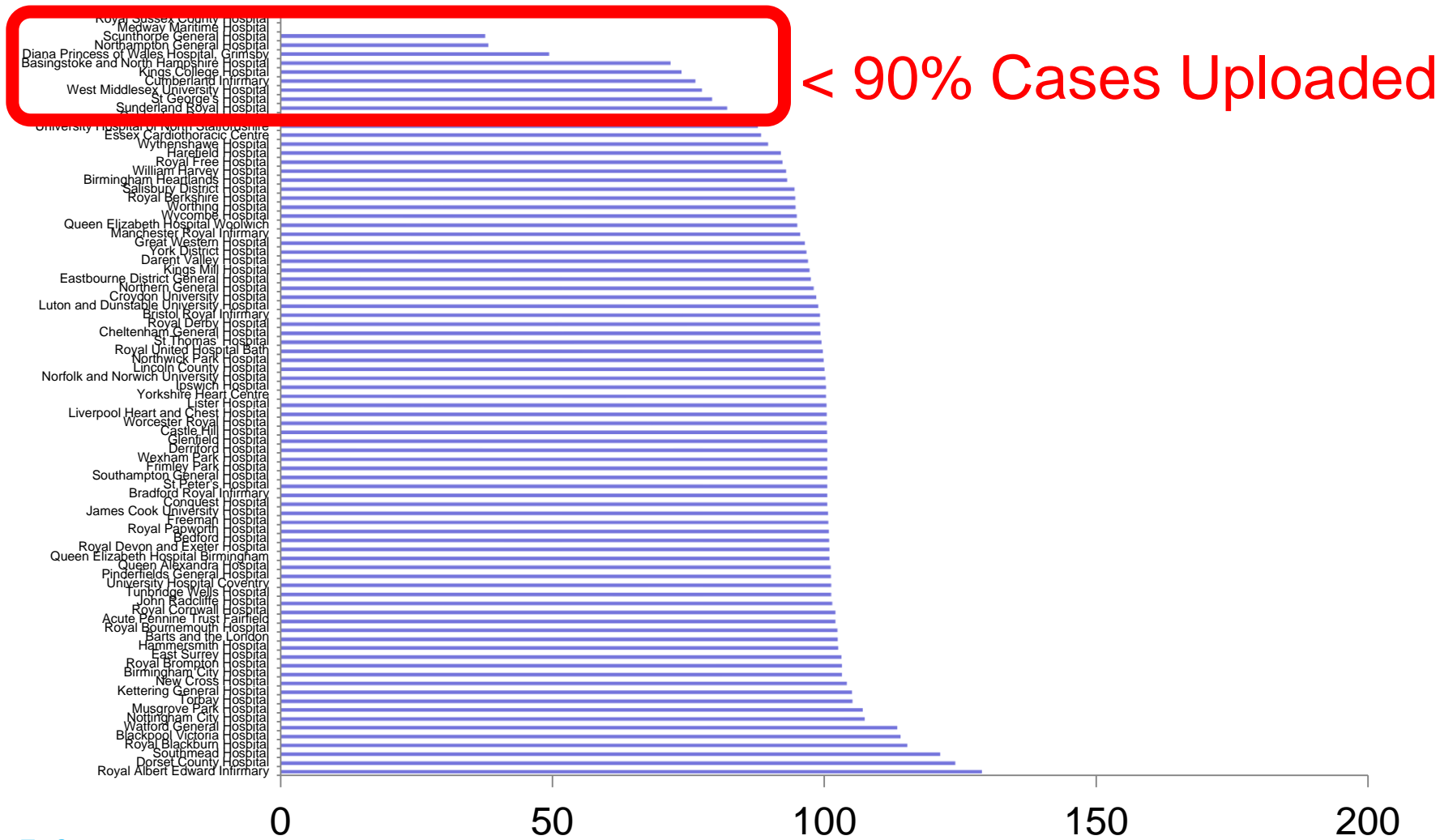
UK PCI data in NICOR as % of Reported Totals



NICOR Case Ascertainment England and Wales NHS Centres PCI data in NICOR as % of Reported Totals



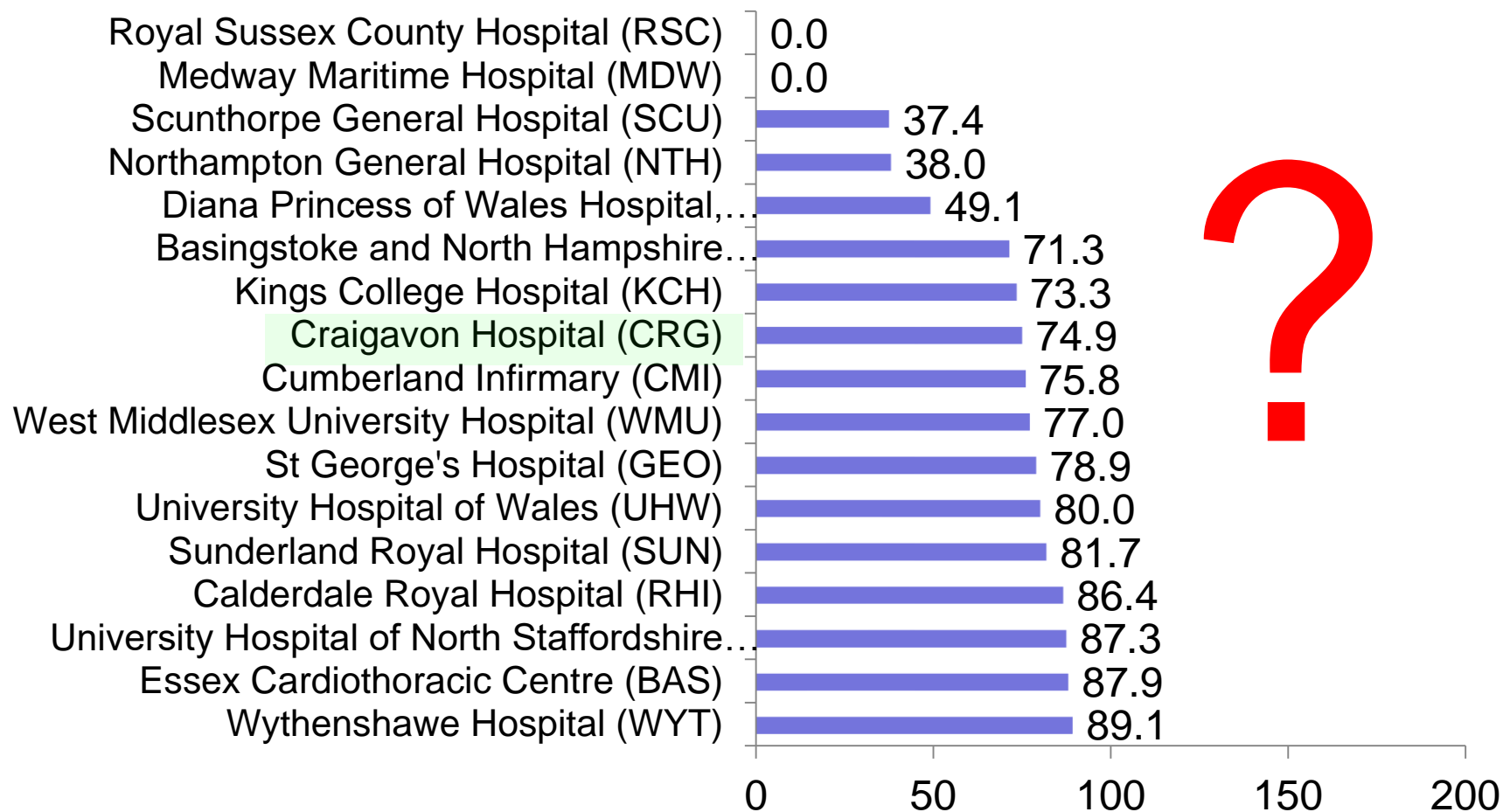
NICOR Case Ascertainment England and Wales NHS Centres PCI data in NICOR as % of Reported Totals



NICOR Case Ascertainment England and Wales NHS Centres

PCI data in NICOR as % of Reported Totals

< 90% Cases Uploaded



Data Entry



Direct

Patient	Pre-PCI Status	Medical History	Shock/O
Patient			
Hospital Identifier *			
Local Patient Identifier *			
Patient Name (Surname)			
Patient Name (Forename)			

CSV

CSV Import Process

Upload File

required to save record

Uploading by: PETER LUDMAN@NICOR

Hospital exporting: QEB

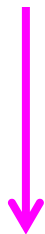
Date: 20/12/2018 09:44

Audio: Please Select

Select CSV file:

© 2018 National Institute For Cardiovascular Outcomes Research (NICOR) in collaboration with Uppsala Clinical Research Centre
NICOR User Guide
For Technical Support call 0203 765 2000 or email your feedback@camhospitals.nhs.uk

PCI



Local
database

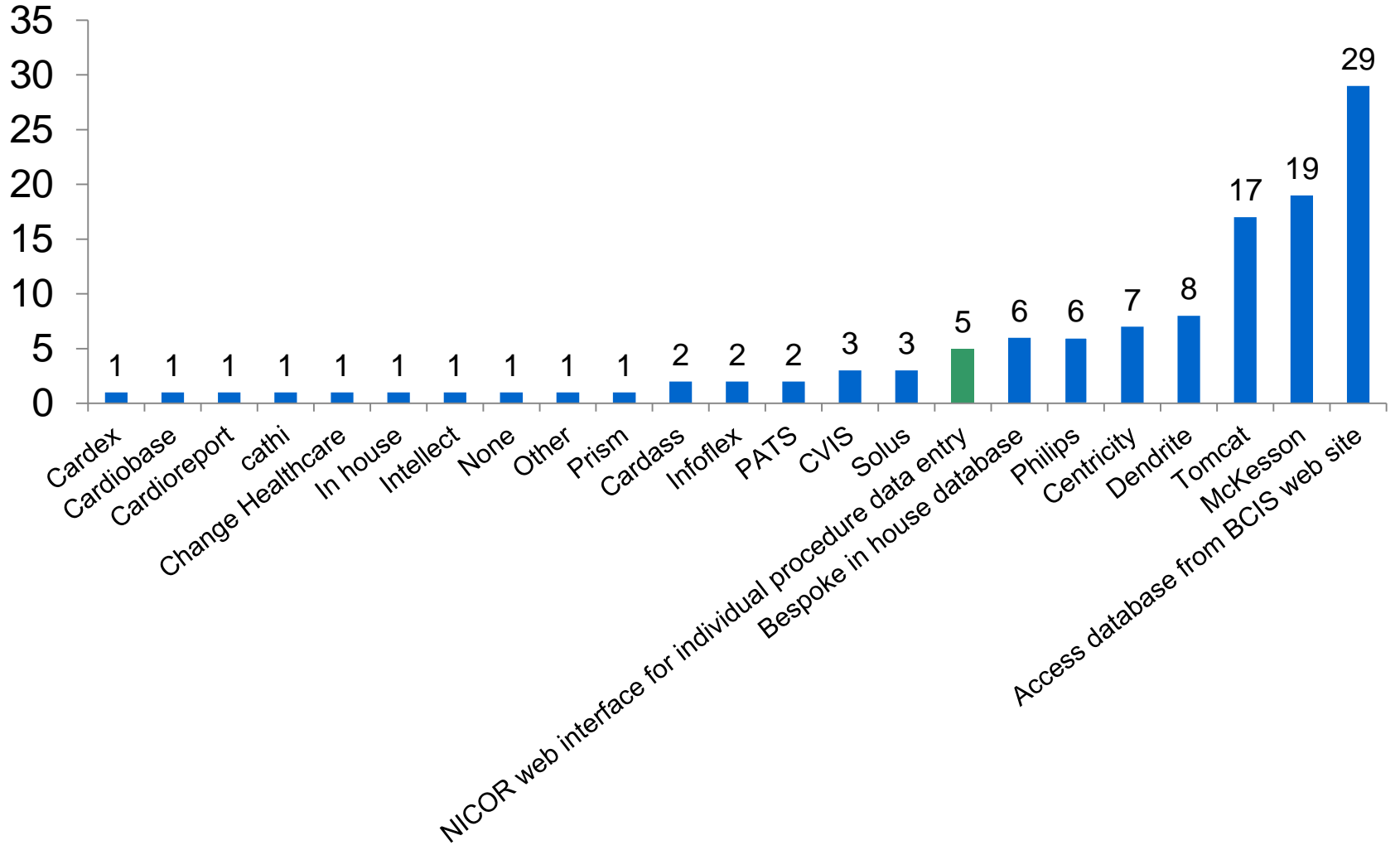


csv file
export



Data Gathering Software

2021/22



Procedure Specific Data Collection

The screenshot shows the NICOR Web Portal interface. The browser address bar displays <https://ncap.nicor.org.uk/web/restricted>. The page title is "NICOR Web Portal" and the user is logged in as "NICOR". The navigation menu includes "Home", "Search Patient", "Import", "Export", "Completeness", and "Logout". The domain is "PCI" and the hospital is "QEB, Queen Elizabeth Hospital, Edgbaston". The user is "PETER LUDMAN/QEB/NICOR".

The main content area is titled "CSV Import Process". A red box highlights the "Upload File" button. Below this, there are several form fields:

- A red asterisk indicates a required field: "* needed to save record".
- "Uploading by": PETER LUDMAN/QEB/NICOR
- "Hospital importing *": QEB
- "Date": 20/12/2018 09:44
- "Audit *": Please Select (dropdown menu)
- "Select CSV file *": Browse... (button)

© 2018 National Institute For Cardiovascular Outcomes Research (NICOR) in collaboration with Uppsala Clinical Research Centre

NCAP User Guide

For Technical Support call: 0203 765 8550 or email nicor-helpdesk@bartshhealth.nhs.uk

Procedure Specific Data Collection

Home Search Patient **Import** Export Data completeness User Reports QI Resources Data submission timeliness

Domain: PCI | Hospital : QEB. Queen Elizabeth Hospital, Edgbaston | PETER I

Data Import Process

BCIS.csv file uploaded successfully and placed in queue

The Import process runs every 5 minutes and your import should be processed shortly. Please note that it may take up to 45 minutes depending on the number of requests.

In the meantime, you do not need to stay on this page, and you can close your web browser and shut down your computer. To check that the import is completed, go to "Previous imports" on the Import menu. If it's complete there will be a link to the import log file. If your import has not been processed after 45 minutes, please contact the Helpdesk.

[Check Status](#)

Procedure Specific Data Collection

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"

Uploaded Date	Dataset Version	Records Count							Messages Count			Status	Log	CSV	Excel
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious	Fatal				
07/01/202313:59	Pci_5.6.5	0	0	0	0	0	0	0	0	0	0	In Progress	NA	NA	-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-
15/12/202215:33	Pci_5.6.5	766	1	0	1	0	0	764	4	0	0	Completed			-

Procedure Specific Data Collection

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"





Uploaded Date	Dataset Version	Records Count							Messages Count			Status	Log	CSV	Excel
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious	Fatal				
07/01/202313:59	Pci_5.6.5	0	0	0	0	0	0	0	0	0	0	In Progress	NA	NA	-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-
15/12/202215:33	Pci_5.6.5	766	1	0	1	0	0	764	4	0	0	Completed			-

Procedure Specific Data Collection

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"





Uploaded Date	Dataset Version	Records Count							Messages Count			Status	Log	CSV	Excel
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious	Fatal				
07/01/202313:59	Pci_5.6.5	818	22	1	10	0	1	784	6	2	1	Completed			-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-

Procedure Specific Data Collection

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"

Uploaded Date	Dataset Version	Records Count						Messages Count			Status	Log	CSV	Excel	
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious					Fatal
07/01/202313:59	Pci_5.6.5	818	22	1	10	0	1	784	6	2	1	Completed			-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-

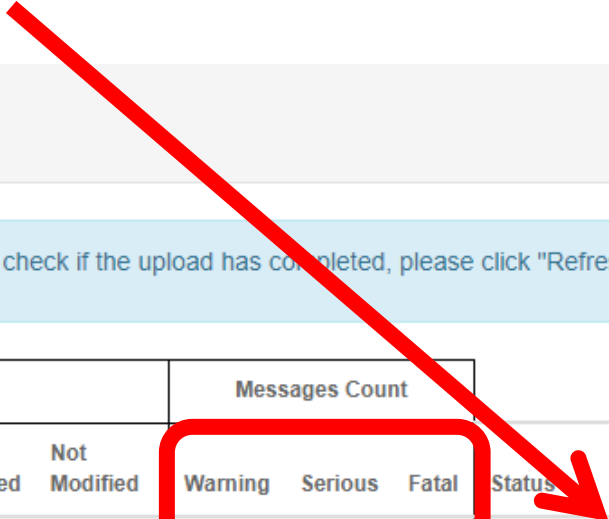
Procedure Specific Data Collection

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"

Uploaded Date	Dataset Version	Records Count							Messages Count			Status	Log	CSV	Excel
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious	Fatal				
07/01/202313:59	Pci_5.6.5	818	22	1	10	0	1	784	6	2	1	Completed			-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-



Procedure Specific Data Collection

	A	B	C	D	E	F	G	H	I	J	K
1	RECORD SEQUENCE NUMBER	LOG ENTRY DATE"	SURN AME	FORE NAME	HOSPITAL NUMBER	DATE_AND_TIME_OF_OPERATION	CONSULTANT RESPONSIBLE FOR PROCEDURE_GMC_NUMBER	TYPE	LOG		
2	334	07/01/2023 14:01				21/05/2022 19:46	4077196	WARNING	Out of Hospital Arrest is 1. Yes and Arterial blood gas on arrival: Base is blank		
3	334	07/01/2023 14:01				21/05/2022 19:46	4077196	WARNING	Out of Hospital Arrest is 1. Yes and Arterial blood gas on arrival: Lactate is blank		
4	334	07/01/2023 14:01				21/05/2022 19:46	4077196	WARNING	Out of Hospital Arrest is 1. Yes and Arterial blood gas on arrival: ph is blank		
5	368	07/01/2023 14:01				06/06/2022 17:21	4077196	WARNING	Clinical syndrome (PCI) is option 1 Stable and Enzymes Post-op is option 2. Major elevation >= X5 ULN		
6	700	07/01/2023 14:01				15/11/2022 13:25	2931874	SERIOUS	If Clinical Syndrome (PCI) is 2. Acute Coronary Syndrome and Admission route is 1. Direct to cardiac centre		
7	785	07/01/2023 14:01				23/12/2022 12:32	6048882	WARNING	No Mapping found for Variable Key REFERRING_HOSPITAL for value : ROH		
8	787	07/01/2023 14:01				26/12/2022 09:46	6111053	WARNING	Postcode Of Usual Address is in invalid format. Please check and enter valid Postcode		
9	813	07/01/2023 14:02				05/01/2023 16:48	7016501	SERIOUS	Number of stents used cannot be less than number of drug eluting stents used.		
10	818	07/01/2023 14:02				07/01/2023 13:39	4613174	FATAL	No 3.10 Vessel or 3.11 Lesion attempted and not an IVUS or FFR study (3.19 Diagnostic Device does not cont		

Previous imports for QEB

Refresh

The information regarding the status of your upload does not automatically refresh. To check if the upload has completed, please click "Refresh"

Uploaded Date	Dataset Version	Records Count							Messages Count			Status	Log	CSV	Excel
		Total	New Signed	New Draft	Modified Signed	Modified Draft	Rejected	Not Modified	Warning	Serious	Fatal				
07/01/202313:59	Pci_5.6.5	818	22	1	10	0	1	784	6	2	1	Completed			-
28/12/202216:01	Pci_5.6.5	794	29	0	6	1	0	758	6	1	0	Completed			-


Denominators in Analysis

- Interpreting the data
 - Data from the Annual Survey uses the Survey total as denominator for percentage calculations
 - Data from the Procedure specific analyses (i.e. data in the NICOR dataset) use the NICOR dataset totals for analysis
 - Data therefore missing from those centres not uploading
 - Also data missing from centres uploading less than 100% of cases
 - **Total number of PCI procedures 2021/22**
 - **Annual Survey: 97,765**
 - **NICOR dataset: 80,334**

Procedure Specific Data Analysis

- Data Quality
 - Centre participation
 - Case ascertainment
 - Data completeness

Procedure Specific Data Analysis

- Data Quality
 - Centre participation
 - Case ascertainment
 - Data completeness
- 
- Assessed for 3 scenarios:
 - 1. Risk adjusted outcomes
 - 2. Delays to treatment for Primary PCI
 - 3. Delays to treatment for UA / NSTEMI

NICOR Minimum Data Standard

- > 95% completeness

All PCI

1.03	NHS number (E&W)
1.06	Birth date
1.07	Sex
5.05	Medical History
2.13	Previous MI
5.06	History of renal disease
2.16	Diabetes
5.35	Creatinine
2.18	Weight
2.04	Cardiogenic shock (Pre- PCI)
2.03	Procedure urgency
3.09	Vessels attempted
4.04	Discharge date
4.03	Status at discharge
4.01	PCI Hospital outcome
5.31	Consultant responsible GMC Number
3.02	Consultant responsible Name

Primary PCI

(in community at symptom onset)

5.30	Location of Patient at STEMI onset
3.26	Date/time of first balloon inflation

PCI for all types of ACS

2.07	Date/time of symptom onset
5.27	Date/time of call for help
2.08	Date/time of arrival at first hospital
5.26	Date/time of arrival at PCI hospital
2.09	Admission Route

Data Completeness Tool

The screenshot displays the Data Completeness Tool interface. At the top, a navigation bar includes links for Home, Search Patient, Import, Export, Data completeness, User Reports, QI Reports, and QI Resources. A green box on the right indicates the current context: Domain: PCI | Hospital: QEB. C. Below the navigation bar, the main content area features the NICOR logo, a 'Data Completeness' header with a grid icon, and a 'Calculate Completeness' button. The main form contains three input fields: 'Audit' (a dropdown menu with 'Please Select' selected), 'Date Interval' (a date picker with 'DD/MM/YYYY' entered), and 'Report Level' (a dropdown menu with 'COMPLETE' selected). A red box highlights the 'Data completeness' menu item in the navigation bar, and a red arrow points from this box to the 'Data completeness' menu item in the main content area.

Home Search Patient Import Export **Data completeness** User Reports QI Reports QI Resources Domain: PCI | Hospital: QEB. C.

NICOR Data Completeness Calculate Completeness

Audit Please Select

Date Interval DD/MM/YYYY And DD/MM/YYYY

Report Level COMPLETE

Data completeness User Reports QI Reports

Appropriateness (PCI)

1 of 3



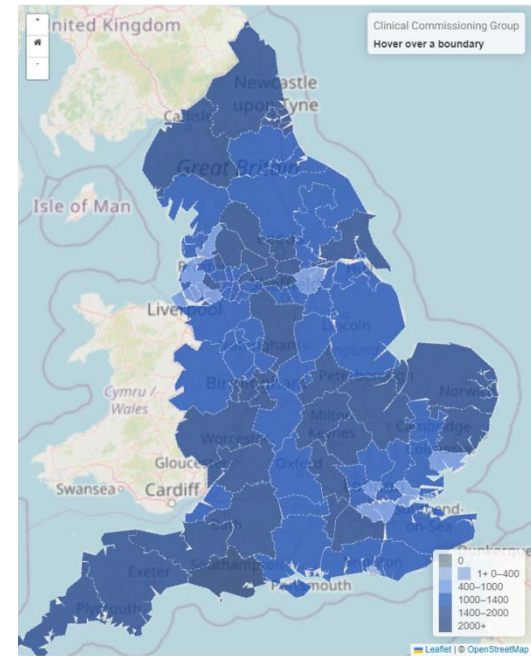
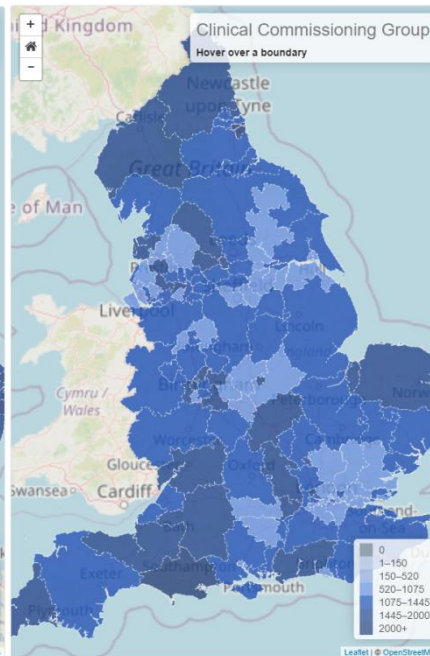
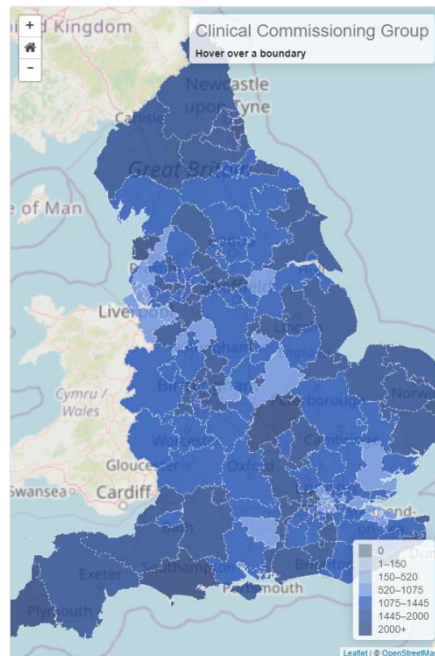
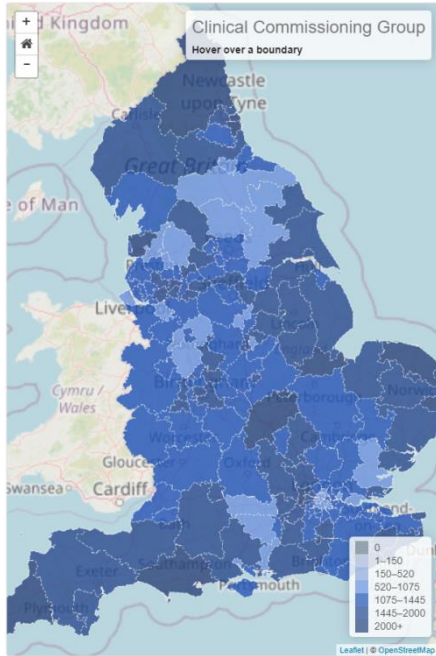
PCI pmp - All

2018/19

2019/20

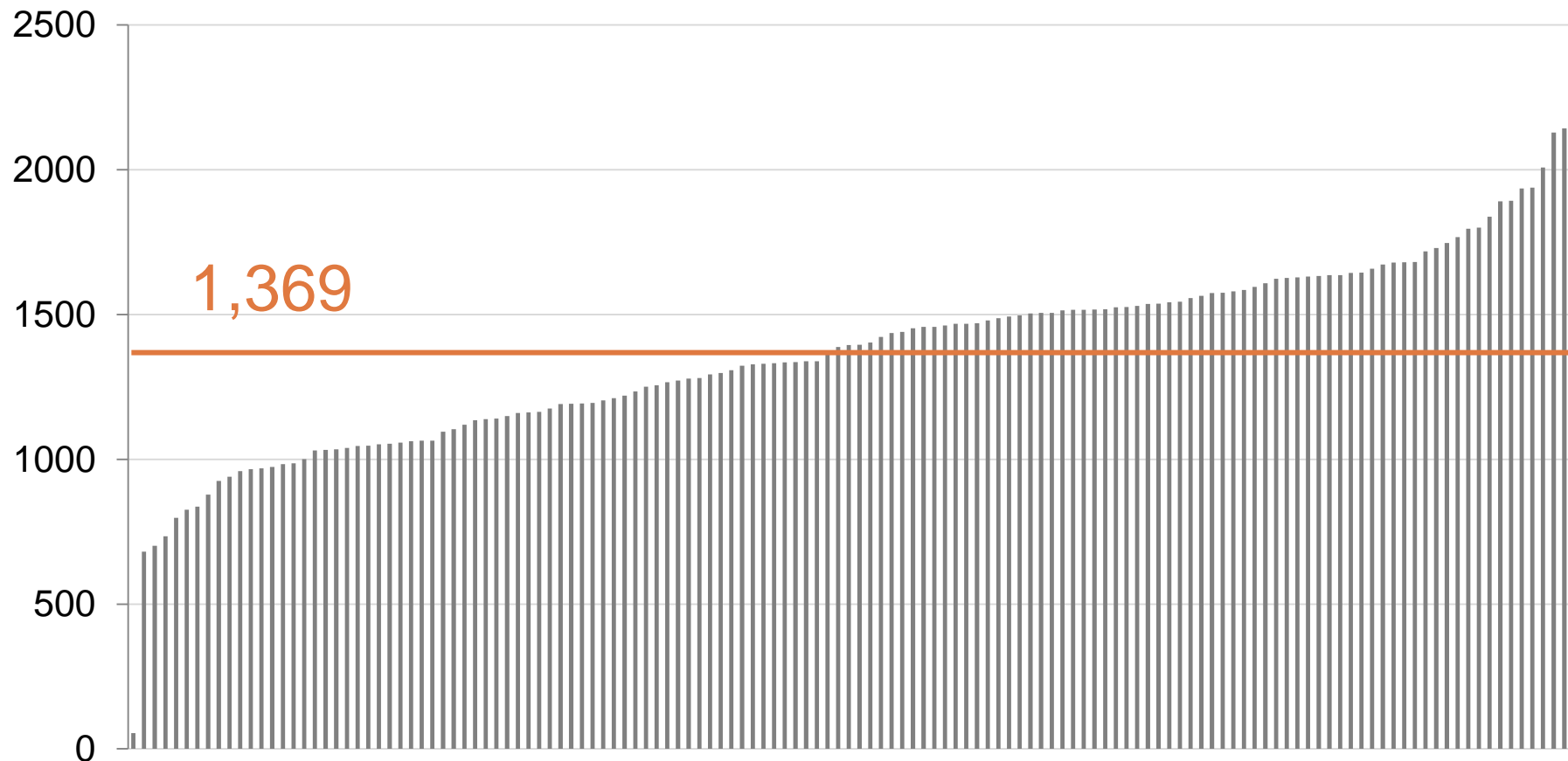
2020/21

2021/22



PCI pmp - all procedures

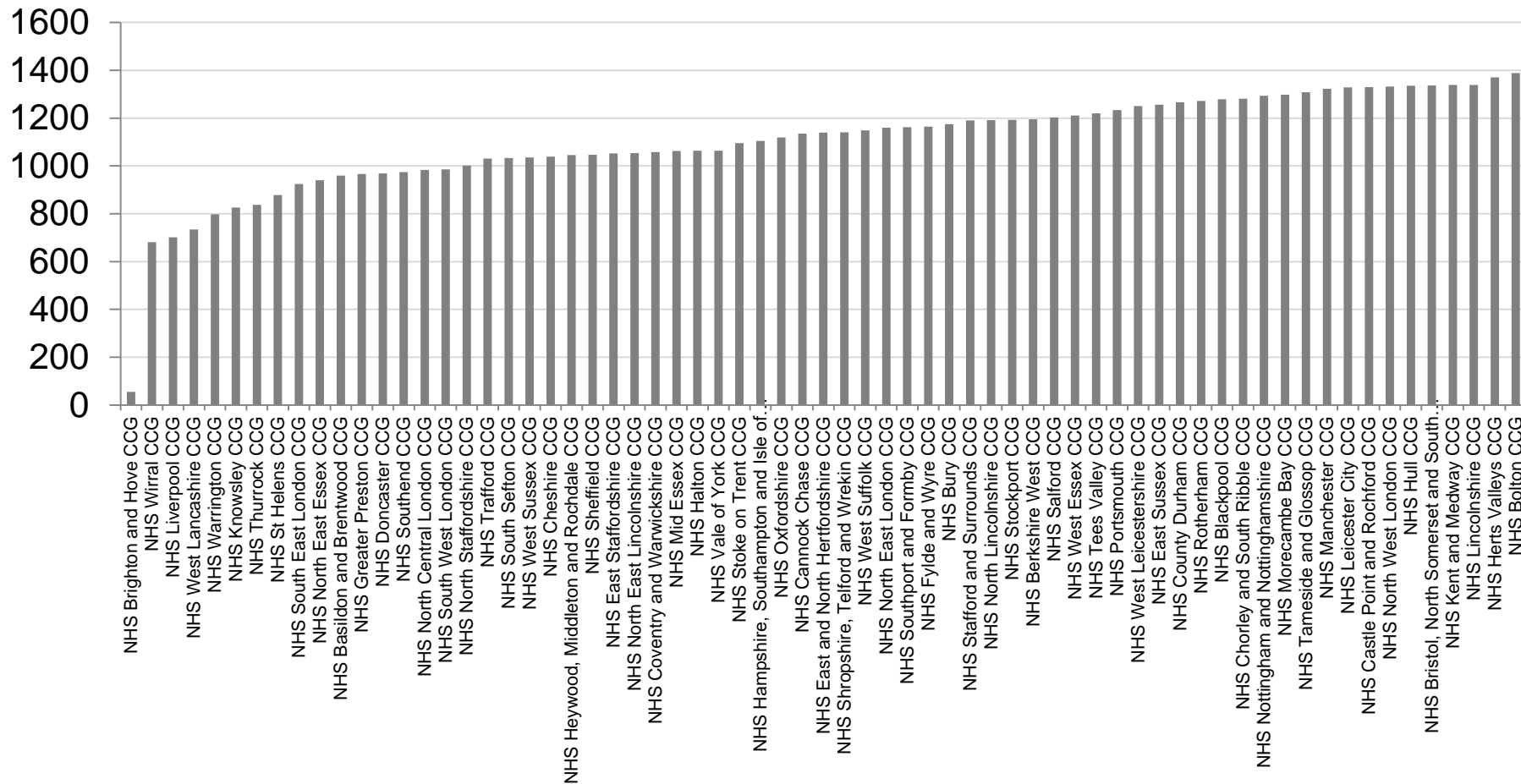
England - By Region 2021/22 (all)



N.B. Overall Rate pmp England = 1,422 from Survey
(Not all data uploaded to NICOR)

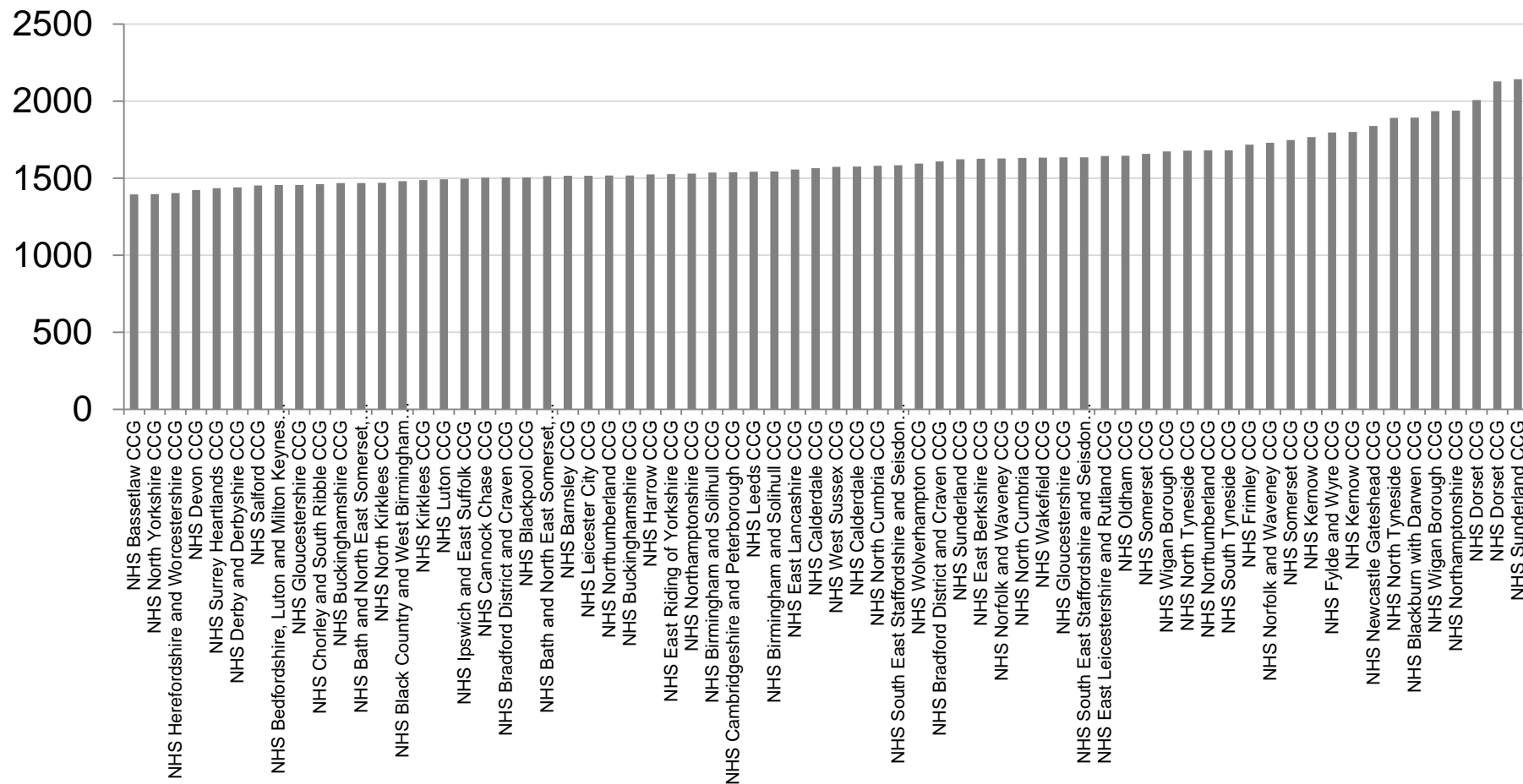
PCI pmp - all procedures

England - By Region 2021/22 (1 of 2)

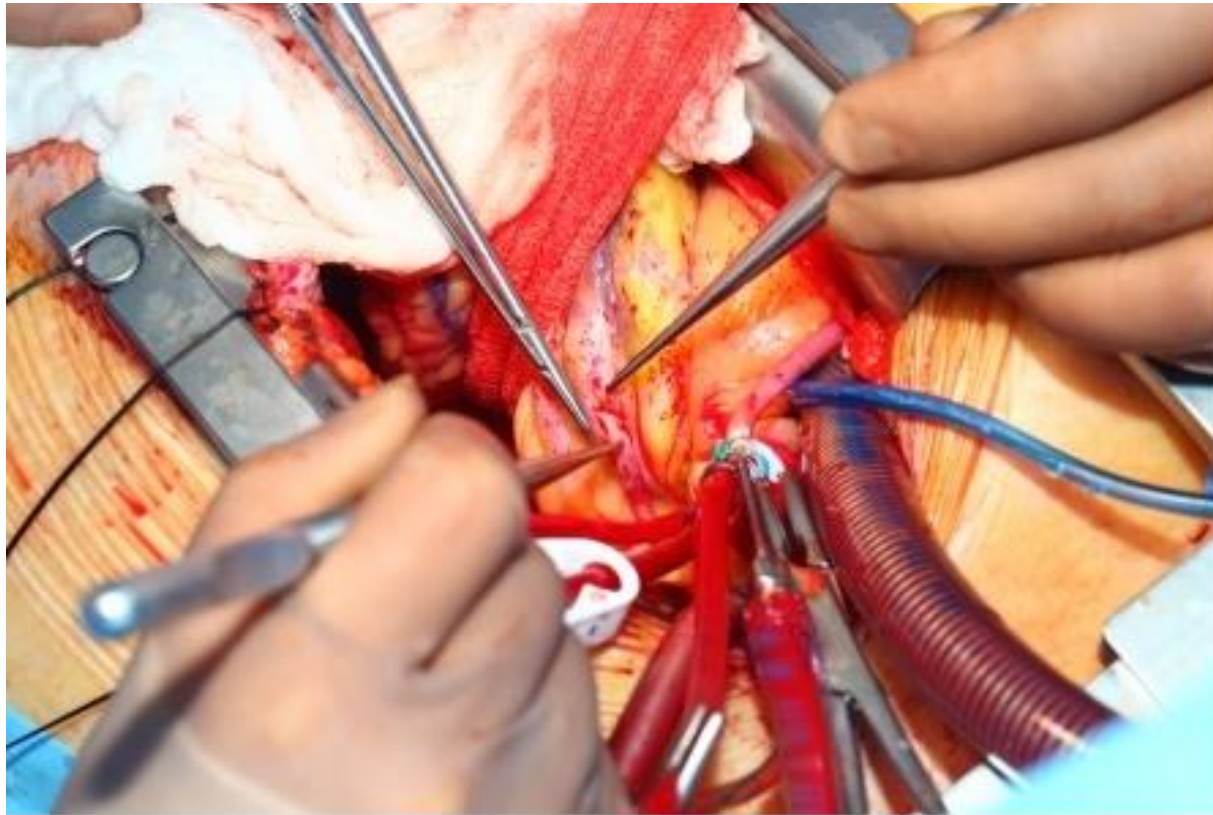


PCI pmp - all procedures

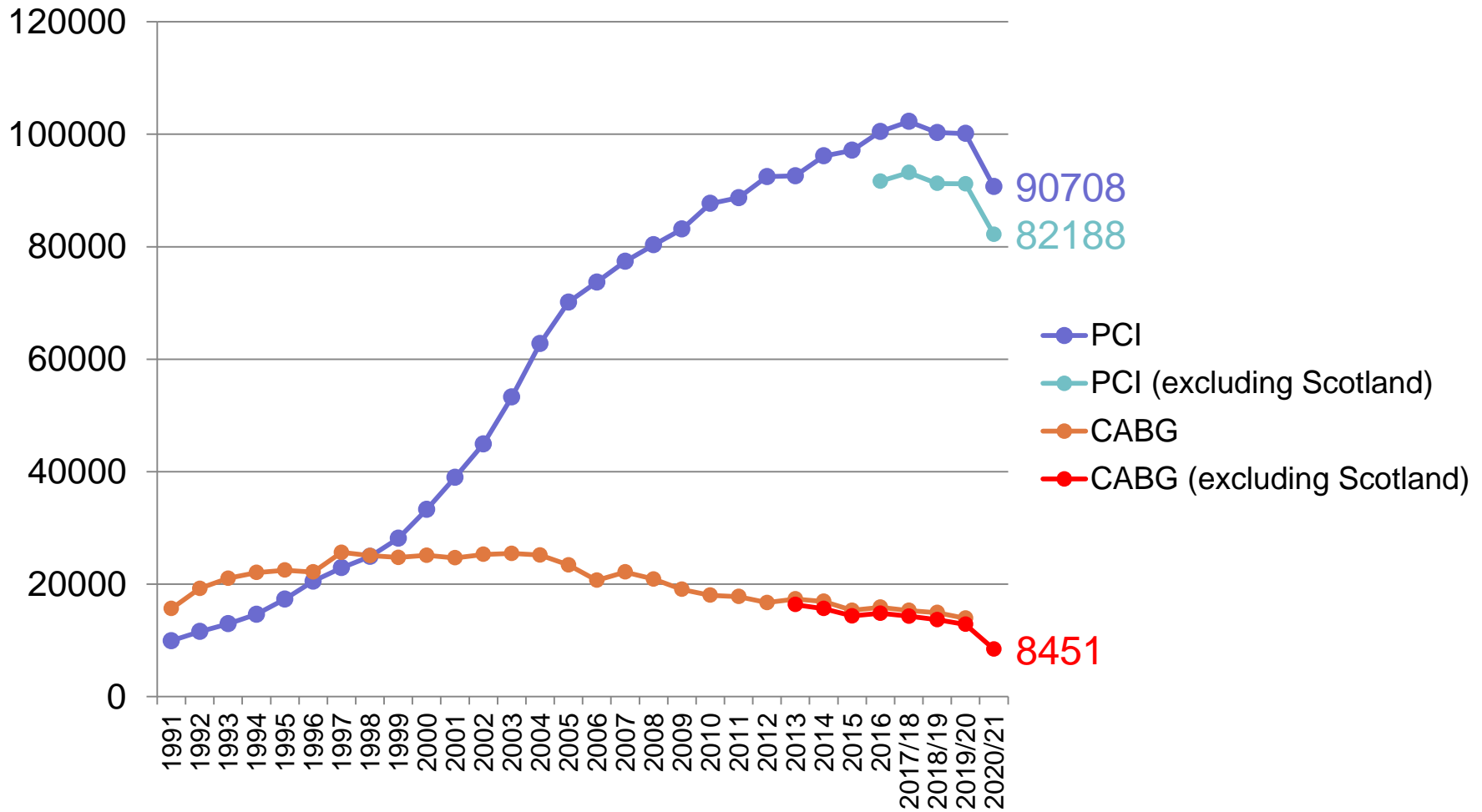
England - By Region 2021/22 (1 of 2)



PCI v CABG



Total PCI vs Isolated CABG



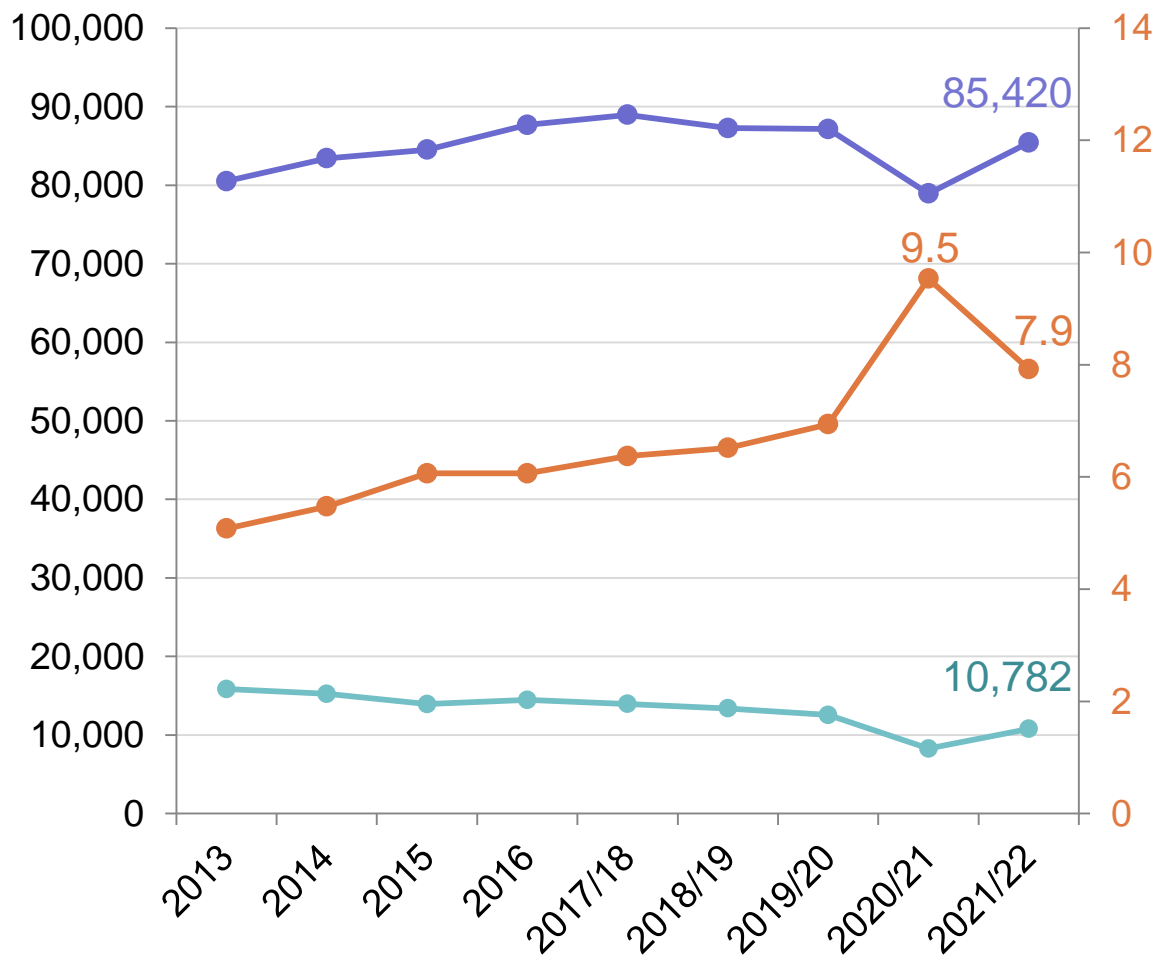
Total PCI vs Isolated CABG

England and Wales Only

● PCI (E&W)
 ● CABG (E&W)
 ● Ratio

Procedures (n)

Ratio PCI/CABG



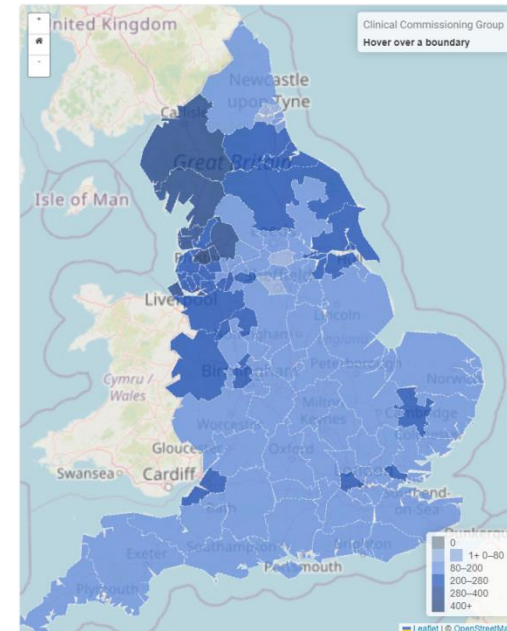
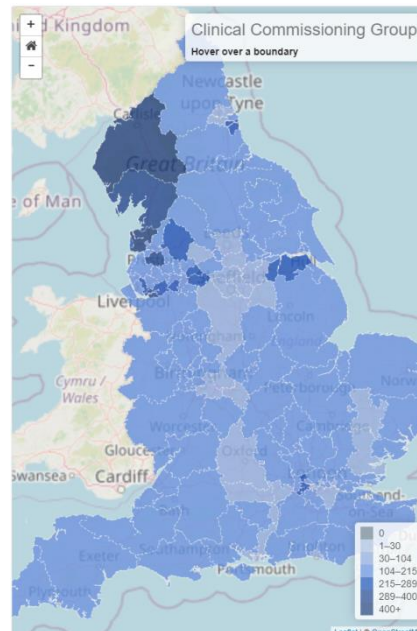
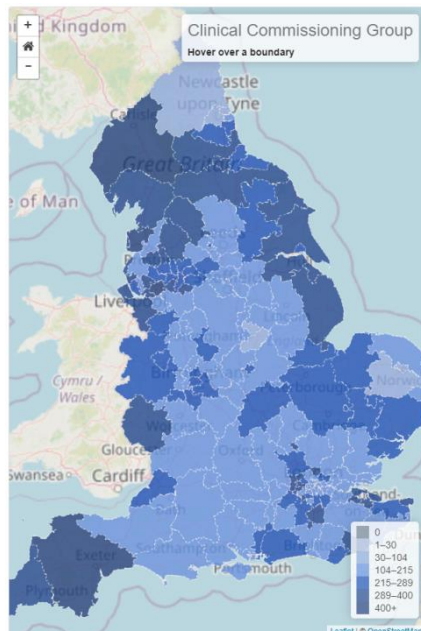
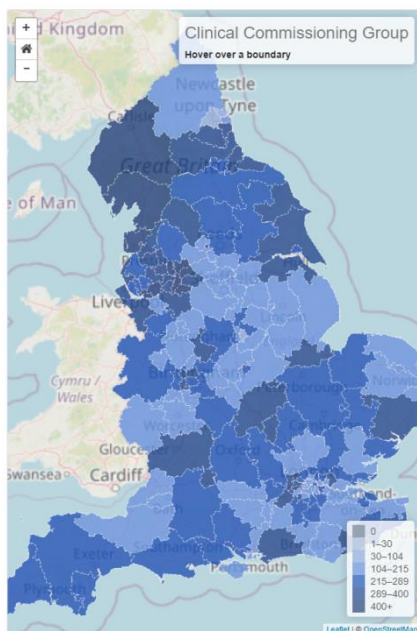
CABG (all)

2018/19

2019/20

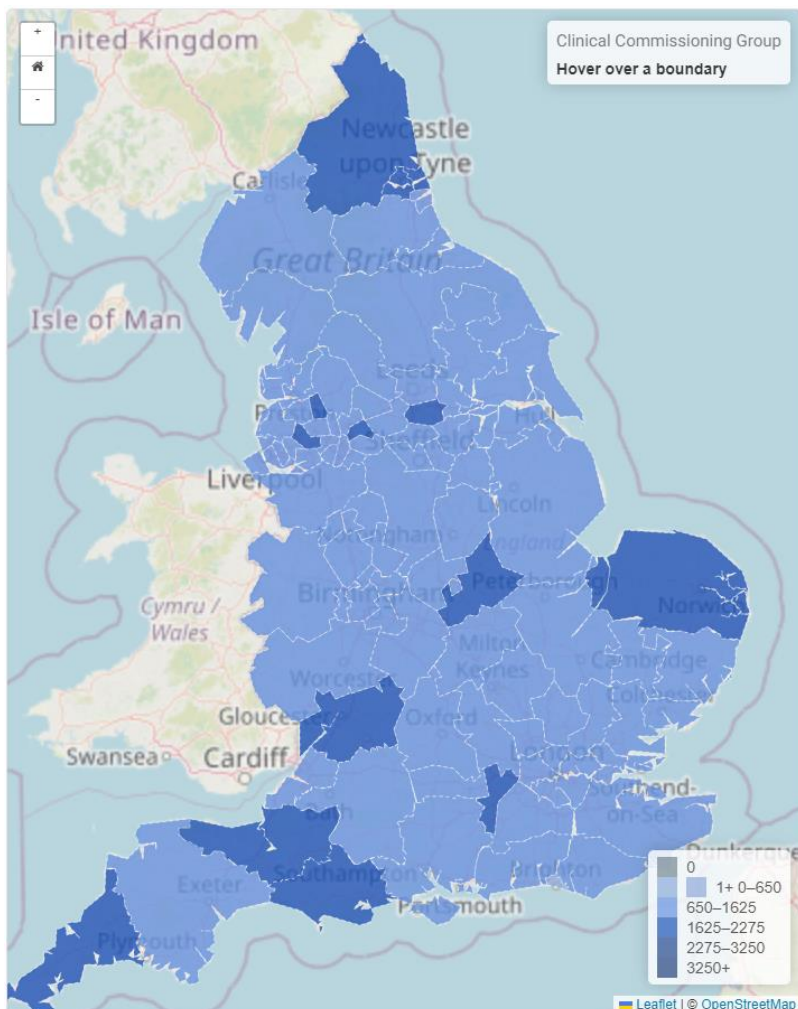
2020/21

2021/22

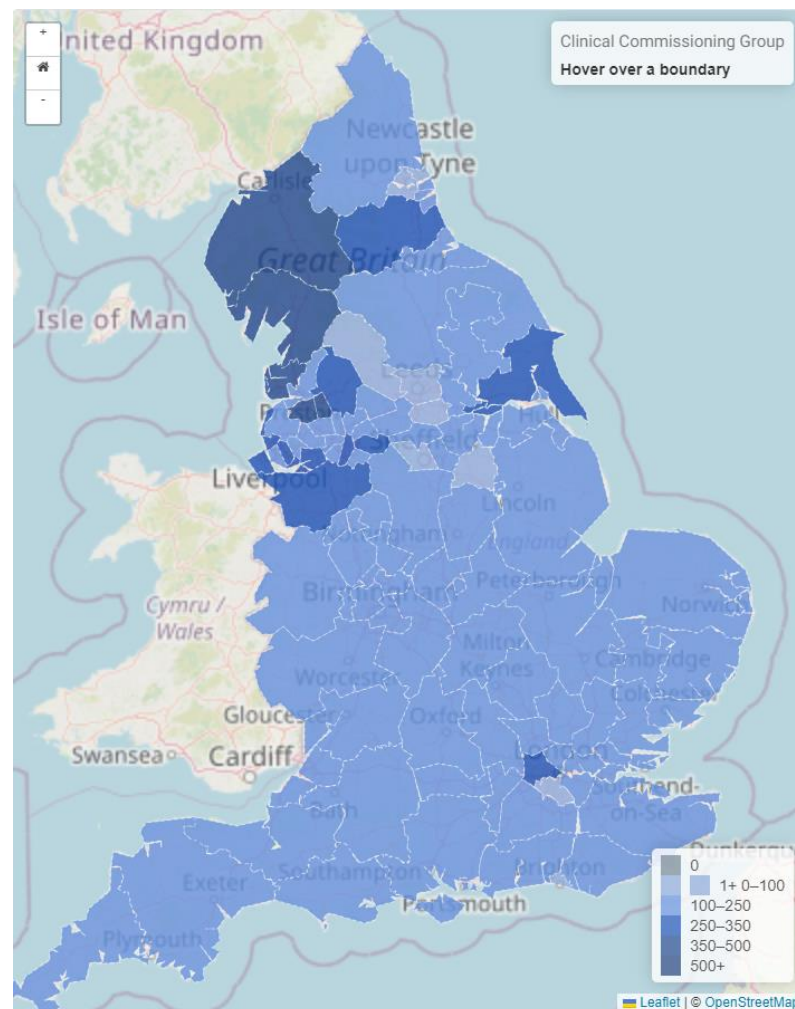


PCI and CABG 2021/22

PCI



CABG

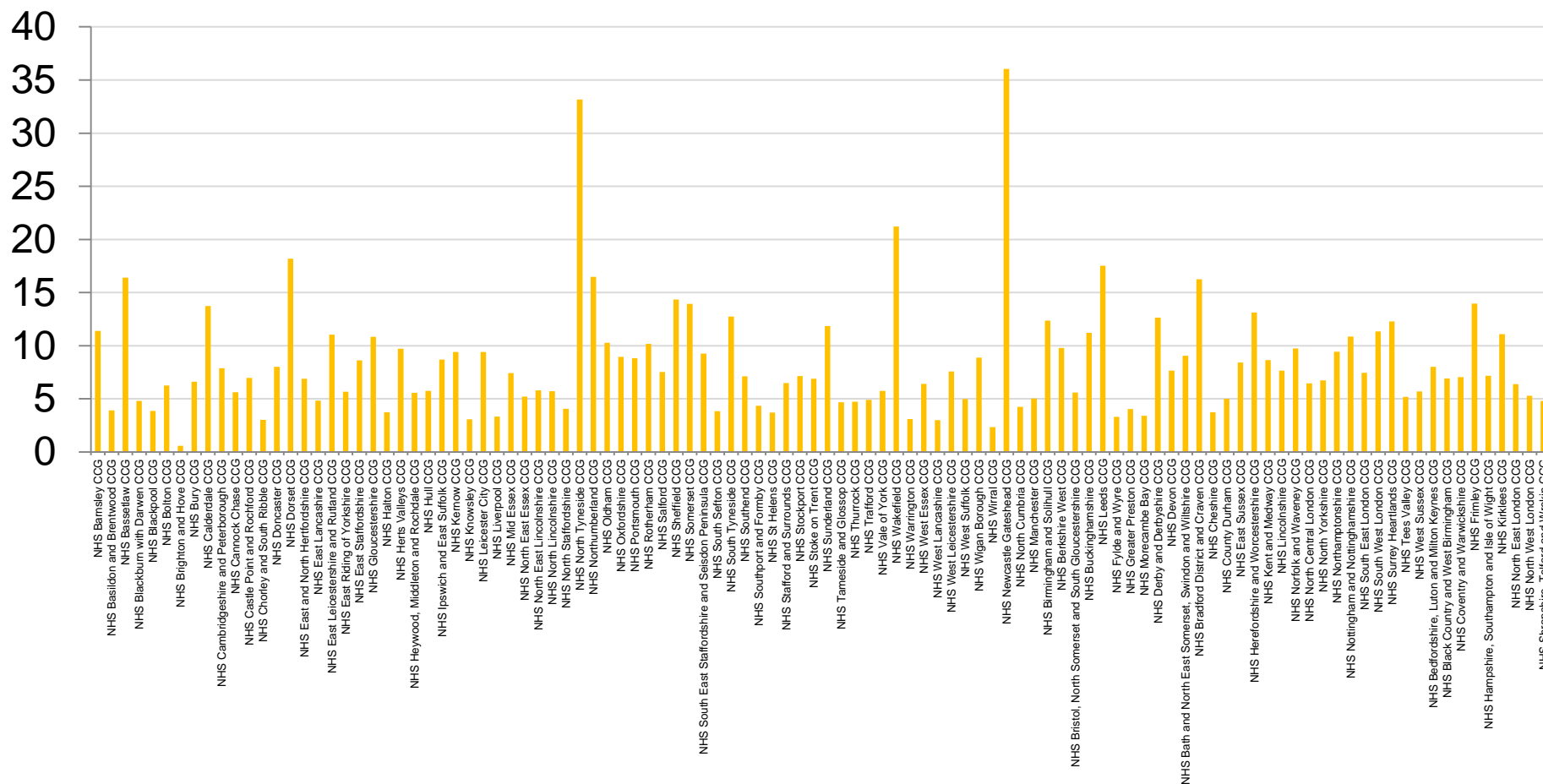


Maps modified to highlight hot spots

PCI:CABG pmp ratio

By Region 2021/22 (all)

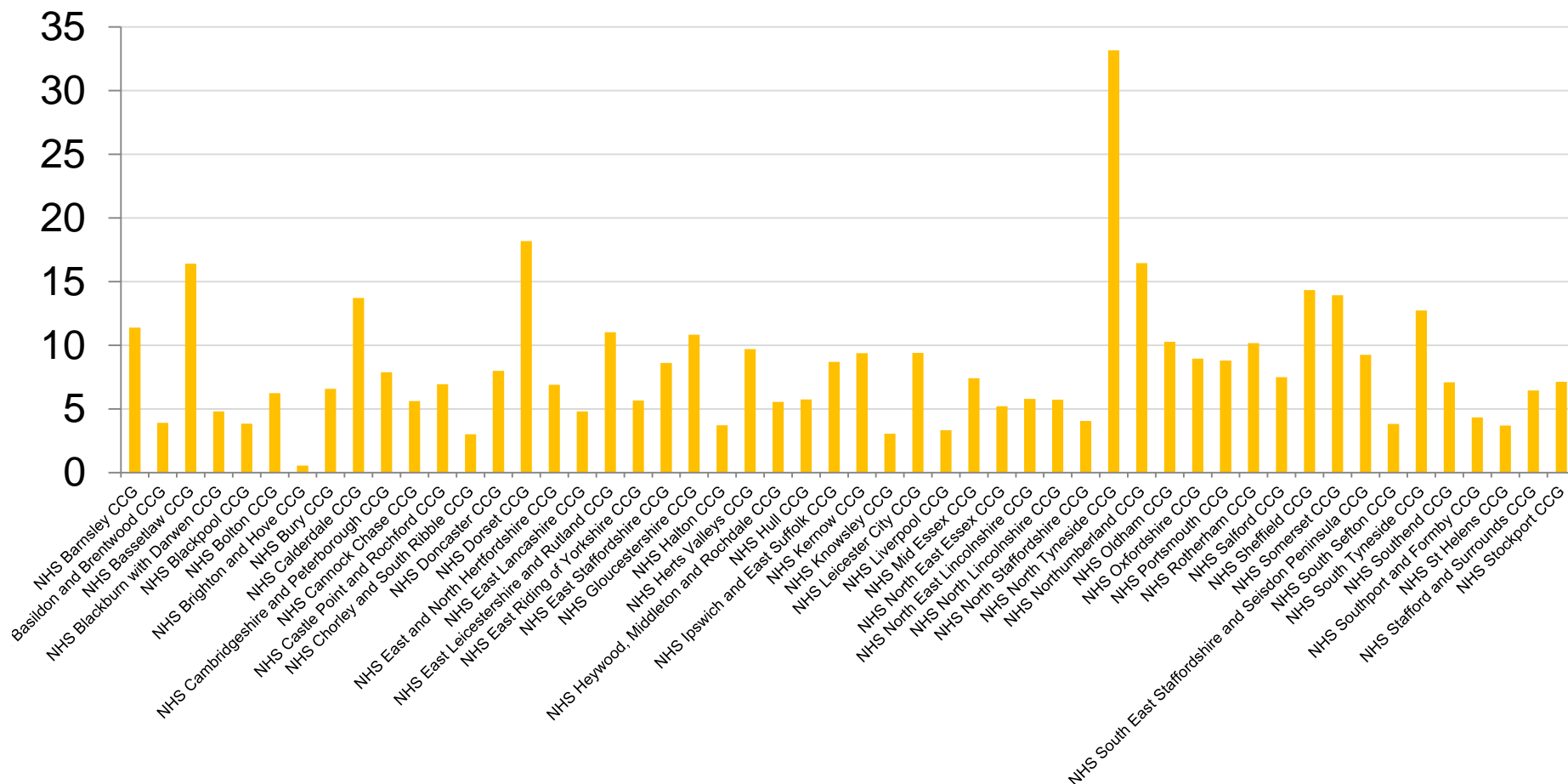
PCI / CABG



PCI:CABG pmp ratio

By Region 2021/22 (Barnsley to Stockport)

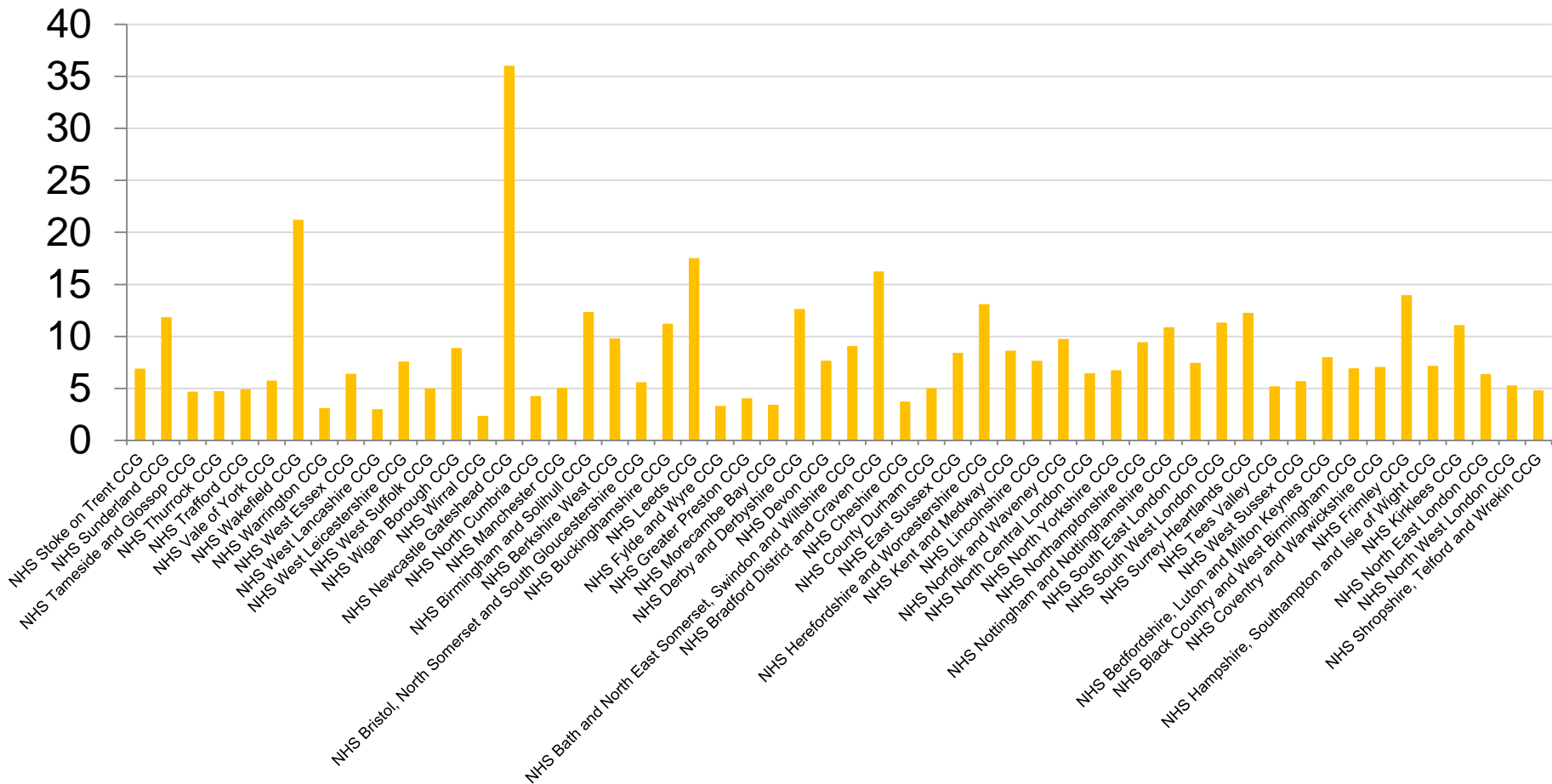
PCI / CABG



PCI:CABG pmp ratio

By Region 2021/22 (Stoke to Shrophire)

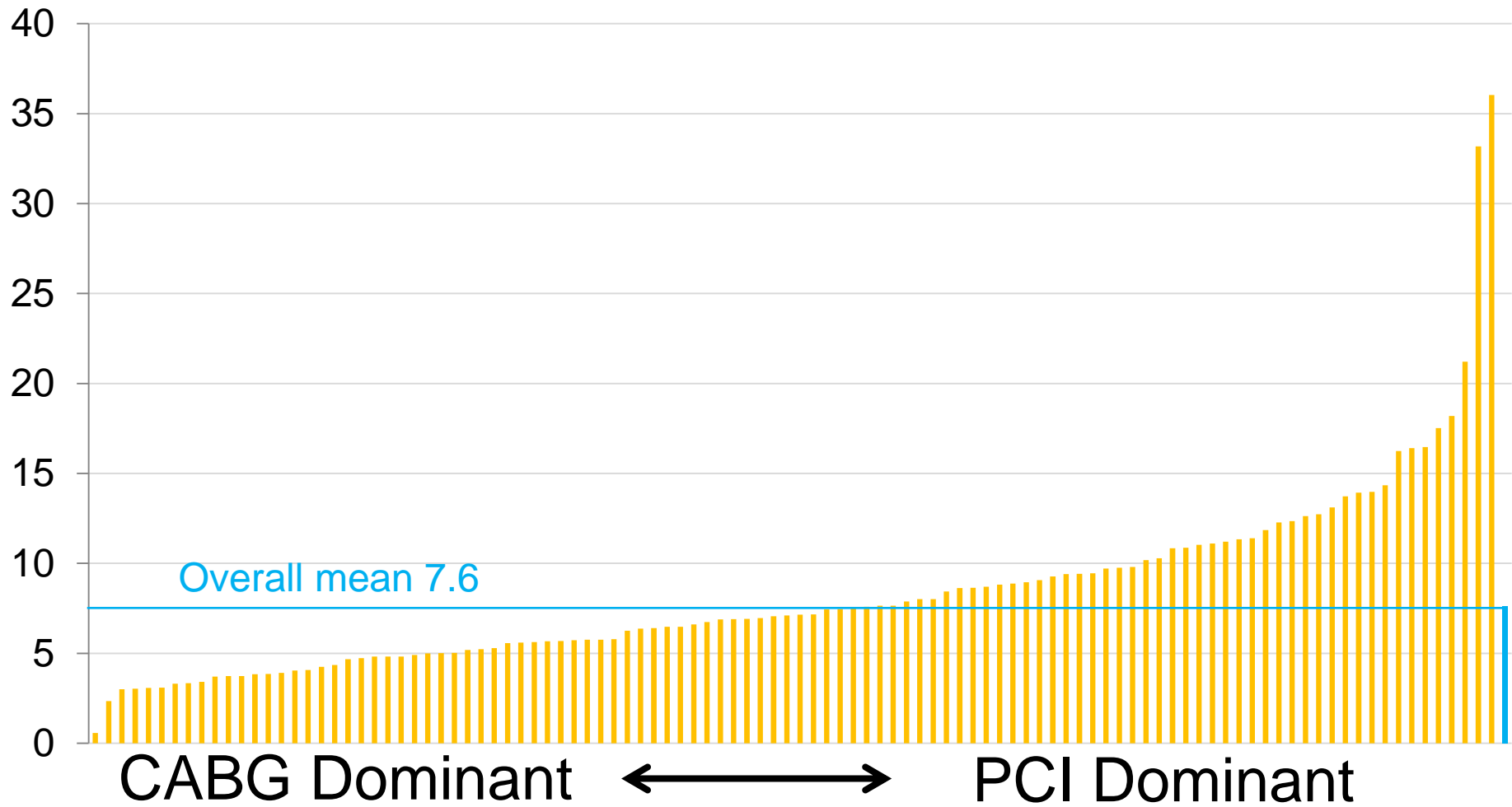
PCI / CABG



PCI:CABG pmp ratio

By Region 2021/22 (all)

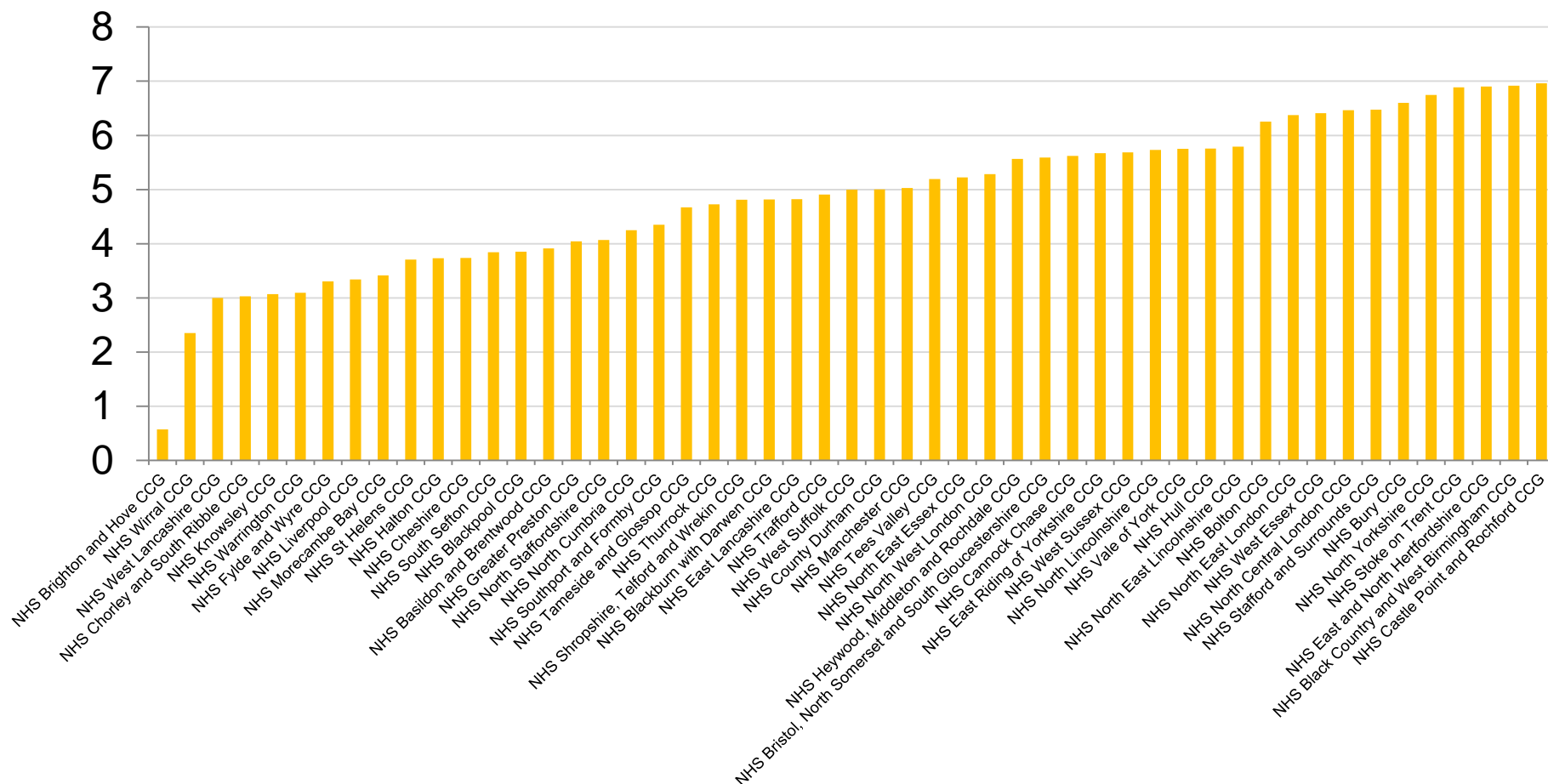
PCI / CABG



PCI:CABG pmp ratio

By Region 2021/22 (Ratio 0.5 to 7)

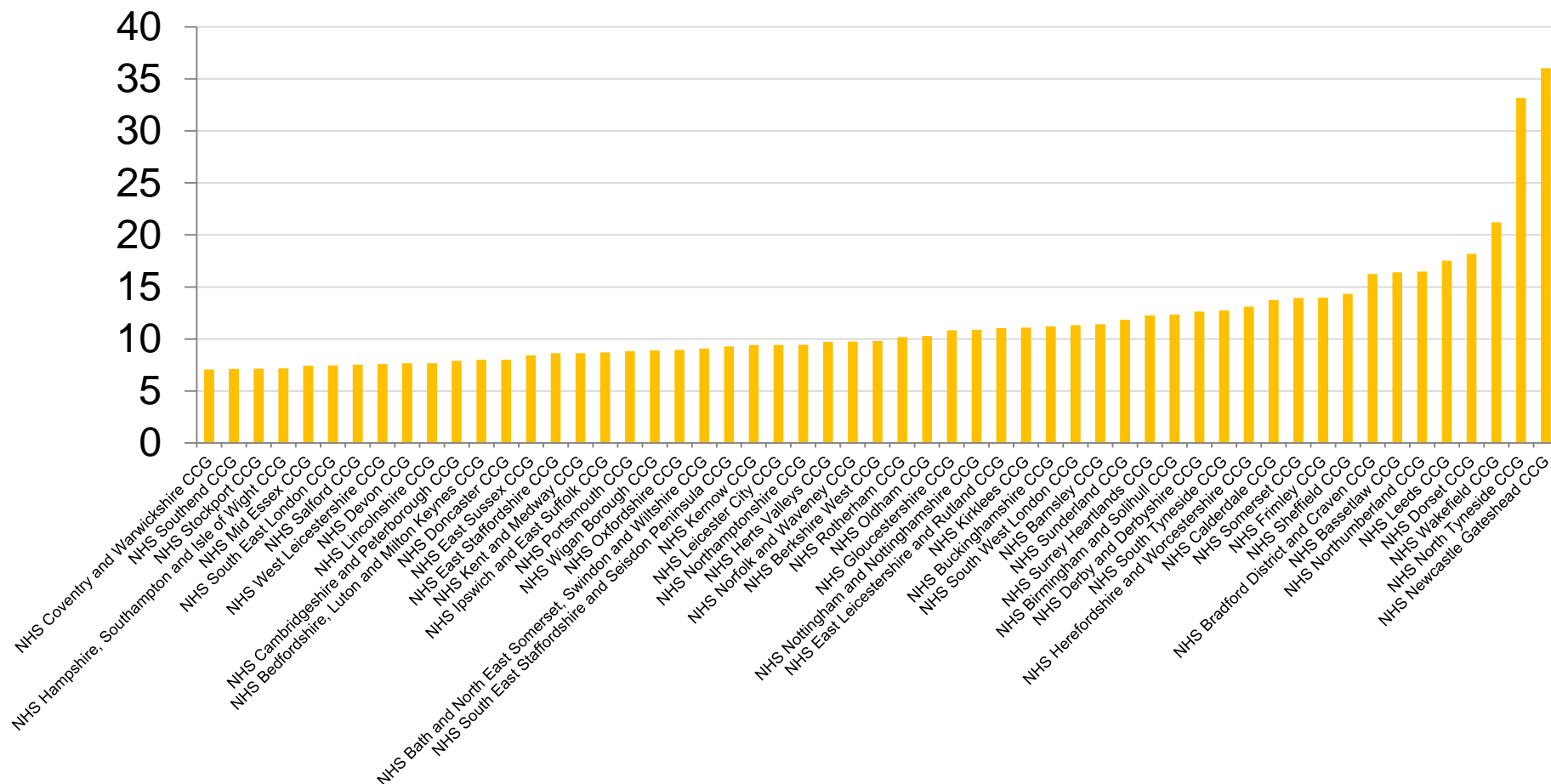
PCI / CABG



PCI:CABG pmp ratio

By Region 2021/22 (Ratio >7 to 36)

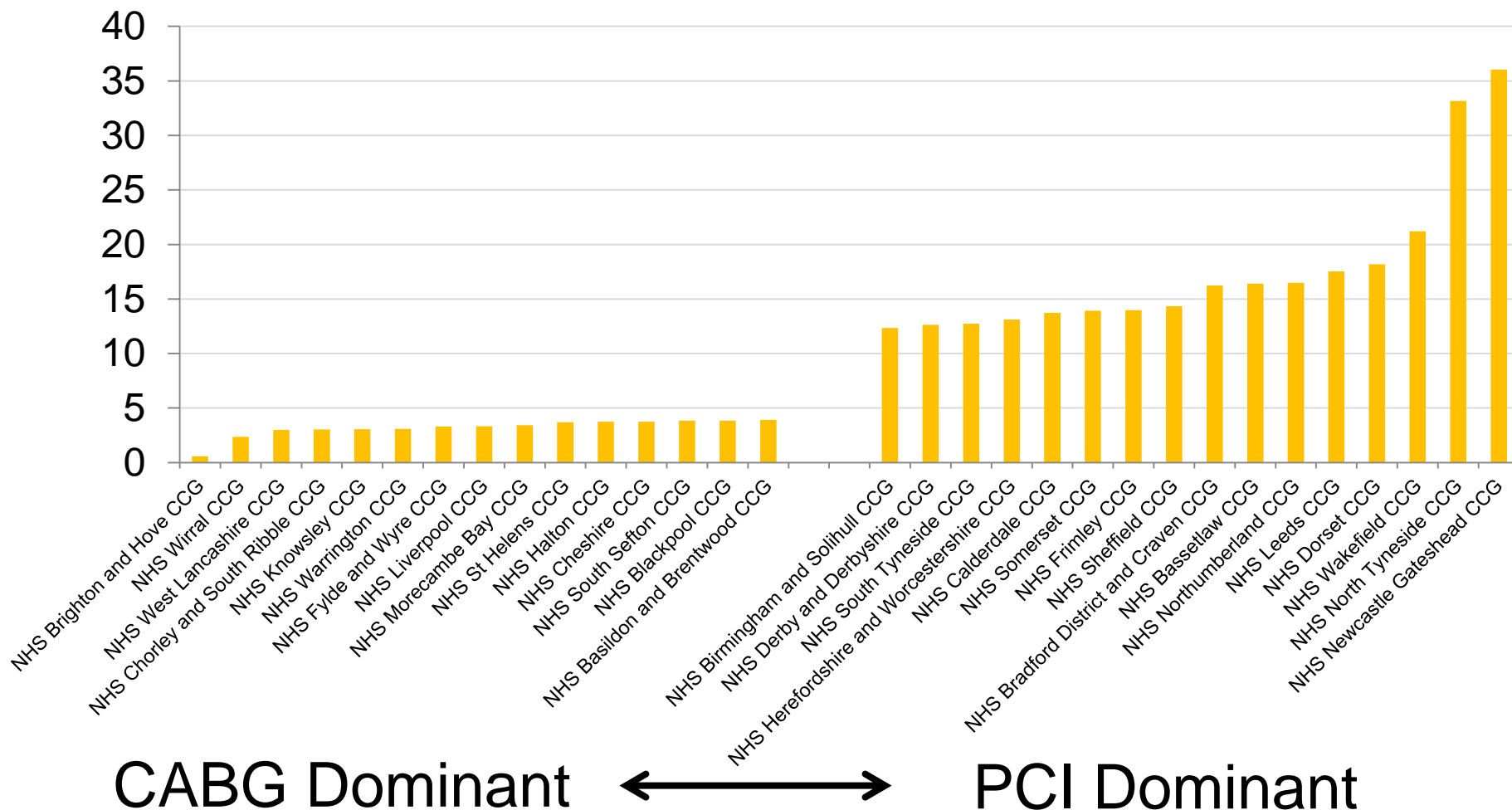
PCI / CABG



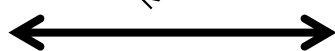
PCI:CABG pmp ratio

By Region 2021/22 (Ratio lowest v highest)

PCI / CABG



CABG Dominant

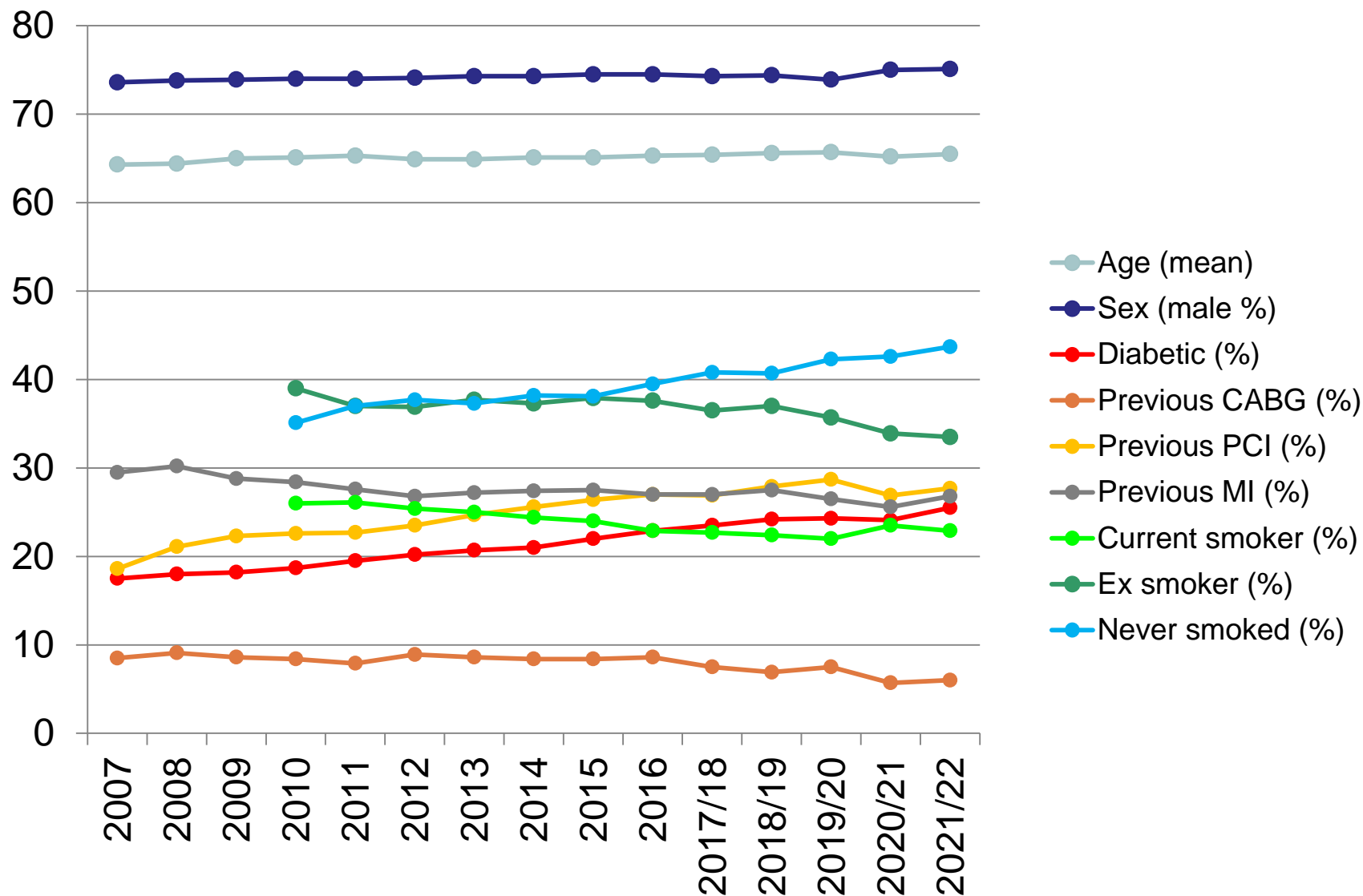


PCI Dominant

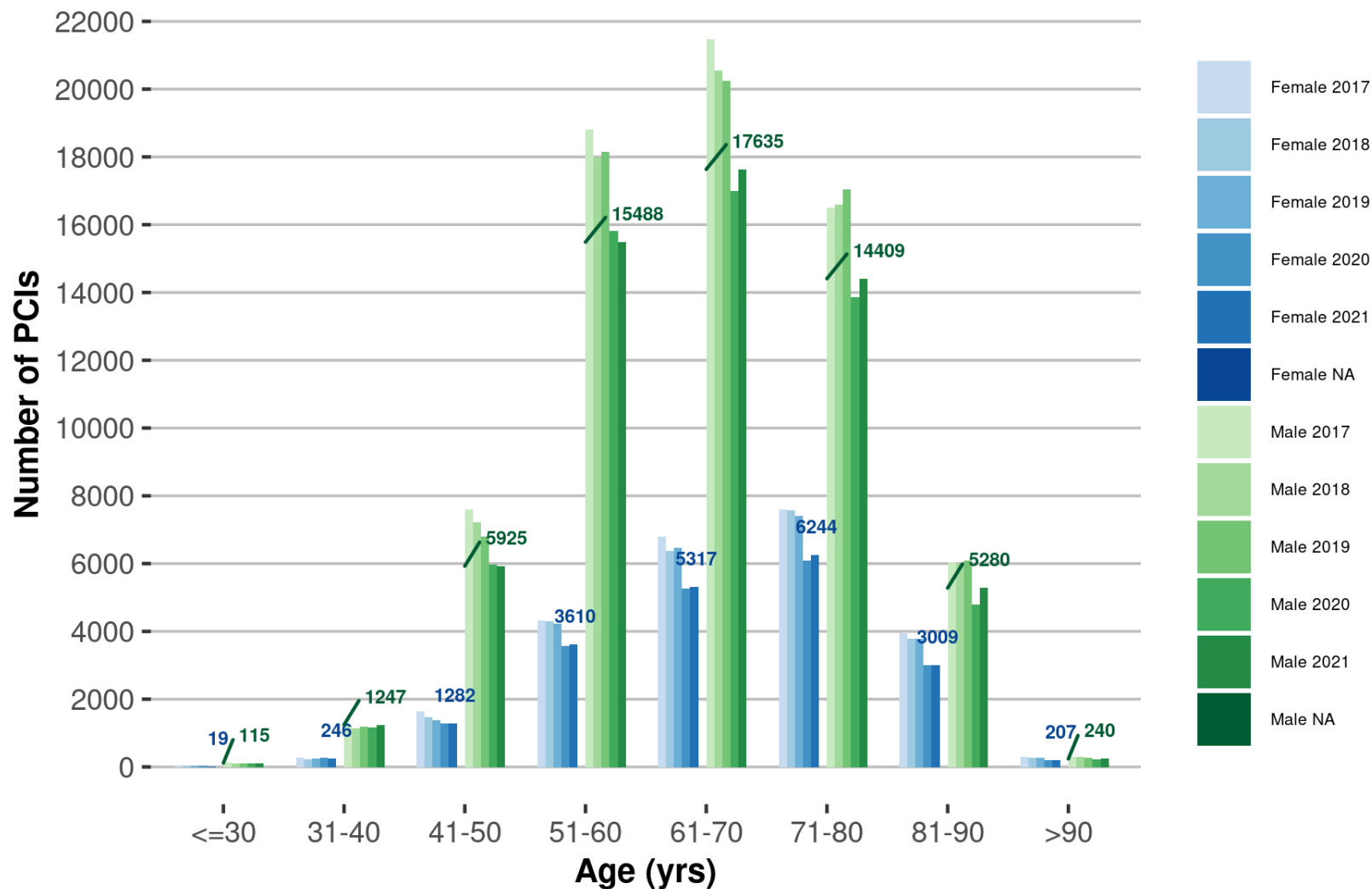
Demographics

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017/ 18	2018/ 19	2019 /20	2020 /21	2021 /22
Age (mean)	64.3	64.4	65.0	65.1	65.3	64.9	64.9	65.1	65.1	65.3	65.4	65.6	65.7	65.2	65.5
Sex (male %)	73.6	73.8	73.9	74.0	74.0	74.1	74.3	74.3	74.5	74.5	74.3	74.4	73.9	75.0	75.1
Diabetic (%)	17.5	18.0	18.2	18.7	19.5	20.2	20.7	21.0	22.0	22.9	23.5	24.2	24.3	24.1	25.5
Previous CABG (%)	8.5	9.1	8.6	8.4	7.9	8.9	8.6	8.4	8.4	8.6	7.5	6.9	7.5	5.7	6.0
Previous PCI (%)	18.6	21.1	22.3	22.6	22.7	23.5	24.7	25.6	26.4	27	26.9	27.9	28.7	26.9	27.7
Previous MI (%)	29.5	30.2	28.8	28.4	27.6	26.8	27.2	27.4	27.5	27	27	27.5	26.5	25.6	26.8
Current smoker (%)				26.0	26.1	25.4	25	24.4	24.0	22.9	22.7	22.4	22	23.5	22.9
Ex smoker (%)				39.0	37.0	36.9	37.7	37.3	37.9	37.6	36.5	37	35.7	33.9	33.5
Never smoked (%)				35.1	37.0	37.7	37.3	38.2	38.1	39.5	40.8	40.7	42.3	42.6	43.7

Demographics

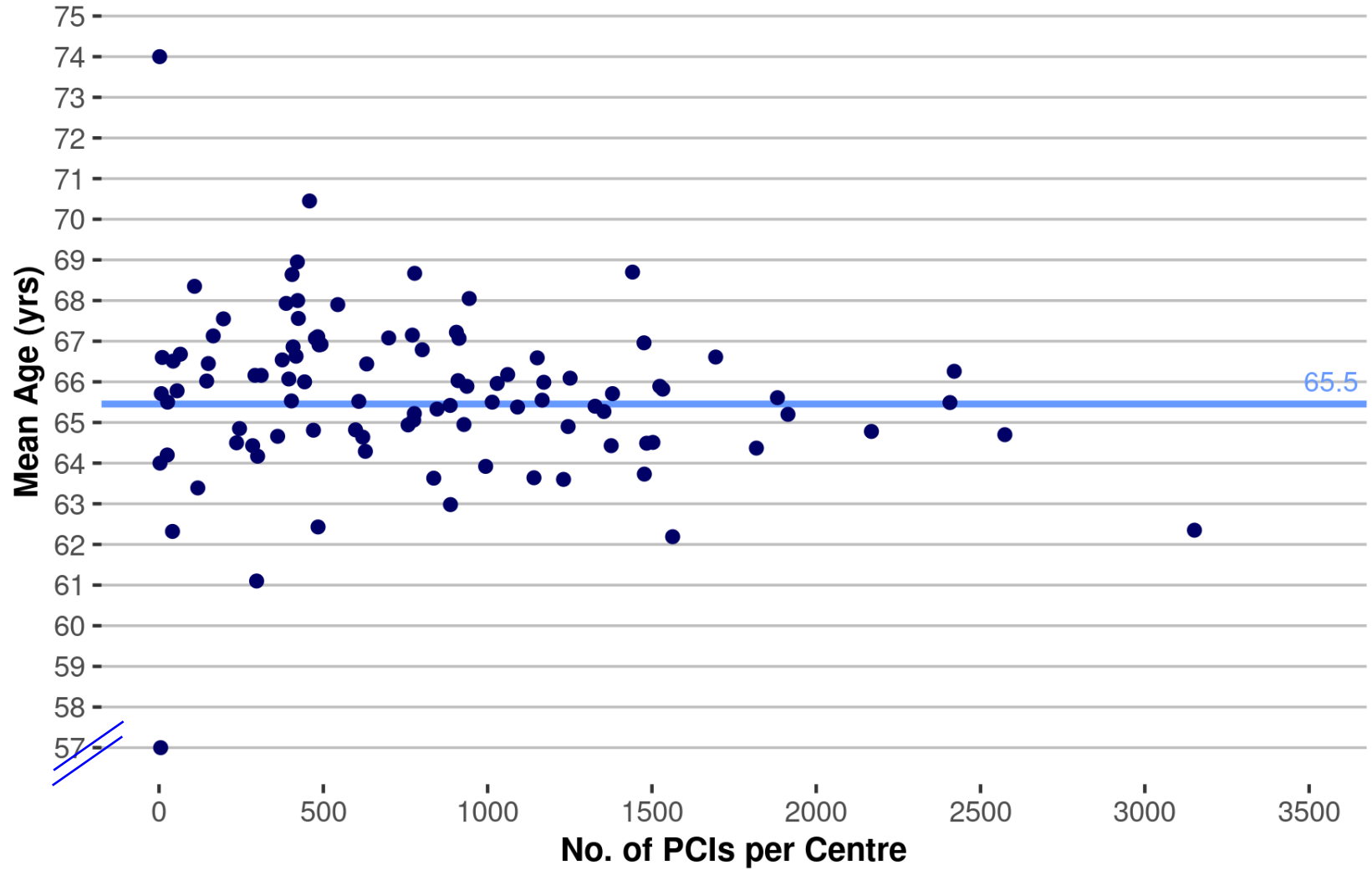


Demographics - Age

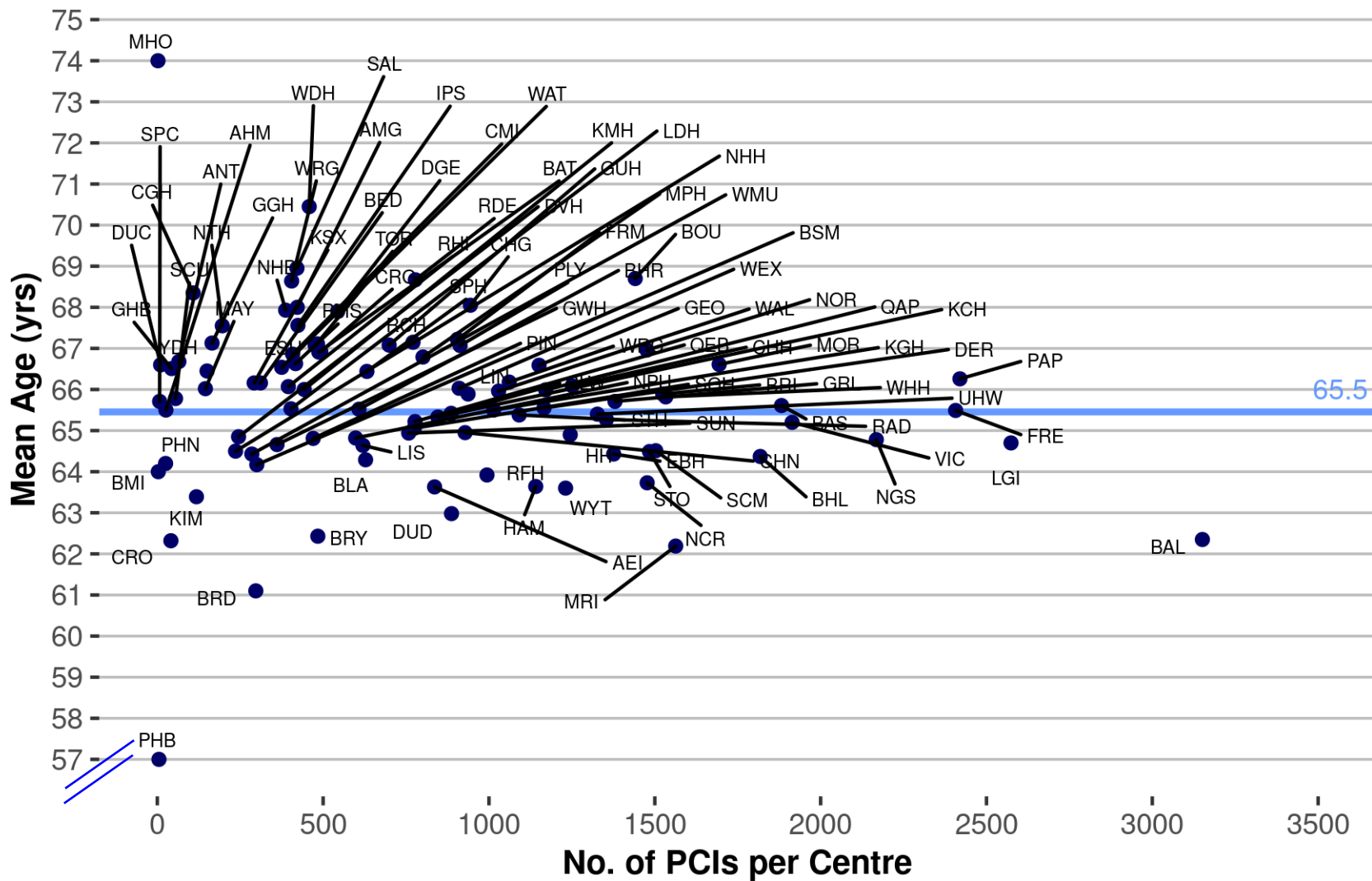


(N.B. Financial year, 2020 = 2020-21)

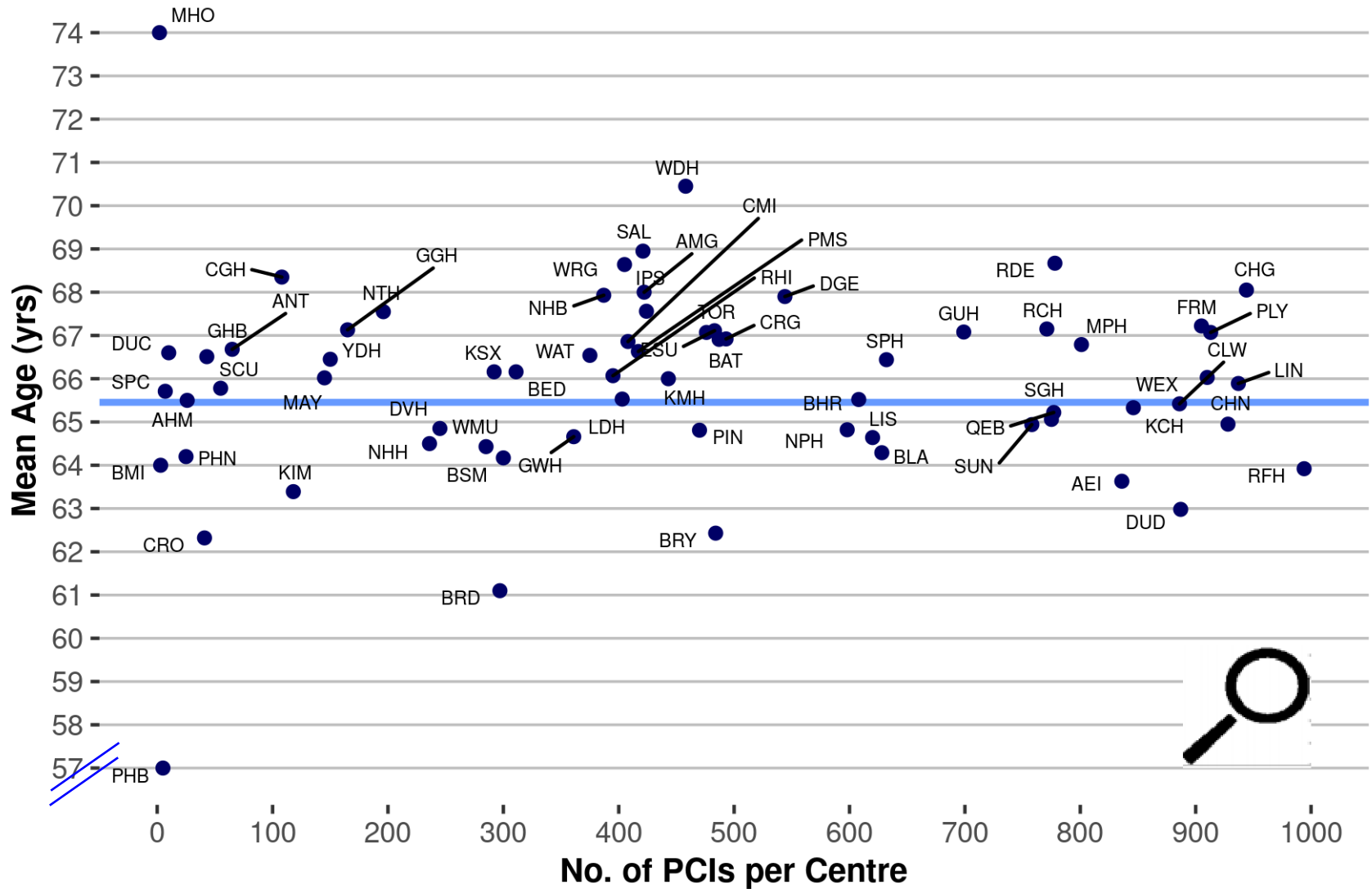
Demographics - Age



Demographics - Age



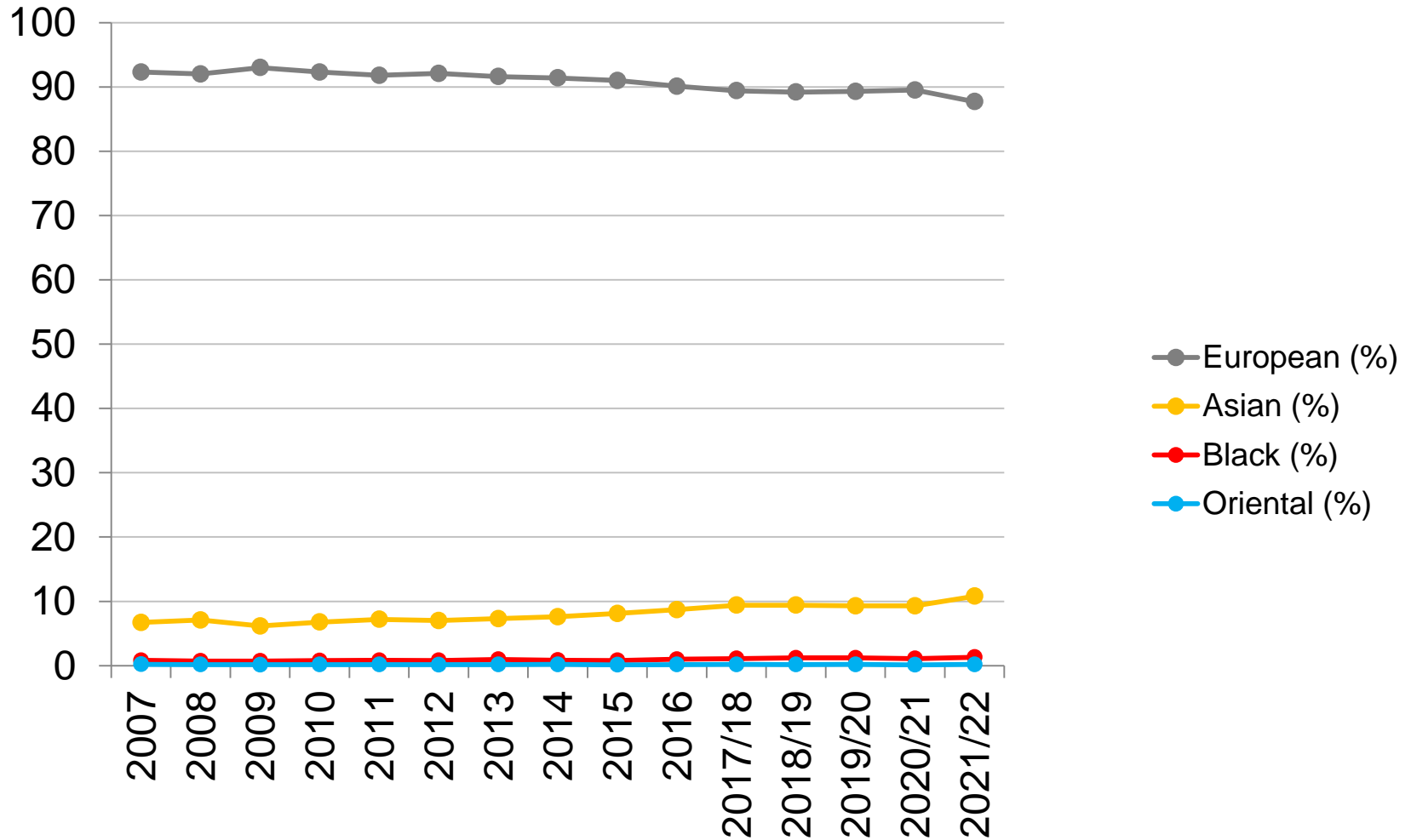
Demographics - Age



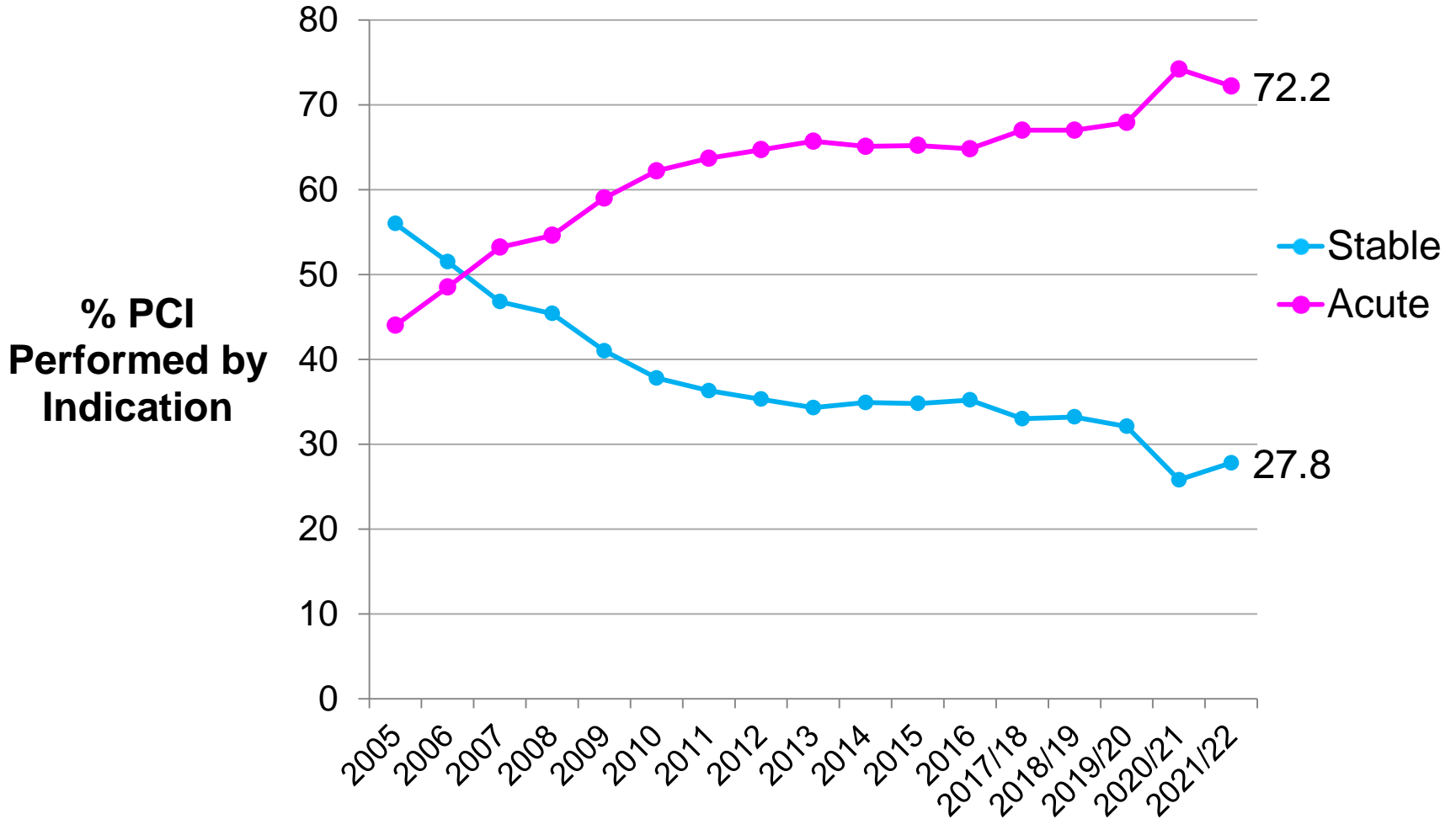
Demographics

Ethnic Origin															
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 /18	2018/ 19	2019/ 20	2020/ 21	2021/ 22
Data available	46,643	48,267	55,572	61,966	64,355	62,350	62,499	63,872	63,305	63,771	66,987	61,567	65,993	58,306	65,388
European (%)	92.3	92.0	93.0	92.3	91.8	92.1	91.6	91.4	91.0	90.1	89.4	89.2	89.3	89.5	87.7
Asian (%)	6.7	7.1	6.16	6.77	7.2	7.0	7.3	7.6	8.1	8.7	9.4	9.4	9.3	9.3	10.8
Black (%)	0.83	0.72	0.71	0.79	0.83	0.81	0.98	0.85	0.80	1.0	1.1	1.2	1.2	1.1	1.3
Oriental (%)	0.2	0.17	0.15	0.17	0.17	0.14	0.16	0.18	0.12	0.17	0.19	0.17	0.19	0.12	0.18

Ethnicity

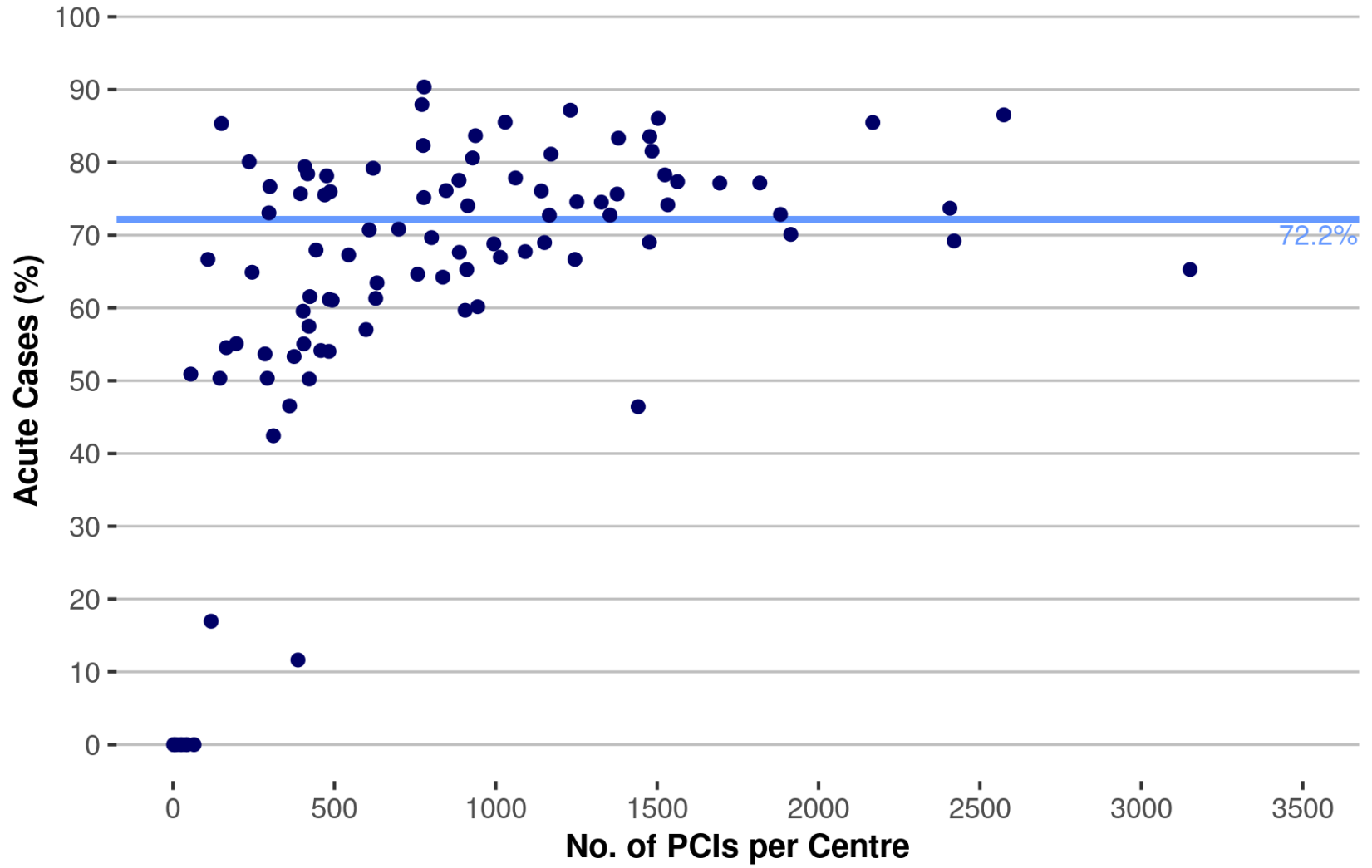


Clinical Syndrome



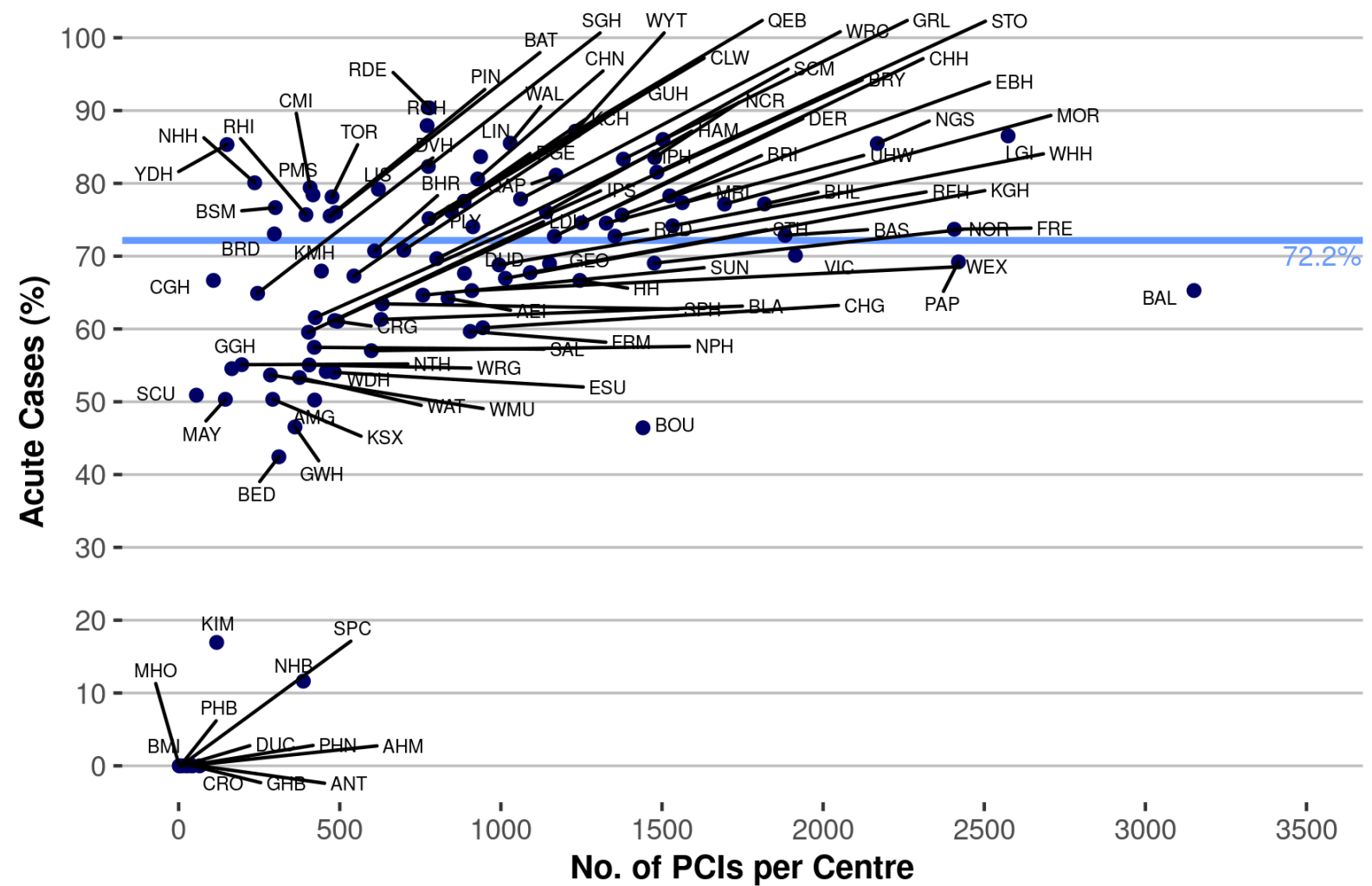
Clinical Syndrome

% Acute Coronary Syndrome



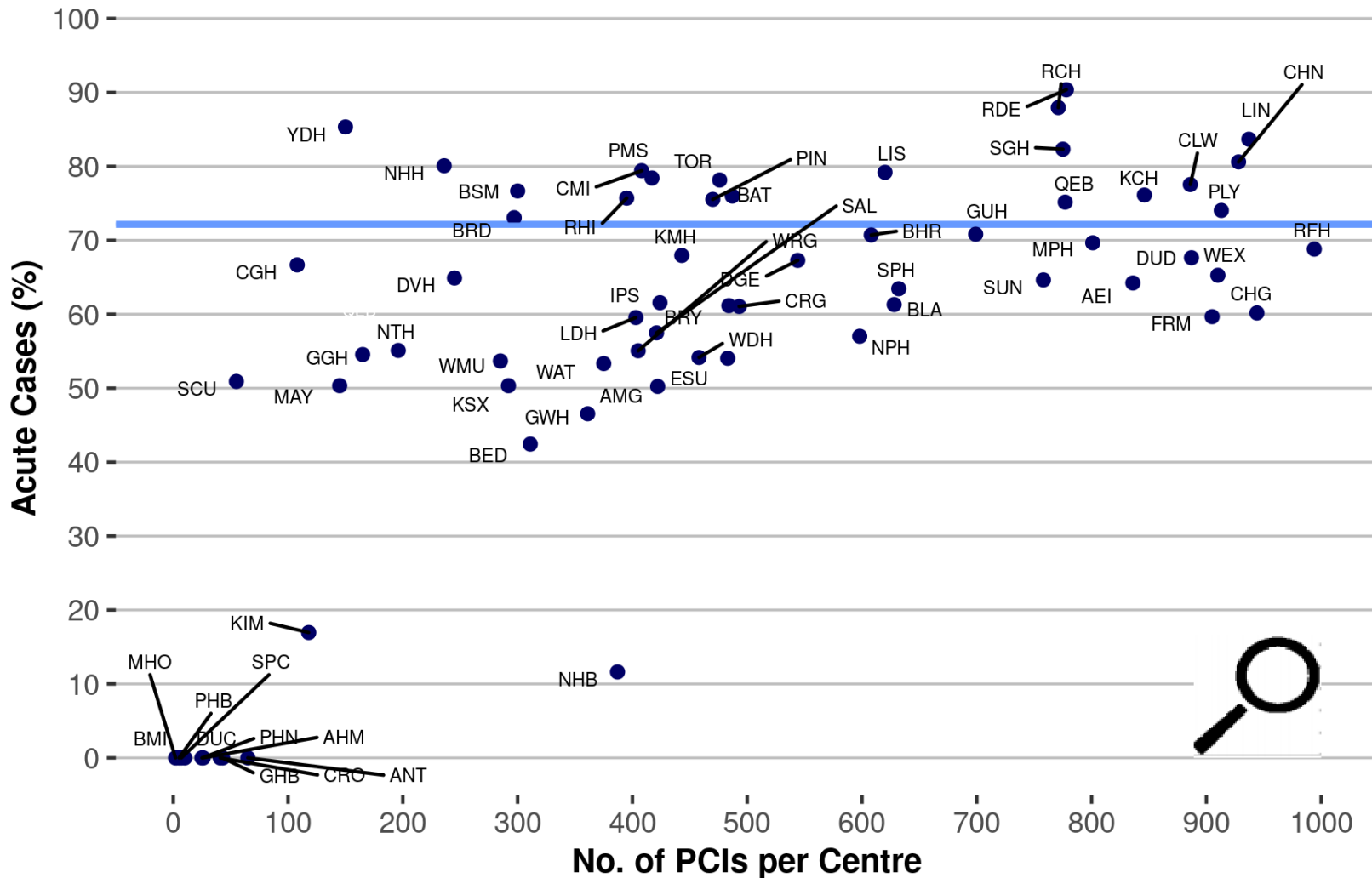
Clinical Syndrome

% Acute Coronary Syndrome

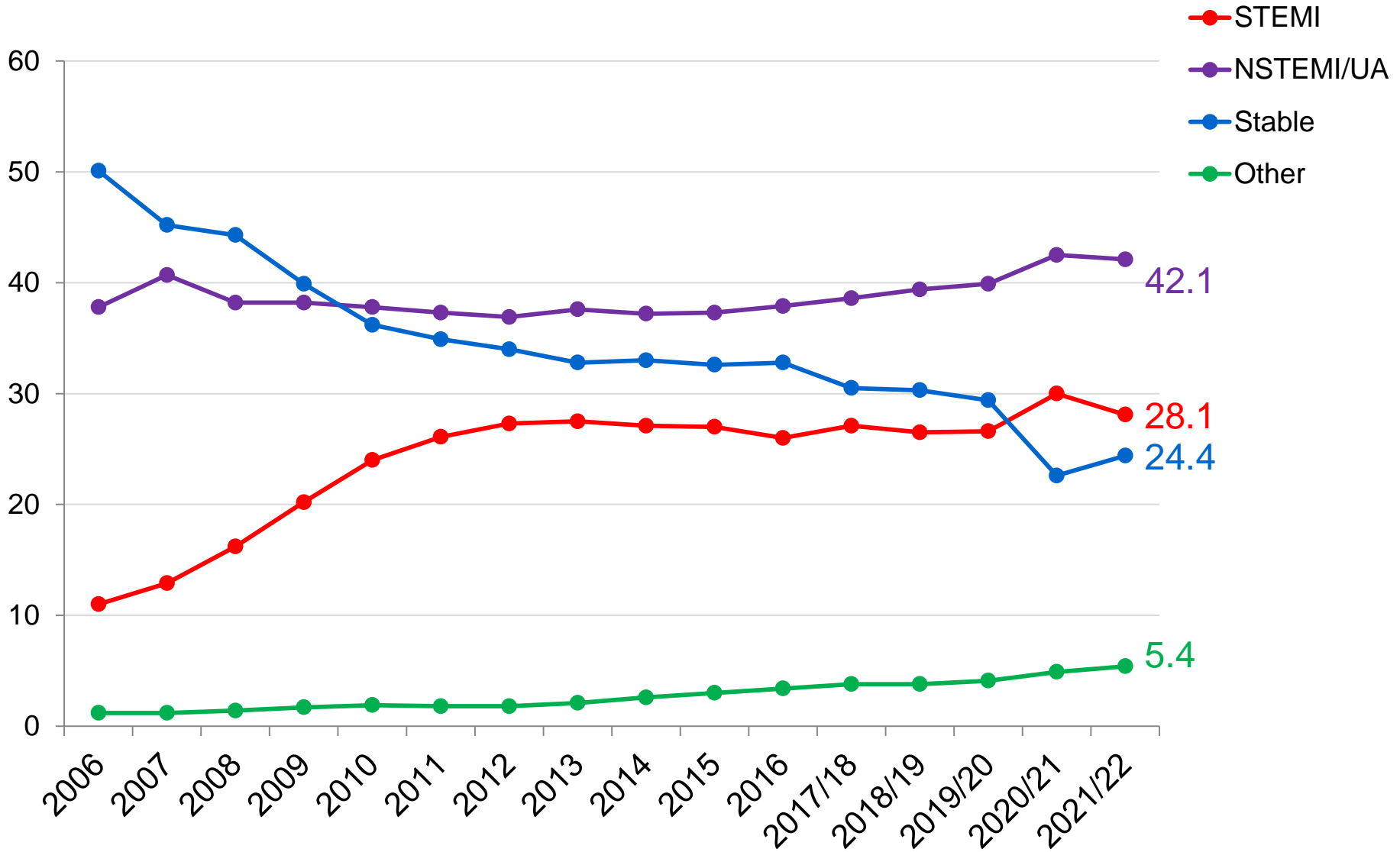


Clinical Syndrome

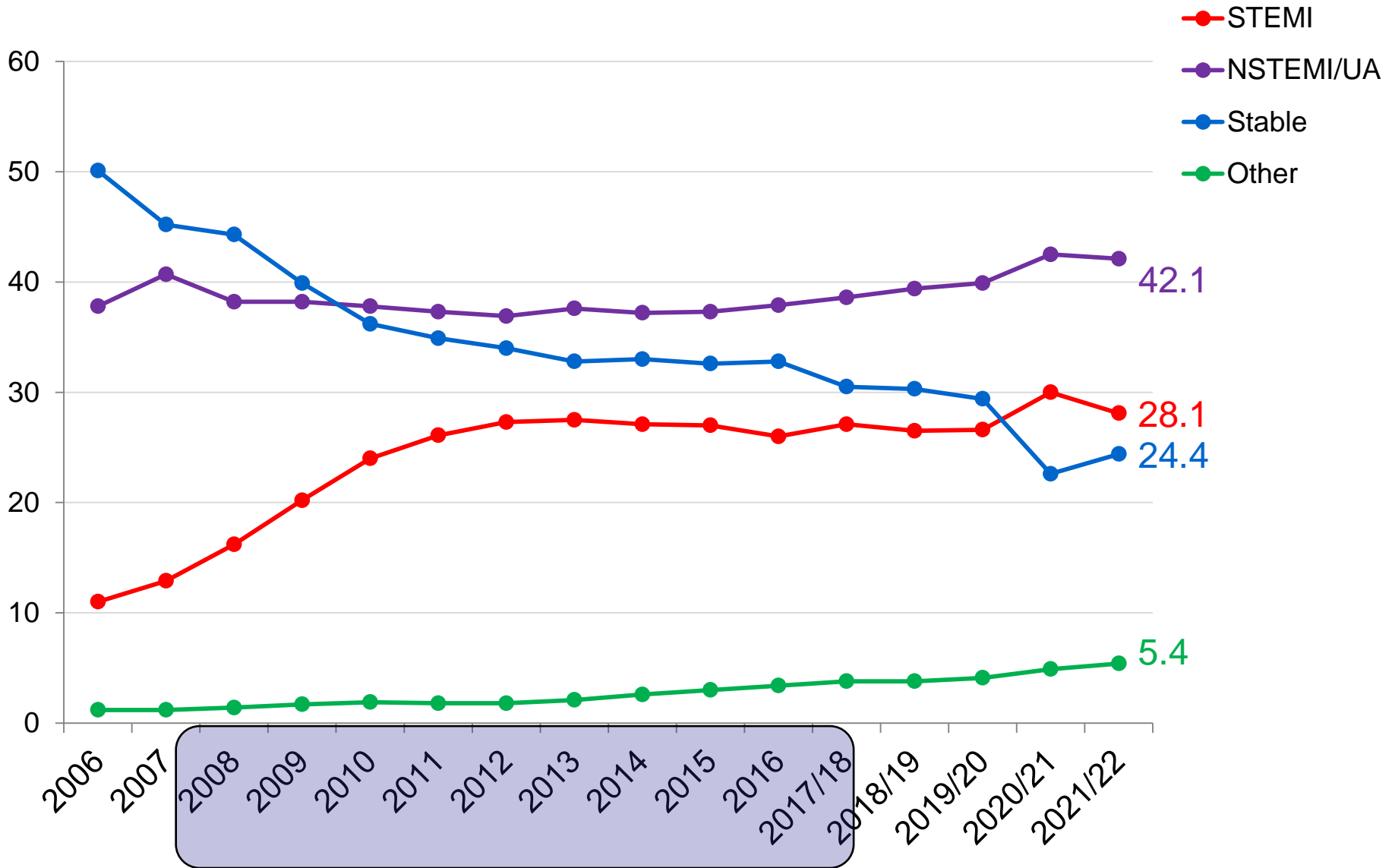
% Acute Coronary Syndrome



Indication for PCI



Indication for PCI



Stable Angina

- **COURAGE (2007)**
 - As an initial management strategy in patients with stable coronary artery disease, PCI did not reduce the risk of death, MI or MACE when added to optimal medical therapy
- **ORBITA (2017)**
 - In patients with medically treated angina and severe coronary stenosis, PCI did not increase exercise time by more than the effect of a placebo procedure

PCI rates COURAGE and ORBITA

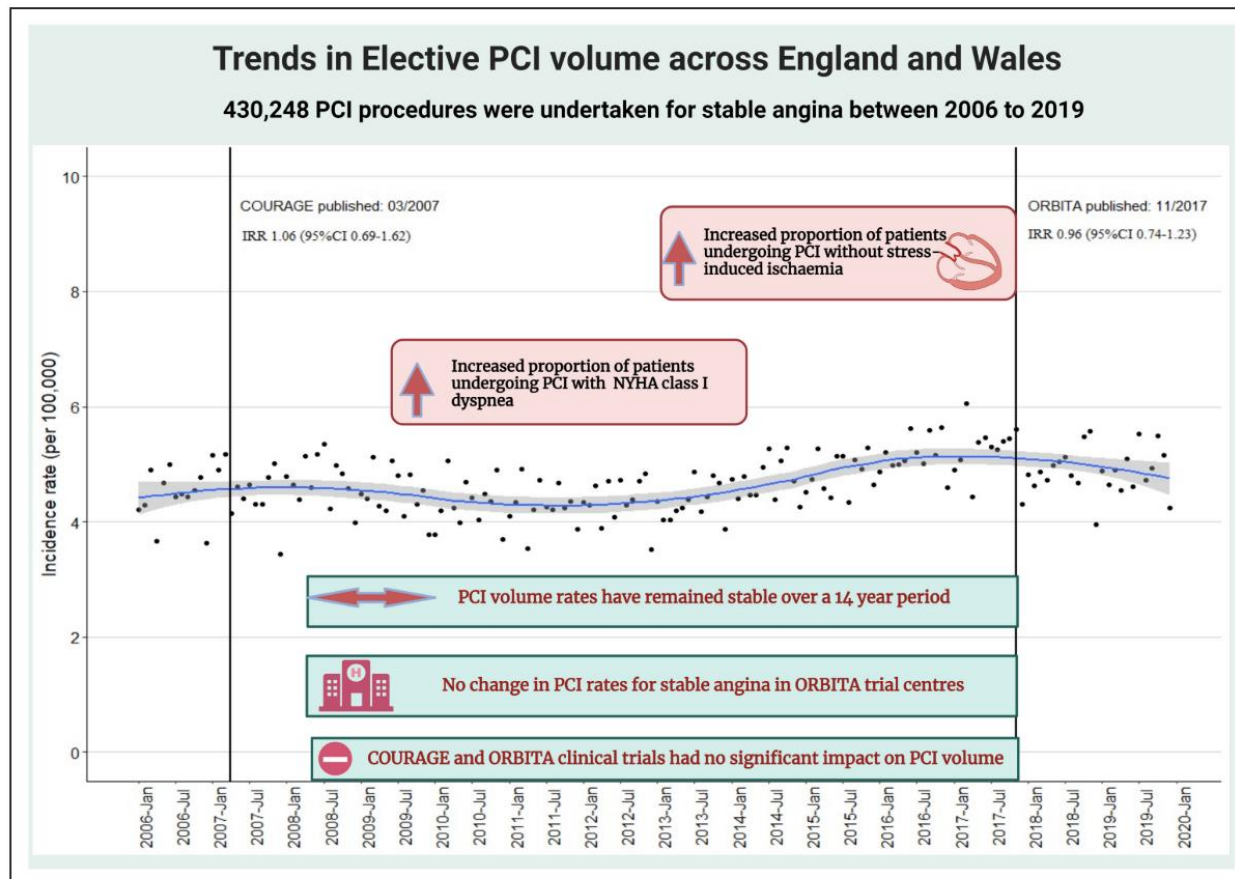
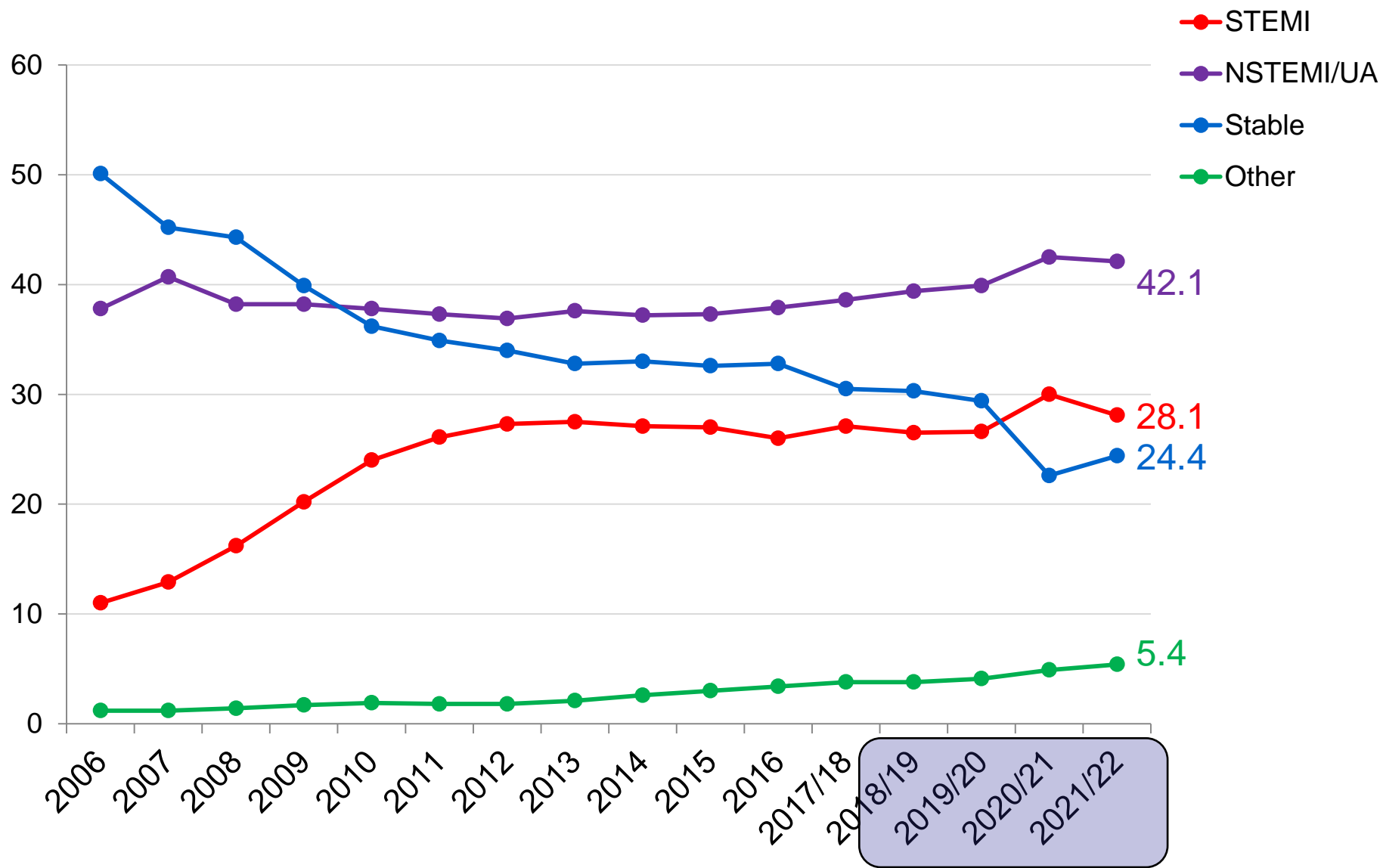


Figure 1. Temporal trends in rates of elective percutaneous coronary intervention (PCI) volume per 100000 population for stable angina in England and Wales.

COURAGE indicates Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation; IRR, incidence rate ratio; NYHA, New York Heart Association; and ORBITA, Objective Randomized Blinded Investigation With Optimal Medical Therapy of Angioplasty in Stable Angina.

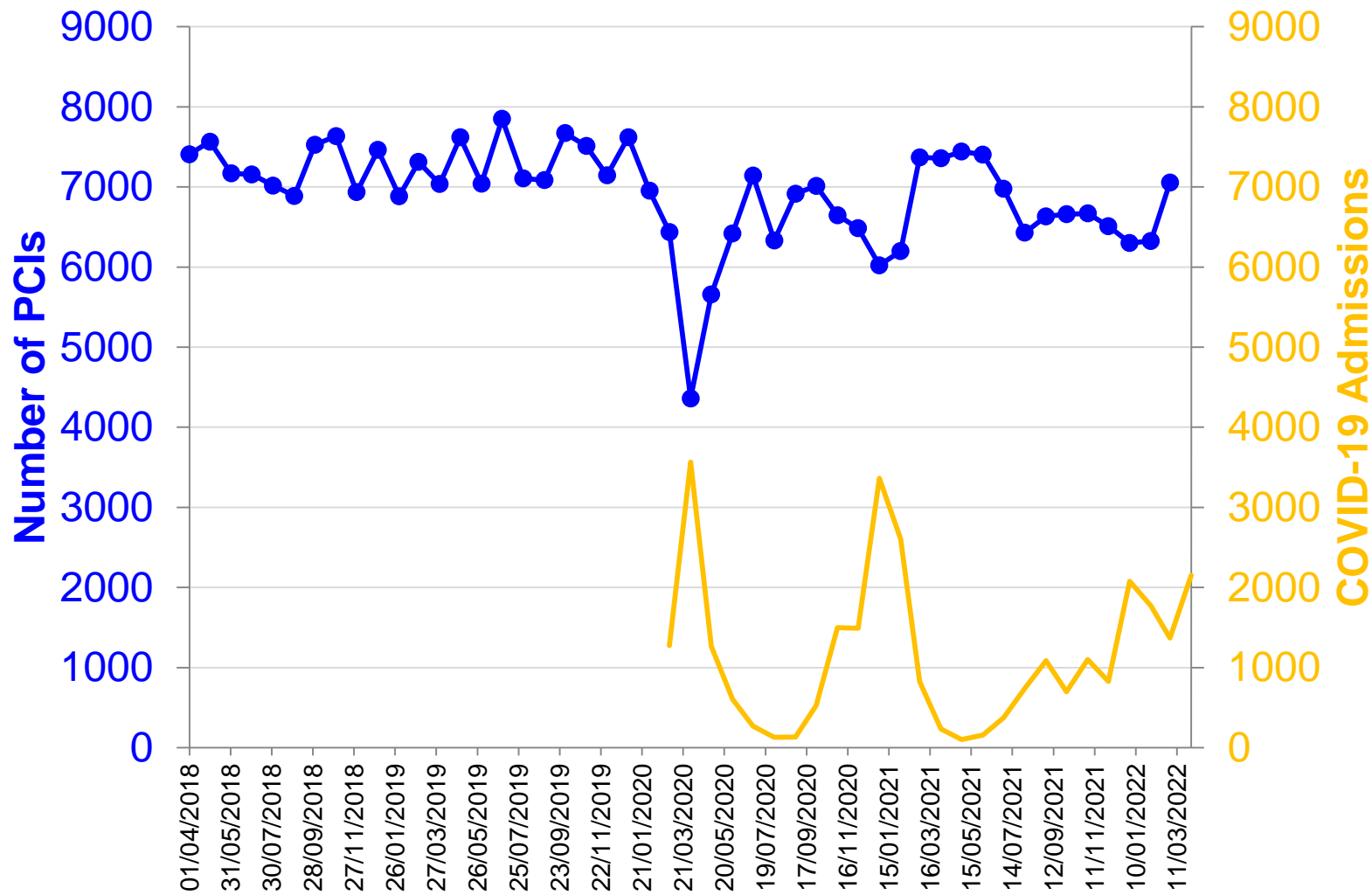
Indication for PCI



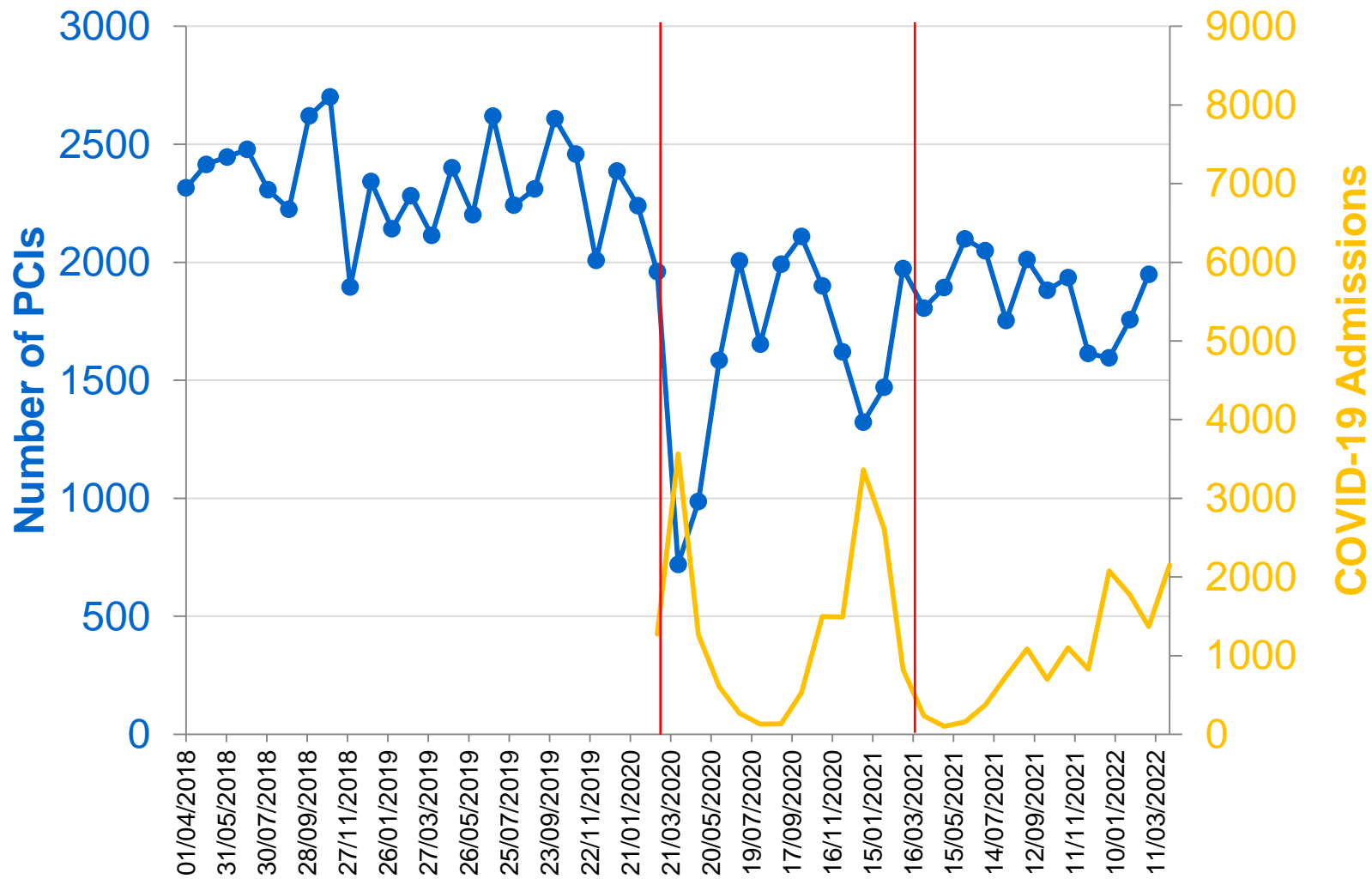
Stable Angina

- ISCHEMIA (2020)
 - Invasive v Conservative
 - Revasc failed to reduce mortality or MACCE
 - No difference for
 - Amount of ischaemia
 - Extent of coronary disease
 - Diabetes
- REVIVED(2022)
 - severe ischemic LV dysfunction who received optimal medical therapy, PCI did not result in a lower incidence of death or hospitalization for heart failure

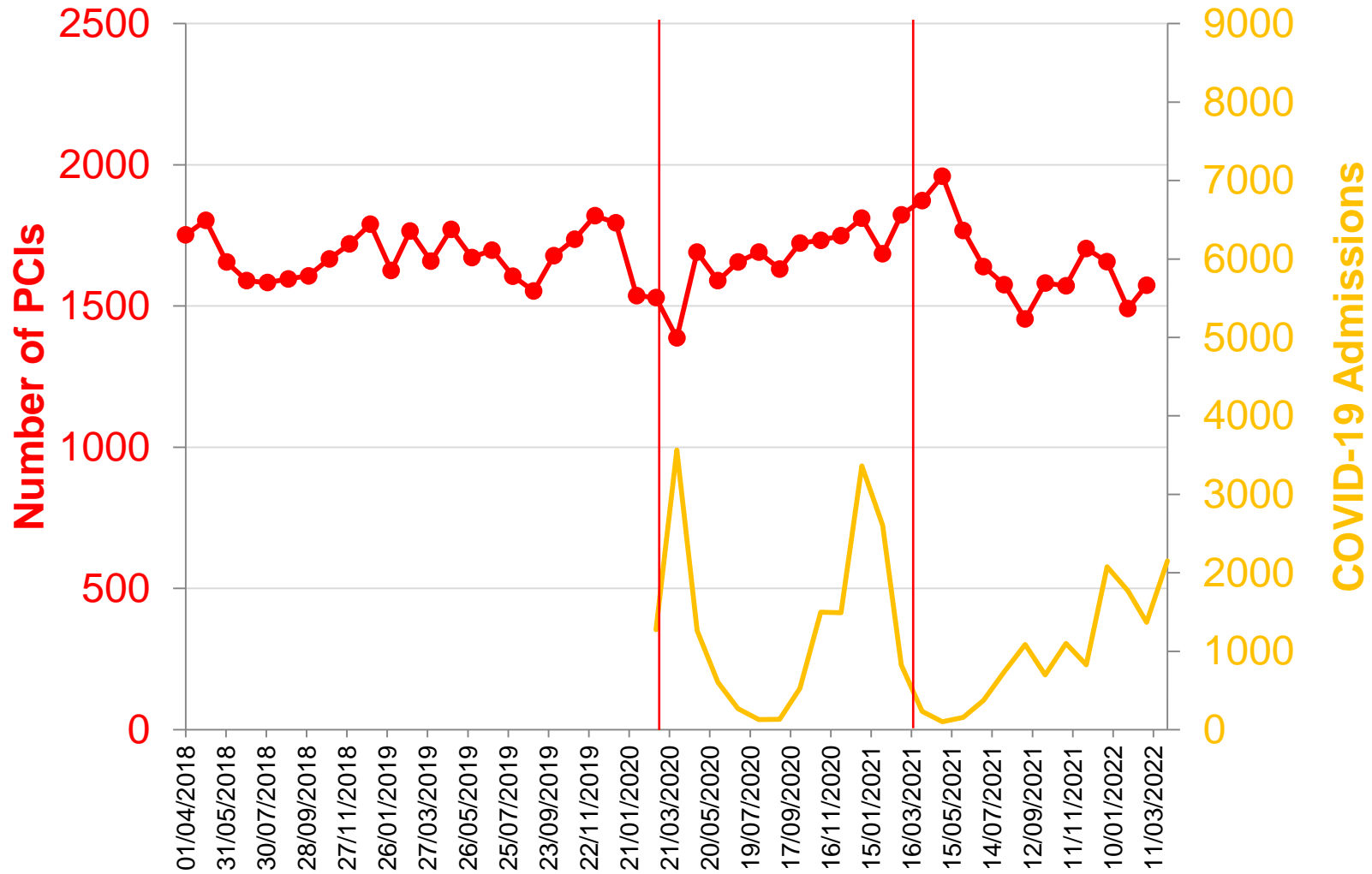
Total PCIs in E&W by Month Compared with COVID-19 admissions (UK)



Elective PCIs in E&W by Month Compared with COVID-19 admissions (UK)

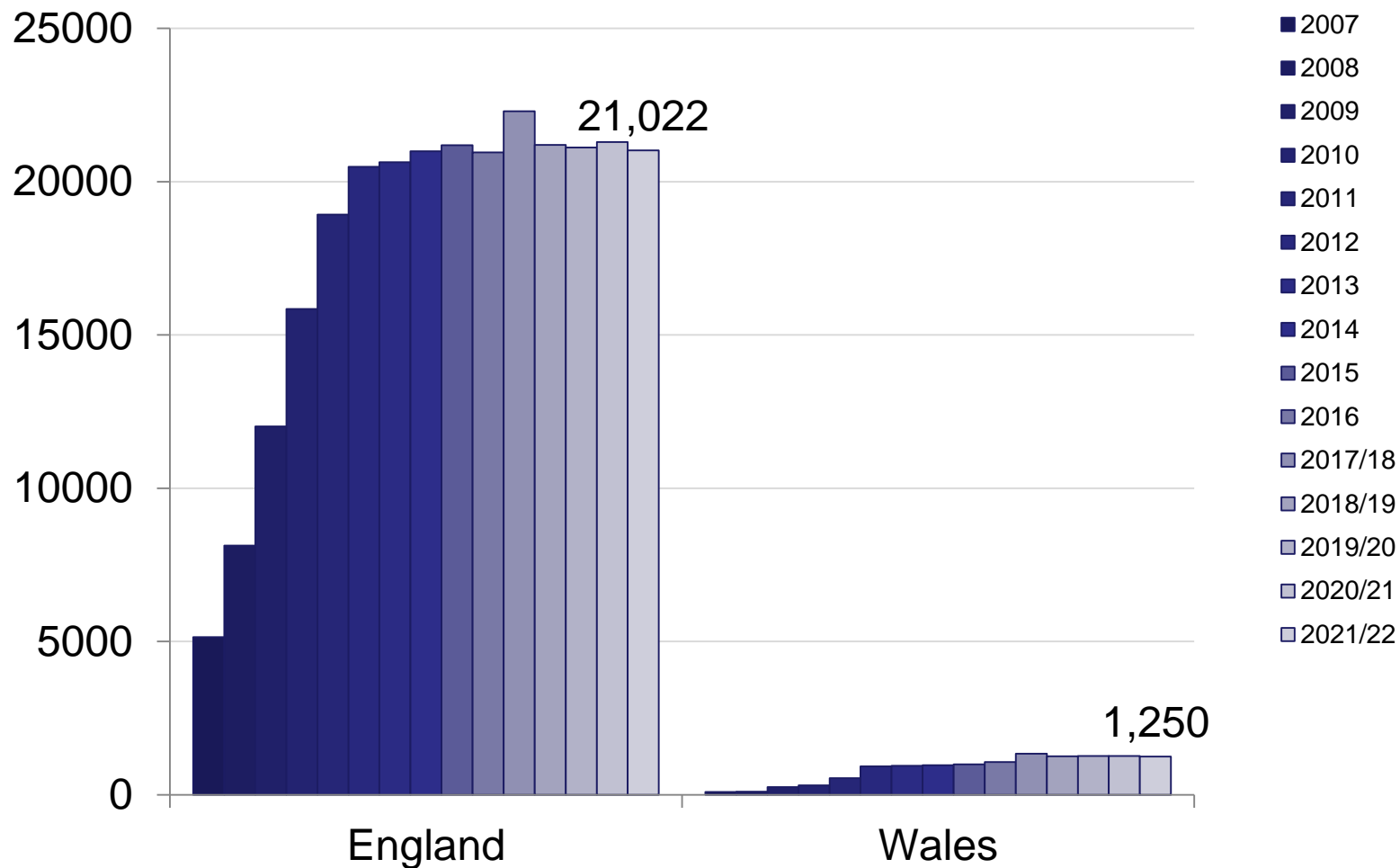


Primary PCIs in E&W by Month Compared with COVID-19 admissions (UK)



Primary PCI

UK Countries - Total number of procedures in NICOR

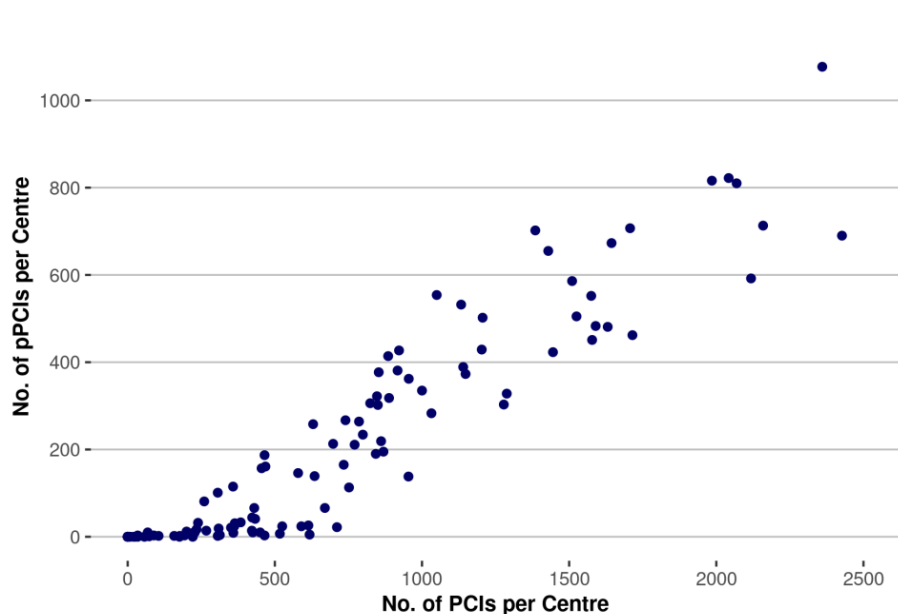


Note few Scottish and NI data uploaded in recent years

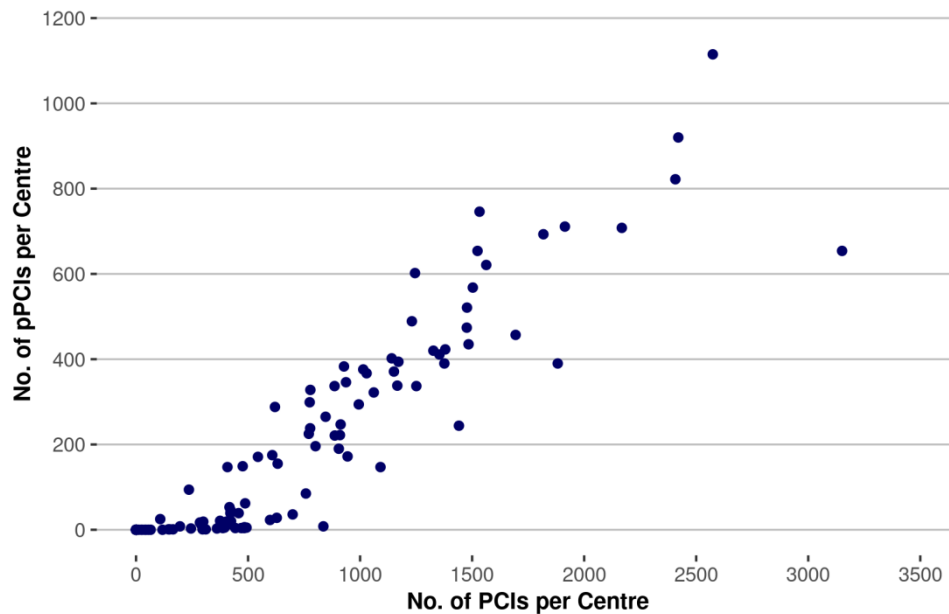
Primary PCI for STEMI

Absolute numbers

2020/21

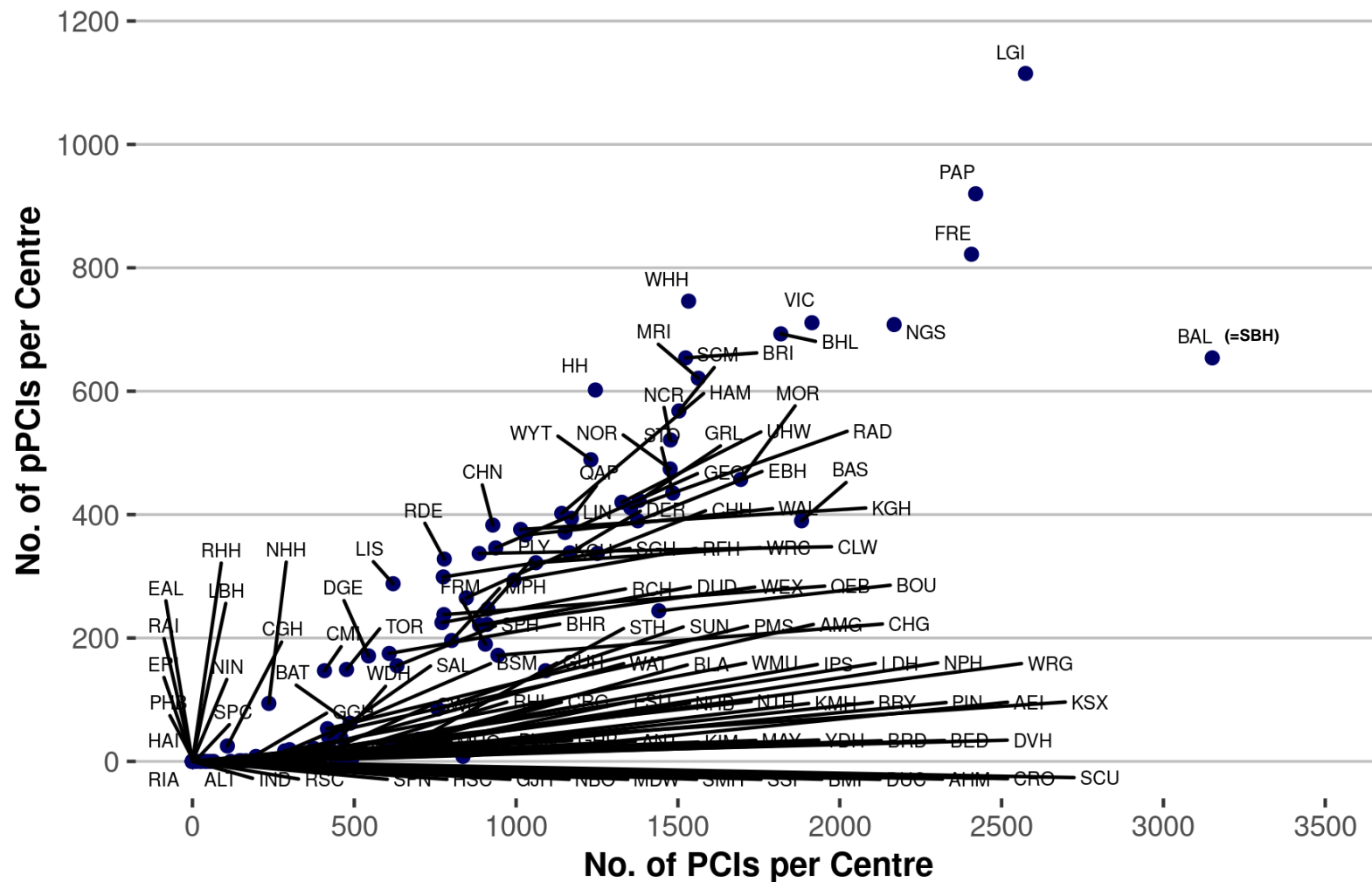


2021/22

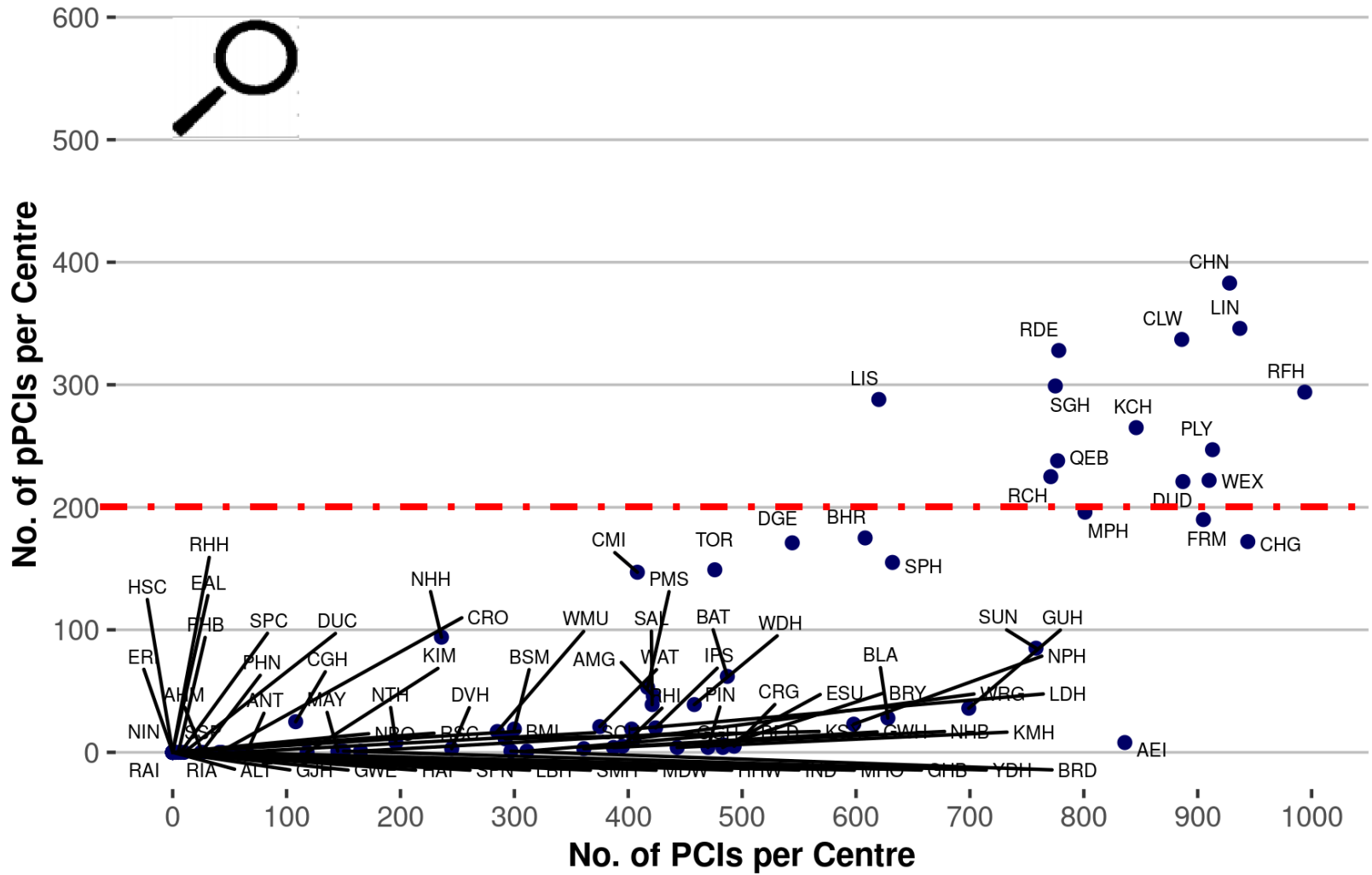


Primary PCI for STEMI

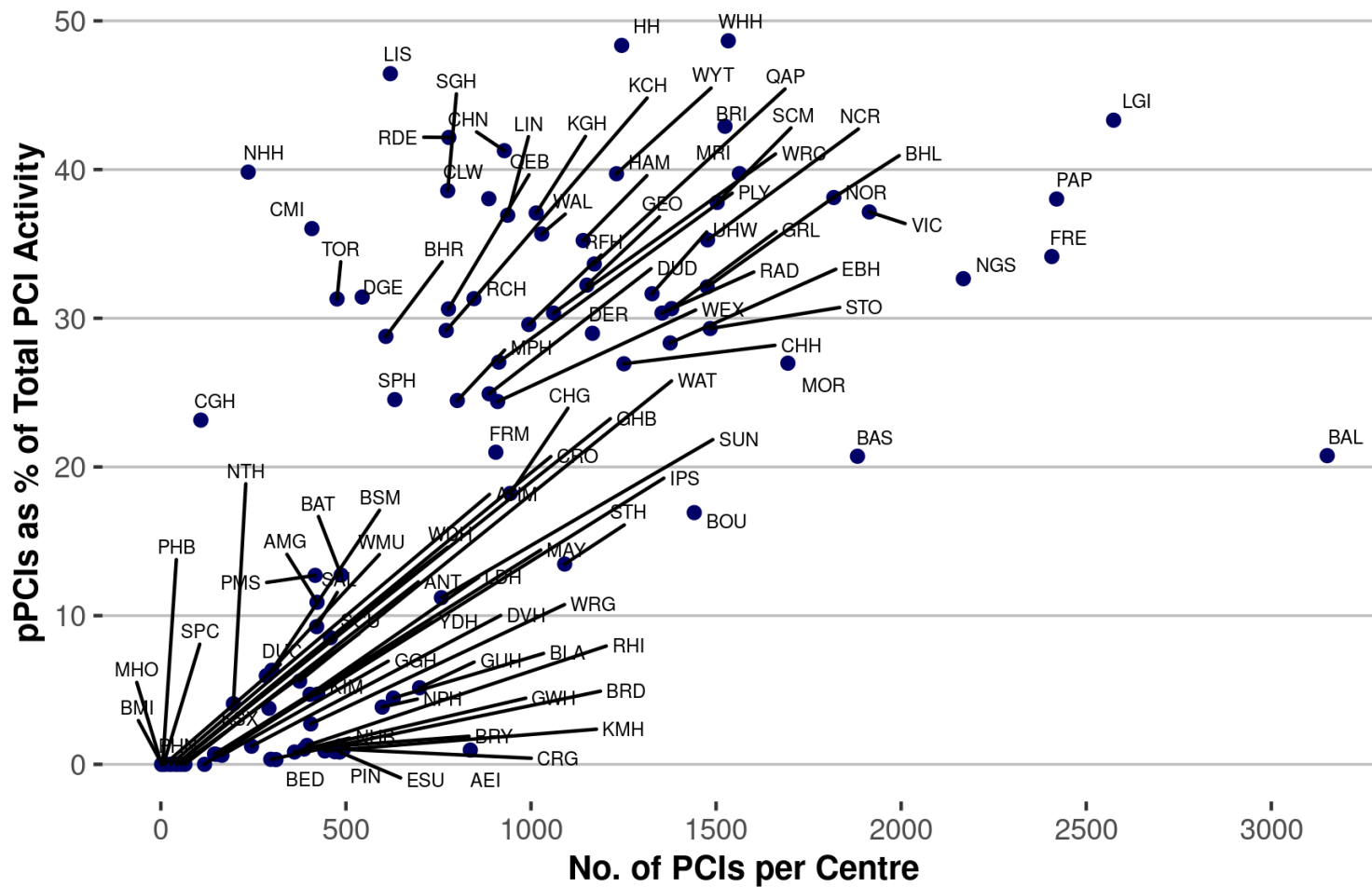
Absolute numbers



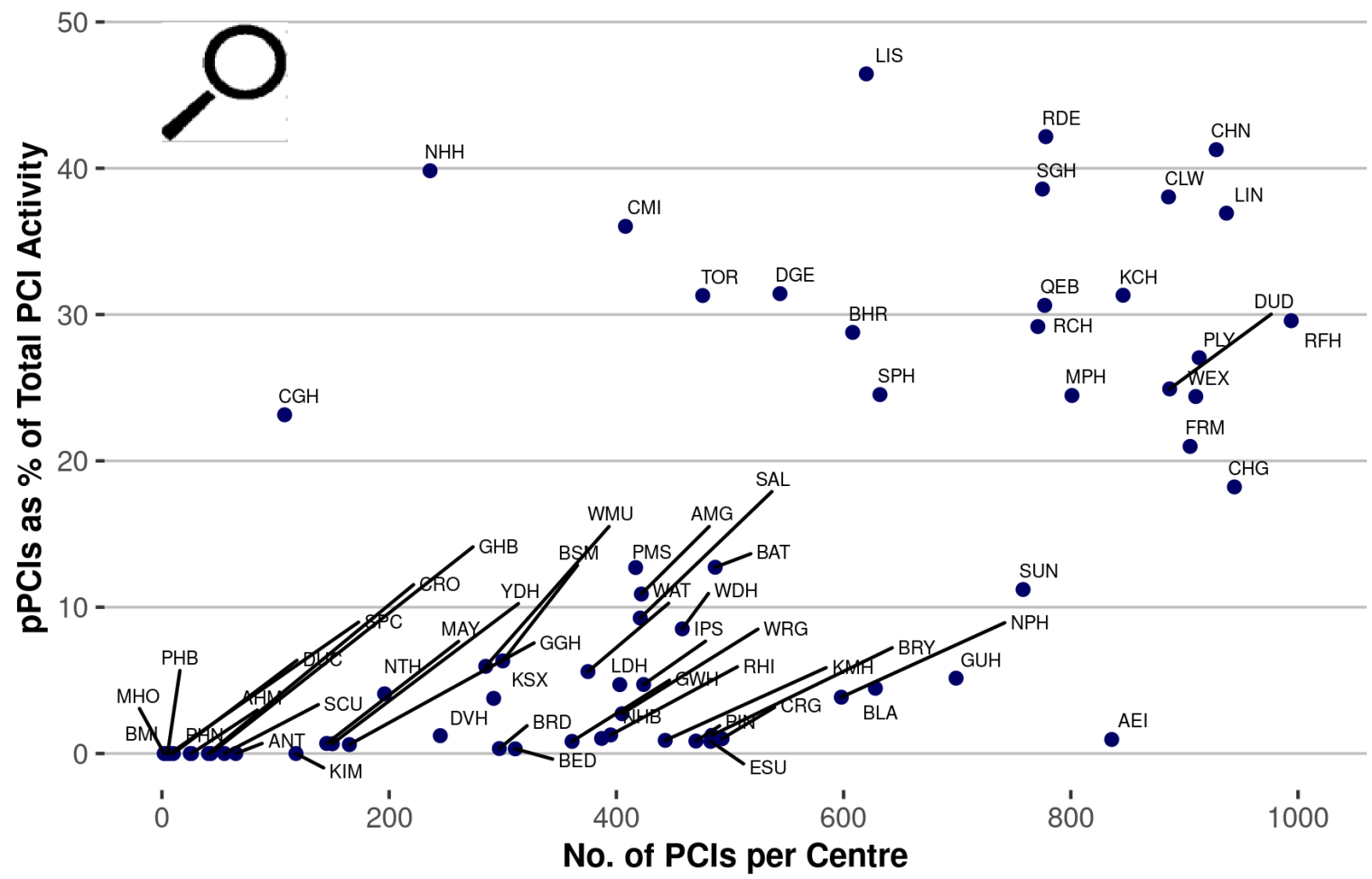
Primary PCI for STEMI Absolute numbers



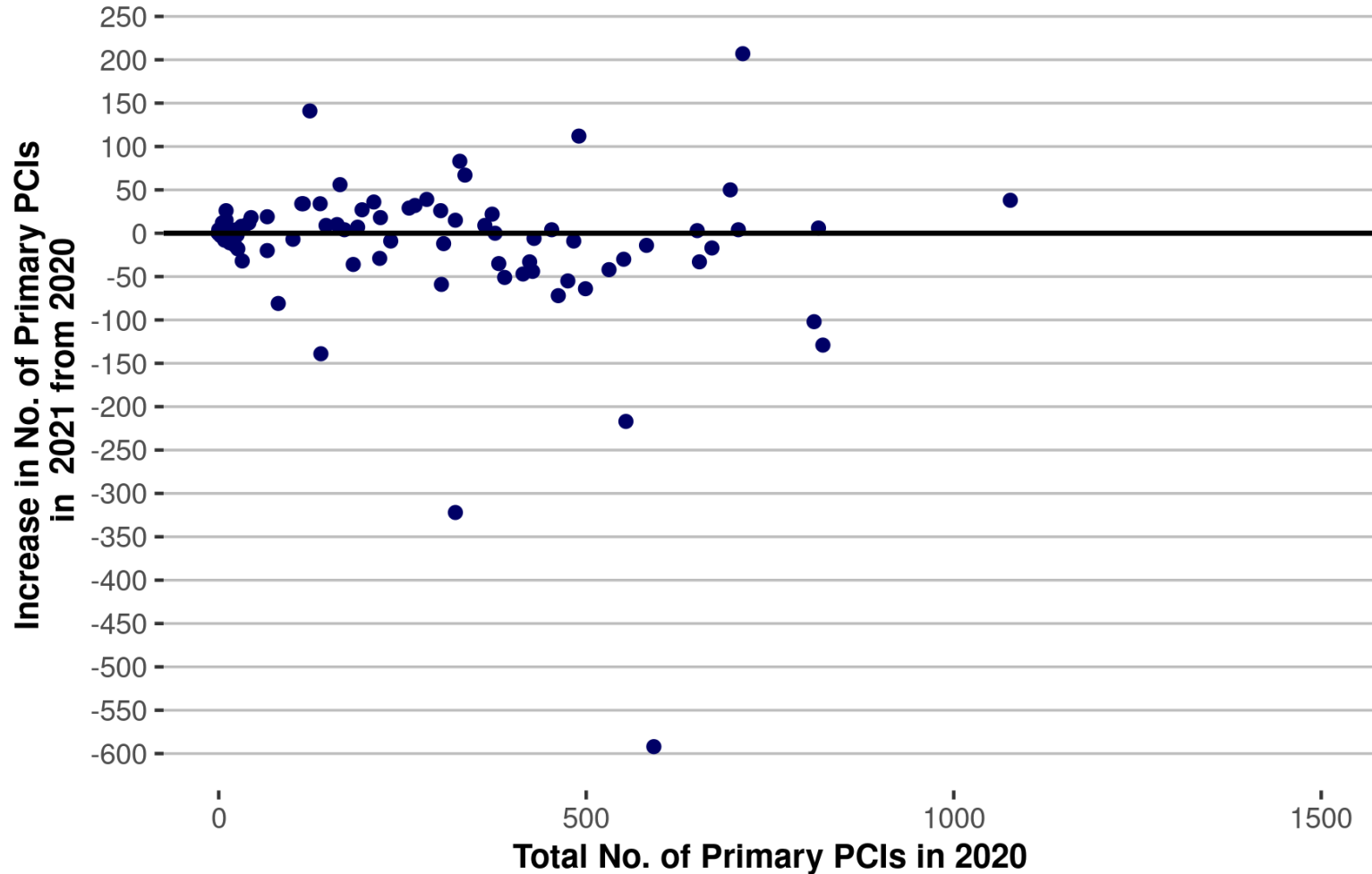
Primary PCI for STEMI As % of Total PCIs



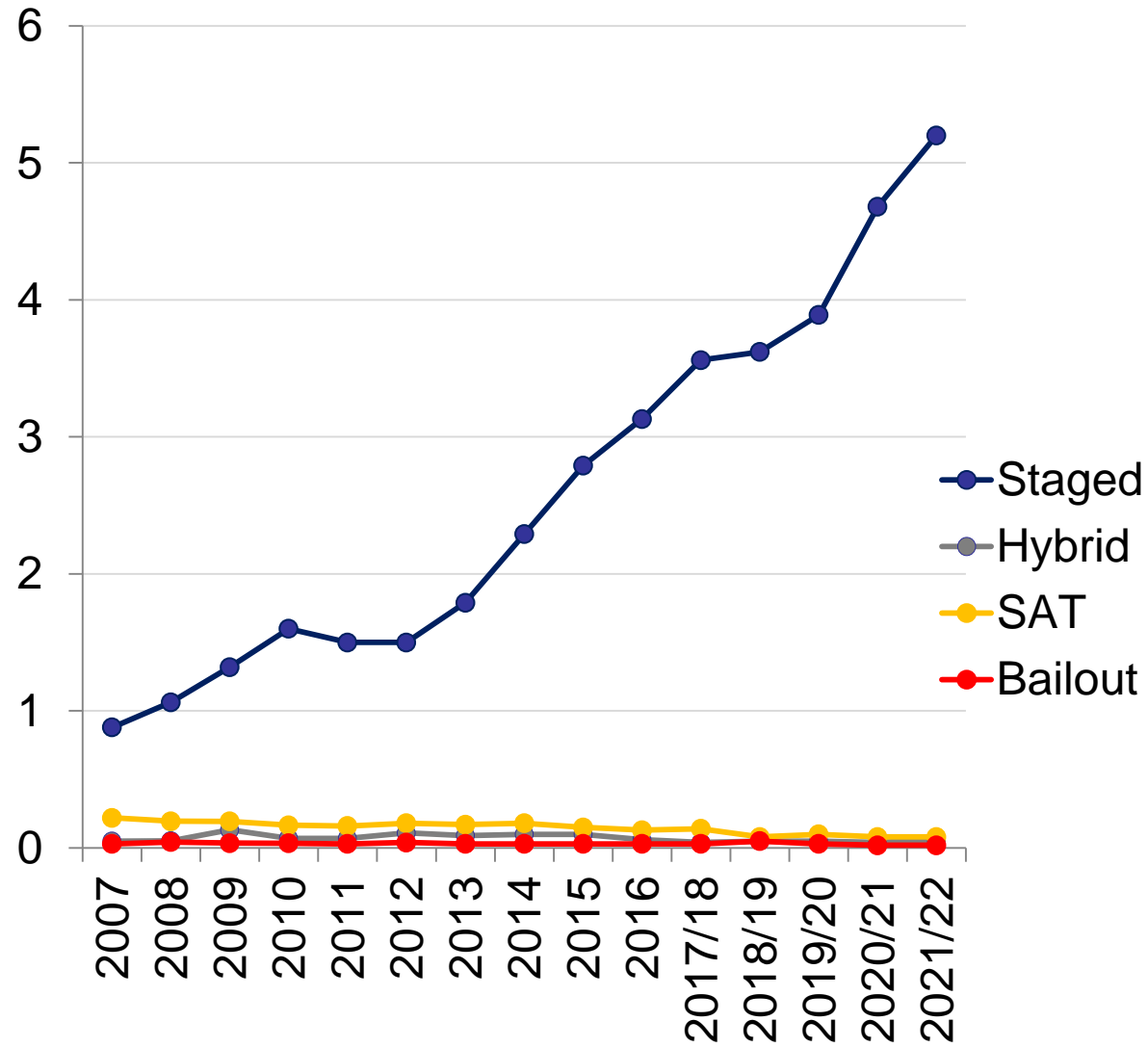
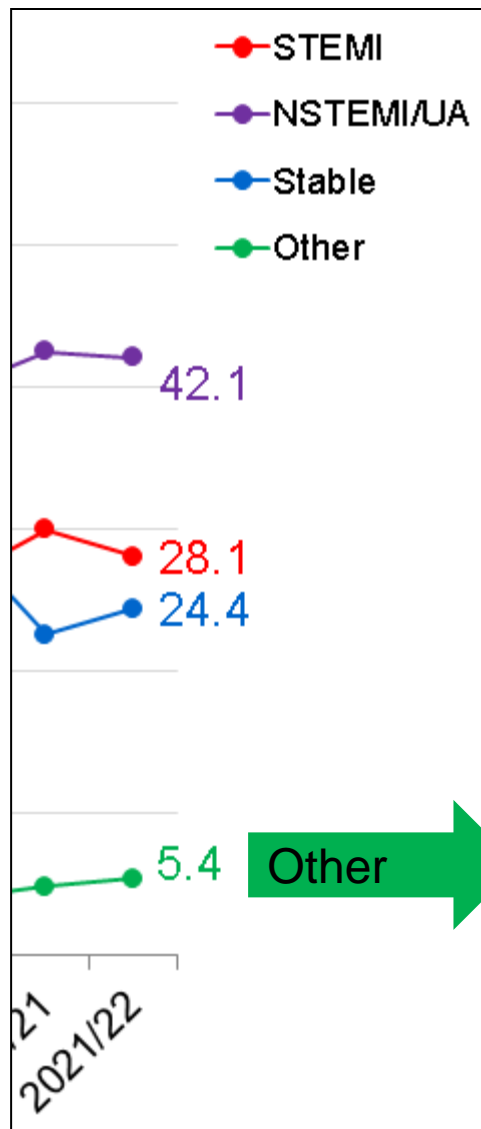
Primary PCI for STEMI As % of Total PCIs



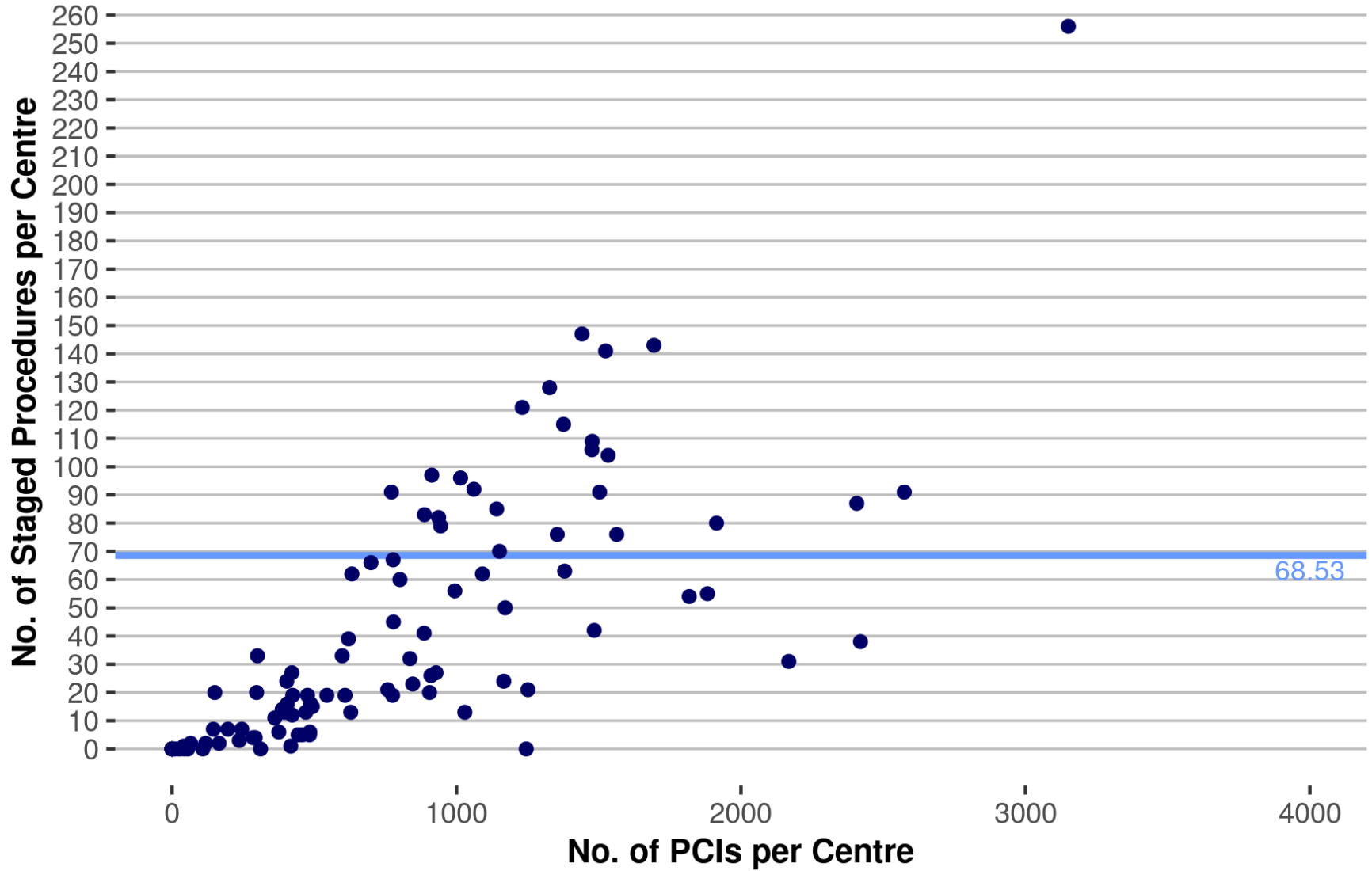
Primary PCI for STEMI Increase



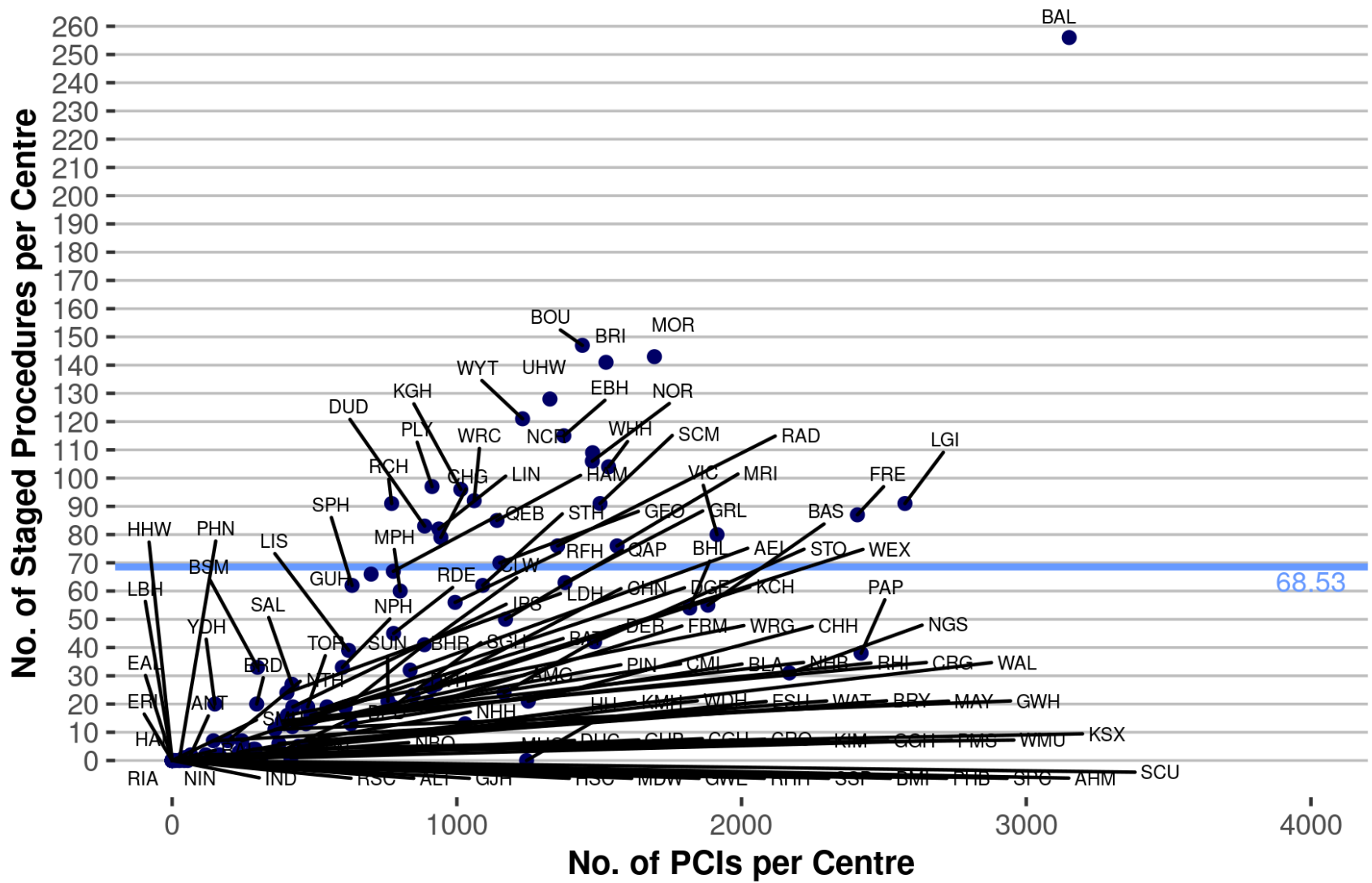
Indication for PCI



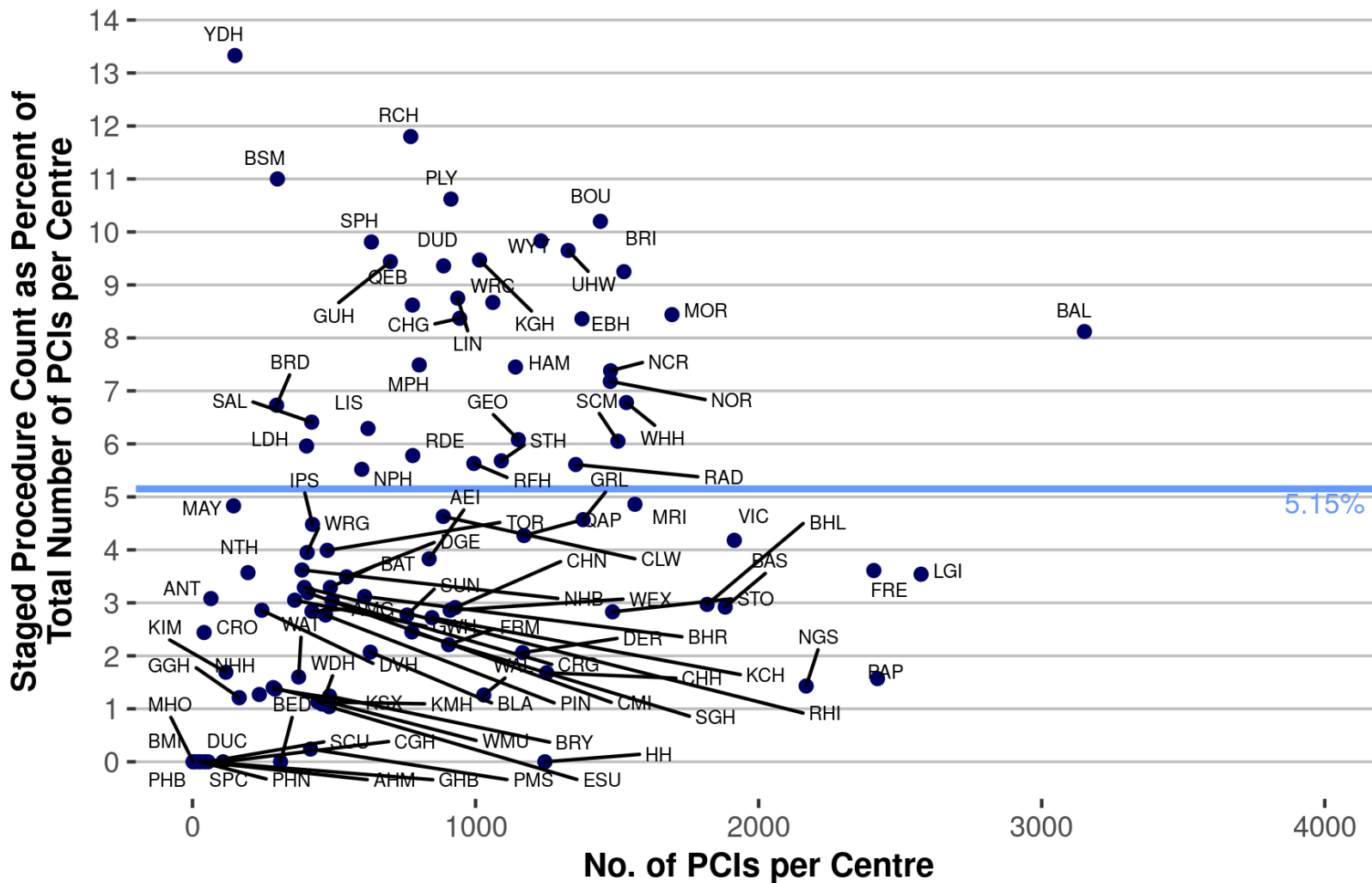
Staged - Totals



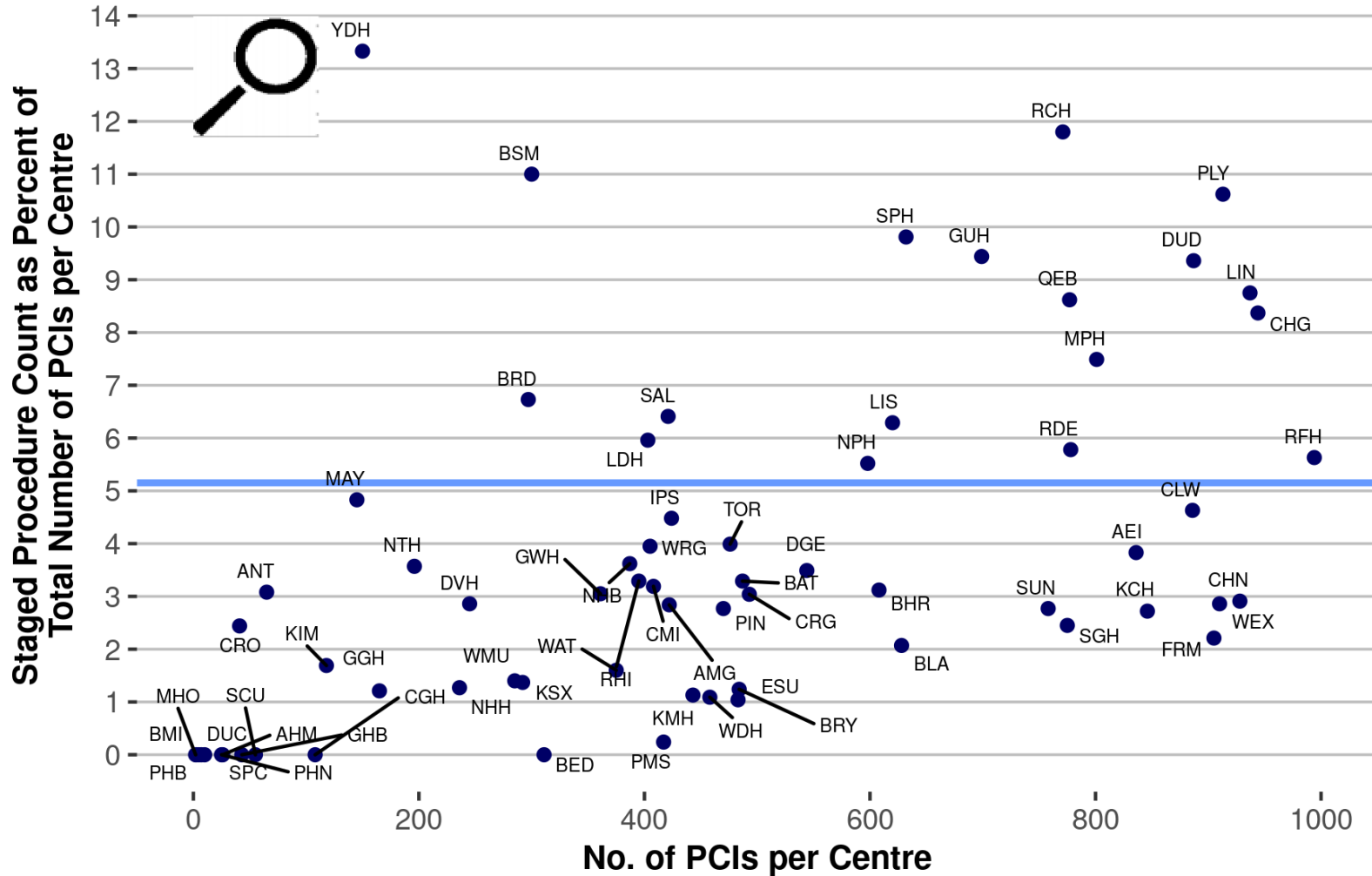
Staged - Totals



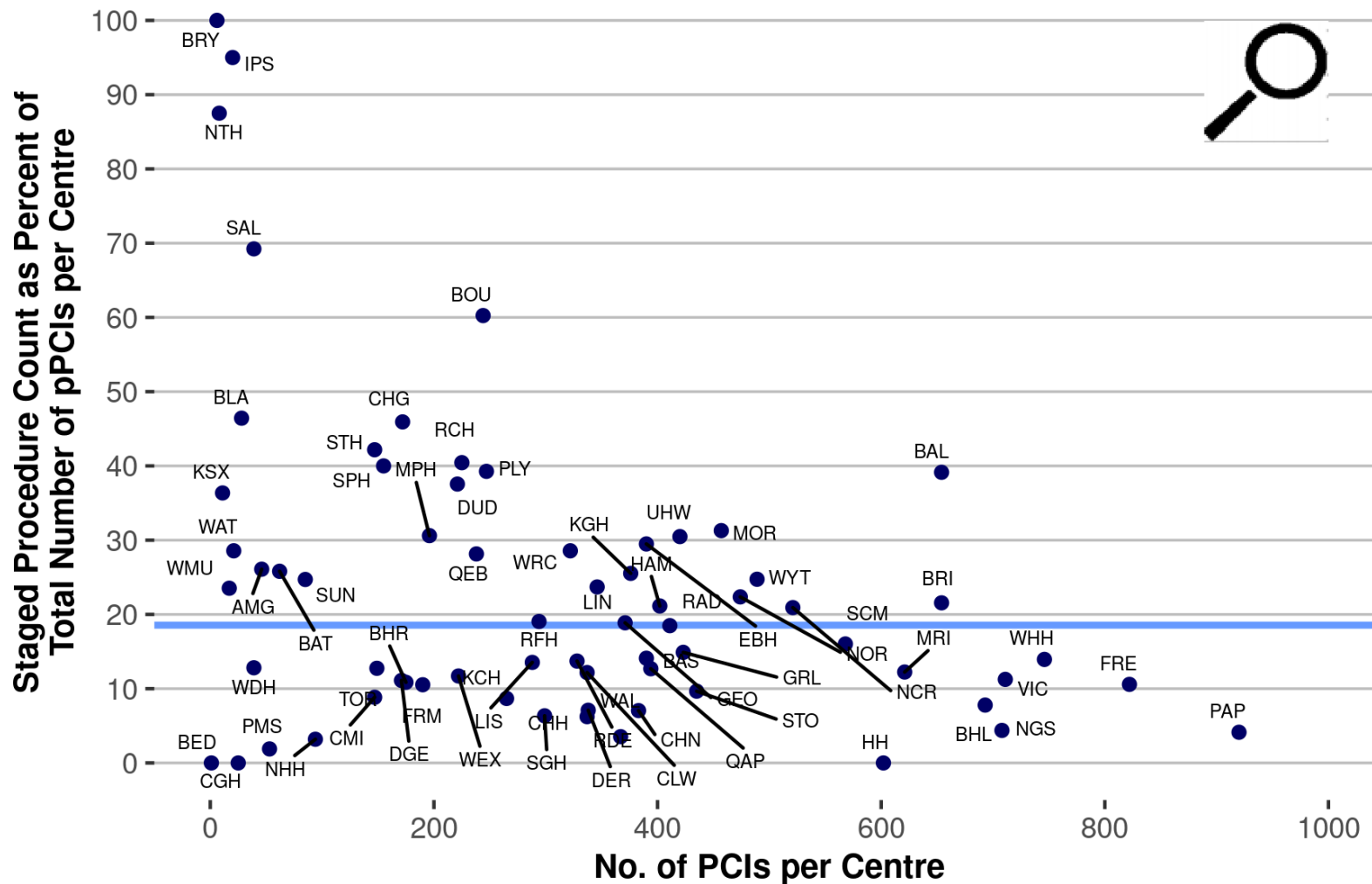
Staged % of all PCI



Staged % of all PCI



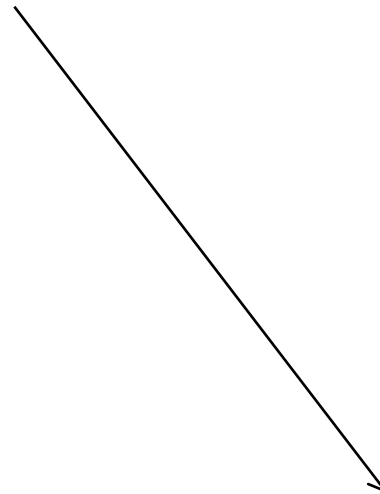
Staged % of Primary PCI





Out of Hospital Cardiac Arrest

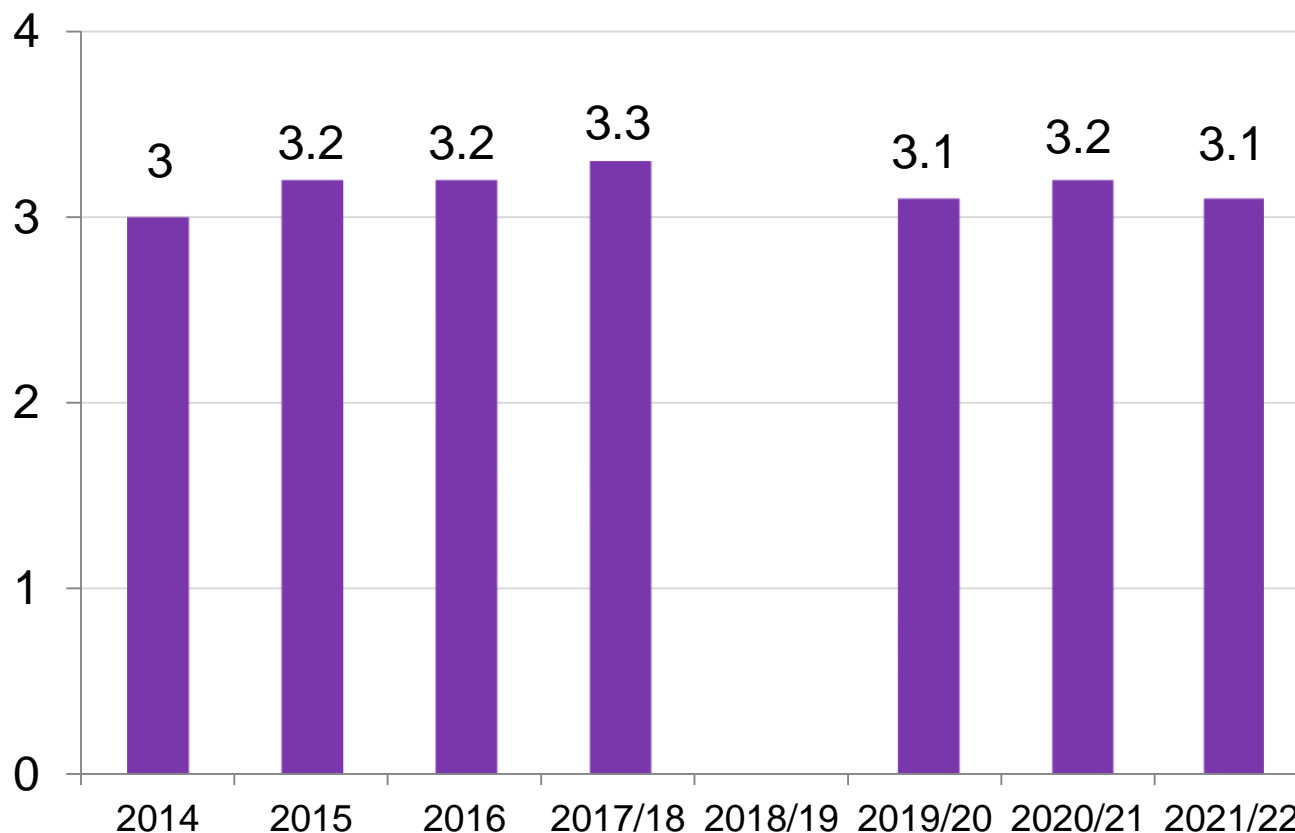
The only procedures we see in the PCI audit



PCI performed

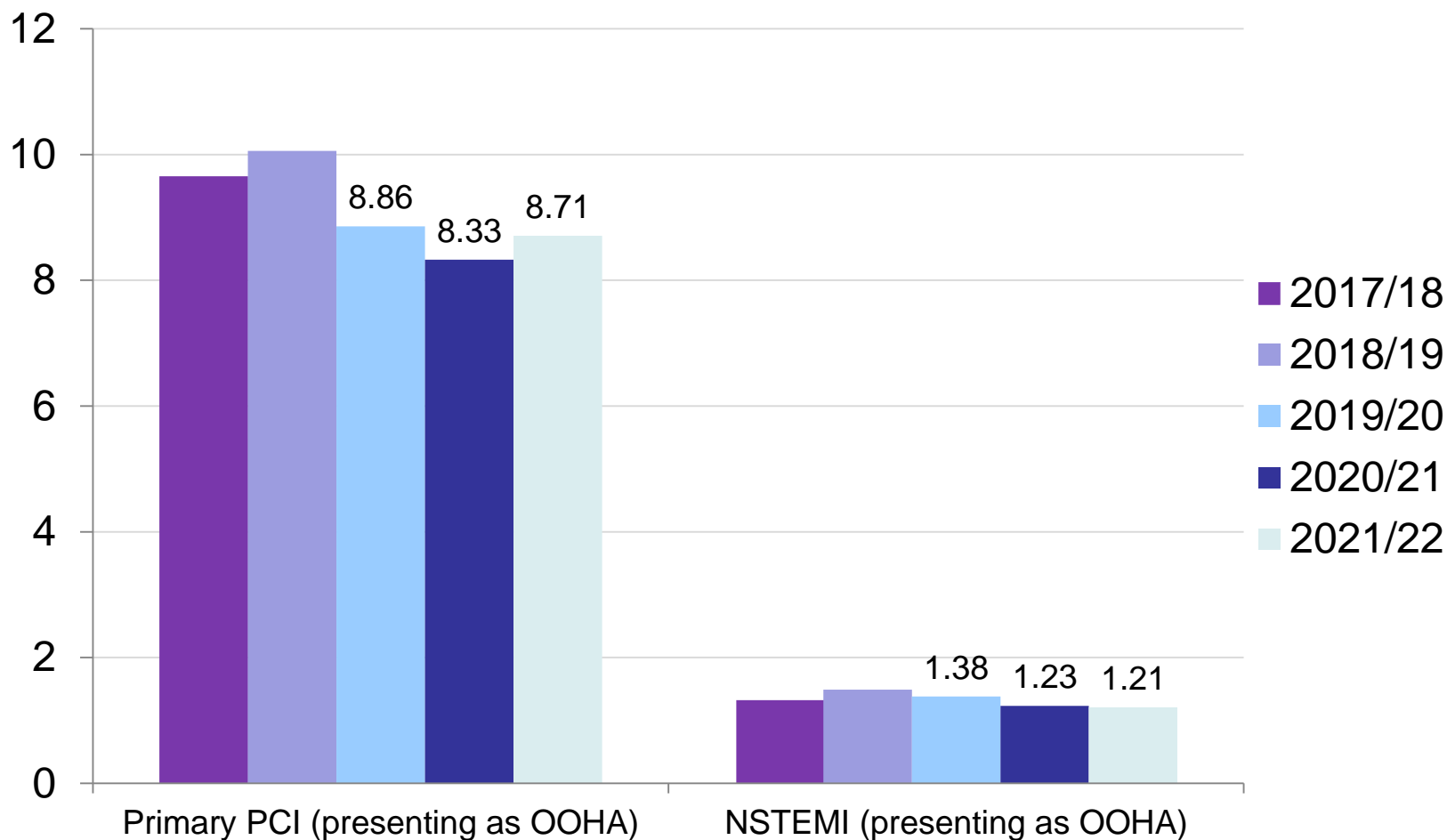
Out of Hospital Cardiac Arrest

- Of patients treated by PCI
 - % who had had an Out of Hospital Cardiac Arrest (ventilated or not)



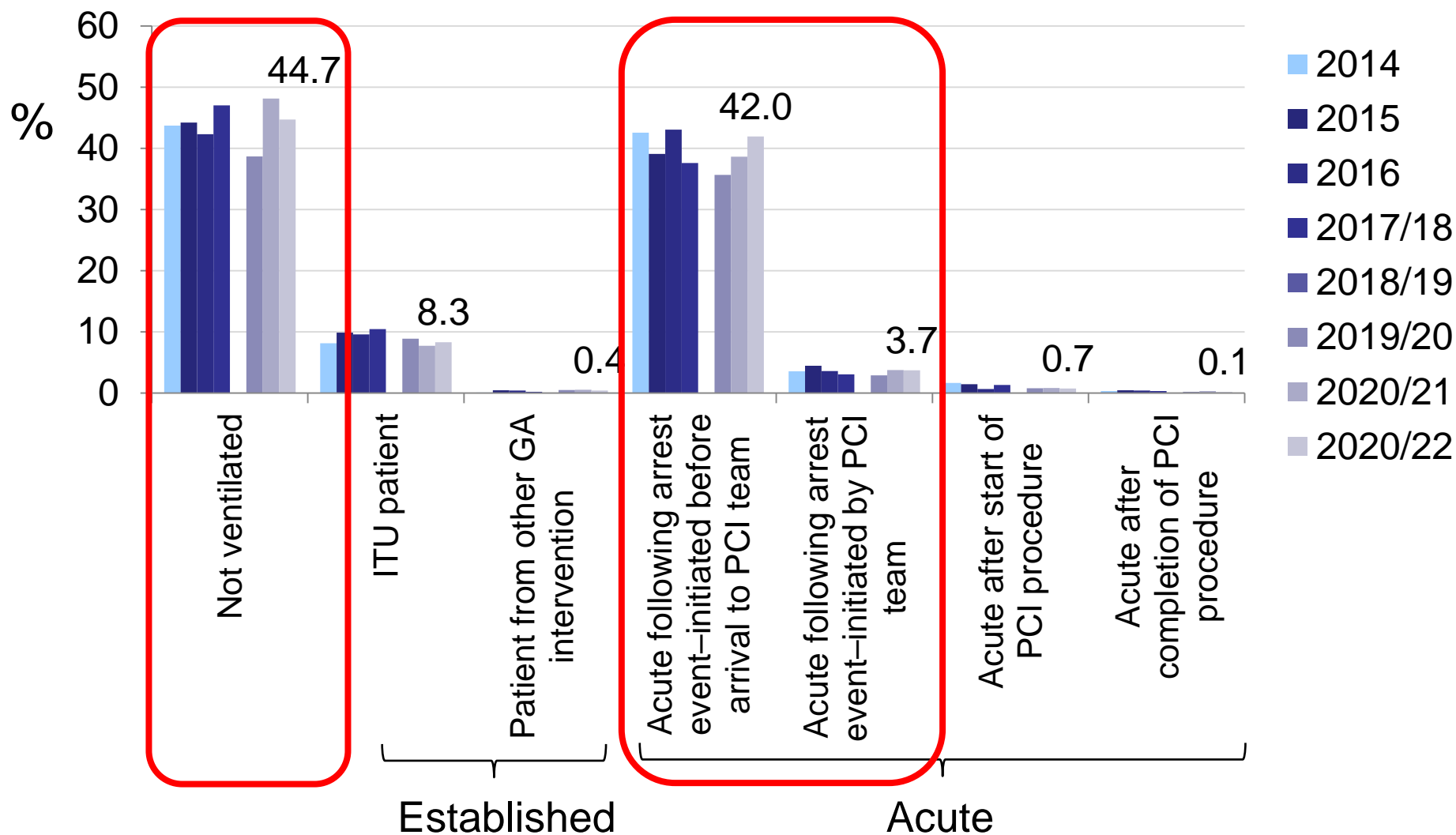
Out of Hospital Cardiac Arrest

As % of all cases with PCI Indication as below
(ventilated or not)



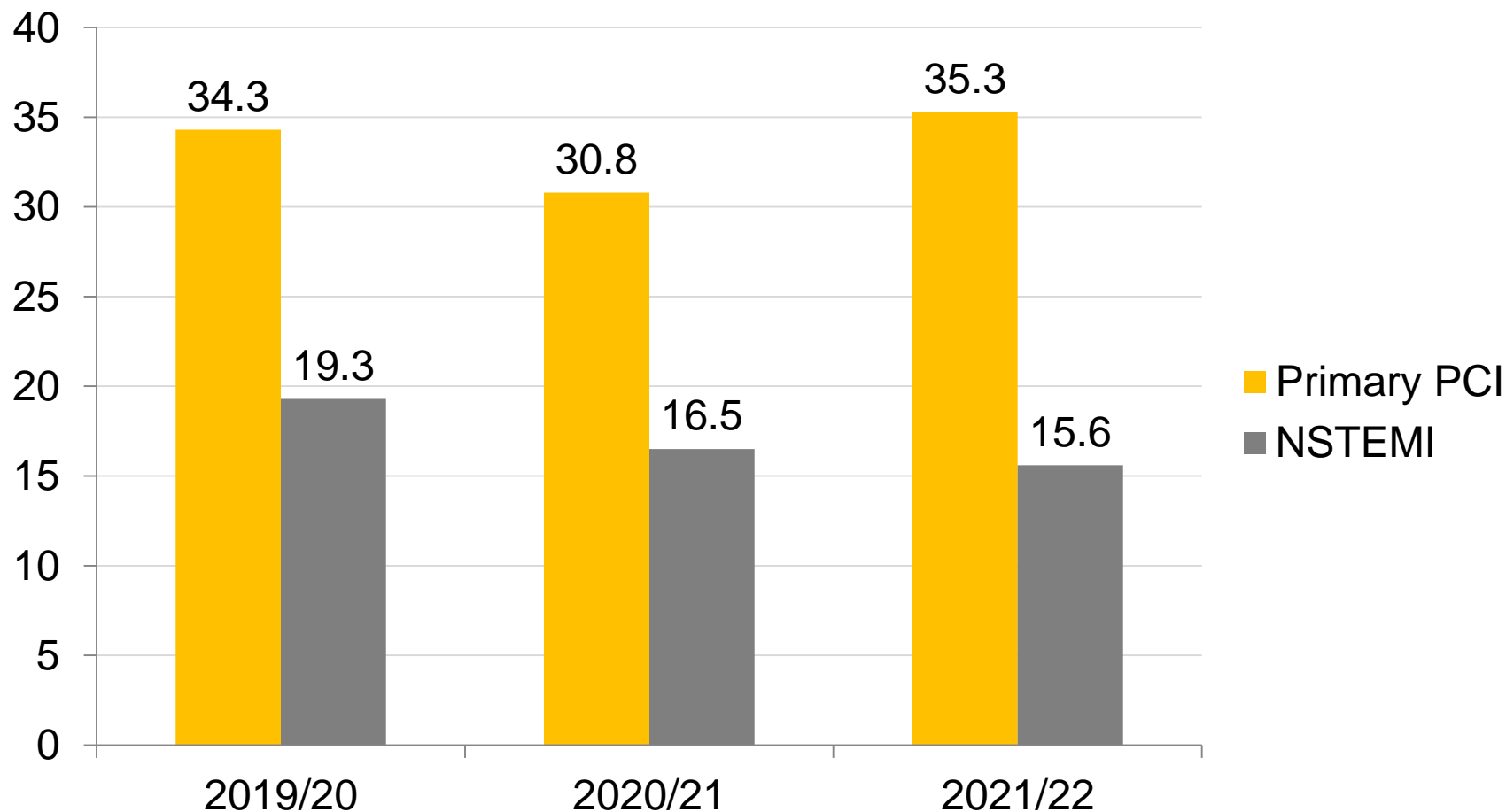
Out of Hospital Cardiac Arrest

(By type of ventilation requirement)



Out of Hospital Cardiac Arrest

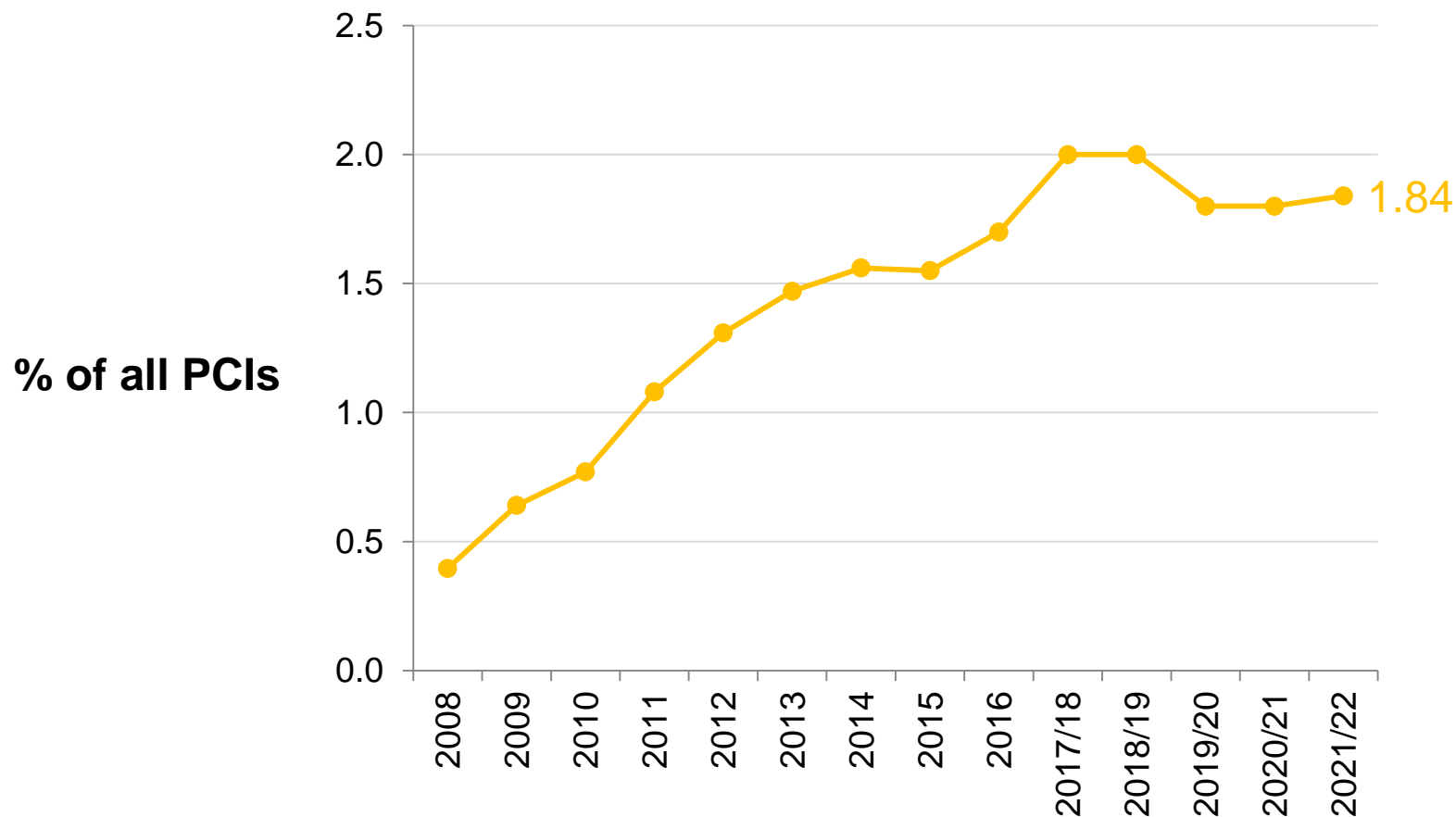
% of Cases with OHCA treated by PCI in Shock



Out of Hospital Cardiac Arrest

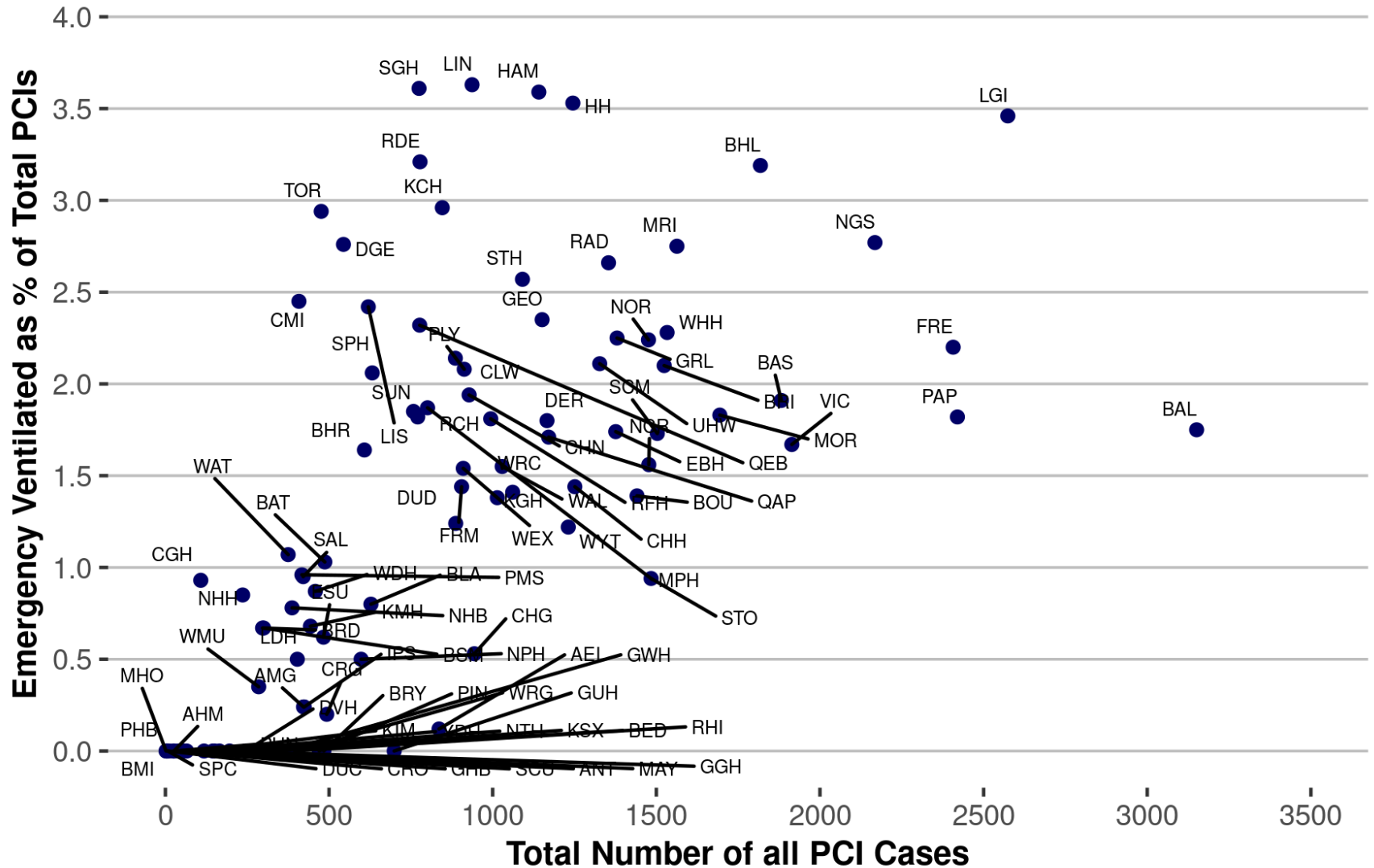
Total Number of Emergency cases with Pre PCI ventilation

- Surrogate of out of hospital cardiac arrest

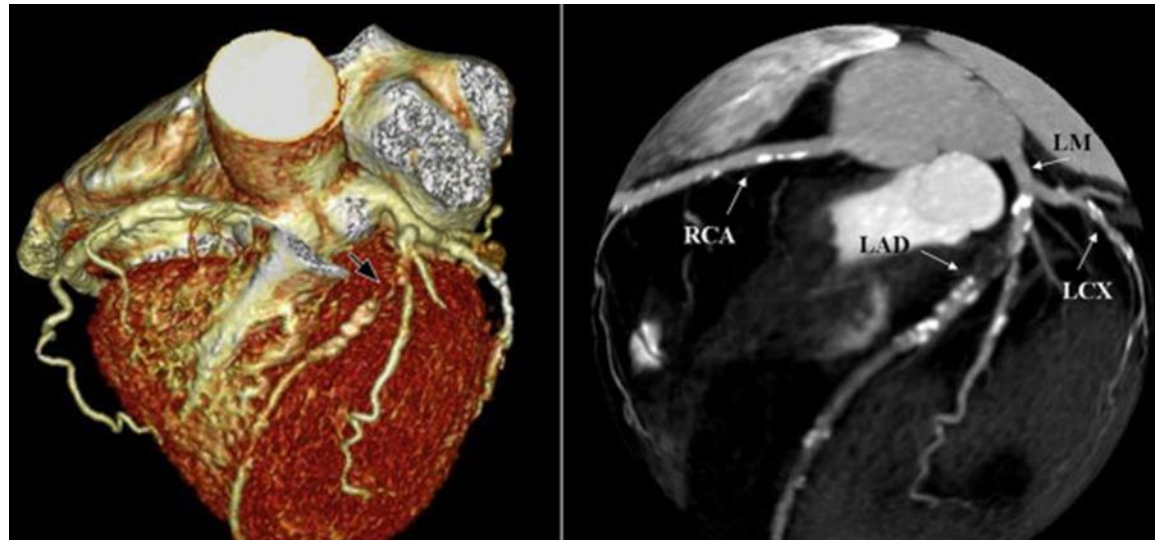


Pre PCI Ventilation

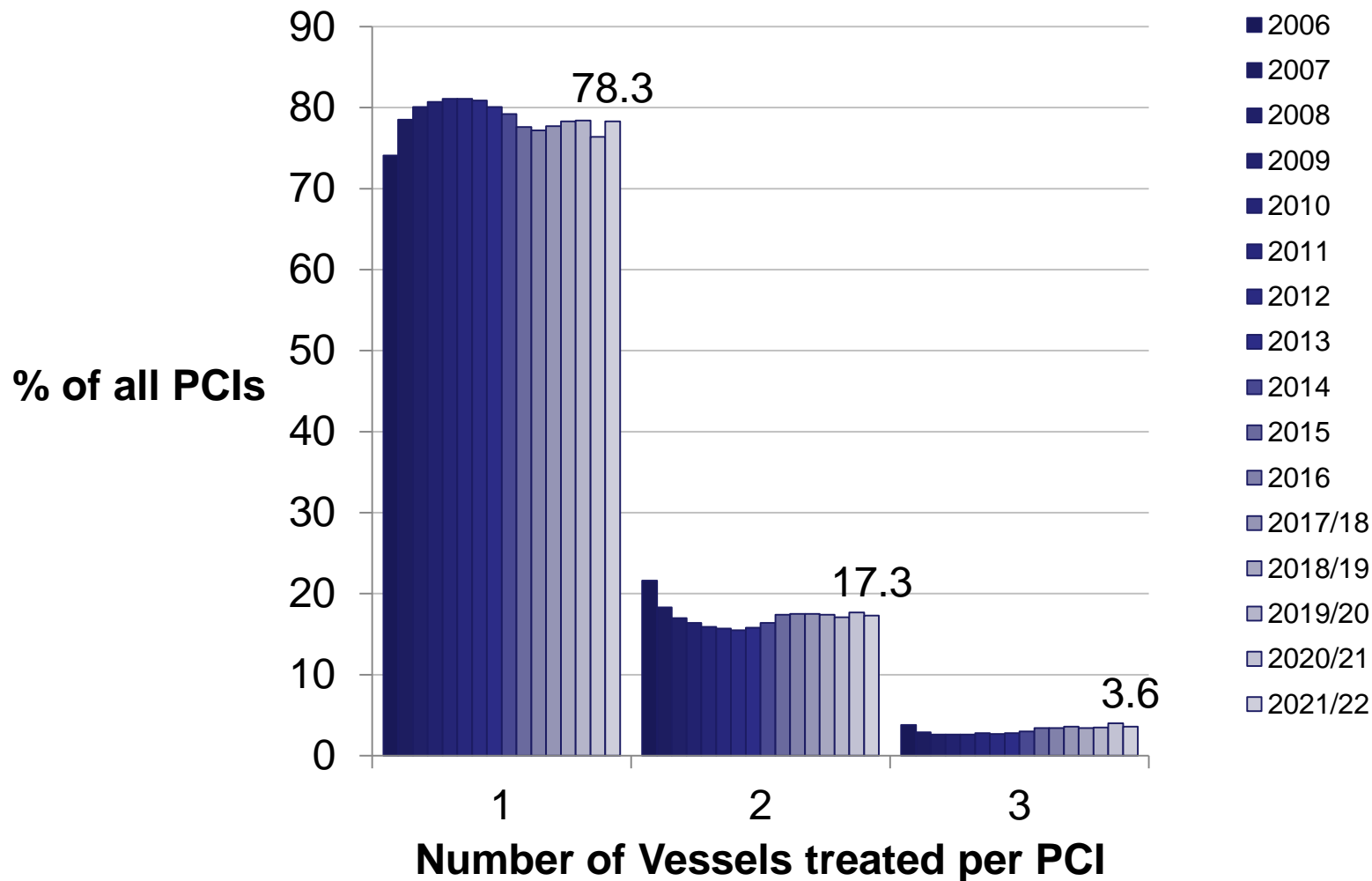
As % of all PCI activity



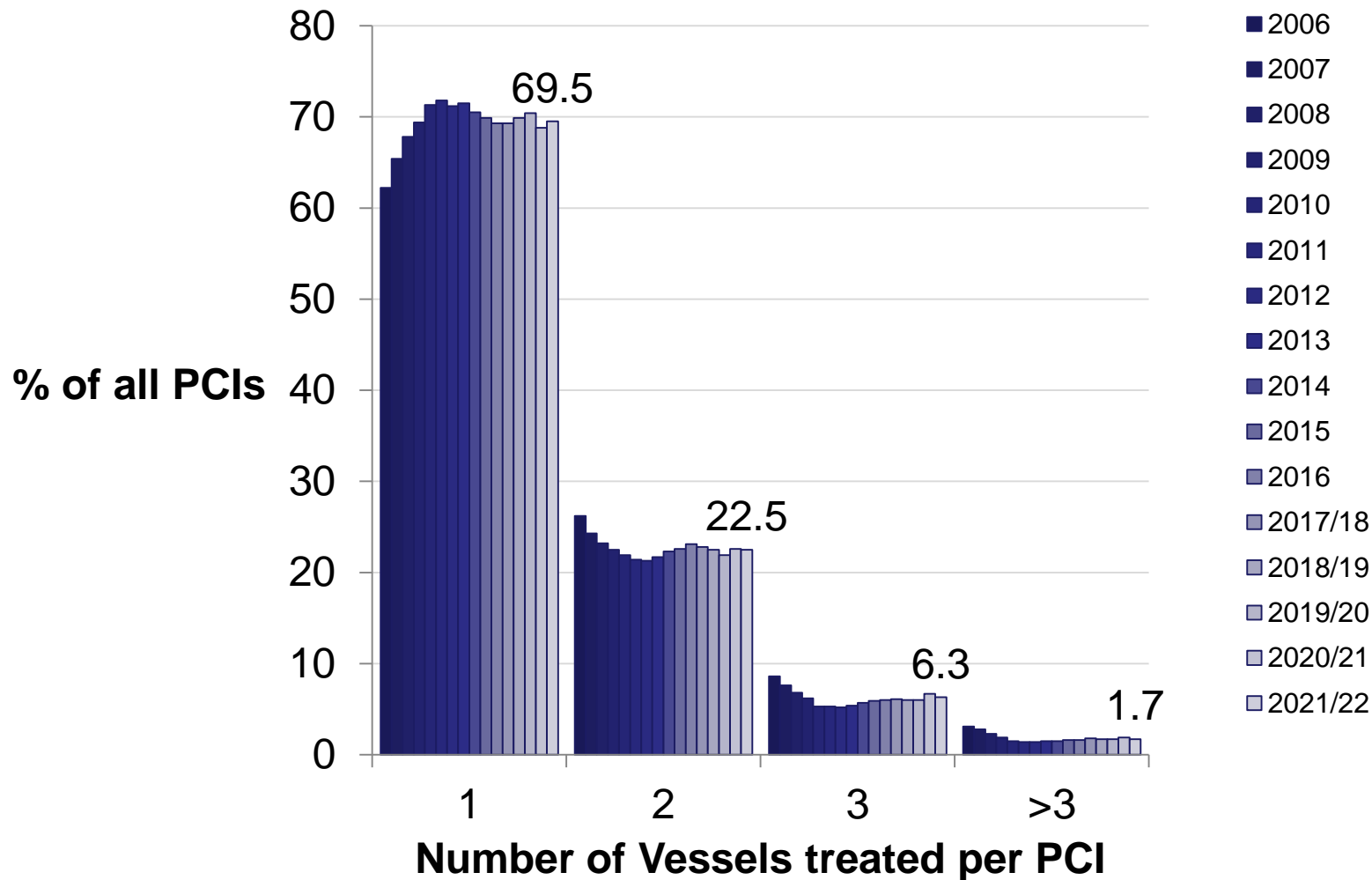
Multi-vessel Disease



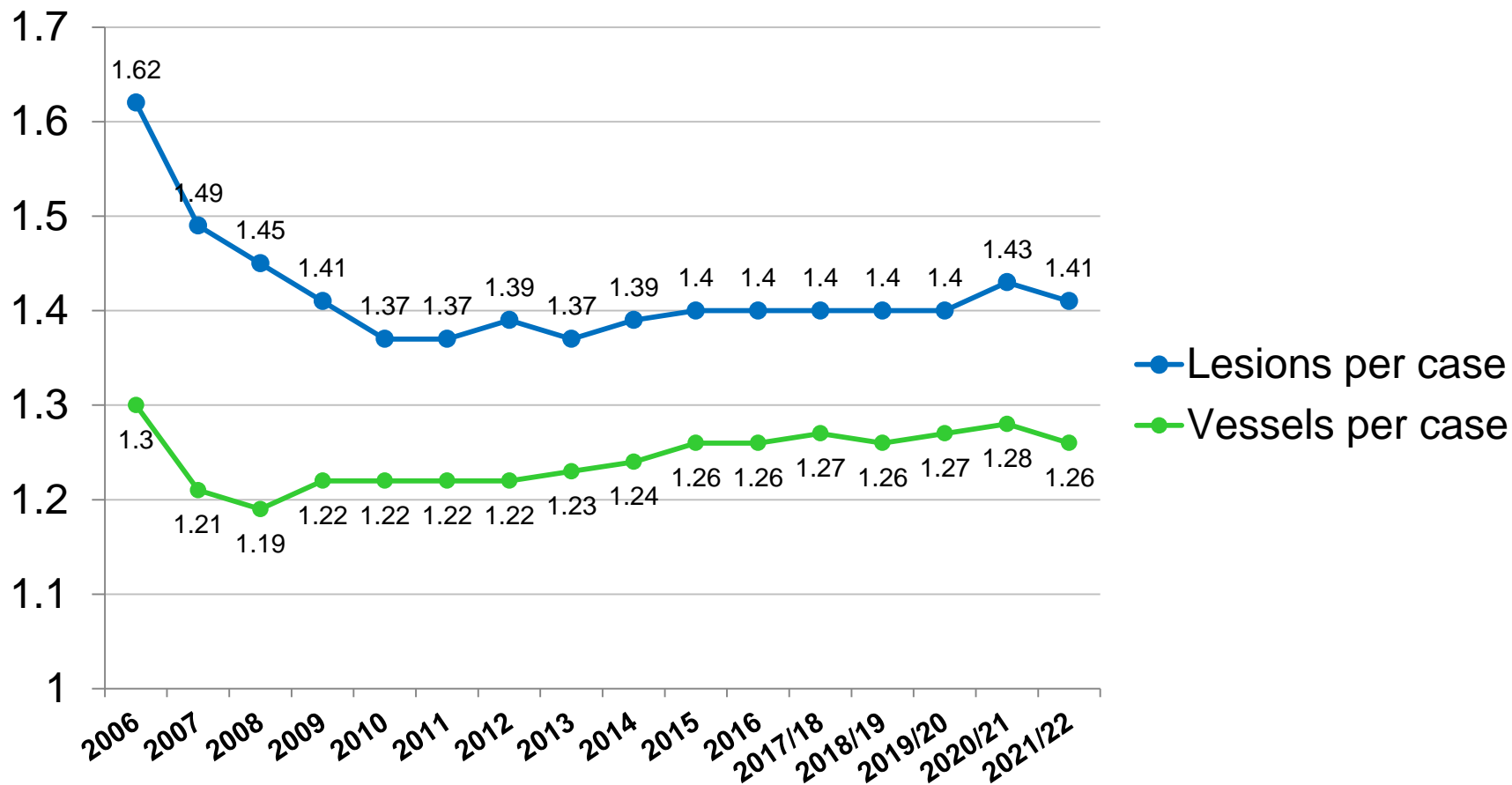
Multi-vessel Treatment



Multi-vessel Treatment



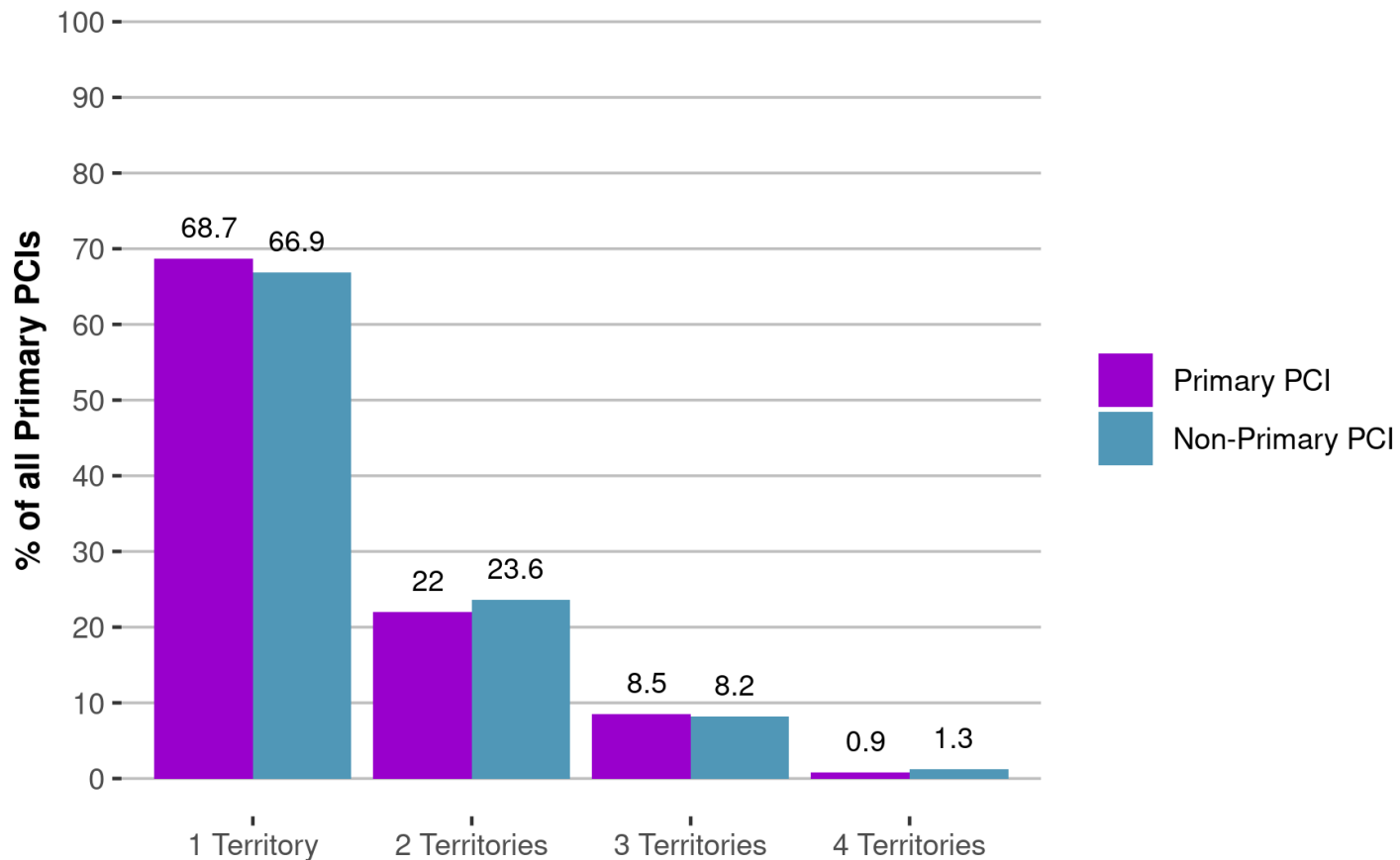
PCI to Multiple Lesions and vessels



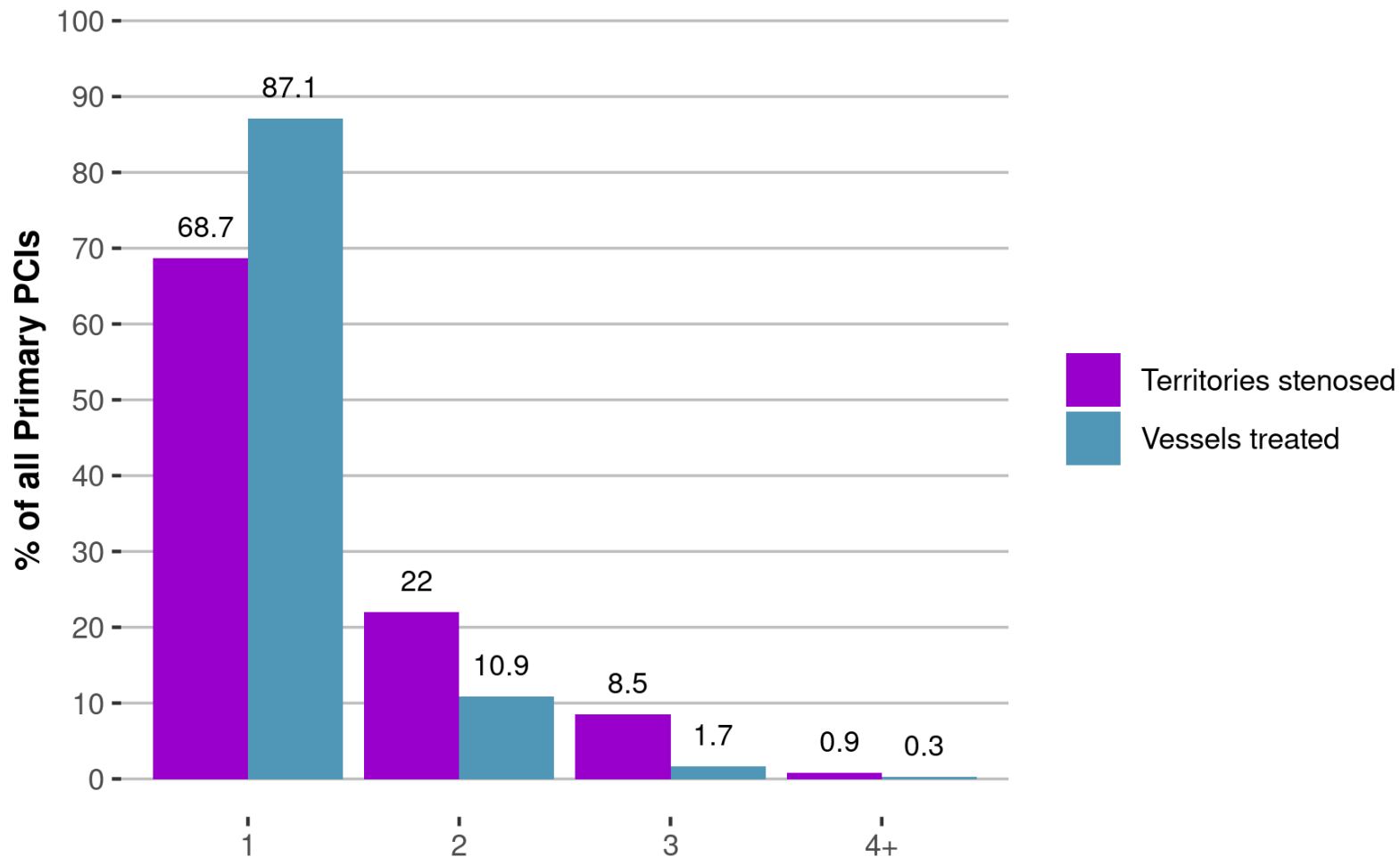
Disease Burden

Primary PCI v Non-Primary PCI Cases

Epicardial Territories with > 75% stenoses

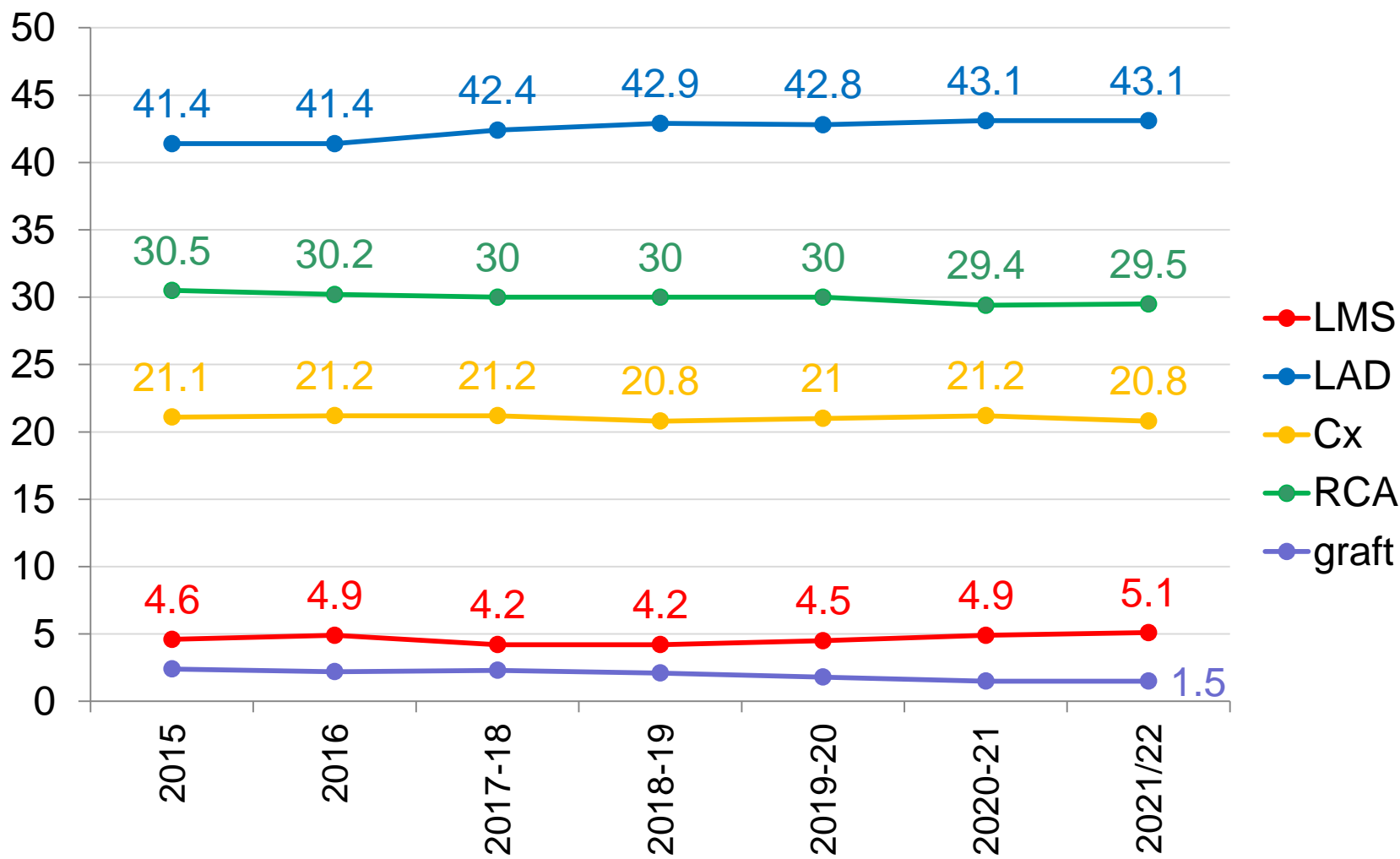


Primary PCI Multi-vessel Rx



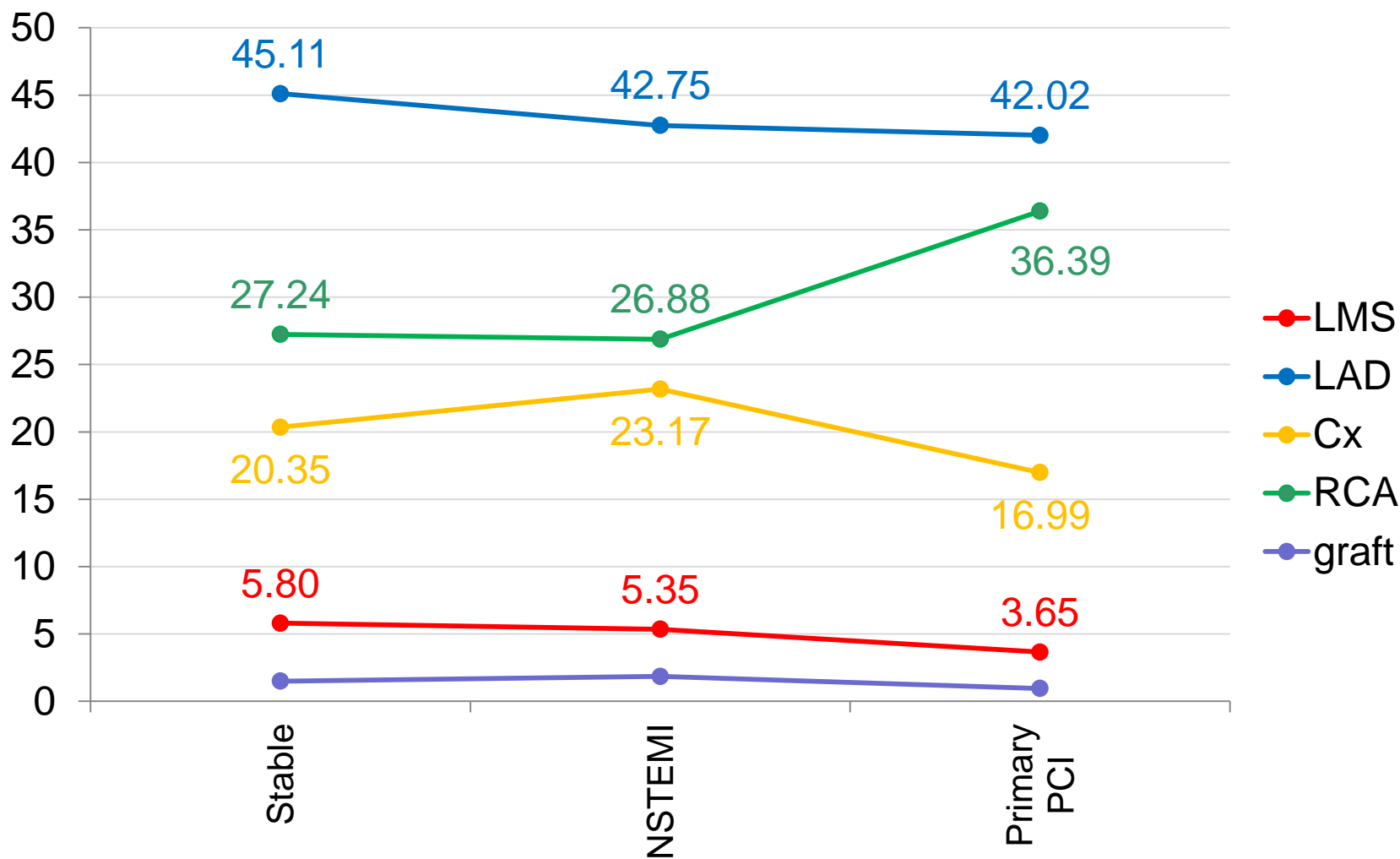
All PCI

Epicardial Territory Treated

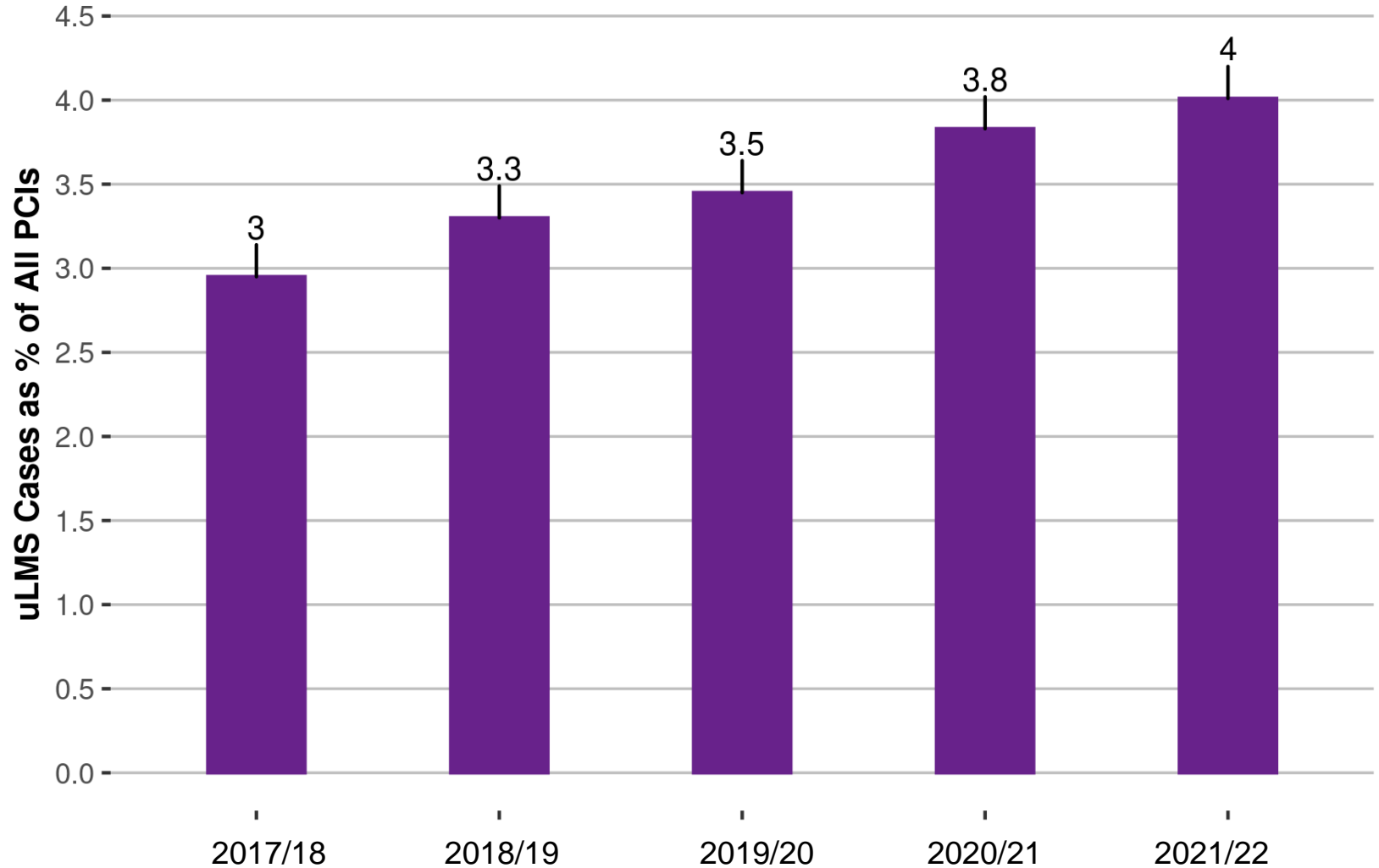


PCI

Epicardial Territory Treated by Indication (2021/22)

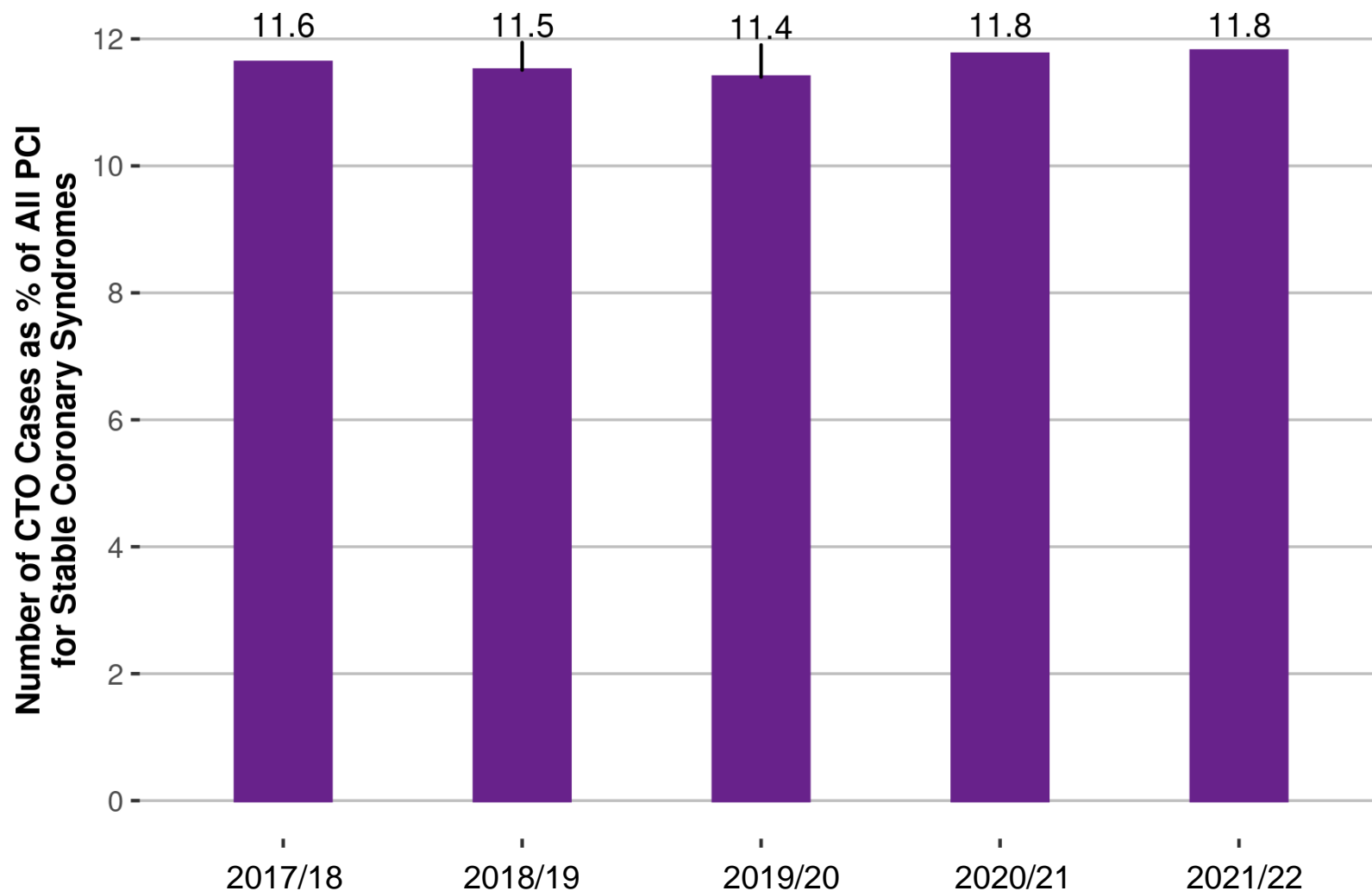


Unprotected LMS



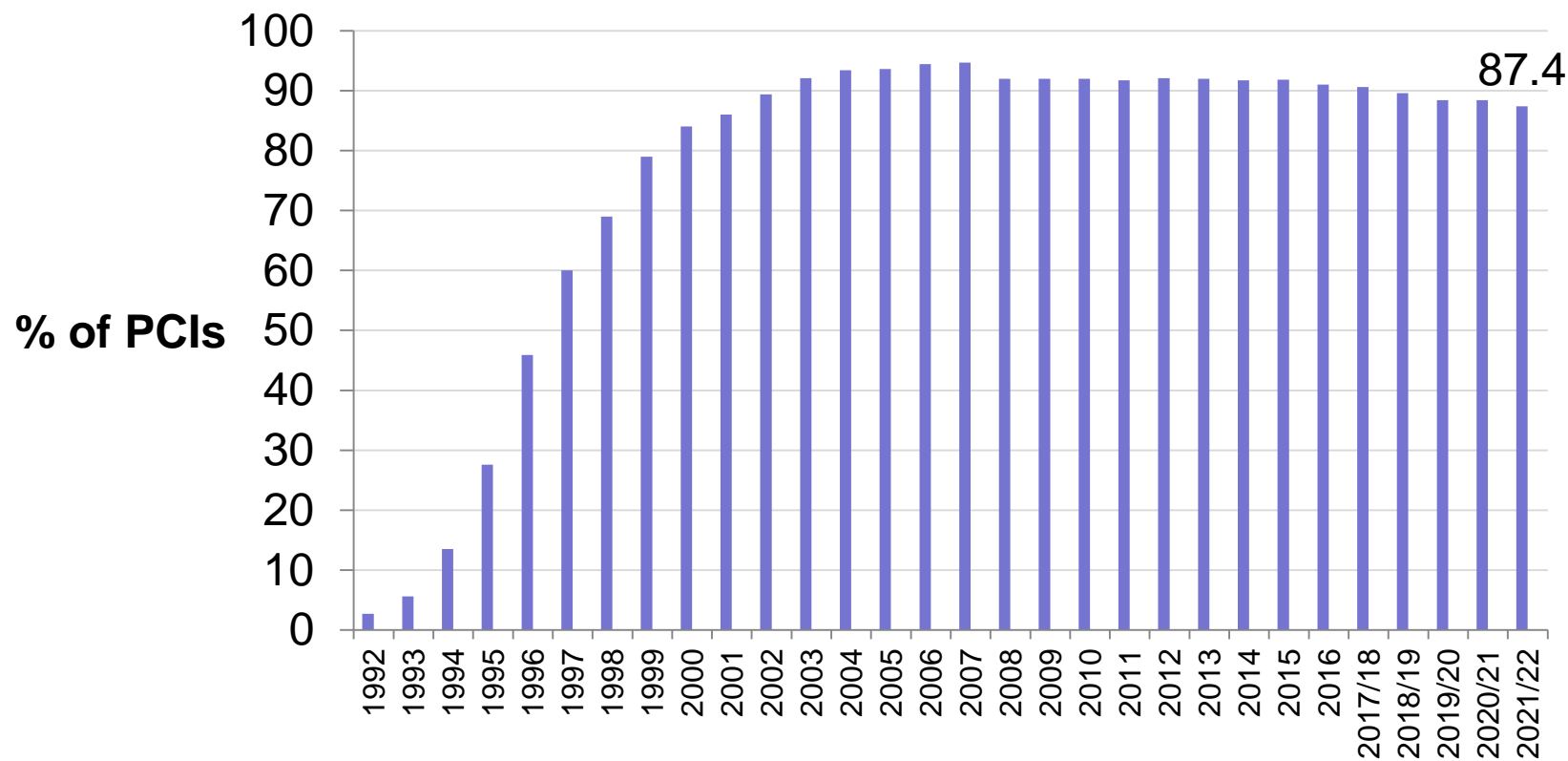
Chronic Total Occlusion

Stable only

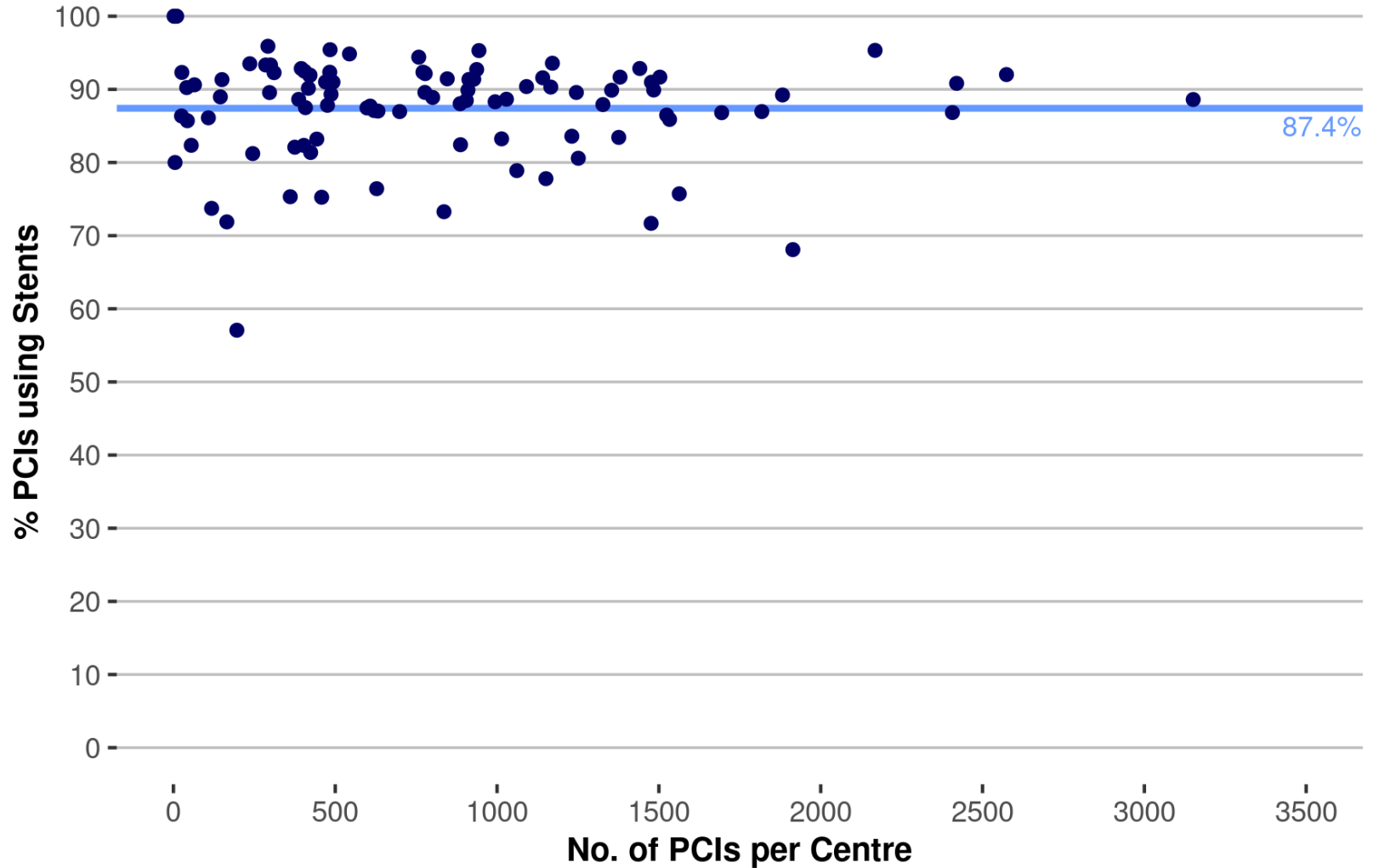


Stents

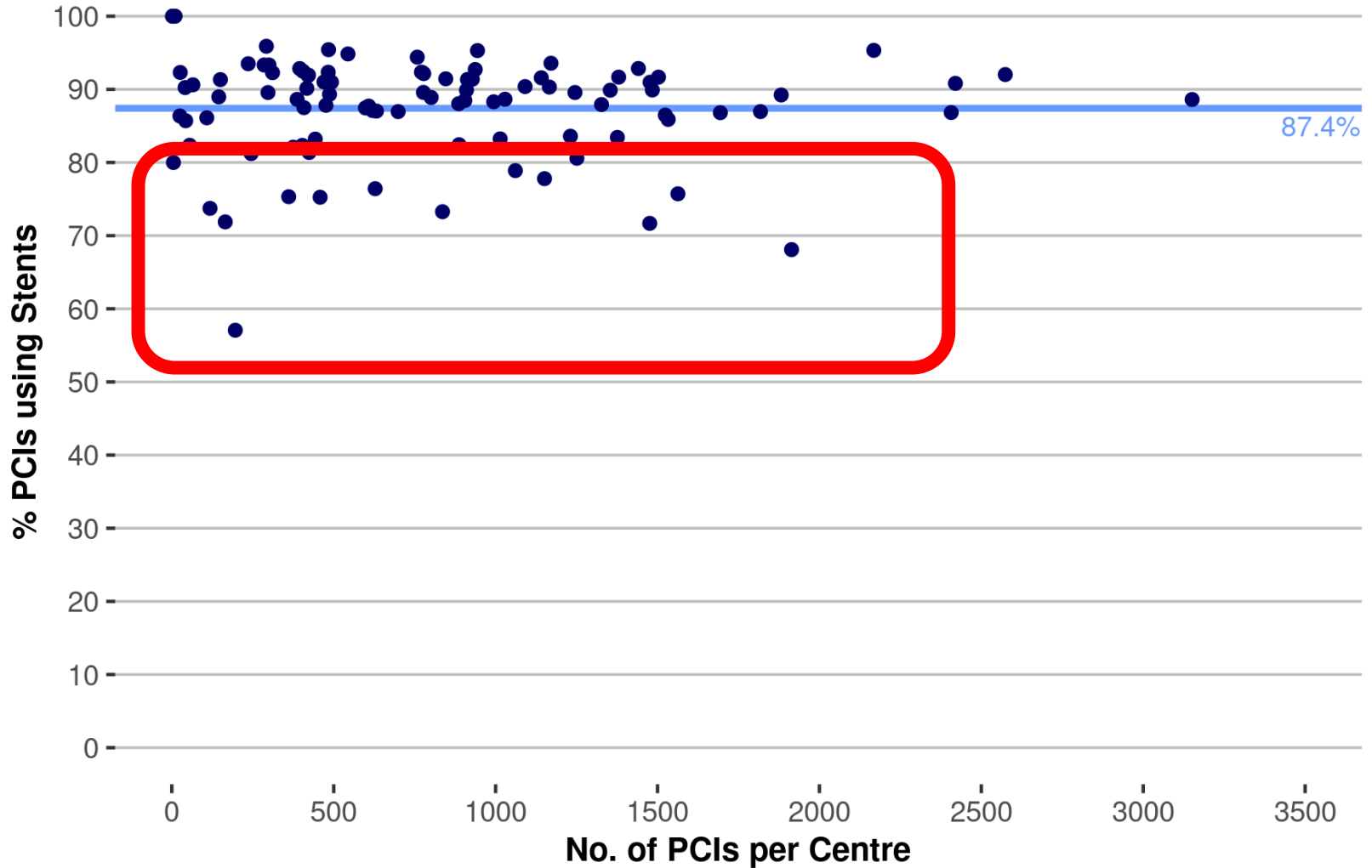
Procedures using Stents



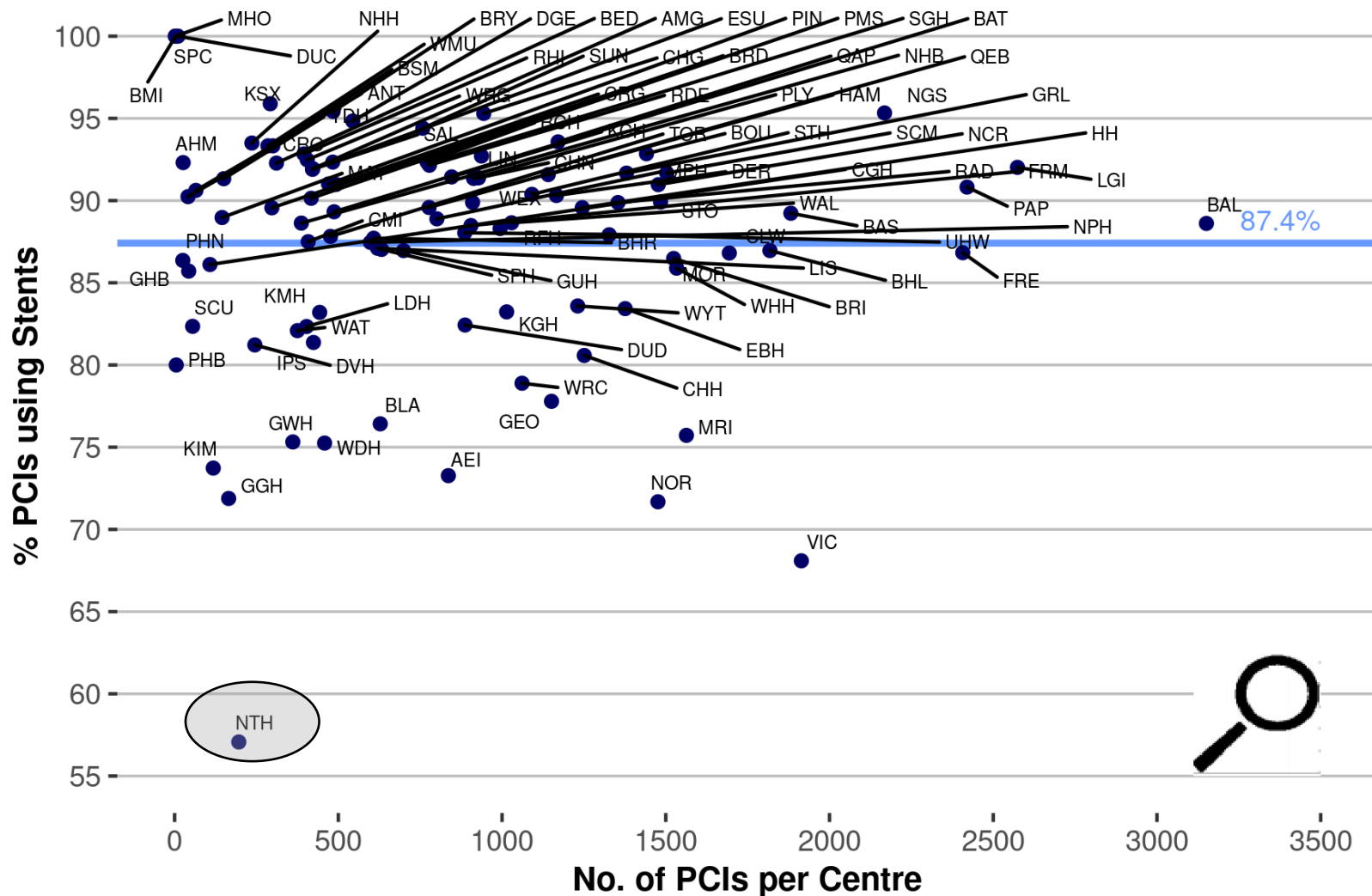
Procedures using Stents



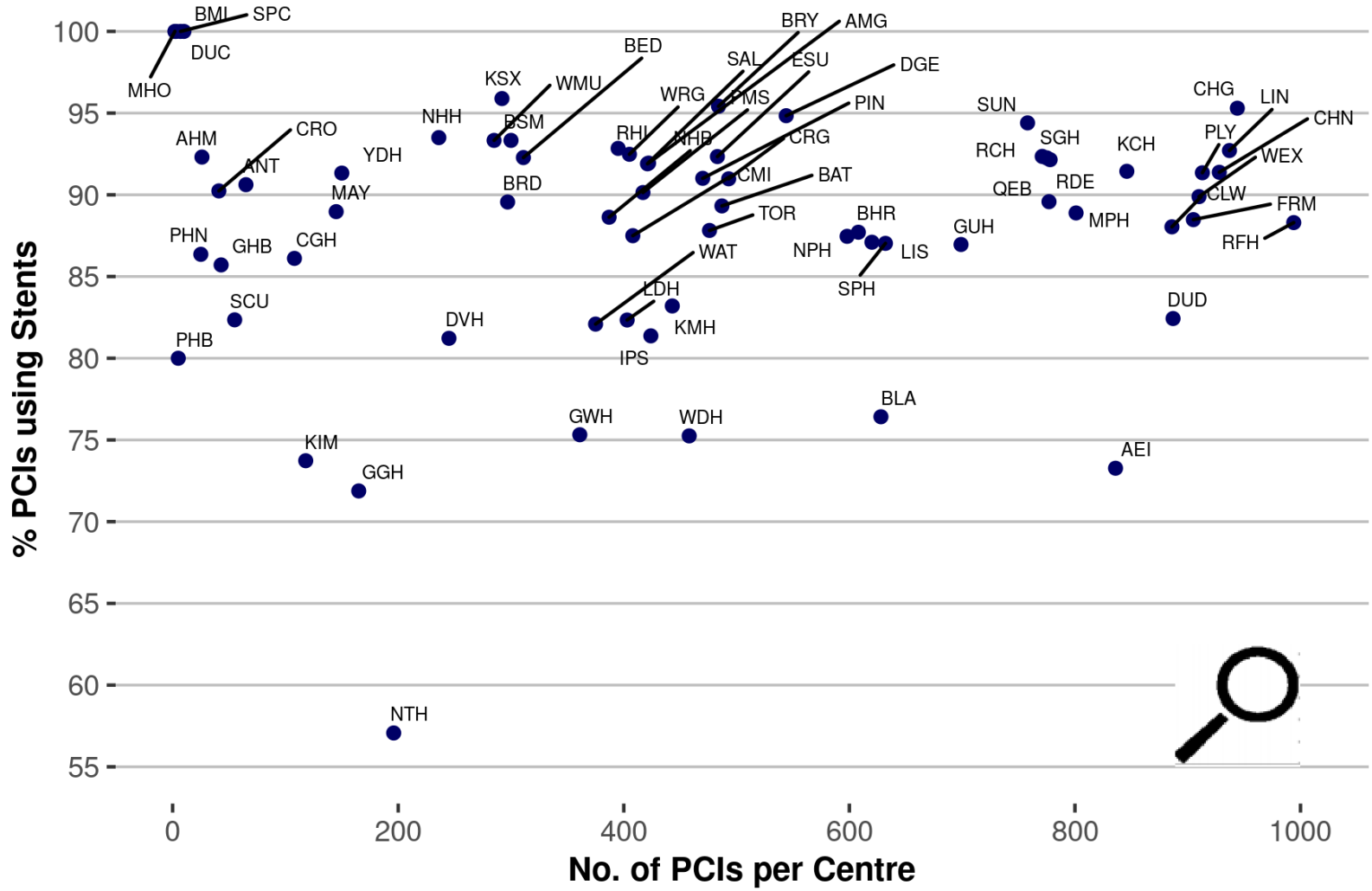
Procedures using Stents



Procedures using Stents



Procedures using Stents



Procedures using Stents

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization

A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

Recommendation for Choice of Stent Type

Referenced studies that support the recommendation are summarized in [Online Data Supplement 24](#).

COR	LOE	RECOMMENDATION
1	A	1. In patients undergoing PCI, DES should be used in preference to BMS to prevent restenosis, MI, or acute stent thrombosis (1-4).

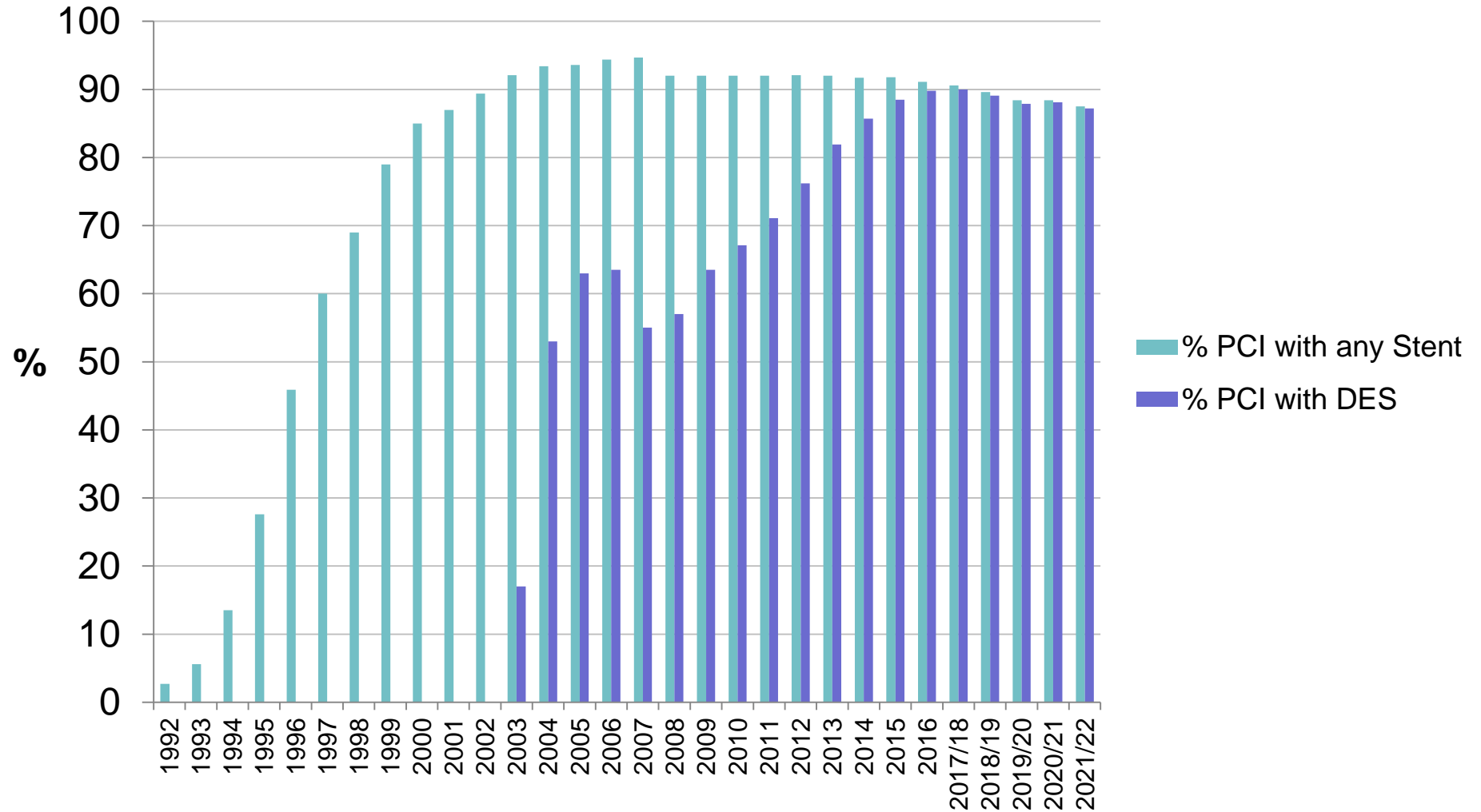
Acute coronary syndromes

NICE guideline [NG185] Published: 18 November 2020

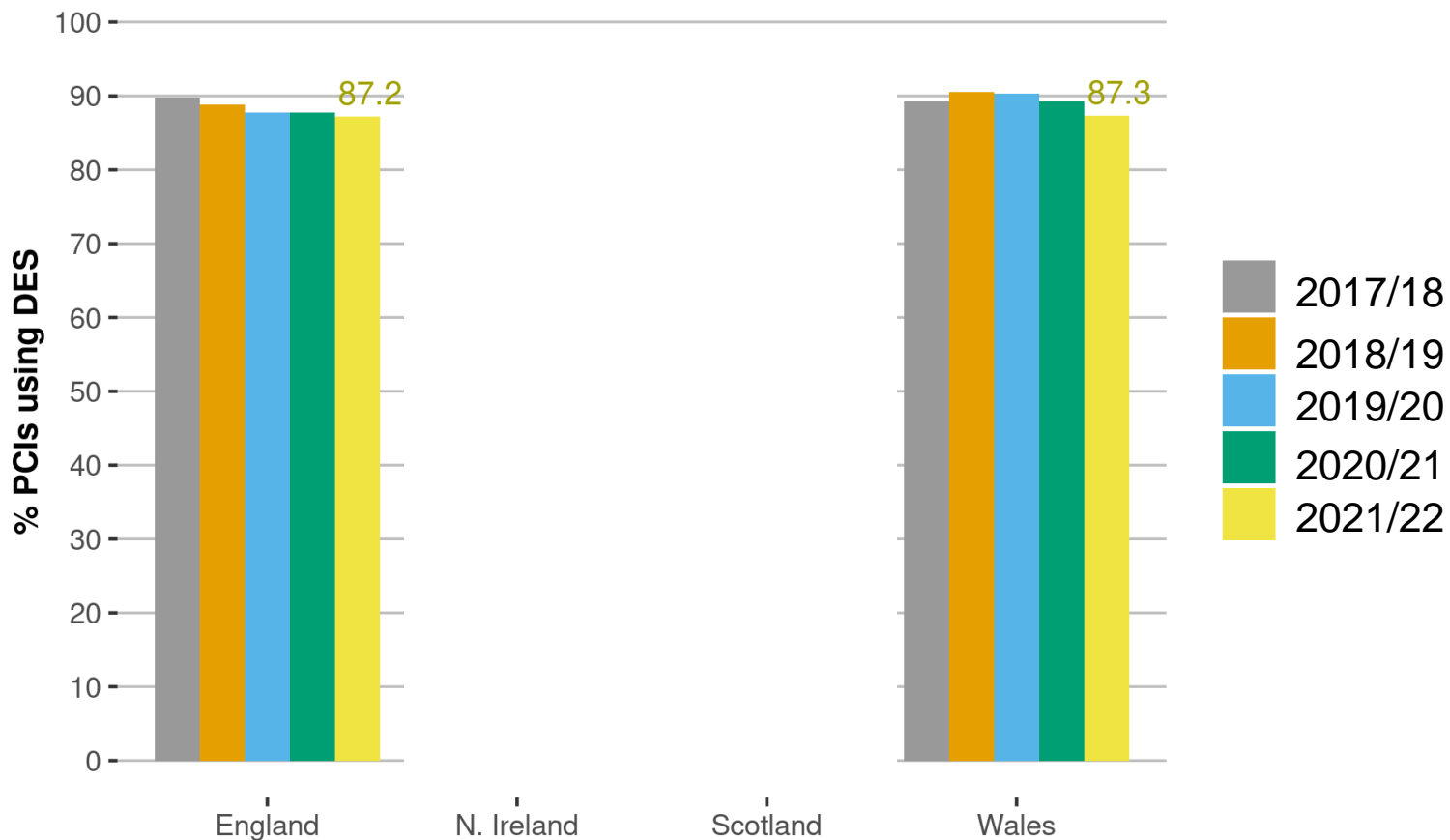
Stenting and revascularisation

- If stenting indicated, offer a drug-eluting stent

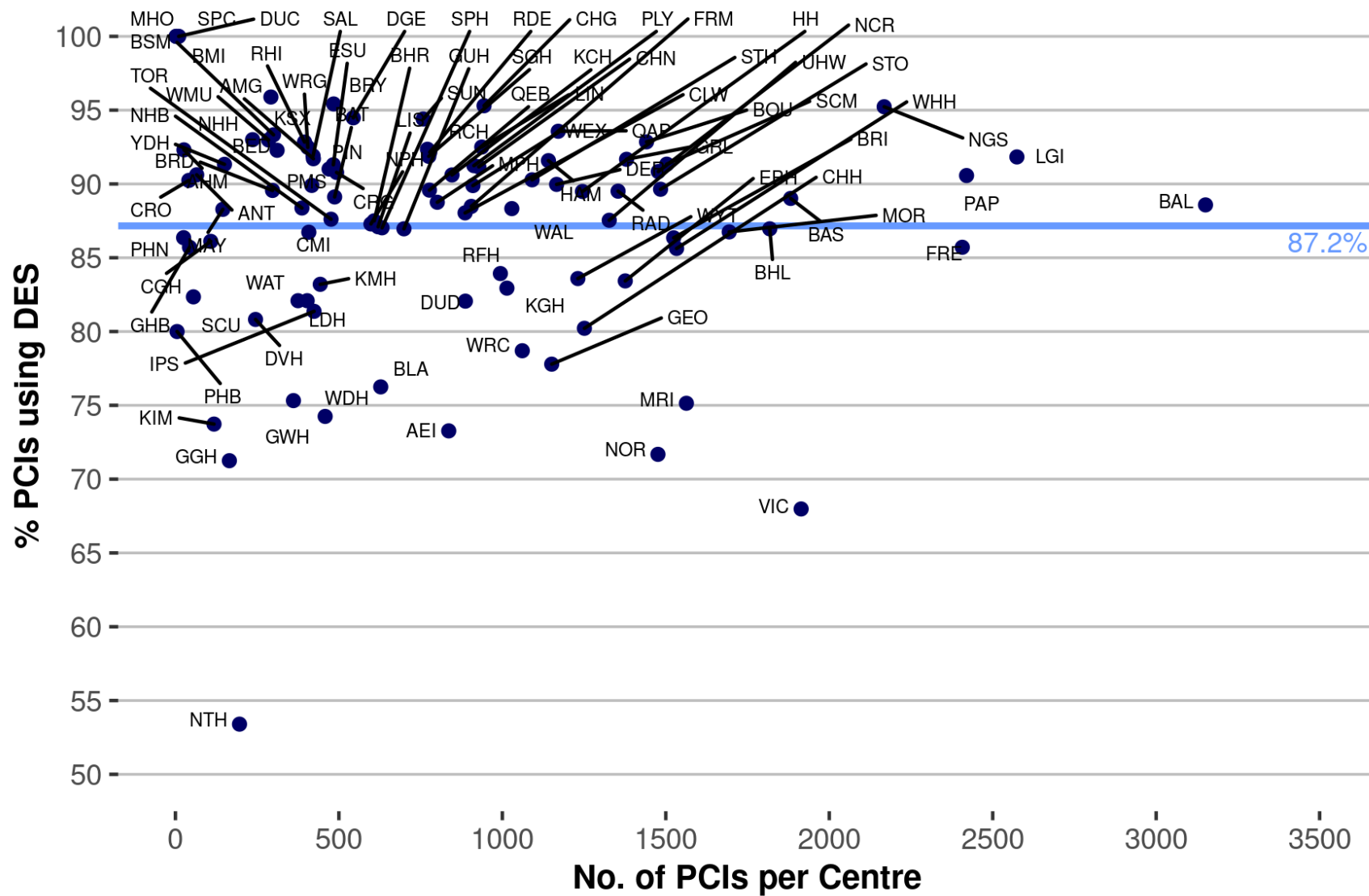
BMS and DES use



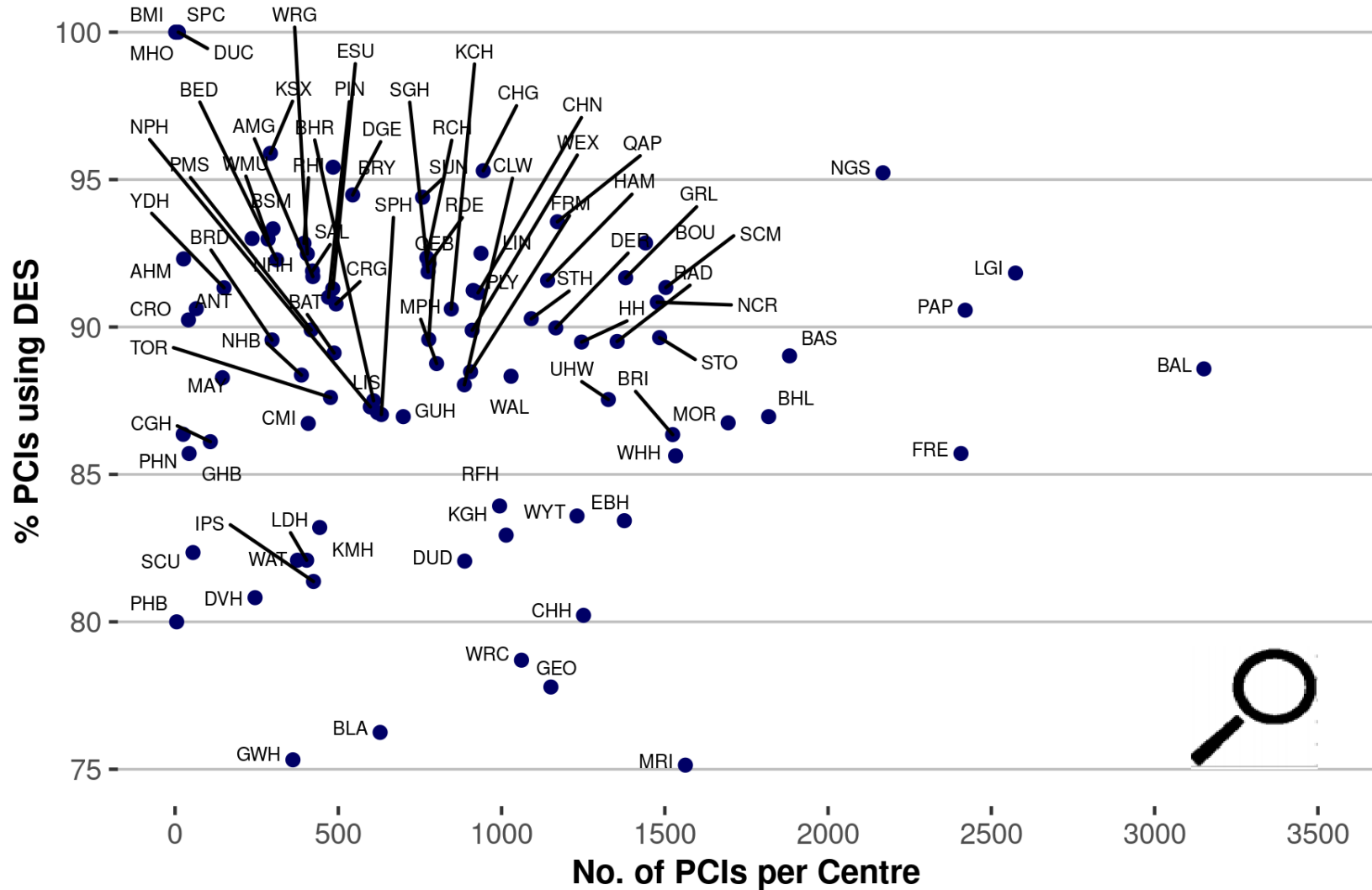
BMS and DES use By Country



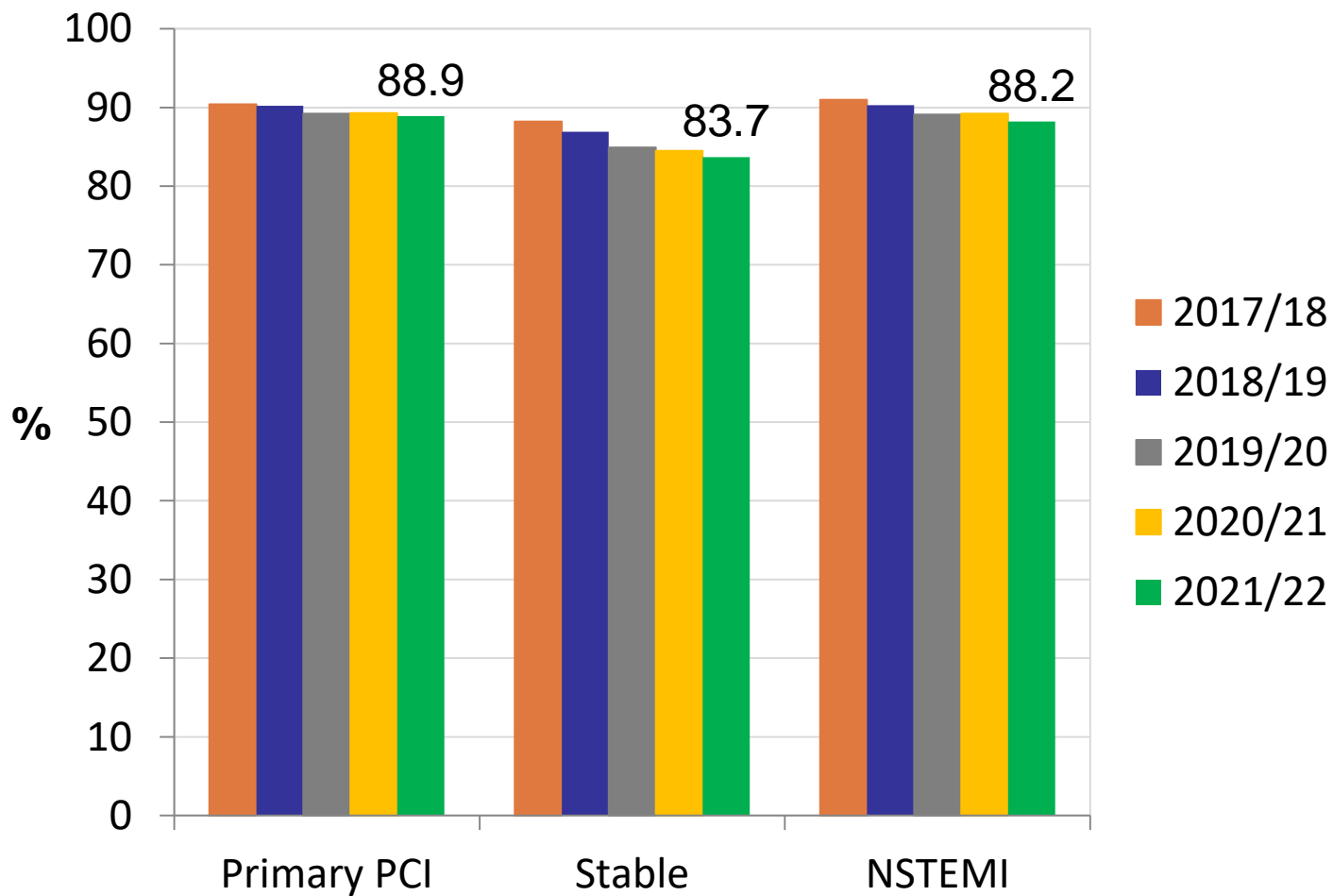
PCI with Drug Eluting Stents



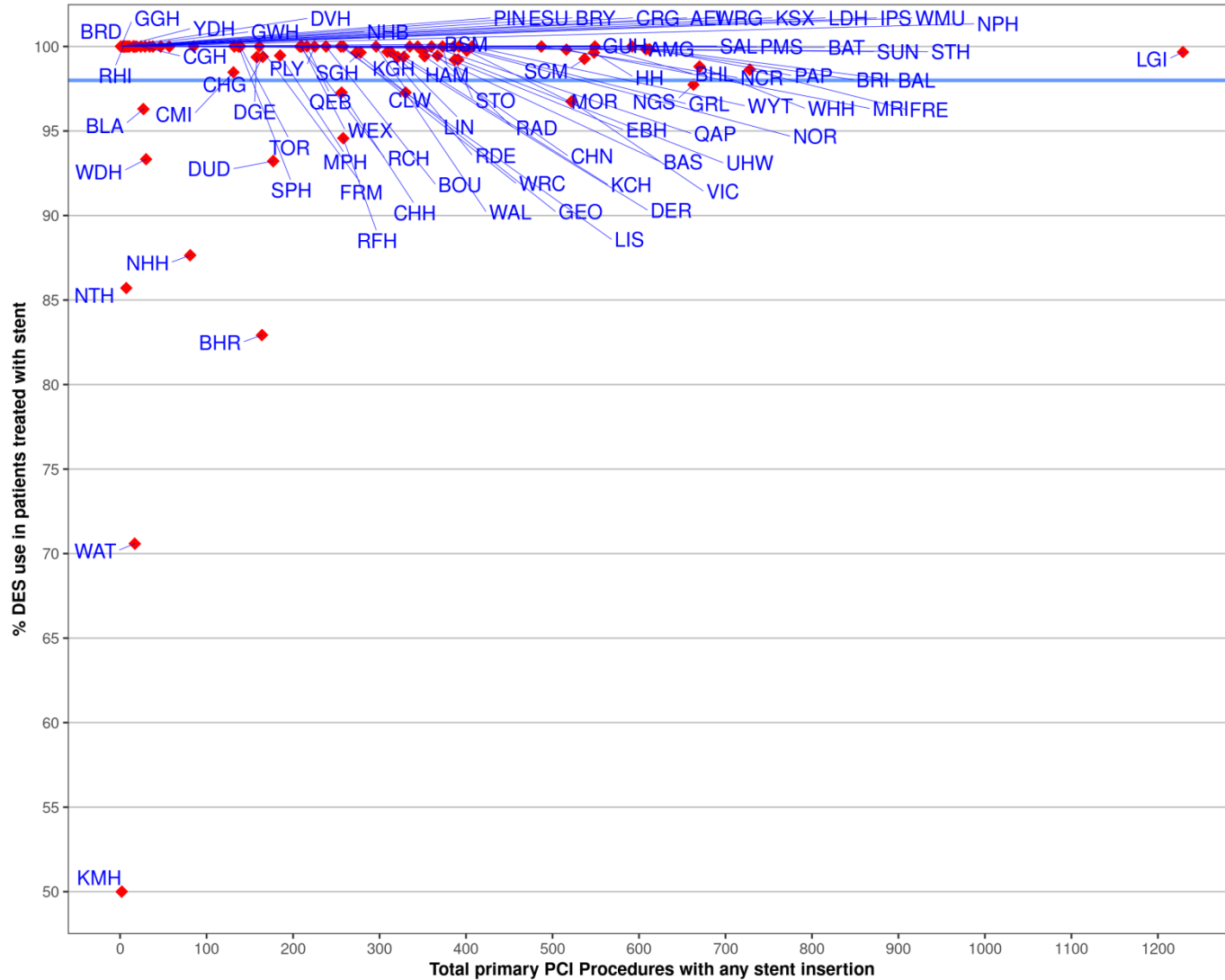
PCI with Drug Eluting Stents



PCI with Drug Eluting Stents By Syndrome

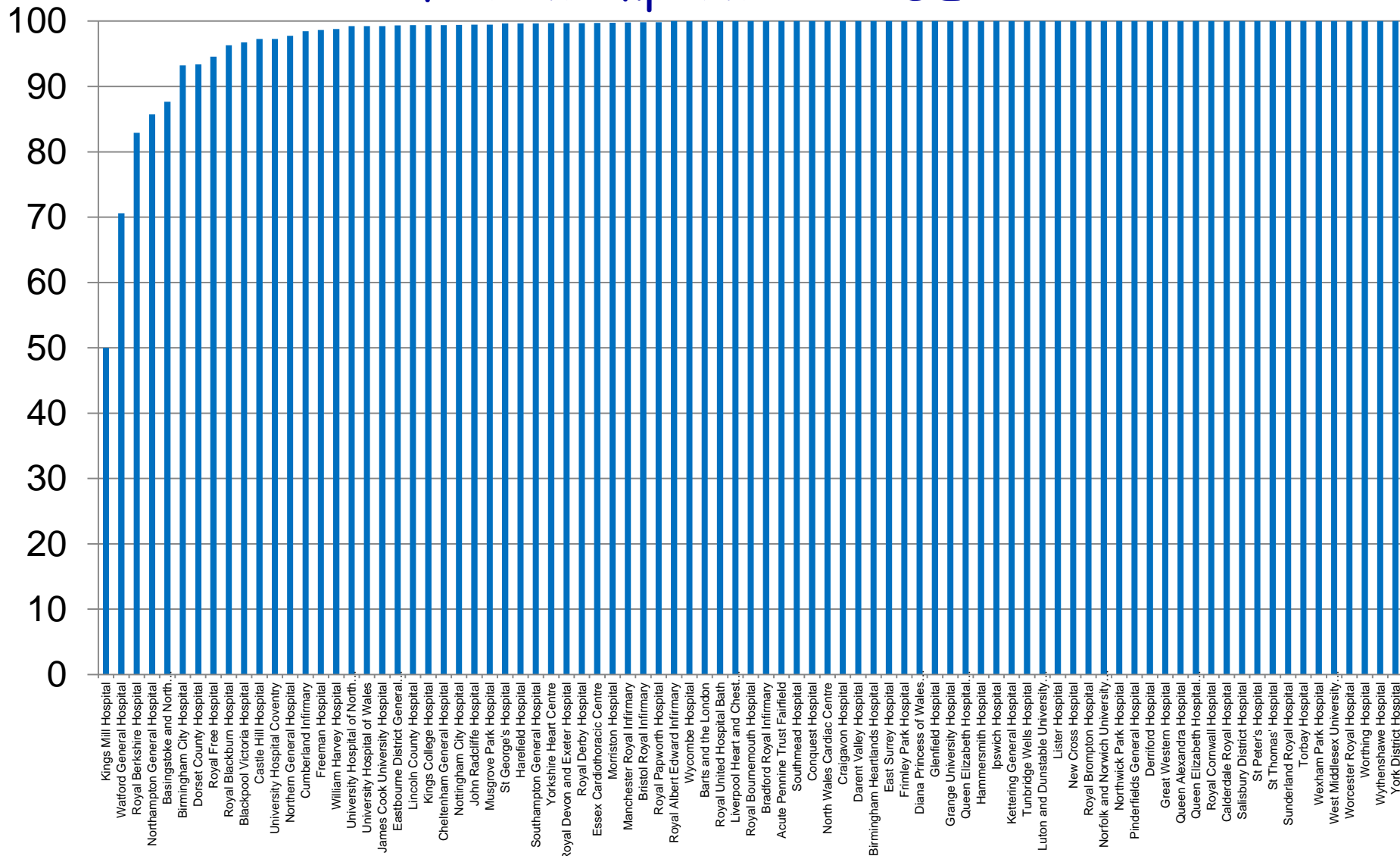


Primary PCI If stent implanted - %DES



Primary PCI

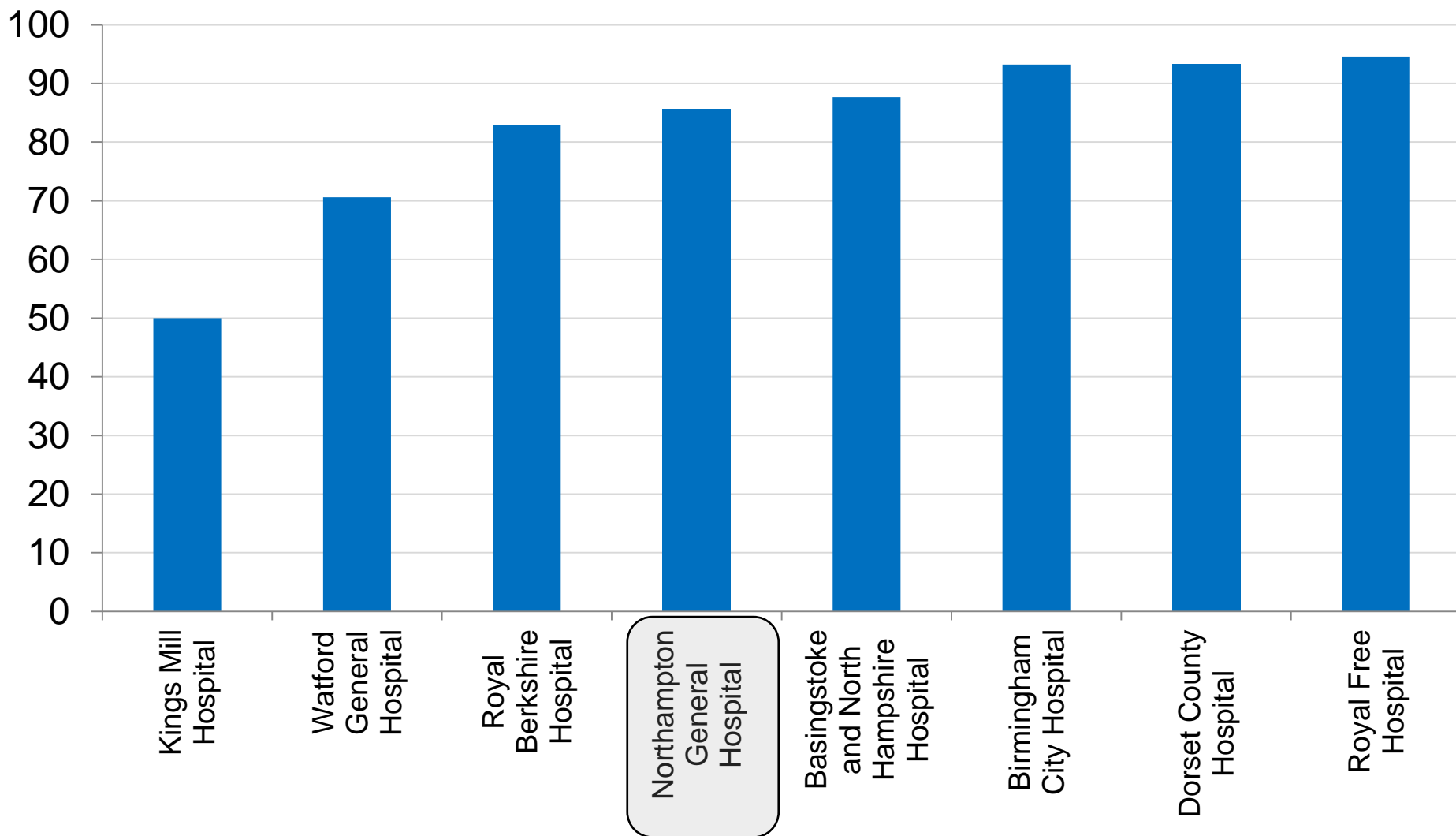
If stent implanted - %DES



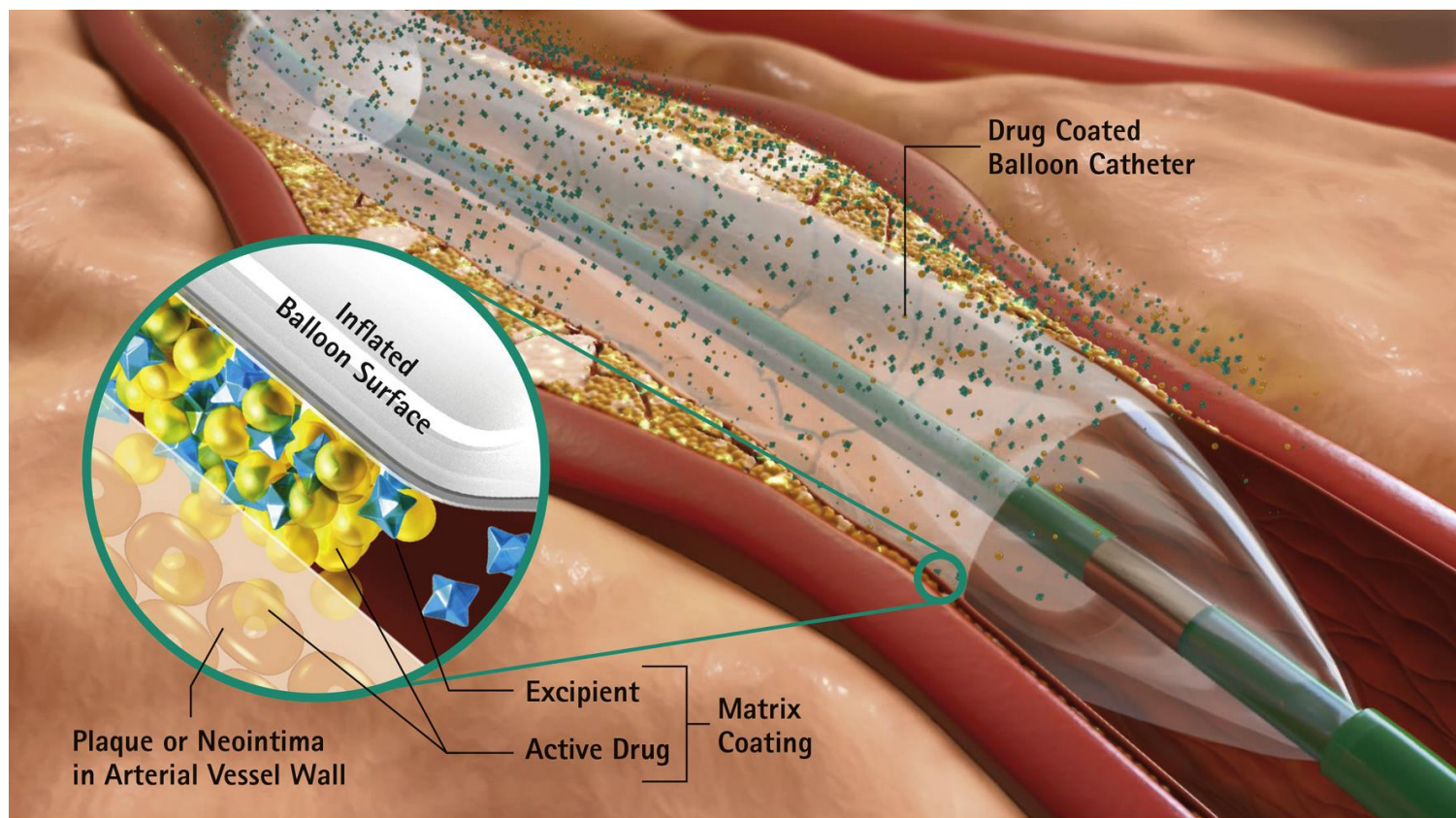
Primary PCI

If stent implanted - %DES

Centres using DES in < 95% of cases



Drug Eluting Balloons



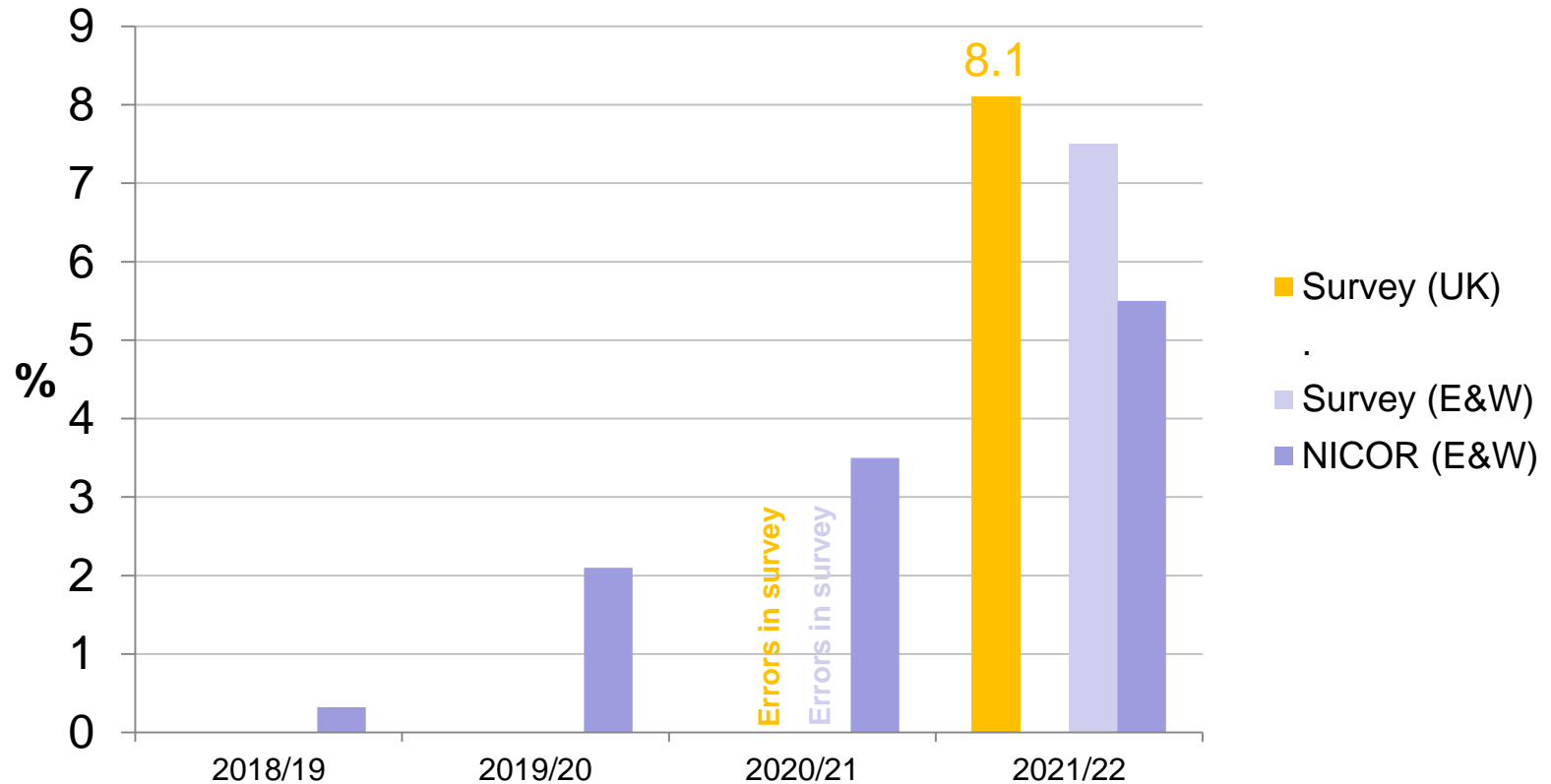
Raban V. et al Third Report of the International DCB Consensus Group, JACC: Cardiovascular Interventions, 2020;13:1391-1402

Drug Eluting Balloon use

Live dataset v Survey

Drug eluting balloon used added as menu update in May 2019

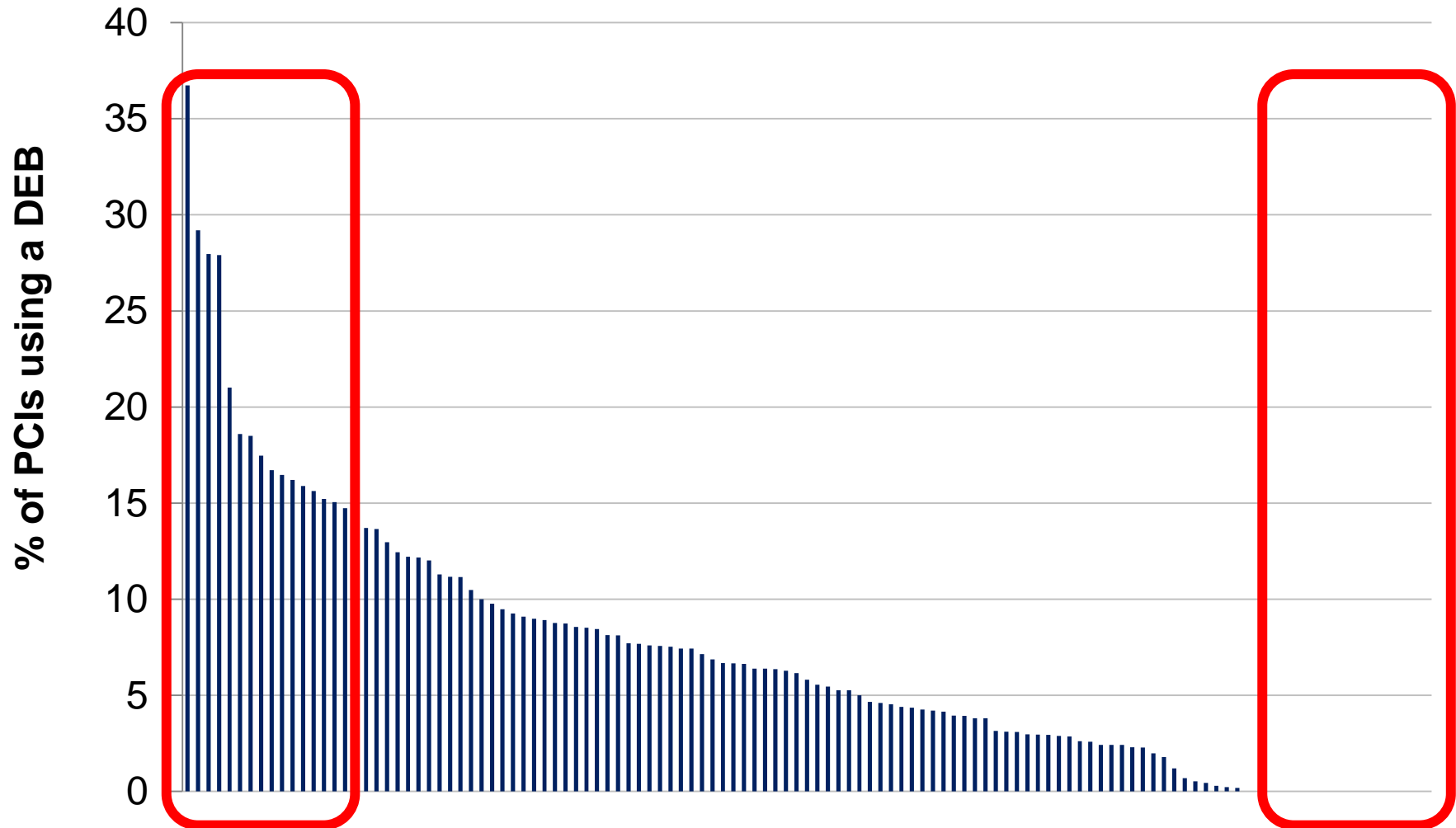
DEB use as % of all PCI Procedures



73% in NICOR

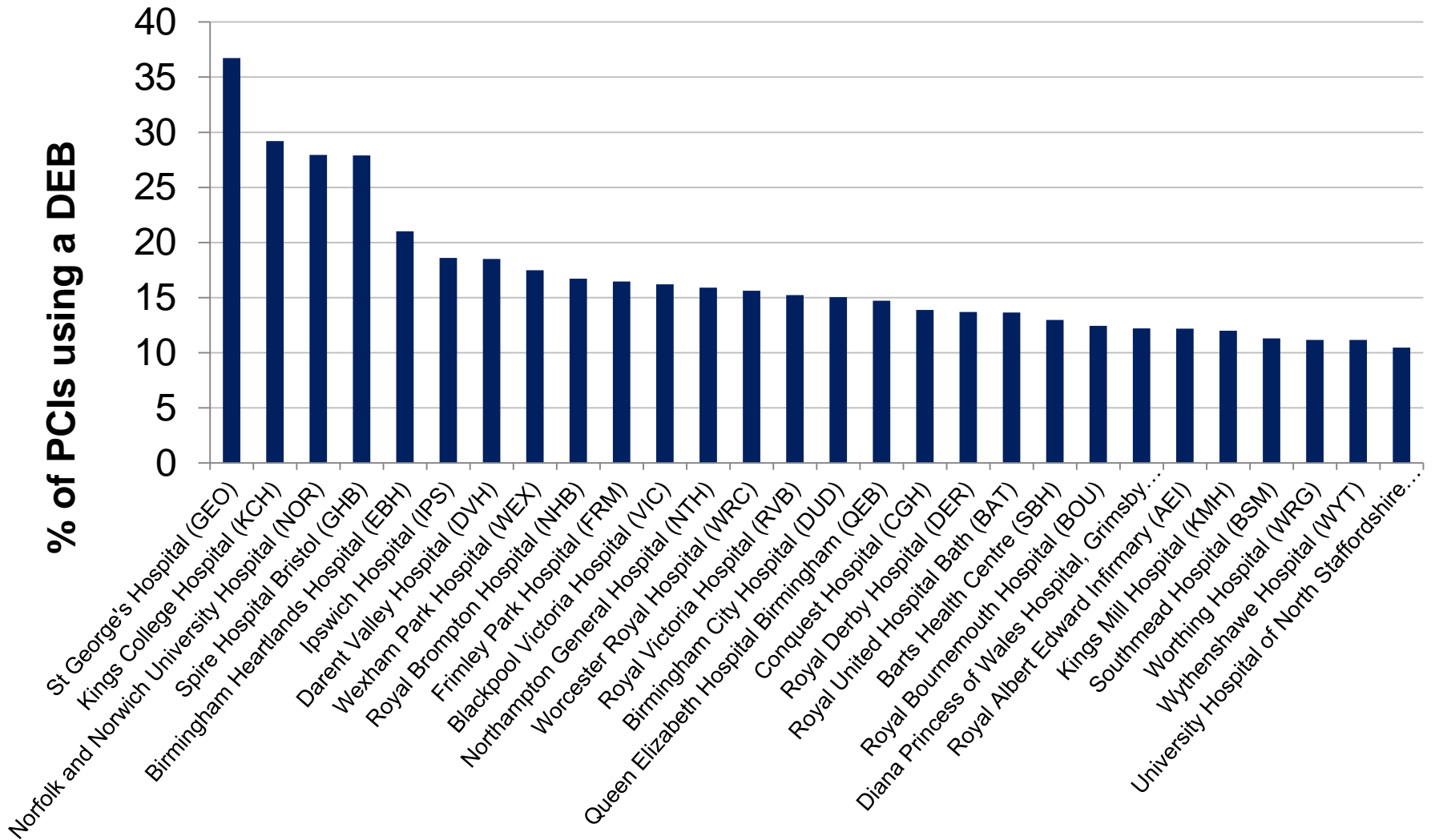
Drug Eluting Balloon use

Survey by Centre

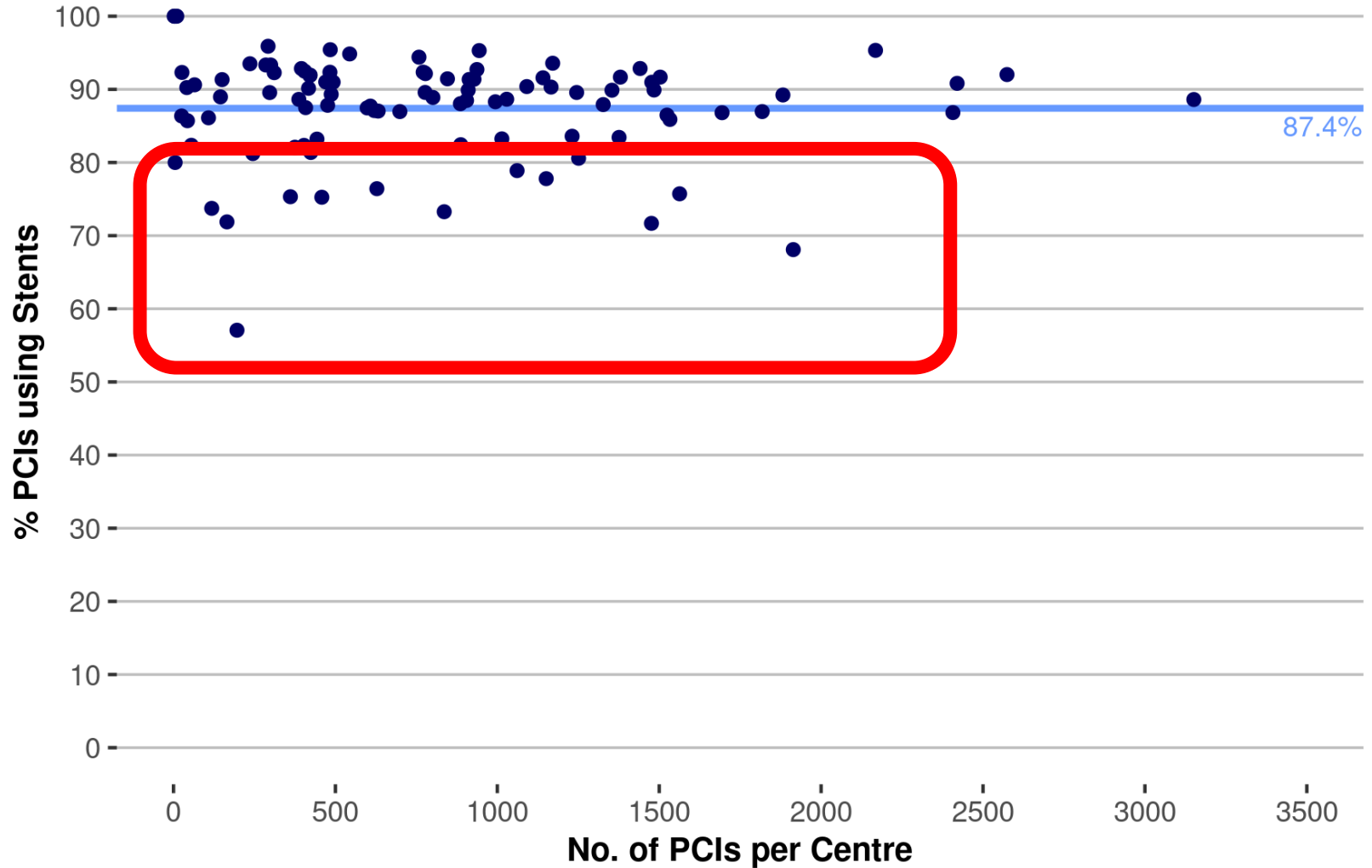


Drug Eluting Balloon use

Survey by Centre (> 10%)

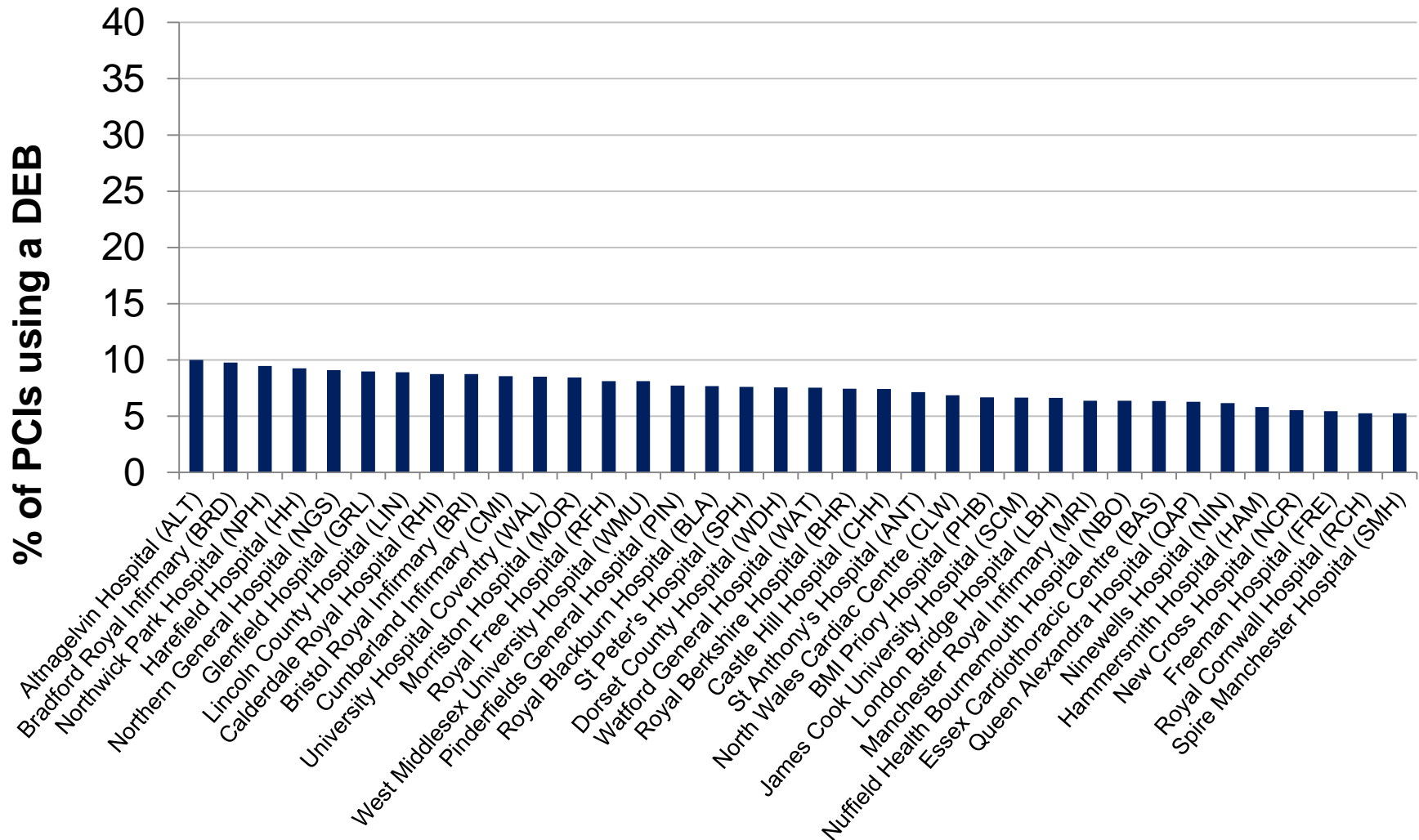


Procedures using Stents



Drug Eluting Balloon use

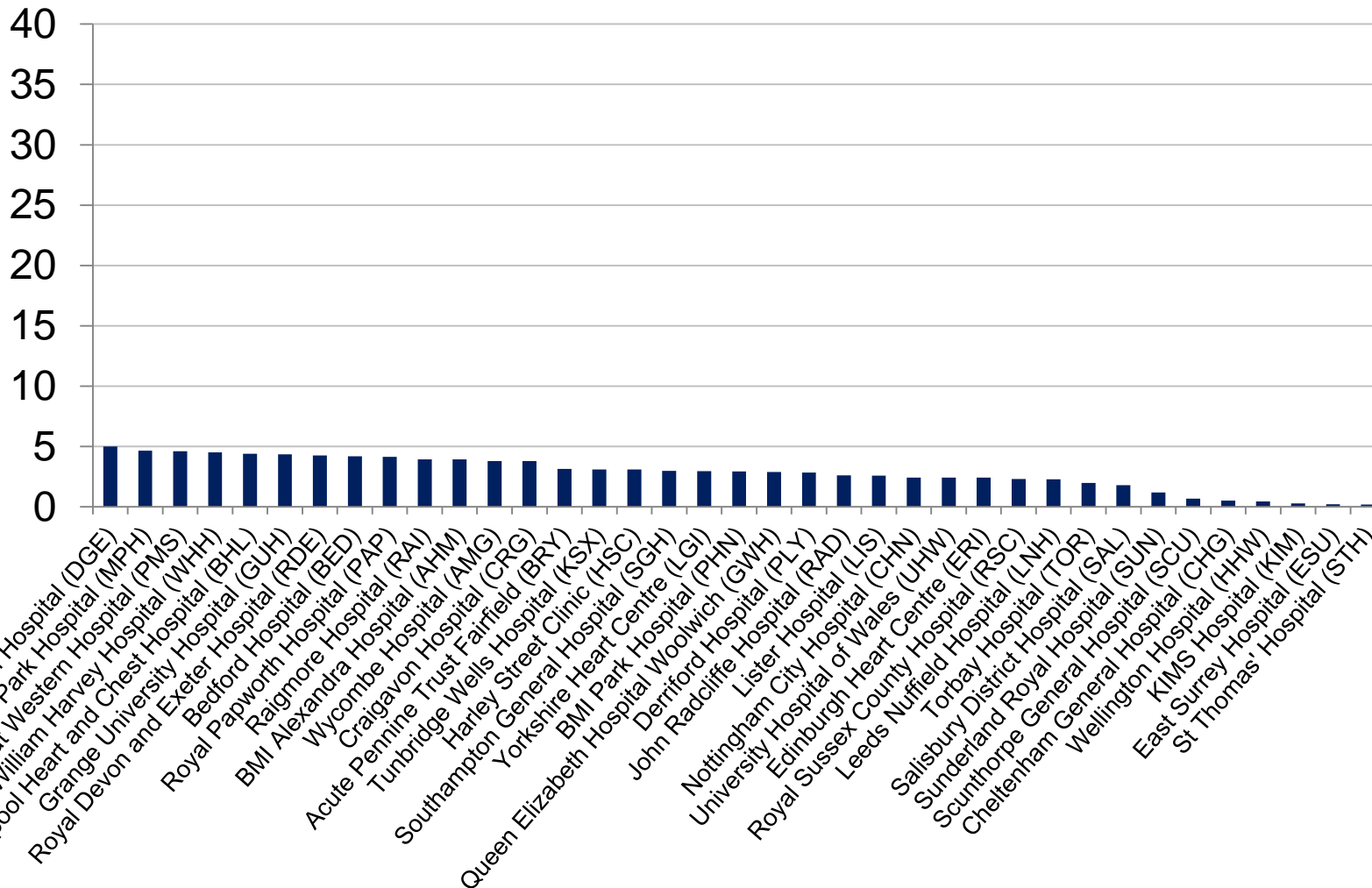
Survey by Centre (5 to 10%)



Drug Eluting Balloon use

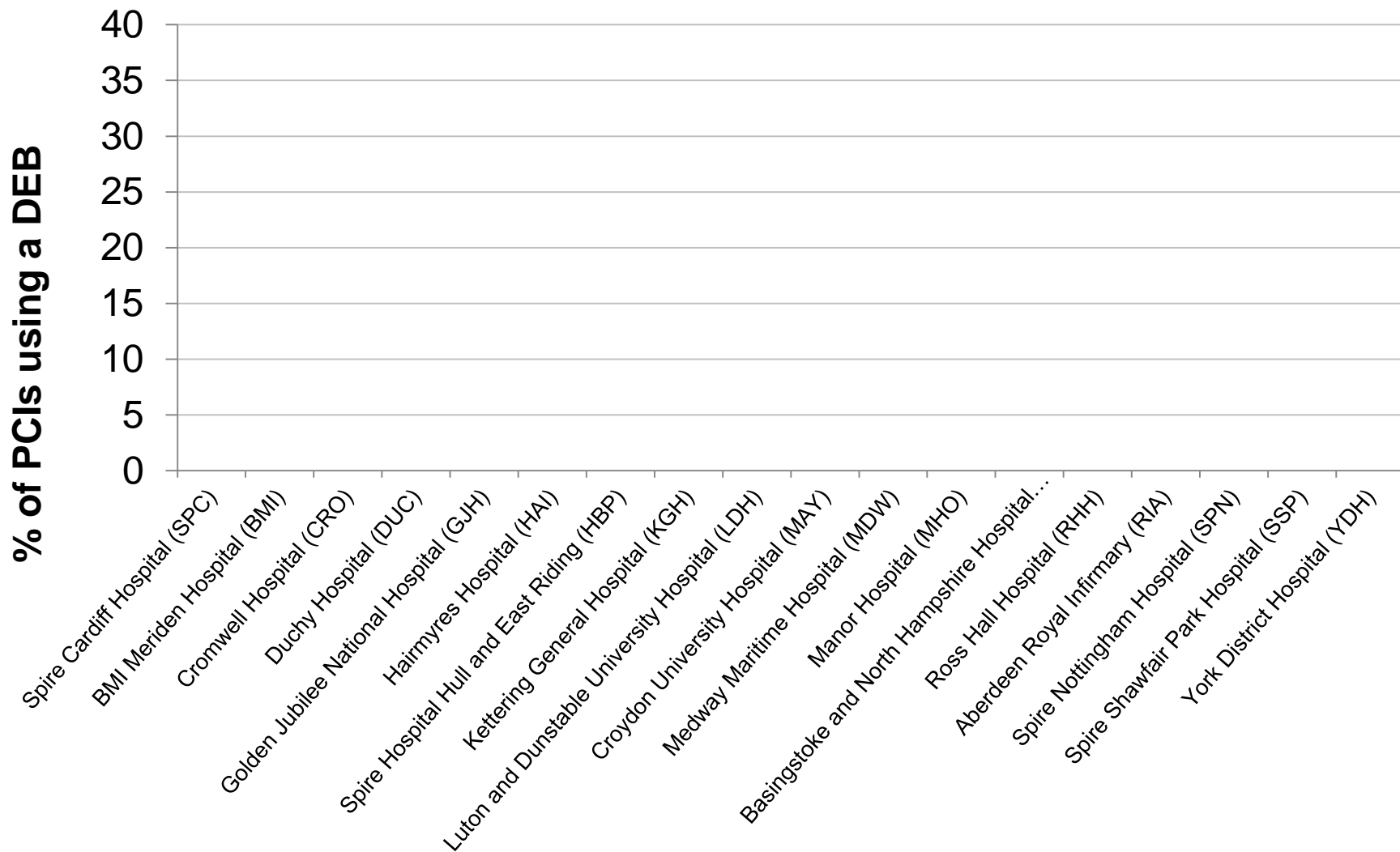
Survey by Centre (< 5 %)

% of PCIs using a DEB



Drug Eluting Balloon use

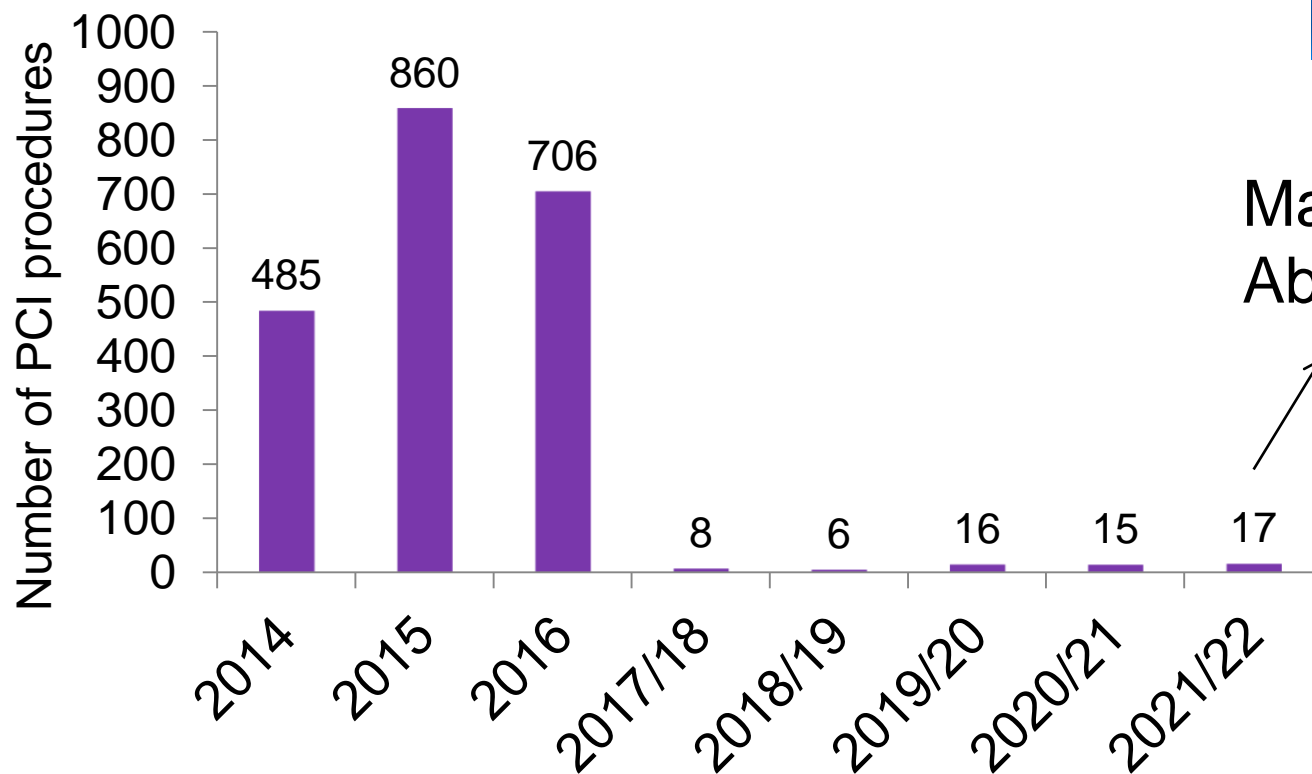
Survey by Centre (None used)



PCI with Bioabsorbable Vascular Scaffolds



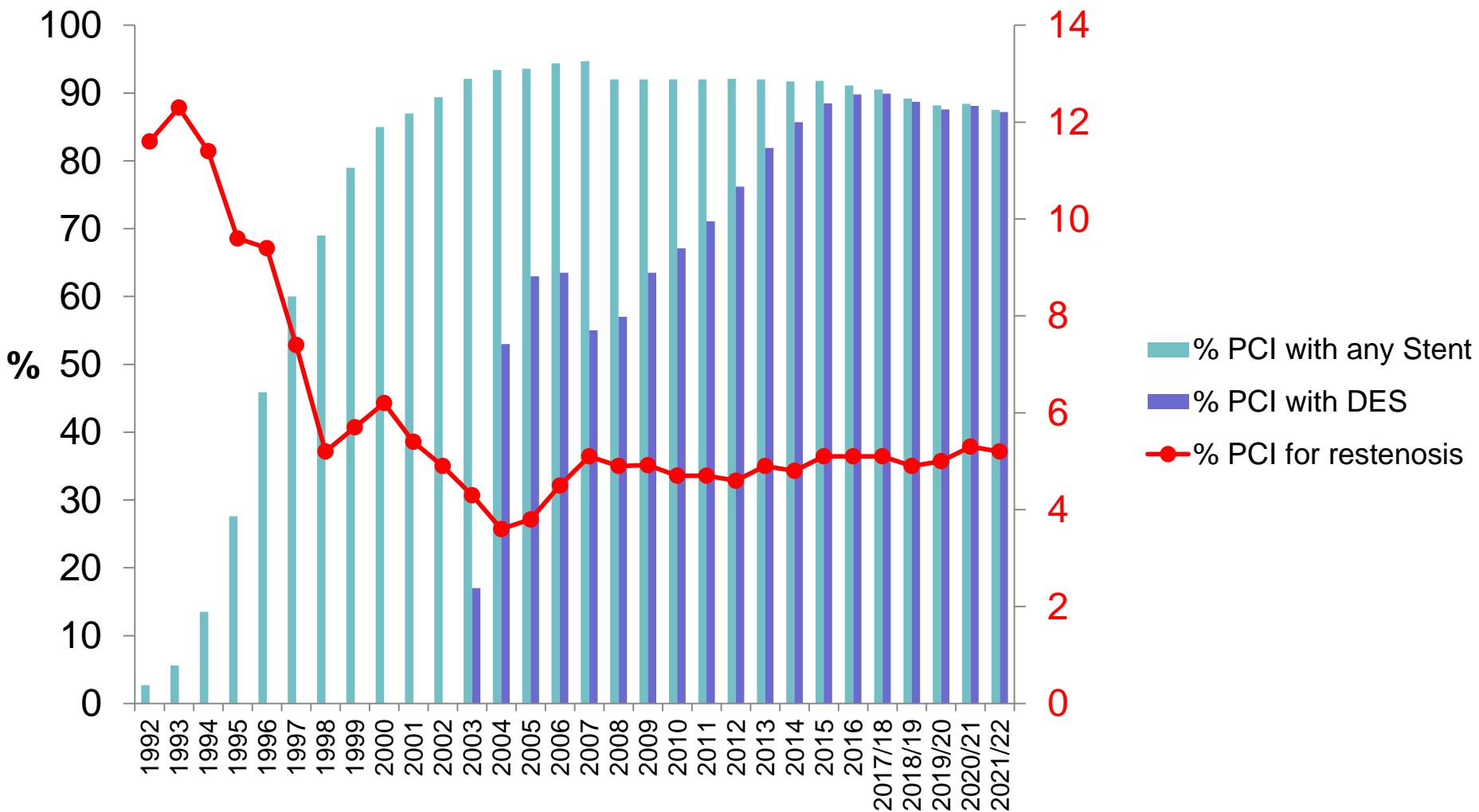
BVS +/- other stents



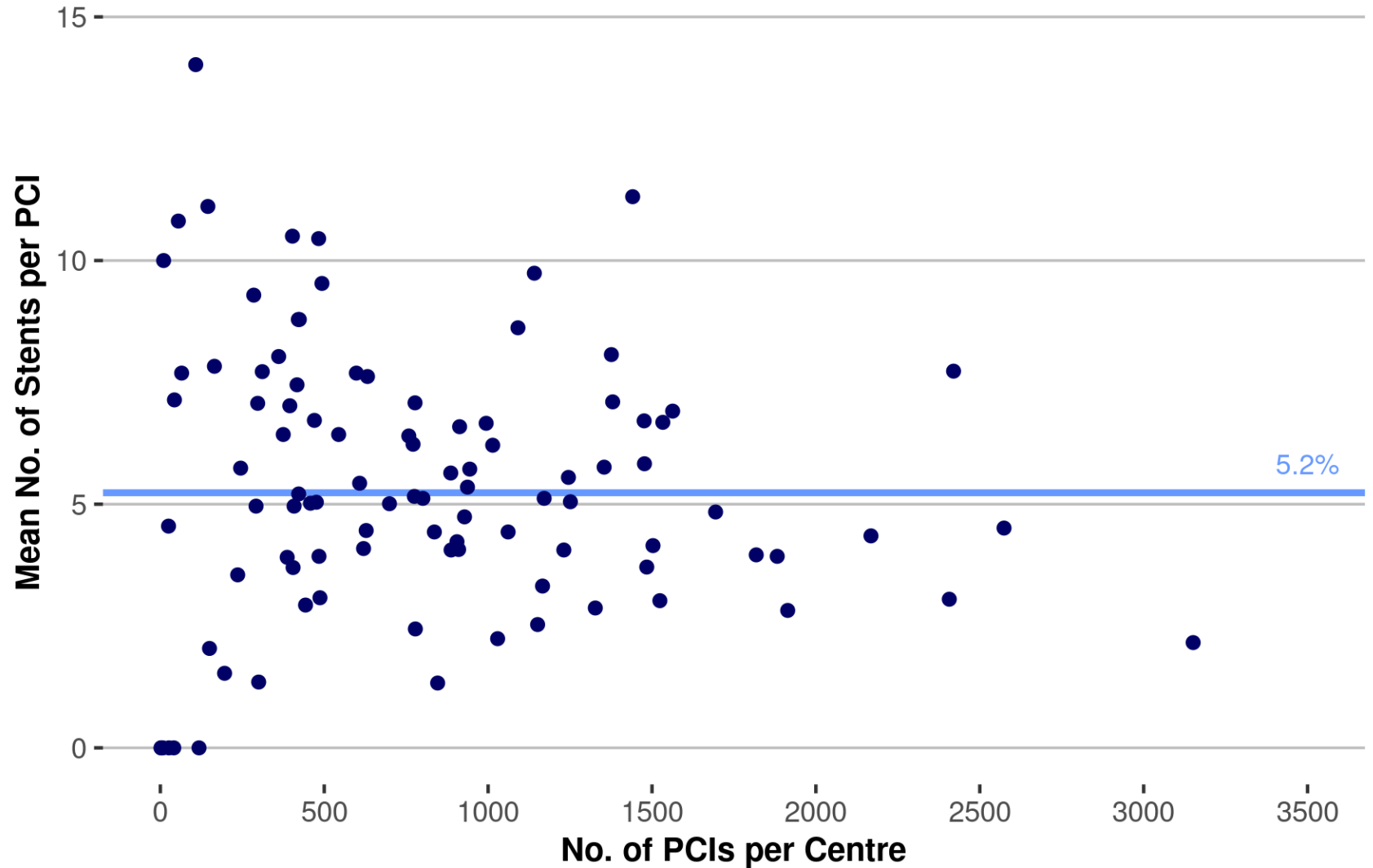
Magmaris (13)
Absorb BVS (4)



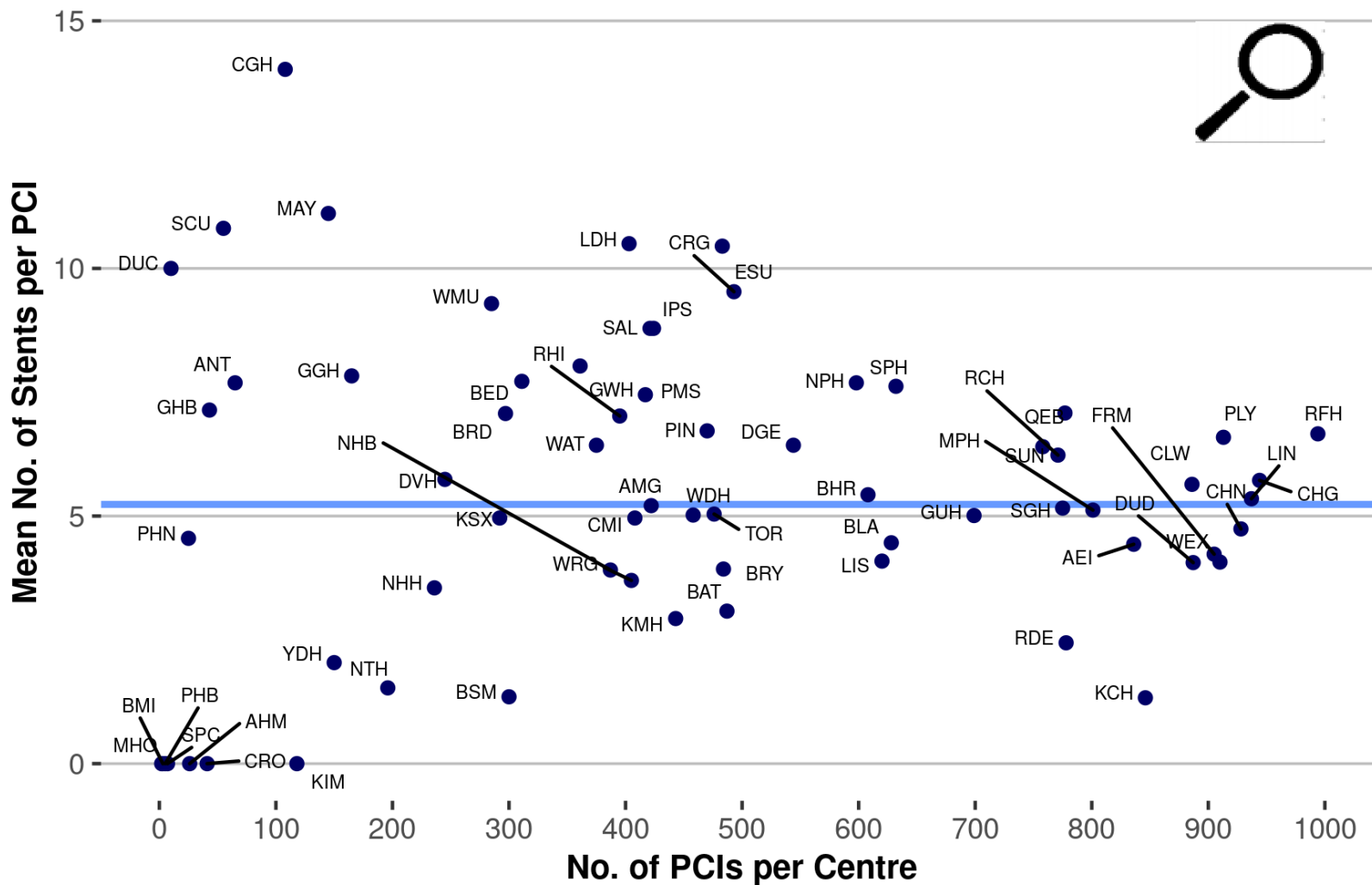
BMS and DES use v PCI for Restenosis



Procedures for Restenosis

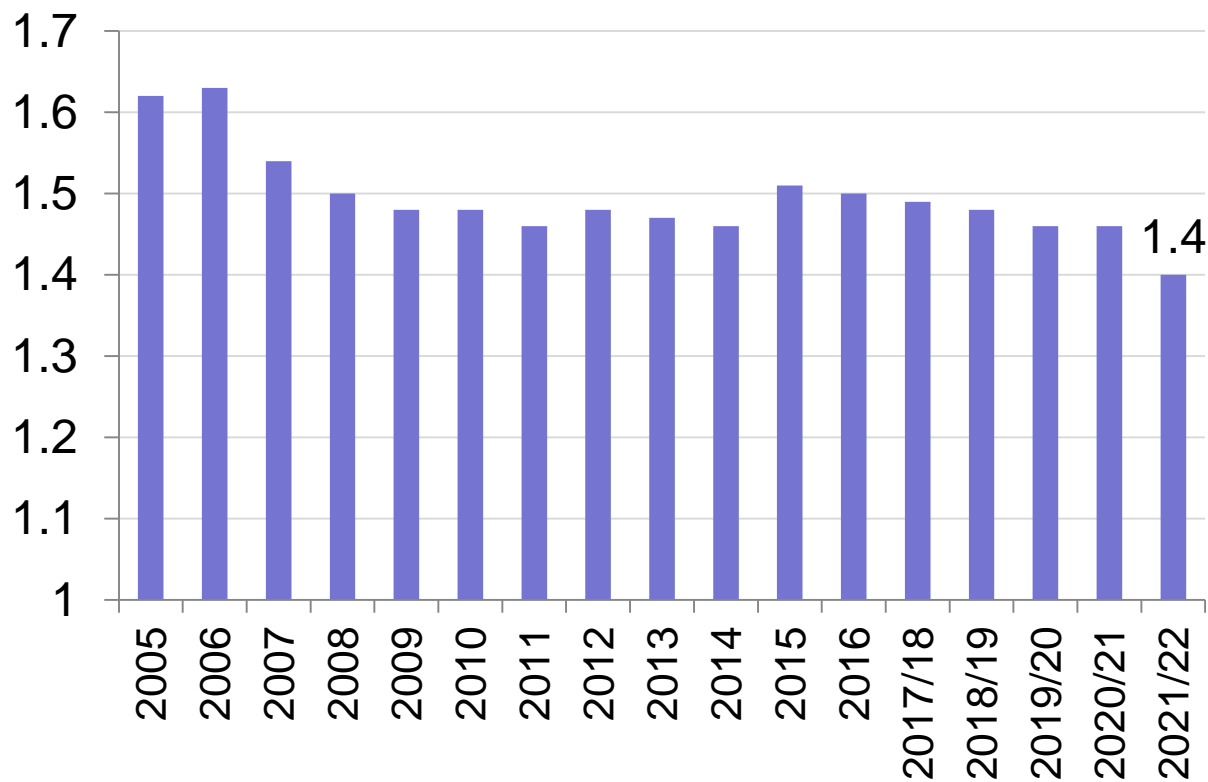


Procedures for Restenosis

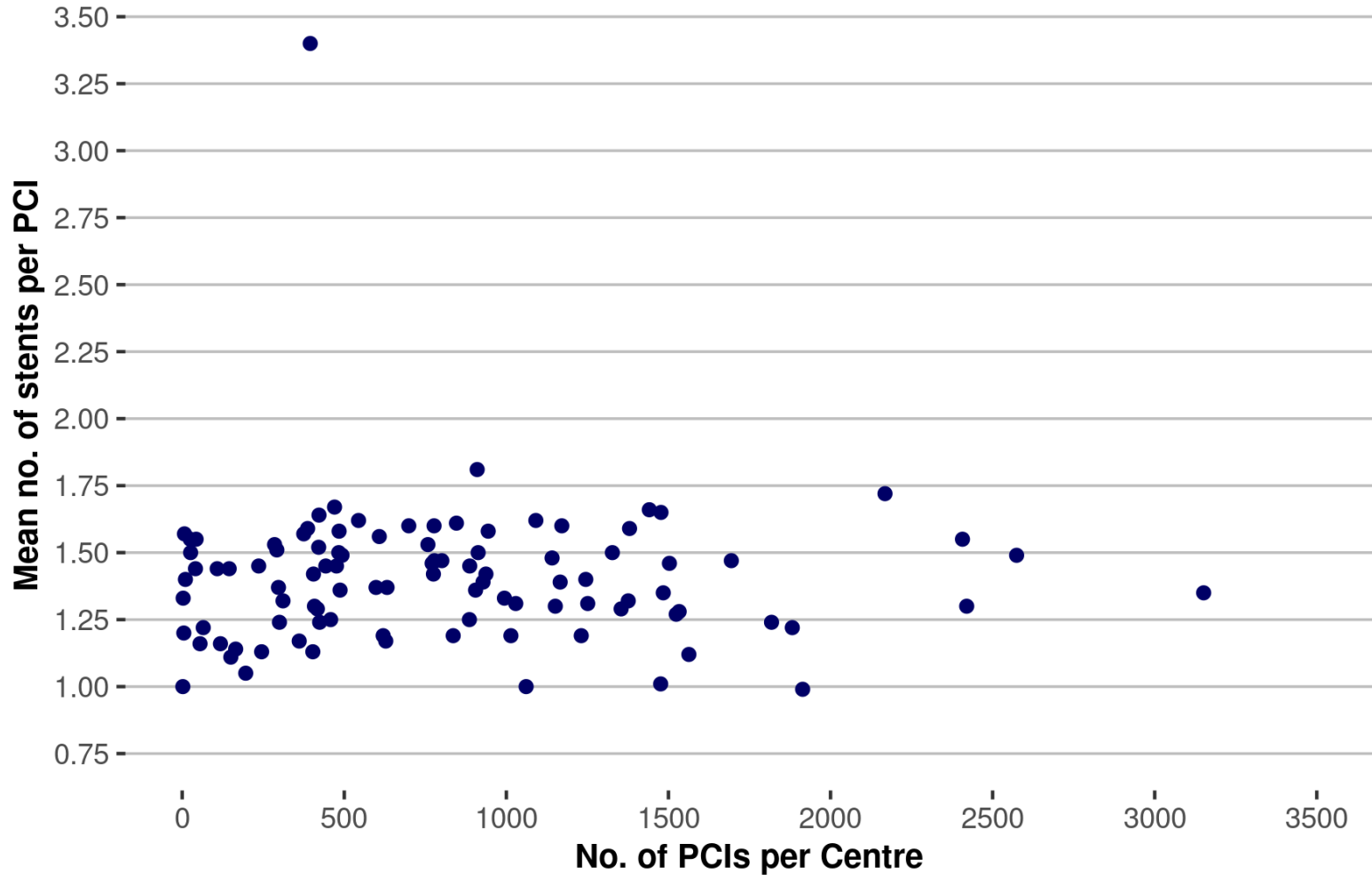


Stents per Case

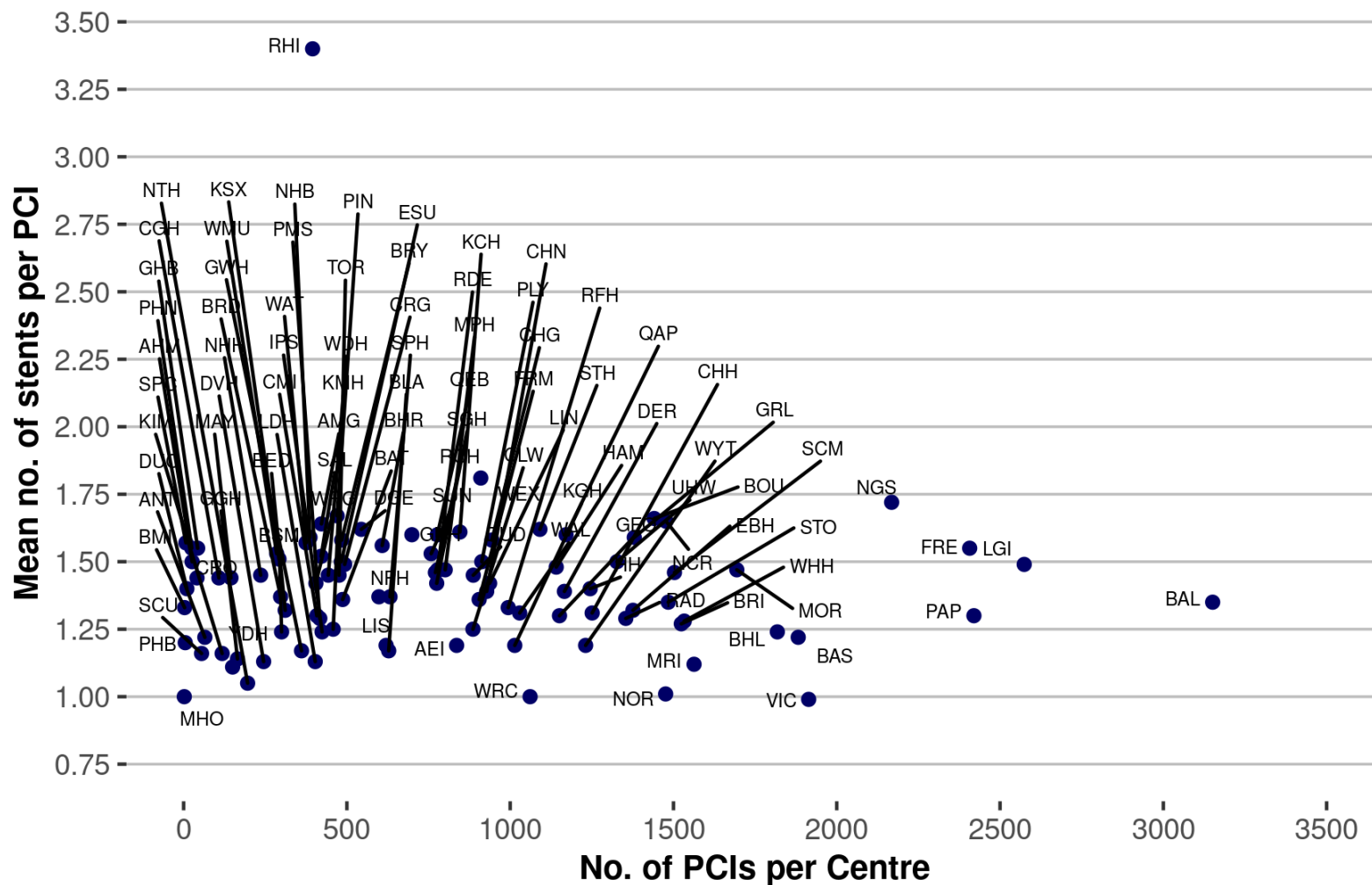
Mean number of stents per case



Mean Stents per Case (by PCI unit)



Mean Stents per Case (by PCI unit)



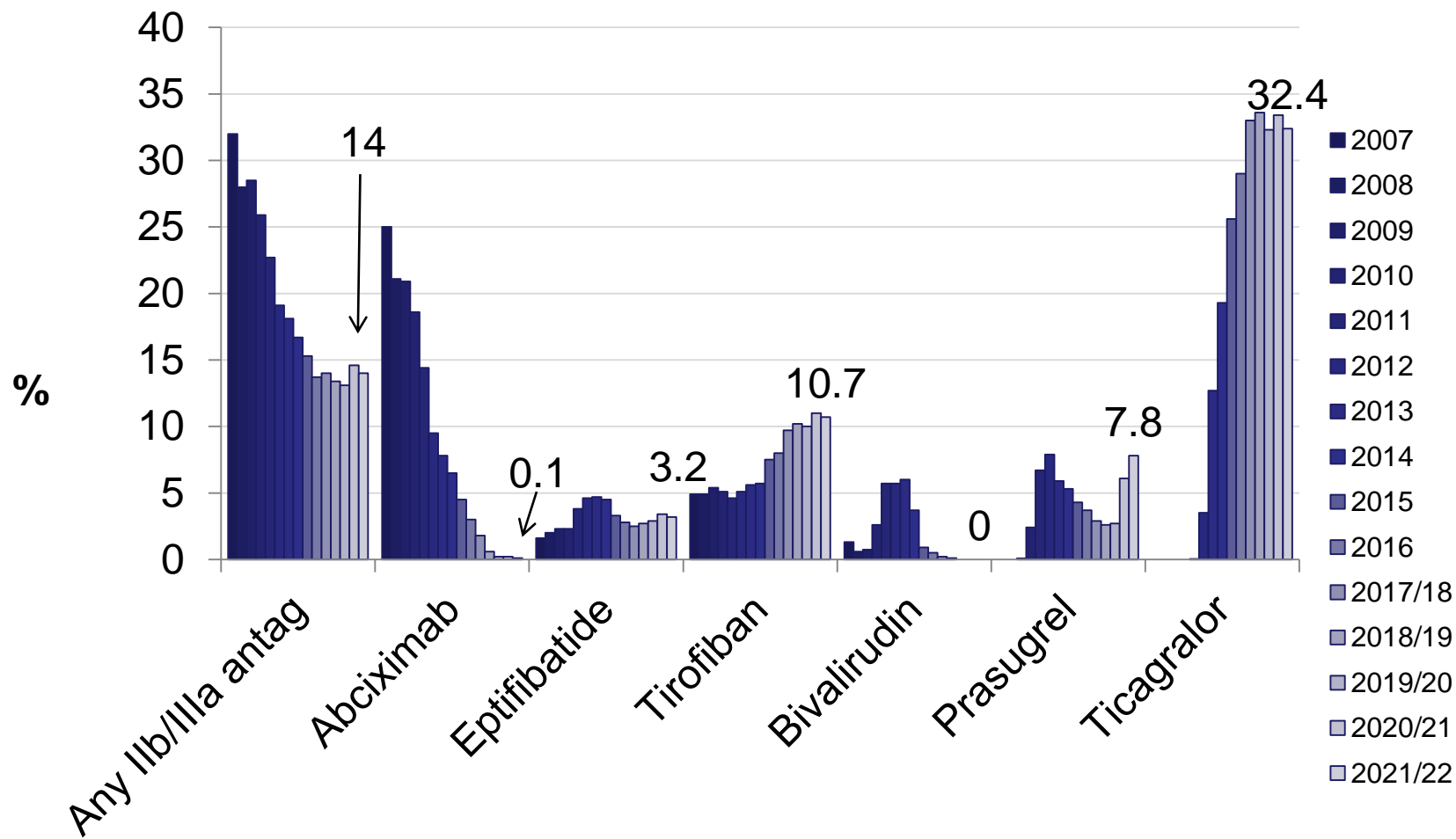
Adjunctive Therapy

1 of 3



Adjunctive therapy

All PCI Indications

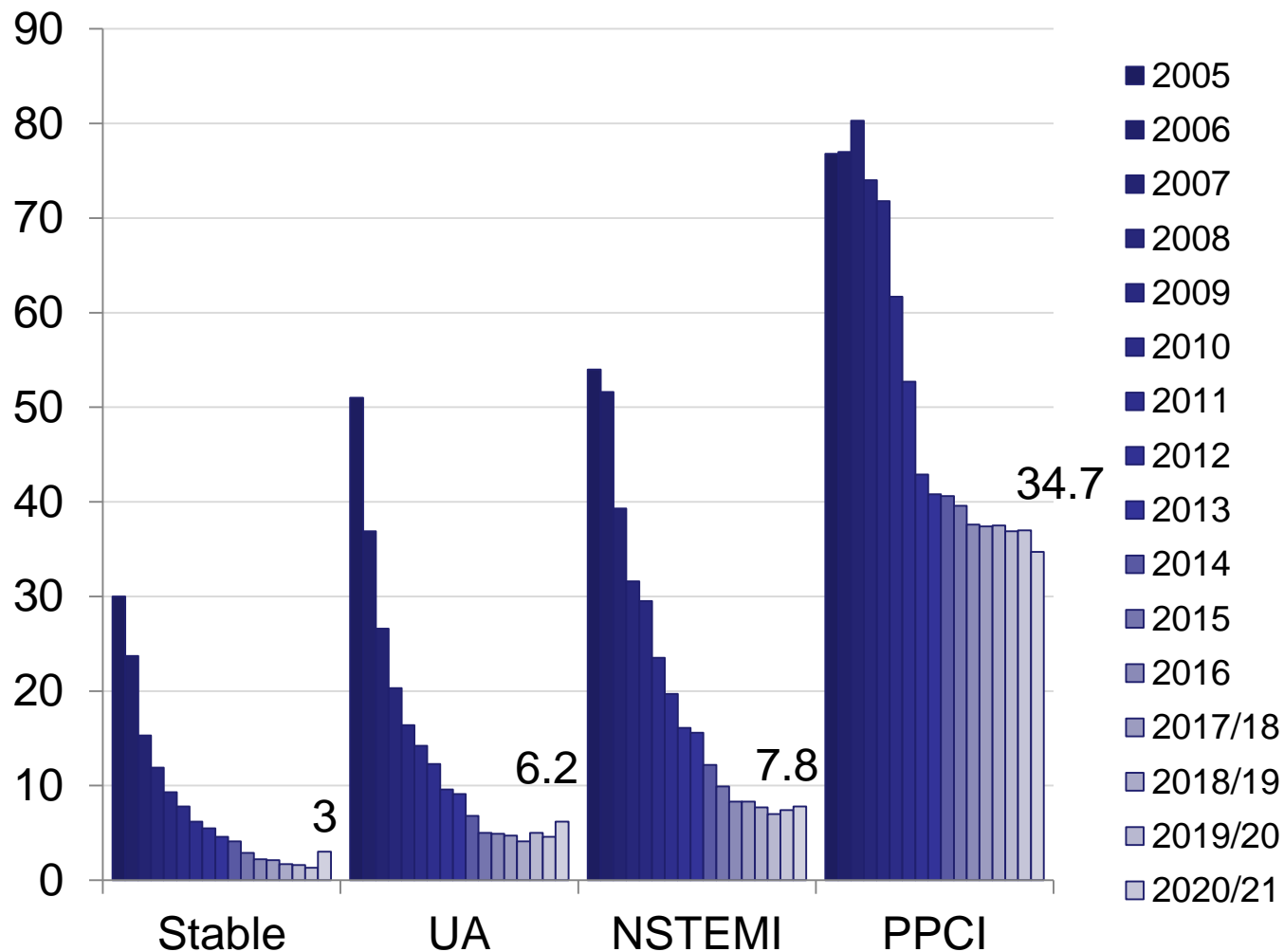


Number labels for latest year

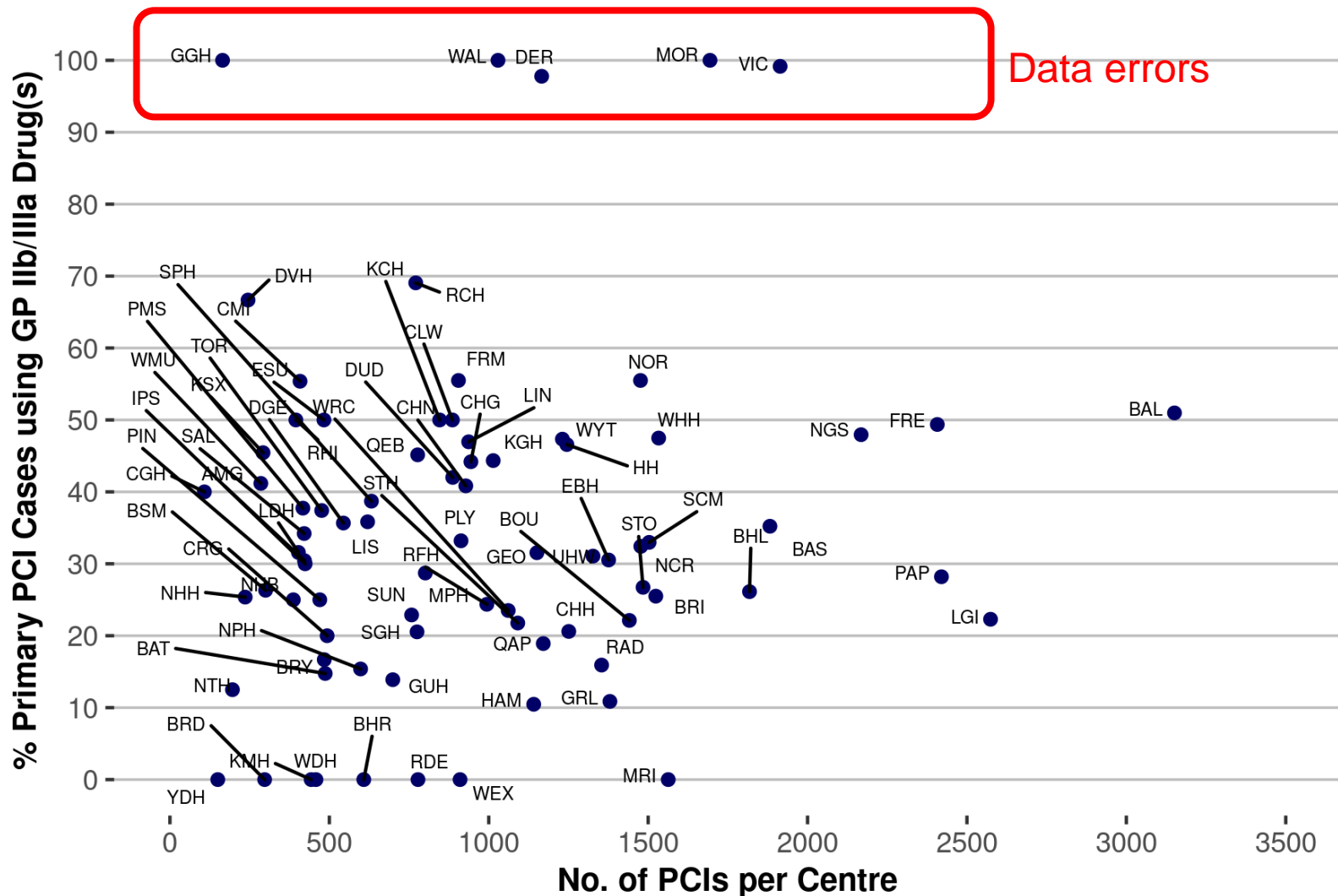
GP IIb/IIIa Antagonists

Use by Syndrome

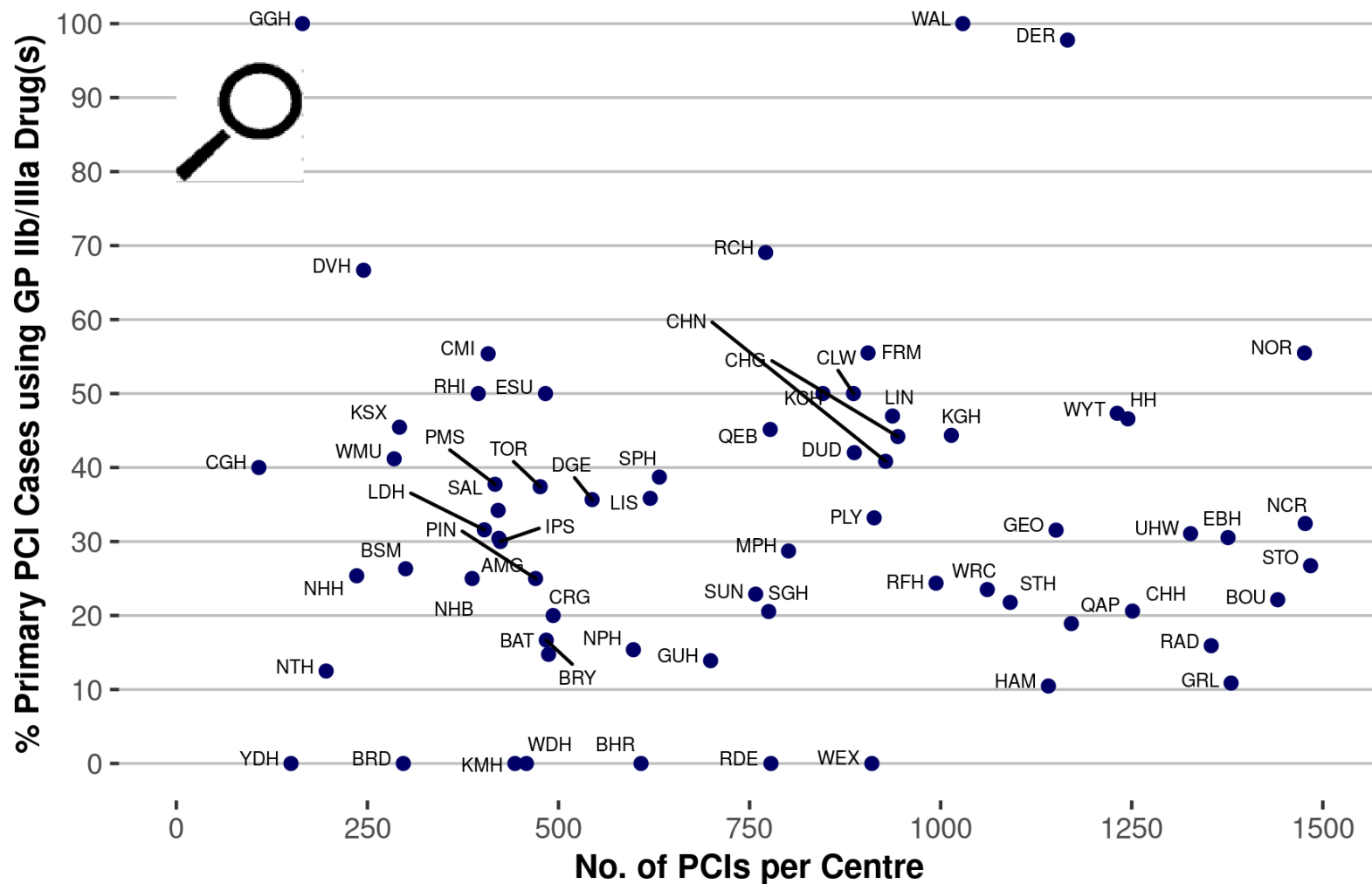
% Procedures with any GP IIb/IIIa blocker



Any GP IIb/IIIa Antagonist Use in Primary PCI v activity per unit



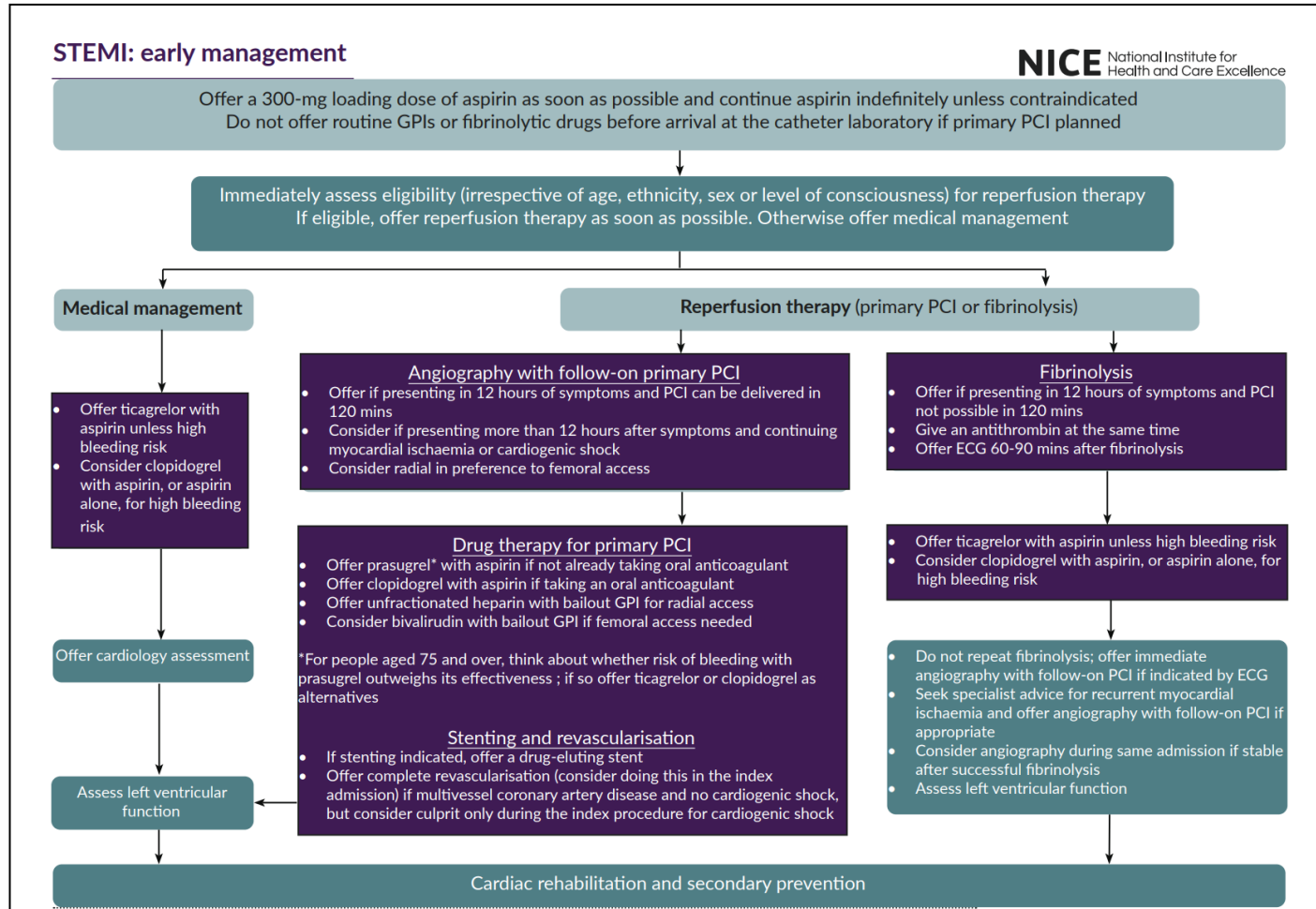
Any GP IIb/IIIa Antagonist Use in Primary PCI v activity per unit



Acute coronary syndromes

NICE National Institute for Health and Care Excellence

NICE guideline [NG185] Published: 18 November 2020



Acute coronary syndromes

NICE National Institute for
Health and Care Excellence

NICE guideline [NG185] Published: 18 November 2020

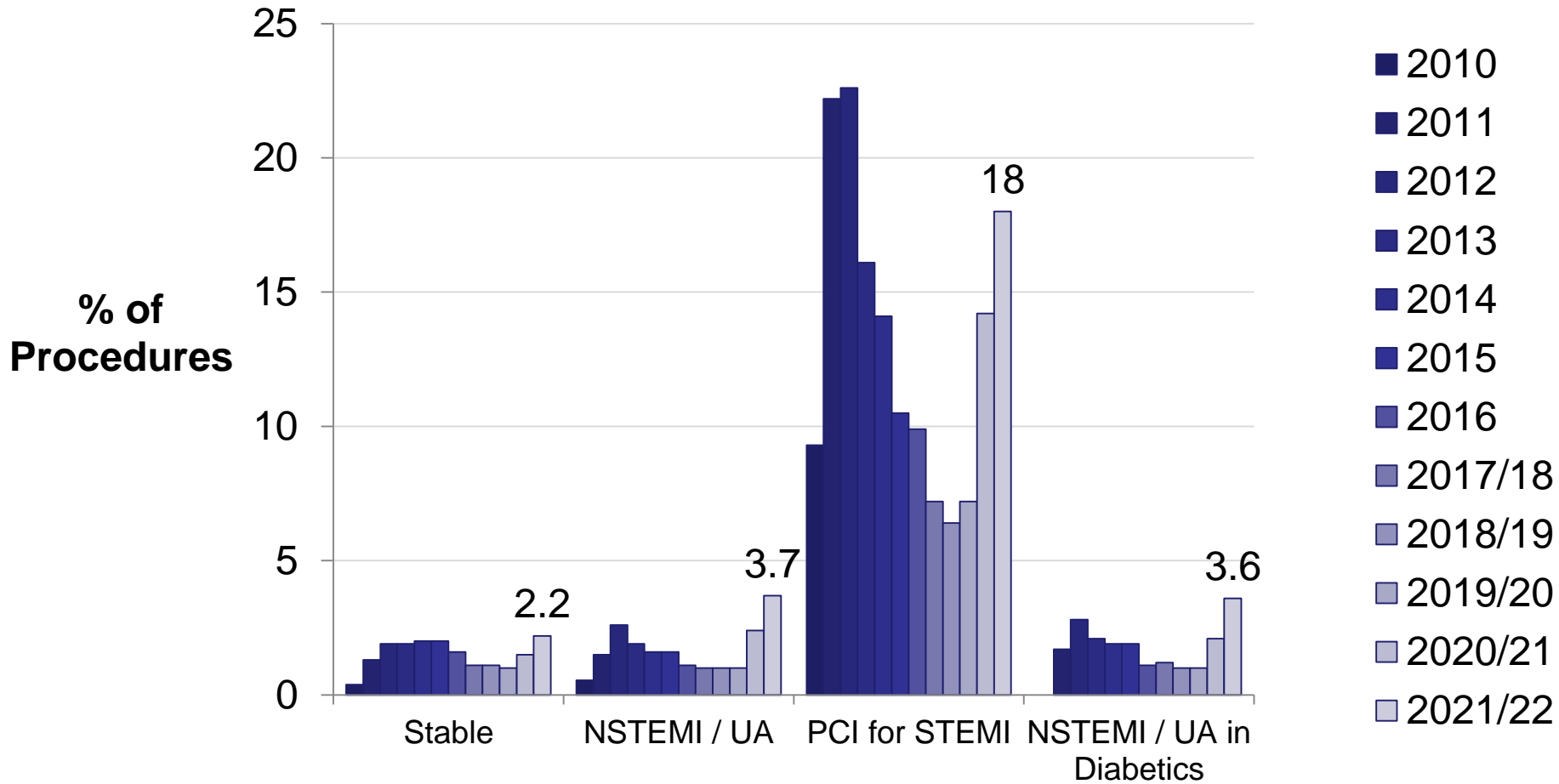
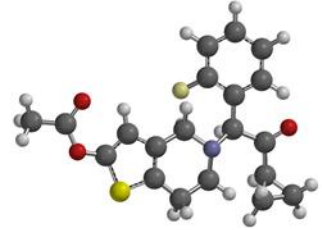
Drug therapy for primary PCI

- Offer prasugrel* with aspirin if not already taking oral anticoagulant
- Offer clopidogrel with aspirin if taking an oral anticoagulant
- Offer unfractionated heparin with bailout GPI for radial access
- Consider bivalirudin with bailout GPI if femoral access needed

*For people aged 75 and over, think about whether risk of bleeding with prasugrel outweighs its effectiveness ; if so offer ticagrelor or clopidogrel as alternatives

Prasugrel

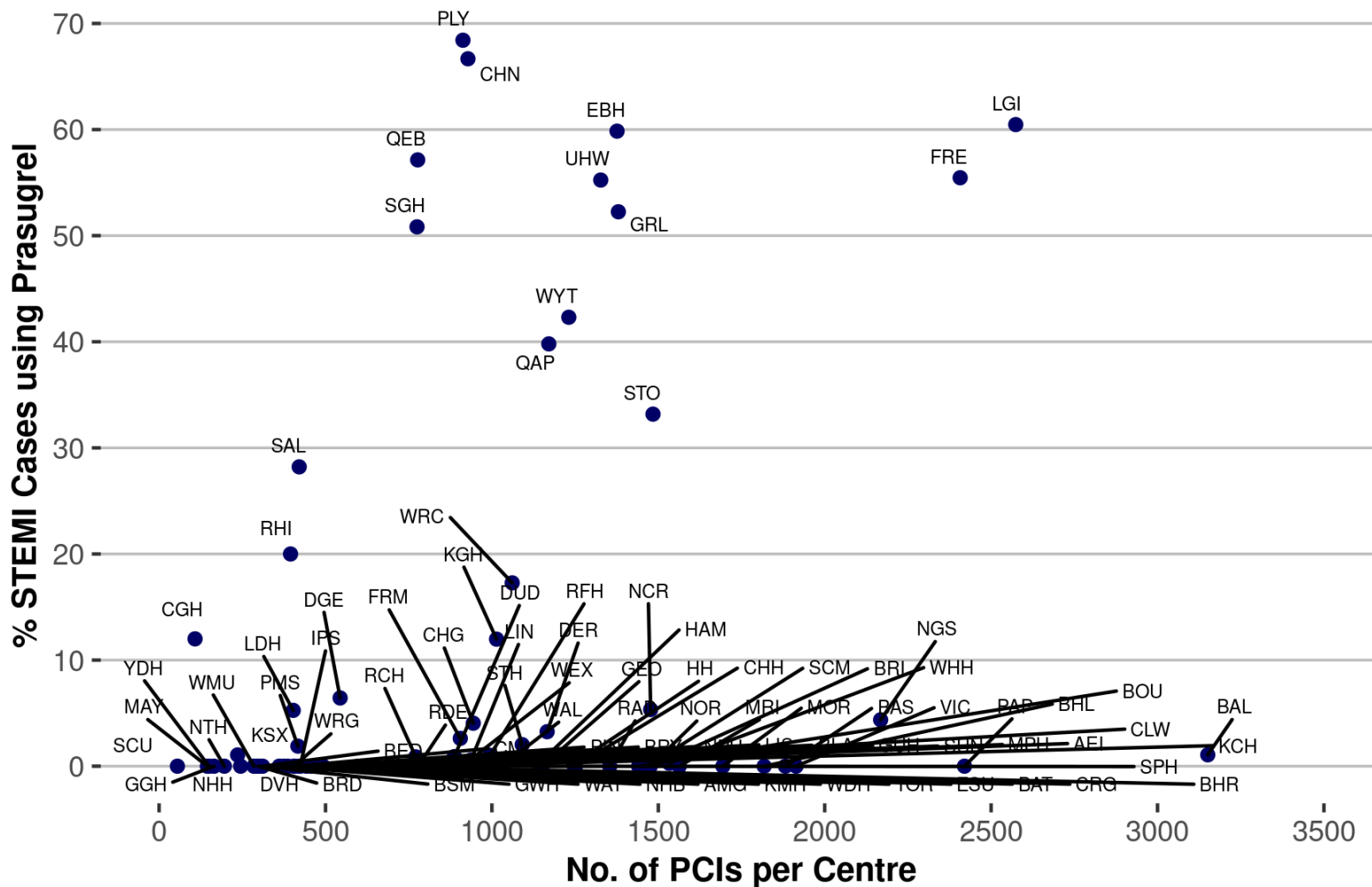
Use by Indication for PCI



Note: PCI for STEMI includes all indications including rescue

Prasugrel

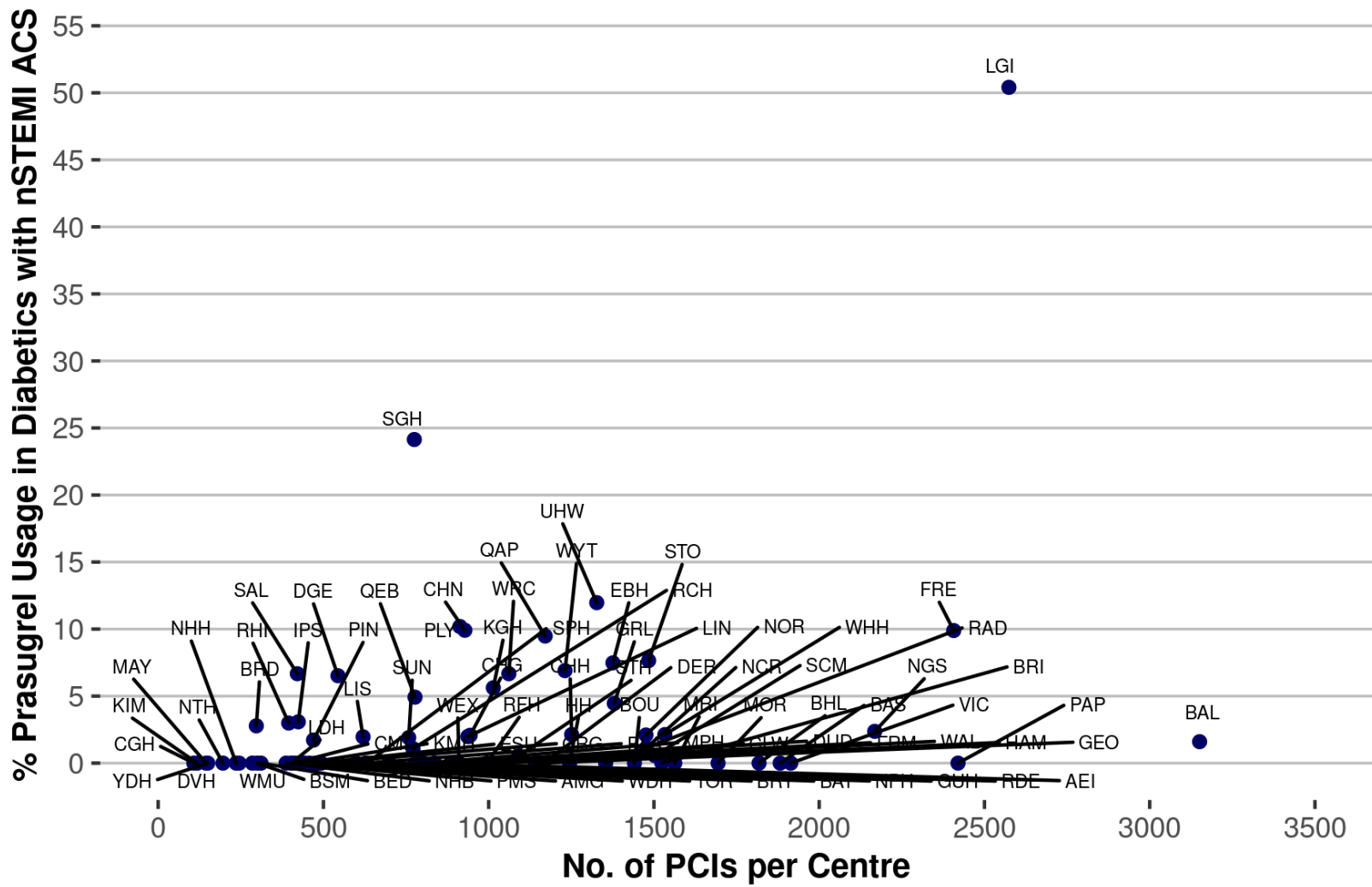
Use in PCI for STEMI v activity per unit



Note: PCI for STEMI includes all indications including rescue

Prasugrel

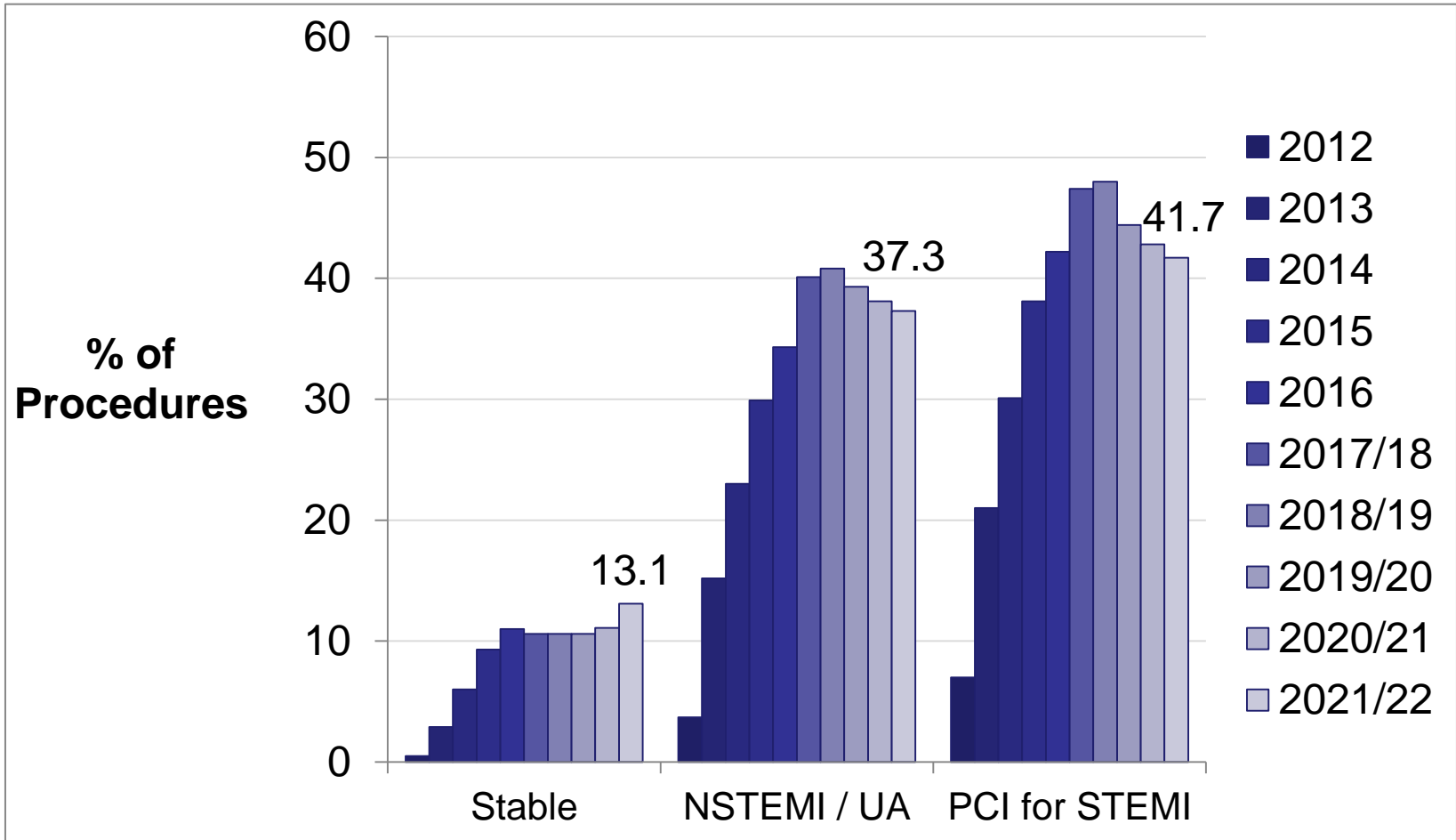
Use in Diabetics with NSTEMI by centre





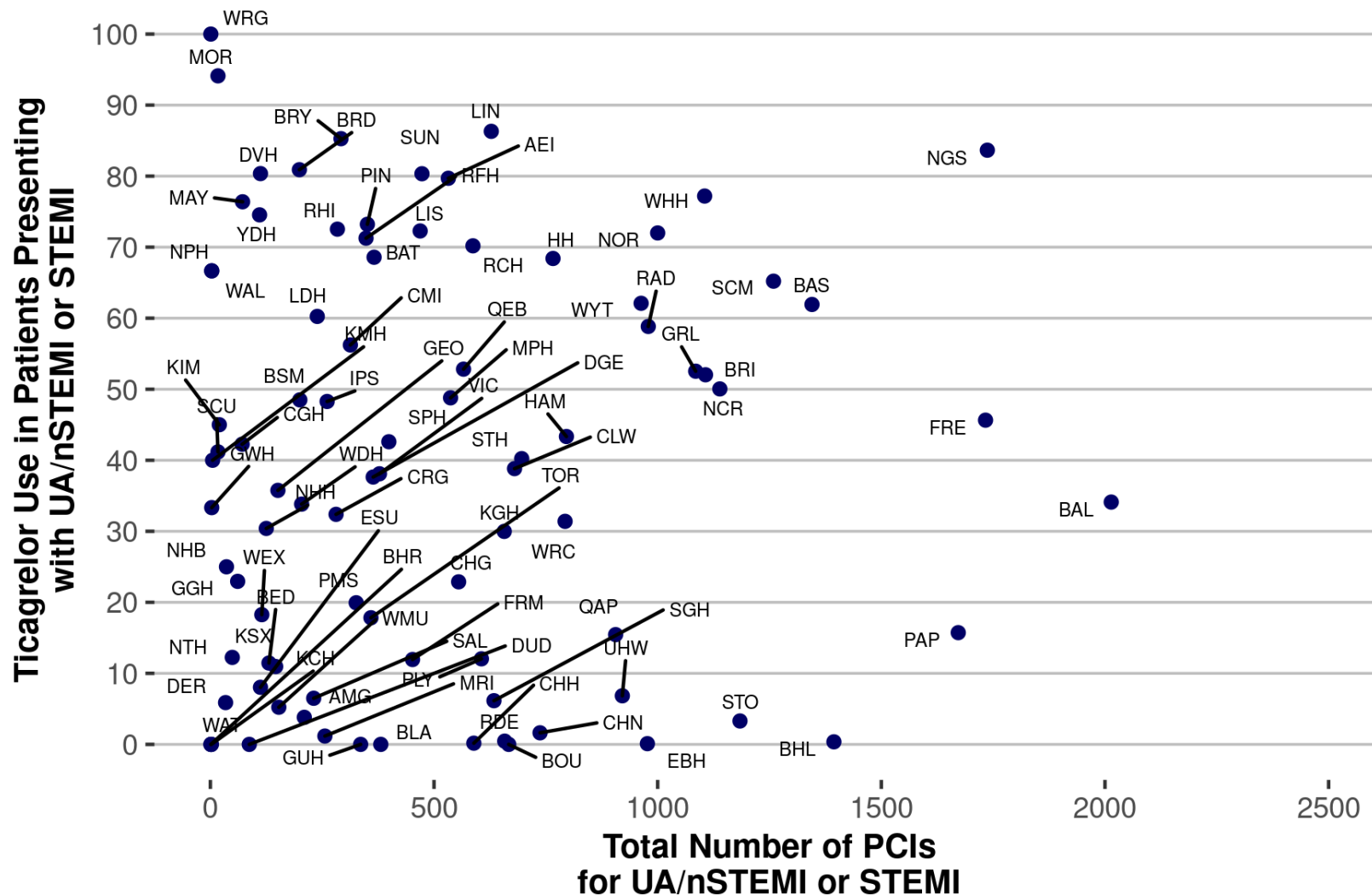
Ticagrelor

Use by Indication for PCI



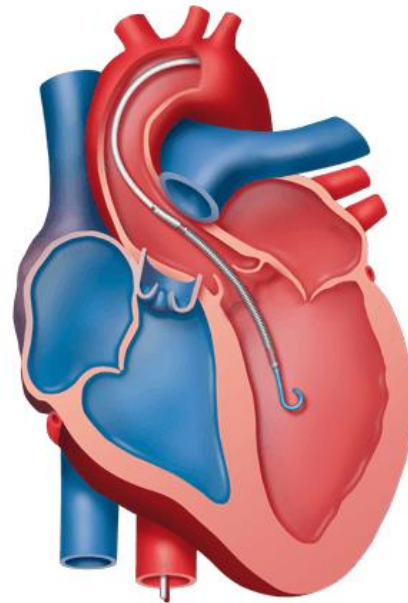
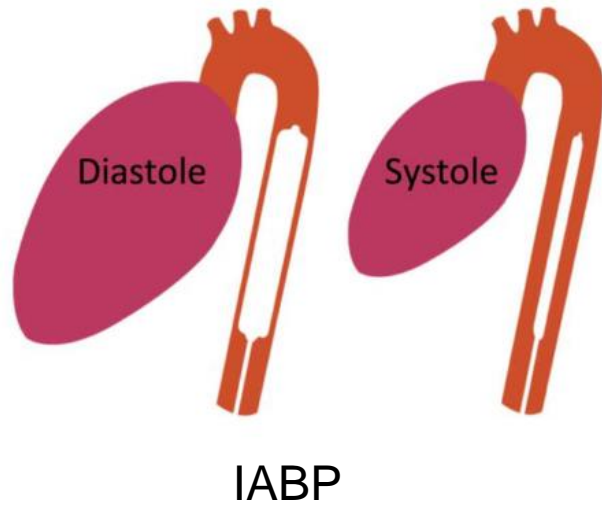
Ticagrelor

Use in all NSTEMI and STEMI by Centre

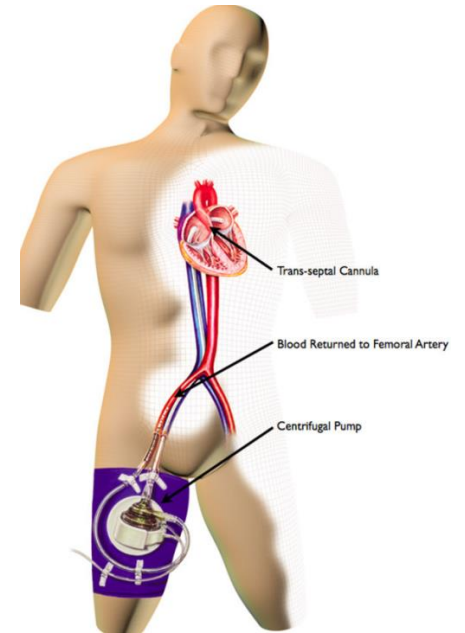


Note: PCI for STEMI includes all indications including rescue

LV Support



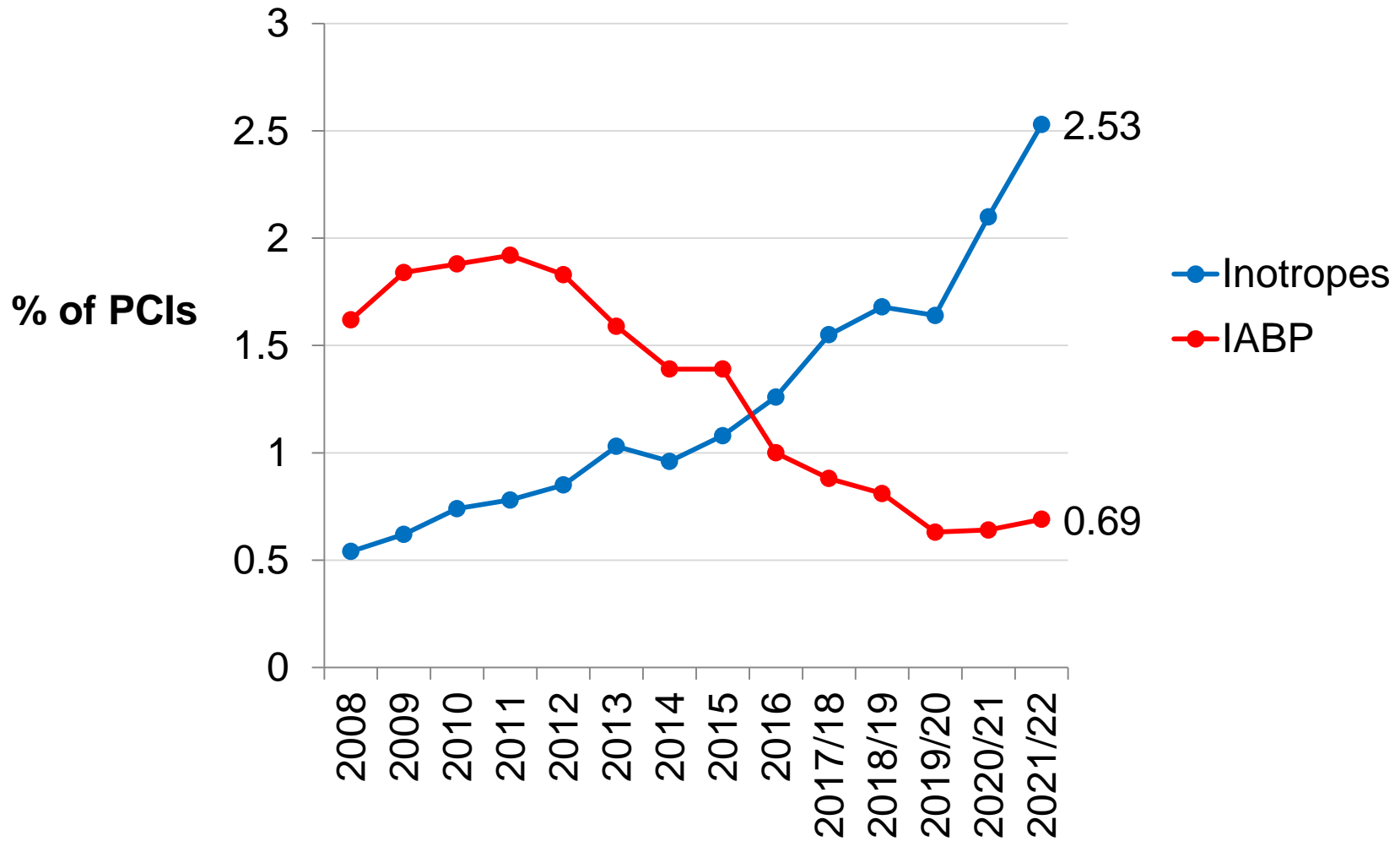
Impella



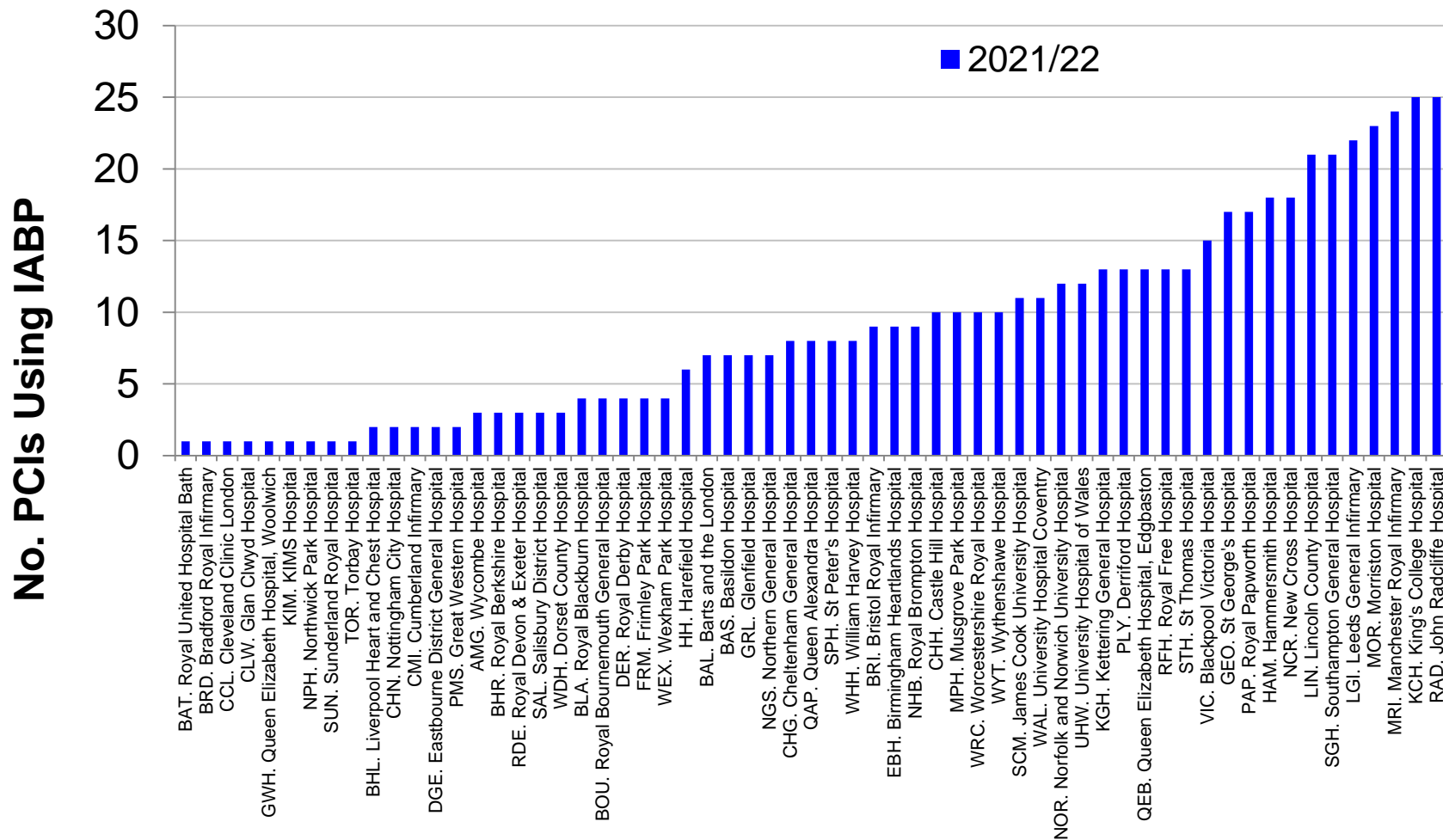
Tandem Heart

LV Support

Inotropes and IABP

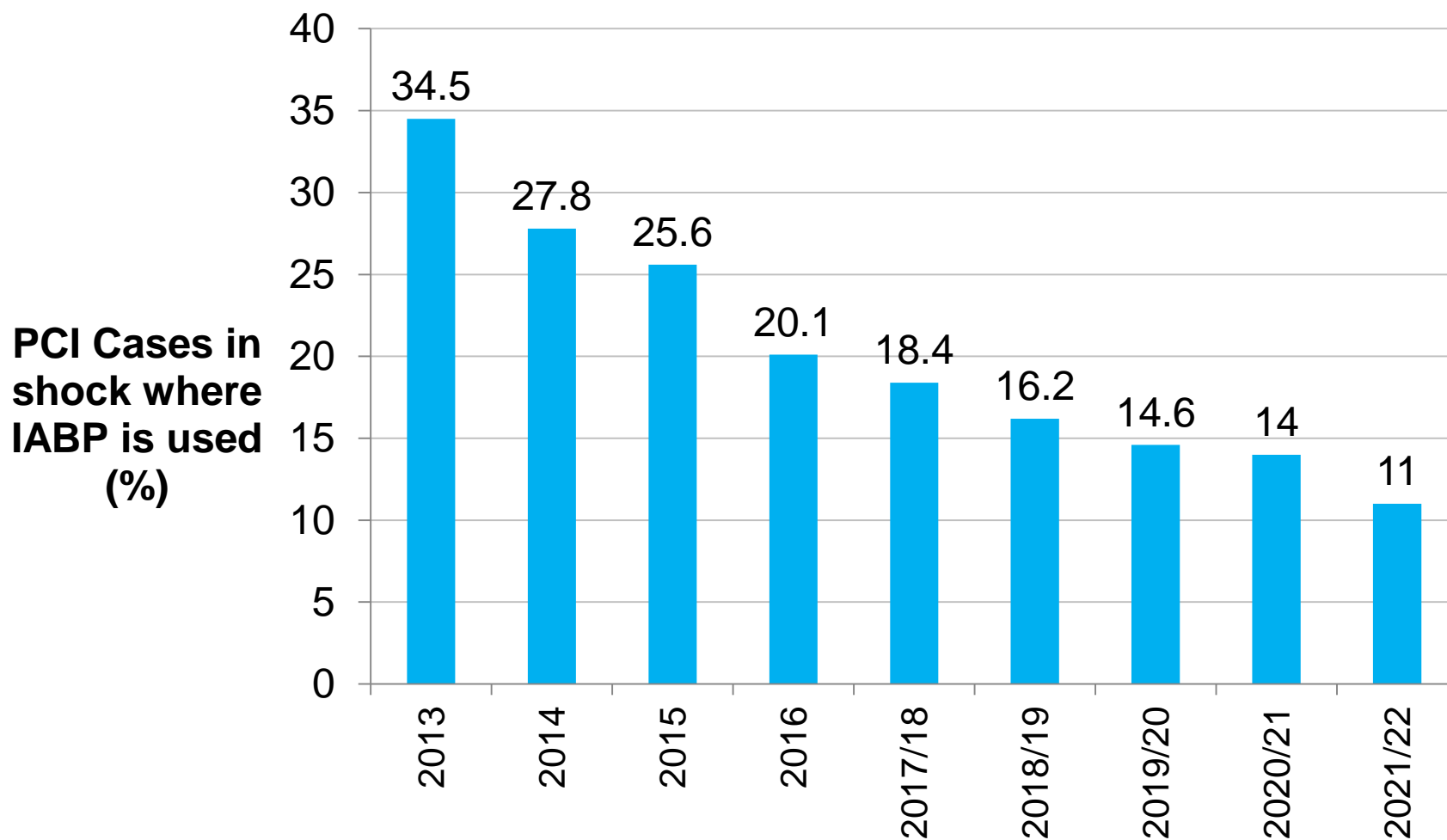


LV Support IABP

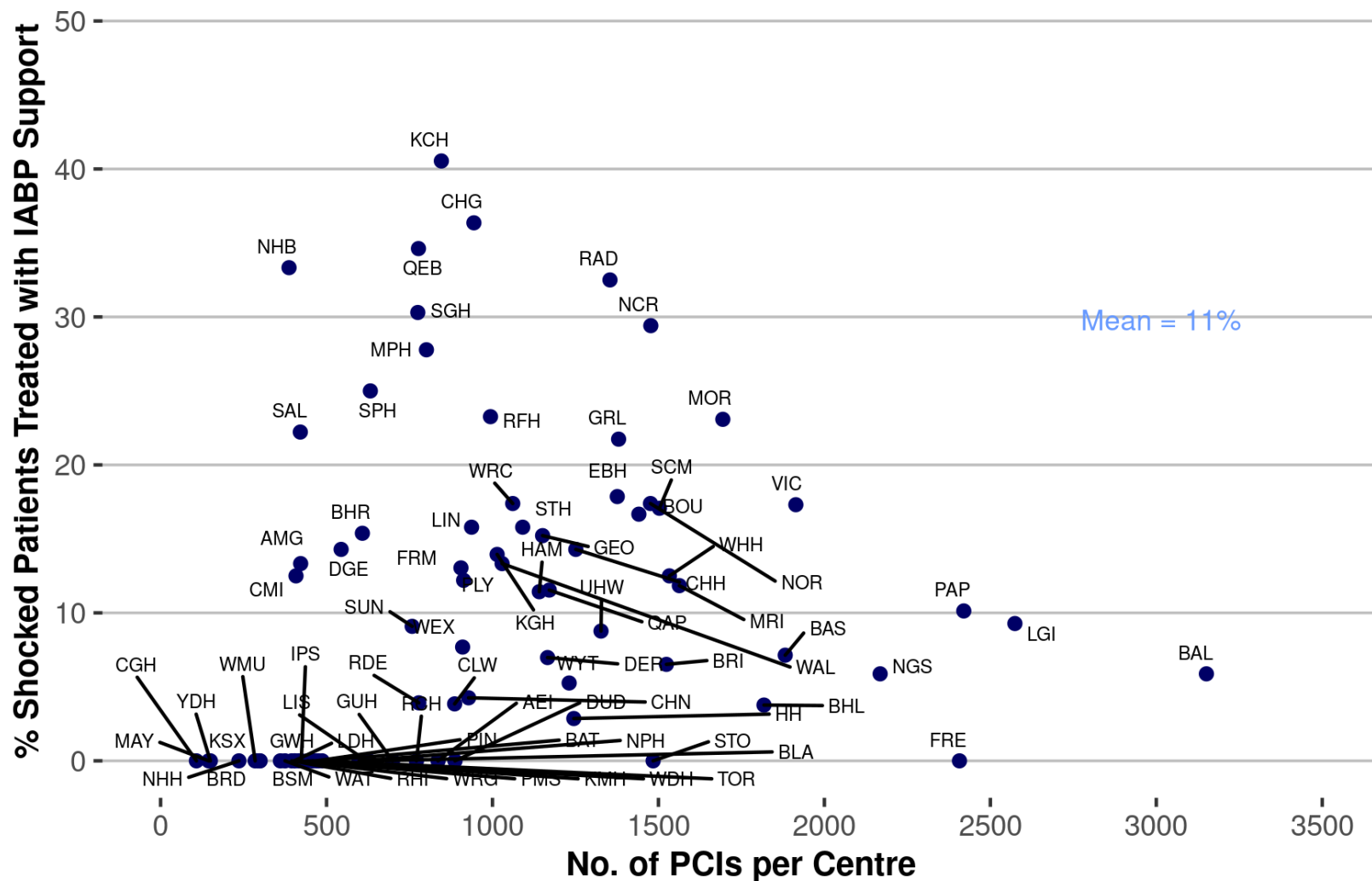


PCIs with at least this type of support

Shock Cases Treated with IABP

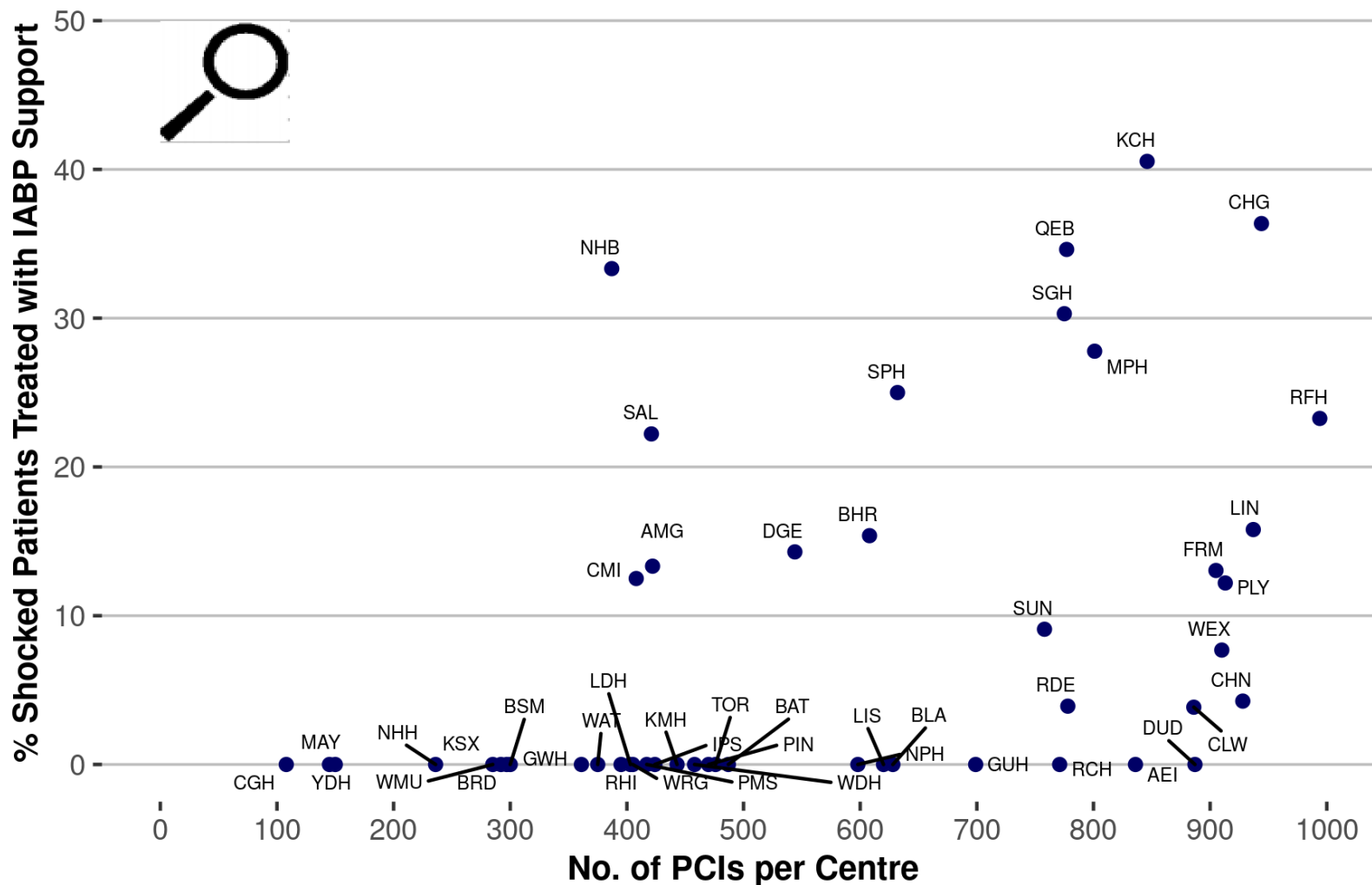


Shock Cases Treated with IABP support



Does not include Impella use

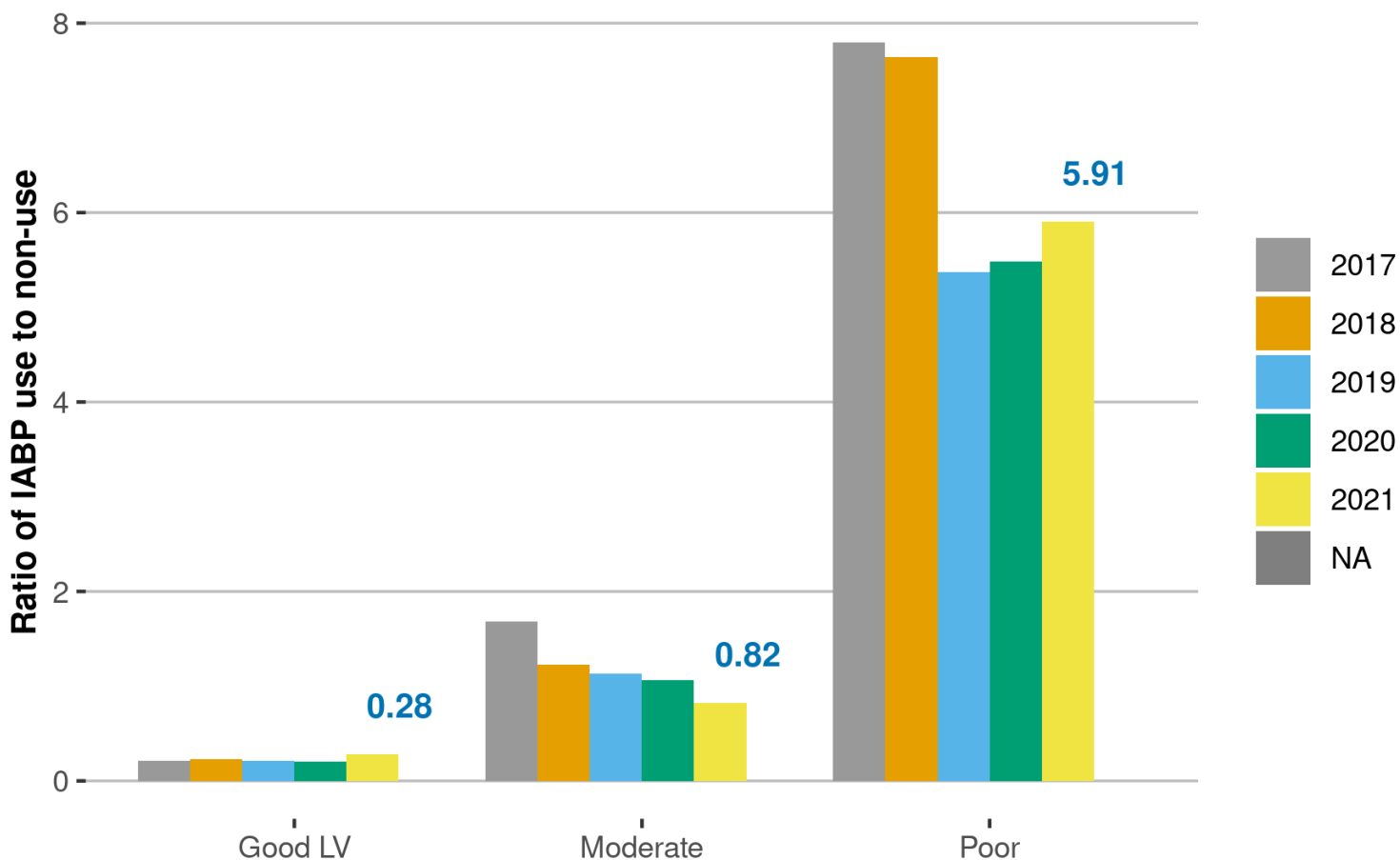
Shock Cases Treated with IABP support



Does not include Impella use

LV Support

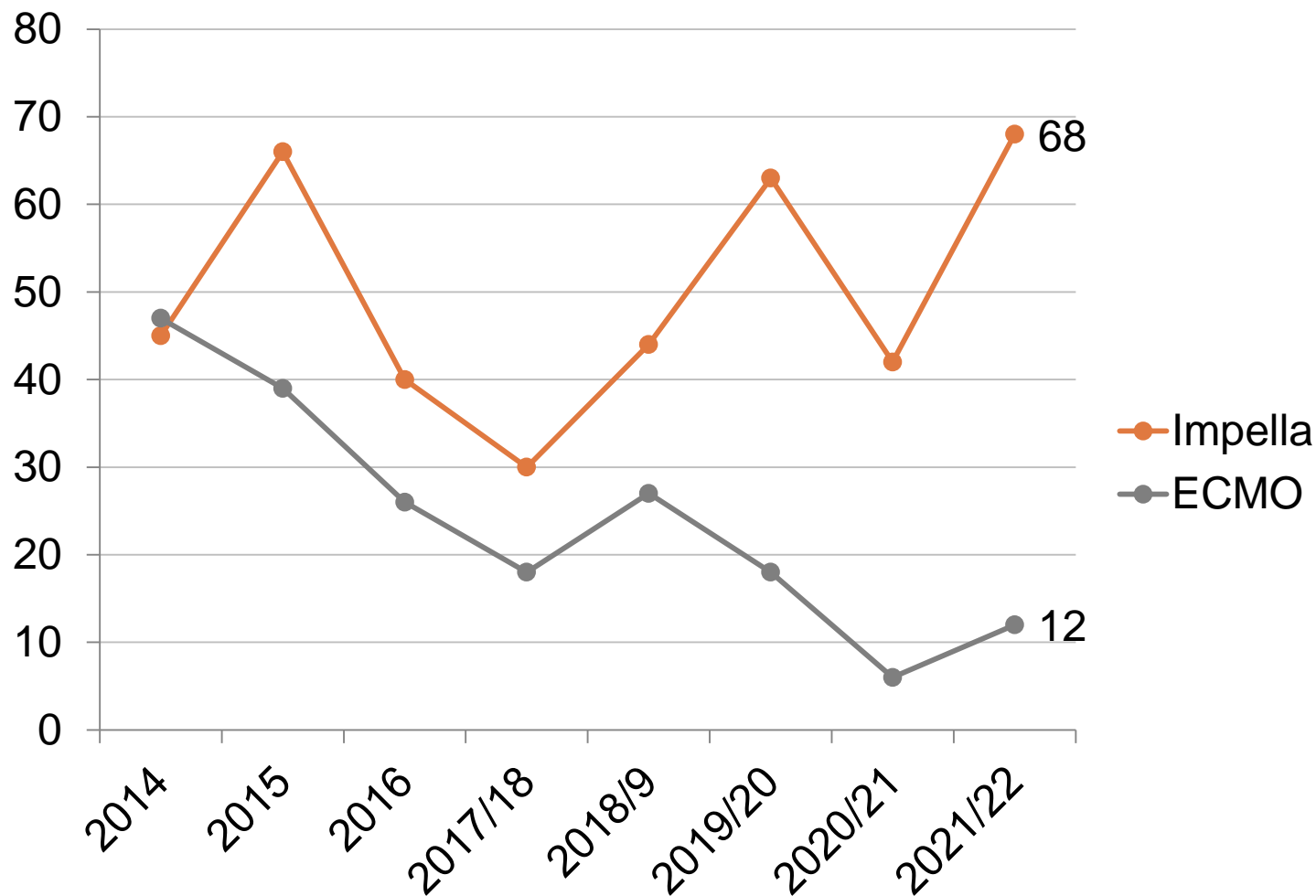
% Cases using IABP v LV function



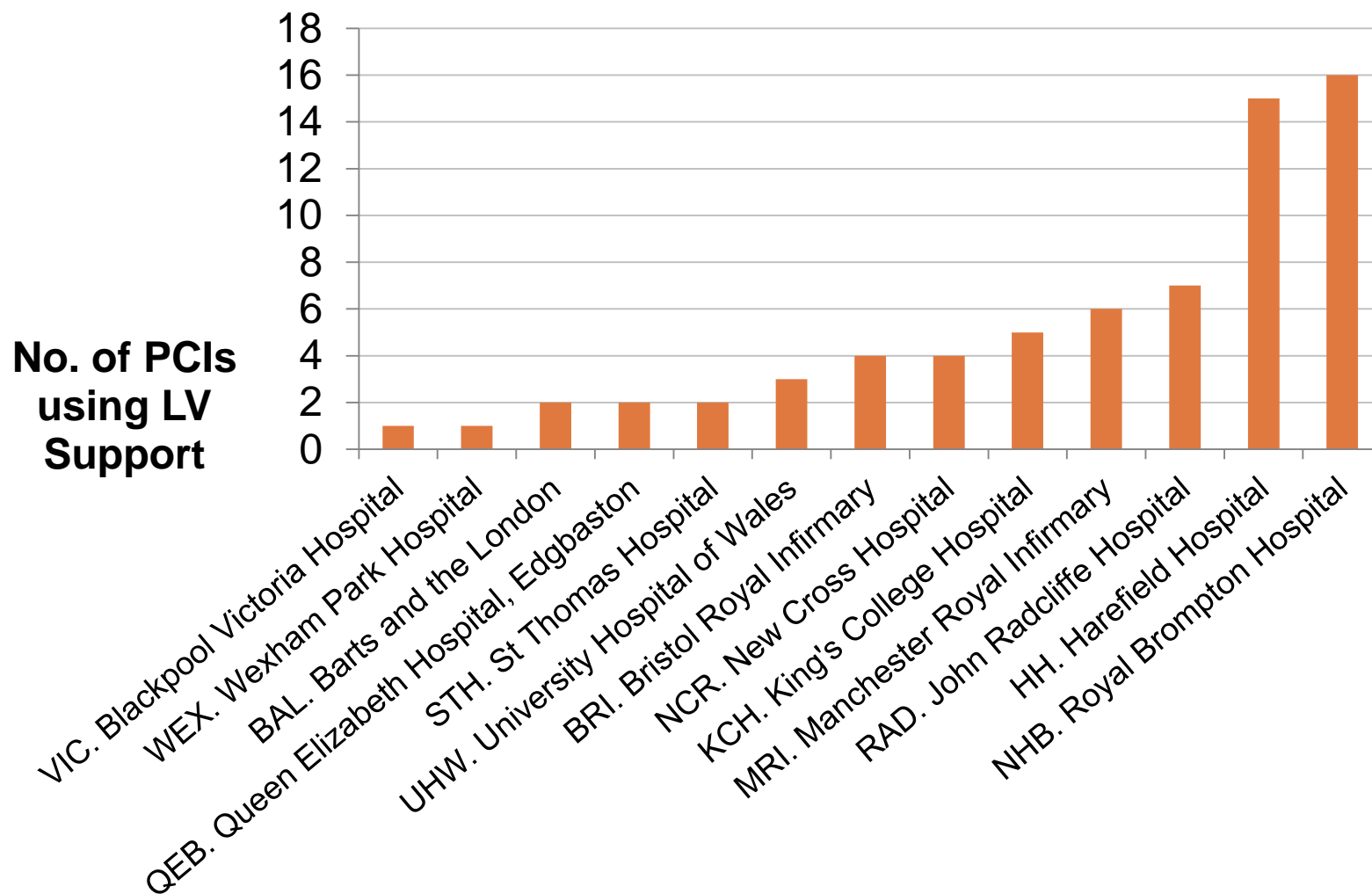
LV Support

Other options

No. of PCIs using LV Support

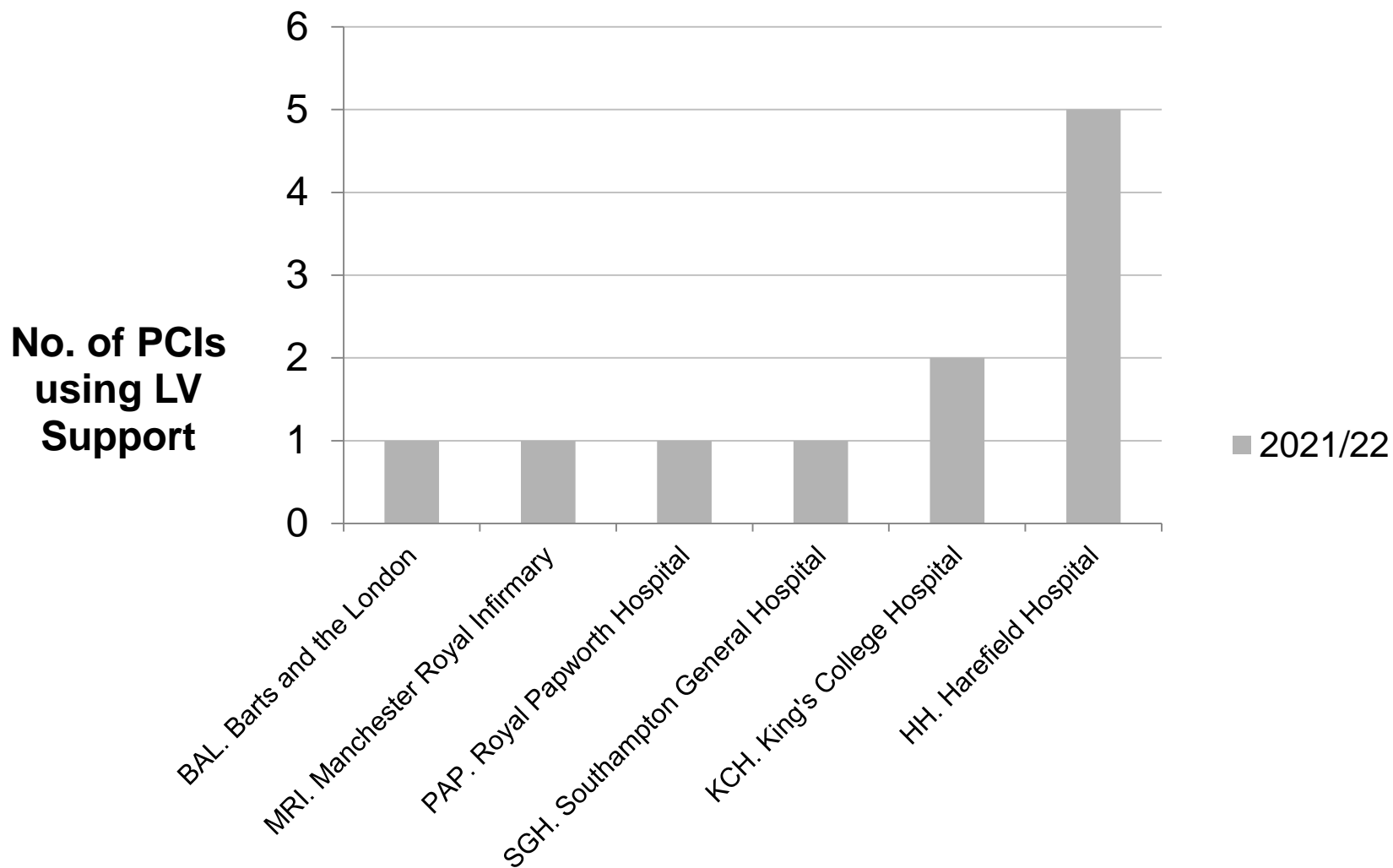


LV Support Impella



PCIs with at least this type of support

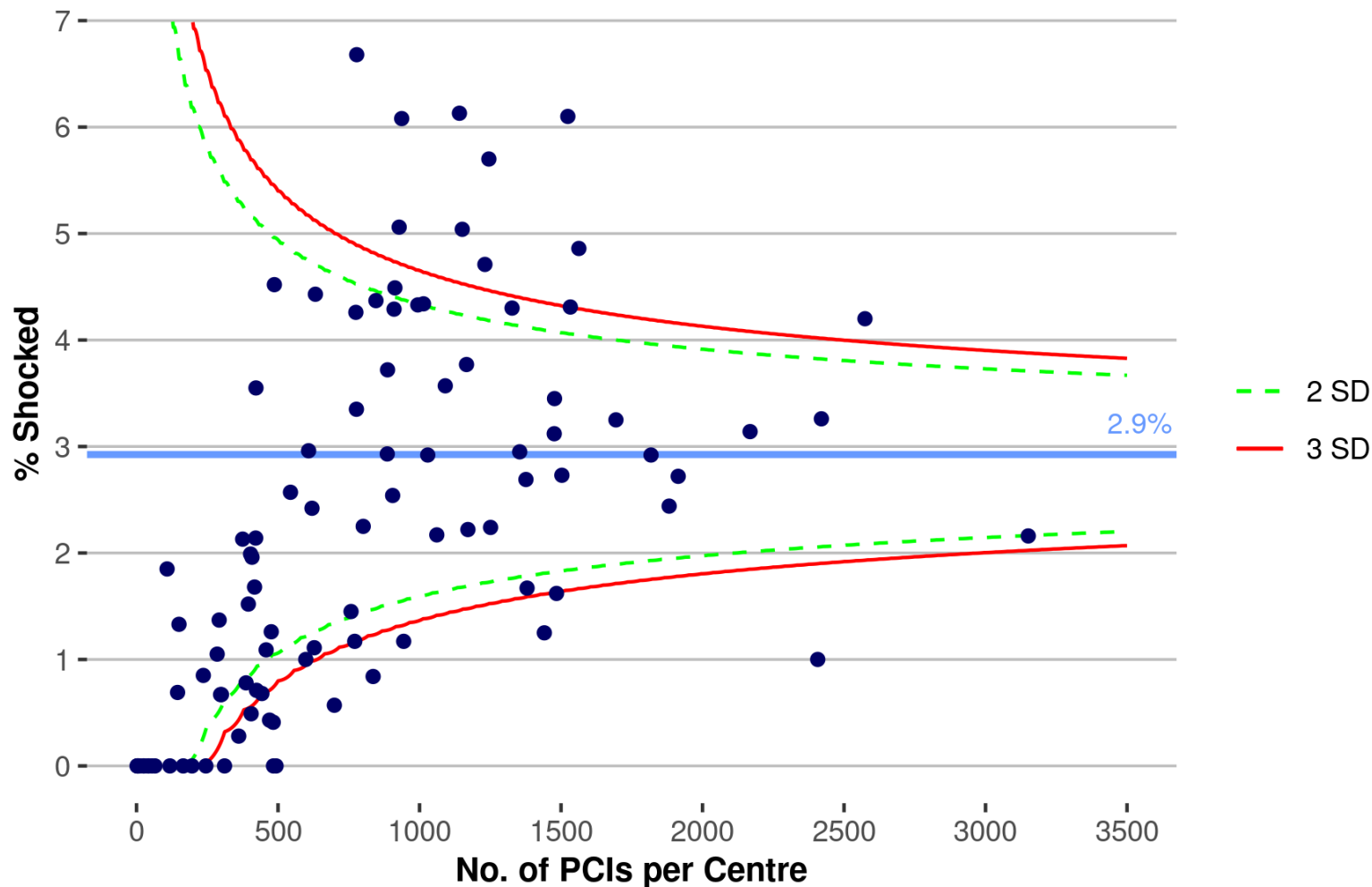
LV Support ECMO



PCIs with at least this type of support

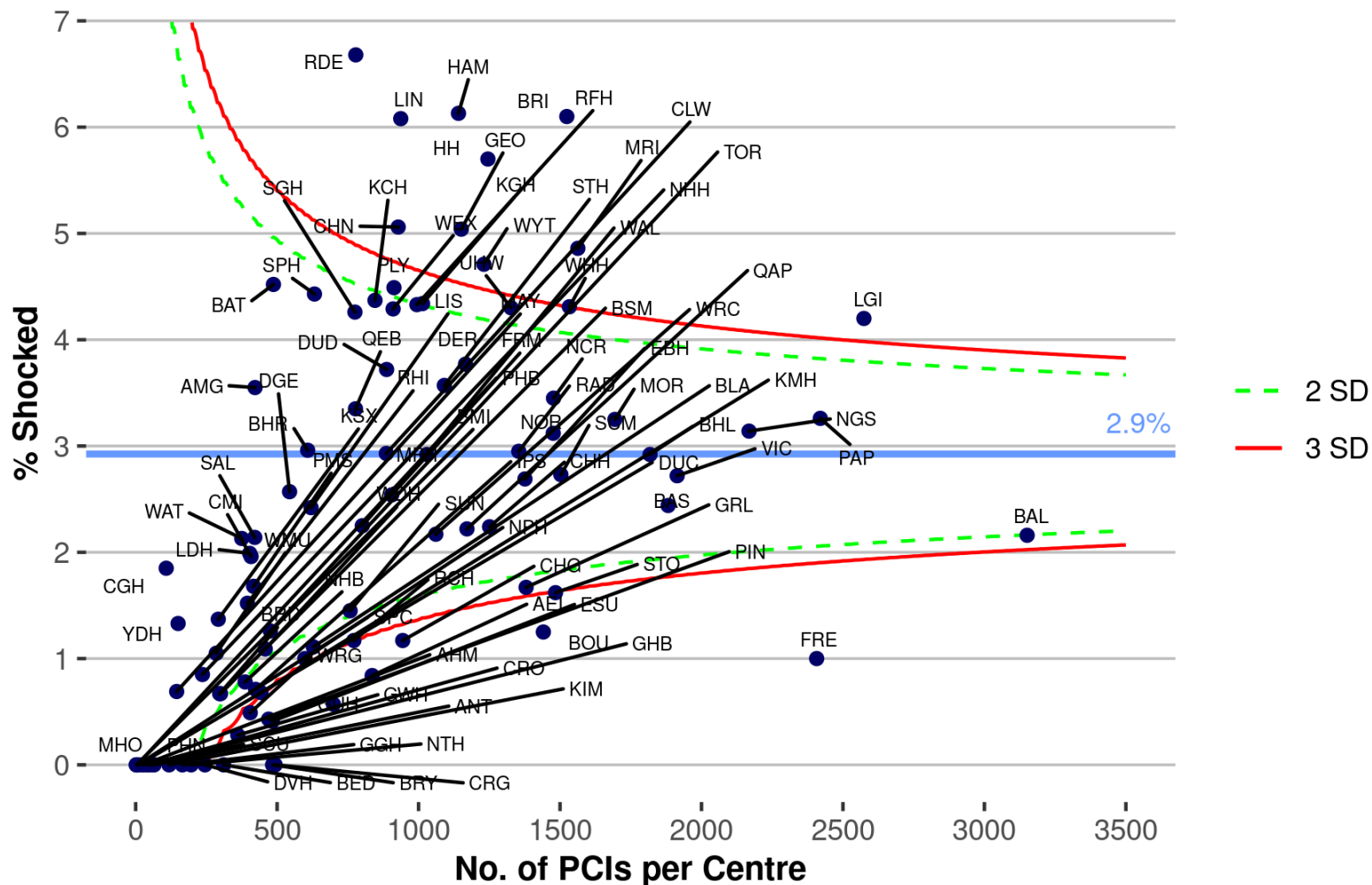
Cardiogenic Shock

% Cases with shock by PCI unit



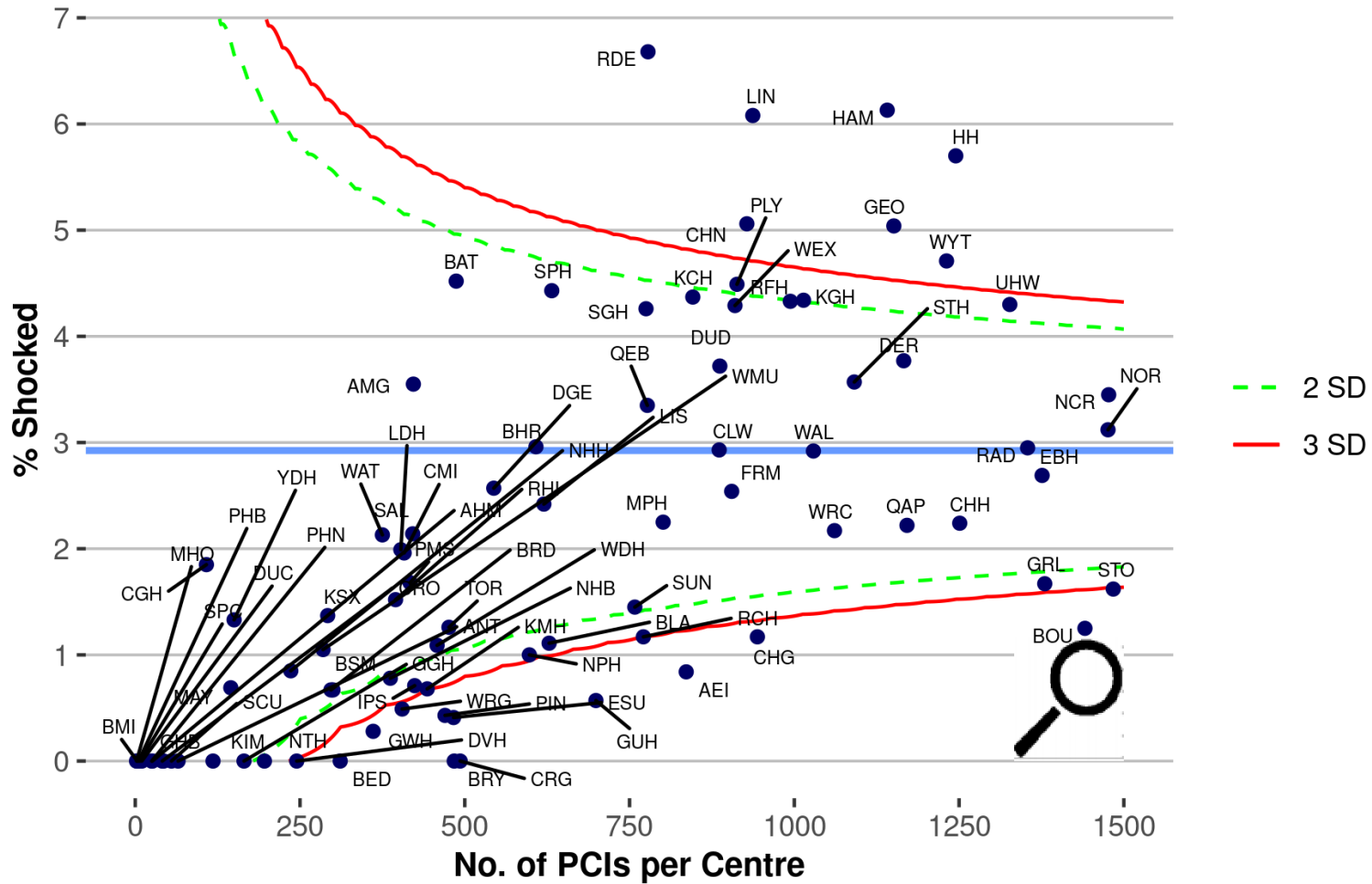
Cardiogenic Shock

% Cases with shock by PCI unit



Cardiogenic Shock

% Cases with shock by PCI unit



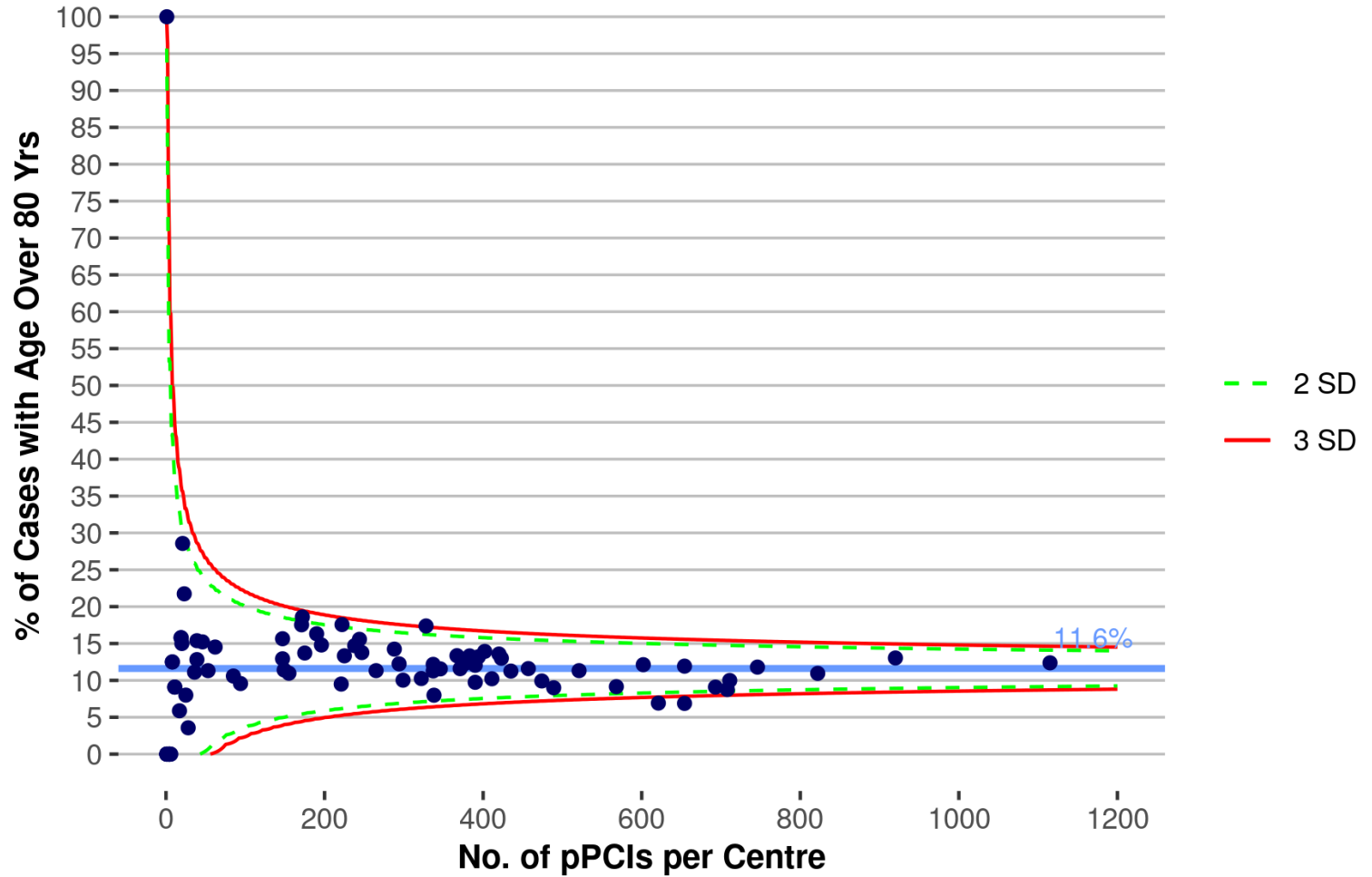
Primary PCI % cases over 80

Case selection for PPCI?

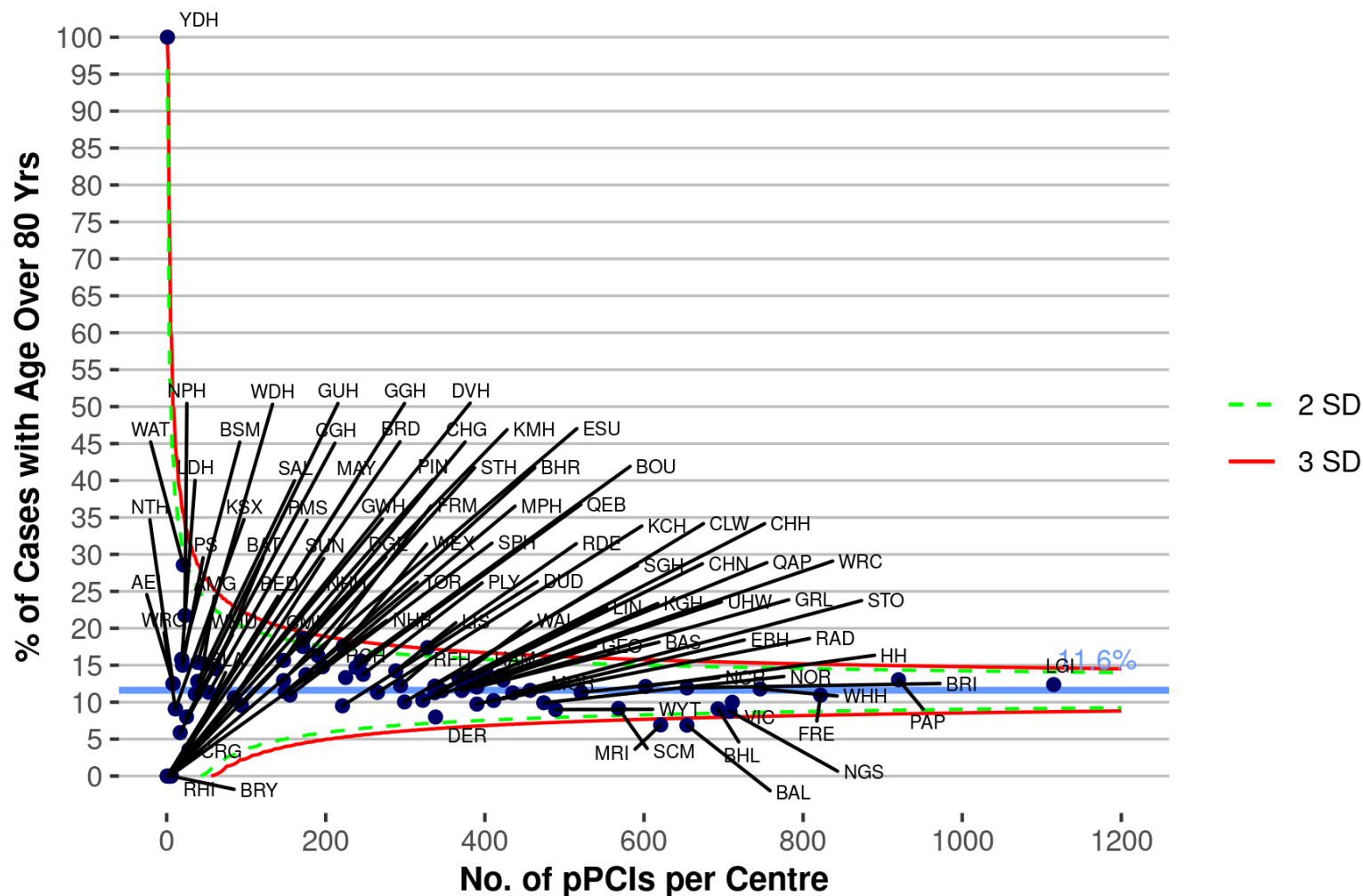


Primary PCI

% cases over 80

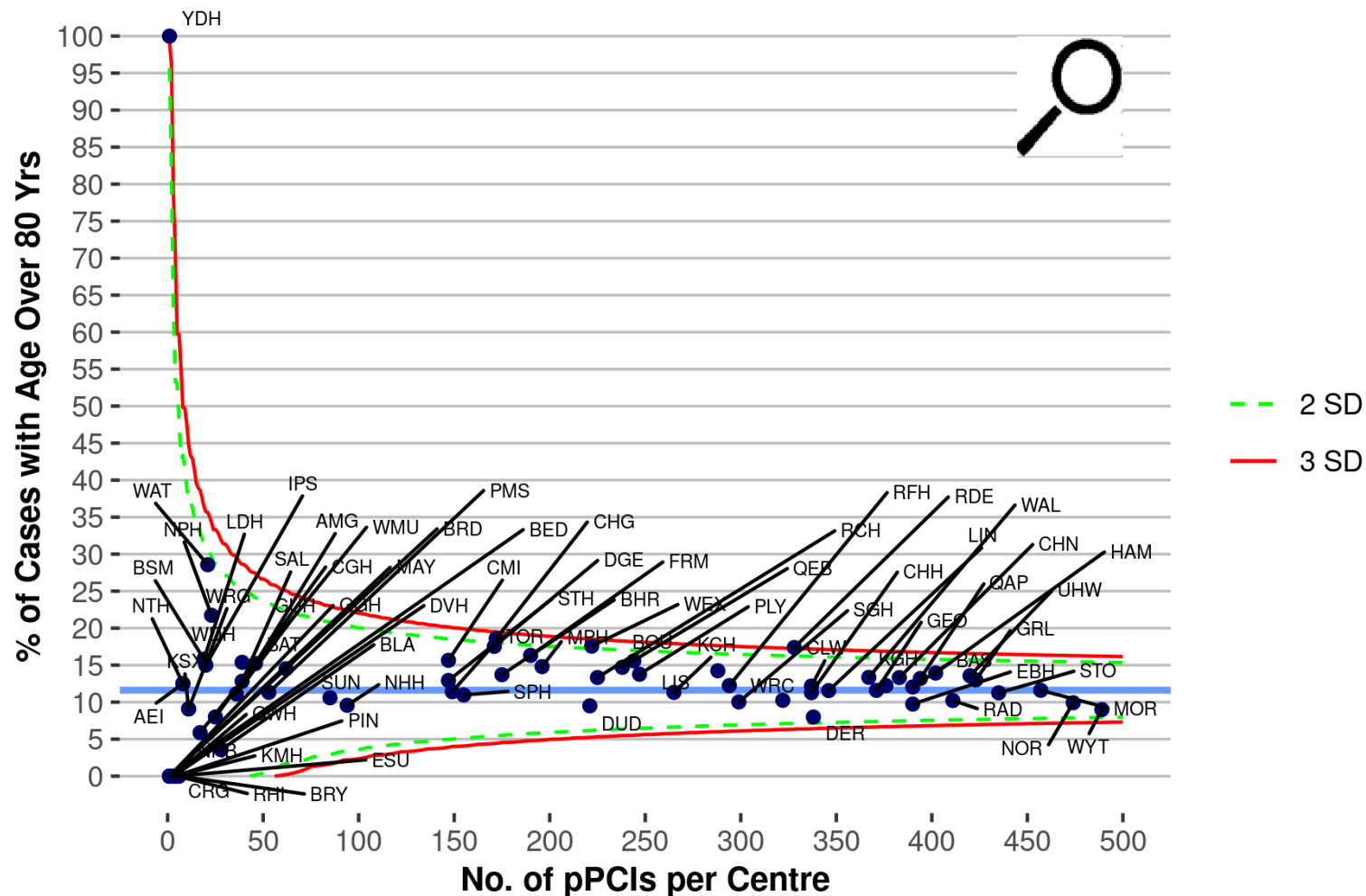


Primary PCI % cases over 80



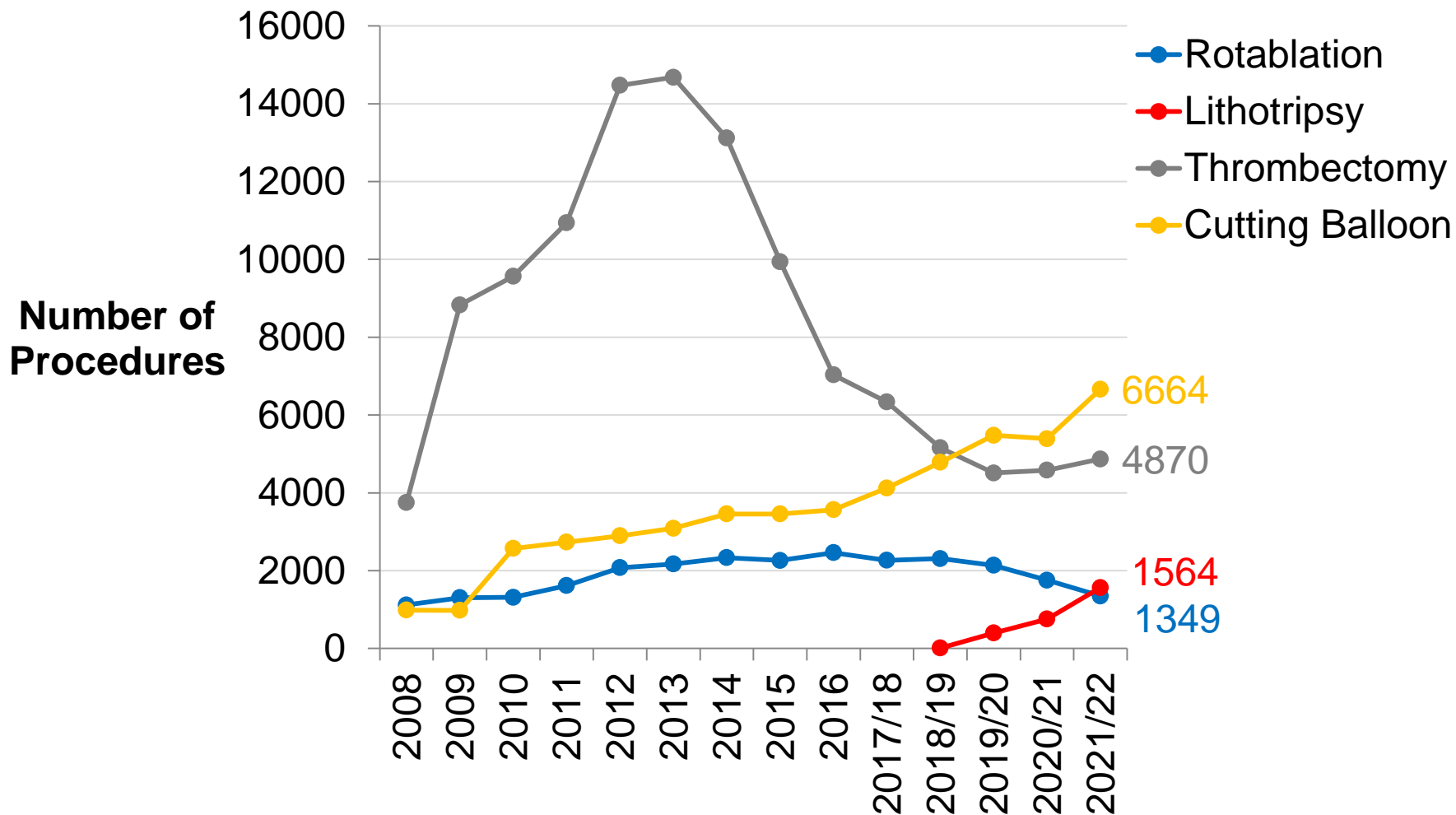
Primary PCI

% cases over 80



Additional Interventional Coronary Techniques

Additional Interventional Coronary Techniques

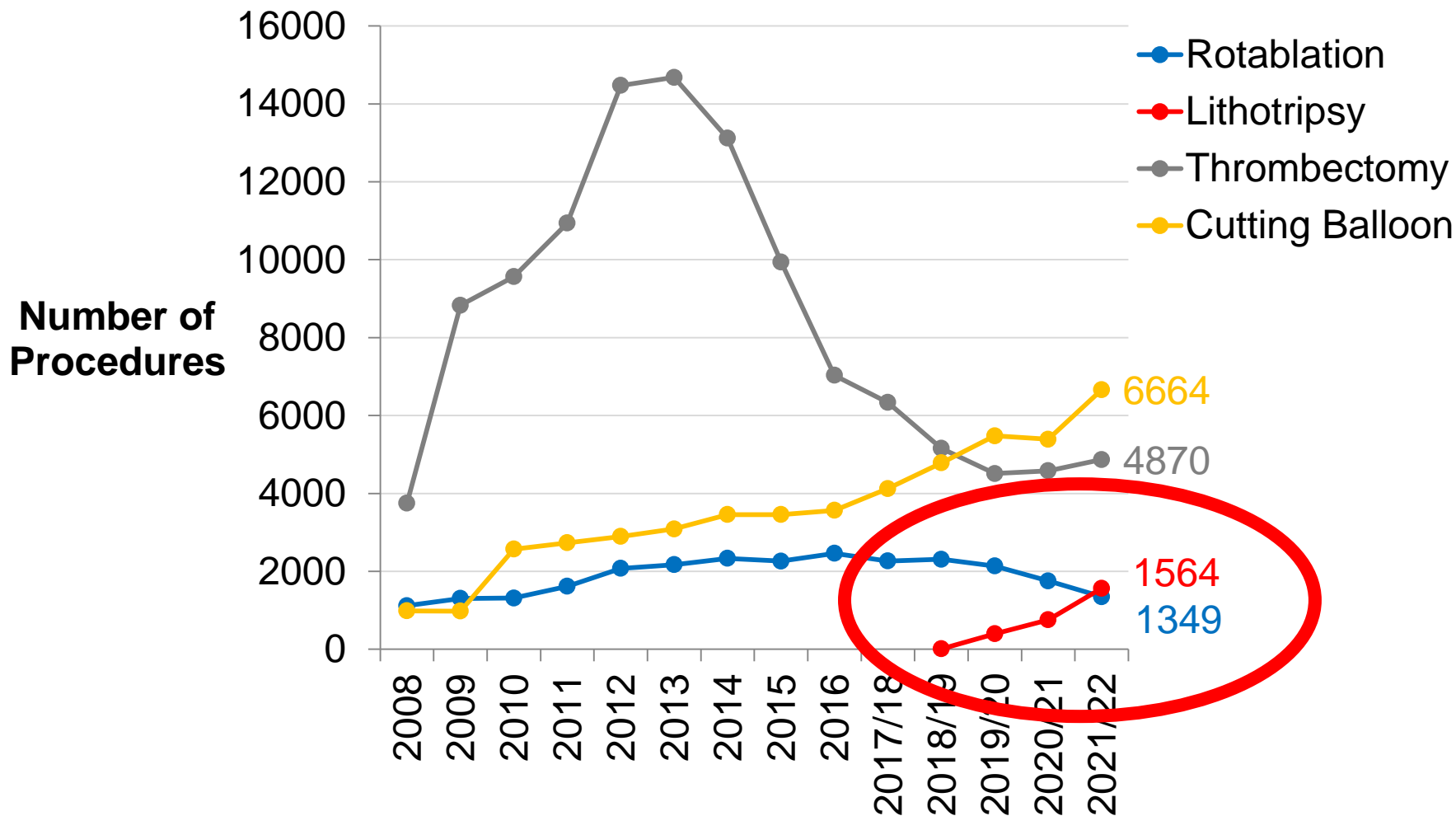


Notes:

Assume DCA usually is actually rota, therefore DCA and Rota summed to give 'Rotablation'

Rotablation includes legacy and rota pro

Additional Interventional Coronary Techniques

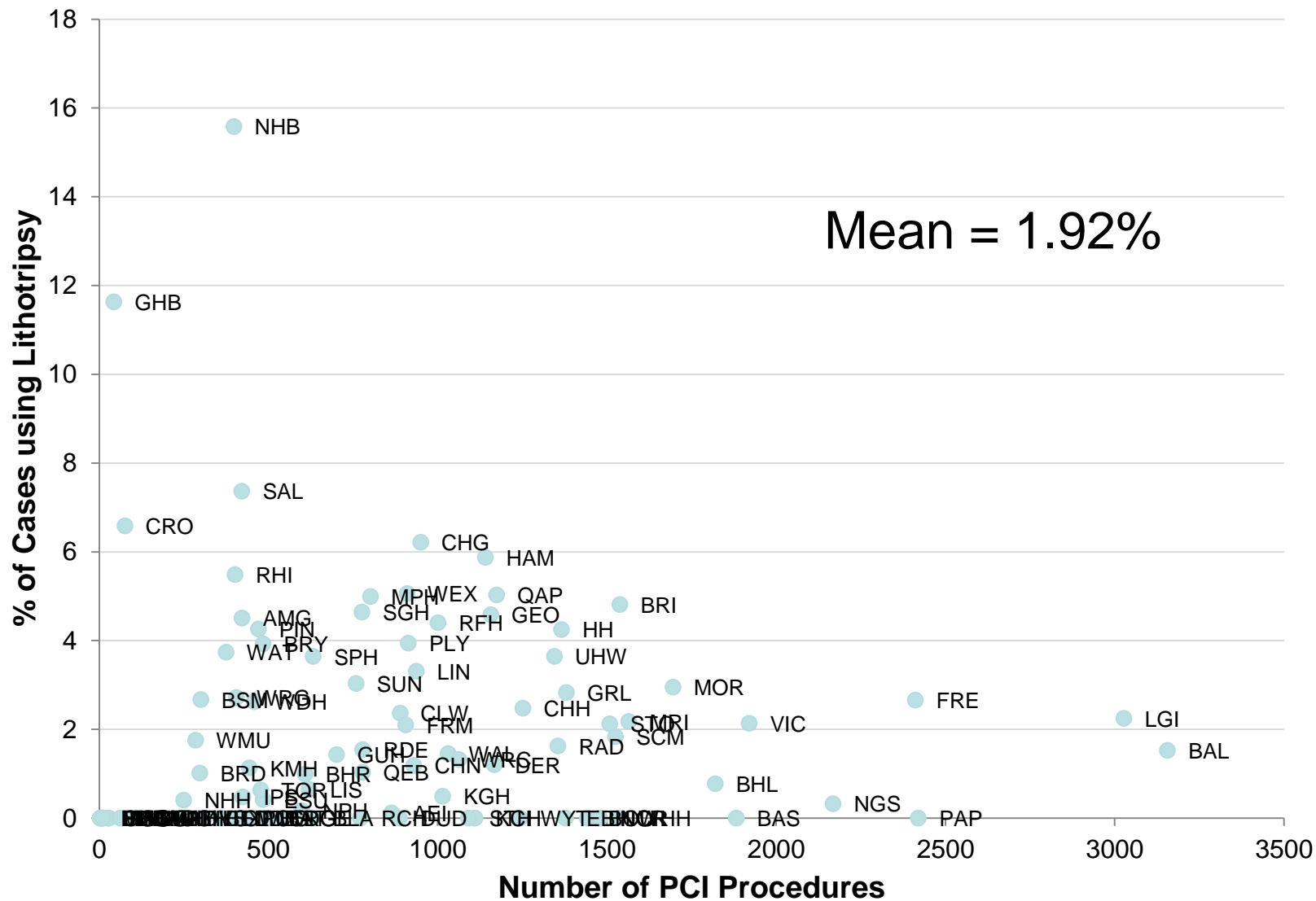


Notes:

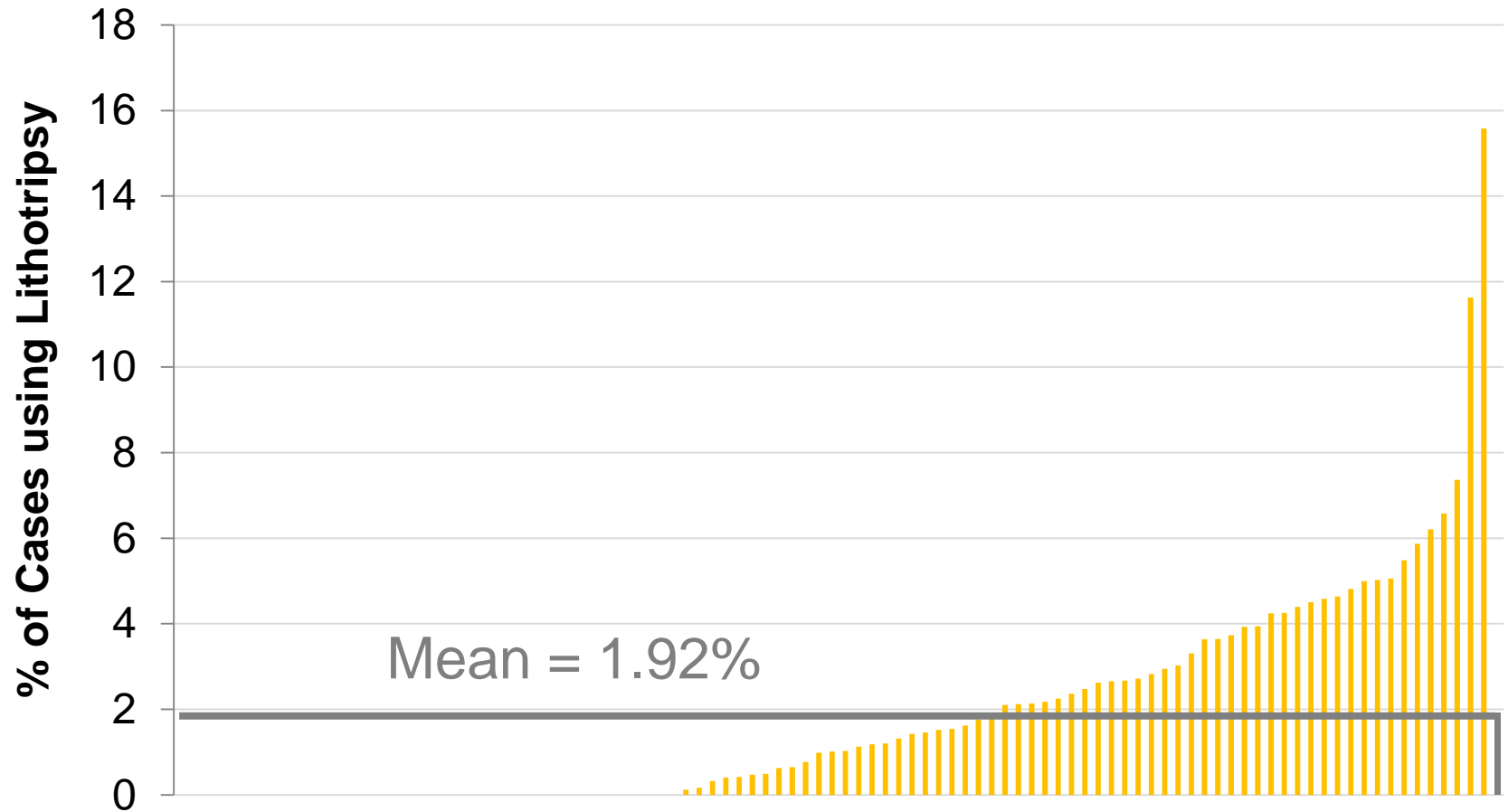
Assume DCA usually is actually rota, therefore DCA and Rota summed to give 'Rotablation'

Rotablation includes legacy and rota pro

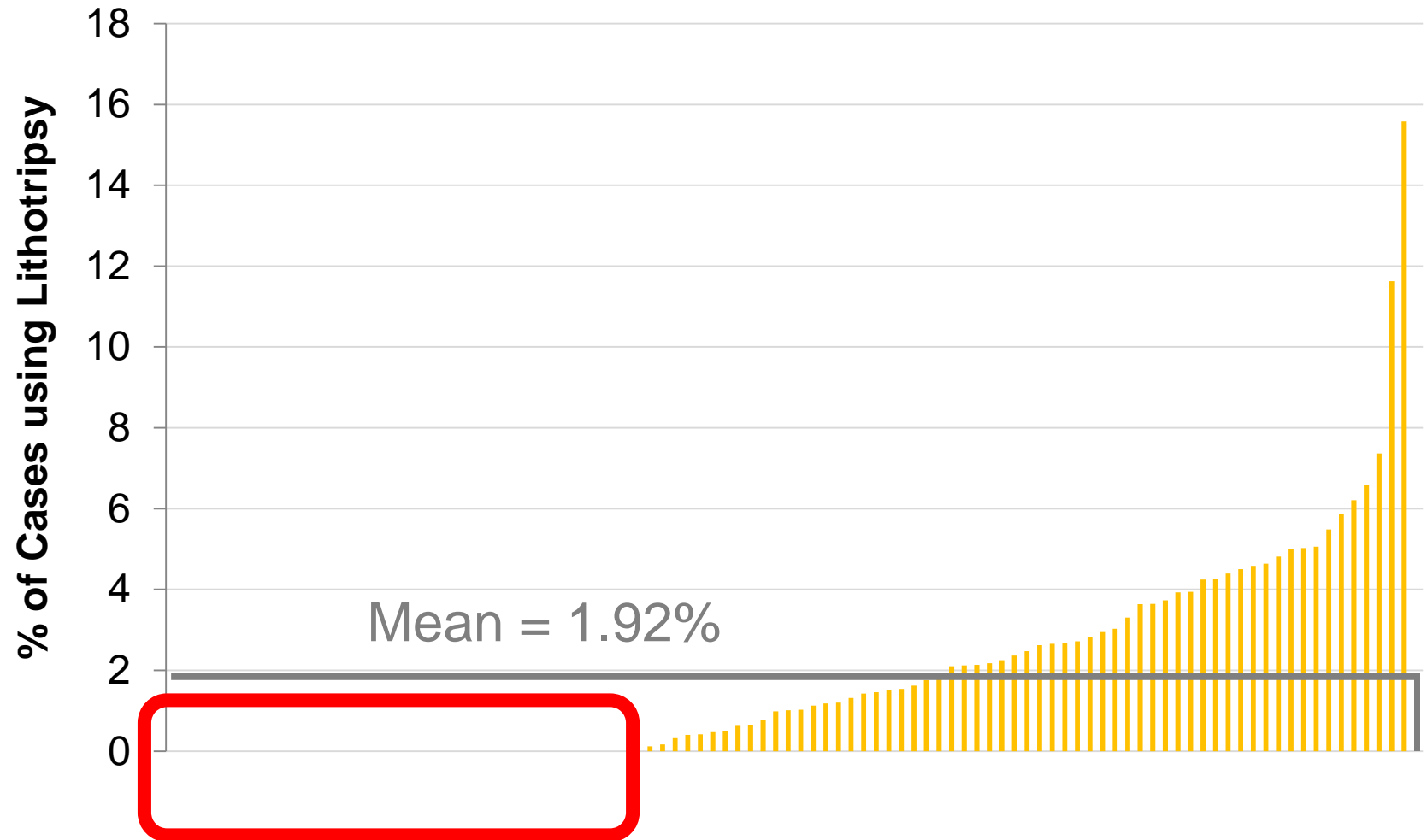
Lithotripsy



Lithotripsy



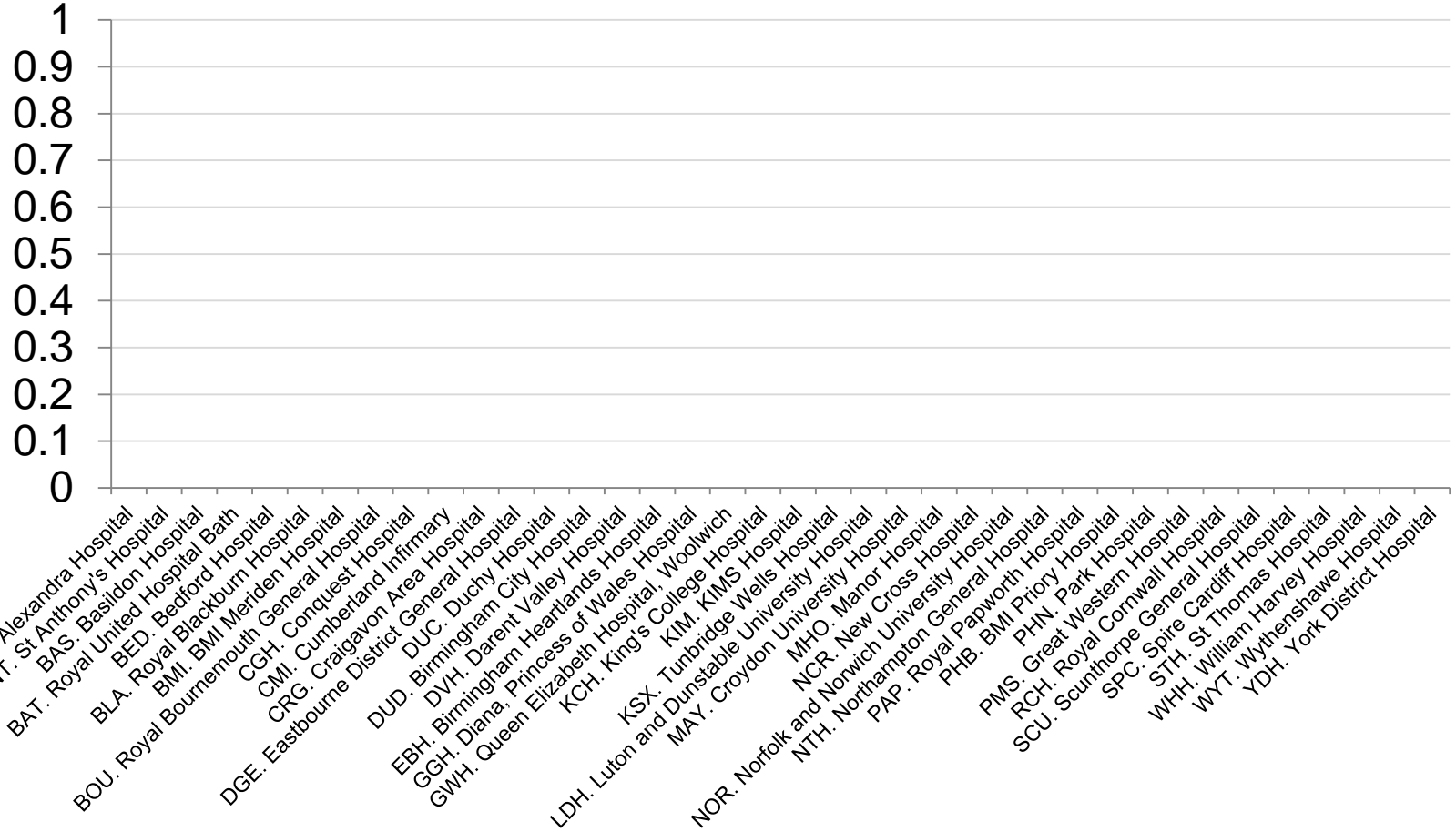
Lithotripsy



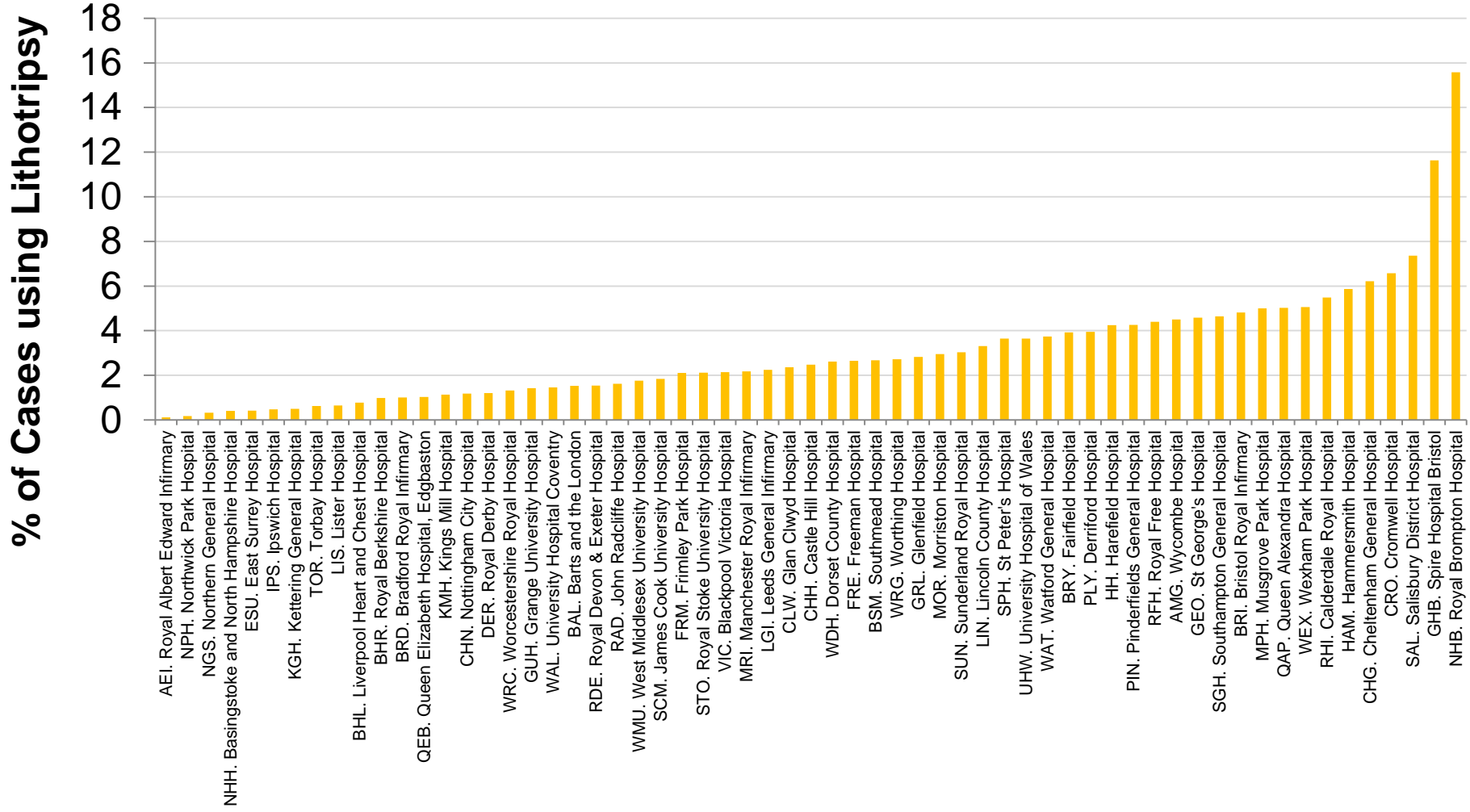
Lithotripsy

None recorded

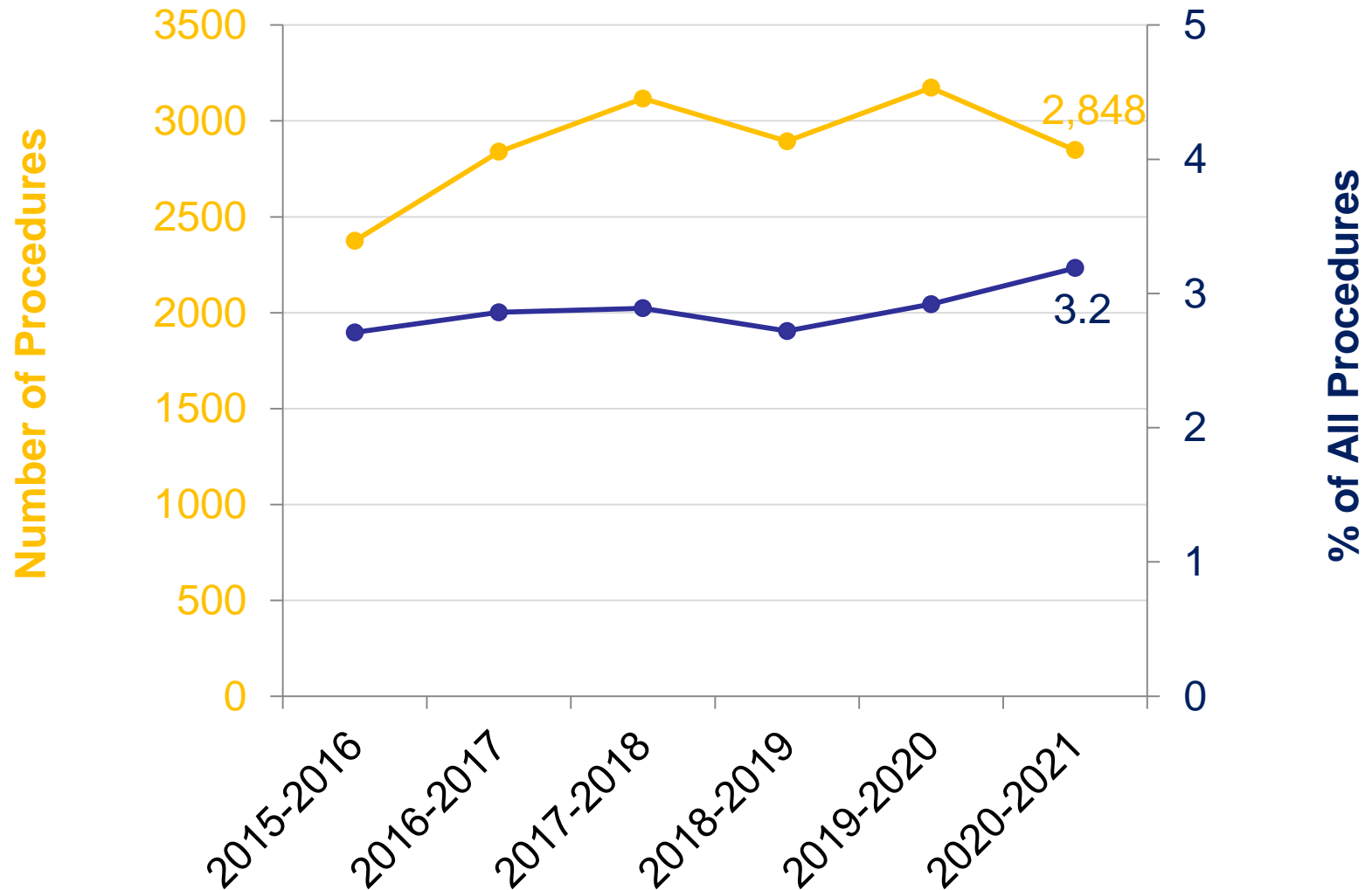
% of Cases using Lithotripsy



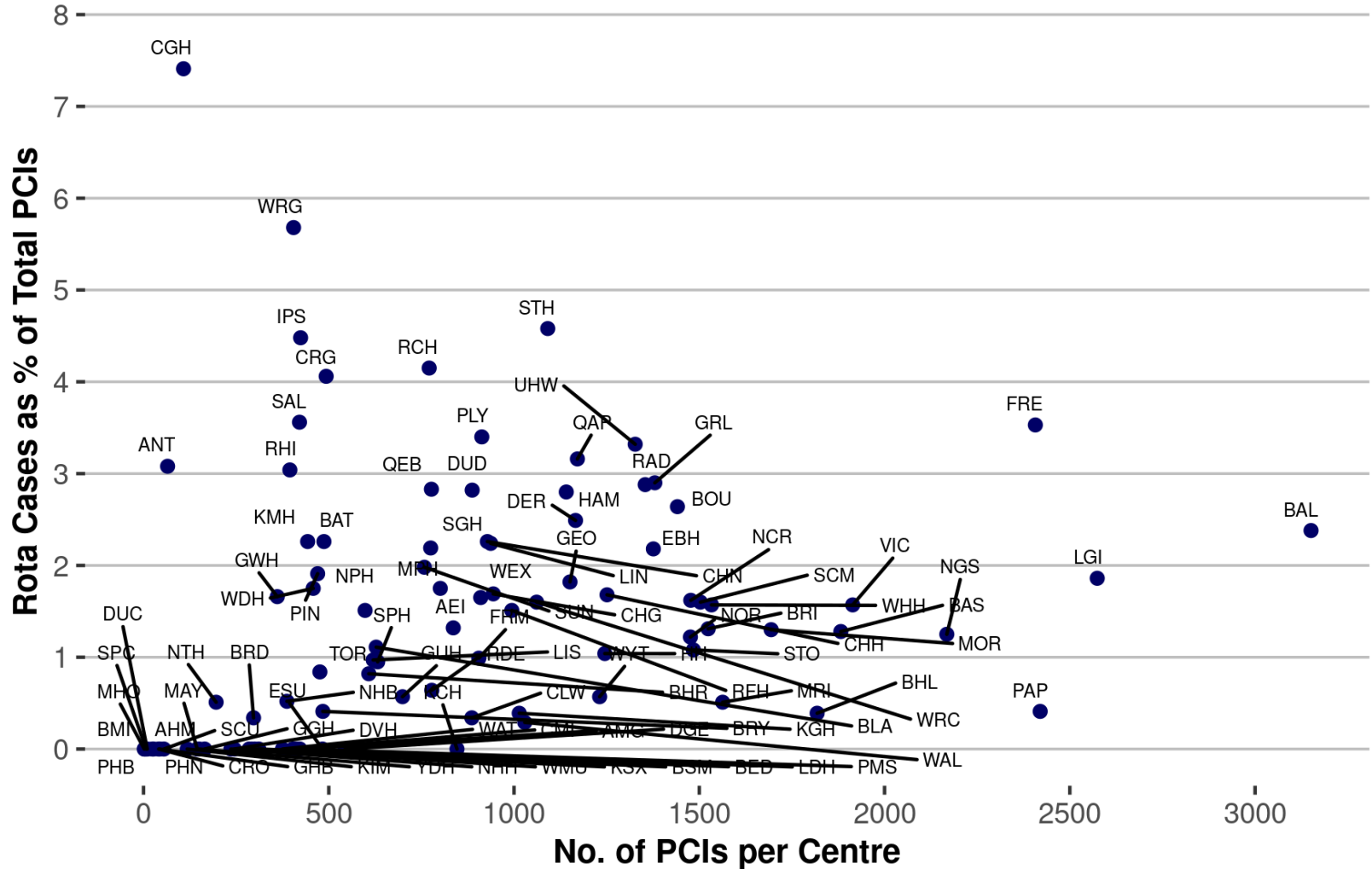
Lithotripsy



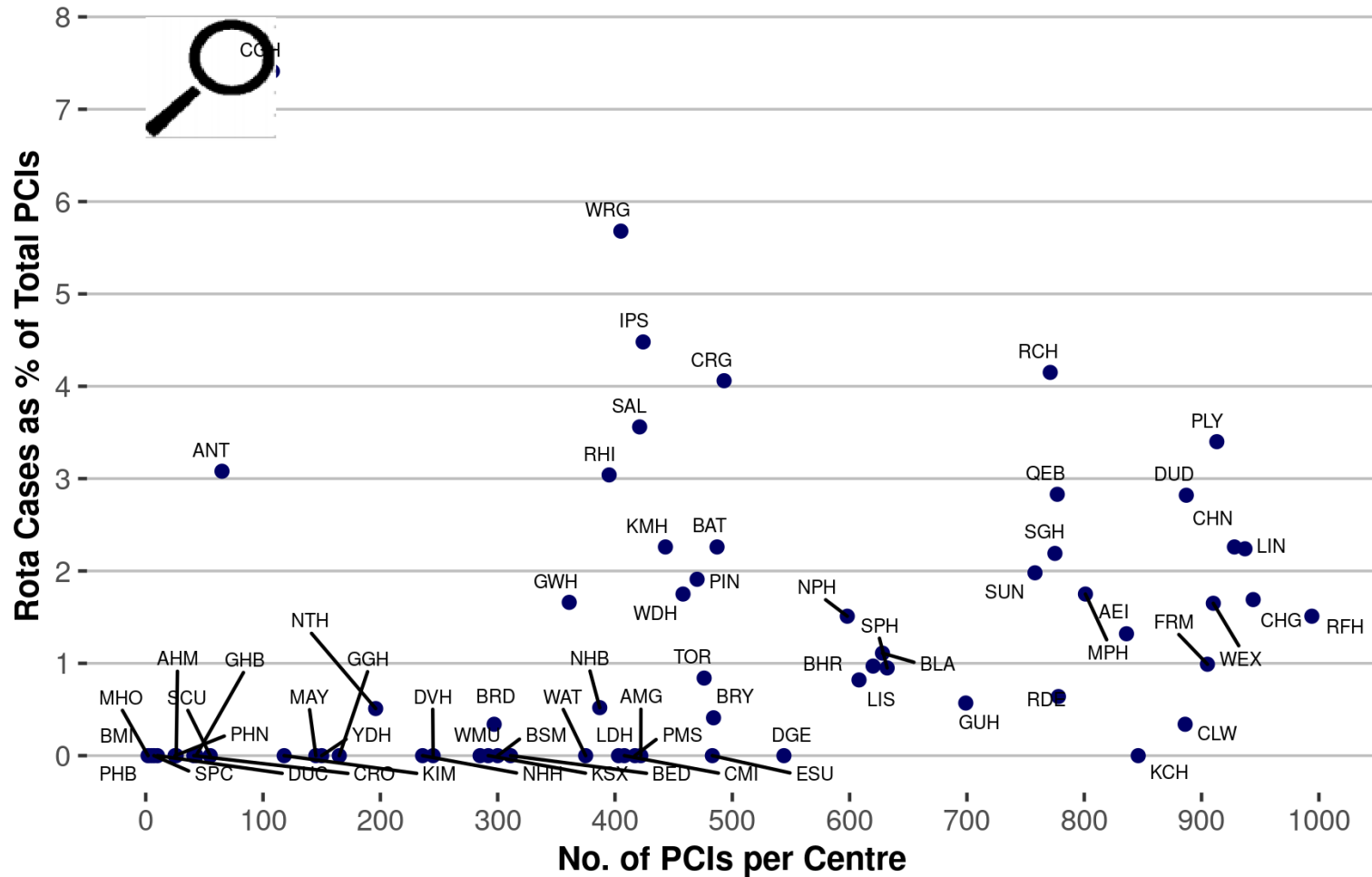
Micro-catheter Use



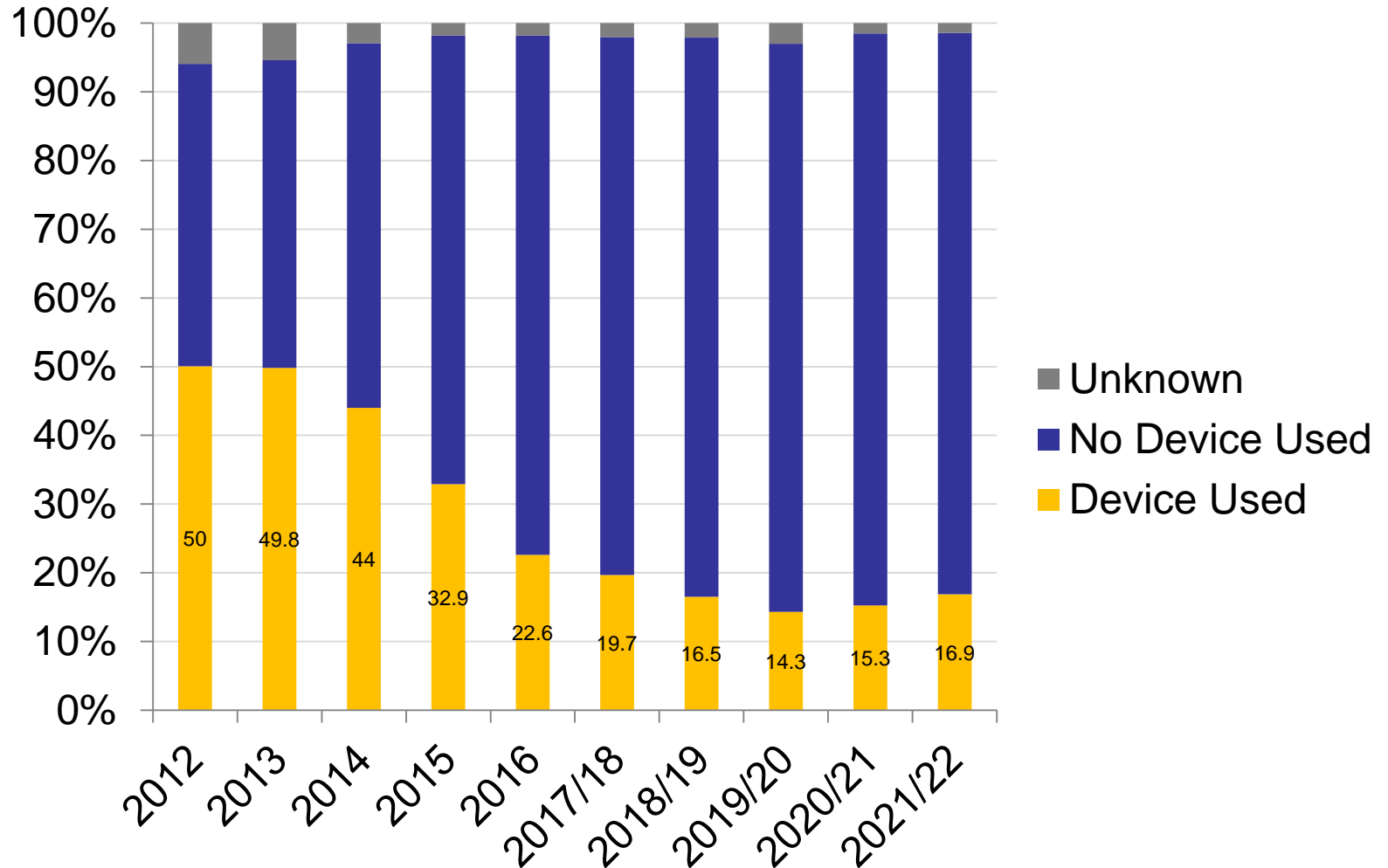
Rotational Atherectomy



Rotational Atherectomy

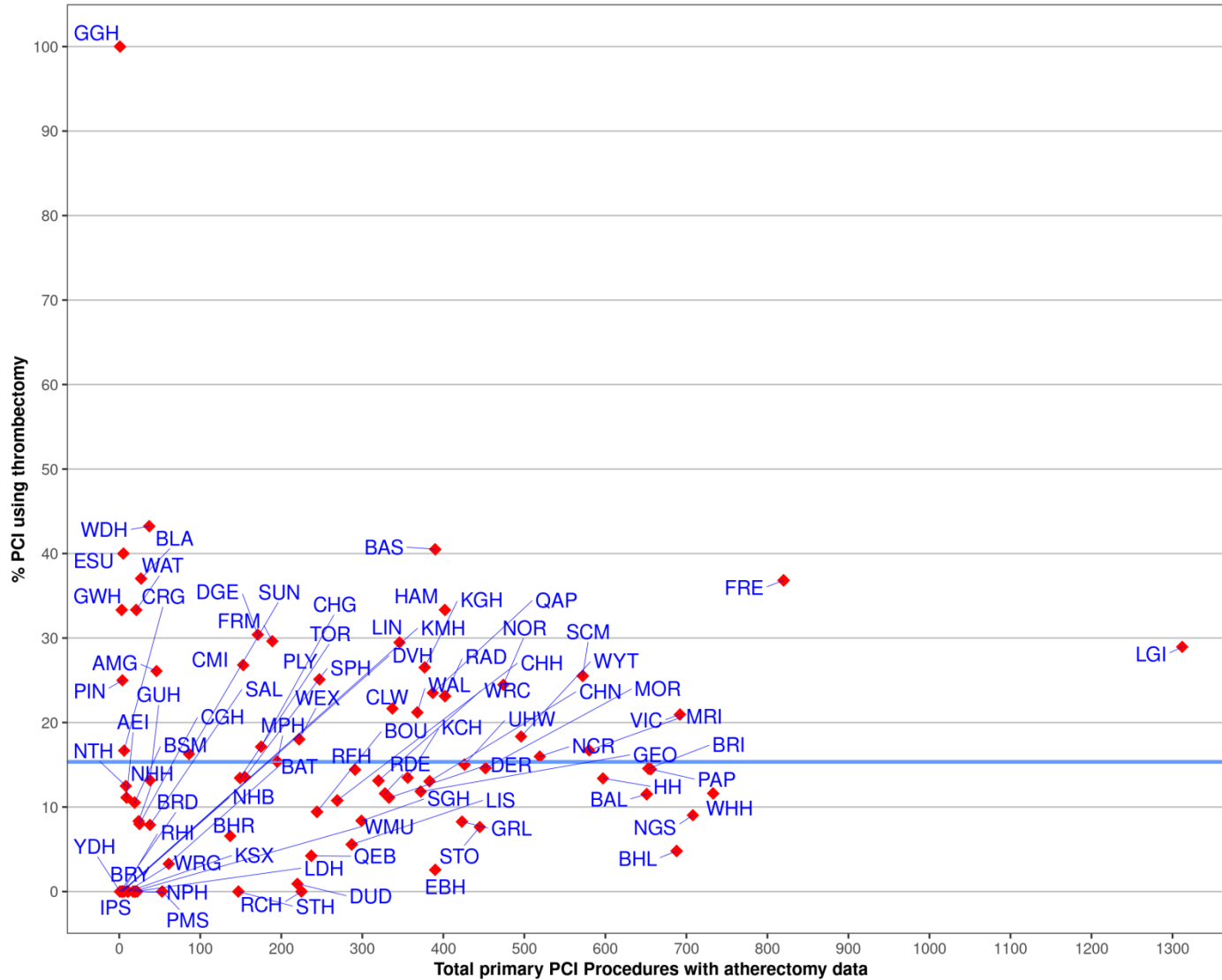


Primary PCI Extraction Atherectomy

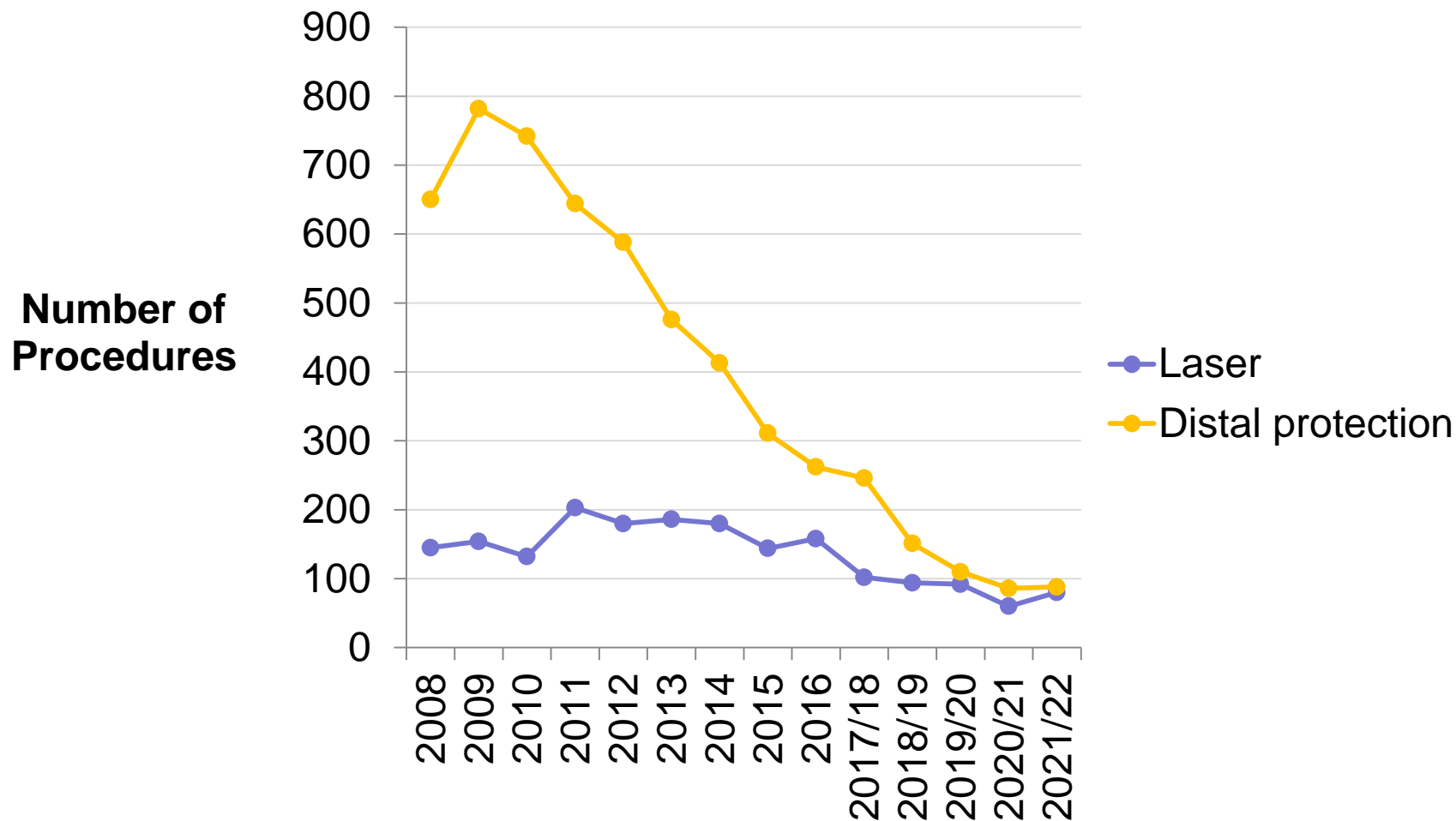


Thrombectomy in PPCI

2021/22



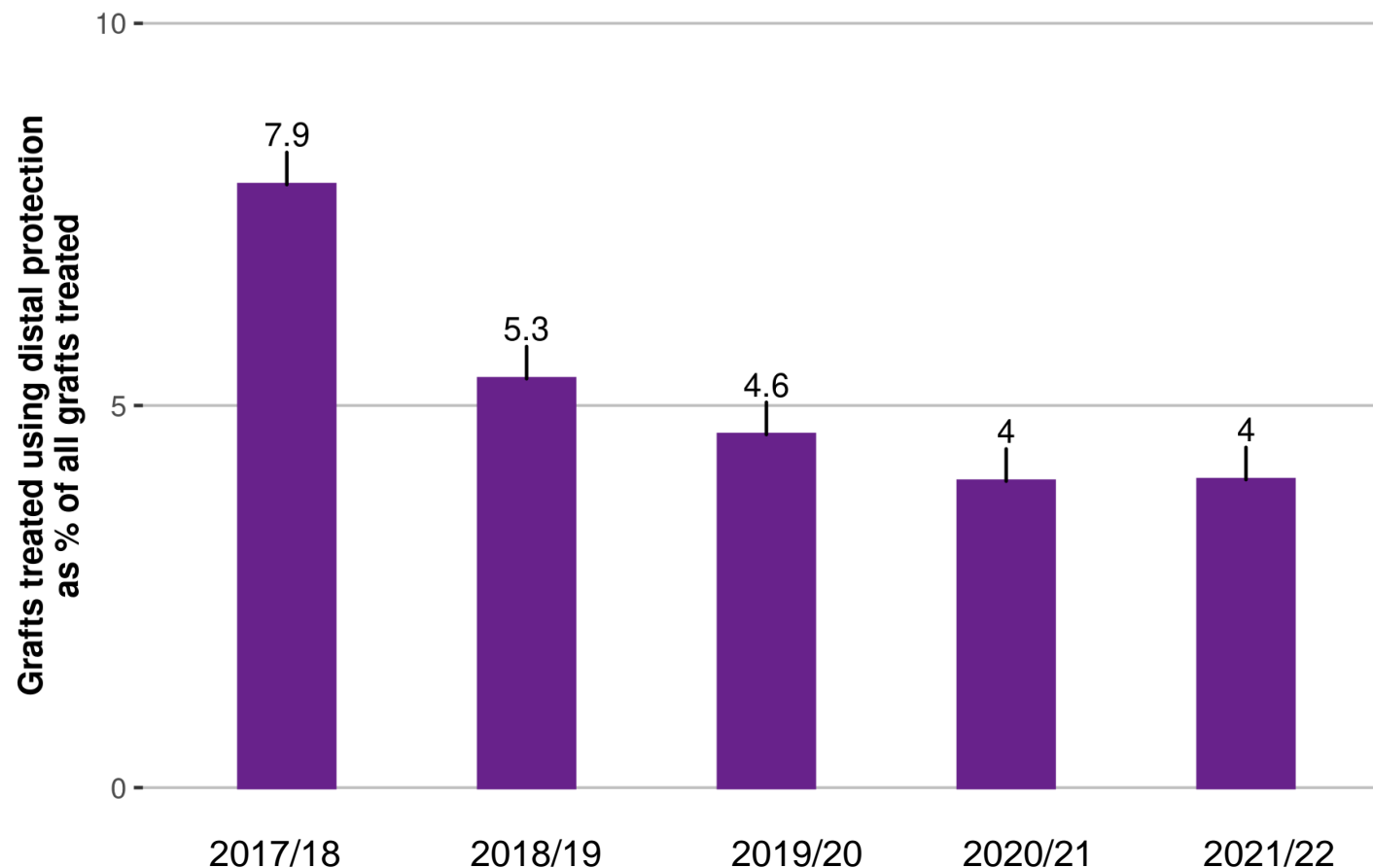
Additional Interventional Coronary Techniques



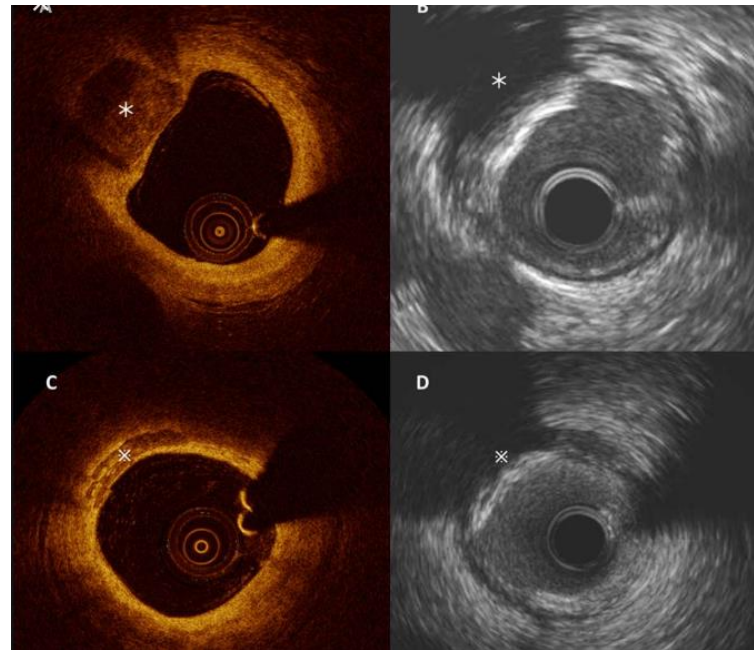
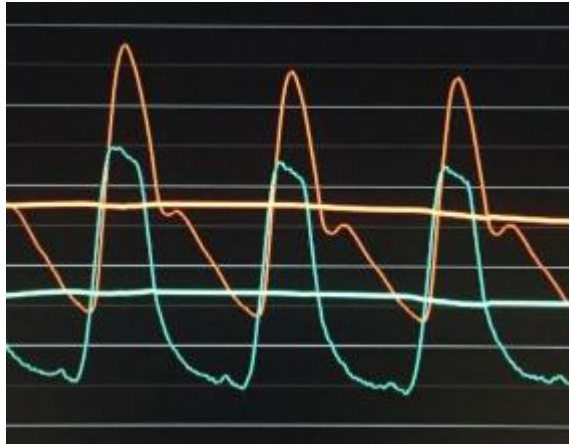
Notes:
Laser wire and laser angioplasty summed to give 'laser'

Distal protection in Bypass Grafts

(all types - SVG and IMA etc)



Intravascular Physiology and Imaging



Interventional Diagnostic Procedure Recording in PCI database

3 September 2013

Sent to all BCIS members and database contacts

Diagnostic Interventional Procedures

Invasive coronary angiography with the use of adjunctive invasive diagnostic equipment such that a coronary device approaches, probes or crosses one or more coronary lesions (including - but not limited to – **a pressure wire, intravascular ultrasound and swept laser imaging**), before the intention to treat by mechanical revascularisation has been decided. Interventional diagnostic cases should be performed by interventional cardiologists in intervention capable centres.

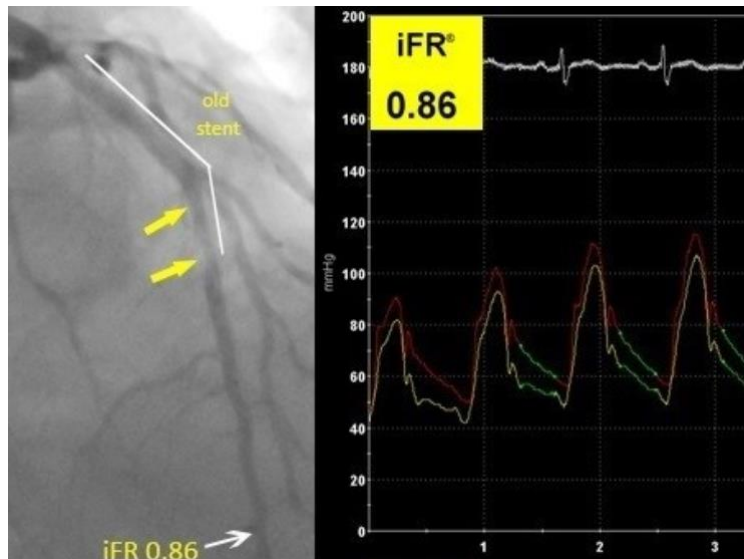
It is suggested that recording all 'Interventional Diagnostic Procedures' should start from Jan 2014

Interventional Diagnostic Procedure

Database entry

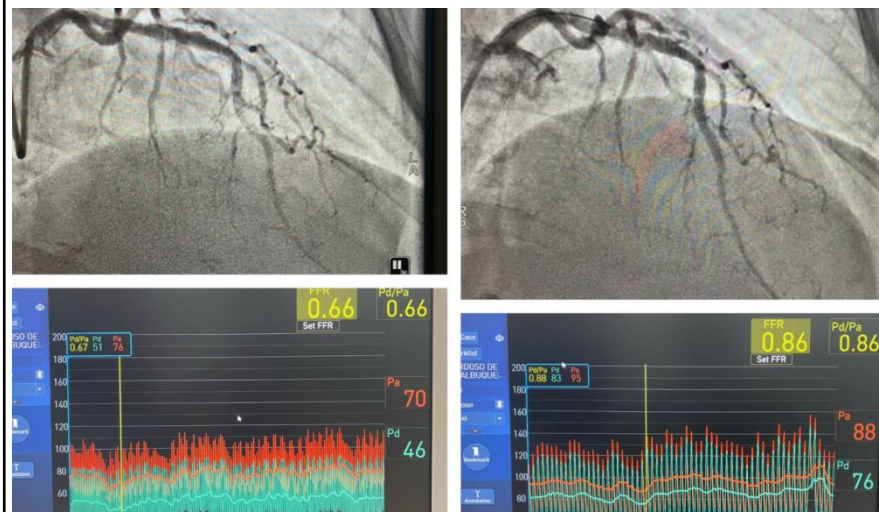
- Total number of lesions attempted (field 3.11) must = 0
 - And Total number of vessels attempted (field 3.10) must =0
 - And 'Diagnostic device' (field 3.19) should include a device
 - And Vessels attempted (field 3.09) should be left empty
-
- Demographics and adverse in-hospital outcomes should be recorded in the same way as for a PCI procedure

Diagnostic Only v During PCI



Coronary anatomy assessed
But no PCI

Interventional Diagnostic Study
(IDP)

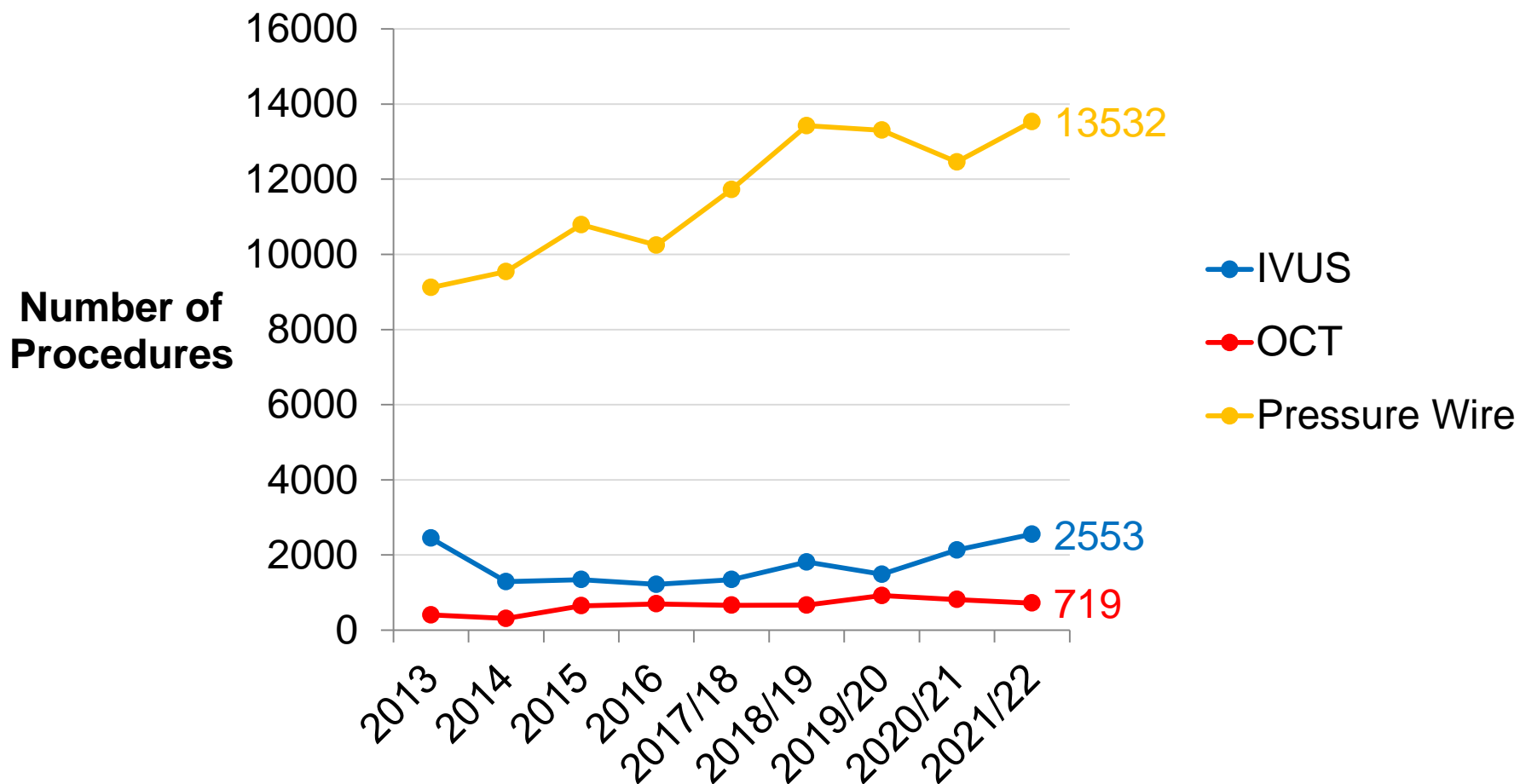


FFR and proceed to PCI

PCI with FFR/iFR

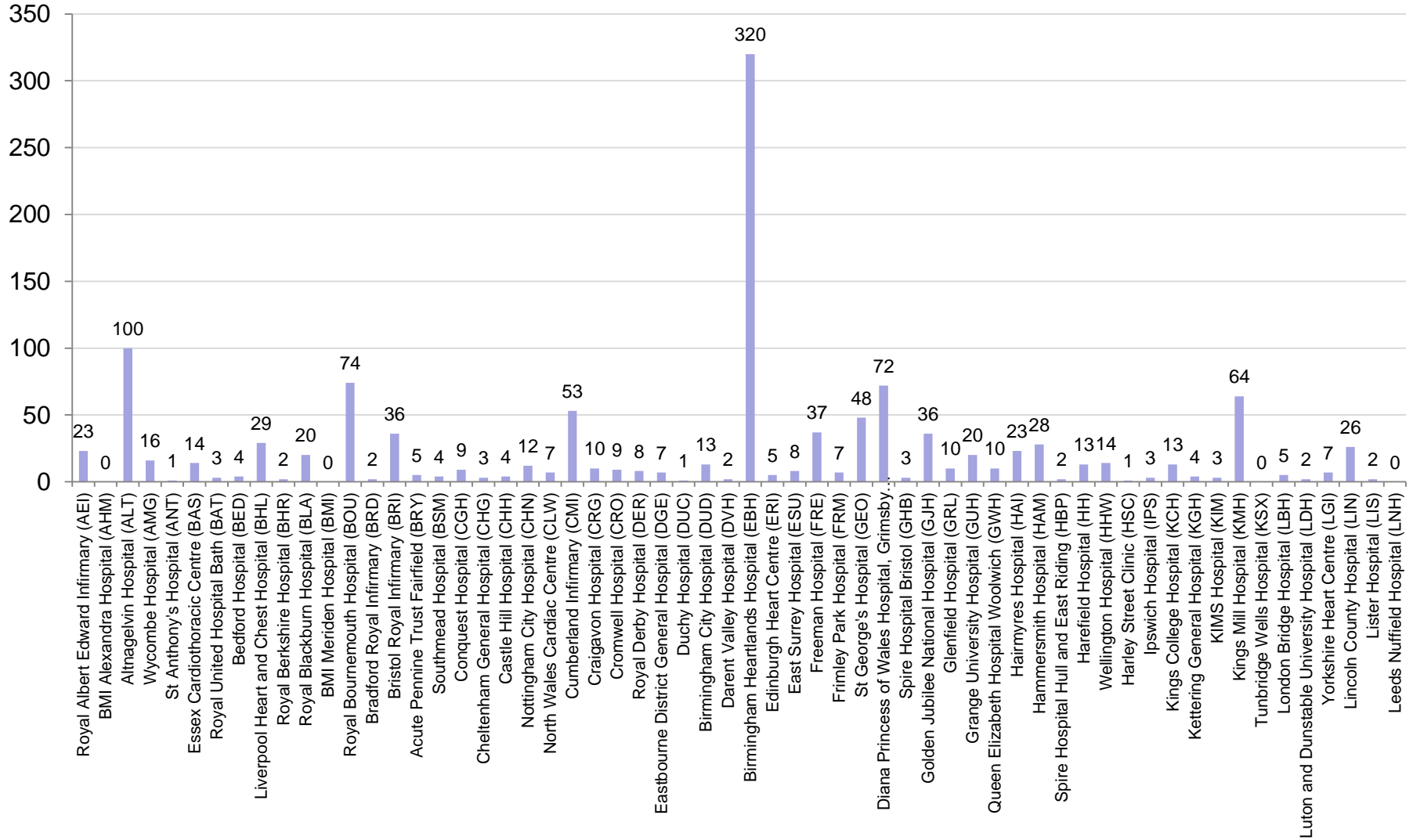
Additional Interventional Coronary Techniques

Diagnostic only (not during PCI)



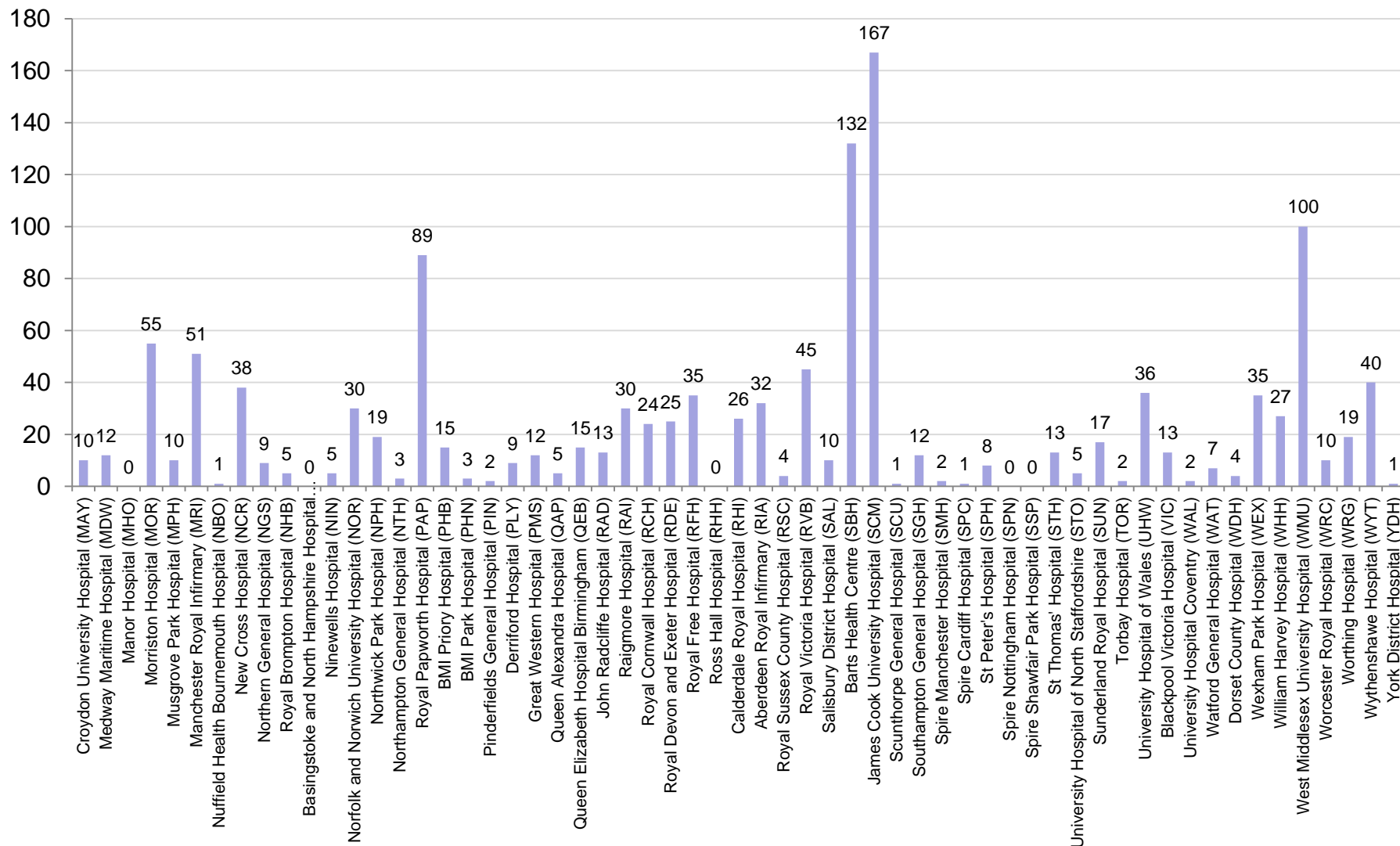
Intravascular Ultrasound

Diagnostic only studies (Centres codes A to L)



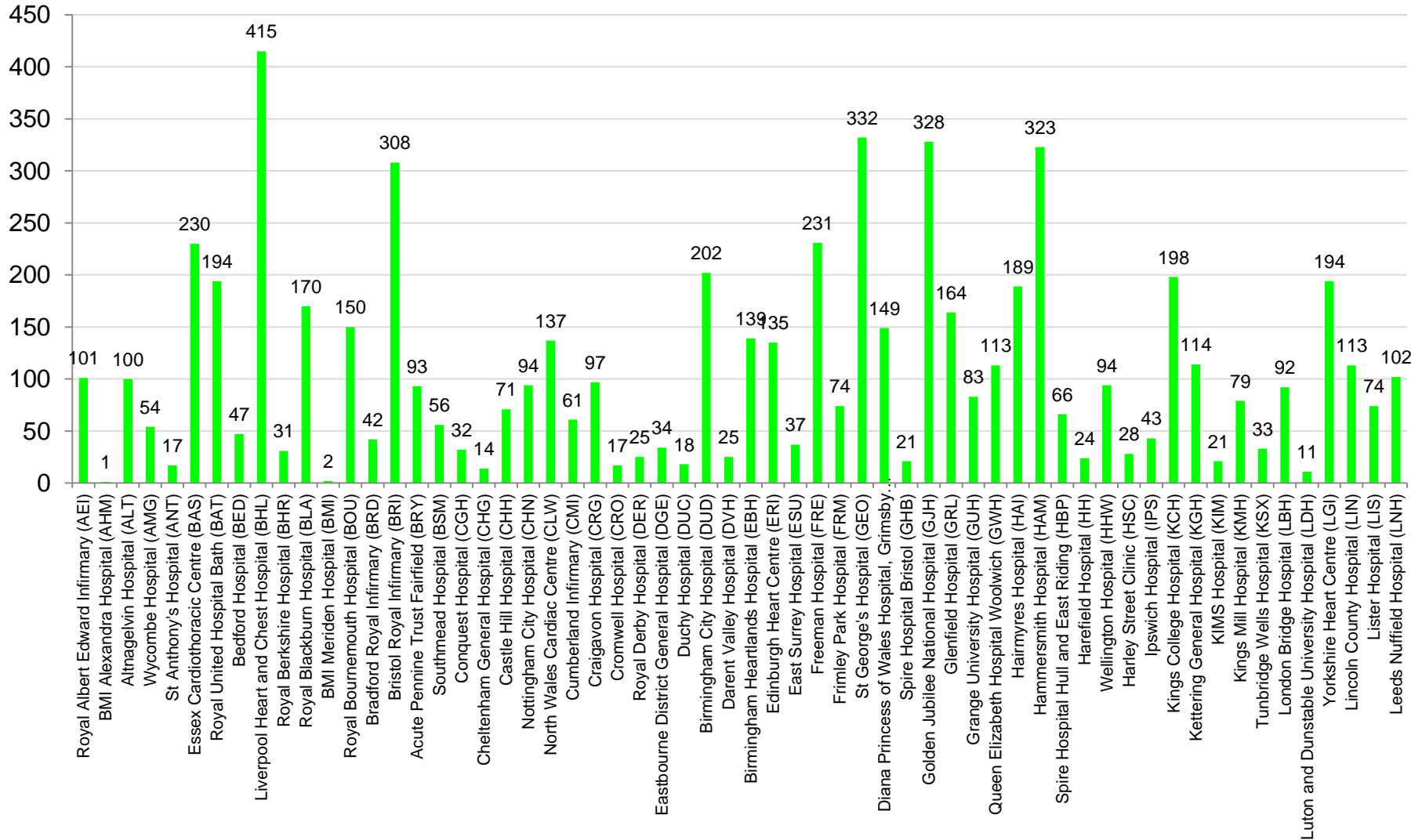
Intravascular Ultrasound

Diagnostic only studies (Centres codes M to Y)



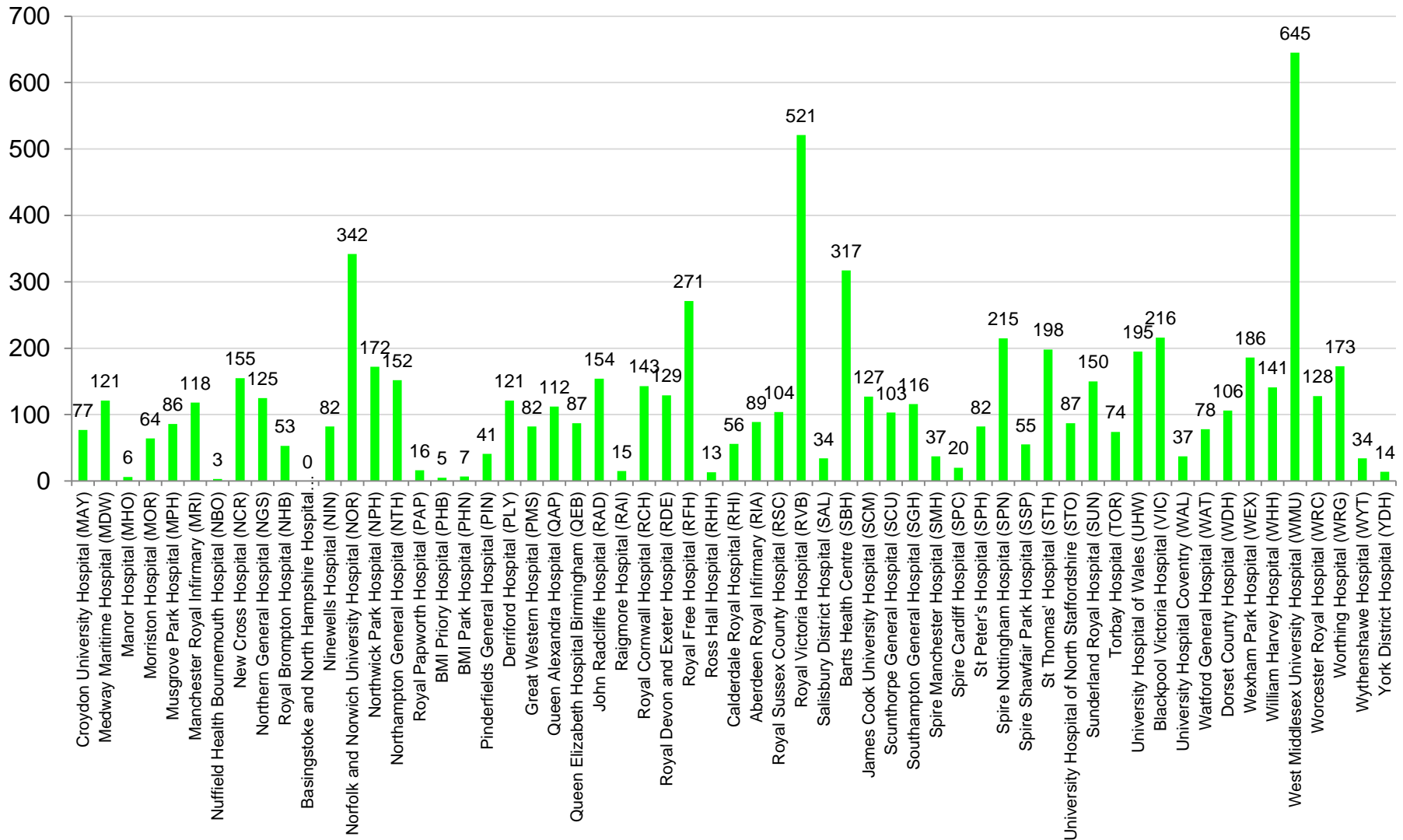
FFR, iFR, CFR, dPR, RFR etc

Diagnostic only studies (Centres codes A to L)



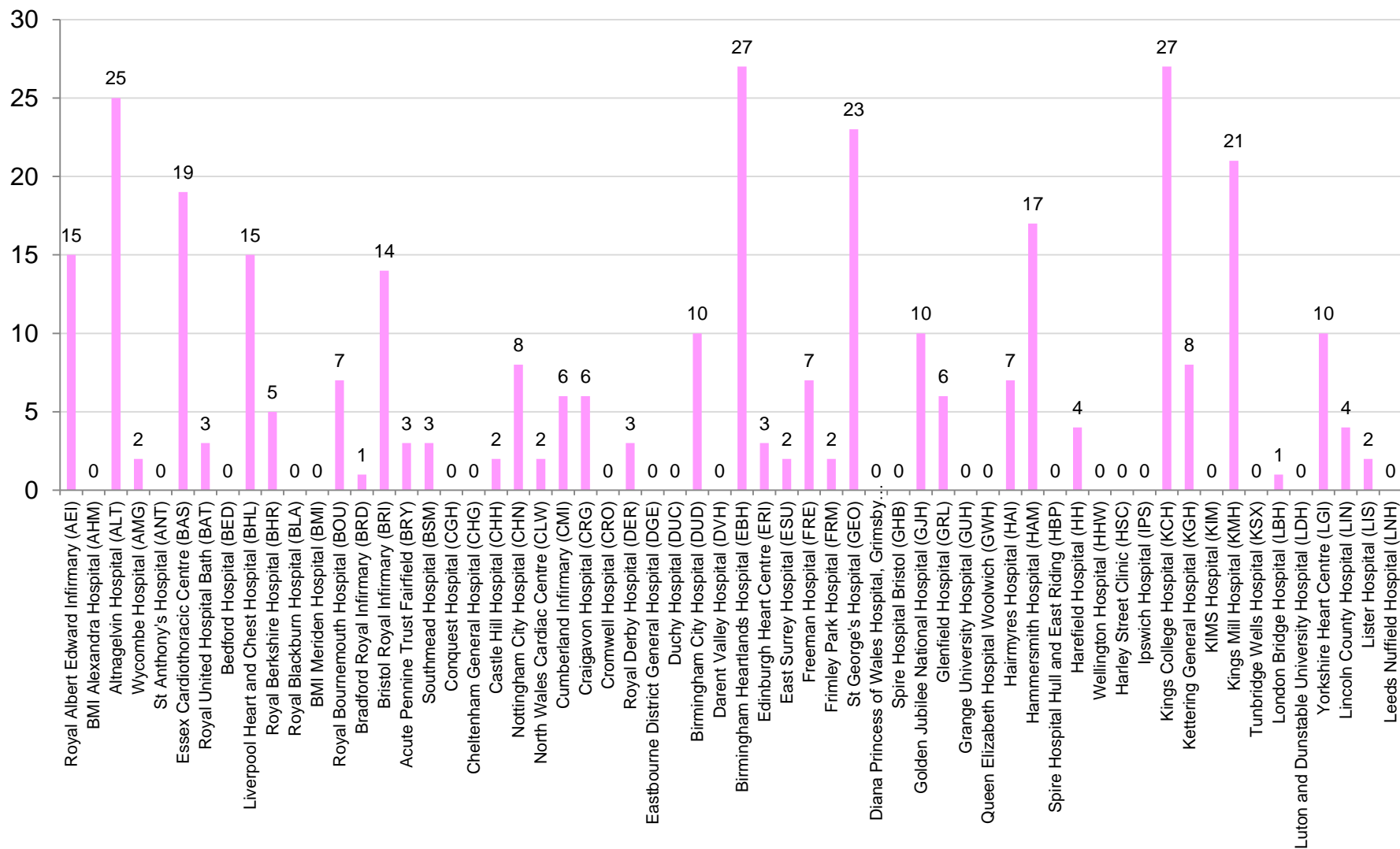
FFR, iFR, CFR, dPR, RFR etc

Diagnostic only studies (Centres codes M to Y)



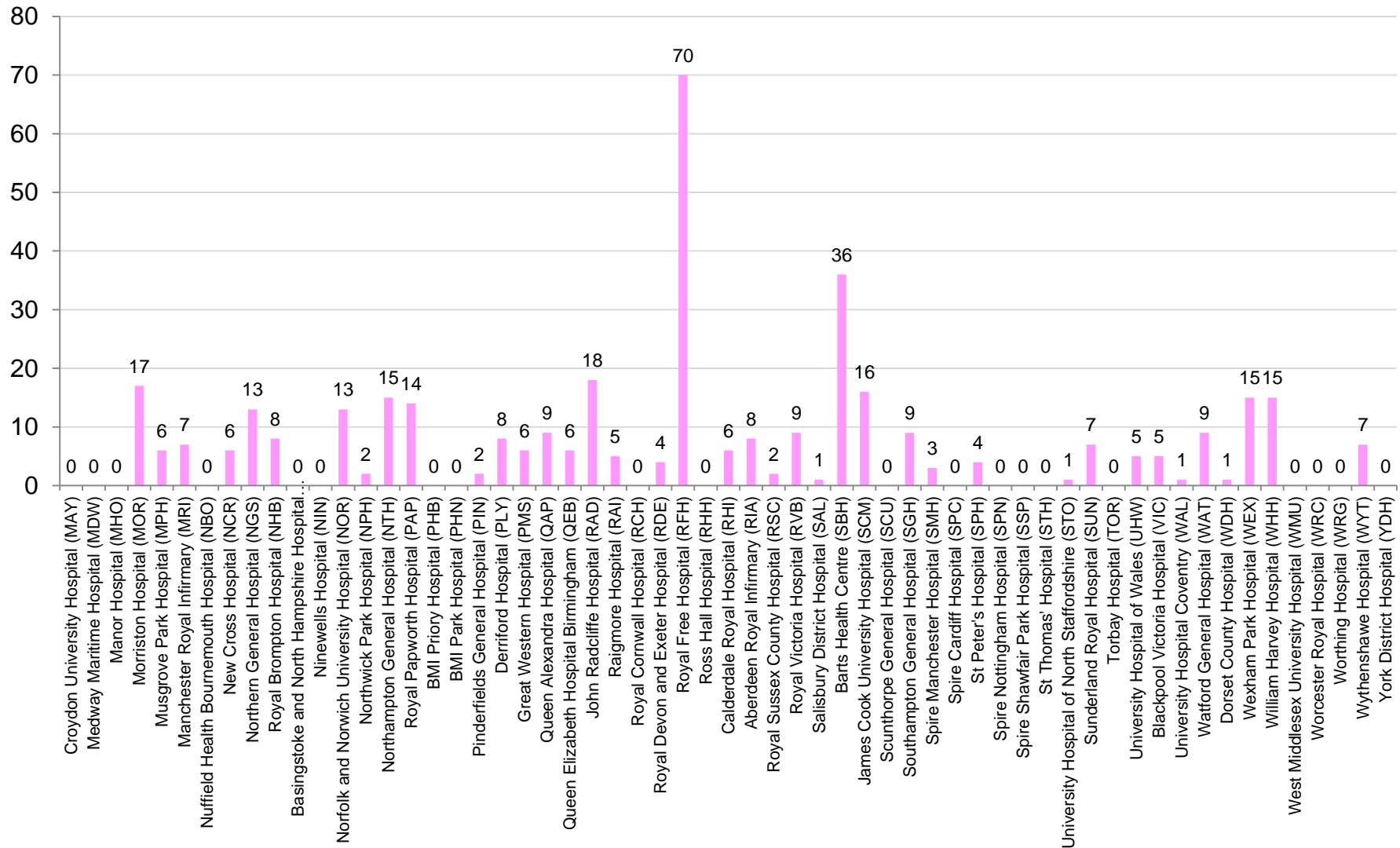
Swept Laser Imaging (OCT, OFDI)

Diagnostic only studies (Centres codes A to L)



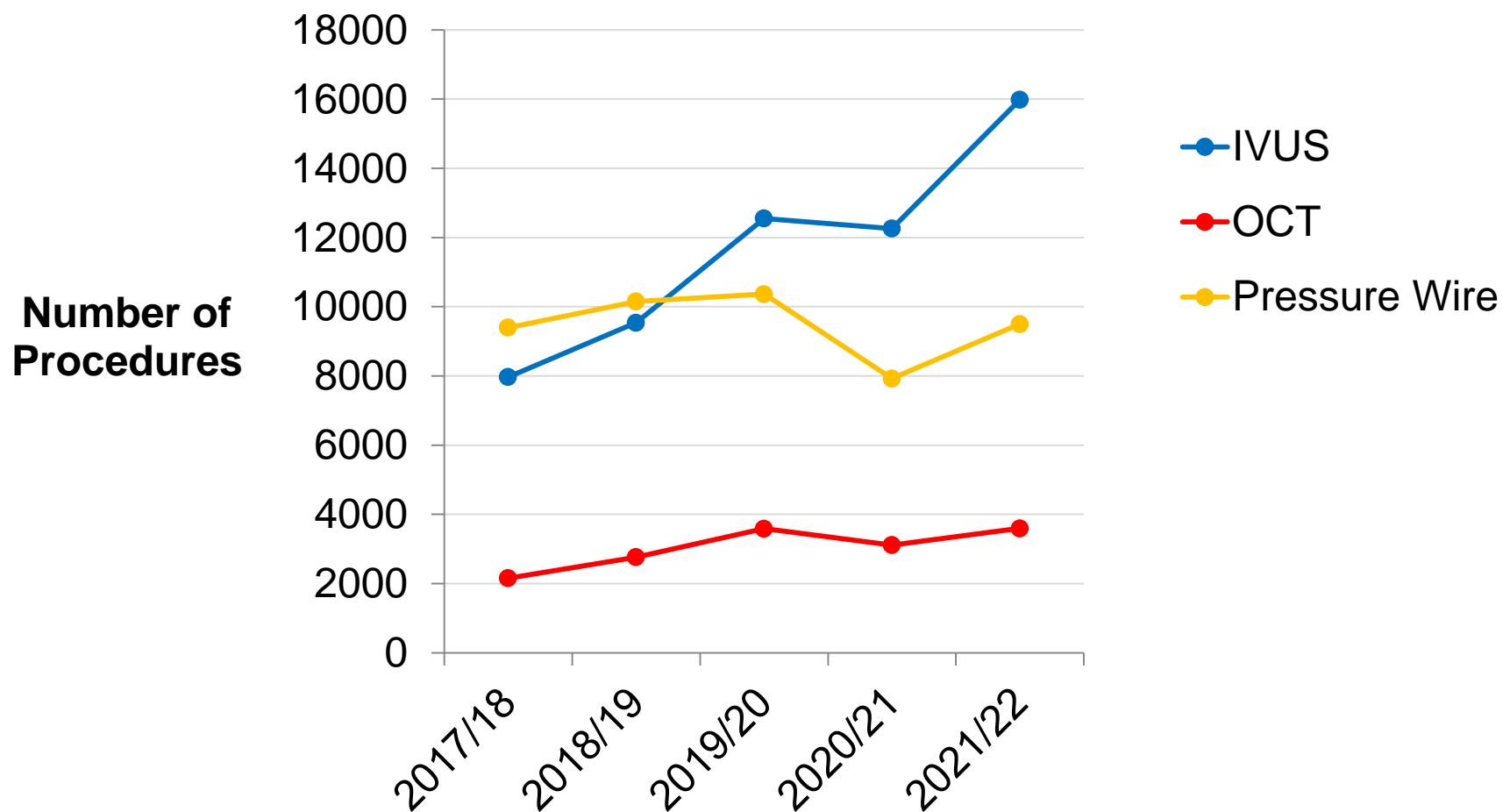
Swept Laser Imaging (OCT, OFDI)

Diagnostic only studies (Centres codes M to Y)



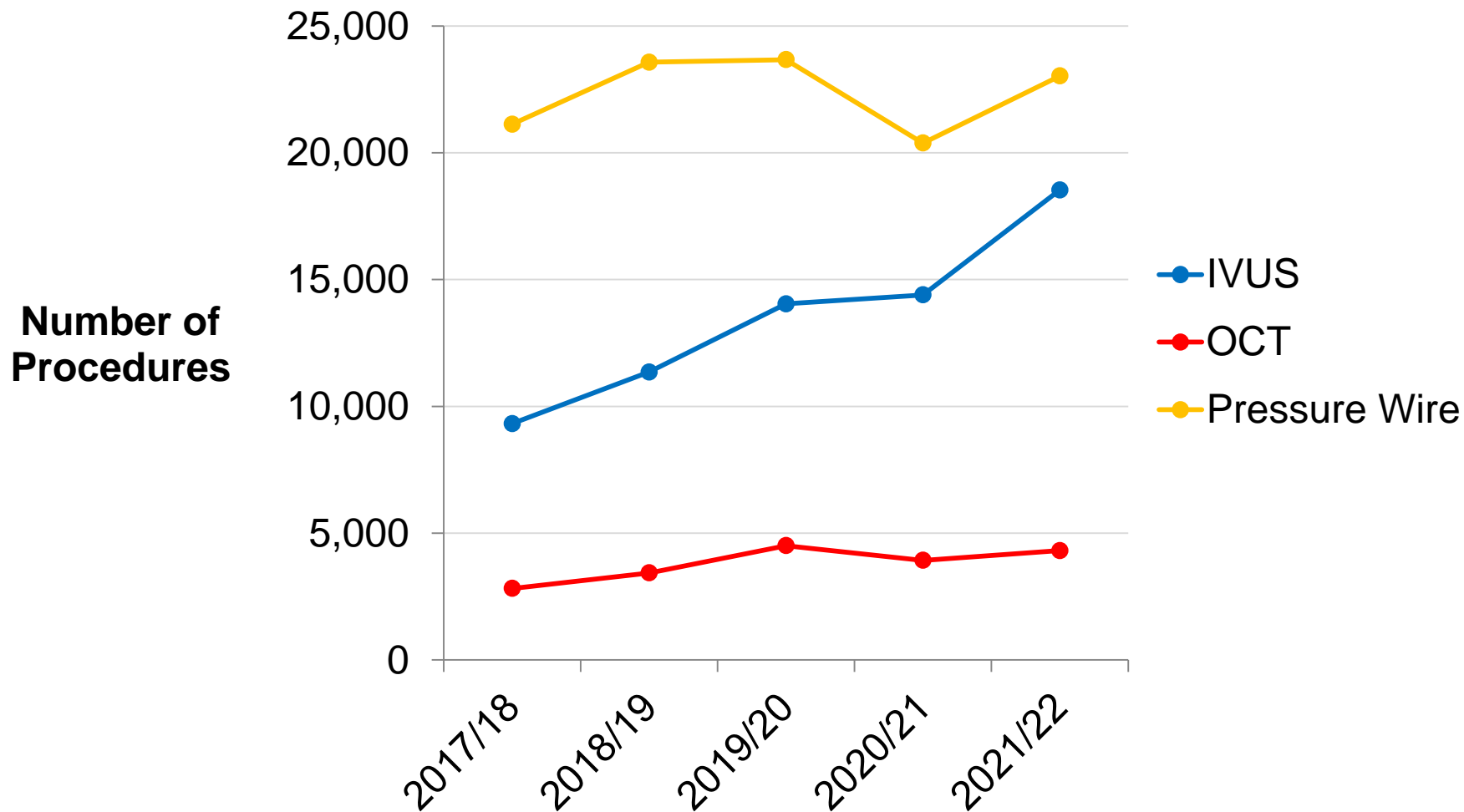
Additional Interventional Coronary Techniques

Used during a PCI procedure



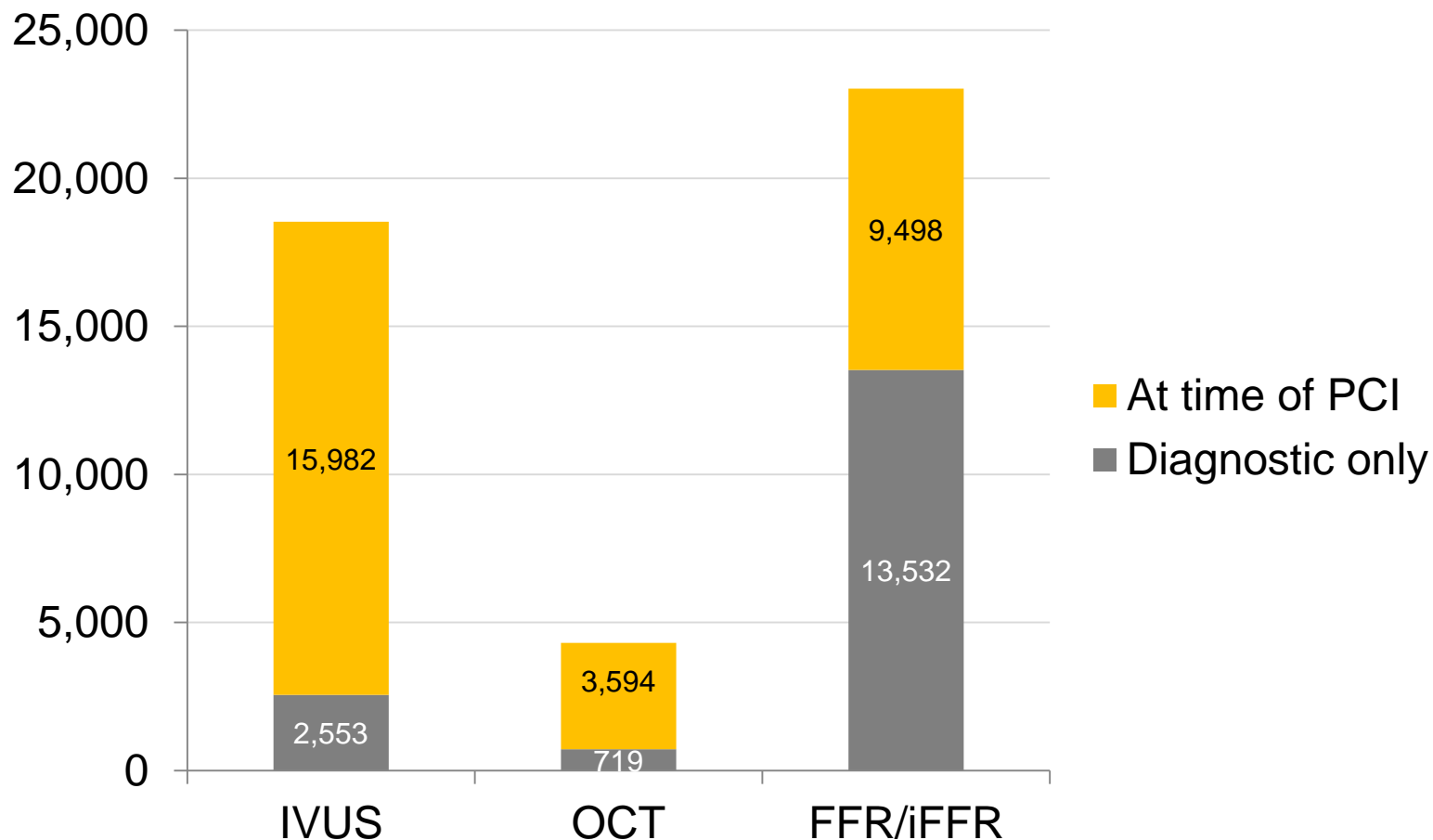
Additional Interventional Coronary Techniques

All cases: Diagnostic only + when part of a PCI procedure



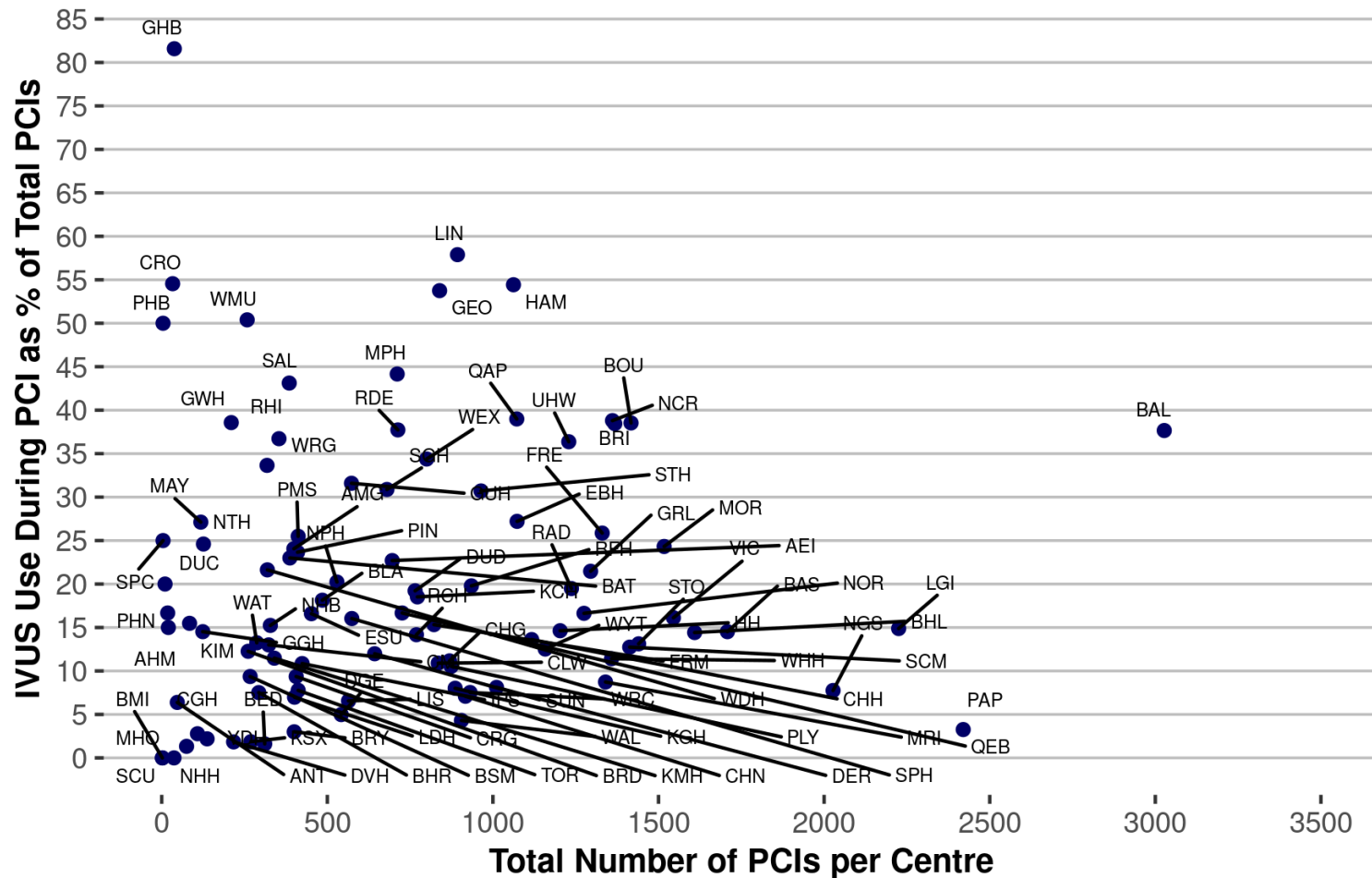
Additional Interventional Coronary Techniques

2021/22



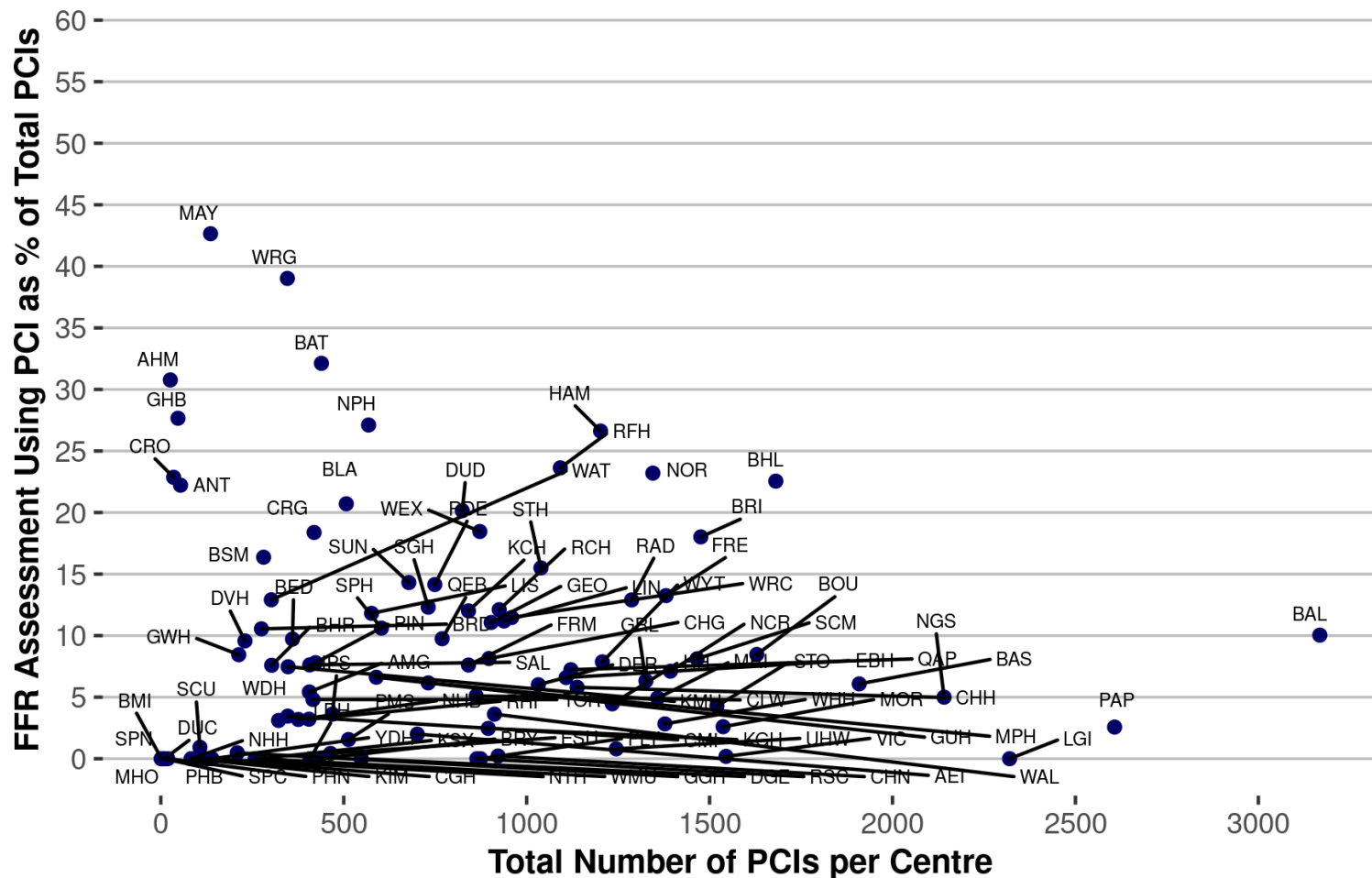
IVUS

IVUS during a PCI procedure



Pressure Wire

During a PCI procedure (includes iFR etc)



Consensus on Intracoronary Imaging



European Heart Journal (2018) 39, 3281–3300
European Society of Cardiology doi:10.1093/eurheartj/ehy285

FASTTRACK CLINICAL RESEARCH
Coronary artery disease

Clinical use of intracoronary imaging. Part 1: guidance and optimization of coronary interventions. An expert consensus document of the European Association of Percutaneous Cardiovascular Interventions

Endorsed by the Chinese Society of Cardiology

Lorenz Räber¹, Gary S. Mintz², Konstantinos C. Koskinas¹, Thomas W. Johnson³, Niels R. Holm⁴, Yoshinubo Onuma⁵, Maria D. Radu⁶, Michael Joner^{7,8}, Bo Yu⁹, Haibo Jia⁹, Nicolas Meneveau^{10,11}, Jose M. de la Torre Hernandez¹², Javier Escaned¹³, Jonathan Hill¹⁴, Francesco Prati¹⁵, Antonio Colombo¹⁶, Carlo di Mario¹⁷, Evelyn Regar¹⁸, Davide Capodanno¹⁹, William Wijns²⁰, Robert A. Byrne²¹, and Giulio Guagliumi^{22*}

Downloaded from https://academic.oup.com/eurheartj/



European Heart Journal (2019) 40, 2566–2584
European Society of Cardiology doi:10.1093/eurheartj/ehz332

FASTTRACK CLINICAL RESEARCH
Interventional cardiology

Clinical use of intracoronary imaging. Part 2: acute coronary syndromes, ambiguous coronary angiography findings, and guiding interventional decision-making: an expert consensus document of the European Association of Percutaneous Cardiovascular Interventions

Endorsed by the Chinese Society of Cardiology, the Hong Kong Society of Transcatheter Endocardiovascular Therapeutics (HKSTENT) and the Cardiac Society of Australia and New Zealand

Thomas W. Johnson¹, Lorenz Räber², Carlo di Mario³, Christos Bourantas⁴, Haibo Jia⁵, Alessio Mattesini⁴, Nieves Gonzalo⁶, Jose M. de la Torre Hernandez⁷, Francesco Prati⁸, Konstantinos Koskinas², Michael Joner⁹, Maria D. Radu¹⁰, David Erlinge¹¹, Evelyn Regar¹², Vijay Kunadian¹³, Akiko Maehara¹⁴, Robert A. Byrne⁹, Davide Capodanno¹⁵, Takashi Akasaka¹⁶, William Wijns¹⁷, Gary S. Mintz¹⁴, and Giulio Guagliumi^{18*}

Downloaded from https://academic.oup.com/eurheartj/advance-article/doi/10.1093/eurheartj/ehz332/5549179

Table 2 Recommendations on the adjunctive use of intravascular imaging for diagnostic evaluation of coronary artery disease, guidance and optimization of PCIs

- **Diagnostic assessment of coronary lesions**

Consensus opinion

Angiographically unclear/ambiguous findings (e.g. dissection, thrombus, calcified nodule)

Assessment of left main stenosis

Complex bifurcation lesions

Suspected culprit lesion of ACS

- **PCI guidance and optimization**

RCT evidence

Long lesions

Chronic total occlusions

Consensus opinion

Patients with acute coronary syndromes

Left main coronary artery lesions

Two stents bifurcation

Implantation of bioresorbable scaffolds

Patients with renal dysfunction (IVUS)

- **Identification of mechanism of stent failure**

Restenosis

Stent thrombosis

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization

A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

10.3. Use of Intravascular Imaging

Recommendations for Use of Intravascular Imaging

Referenced studies that support the recommendations are summarized in [Online Data Supplement 25](#).

COR	LOE	RECOMMENDATIONS
2a	B-R	1. In patients undergoing coronary stent implantation, IVUS can be useful for procedural guidance, particularly in cases of left main or complex coronary artery stenting, to reduce ischemic events (1-10).
2a	B-R	2. In patients undergoing coronary stent implantation, OCT is a reasonable alternative to IVUS for procedural guidance, except in ostial left main disease (11-13).
2a	C-LD	3. In patients with stent failure, IVUS or OCT is reasonable to determine the mechanism of stent failure (14-17).

ORIGINAL RESEARCH

Impact of Intracoronary Imaging-Guided Percutaneous Coronary Intervention on Procedural Outcomes Among Complex Patient Groups

Mohamed O. Mohamed ^{id}, PhD; Tim Kinnaird ^{id}, MD; Harindra C. Wijeyesundera ^{id}, MD; Thomas W. Johnson ^{id}, MD; Sarah Zaman ^{id}, PhD; Muhammad Rashid ^{id}, PhD; Saadiq Moledina, MRCP(UK); Peter Ludman, MD; Mamas A. Mamas ^{id}, DPhil

- UK PCI Registry (April 2014- March 2020)
 - 555,398 PCIs, ICI in 59,752 (7.8% → 17.5%)
 - Stratified by
 - PCI for stent thrombosis
 - ISR
 - Renal failure
 - BVS
 - Stented length > 60mm
 - ACS
 - CTO
 - LMS intervention

Table 2 Recommendations on the adjunctive use of intravascular imaging for diagnostic evaluation of coronary artery disease, guidance and optimization of PCIs

• Diagnostic assessment of coronary lesions
Consensus opinion
Angiographically unclear/ambiguous findings (eg, dissection, thrombus, calcified nodule)
Assessment of left main stenosis
Complex bifurcation lesions
Suspected culprit lesion of ACS
• PCI guidance and optimization
RCT evidence
Long lesions
Chronic total occlusions
Consensus opinion
Patients with acute coronary syndromes
Left main coronary artery lesions
Two stents bifurcation
Implantation of bioresorbable scaffolds
Patients with renal dysfunction (IVUS)
• Identification of mechanism of stent failure
Restenosis
Stent thrombosis

Intracoronary Imaging

Table 4. Adjusted Odds Ratio* and 95% CI of In-Hospital Adverse Outcomes in Patients Undergoing Intracoronary Imaging

	OR (95% CI)	P value
MACCE		
Overall	0.78 (0.72–0.84)	<0.001
Imaging-recommended [†]	0.75 (0.69–0.81)	<0.001
No imaging-recommended	0.85 (0.64–1.13)	0.259
All-cause mortality		
Overall	0.70 (0.64–0.78)	<0.001
Imaging-recommended [†]	0.69 (0.63–0.76)	<0.001
No imaging-recommended	0.87 (0.53–1.42)	0.570

Intracoronary Imaging

Table 4. Adjusted Odds Ratio* and 95% CI of In-Hospital Adverse Outcomes in Patients Undergoing Intracoronary Imaging

	OR (95% CI)	P value
MACCE		
Overall	0.78 (0.72–0.84)	<0.001
Imaging-recommended [†]	0.75 (0.69–0.81)	<0.001
No imaging-recommended	0.85 (0.64–1.13)	0.259
All-cause mortality		
Overall	0.70 (0.64–0.78)	<0.001
Imaging-recommended [†]	0.69 (0.63–0.76)	<0.001
No imaging-recommended	0.87 (0.53–1.42)	0.570



Intracoronary Imaging

Table 4. Adjusted Odds Ratio* and 95% CI of In-Hospital Adverse Outcomes in Patients Undergoing Intracoronary Imaging

	OR (95% CI)	P value
MACCE		
Overall	0.78 (0.72–0.84)	<0.001
Imaging-recommended [†]	0.75 (0.69–0.81)	<0.001
No imaging-recommended	0.85 (0.64–1.13)	0.259
All-cause mortality		
Overall	0.70 (0.64–0.78)	<0.001
Imaging-recommended [†]	0.69 (0.63–0.76)	<0.001
No imaging-recommended	0.87 (0.53–1.42)	0.570



Intracoronary Imaging

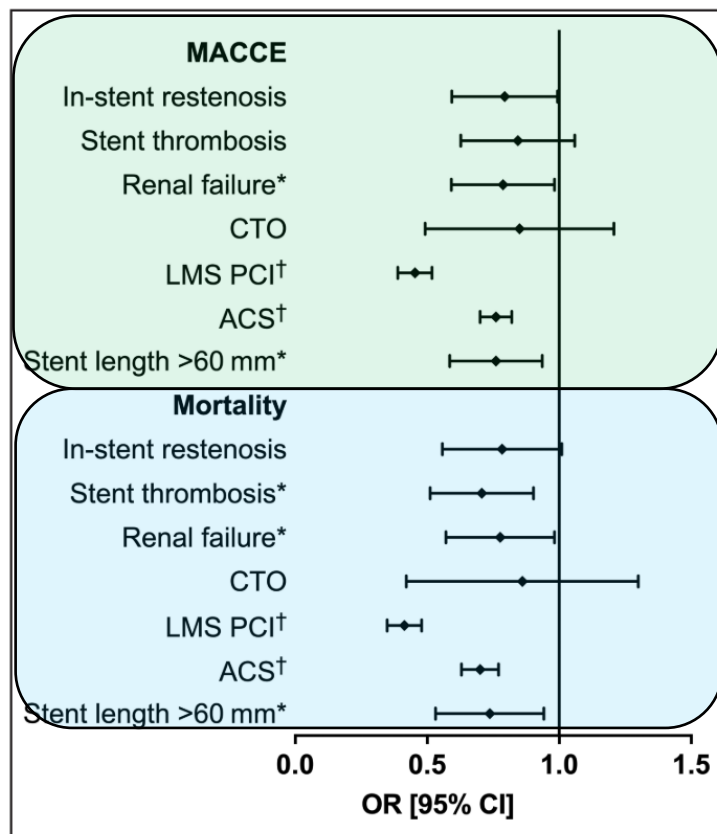
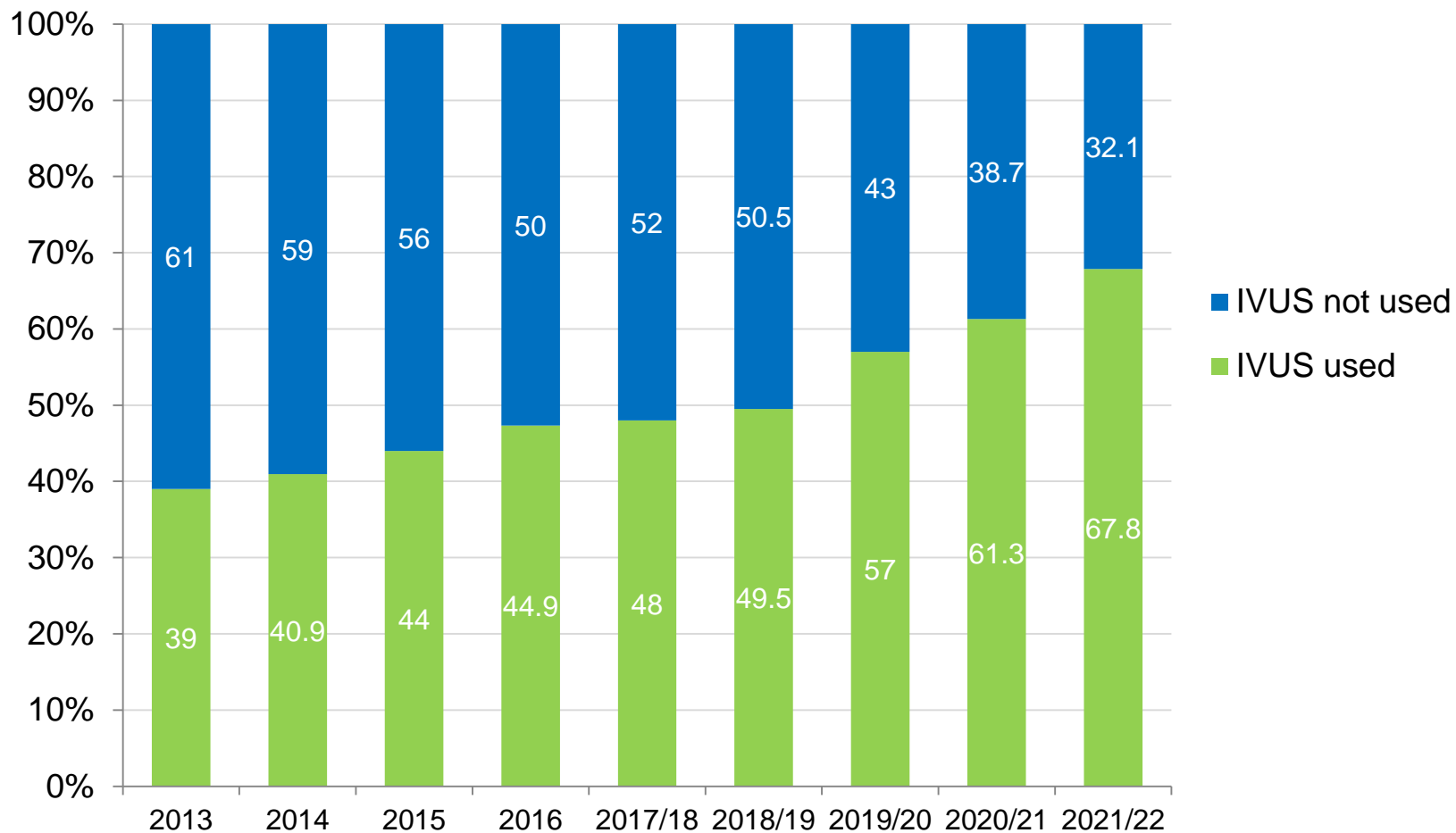


Figure 5. Adjusted odds of in-hospital outcomes associated with intracoronary imaging use according to individual recommendation.

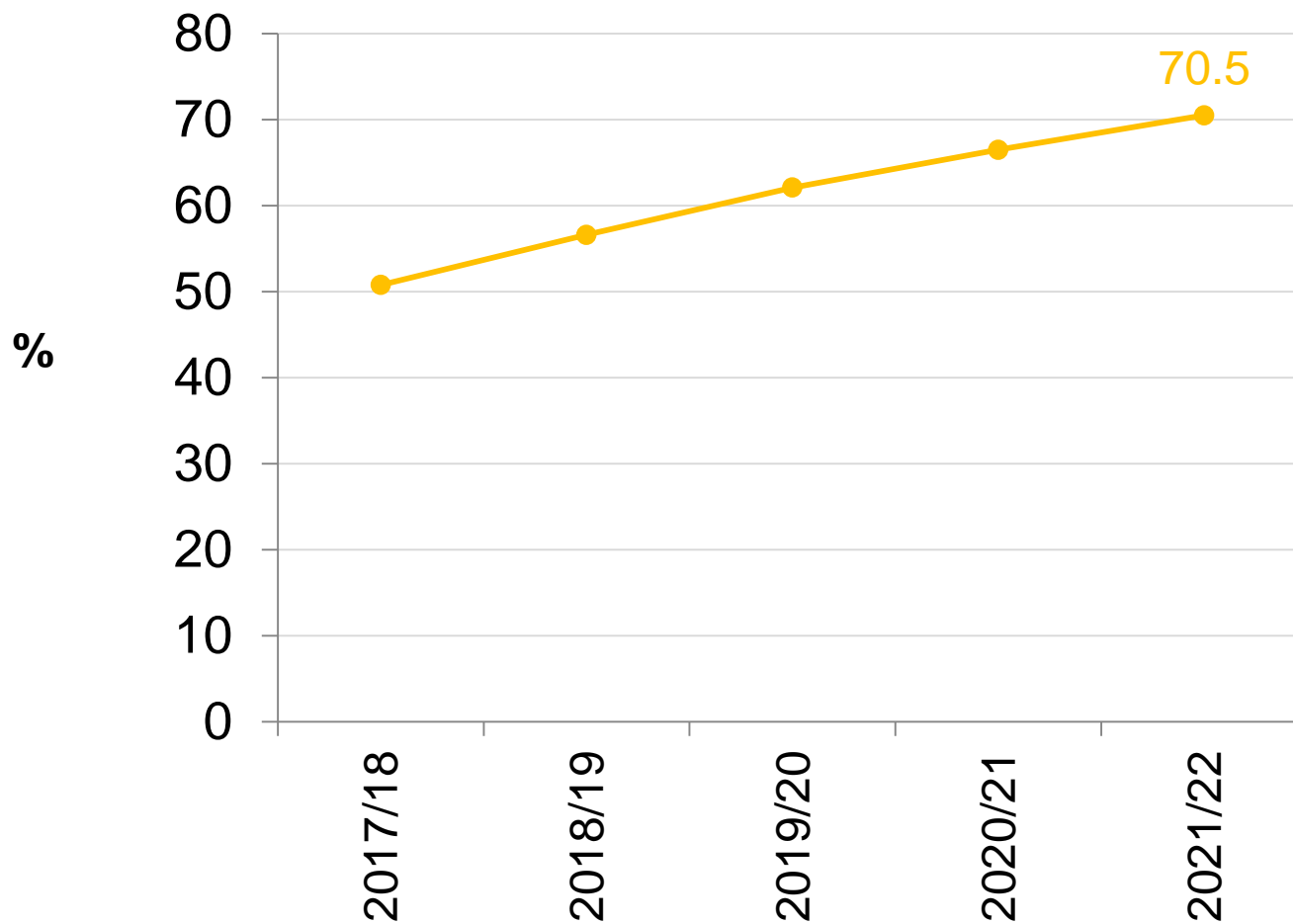
IVUS

PCI to Unprotected LMS



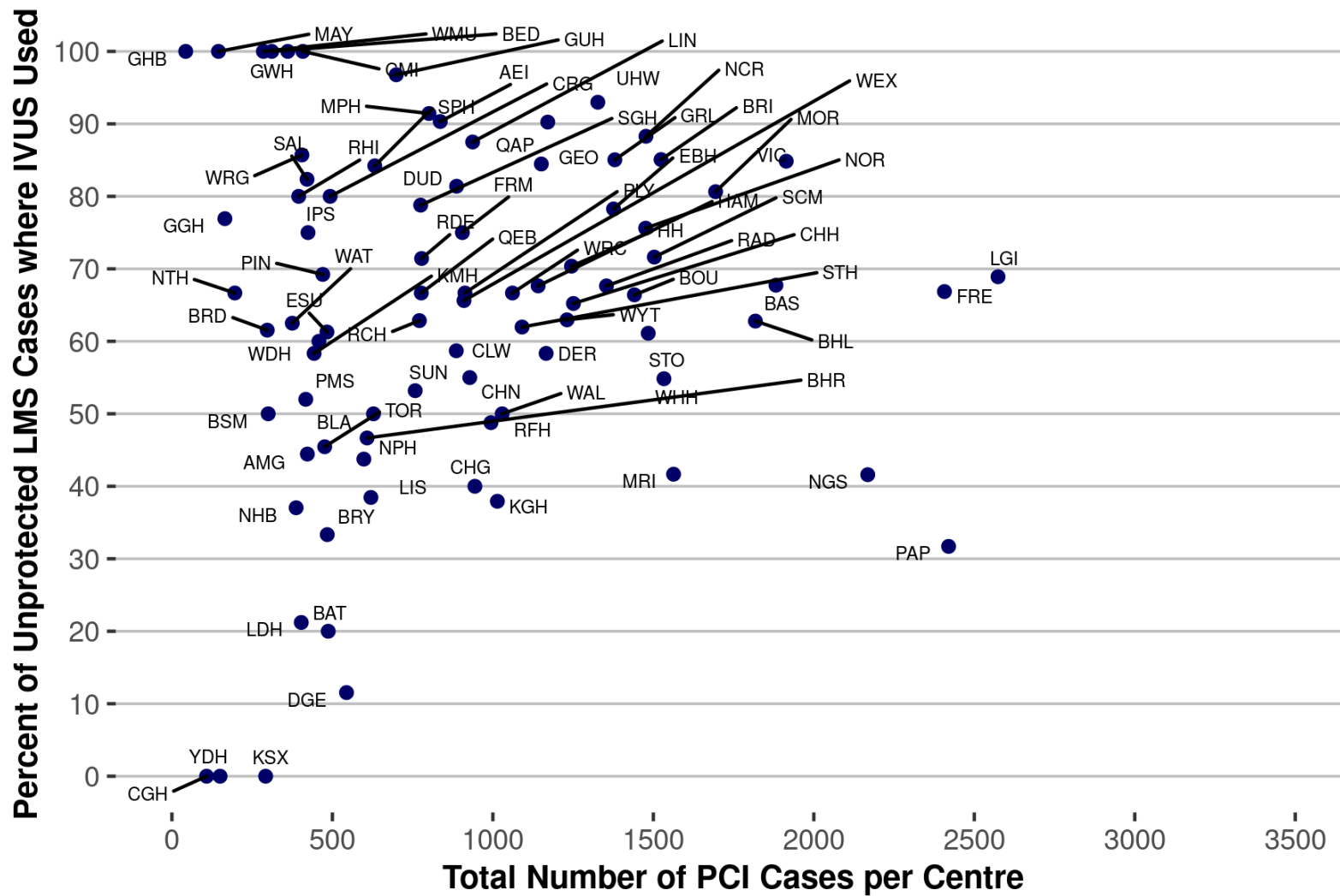
Note:
Does not include OCT

OCT or IVUS PCI to Unprotected LMS



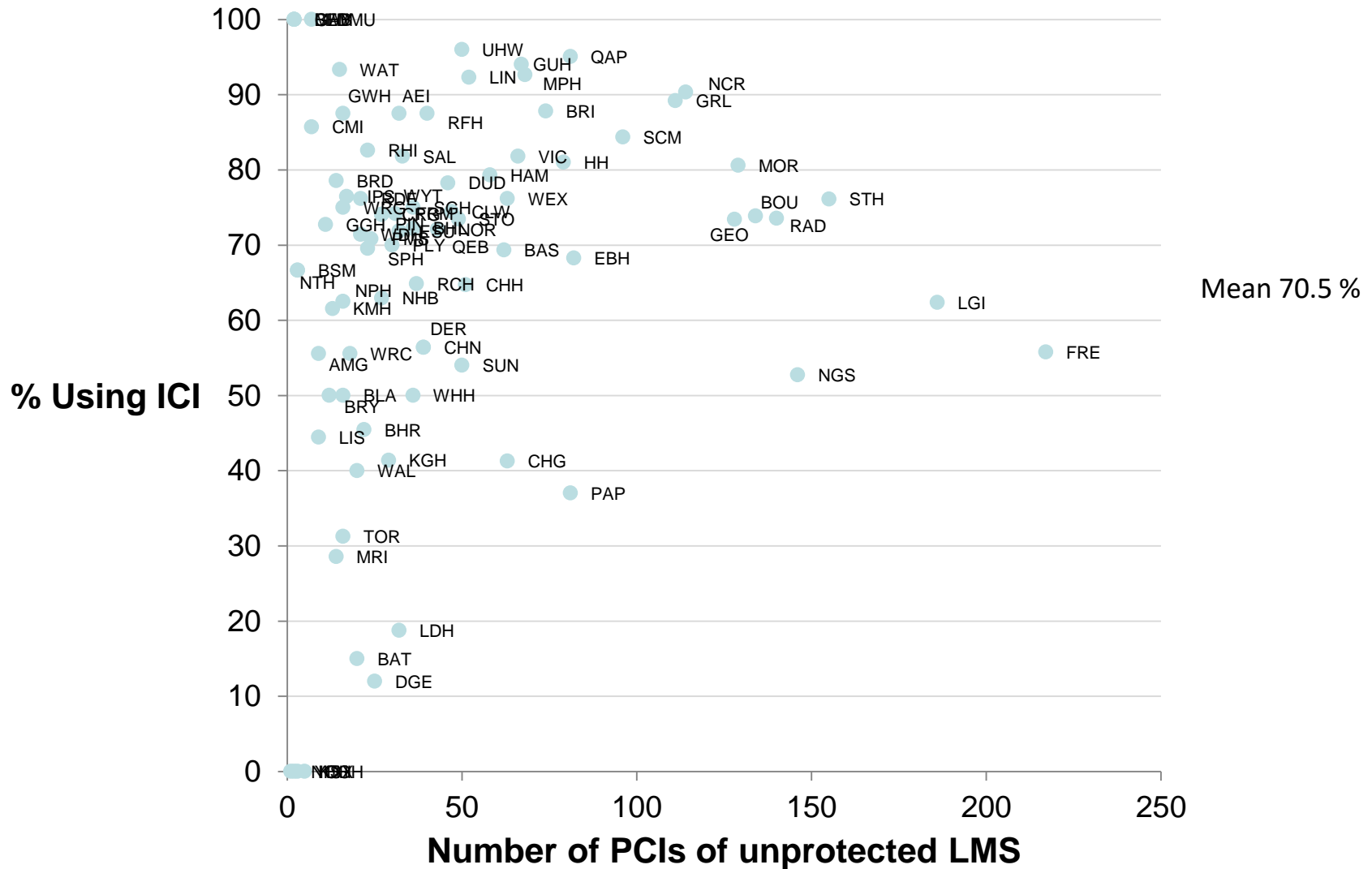
IVUS

PCI to Unprotected LMS



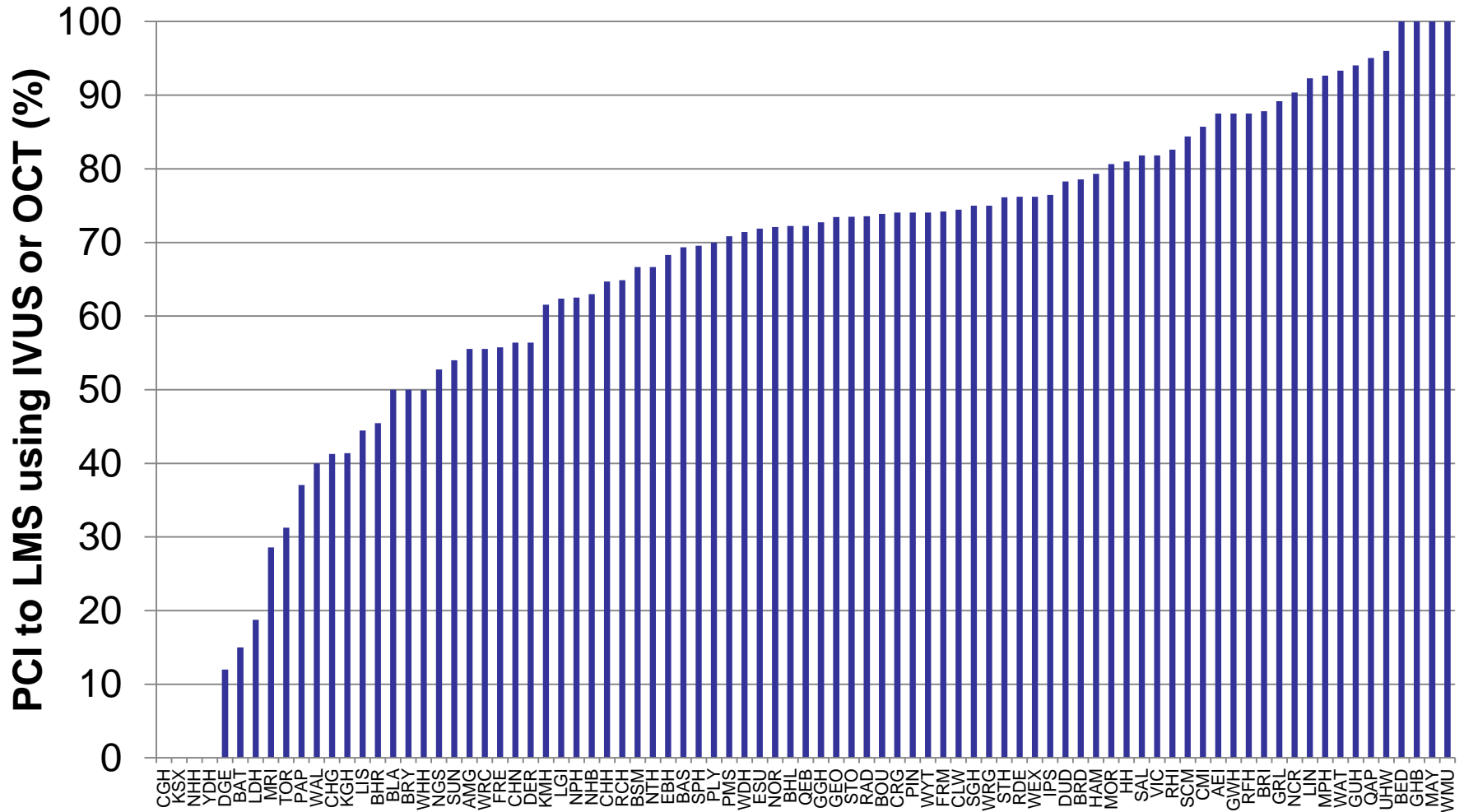
OCT or IVUS

PCI to Unprotected LMS



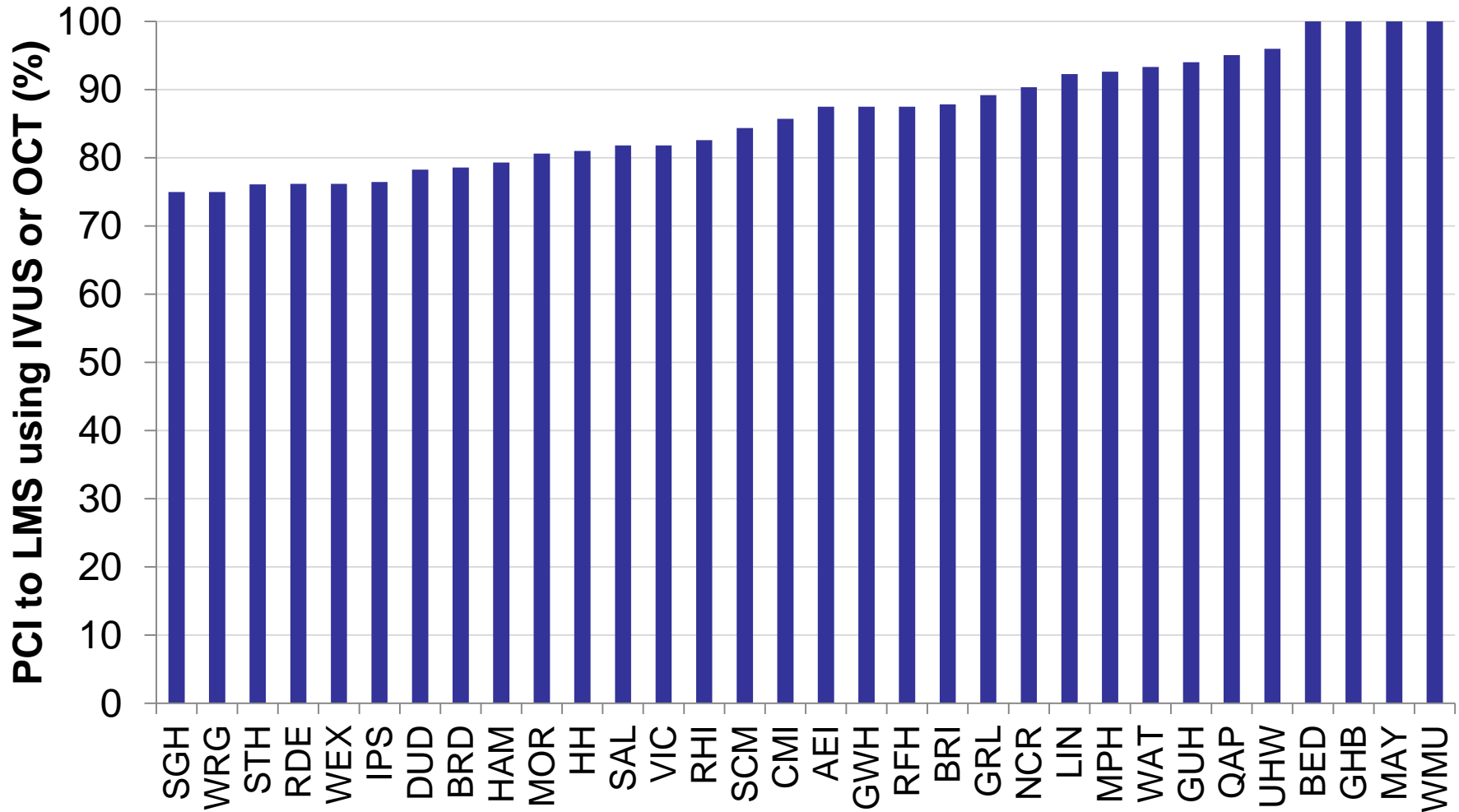
OCT or IVUS

PCI to Unprotected LMS (all Centres)



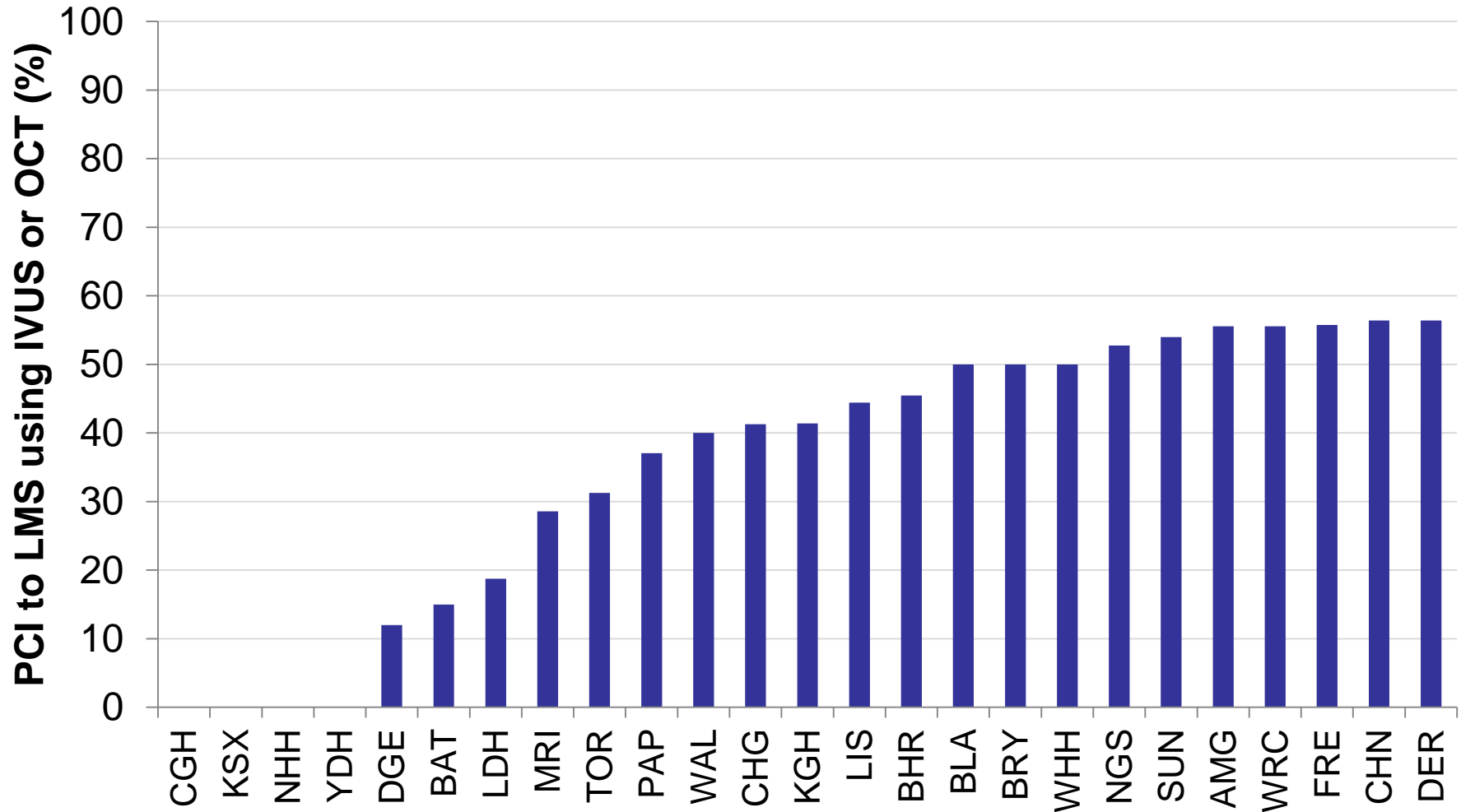
OCT or IVUS

PCI to Unprotected LMS ($\geq 75\%$)



OCT or IVUS

PCI to Unprotected LMS (< 60%)



Arterial access

1 of 3



2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization

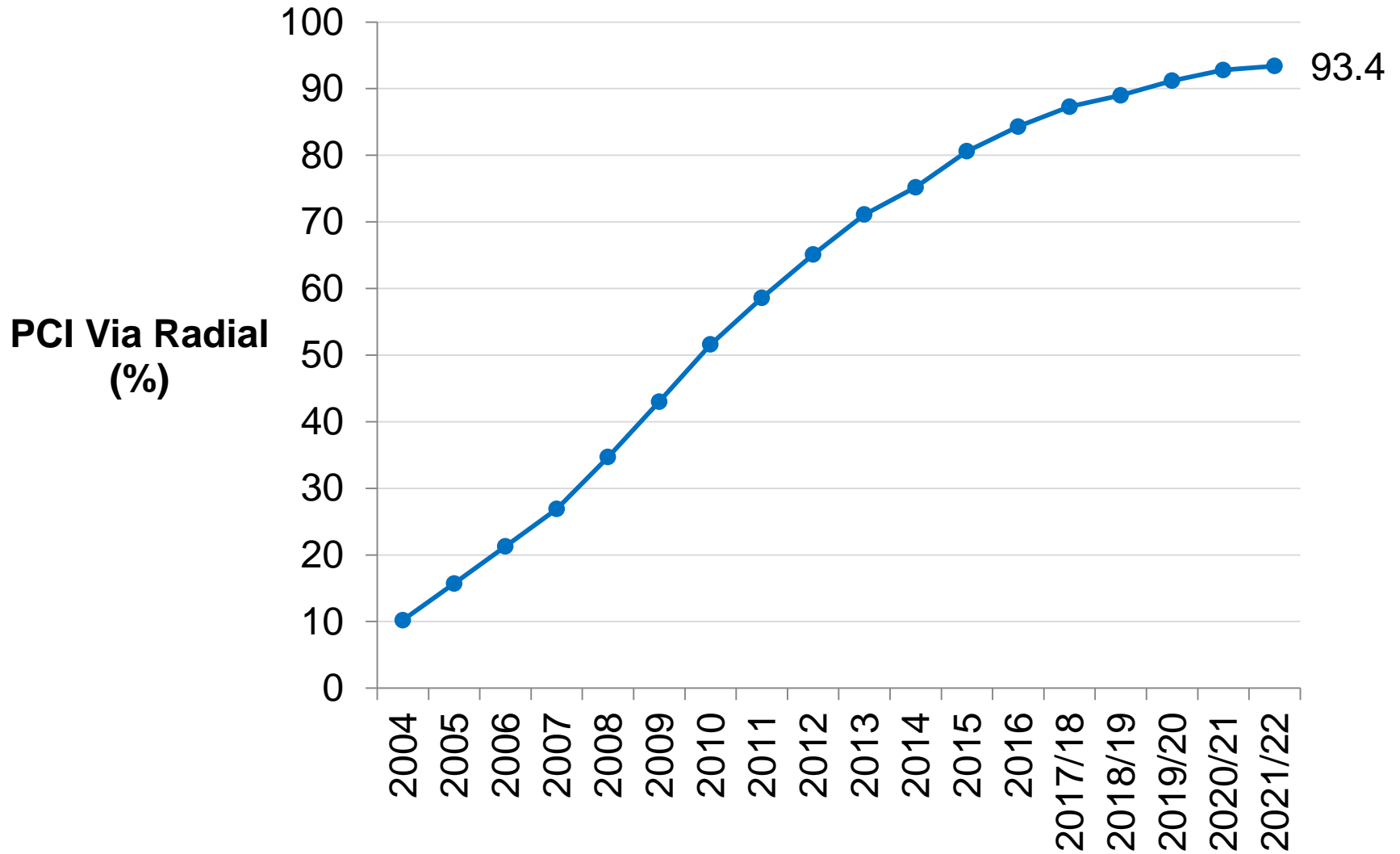
A Report of the American College of Cardiology/American Heart Association
Joint Committee on Clinical Practice Guidelines

Recommendations for Radial and Femoral Approaches for PCI

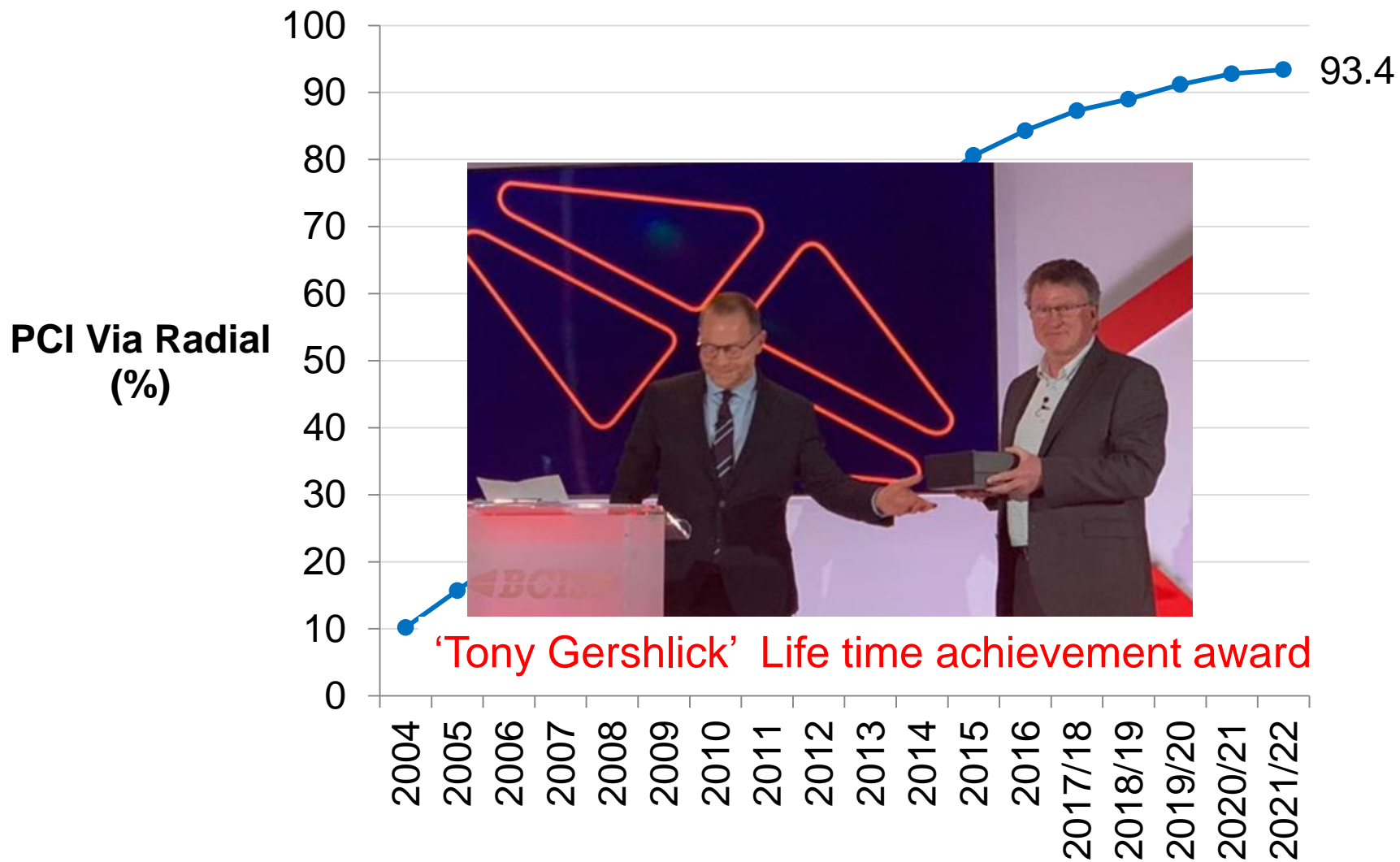
Referenced studies that support the recommendations are summarized in [Online Data Supplement 23](#).

COR	LOE	RECOMMENDATIONS
1	A	1. In patients with ACS undergoing PCI, a radial approach is indicated in preference to a femoral approach to reduce the risk of death, vascular complications, or bleeding (1-4).
1	A	2. In patients with SIHD undergoing PCI, the radial approach is recommended to reduce access site bleeding and vascular complications (4-7).

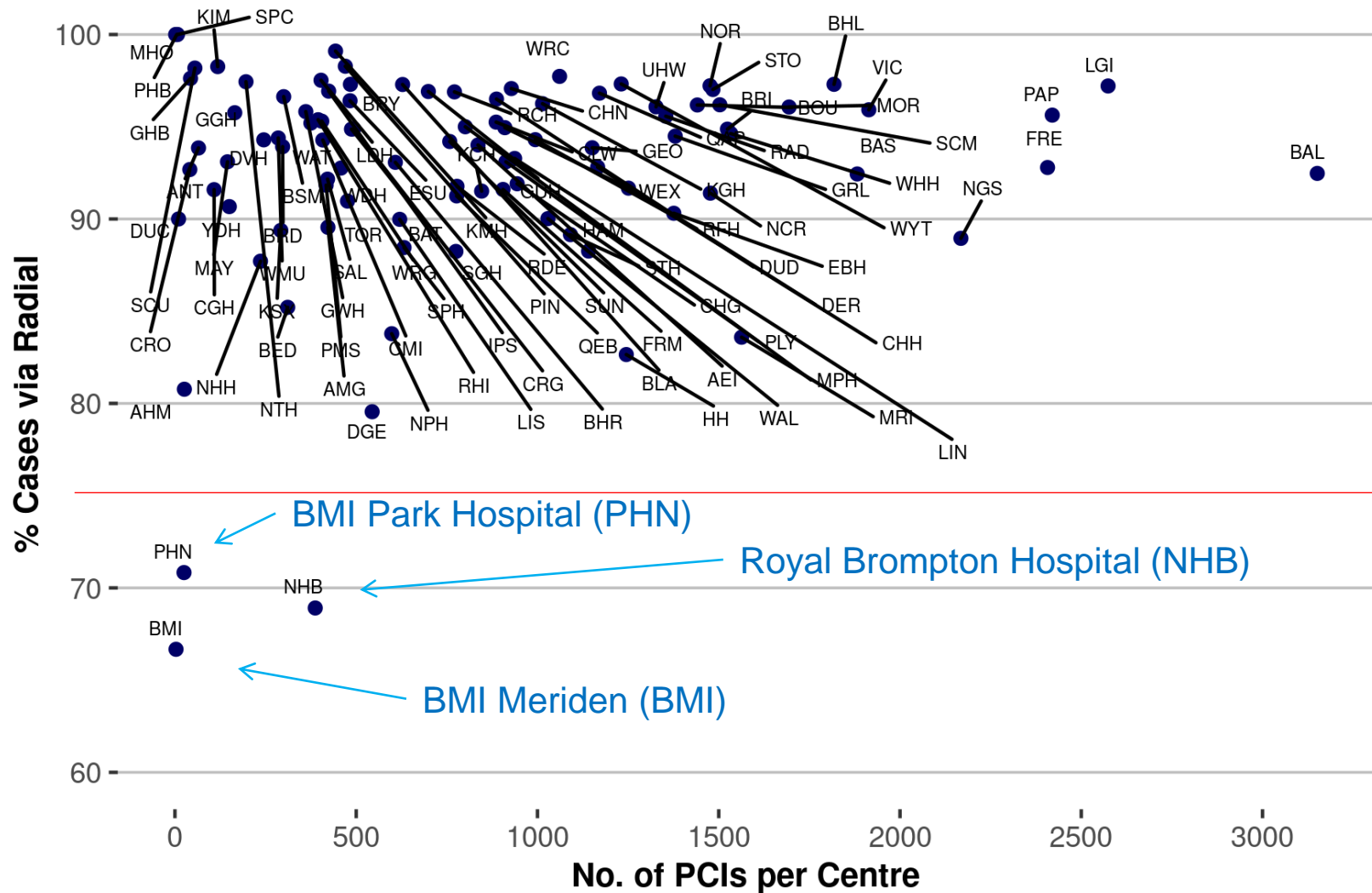
Radial Artery Access



Radial Artery Access

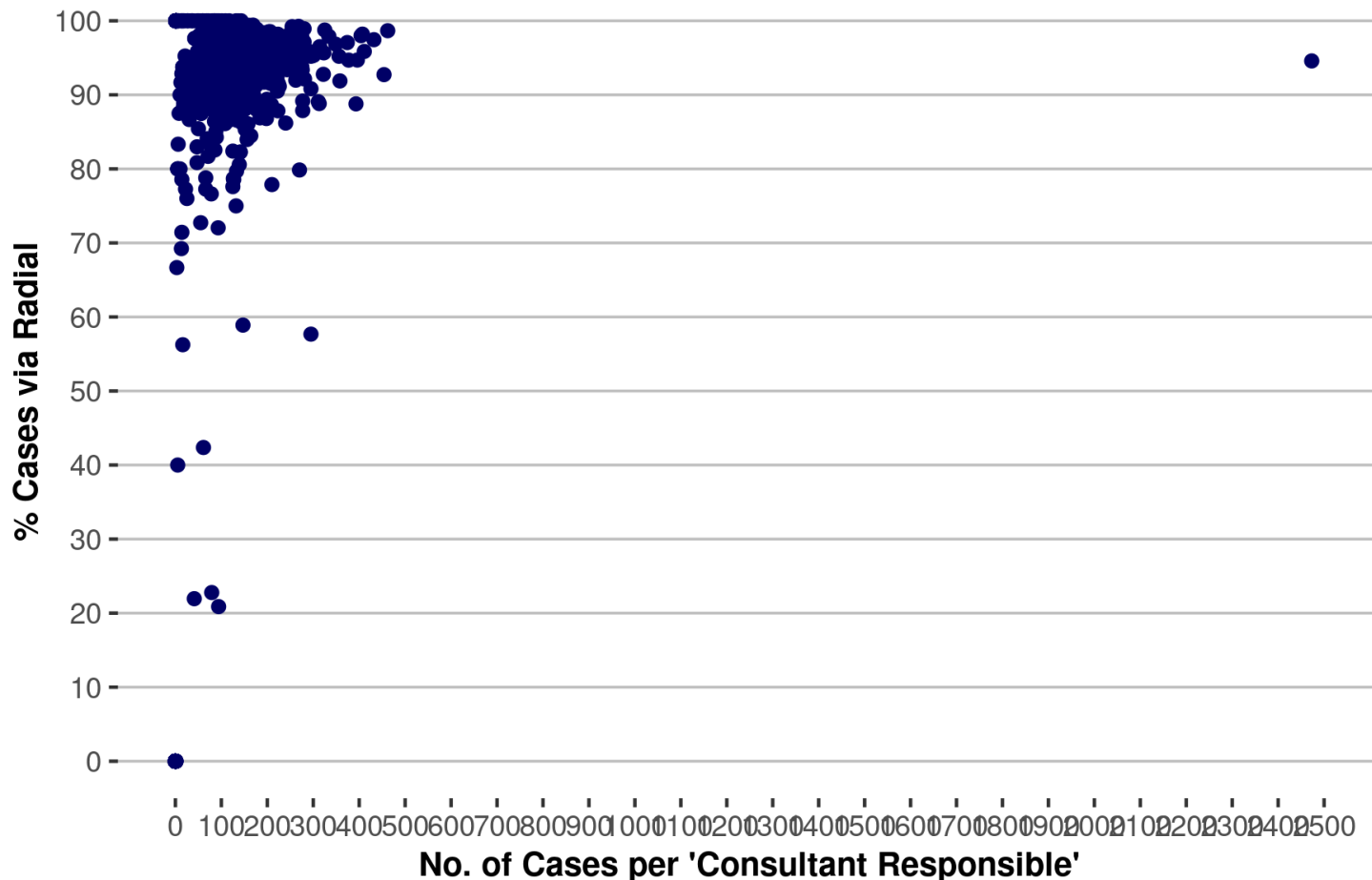


Radial Artery Access

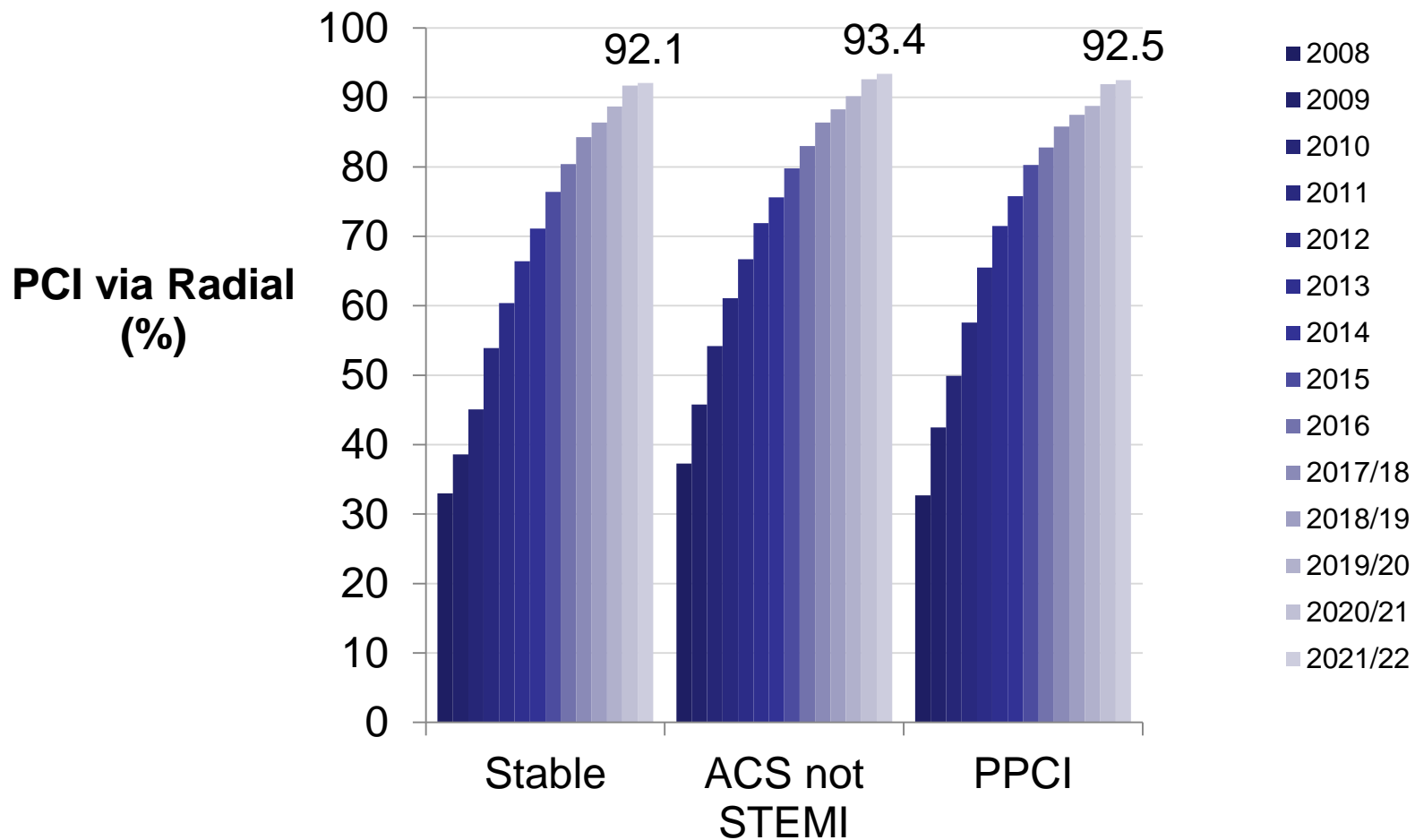


Radial Artery Access By operator

- Any case with any radial (including multiple access)

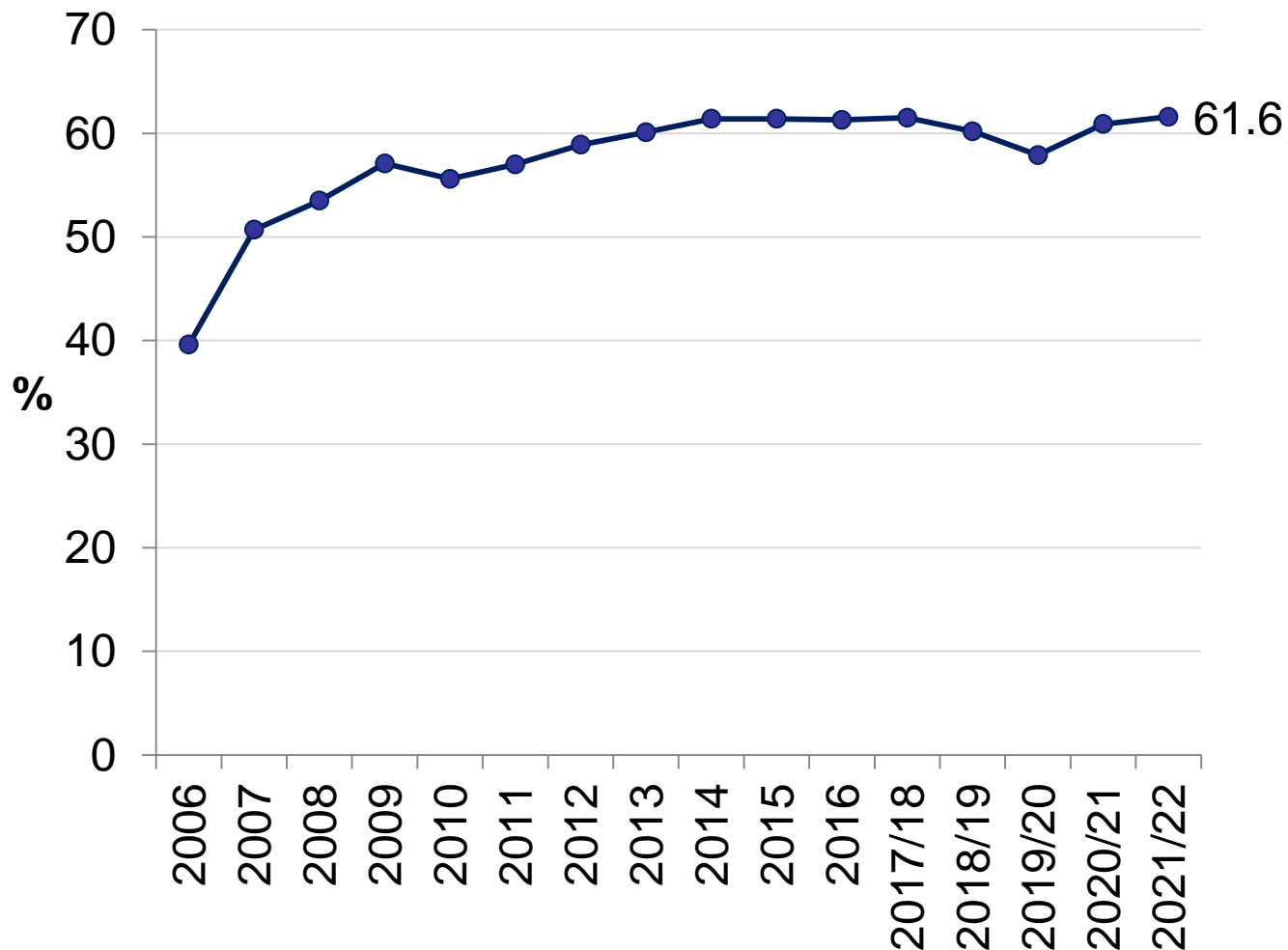


Radial Artery Access Clinical Syndrome



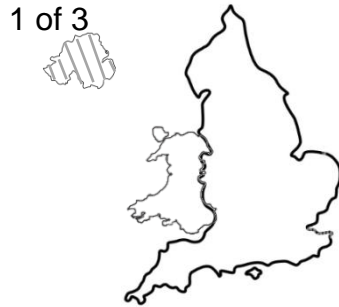
Femoral closure devices

Of PCI via FA - % punctures closed with a device

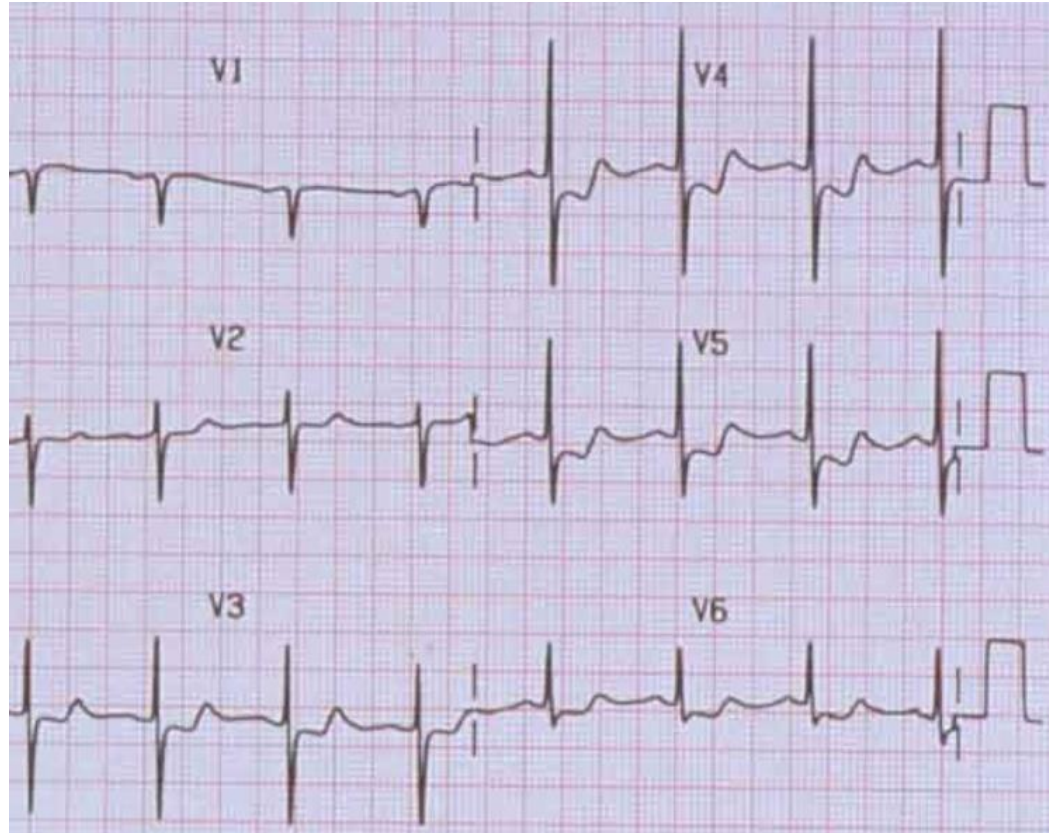


Time Delays to Treatment

1 of 3



Delays to PCI in NSTEMI



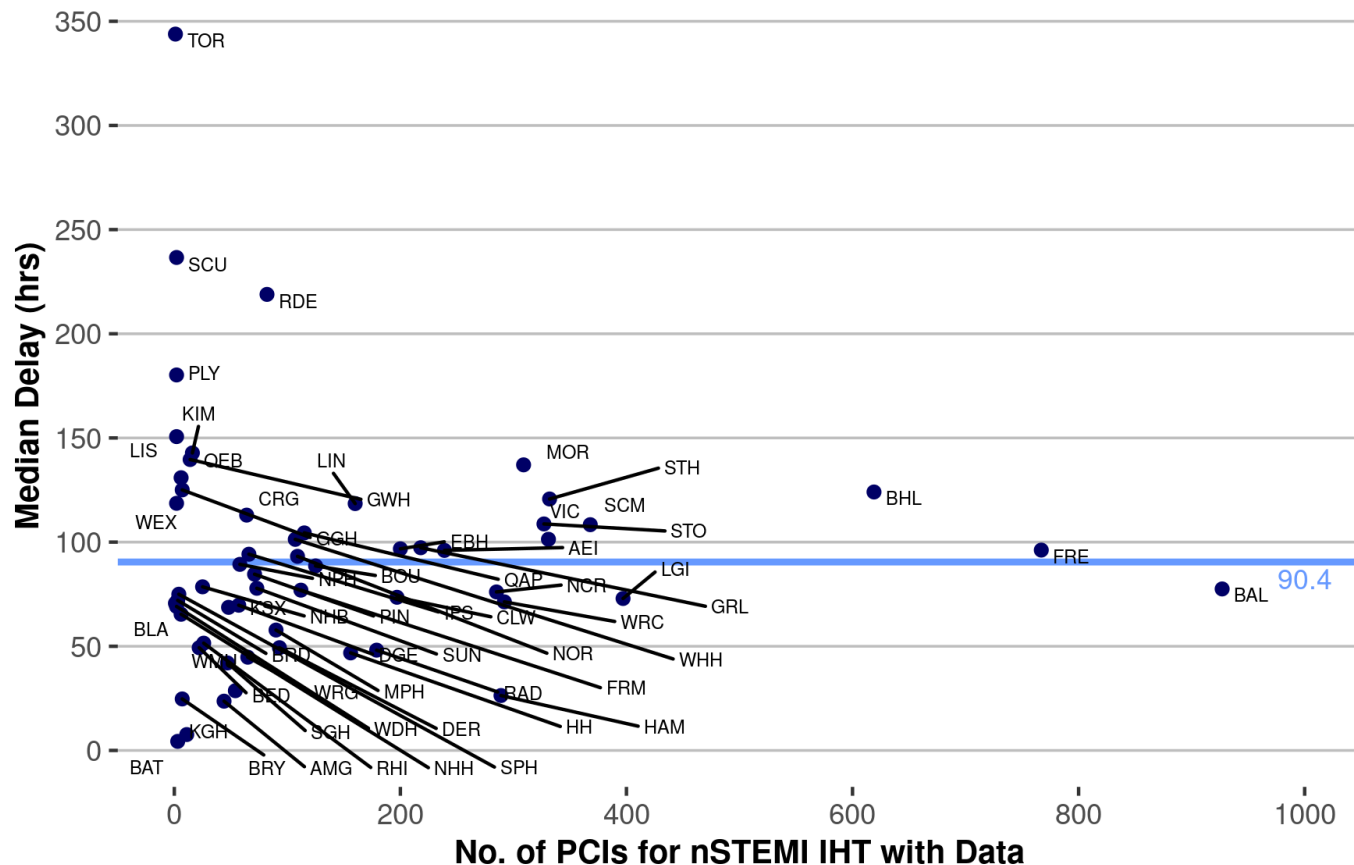
Delays to PCI in NSTEMI

Note:

- For NSTEMI overall delays are calculated from FIRST hospital arrival to treatment
- For PPCI the timing for the 'Direct' admissions is from PCI door (which in transferred patients is door 2)

Delays to PCI in NSTEMI

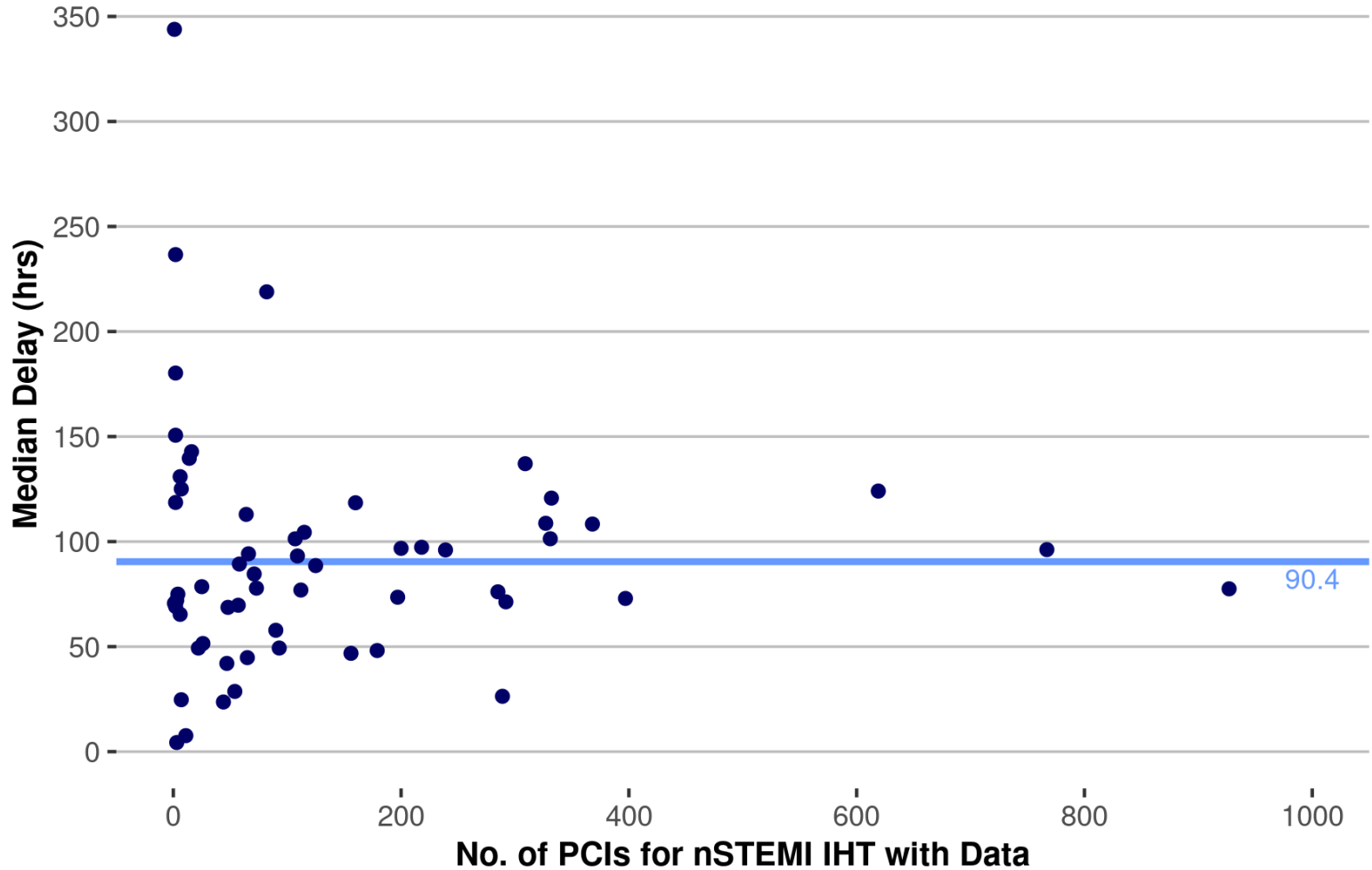
Admission Route - Direct to PCI Centre



Centres with < 90% data completeness excluded

Delays to PCI in NSTEMI

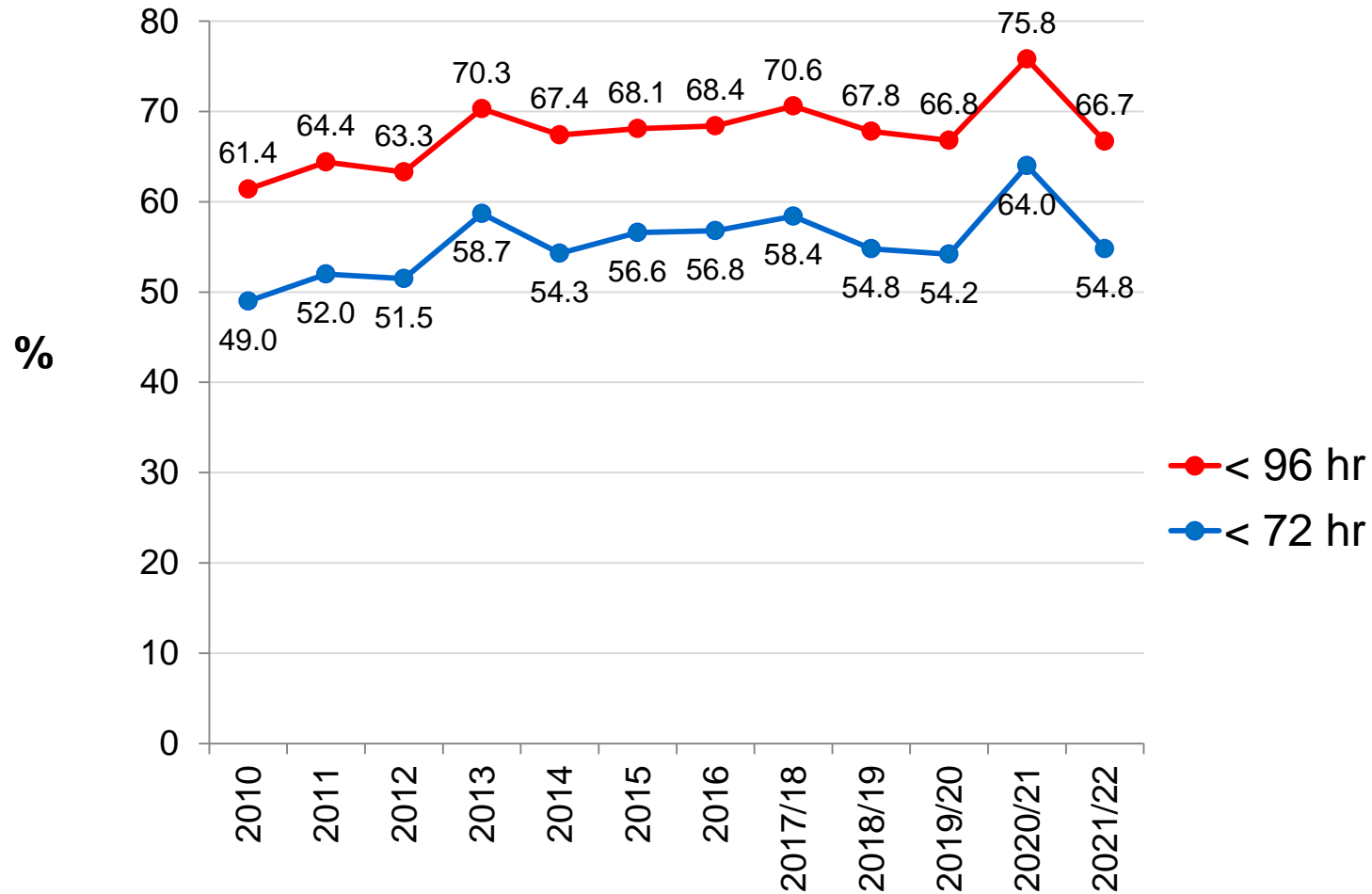
Admission Route - IHT



Centres with < 90% data completeness excluded

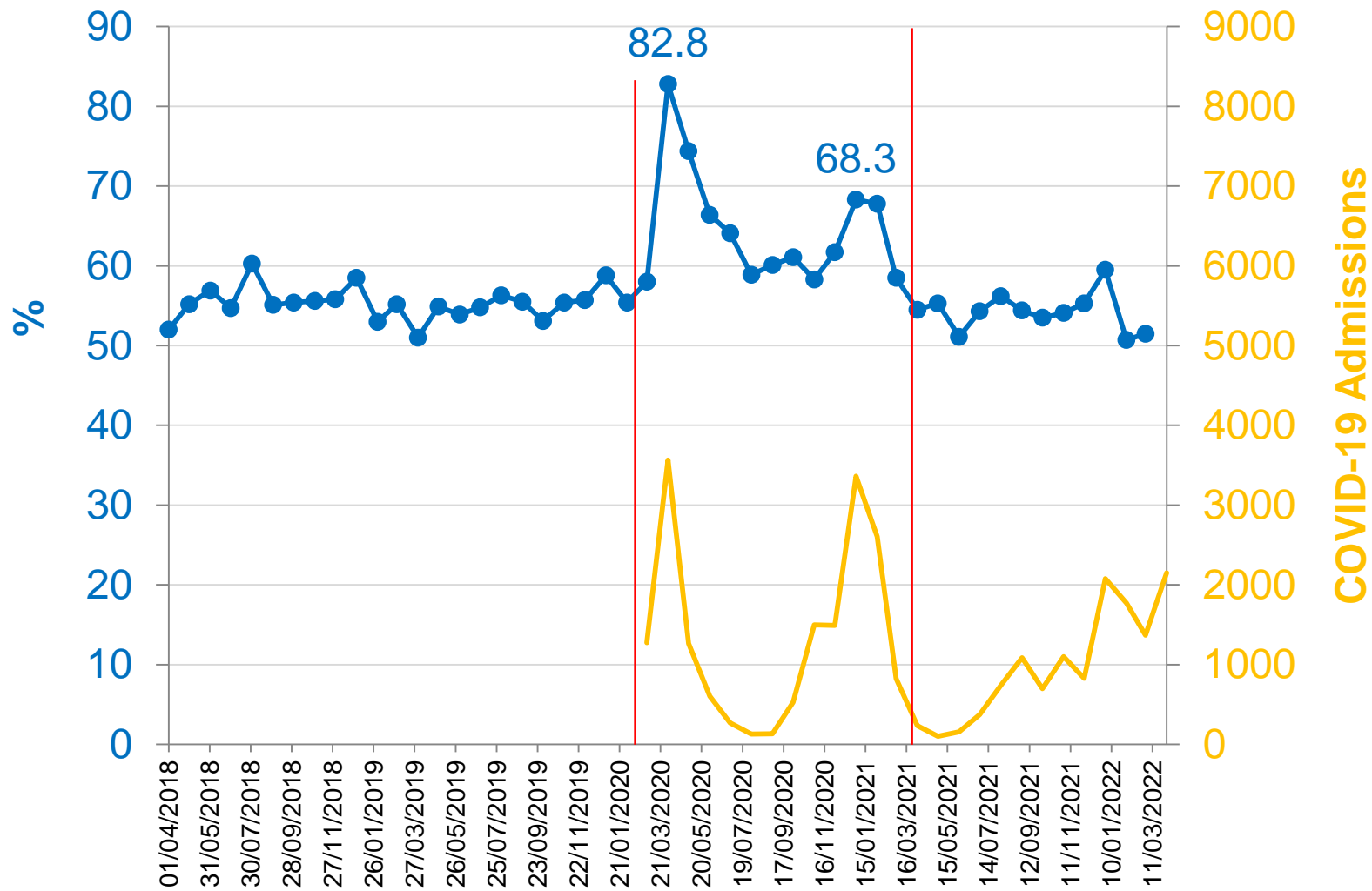
Delays to PCI in NSTEMI

Direct AND IHT



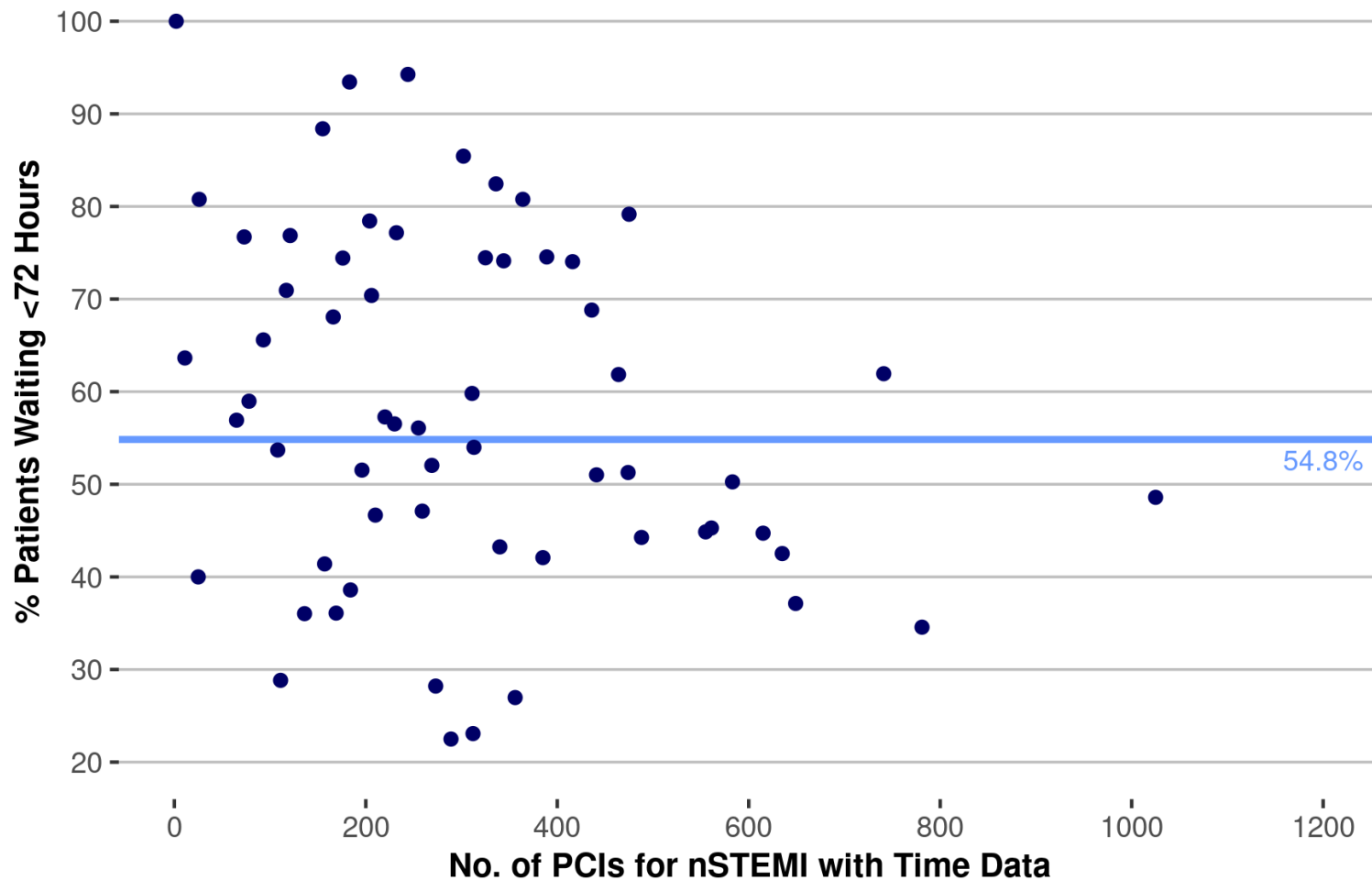
NSTEMI waiting < 72 hrs in E&W

Compared with COVID-19 admissions (UK)



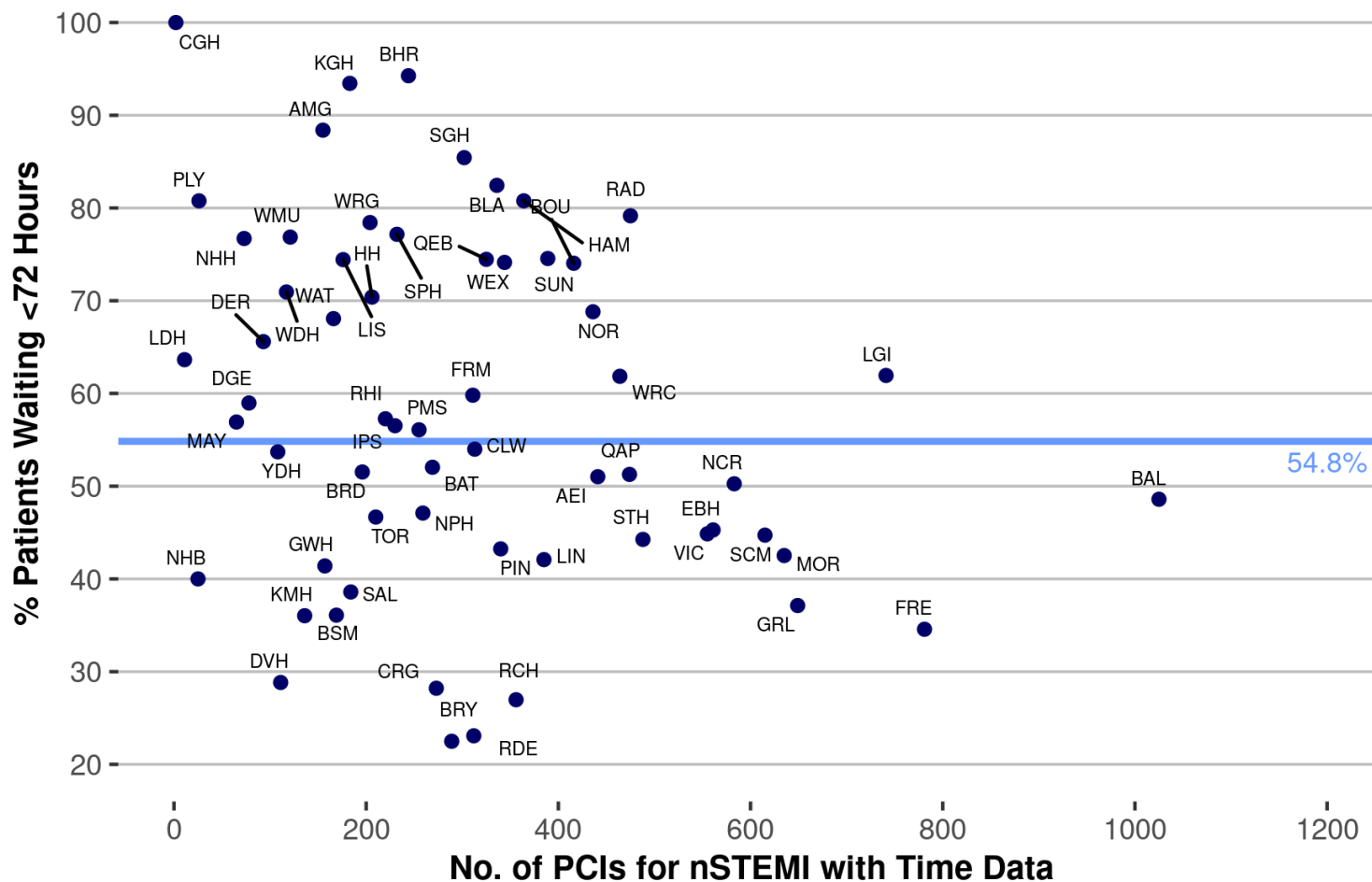
Delays to PCI in NSTEMI

Direct AND IHT % < 72 hr



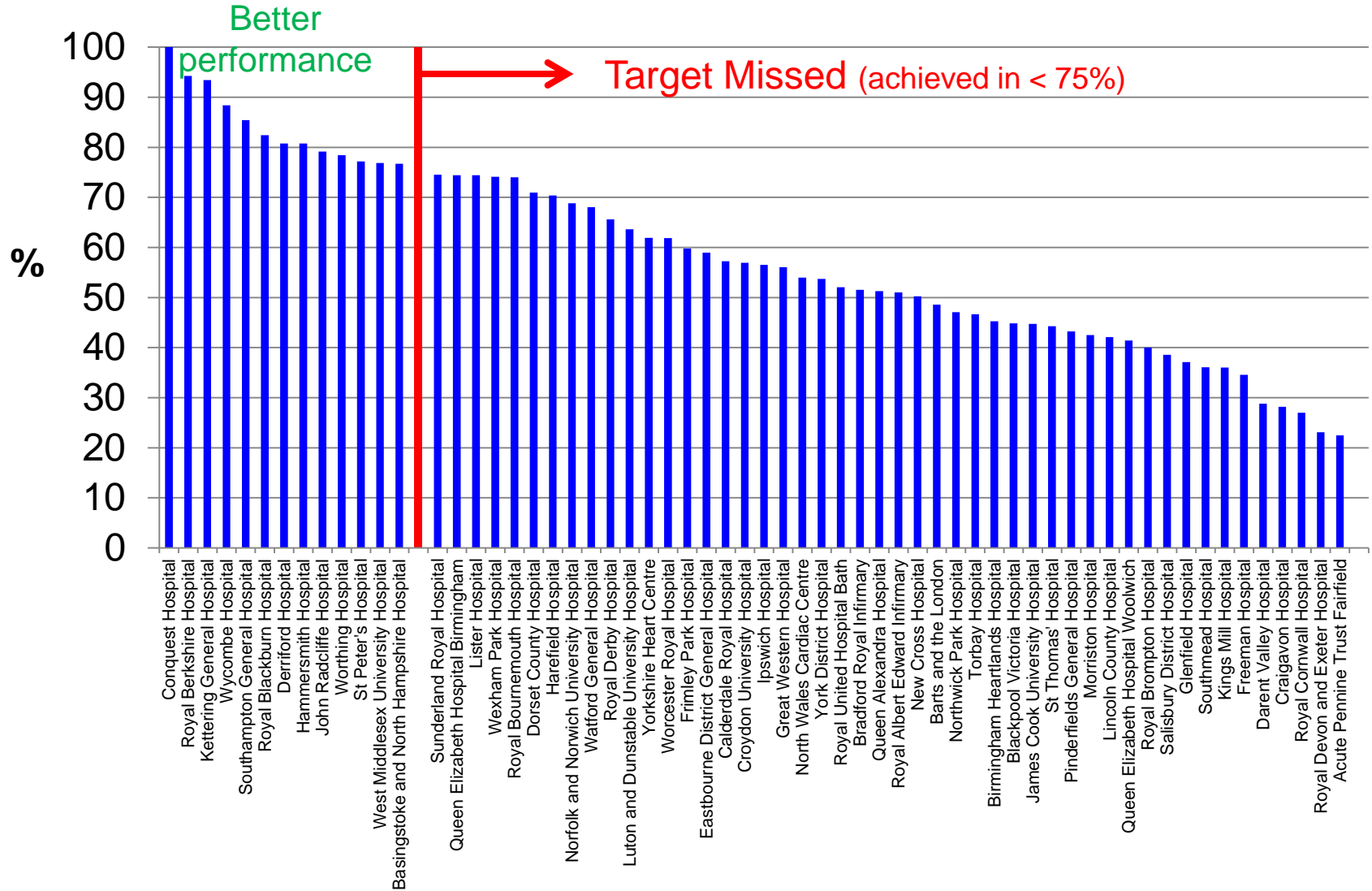
Delays to PCI in NSTEMI

Direct AND IHT % < 72 hr



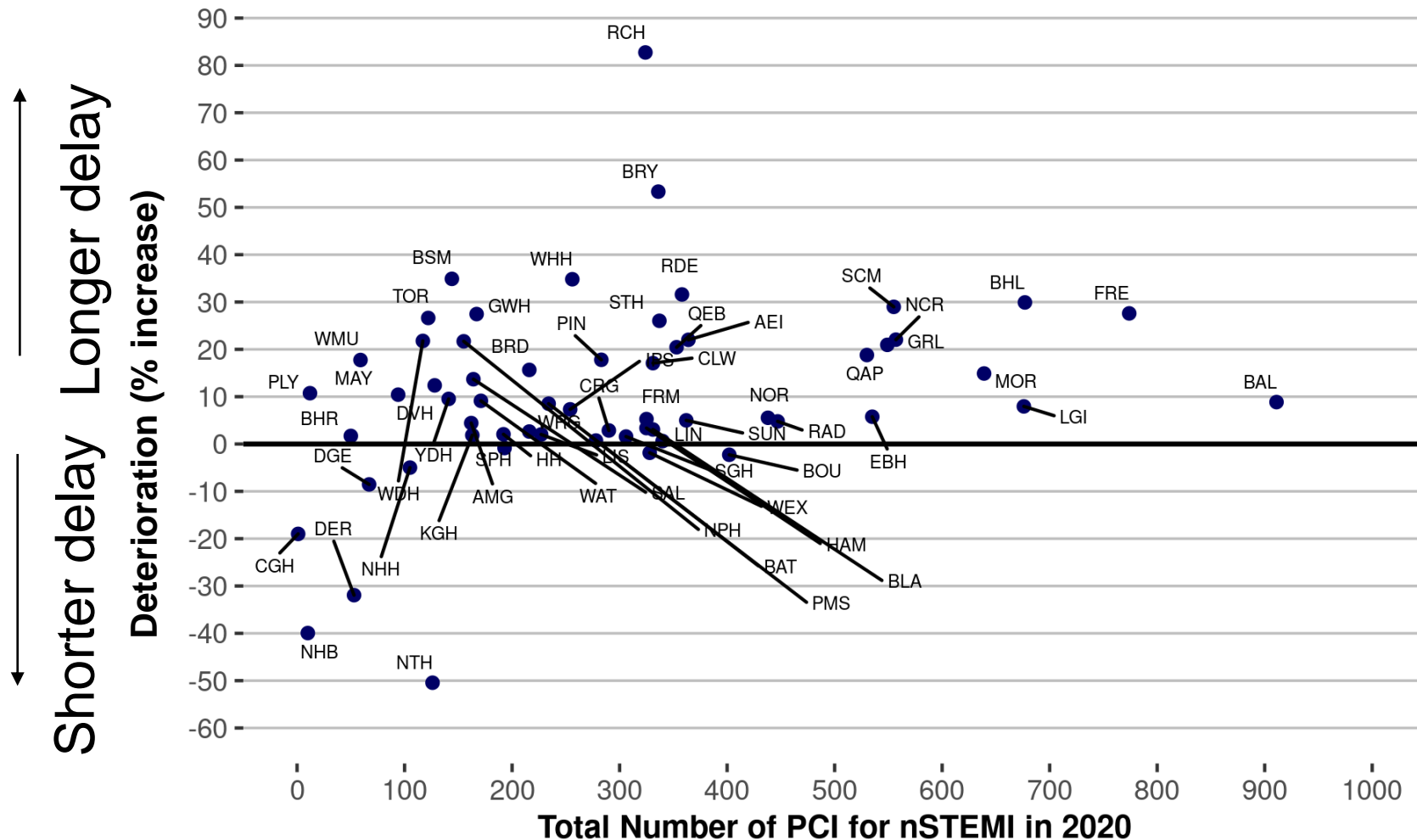
Delays to PCI in NSTEMI

Direct AND IHT % < 72 hr

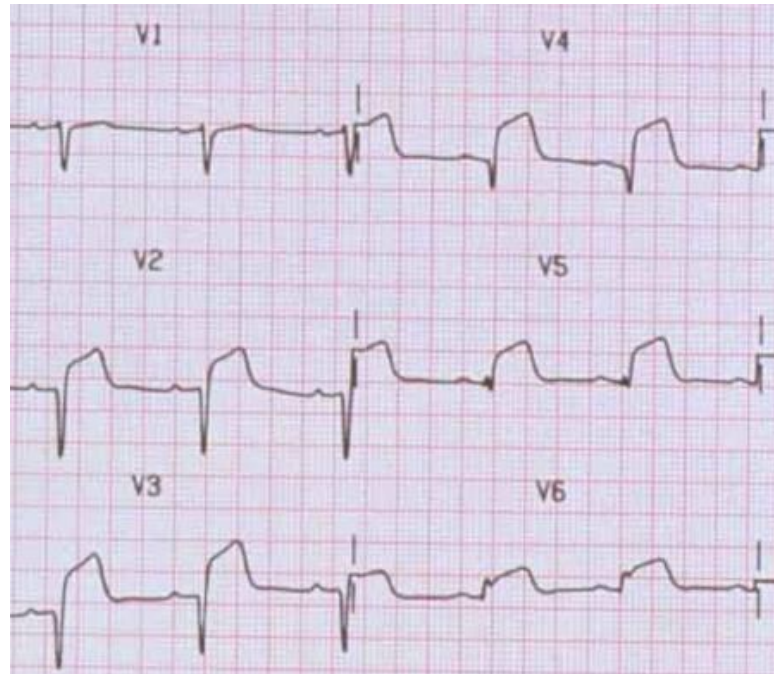


Delays to PCI in NSTEMI

Direct and IHT combined



Primary PCI



Primary PCI

Rx for STEMI (NHS centres)

- Funnel analysis for **TIMING DELAYS**
 - All units performing > 10 cases of PPCI
 - Patients with onset of symptoms in the community
 - Excludes patients in cardiogenic shock
 - Excludes those needing pre-PCI ventilation

PCI for Acute Sx

Variety of analysis methods

- Direct and Inter-hospital transfer (IHT)
 - Call to 'balloon' time as % < 150 min and as median times
 - Graphics: funnel, cf last year (plotted against vol and last yrs %)
 - Door to 'balloon' time as % < 90 min and as median times
 - Graphics: funnel, cf last year (plotted against vol and last yrs %)
 - Door to 'balloon' time as % < 60 min
- Direct only
 - Door to 'balloon' time as % < 90 min (and analysis of weekend delays)
 - Door to 'balloon' time as % < 60 min
- Median time delays
 - IHT v Direct admission

PCI for Acute Sx

Four admission scenarios

Admitted from
the community

Already
in hospital

Admission to
Non-PCI centre

Direct admission
to PCI centre

Transfer
to PCI centre

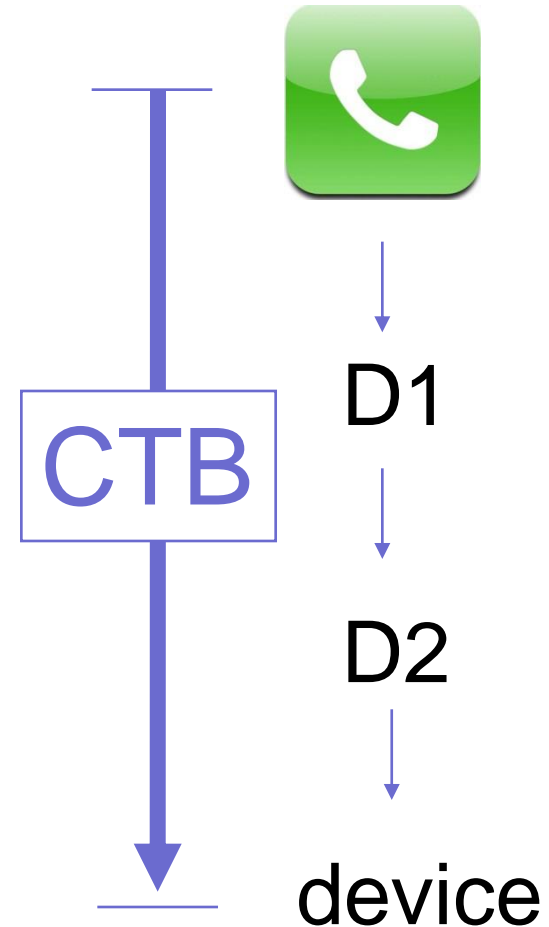
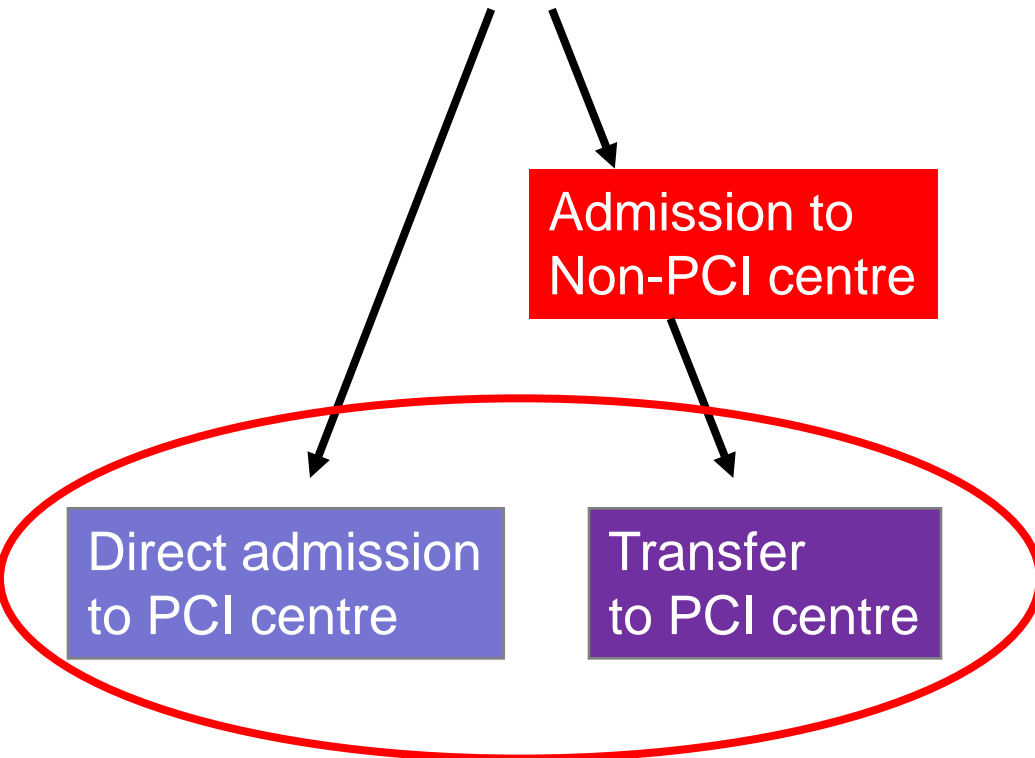
Hospital is a
PCI centre

Hospital is a
Non-PCI centre

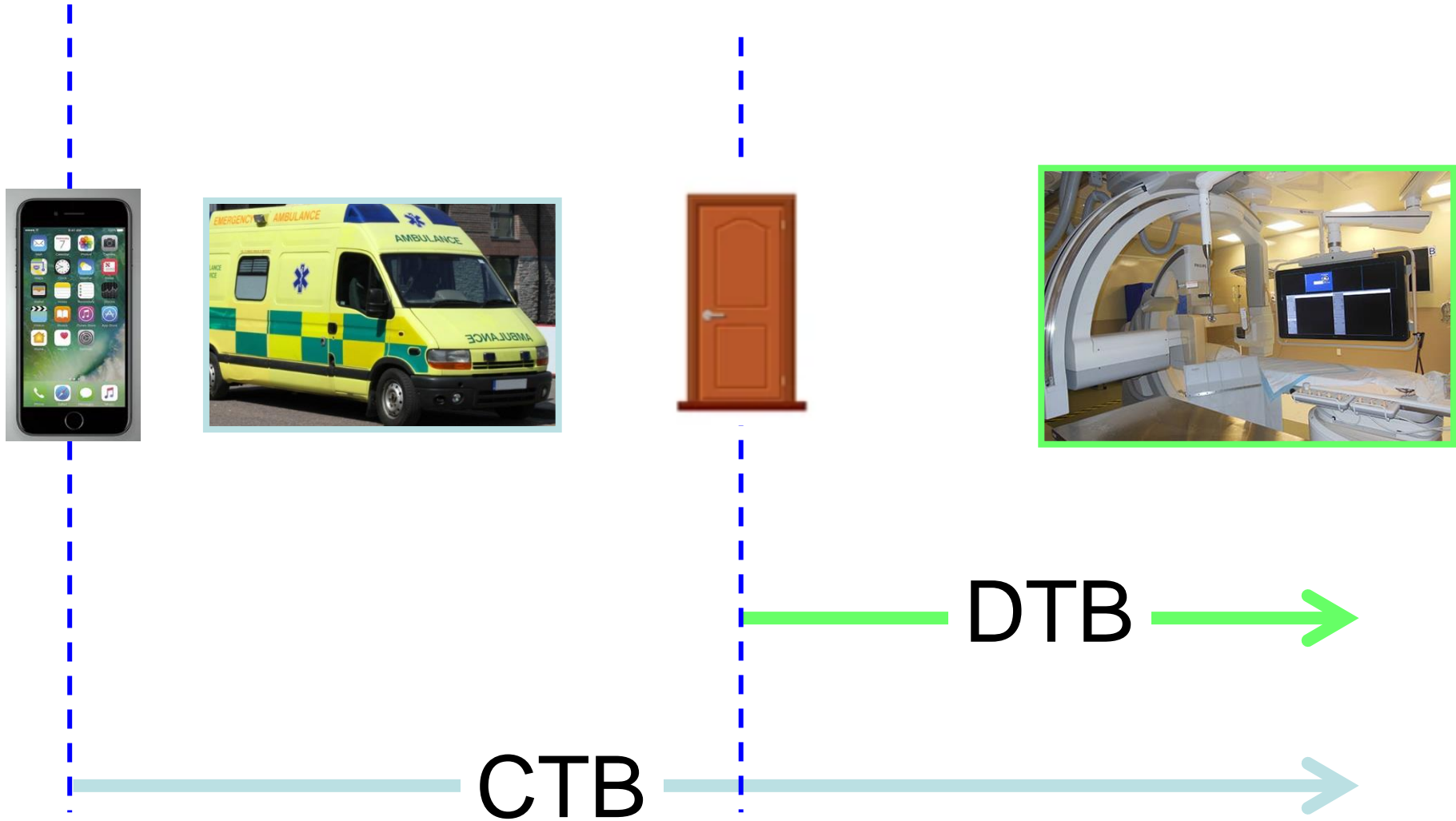
PCI for Acute Sx

Four admission scenarios

Admitted from
the community



Call and Door to 'Balloon'

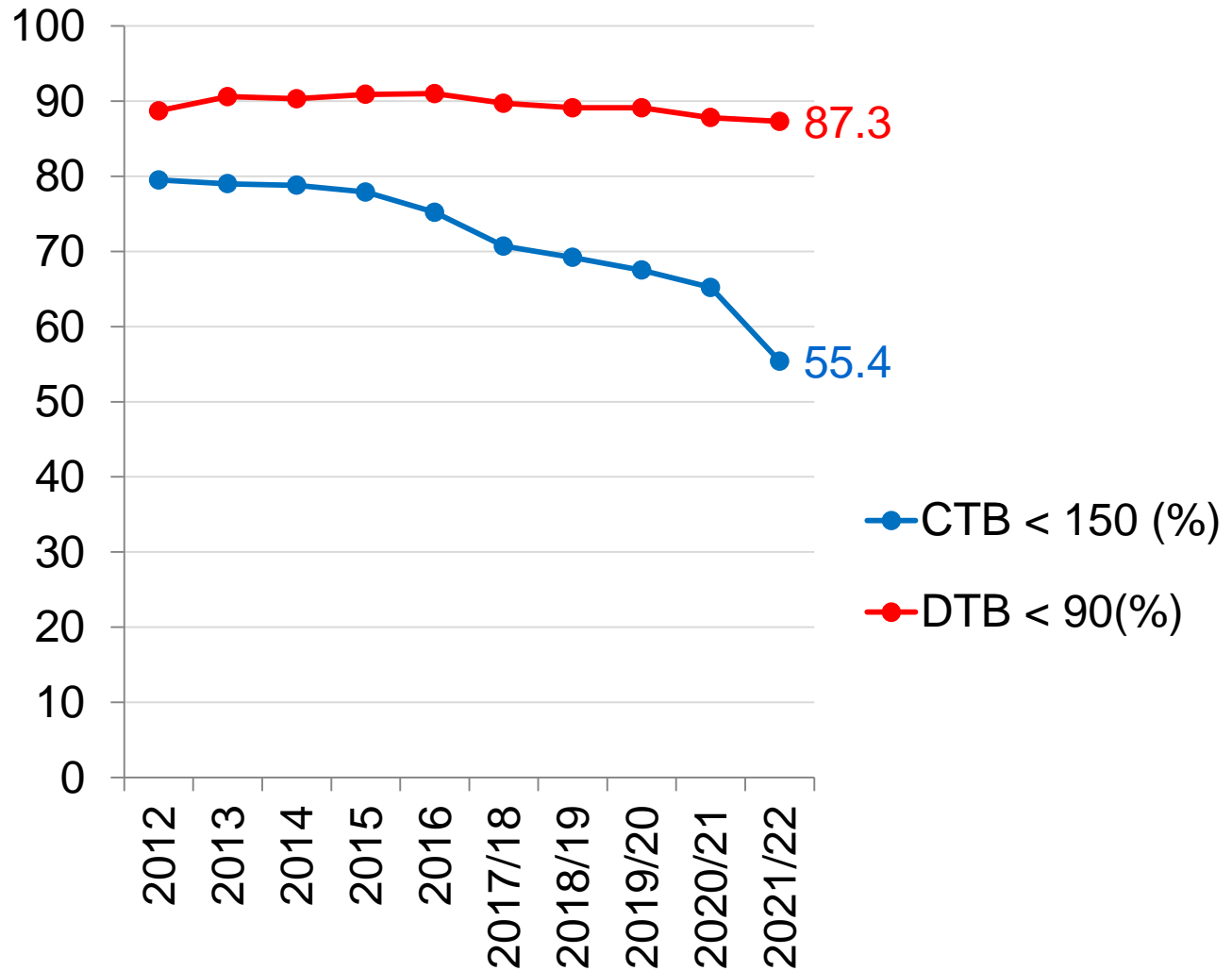


Primary PCI (excl shock/vent)

Direct and IHT

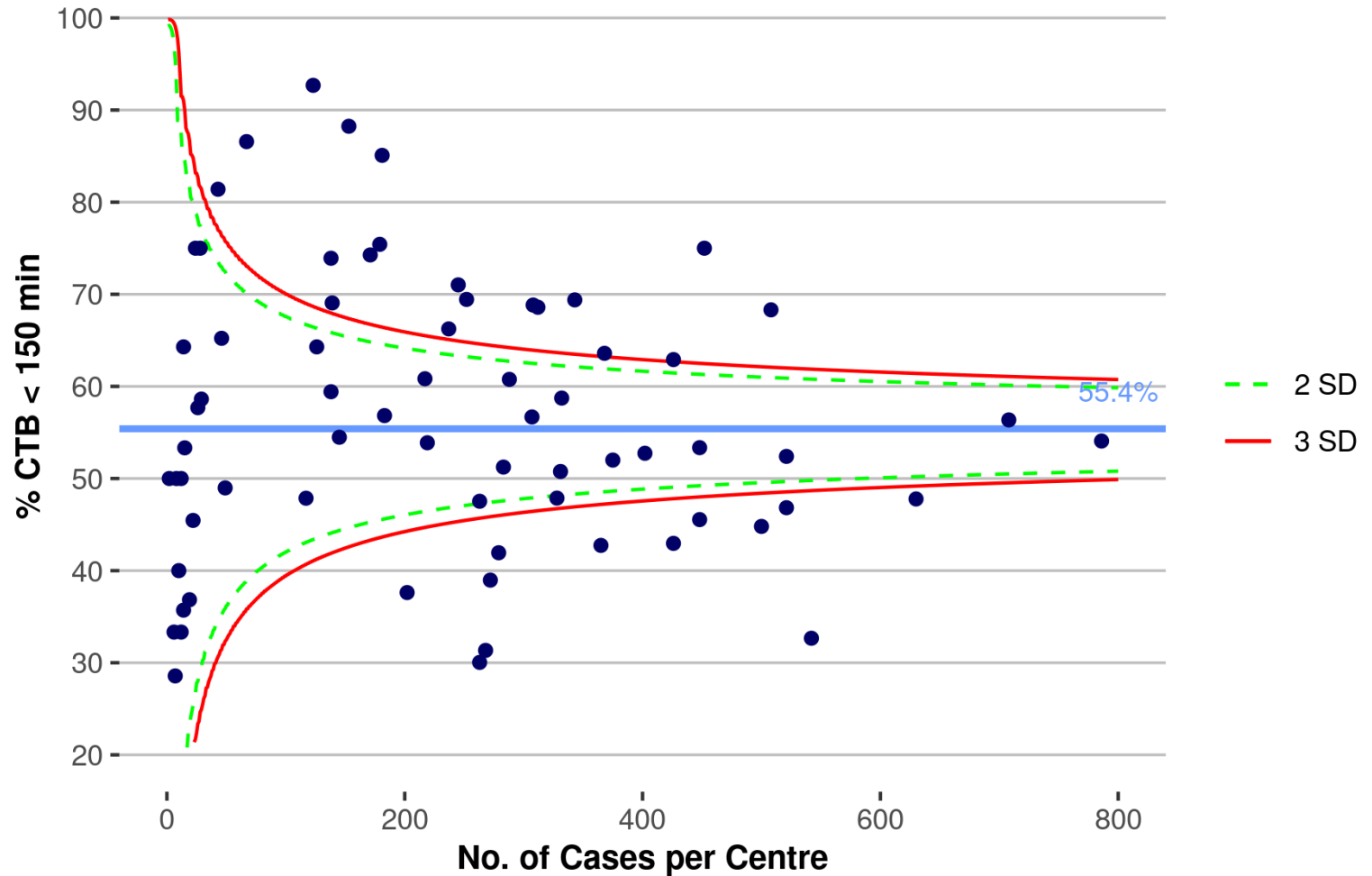


**% Patients
treated within
time limits**



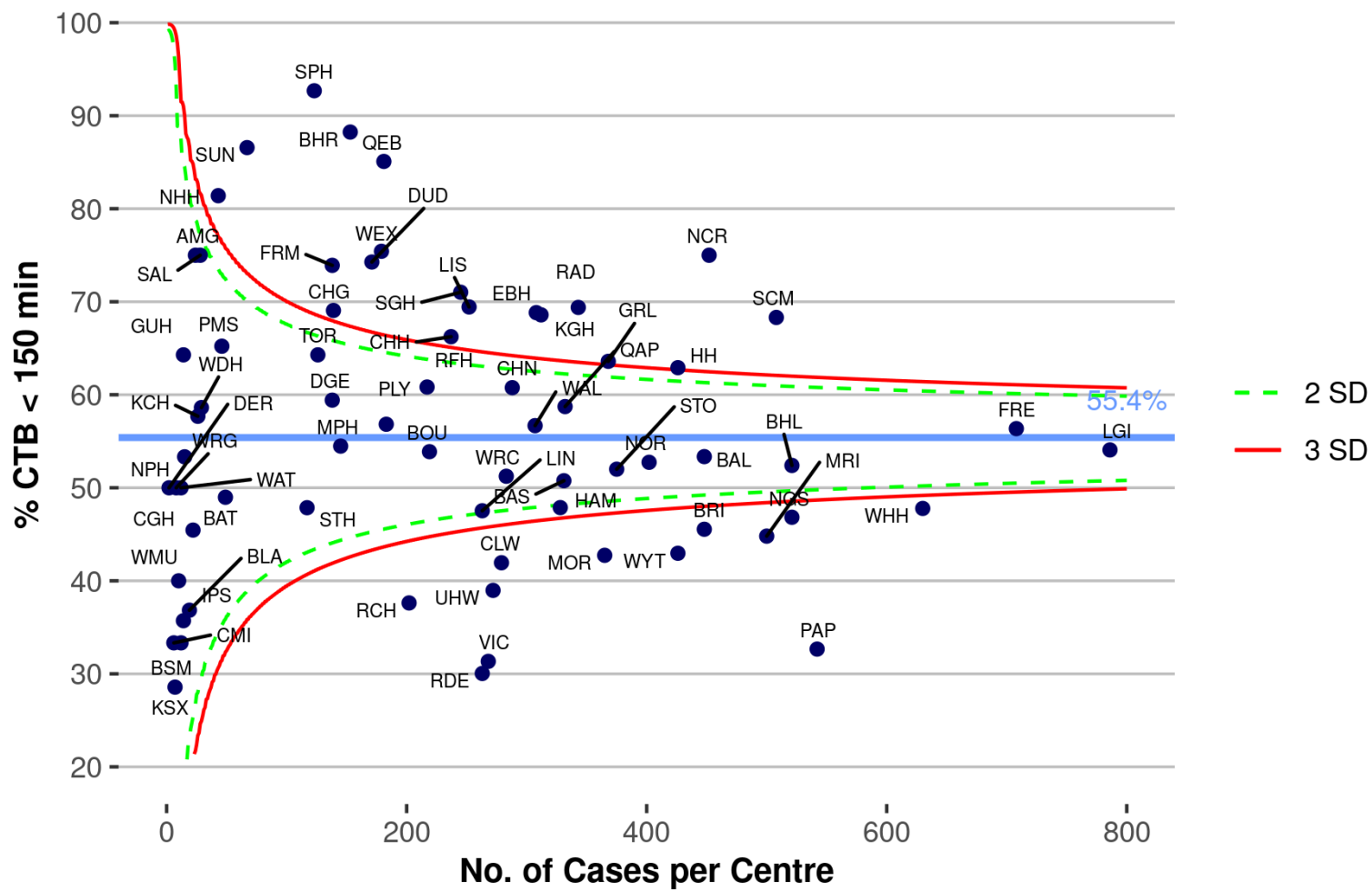
Primary PCI (excl shock/vent)

Direct and IHT: Call to Balloon times < 150 min



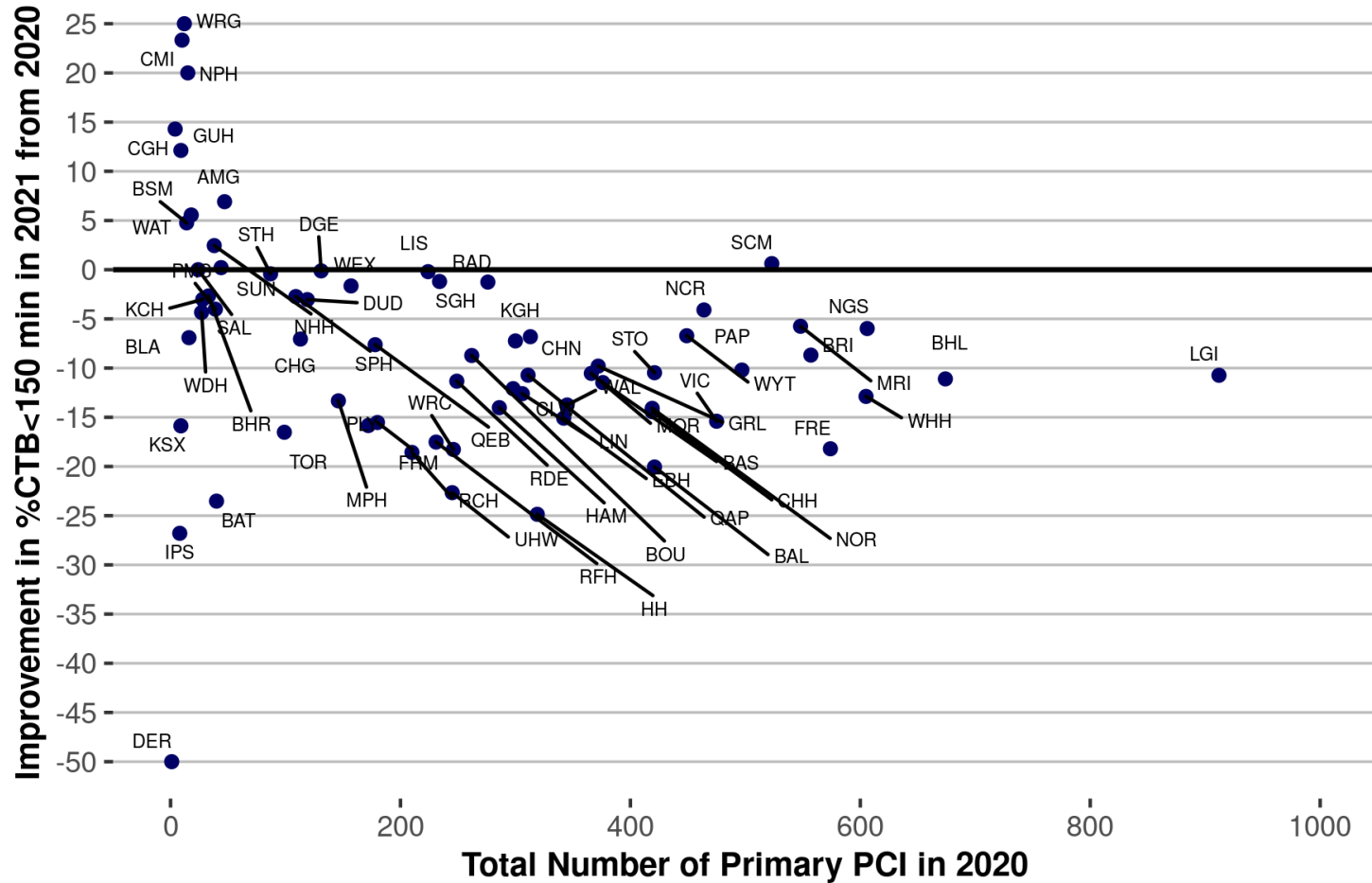
Primary PCI (excl shock/vent)

Direct and IHT: Call to Balloon times < 150 min



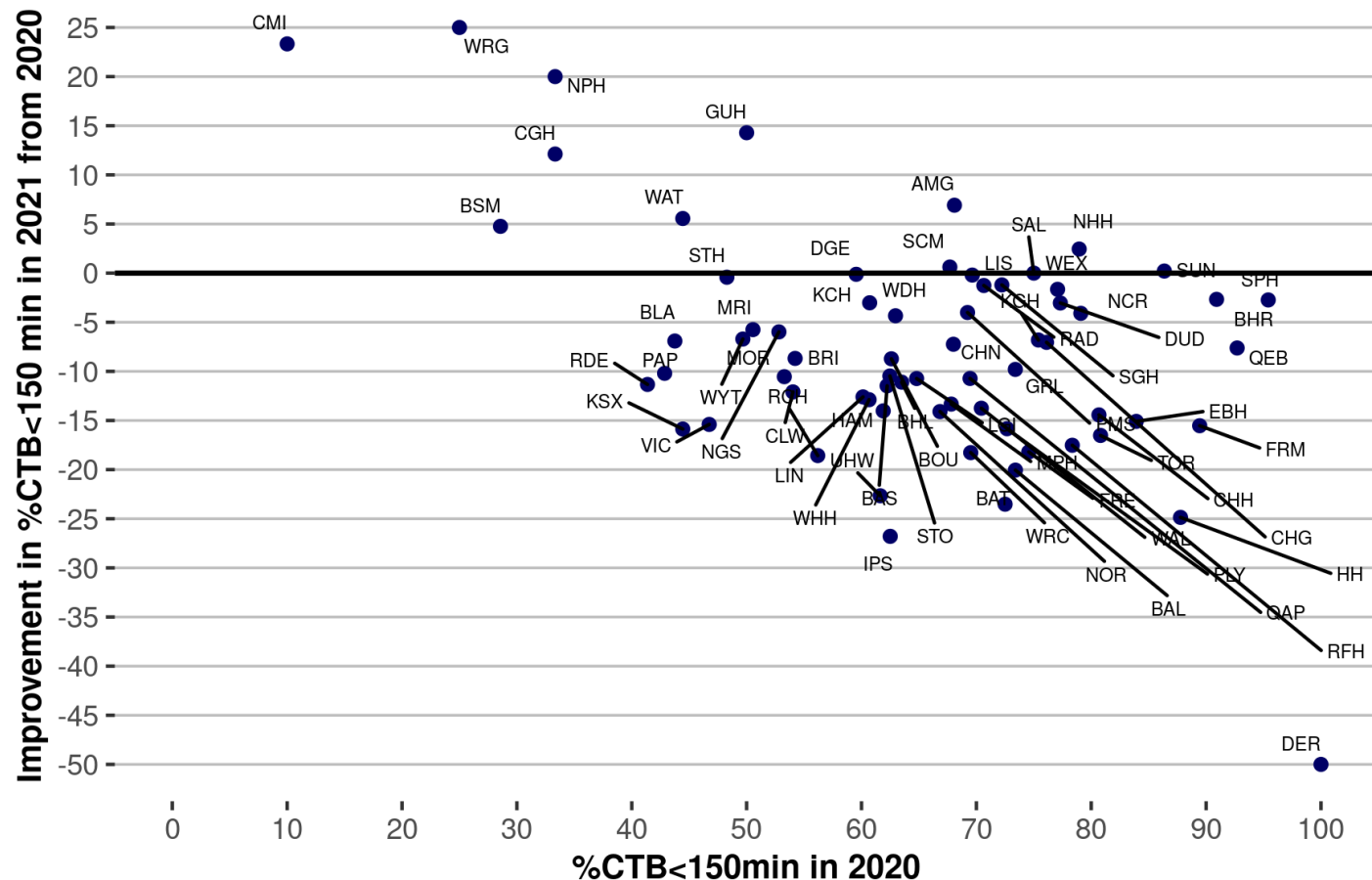
Primary PCI Changes (excl shock/vent)

Direct and IHT: CTB < 150 min



Primary PCI Changes (excl shock/vent)

Direct and IHT: CTB < 150 min

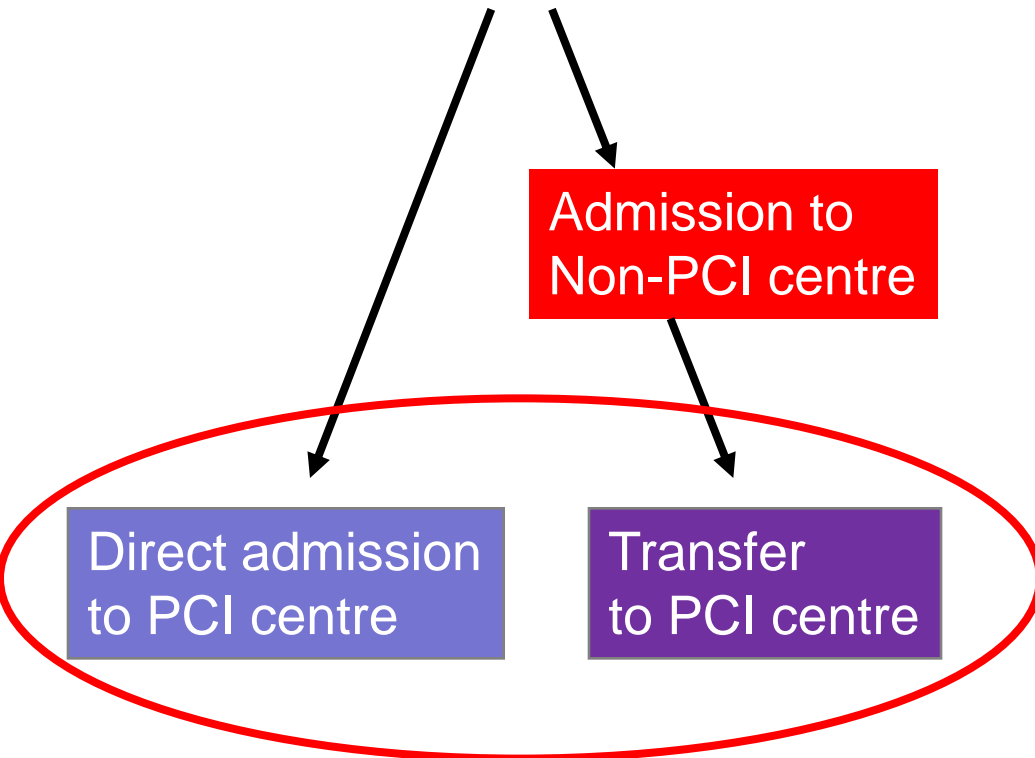


2020=2020/21 etc

PCI for Acute Sx

Four admission scenarios

Admitted from
the community



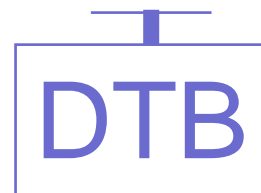
D1



D2

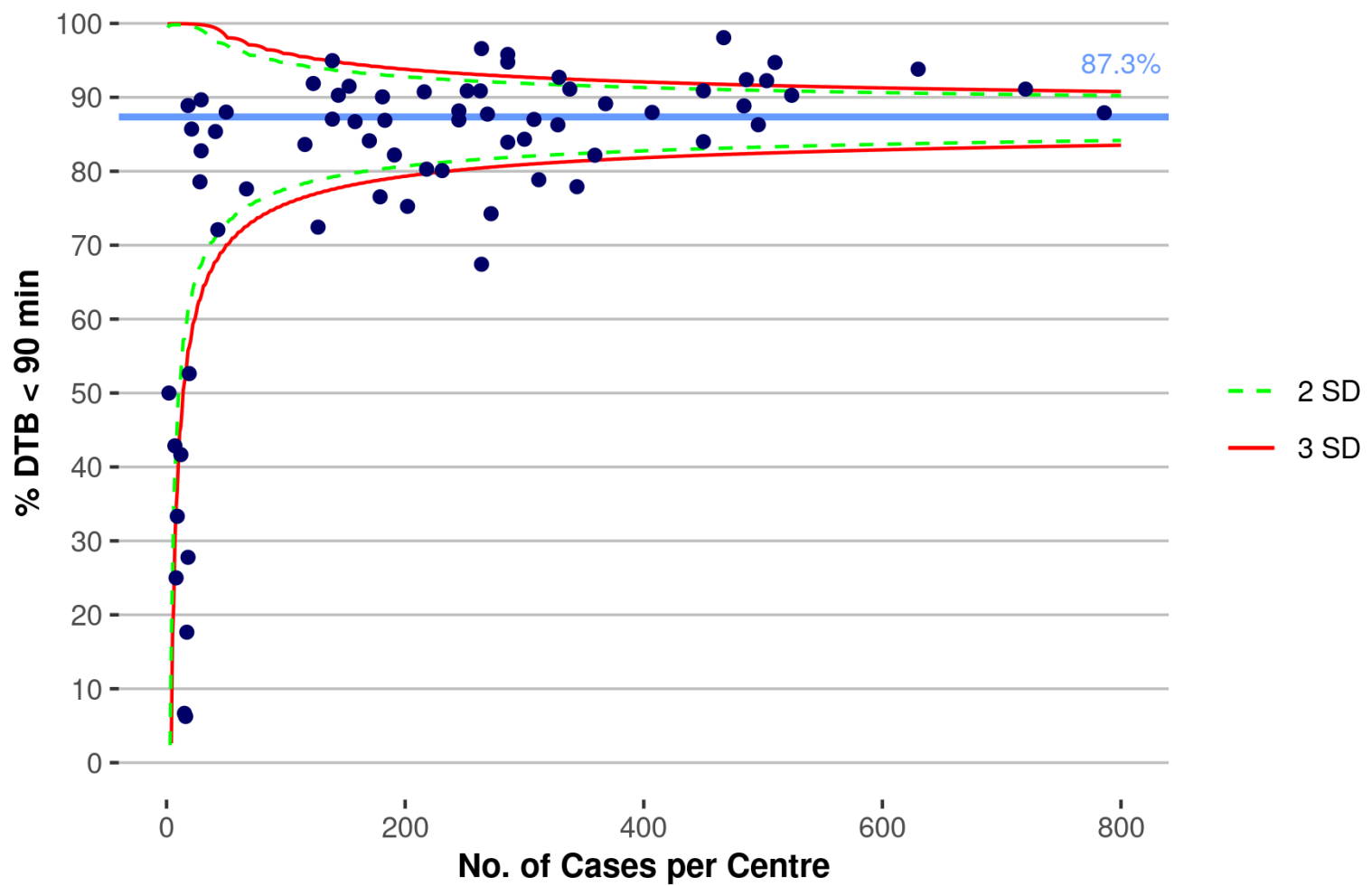


device



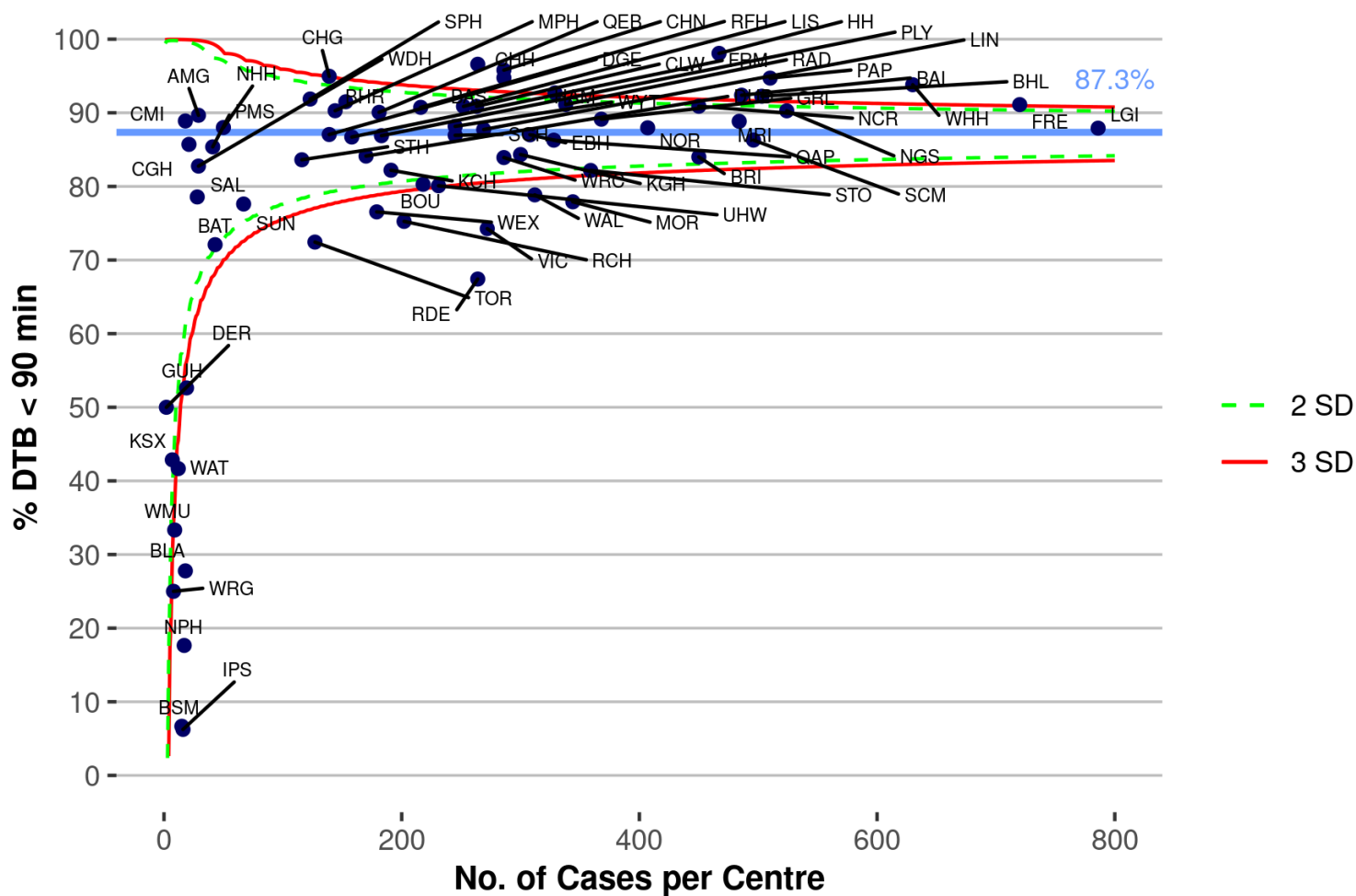
Primary PCI (excl shock/vent)

Direct and IHT: Door to Balloon < 90 min



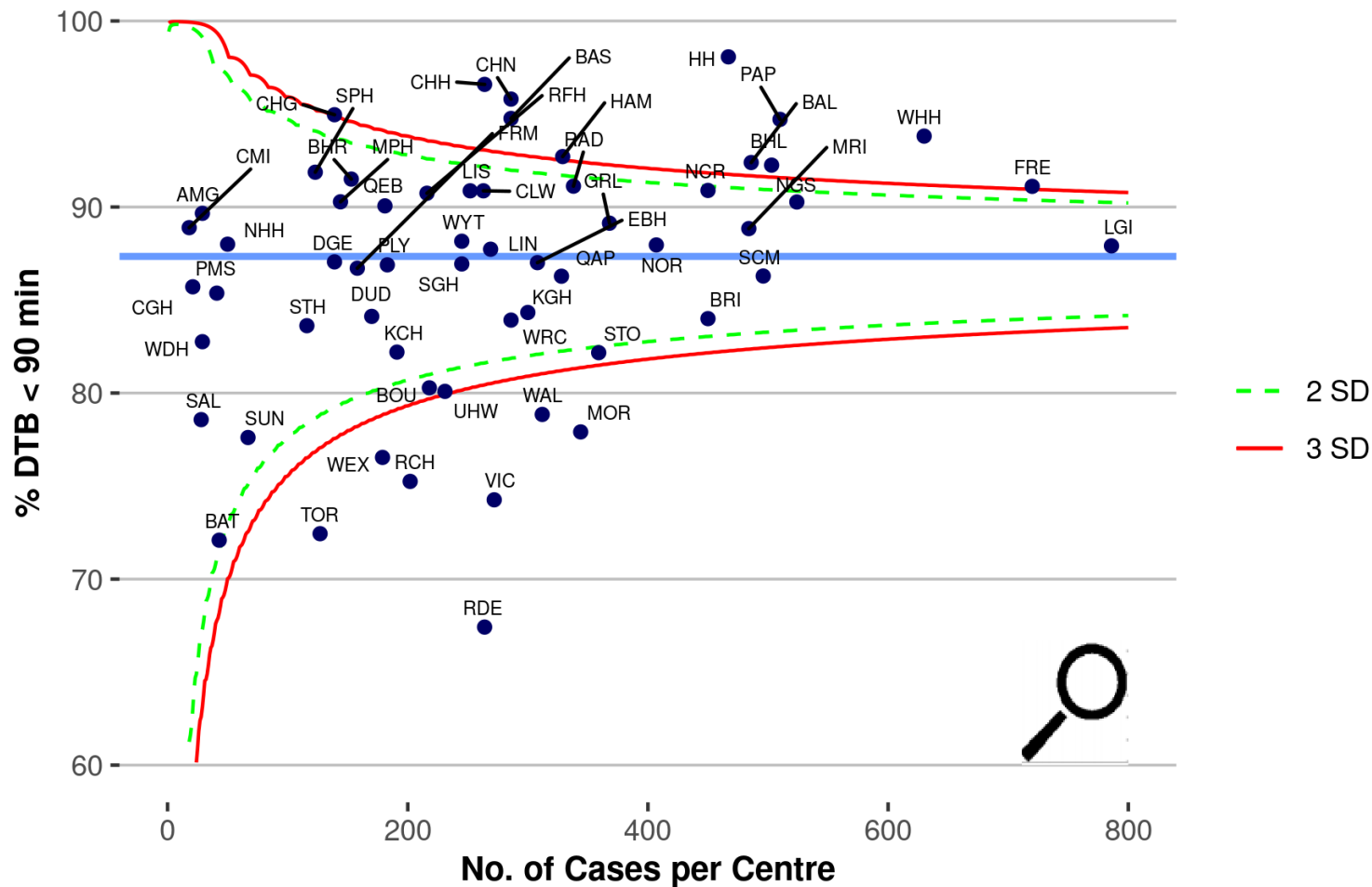
Primary PCI (excl shock/vent)

Direct and IHT: Door to Balloon < 90 min



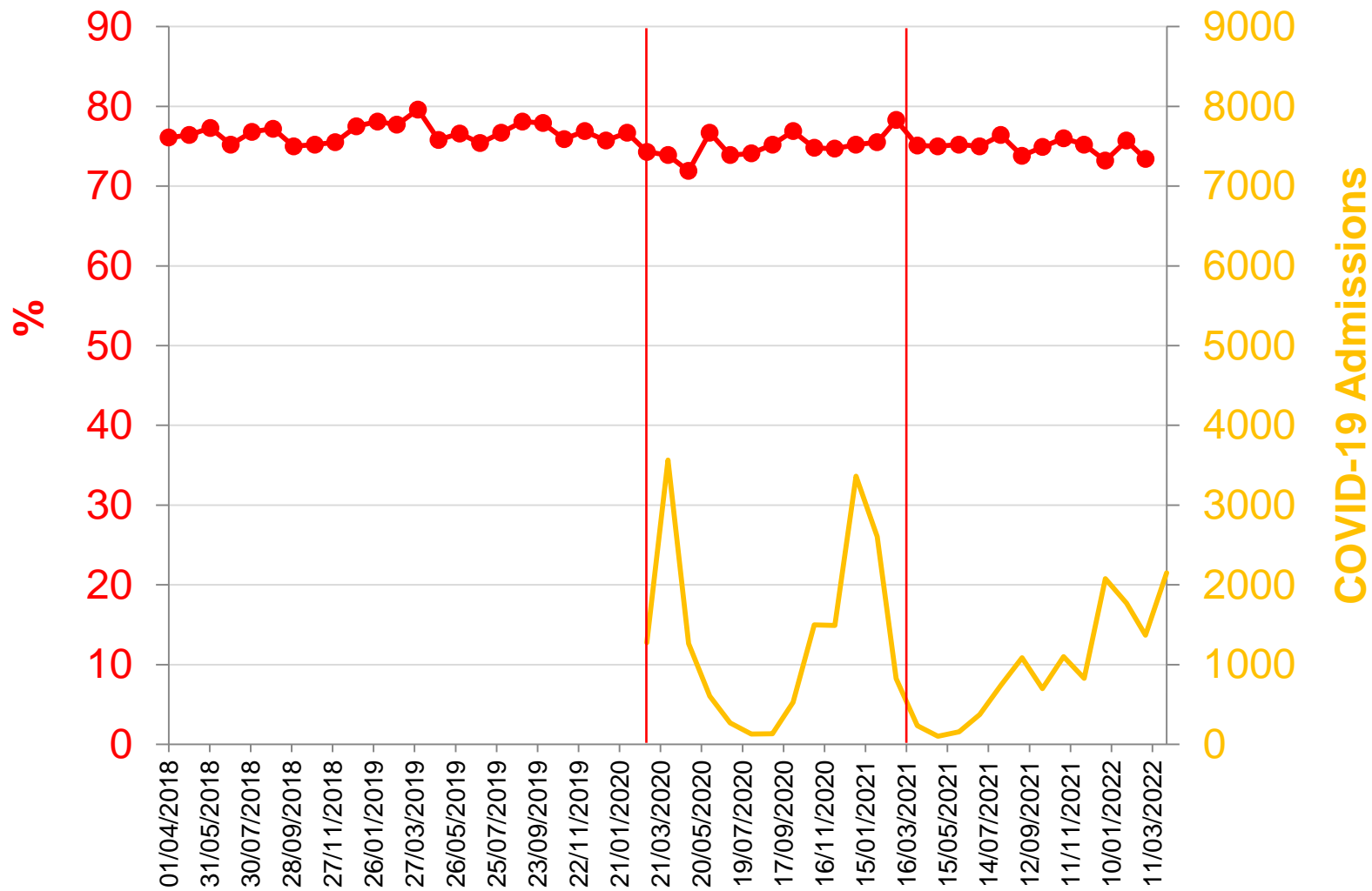
Primary PCI (excl shock/vent)

Direct and IHT: Door to Balloon < 90 min



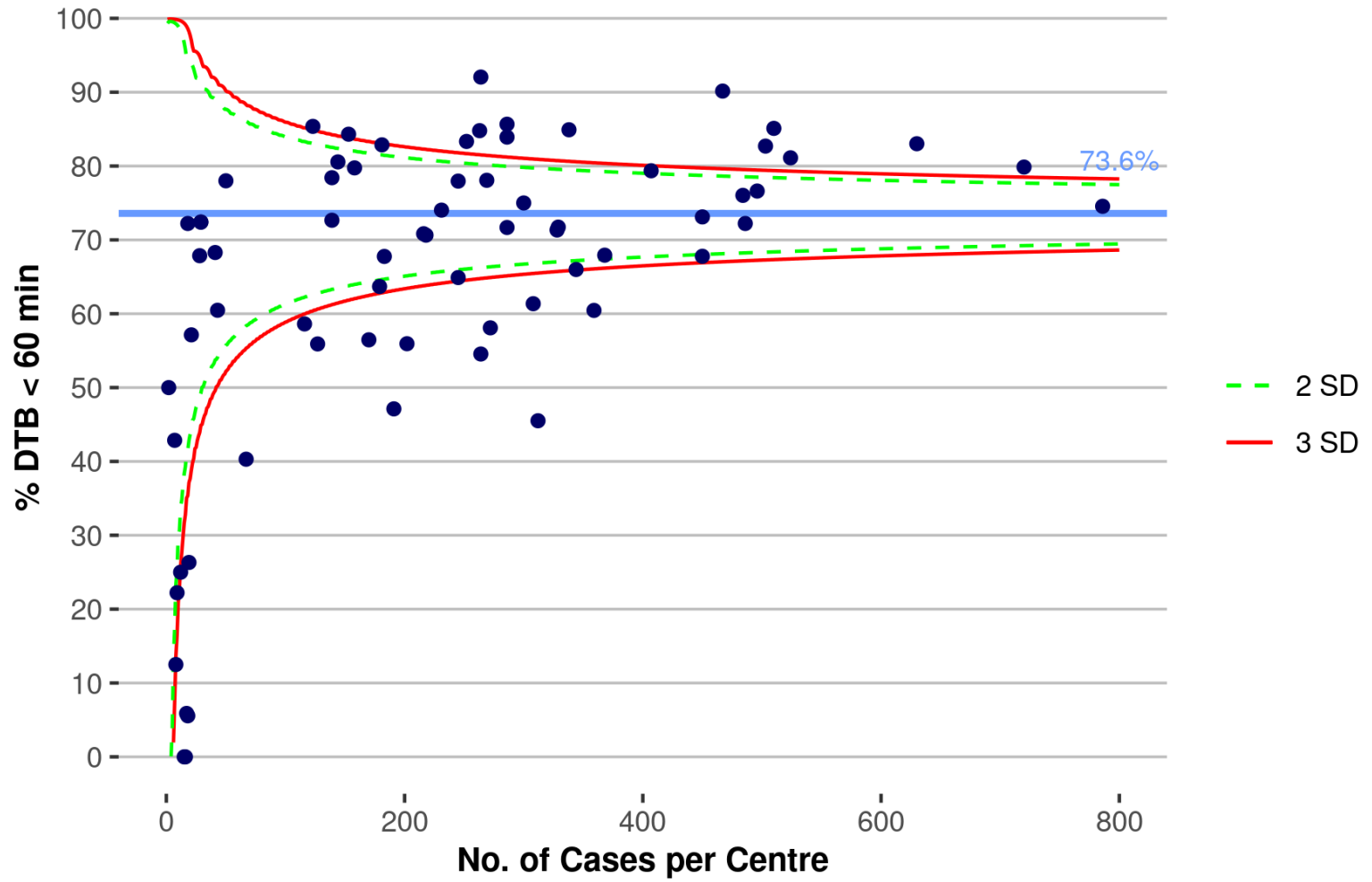
Primary PCI (excl shock/vent)

Direct and IHT: DTB < 60 min



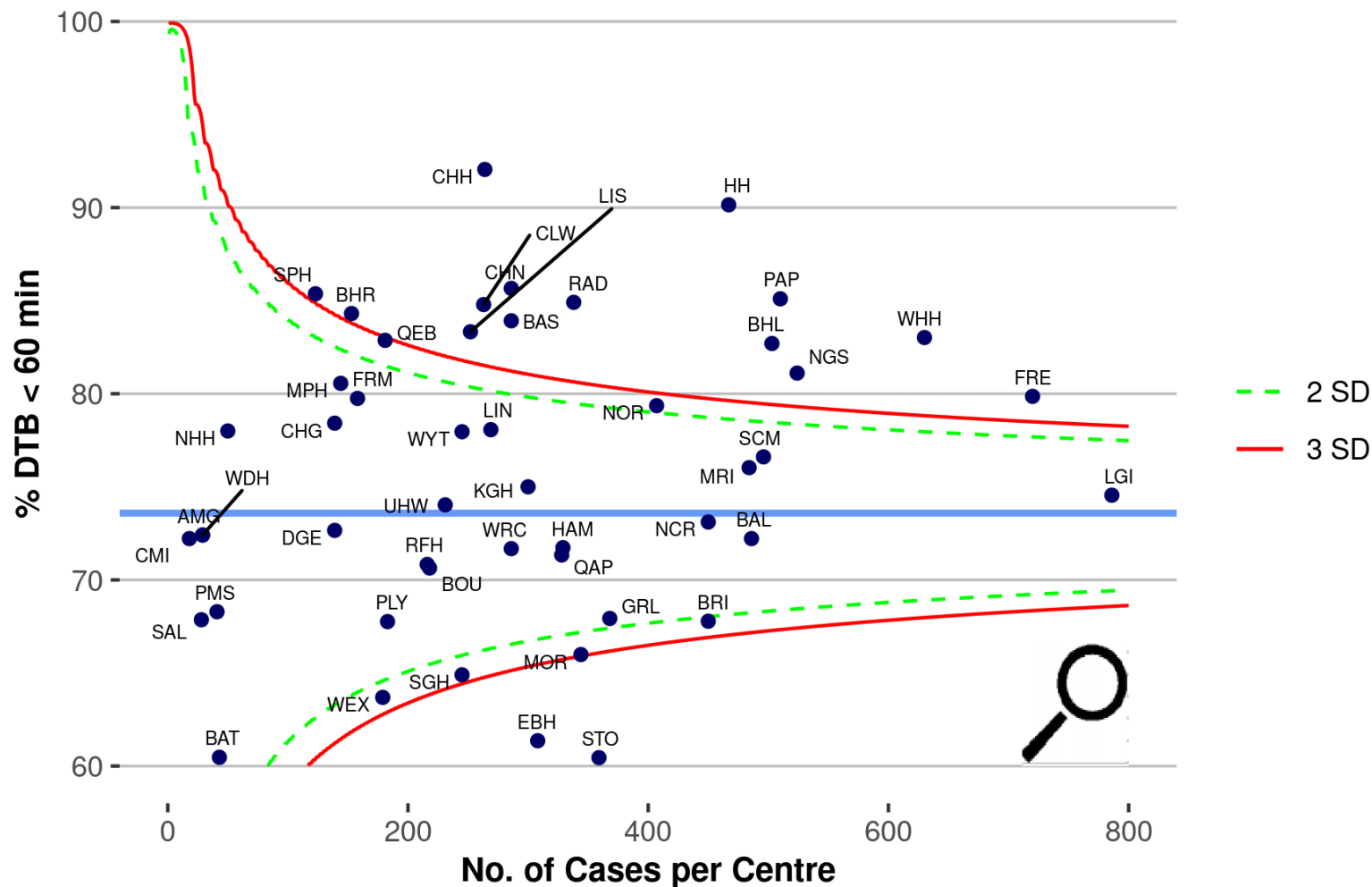
Primary PCI (excl shock/vent)

Direct and IHT: PCI Door to Balloon < 60 min



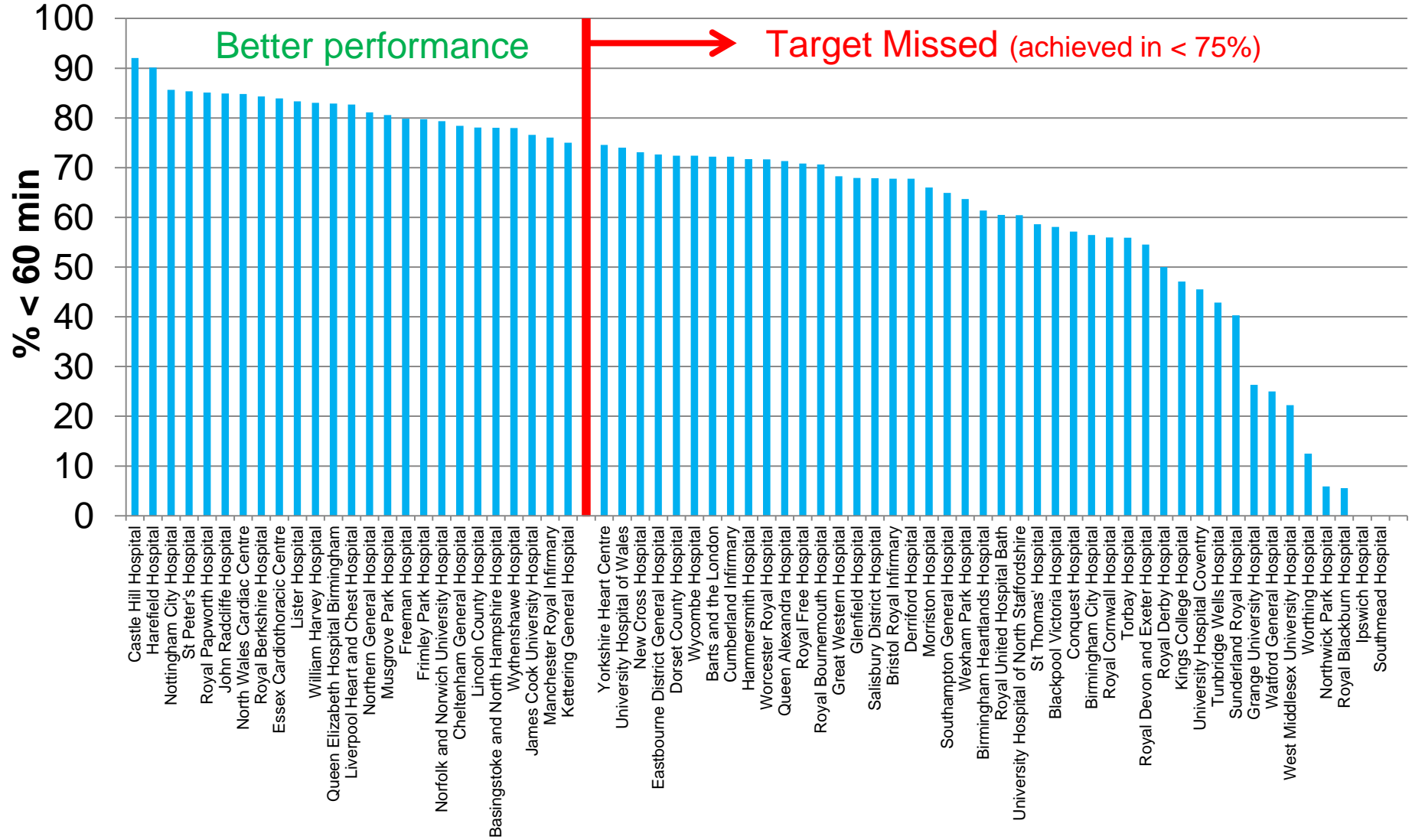
Primary PCI (excl shock/vent)

Direct and IHT: PCI Door to Balloon < 60 min



Primary PCI (excl shock/vent)

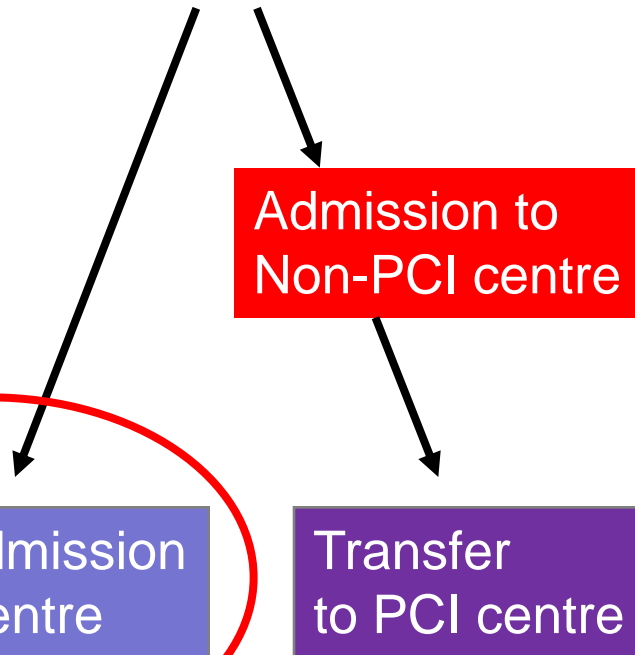
Direct and IHT: PCI Door to Balloon < 60 min (E&W)



PCI for Acute Sx

Four admission scenarios

Admitted from
the community



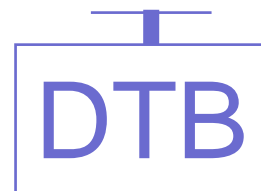
D1



D2

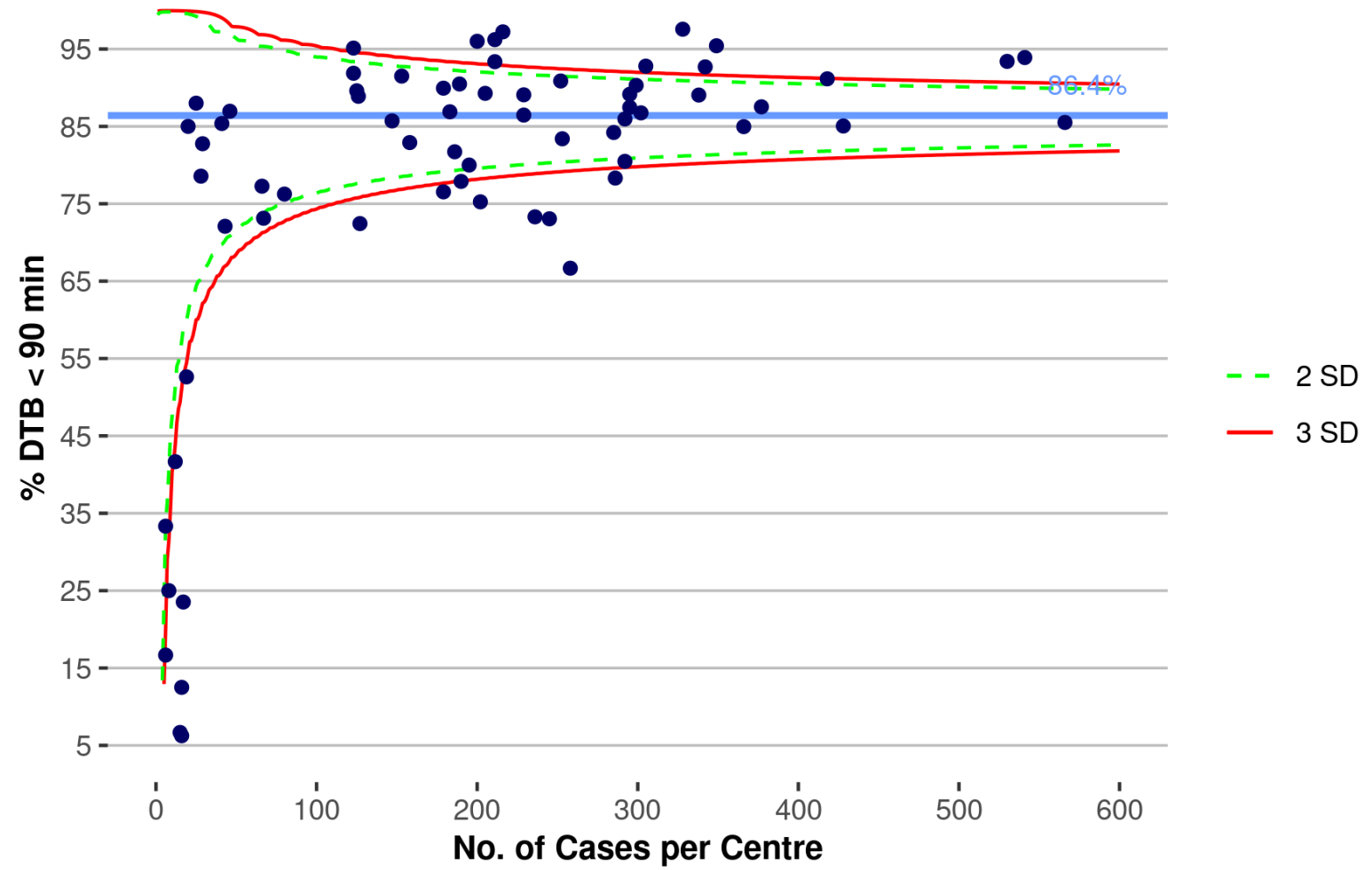


device



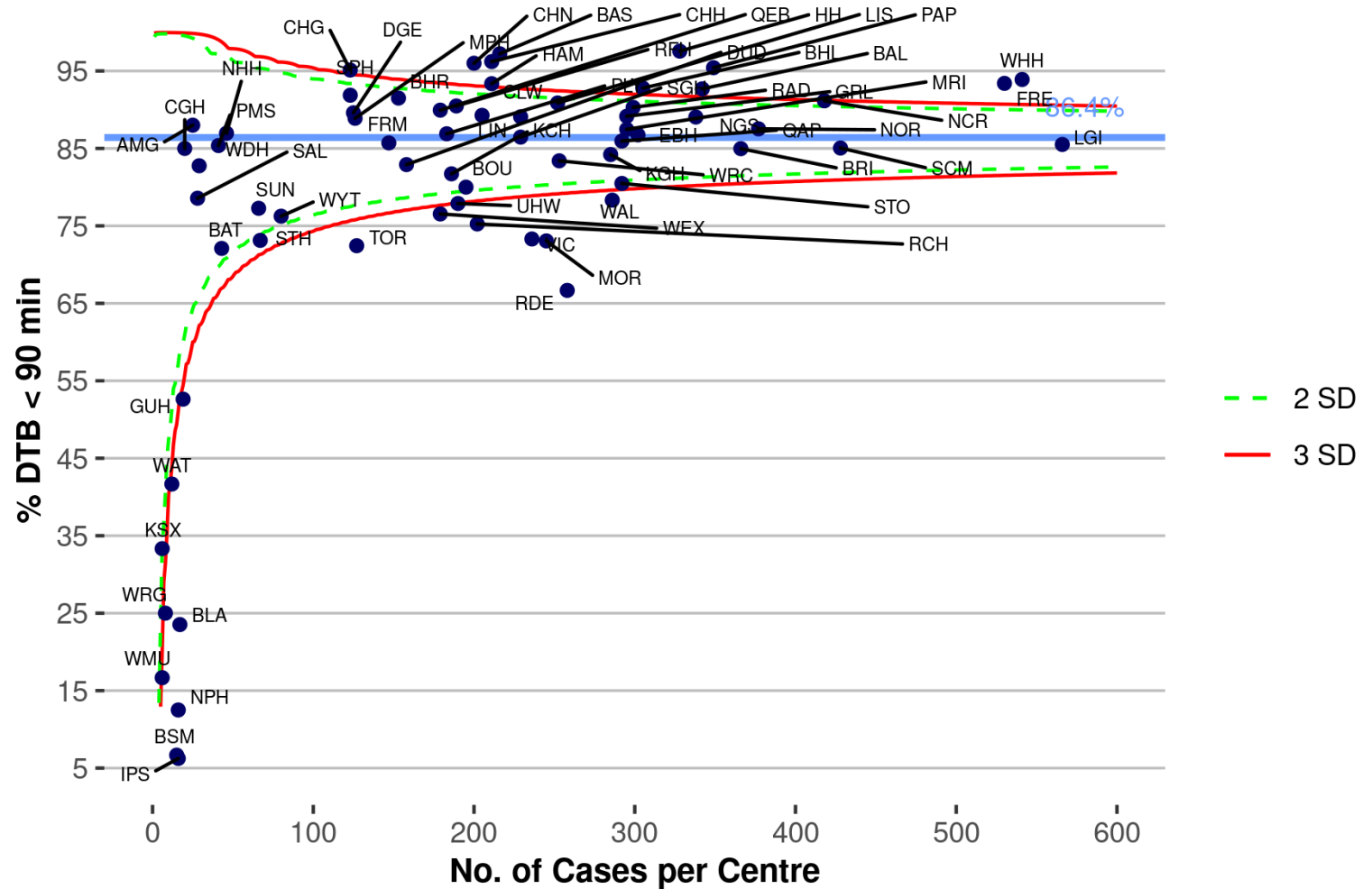
Primary PCI (excl shock/vent)

Direct ONLY: PCI Door to Balloon < 90 min



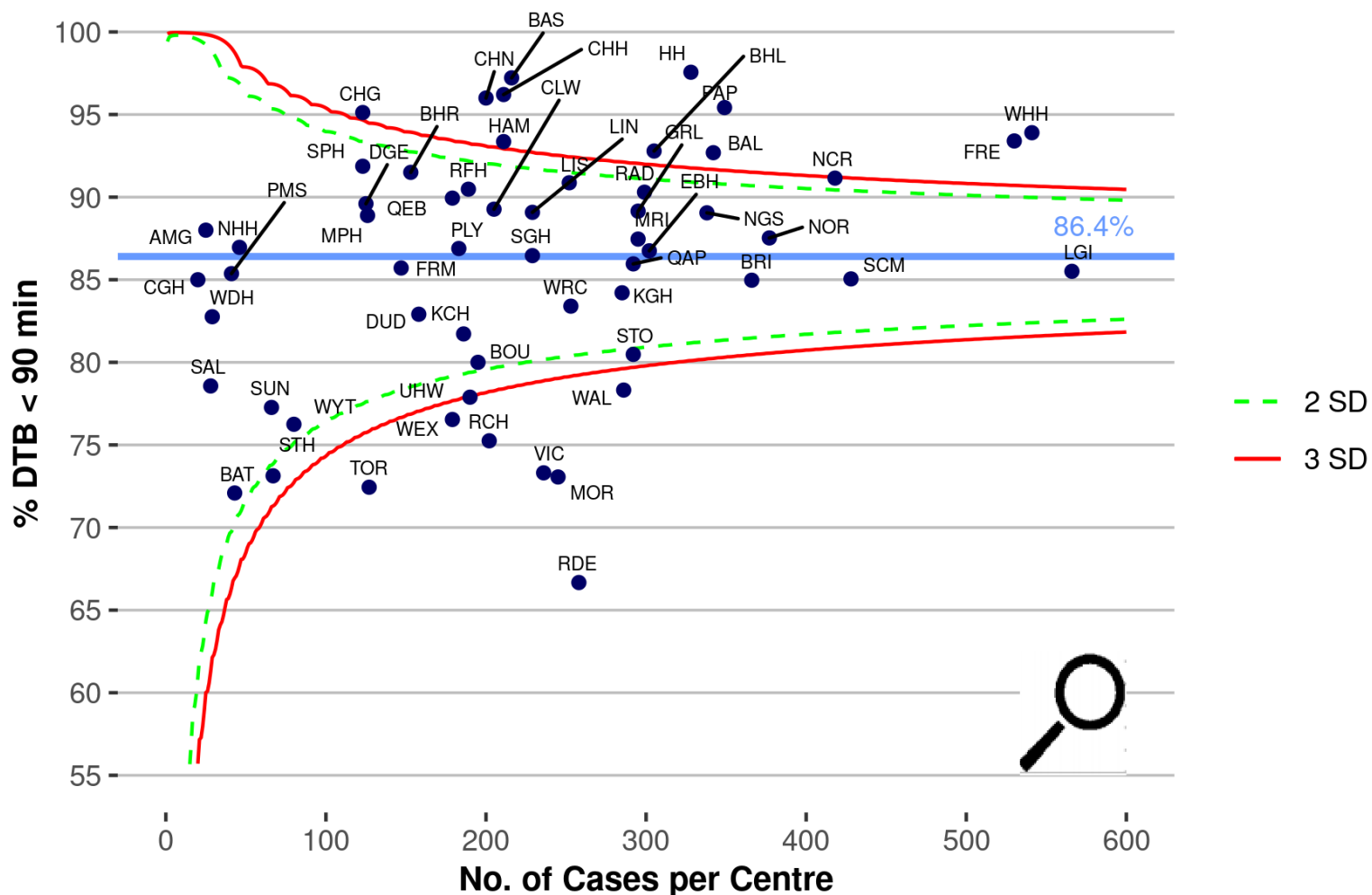
Primary PCI (excl shock/vent)

Direct ONLY: PCI Door to Balloon < 90 min



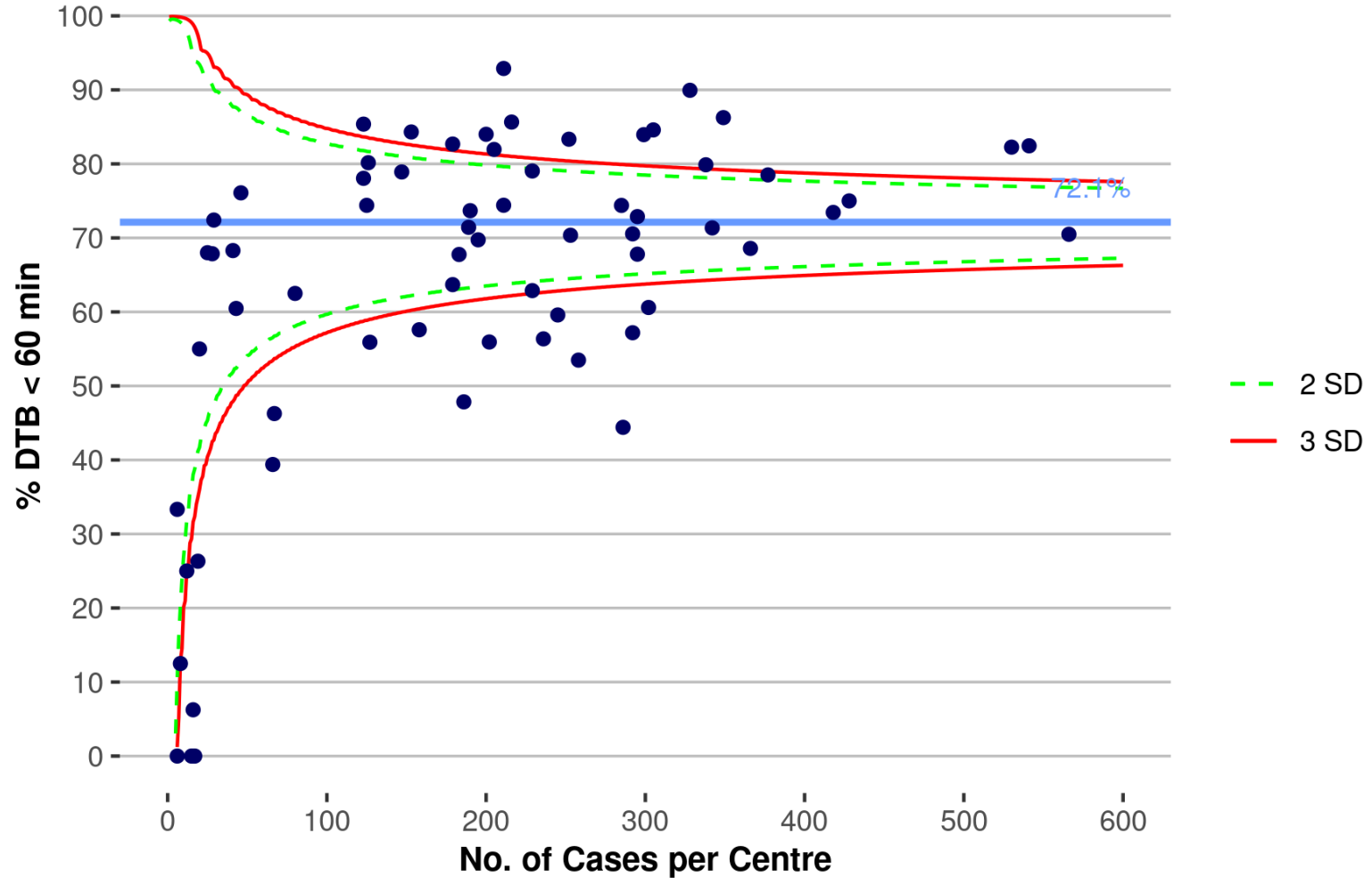
Primary PCI (excl shock/vent)

Direct ONLY: PCI Door to Balloon < 90 min



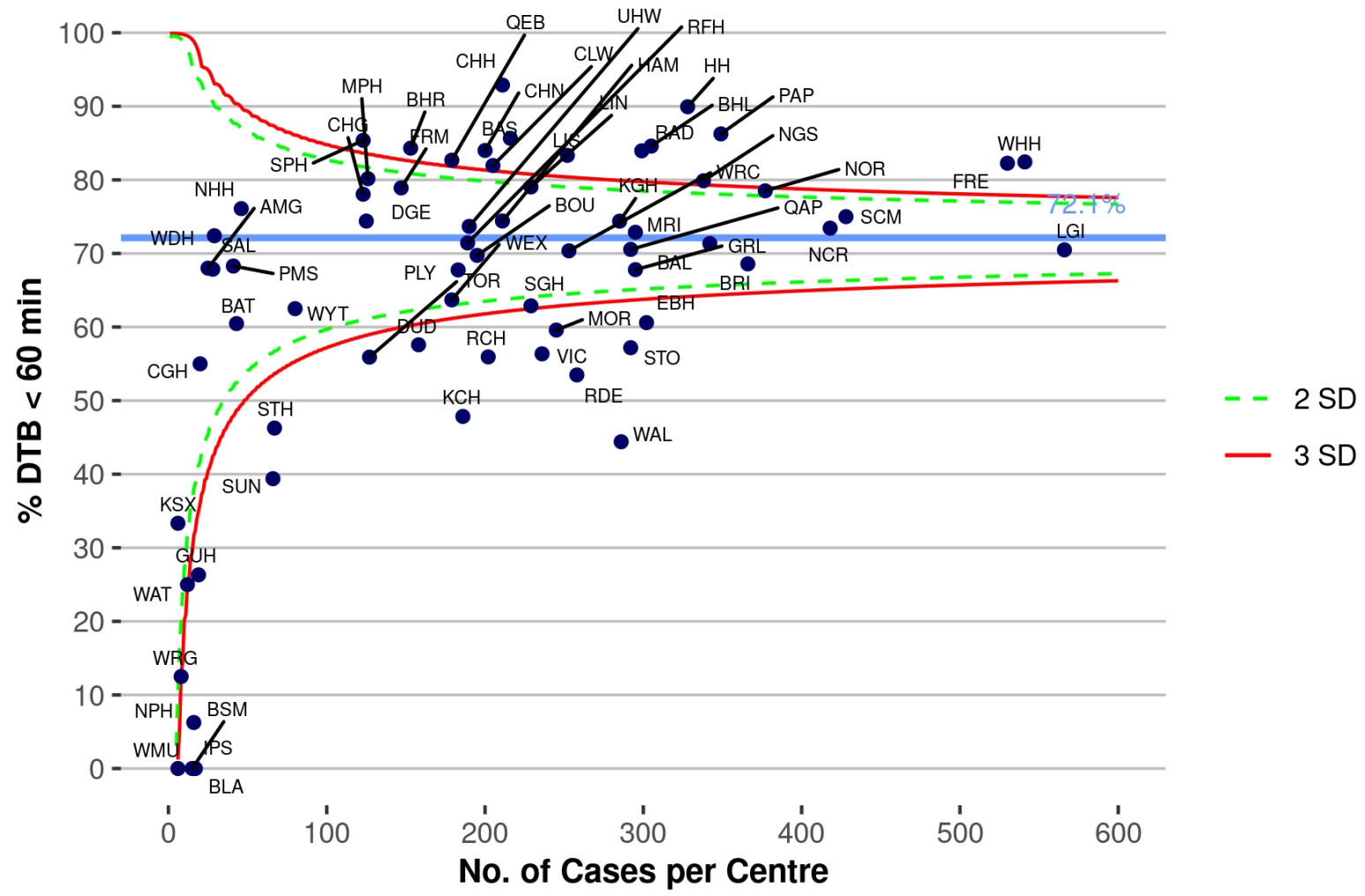
Primary PCI (excl shock/vent)

Direct only : PCI Door to Balloon < 60 min



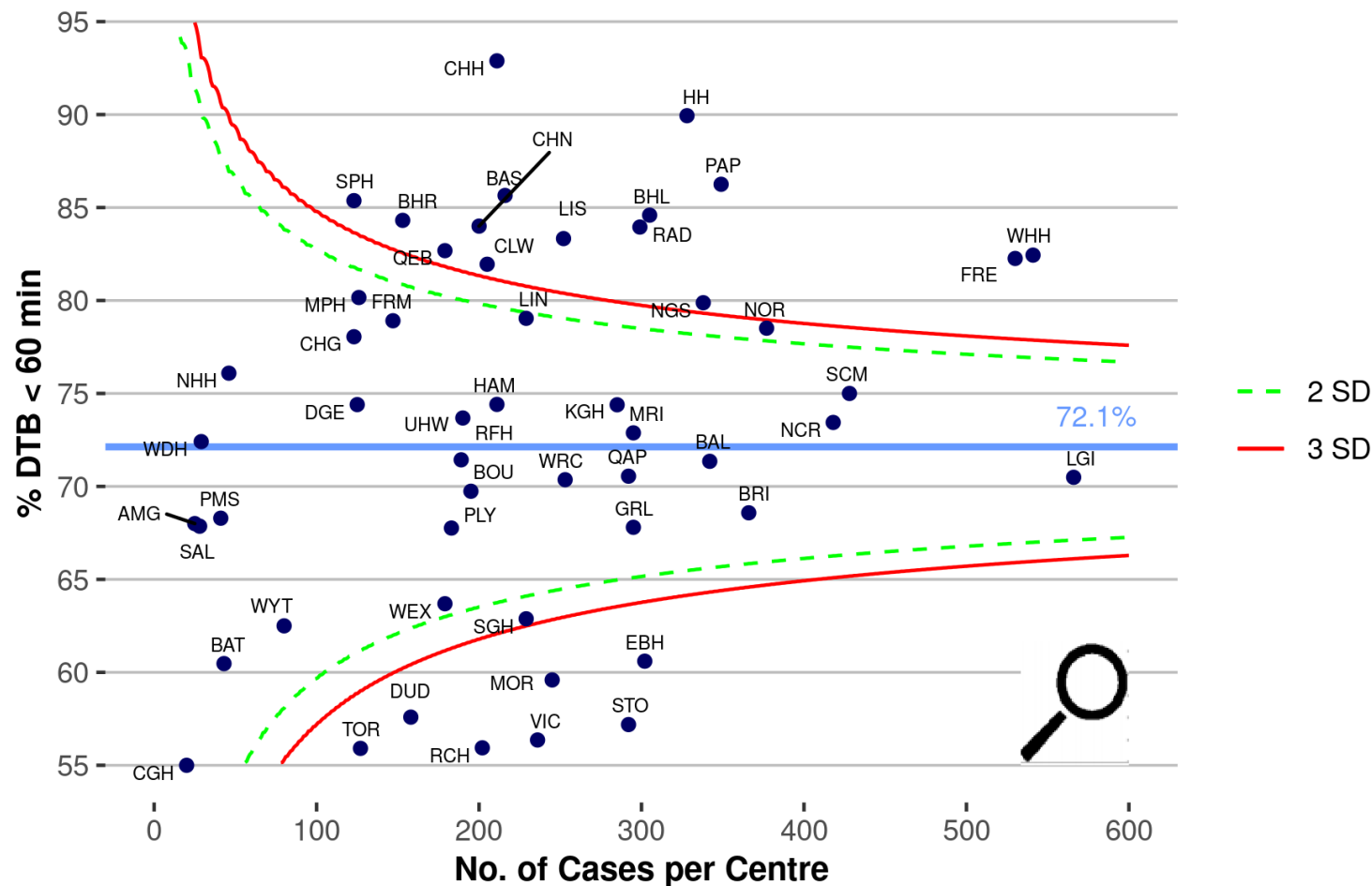
Primary PCI (excl shock/vent)

Direct only : PCI Door to Balloon < 60 min



Primary PCI (excl shock/vent)

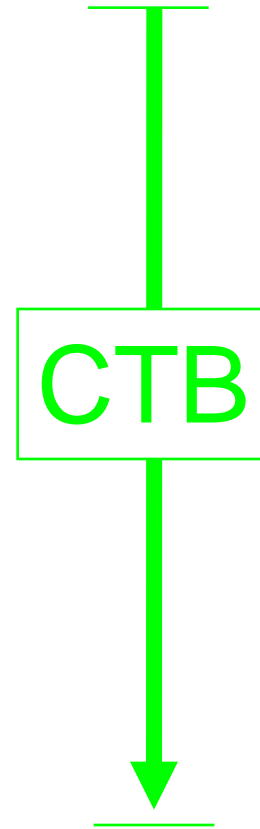
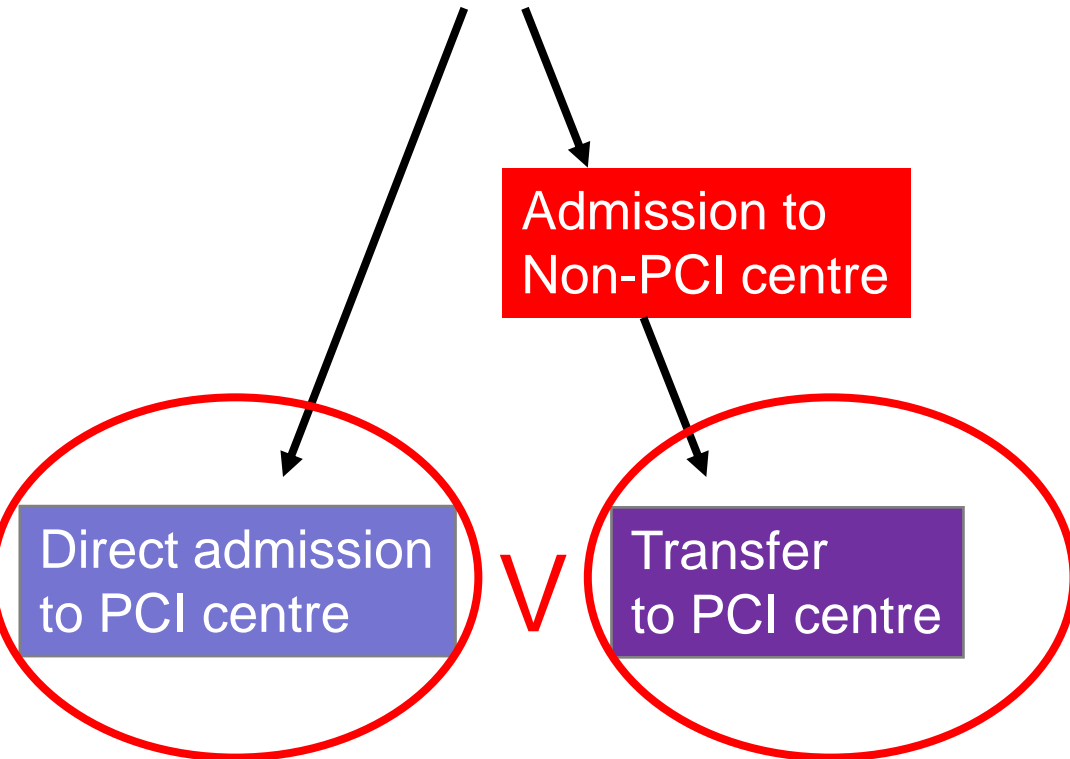
Direct only : PCI Door to Balloon < 60 min



PCI for Acute Sx

Four admission scenarios

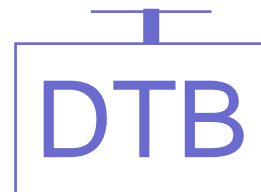
Admitted from the community



D1

D2

device



Interhospital transfer



Self Presenters



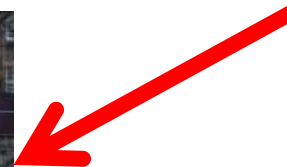
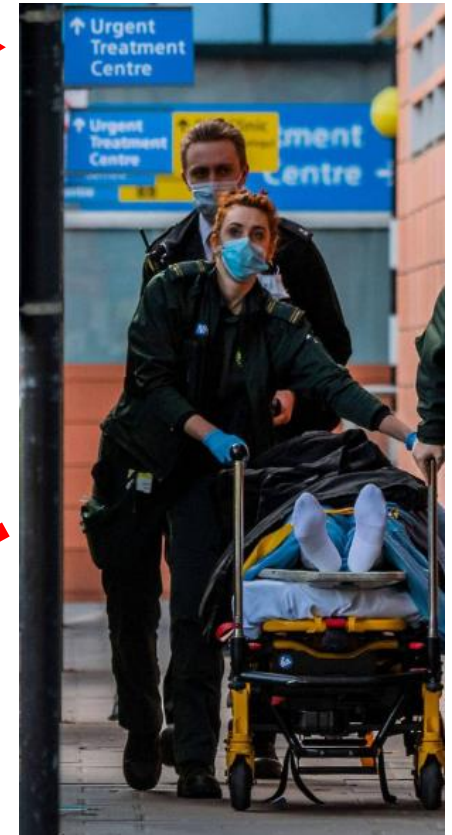
'Wrong'
Hospital



Interhospital transfer

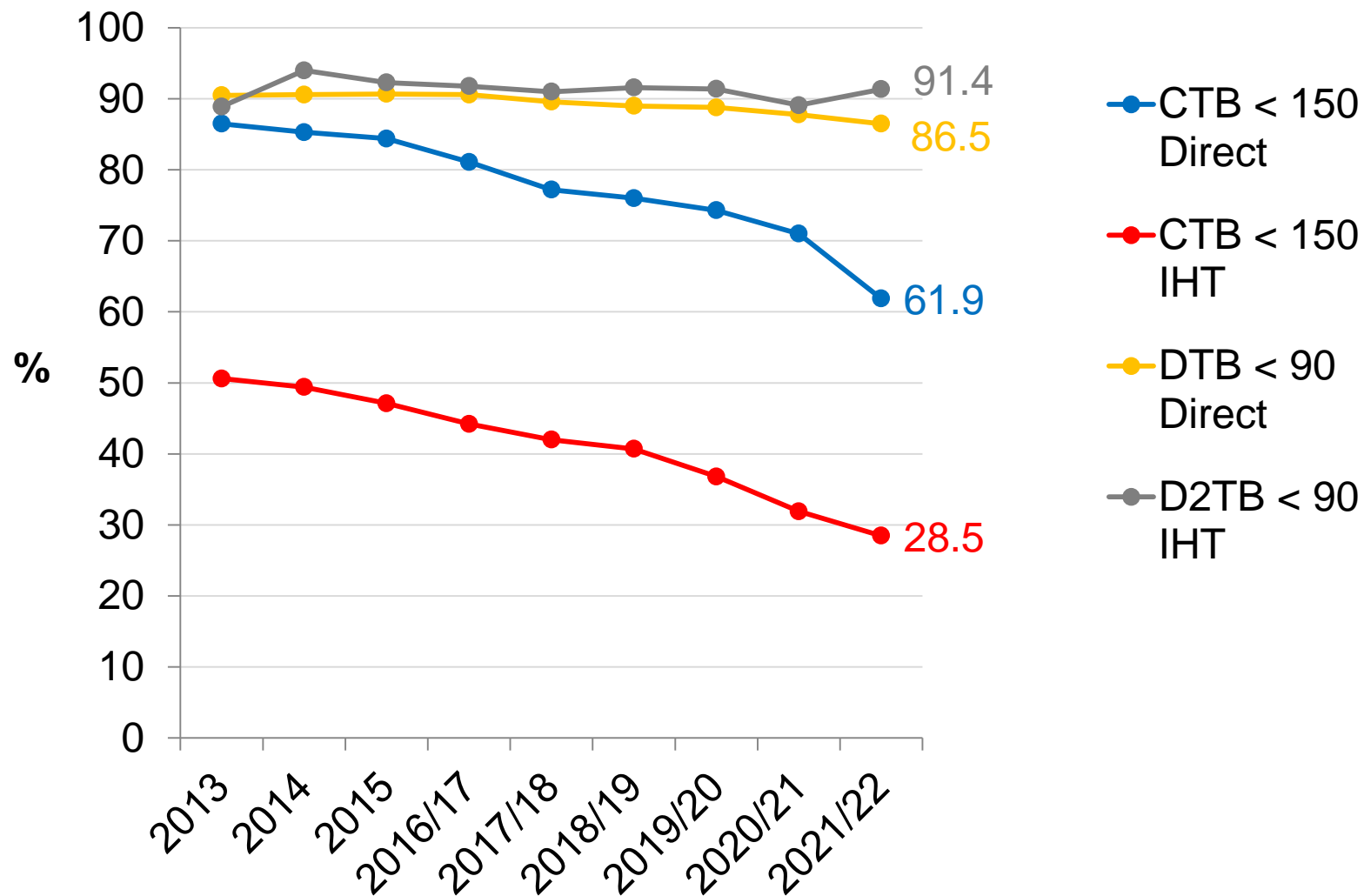


'Wrong'
Hospital



Primary PCI (excl shock/vent)

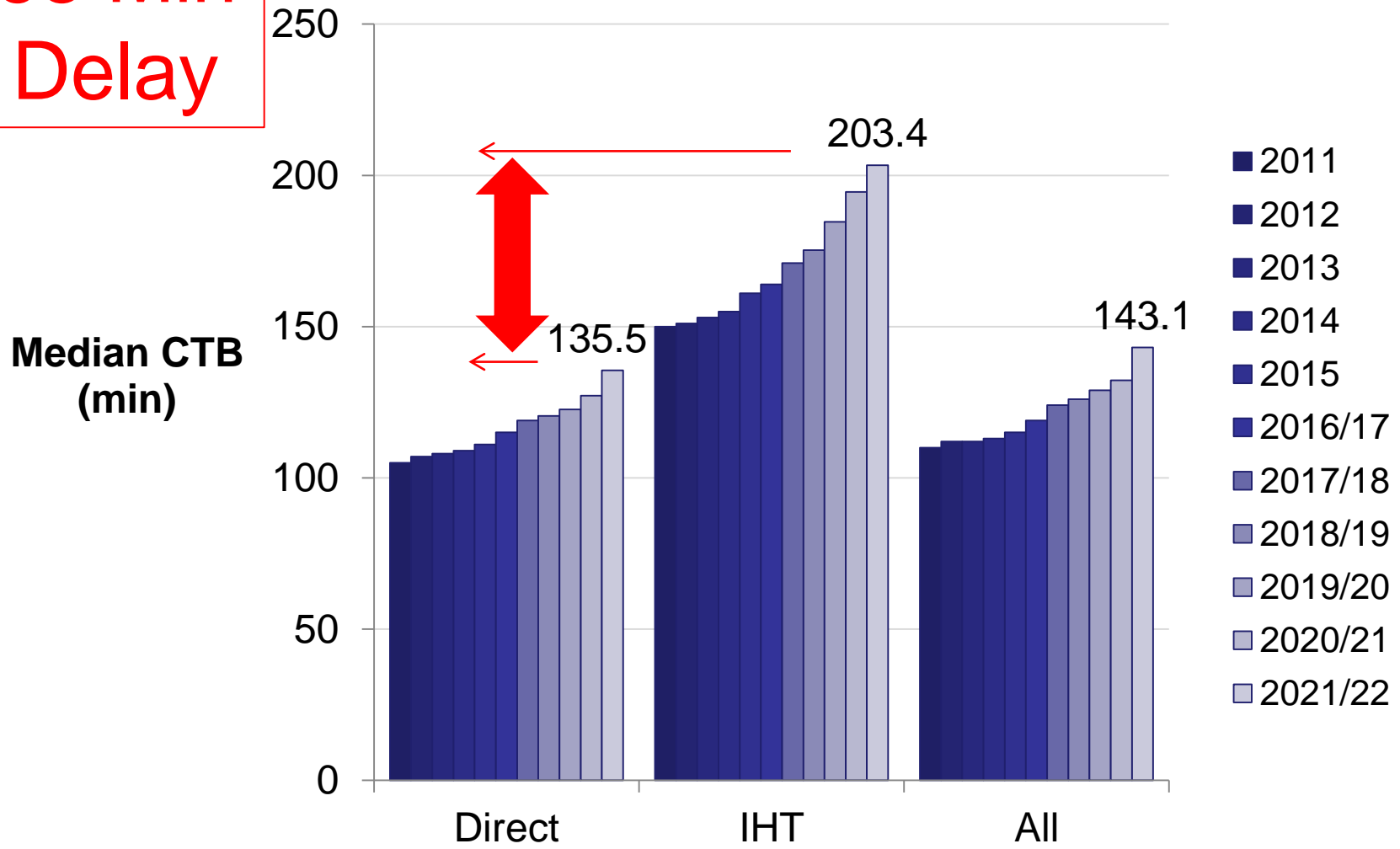
According to admission route



PPCI Call to Balloon time (excl shock/vent)

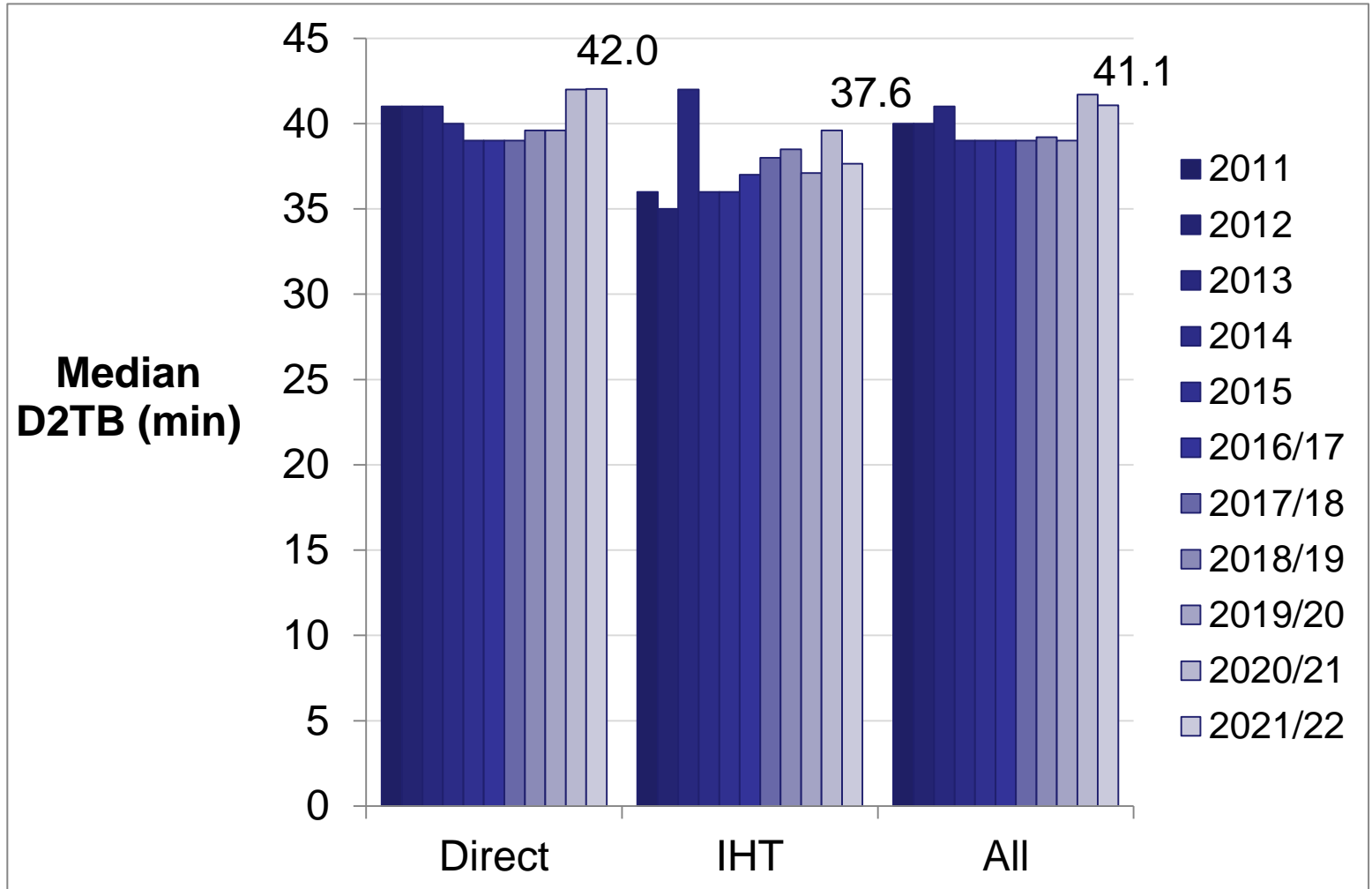
By Admission Route

68 Min
Delay



PPCI Door to Balloon time (excl shock/vent)

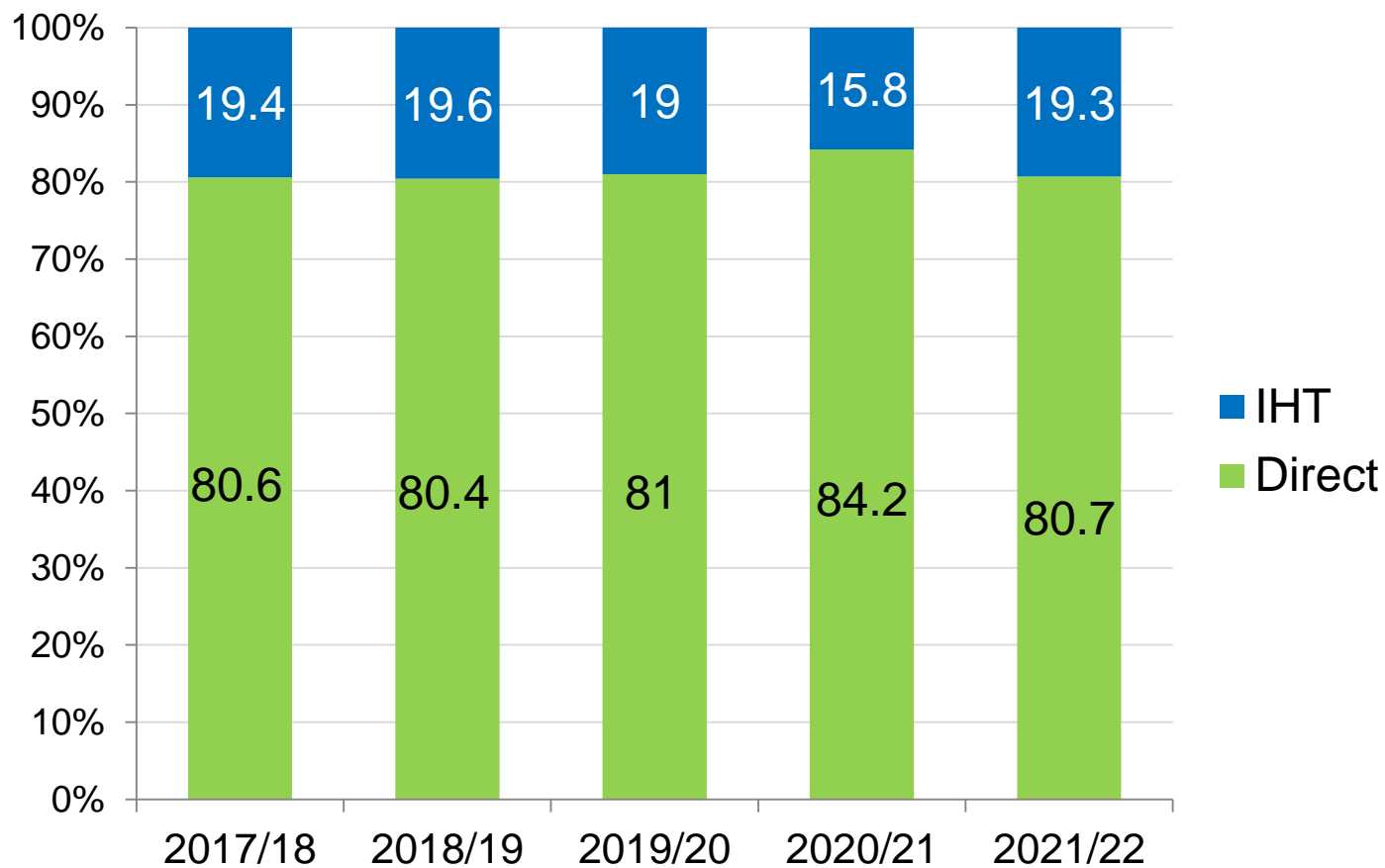
By Admission Route



Primary PCI

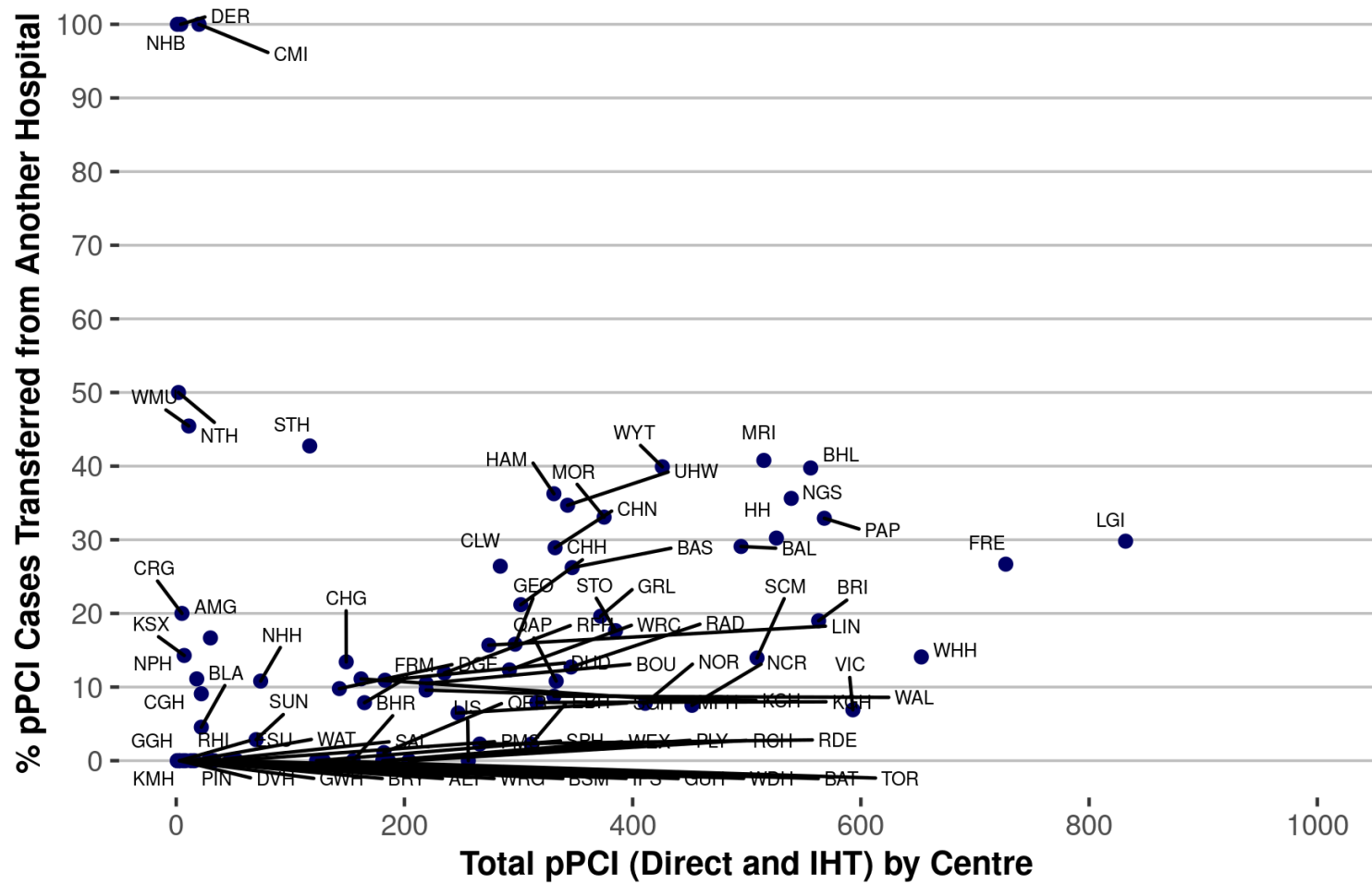
Admission routes

% Patients admitted directly or by IHT for PPCI



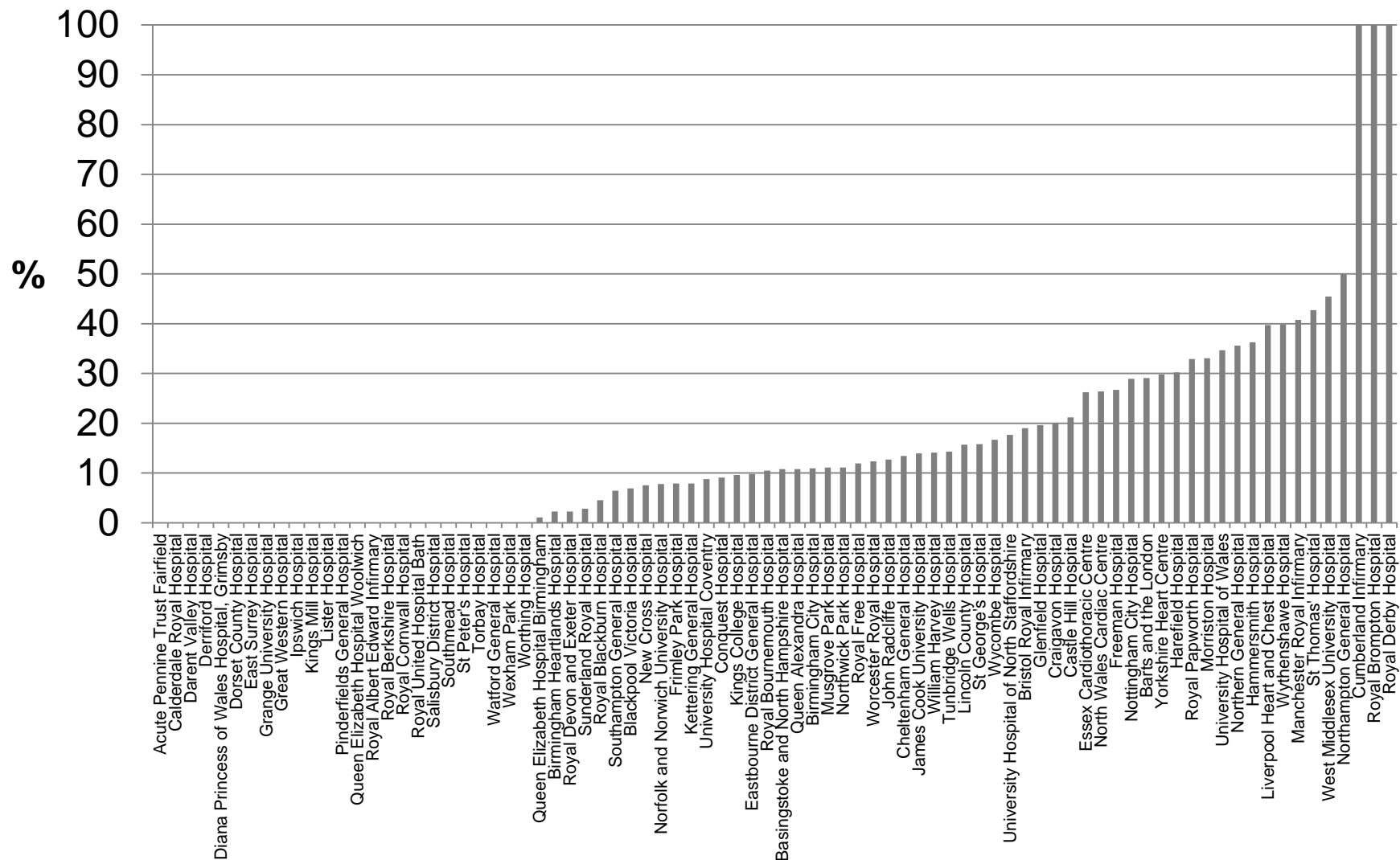
Primary PCI (exclude shock/vent)

Admission routes: Proportion who are IHTs



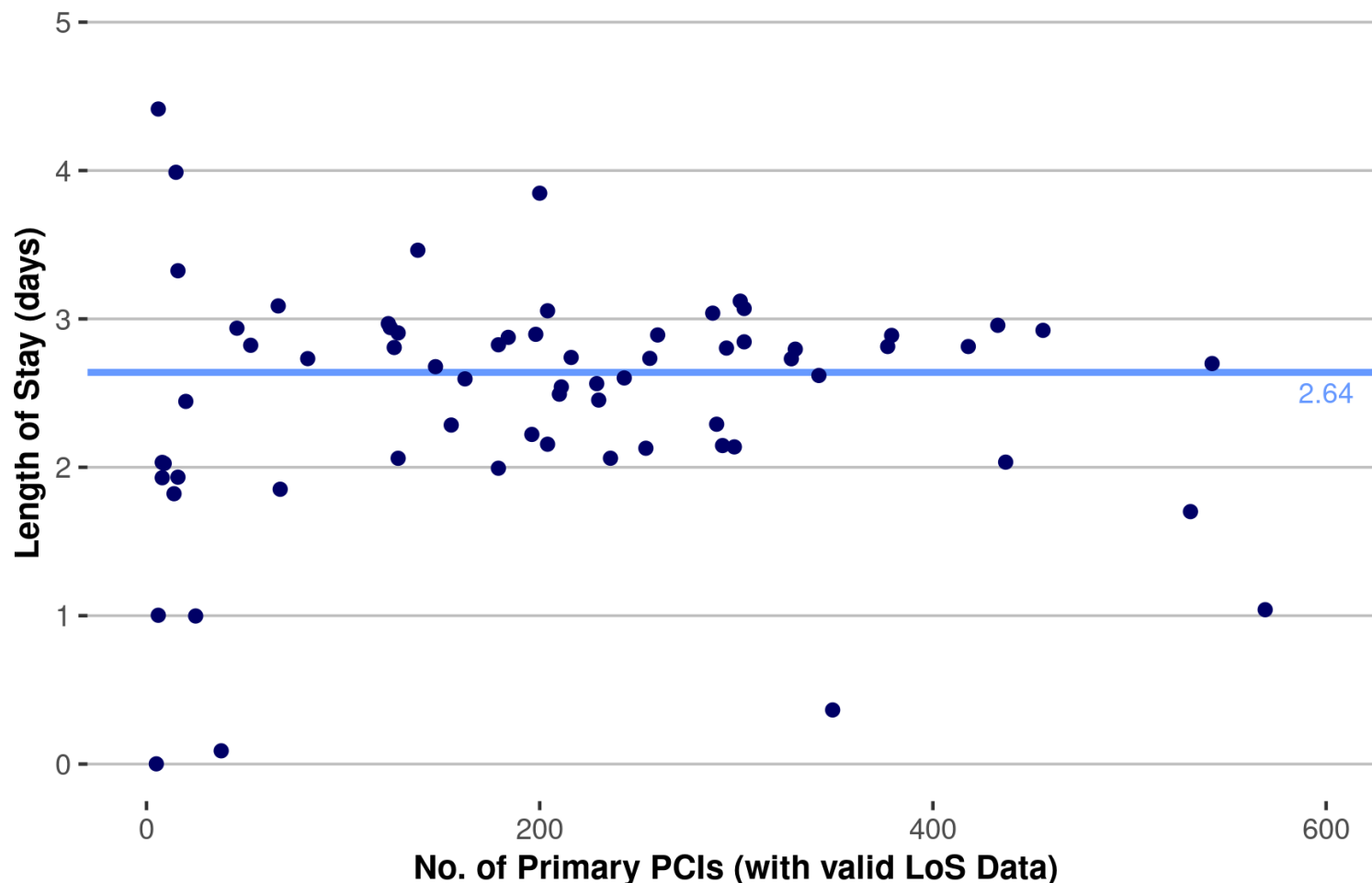
Primary PCI (exclude shock/vent)

Admission routes: Proportion who are IHTs (E&W)



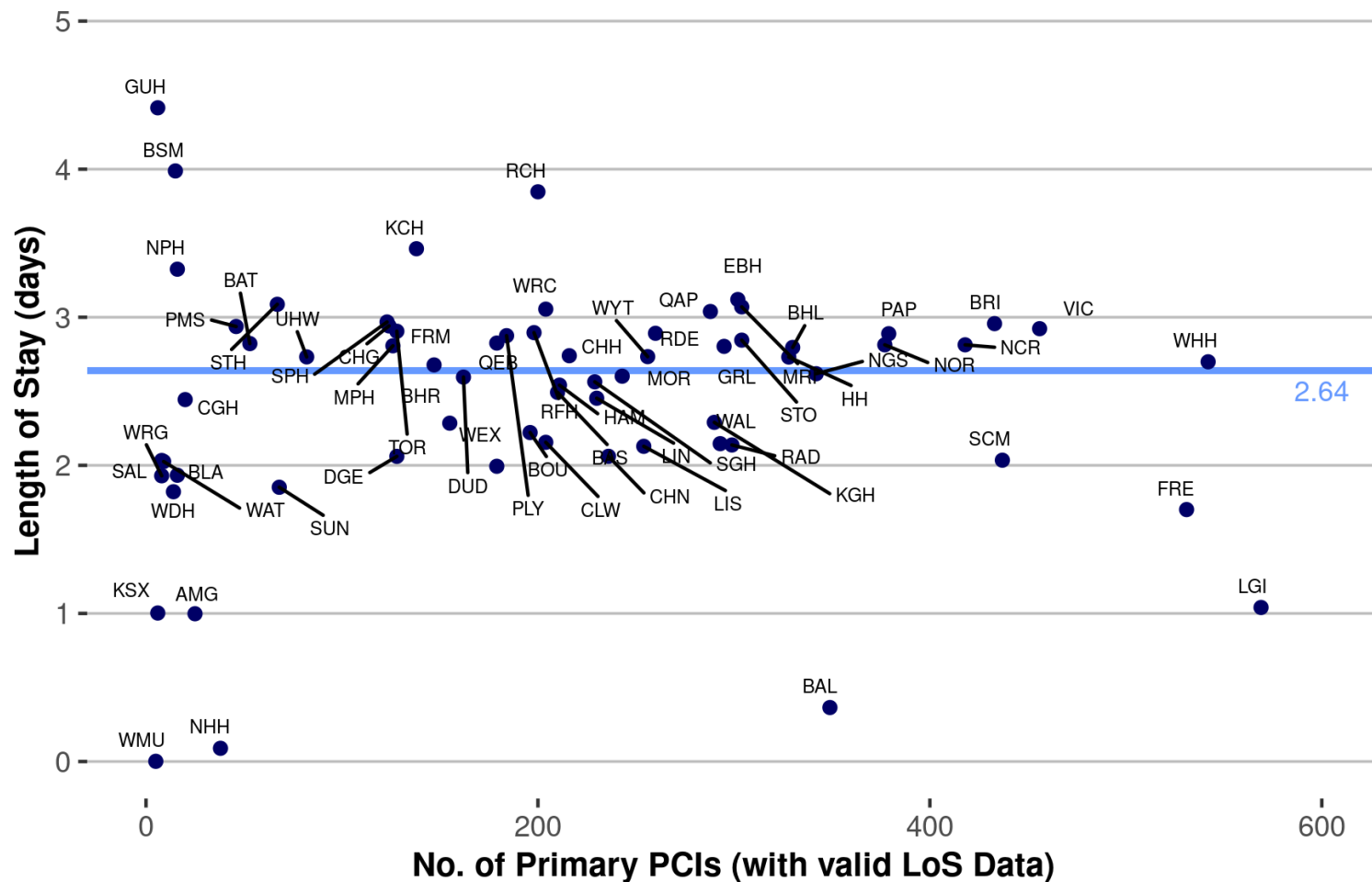
PPCI Direct from Community

Median Length of stay in PCI Centre (excl shock and vent)



PPCI Direct from Community

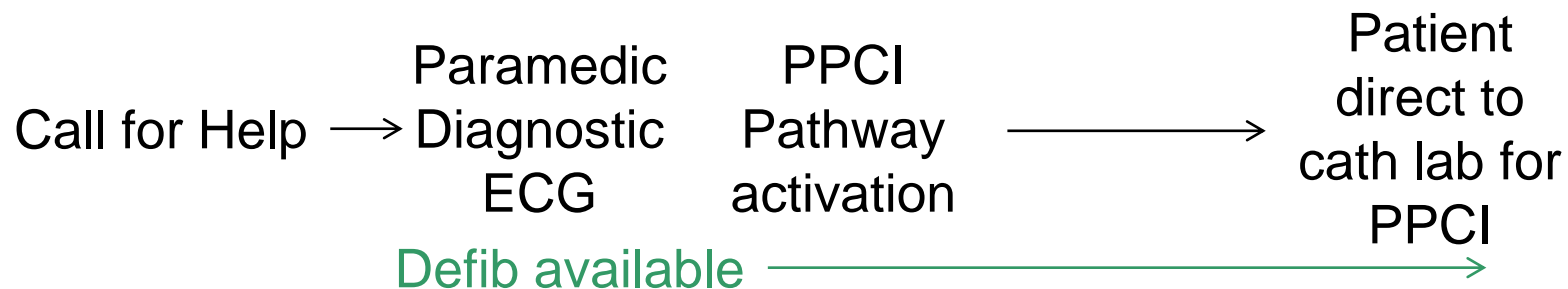
Median Length of stay in PCI Centre (excl shock and vent)



LOS = First device time to discharge (assuming discharge at midday)

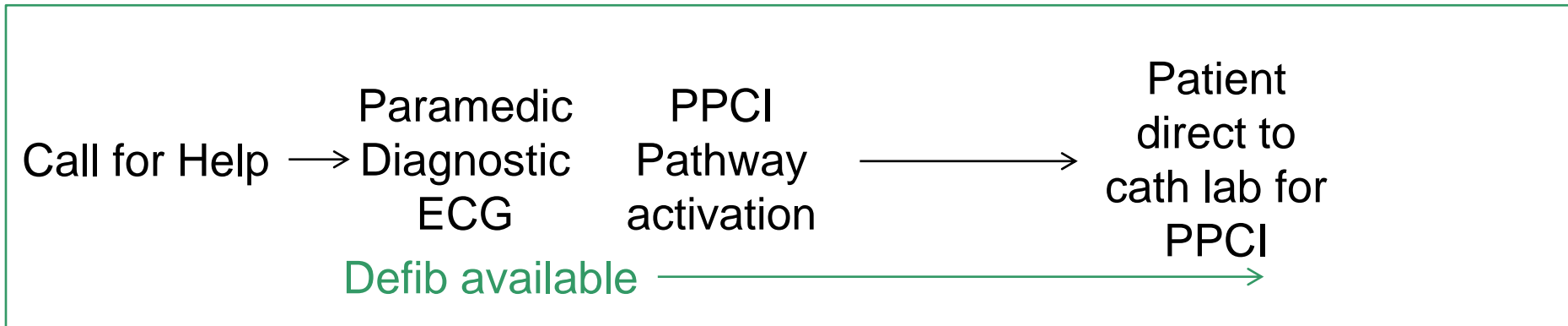
Self Presenters

Ideal

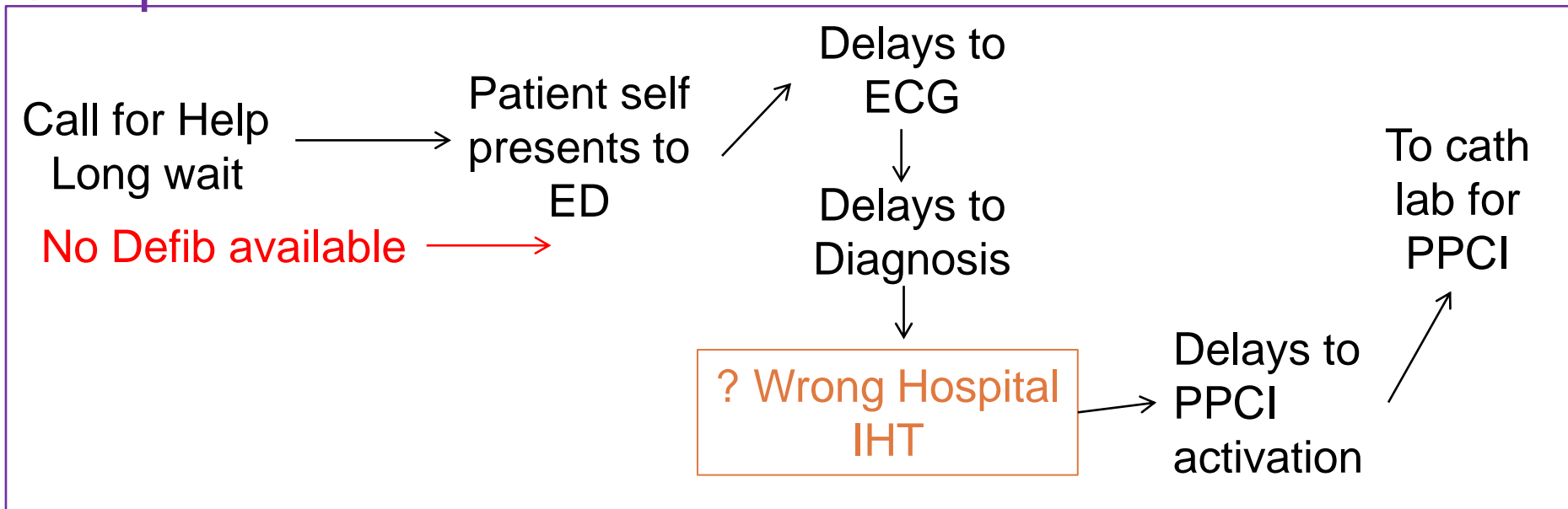


Self Presenters

Ideal

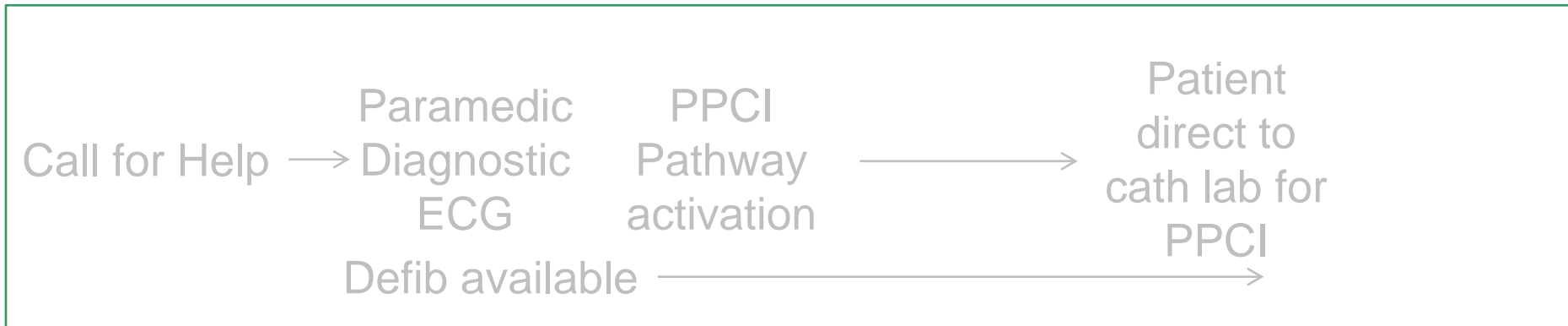


Self presentation

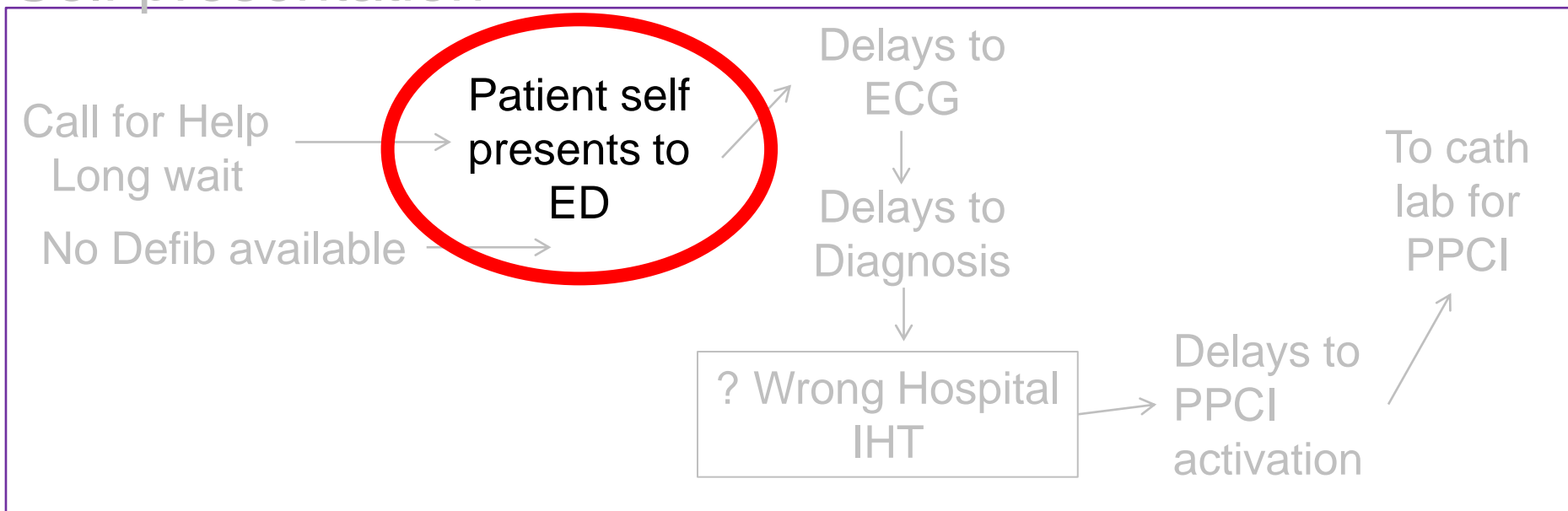


Self Presenters

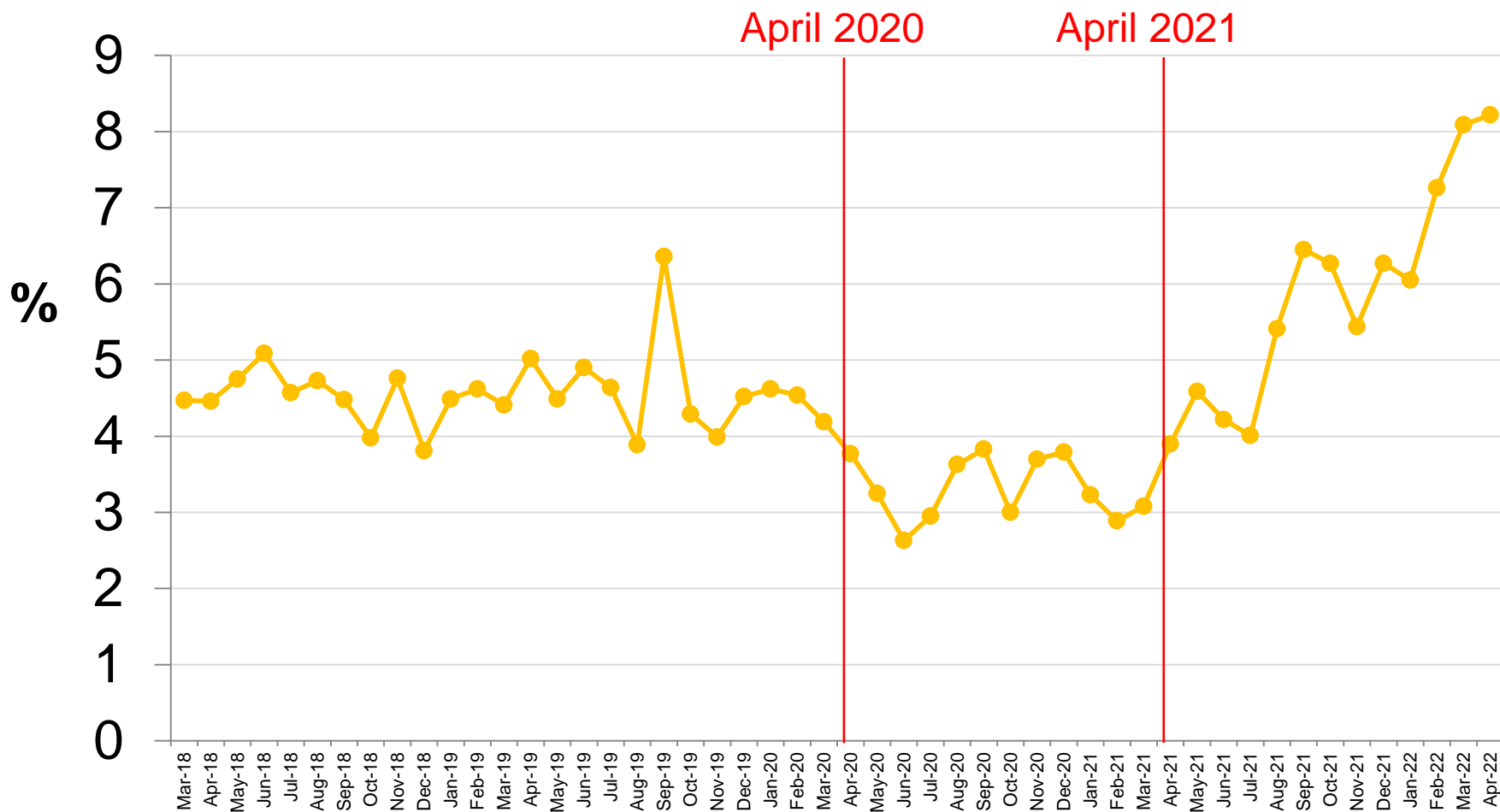
Ideal



Self presentation



PPCI Self Presentation MINAP live data



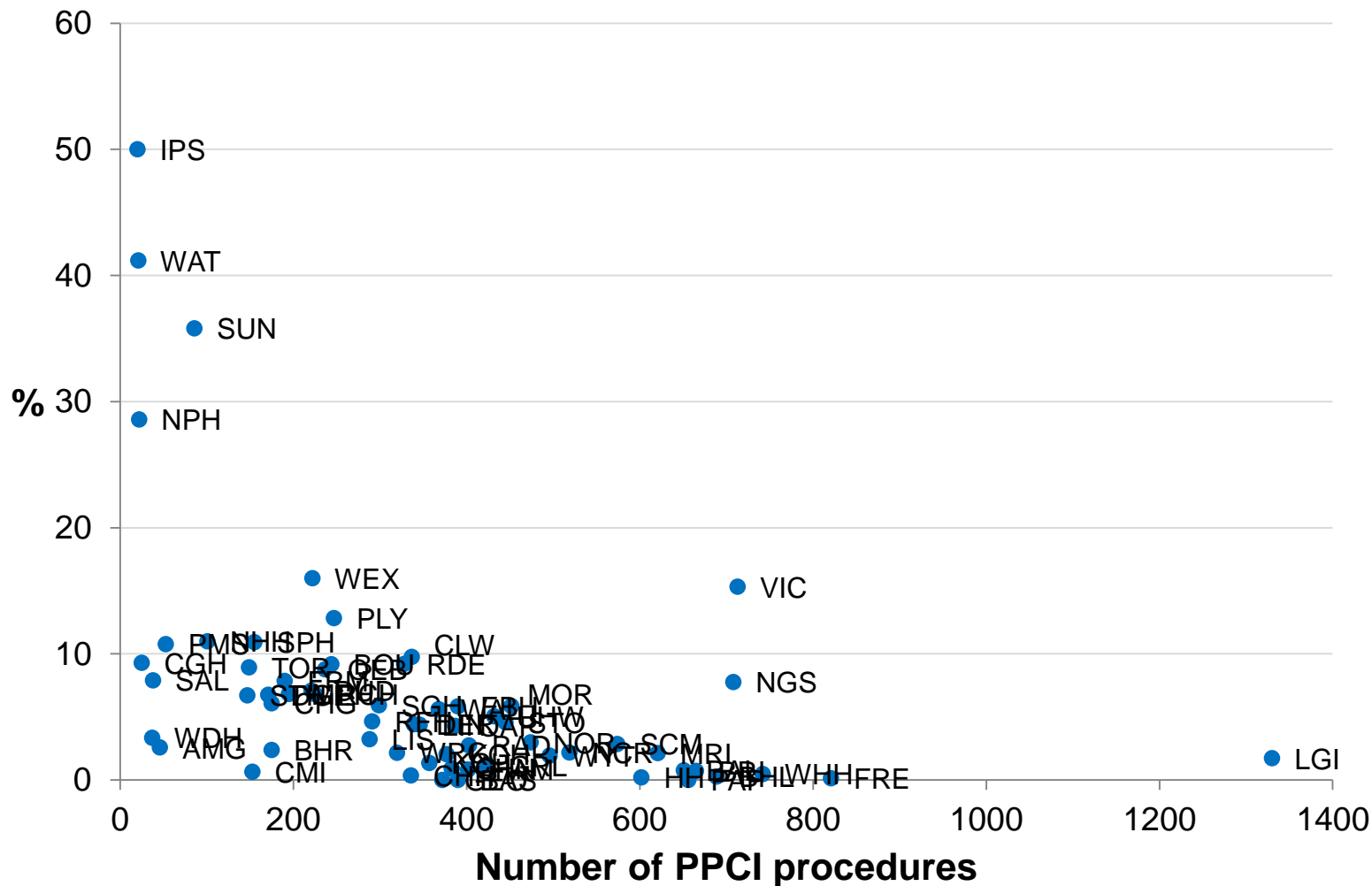
PPCI Presentation

- Self presenters
 - BCIS live data
 - Dataset definition
 - ‘Arrival at PCI centre’ = ‘Call for Help’
 - 2019/20 (pre-pandemic) v 2021/22
 - Excluded centres with < 20 PPCIs

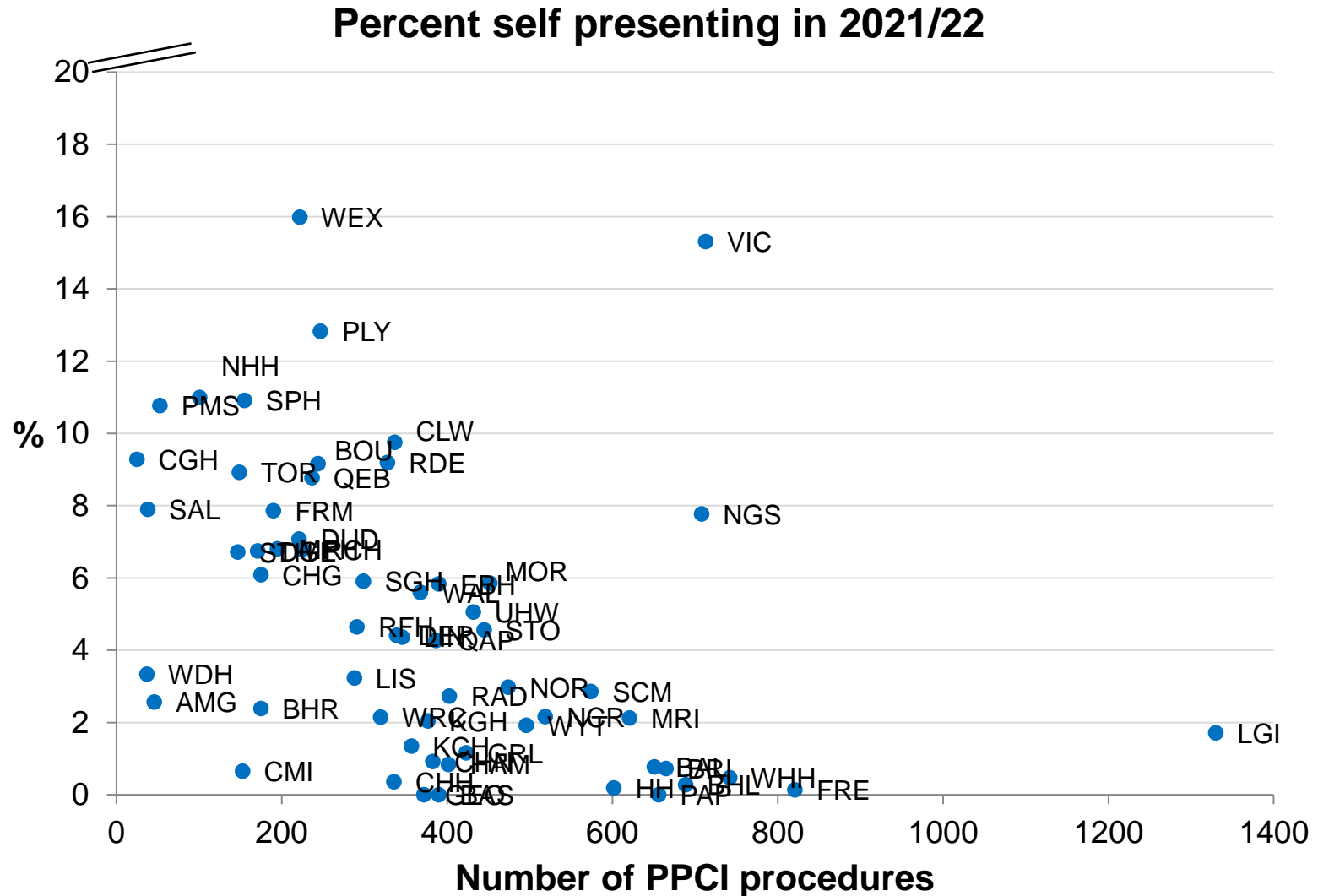
	2019/20	2021/22
Total Primary PCI	21,797	22,081
% Self Presenting	3.98%	5.9%

PPCI Self Presentation

Percent self presenting in 2021/22

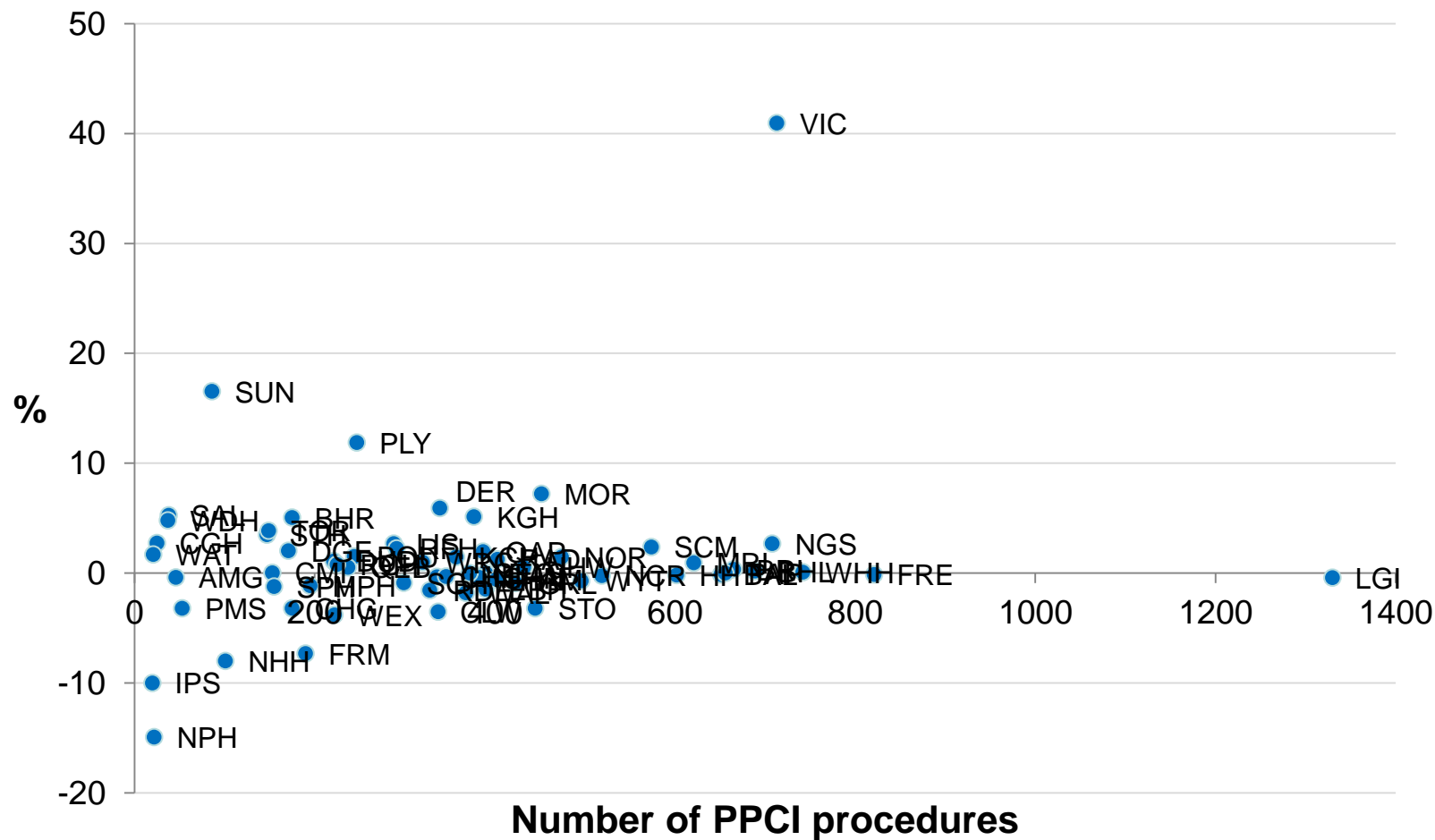


PPCI Self Presentation

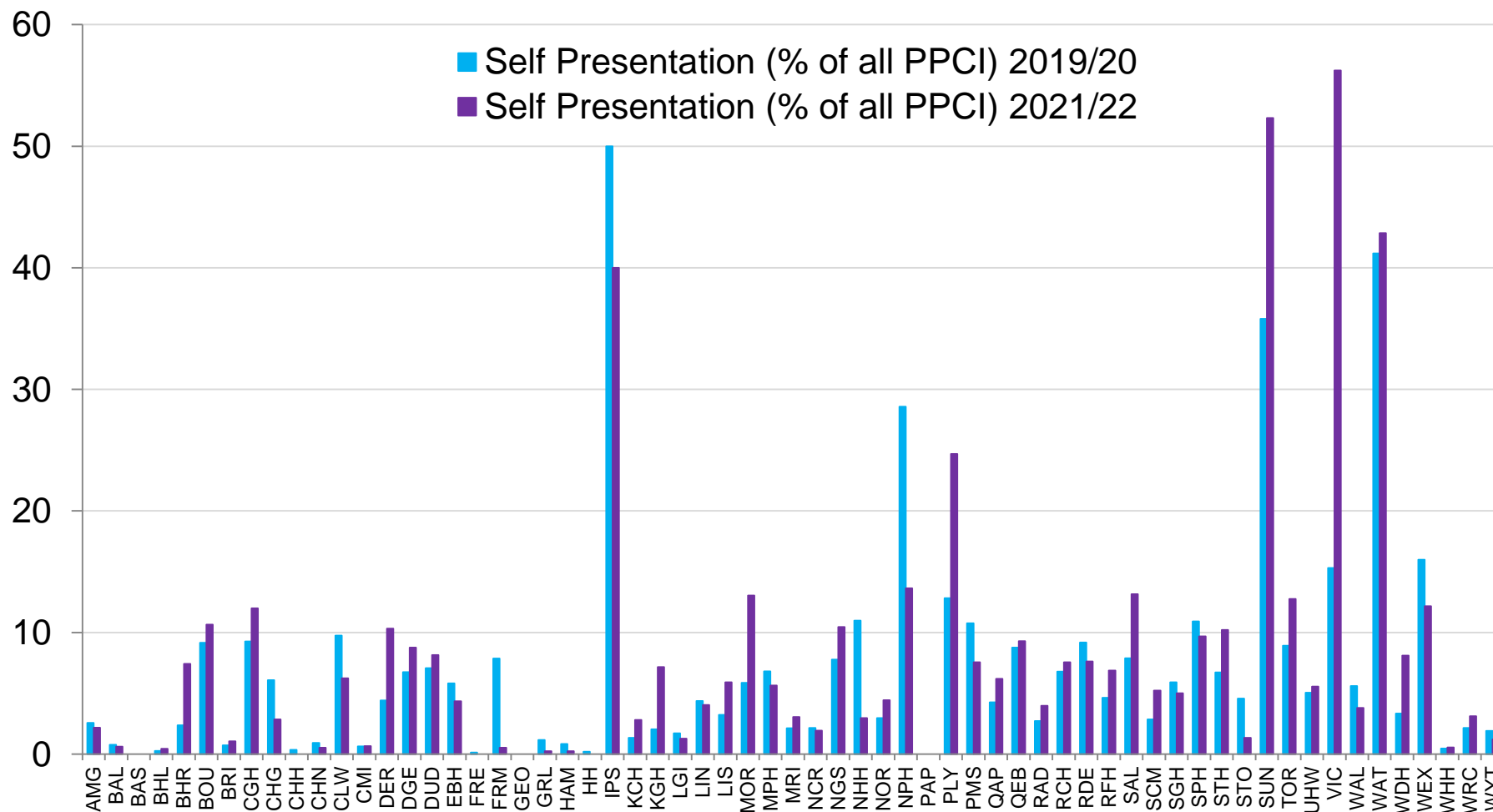


PPCI Self Presentation

Increase in absolute % self presentation 2019/20 v 2020/21

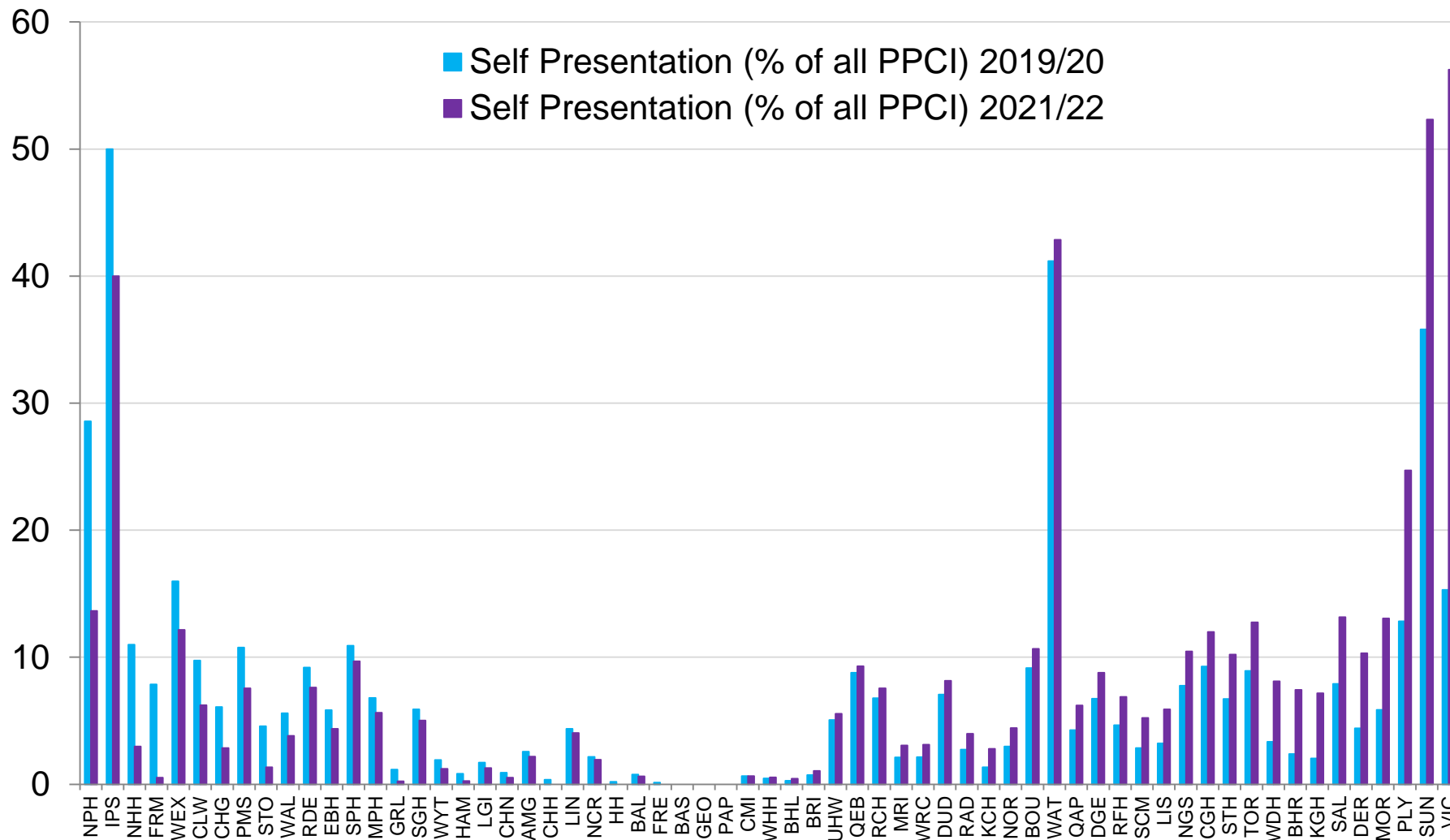


PPCI Self Presentation



PPCI Self Presentation

(Increasing SP to right)



PPCI Summary Stats

2021/22

		All	Direct	IHT	LOS
Call to 'Balloon'	< 150 min	55.40%	61.90%	28.50%	
	Median	143.1min	135.5 min	203.4	
PCI Door to 'Balloon'	< 90 min	87.30%	86.40%	91.40%	
	< 60 min	73.60%	72.10%		
	Median	41.1	42.0 min	47.6	
All (mean of medians)					2.6 days

Outcome (PCI)

1 of 3

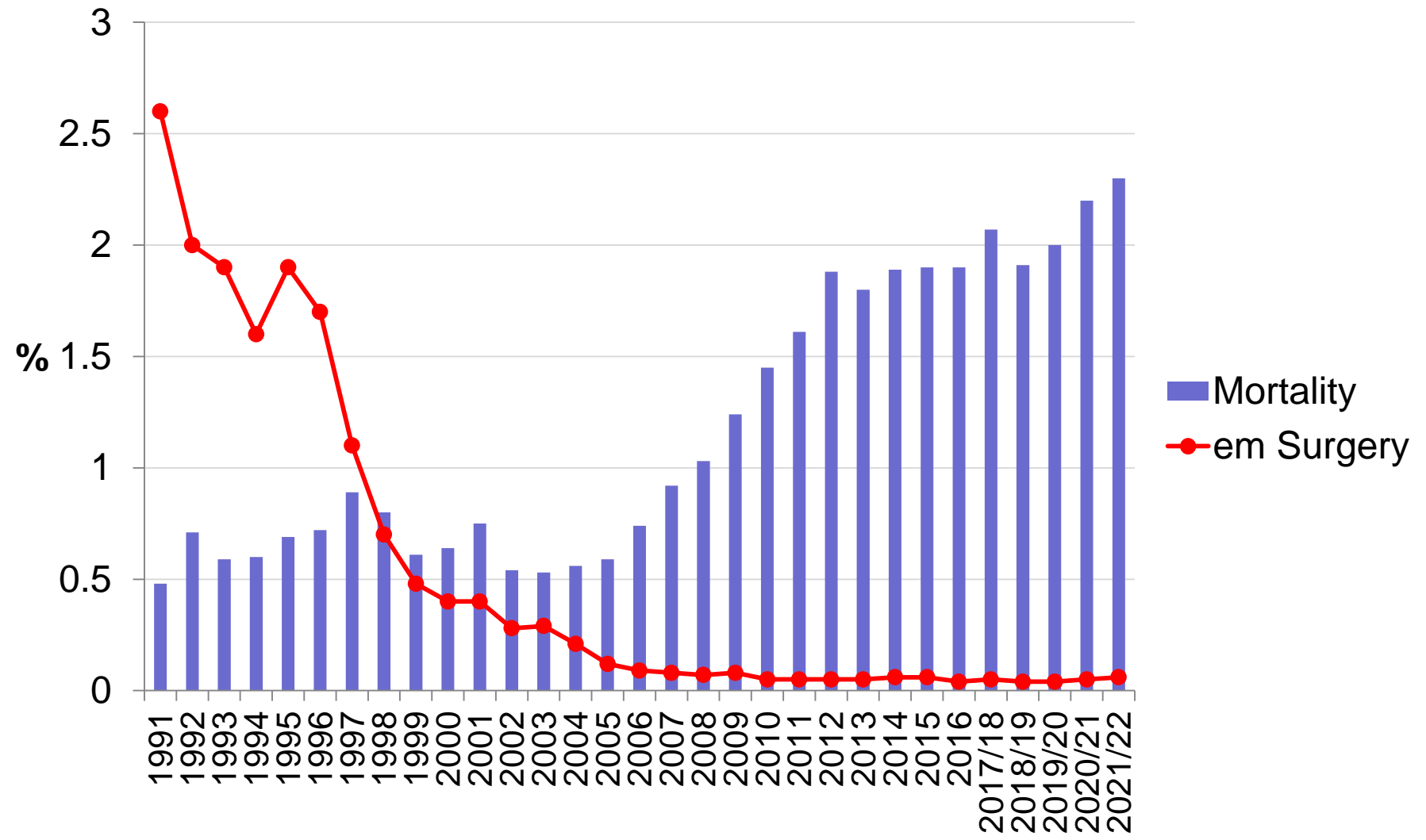


MACCE - All PCIs

Year	Procedure Success (%)	QMI %	NQMI (stable) (%)	Em CABG (%)	CVA (%)	Mortality (%)	30 day Mortality (%) (Tracked)
1997	92	1.2		1.1		0.89	
1998	92	0.8		0.7		0.80	
1999	90	0.57		0.48		0.61	
2000	92	0.6		0.4		0.64	
2001	94	0.5		0.4		0.75	
2002	92	0.57		0.28		0.54	
2003	92	0.36		0.29		0.53	
2004	93.5	0.30		0.21		0.56	
2005	90.2	0.24		0.12		0.59	
2006	95.5	0.15	0.74	0.09		0.74	
2007	92.1	0.15	0.59	0.08	0.05	0.92	1.5
2008	91.9	0.14	0.51	0.07	0.08	1.03	1.6
2009	91.2	0.11	0.46	0.08	0.09	1.24	2.0
2010	92.0	0.18	0.57	0.05	0.12	1.5	2.1
2011	91.8	0.13	0.37	0.05	0.08	1.6	2.4
2012	90.6	0.11	0.34	0.05	0.09	1.9	2.8
2013	91.3	0.09	0.3	0.05	0.09	1.8	2.9
2014	91.5	0.13	0.25	0.06	0.09	1.9	2.9
2015	91.5	0.09	0.18	0.06	0.08	1.9	3.0
2016	91.6	0.07	0.23	0.04	0.09	1.9	3.0
2017/18	90.5	0.05	0.2	0.05	0.08	2.1	3.5
2018/19	89.6	0.07	0.16	0.04	0.07	1.9	3.1
2019/20	88.8	0.08	0.1	0.04	0.08	2.0	3.1
2020/21	89.3	0.15	0.07	0.05	0.08	2.2	3.5
2021/22	88.1	0.15	0.17	0.06	0.1	2.3	3.6

Adverse Outcome

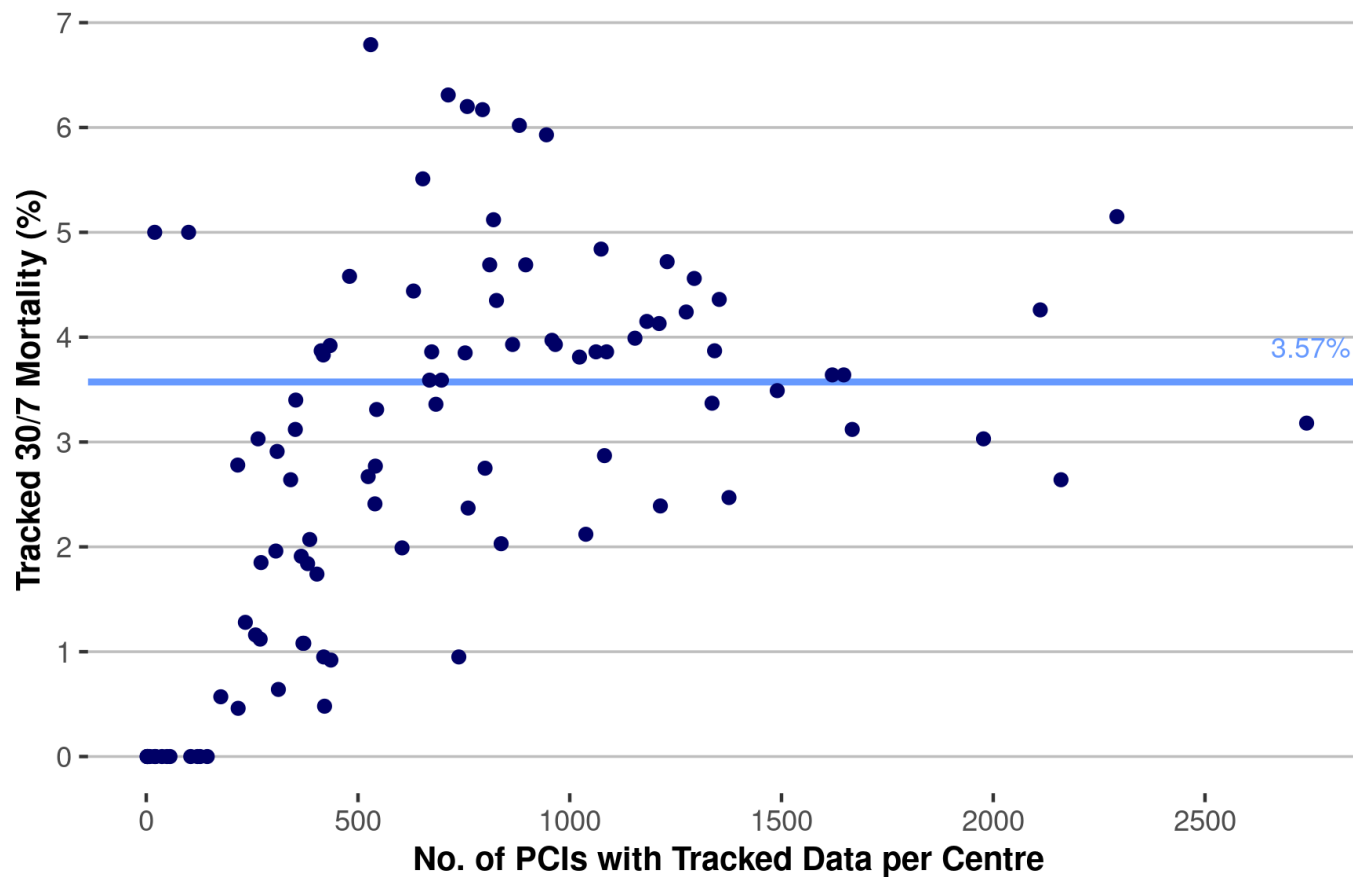
Death and emergency surgery



Adverse Outcomes

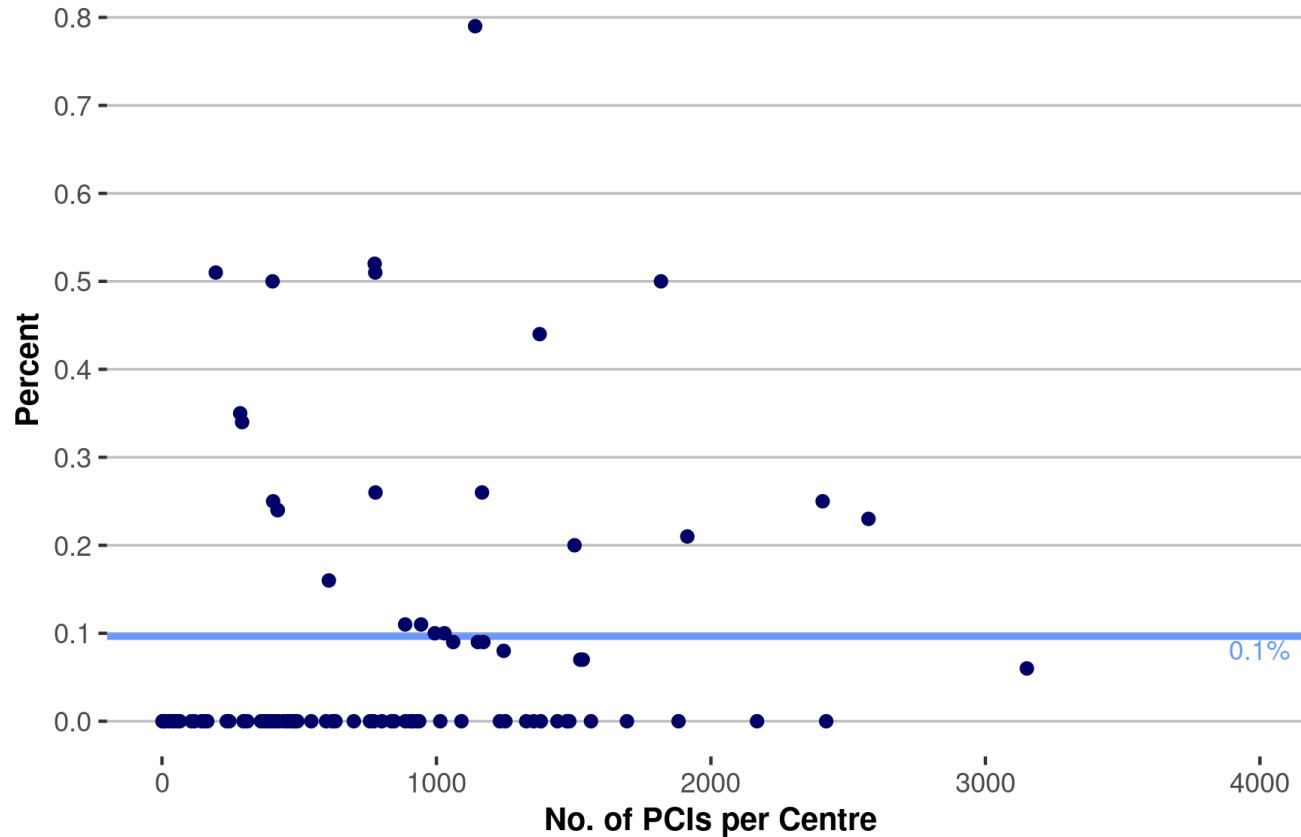
Death

- Mortality to 30/7 (from ONS track)



Adverse Outcomes CVA

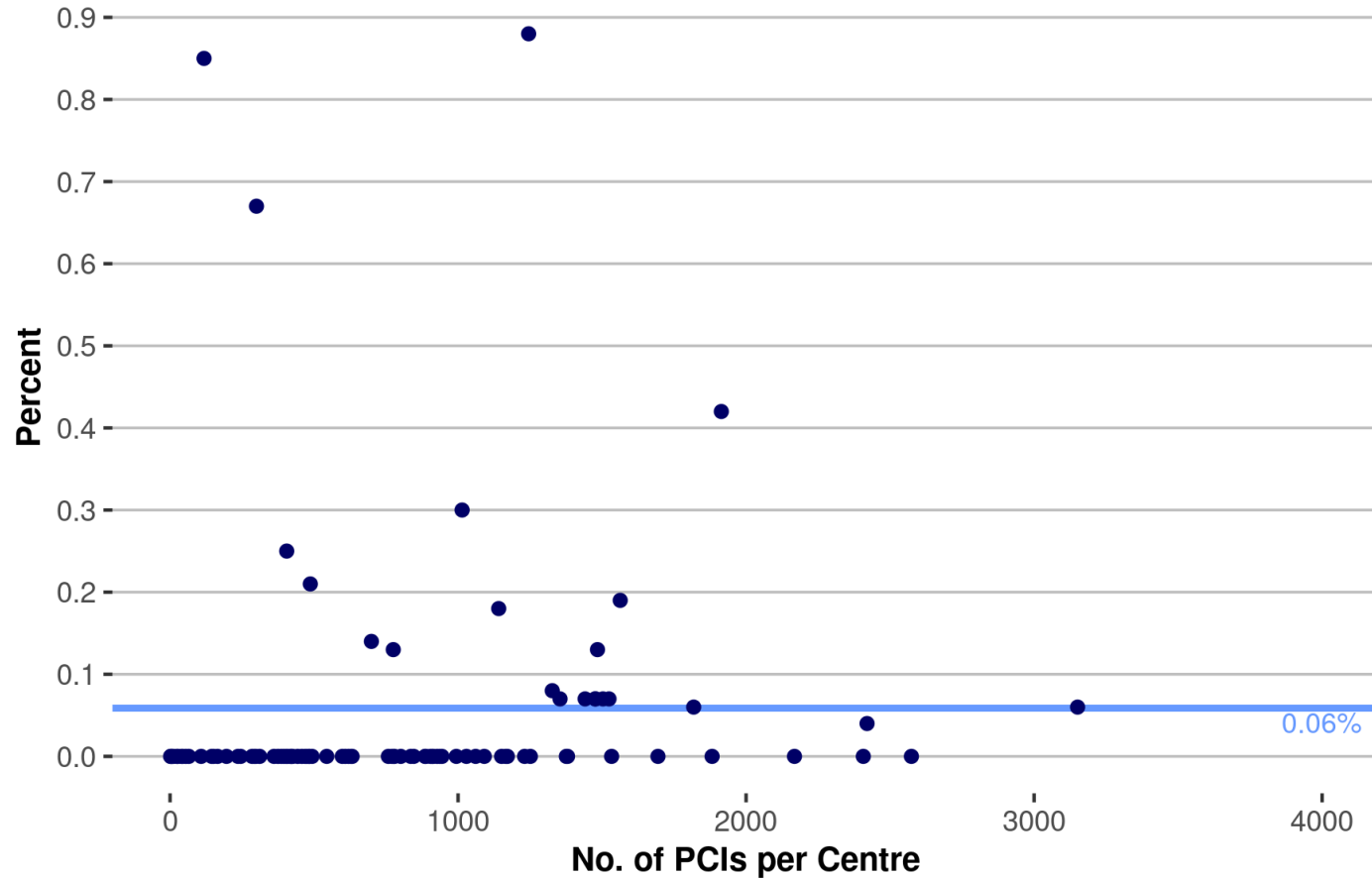
- % of all cases with CVA (not TIA)



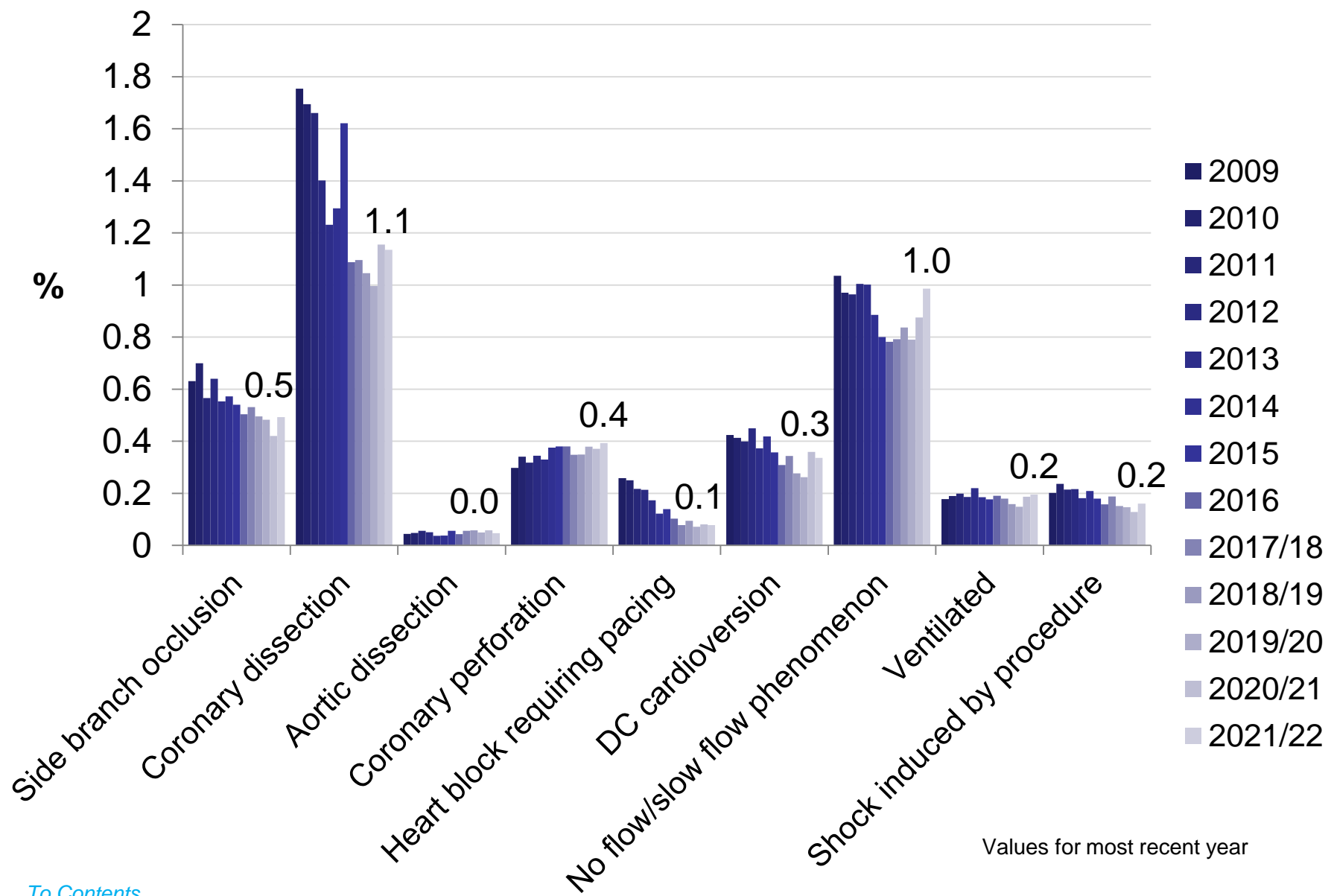
Adverse Outcomes

Surgery

- % of all cases needing emergency cardiac surgery

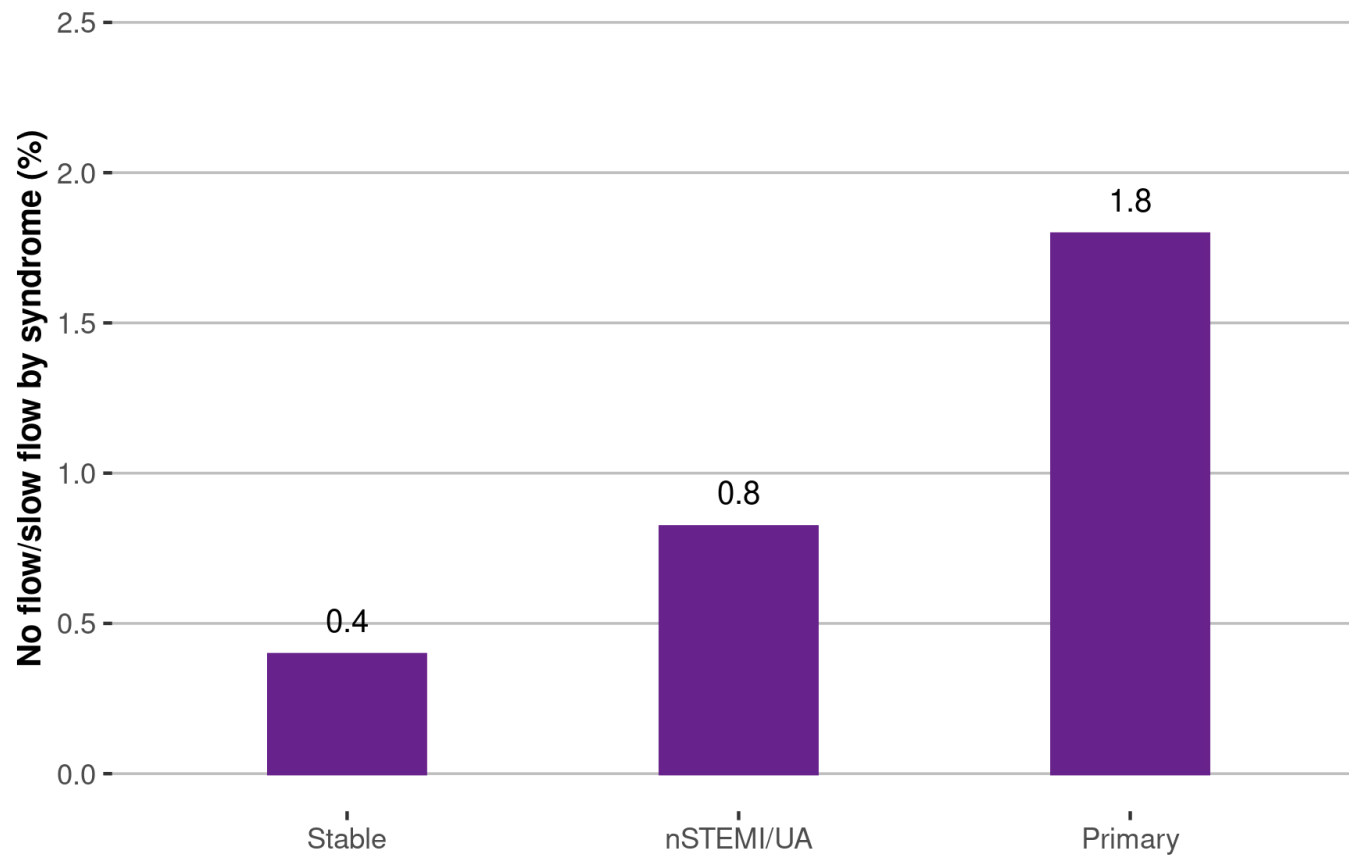


Peri-procedural Complications



Peri-procedural Complications

No flow / Slow flow by syndrome

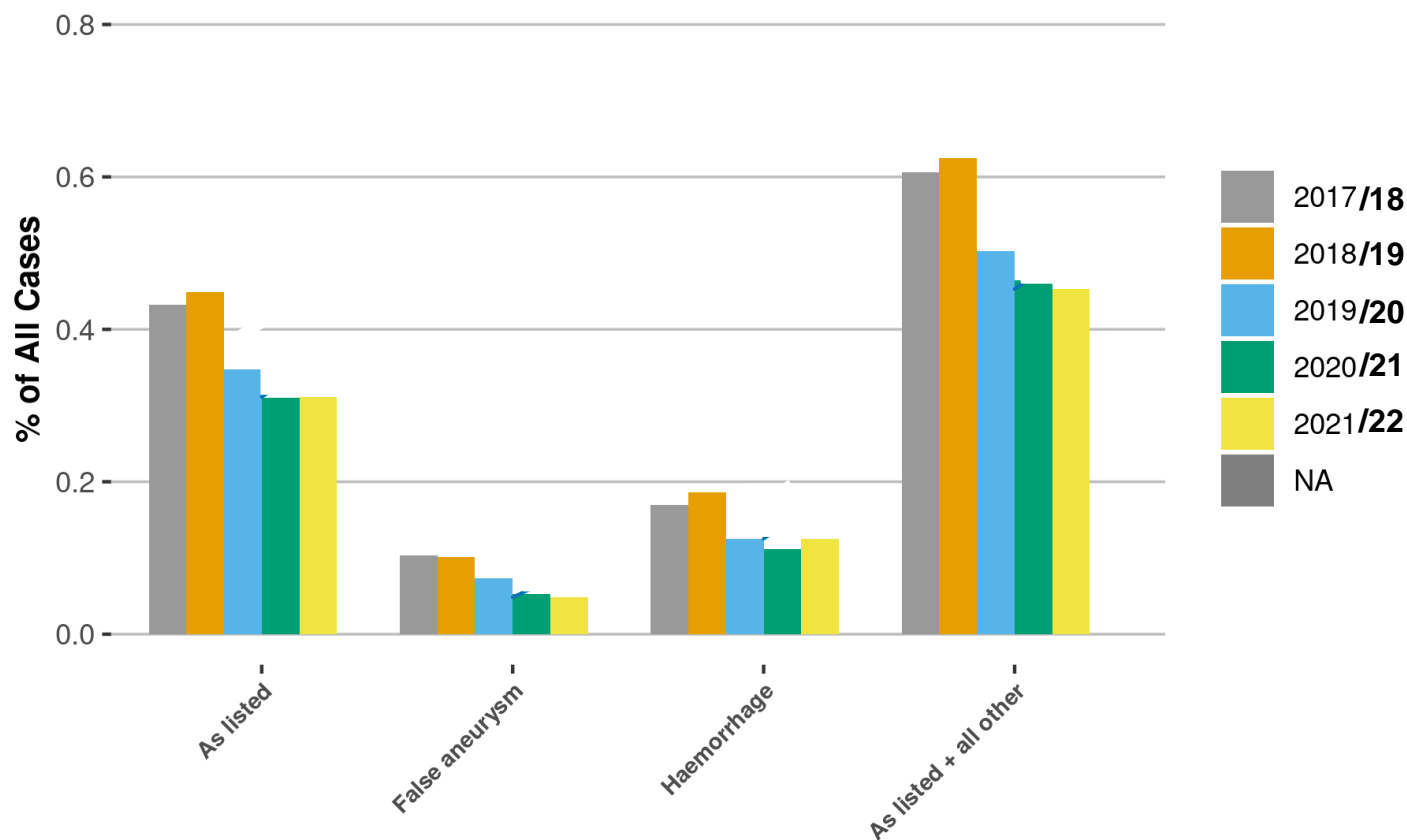


Access site complications

Complications to hospital Dx:

False aneurysm, haemorrhage, arterial occlusion / dissection

Any other surgical intervention



Complication by Access route

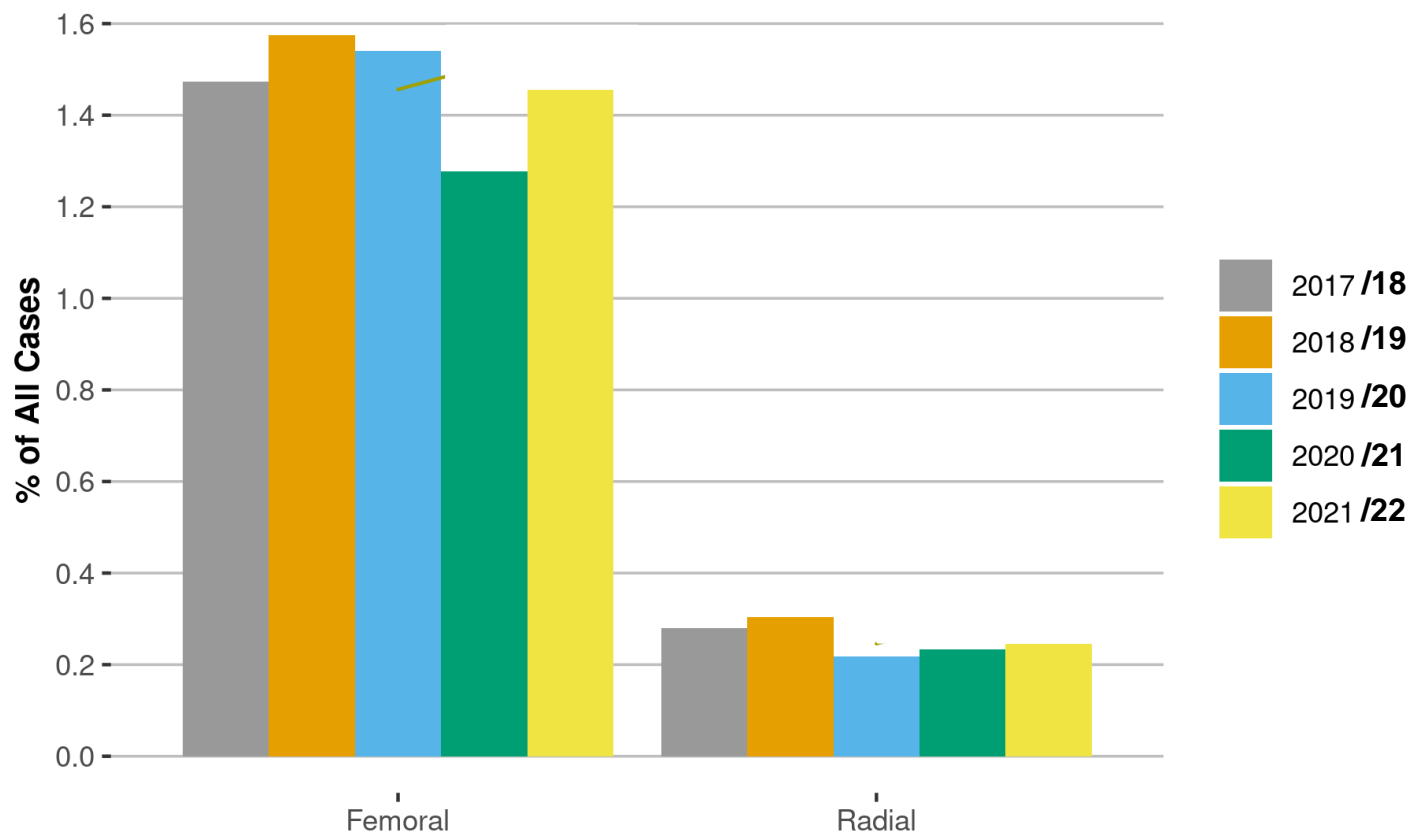
Complications to hospital Dx:

False aneurysm

Haemorrhage (retroperitoneal, delay Dx, surgery)

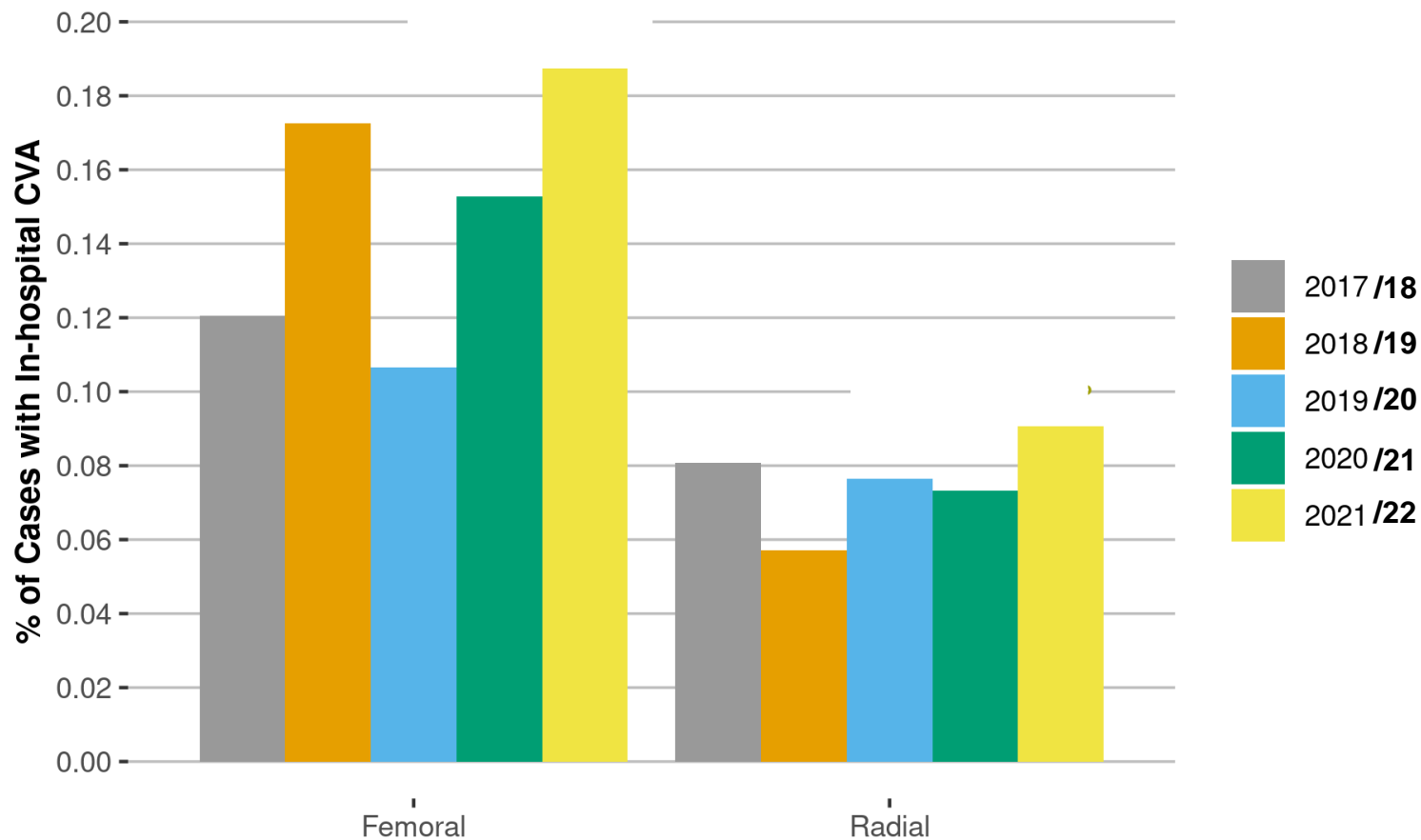
Art occlusion / dissection

Any need for surgery



Complication by Access route

CVA



Outcome 2021/22

Elective Patients

All as %	No. cases	Success	Partial success	Fail no comp	Re-PCI	QMI	Em CABG	CVA	Death In Hosp	Death 30/7 Track
Stable SV (no CTO)	14,351	89.9	NA	8.2	0.08	0.07	0.03	0.05	0.12	
MV (no CTO)	4,948	86.0	6.2	7.0	0.12	0.1	0.06	0.04	0.38	
SV CTO	1,918	75.0	NA	22.6	0.21	0.16	0.05	0.05	0.36	
MV CTO	634	76.0	19.2	4.1	0.32	0	0	0	0.31	
OVERALL STABLE										
All Stable	21,851	87.26	NA	9.10	0.11	0.08	0.04	0.05	0.21	0.47

Outcome

Elective Patients

Analysis of live raw NICOR data

Year	Number of Stable Elective PCIs	In Hospital Mortality
2018/19	28,683	0.09
2019/20	28,177	0.11
2020/21	17,981	0.15
2021/22	19,772	0.14

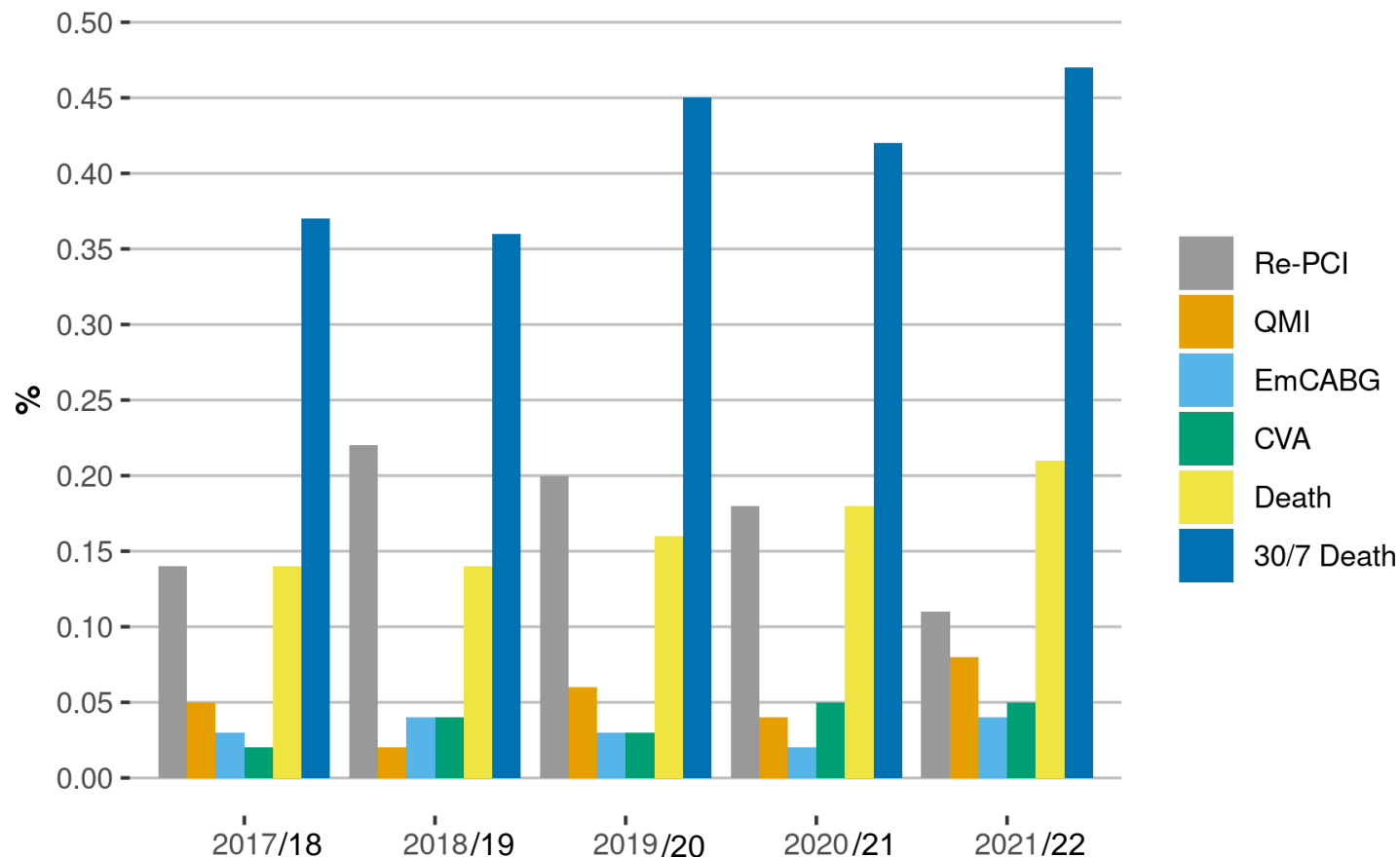
Outcome 2021/22

Acute Coronary Syndromes

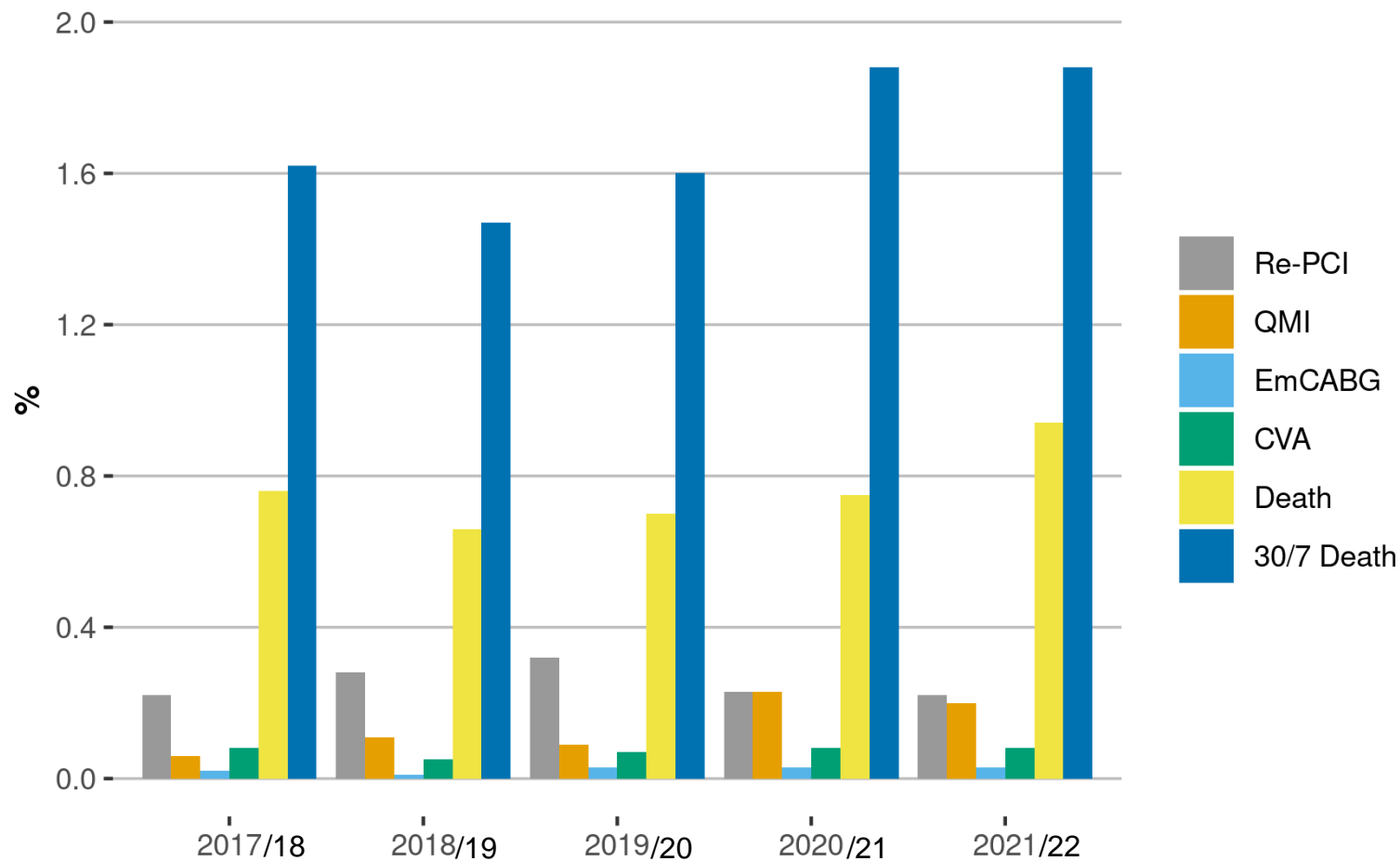
All as %	No.	Success	Partial success	Fail no comp	Re-PCI	QMI	Em CABG	CVA	Death In hosp	Death 30/7 CR
NSTEMI / UA no shock	32,435	90.74	2.37	5.25	0.22	0.2	0.03	0.08	0.94	1.9
All STEMI no shock	20,154	89.9	2.02	3.99	0.99		0.11	0.12	3.25	4.9
*Primary PCI	21,841	86.9	2	4.06	1.01		0.11	0.16	6.21	8.4
*Rescue PCI	46	71.7	0	4.35	0		0	0	23.9	24.4
Shock	2,336	55.61	1.93	4.41	0.98		0.21	0.56	36.8	43.9

All Elective Stable Cases

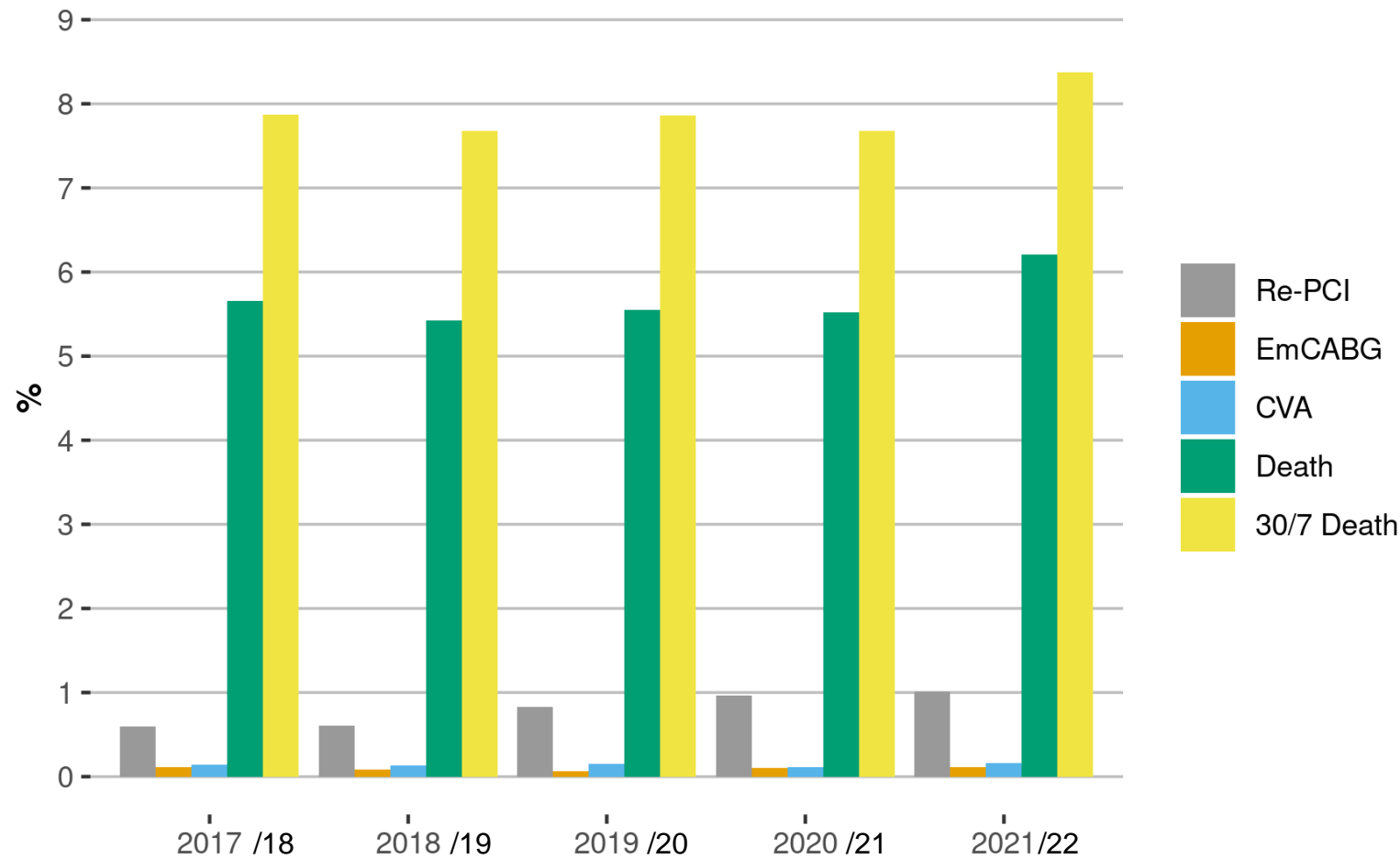
SV no CTO, MV no CTO, SV CTO, MV CTO



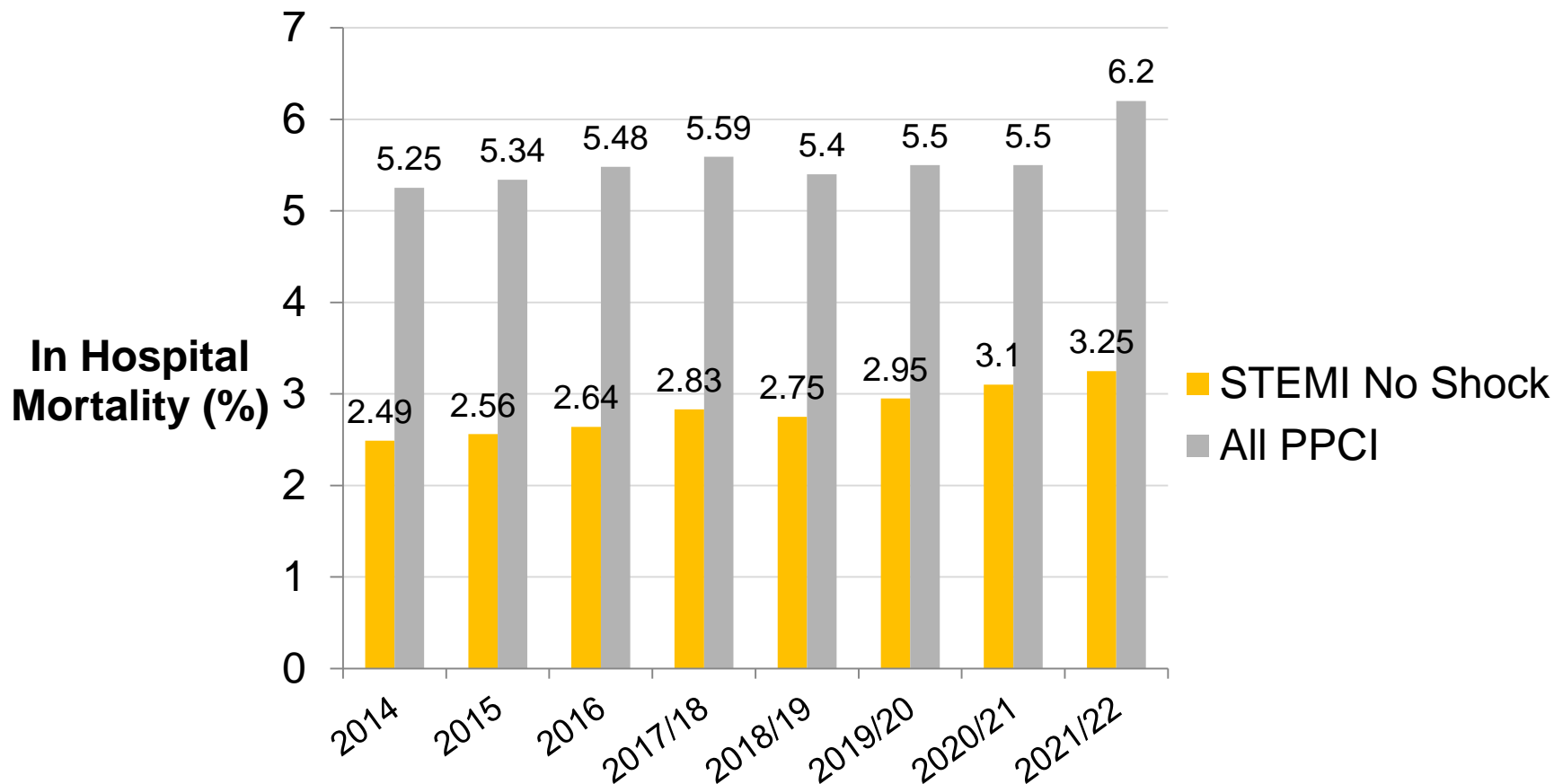
NSTEMI, no Shock



All Primary PCI (includes shock)

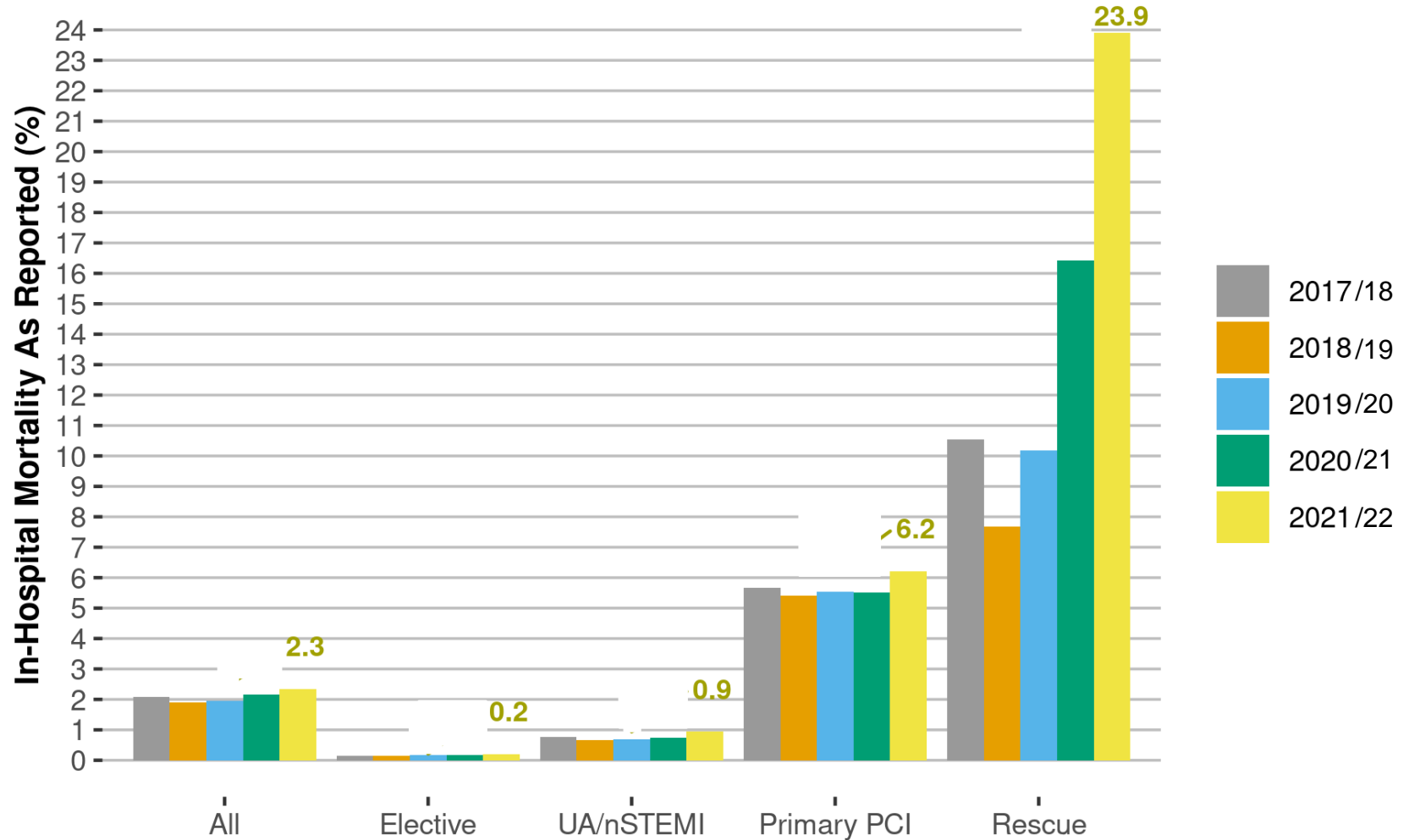


Primary PCI Mortality



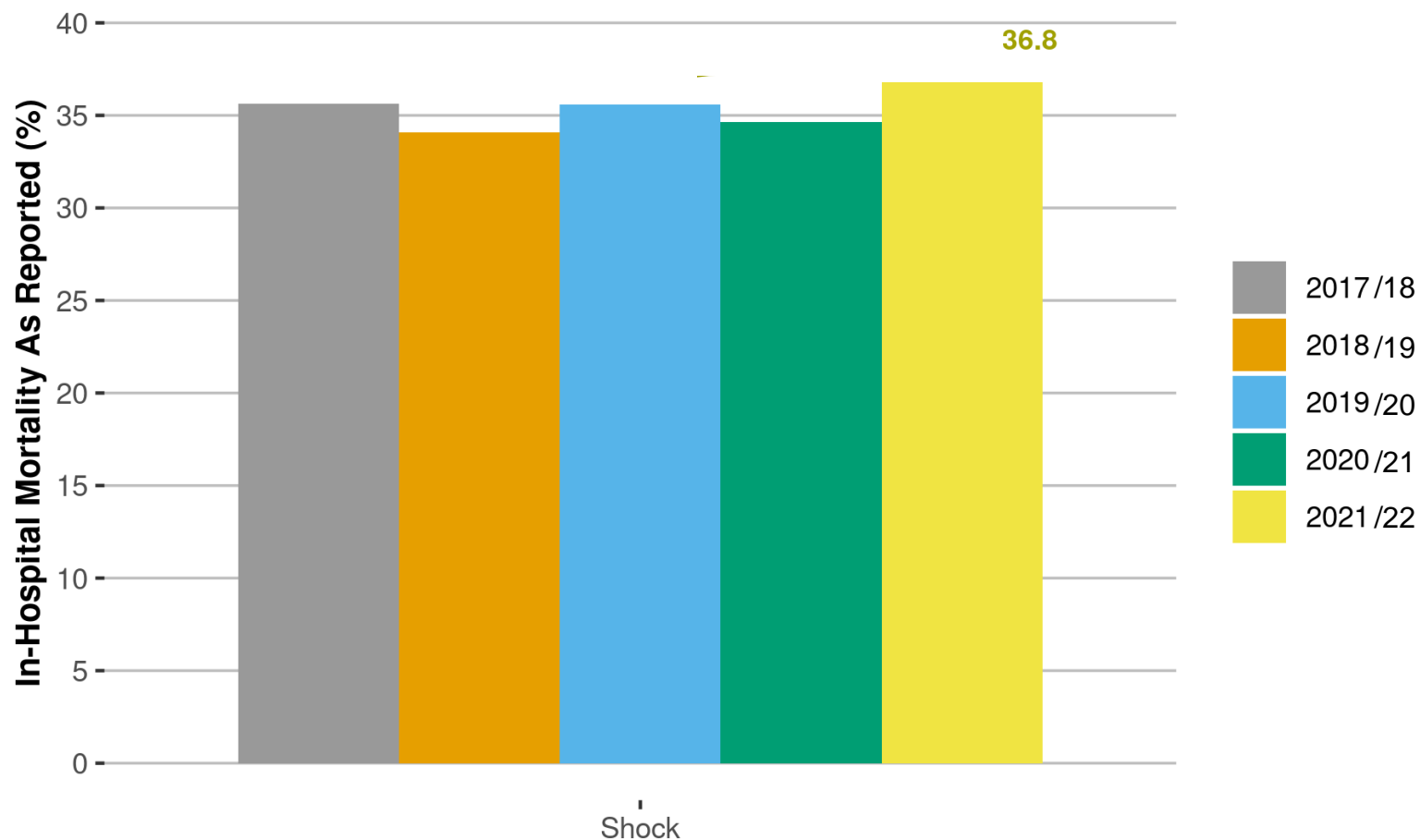
Summary: Mortality

Risk Stratified by Syndrome



Summary: Mortality



Risk Stratified by Syndrome



Risk Prediction Calculator

www.bcis.org

PCI 30 day Mortality Calculator



Calculation result | [Risk factor definitions](#) | [Acknowledgements](#) | [Terms and Conditions](#)

Predicted 30 Day Mortality
Following PCI
2.8 %

This model can only provide an estimate of the mortality risk. The precision of the estimate will be less good for cases that involve a combination of factors that is less frequently encountered
The model has not been validated for clinical decision support

Age (years)
58

Sex
 Female
 Male

Indication for PCI
Primary

Urgency
Emergency

Diabetes
Yes

Cardiogenic shock
No

Renal function
Not dialysed and Creatinine < 200

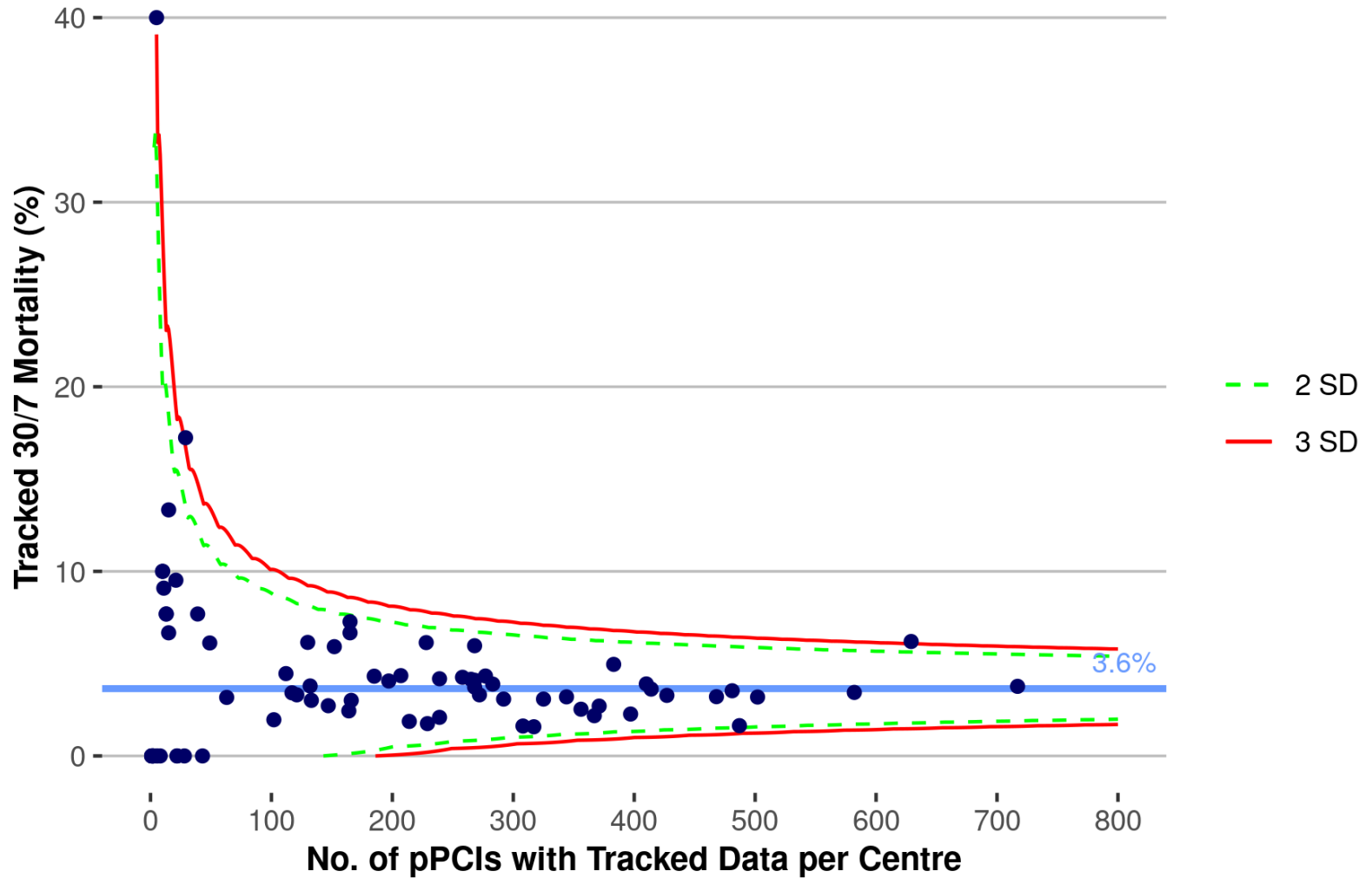
Previous myocardial infarction
No

Previous cerebrovascular accident
No

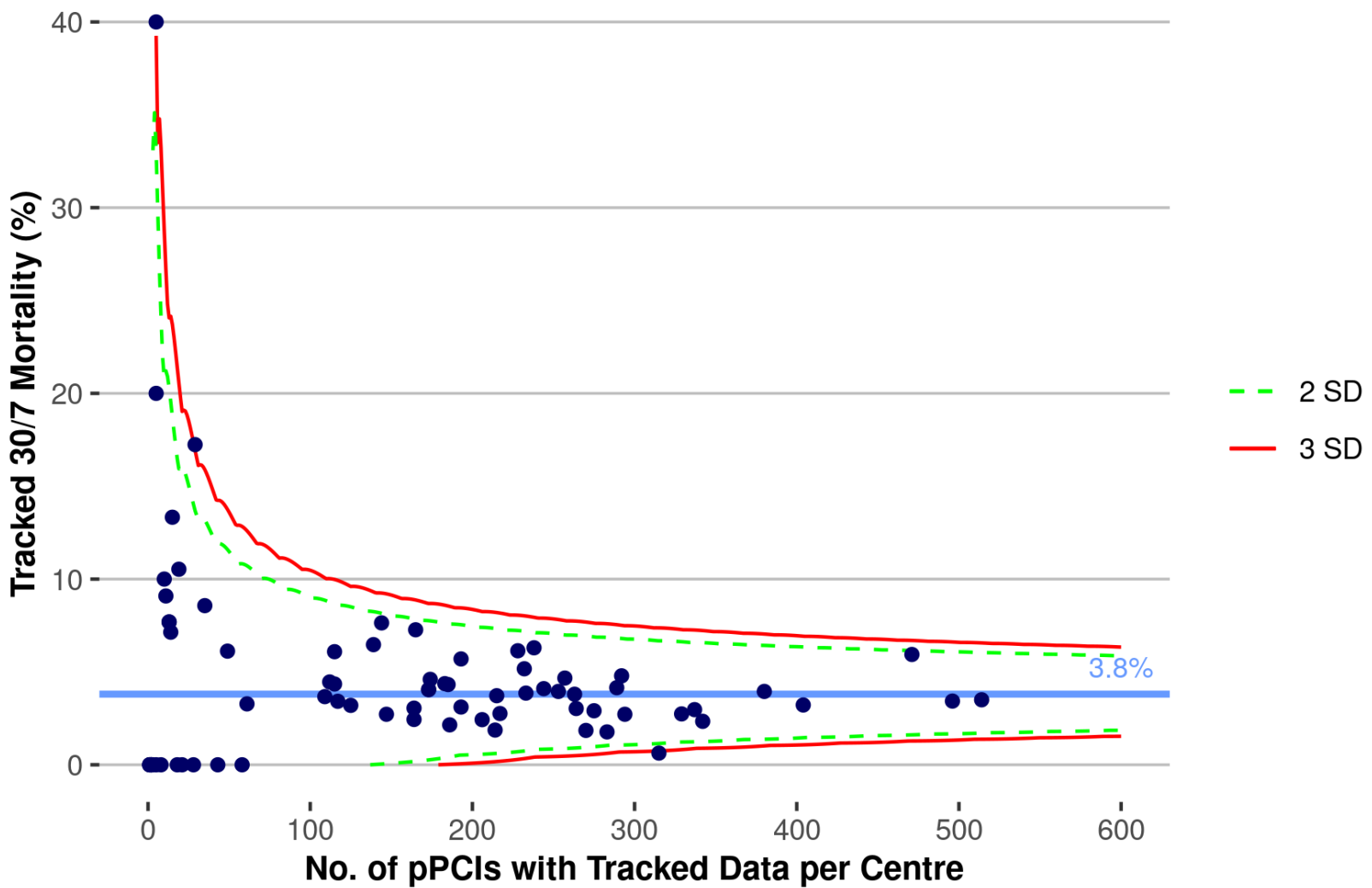
Tracked Mortality at 30/7

- 30 day Mortality by centre (England and Wales)

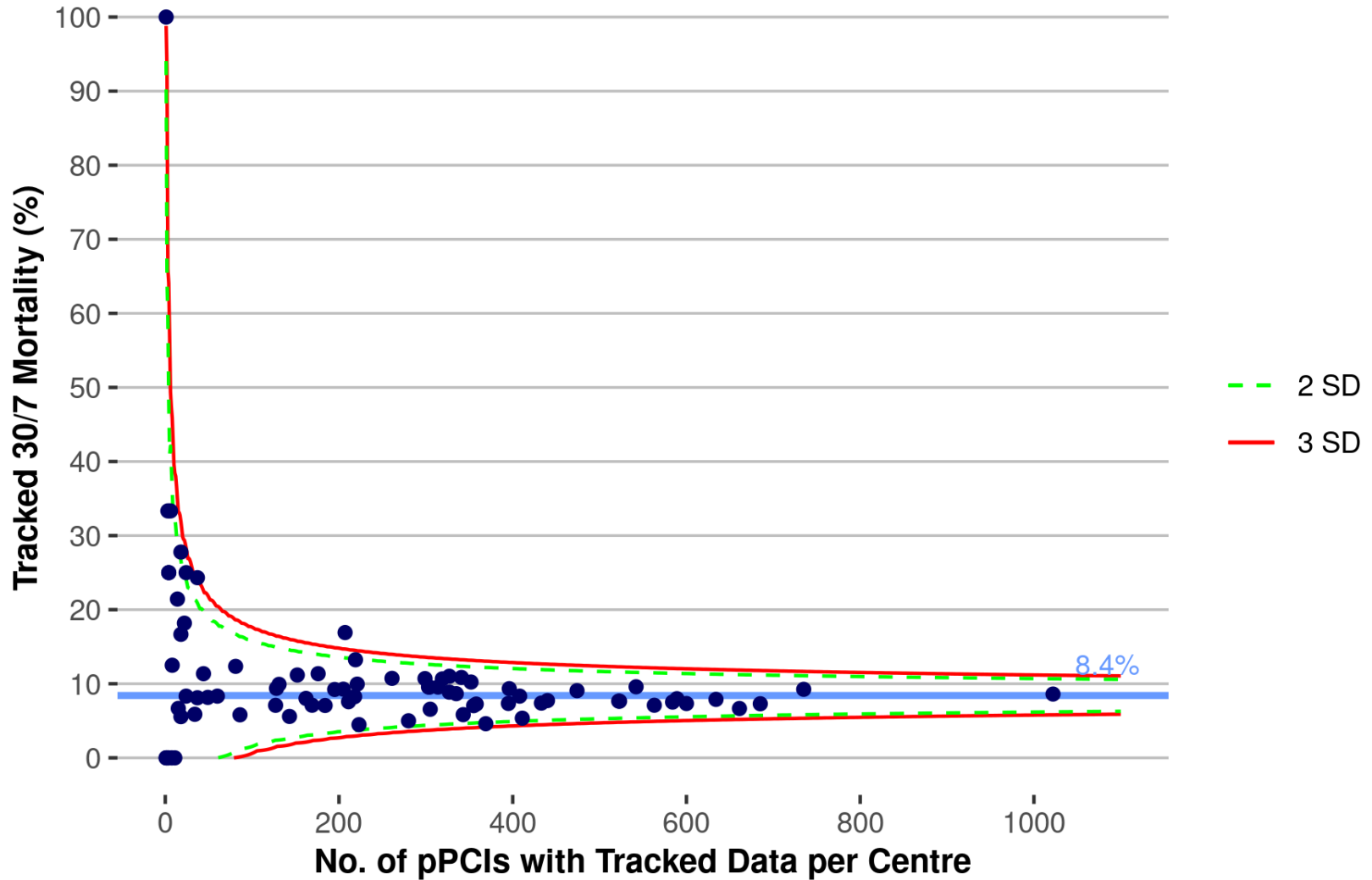
Primary PCI (shock/vent EXCLUDED)



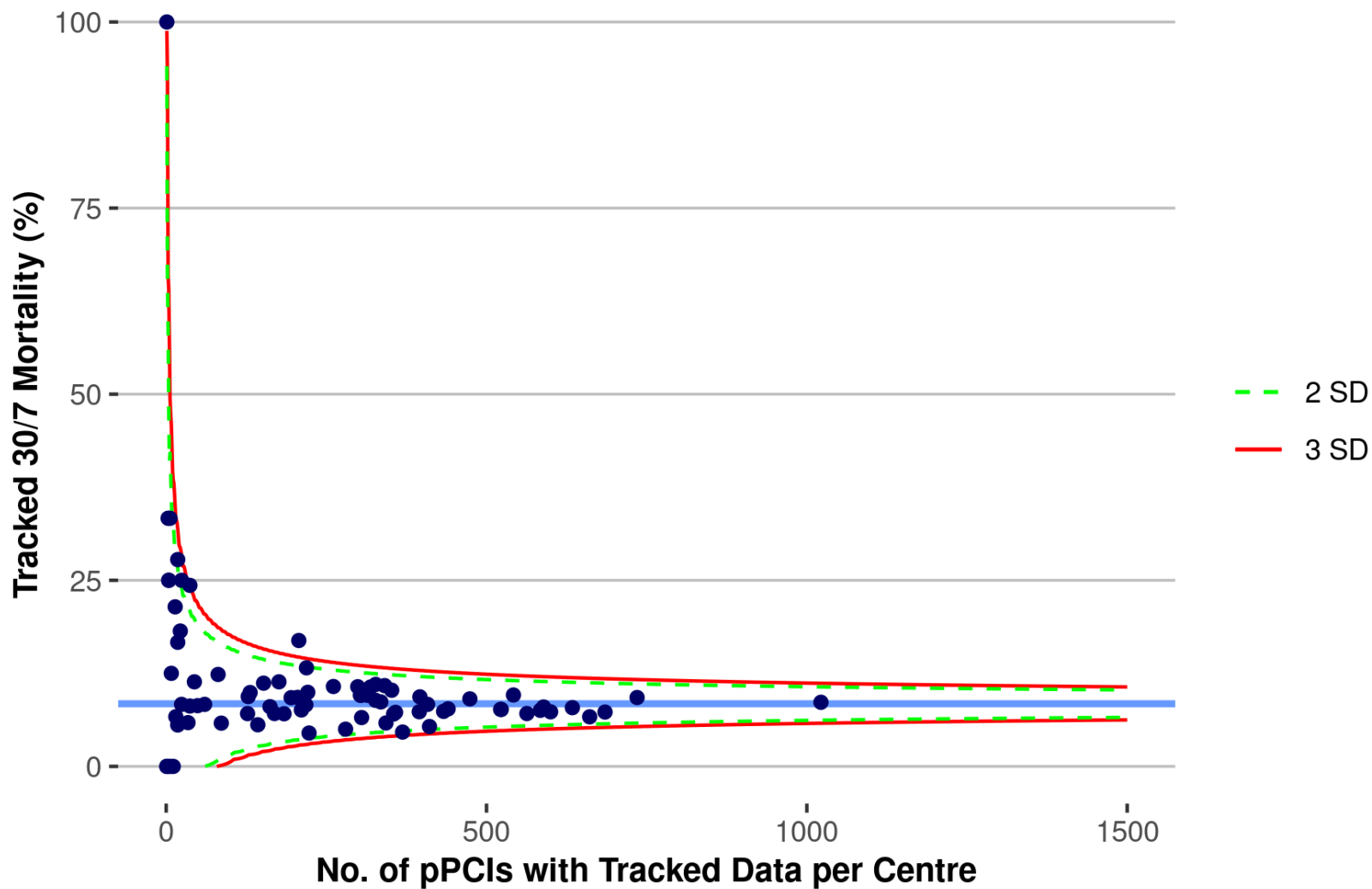
Primary PCI - Direct admission (shock/vent EXCLUDED)



Primary PCI (shock/vent INCLUDED)

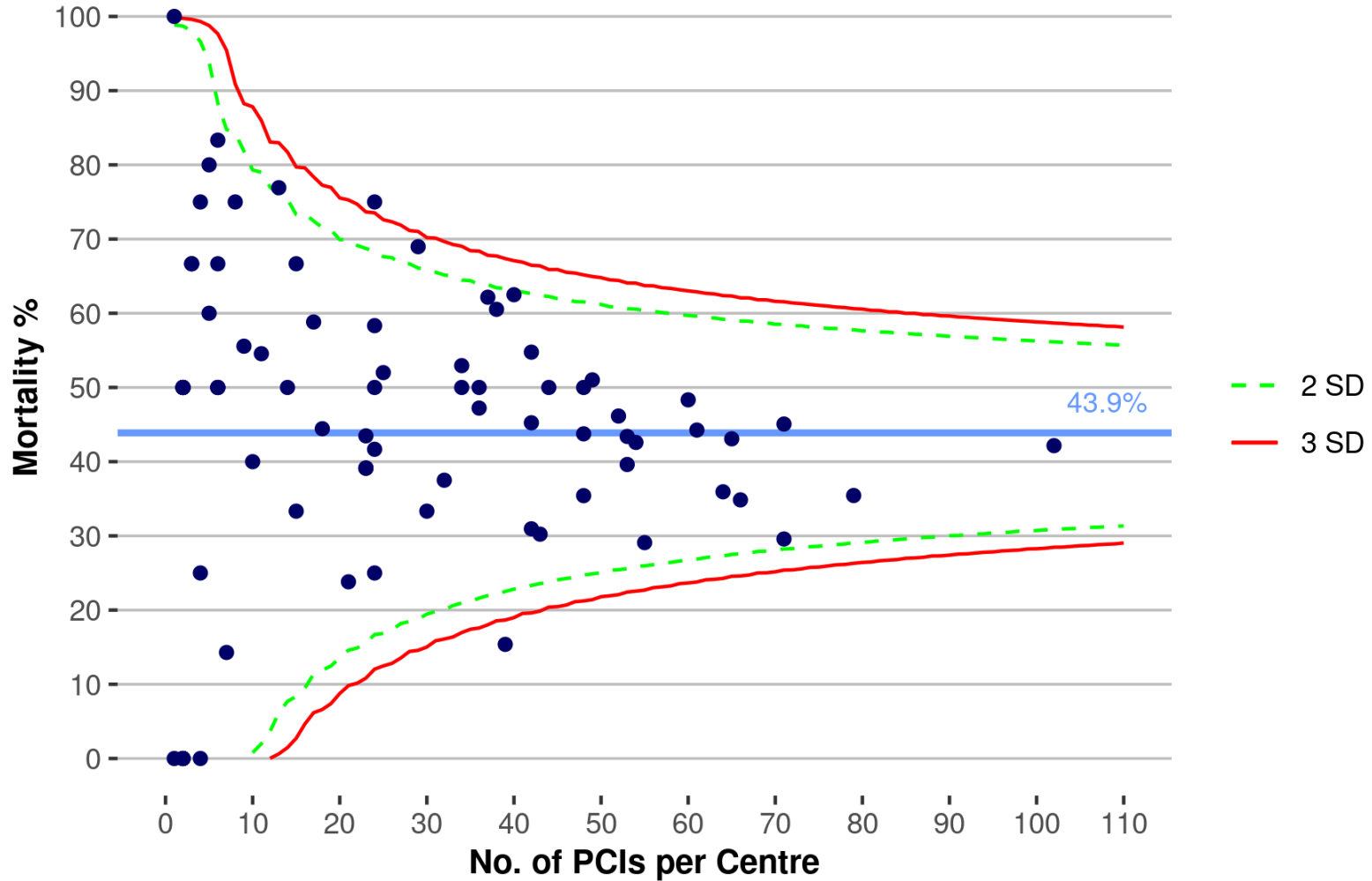


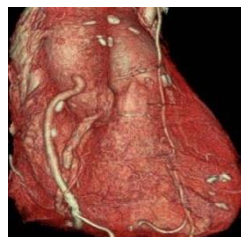
Primary PCI (shock/vent INCLUDED)



Cardiogenic Shock

Tracked 30 day mortality



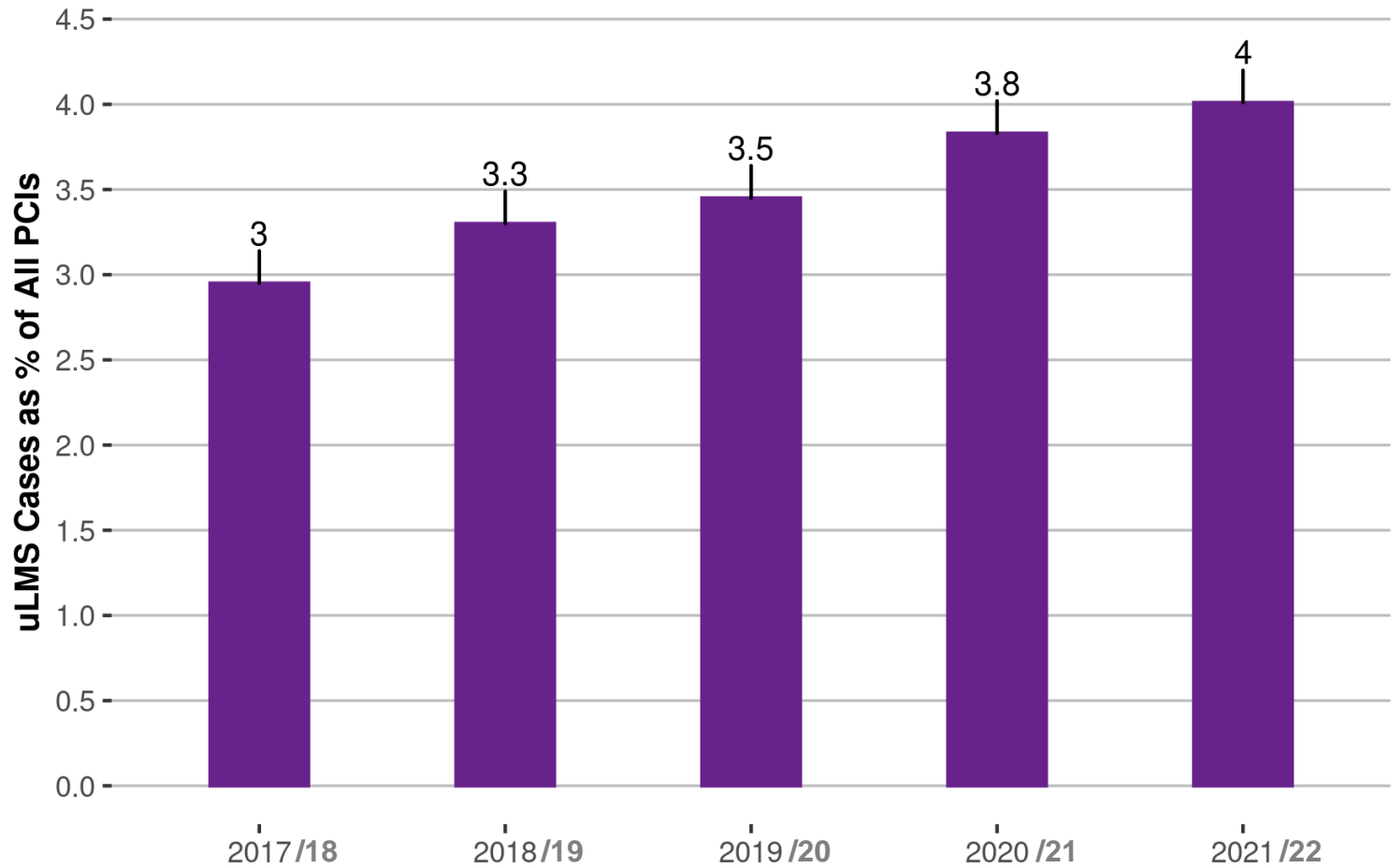


Bypass grafts

PCI of SVG and Arterial

All as %	No.	Success	Partial success	Fail no comp	Re-PCI	QMI	Em CABG	In Hosp Death	30/7 Death (CR)
2007	3900	88.5	2.72	7.79	0.23	0.21	0	0.78	1.6
2008	4284*	91.0	3.2	5.11	0.21	0.09	0.02	0.58	1.3
2009	2599	88.9	3.69	5.93	0.23	0.23	0	1.22	1.7
2010	2602	90.8	2.34	5.46	0.19	0.27	0	0.94	1.5
2011	2741	87.8	3.65	6.79	0.47	0.33	0	1.39	2.6
2012	2903	88.7	4.72	4.48	0.28	0.07	0.07	1.8	2.7
2013	2512	86.8	5.69	5.97	0.36	0.08	0	1.37	2.0
2014	2571	85.1	7.12	5.56	0.39	0.08	0.08	2.04	2.9
2015	2647	80.2	12.8	4.84	0.23	0.08	0	1.98	2.9
2016/17	2554	80	13.3	4.1	0.23	0.12	0.08	1.94	2.8
2017/18	2590	78.11	12.12	7.72	0.35	0.12	0.04	1.84	3.03
2018/19	2263	81.09	10.08	7.11	0.22	0.09	0	1.58	2.78
2019/20	2066	76.52	14.47	6.87	0.29	0.1	0.05	1.73	2.83
2020/21	1373	80.04	9.61	7.57	0.36	0.36	0	2.24	4.4
2021/22	1347	85.52	3.86	6.76	0.22	0.45	0	3.01	4.1

Unprotected LMS



Unprotected LMS

Including Shock and STEMI

All as %	No.	Success	Partial success	Fail no comp	Re-PCI	QMI	Em CABG	In Hosp Death	Death 30/7 (CR)
2006	583	86.8	4.5	0.9	0.3	0.51	0.17	7.0	
2007	854	83.7	7.14	1.99	0.12	0.35	0.7	6.6	8.81
2008	1085	83.7	5.35	2.12	0.65	0.37	0.46	7.9	10.85
2009	1458	84.8	3.84	3.16	0.34	0.27	0.34	7.6	9.37
2010	1504	86.1	3.06	2.19	0.47	0.13	0.07	8.1	9.59
2011	1984	86.0	3.93	2.17	0.3	0.35	0.2	7.4	10
2012	2374	85.5	4.59	1.22	0.42	0.17	0.08	8.2	12.0
2013	2541	85.8	4.21	1.53	0.35	0.16	0.12	7.9	11.4
2014	2836	86.6	3.35	1.69	0.28	0.25	0.14	8.0	11.8
2015	3171	86.3	3.4	1.8	0.38	0.16	0.16	8.0	11.4
2016	3590	89.1	3.0	1.4	0.4	0.04	0.06	6.4	9.6
2017/18	3515	85.6	3.9	2.2	0.26	0.06	0.3	8.3	11.2
2018/19	3443	86.7	4.0	2.8	0.32	0.12	0.09	6.2	8.9
2019/20	3648	85.6	4.3	3.4	0.38	0.11	0.08	6.1	8.8
2020/21	3538	86.0	4.2	3.3	0.28	0.31	0.2	6.0	8.3
2021/22	3721	83.36	3.98	4.54	0.38	0.3	0.16	6.4	8.5

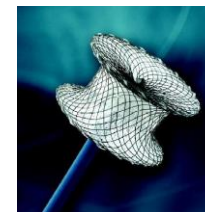
Chronic Total Occlusion

Stable only

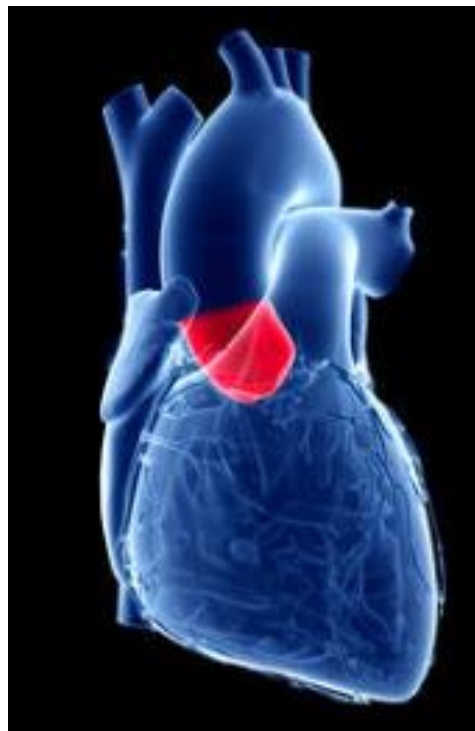
All as %	No.	Success	Partial success	Fail no comp	Re-PCI	QMI	Em CABG	In Hosp Death	Death 30/7 (CR)
2011	3976	70.5	6.2	22.96	0.13	0.03	0.05	0.25	0.4
2012	4208	71.6	6.4	21.65	0.26	0.07	0.1	0.21	0.5
2013	3874	72.5	5.6	21.63	0.1	0.05	0.05	0.15	0.4
2014	4029	73.2	5.9	20.3	0.15	0.07	0.15	0.34	0.6
2015	4283	76.0	6.4	17.3	0.16	0.02	0.07	0.21	0.4
2016	4043	75.8	6.3	17.6	0.12	0.05	0.07	0.33	0.5
2017/18	3714	73.64	7	19.06	0.27	0.05	0	0.21	0.53
2018/19	3513	74.32	6.12	19.19	0.63	0.03	0.09	0.22	0.49
2019/20	3449	74.86	6.35	18.3	0.61	0.06	0.06	0.37	0.6
2020/21	2369	74.93	6.54	18.15	0.25	0	0.04	0.34	0.66
2021/22	2621	75.28	6.33	17.67	0.27	0.11	0.04	0.34	0.59

Audit Presentation

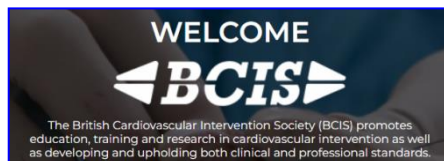
- PCI
 - Survey (UK)
 - PCI procedural data (E&W)
- **Structural Intervention**
- NICOR update



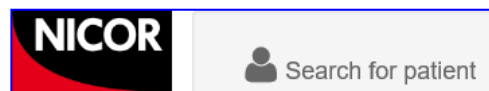
Aortic



TAVI Data Sources



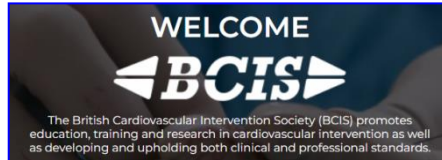
- Annual survey



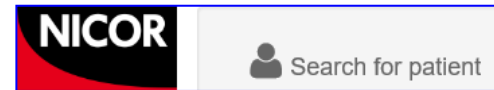
- TAVI Procedural data



Data Sources



- Annual survey



- TAVI Procedural data



← or →



Data extract
xx-xx-2023

TAVI Centres

2021/22

42 centres

BMI Alexandra Hospital (AHM)
 Essex Cardiothoracic Centre (BAS)
 Liverpool Heart and Chest Hospital (BHL)
 Bristol Royal Infirmary (BRI)
 Castle Hill Hospital (CHH)
 Nottingham City Hospital (CHN)
 Cromwell Hospital (CRO)
 Edinburgh Heart Centre (ERI)
 Freeman Hospital (FRE)
 St George's Hospital (GEO)
 Spire Hospital Bristol (GHB)
 Golden Jubilee National Hospital (GJH)
 Glenfield Hospital (GRL)
 Hammersmith Hospital (HAM)
 Harefield Hospital (HH)
 Wellington Hospital (HHW)
 Harley Street Clinic (HSC)
 Kings College Hospital (KCH)
 London Bridge Hospital (LBH)
 Yorkshire Heart Centre (LGI)
 Morriston Hospital (MOR)
 Manchester Royal Infirmary (MRI)
 New Cross Hospital (NCR)
 Northern General Hospital (NGS)
 Royal Brompton Hospital (NHB)
 Royal Papworth Hospital (PAP)
 BMI Park Hospital (PHN)
 Derriford Hospital (PLY)
 Queen Elizabeth Hospital Birmingham (QEB)
 John Radcliffe Hospital (RAD)
 Aberdeen Royal Infirmary (RIA)
 Royal Sussex County Hospital (RSC)
 Royal Victoria Hospital (RVB)
 Barts Health Centre (SBH)
 James Cook University Hospital (SCM)
 Southampton General Hospital (SGH)
 St Thomas' Hospital (STH)
 University Hospital of North Staffordshire (STO)
 University Hospital of Wales (UHW)
 Blackpool Victoria Hospital (VIC)
 University Hospital Coventry (WAL)
 Wythenshawe Hospital (WYT)

Stopped:

St Anthony's Hospital (ANT)

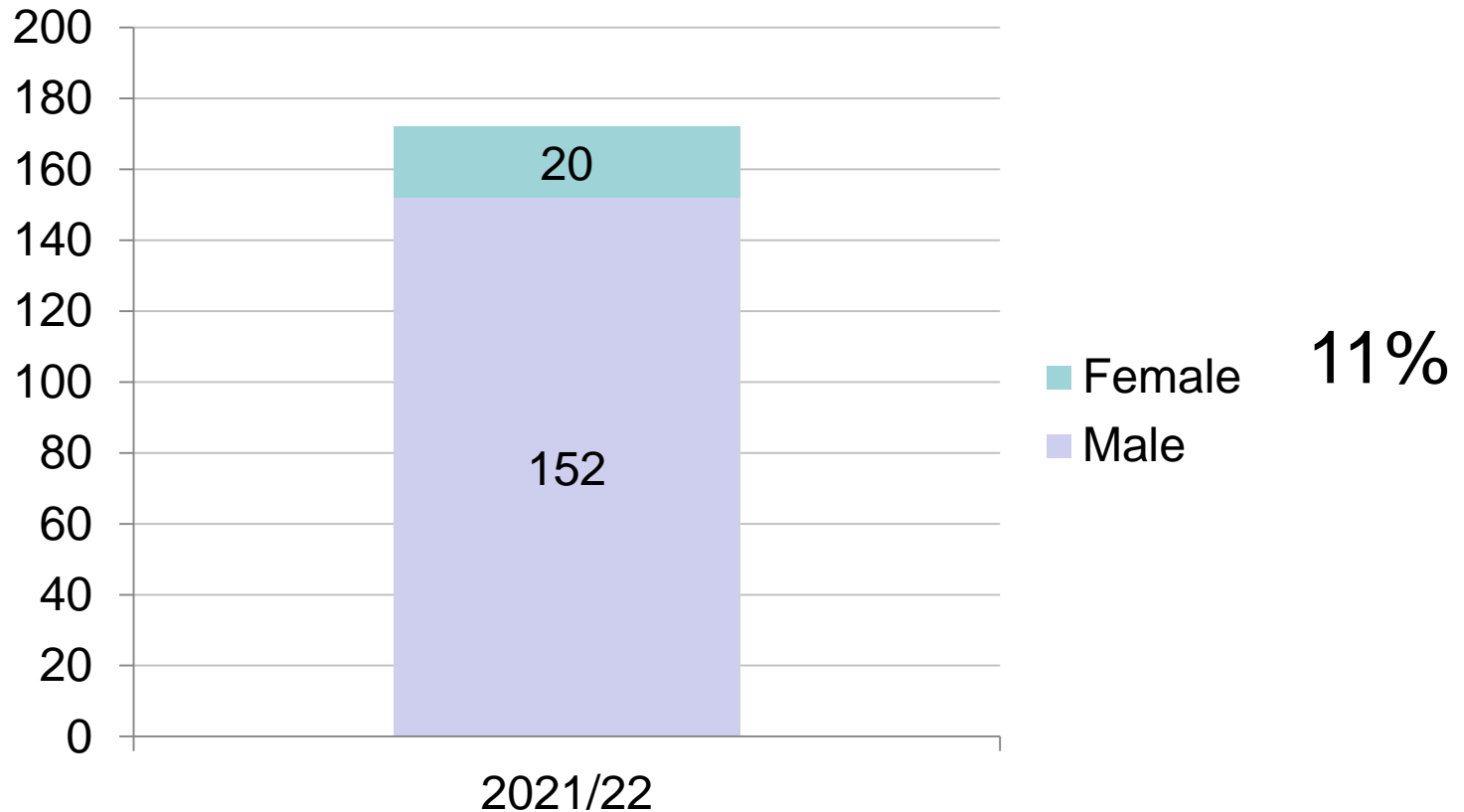
Manor Hospital (MHO)

Started:

BMI Alexandra Hospital (AHM)

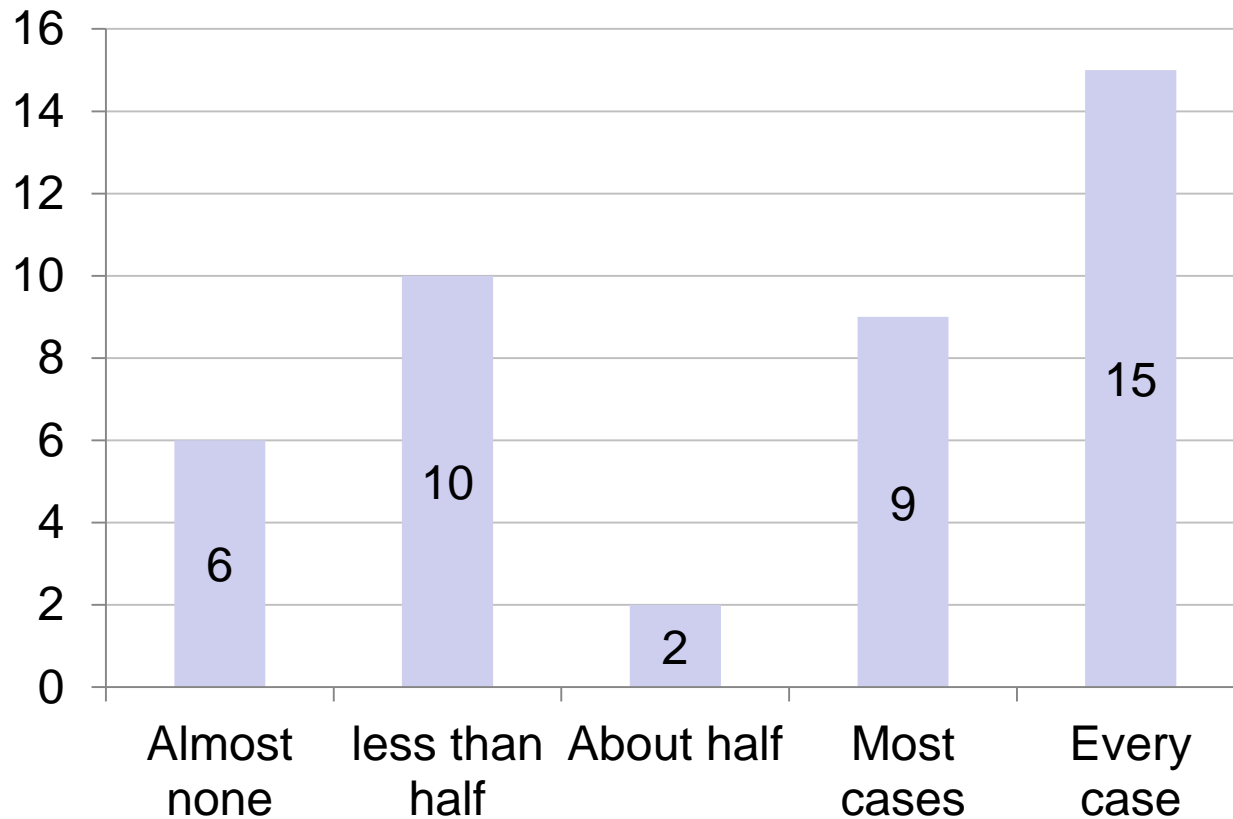


TAVI Consultant Operators

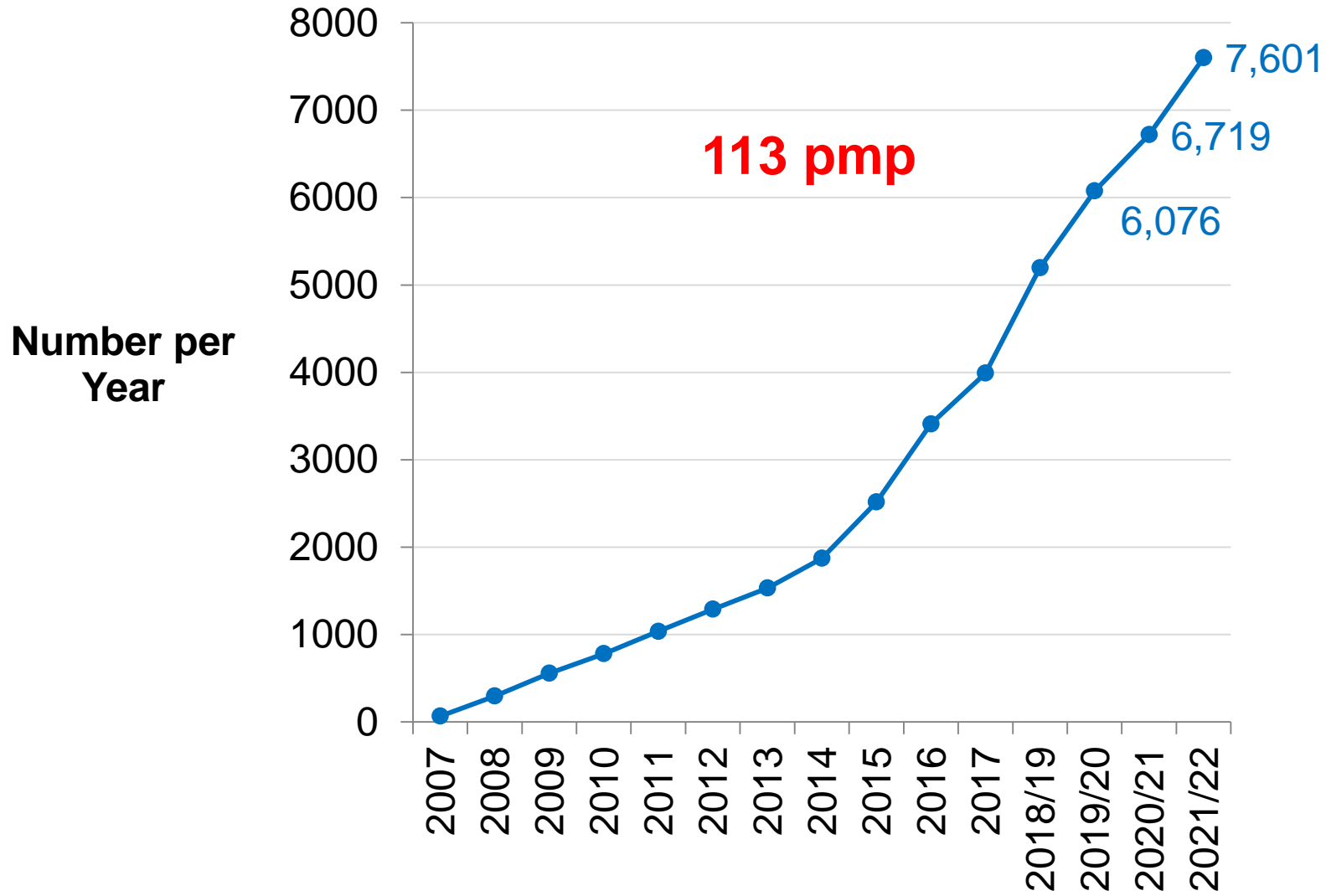


TAVI MDTs

% of patients treated by surgical AVR discussed at your centre's Aortic Multi Disciplinary Meeting

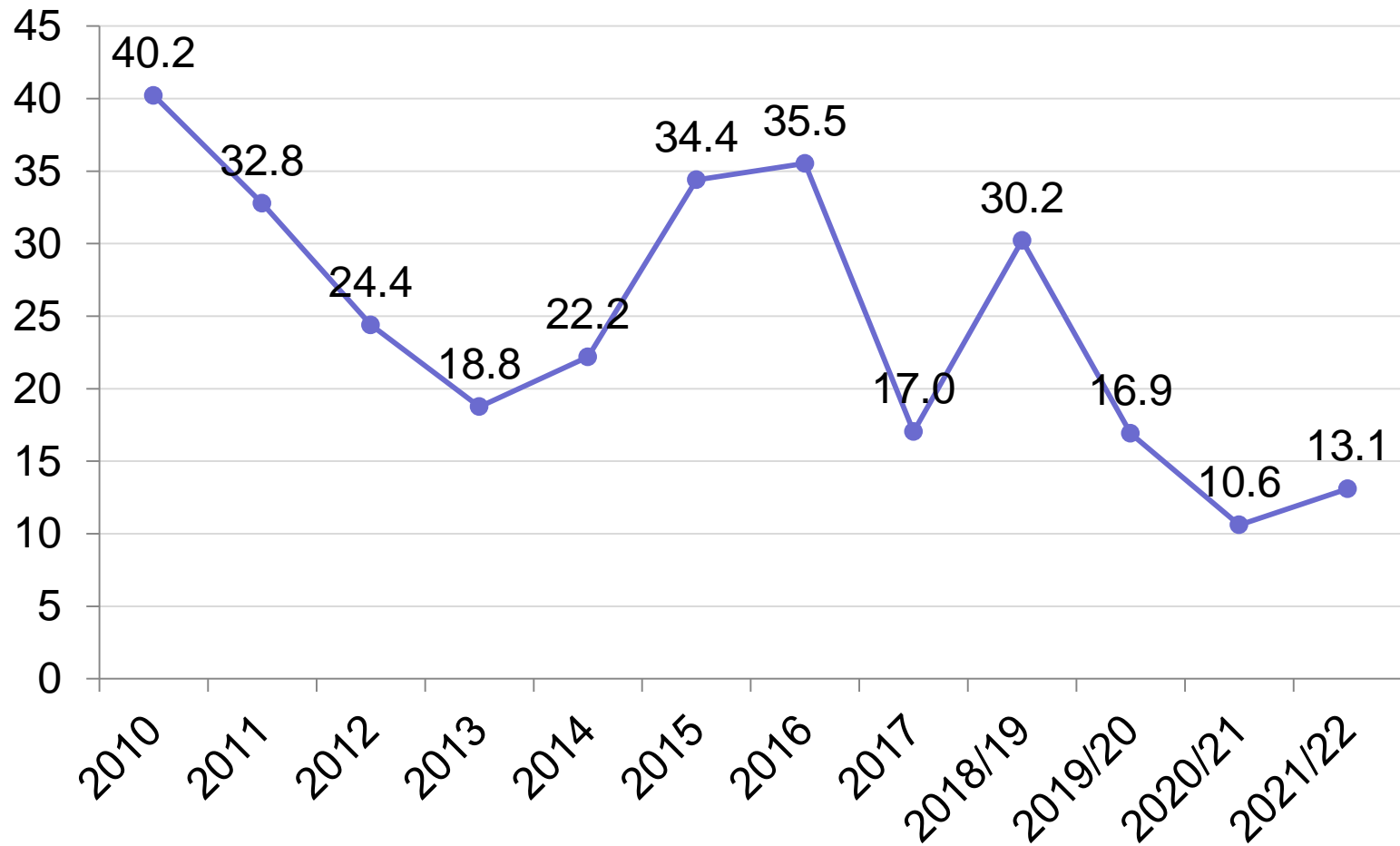


TAVI



TAVI

Rate of Increase in Procedures



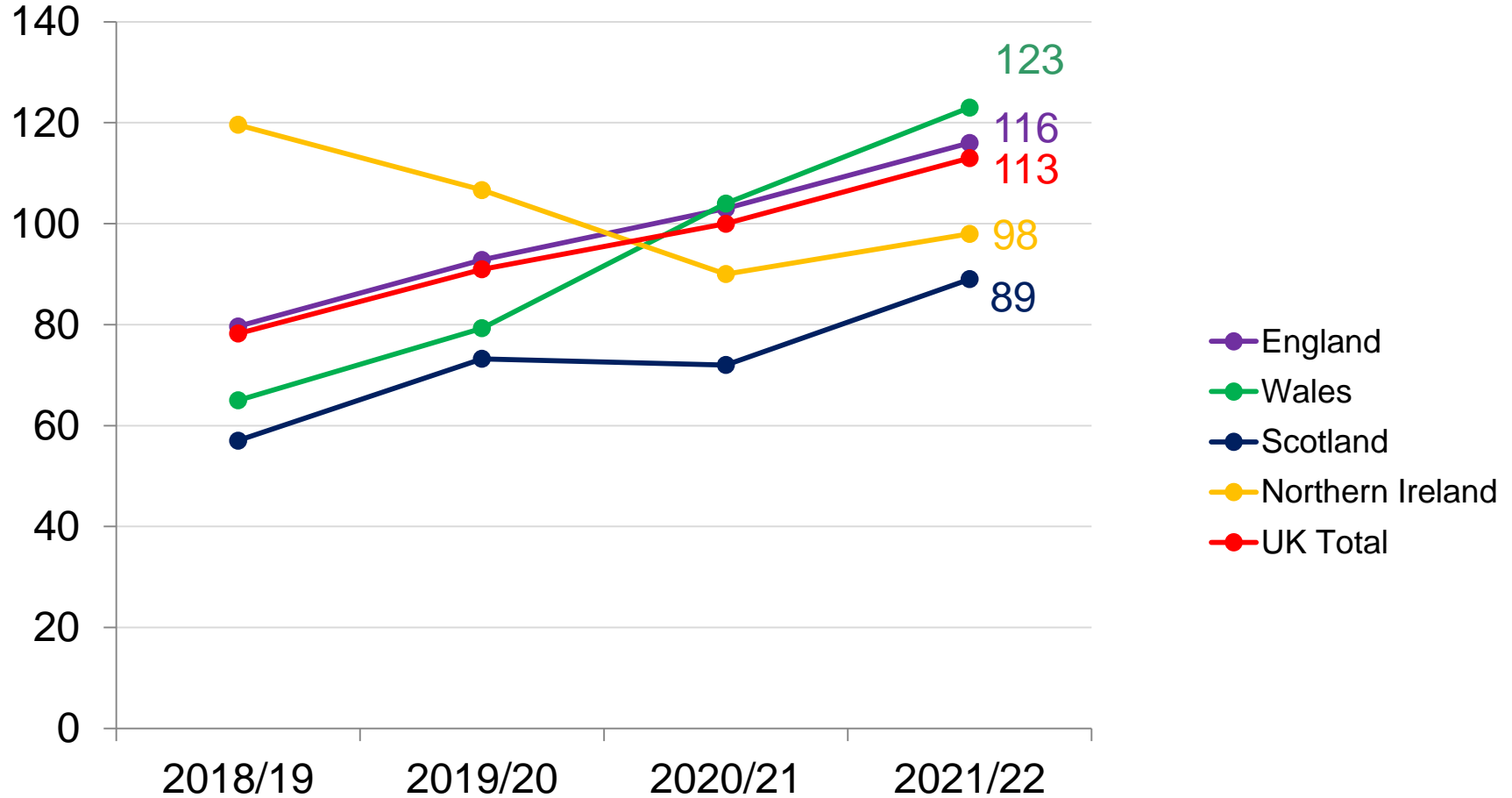
TAVI

By UK Country

Country Treated	Number of Centres	Total TAVI	Population mid 2021	TAVI pmp
England	36	6542	56.49	116
Wales	2	383	3.11	123
Scotland	3	490	5.48	89
Northern Ireland	1	186	1.90	98
ALL	42	7601	66.98	113

TAVI

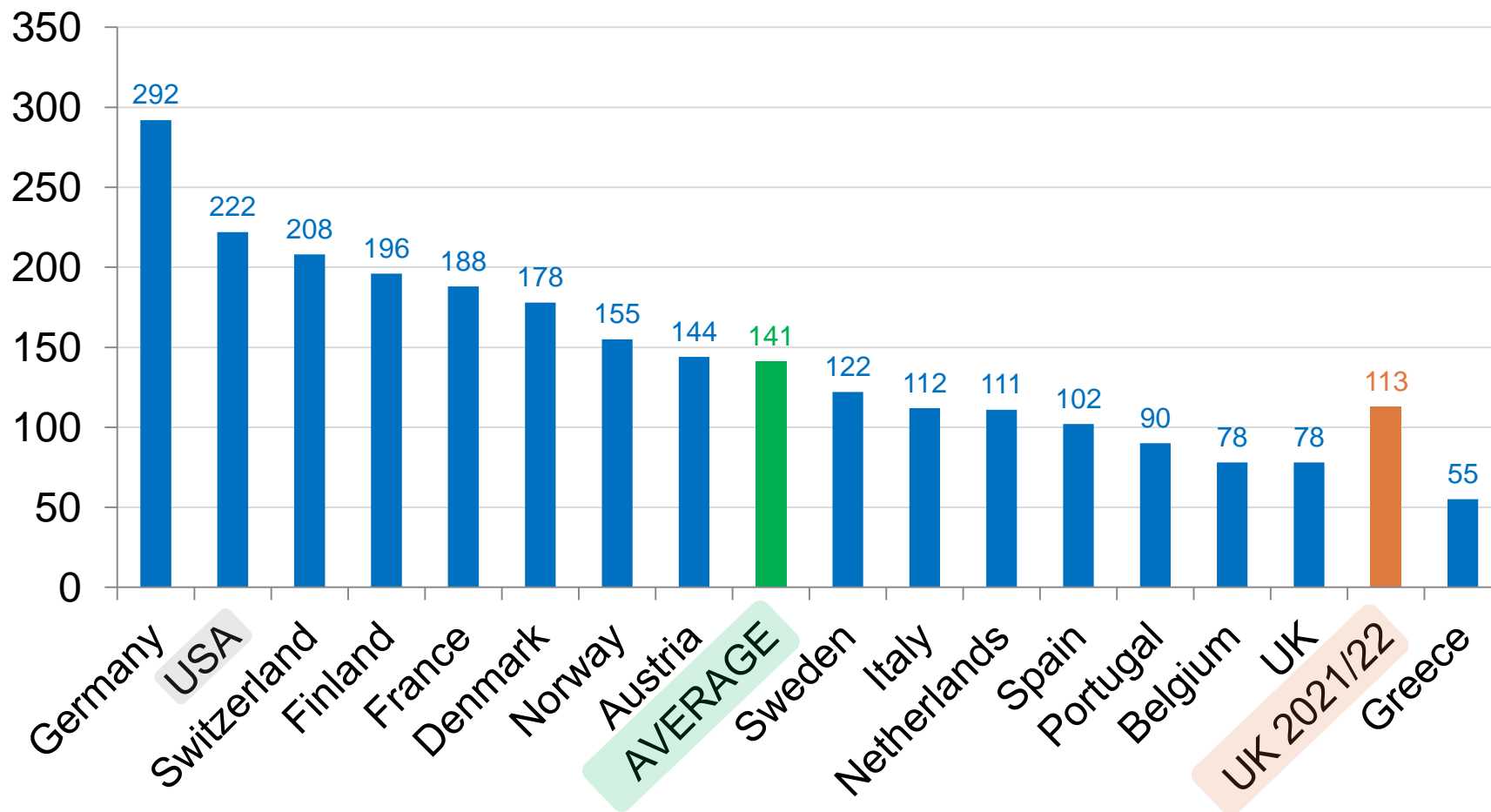
Rate pmp by Country



TAVI

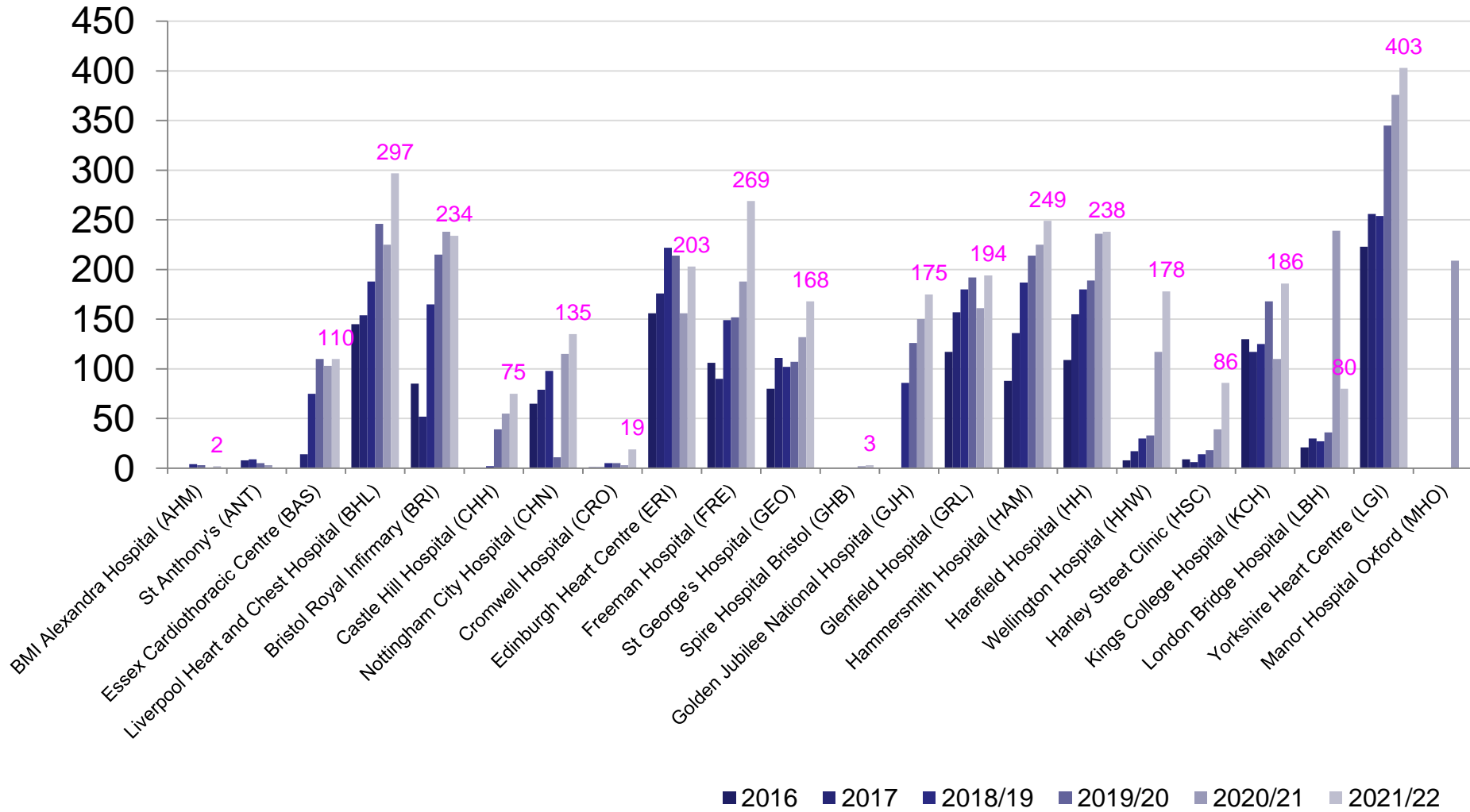
Rate pmp National Comparison

TAVI procedures per million population 2019



TAVI

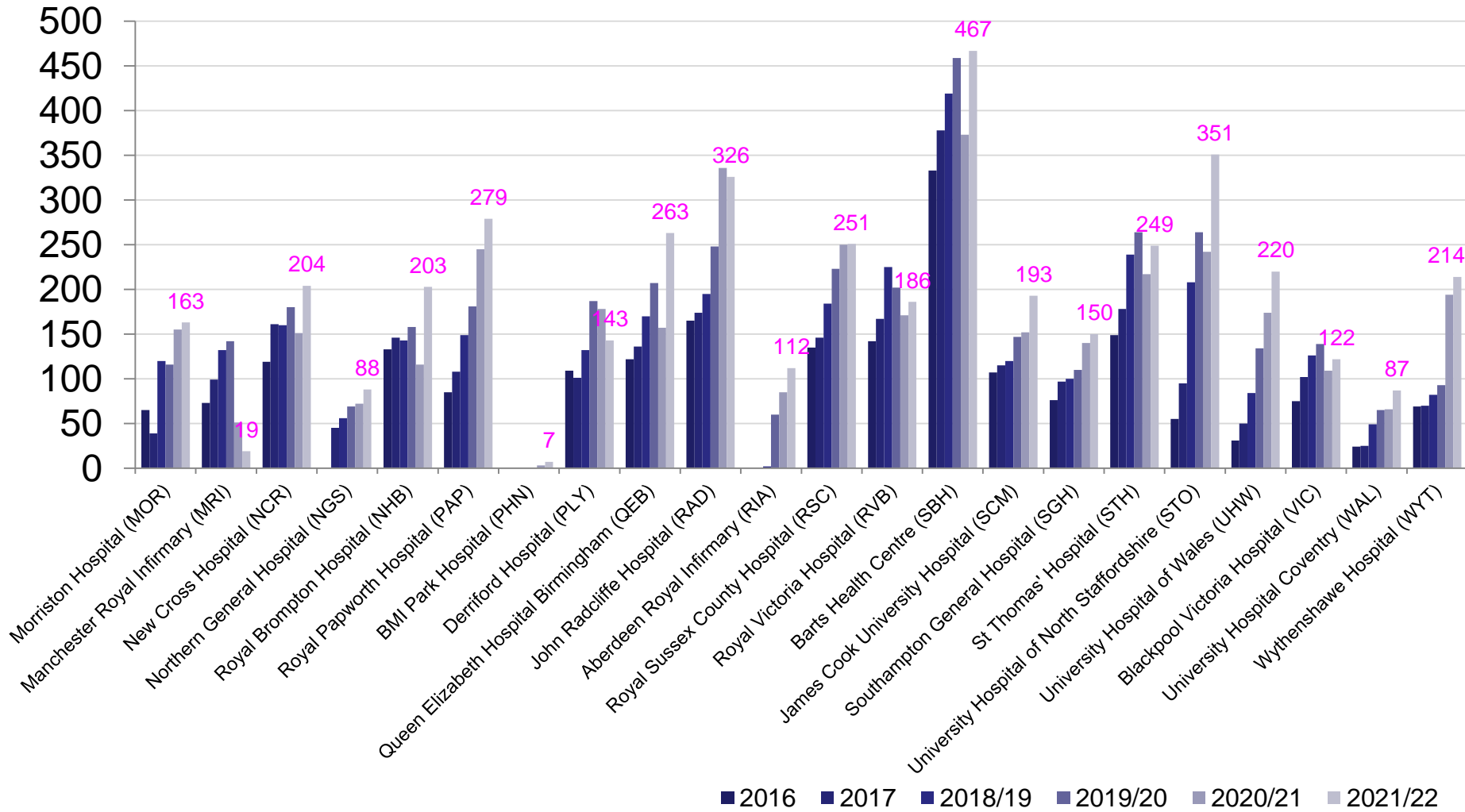
Centres by Site Code (AHM to MHO)



Number is for latest year

TAVI

Centres by Site Code (MOR to WYT)

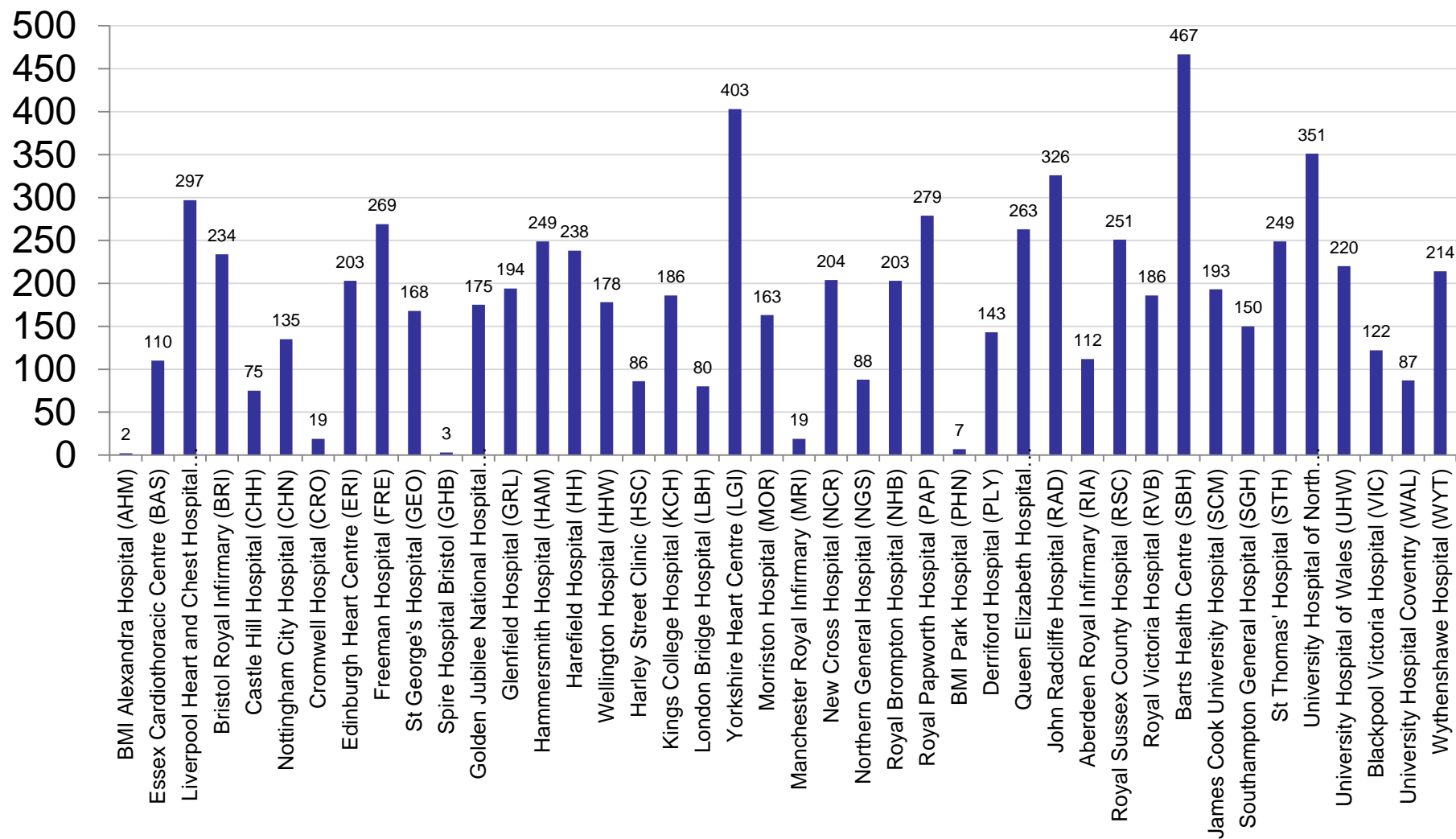


■ 2016 ■ 2017 ■ 2018/19 ■ 2019/20 ■ 2020/21 ■ 2021/22

Number is for latest year

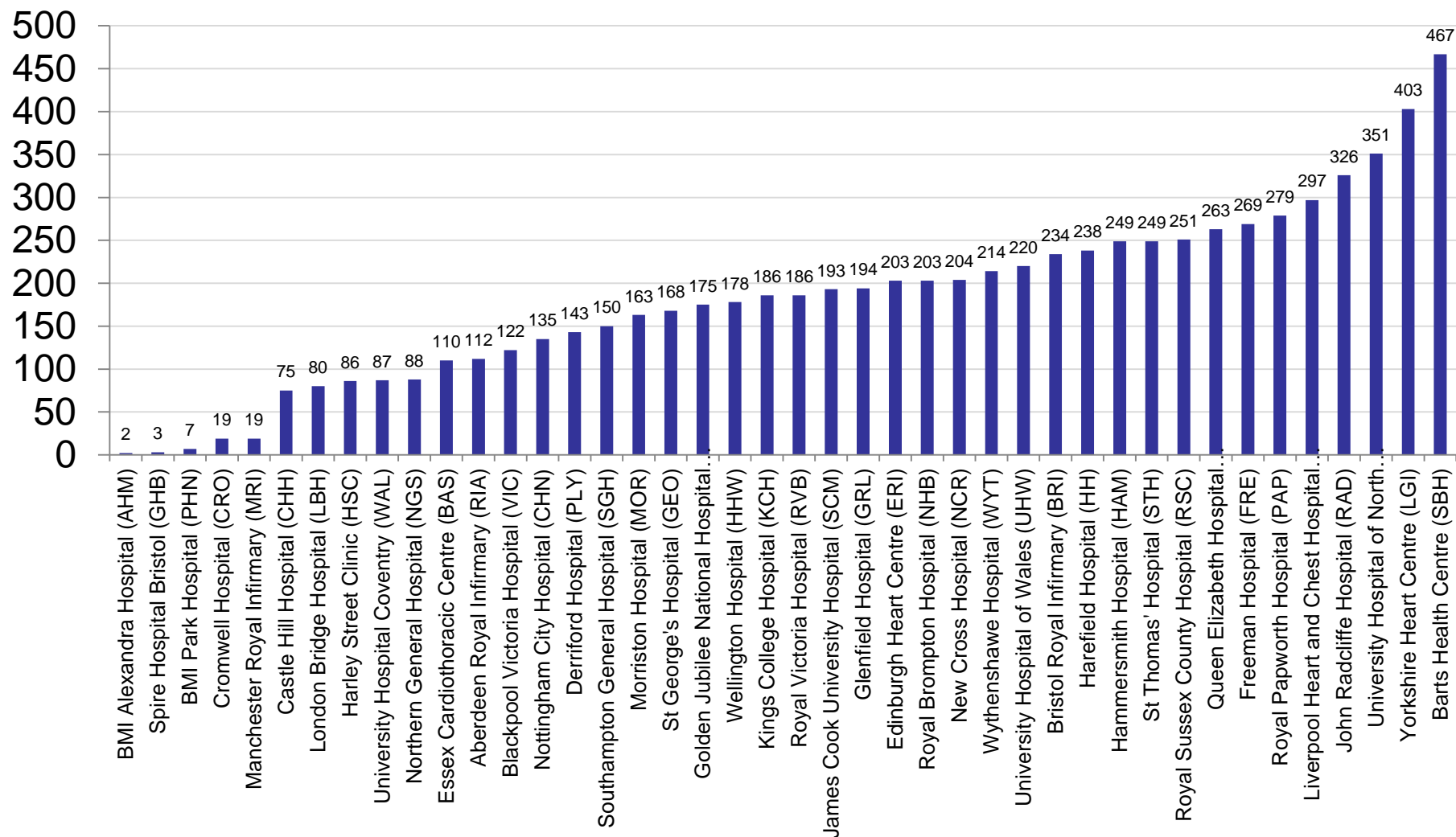
TAVI

Centres by Procedures in 2021/22



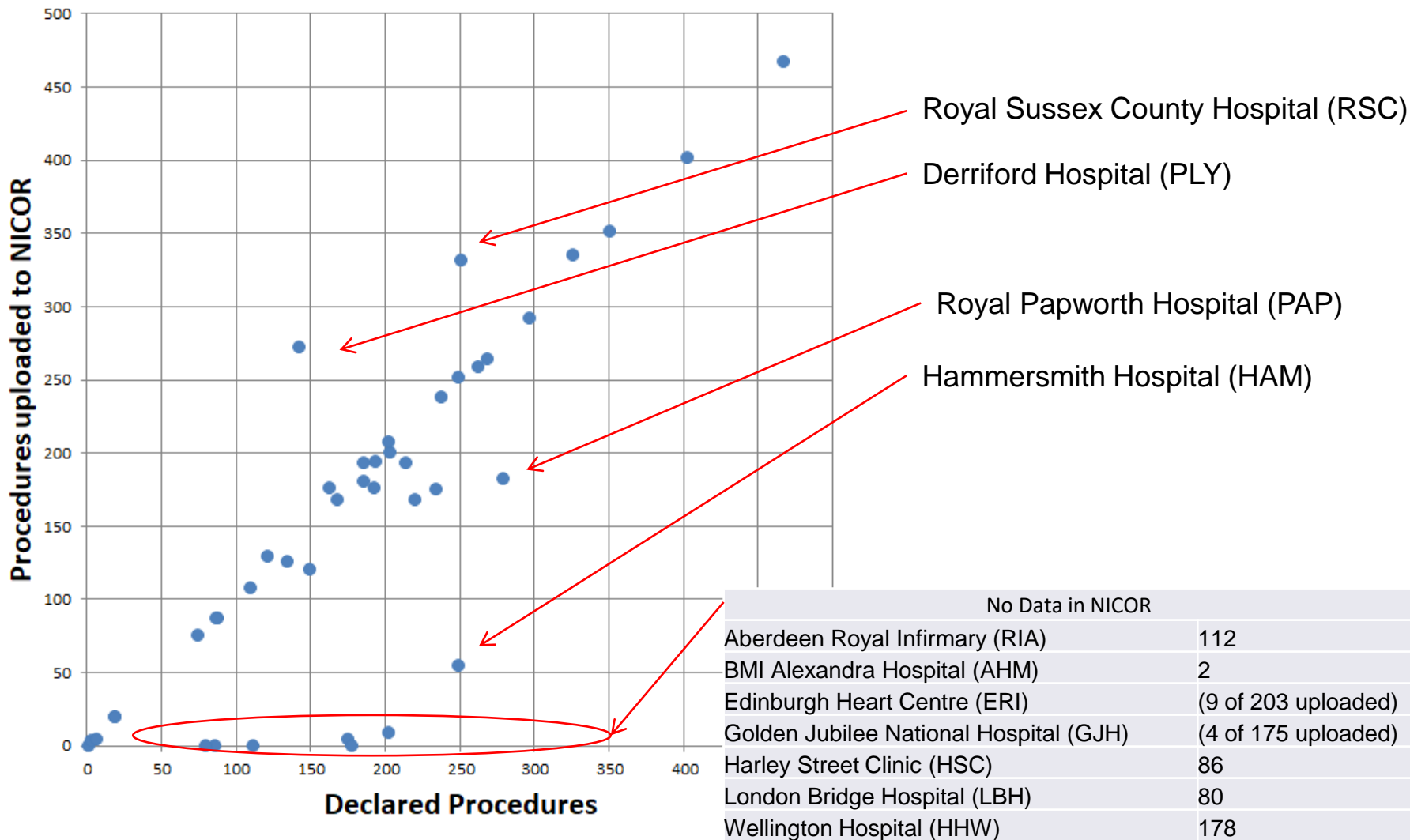
TAVI

Centres by Procedures in 2021/22



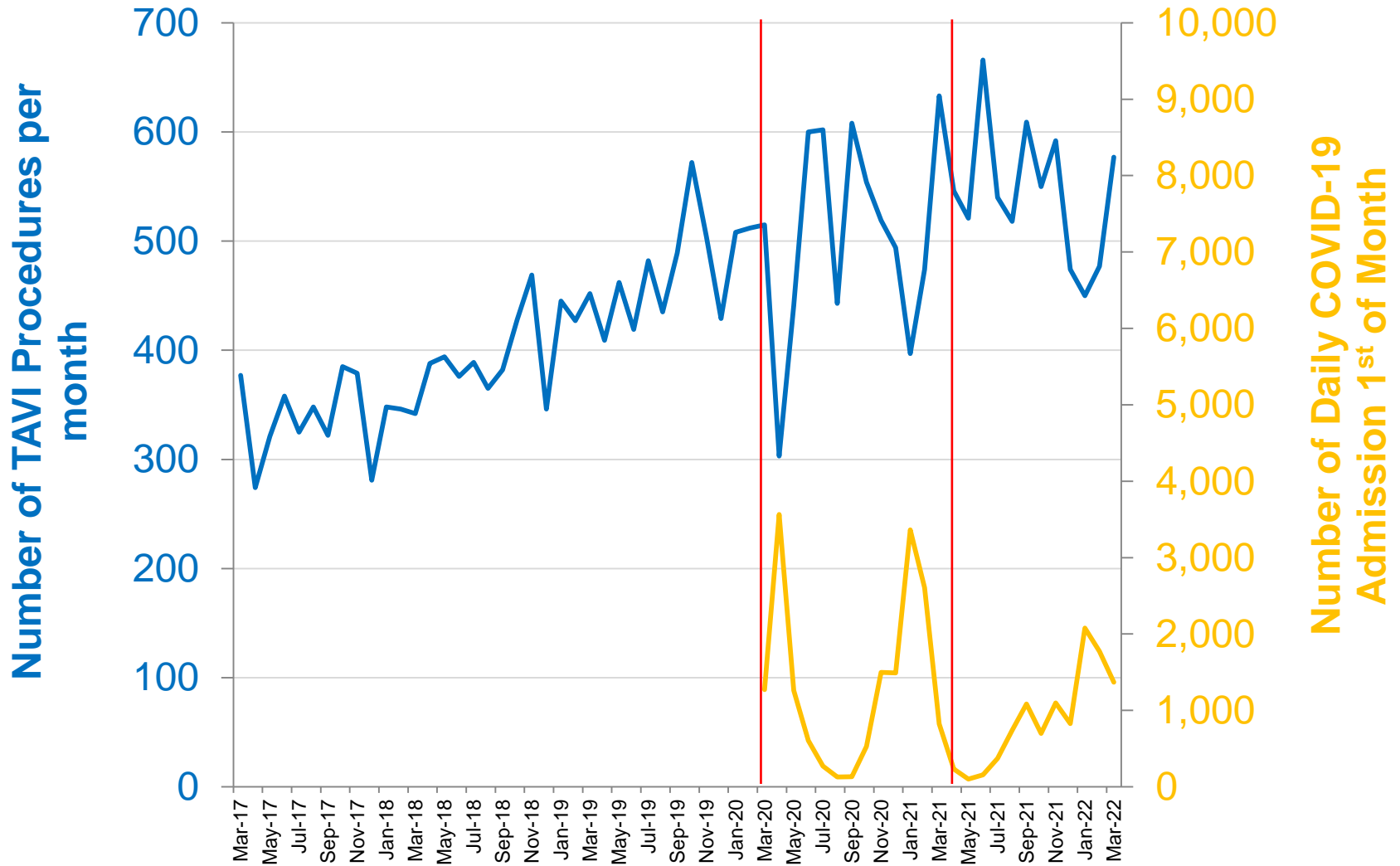
TAVI

7601 Declared v 6520 in NICOR



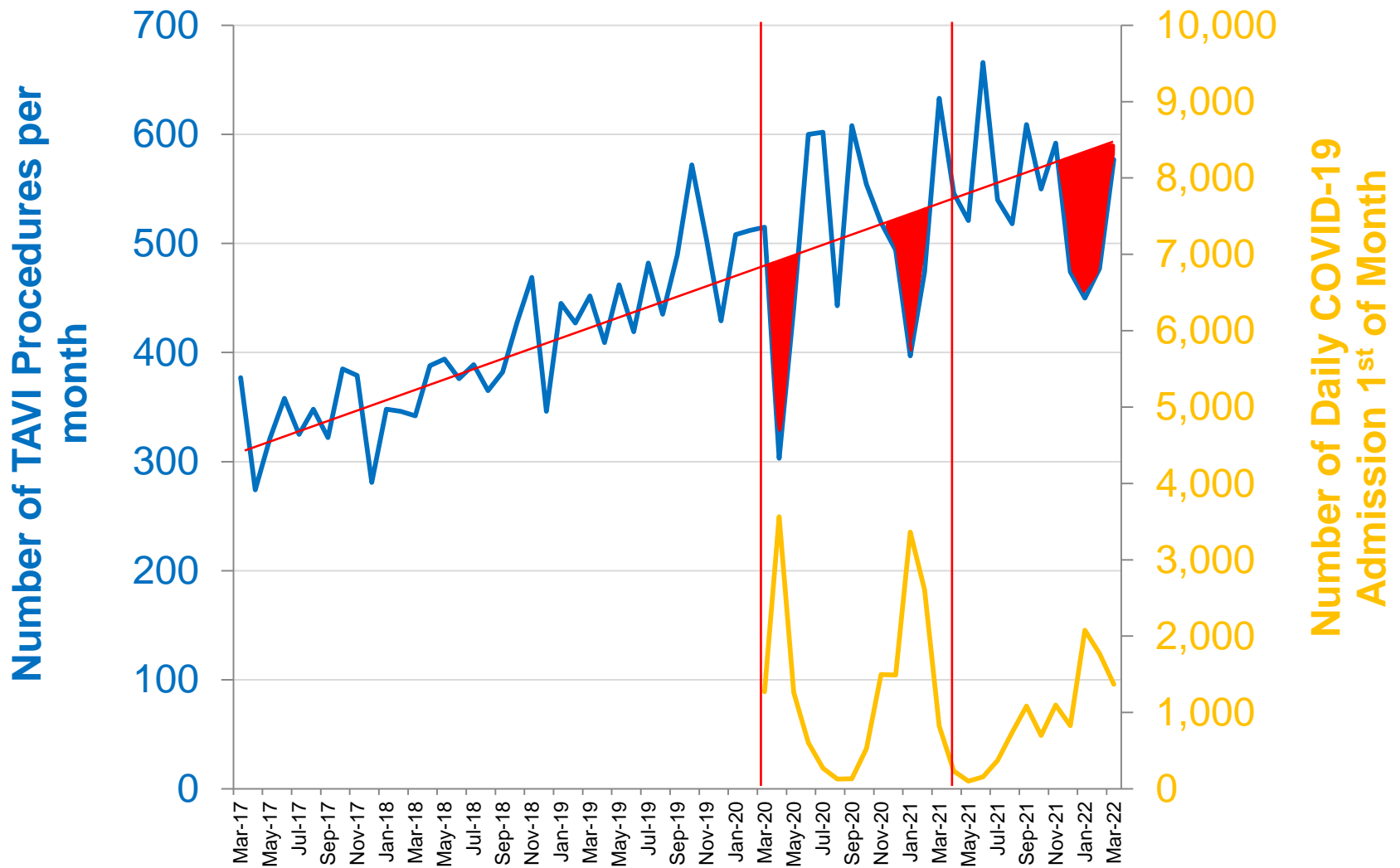
TAVI per month

5 years: March 2017-March 2022



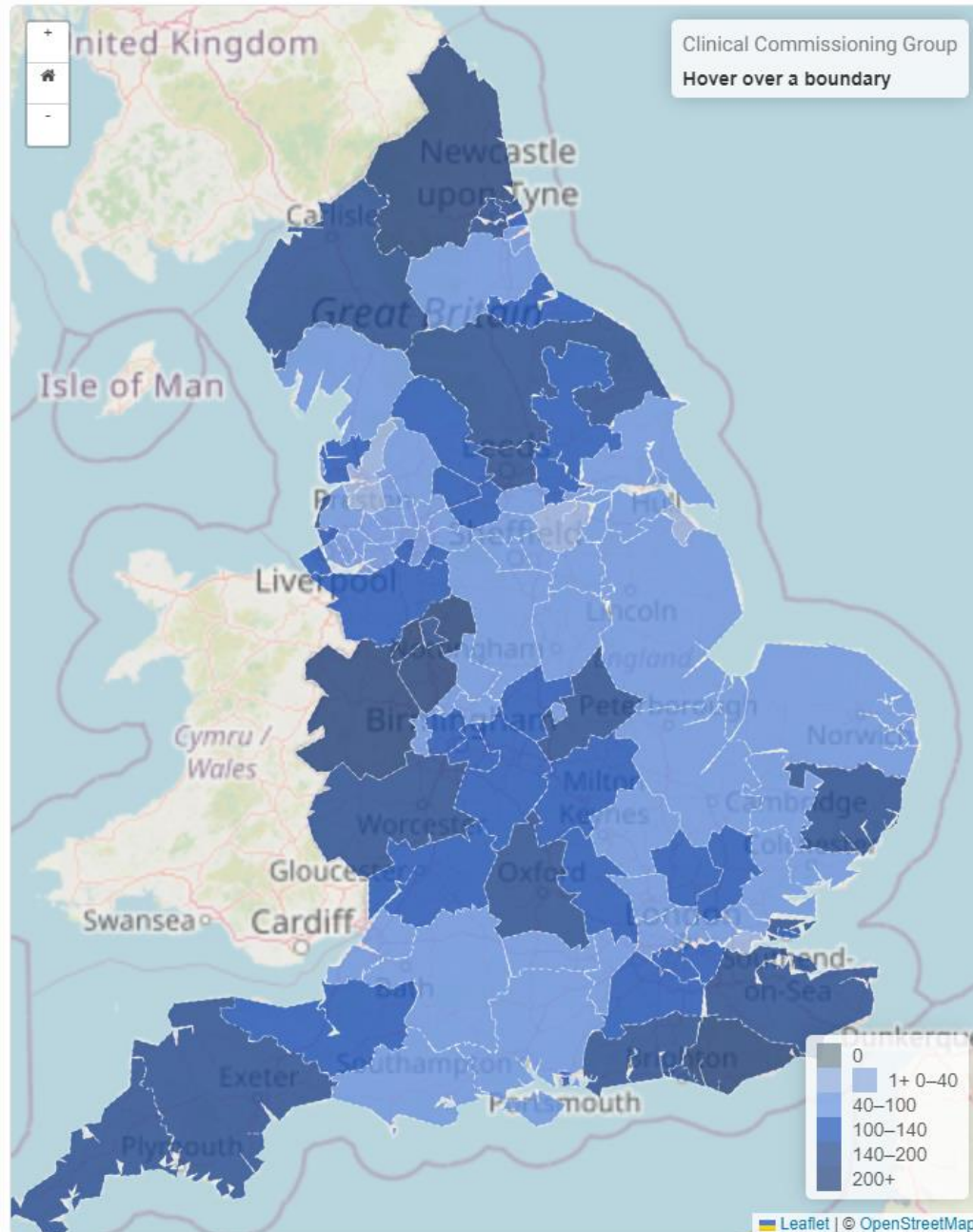
TAVI per month

6 years: March 2017-March 2022



TAVI

2021/22



TAVI

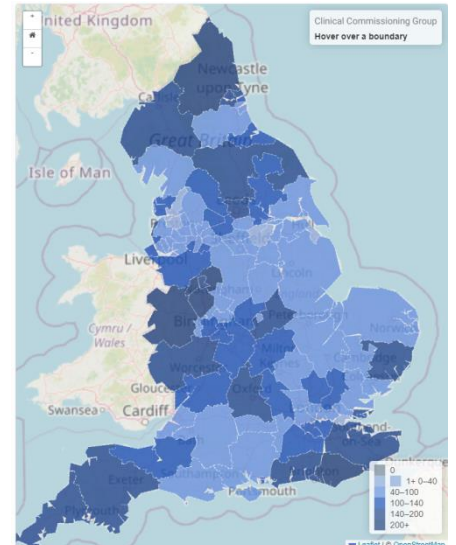
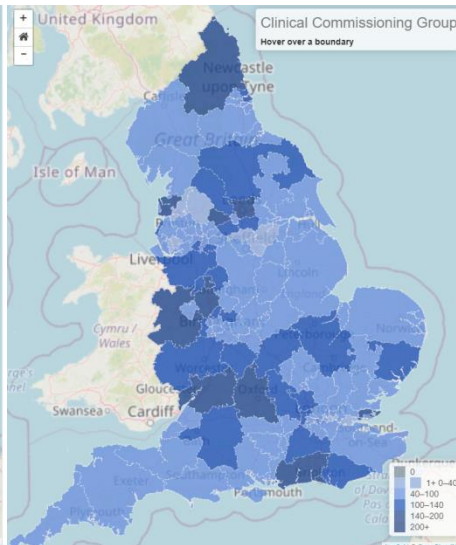
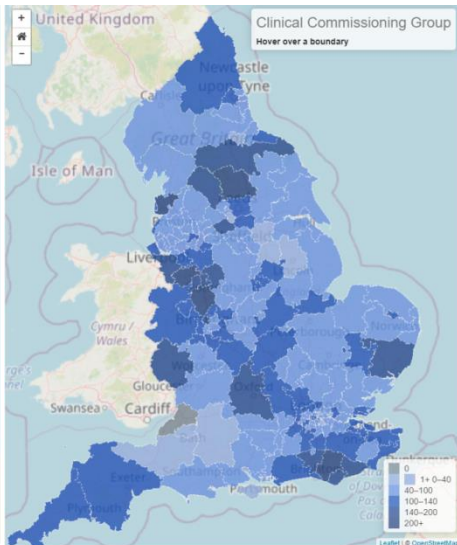
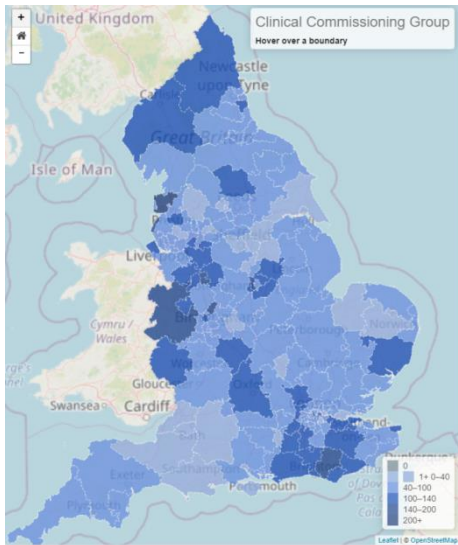
pmp

2018/19

2019/20

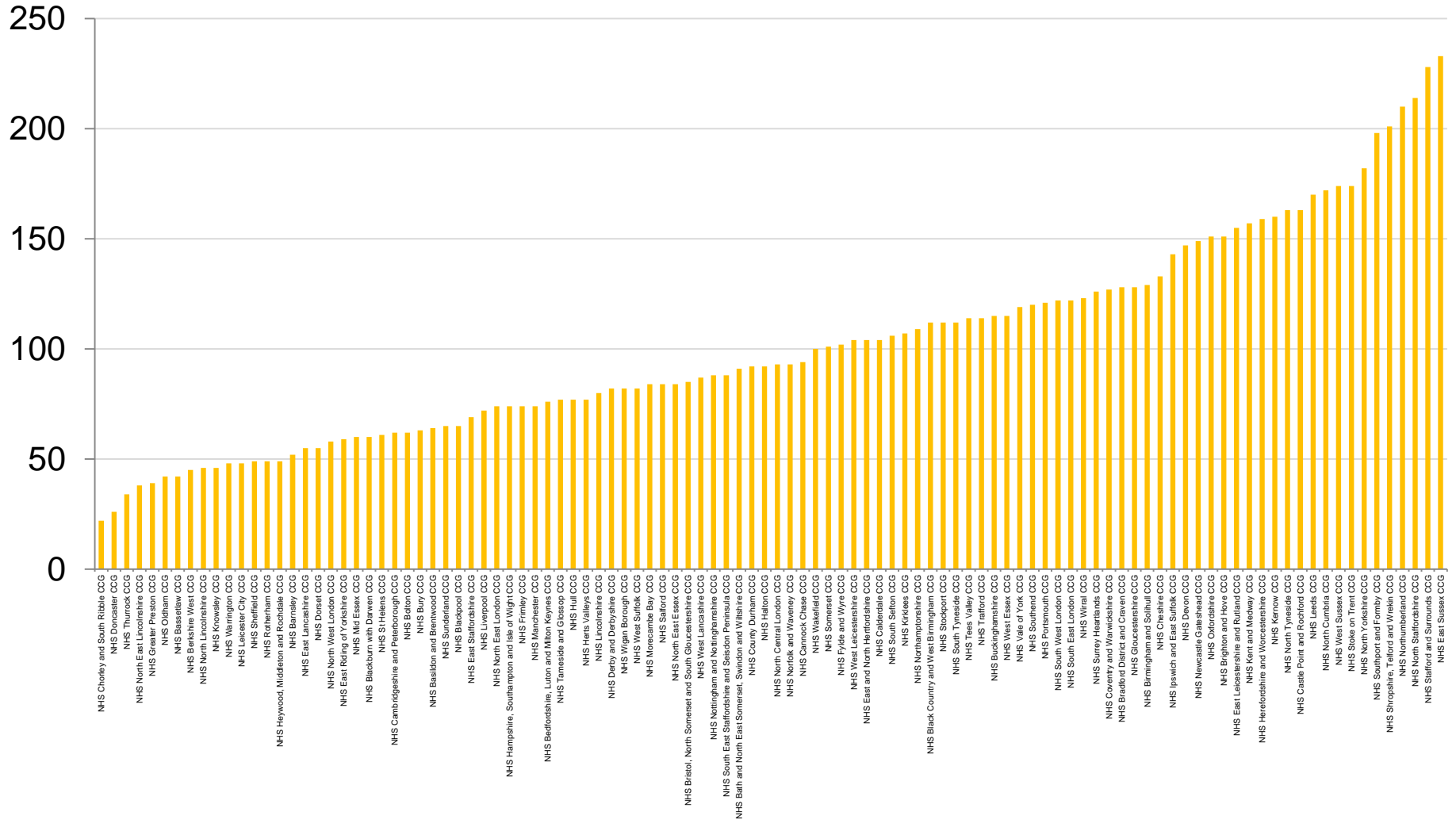
2020/21

2021/22



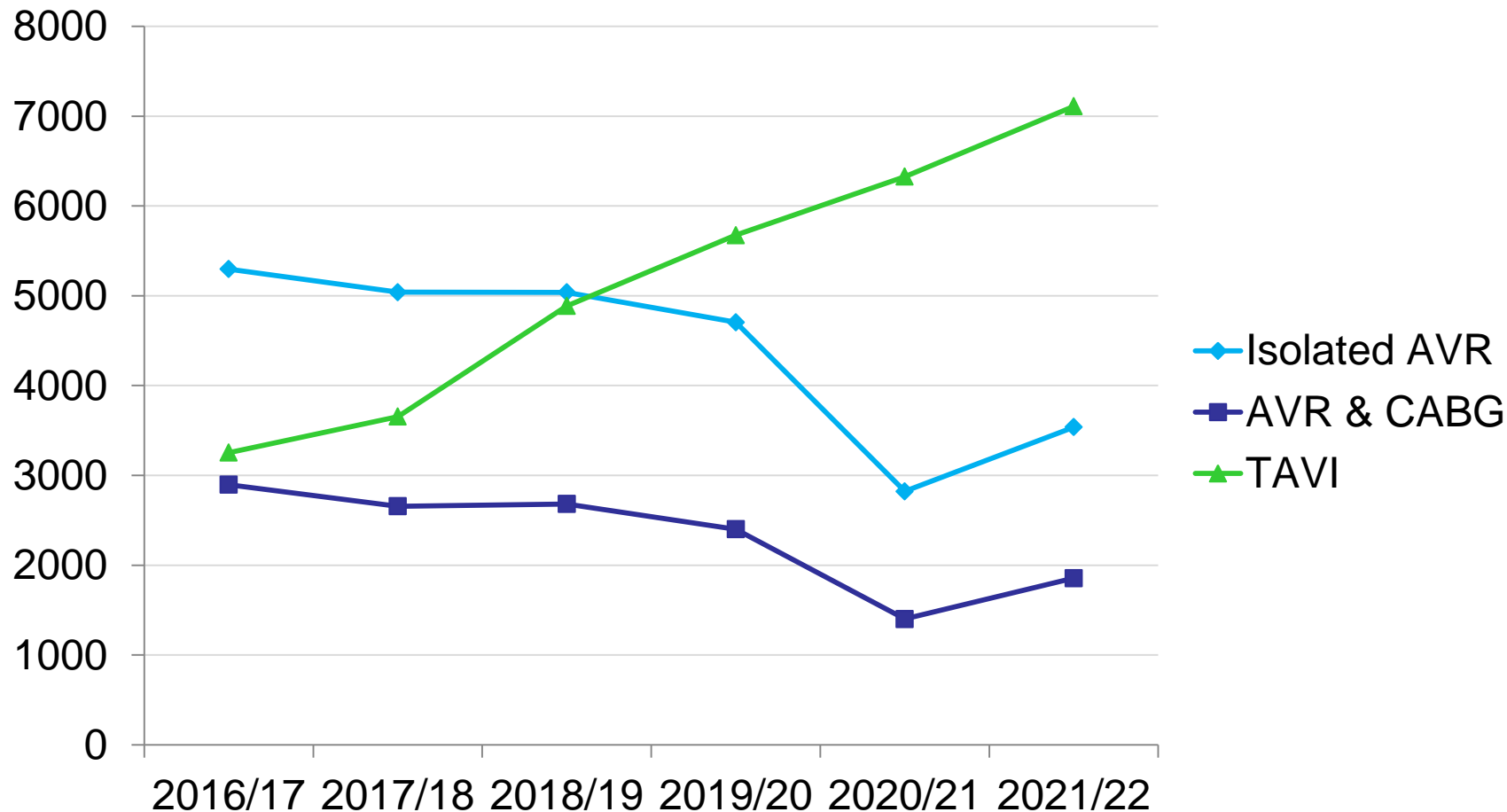
TAVI

By Region 2021/22



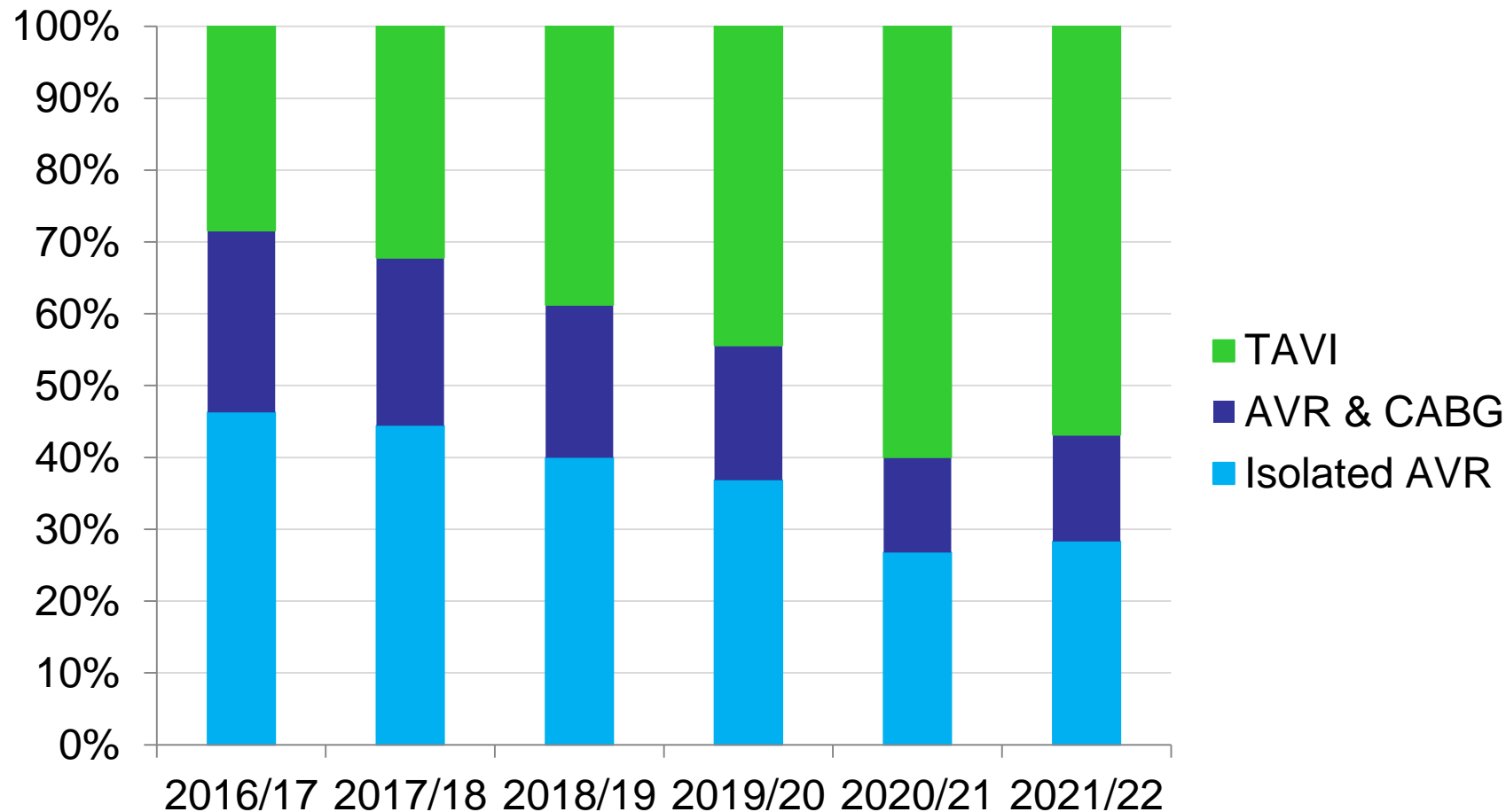
TAVI and sAVR

UK excluding Scotland



TAVI and sAVR

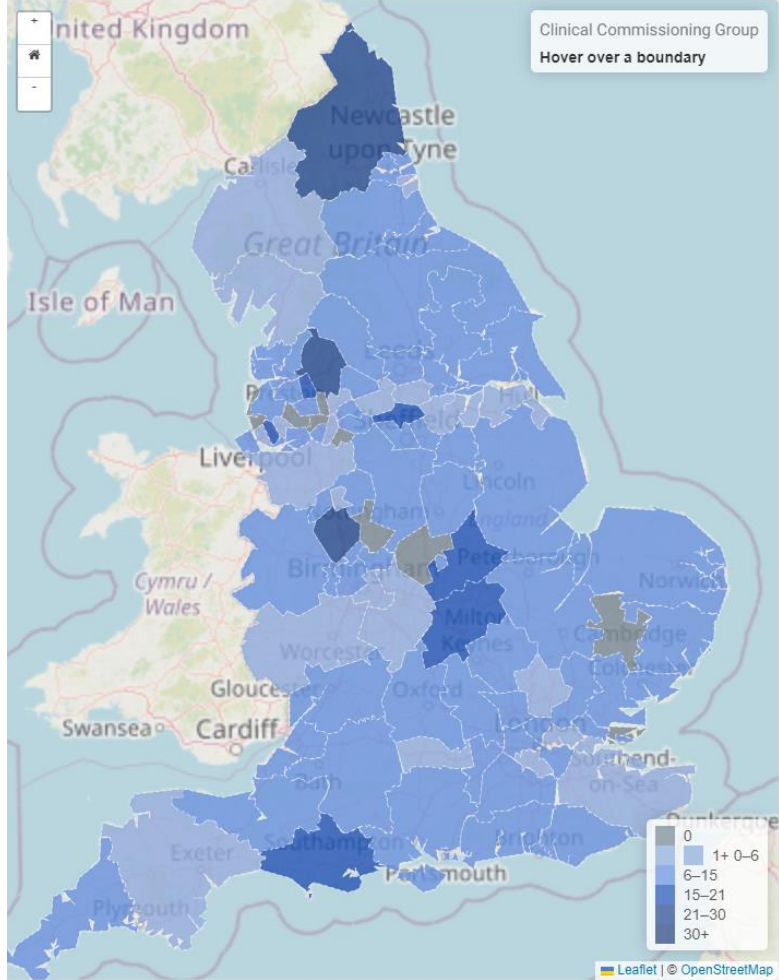
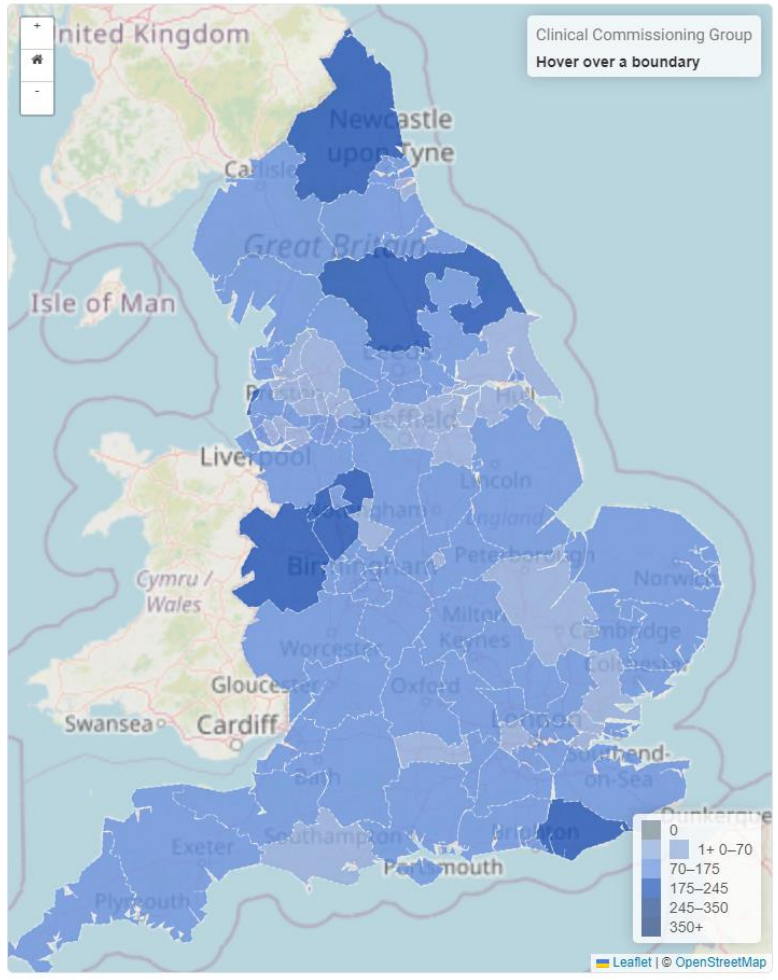
UK excluding Scotland



TAVI and SAVR pmp 2021/22

TAVI

sAVR

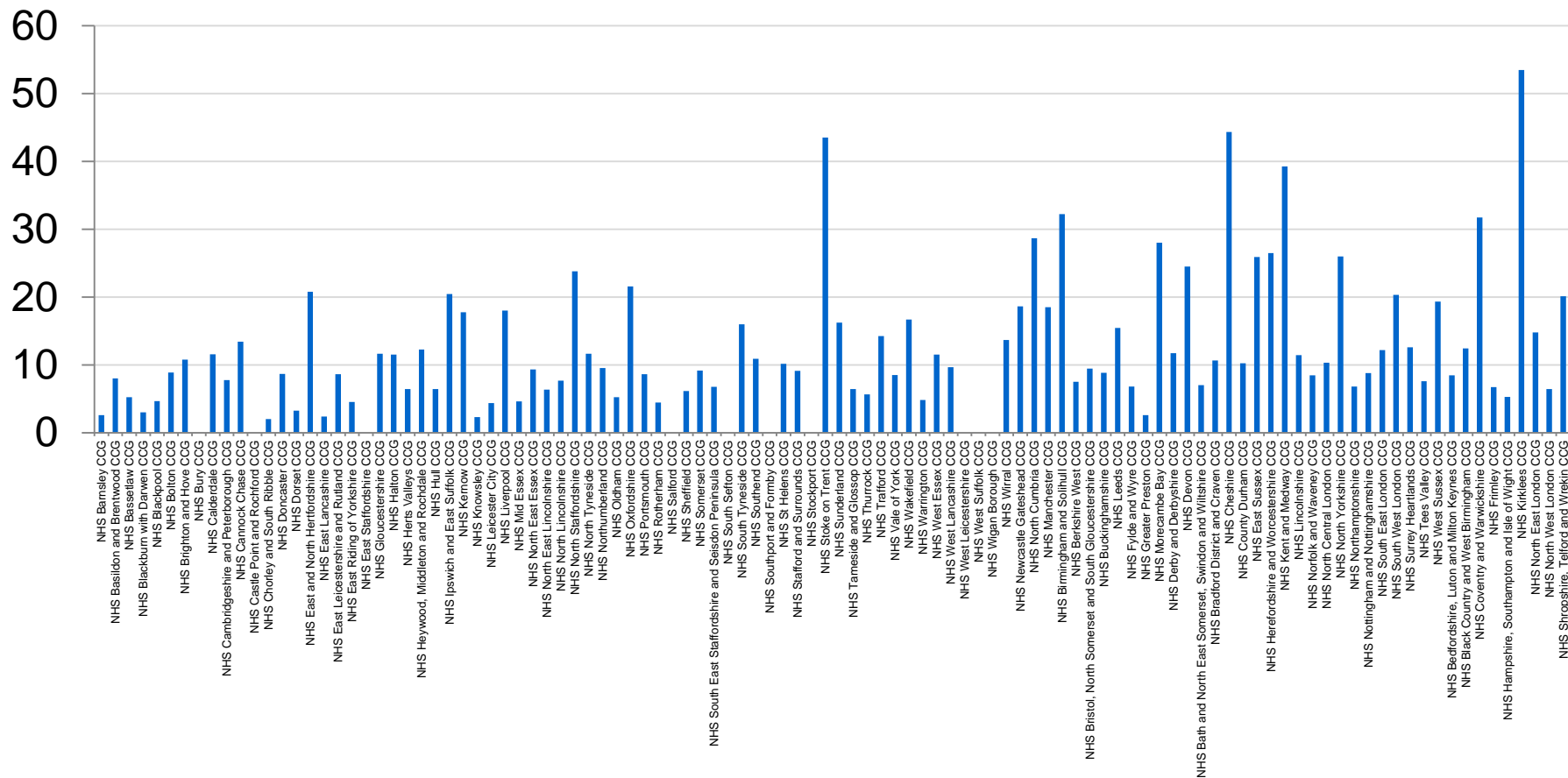


Map range modified to show hot spots

TAVI : SAVR ratio

2021/22 ALL CCG

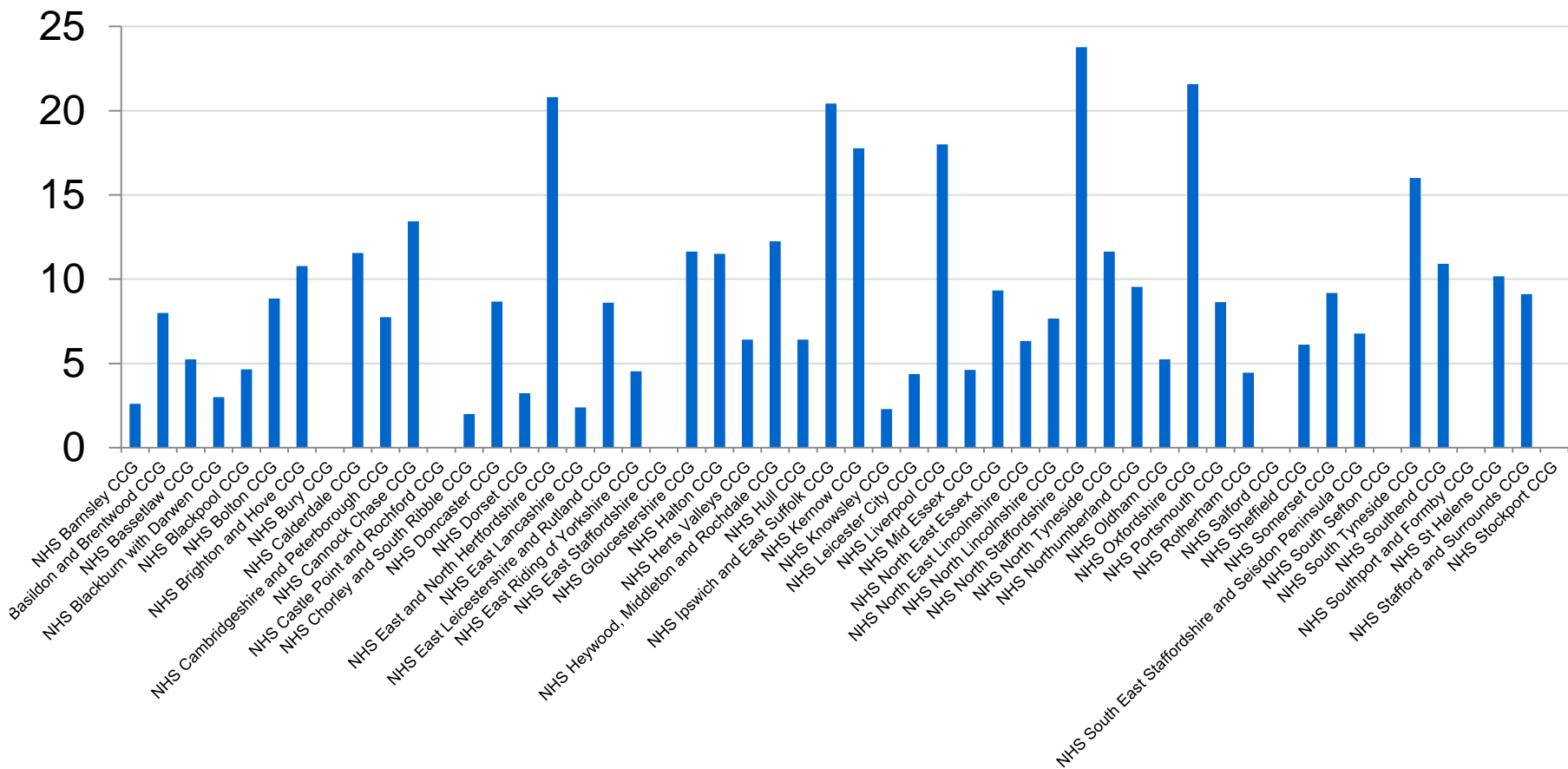
TAVI/SAVR



TAVI : SAVR ratio

2021/22 (1 of 2 Barnsley to Stockport)

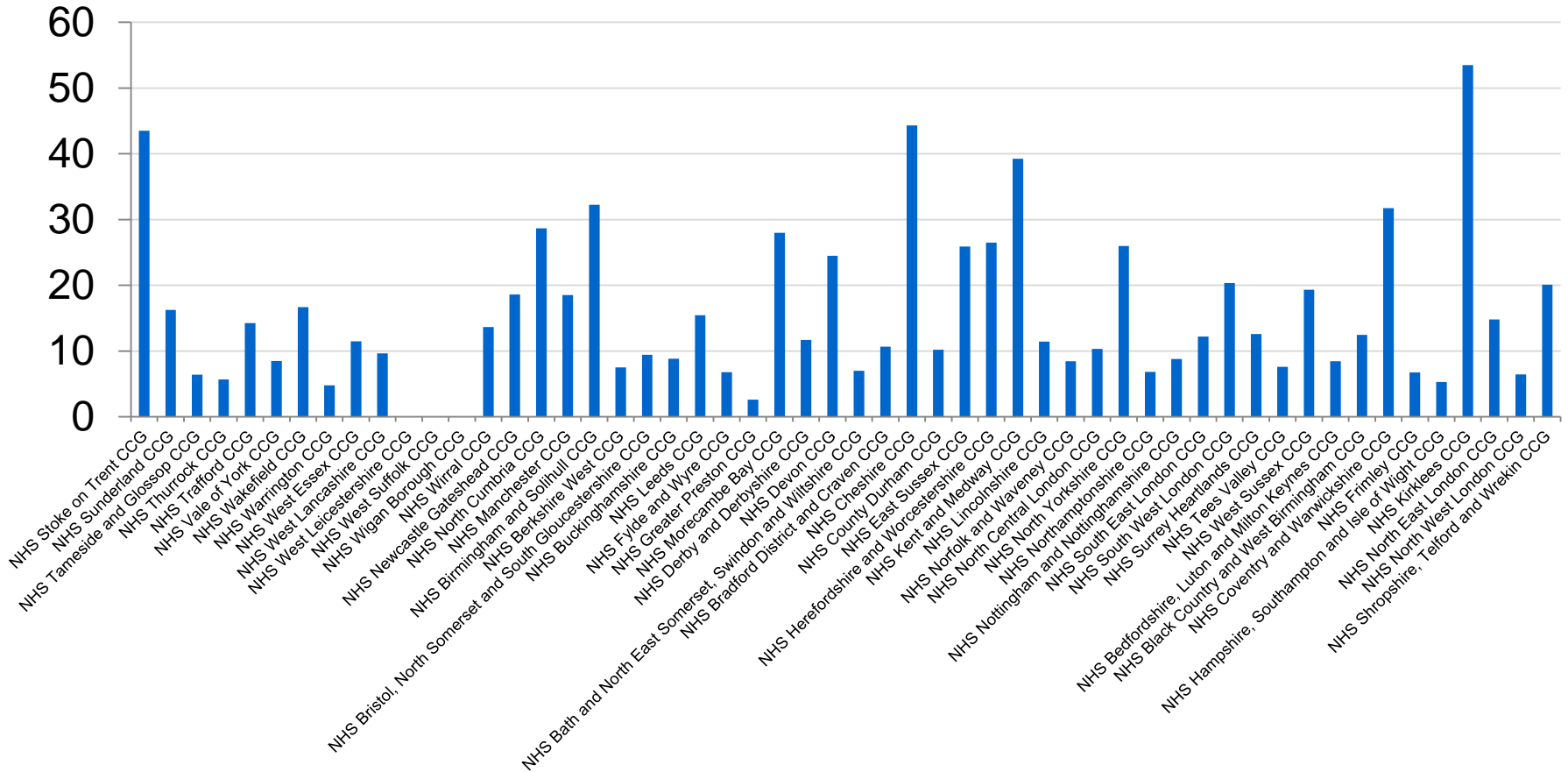
TAVI/SAVR



TAVI : SAVR ratio

2021/22 (2 of 2 Stoke to Shropshire)

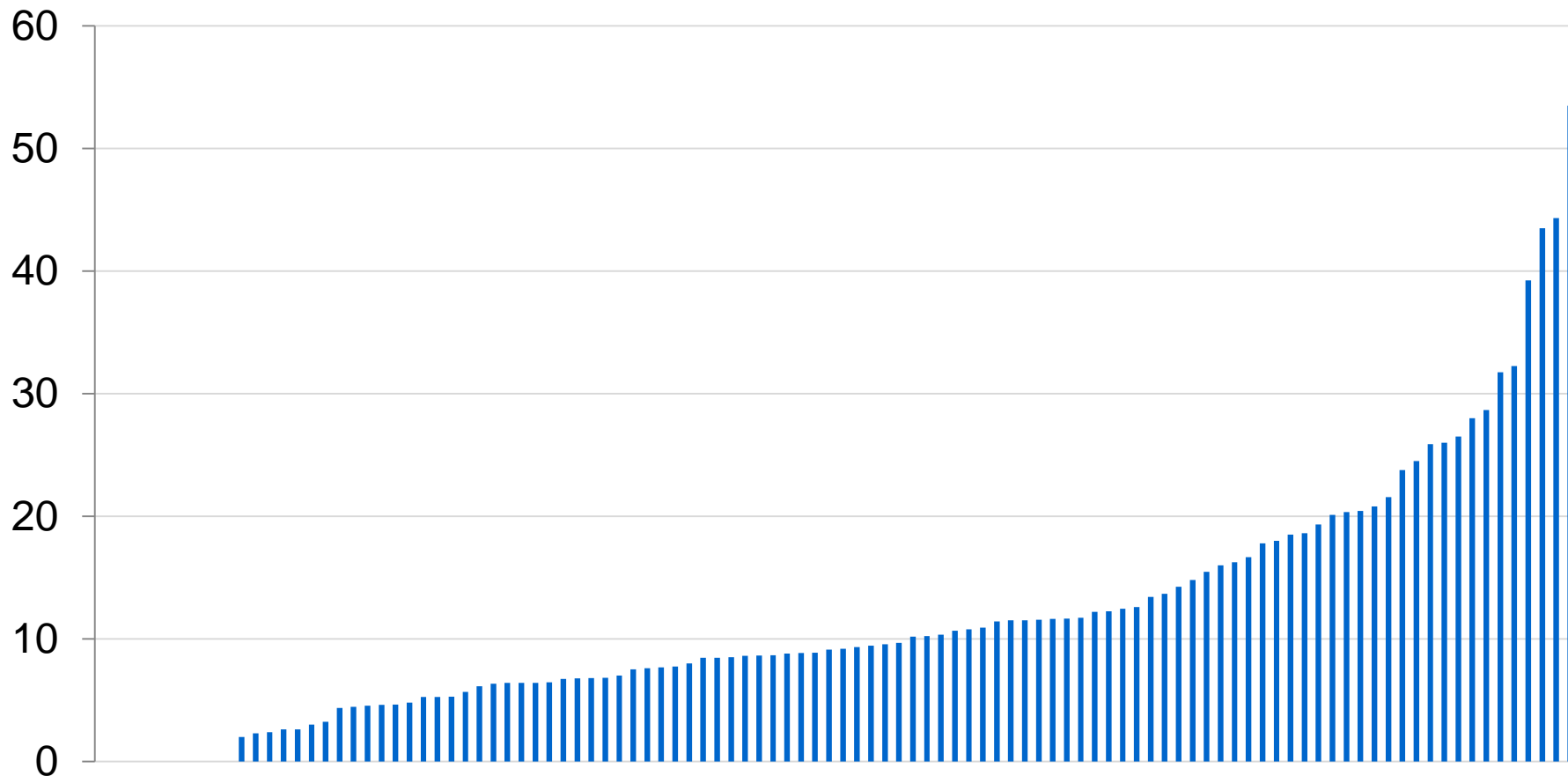
TAVI/SAVR



TAVI : SAVR ratio

2021/22 ALL CCG

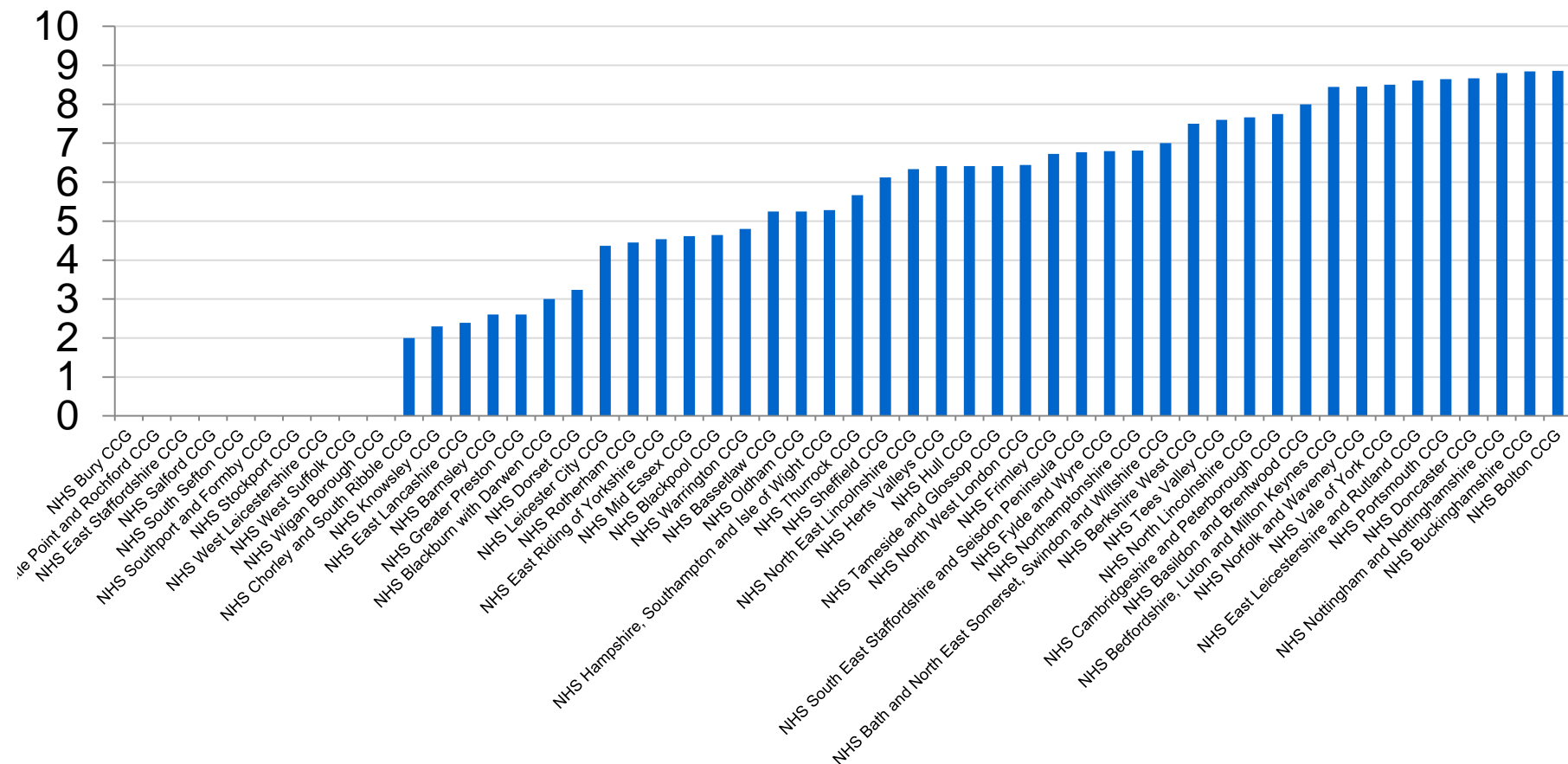
TAVI/SAVR



TAVI : SAVR ratio

2021/22 Ratio 0 to 9

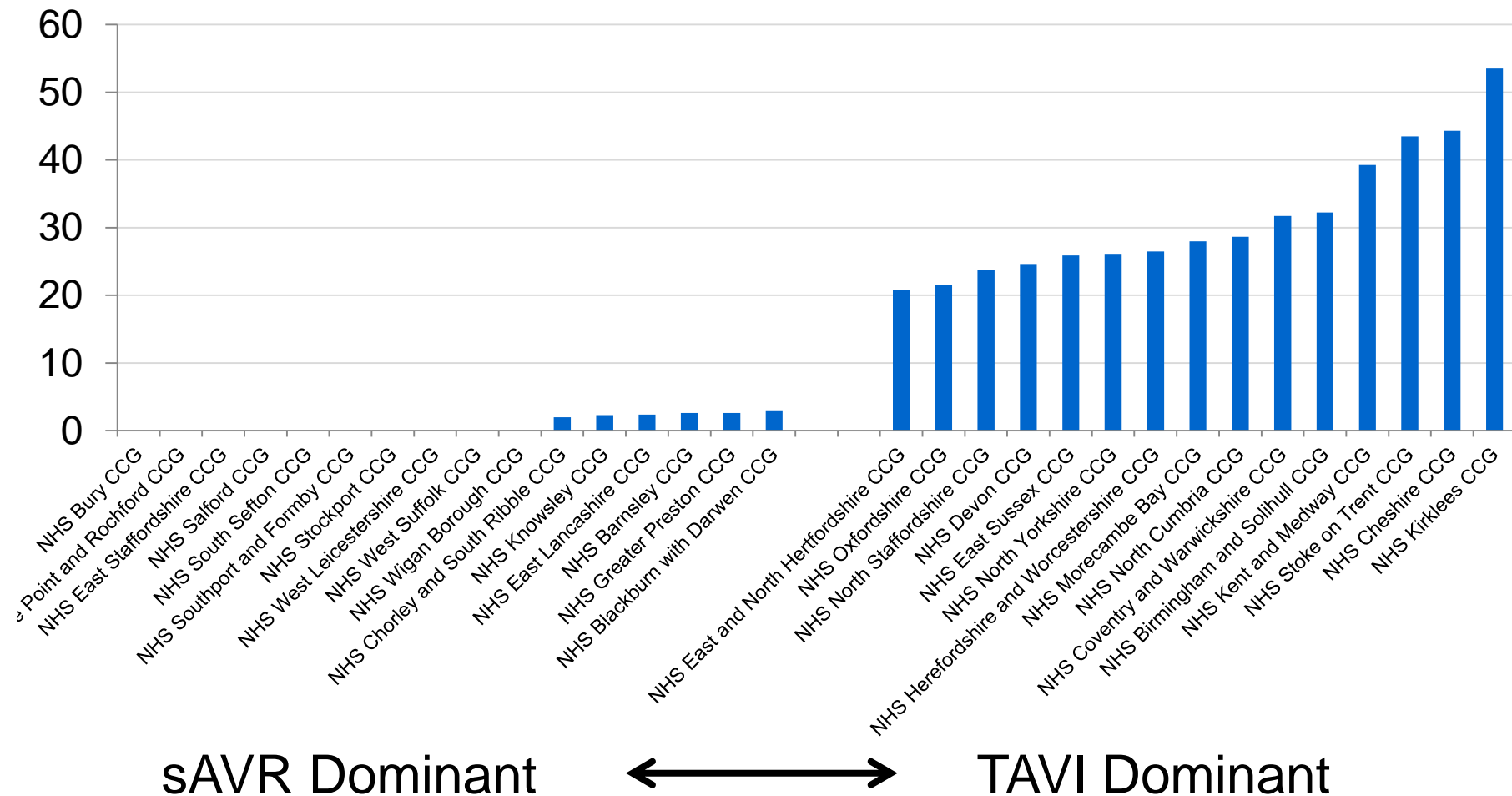
TAVI/SAVR



TAVI : SAVR ratio

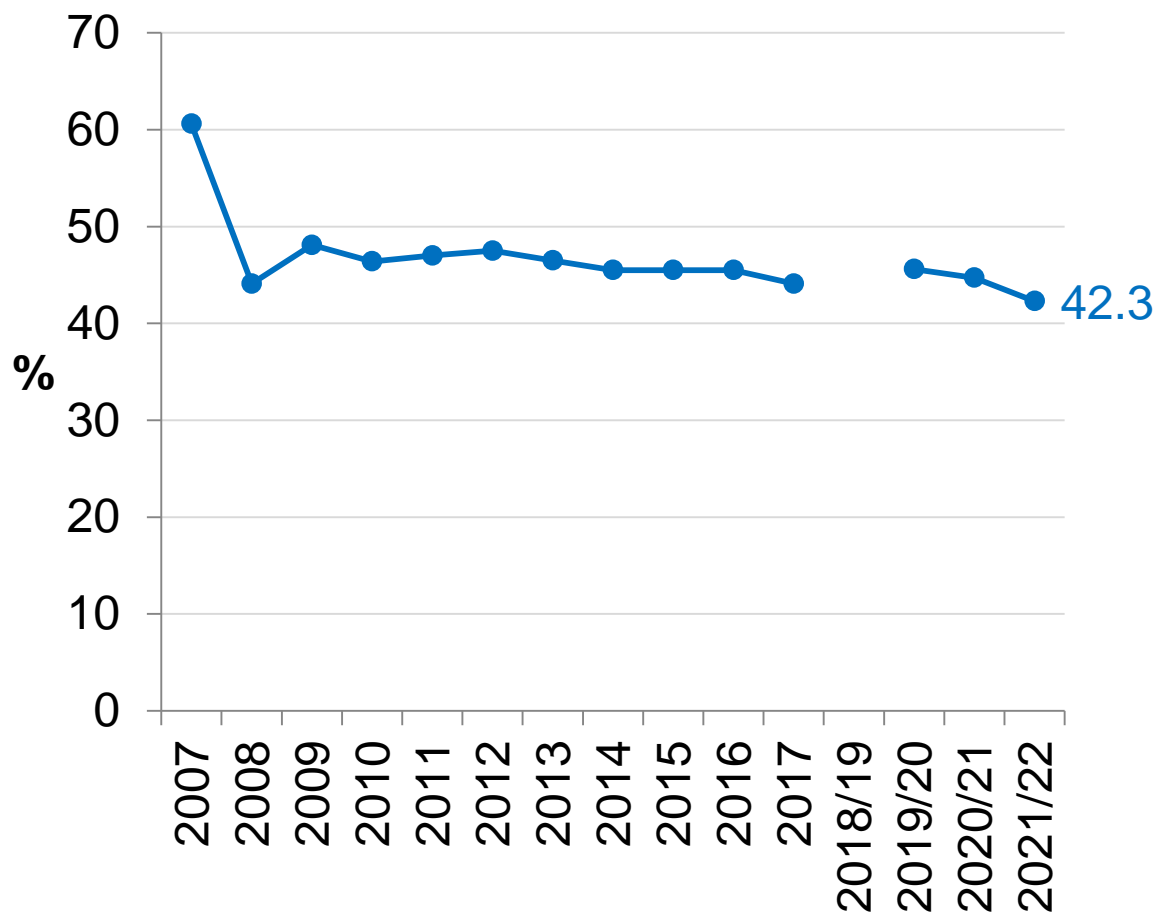
2021/22 Ratio (highest v lowest 10)

TAVI/sAVR



Sex

Female (%)

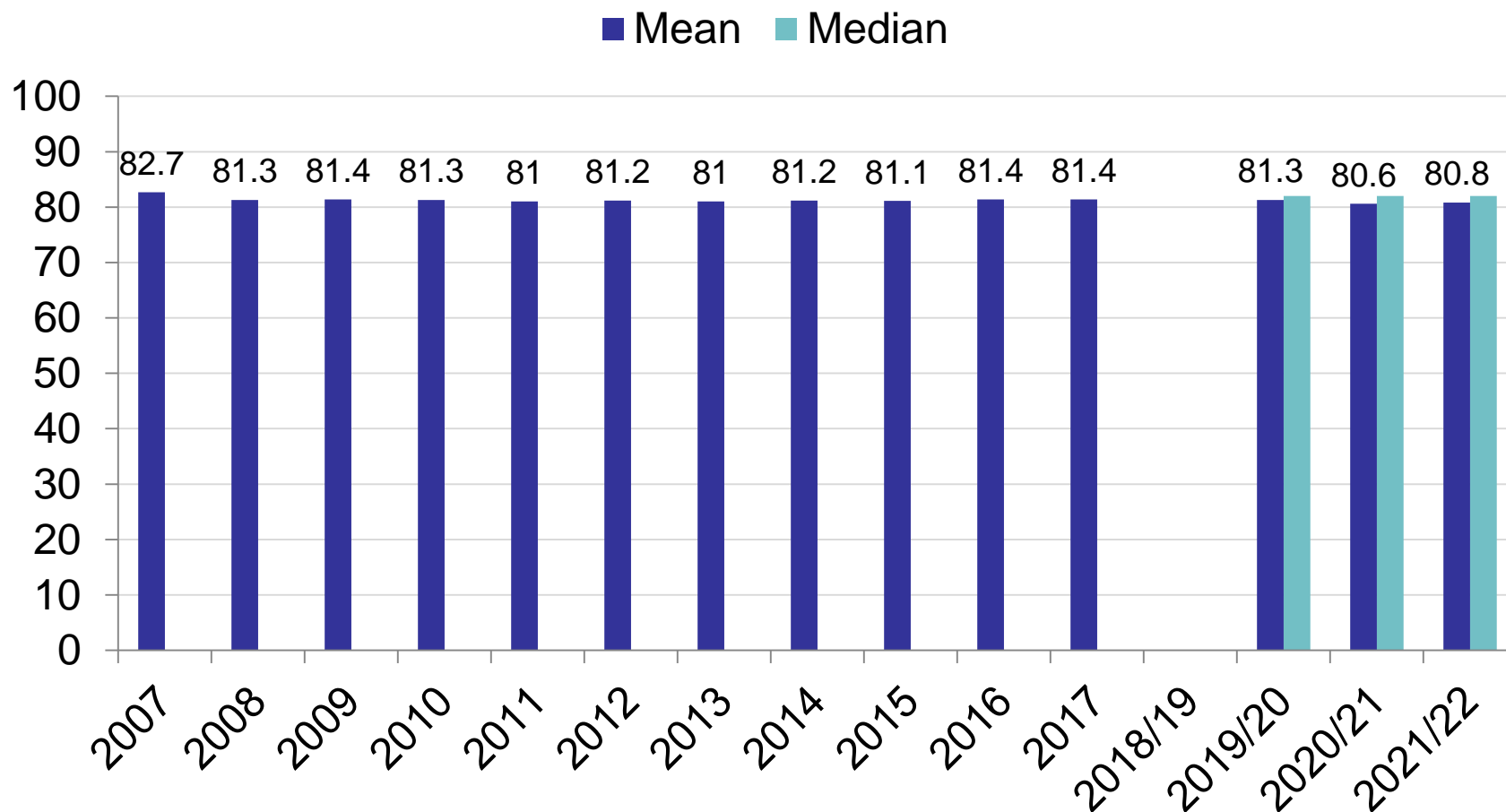


Ethnic Origin

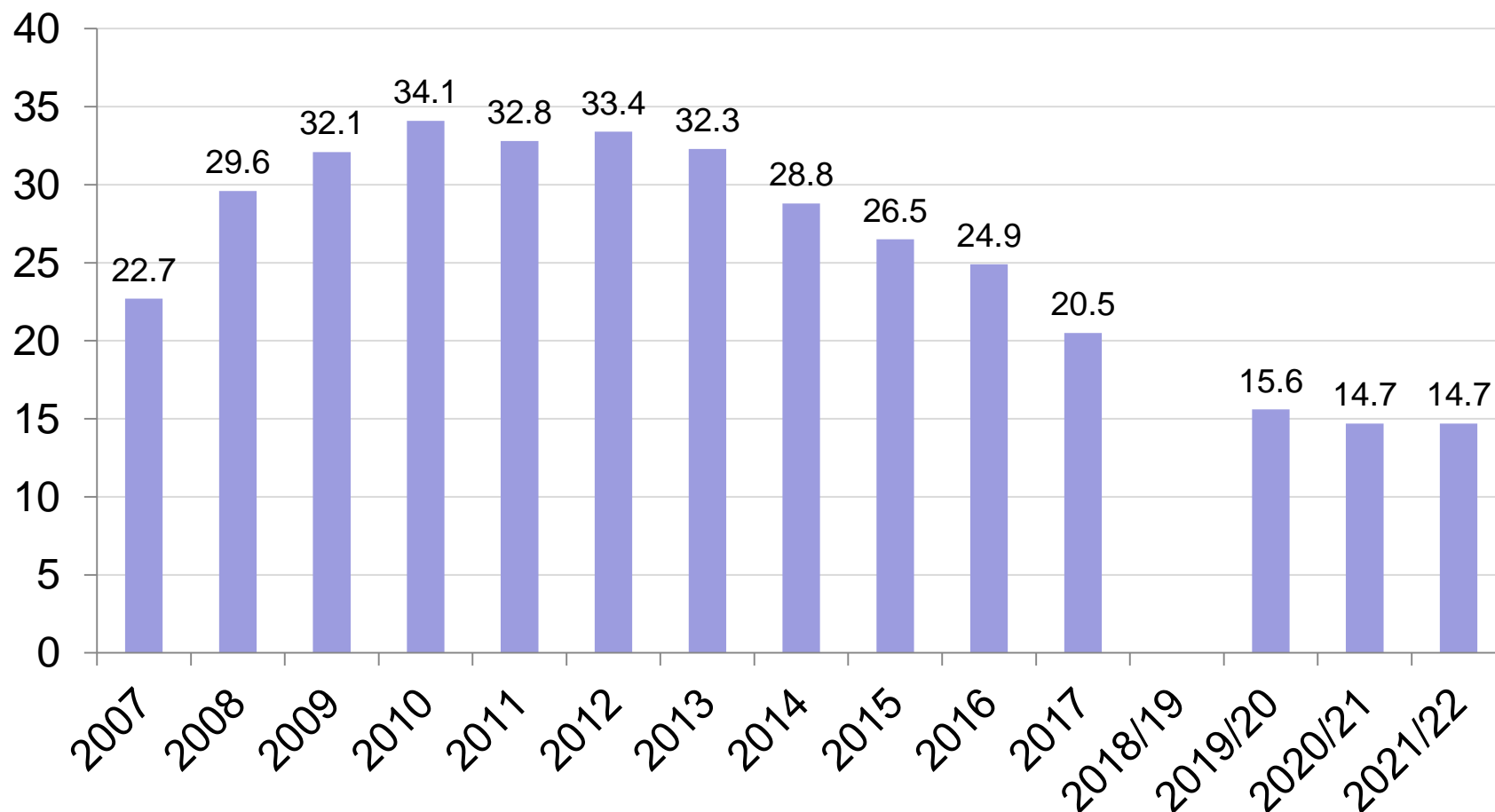
	2020-21		2021-22	
	n	%	n	%
White	3967	96.7	4533	96.5
Black	26	0.7	42	0.9
Asian	84	2.05	95	2.02
Chinese	2	0.05	2	0.04
Other	25	0.6	26	0.6
<i>Unknown</i>	<i>557</i>	<i>13.57</i>	<i>444</i>	<i>8.6</i>

(% calculated from where data available)

Age

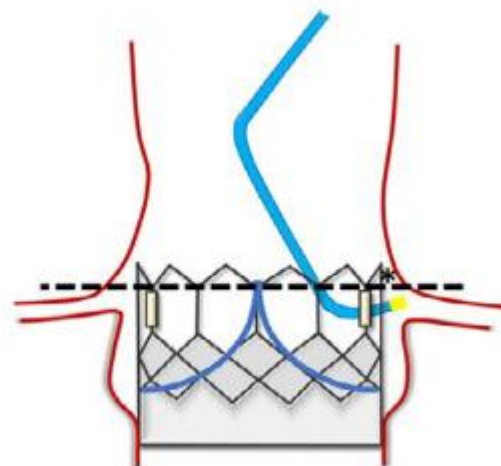
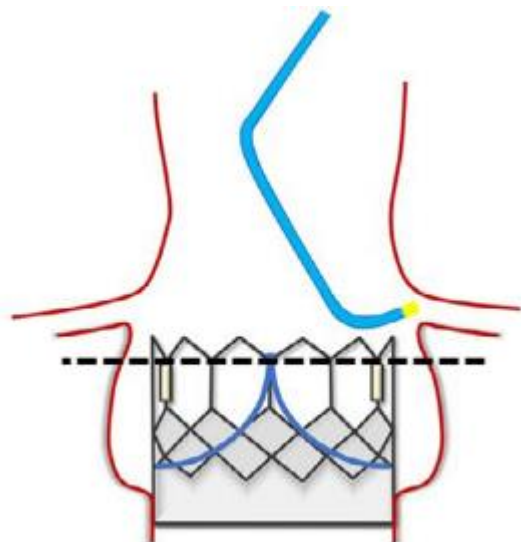


Prior Cardiac Surgery



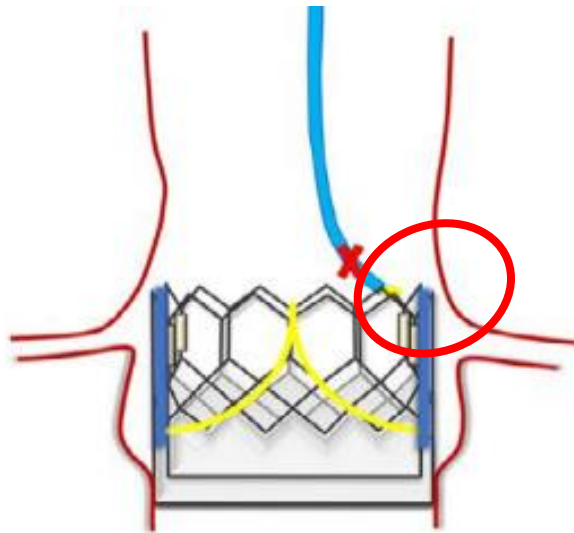
Prior TAVI

- 2 phases following TAVI
 - Coronary access post TAVI
 - Coronary access post V-in-V TAVI

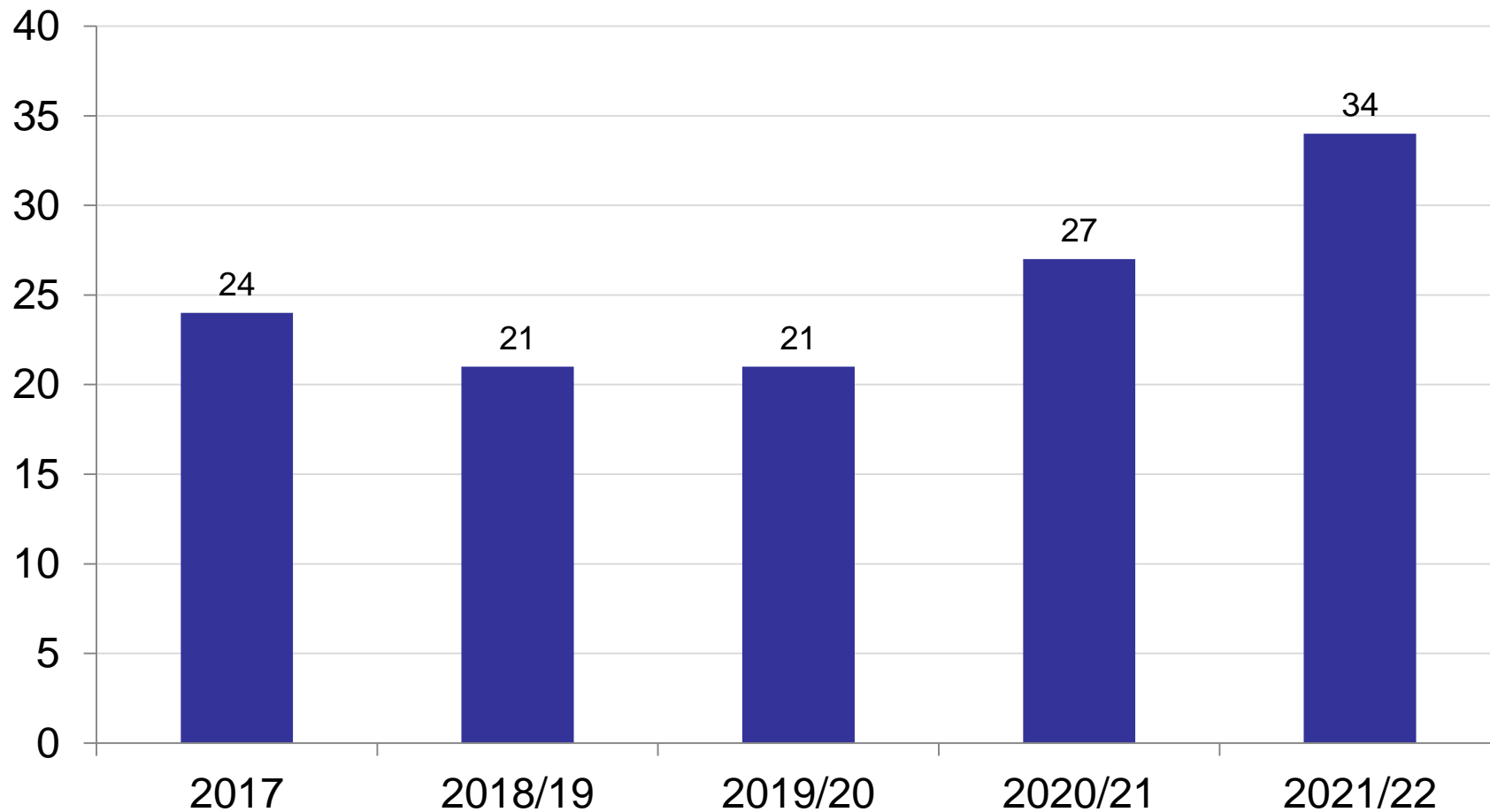


Prior TAVI

- 2 phases following TAVI
 - Coronary access post TAVI
 - Coronary access post V-in-V TAVI

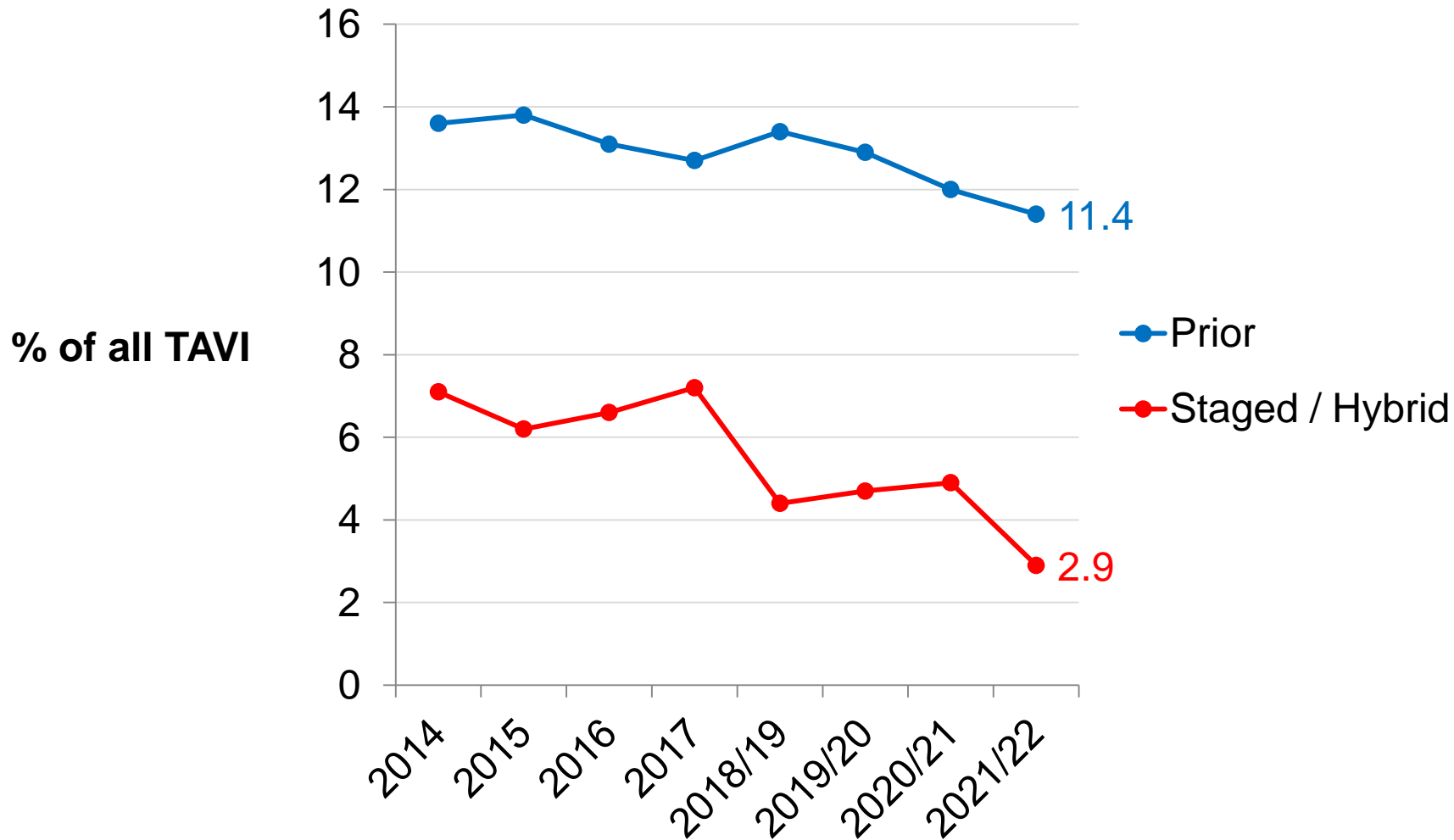


TAVI in TAVI (Prior TAVI)

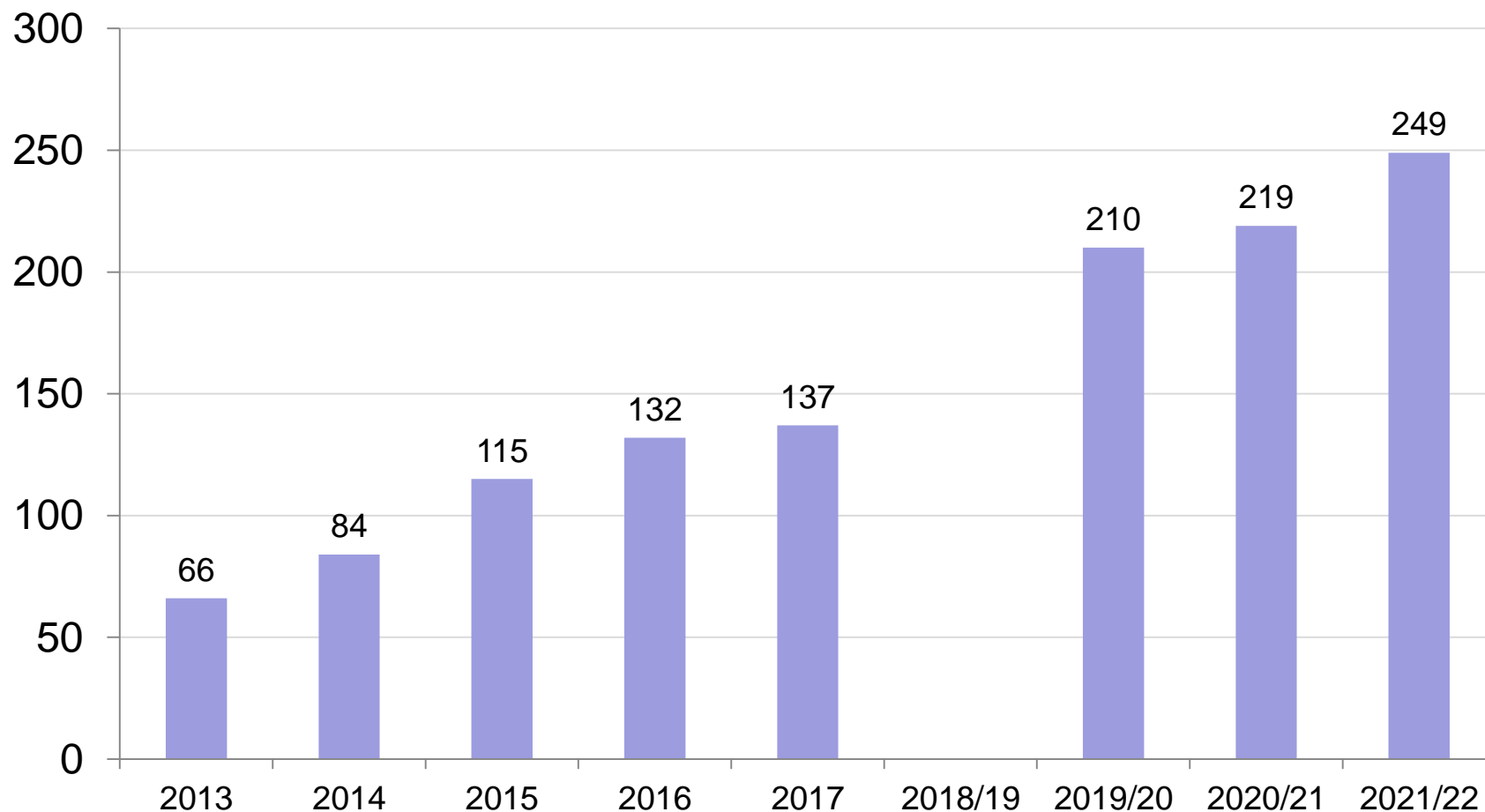


PCI

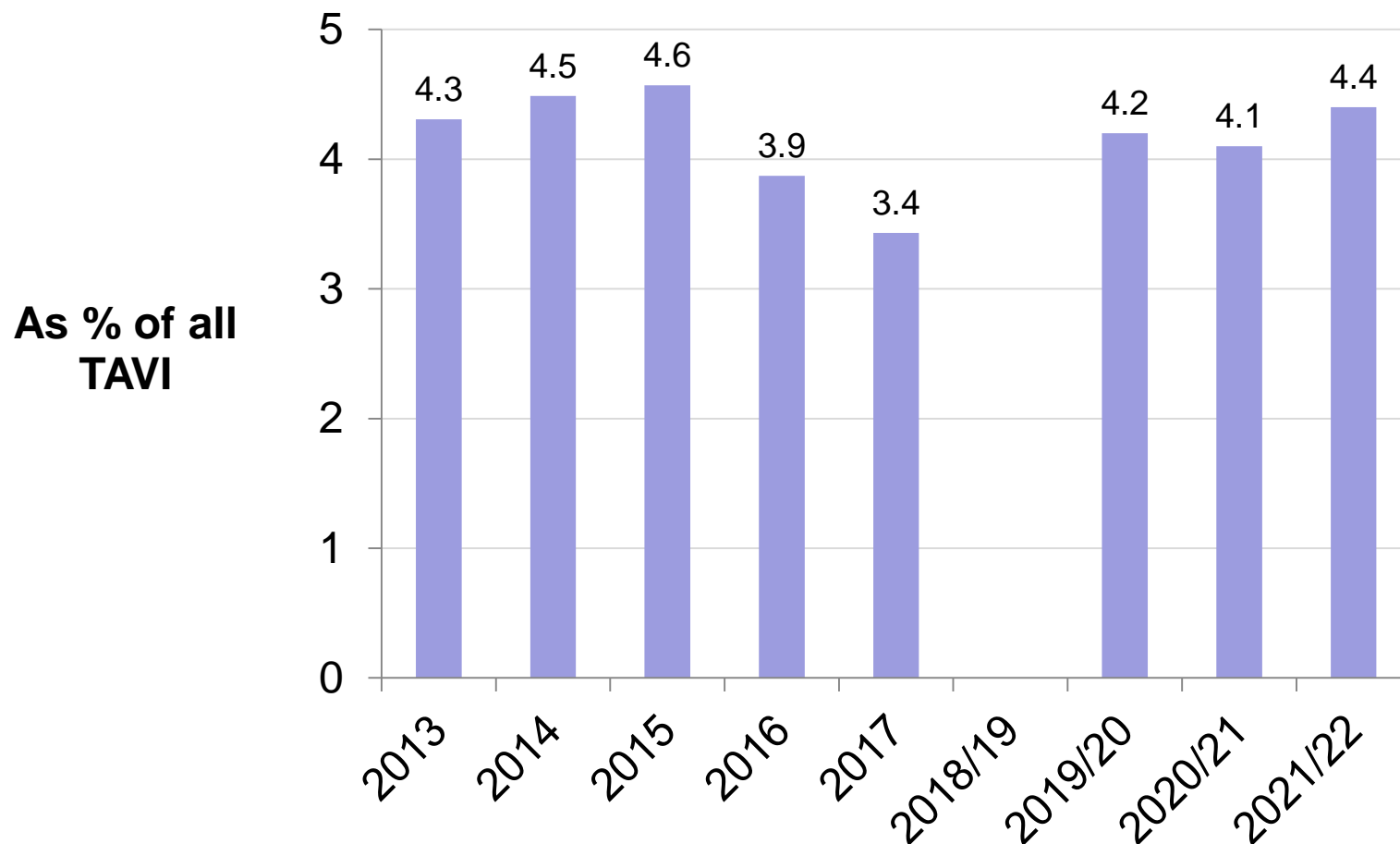
Prior or Staged/Hybrid



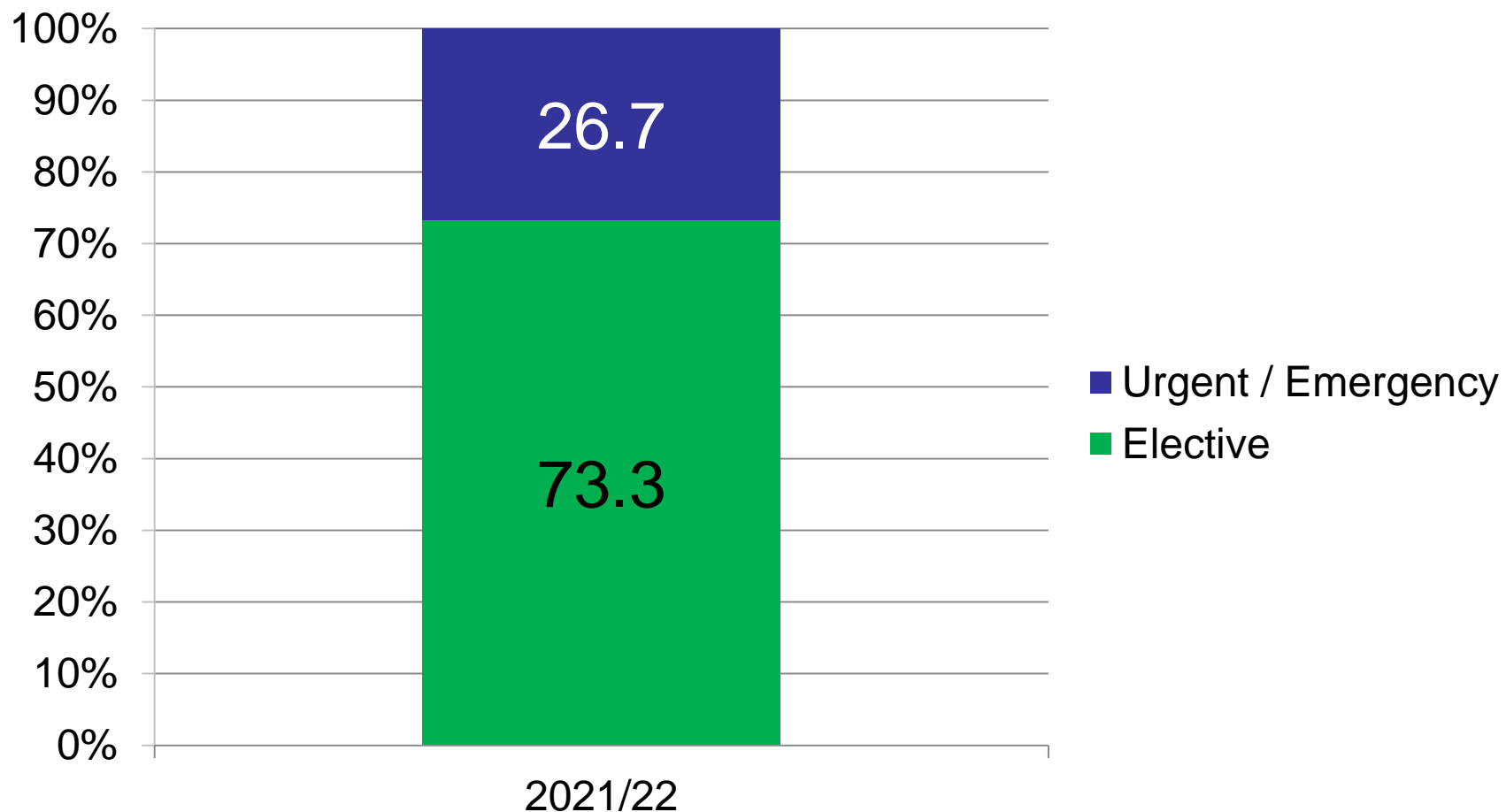
TAVI for Aortic Bioprosthetic Valve Failure



TAVI for Aortic Bioprosthetic Valve Failure

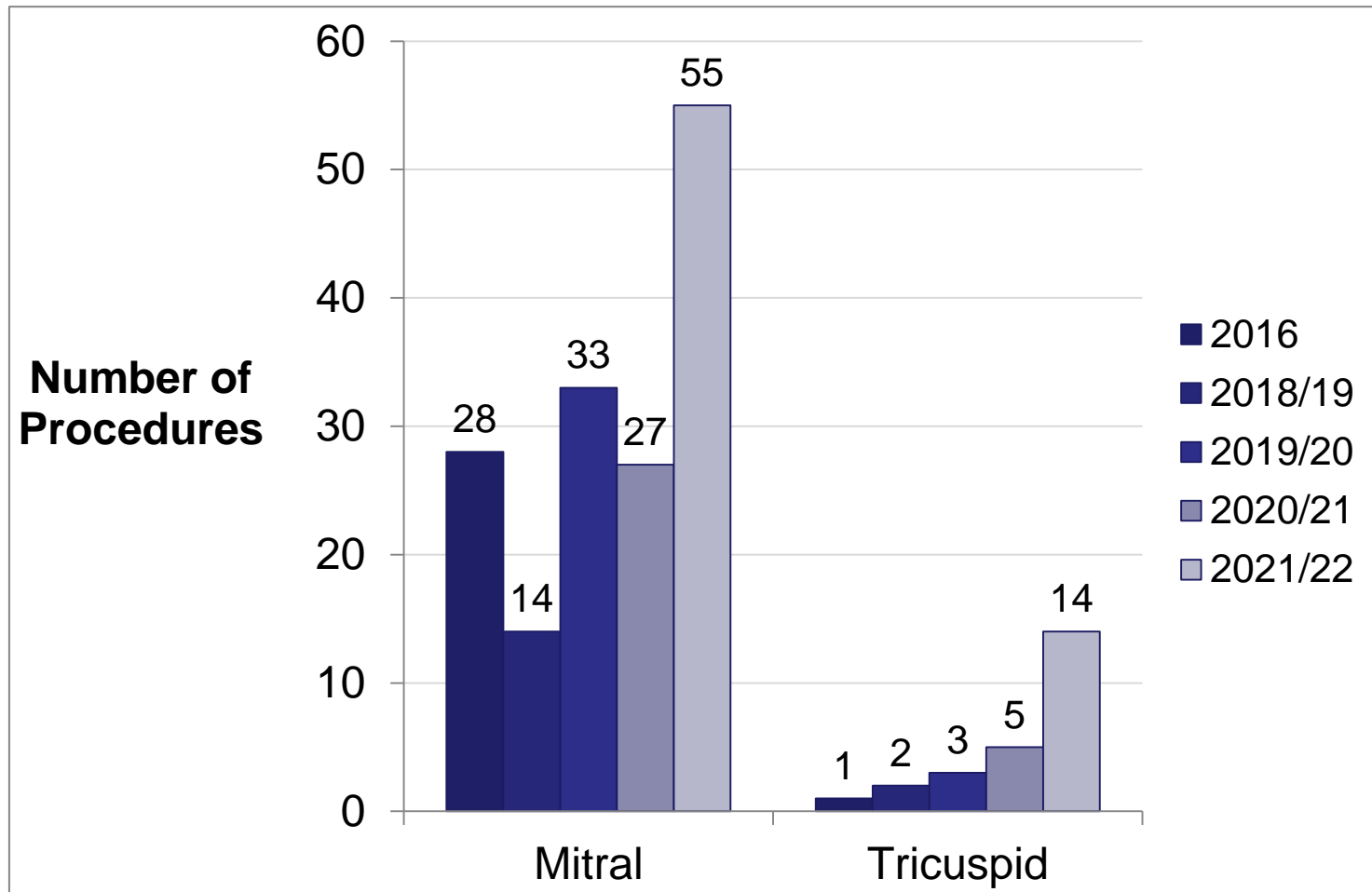


TAVI - Urgency



Percutaneous Valves

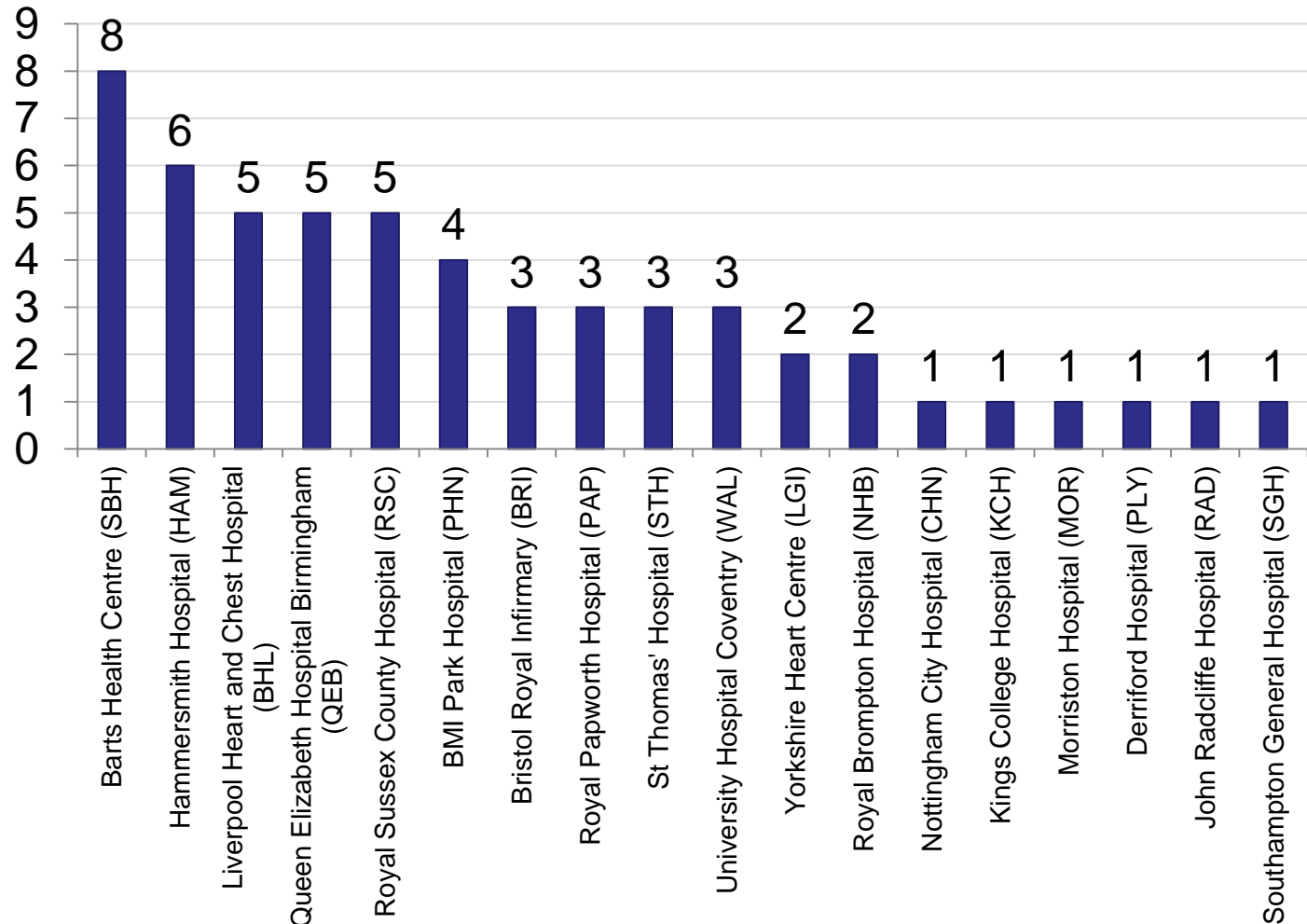
TAVI Valve to treat failing bioprostheses



Percutaneous Valves

TAVI Valve to treat failing mitral bioprosthesis

Number of
Procedures
2021/22

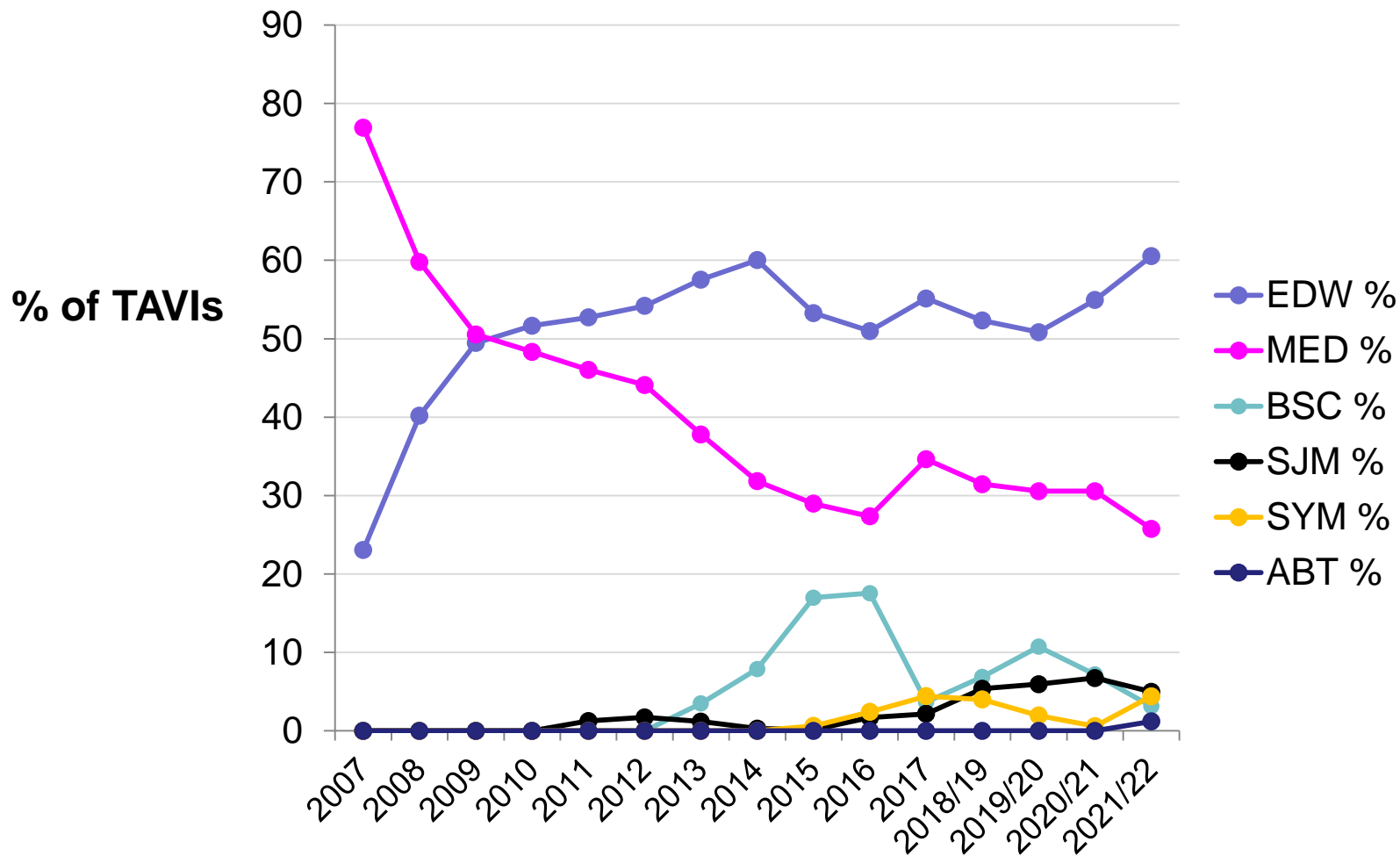


TAVI

Procedural Details

TAVI

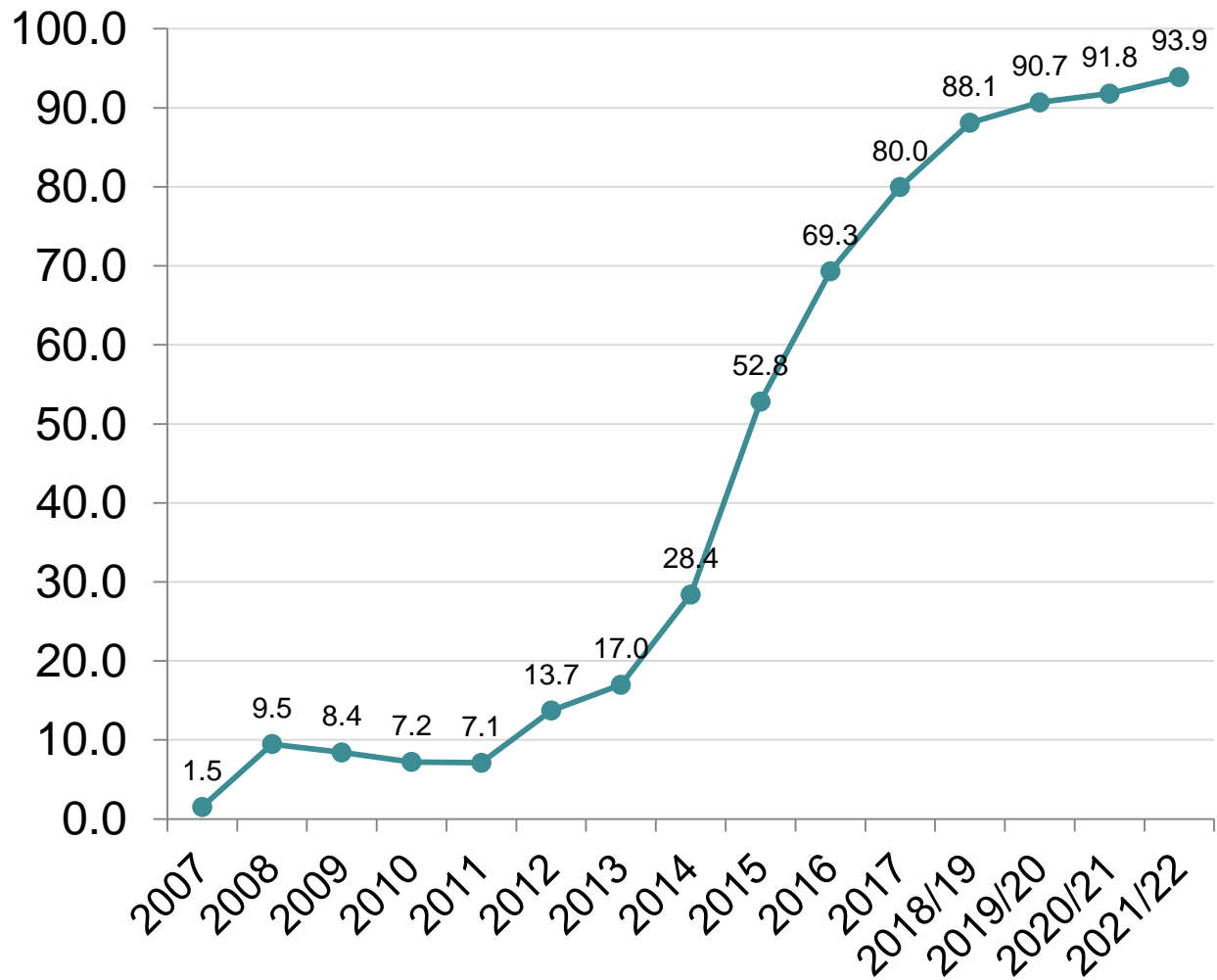
Device Manufacturer



TAVI

Conscious Sedation

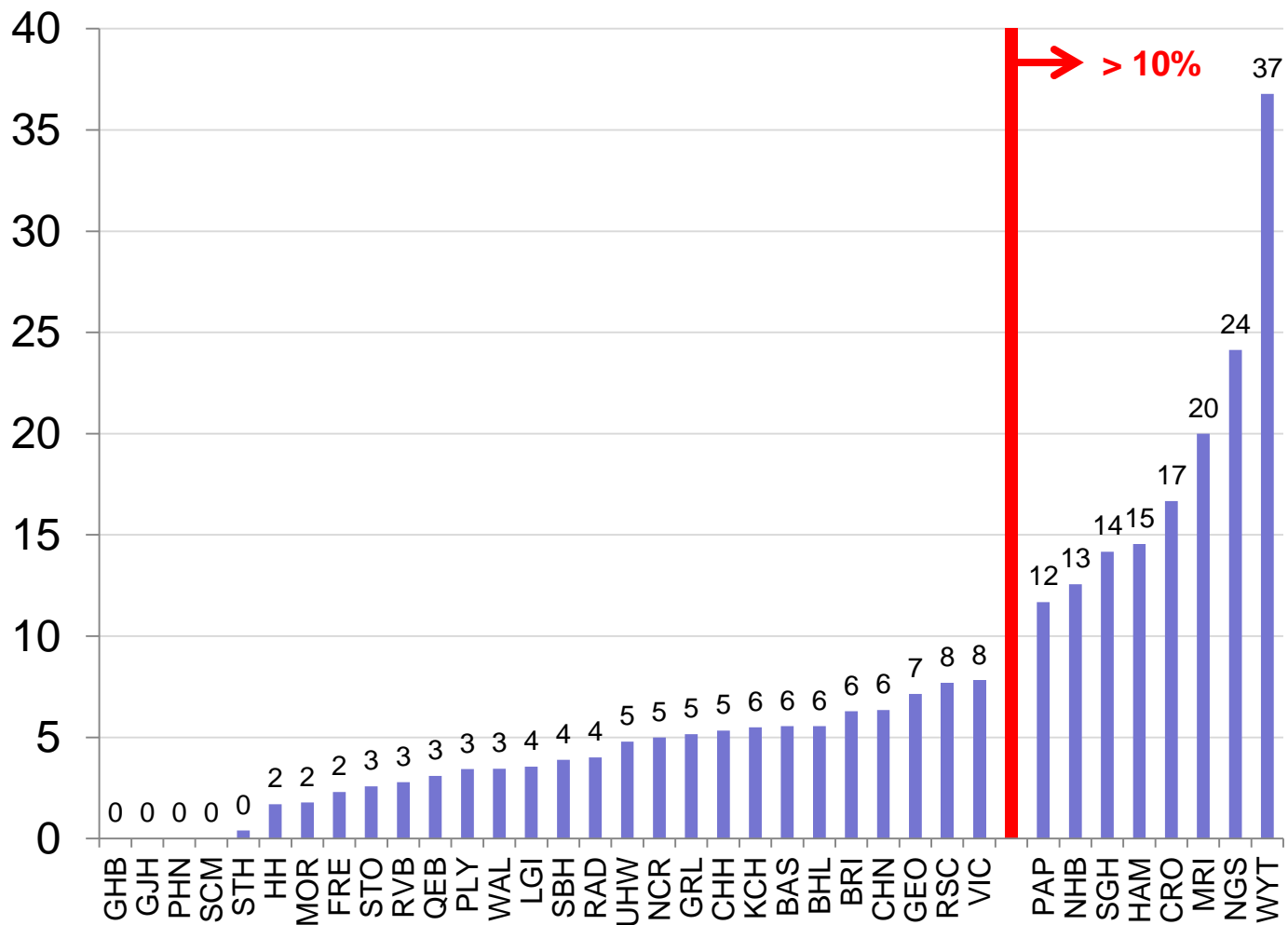
**TAVI under
Conscious
Sedation (%)**



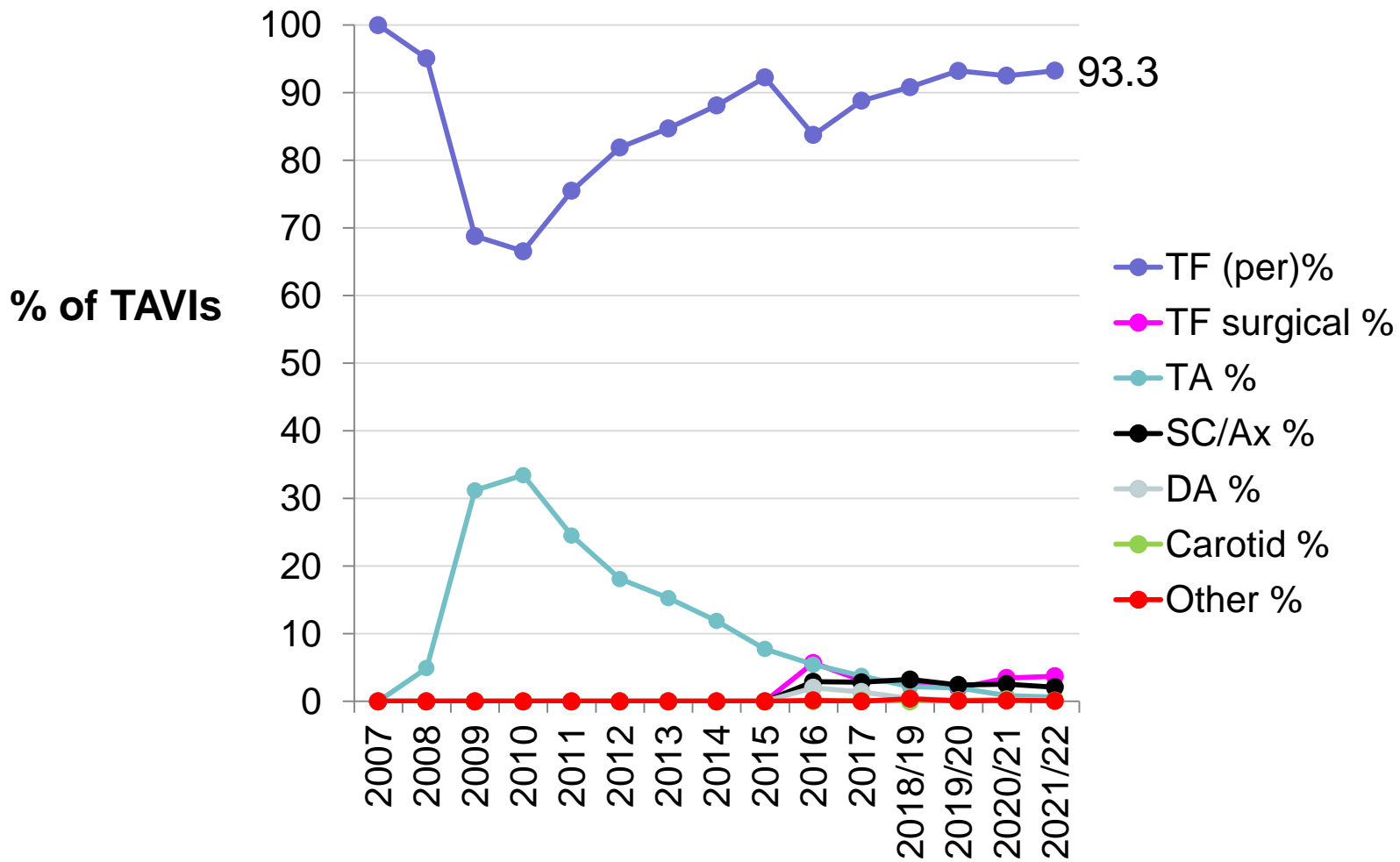
TAVI

GA v Conscious Sedation

General Anaesthetic (%)

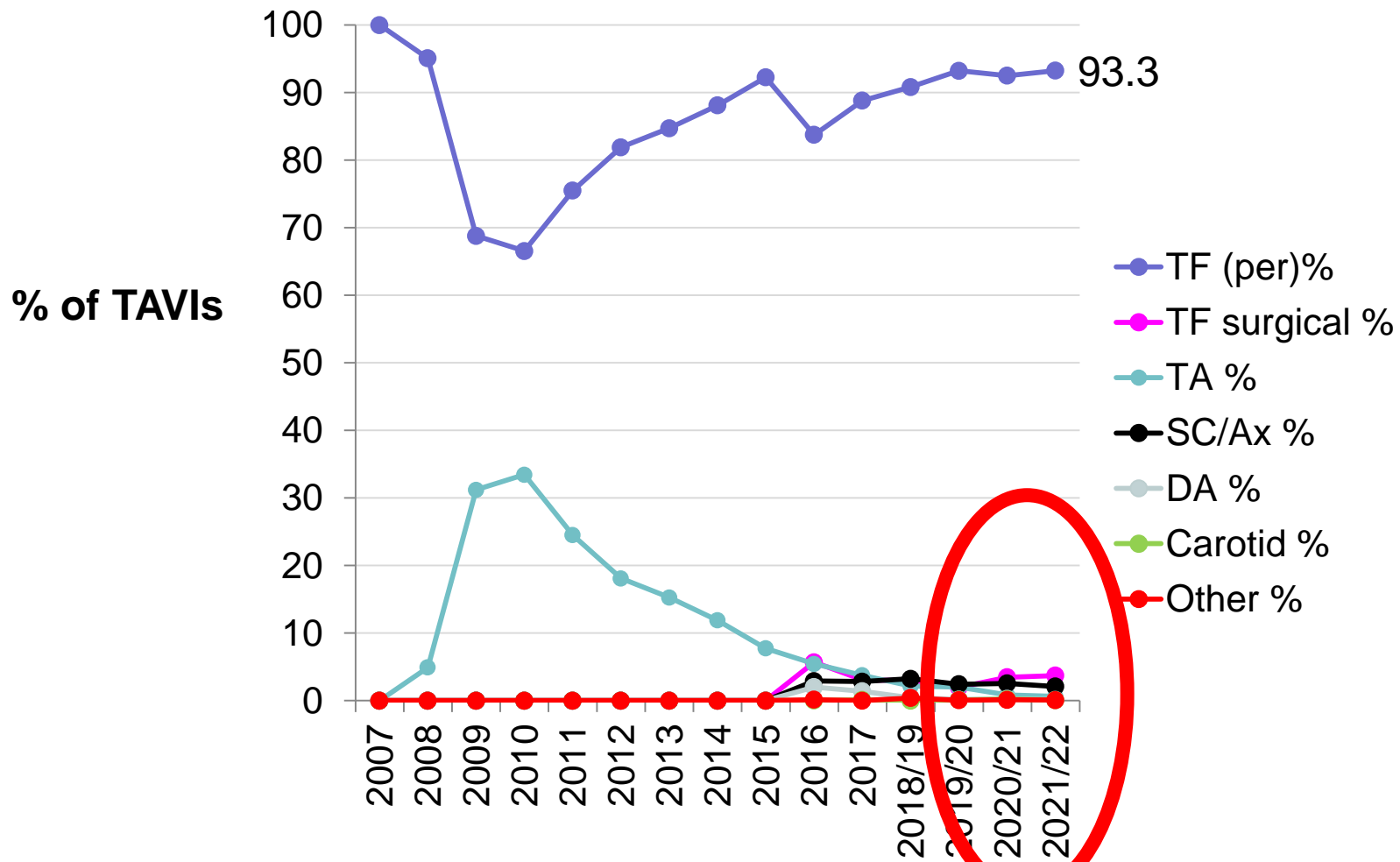


TAVI Delivery Approach



UK wide until 2019/20, then excludes Scotland

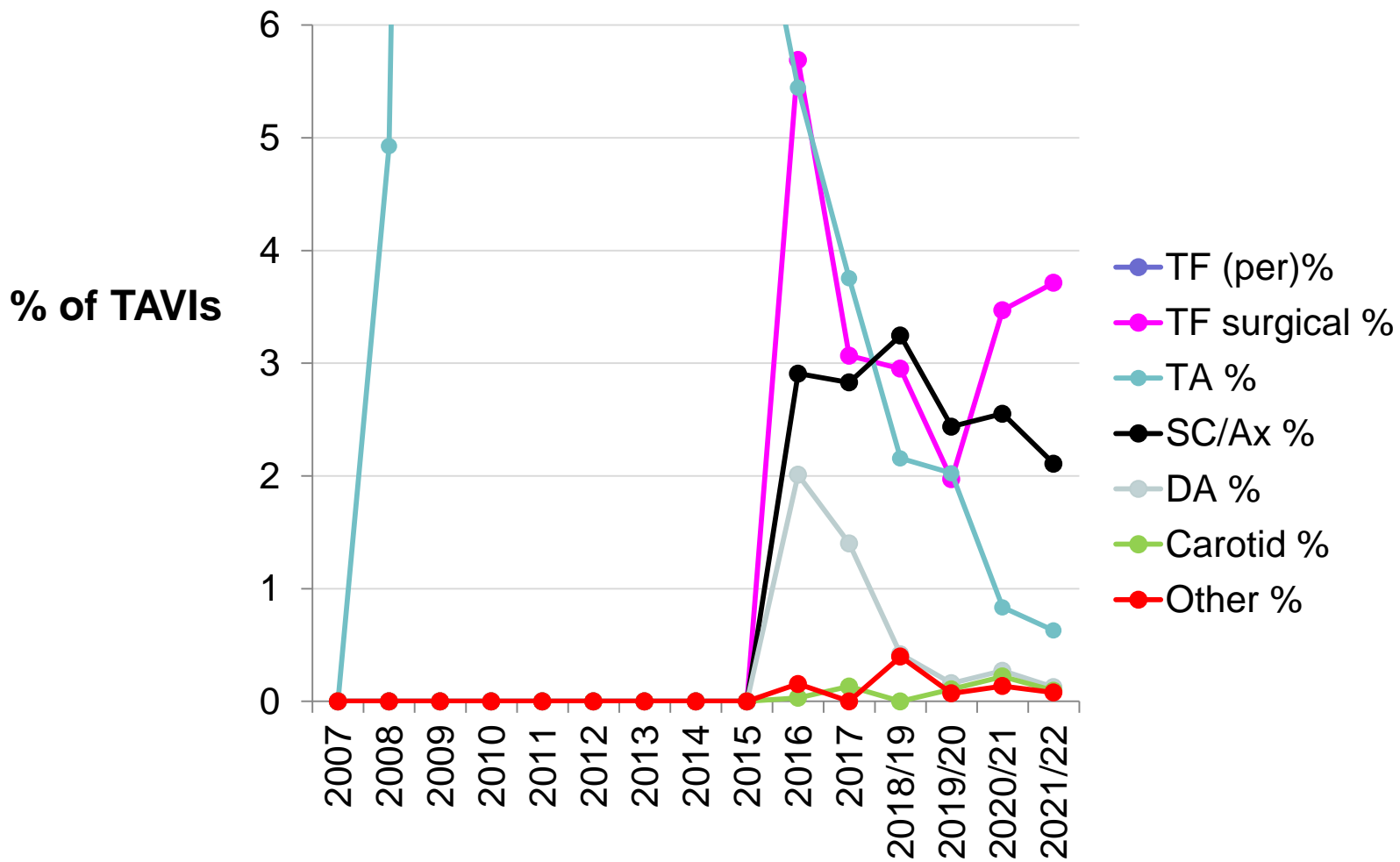
TAVI Delivery Approach



UK wide until 2019/20, then excludes Scotland

TAVI

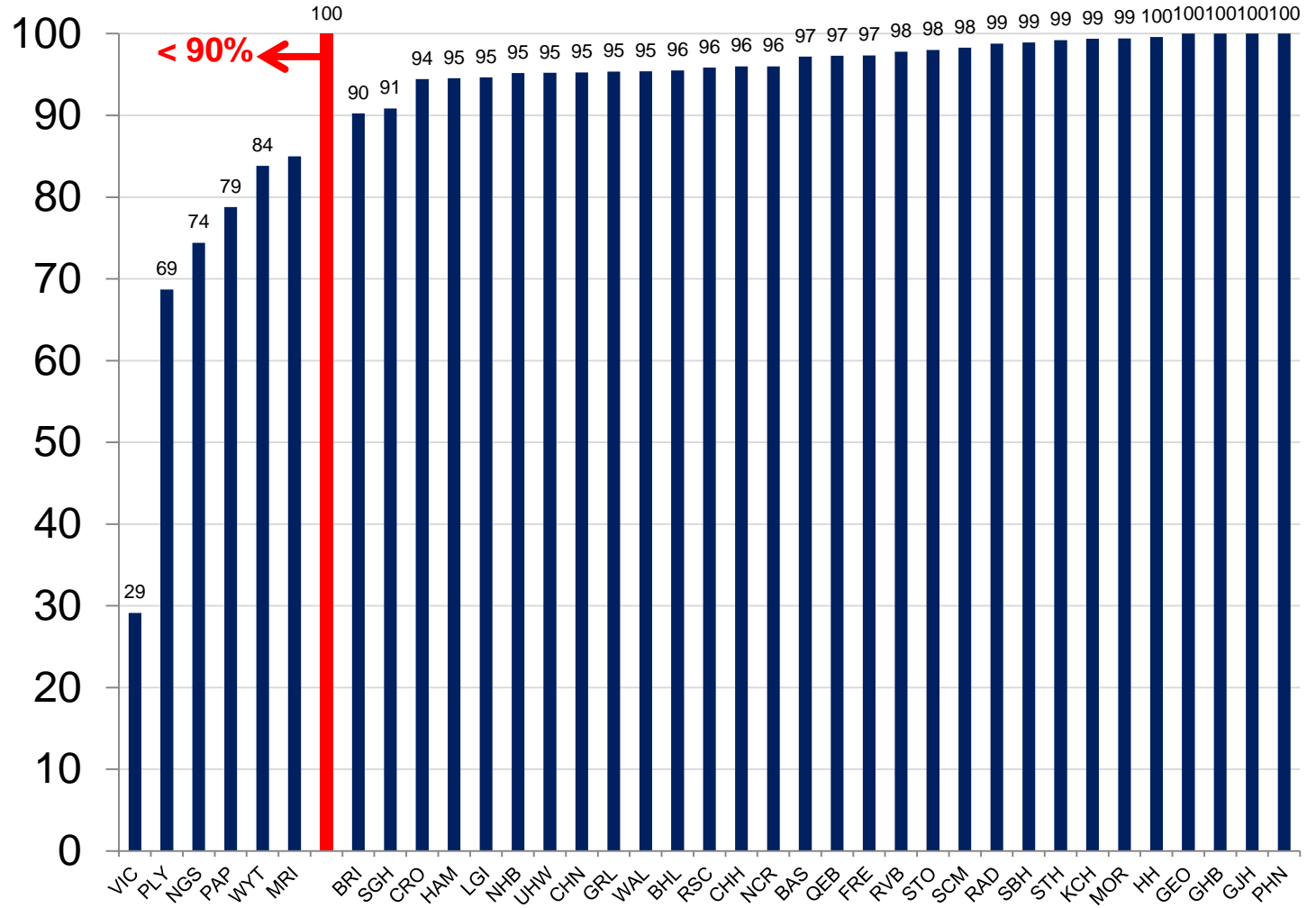
Delivery Approach



UK wide until 2019/20, then excludes Scotland

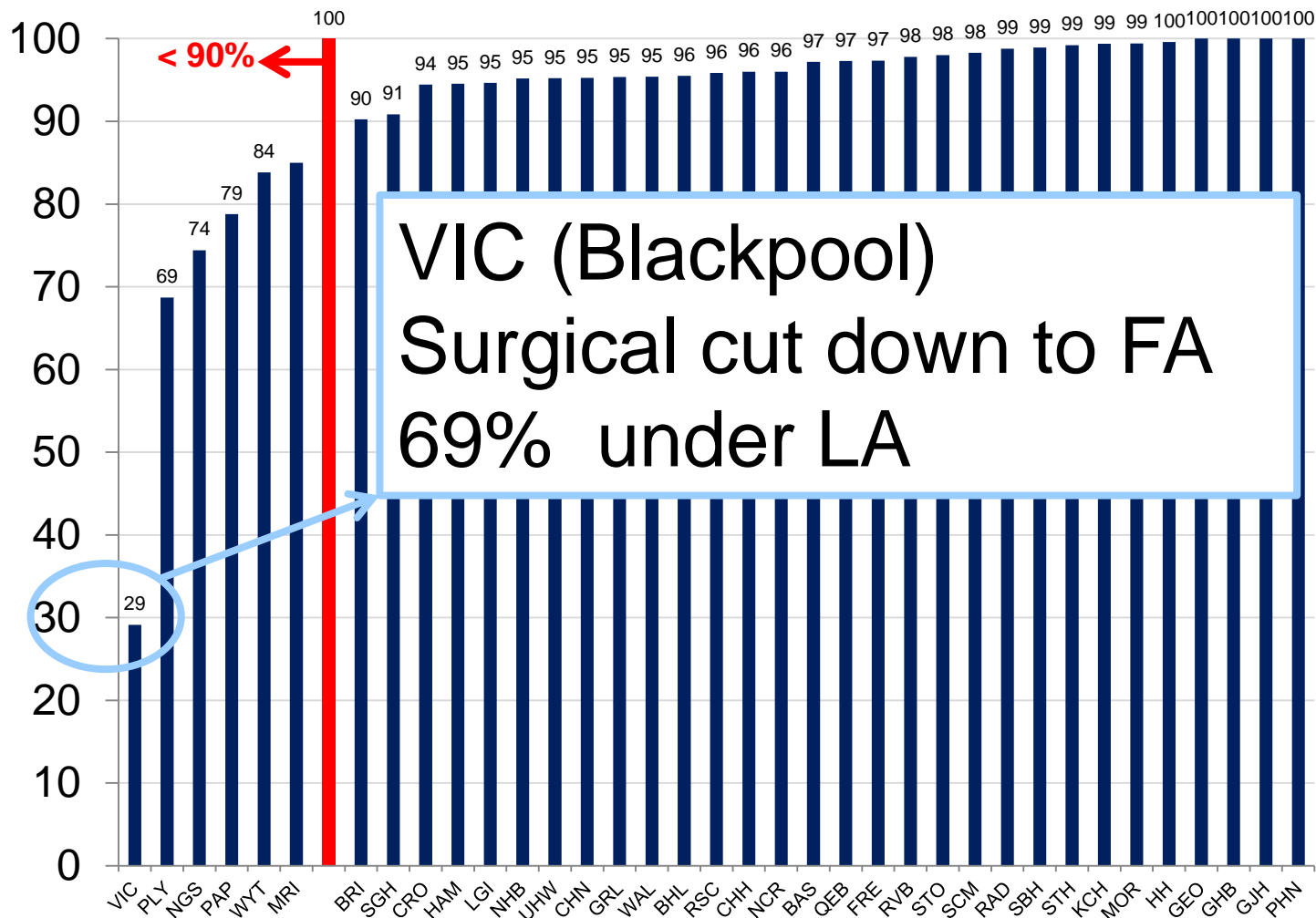
TAVI Delivery Approach

**Transfemoral
Percutaneous
(%)**



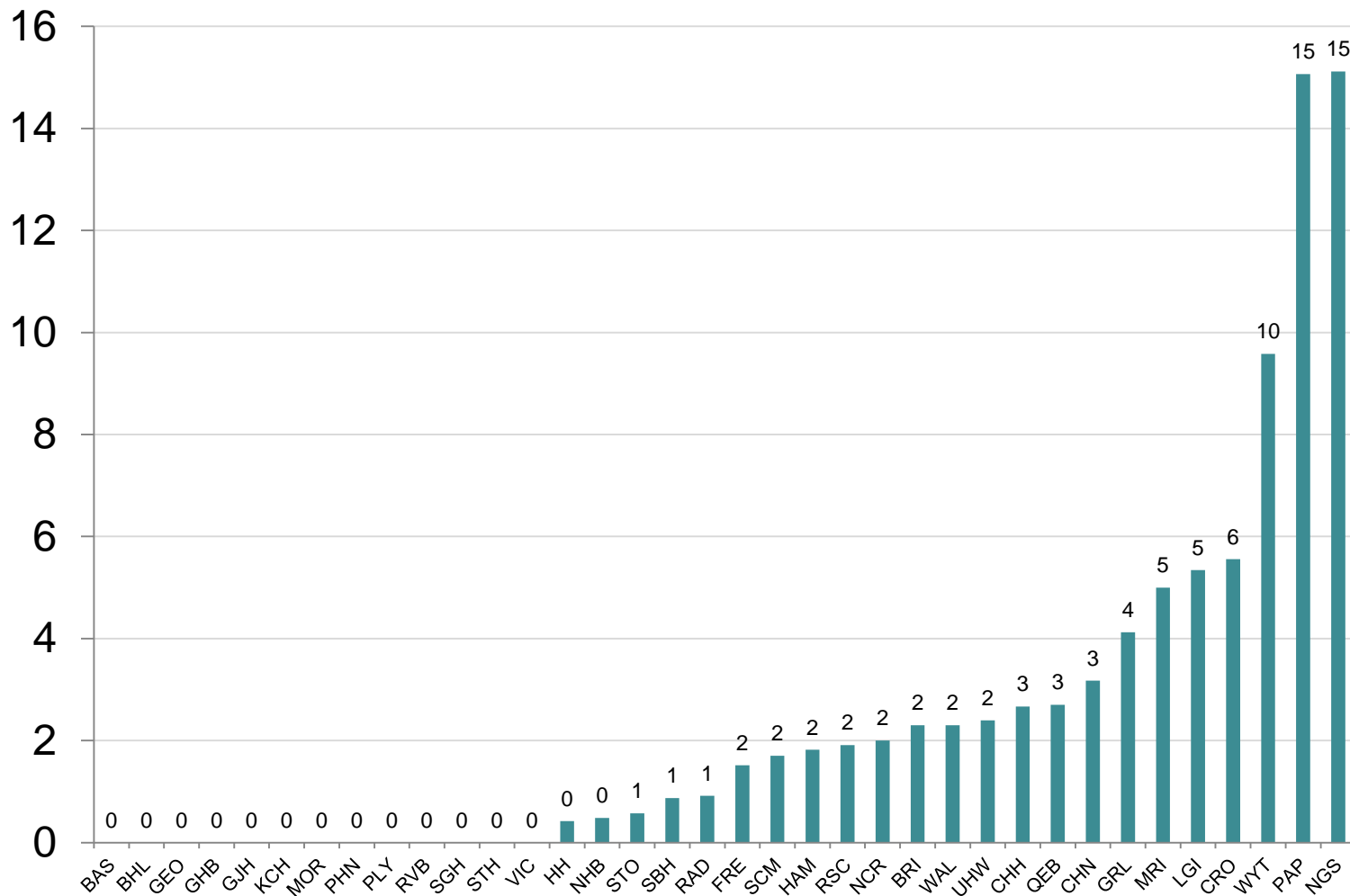
TAVI Delivery Approach

Transfemoral
Percutaneous
(%)



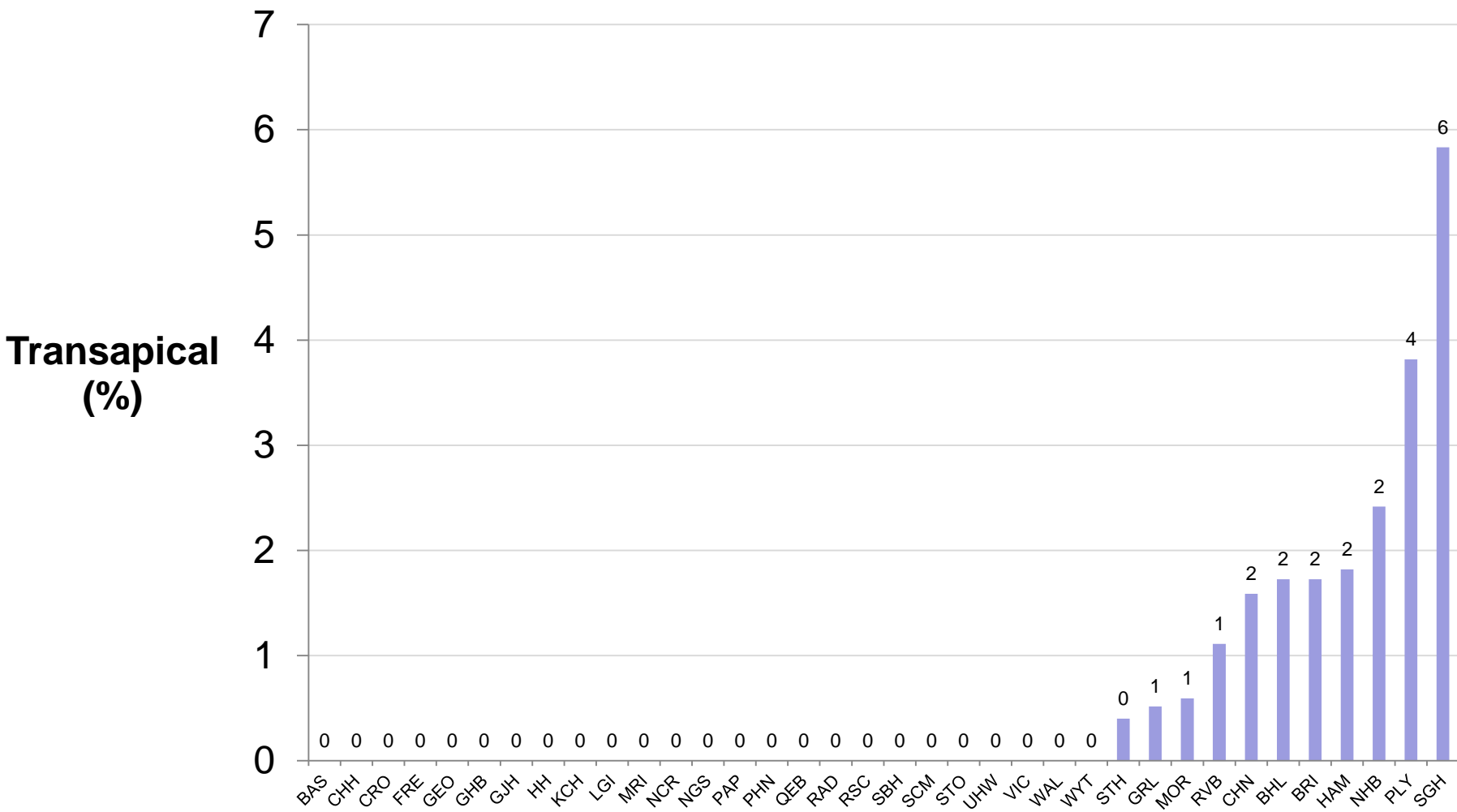
TAVI Delivery Approach

Subclavian
(%)



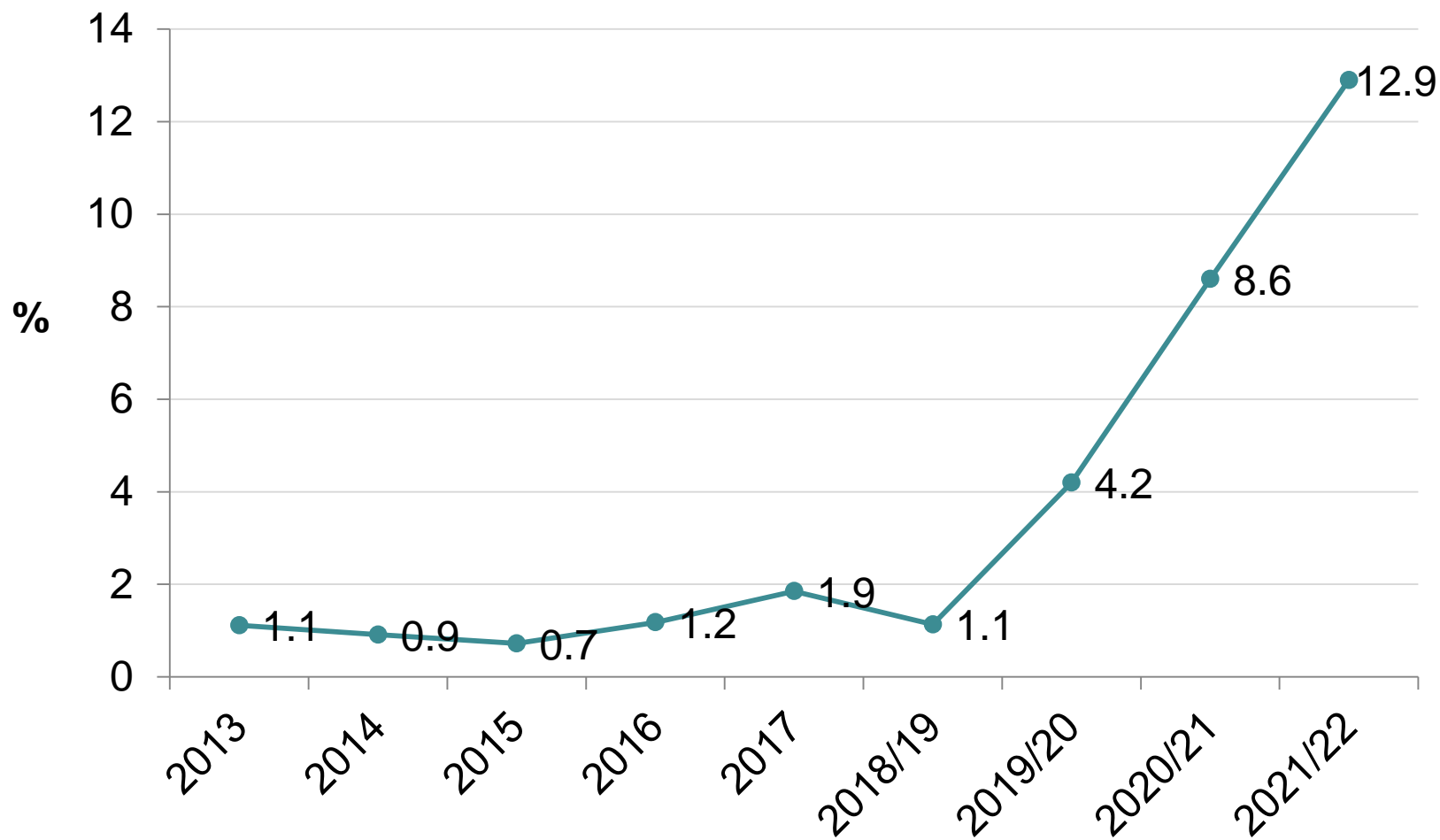
TAVI

Delivery Approach



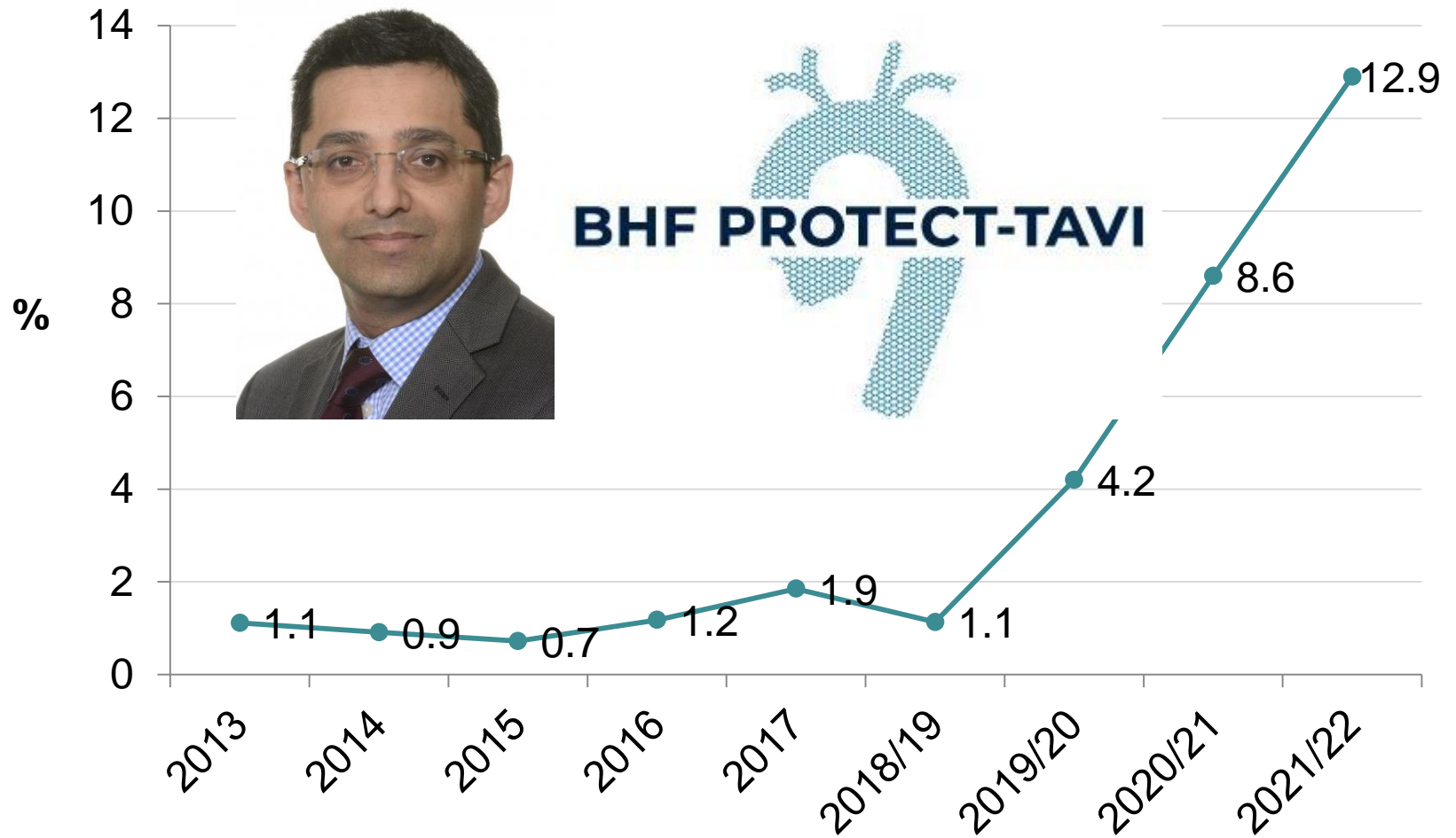
TAVI

Procedures where Cerebral Protection Device Used



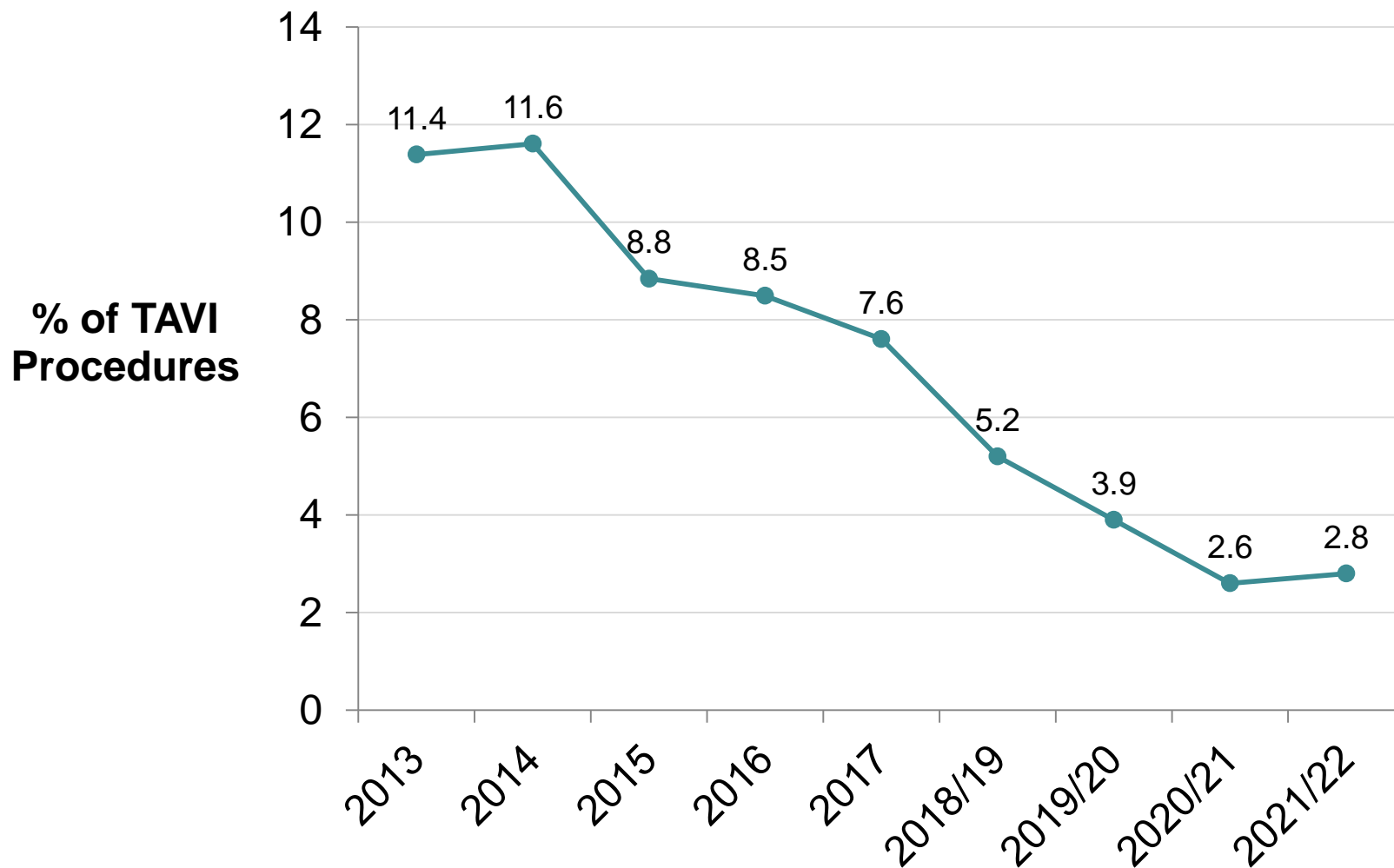
TAVI

Procedures where Cerebral Protection Device Used



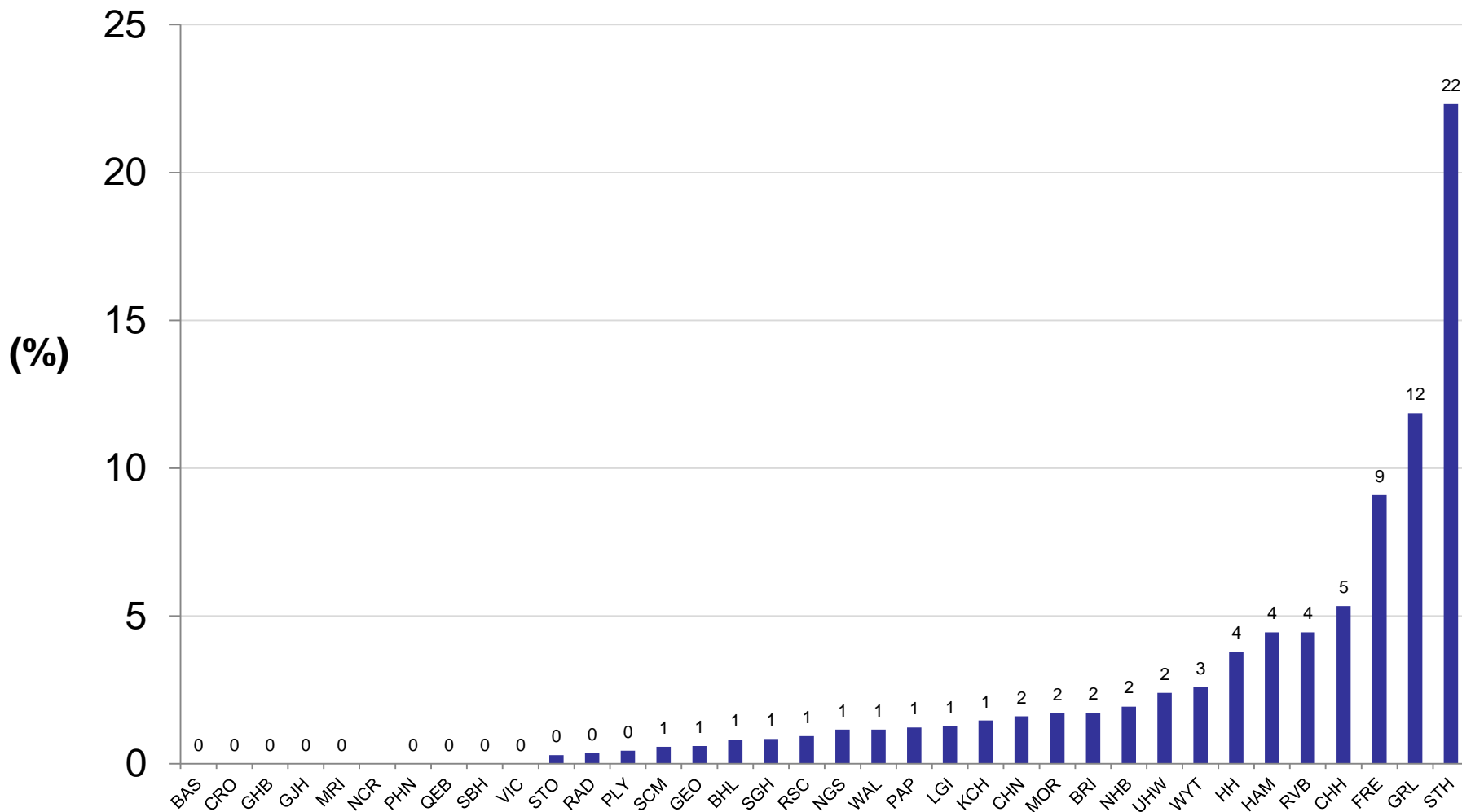
TAVI

Aortic Balloon Valvuloplasty Prior to TAVI Date

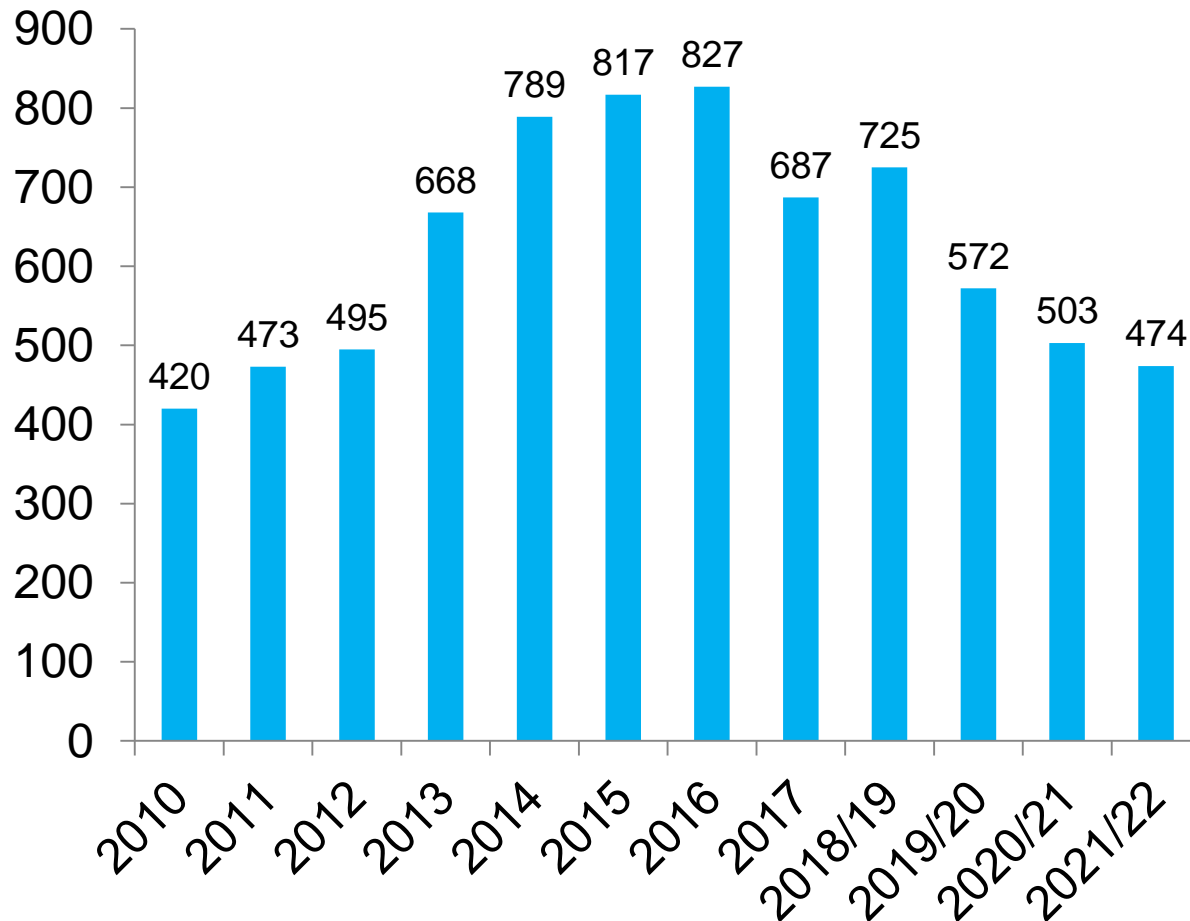


TAVI

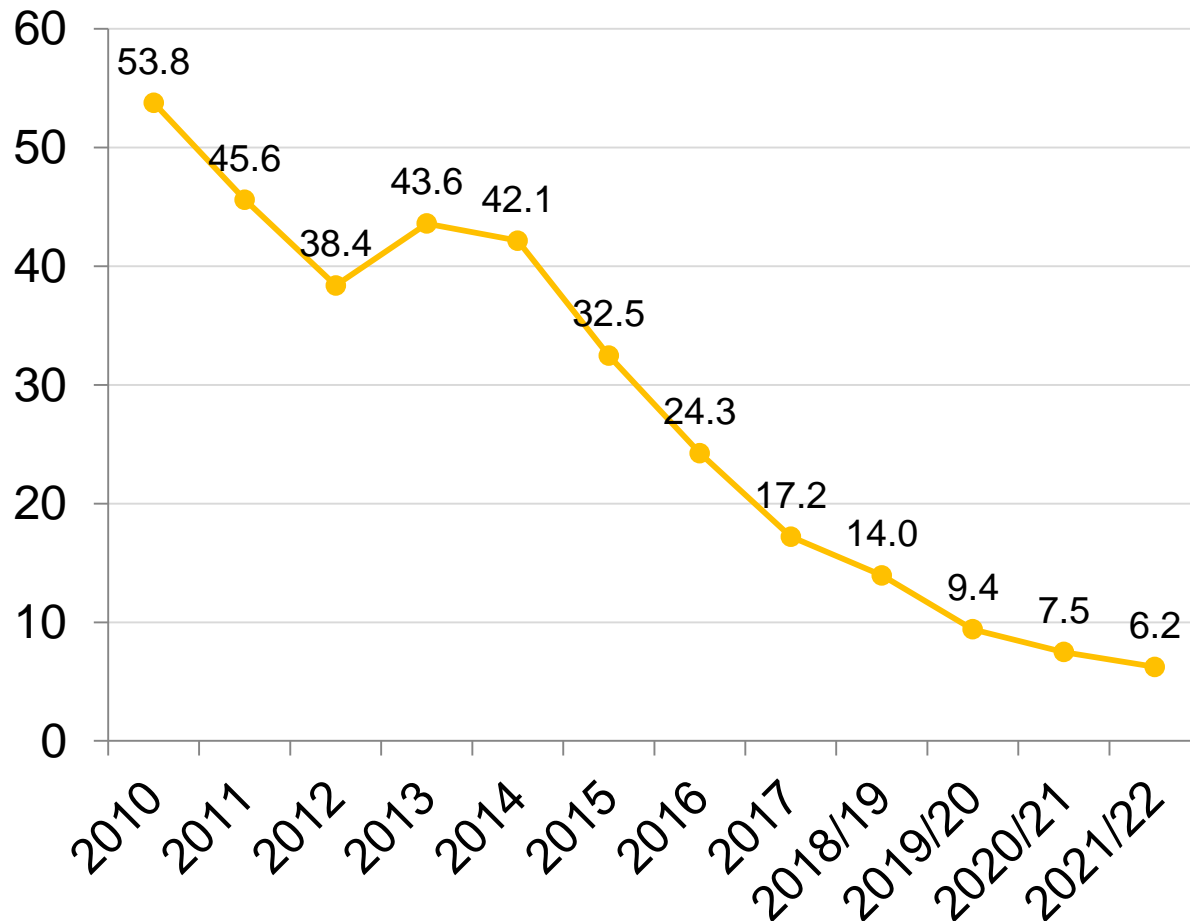
Aortic Balloon Valvuloplasty Prior to TAVI Date



Stand Alone Aortic Balloon Valvuloplasty (not as part of TAVI)



Aortic Balloon Valvuloplasty (not as part of TAVI - as a % of TAVI)

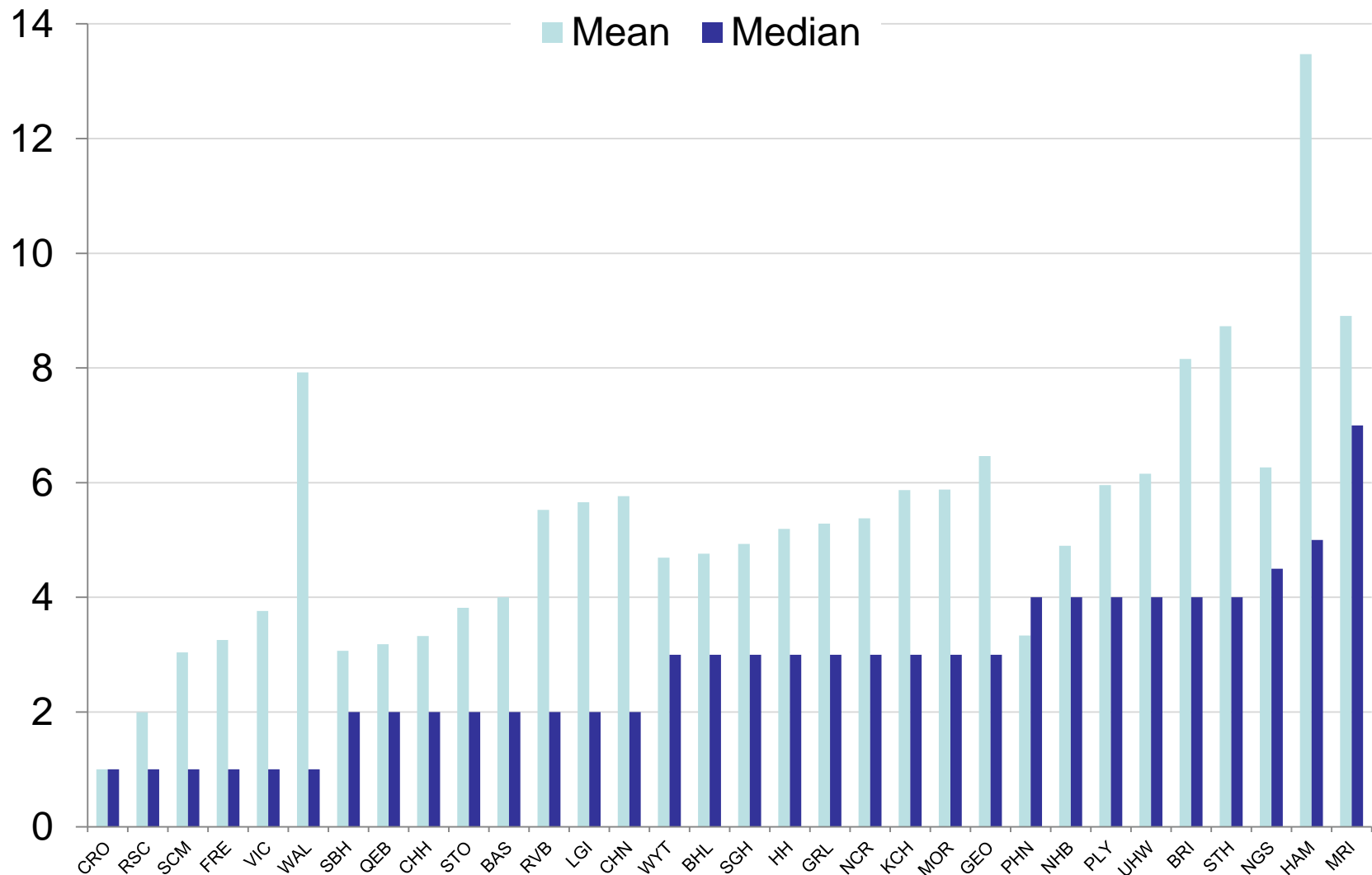


Time to TAVI and Dx

2020/21	Admission to TAVI (all)	TAVI to Dx (all)	LOS (all)	LOS (elective)
Mean (days)	4.8	3.9	7.7	4.8
Median (days)	1.9	2.1	3	3

2021/22	Admission to TAVI (all)	TAVI to Dx (all)	LOS (all)	LOS (elective)
Mean (days)	6.0	4.0	9.0	5.1
Median (days)	1.9	2.1	3	3

TAVI Length Of Stay Elective cases



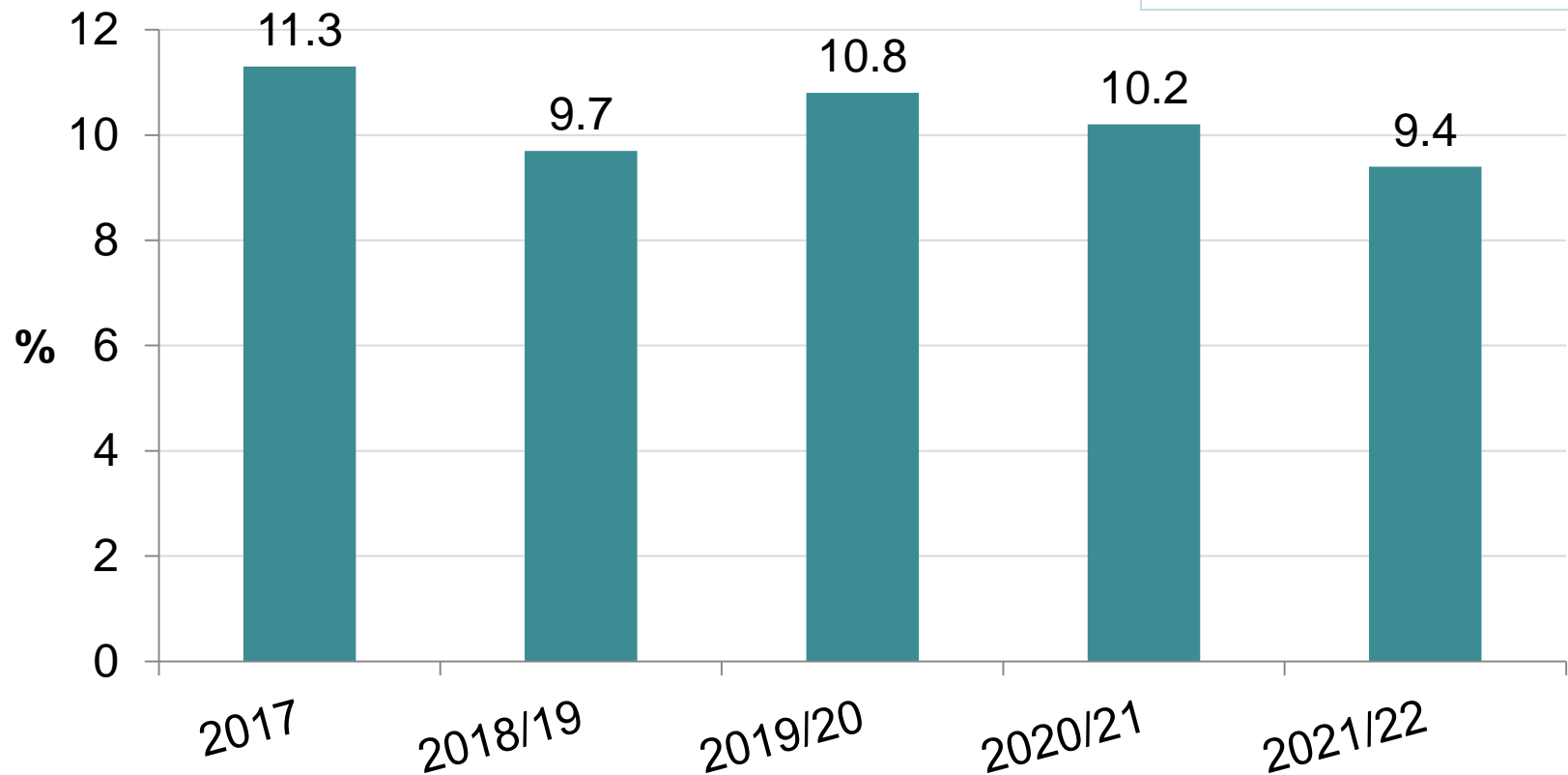
TAVI

Complications

Implantation of PPM Due to TAVI

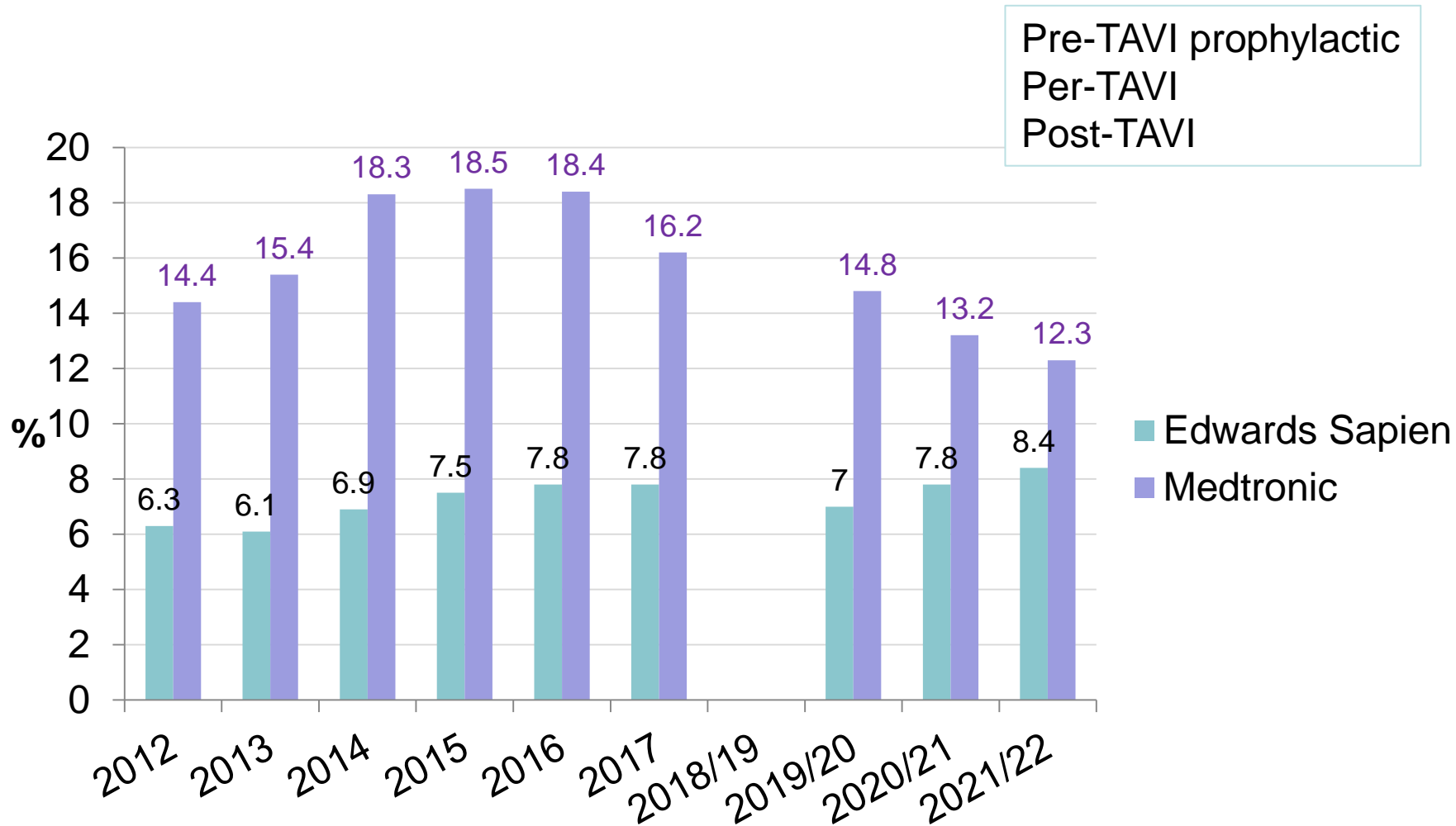
All procedures

Defined as:
Pre-TAVI prophylactic
Per-TAVI
Post-TAVI

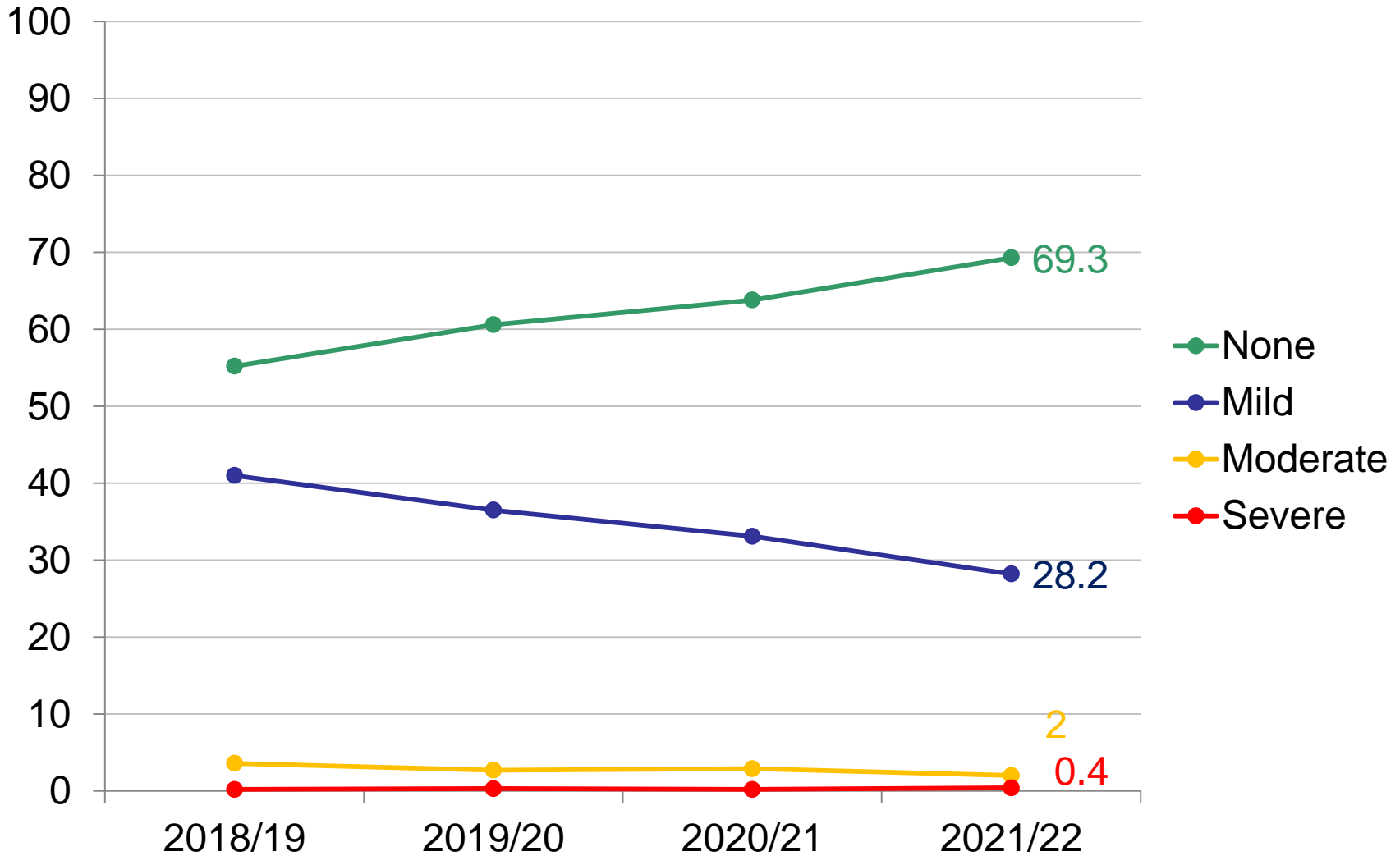


Implantation of PPM Due to TAVI

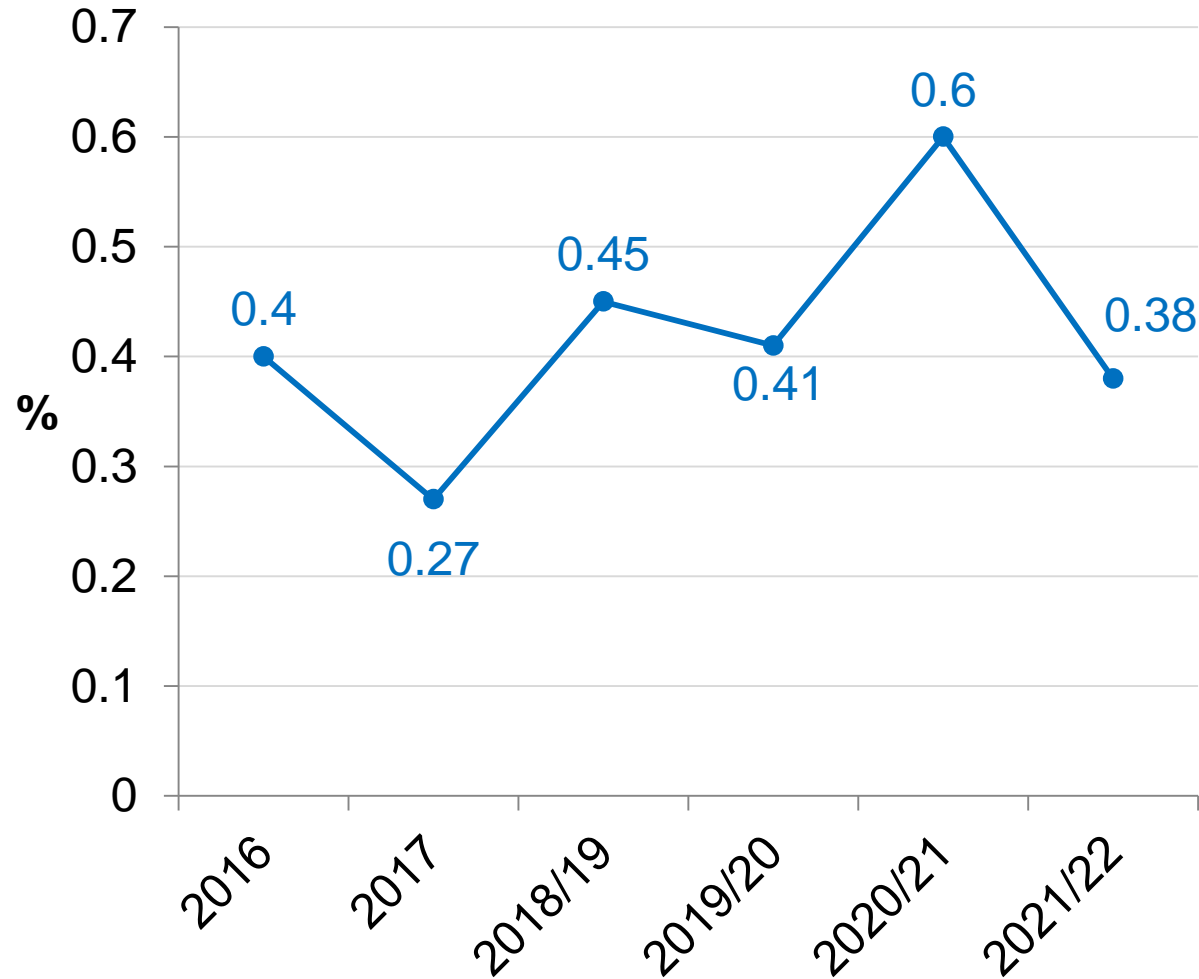
Edwards Sapien v Medtronic



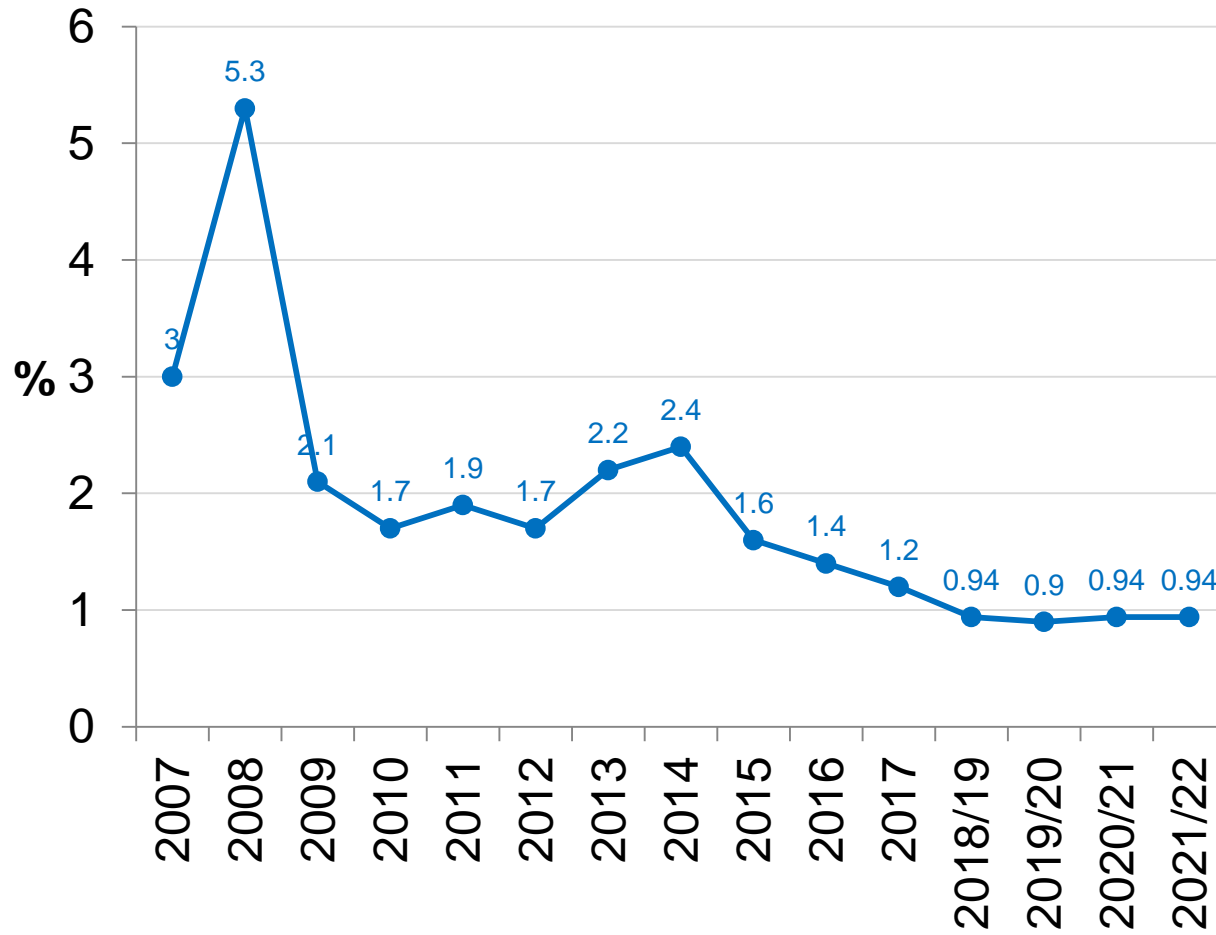
Post TAVI Aortic Regurgitation



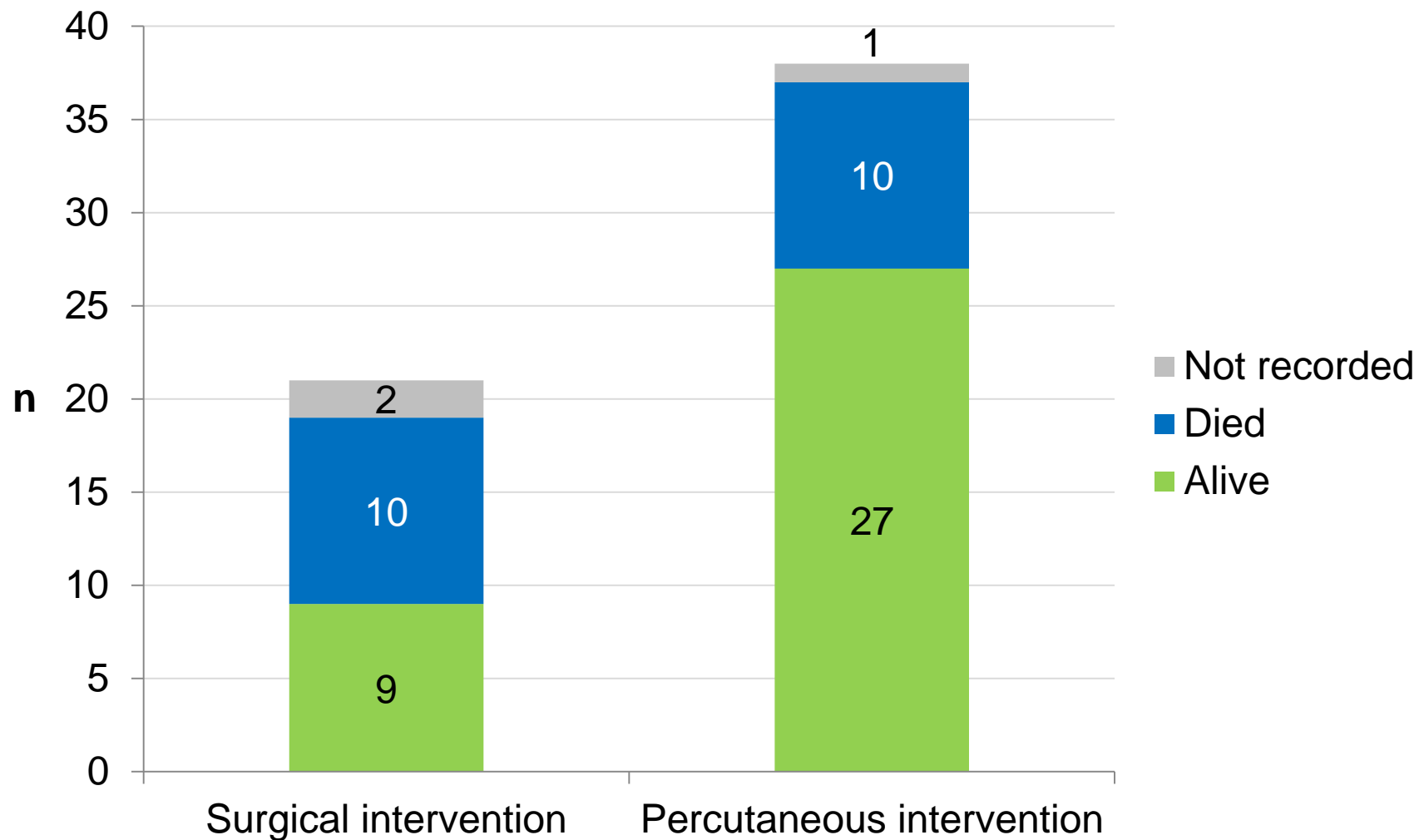
Bail out PCI



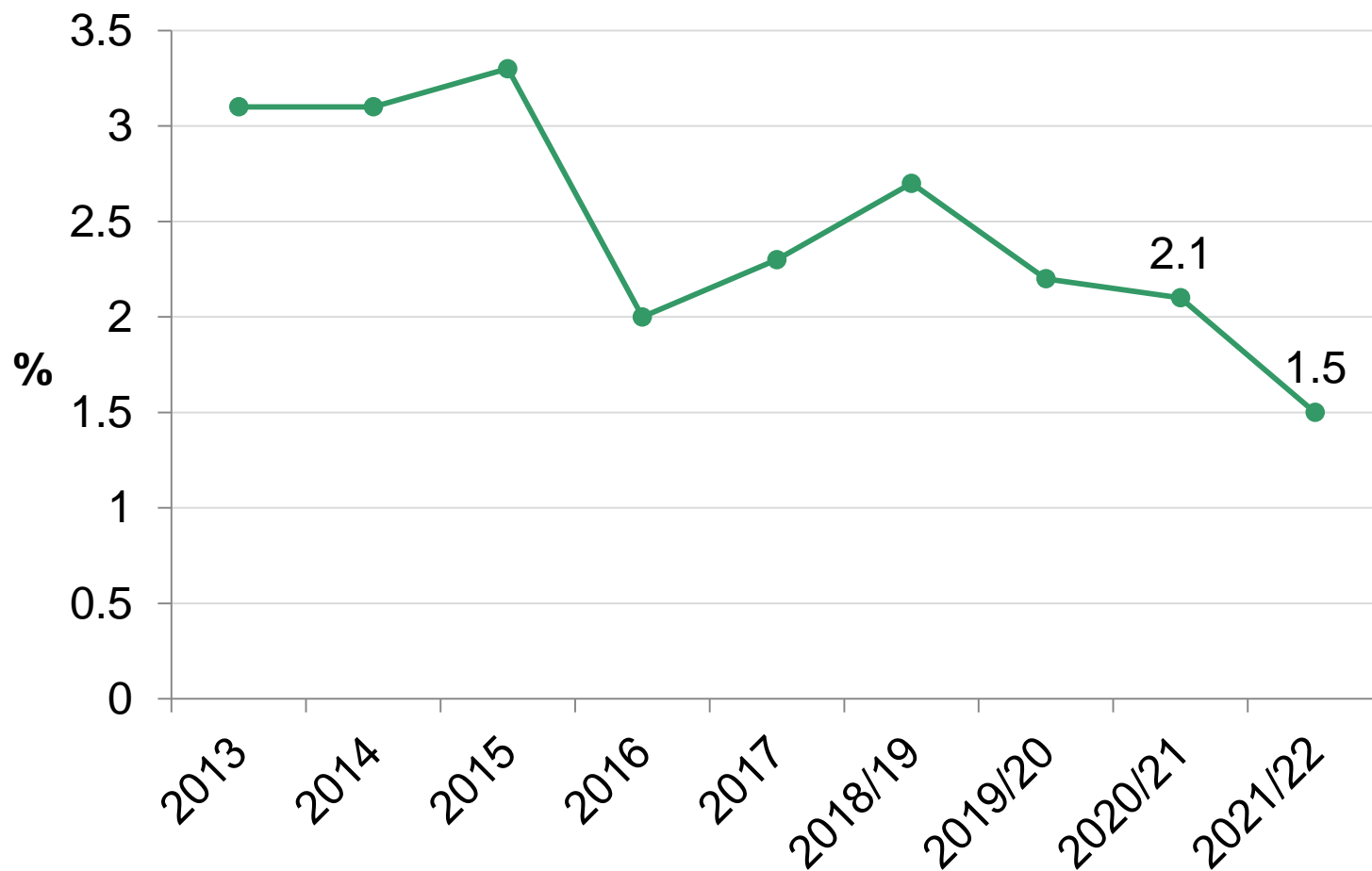
Tamponade



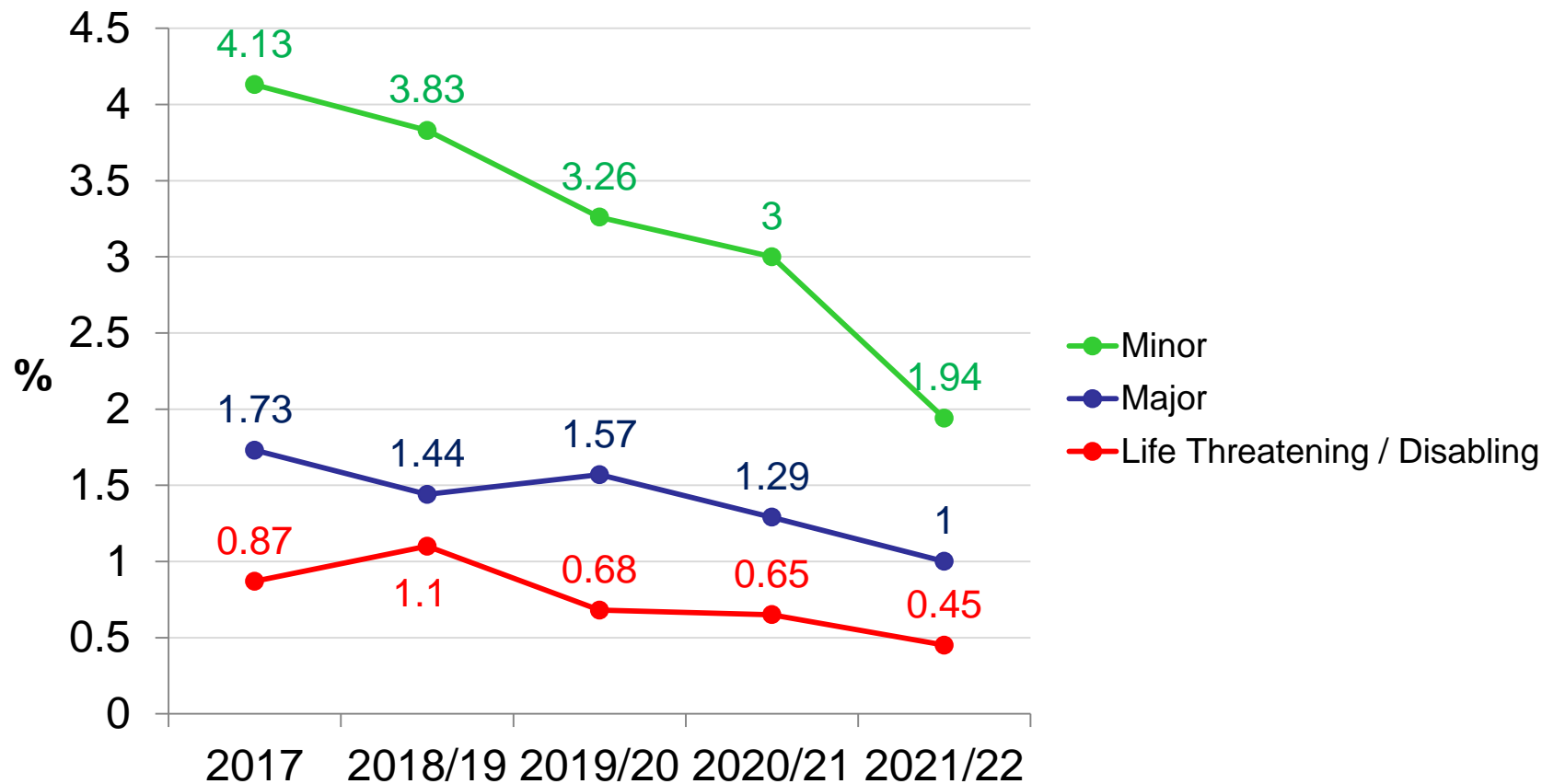
Tamponade 2021/22



Major Vascular Access Complication

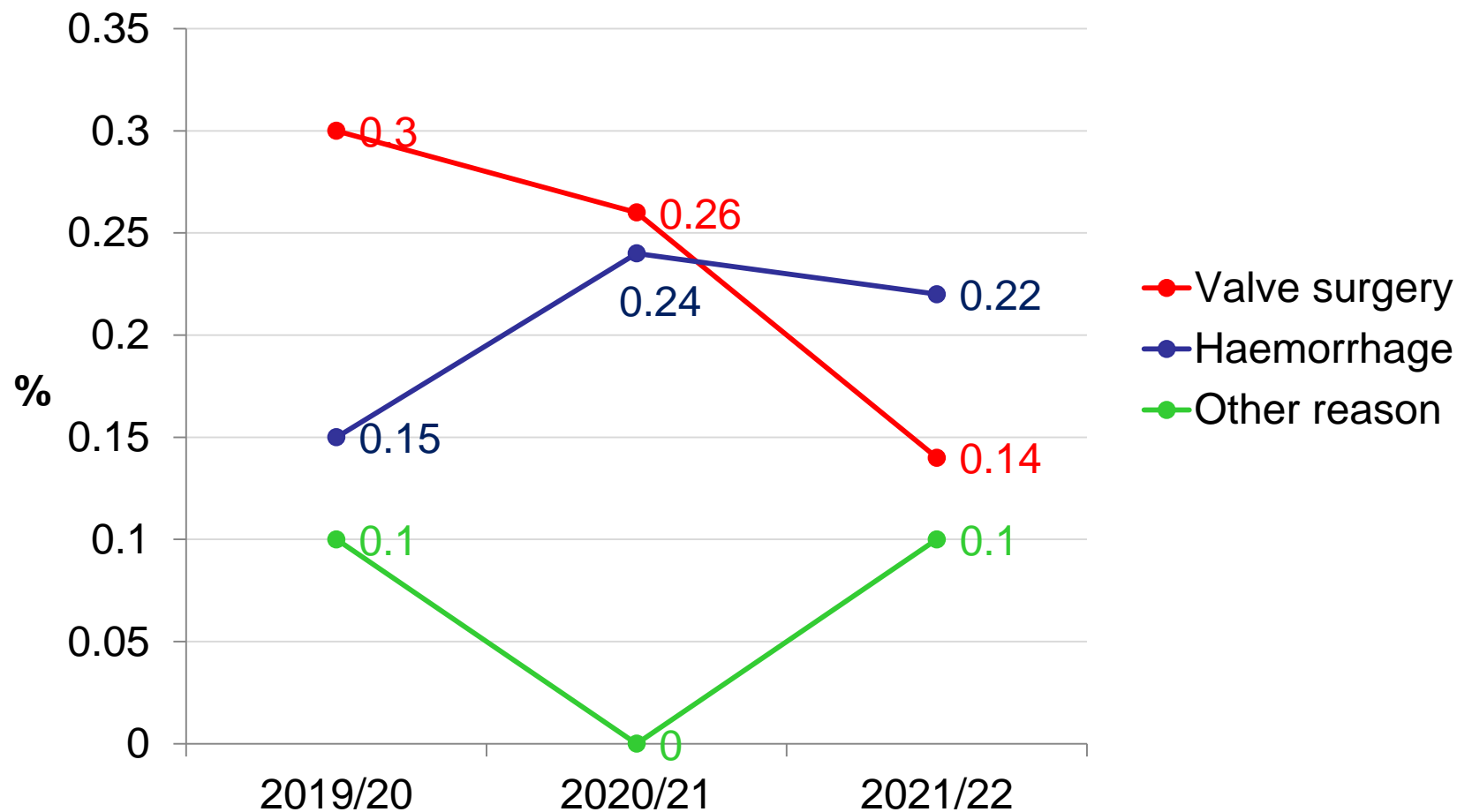


Major Bleeding

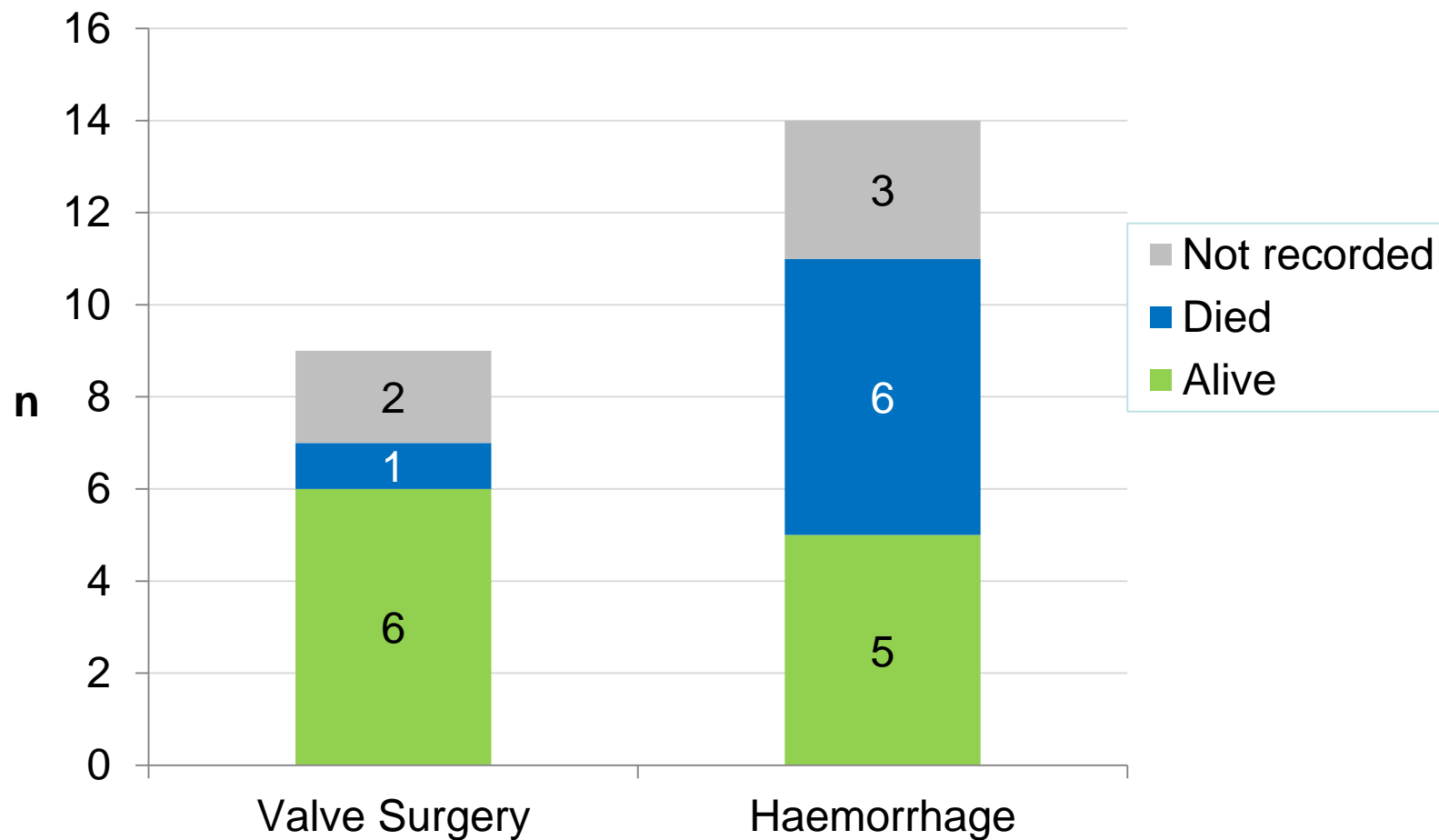


Life Threatening / Disabling = BARC 5, BARC 3b and 3c
 Major = BARC 3a
 Minor = BARC 2 or 3a according to severity

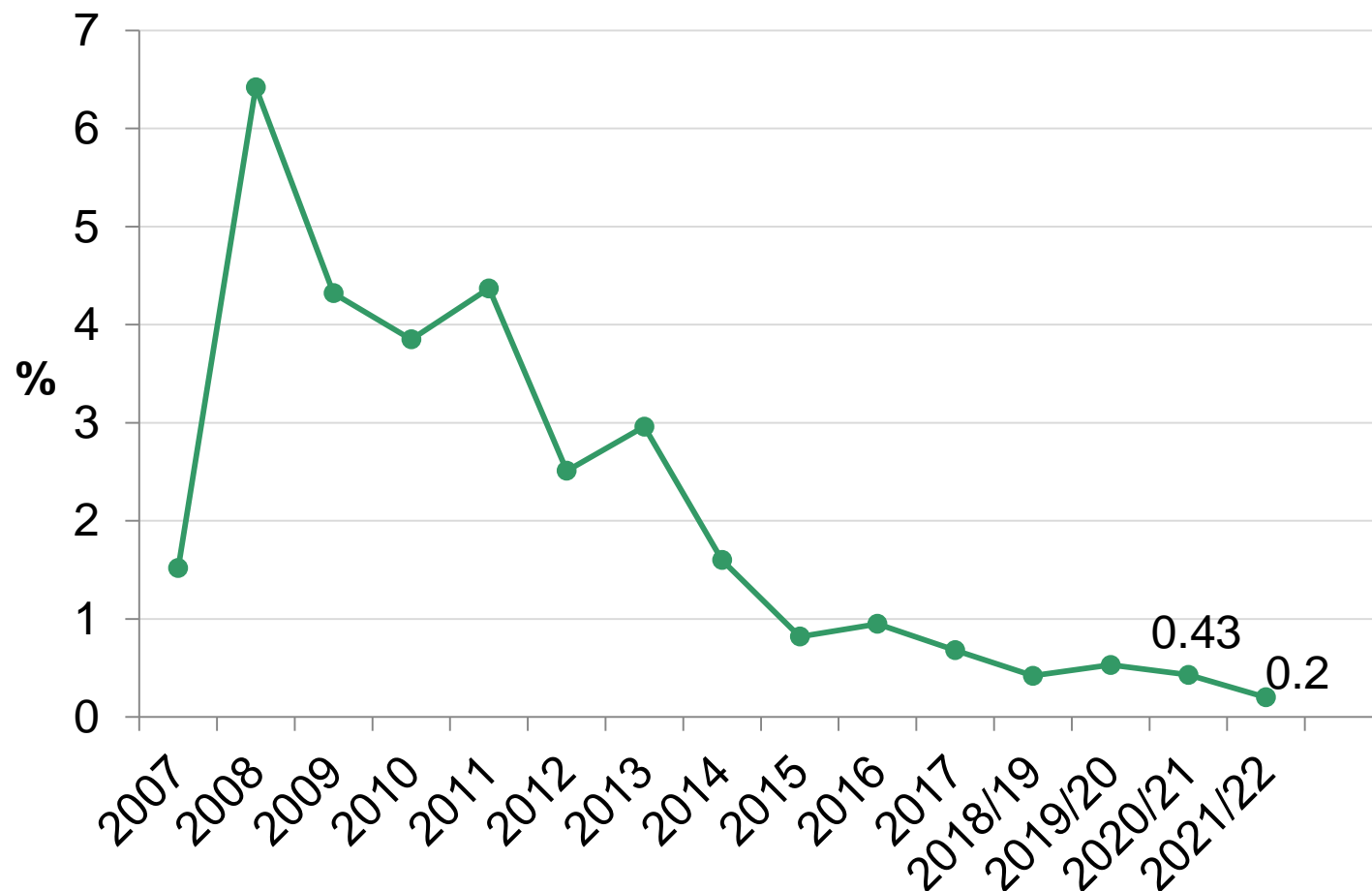
Conversion to Full Sternotomy



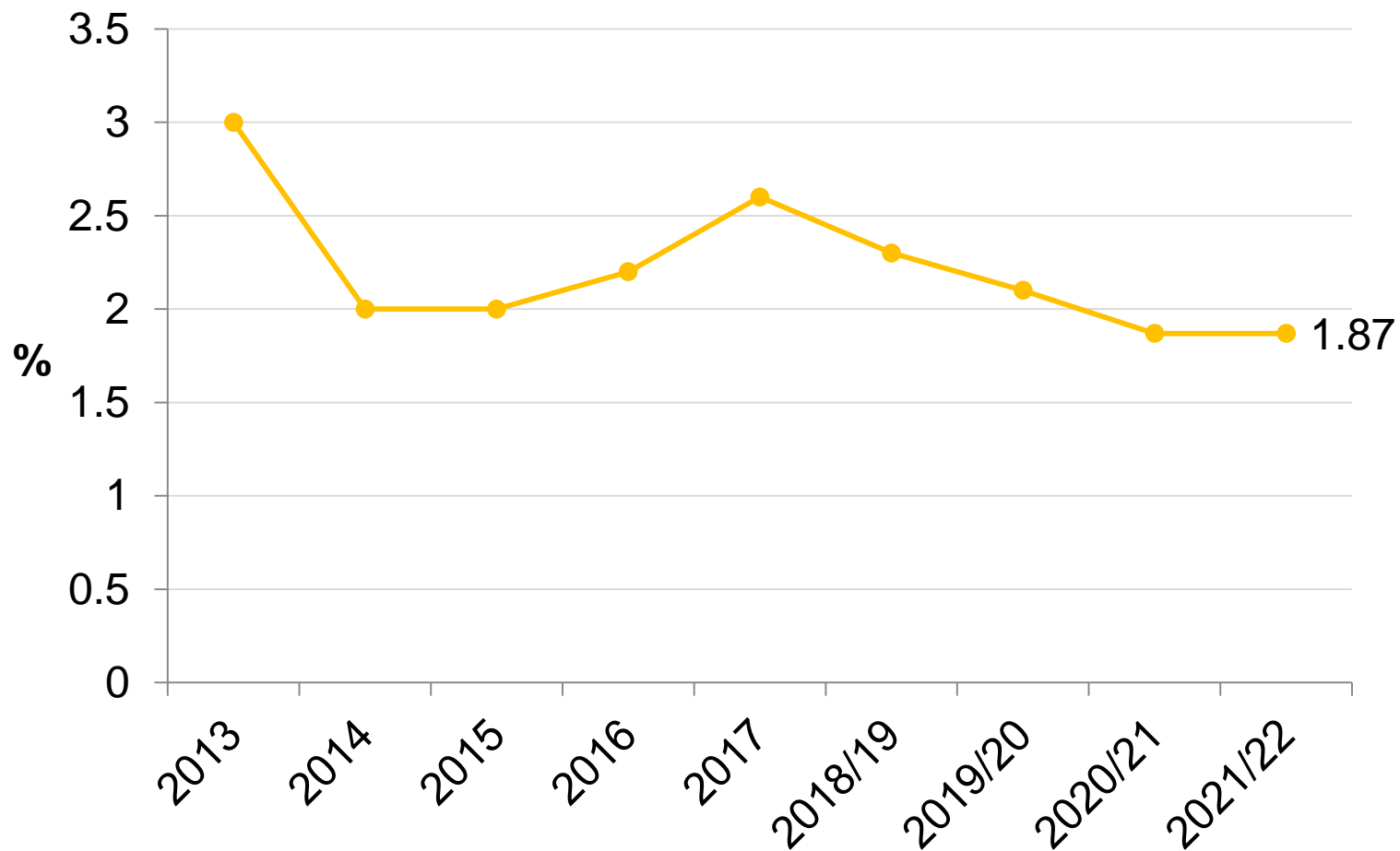
Conversion to Full Sternotomy 2021/22



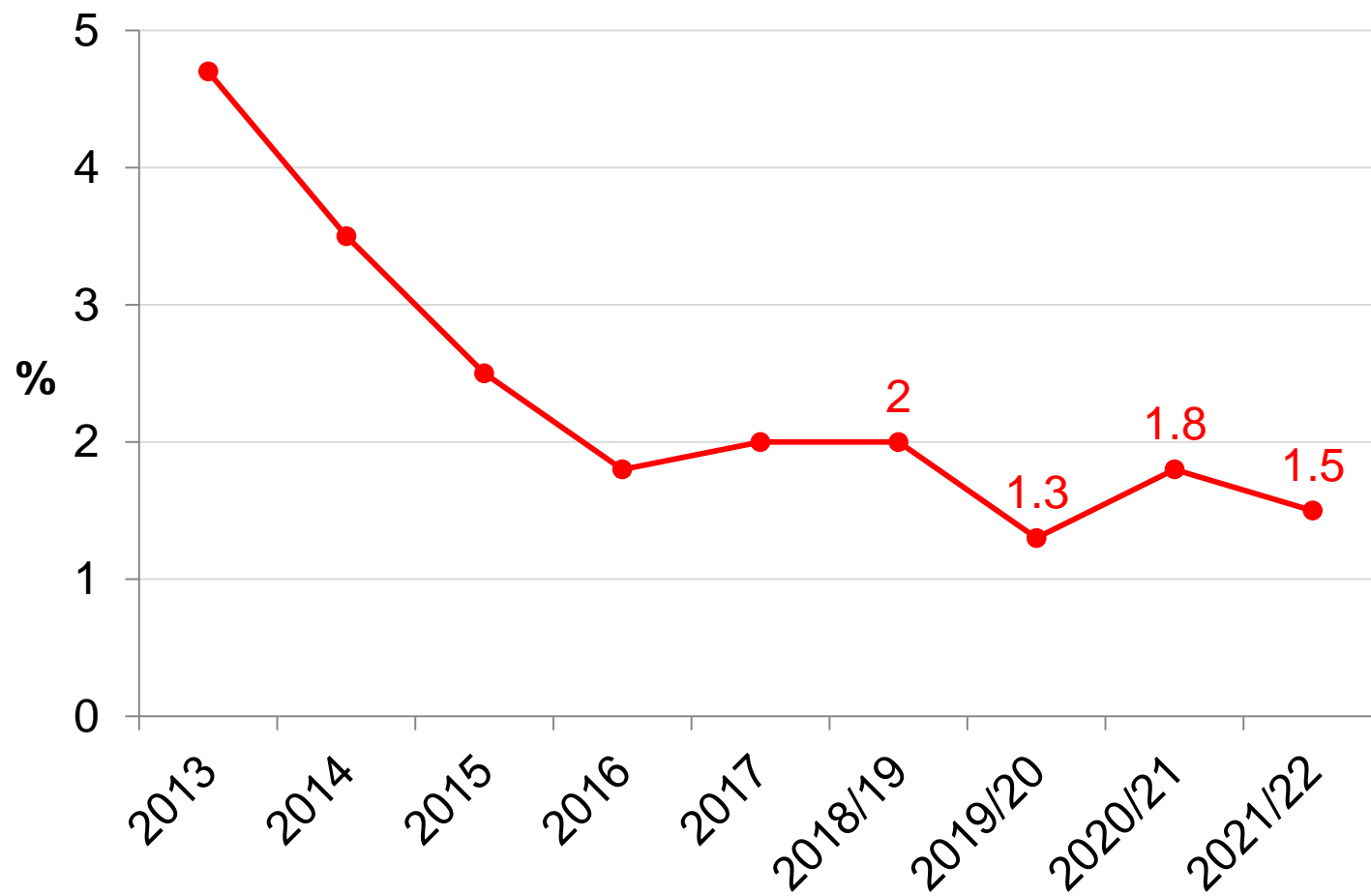
New Haemofiltration or Dialysis Post Procedure



In Hospital CVA



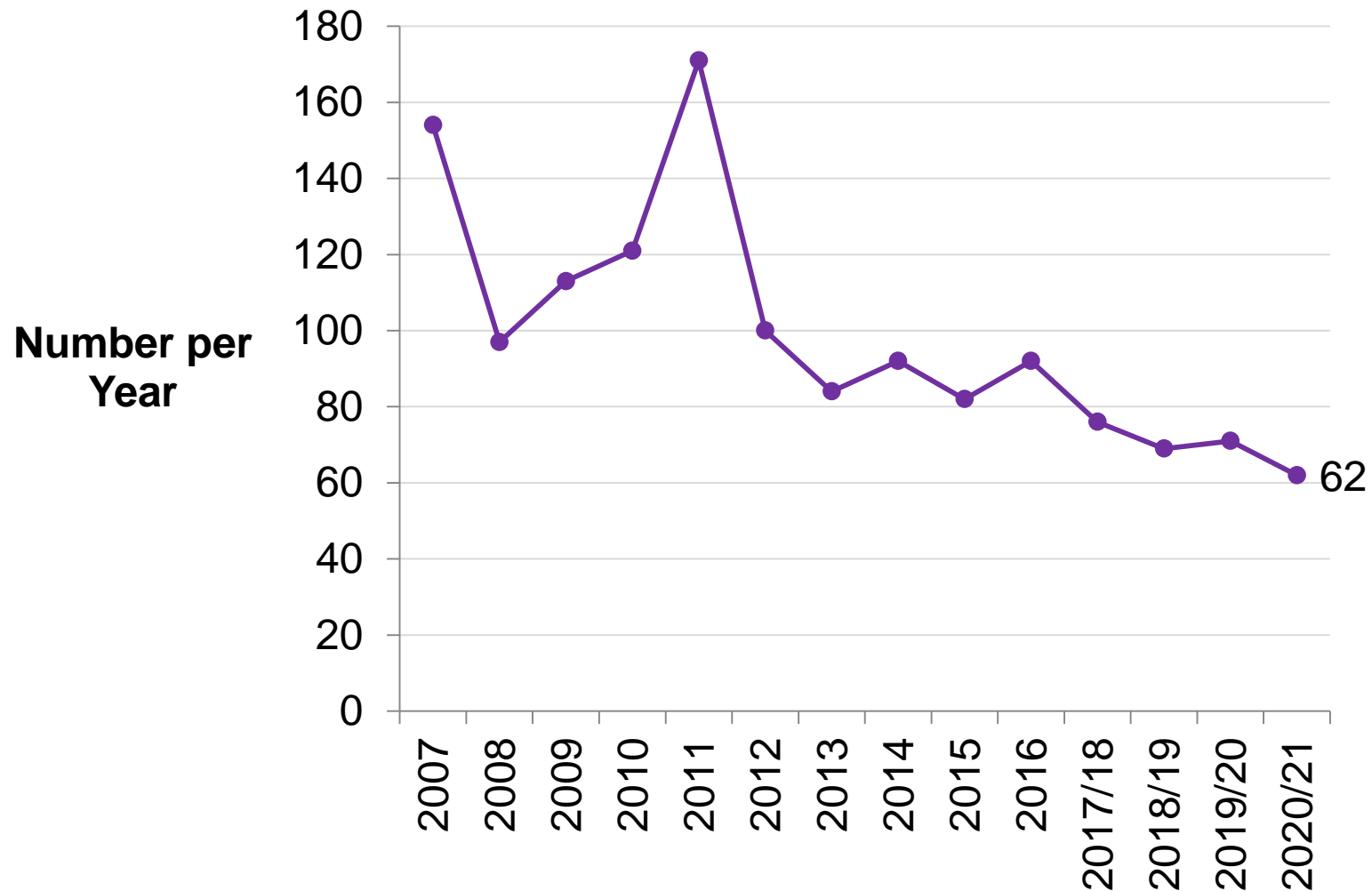
In Hospital Mortality



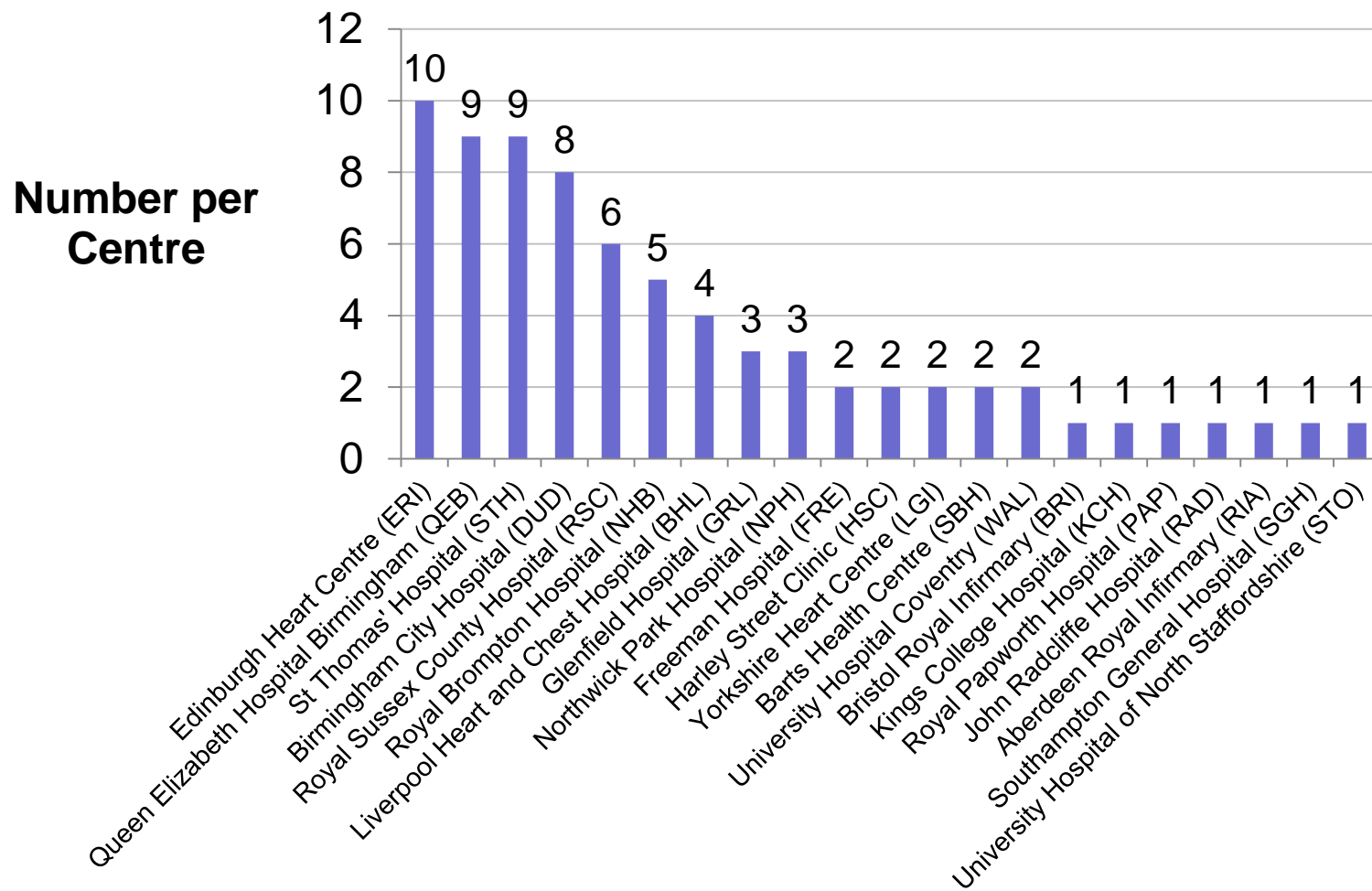
Mitral



Mitral Balloon Valvuloplasty



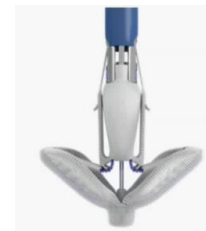
Mitral Balloon Valvuloplasty 2021/22



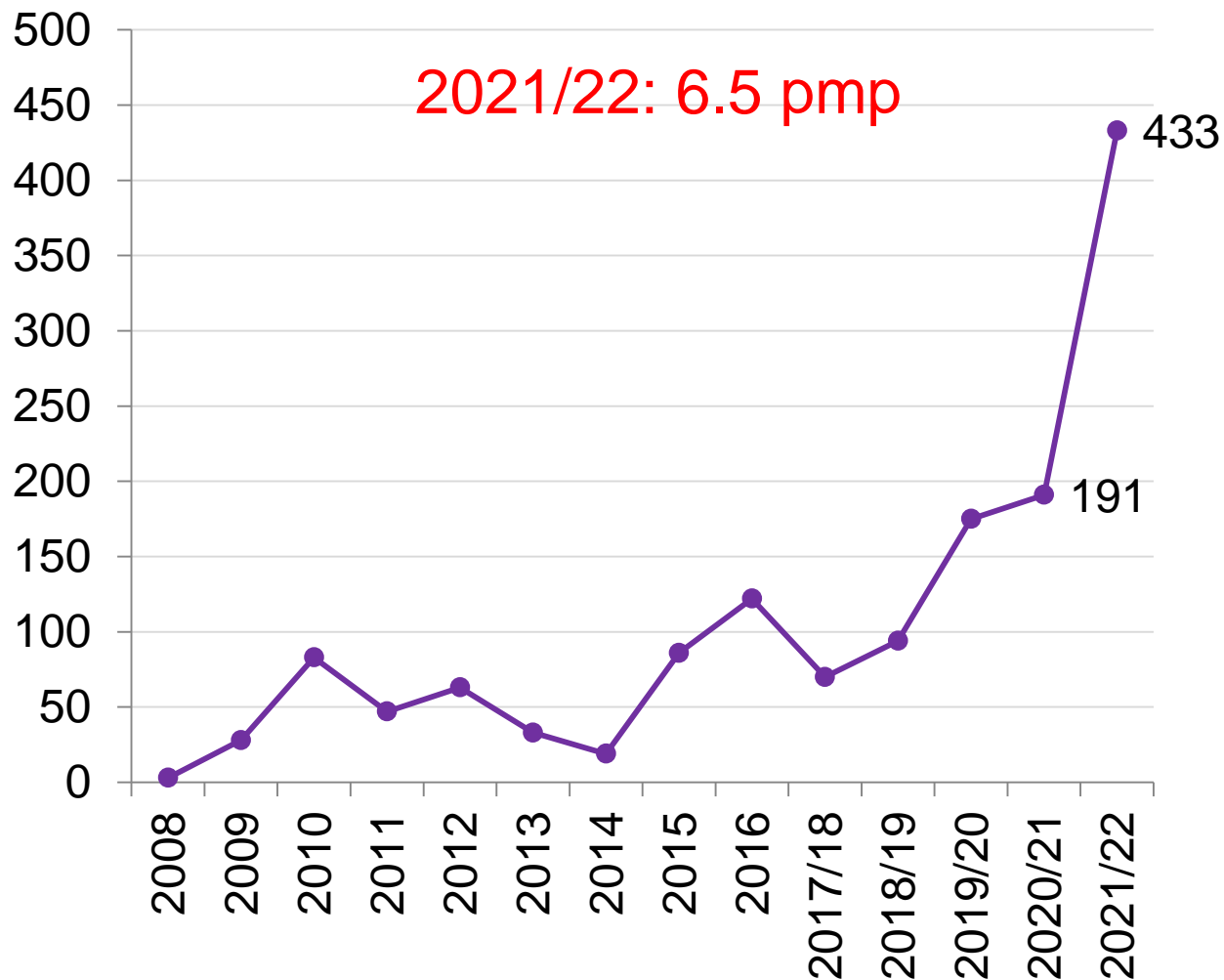
Number of centres: 21

Percutaneous Valves

Mitral Edge to Edge repair



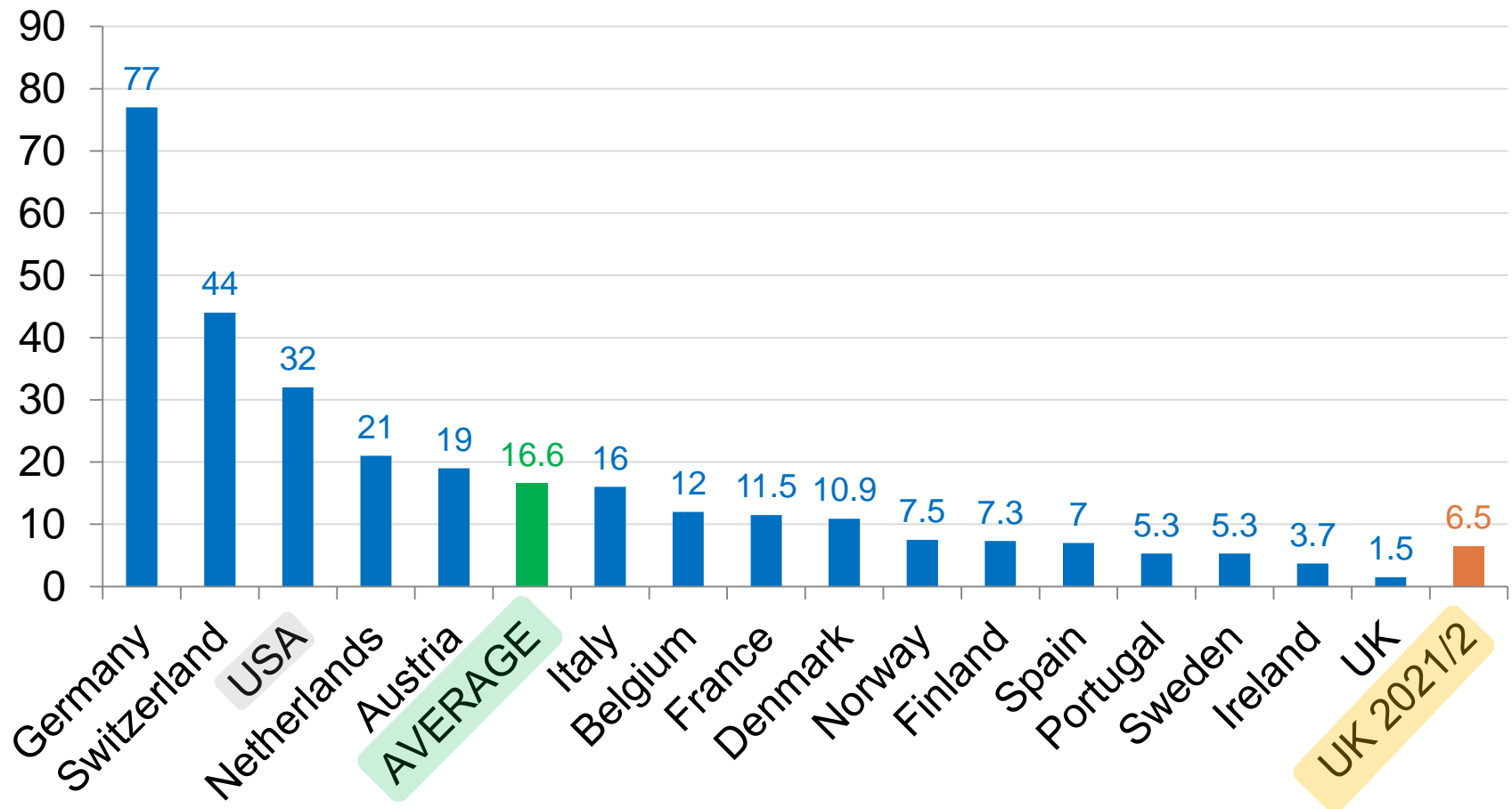
Number per
Year



Percutaneous Valves

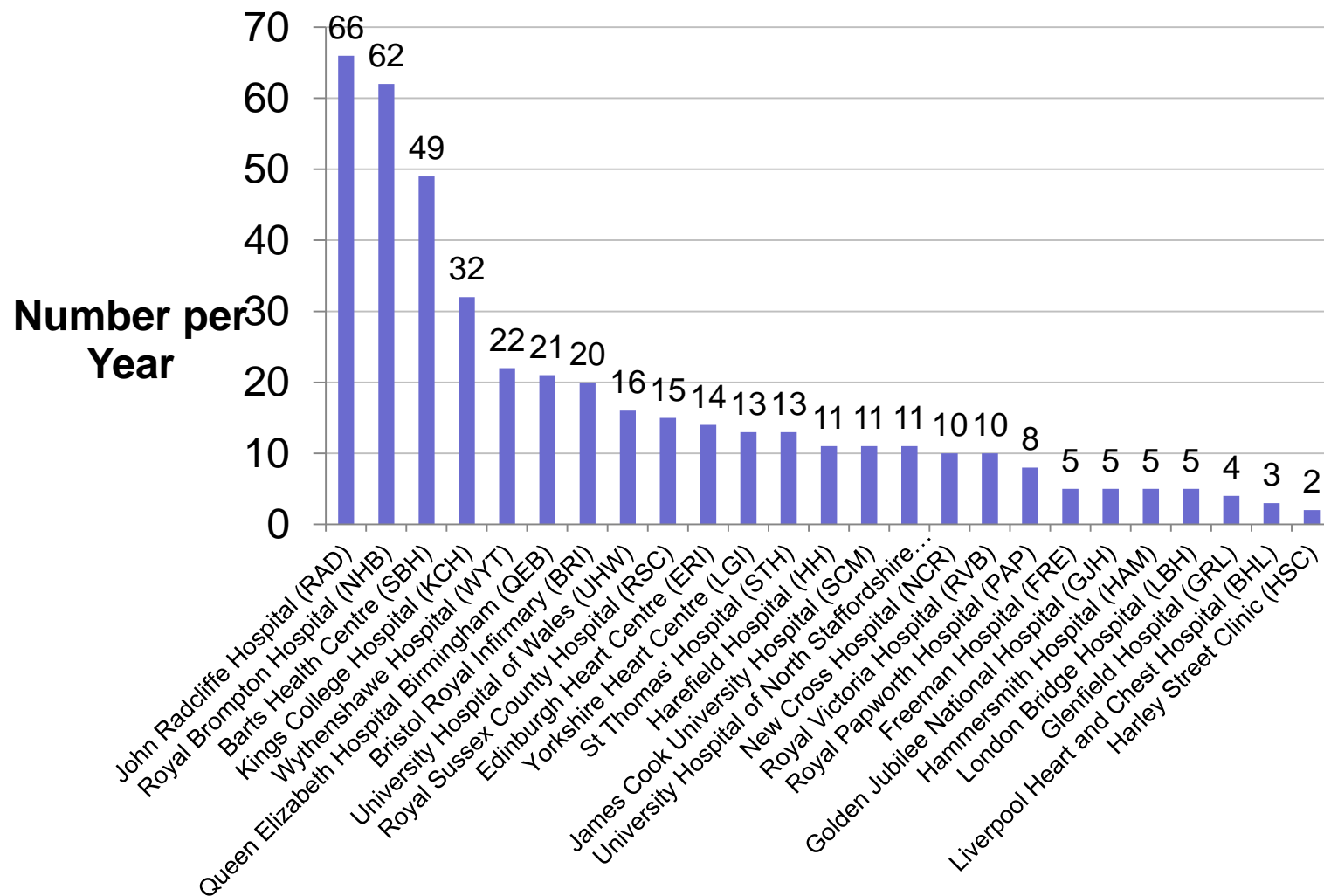
Mitral Edge to Edge repair - National Comparison

Procedures per million population **2019**



Percutaneous Valves

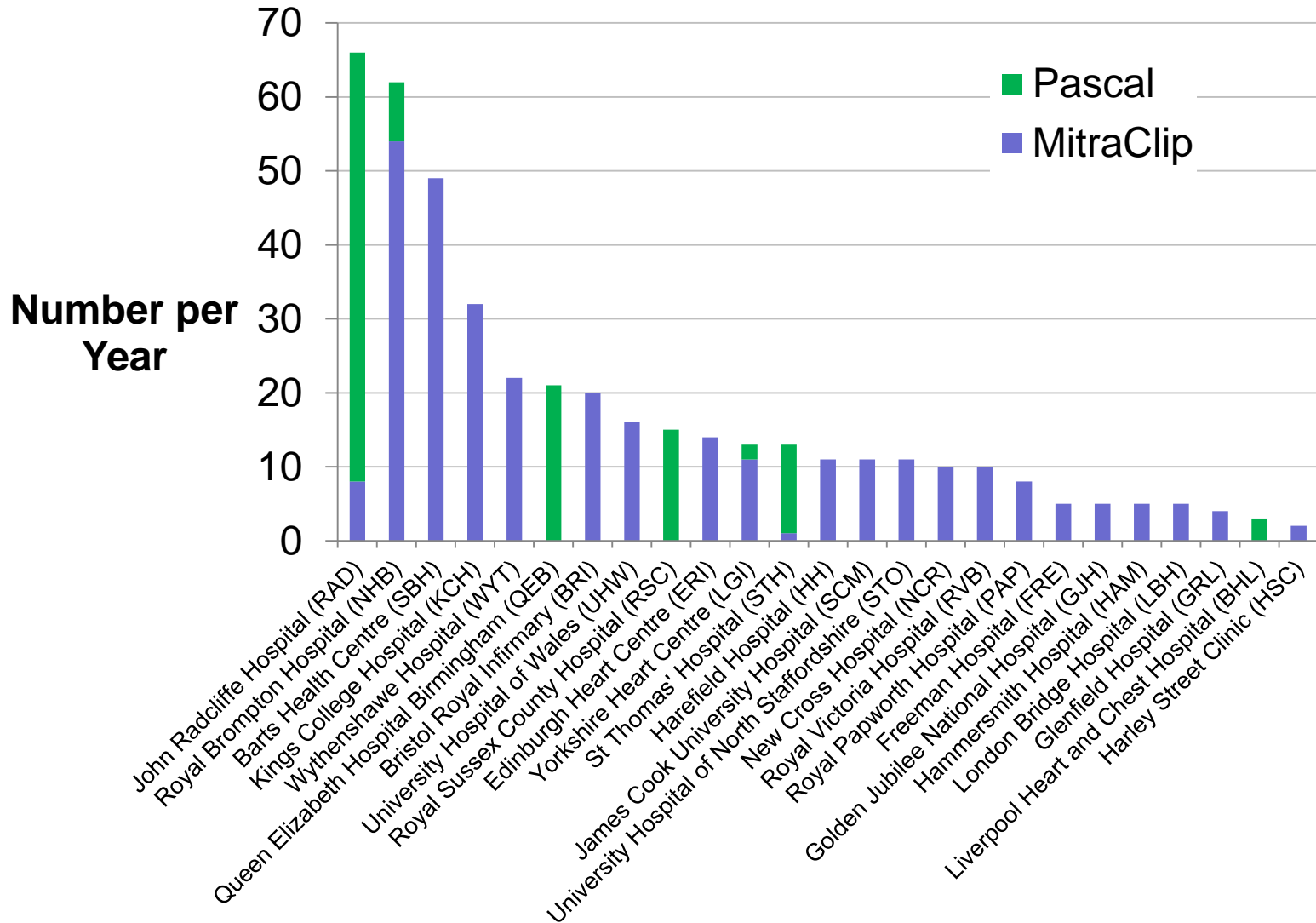
Mitral Edge to Edge repair 2021/22



MitraClip + Pascal

Percutaneous Valves

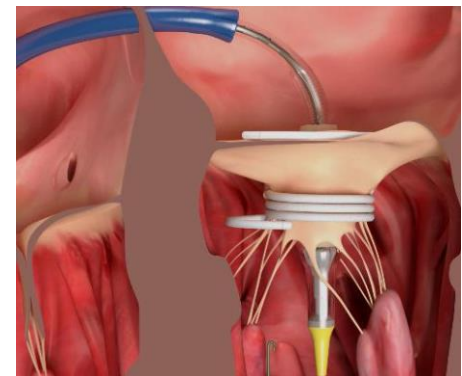
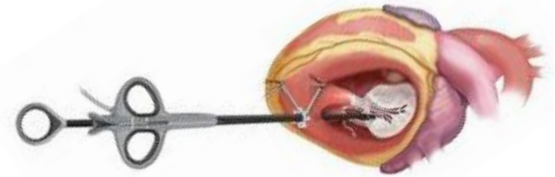
Mitral Edge to Edge repair 2021/22



Percutaneous Valves

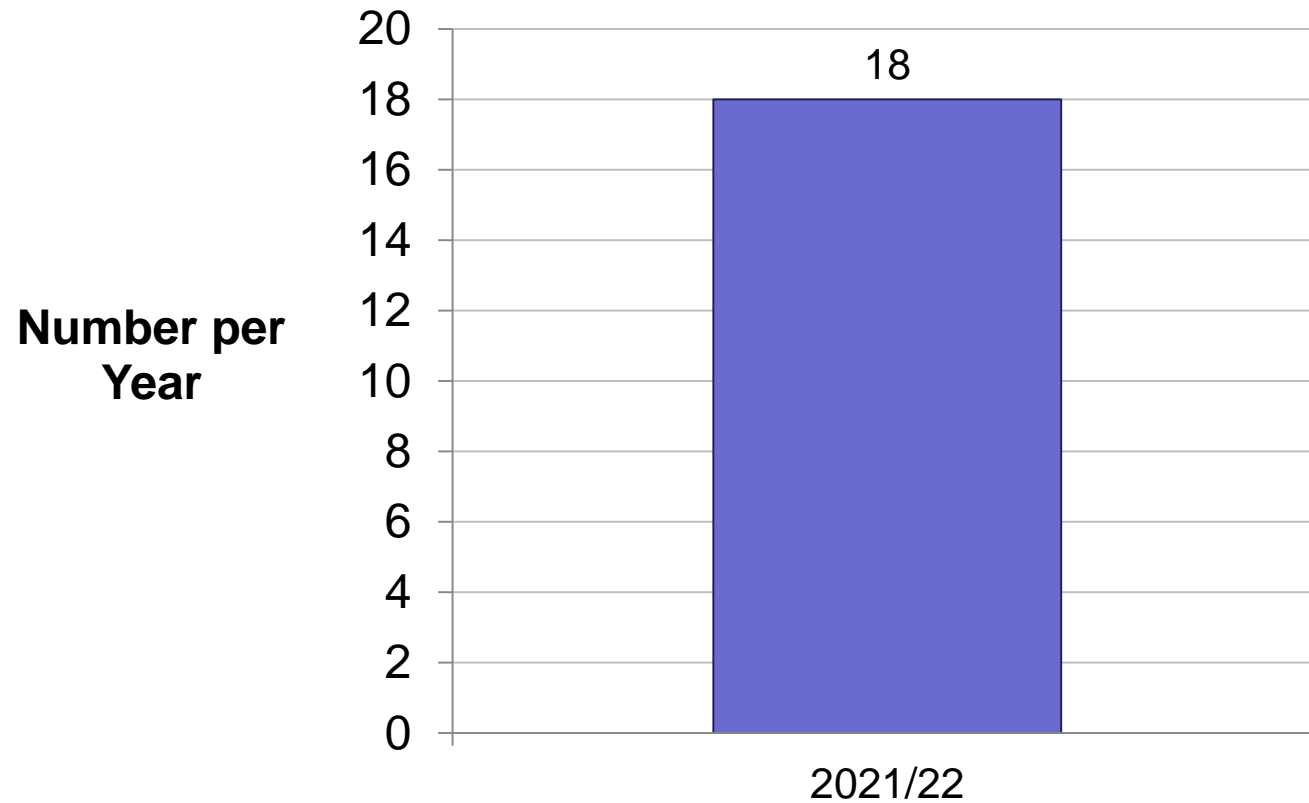
Mitral Valve Repair - Other 2021/22

- Royal Brompton Hospital (NHB)
 - 2 Neochord
 - 12 Tendyne
- Royal Sussex County Hospital (RSC)
 - 1 Highlife



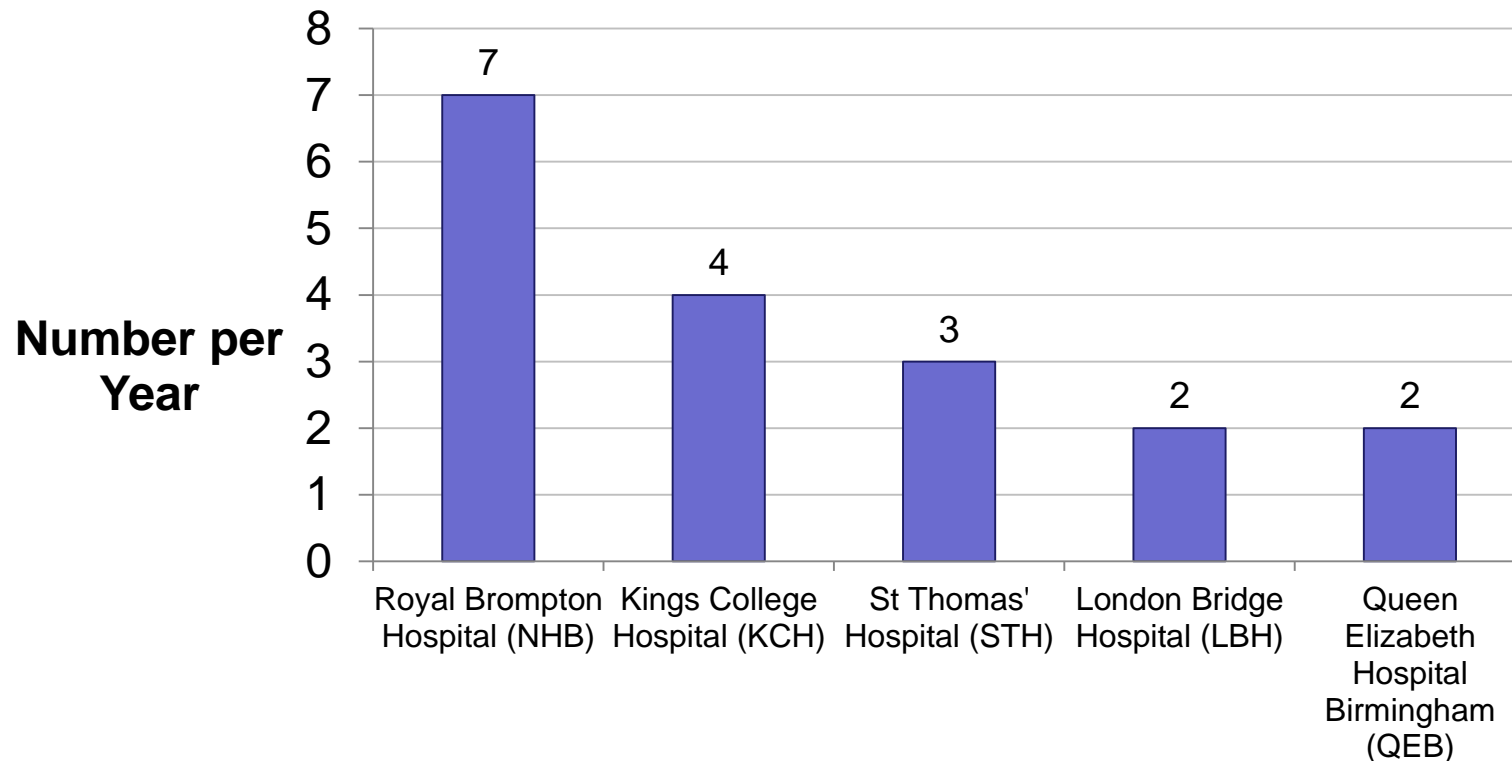
Percutaneous Valves

Tricuspid Edge to Edge repair



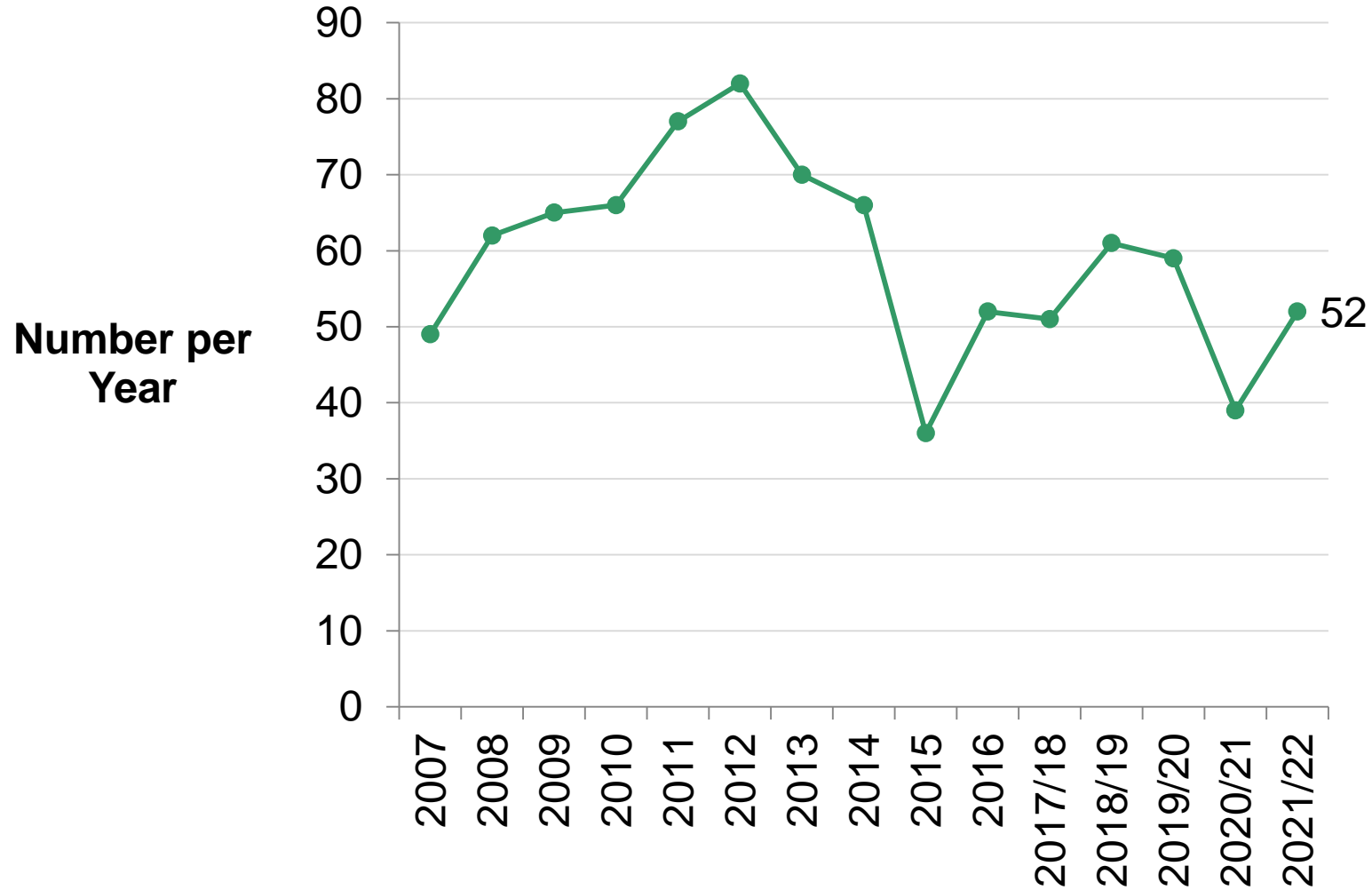
Percutaneous Valves

Tricuspid Edge to Edge repair 2021/22



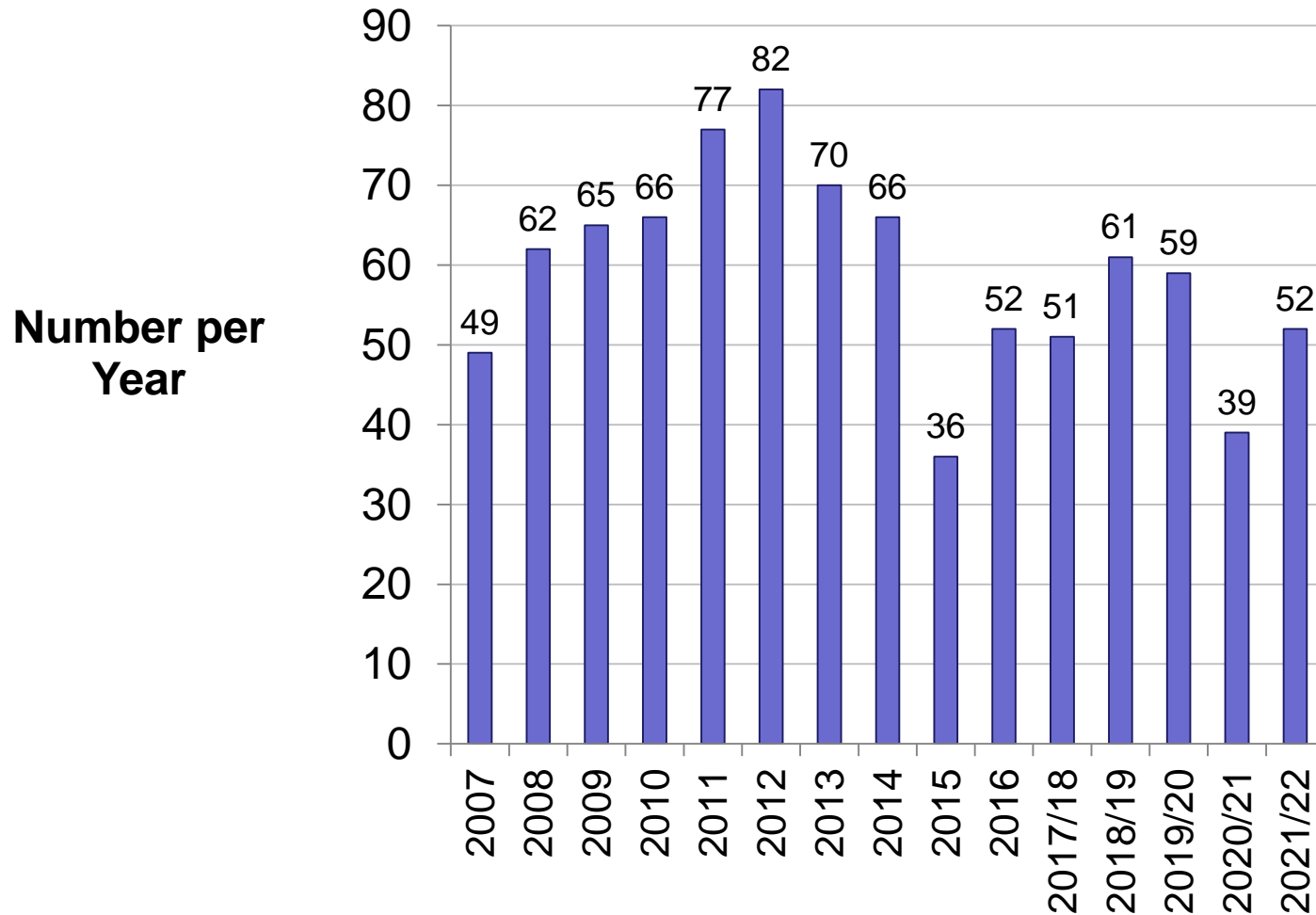
HCM

Alcohol Mediated Septal Ablation



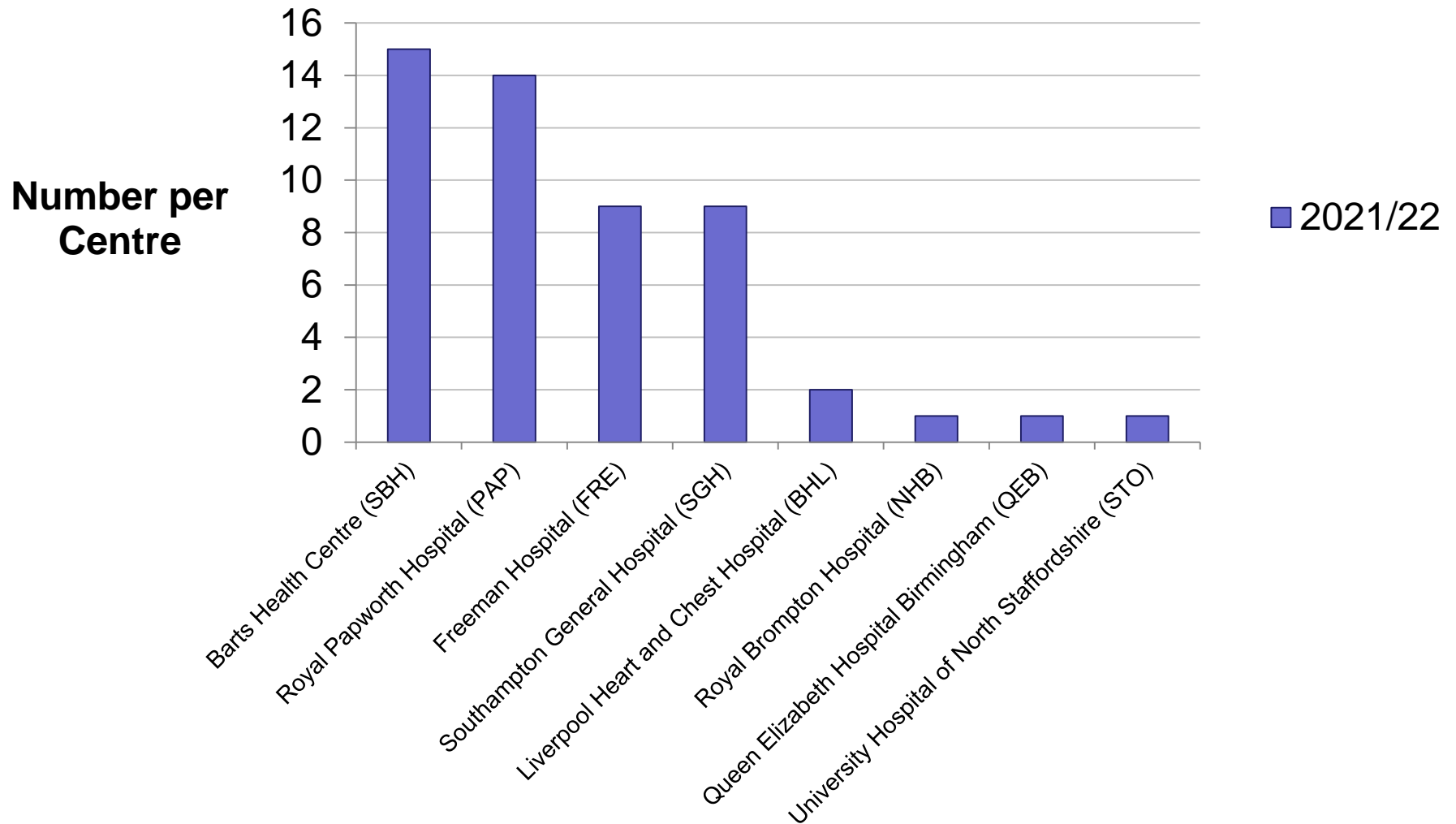
HCM

Alcohol Mediated Septal Ablation



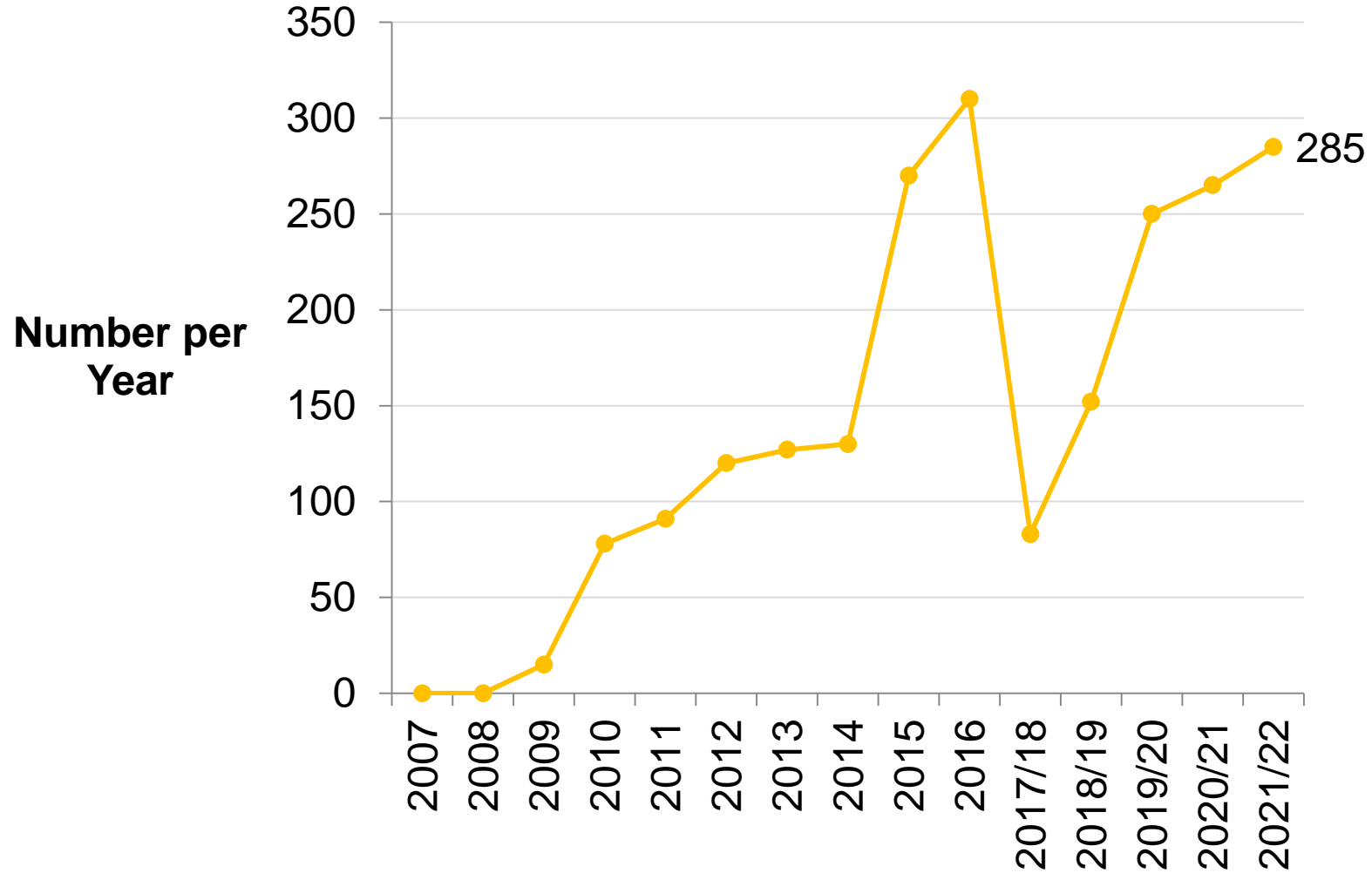
HCM

Alcohol Mediated Septal Ablation



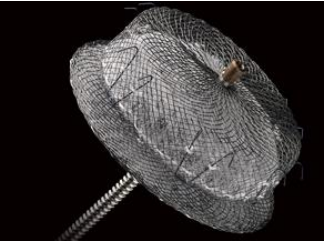
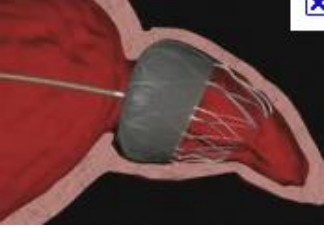
No other methods being used

LAA Occlusion

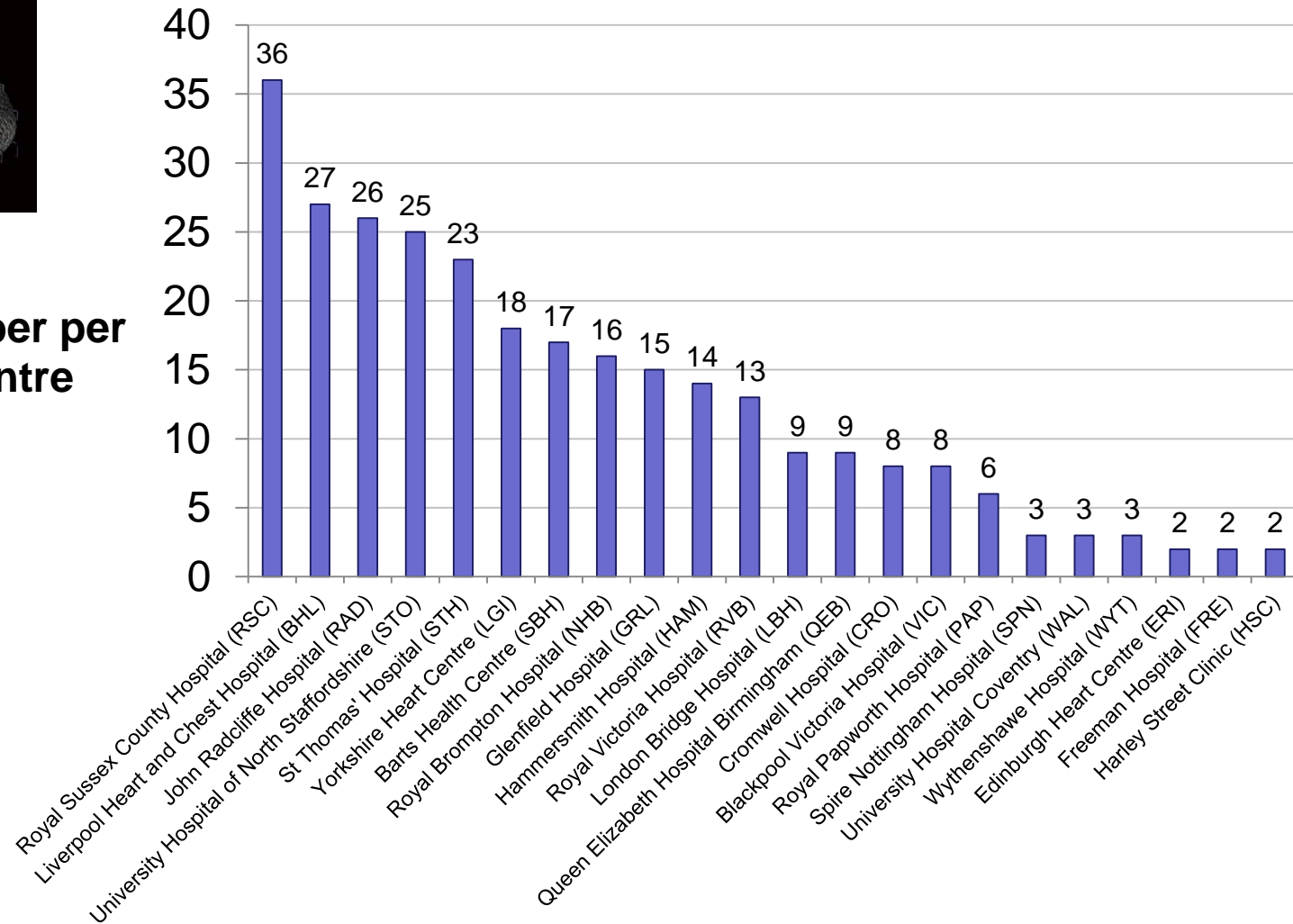


LAA Occlusion

2020/21



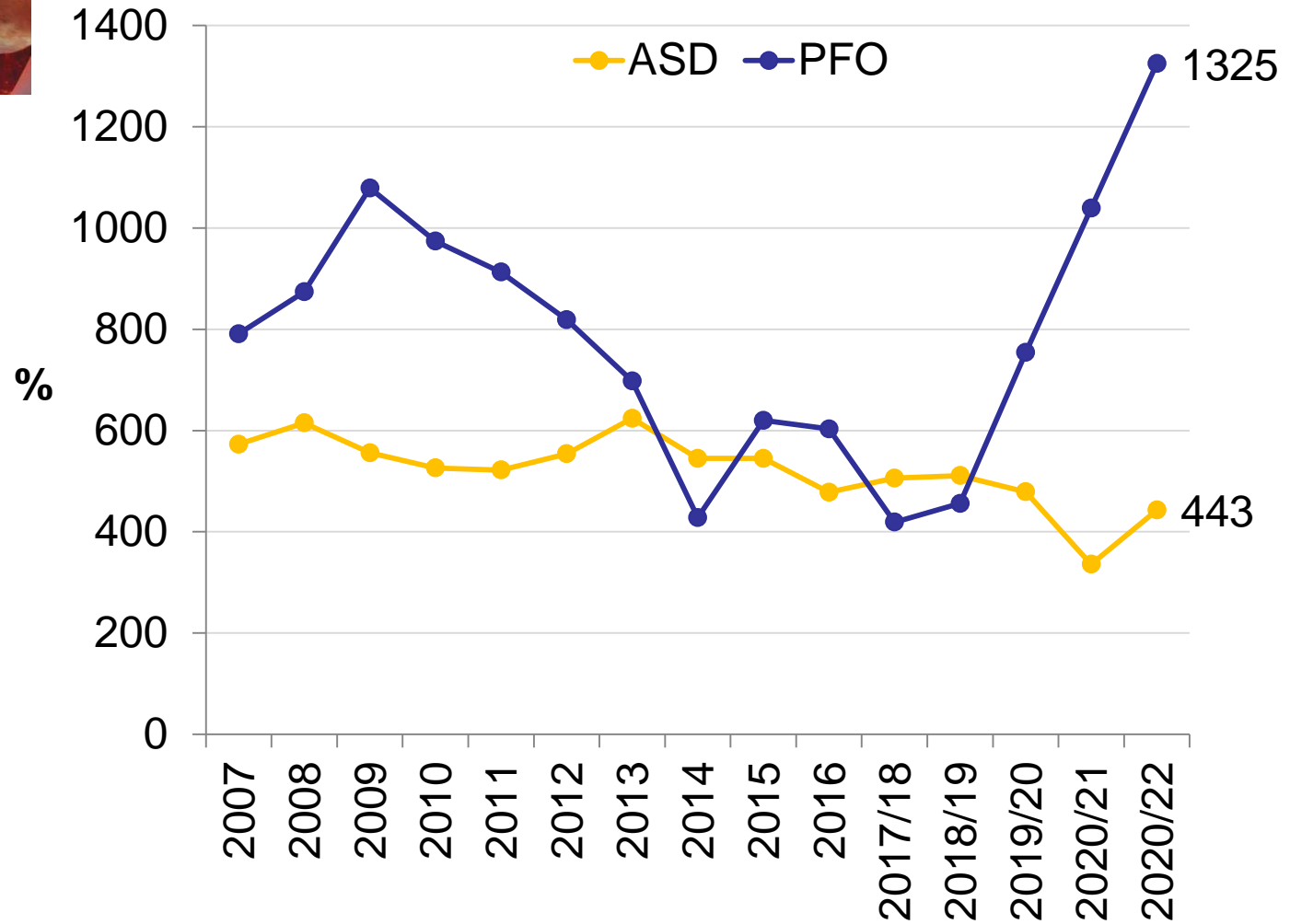
Number per
Centre



Number of centres: 22

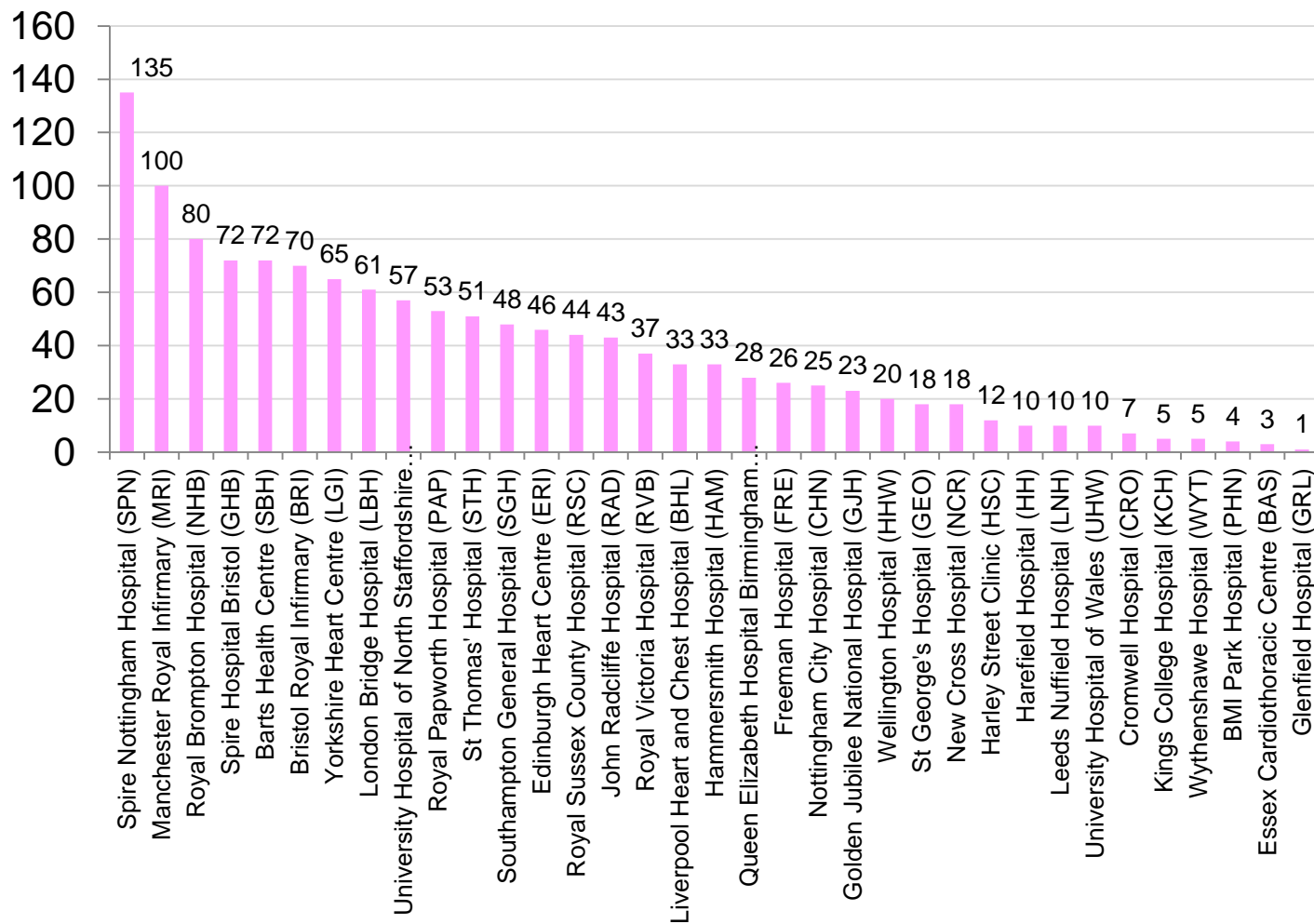


ASD and PFO Closure



PFO Closure

Procedures in
2021/22

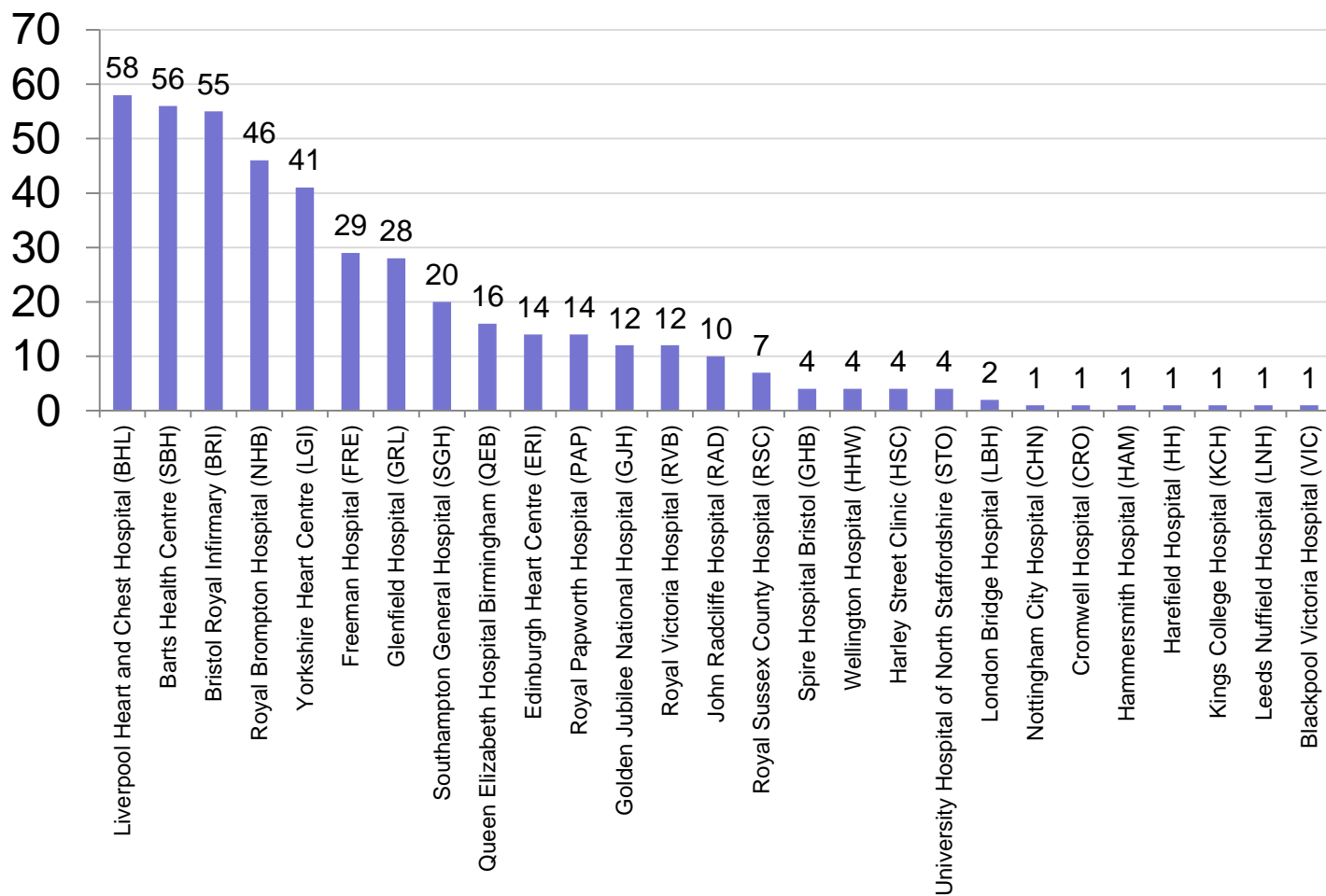


Number of centres: 35



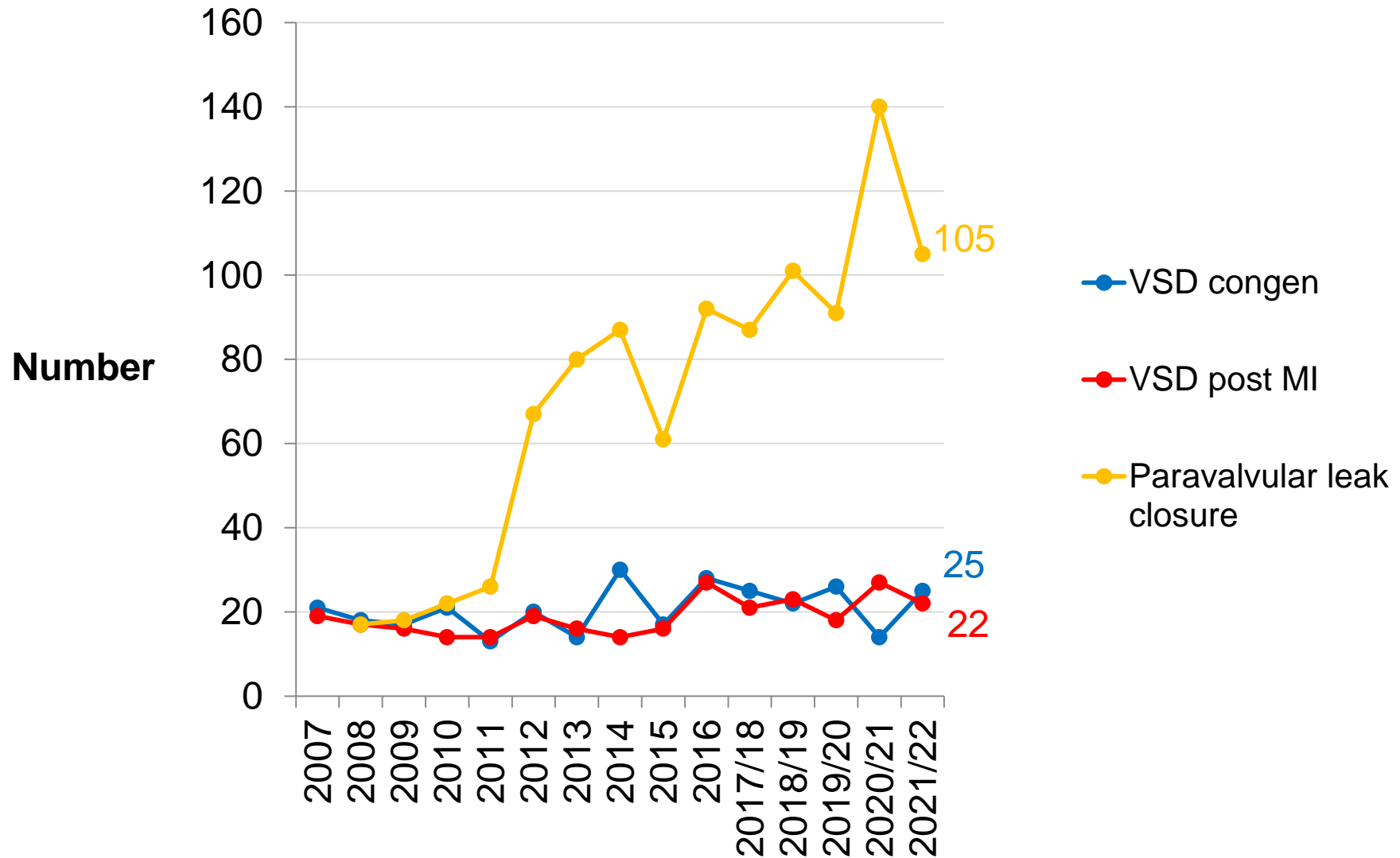
ASD Closure

Procedures in
2021/22

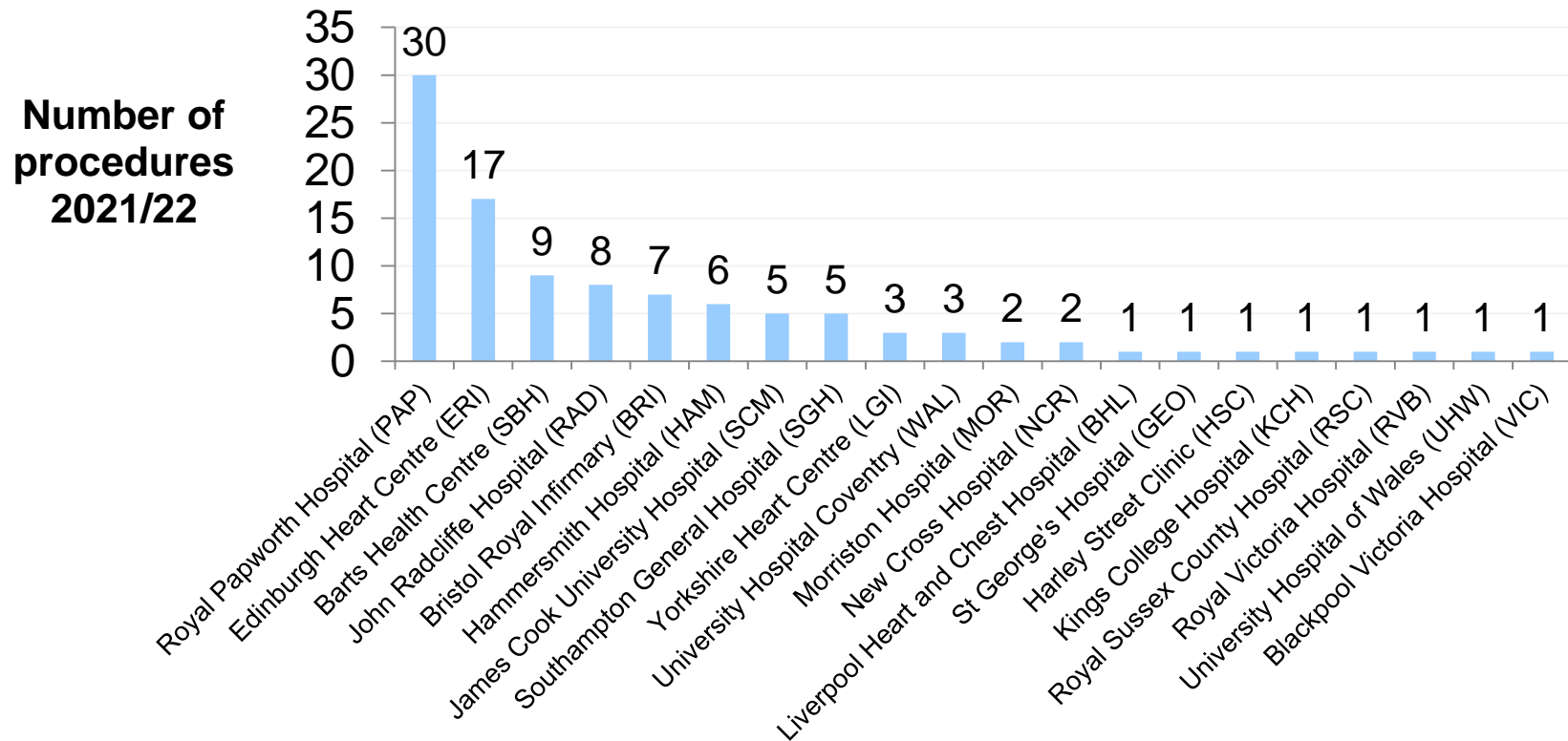


Number of centres: 27

VSDs and Paravalvular Leaks



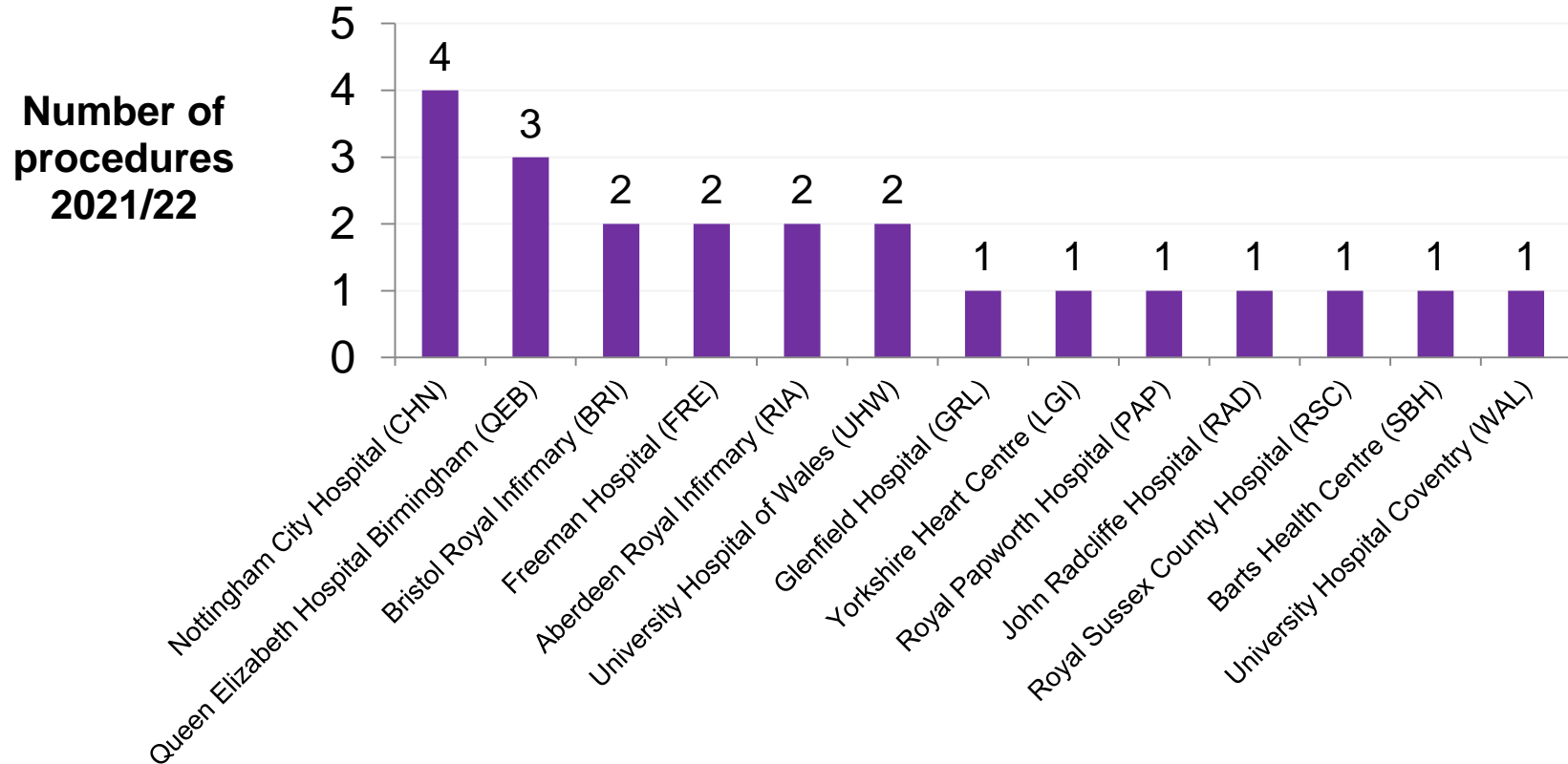
Prosthetic paravalvular leak closure



Number of centres: 20

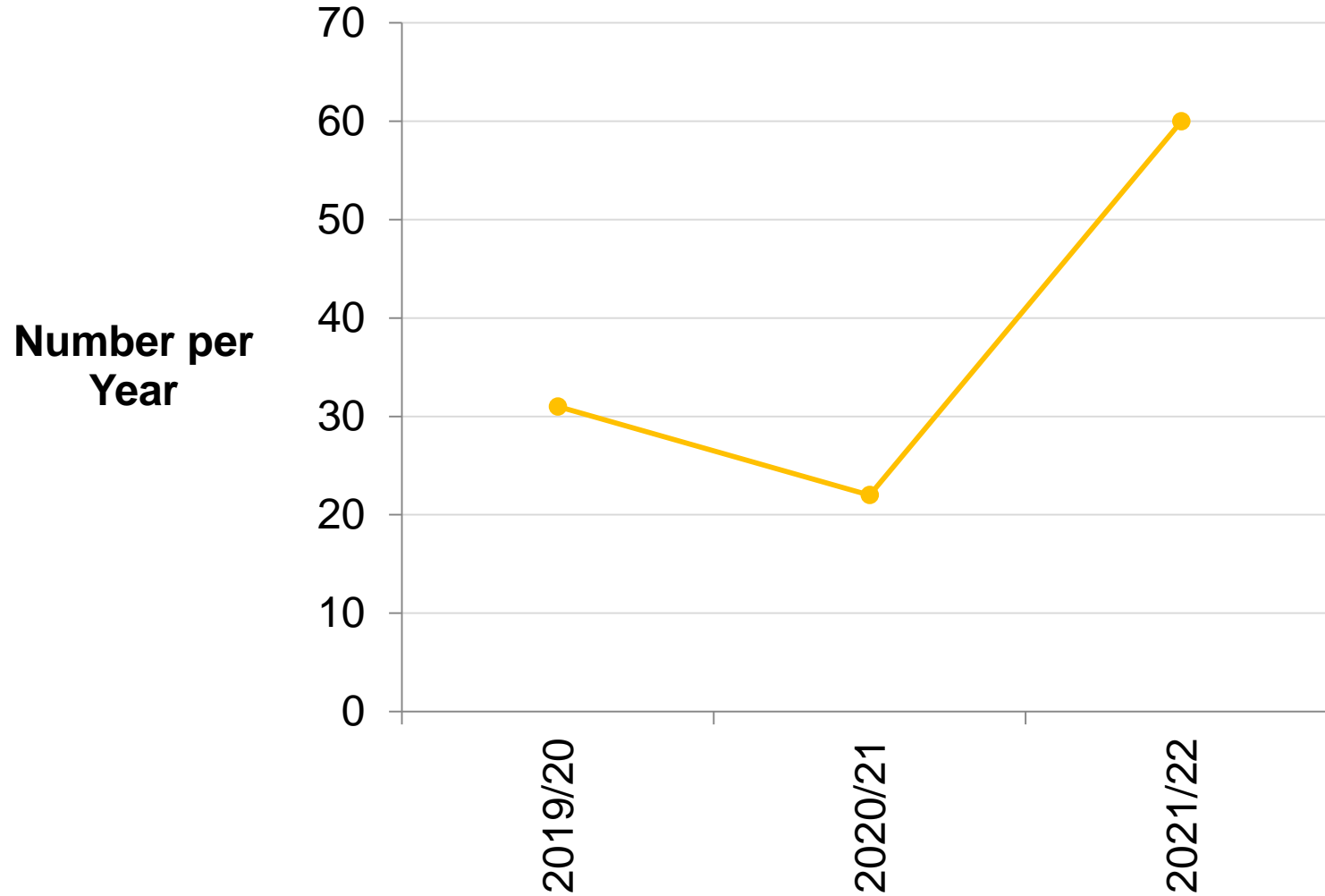
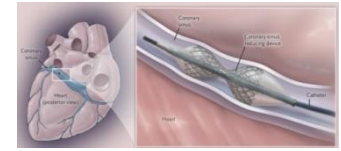
Post Infarct VSD

Device closure

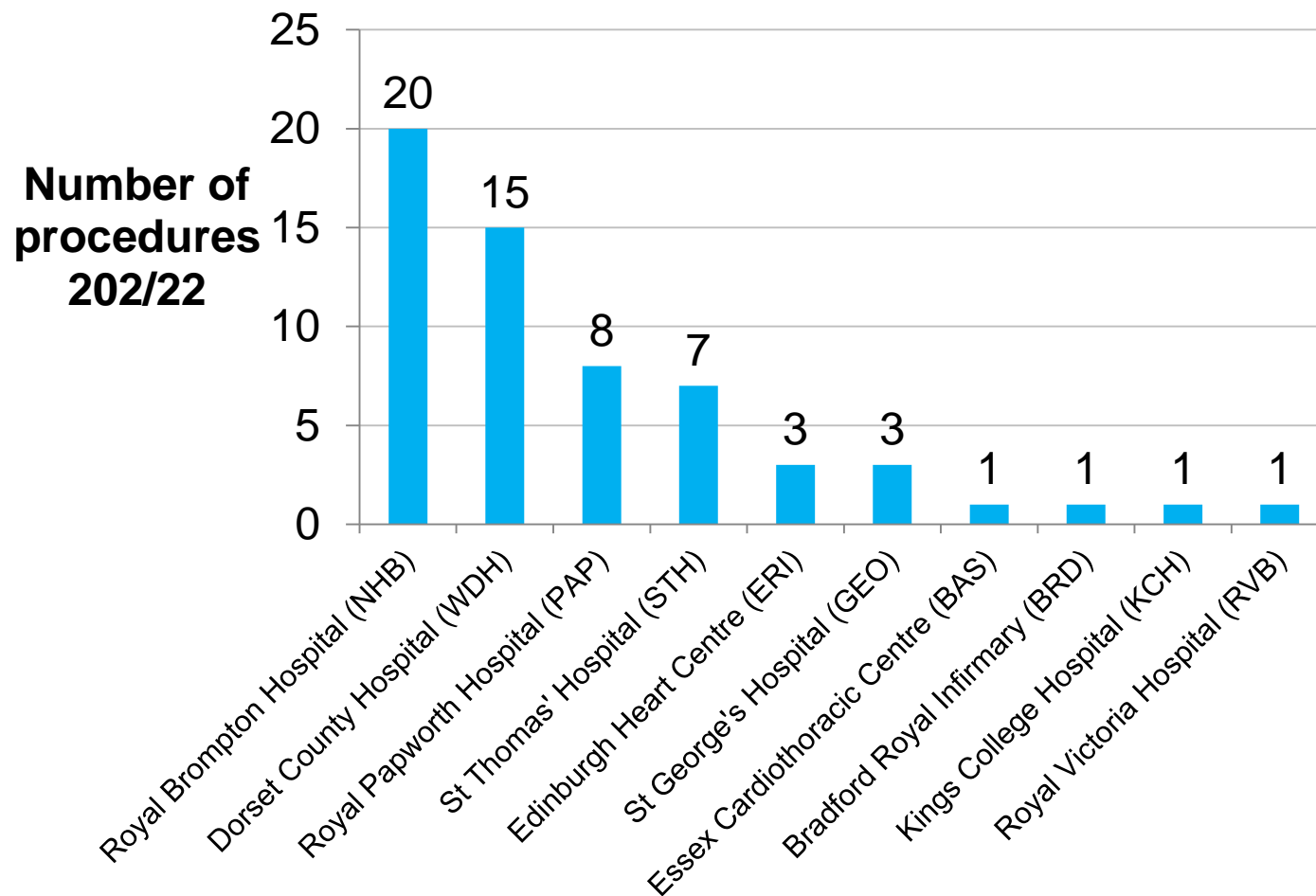
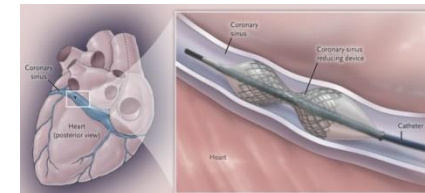


Number of centres: 13

Coronary Sinus Reducer (for refractory angina)



Coronary Sinus Reducer (for refractory angina)



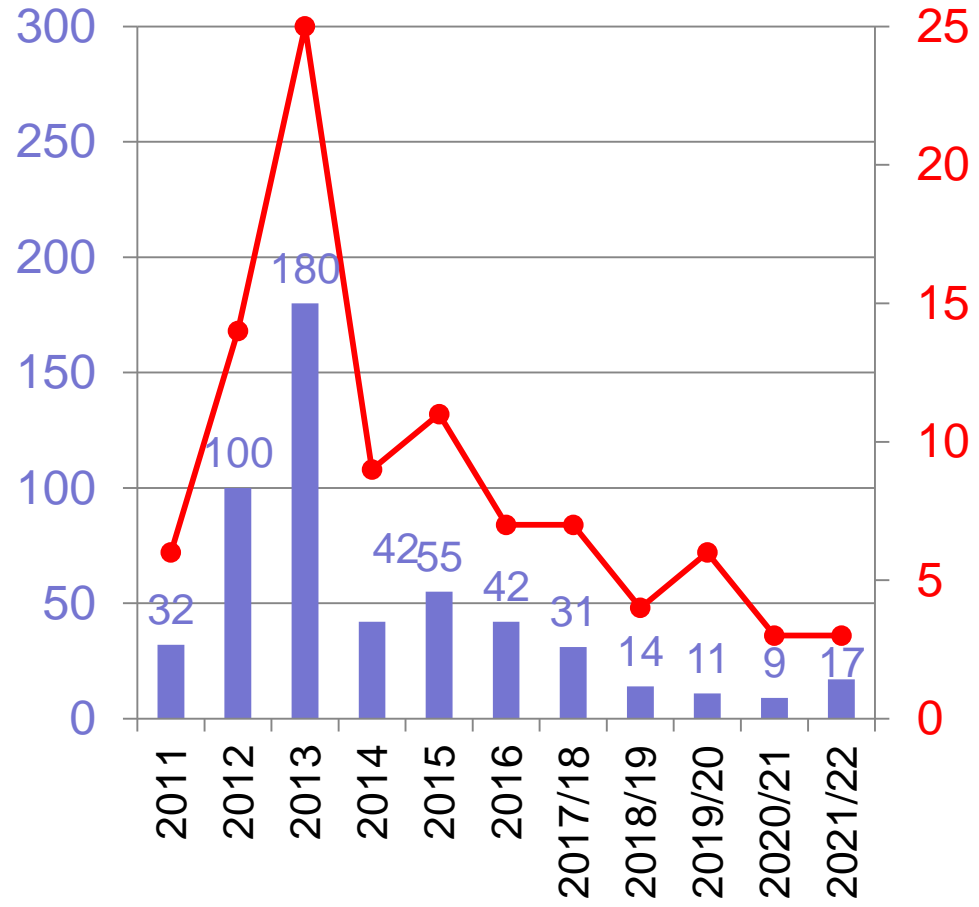
10 Centres



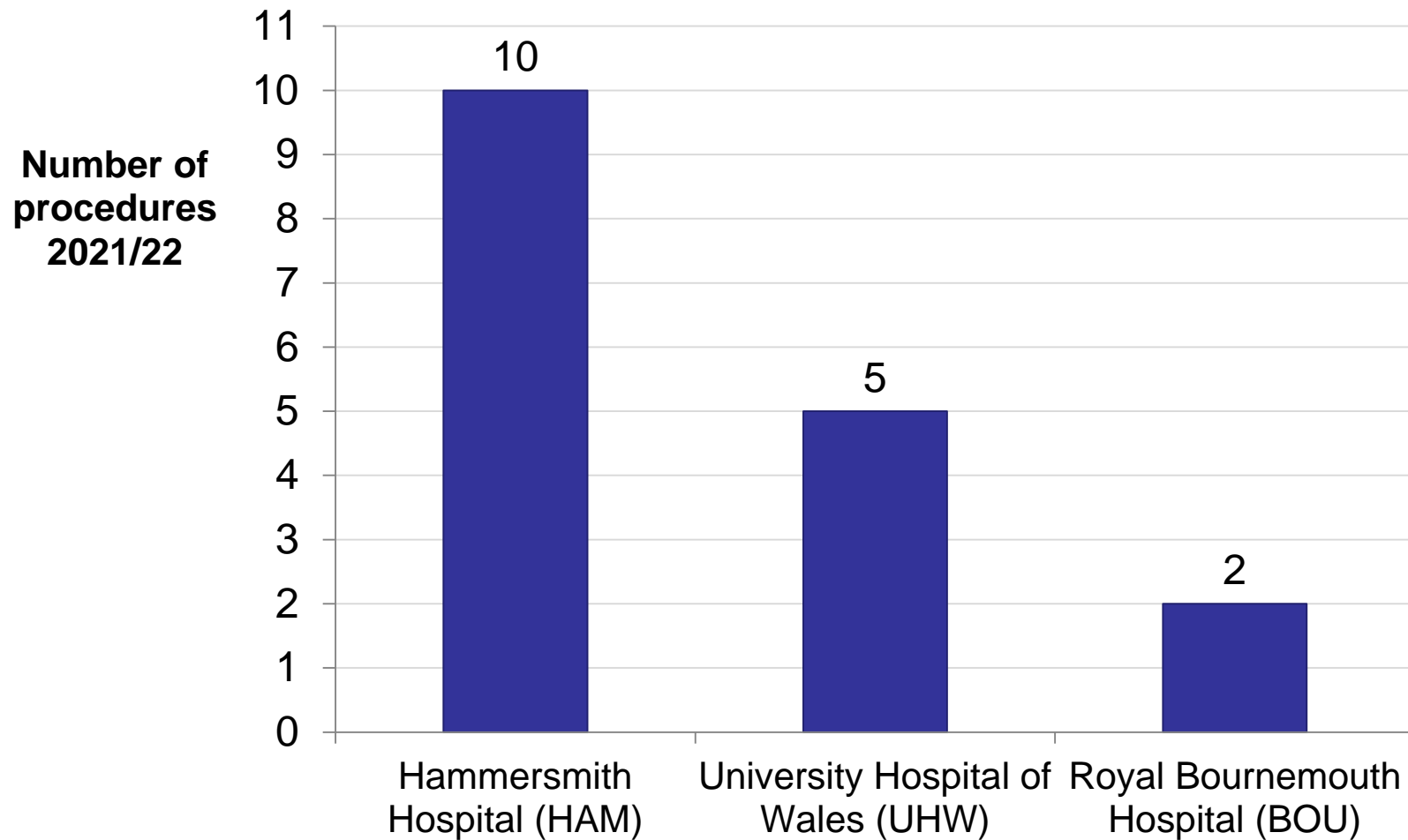
Renal Denervation

Number of Procedures

Number of Centres



Renal Denervation



Number of centres: 3

Audit Presentation

- PCI
 - Survey (UK)
 - PCI procedural data (E&W)
- Structural Intervention
- **NICOR update**

NICOR

NICOR

Arden and GEM



NICOR

NICOR

Arden and GEM



NHS Improvement

NHS Digital

NHS X

NICOR

- NHSE requests NICOR to expand portfolio:
 - TAVI
 - Mitral E2E repair
 - PFO closure
 - LAAO
 - National Audit for Cardiac Rehabilitation
 - MINAP for Critical Time Standards
- Expand back to a UK audit
 - NICOR seeking data sharing agreement with Scotland
 - Discussions on going with NI
 - Private Hospitals
- A single statutory body for all data
 - Linkage with cancer / renal / respiratory etc
 - Streamlined access to data for research

NICOR

- PCI consultant public reports (COP) remain on hold
 - Pending appropriate analytical support
- Professional involvement high priority
 - Each of the new registries will be overseen by a ‘Domain’ lead
 - Joint appointment BCIS and NICOR
 - 1 PA funding
- Analysts
 - Difficult to recruit (? opportunities following mergers)
- NICOR data collection and live analytics (Developers)
 - Sue Manuel, Satya Phanthala and Satya Kalla
 - Moving from Wicket (QREG 5) to Angular – data direct to MongoDB
 - New CAR framework for data analytics and visualization

NICOR

- PCI public reports remain on hold
 - Pending appropriate analytical support
- Professional involvement high priority
 - Each of the new registries will be overseen by a 'Domain' lead
 - Joint appointment Professional Society and NICOR
 - 1 PA funding
- Analysts
 - Difficult to recruit (? opportunities following mergers)
- **NICOR data collection and live analytics (Developers)**
 - Sue Manuel, Satya Phanthala and Satya Kalla
 - Moving from Wicket (QREG 5) to Angular – data direct to MongoDB
 - New CAR framework for data analytics and visualization



The screenshot shows a web browser window with the URL <https://ncap.nicor.org.uk/web/wicket/bookmarkable/uk.org.nicor.ncap.web.reports.reporting.fixed.FixedReportingPage?sessionId=A196D129E4FA2A32D0C1CD492121412A76>. The browser's address bar and tabs are visible, along with a navigation menu at the top containing links for Home, Search Patient, Import, Export, Data completeness, User Reports (selected), QI Resources, and Data submission timeliness. A user information bar shows 'Domain: PCI | Hospital: QEB, Queen Elizabeth Hospital, Edgbaston | PETER LUDMAN/QEB/NICOR' and a Logout button.

The main content area features the NICOR logo, a 'User Reports' section with a bar chart icon, and two buttons: 'Generate Report' and 'User Guides'. Below this is a 'Select Report' dropdown menu currently displaying 'Please Select'. A 'Results' section is visible at the bottom of the page but is currently empty.

NCAP Tools

Please Select

All Interventional Diagnostic Procedure Counts

All PCI procedures counts

PCI Procedure clinical syndrome

Structure and techniques

Day case treatment for elective PCI

Drug eluting stents used in Primary PCI

Radial Access

Thrombus Atherectomy Occurred

Data Quality

Missing stent data (Primary PCI)

Missing Drug Eluting Stent data

Missing dates for elective PCI

Missing atherectomy data

Process

PCI within 72 hours for NSTEMI (from first hospital admission)

Door to Balloon Delay within 90 minutes

Door to Balloon Delay within 60 minutes

Call to Balloon Delay within 150 minutes

Call to Balloon Delay within 120 minutes

Outcomes

All PCI with in hospital self reported death

All PCI with cardiogenic shock and in hospital self reported death

All PCI with no cardiogenic shock and in hospital self reported death

All PCI with neither cardiogenic shock nor pre-PCI ventilation and in hospital self reported death



User Reports

Generate Report

User Guides

Select Report **Radial Access**

Report Description No. of lesions attempted (3.11) > 0 AND Arterial access (5.15) contains options 5 and/or 6.

Date Interval DD/MM/YYYY

And

Group By CALENDAR_YEAR

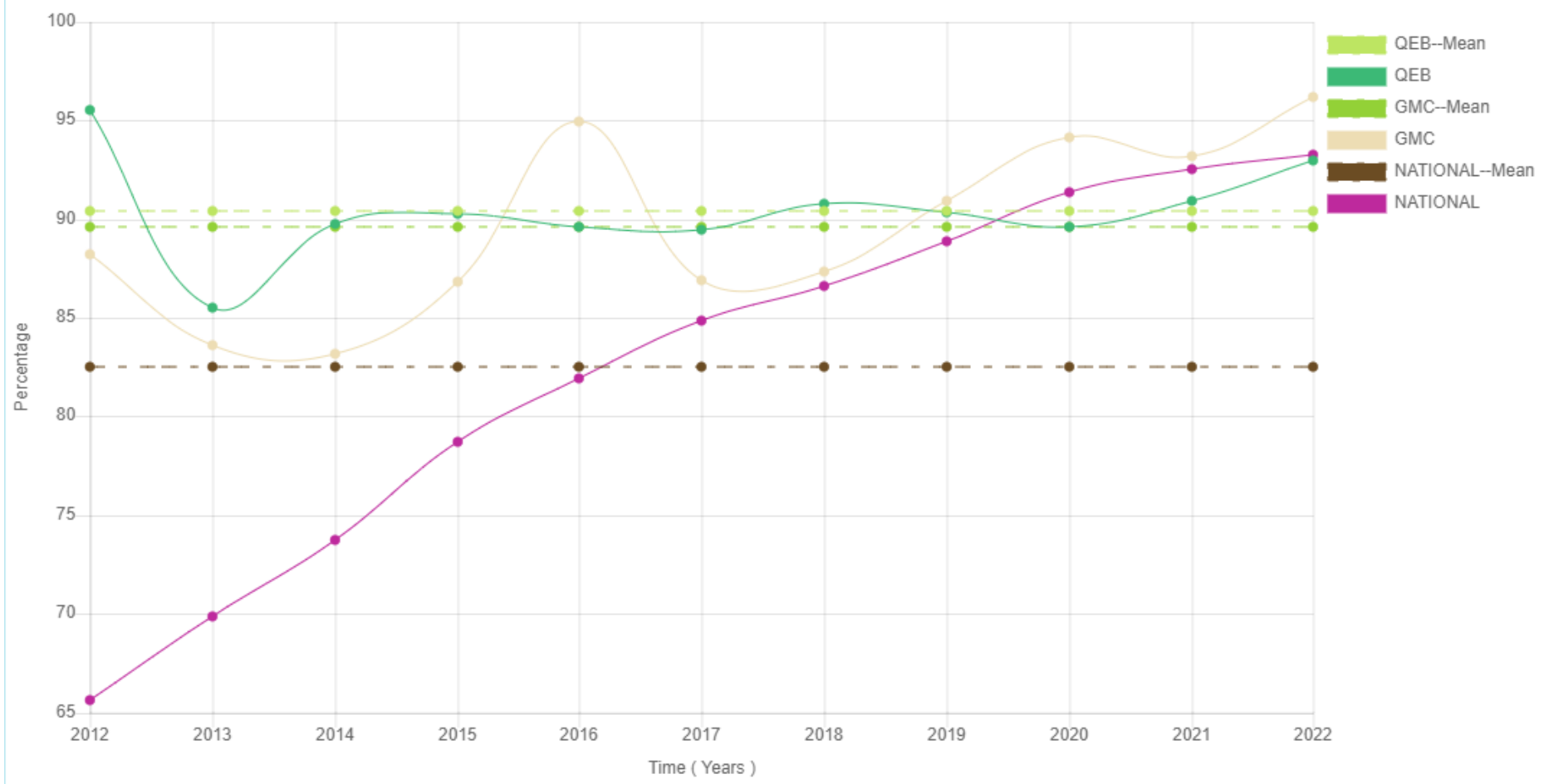
GMC 2931874- Peter Ludman

Include National Aggregate YES

Filter National Aggregate by Countries All countries

Include Top 10 Hospital Aggregate NO

Chart Type LINE



Time (Years)	GMC 2931874 Percentage ?	QEB Percentage	National Percentage
2012	88.24 (15/17)	95.56 (86/90)	65.66 (6970/10616)
2013	83.64 (92/110)	85.53 (656/767)	69.9 (63540/90902)
2014	83.18 (89/107)	89.77 (623/694)	73.78 (69371/94020)

BCIS Audit Lead



BCIS Audit Lead



- Professor Mamas Mamas
 - Professor of Interventional Cardiology
 - Consultant Cardiologist, Royal Stoke Hospital
 - Busy operator: PCI / ICI / TAVI
 - Director for the Centre for Prognosis Research
 - Keele University
 - Institute of Primary Care and Health Sciences
 - Big data research with > 700 publications
 - Honorary Professor of Population Health, University of Manchester
 - Adjunct Professor of Research Jefferson University, Philadelphia, USA
 - Visiting Professor Case Western University, Heart & Vascular Center, MetroHealth Medical Center, USA

BCIS Audit Lead



– 56 K Followers on Twitter



Acknowledgments

- All UK Centres for Survey completion and data upload
- NICOR
 - Keeping the lights on at NICOR
 - Mark DeBelder, John Deanfield, James Chal
 - Developers
 - Sue Manuel, Satya Phanthala, Satya Kalla, Nadeem Fazal
 - Analysis
 - Dr Glen Martin, Senior Lecturer in Health Data Science
 - The Health e-Research Centre, University of Manchester
 - Project Management
 - Sam Perwaiz, Jane Kerr

Summary

- **PCI**
 - PCI centres ≈ unchanged
 - PCI numbers largely recovered from initial COVID pandemic
 - Regional variation in PCI and CABG rate pmp to be explored
 - Increasing use of DEB and Lithotripsy
 - Dramatic further fall in the ability of Paramedics to respond to STEMI
- **Structural intervention**
 - TAVI least affected by COVID, largely recovered
 - Regional variation in TAVI and in TAVI : sAVR ratios
 - Some centres characterised by
 - High GA rates
 - Non TF percutaneous access
 - Increased LOS
 - Large increase in Mitral edge to edge and PFO procedures
- **Future**
 - NICOR to NHSE
 - NICOR to expand to host more data collection including TAVI, E2E, PFO and LAAO
 - Developers in NICOR continue to expand excellent data visualization platforms

Thank You

UK PCI Centre Codes 2020/21



UK PCI Centre Codes 2020/21

AEI	Royal Albert Edward Infirmary (Wigan)	DVH	Darent Valley Hospital
AHM	BMI Alexandra Hospital	EAL	Ealing Hospital
ALT	Altnagelvin Hospital	EBH	Birmingham Heartlands Hospital
AMG	Wycombe Hospital	ERI	Edinburgh Heart Centre
ANT	St Anthony's Hospital	ESU	East Surrey Hospital, Surrey and Sussex NHS trust
BAS	Basildon and Thurrock University Hospitals	FRE	Freeman Hospital
BAT	Royal United Hospital Bath	FRM	Frimley Park Hospital
BED	Bedford Hospital	GEO	St George's Hospital
BHL	Liverpool Cardiothoracic Centre	GHB	Spire Hospital Bristol
BHR	Royal Berkshire and Battle Hospital	GJH	Golden Jubilee National Hospital (formerly HCI)
BLA	Royal Blackburn Hospital	GRL	Glenfield Hospital
BMI	BMI Meriden Hospital	GWE	Royal Gwent Hospital
BOU	Royal Bournemouth Hospital	GWH	Queen Elizabeth Hospital Woolwich
BRD	Bradford Royal Infirmary	HAI	Hairmyres Hospital
BRI	Bristol Royal Infirmary	HAM	Hammersmith Hospital
BRY	Acute Pennine Trust Fairfield	HBP	Spire Hospital Hull and East Riding
BSM	Southmead Hospital Bristol	HH	Royal Brompton Hospital and Harefield NHS Trust, Harefield site
CGH	Conquest Hospital	HHW	Wellington Hospital
CHG	Cheltenham General Hospital	HSC	Harley Street Clinic
CHH	Castle Hill Hospital (Hull and East Yorkshire NHS Trust)	IND	London Independent Hospital
CHN	Nottingham City Hospital	IPS	Ipswich Hospital
CLW	North Wales Cardiac Centre	KCH	Kings College Hospital
CMI	Cumberland Infirmary	KGH	Kettering General Hospital
CRG	Craigavon Hospital	KIM	Kent Institute of Medicine & Surgery
CRO	Cromwell Hospital	KMH	Kings Mill Hospital
DER	Royal Derby Hospital	KSX	Tunbridge Wells Hospital
DGE	Eastbourne Hospital	LBH	London Bridge Hospital
DUC	Duchy Hospital	LDH	Luton and Dunstable University Hospital
DUD	Birmingham City Hospital	LGI	Yorkshire Heart Centre

UK PCI Centre Codes 2020/21

LIN	Lincoln County Hospital	RFH	Royal Free Hospital
LIS	Lister Hospital	RHH	Ross Hall Hospital
LNH	Leeds Nuffield Hospital	RHI	Calderdale Royal Hospital
MAY	Croydon University Hospital	RIA	Aberdeen Royal Infirmary
MDW	Medway Maritime Hospital	RSC	Royal Sussex County Hospital
MHO	Manor Hospital Oxford	RVB	Royal Victoria Hospital
MOR	Morrison Hospital	SAL	Salisbury District Hospital
MPH	Musgrove Park Hospital	SBH	Barts Health Centre, St Bartholomew's Hospital
MRI	Manchester Royal Infirmary	SCM	James Cook University Hospital
NBO	Nuffield Health Bournemouth Hospital	SCU	Scunthorpe General Hospital
NCR	New Cross Hospital	SGH	Southampton General Hospital
NGS	Northern General Hospital	SPC	Spire Cardiff Hospital
NHB	Royal Brompton Hospital and Harefield NHS Trust, Brompton site	SPH	St Peter's Hospital
NHH	Basingstoke and North Hampshire Hospital	SSP	Spire Shawfair Park Hospital
NIN	Ninewells Hospital	STH	St Thomas' Hospital
NOR	Norfolk and Norwich University Hospital	STO	City General Hospital (University Hospital of North Staffordshire)
NPH	Northwick Park Hospital	SUN	Sunderland Royal Hospital
NTH	Northampton General Hospital	TOR	Torbay Hospital
PAP	Papworth Hospital	UHW	University Hospital of Wales
PHB	BMI Priory Hospital	VIC	Blackpool Victoria Hospital
PHN	BMI Park Hospital	WAL	Walsgrave Hospital (University Hospital Coventry)
PIN	Pinderfields General Hospital	WAT	Watford General Hospital
PLY	Derriford Hospital, Southwest Cardiothoracic Centre	WDH	Dorset County Hospital
PMS	Great Western Hospital, Wiltshire Cardiac Centre	WEX	Wexham Park Hospital
QAP	Queen Alexandra Hospital	WHH	William Harvey Hospital, East Kent Hospitals NHS Trust
QEB	Queen Elizabeth Hospital, Birmingham	WMU	West Middlesex University Hospital
RAD	John Radcliffe Hospital	WRC	Worcester Royal Hospital
RAI	Raigmore Hospital	WRG	Worthing Hospital
RCH	Royal Cornwall Hospital	WYT	Wythenshawe Hospital
RDE	Royal Devon & Exeter Hospital	YDH	York District General Hospital

Versions

History of Changes to Slide Set

- 20-01-2023 First version
- 05-02-2023 Updated acknowledgments
- 23-02-2023 Updated with 30 day mortality data