NICOR

SCTS BCIS

2016 data

(data extracted May 2017)

Transcatheter Aortic Valve Implantation

- UK TAVI Audit Slide Set
- 2007 to 2016

Peter Ludman
on behalf of the UK TAVI Steering Group

Data extract taken in May 2017

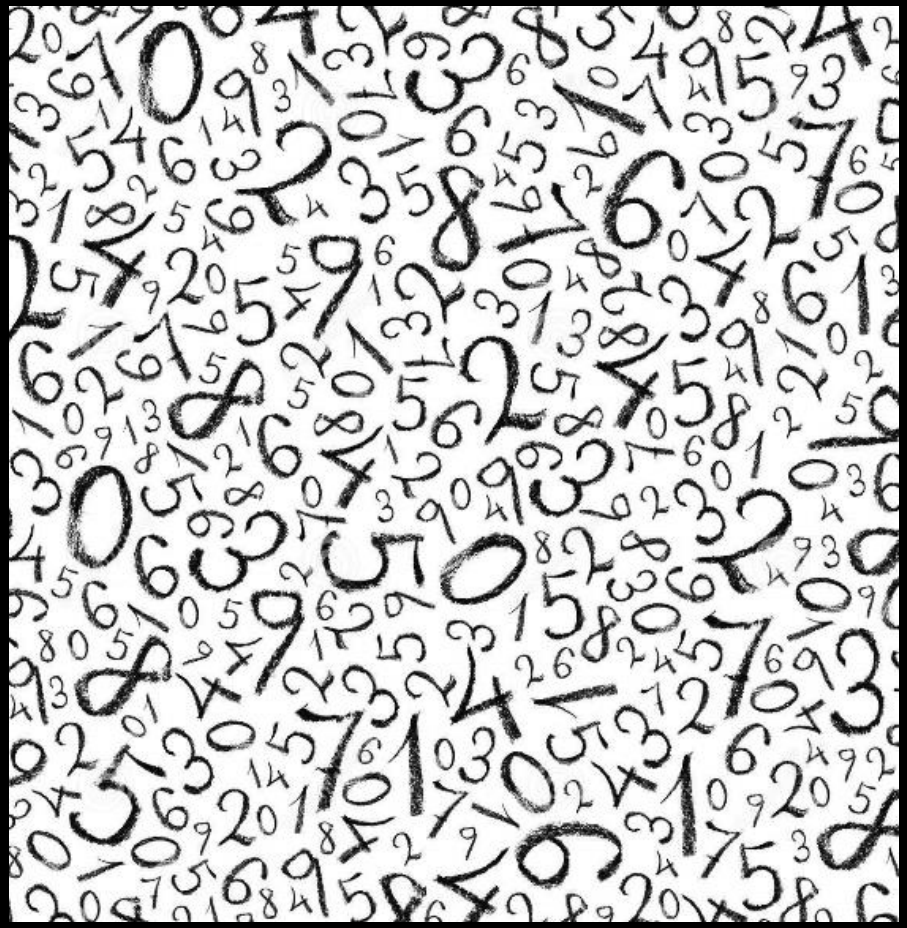
NICOR

SCTS BCIS

2016 data

(data extracted May 2017)

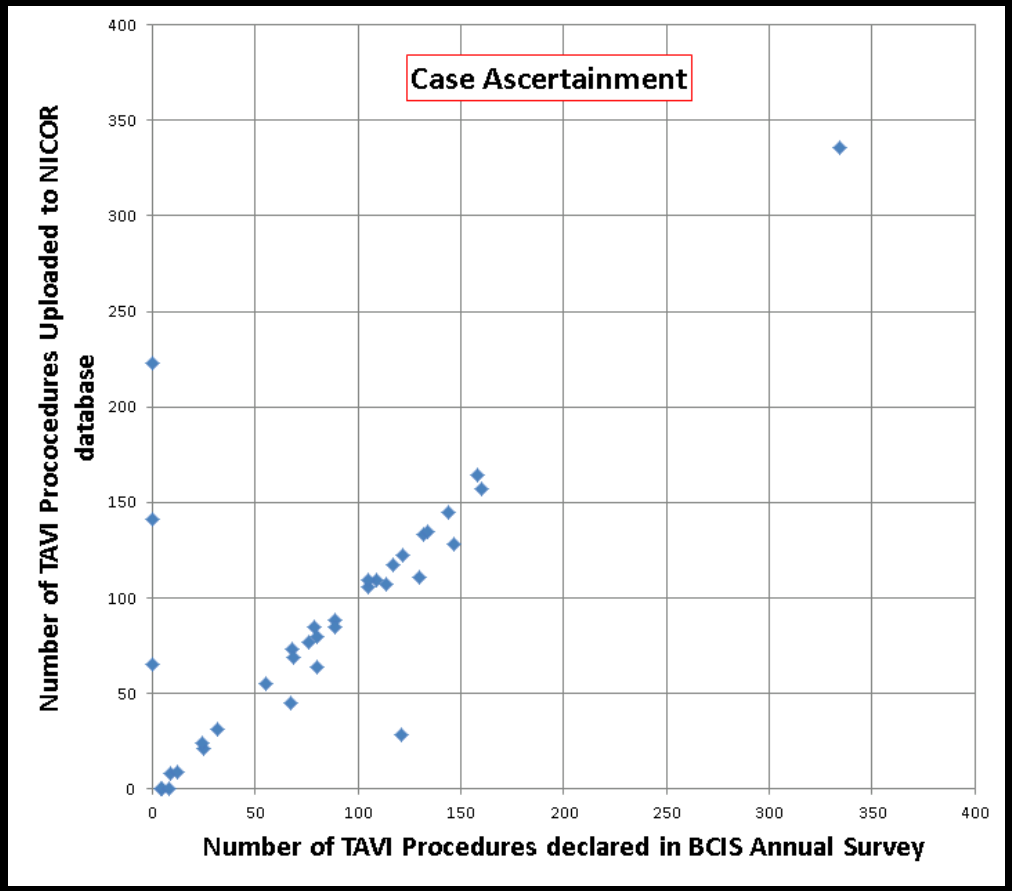
Number of procedures



Case Ascertainment

2016 data

(data extracted May 2017)



Ascertainment data from BCIS Survey Monkey as June 2017

Procedures in the database but not yet declared from LGI, CHN, RVB

Procedures not uploaded to database AHM (4), CRO (5), NGS (8)

Partial upload of procedures: NCR (28 of 121)

Therefore the following analysis probably misses 110 cases of 3,250 (3%)

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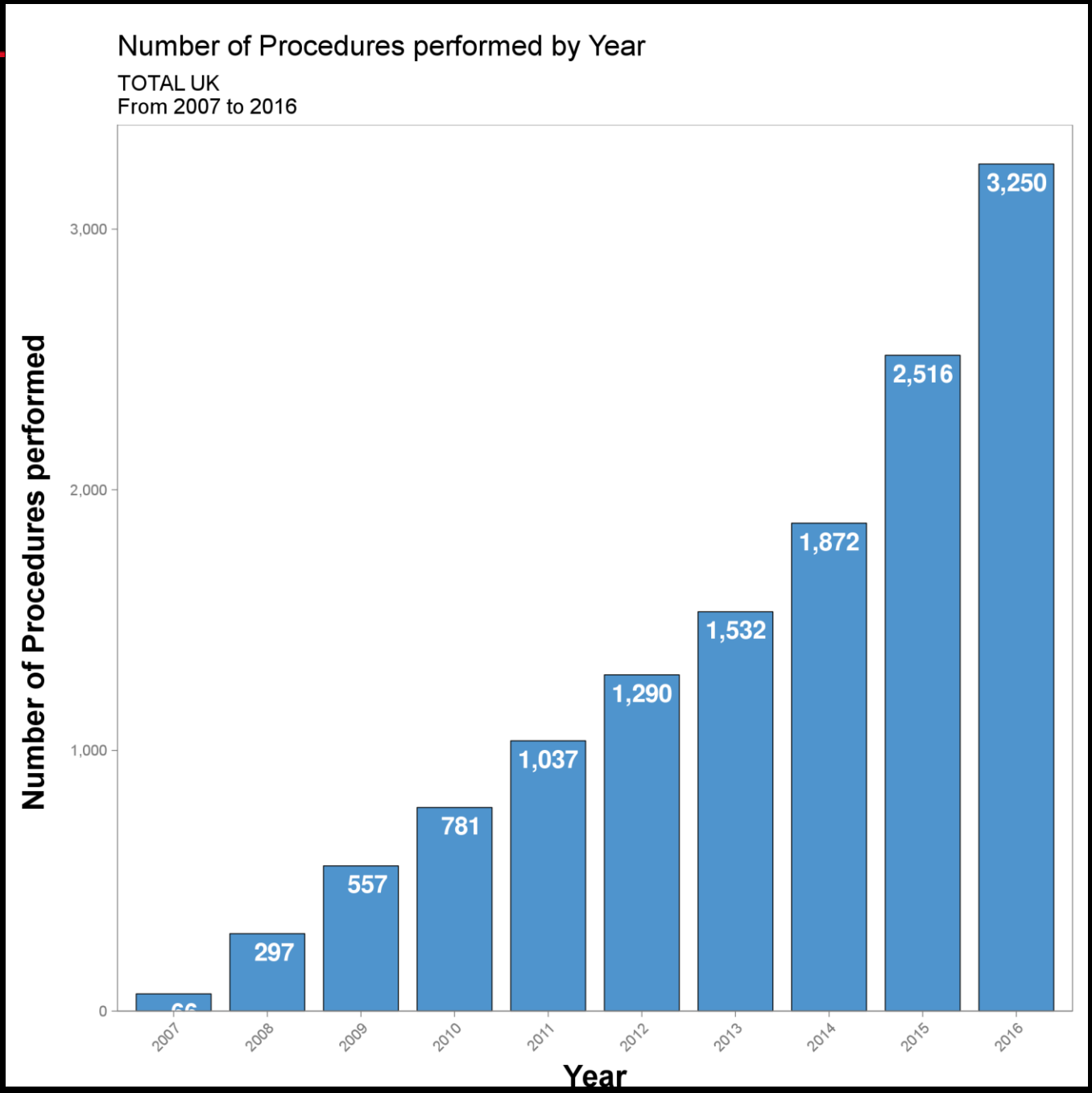
BCIS

2016 data

(data extracted May 2017)



UK rate pmp = 49.5

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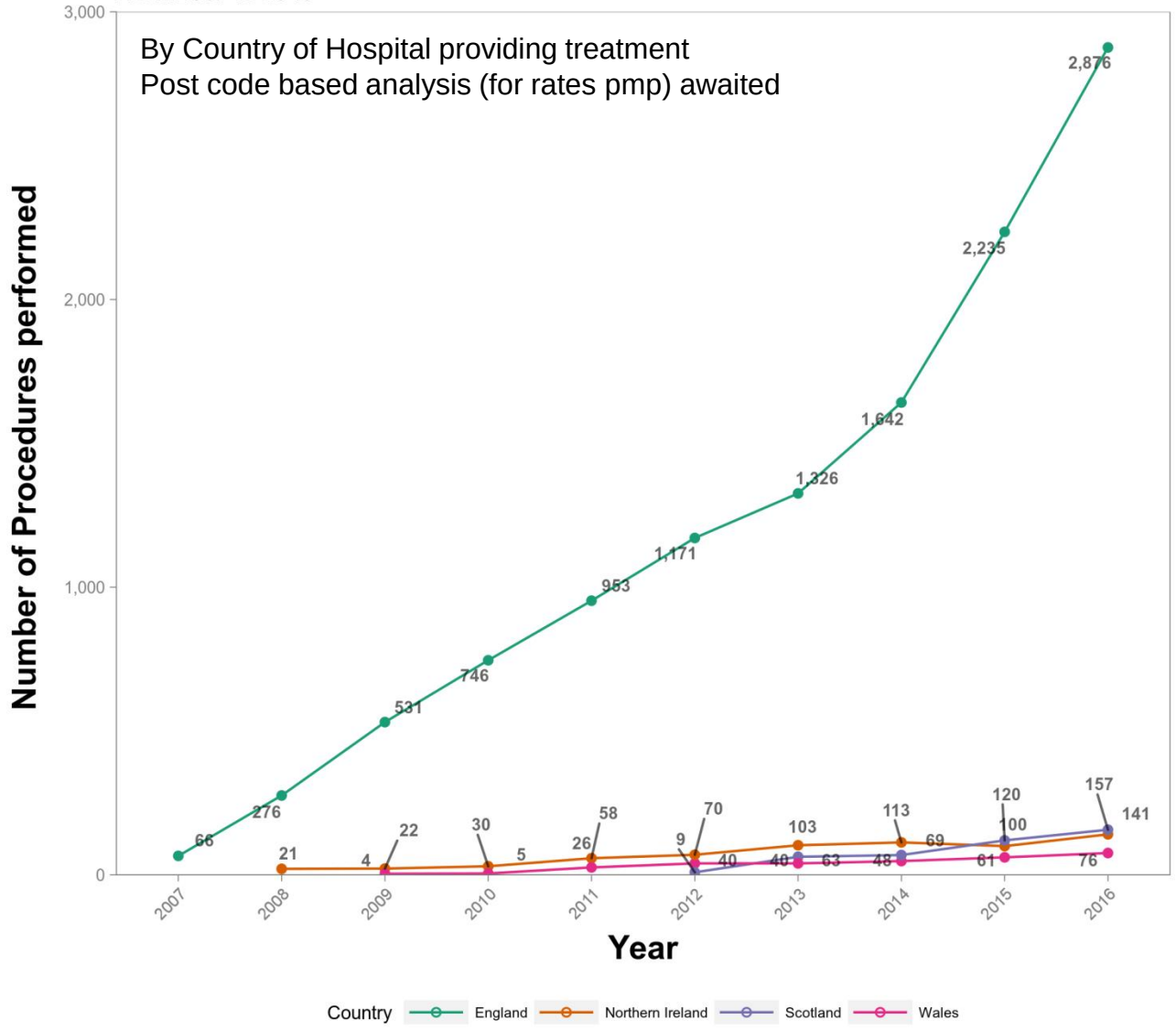
SCTS BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year Grouped by Country

TOTAL UK
From 2007 to 2016



NICOR

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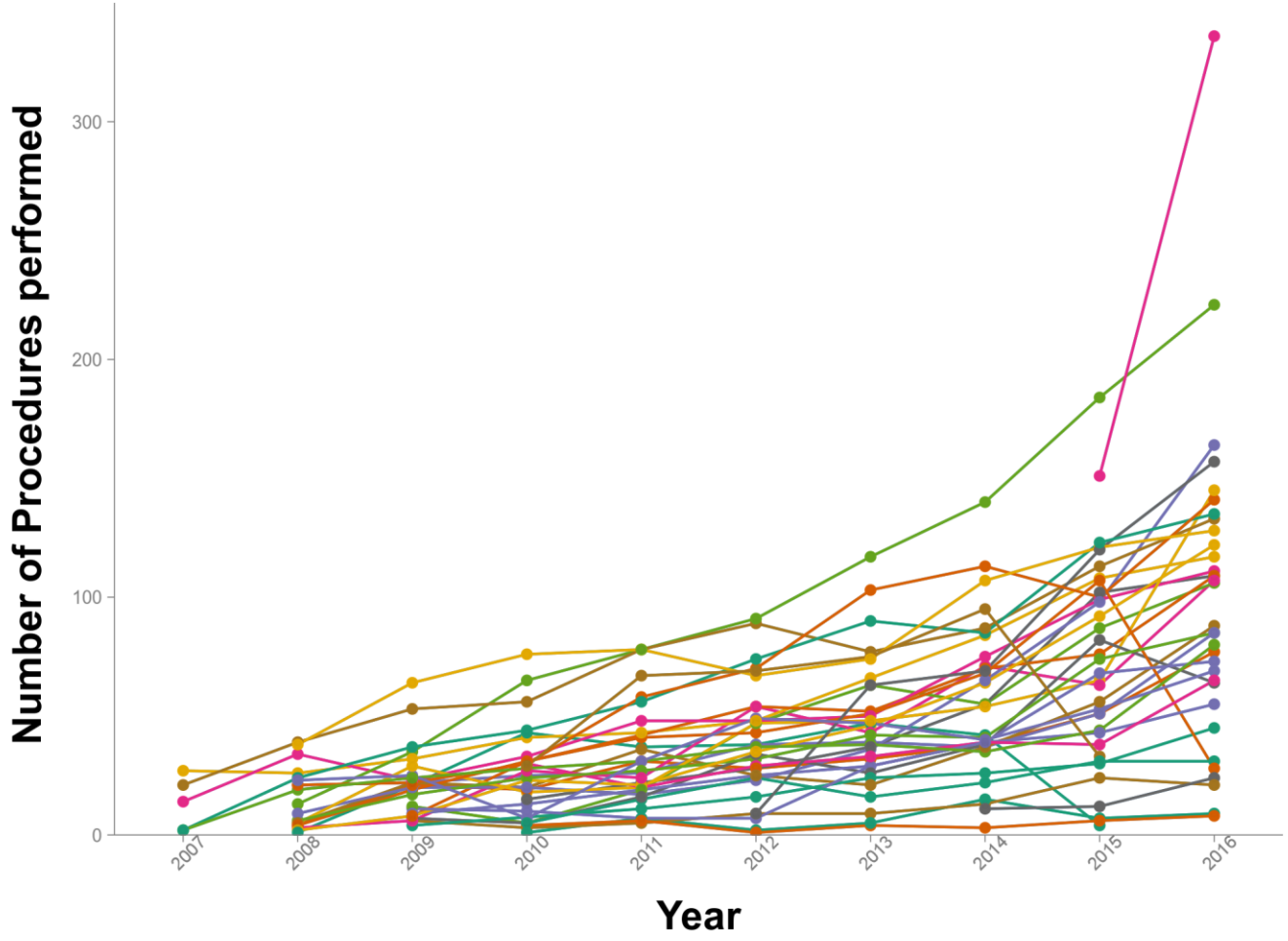
BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year grouped by Centre

Total UK
From 2007 to 2016



Barts And The London Hospital
Blackpool Victoria Hospital
Bristol Royal Infirmary
Derriford Hospital
Freeman Hospital
Glenfield Hospital
Hammersmith Hospital
Harefield Hospital
Harley Street Clinic
James Cook University Hospital
John Radcliffe Hospital
Kings College Hospital
Leeds General Infirmary
Liverpool Heart And Chest Hospital
London Bridge Hospital
Manchester Royal Infirmary
Morriston Hospital
New Cross Hospital
North Staffordshire Hospital
Nottingham City Hospital
Papworth Hospital
Queen Elizabeth Hospital, Edgbaston
Royal Brompton Hospital
Royal Infirmary Of Edinburgh
Royal Sussex County Hospital
Royal Victoria Hospital
Southampton General Hospital
St Bartholomews Hospital
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SCTS

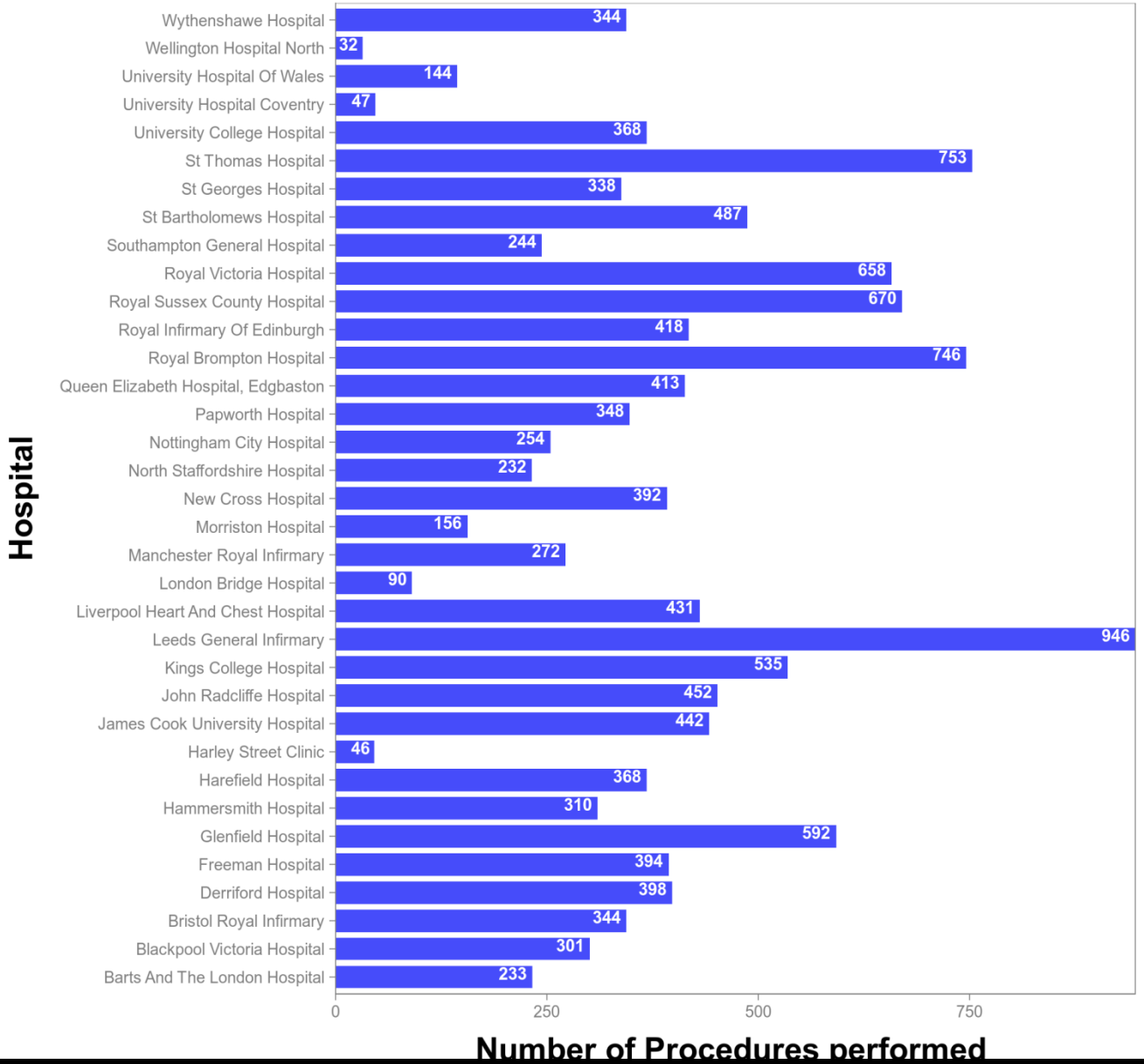
BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Hospital

From 2007 to 2016



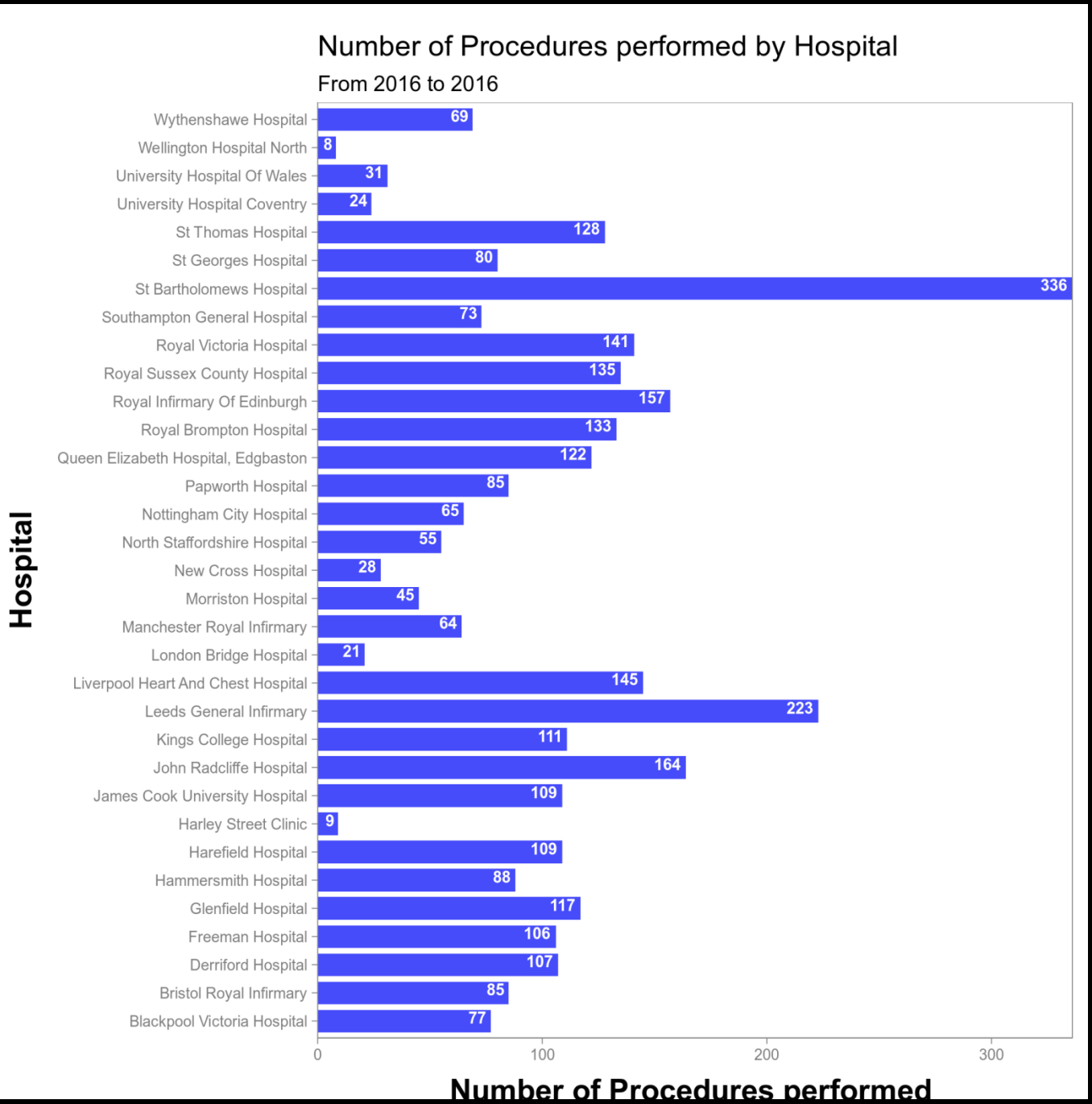
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

SCTS

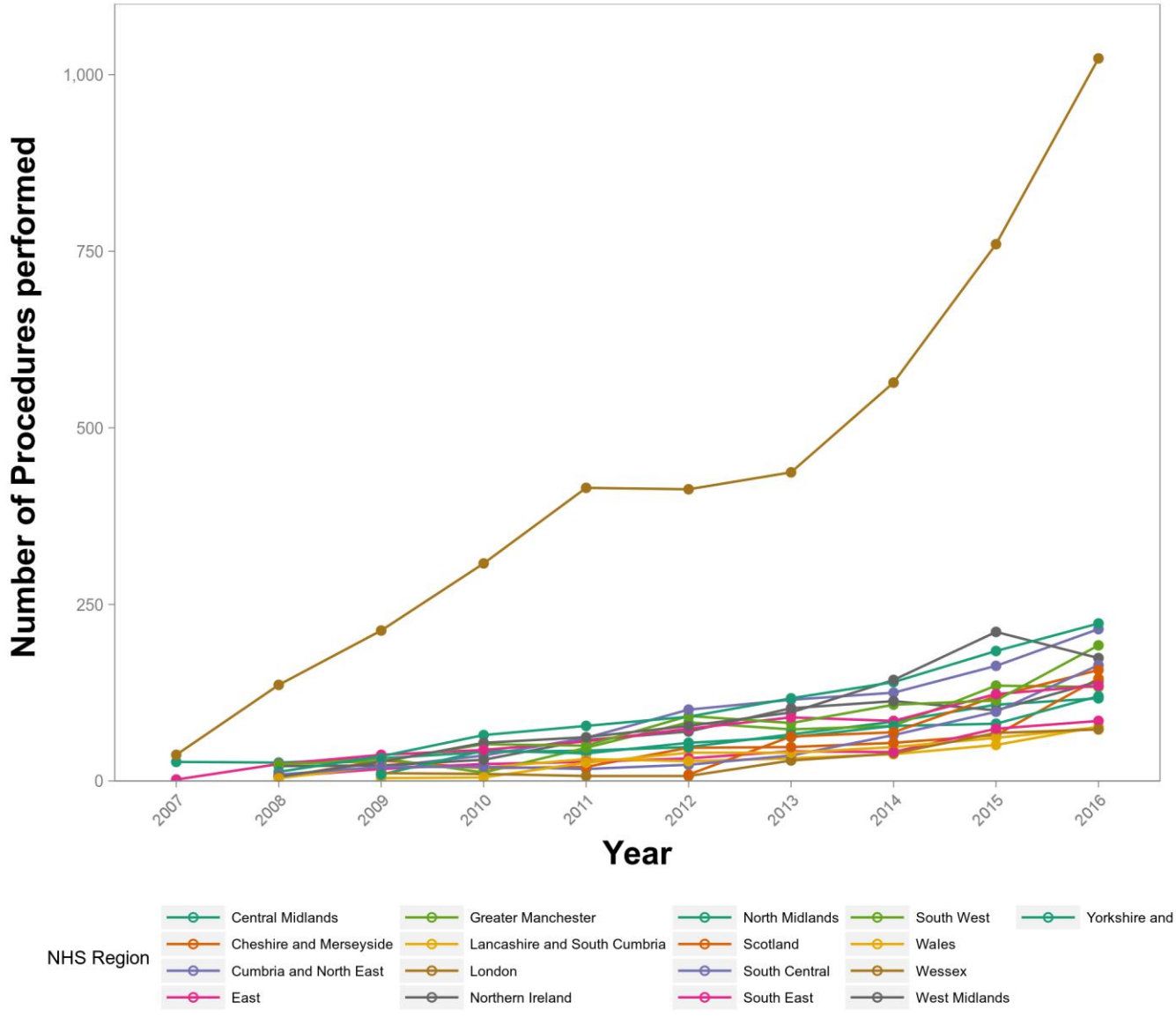
BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year Grouped by NHS Region

TOTAL UK
From 2007 to 2016



NICOR

SCTS

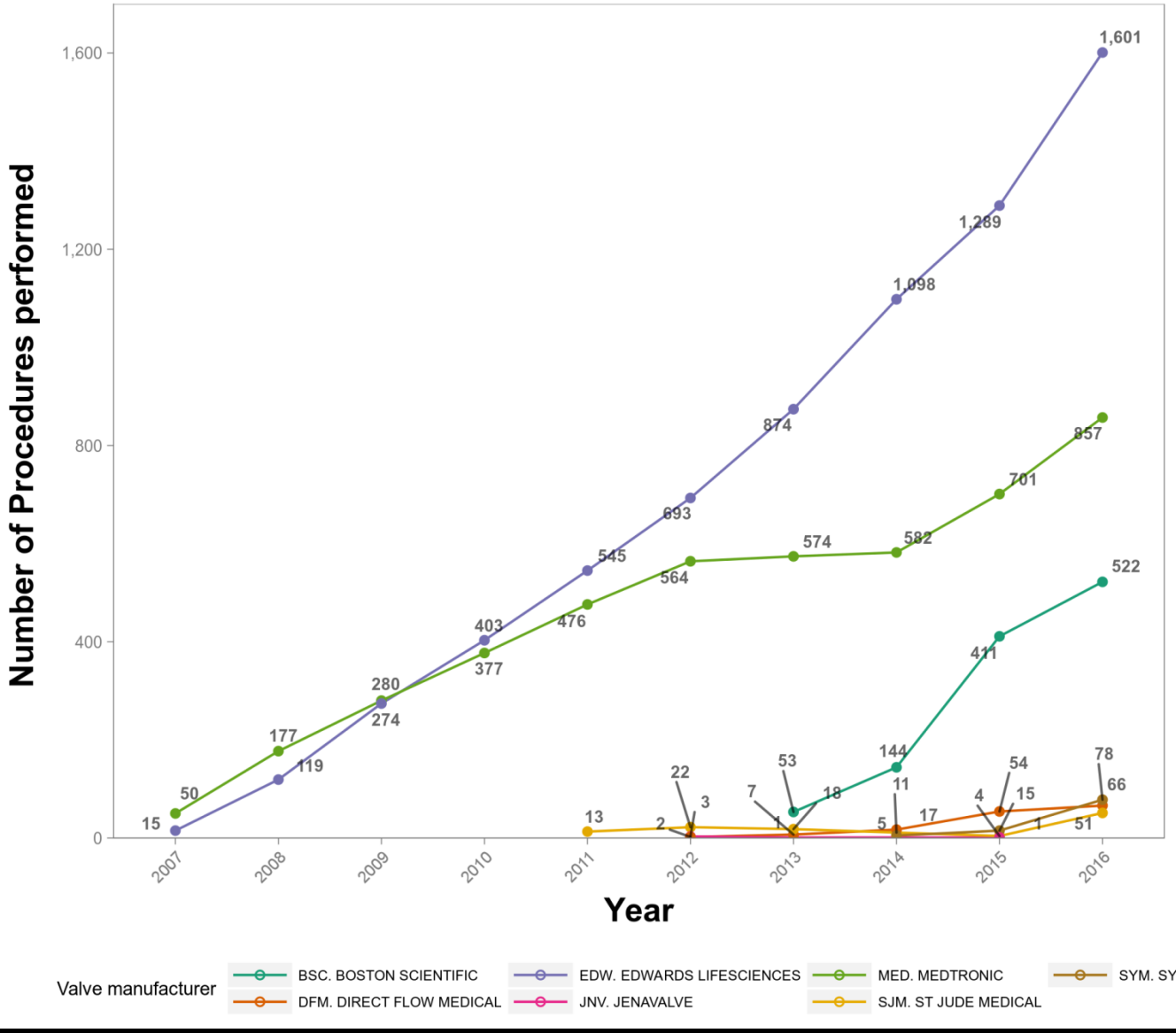
BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year
Grouped by Valve manufacturer

TOTAL UK
From 2007 to 2016



NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)

Demographic features

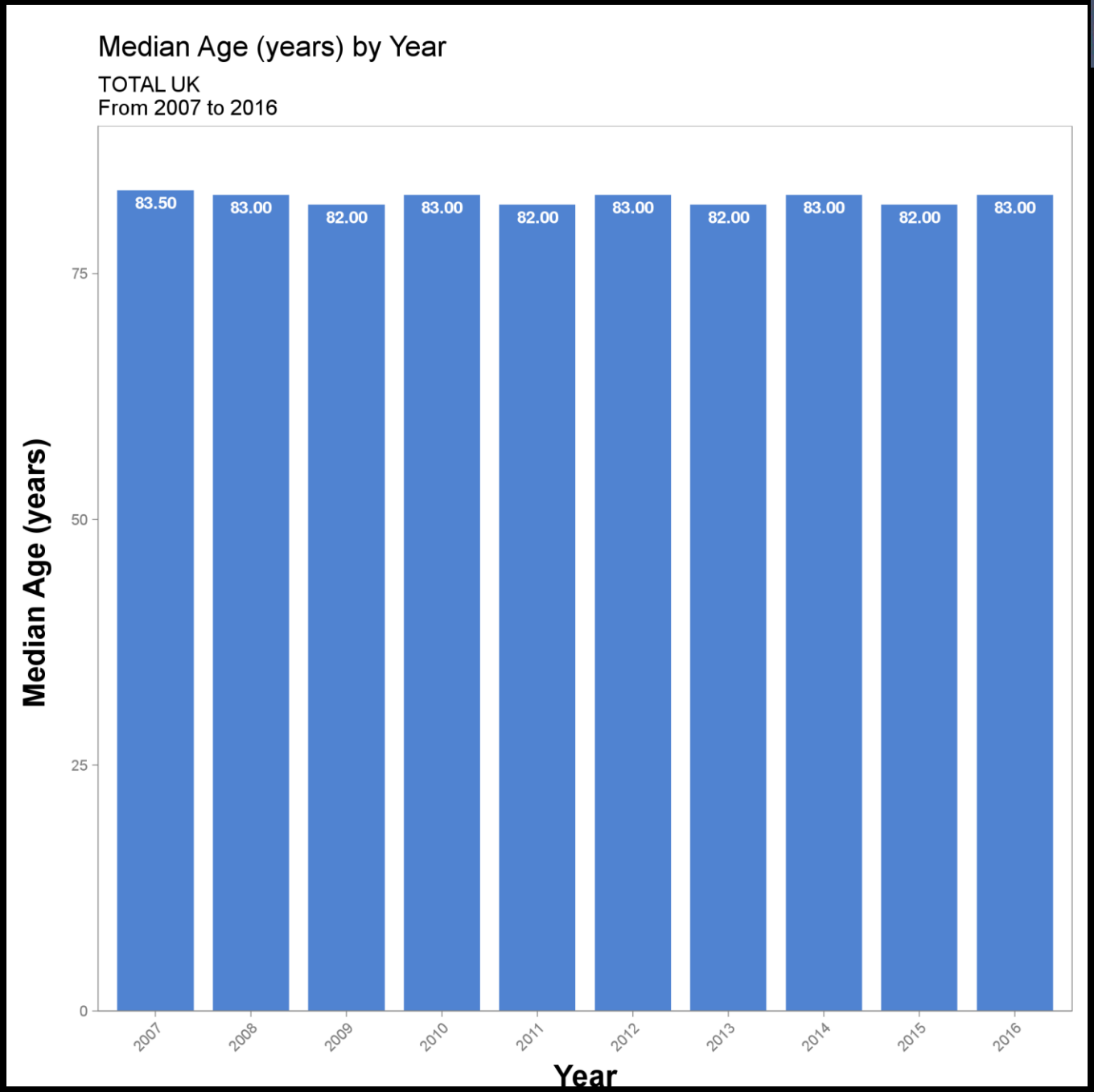
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



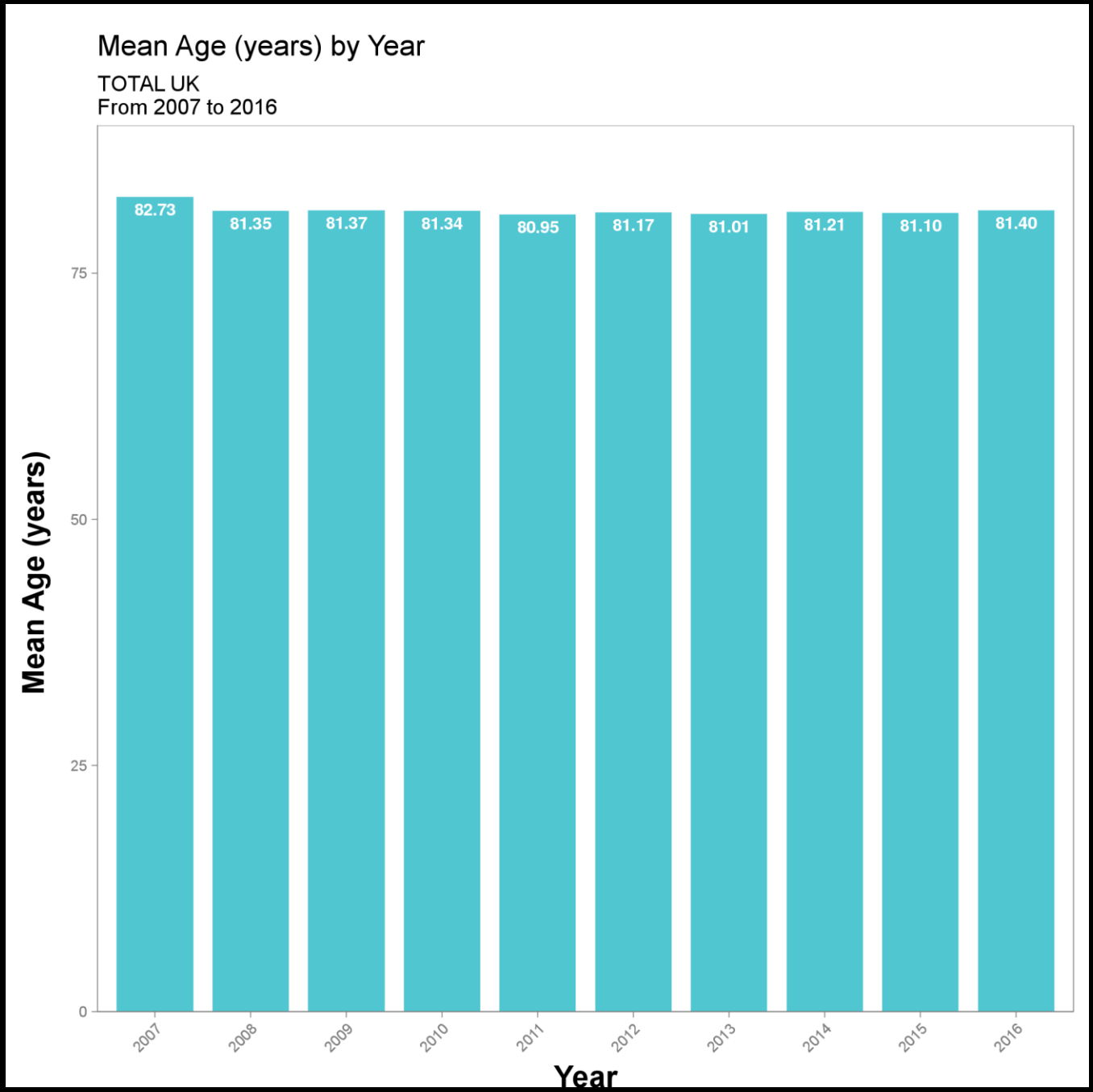
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

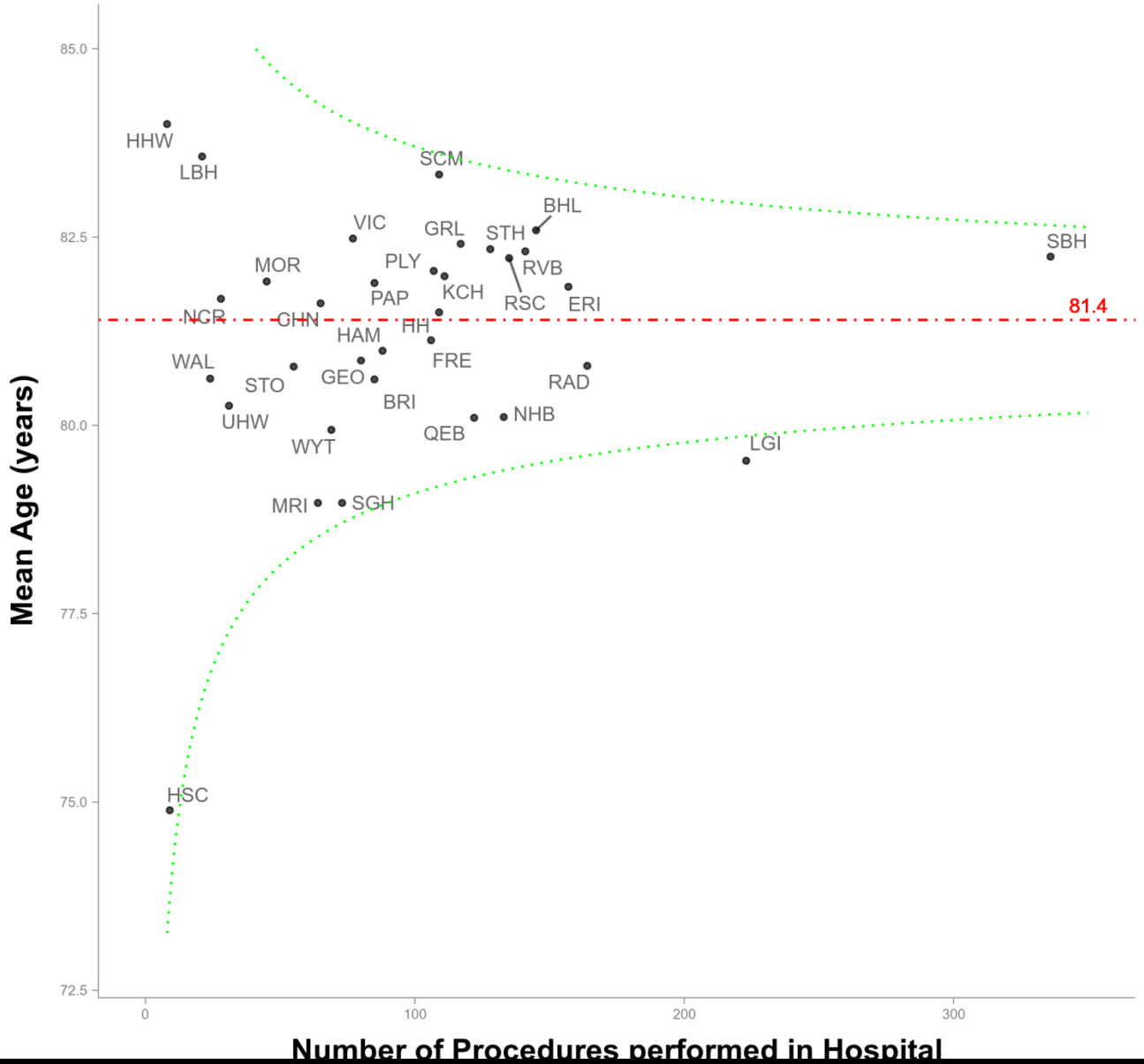
SCTS BCIS

2016 data

(data extracted May 2017)

Mean Age (years) by Number of Procedures performed in Hospital

From 2016 to 2016



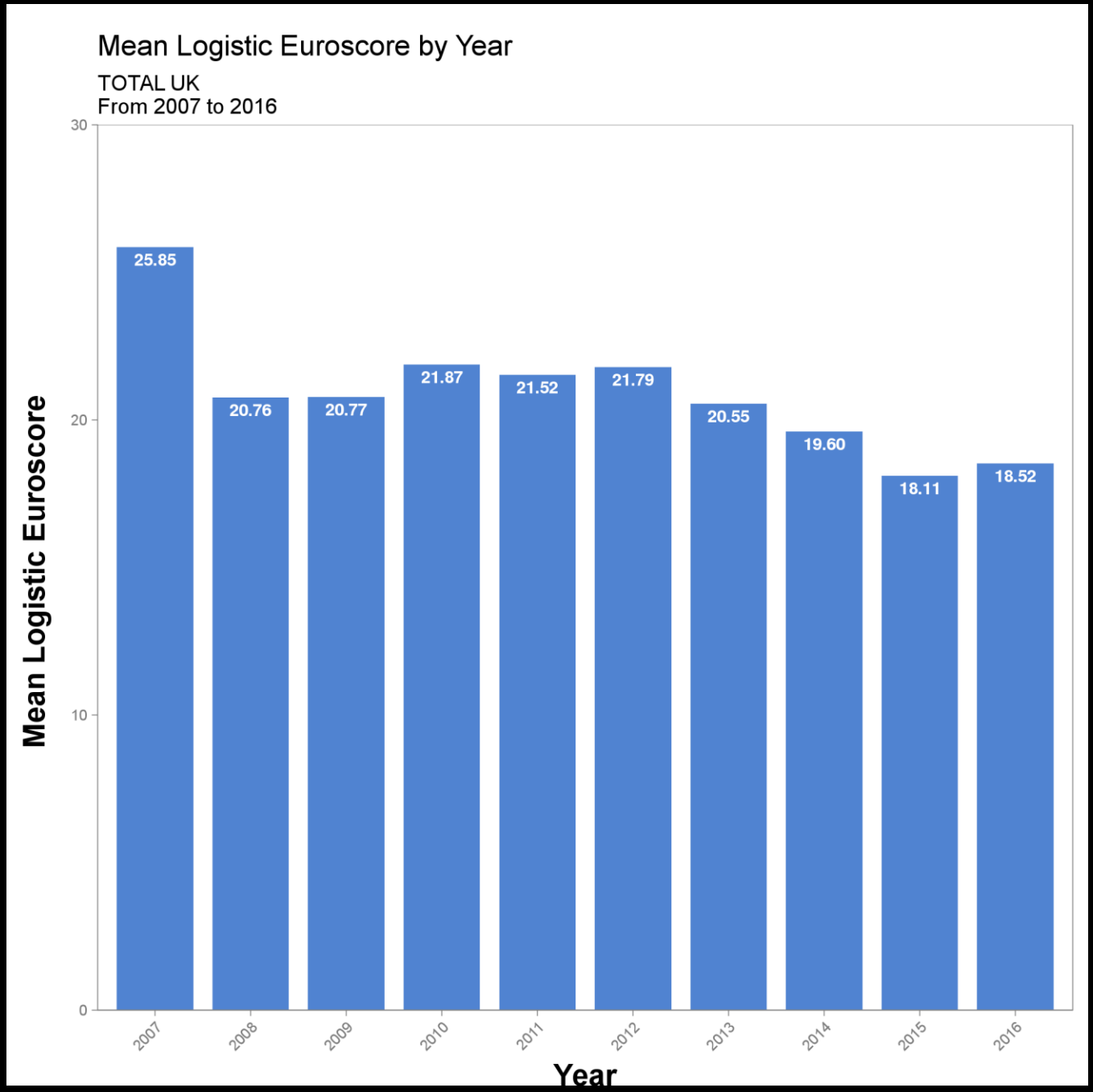
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



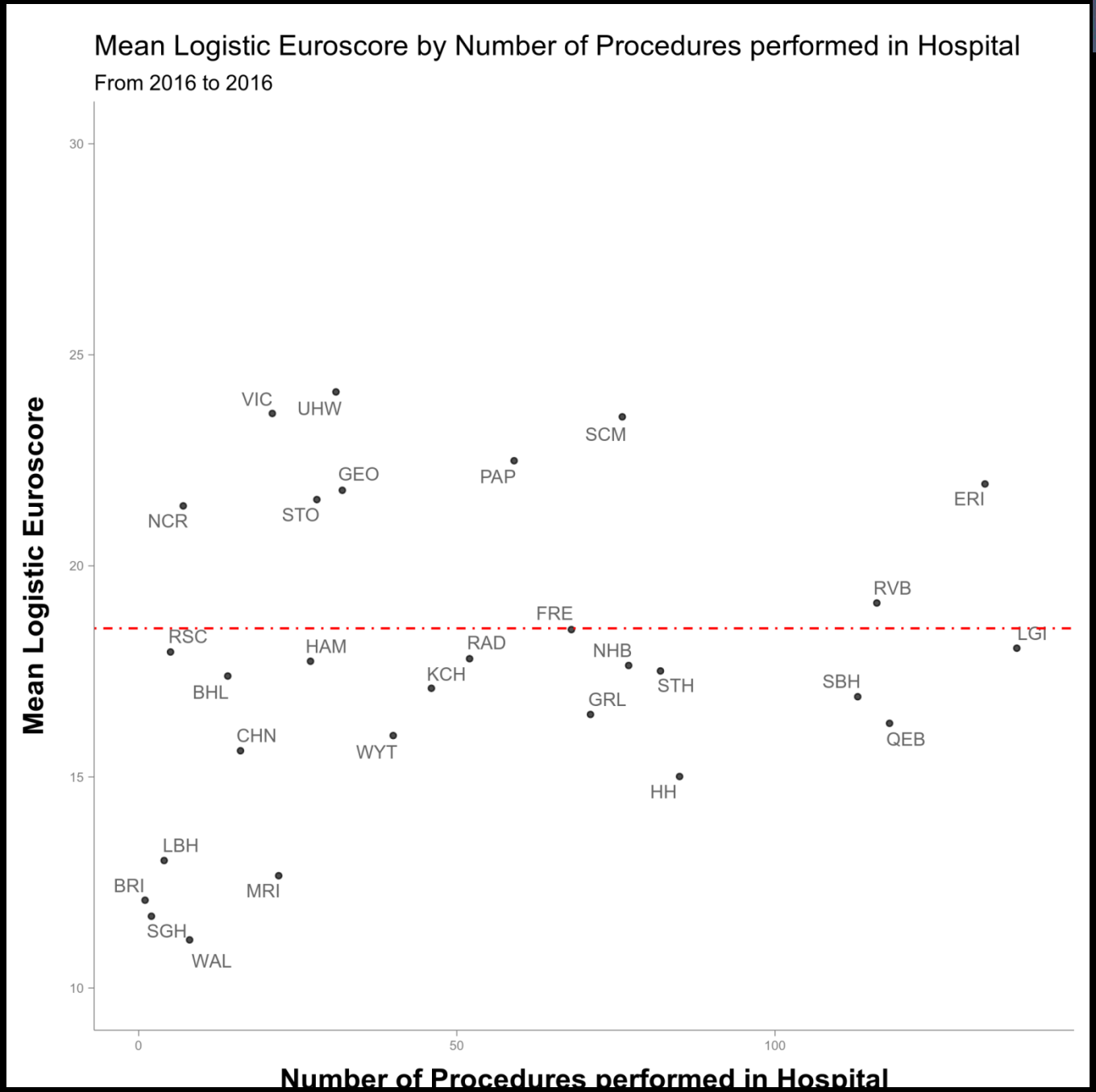
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

SCTS

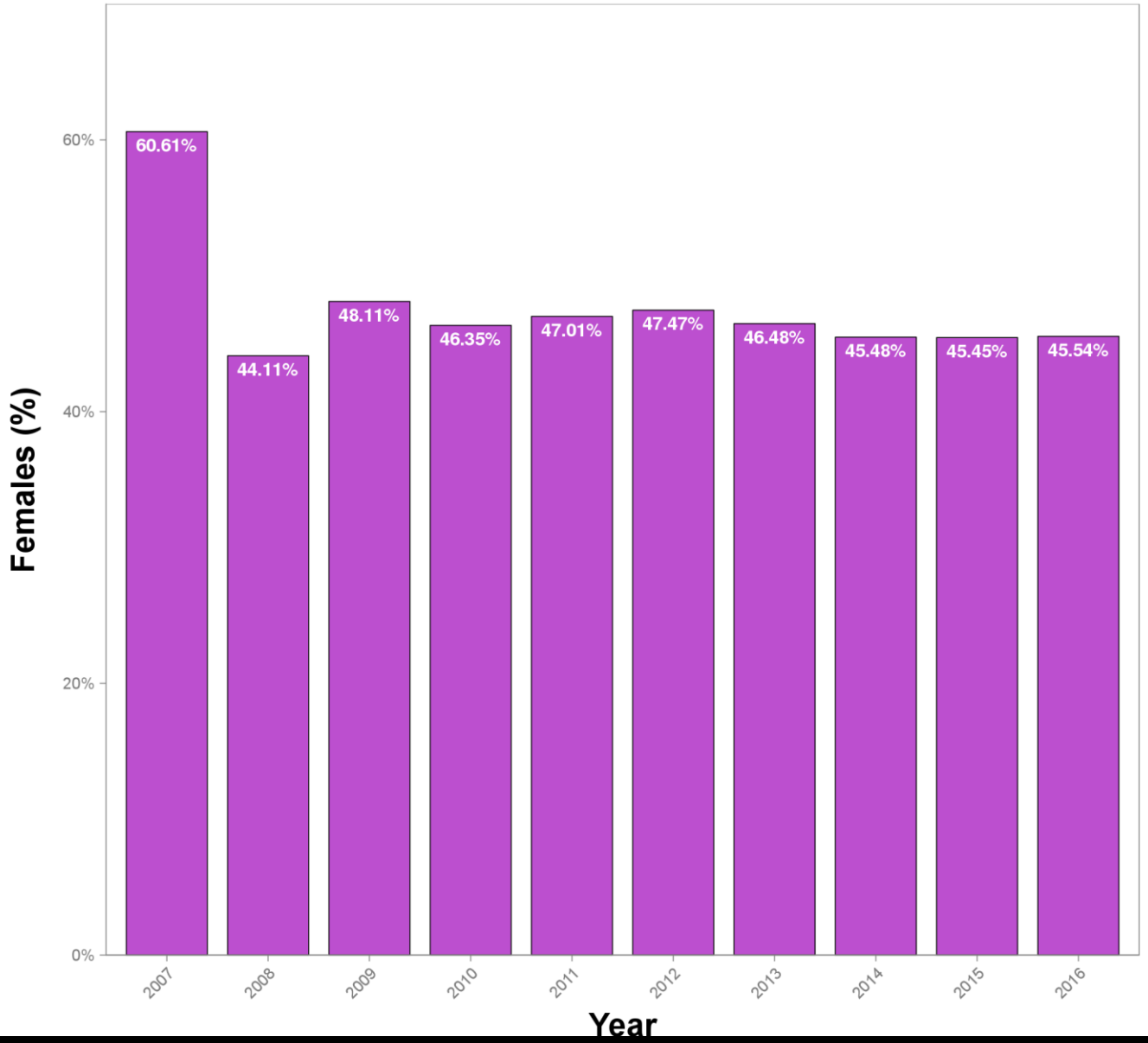
BCIS

2016 data

(data extracted May 2017)

Females (%) by Year

TOTAL UK
From 2007 to 2016



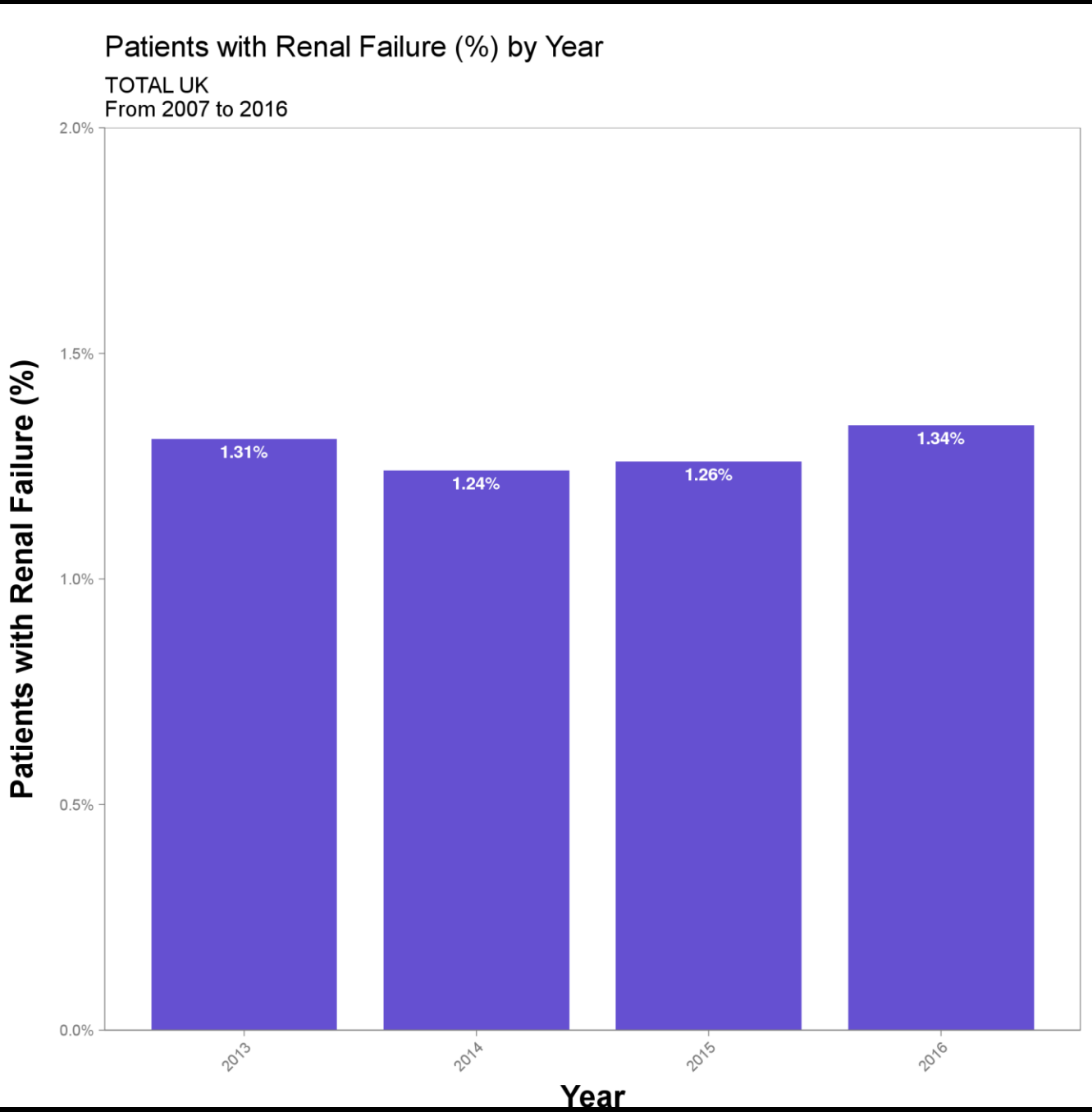
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



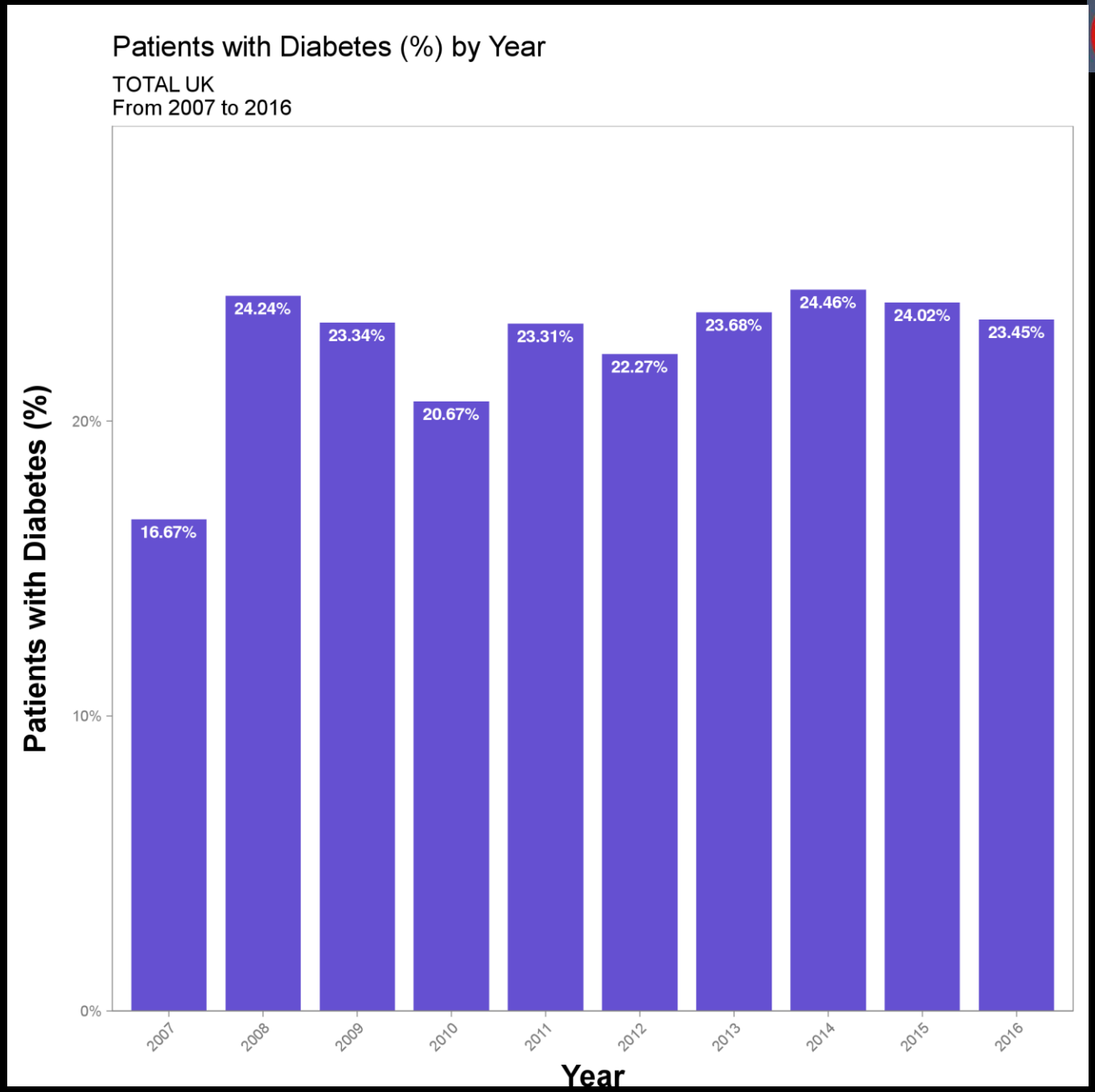
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



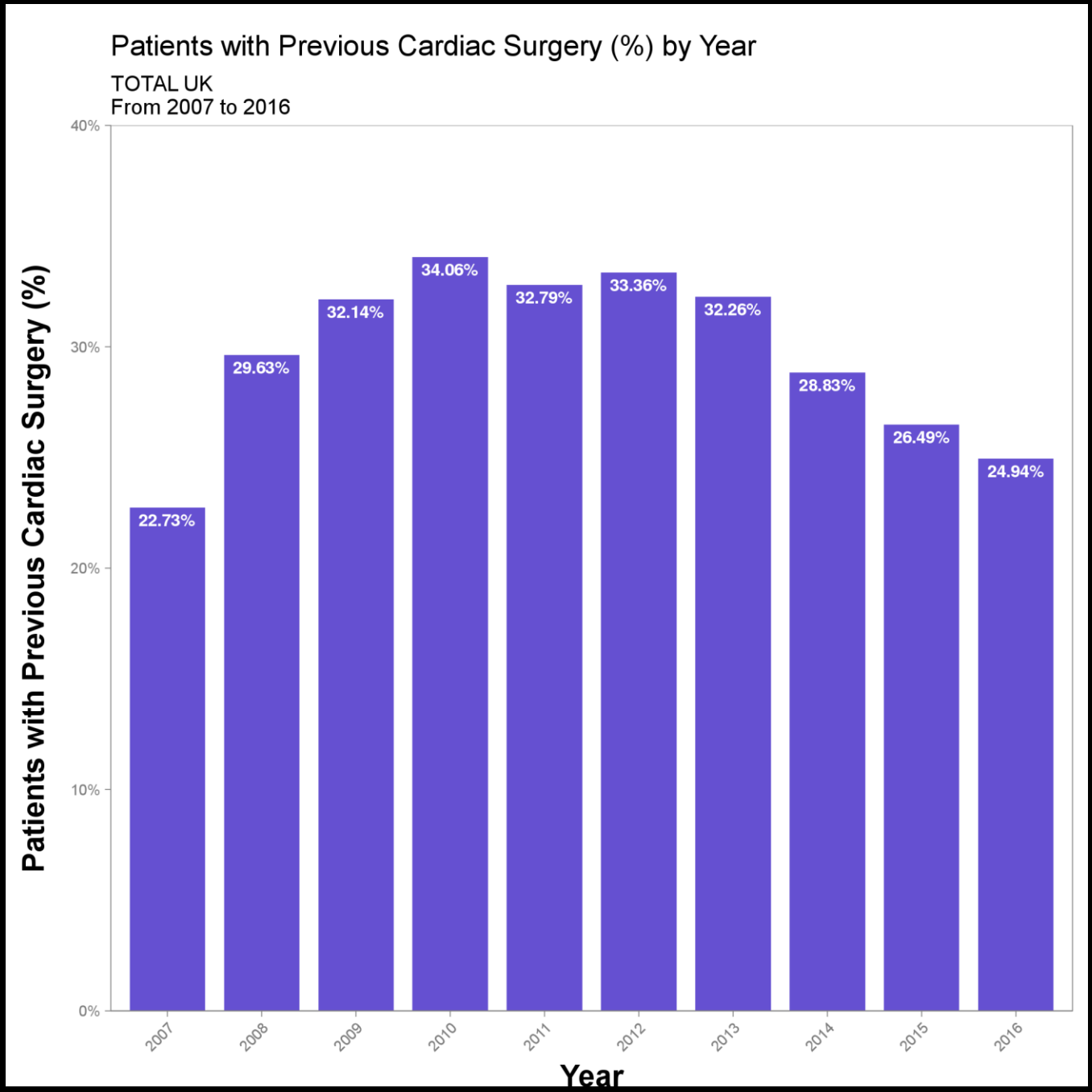
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



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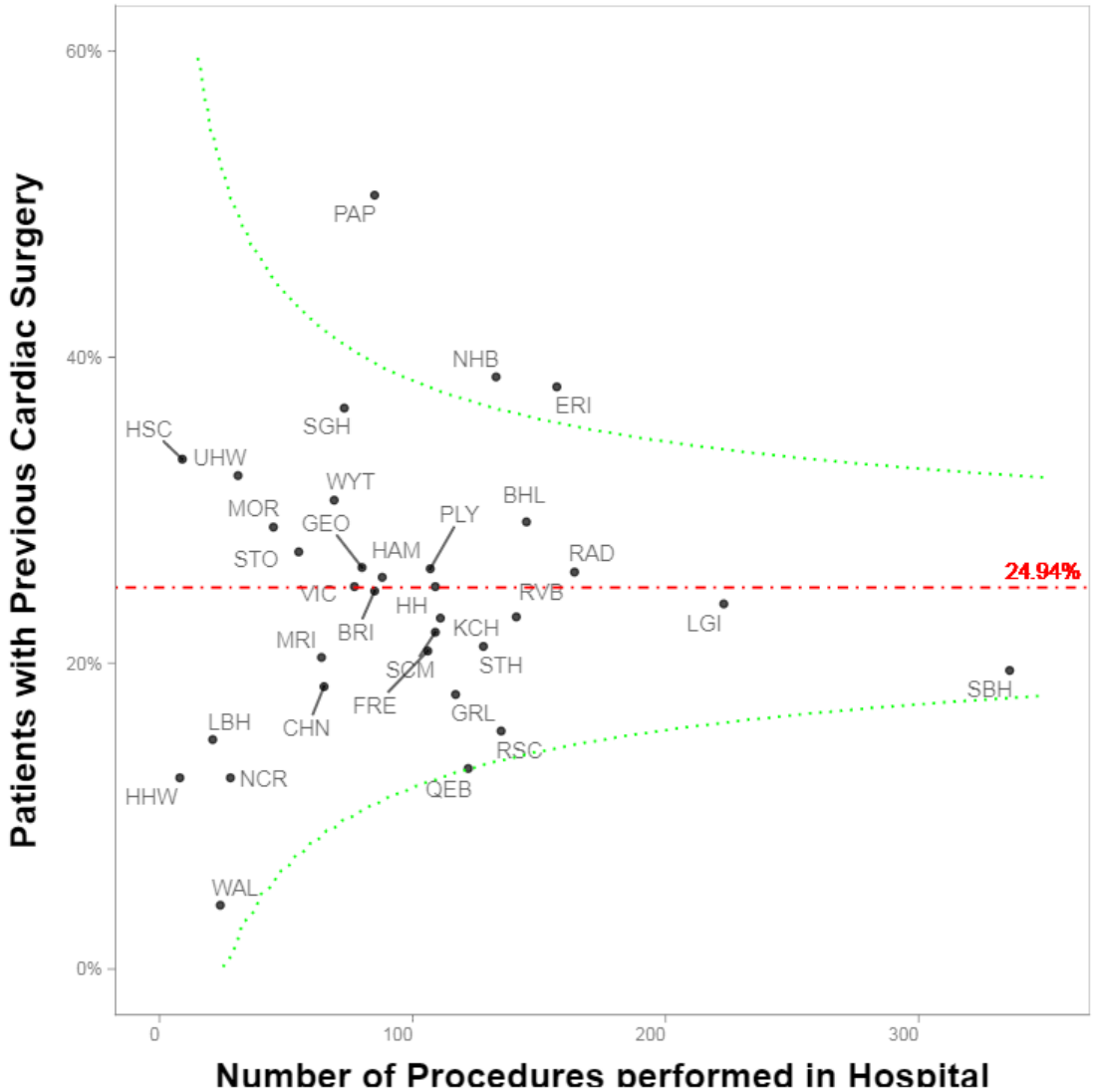
2016 data

(data extracted May 2017)

Patients with Previous Cardiac Surgery (%) by Number of Procedures performed in Hospital From 2016 to 2016



NICOR

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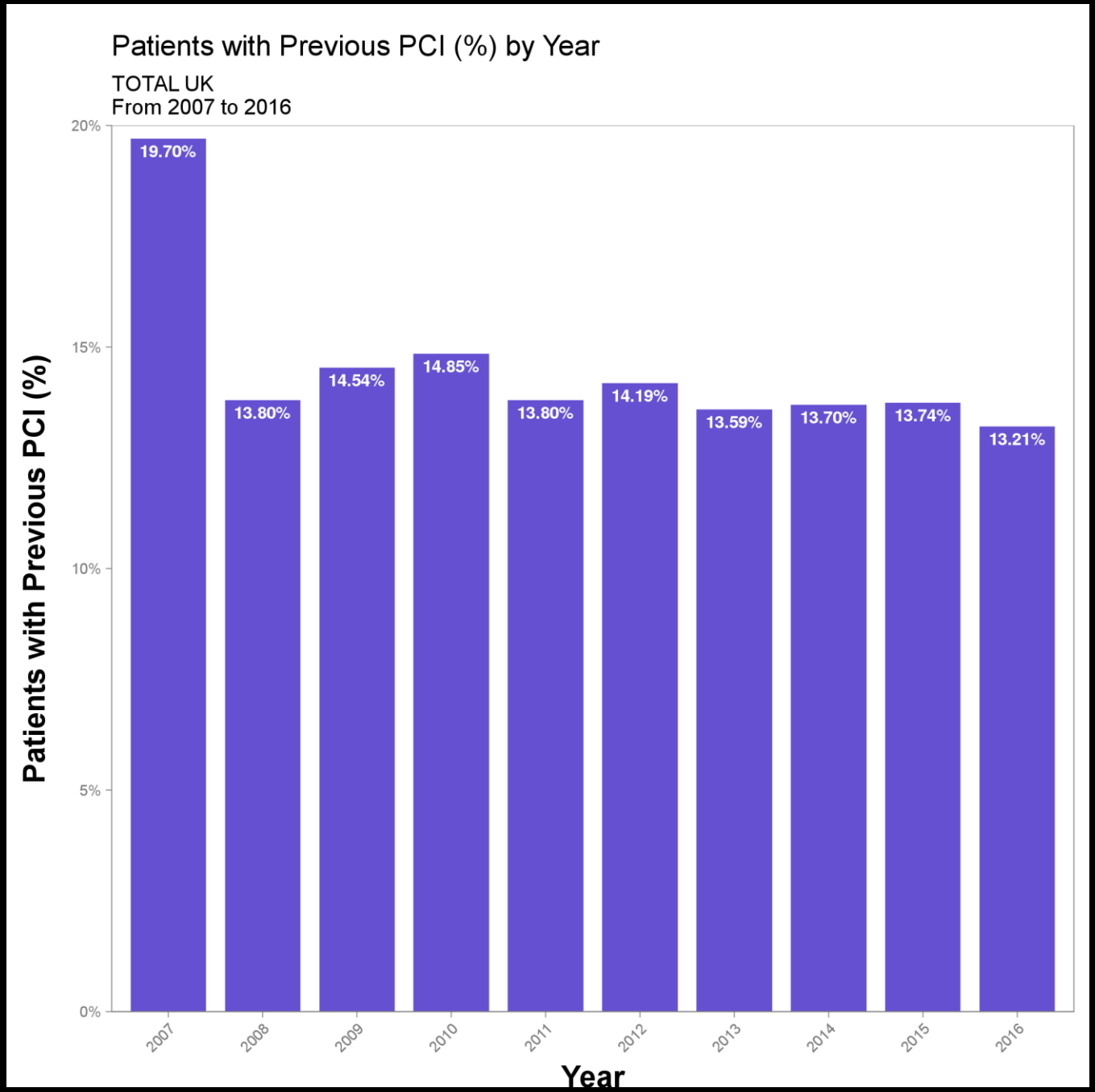
BCIS

2016 data

(data extracted May 2017)

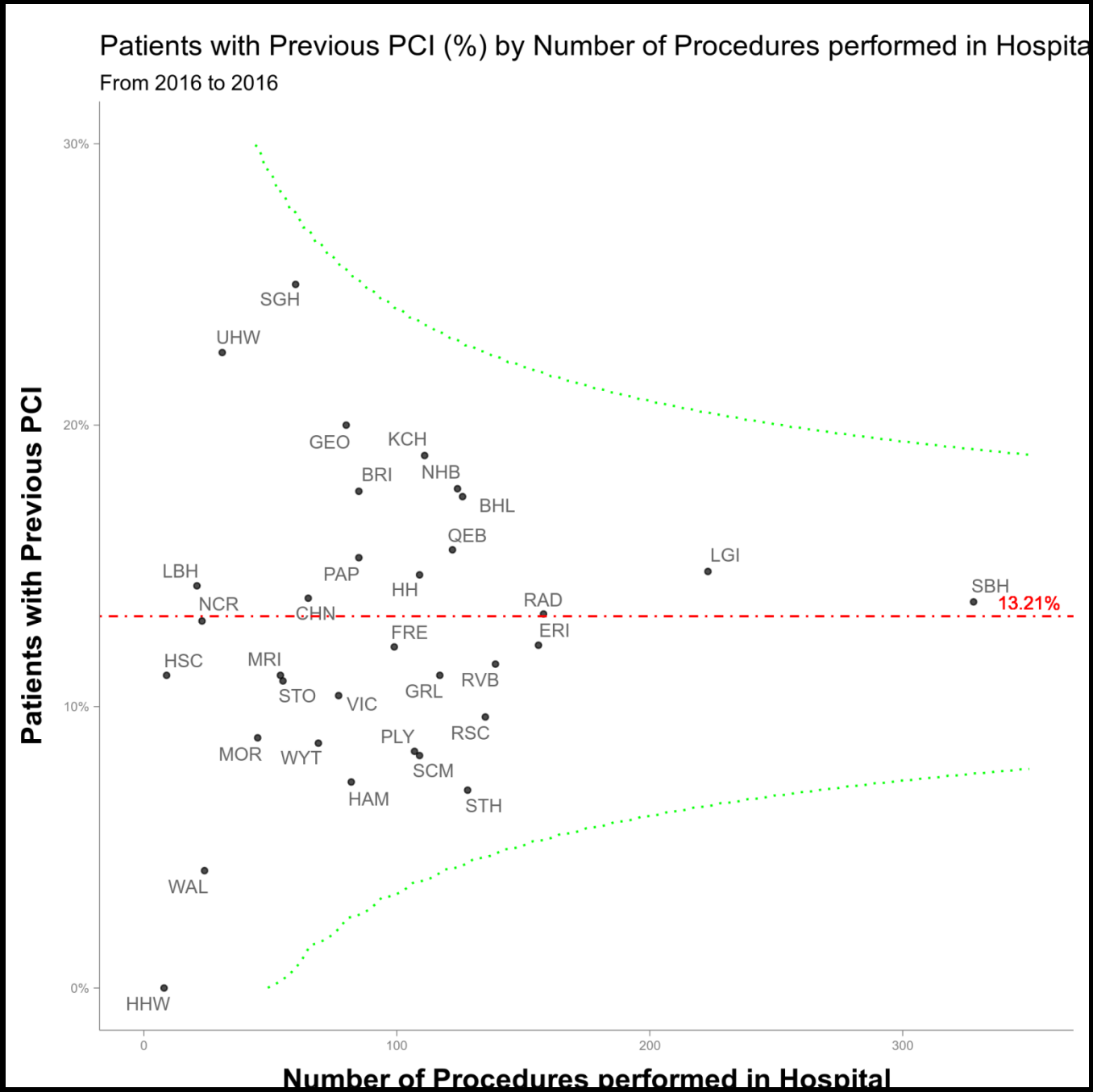


NICOR

SCTS BCIS

2016 data

(data extracted May 2017)



NICOR

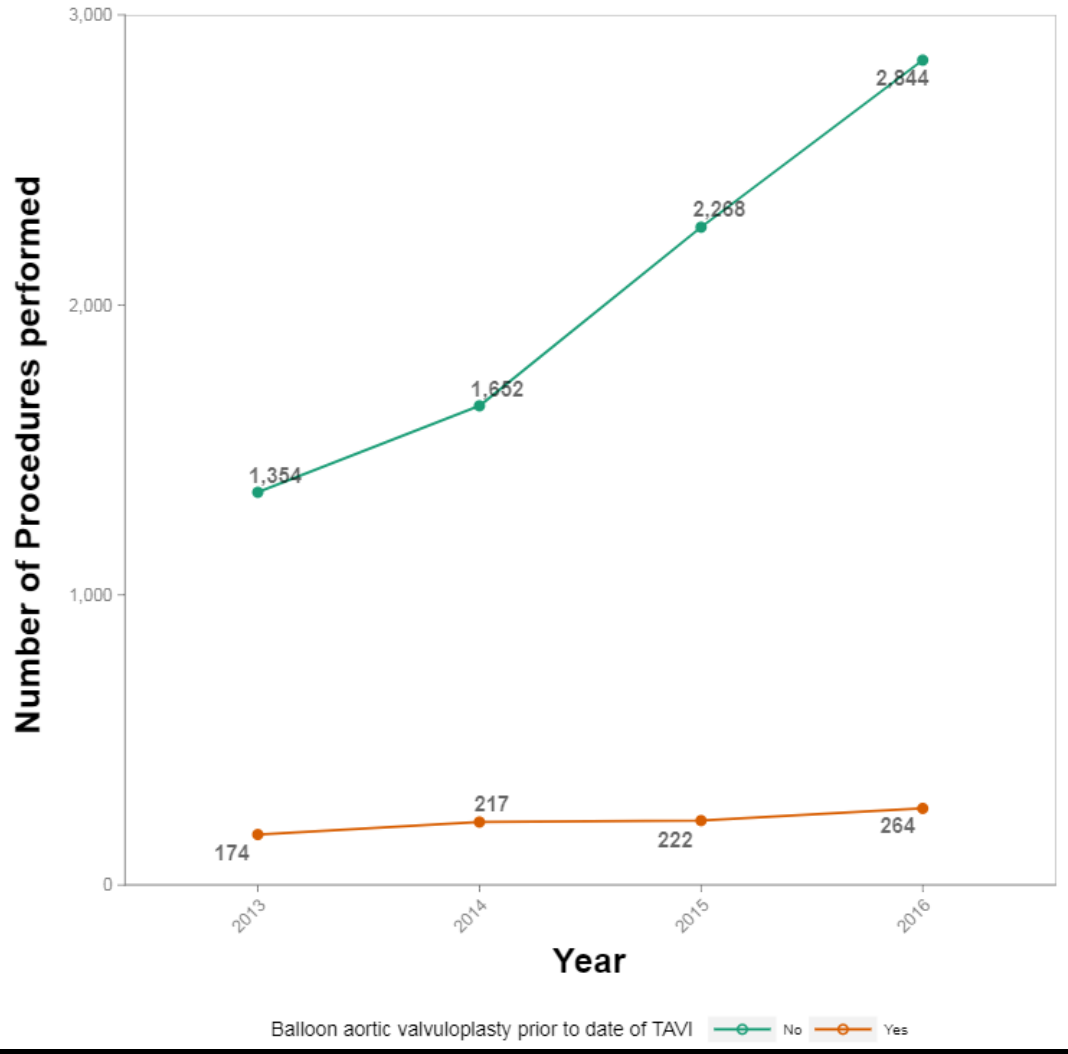
SCTS BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year
Grouped by Balloon aortic valvuloplasty prior to date of TAVI
TOTAL UK
From 2007 to 2016

Valvuloplasty prior to TAVI procedure date



NICOR

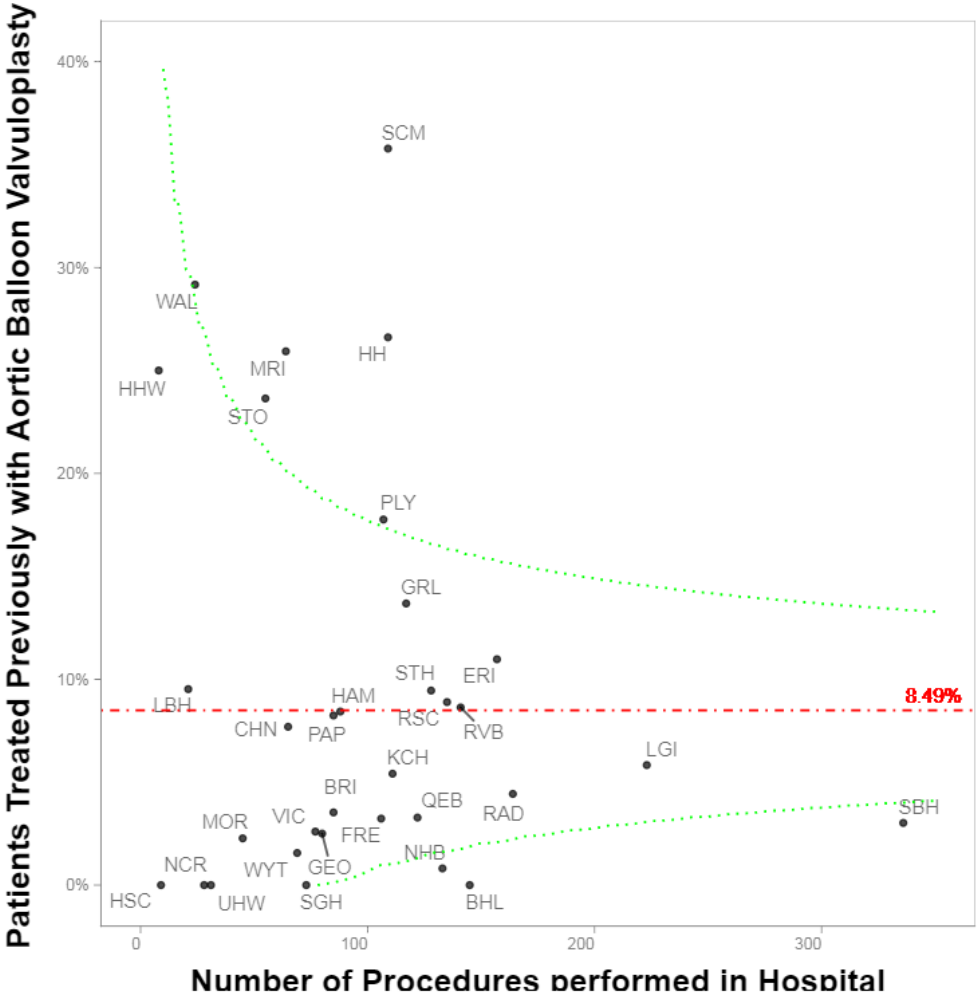
SCTS BCIS

2016 data

(data extracted May 2017)

Patients Treated Previously with Aortic Balloon Valvuloplasty (%) by Number of Procedures performed in Hospital
From 2016 to 2016

Valvuloplasty prior to TAVI procedure date



NICOR

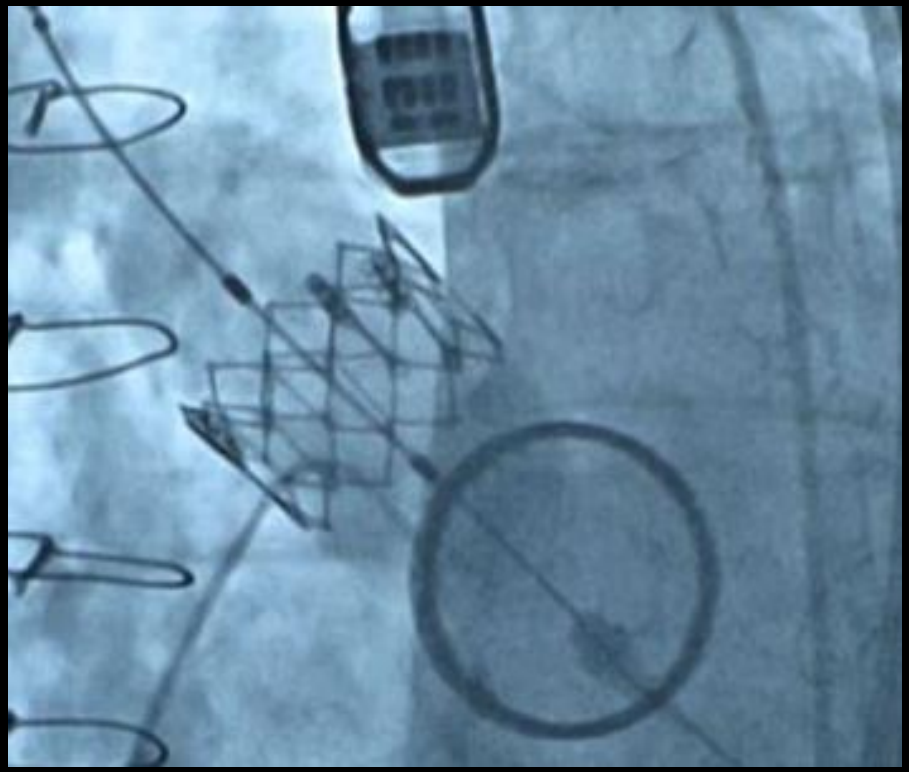
SCTS

BCIS

2016 data

(data extracted May 2017)

Procedural details



NICOR

SCTS

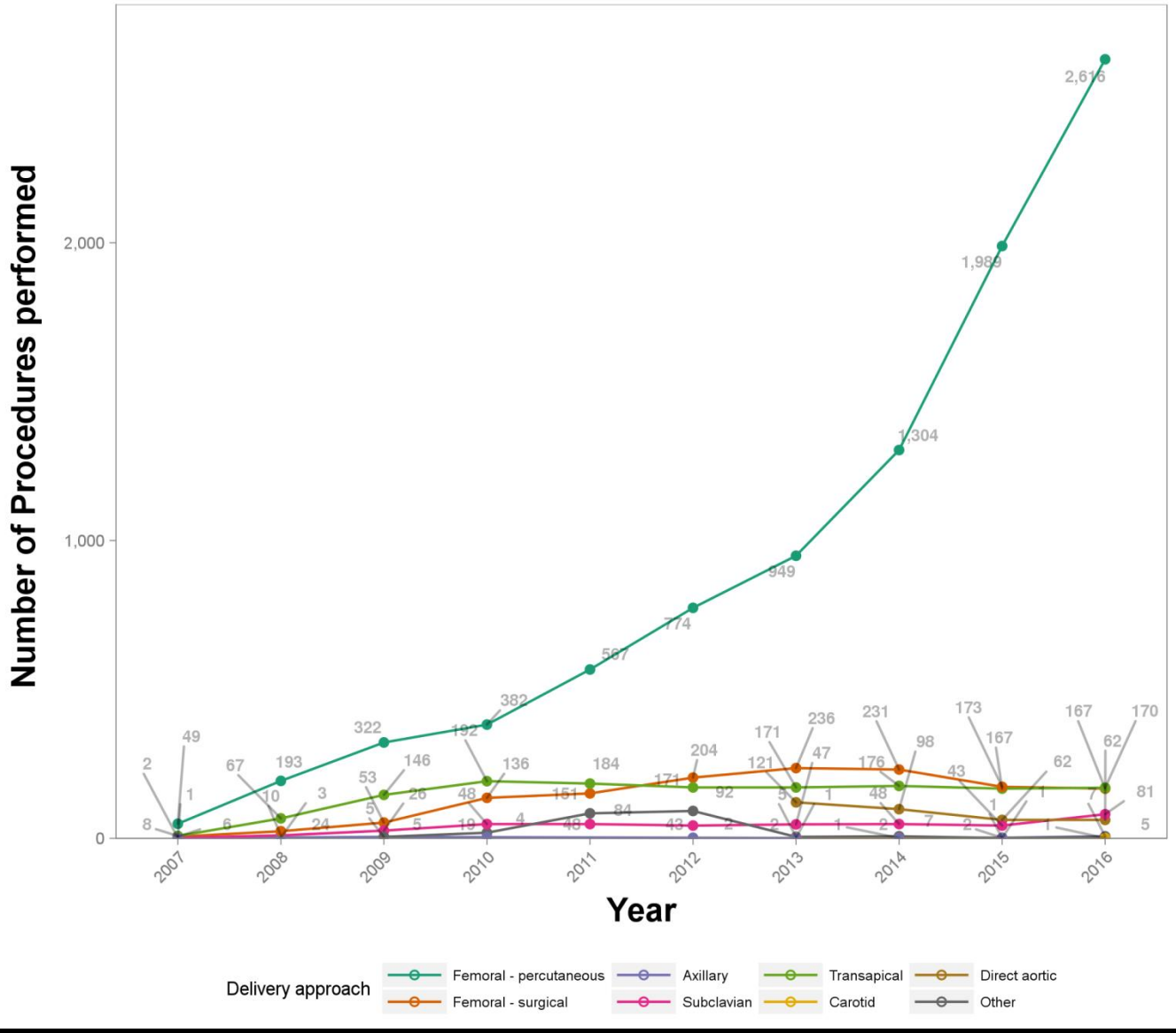
BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year Grouped by Delivery approach

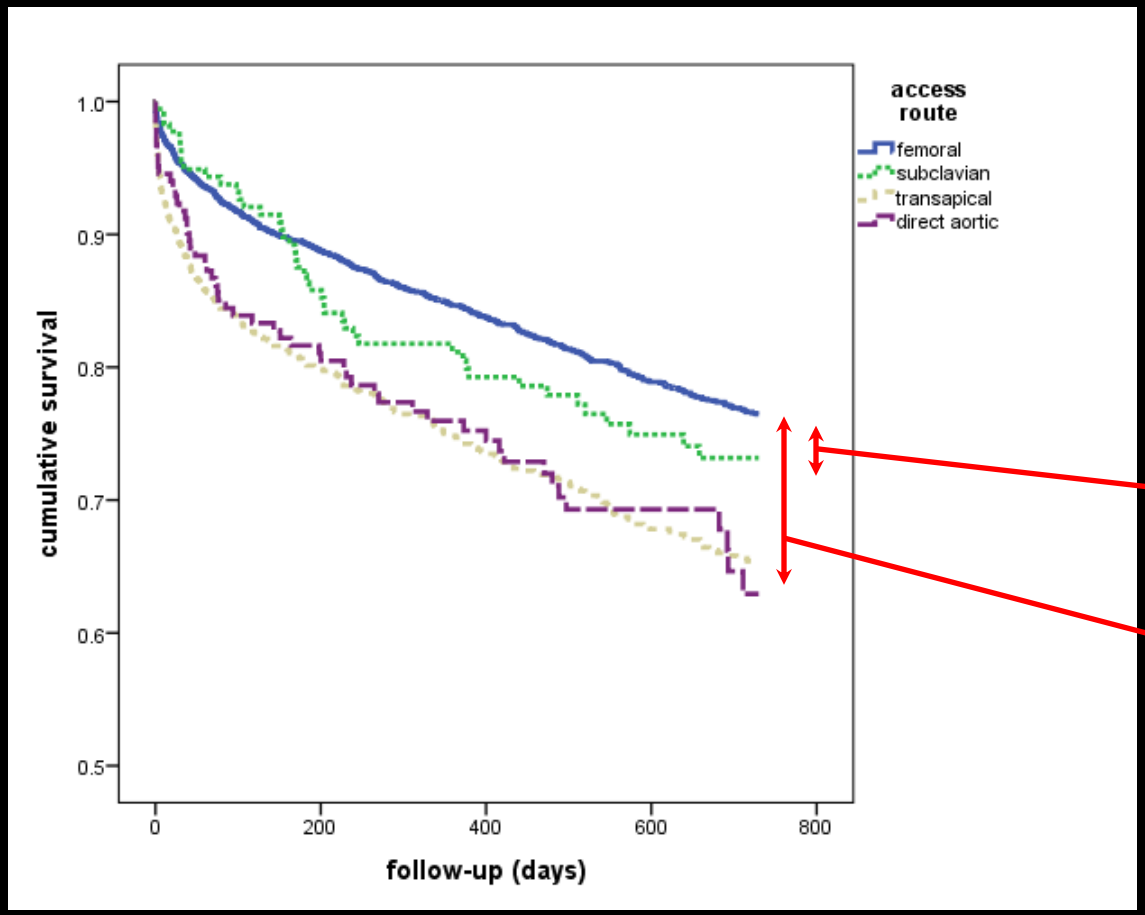
TOTAL UK
From 2007 to 2016



Access Route

Fröhlich GM, Am J Cardiol 2015;116:1555–9

UK TAVI Registry data 2007 to 2012 FU to 2014



LES
17.0% Femoral

22.1% SC
21.2% TA
20.3% DA

P=0.24

P<0.001 (TA)
P<0.01 (DA)

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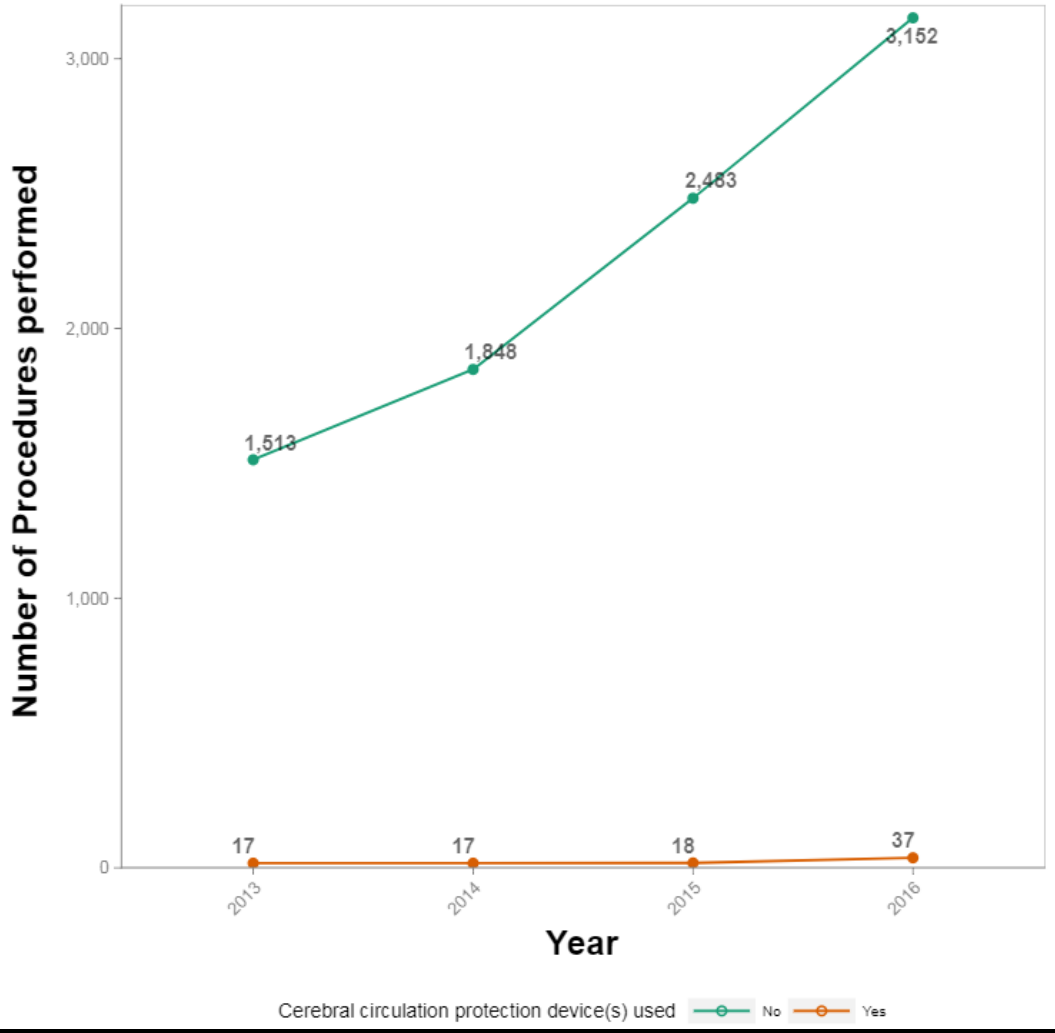
SCTS BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year
Grouped by Cerebral circulation protection device(s) used
TOTAL UK
From 2007 to 2016



NICOR

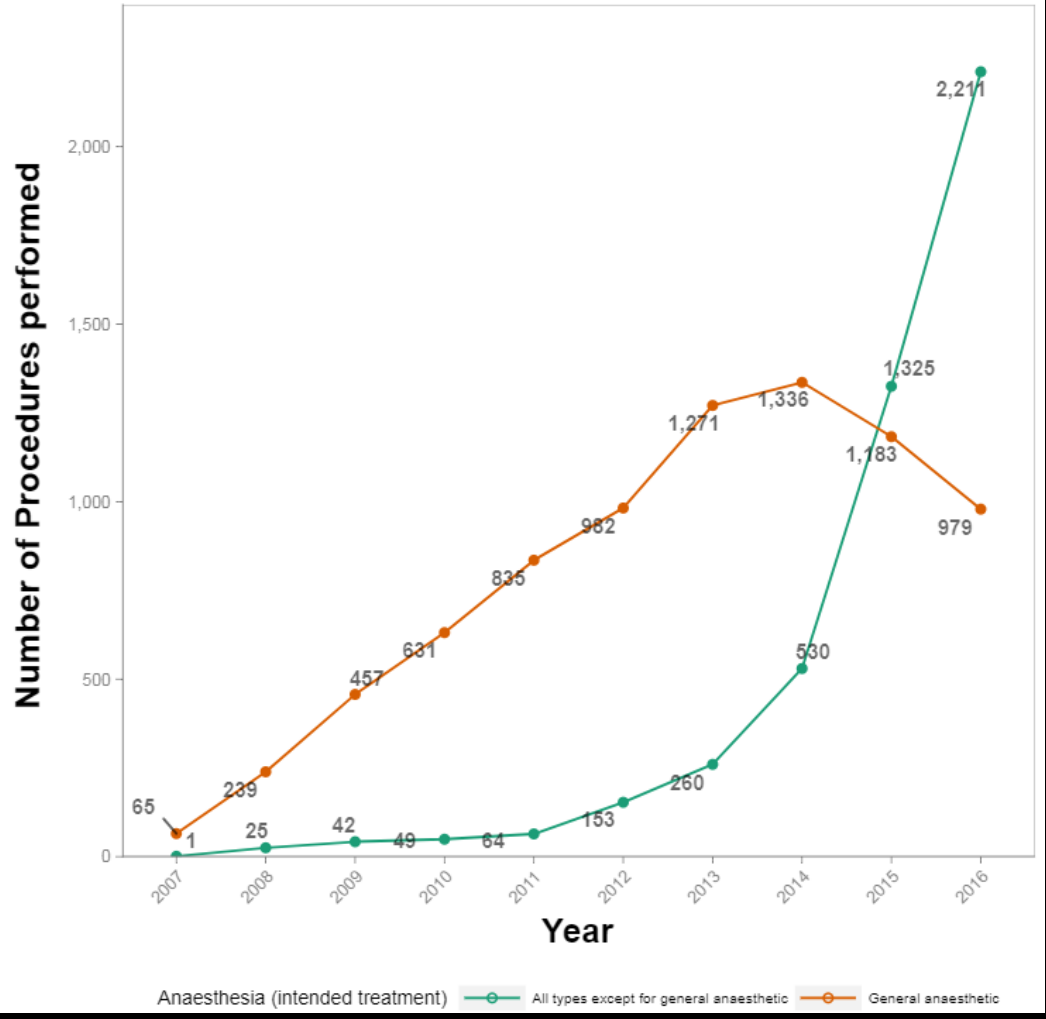
SCTS

BCIS

2016 data

(data extracted May 2017)

Number of Procedures performed by Year
Grouped by Anaesthesia (intended treatment)
TOTAL UK
From 2007 to 2016



NICOR

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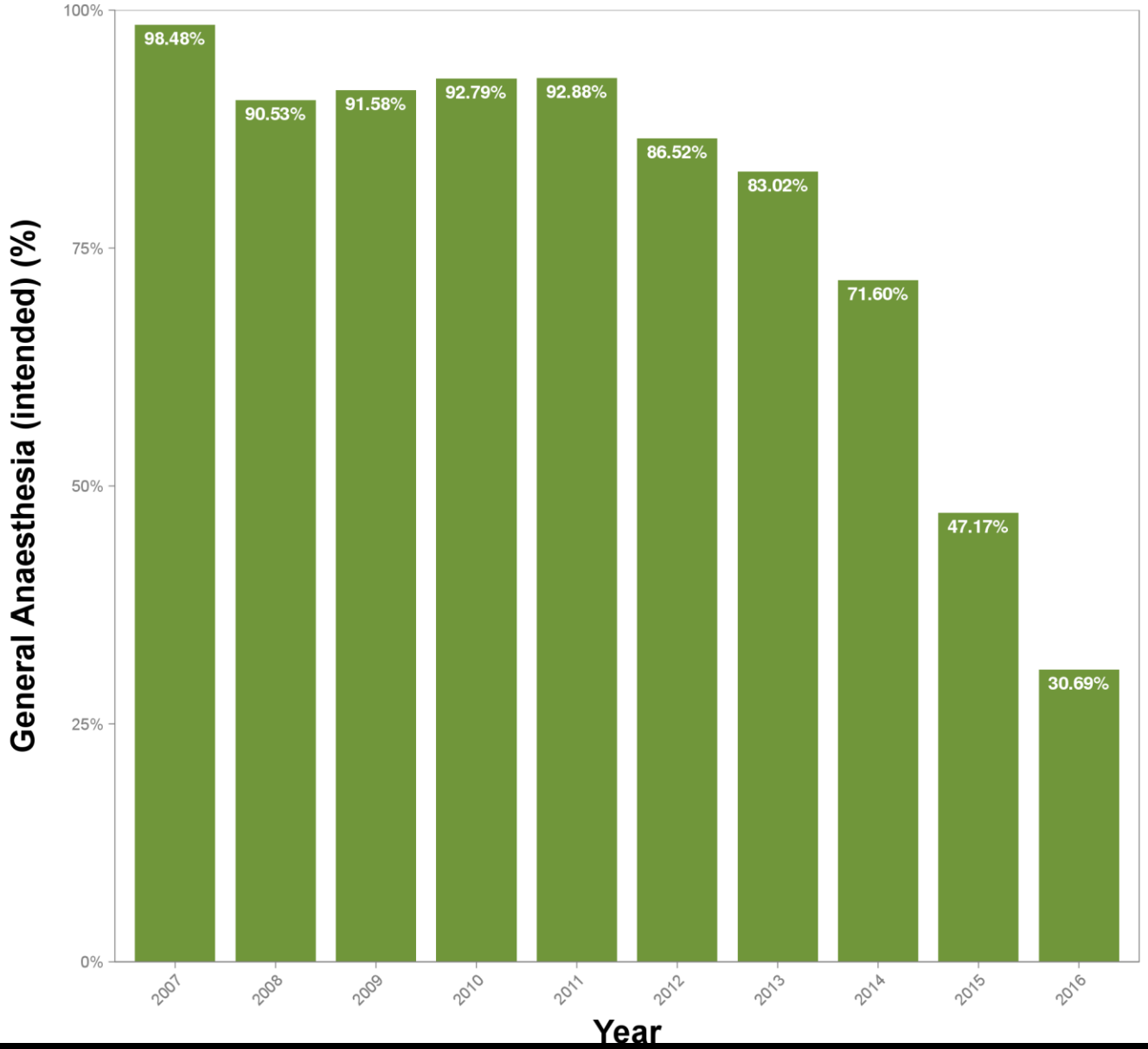
BCIS

2016 data

(data extracted May 2017)

General Anaesthesia (intended) (%) by Year

TOTAL UK
From 2007 to 2016



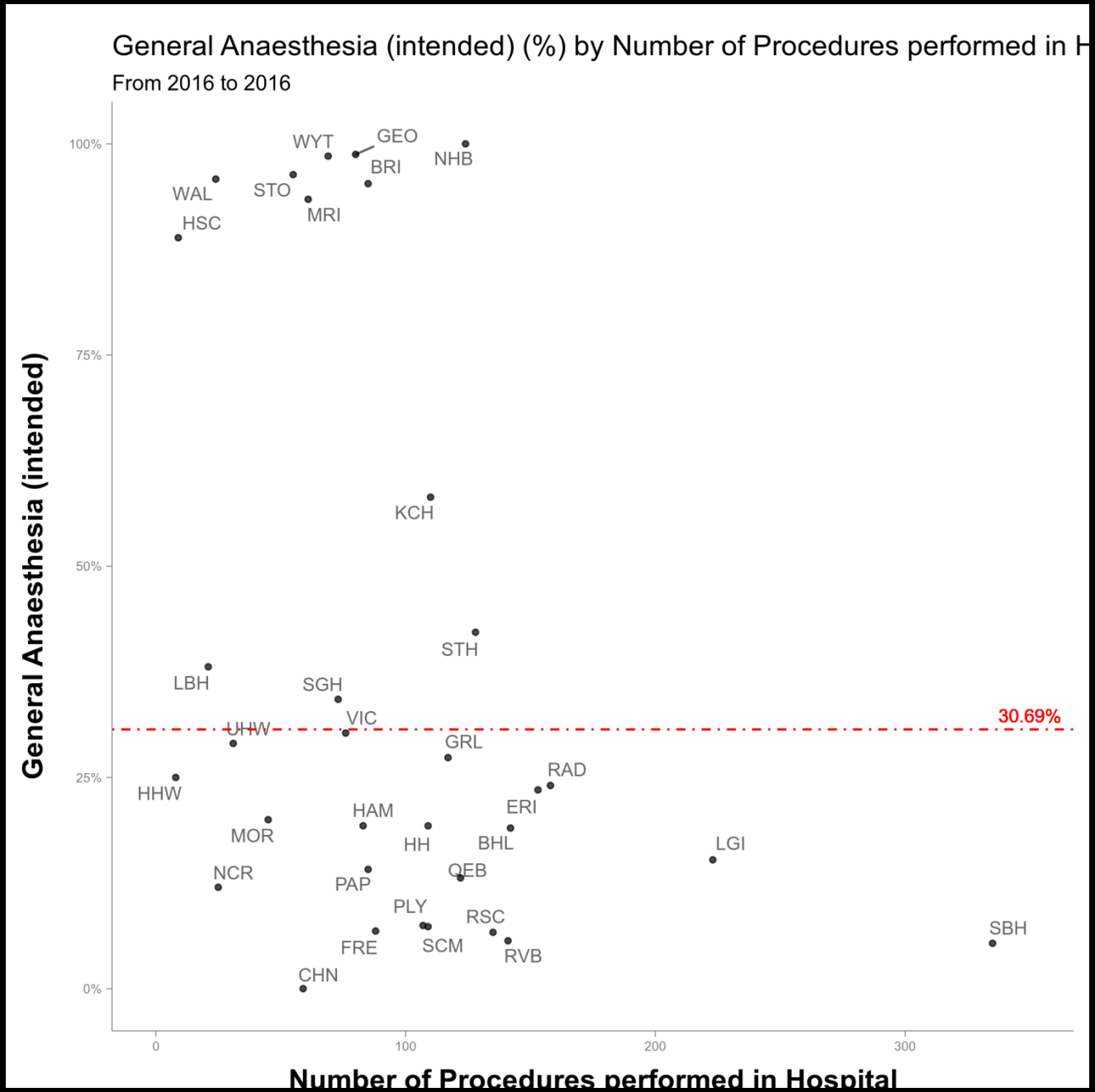
NICOR

SCTS

BCIS

2016 data

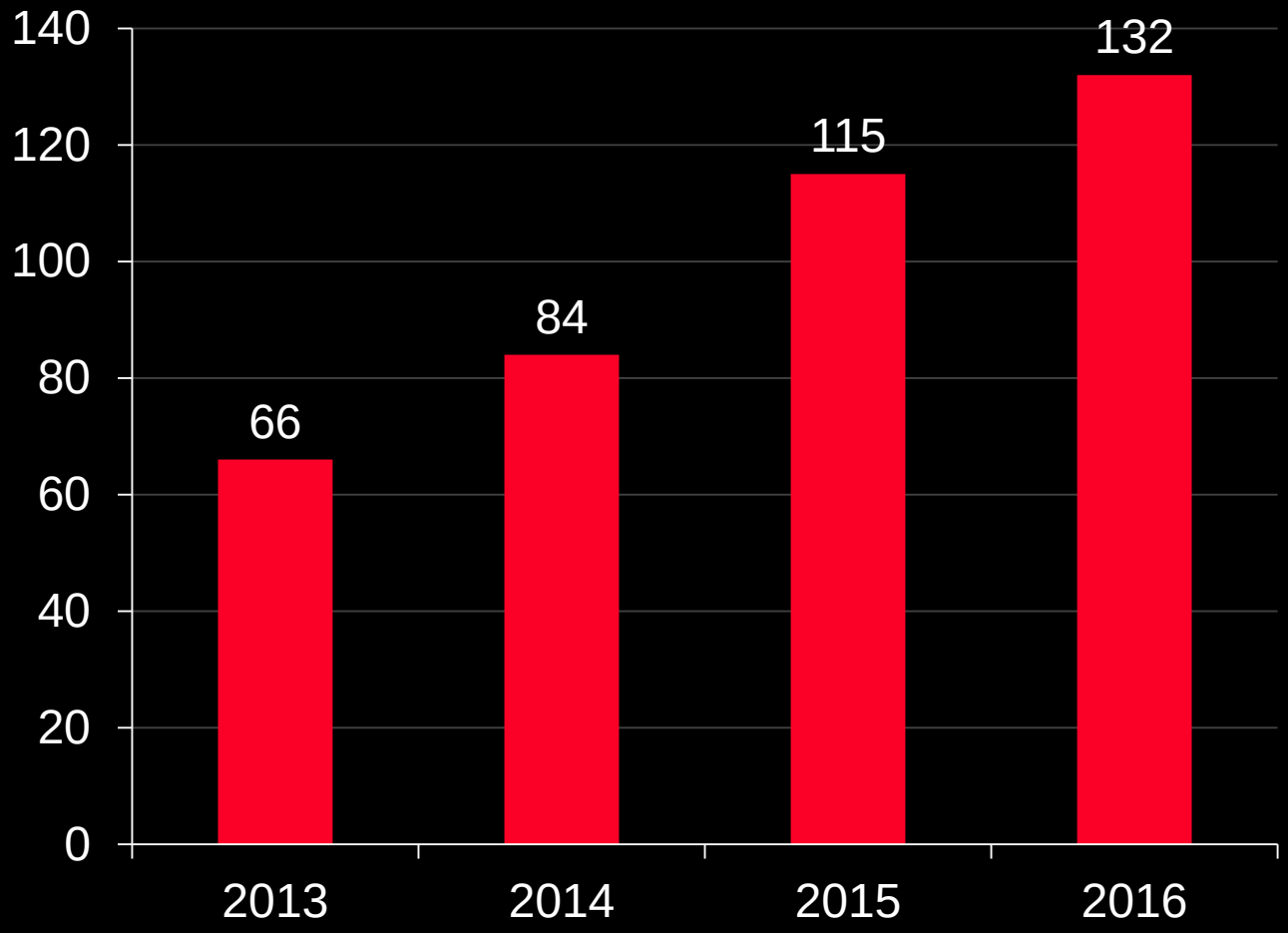
(data extracted May 2017)



TAVI for Aortic Bioprosthetic failure

2016 data

(data extracted May 2017)



NICOR

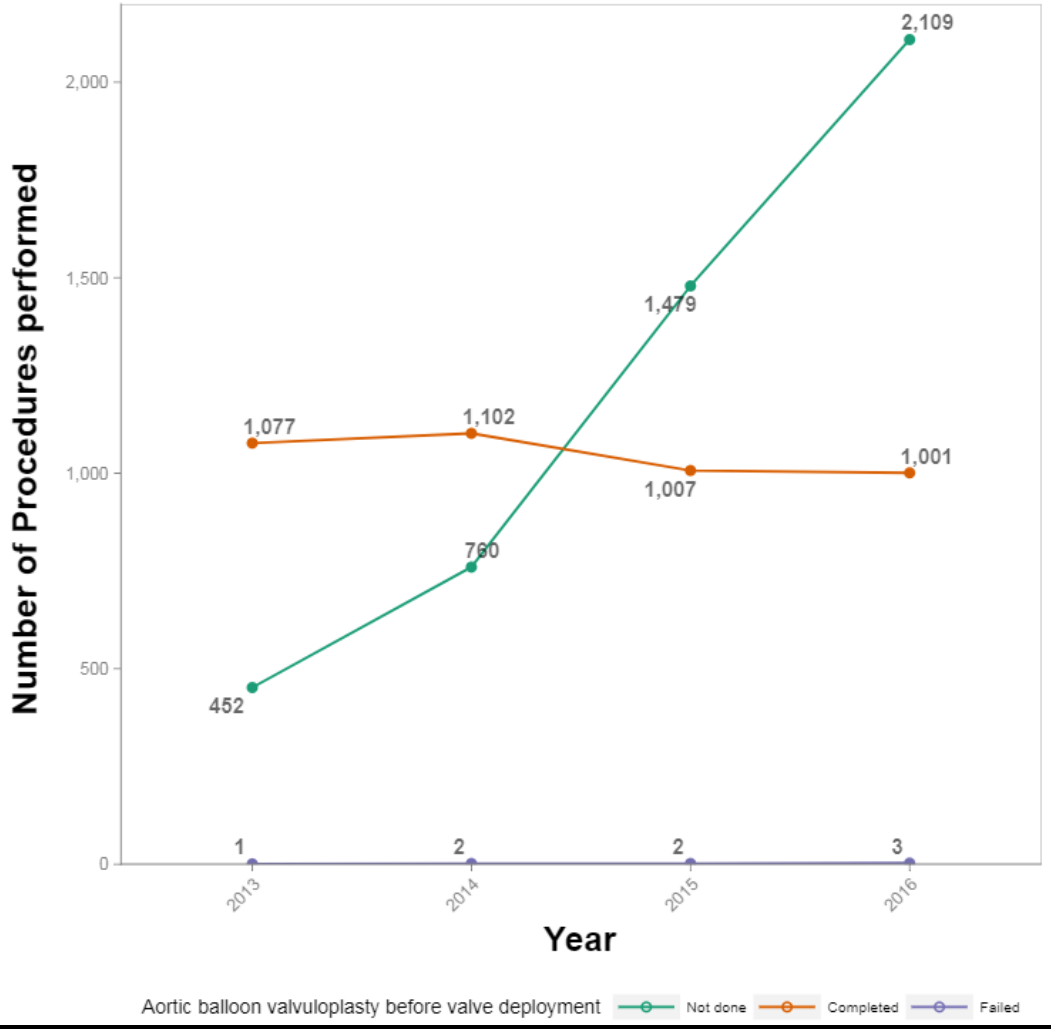
SCTS BCIS

2016 data

(data extracted May 2017)

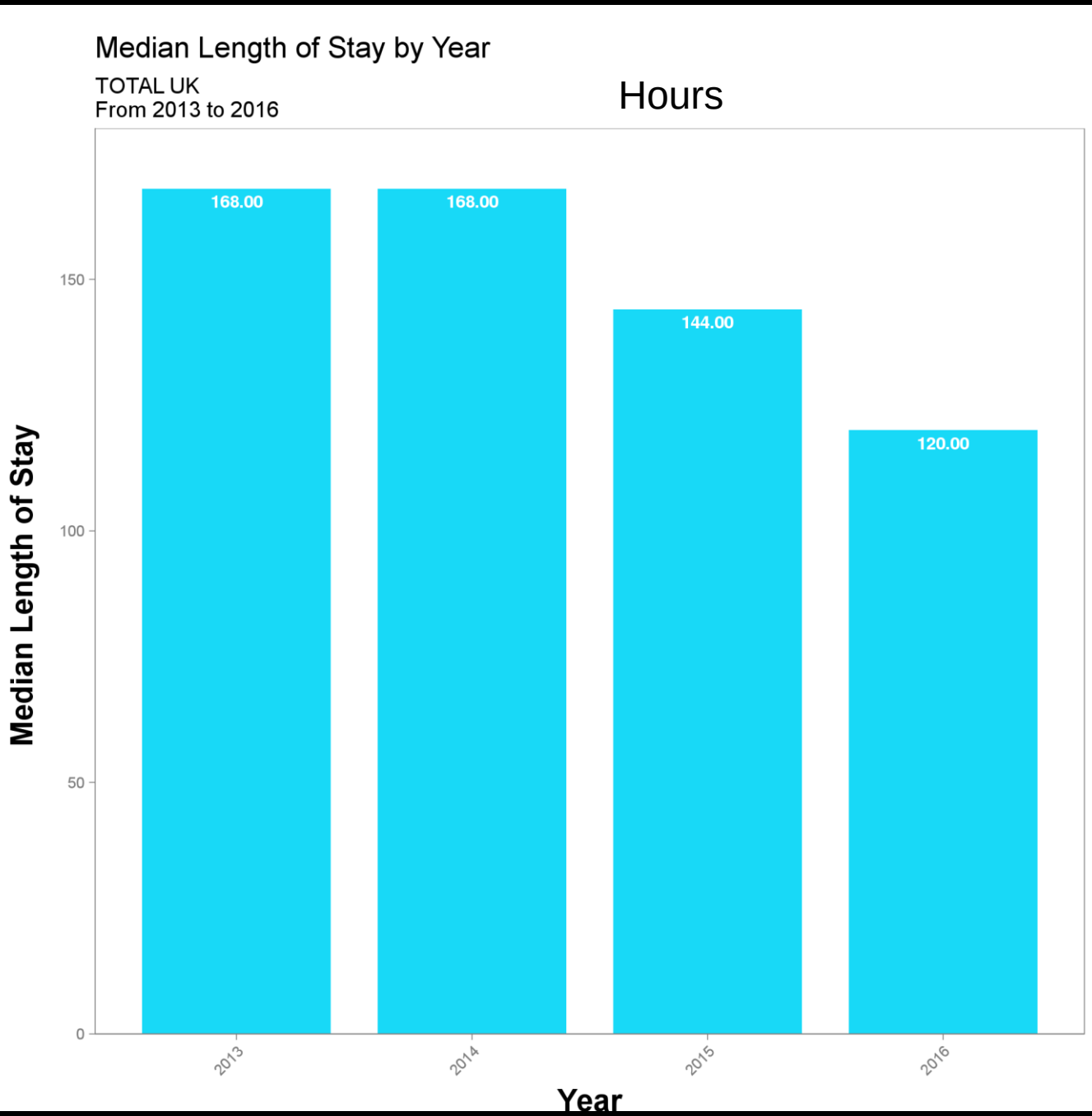
Number of Procedures performed by Year
Grouped by Aortic balloon valvuloplasty before valve deployment
TOTAL UK
From 2007 to 2016

Pre-dilatation of AV During TAVI procedure



2016 data

(data extracted May 2017)



NICOR

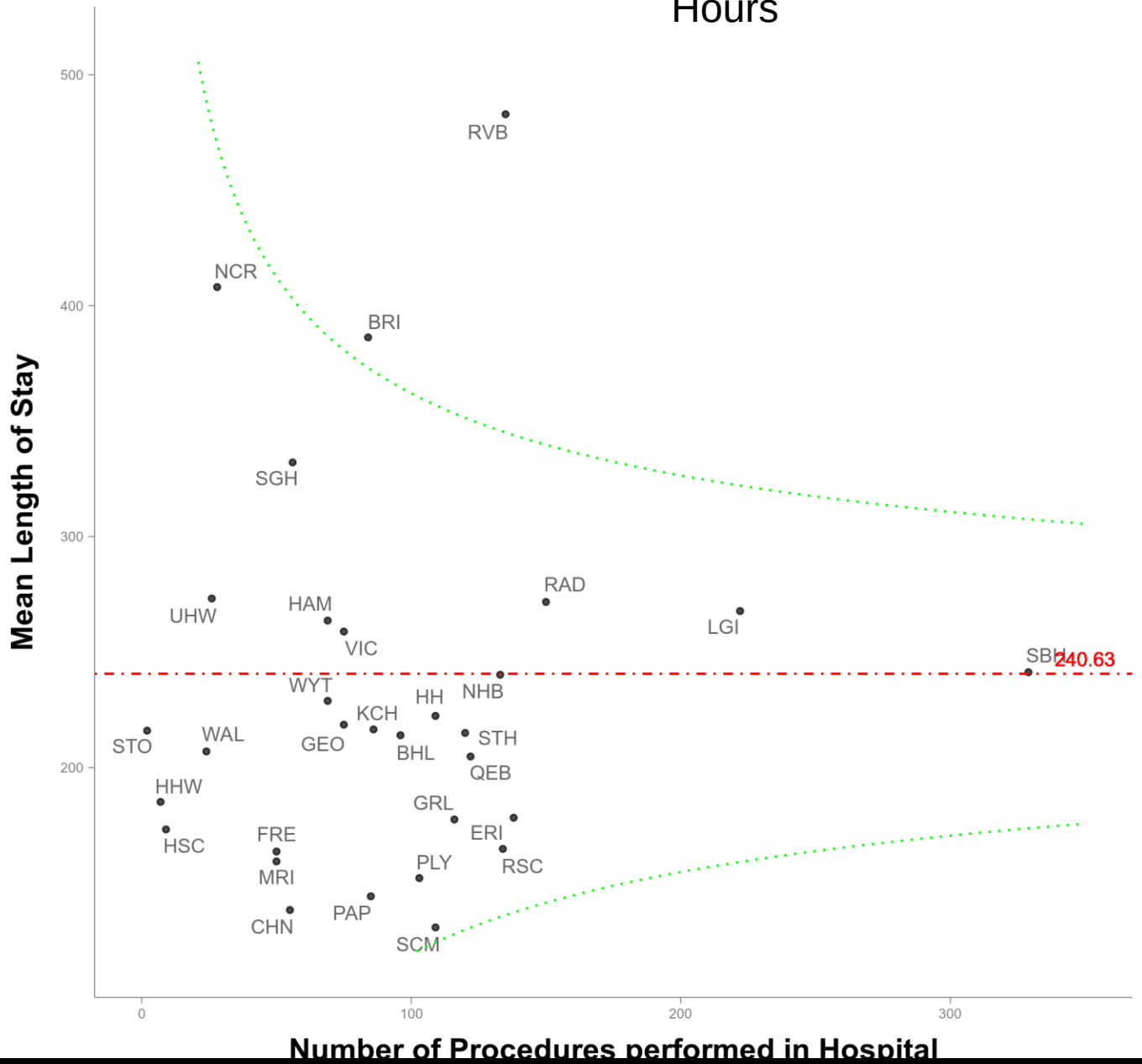
SCTS BCIS

2016 data

(data extracted May 2017)

Mean Length of Stay by Number of Procedures performed in Hospital

From 2016 to 2016



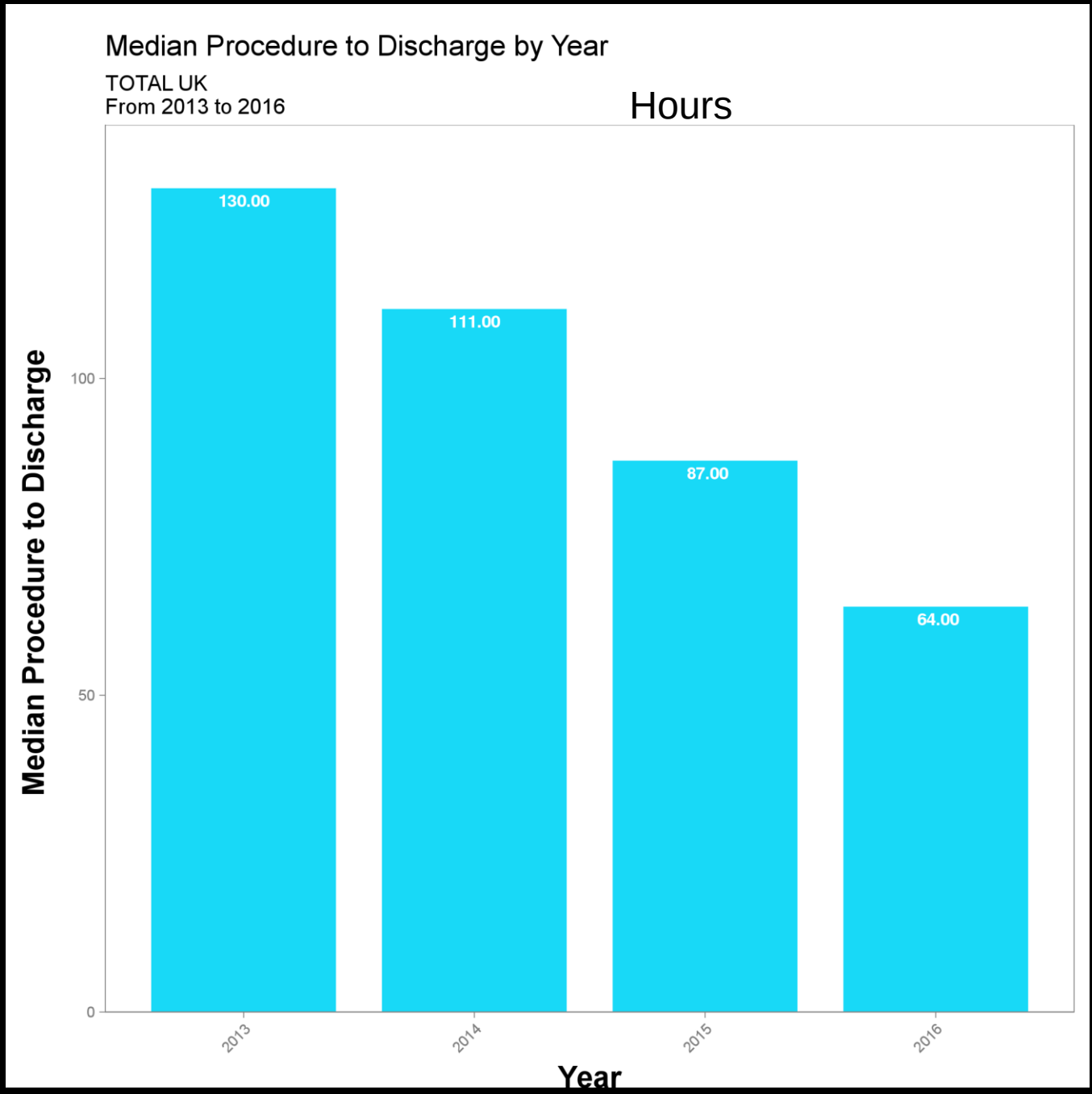
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

SCTS

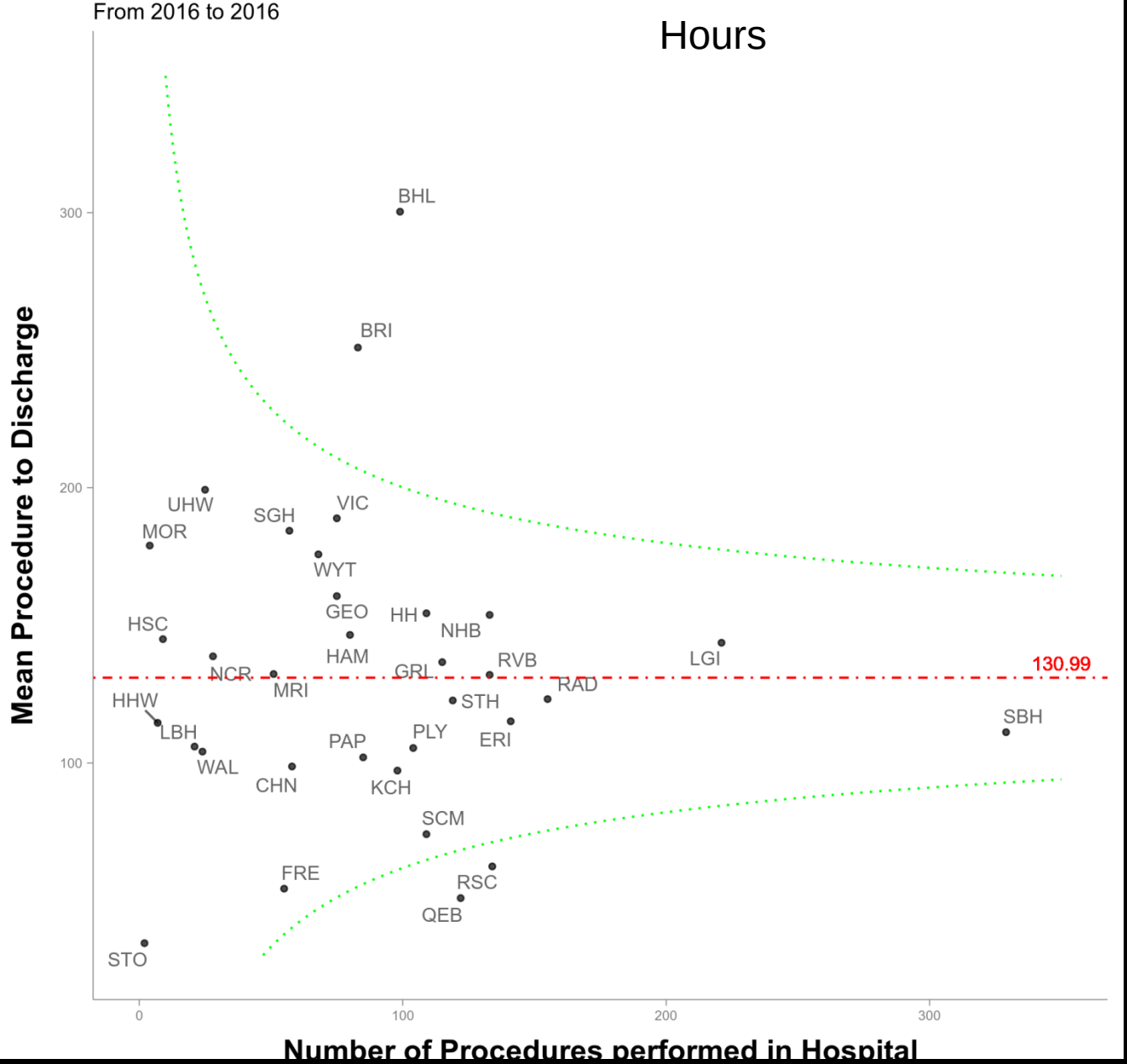
BCIS

2016 data

(data extracted May 2017)

Mean Procedure to Discharge by Number of Procedures performed in Hospital

From 2016 to 2016



NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)

Outcomes

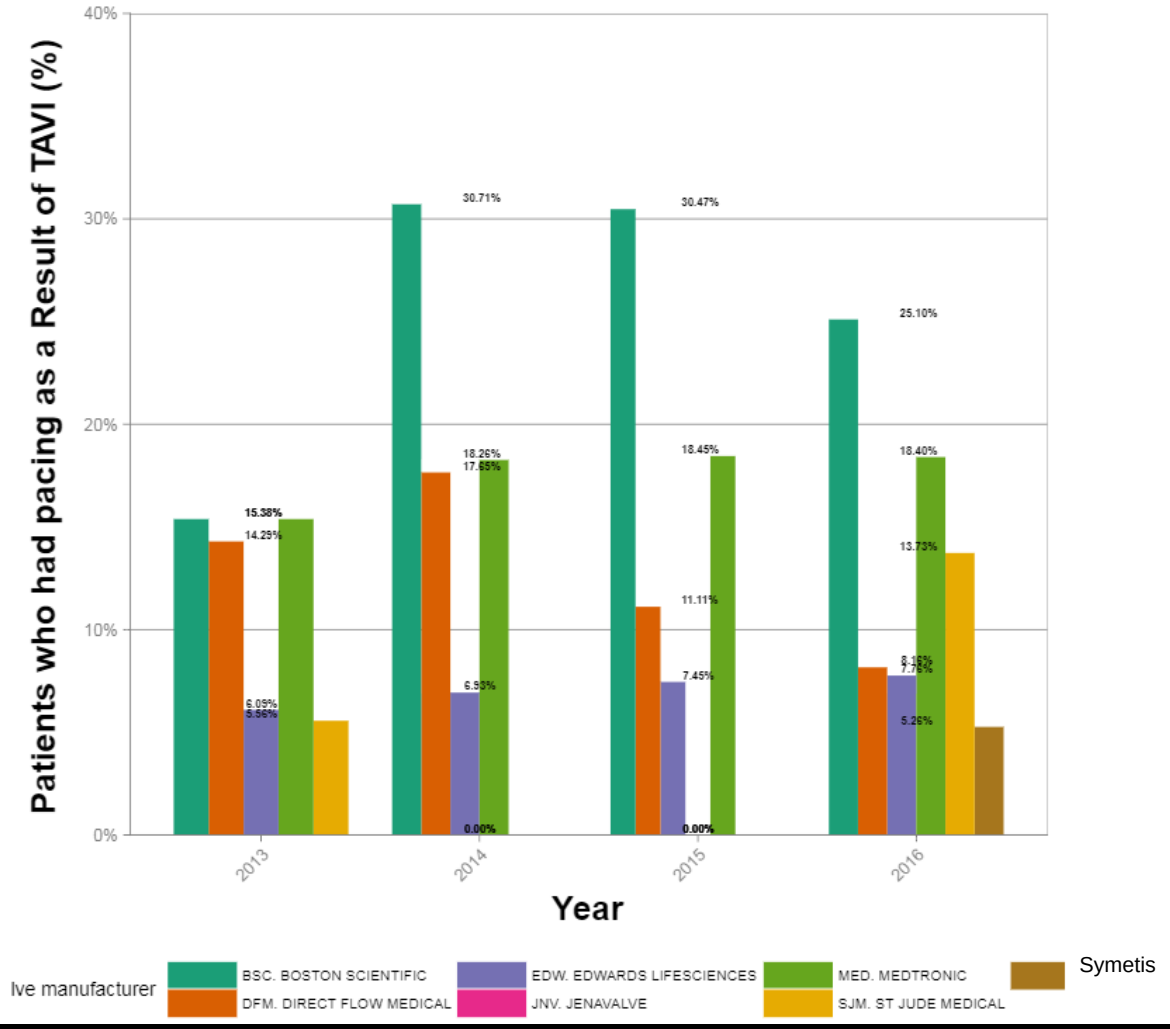
NICOR

SCTS BCIS

2016 data

(data extracted May 2017)

Patients who had pacing as a Result of TAVI (%) by Year
Grouped by Valve manufacturer
TOTAL UK
From 2013 to 2016



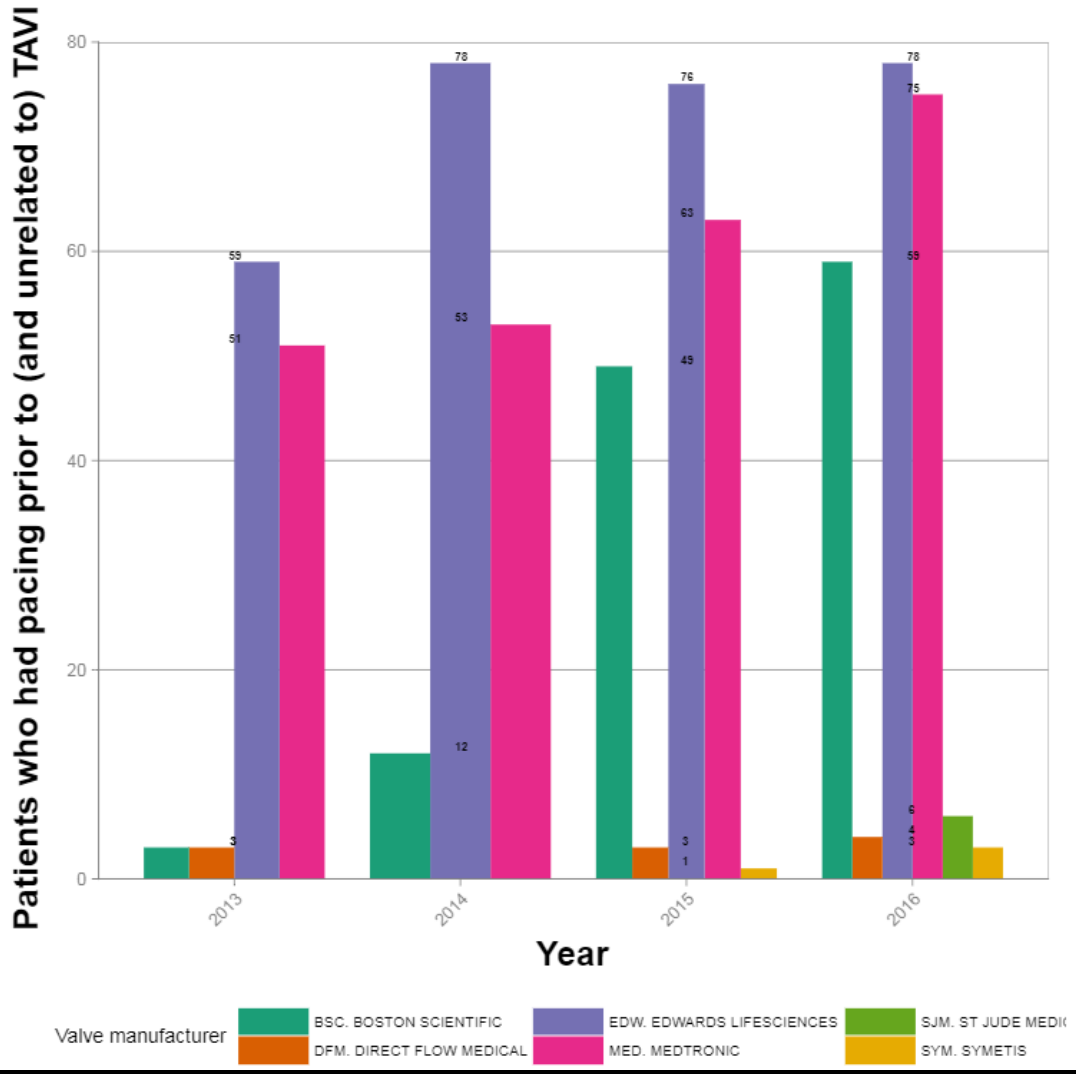
NICOR

SCTS BCIS

2016 data

(data extracted May 2017)

Patients who had pacing prior to (and unrelated to) TAVI by Year
Grouped by Valve manufacturer
TOTAL UK
From 2013 to 2016



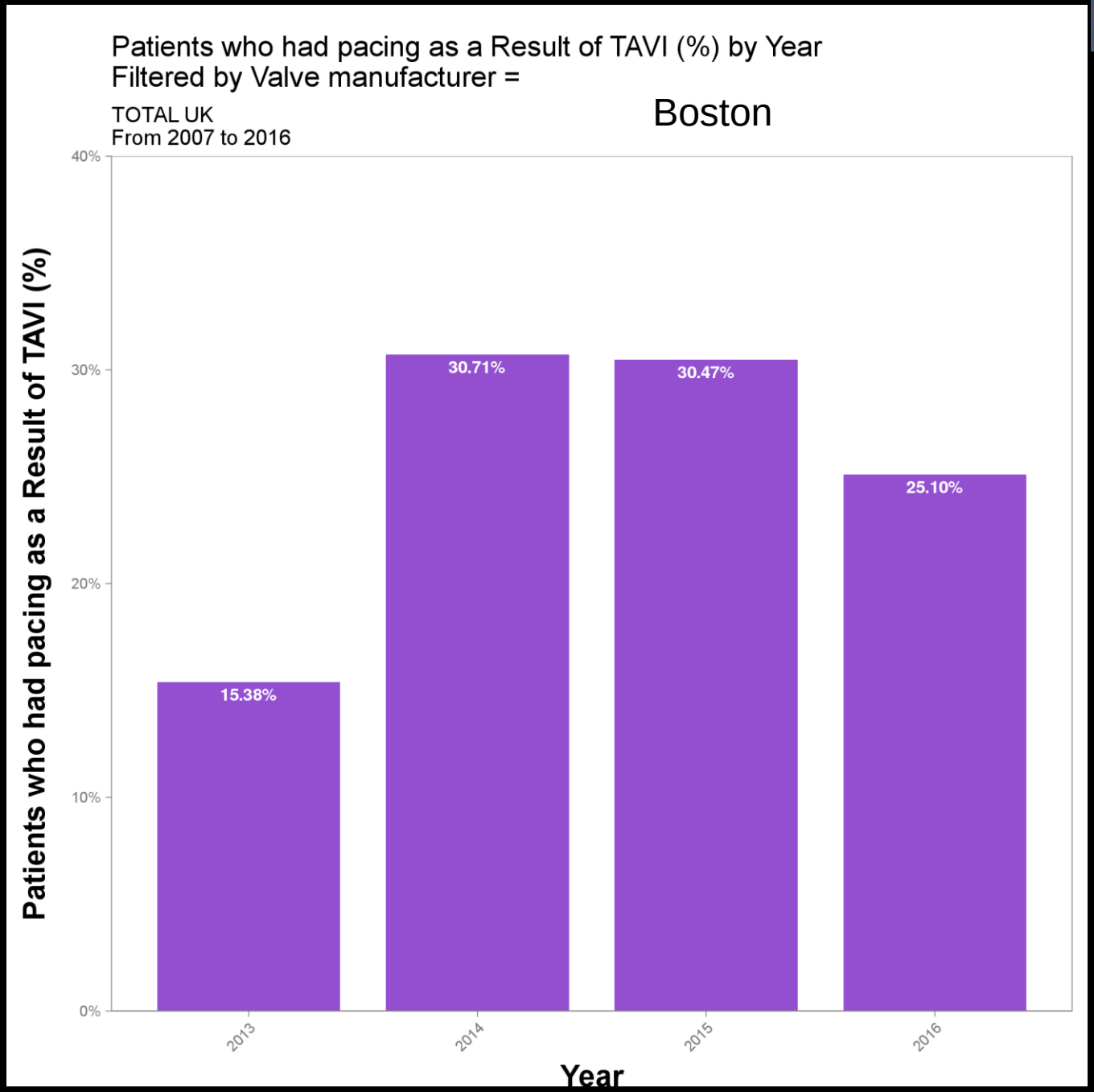
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

SCTS BCIS

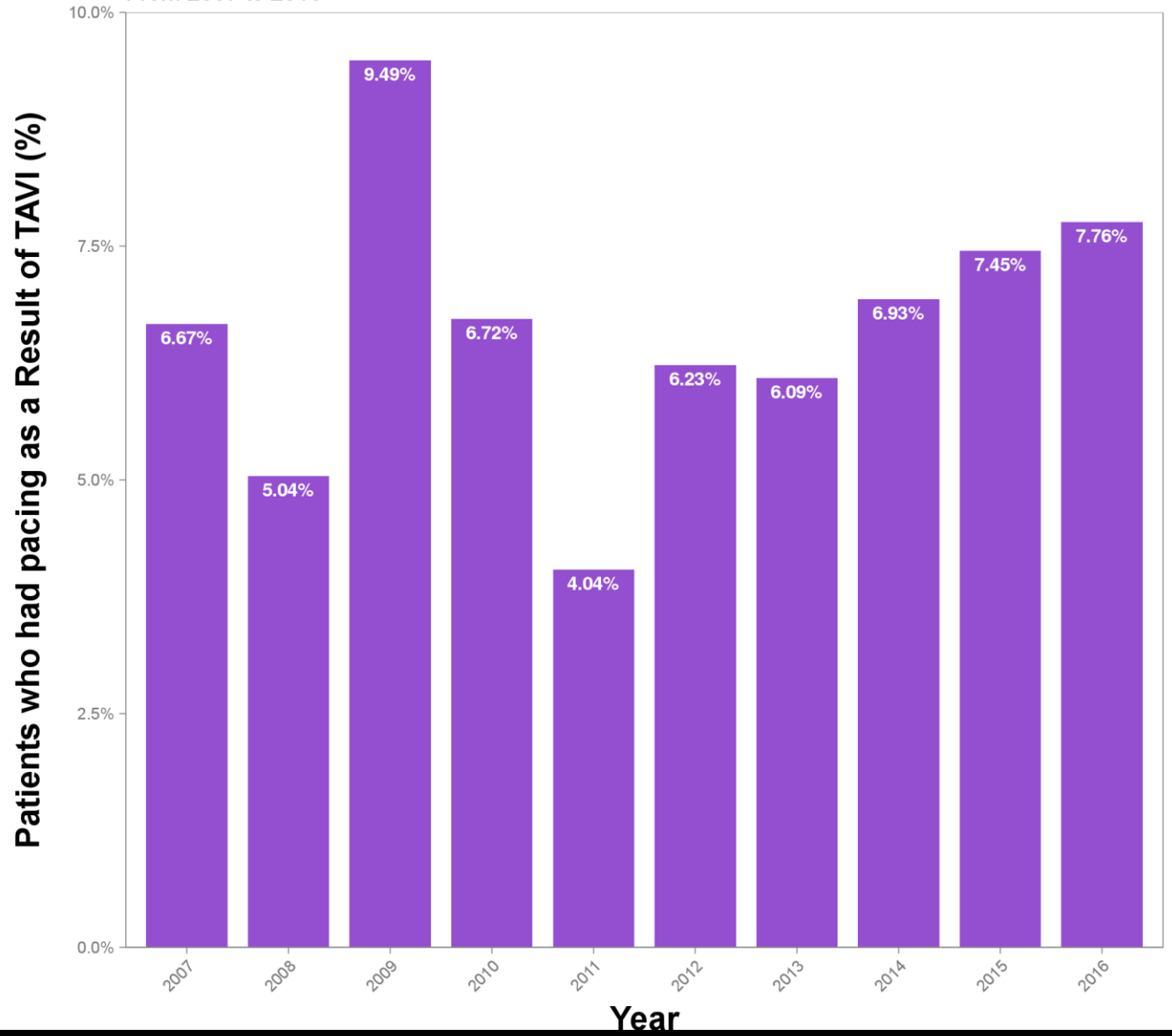
2016 data

(data extracted May 2017)

Patients who had pacing as a Result of TAVI (%) by Year
Filtered by Valve manufacturer =

TOTAL UK
From 2007 to 2016

Edwards



NICOR

SCTS

BCIS

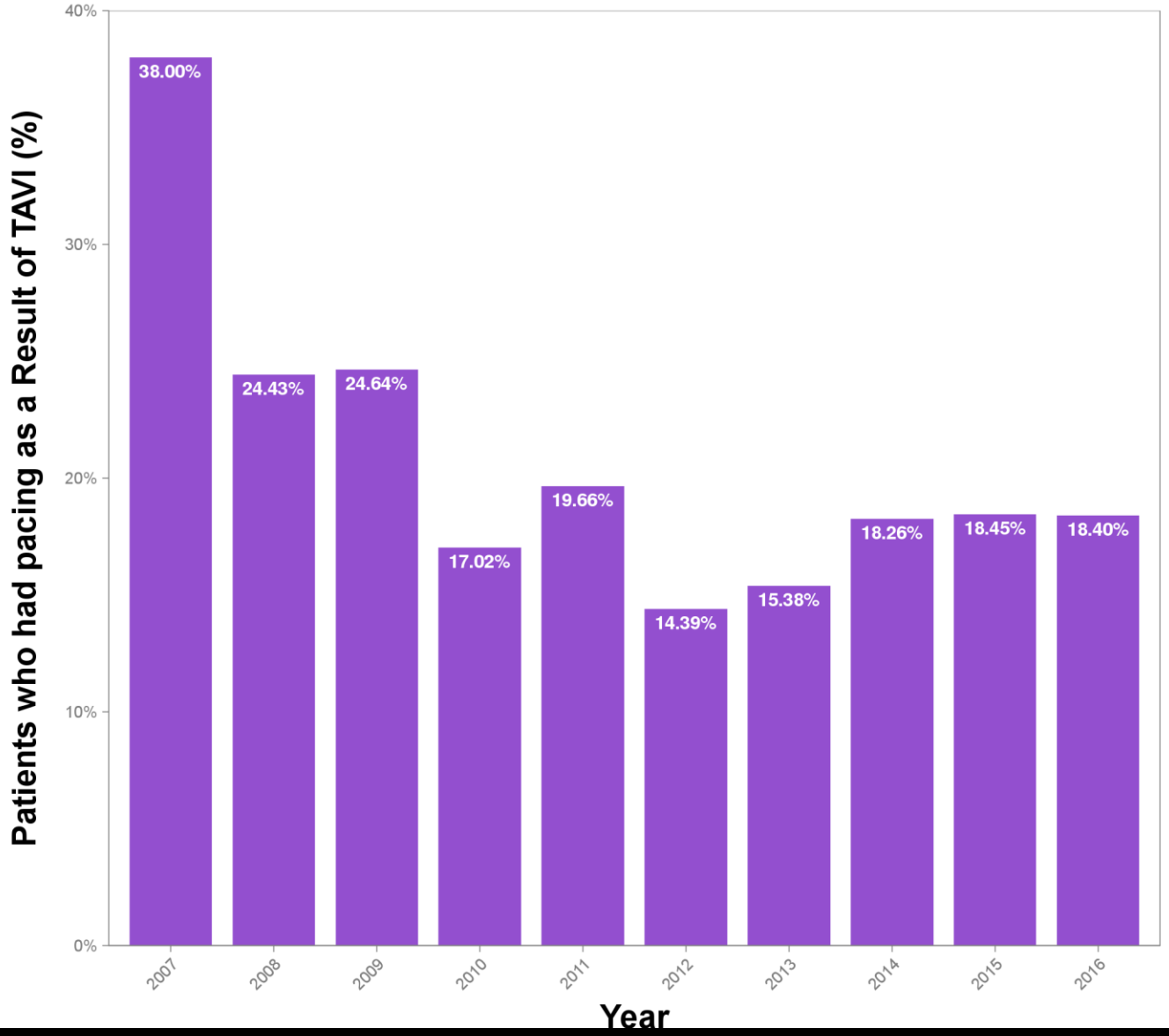
2016 data

(data extracted May 2017)

Patients who had pacing as a Result of TAVI (%) by Year
Filtered by Valve manufacturer =

TOTAL UK
From 2007 to 2016

Medtronic



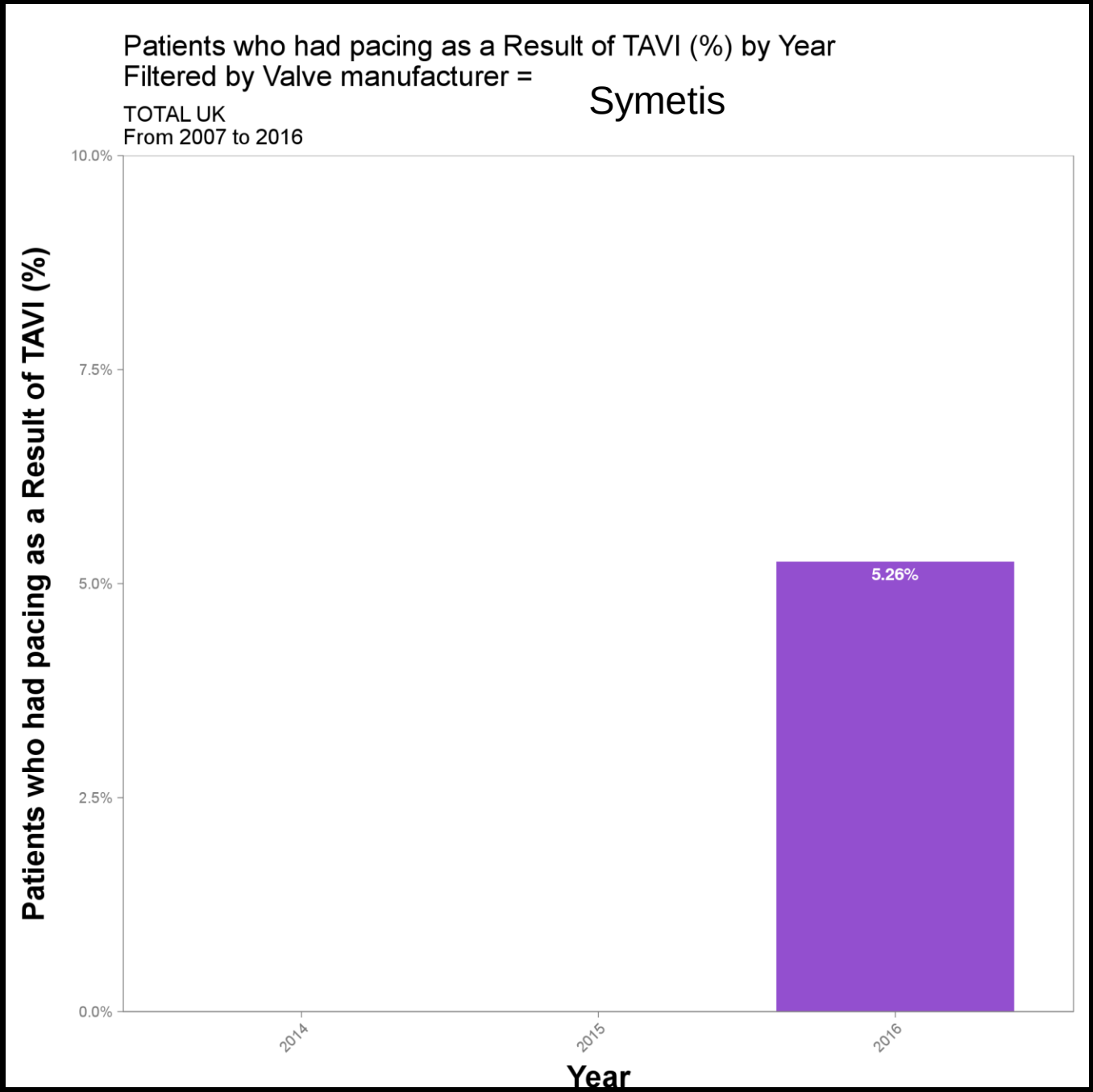
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



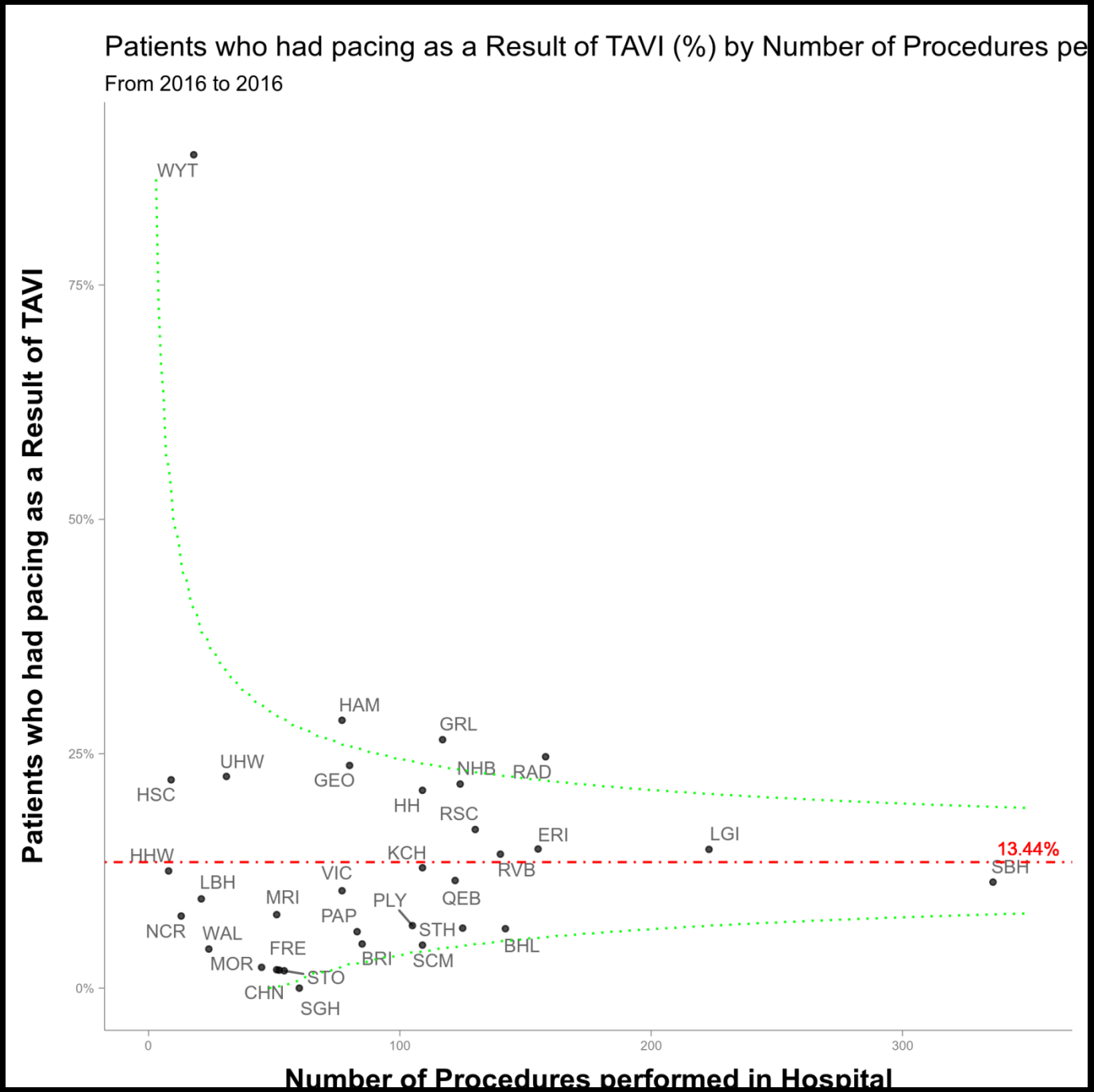
NICOR

SCTS

BCIS

2016 data

(data extracted May 2017)



NICOR

SCTS

BCIS

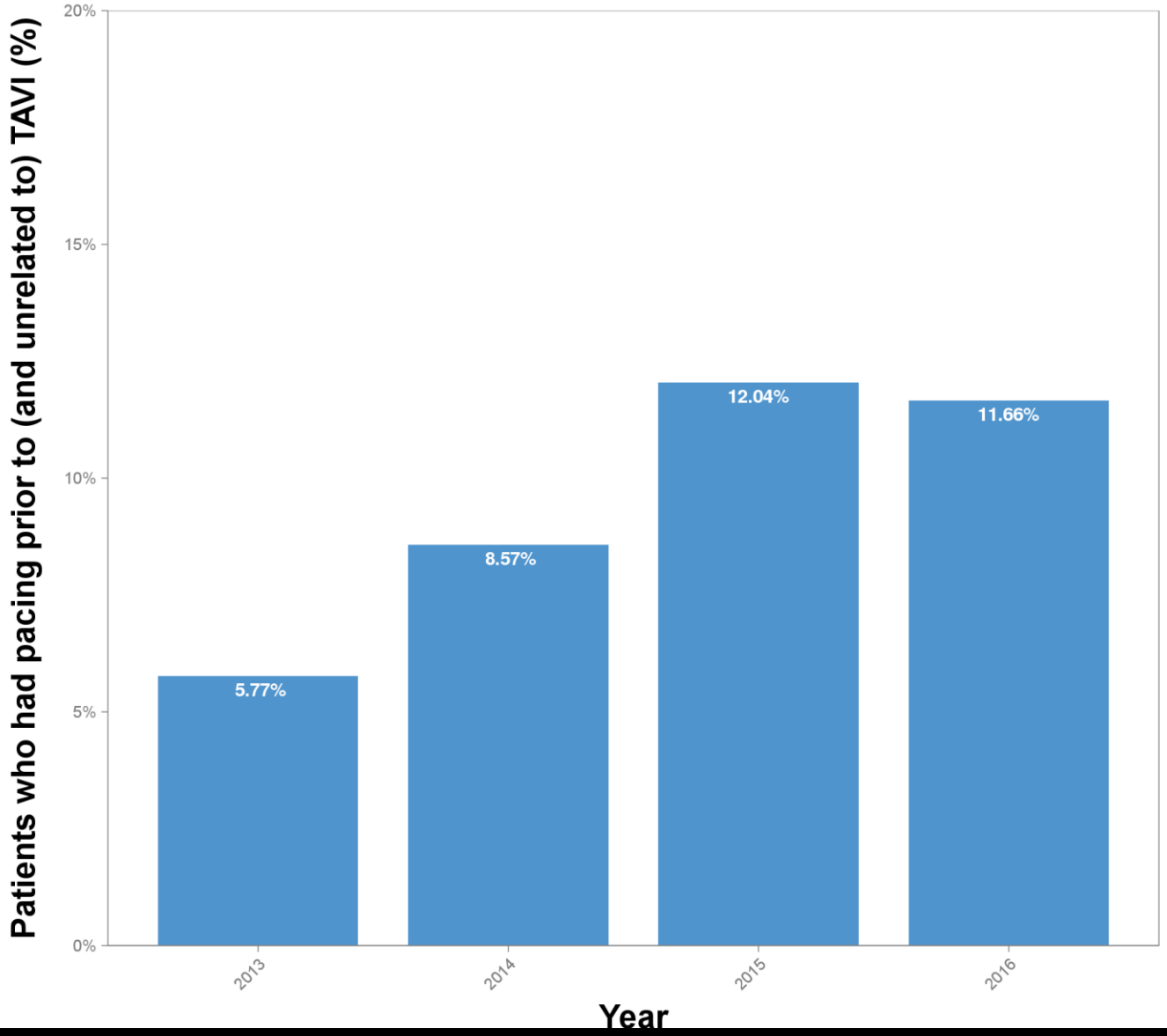
2016 data

(data extracted May 2017)

Patients who had pacing prior to (and unrelated to) TAVI (%) by Year
Filtered by Valve manufacturer =

Boston

TOTAL UK
From 2007 to 2016



NICOR

SCTS

BCIS

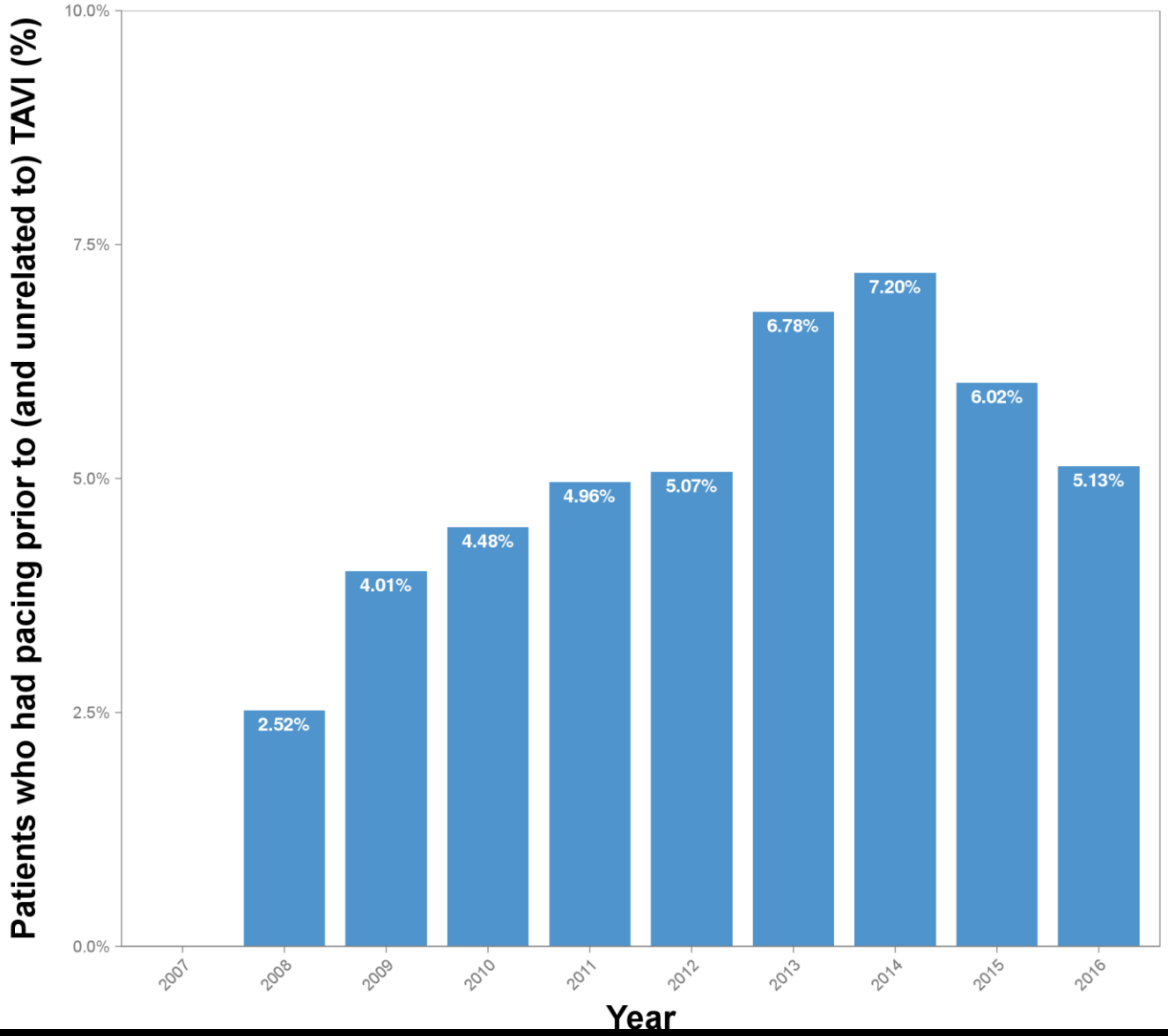
2016 data

(data extracted May 2017)

Patients who had pacing prior to (and unrelated to) TAVI (%) by Year
Filtered by Valve manufacturer =

TOTAL UK
From 2007 to 2016

Edwards



NICOR

SCTS BCIS

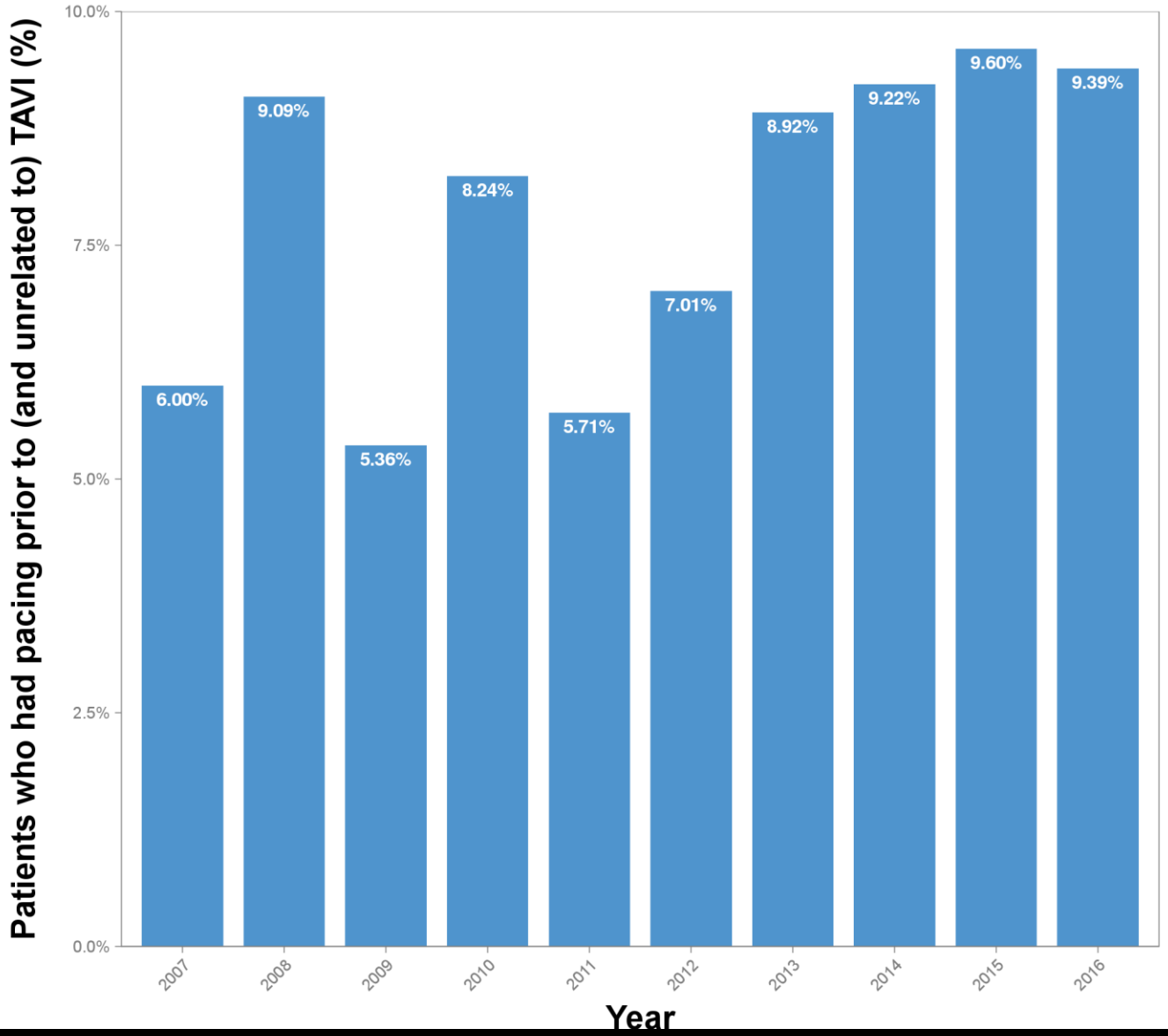
2016 data

(data extracted May 2017)

Patients who had pacing prior to (and unrelated to) TAVI (%) by Year
Filtered by Valve manufacturer =

Medtronic

TOTAL UK
From 2007 to 2016



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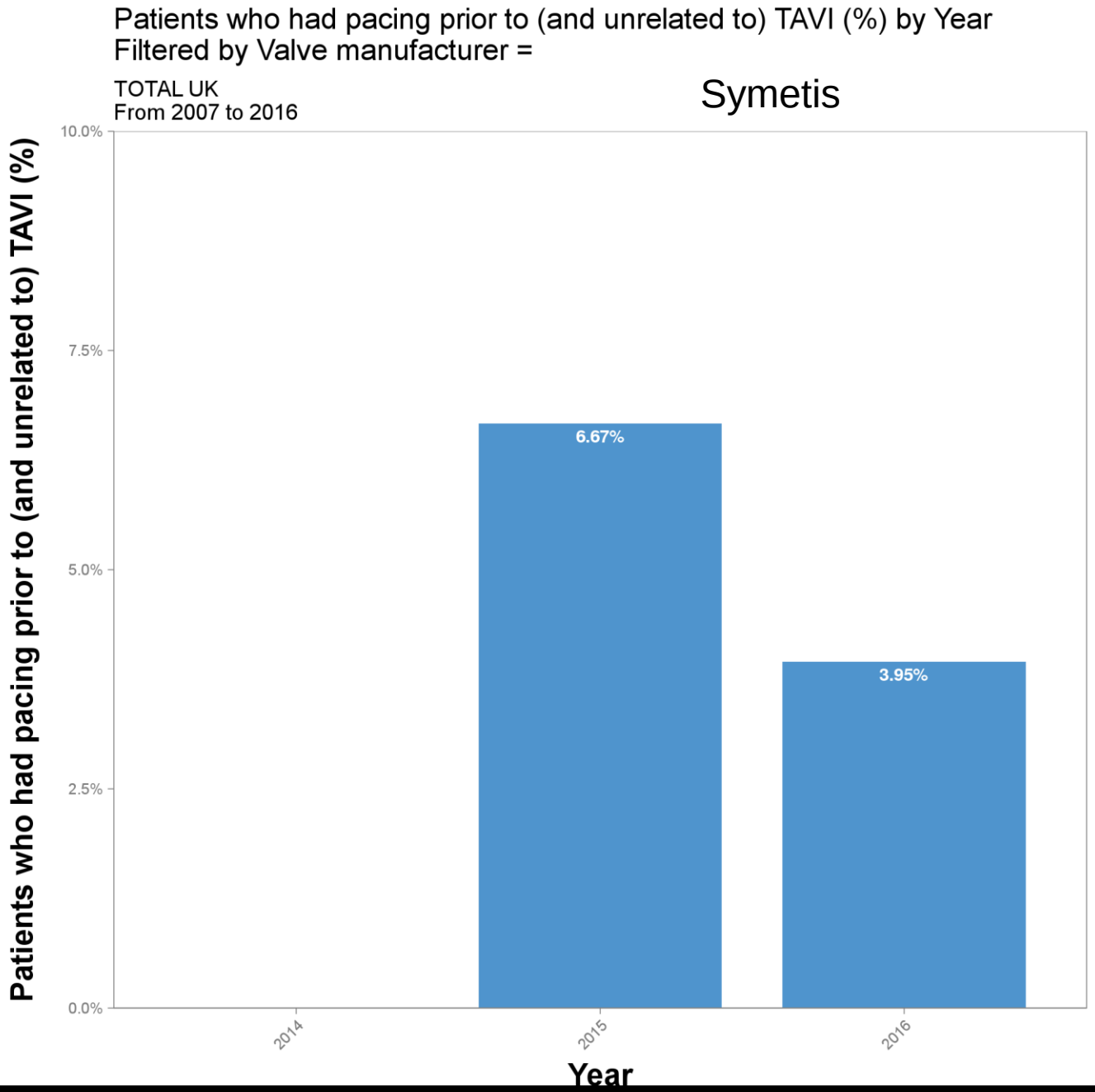
2016 data

(data extracted May 2017)



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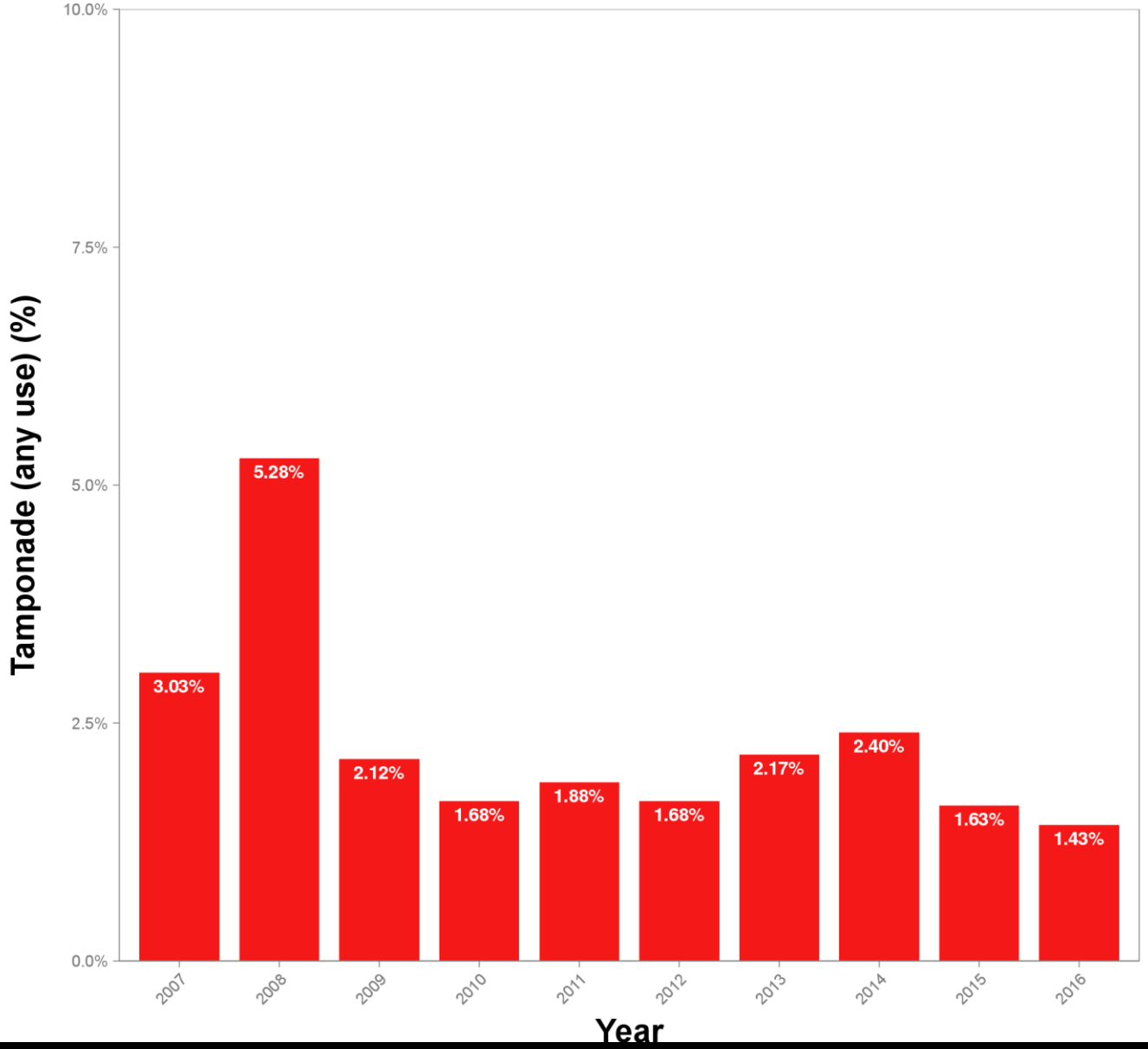
2016 data

(data extracted May 2017)

Tamponade

TOTAL UK
From 2007 to 2016



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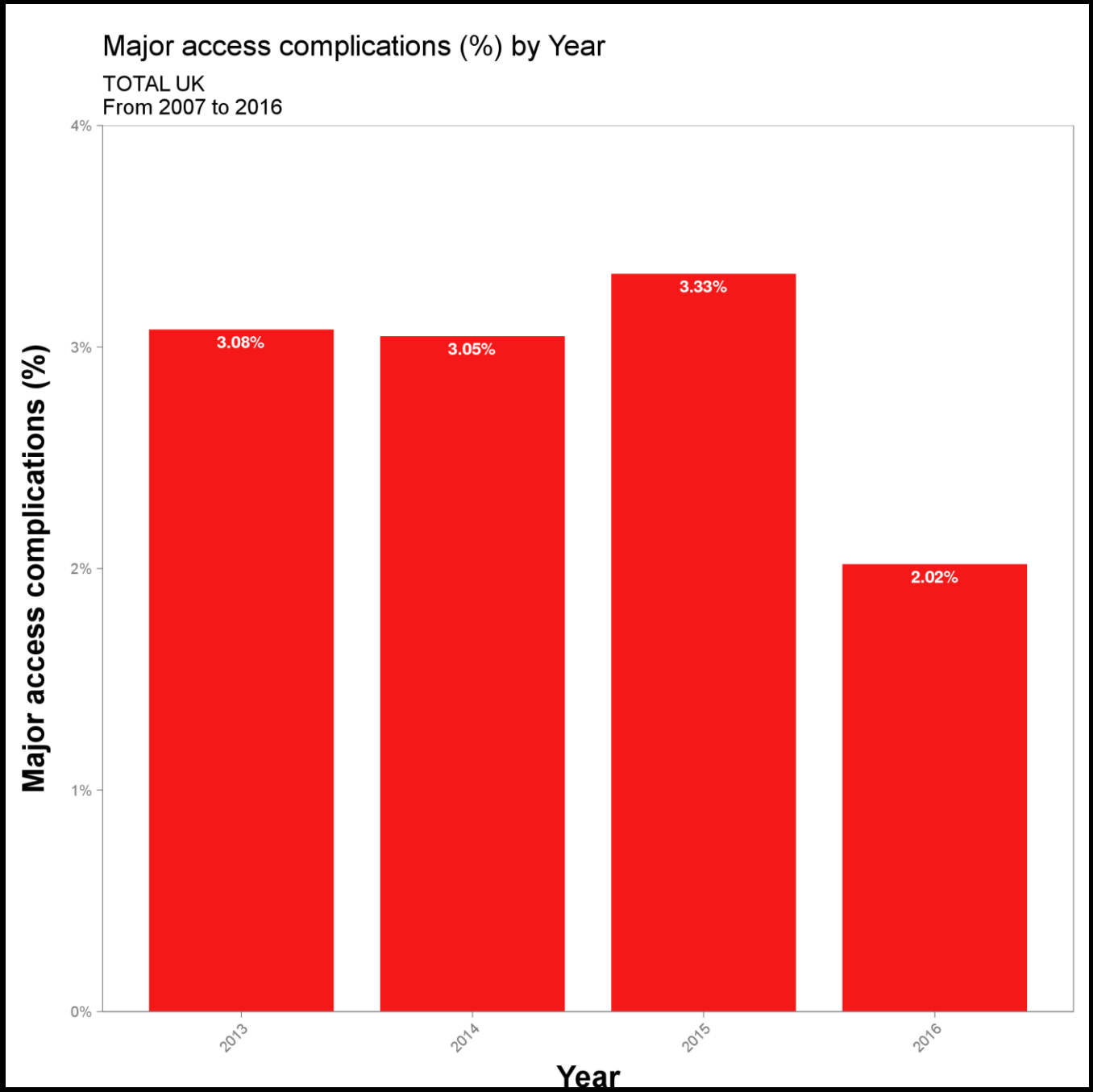
2016 data

(data extracted May 2017)



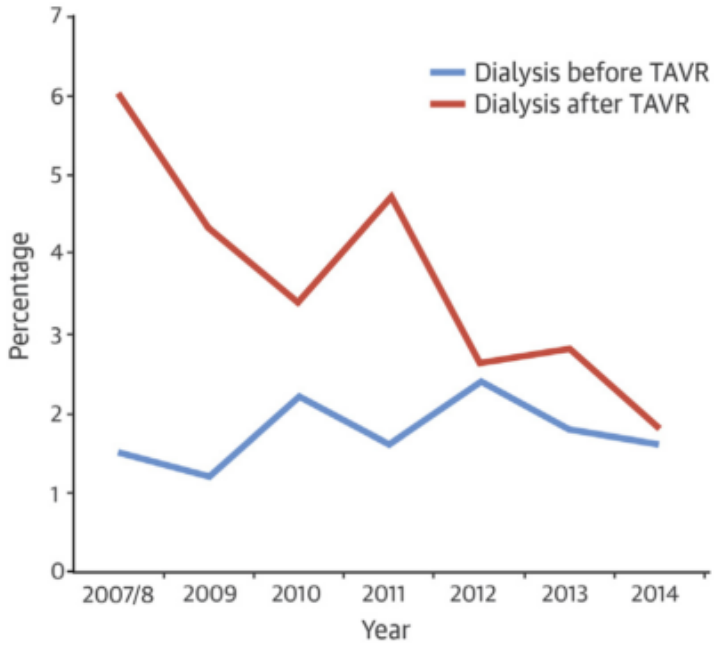
Survival v Dialysis

2016 data

(data extracted May 2017)

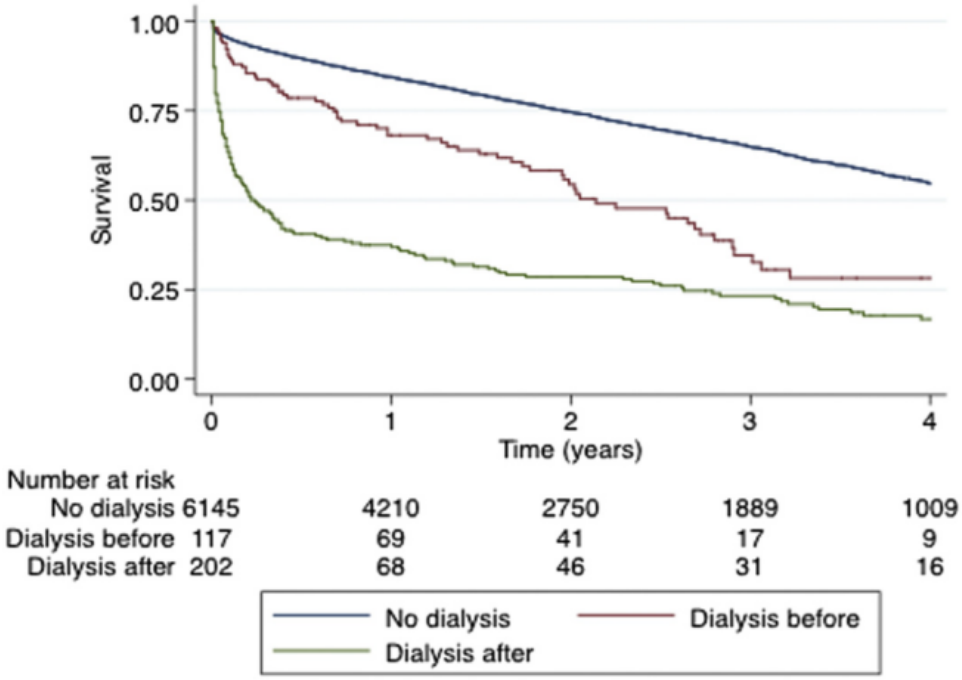
Ferro CJ JACC Int 2017

FIGURE 1 Percentage of Patients on Dialysis Before TAVR and With New Requirement for Dialysis After TAVR (2007 to 2014)



The proportion of patients on dialysis undergoing transcatheter aortic valve replacement (TAVR) has remained constant over the study time period whereas the proportion of patients requiring dialysis for the first time after the procedure has declined.

FIGURE 2 Kaplan-Meier Curves for All-Cause Cumulative Survival



Study patients are divided according to the need for dialysis either before or after transcatheter aortic valve replacement (global log-rank test $p < 0.001$). Patients requiring dialysis after transcatheter aortic valve replacement had a higher mortality than both patients already on dialysis (pairwise log-rank test $p < 0.001$) and those with no dialysis requirement (pairwise log-rank test $p < 0.001$).

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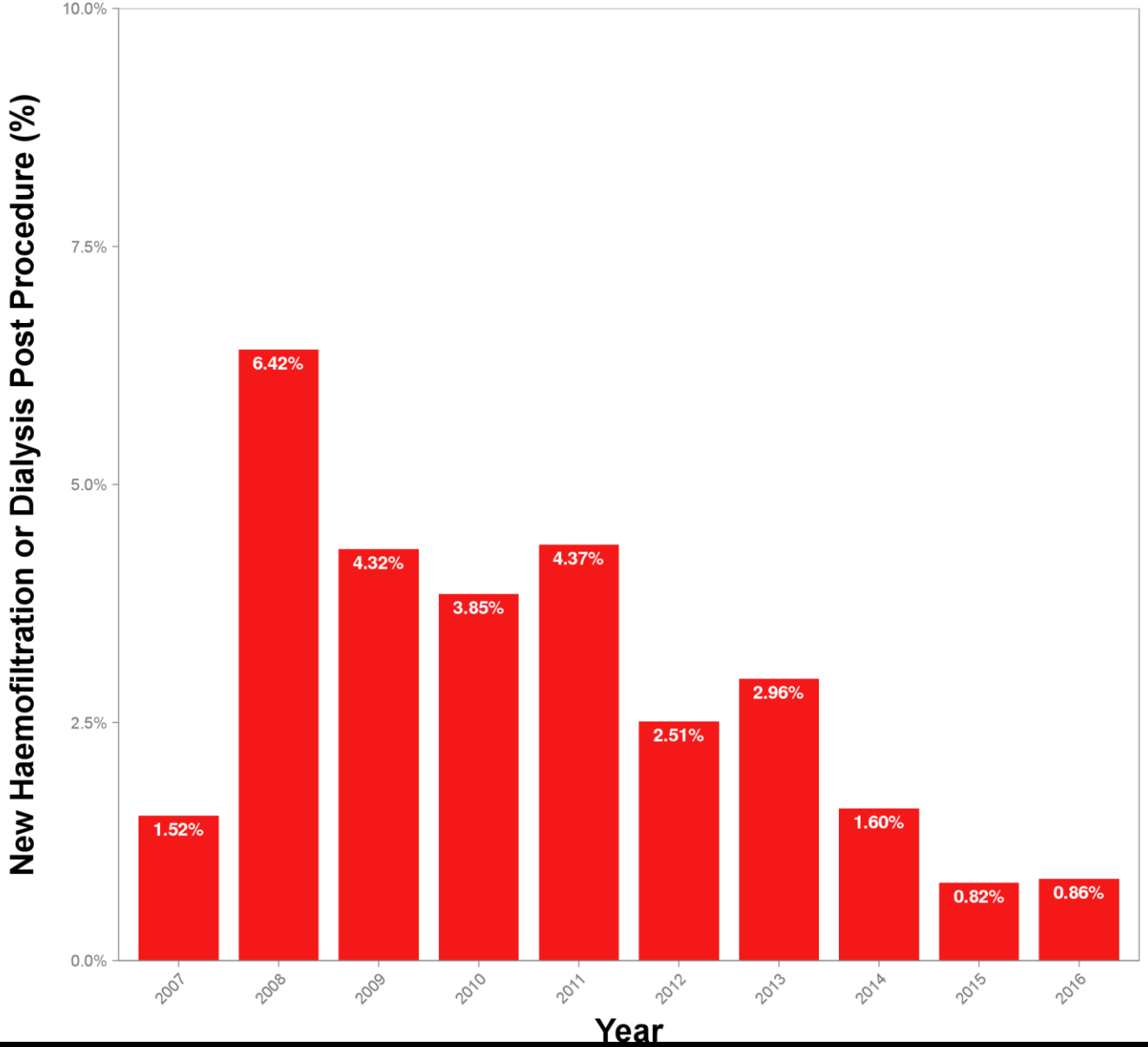
2016 data

(data extracted May 2017)

New Haemofiltration or Dialysis Post Procedure (%) by Year

TOTAL UK
From 2007 to 2016



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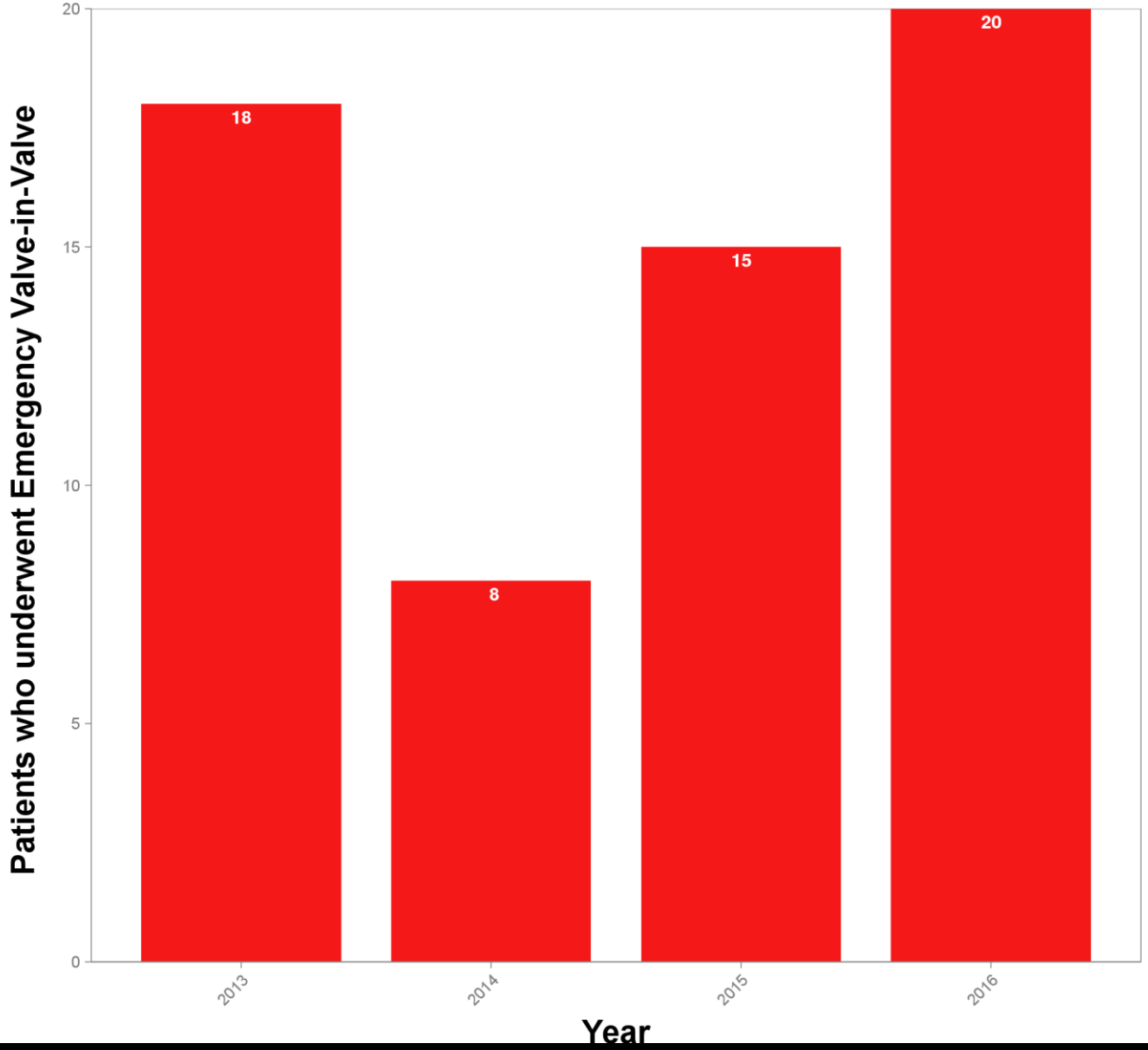
BCIS

2016 data

(data extracted May 2017)

Patients who underwent Emergency Valve-in-Valve by Year

TOTAL UK
From 2007 to 2016



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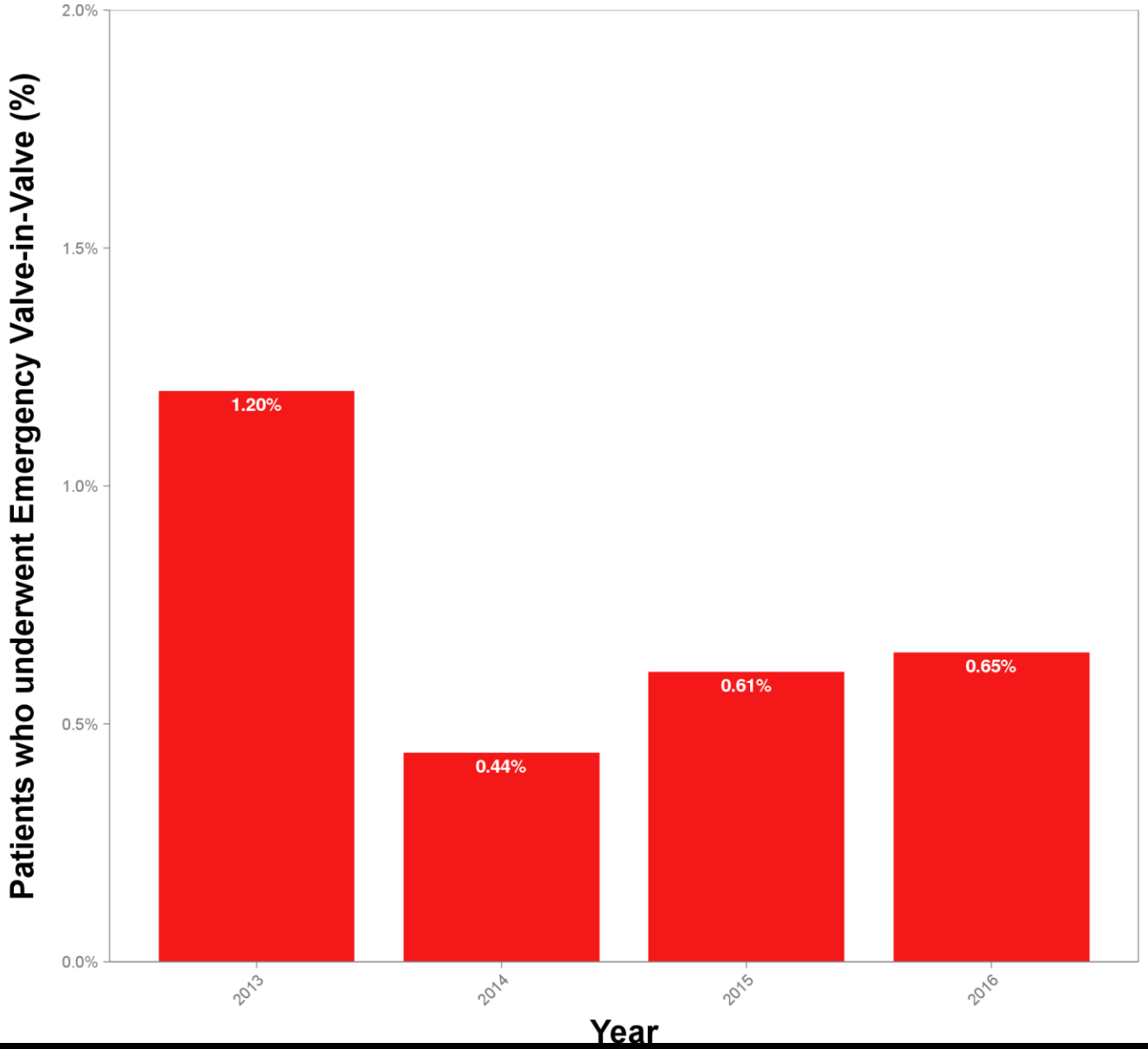
BCIS

2016 data

(data extracted May 2017)

Patients who underwent Emergency Valve-in-Valve (%) by Year

TOTAL UK
From 2007 to 2016

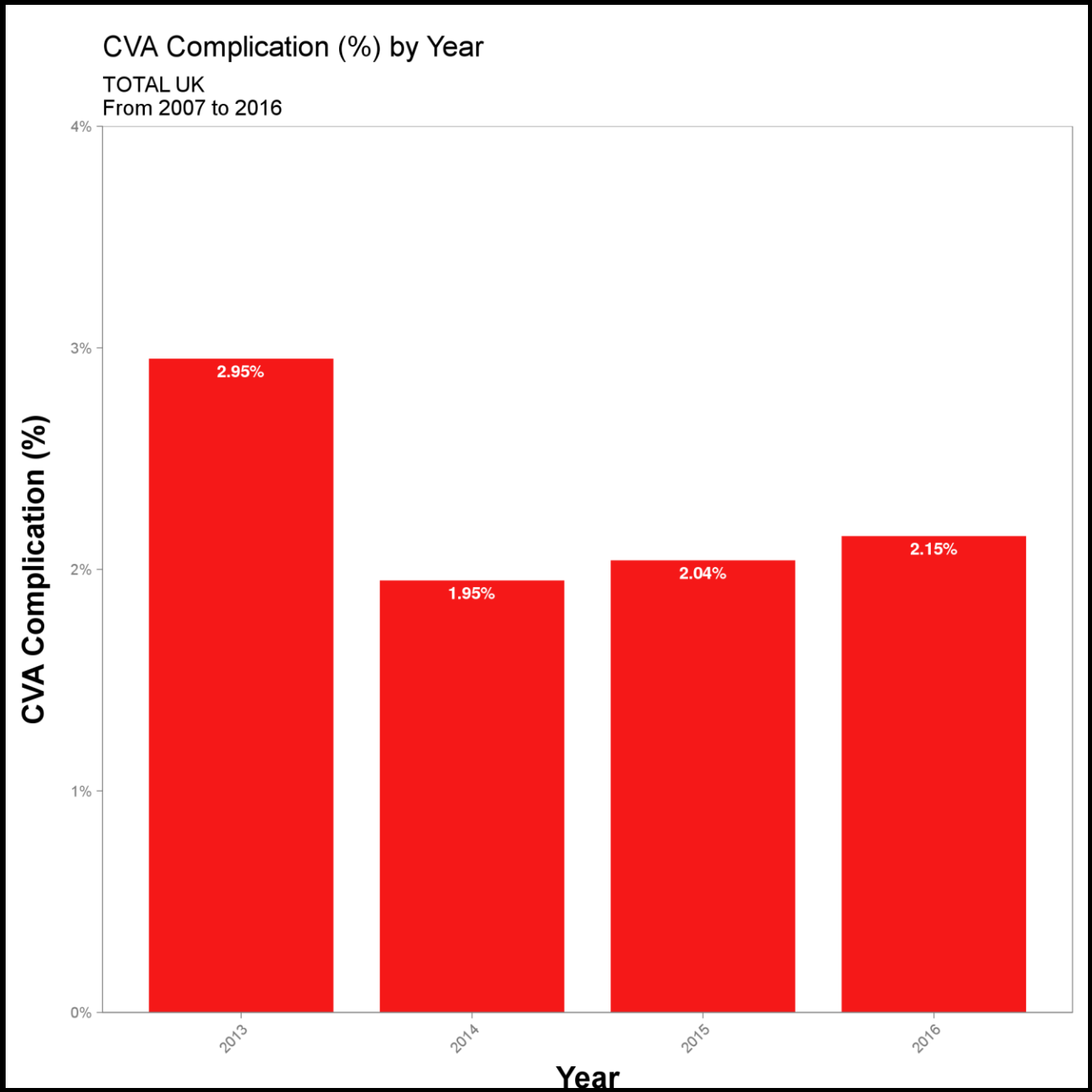


NICOR

SCTS BCIS

2016 data

(data extracted May 2017)



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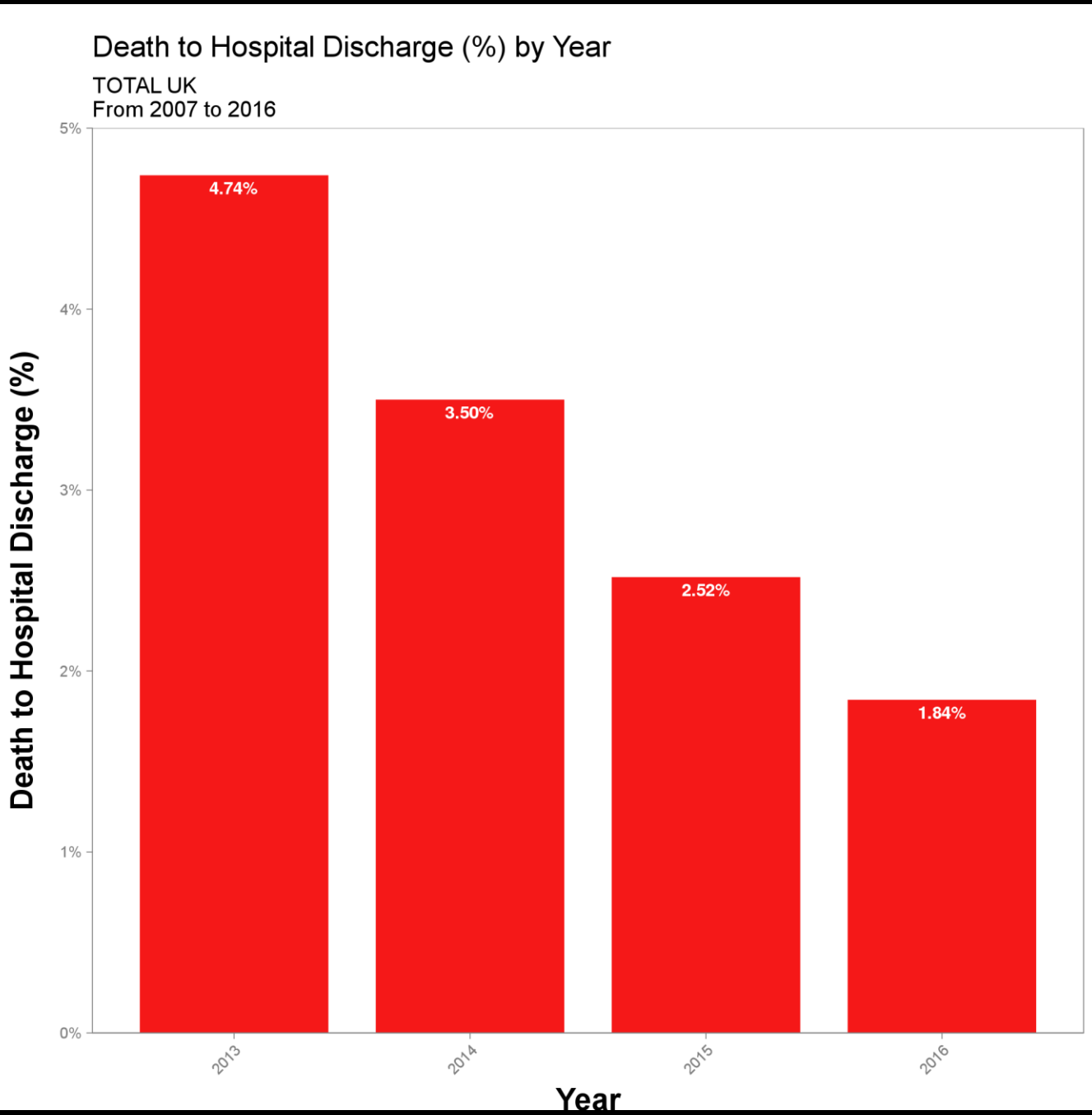
SCTS

BCIS

2016 data

(data extracted May 2017)



Risk Prediction Models

Martin GP, AHJ 2016;184:97-105

	Calibration	AUC
German AV	0.44	0.59
FRANCE-2	0.69	0.62
OBSERVANT	0.39	0.57
ACC-TAVI	0.67	0.64
LES	0.35	0.57
ESII	0.40	0.59
STS	0.56	0.60

Prediction Model with Frailty
30-day Mortality after TAVI in the United Kingdom

2016 data

(data extracted May 2017)

Martin G et al. Heart in press

Table 3: Variables and coefficients included in the final multivariable UK-TAVI CPM.

Variable*	Coefficient (SE)	OR (95% CI)
Intercept	-3.3633 (0.2370)	N/A
Mean-centred Age	0.0095 (0.0086)	1.010 (0.993, 1.027)
Female	0.1051 (0.1183)	1.111 (0.880, 1.401)
Mean-centred BMI	-0.0286 (0.0119)	0.972 (0.949, 0.995)
Mean-centred BMI Squared	0.0013 (0.0000)	1.001 (1.000, 1.003)
Glomerular Filtration Rate per 5 unit increase	-0.0386 (0.014)	0.962 (0.936, 0.989)
Pulmonary disease	0.2375 (0.1275)	1.268 (0.988, 1.628)
Sinus pre-operative heart rhythm	-0.1950 (0.1213)	0.823 (0.649, 1.044)
Prior BAV	0.2594 (0.1651)	1.296 (0.938, 1.791)
Critical pre-operative status	0.6273 (0.2815)	1.873 (1.079, 3.251)
Poor Mobility	0.1865 (0.2376)	1.205 (0.756, 1.920)
CSHA Frailty	0.235 (0.2091)	1.265 (0.840, 1.906)
KATZ<6	0.3776 (0.2839)	1.459 (0.836, 2.545)
PA Systolic pressure >60mmHg	0.2283 (0.1575)	1.257 (0.923, 1.711)
Non-elective procedure	0.3840 (0.1615)	1.468 (1.070, 2.015)
Non-transfemoral access	0.6871 (0.1250)	1.988 (1.556, 2.540)

Abbreviations: BAV: Balloon aortic valvuloplasty, BMI: Body mass index, OR: Odds ratio, SE: standard error

Frailty phenotype:

Vulnerability to physiological stressors

Age associated decline in resilience & reserve.

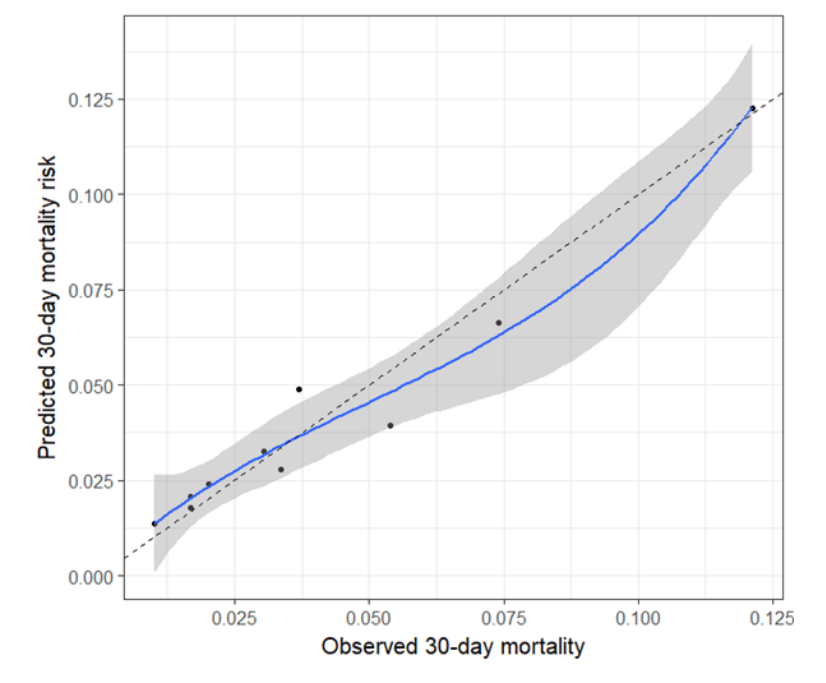
Commonly manifests as slowness, weakness, reduced activity, low energy levels and unintended weight loss.

Prediction Model with Frailty
30-day Mortality after TAVI in the United Kingdom

2016 data

(data extracted May 2017)

Martin G et al. Heart in press



Validation	Calibration Intercept (95% CI)	Calibration Slope (95% CI)	AUC (95% CI)
Apparent	0.00 (-0.18, 0.18)	1.00 (0.76, 1.24)	0.70 (0.65, 0.75)
Internal*	0.02 (-0.17, 0.20)	0.79 (0.55, 1.03)	0.66 (0.61, 0.71)

Prediction Model with Frailty
30-day Mortality after TAVI in the United Kingdom

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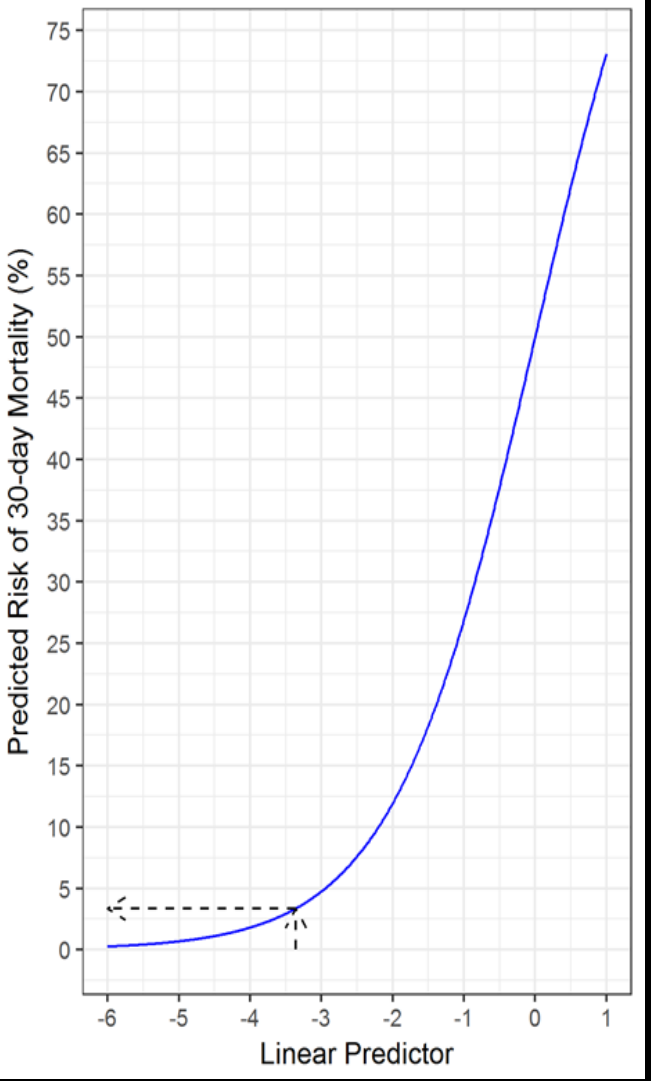
Variable	Coefficient	Score
Intercept	−3.6119	−3.6119
(BMI − 27.3)	−0.0257	–
$(BMI - 27.3)^2$	0.0011	–
Y/N Critical pre-op status	0.5914	–
Y/N Extracardiac arteriopathy	0.1912	–
Y/N Female	0.1393	–
floor round(eGRF/5)	−0.0342	–
(Age − 81.25)	0.0115	–
Y/N Non-TF access	0.5436	–
Y/N PA Systolic >60mmHg	0.1867	–
Y/N Prior BAV	0.2469	–
Y/N Pulmonary disease	0.214	–
Y/N Sinus rhythm	−0.1798	–
Y/N Non-elective procedure	0.3719	–
(6 − KATZ)	0.2362	–
Y/N Poor Mobility	0.6302	–
Linear Predictor (sum Score column)	N/A	–



Prediction Model with Frailty
30-day Mortality after TAVI in the United Kingdom

2016 data

(data extracted May 2017)

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Strong calibration

Only moderate discrimination

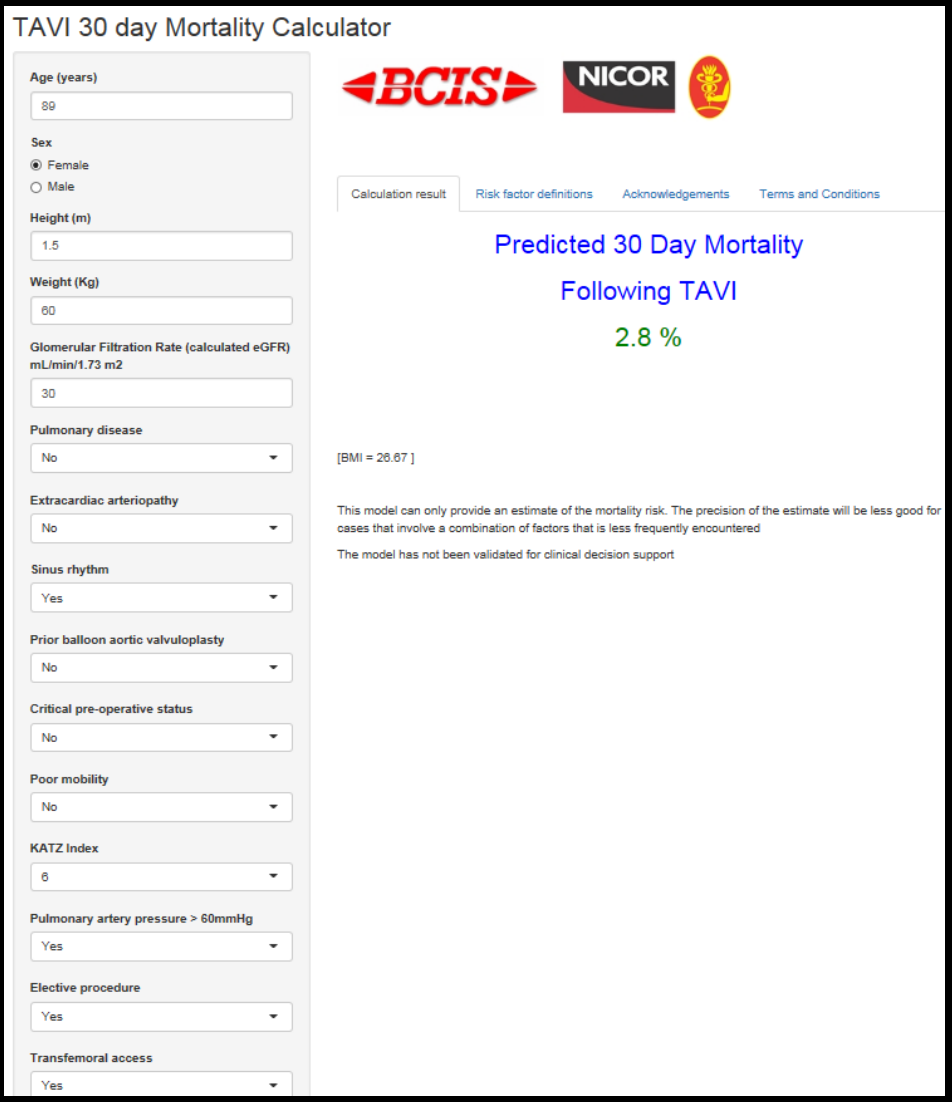
Better for risk-adjusted outcomes between centres than in predicting risk for individual patients being offered TAVI

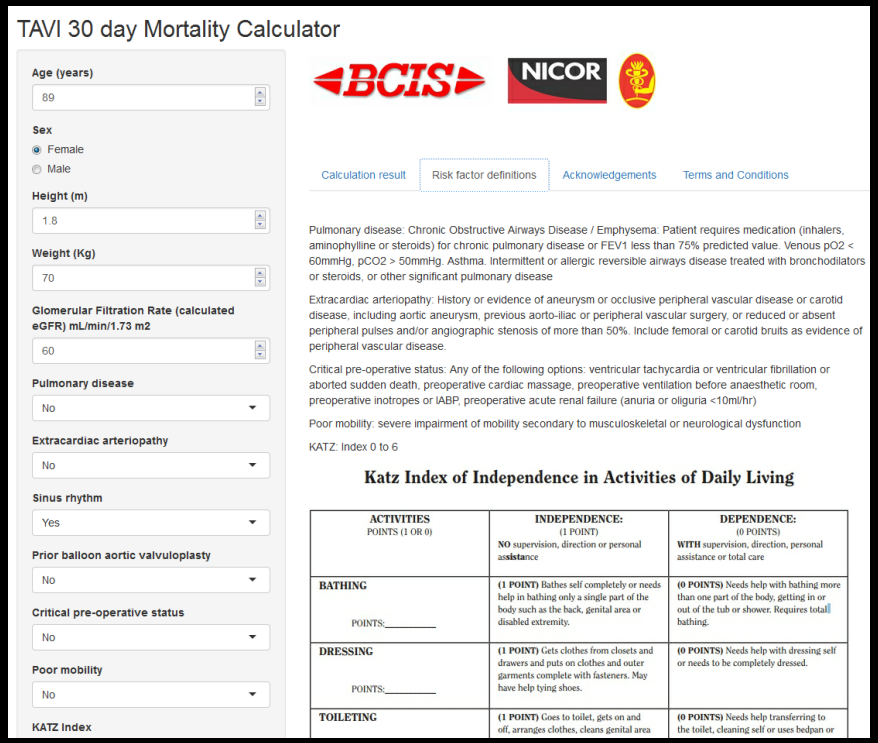
TAVI risk calculator

2016 data

(data extracted May 2017)

https://www.bcis.org.uk/resources/tavi-risk-calculator/





Acknowledgments

NICOR for data and project management
Luca Valnegri (NICOR) for programming of Shiny analytic platform
All staff at every TAVI centre for uploading procedural data